CHAPTER 1

VI-MATHEMATICS-NCERT

1. KNOWING OUR NUMBERS (NOTES)

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1.

Number	In words
1	One
2	Two
3	Three
4	Four
5	Five
6	Six
7	Seven
8	Eight
9	Nine
10	Ten
11	Eleven
12	Twelve
13	Thirteen
14	Fourteen
15	Fifteen

16	Sixteen
17	Seventeen
18	Eighteen
19	Nineteen
20	Twenty
30	Thirty
40	Forty
50	Fifty
60	Sixty
70	Seventy
80	Eighty
90	Ninety
100	One hundred
200	Two hundred
300	Three hundred
400	Four hundred

500	Five hundred
600	Six hundred
700	Seven hundred
800	Eight hundred
900	Nine hundred
1,000	One thousand
2,000	Two thousand
3,000	Three thousand
4,000	Four thousand
5,000	Five thousand
6,000	Six thousand
7,000	Seven thousand
8,000	Eight thousand
9,000	Nine thousand
10,000	Ten thousand
90,000	Ninety thousand

Try These

Can you instantly find the greatest and the smallest numbers in each row?

1. 382, 4972, 18, 59785, 750.

Ans. The greatest= 59785 and the smallest.= 18

2. 1473, 89423, 100, 5000, 310.

Ans. The greatest =89423 and the smallest=100

3. 1834, 75284, 111, 2333, 450.

Ans. The greatest=75284 and the smallest=111

4. 2853, 7691, 9999, 12002, 124

Ans. The greatest=12002 and the smallest=124.

(a) 4536, 4892, 4370, 4452.

Ans. The greatest=4892 and the smallest=4370.

(b) 15623, 15073, 15189, 15800.

Ans. The greatest=15800 and the smallest=15073.

(c) 25286, 25245, 25270, 25210.

Ans. The greatest=25286 and the smallest=25210.

(d) 6895, 23787, 24569, 24659.

Ans. The greatest=24659 and the smallest6895.

Try These

1. **Use the given digits without repetition and make the greatest and smallest 4-digit numbers.**

Digits	greatest 4-digit number	smallest 4-digit number
(a) 2,8,7,4	8742	2478
(b) 9,7,4,1	9741	1479
(c) 4,7,5,0	7540	4057
(d) 1,7,6,2	7621	1267
(e) 5,4,0,3	5430	3045

2. **Now make the greatest and the smallest 4-digit numbers by using any one digit twice**

Digits	greatest 4-digit number	smallest 4-digit number
(a) 3,8,7	8873	3378
(b) 9,0,5	9950	5009
(c) 0,4,9	9940	4009
(d) 8,5,1	8851	1158

3. **Make the greatest and the smallest 4-digit numbers using any four different digits with conditions as given .**

Condition	greatest 4-digit number	smallest 4-digit number
(a) Digit 7 is always at ones place	9867	1027
(b) Digit 4 is always at tens place	9945	1045
(c) Digit 9 is always at hundreds place	9940	1905
(d) Digit 1 is always at thousands place	1987	1021

4. **Take two digits, say 2 and 3. Make 4-digit numbers using both the digits equal number of times.**

Ans:(i) 3322 (ii) 3223 (iii) 3232 (iv) 2323 (v) 2332 (vi) 2233

3322 is the greatest number and 2233 is the smallest number.

Ascending order: Arrangement from the smallest to the greatest.

Descending order: Arrangement from the greatest to the smallest.

1. **Arrange the following numbers in ascending order :**

(a) 847, 9754, 8320, 571

Ascending order: 571, 847, 8320, 9754

Descending order: 9754, 8320, 847, 571.

(b) 9801, 25751, 36501, 38802

Ascending order: 9801, 25571, 36501, 38802.

Descending order: 38802, 36501, 25571, 9801.

Introducing 10,000

The greatest 4-digit number+1 = 9999 +1=10000 = Ten thousand (Smallest 5- digit number)

Try These

Read and expand the numbers.

(i) 20,000 – Twenty thousand

$20000 = 2 \times 10000$

(ii) 26000- Twenty six thousand.

$26000=2\times10000+6\times1000$

(iii) 38400-Thirty eight thousand four hundred

$38400=3 \times 10000 + 8 \times 1000+ 4\times100$

(iv) 65740 -Sixty five thousand seven hundred forty.

$65740=6 \times 10000 + 5 \times 1000 + 7 \times 100 + 4 \times 10$

(v) 89324 -Eighty nine thousand three hundred twenty four

$89324=8 \times 10000 + 9 \times 1000 + 3 \times 100 + 2 \times 10 + 4 \times 1$

(vi) 50000- Fifty thousand

$50000=5\times10000$

(vii) 41000-Fortyone thousand.

$41000=4\times10000+1\times1000.$

(viii) 47300- Forty seven thousand three hundred.

$47300=4\times10000+7\times1000+3\times100.$

(ix) 57630- Fifty seven thousand six hundred thirty.

$57630=5\times10000+7\times1000+6\times100+3\times10$

(x) 29485- Twenty nine thousand four hundred eighty five.

$29485=2 \times 10000 + 9 \times 1000 + 4 \times 100 + 8 \times 10 + 5 \times 1$

(xi) 29085- Twenty nine thousand eighty five.

$29085=2 \times 10000 + 9 \times 1000 + 8 \times 10 + 5 \times 1$

(xii) 20085- Twenty thousand eighty five.

$20085=2 \times 10000 + 8 \times 10 + 5 \times 1$

(xiii) 20005- Twenty thousand five.

$20005 = 2 \times 10000 + 5 \times 1$

Introducing 1,00,000

Greatest 5-digit number+1=99,999+1=1,00,000 is named one lakh(Six digit smallest number)

Try These

Read and expand the numbers

(i) 3,00,000 – Three lakh

$3,00,000 = 3 \times 1,00,000$

(ii) 3,50,000 – Three lakh fifty thousand

$3,50,000 = 3 \times 1,00,000 + 5 \times 10,000$

(iii) 3,53,500 three lakh fifty three thousand five hundred

$3,53,500 = 3 \times 1,00,000 + 5 \times 10,000 + 3 \times 1000 + 5 \times 100.$

(iv) 4,57,928 – Four lakh fifty seven thousand nine hundred twenty eight.

$4,57,928 = 4 \times 1,00,000 + 5 \times 10,000 + 7 \times 1000 + 9 \times 100 + 2 \times 10 + 8 \times 1$

(v) 4,07,928 – Four lakh seven thousand nine hundred twenty eight.

$4,07,928 = 4 \times 1,00,000 + 7 \times 1000 + 9 \times 100 + 2 \times 10 + 8 \times 1$

(vi) 4,00,829 – Four lakh eight hundred twenty eight.

$4,00,829 = 4 \times 1,00,000 + 8 \times 100 + 2 \times 10 + 8 \times 1$

(vii) 4,00,029 – Four lakh twenty nine.

$4,00,029 = 4 \times 1,00,000 + 2 \times 10 + 9 \times 1$

Larger numbers

Complete the pattern :

$9 + 1 = 10$

$99 + 1 = 100$

$999 + 1 = 1000$

$9,999 + 1 = 10,000$

$99,999 + 1 = 1,00,000$

$9,99,999 + 1 = 10,00,000$

$99,99,999 + 1 = 1,00,00,000$

Try These

1. 10-1=9
2. 100-1=99
3. 1,000-1=999
4. 10,000-1=9,999
5. 1,00,000-1=99,999
6. 1,00,00,000-1=99,99,999

Try These

1. Give five examples where the number of things counted would be more than 6-digit number

2. **Starting from the greatest 6-digit number, write the previous five numbers in descending order.**

Ans: 9,99,999 ; 9,99,998 ; 9,99,997 ; 9,99,996 ; 9,99,995 ; 9,99,994

3. **Starting from the smallest 8-digit number, write the next five numbers in ascending order and read them.**

Ans: 1,00,00,000 ; 1,00,00,001 ; 1,00,00,002 ; 1,00,00,003 ; 1,00,00,004 ; 1,00,00,005.

Indian system of numeration (hindu-arabic)											
Crores					Lakhs		Thousands		Units		
TThCr	ThCr	HCr	TCr	Cr	Tlakh	Lakh	TTh	Th	H	T	O
International system place value chart											
Billions			Millions			Thousands			Ones		
HBil	TBil	Bil	HMil	TMil	Mil	HTh	TTh	Th	H	T	O

Try These

1. **Read these numbers. Write them using placement boxes and then write their expanded forms.**

(i) 4,75,320 – Four lakh seventy five thousand three hundred twenty.

$4,75,320 = 4 \times 1,00,000 + 7 \times 10,000 + 5 \times 1,000 + 3 \times 100 + 2 \times 10$

(ii) 98,47,215 – Ninety eight lakh forty seven thousand two hundred fifteen.

$98,47,215 = 9 \times 10,00,000 + 8 \times 1,00,000 + 4 \times 10,000 + 7 \times 1,000 + 2 \times 100 + 1 \times 10 + 5 \times 1$

(iii) 9,76,45,310 – Nine crore seventy six lakh forty five thousand three hundred ten.

$9,76,45,310 = 9 \times 1,00,00,000 + 7 \times 10,00,000 + 6 \times 1,00,000 + 4 \times 10,000$

$+5 \times 1,000 + 3 \times 100 + 1 \times 10$

(iv) 3,04,58,094 – Three crore four lakh fifty eight thousand ninety four.

$3,04,58,094 = 3 \times 1,00,00,000 + 4 \times 1,00,000 + 5 \times 10,000 + 8 \times 1,0008 + 9 \times 10 + 4 \times 1$

(a) The smallest number=4,75,320

(b) The greatest number=9,76,45,310.

(c) Ascending order: 4,75,320; 98,47,215; 3,04,58,094; 9,76,45,310.

Descending order: 9,76,45,310; 3,04,58,094; 98,47,215; 4,75,320.

2. Read these numbers. Write these numbers using placement boxes and then using commas in Indian as well as International System of Numeration. Arrange these in ascending and descending order.

(i) 527864 (ii) 95432 (iii) 18950049 (iv) 70002509

Sol: Indian system of Numeration:

(i) 5,27,864 (ii) 95,432 (iii) 1,89,50,049 (iv) 7,00,02,509

International System of Numeration

(i) 527,864 (ii) 95,432 (iii) 18,950,049 (iv) 70,002,509

Ascending order: (i) 95,432 (ii) 5,27,864 (iii) 18,950,049 (iv) 70,002,509

Descending order: (i) 70,002,509 (ii) 18,950,049 (iii) 5,27,864 (iv) 95,432

Try These

1. **You have the following digits 4, 5, 6, 0, 7 and 8. Using them, make five numbers each with 6 digits. (a) Put commas for easy reading. (b) Arrange them in ascending and descending order.**

Sol: (i) 4,56,078 (ii) 5,60,784 (iii) 6,08,457 (iv) 7,45,086 (v) 8,54,067

Ascending order: (i) 4,56,078 (ii) 5,60,784 (iii) 6,08,457 (iv) 7,45,086 (v) 8,54,067

Descending order: (i)) 8,54,067 (ii) 7,45,086 (iii)) 6,08,457 (iv) 5,60,784 (v) 4,56,078

2. **Take the digits 4, 5, 6, 7, 8 and 9. Make any three numbers each with 8 digits. Put commas for easy reading**

Sol: (i) 4,56,57,,489 (ii) 5,67,78,498 (iii) 6,45,54,789

3. **From the digits 3, 0 and 4, make five numbers each with 6 digits. Use commas.**

Sol: (i) 3,03,430 (ii) 3,04,340 (iii) 4,30,034 (iv) 4,03,330 (v) 4,33,004

EXERCISE 1.1

1. **Fill in the blanks**:
   (a) 1 lakh = **Ten** ten thousand.
   (b) 1 million = **Ten** hundred thousand.
   (c) 1 crore = **Ten** ten lakh.
   (d) 1 crore = **Ten** million.
   (e) 1 million =**Ten** lakh
2. **Place commas correctly and write the numerals**:

(a) Seventy three lakh seventy five thousand three hundred seven.

Ans: 73,75,307

(b) Nine crore five lakh forty one.

Ans: 9,05,00,041

(c) Seven crore fifty two lakh twenty one thousand three hundred two.

Ans: 7,52, 21,302.

(d) Fifty eight million four hundred twenty three thousand two hundred two.

Ans: 58,423,202.

(e) Twenty three lakh thirty thousand ten.

Ans: 23,30,010

3. Insert commas suitably and write the names according to Indian System of Numeration.

(a) 8,75,95,762

Ans: Eight crore seventy-five lakh ninety-five thousand seven hundred sixty two.

(b) 85,46,283

Ans: Eighty-five lakh forty-six thousand two hundred eighty-three.

(c) 9,99,00,046

Ans: Nine crore ninety-nine lakh forty six

(d) 9,84,32,701

Ans: Nine crore eighty-four lakh, thirty-two thousand seven hundred one.

4. Insert commas suitably and write the names according to International System of Numeration :

(a) 78,921,092

Ans: Seventy-eight million, nine hundred twenty-one thousand, ninety-two

(b) 7,452,283

Ans: Seven million four hundred fifty-two thousand two hundred eighty-three.

(c) 99,985,102

Ans: Ninety-nine million nine hundred eighty-five thousand, one hundred two

(d) 48,049,831

Ans: Forty-eight million forty-nine thousand eight hundred thirty one.

Large Numbers in Practice

(a) 10 millimetres = 1 centimetre

(b) 1 metre = 100 centimetres= = 1000 millimetres

(c) 1 kilometre = 1000 metres=100,000 centimetres= 10,00,000 millimetres

(d) 1 gram = 1000 milligrams

(e) 1 kilogram = 1000 grams=10, 00,000 milligrams.

(f) 1 litre = 1000 millilitres.

Try These

1. How many centimetres make a kilometre?

Sol: 100,000 centimetres=1 kilometre

2. **Name five large cities in India. Find their population. Also, find the distance in kilometres between each pair of these cities.**

Sol:

City	Population
Hyderabad	10,801,000
Delhi	32,941,000
Mumbai	21,297,000
Kolakata	15,333,000
Bengaluru	13,608,000

(i)

Two cities	Distance
Hyderabad-Delhi	1559 km
Hyderabad-Mumbai	716 km
Hyderabad - Kolkata	1192 km
Hyderabad-Bengaluru	575 km

3. How many milligrams make one kilogram?

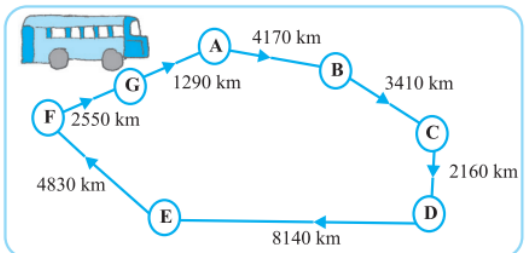
Sol: 10,00,000 milligrams=1 kilogram.

4. A box contains 2,00,000 medicine tablets each weighing 20 mg. What is the total weight of all the tablets in the box in grams and in kilograms?

Sol: Weight of 1 tablet=20 mg

Weight of 2,00,000 tablets =2,00,000×20 mg=40,00,000 mg=4000 g=4 kg.

5. A bus started its journey and reached different places with a speed of 60 km/hour. The journey is shown on



(i) Find the total distance covered by the bus from A to D.

Sol: AB+BC+CD= 4170 +3410+2160=9740 km

(ii) Find the total distance covered by the bus from D to G.

Sol: DE+EF+FG=8140+4830+2550=15520 km

(iii) Find the total distance covered by the bus, if it starts from A and returns back to A.

Sol: AB+BC+CD+ DE+EF+FG+GA=9740 km+15520km+1290km=26550km

(iv) Can you find the difference of distances from C to D and D to E?

Sol: DE-CD=8140 km-2160 km=5980 km

(v) (a) Time taken by the bus to reach A to B $= \frac{\text{Distance}}{\text{Speed}} = \frac{4170}{60} = 69\frac{1}{2}$ hours

(b) Time taken by the bus to reach C to D $= \frac{\text{Distance}}{\text{Speed}} = \frac{2160}{60} = 36$ hours

(c) Time taken by the bus to reach E to G $= \frac{\text{Distance}}{\text{Speed}} = \frac{4830 + 2550}{60} = \frac{7380}{60} = 123$ hours

(d) Time taken by the bus to total journey $= \frac{\text{Distance}}{\text{Speed}} = \frac{26550}{60} = 442\frac{1}{2}$ hours

6.

Raman's shop

Things	Price
Apples	₹ 40 per kg
Oranges	₹ 30 per kg
Combs	₹ 3 for one
Tooth brushes	₹ 10 for one
Pencils	₹ 1 for one
Note books	₹ 6 for one
Soap cakes	₹ 8 for one

The sales during the last year

Apples	2457 kg
Oranges	3004 kg
Combs	22760
Tooth brushes	25367
Pencils	38530
Note books	40002
Soap cakes	20005

(a) Can you find the total weight of apples and oranges Raman sold last year?

Weight of apples = 2457 kg

Weight of oranges = 3004 kg

Therefore, total weight = 2457 kg + 3004 kg = 5461 kg

Answer – The total weight of oranges and apples = 5461 kg.

(b) Can you find the total money Raman got by selling apples?

Ans: The total money Raman got by selling apples=₹40×2457=₹98,280

(c) Can you find the total money Raman got by selling apples and oranges together?

Ans: the total money Raman got by selling apples and oranges together

=₹40×2457+₹30×3004

=₹98,280+₹90,120=₹1,88,400

(d) Make a table showing how much money Raman received from selling each item. Arrange the entries of amount of money received in descending order. Find the item which brought him the highest amount. How much is this amount?

Ans:

Things	Price	sales	Amount received
Apples	₹ 40 per kg	2457 kg	40×2457= ₹98,280
Oranges	₹ 30 per kg	3004 kg	30×3004= ₹90,120
Combs	₹ 3 for one	22760	3×22760= ₹68,280

Tooth brushes	₹ 10 for one	25367	10×25367= ₹2,53,670
Pencils	₹ 1 for one	38530	1×38,530= ₹38,530
Note books	₹ 6 for one	40002	6×40,002= ₹2,40,012
Soap cakes	₹ 8 for one	20005	8×20005= ₹1,60,040

The highest amount of money is received brought the item is "tooth brushes.

The amount=₹2,53,670.

Example 1 : Population of Sundarnagar was 2,35,471 in the year 1991. In the year 2001 it was found to be increased by 72,958. What was the population of the city in 2001?

Solu : Population of the city in 2001 = Population in 1991 + Increase in population

= 2,35,471 + 72,958=3,08,429.

```
  235471
+ 72958
--------
  308429
```

Example 2 : In one state, the number of bicycles sold in the year 2002-2003 was 7,43,000. In the year 2003-2004, the number of bicycles sold was 8,00,100. In which year were more bicycles sold? and how many more?

Sol: the number of bicycles sold in the year 2002-2003=7,43,000

In the year 2003-2004=8,00,100

More bicycles were sold more in the year 2003-2004 than in 2002-2003

The number of more bicycles was sold in the year 2003-2004.

= 8,00,100 − 7,43,000 = 57,100

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  800100
- 743000
--------
  057100
```


Example 3 : The town newspaper is published every day. One copy has 12 pages. Everyday 11,980 copies are printed. How many total pages are printed everyday.

Sol: Number of pages in one copy=12

Number of pages in 11,980 copies=12×11,980=1,43,760

Everyday 1,43,760 pages are printed.

```
  11980
×    12
--------
  23960
+ 119800
--------
  143760
```

Example 4 : The number of sheets of paper available for making notebooks is 75,000. Each sheet makes 8 pages of a notebook. Each notebook contains 200 pages. How many notebooks can be made from the paper available?

Sol: One sheet=8 pages

```
  75000
×     8
--------
 600000
```

```
      3000
   ------
200 ) 600000
    - 600
    ------
      0000
```

75,000 sheets=75,000×8 pages=6,00,000 pages

One note book=200 pages

Number of note books=6,00,000÷200=3000

EXERCISE 1.2

1. **A book exhibition was held for four days in a school. The number of tickets sold at the counter on the first, second, third and final day was respectively 1094, 1812, 2050 and 2751. Find the total number of tickets sold on all the four days.**

Sol: First day =1,094
Second day =1,812
Third day =2,050
Fourth day =2,751
7,707

The total number of tickets sold on all the four days=7,707

2. **Shekhar is a famous cricket player. He has so far scored 6980 runs in test matches. He wishes to complete 10,000 runs. How many more runs does he need?**

Sol: Runs scored by Shekhar=6980

The number of runs he wants to complete=1000

More runs does Shekhar need=1000 − 6980 = 3020

3. **In an election, the successful candidate registered 5,77,500 votes and his nearest rival secured 3,48,700 votes. By what margin did the successful candidate win the election?**

Sol: Number of votes secured by successful candidate=5,77,500

Number of votes secured by rival candidate=3,48,700

The margin by the successful candidate win the election = 5,77,500 − 3,48,700 = 2,28,800

4. **Kirti bookstore sold books worth ₹ 2,85,891 in the first week of June and books worth ₹ 4,00,768 in the second week of the month. How much was the sale for the two weeks together? In which week was the sale greater and by how much?**

Sol: First week =₹ 2,85,891

Second week=₹ 4,00,768

Total = ₹6,86,659

The sale for the two weeks together=₹ 6,86,659

The second week sale is the greater.

The greater sale = 4,00,768 − 2,85,891 = ₹1,14,877

5. Find the difference between the greatest and the least 5-digit number that can be written using the digits 6, 2, 7, 4, 3 each only once.

Sol: The greatest number=76,432 ; The least number=23,467

Difference = 76,432 − 23,467 = 52965

6. A machine, on an average, manufactures 2,825 screws a day. How many screws did it produce in the month of January 2006?

Sol: Number of screws manufactured in a day=2,825

Number of screws manufactured in January=31×2,825=87,575

$$\begin{array}{r} 2825 \\ \times\ 31 \\ \hline 2825 \\ 8475\ \times \\ \hline 87575 \end{array}$$

7. A merchant had ₹ 78,592 with her. She placed an order for purchasing 40 radio sets at ₹ 1200 each. How much money will remain with her after the purchase?

Sol: Price of one radio set=1200

Price of 40 radio sets=40×1200=48,000

Money available with merchant=78,592

Money remain after the purchase = 78,592 − 48,000 = 30,592

8. A student multiplied 7236 by 65 instead of multiplying by 56. By how much was his answer greater than the correct answer?

Sol: The student multiplied by 65-56=9 times more

The answer greater than the correct answer=7236×9=65,124

(or)

Incorrect multiplication

$$\begin{array}{r} 7236 \\ \times\ 65 \\ \hline 36180 \\ 43416\ \times \\ \hline 470340 \end{array}$$

Correct multiplication

$$\begin{array}{r} 7236 \\ \times\ 56 \\ \hline 43416 \\ 36180\ \times \\ \hline 405216 \end{array}$$

The answer greater than the correct answer $= 4{,}70{,}340 - 4{,}05{,}216 = 65{,}124$

9. To stitch a shirt, 2 m 15 cm cloth is needed. Out of 40 m cloth, how many shirts can be stitched and how much cloth will remain?

Sol: Total length of cloth= 40m=4000 cm

Cloth needed for one shirt=2 m 15 cm=215 cm

Now $\frac{4000}{215} = \frac{800}{43} = 18\frac{26}{43}$

Number shirts can be switched=18

The remaining cloth $= 4000 - 18 \times 125 = 4000 - 3870 = 130$ cm $= 1$ m 30 cm.

10. Medicine is packed in boxes, each weighing 4 kg 500g. How many such boxes can be loaded in a van which cannot carry beyond 800 kg?

Sol: Weight of one box=4 kg 500 g=4500 g

Capacity of van=800 kg=800000 g

Now $\frac{800\cancel{00}}{45\cancel{00}} = 177\frac{35}{45}$

Number of boxes can be loaded in the van $= 177$

11. The distance between the school and a student's house is 1 km 875 m. Everyday she walks both ways. Find the total distance covered by her in six days.

Sol: Distance covered in one day= 2×1 km 875 m=2×1875 m=3750 m

Distance covered in six days=6×3750 m= 22500 m=22 km 500 m

$$\begin{array}{r} 3750 \\ \times\ 6 \\ \hline 22500 \end{array}$$

12. A vessel has 4 litres and 500 ml of curd. In how many glasses, each of 25 ml capacity, can it be filled?

Sol: Quantity of curd in vessel=4 litres 500 ml=4500 ml

Capacity of one glass=25 ml

Number of glasses to be filled=4500÷25= 180

$$\begin{array}{r} 180 \\ 25\overline{)4500} \\ 25 \\ \hline 200 \\ 200 \\ \hline 0 \end{array}$$

1. 1, 2, 3, 4,... counting numbers as Natural numbers.
2. **Predecessor and successor**: Just before number is called predecessor and just after number is called successor.
3. If you add 1 to a number, we get its successor. If you subtract 1 from a number, you get its predecessor.

Try These

1. **Write the predecessor and successor of 19; 1997; 12000; 49; 100000.**

Predecessor	Number	Successor
18	19	20
1996	1997	1998
11999	12000	12001
48	49	50
99999	100000	100001

2. **Is there any natural number that has no predecessor?**

Sol: The natural number 1 has no predecessor.

3. **Is there any natural number which has no successor? Is there a last natural number?**

Sol: Every natural numbers has a successor. There is no last natural number.

Whole Numbers

The natural numbers along with zero form the collection of whole numbers.

Whole numbers (W)={0,1,2,3,4,5...}

Try These

1. **Are all natural numbers also whole numbers?**

Sol: Yes, all natural numbers also whole numbers.

2. **Are all whole numbers also natural numbers?**

Sol: No, 0 is a whole number but not natural number.

3. **Which is the greatest whole number?**

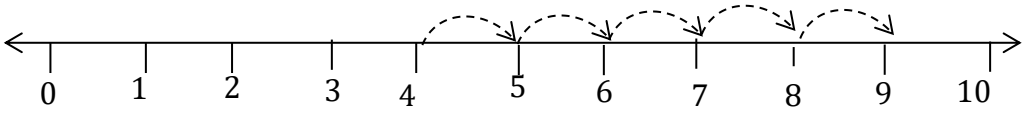
Sol: There is no greatest whole number.

Try These

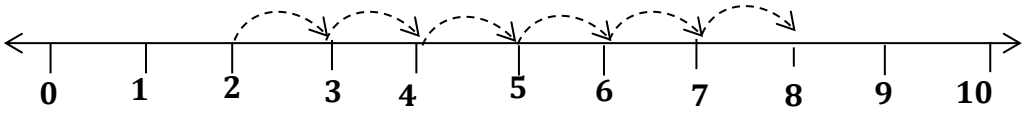
In addition move towards right with 1 jump of 1 unit.

Find 4 + 5; 2 + 6; 3 + 5 and 1+6 using the number line

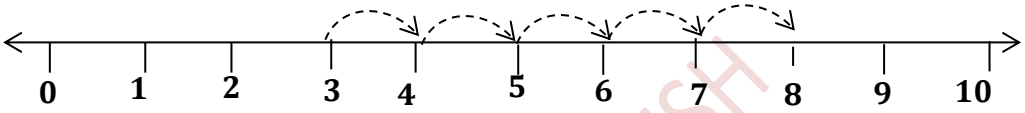
4+5=9



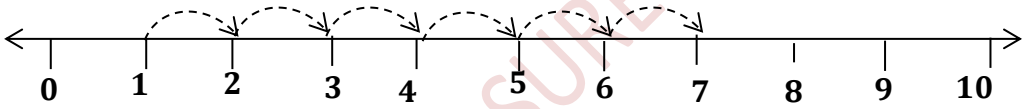
2+6=8



3+5=8



1+6=7



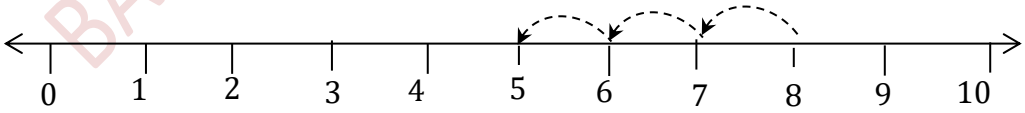
Subtraction on the number line:

In subtraction move towards left with 1 jump of 1 unit.

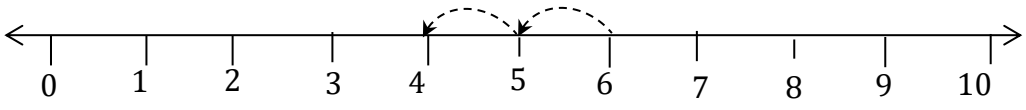
Try These

Find 8 – 3; 6 – 2; 9 – 6 using the number line

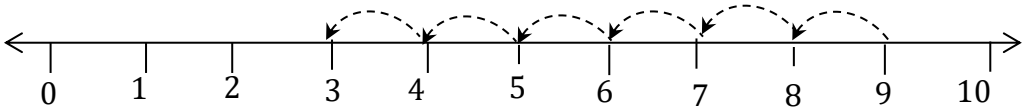
8 − 3 = 5



6 − 2 = 4



9 − 6 = 3

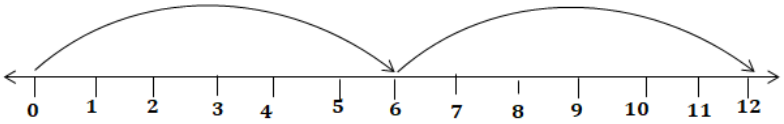


Multiplication on the number line

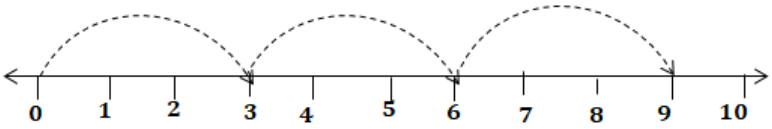
Try These

Find 2 × 6; 3 × 3; 4 × 2 using the number line.

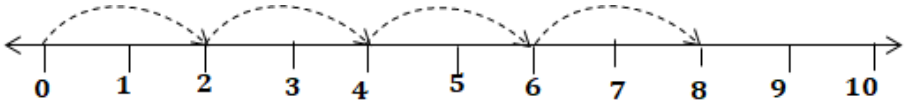
$2 \times 6 = 12$



$3 \times 3 = 9$



$4 \times 2 = 8$



EXERCISE 2.1

1. Write the next three natural numbers after 10999.

Sol: 11,000; 11,001; 11,002

2. Write the three whole numbers occurring just before 10001.

Sol: 9,998; 9,999; 10,000

3. Which is the smallest whole number?

Sol: 0(zero)

4. How many whole numbers are there between 32 and 53?

Sol: $(53 - 32) - 1 = 21 - 1 = 20$

5. Write the successor of

(a) 2440701 (b) 100199 (c) 1099999 (d) 2345670

Sol: (a) Successor of 2440701 is 2440701+1=2440702

(b) Successor of 100199 is 100199+1=100200

(c) Successor of 1099999 is 1099999+1=1100000

(d) Successor of 2345670 is 2345670+1=2345671

6. Write the predecessor of :

(a) 94 (b) 10000 (c) 208090 (d) 7654321

Sol: (a) predecessor of 94 is $94 - 1 = 93$.

(b) Predecessor of 10000 is $10,000 - 1 = 9,999$.

(c) Predecessor of 208090 is $2,08,090 - 1 = 2,08,089$.

(d) Predecessor of 7654321 is $7654321 - 1 = 7654320$.

7. **In each of the following pairs of numbers, state which whole number is on the left of the other number on the number line. Also write them with the appropriate sign (>, <) between them.**

(a) 530, 503 (b) 370, 307 (c) 98765, 56789 (d) 9830415, 10023001

Sol: (a) $530 > 503$ (b) $370 > 307$ (c) $98765 > 56789$ (d) $9830415 < 10023001$

8. **Which of the following statements are true (T) and which are false (F) ?**

(a) Zero is the smallest natural number. (F)
(1 is the smallest natural number)

(b) 400 is the predecessor of 399. (F)
(400 is the successor of 399)

(c) Zero is the smallest whole number. (T)

(d) 600 is the successor of 599. (T)

(e) All natural numbers are whole numbers. (T)

(f) All whole numbers are natural numbers.

(g) The predecessor of a two digit number is never a single digit number. (F)
(The predecessor of 10 is 9 a single digit number)

(h) 1 is the smallest whole number.(F)
(0 is the smallest whole number)

(i) The natural number 1 has no predecessor. (T)

(j) The whole number 1 has no predecessor. (F)
(0 is the predecessor of 1)

(k) The whole number 13 lies between 11 and 12. (F)
(No whole numbers between 11 and 12)

(l) The whole number 0 has no predecessor. (T)

(m) The successor of a two digit number is always a two digit number.(F)
(The successor of 99 is 100 a three digit number)

CHAPTER 3

VI-MATHEMATICS-NCERT

3. PLAYING WITH NUMBERS (notes)

PREPARED BY: BALABHADRA SURESH

1. **Factor:** A factor of a number is an exact divisor of that number.

NUMBER	FACTORS
1	1
2	1,2
3	1,3
4	1,2,4
5	1,5
6	1,2,3,6
7	1,7

NUMBER	FACTORS
8	1,2,4,8
9	1,3,9
10	1,2,5,10
11	1,11
12	1,2,3,4,6,12
13	1,13
14	1,2,7,14

NUMBER	FACTORS
15	1,3,5,15
16	1,2,4,8,16
17	1,17
18	1,2,3,6,9,18
19	1,19
20	1,2,4,5,10,20
21	1,3,7,21

2. 1 is a factor of every number.
3. Every number is a factor of itself.
4. Every factor is less than or equal to the given number.
5. Number of factors of a given number are finite
6. **Multiple:** A number multiplied by 1,2,3,4,...we get multiples of that number

Number	Multiples
1	1, 2, 3, 4, 5, 6, 7,...
2	2, 4, 6, 8, 10, 12, 14,.....
3	3, 6, 9, 12, 15,18,...
4	4, 8,12,16,20,24,...
5	5,10,15,20,25,30,..
6	6,12,18,24,30,36,...
7	7,14,21,28,35,42,49,56,63,70,.

7. Every multiple of a number is greater than or equal to that number
8. The number of multiples of a given number is infinite.
9. Every number is a multiple of itself.

Perfect number:

A number for which sum of all its factors is equal to twice the number is called a perfect number.

Ex: (i) Factors of 6 are 1,2,3,6

Sum of factors of $6=1+2+3+6=12=2\times6$

$\therefore$ 6 is a perfect number

(ii) Factors of 28 are 1,2,4,7,14,28.

Sum of factors of $28=1+2+4+714+28=56=2\times28$

$\therefore$ 28 is a perfect number

(iii) Next perfect number=496

Try These

Find the possible factors of 45, 30 and 36.

(i) $45=1\times45$
$=3\times15$
$=5\times9$
Factors of 45 are:1,3,5,9,15,45

(ii) $30=1\times30$
$=2\times15$
$=3\times10$
$=5\times6$
Factors of 30 are:1,2,3,5,6,10,15,30.

(iii) $36=1\times36$
$=2\times18$
$=3\times12$
$=4\times9$
$=6\times6$
Factors of 36 are:1,2,3,4,6,9,12,18,36.

Example 1 : Write all the factors of 68.

Sol: $68 = 1 \times 68$
$= 2 \times 34$
$= 4 \times 17$
The factors of 68 are 1, 2, 4,17,34, 68.

Example 2 : Find the factors of 36.

Sol: $36 = 1 \times 36$
$= 2 \times 18$
$= 3 \times 12$
$= 4 \times 9$
$= 6 \times 6$
The factors of 68 are 1, 2, 3,4,6,9,12,18,36.

Example 3 : Write first five multiples of 6.

Sol: First 5 multiples of 6 are: $6 \times 1, 6 \times 2, 6 \times 3, 6 \times 4, 6 \times 5$

i.e. 6, 12, 18, 24 and 30.

EXERCISE 3.1

1. **Write all the factors of the following numbers :**

(a) 24

Sol:$24 = 1 \times 24$
$= 2 \times 12$
$= 3 \times 8$
$= 4 \times 6$
Factors of 24 are : 1,2,3,4,6,8,12,24

(b) 15

Sol: $15=1\times15=3\times5$
Factors of 15 are: 1,3,5,15.

(c) 21

Sol:21=1×21
=3×7
Factors of 21 are:1,3,7,21

(d) 27

Sol: 27=1×27
=3×9
Factors of 27 are: 1,3,9,27.

(e) 12

Sol: 12=1×12
=2×6
=3×4
Factors of 12 are:1,2,3,4,6,12

(f) 20

Sol: 20=1×20
=2×10
=4×5
Factors of 20 are 1,2,4,5,10,20.

(g) 18

Sol: 18=1×18
=2×9
=3×6
Factors of 18 are 1,2,3,6,9,18.

(h) 23

Sol: 23=1×23
Factors of 23 are 1,23.

(i) 36

Sol: 36=1×36
=2×18
=3×12
=6×6
Factors of 36 are 1,2,3,6,12,18,36

2. Write first five multiples of :

(a) 5 (b) 8 (c) 9

Sol: (a) First 5 multiples of 5 are:5,10,15,20,25.
(b) First 5 multiples of 8 are: 8,16,24,32,40.
(c) First 5 multiples of 9 are: 9,18,27,36,45.

3. **Match the items in column 1 with the items in column 2.**

(i) 35 (b) Multiple of 7
(ii) 15 (d) Factor of 30
(iii) 16 (a) Multiple of 8
(iv) 20 (f) Factor of 20
(v) 25 (e) Factor of 50

4. Find all the multiples of 9 upto 100.

Sol: Multiples of 9 are: 9,18,27,36,45,54,63,72,81,90,99

Prime and Composite Numbers

Number	Factors	No. of factors
1	1	1
2	1,2	2
3	1,3	2
4	1,2,4	3
5	1,5	2
6	1,2,3,6	4
7	1,7	2
8	1,2,4,8	4
9	1,3,9	3
10	1,2,5,10	4

Number	Factors	No. of factors
11	1,11	2
12	1,2,3,4,6,12	6
13	1,13	2
14	1,2,7,14	4
15	1,3,5,15	4
16	1,2,4,8,16	5
17	1,17	2
18	1,2,3,6,9,18	6
19	1,19	2
20	1,2,4,5,10,20	6

The numbers having exactly two factors are **prime numbers**.

Numbers having more than two factors are called **Composite numbers**

1 is neither a prime nor a composite number

Prime numbers up to 100 (25 numbers)
2,3,5,7,11,13,17,19,23,29,31,37,41,47,53,59,61,67,71,73,79,83,89,97.

Twin primes:

Two prime numbers whose difference is 2 are called twin primes

Ex: 3,5; 5,7; 11,13; 17,19; 71,73;

Try These

Observe that $2 \times 3 + 1 = 7$ is a prime number. Here, 1 has been added to a multiple of 2 to get a prime number. Can you find some more numbers of this type?

(i) $2\times5+1=11$ is a prime number

(ii) $2\times6+1=13$ is a prime number

(iii) $2\times8+1=17$ is a prime number

(iv) $2\times9+1=19$ is a prime number

(v) $2\times11+1=23$ is a prime number

Example 4 : Write all the prime numbers less than 15

Sol: 2,3,5,7,11,13

Even and odd numbers .

The multiples of 2 are called even numbers. The rest of natural numbers are called odd numbers

Even numbers: 2,4,6,8,10,12,14,16,18,20,....

Odd Numbers: 1,3,5,7,9,11,13,15,17,19,.....

1. 2 is the even prime number.
2. Every prime number except 2 is odd.

EXERCISE 3.2

1. What is the sum of any two (a) Odd numbers? (b) Even numbers?

Sol: (a) (i) 1+3=4 (ii) 3+7=10 (iii) 5+7=12

Sum of two odd numbers is even number.

(b) (i) 2+4=6 (ii) 4+12=16 (iii) 8+12=20

Sum of two even numbers is even number.

2. State whether the following statements are True or False:

(a) The sum of three odd numbers is even. (F)

(b) The sum of two odd numbers and one even number is even. (T)

(c) The product of three odd numbers is odd. (T)

(d) If an even number is divided by 2, the quotient is always odd. (F)
(e) All prime numbers are odd. (F)
(f) Prime numbers do not have any factors. (F)
(g) Sum of two prime numbers is always even. (F)
(h) 2 is the only even prime number. (T)
(i) All even numbers are composite numbers. (F)
(j) The product of two even numbers is always even. (T)

3. The numbers 13 and 31 are prime numbers. Both these numbers have same digits 1 and 3. Find such pairs of prime numbers upto 100

Sol: 17,71; 37,73; 79,97.

4. Write down separately the prime and composite numbers less than 20.

Sol: Prime numbers less than 20: 2,3,5,7,11,13,17,19.

Composite numbers less than 20: 4,6,8,9,10,12,14,15,16,18.

5. What is the greatest prime number between 1 and 10?

Sol: 7

6. Express the following as the sum of two odd primes.
(a) 44 (b) 36 (c) 24 (d) 18

Sol: (a) 44=3+41=7+37=13+31

(b) 36=5+31=7+29=13+23=17+19

(c) 24=5+19=7+17=11+13

(d) 18=5+13=7+11

7. Give three pairs of prime numbers whose difference is 2

Sol: (i) 5,7 (ii) 11,13 (iii) 17,19 (iv) 27,29 (v) 41,43

8. Which of the following numbers are prime?
(a) 23 (b) 51 (c) 37 (d) 26

Sol: (a) 23 (c) 37

9. **Write seven consecutive composite numbers less than 100 so that there is no prime number between them.**

Sol: 90,91,92,93,94,95,96.

10. Express each of the following numbers as the sum of three odd primes:
(a) 21 (b) 31 (c) 53 (d) 61

Sol: (a) 21=3+5+13=3+7+11

(b) 31=5+7+19=7+11+13

(c) 53=13+17+23=11+19+23

(d) 61=11+13+37=11+19+31

11. **Write five pairs of prime numbers less than 20 whose sum is divisible by 5.**

Sol: (i) 2,3 (ii) 2,13 (iii) 3,7 (iv) 3,17 (v) 7,13

12. Fill in the blanks :

(a) A number which has only two factors is called a **Prime number**.

(b) A number which has more than two factors is called a **Composite number**.

(c) 1 is neither **Prime** nor **Composite**.

(d) The smallest prime number is **2**.

(e) The smallest composite number is **4.**

(f) The smallest even number is **2**.

Tests for Divisibility of Numbers

1. **Divisibility by 10**: If a number has 0 in the ones place then it is divisible by 10.
   Ex: 10,30,500,420,6000,... are divisible by 10
2. **Divisibility by 5**: A number which has either 0 or 5 in its ones place is divisible by 5.
   Ex: 15,20,35,545,6020,215,...are divisible by 5.
3. **Divisibility by 2** : A number is divisible by 2 if it has any of the digits 0, 2, 4, 6 or 8 in its ones place.
   Ex: 48,50,64,848,520,362,...
4. **Divisibility by 3**: If the sum of the digits is a multiple of 3, then the number is divisible by 3
   Ex: 36,54,153,642,... are divisible by 3.
5. **Divisibility by 6**: if a number is divisible by 2 and 3 both then it is divisible by 6 also.
6. **Divisibility by 4**: A number with 3 or more digits is divisible by 4 if the number formed by its last two digits (i.e. ones and tens) is divisible by 4.
7. **Divisibility by 8** : A number with 4 or more digits is divisible by 8, if the number formed by the last three digits is divisible by 8.
8. **Divisibility by 9** : If the sum of the digits of a number is divisible by 9, then the number itself is divisible by 9
9. **Divisibility by 11**: Find the difference between the sum of the digits at odd places (from the right) and the sum of the digits at even places (from the right) of the number. If the difference is either 0 or divisible by 11, then the number is divisible by 11.

EXERCISE 3.3

1. Using divisibility tests complete the table.

Number	Divisible by								
	2	3	4	5	6	8	9	10	11
128	Yes	No	Yes	No	No	Yes	No	No	No
990	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes
1586	Yes	No	No	No	No	No	No	No	No
275	No	No	No	Yes	No	No	No	No	Yes
6686	Yes	No	No	No	No	No	No	No	No
639210	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes
429714	Yes	Yes	No	No	Yes	No	Yes	No	No
2856	Yes	Yes	Yes	No	Yes	Yes	No	No	No

3060	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
406839	No	Yes	No	No	No	No	No	No	No

2. Using divisibility tests, determine which of the following numbers are divisible by 4; by 8

If the last two digit number is divisible by 4 then the number is divisible by 4.

If the last three digit number is divisible by 8 then the number is divisible by 8.

(a) 572

Sol: Number formed by last two digits=72 =4×18 which is divisible by 4

So, 572 is divisible by4

Number formed last three digits=572 is not divisible by 8

So, 572 is not divisible by 8

(b) 726352

Sol: Number formed by last two digits =52 =4×13 which is divisible by 4

So, 726352 is divisible by4

Number formed last three digits =352 =44×8 which is divisible by 8

So, 726352 is divisible by 8

(c) 5500

Sol: Number formed by last two digits =00

So, 5500 is divisible by 4

Number formed last three digits =500 is not divisible by 8

So, 5500 is not divisible by 8

(d) 6000

Sol: Number formed by last two digits =00

So, 6000 is divisible by 4

Number formed last three digits =000 is divisible by 8

So, 6000 is divisible by 8

(e) 12159

Sol: Number formed by last two digits =59 is not divisible by 8

So, 12159 is divisible by 4

Number formed by last three digits =159 is not divisible by 8

So, 12159 is not divisible by 8

(f) 14560

Sol: Number formed by last two digits =60=4×15

So, 14560 is divisible by 4

Number formed by last three digits =560=8×70 is divisible by 8

So, 14560 is divisible by 8

(g) 21084

Sol: Number formed by last two digits =00

So, 5500 is divisible by 4

Number formed last three digits =500 is not divisible by 8

So, 5500 is not divisible by 8

(h) 31795072

Sol: Number formed by last two digits =72(=4×18) is divisible by 4

So, 31795072 is divisible by 4

Number formed last three digits =072=72(=8×9) is divisible by 8

So, 31795072 is divisible by 8

(i) 1700

Sol: Number formed by last two digits =00

So, 1700 is divisible by 4

Number formed last three digits =700 is not divisible by 8

So, 1700 is not divisible by 8

(j) 2150.

Sol: Number formed by last two digits =50 is not divisible by 4

So, 2150 is not divisible by 4

Number formed last three digits =150 is not divisible by 8

So, 2150 is not divisible by 8

3. **Using divisibility tests, determine which of following numbers are divisible by 6**:

If a number is divisible by 2 and 3 both then it is divisible by 6 also.

(a) 297144

Sol: Last digit=4 . So, 297144 is divisible by 2

Sum of digits=2+9+7+1+4+4=27 is divisible by3

So, 297144 is divisible by 3

Now 297144 is divisible by 2 and 3 .So, 297144 is divisible by 6

(b) 1258

Sol: Last digit=4 . So, 297144 is divisible by 2

Sum of digits=2+9+7+1+4+4=27 is divisible by3

So, 297144 is divisible by 3

Now 297144 is divisible by 2 and 3 .So, 297144 is divisible by 6

(c) 4335

Sol: Last digit=4 . So, 297144 is divisible by 2

Sum of digits=2+9+7+1+4+4=27 is divisible by3

So, 297144 is divisible by 3

Now 297144 is divisible by 2 and 3 .So, 297144 is divisible by 6

(d) 61233

Sol: Last digit=4 . So, 297144 is divisible by 2

Sum of digits=2+9+7+1+4+4=27 is divisible by3

So, 297144 is divisible by 3

Now 297144 is divisible by 2 and 3 .So, 297144 is divisible by 6

(e) 901352

Sol: Last digit=2 . So, 901352 is divisible by 2

Sum of digits=9+0+1+3+5+2=20 is not divisible by3

So, 901352 is not divisible by 3

Now 901352 is divisible by 2 and not divisible by 3 .So, 901352 is not divisible by 6.

(f) 438750

Sol: Last digit=0 . So, 438750 is divisible by 2

Sum of digits=4+3+8+7+5+0=27 is divisible by3

So, 438750 is divisible by 3

Now 438750 is divisible by 2 and 3 .So, 438750 is divisible by 6

(g) 1790184

Sol: Last digit=4 . So, 1790184 is divisible by 2

Sum of digits=1+7+9+0+1+8+4=30 is divisible by3

So, 1790184 is divisible by 3

Now 1790184 is divisible by 2 and 3 .So, 1790184 is divisible by 6

(h) 12583

Sol: Last digit=3 . So, 297144 is not divisible by 2

Now 297144 is not divisible by 2 .So, 297144 is not divisible by 6

(i) 639210

Sol: Last digit=0 . So, 639210 is divisible by 2

Sum of digits=6+3+9+2+1+0=21 is divisible by3

So, 639210 is divisible by 3

Now 639210 is divisible by 2 and 3 .So, 639210 is divisible by 6

(j) 17852.

Sol: Last digit=4 . So, 17852 is divisible by 2

Sum of digits=1+7+8+5+2=23 is not divisible by3

So, 17852 is not divisible by 3

Now 17852 is divisible by 2 and not divisible by 3 .So, 17852 is not divisible by 6.

4. **Using divisibility tests, determine which of the following numbers are divisible by 11**:
(If the difference between the sum of the digits at odd places and the sum of the digits at even places of the number is either 0 or divisible by 11 then the number is divisible by 11)

(a) 5445

Sol: Sum of the digits at odd places=5+4=9

Sum of the digits at even places=4+5=9

Difference=9-9=0

$\therefore$ 5445 is divisible by 11

(b) 10824

Sol: Sum of the digits at odd places=4+8+1=13

Sum of the digits at even places=2+0=2

Difference=13-2=11

$\therefore$ 10824 is divisible by 11

(c) 7138965

Sol: Sum of the digits at odd places=5+9+3+7=24

Sum of the digits at even places=6+8+1=15

Difference=24-15=9

$\therefore$ 7138965 is not divisible by 11

(d) 70169308

Sol: Sum of the digits at odd places=8+3+6+0=17

Sum of the digits at even places=0+9+1+7=17

Difference=17-17=0

$\therefore$ 70169308 is divisible by 11

(e) 10000001

Sol: Sum of the digits at odd places=1+0+0+0=1

Sum of the digits at even places=0+0+0+1

Difference=1-1=0

$\therefore$ 10000001 is divisible by 11

(f) 901153

Sol: Sum of the digits at odd places=3+1+0=4

Sum of the digits at even places=5+1+9=15

Difference=15-4=11

$\therefore$ 901153 is divisible by 11

5. **Write the smallest digit and the greatest digit in the blank space of each of the following numbers so that the number formed is divisible by 3 :**

(a) _ 6724

Sol: Sum of digits=6+7+2+4=19

If we add 2 the number is 21 is divisible by 3

Required smallest digit is 2

If we add 8 the number is 27 is divisible by 3

Required greatest digit=8

(b) 4765 _ 2

Sol: Sum of digits=4+7+6+5+2=24

If we add 0 the number is 24 is divisible by 3

Required smallest digit is 0

If we add 9 the number is 33 is divisible by 3

Required greatest digit=9

6. **Write a digit in the blank space of each of the following numbers so that the number formed is divisible by 11**

(a) 92 _ 389

Sol: Sum of digits at odd places=9+3+2=14

Sum of digits at even places=8+x+9=17+x

Difference=17+x-14=3+x

3+x=0 or 11or 22...

3+x=11

X=8

(b) 8 _ 9484

Sol: Sum of digits at odd places=4+4+x=8+x

Sum of digits at even places=8+9+8=25

Difference=25-8-x=17-x

17-x=0 or 11or 22...

17-x=11

X=6

Common Factors and Common Multiples.

Try These

Find the common factors of

(a) 8, 20

Sol: Factors of 8: 1,2,4,8

Factors of 20: 1,2,4,5,10,20

Common factors of 8,20 : 1,2,4

(b) 9, 15

Sol: Factors of 9: 1,3,9

Factors of 15: 1,3,5,15

Common Factors of 9,15 : 1,3

(c) 4,18

Sol: Factors of 4: 1,2,4

Factors of 18: 1,2,3,6,9,18.

Common Factors of4,18 : 1,2

(d) 4,15

Sol: Factors of 4: 1,2,4.

Factors of 15: 1,3,5,15

Common Factors of 9,15 : 1

(e) 4,12,16

Sol: Factors of 4 : 1,2,4.

Factors of 12: 1,2,3,4,6,12.

Factors of 16: 1,2,4,8,16.

Common Factors of 4,12,16 : 1,2,4

Co-prime numbers:

Two numbers having only 1 as a common factor are called co-prime numbers.

Ex: (i) 4,15 (ii) 7,8 (iii) 12,49 (iv) 18,23

Exp 5 : Find the common factors of 75, 60 and 210

Sol: Factors of 75 are 1, 3, 5, 15, 25 and 75.

Factors of 60 are 1, 2, 3, 4, 5, 6, 10, 12, 15, 30 and 60.

Factors of 210 are 1, 2, 3, 5, 6, 7, 10, 14, 15, 21, 30, 35, 42, 70, 105 and 210.

Thus, common factors of 75, 60 and 210 are 1, 3, 5 and 15.

Exp 6 : Find the common multiples of 3, 4 and 9.

Sol : Multiples of 3 are 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, ...

Multiples of 4 are 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48,...

Multiples of 9 are 9, 18, 27, 36, 45, 54, 63, 72, 81, ...

Clearly, common multiples of 3, 4 and 9 are 36, 72, 108,...

EXERCISE 3.4

1. Find the common factors of :

(a) 20 and 28

Sol: Factors of 20 are 1,2,4,5,10,20.

Factors of 28 are 1,2,4,7,14,28.

Common factors of 20 and 28 are 1,2,4.

(b) 15 and 25

Sol: Factors of 15 are 1,3,5,15.

Factors of 25 are 1,5,25.

Common factors of 15 and 25 are 1,5.

(c) 35 and 50

Sol: Factors of 35 are 1,5,7,35.

Factors of 50 are 1,2,5,10,25,50.

Common factors of 35 and 50 are 1,5.

(d) 56 and 120

Sol: Factors of 56 are 1,2,4,7,8,14,28,56.

Factors of 120 are 1,2,4,5,6,8,10,12,15,20,30,40,60,120.

Common factors of 56 and 120 are 1,2,4,8.

2. Find the common factors of :

(a) 4, 8 and 12

Sol: Factors of 4 are 1,2,4.

Factors of 8 are 1,2,4,8.

Factors of 12 are 1,2,3,4,6,12.

Common Factors of 4,8,12 are 1, 2, and 4

(b) 5, 15 and 25

Sol: Factors of 5 are 1, 5.

Factors of 15 are 1, 3, 5.

Factors of 25 are 1,5,25.

Common Factors of 5, 15, 25 are 1 and 5.

3. Find first three common multiples of :

(a) 6 and 8

Sol: Multiples of 6 are 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, ...

Multiples of 8 are 8, 16, 24, 32, 40, 48, 56, 64, 72, 80,.....

First three common multiples of 6 and 8 are 24,48 and 72

(b) 12 and 18

Sol: Multiples of 12 are 12, 24, 36, 48, 60, 72, 84, 96, 108, 120, 132,...

Multiples of 18 are 18, 36, 54, 72, 90, 108, 126, 144,...

First three common multiples of 12 and 18 are 36,72 and 108.

4. **Write all the numbers less than 100 which are common multiples of 3 and 4.**

Sol: Common multiples of 3 and 4 (multiples of 12) less than 100 are 12,24,36,48,60,72,84,96

5. Which of the following numbers are co-prime?

(a) 18 and 35

Sol: Factors of 18 are 1,2,3,6,9,18

Factors of 35 are 1,5,7,35
Common factor of 18 and 35 is 1
$\therefore$ 18 and 35 are co-primes

(b) 15 and 37

Sol: Factors of 15 are 1,3,5,15
Factors of 35 are 1,37
Common factor of 15 and 37 is 1
$\therefore$ 15 and 37 are co-primes

(c) 30 and 415

Sol: Factors of 30 are 1,2,3,5,6,10,15,30.
Factors of 415 are 1,5,83,415
Common factor s of 30 and 415 are 1,5
$\therefore$ 30 and 415 are not co-primes

(d) 17 and 68

Sol: Factors of 17 are 1,17.
Factors of 68 are 1,2,4,17,34,68
Common factors of 17 and 68 are 1,17
$\therefore$ 17 and 68 are not co-primes.

(e) 216 and 215

Sol: Factors of 216 are 1,2,3,4,6,8,9,12,18,24,27,36,54,72,108,216
Factors of 215 are 1,5,43,215.
Common factor of 18 and 35 is 1
$\therefore$ 18 and 35 are co-primes

(f) 81 and 16

Sol: Factors of 18 are 1,2,3,6,9,18
Factors of 35 are 1,5,7,35
Common factor of 216 and 215is 1
$\therefore$ 216 and 215are co-primes

6. A number is divisible by both 5 and 12. By which other number will that number be always divisible?

Sol: The number divisible by 5 and 12 is $5\times12=60$ and multiples of 60

The required number is 60.

7. A number is divisible by 12. By what other numbers will that number be divisible?

Sol: If a number divisible by 12 then the number divisible by the factors of 12 also.

The number will also divisible by 1,2,3,4,6 and 12

Prime Factorisation

A number is expressed as a product of prime numbers the factorisation is called prime factorisation.

1. Write the prime factorisations of 16,28,38

Sol: 16=2×2×2×2.

28=2×2×7

38=2×19

Expl 7 : Find the prime factorisation of 980.

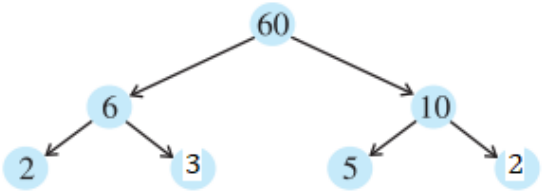
2	980
2	490
5	245
7	49
7	7
	1

Sol: 980=2×2×5×7×7

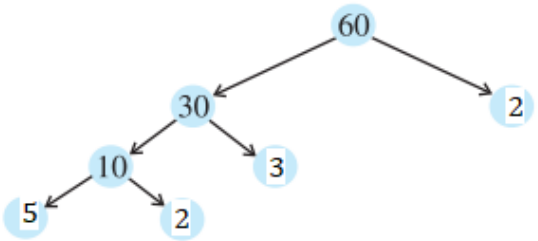
EXERCISE 3.5

1. Here are two different factor trees for 60. Write the missing numbers.

(a)



(b)



2. Which factors are not included in the prime factorisation of a composite number?

Sol: 1 and itself are not included in the prime factorisation of a composite number.

3. **Write the greatest 4-digit number and express it in terms of its prime factors.**

Sol: The greatest 4-digit number=9999

9999=3×3×11×101

3	9999
3	3333
11	1111
	101

4. **Write the smallest 5-digit number and express it in the form of its prime factors.**

Sol: The smallest 5-digit number=10000

10000=2×2×2×2×5×5×5×5

2	10000
2	5000
2	2500
2	1250
5	625
5	125
5	25
	5

5. **Find all the prime factors of 1729 and arrange them in ascending order. Now state the relation, if any; between two consecutive prime factors.**

Sol: $1729=7\times13\times19$

$$\begin{array}{r|l} 7 & 1729 \\ \hline 13 & 247 \\ \hline & 19 \end{array}$$

Difference between two consecutive prime factors is 6

$13-7=6$ and $19-13=6$

6. **The product of three consecutive numbers is always divisible by 6. Verify this statement with the help of some examples.**

Sol: Exp 1: 8,9,10 are three consecutive numbers

Product of the numbers$=8\times9\times10=720$

$720=6\times120$ is divisible by 6

Exp 2: 13,14,15

Product of the numbers$=13\times14\times15=2730=6\times455$ is divisible by 6

7. **The sum of two consecutive odd numbers is divisible by 4. Verify this statement with the help of some examples.**

Sol: (i) Two consecutive odd numbers :7,9

Sum of the numbers$=7+9=16=4\times4$ is divisible by 4.

(ii) 13,15

Sum of the numbers$=13+15=28=4\times7$ is divisible by 4.

8. **In which of the following expressions, prime factorisation has been done?**

(a) $24=2\times3\times4$

Sol: prime factorisation has not been done. Since 4 is not a prime number

(b) $56=7\times2\times2\times2$

Sol: prime factorisation has been done.

(c) $70=2\times5\times7$

Sol: prime factorisation has been done

(d) $54=2\times3\times9$

Sol: prime factorisation has not been done. Since 9 is not a prime number

9. **18 is divisible by both 2 and 3. It is also divisible by $2\times3=6$. Similarly, a number is divisible by both 4 and 6. Can we say that the number must also be divisible by $4\times6=24$? If not, give an example to justify your answer**

Sol: 12 is divisible by 4 and 6 but 12 is not divisible by 24

10. **I am the smallest number, having four different prime factors. Can you find me?**

Sol: Required number$=2\times3\times5\times7=210$

Highest Common Factor (HCF)

The Highest Common Factor (HCF) of two or more given numbers is the highest (or greatest) of their common factors.

Try These

Find the HCF of the following:

(i) 24 and 36

Sol: Factors of 24 are 1,2,3,4,6,8,12,24.

Factors of 36 are 1,2,3,4,6,9,12,18,36

Common factors of 24 and 36 are 1,2,3,4,6,12

HCF of 24 and 36 =12

(ii) 15, 25 and 30

Sol: Factors of 15:1,3,5,15

Factors of 25:1,5,25

Factors of 30:1,2,3,5,6,10,15,30

Common factors of 15, 25 and 30 are 1,5

HCF of 15, 25 and 30=5

(iii) 8 and 12

Sol: Factors of 8:1,2,4,8

Factors of 12:1,2,3,4,6,12

Common factors of 8 and 12 are 1,2,4

HCF of 8 and 12 =4

(iv) 12, 16 and 28

Sol: Factors of 12:1,2,3,4,6,12

Factors of 16:1,2,4,8,16

Factors of 28:1,2,4,7,14,28

Common factors of 12,16 and 28 are 1,2,4.

HCF of 12,16 and 28 =4

Finding HCF by prime factorisation .

1. **Find HCF of 20,28,36 by prime factorisation.**

Sol:

$20 = \boxed{2} \times \boxed{2} \times 5$
$28 = \boxed{2} \times \boxed{2} \times 7$
$36 = \boxed{2} \times \boxed{2} \times 3 \times 3$

2	20
2	10
5	5
	1

2	28
2	14
7	7
	1

2	36
2	18
3	9
3	3
	1

HCF of 20, 28 and 36 is $2 \times 2 = 4$

EXERCISE 3.6

1. **Find the HCF of the following numbers :**

(a) 18, 48

Sol: 18=2×3×3
48=2×2×2×2×3
HCF of 18,48 = 2×3=6

(b) 30, 42

Sol: 30=2×3×5
42=2×3×7
HCF of 30,42=2×3=6

(c) 18, 60

Sol: 18=2×3×3
60=2×2×3×5
HCF of 18,60=2×3=6

(d) 27, 63

Sol: 27=3×3×3
63=3×3×7
HCF of 27,63=3×3=9

(e) 36, 84

Sol:36=2×2×3×3
84=2×2×3×7
HCF of 36,84=2×2×3=12

(f) 34, 102

Sol:34=2×17
102=2×3×17
HCF of 34,102=2×17=54

(g) 70, 105, 175

Sol: 70=2×5×7
105=3×5×7
175=5×5×7
HCF of 70,105,175=5×7=35

(h) 91, 112, 49

Sol: 91=7×13
112=2×2×2×2×7
49=7×7

HCF of 91,112,49=7

(i) 18, 54, 81

Sol: 18=2×3×3

54=2×3×3×3

81=3×3×3×3

HCF of 18,54,81=3×3=9

(j) 12, 45, 75

Sol: 12=2×2×3

45=3×3×5

75=3×5×5

HCF of 12,45,75=3

2. **What is the HCF of two consecutive (a) numbers? (b) even numbers? (c) odd numbers?**

Sol: (a) HCF of two consecutive numbers=1

(b) HCF of two even numbers=2

(c) HCF of two odd numbers=1

3. HCF of co-prime numbers 4 and 15 was found as follows by factorisation : $4 = 2 \times 2$ and $15 = 3 \times 5$ since there is no common prime factor, so HCF of 4 and 15 is 0. Is the answer correct? If not, what is the correct HCF?

Sol: The answer is incorrect.

The HCF of 4 and 15=1

Lowest Common Multiple (LCM)

The Lowest Common Multiple (LCM) of two or more given numbers is the lowest (or smallest or least) of their common multiples.

Exp 8 : Find the LCM of 12 and 18.

Sol: Multiples of 12 are 12, 24, 36, 48, 60, 72, 84, 96, 120, …

Multiples of 18 are 18, 36, 54,72, 90, 108,…..

Common multiples of 12 and 18 are 36, 72, 108, ….

LCM of 12 and 18=36

Finding LCM by prime factorisation:

The LCM of the two numbers is the product of the prime factors counted the maximum number of times they occur in any of the numbers

Example 9 : Find the LCM of 24 and 90.

Sol: 24=2×2×2×3

90=2×3×3×5

LCM of 24 and 90= $(2 \times 2 \times 2) \times (3 \times 3) \times 5 = 360$

Example 10 : Find the LCM of 40, 48 and 45

Sol: $40 = 2 \times 2 \times 2 \times 5$

$48 = 2 \times 2 \times 2 \times 2 \times 3$

$45 = 3 \times 3 \times 5$

LCM $= (2 \times 2 \times 2 \times 2) \times (3 \times 3) \times 5 = 720$

Example 11 : Find the LCM of 20, 25 and 30

Sol: LCM $= 2 \times 2 \times 3 \times 5 \times 5 = 300$

2	20	25	30
2	10	25	15
3	5	25	15
5	5	25	5
5	1	5	1
	1	1	1

Some Problems on HCF and LCM:

Example 12 : Two tankers contain 850 litres and 680 litres of kerosene oil respectively. Find the maximum capacity of a container which can measure the kerosene oil of both the tankers when used an exact number of times.

2	850
5	425
5	85
17	17
	1

2	680
2	340
2	170
5	85
17	17
	1

Sol:

$850 = 2 \times 5 \times 5 \times 17 = \boxed{2} \times \boxed{5} \times \boxed{17} \times 5$

$680 = 2 \times 2 \times 2 \times 5 \times 17 = \boxed{2} \times \boxed{5} \times \boxed{17} \times 2 \times 2$

The HCF of 850 and 680 $= 2 \times 5 \times 17 = 170$.

Maximum capacity of the required container is 170 litres.

Example 13 : In a morning walk, three persons step off together. Their steps measure 80 cm, 85 cm and 90 cm respectively. What is the minimum distance each should walk so that all can cover the same distance in complete steps?

Sol: LCM of 80, 85 and 90 = 12240

The required minimum distance is 12240 cm.

2	12	16	24	36
2	6	8	12	18
2	3	4	6	9
2	3	2	3	9
3	3	1	3	9
3	1	1	1	3
	1	1	1	1

Example 14 : Find the least number which when divided by 12, 16, 24 and 36 leaves a remainder 7 in each case.

Sol: LCM $= 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 144$

The required number is 7 more than 144.

The required least number $= 144 + 7 = 151$.

EXERCISE 3.7

1. **Renu purchases two bags of fertiliser of weights 75 kg and 69 kg. Find the maximum value of weight which can measure the weight of the fertiliser exact number of times.**

Sol: we will find the HCF of 75 and 69

75=3×5×5

69=3×23

HCF of 75, 69=3

The required maximum value of weight=3 kg.

2. **Three boys step off together from the same spot. Their steps measure 63 cm, 70 cm and 77 cm respectively. What is the minimum distance each should cover so that all can cover the distance in complete steps?**

7	63, 70, 77
9	9, 10, 11
10	1, 10, 11
11	1, 1, 11
	1, 1, 1

Sol: We will find the LCM of 63, 70, 77

LCM of 63, 70, 77=7×9×10×11=6930

The minimum distance each should cover so that all can cover the distance in complete steps =6930 cm

3. **The length, breadth and height of a room are 825 cm, 675 cm and 450 cm respectively. Find the longest tape which can measure the three dimensions of the room exactly.**

Sol: We will find HCF of 825,675,450.

825=3×5×5×11

675=3×3×3×5×5

450=2×3×3×5×5

HCF of 825,675,450=3×5×5=75

Required longest tape=75 cm

4. **Determine the smallest 3-digit number which is exactly divisible by 6, 8 and 12.**

2	6, 8, 12
2	3, 4, 6
2	3, 2, 3
3	3, 1, 3
	1, 1, 1

Sol: We will find LCM of 6,8,12

LCM of 6,8,12=2×2×2×3=24

Multiples of 24 are 24,48,72,96,120,...

The smallest 3-digit number which is exactly divisible by 6, 8 and 12=120

5. **Determine the greatest 3-digit number exactly divisible by 8, 10 and 12.**

2	8, 10, 12
2	4, 5, 6
2	2, 5, 3
3	1, 5, 3
5	1, 5, 1
	1, 1, 1

Sol: LCM of 8 10 and 12=2×2×2×3×5=120

Multiples of 120 are 120, 240, 360, 480, 600, 720, 840, 960, 1080,..

The greatest 3-digit number exactly divisible by 8, 10 and 12=960

6. **The traffic lights at three different road crossings change after every 48 seconds, 72 seconds and 108 seconds respectively. If they change simultaneously at 7 a.m., at what time will they change simultaneously again?**

Sol: We will find LCM of 48,72,108

LCM of 48,72 and 108=2×2×2×2×3×3×3

=432

The required time=432 sec

=7×60+12=7 minutes 12 seconds

2	48, 72, 108
2	24, 36, 54
2	12, 18, 27
3	6, 9, 27
3	2, 3, 9
	2, 1, 3

7. **Three tankers contain 403 litres, 434 litres and 465 litres of diesel respectively. Find the maximum capacity of a container that can measure the diesel of the three containers exact number of times.**

Sol: We find HCF of 403, 434 and 465.

403=13×31

434=2×7×31

465=3×5×31

HCF of 403,434 and 465=31

Required maximum capacity of container=31 litres.

8. **Find the least number which when divided by 6, 15 and 18 leave remainder 5 in each case.**

Sol:

LCM of 6,15 and 18=2×3×3×5=90

Remainder=5

Required number=90+5=95

2	6, 15, 18
3	3, 15, 9
3	1, 5, 3
5	1, 5, 1
	1, 1, 1

9. Find the smallest 4-digit number which is divisible by 18, 24 and 32.

Sol: LCM of 18,24 and 32=2×2×2×2×2×3×3=288

Multiples of 288 are 288,576,864,1152,..

The smallest 4-digit number which is divisible by 18, 24 and 32=1152

2	18, 24, 32
2	9, 12, 16
2	9, 6, 8
2	9, 3, 4
2	9, 3, 2
3	9, 3, 1
3	3, 1, 1
	1, 1, 1

10. **Find the LCM of the following numbers : Observe a common property in the obtained LCMs. Is LCM the product of two numbers in each case?**

(a) 9 and 4

Sol: LCM of 9 and 4= 2×2×3×3=36

Product of 9 and 4=9×4=36

2	9,4
2	9, 2
3	9, 1
3	3,1
	1, 1

2	12,5
2	6, 5
3	3, 5
5	1,5
	1, 1

(b) 12 and 5

Sol: LCM of 12 and 5= 2×2×3×5=60

Product of 12 and 5=12×5=60

(c) 6 and 5

Sol: LCM of 6 and 5=2×3×5=30

Product of 6 and 5=6×5=30

2	6, 5
3	3, 5
5	1, 5
	1,1

2	15, 4
2	15, 2
3	15, 1
5	5, 1
	1, 1

(d) 15 and 4.

Sol: LCM of 15 and 4=2×2×3×5=60

Product of 15 and 4=15×4=60

Common property is the LCM of given numbers=Product of given numbers.

(This property holds only the given numbers have no common prime factors)

11. Find the LCM of the following numbers in which one number is the factor of the other. What do you observe in the results obtained?

(a) 5, 20

Sol: LCM of 5,20=5×2×2=20

5	5, 20
2	1, 4
2	1, 2
	1,1

(b) 6, 18

Sol: LCM of 6,18=2×3×3=18

2	6, 18
3	3, 9
3	1, 3
	1,1

(c) 12, 48

Sol: LCM of 12,48= 2×2×2×2×3=48

2	12,48
2	6, 24
2	3, 12
2	3, 6
3	3, 3
	1, 1

(d) 9, 45

Sol: LCM of 9,45= 3×3×5=45

3	9, 45
3	3, 15
5	1, 5
	1, 1

We observe that , in two numbers

one number is factor of another number then LCM of the numbers =The larger number.

CHAPTER 4

VI-MATHEMATICS-NCERT

4 BASIC GEOMETRICAL IDEAS(Notes)

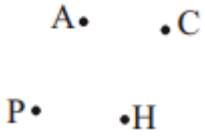
PREPARED BY: BALABHADRA SURESH

1. The term 'Geometry' is the English equivalent of the Greek word 'Geometron'. 'Geo' means Earth and 'metron' means Measurement
2. **Point**: A point determines a location. It is usually denoted by a capital letter A, B, C, ...

Try These

1. **With a sharp tip of the pencil, mark four points on a paper and name them by the letters A,C,P,H. Try to name these points in different ways. One such way could be this.**

Sol:



2. **A star in the sky also gives us an idea of a point. Identify at least five such situations in your daily life.**

Sol: (i) The tip of a pencil.

(ii) The tip of a pen

(iii) The pointed end of the tooth pic

(iv) The sharp tip of compass.

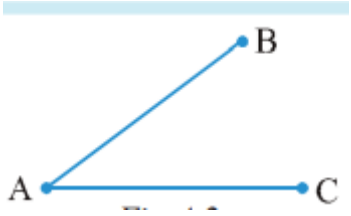
(v) A small bindi.

A Line Segment: This shortest join of point A to B (including A and B) is a line segment. It is denoted by $\overline{AB}$ or $\overline{BA}$

The points A and B are called the end points of the segment.

Try These

1. **Name the line segments in the figure 4.2. Is A, the end point of each line segment?**



Sol: $\overline{AB}$ and $\overline{AC}$

A Line : Aline segment extended both directions without any end point we get a line .

The line AB written as $\overleftrightarrow{AB}$

Sometimes a line is denoted by a letter like $\boldsymbol{l}, \boldsymbol{m}, \boldsymbol{n}$ ...

Intersecting Lines: Two distinct lines meeting at a point are called intersecting lines.

If two lines have one common point, they are called intersecting lines.

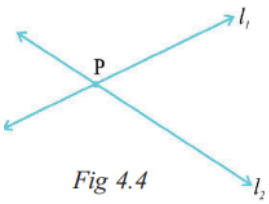
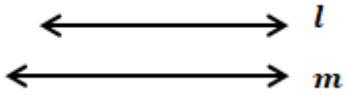


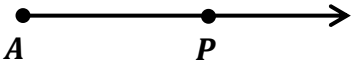
Fig 4.4

Parallel Lines: If two lines have no common points, they are called parallel lines.



Two lines in a plane are said to be parallel if they do not meet.

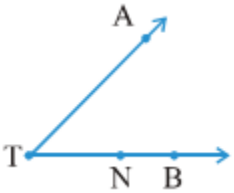
Ray: A ray is a portion of a line. It starts at one point (called starting point or initial point) and goes endlessly in a direction.



Ray AP is denote by $\overrightarrow{AP}$

Try These

1. **Name the rays given in this picture** (Fig 4.8)



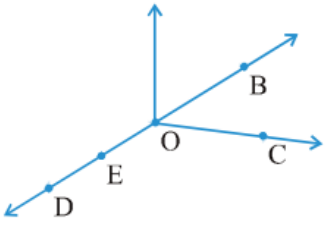
Sol: $\overrightarrow{TA}, \overrightarrow{TN}$ or $\overrightarrow{TB}$

2. **Is T a starting point of each of these rays**?

Sol: T starting point of the rays $\overrightarrow{TA}, \overrightarrow{TN}$ or $\overrightarrow{TB}$ But not $\overrightarrow{NB}$

EXERCISE 4.1

1. **Use the figure to name :**



(a) **Five points** : B,C,D,E,O

(b) **A line** : $\overleftrightarrow{BD}$ or

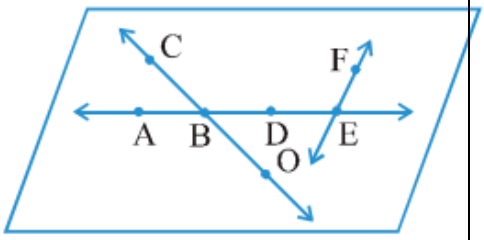
(c) **Four rays** : $\overrightarrow{OC}, \overrightarrow{OB}, \overrightarrow{DB}, \overrightarrow{EB}$

(d) **Five line segments**: $\overline{OB}, \overline{OC}, \overline{DE}, \overline{EO}, \overline{DB}$

2. **Name the line given in all possible (twelve) ways, choosing only two letters at a time from the four given.**

Sol: $\overleftrightarrow{AB}, \overleftrightarrow{AC}, \overleftrightarrow{AD}, \overleftrightarrow{BA}, \overleftrightarrow{BC}, \overleftrightarrow{BD}, \overleftrightarrow{CA}, \overleftrightarrow{CB}, \overleftrightarrow{CD}, \overleftrightarrow{DA}, \overleftrightarrow{DB}, \overleftrightarrow{DC}$.

3. **Use the figure to name :**



(a) **Line containing point E** : $\overleftrightarrow{AE}$ or $\overleftrightarrow{BE}$ or $\overleftrightarrow{DE}$ or $\overleftrightarrow{EF}$

(b) **Line passing through A**: $\overleftrightarrow{AB}, \overleftrightarrow{AD}, \overleftrightarrow{AE}, \overleftrightarrow{BD}, \overleftrightarrow{AE}, \overleftrightarrow{DE}$

(c) **Line on which O lies**: $\overleftrightarrow{OC}, \overleftrightarrow{OD}, \overleftrightarrow{CD}$

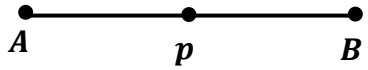
(d) **Two pairs of intersecting lines**: $\overleftrightarrow{OC}, \overleftrightarrow{AE}$; $\overleftrightarrow{OF}, \overleftrightarrow{AE}$

4. How many lines can pass through (a) one given point? (b) two given points?

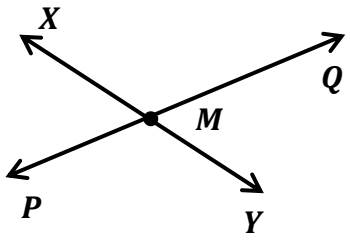
Sol: (a) Infinite lines (b) One line.

5. Draw a rough figure and label suitably in each of the following cases:

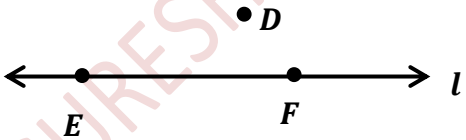
(a) **Point P lies on AB.**



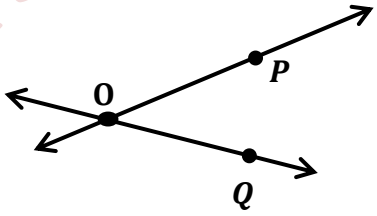
(b) **$\overleftrightarrow{XY}$ and $\overleftrightarrow{PQ}$ intersect at M.**



(c) Line l contains E and F but not D.



(d) $\overleftrightarrow{OP}$ and $\overleftrightarrow{OQ}$ meet at O.



6. **Consider the following figure of line MN . Say whether following statements are true or false in context of the given figure.**

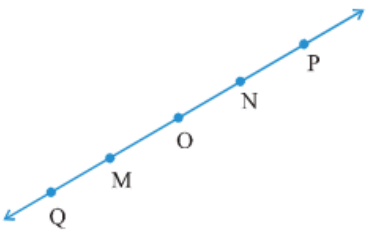
(a) Q, M, O, N, P are points on the line $\overleftrightarrow{MN}$. **(True)**

(b) M, O, N are points on a line segment $\overline{MN}$. **(True)**

(c) M and N are end points of line segment $\overline{MN}$. **(True)**

(d) O and N are end points of line segment $\overline{OP}$. **(False)**

(e) M is one of the end points of line segment $\overline{QO}$. **(False)**



(f) M is point on ray $\overrightarrow{OP}$. **(False)**

(g) Ray $\overrightarrow{OP}$ is different from ray $\overrightarrow{QP}$. **(True)**

(h) Ray $\overrightarrow{OP}$ is same as ray $\overrightarrow{OM}$. **(False)**

(i) Ray $\overrightarrow{OM}$ is not opposite to ray $\overrightarrow{OP}$. **(False)**

(j) O is not an initial point of $\overrightarrow{OP}$. **(False)**

(k) N is the initial point of $\overrightarrow{NP}$ and $\overrightarrow{NM}$. **(True)**

Curves

Any drawing (straight or non-straight) done without lifting the pencil may be called **a curve**. In this sense, **a line is also a curve**.

(i) If a curve does not cross itself, then it is called a simple curve.

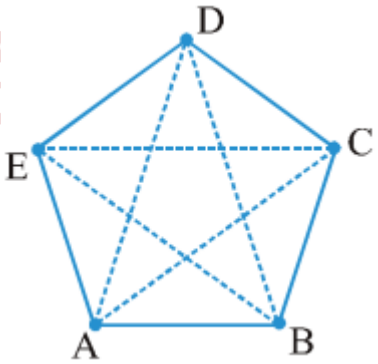
(ii) A simple curve is one that does not cross itself.

(iii) A curve is said to be closed if its ends are joined; otherwise it is said to be open

(iv) The interior of a curve together with its boundary is called its "region".

Polygons

A polygon is a simple closed curve made up of line segments.



(i) The line segments forming a polygon are called its sides.

$\overline{AB}, \overline{BC}, \overline{CD}, \overline{DE}, \overline{EA}$

(ii) Any two sides with a common end point are called the adjacent sides.

$\overline{AB}, \overline{BC}$; $\overline{BC}, \overline{CD}$; $\overline{CD}, \overline{DE}$; $\overline{DE}, \overline{EA}$; $\overline{EA}, \overline{AB}$.

(iii) The meeting point of a pair of sides is called a vertex.

A, B, C, D, E.

(iv) The end points of the same side are adjacent vertices.

A, B; B, C; C, D; D, E; E, A .

(v) The join of any two non-adjacent vertices is a diagonal.

$\overline{AC}, \overline{AD}, \overline{BD}, \overline{BE}$

EXERCISE 4.2

1. **Classify the following curves as (i) Open or (ii) Closed.**

(a) (b) (c) (d) (e)

Sol: (a) , (c) are Open curves.

(b),(d) and (e) are closed curves.

2. Draw rough diagrams to illustrate the following :

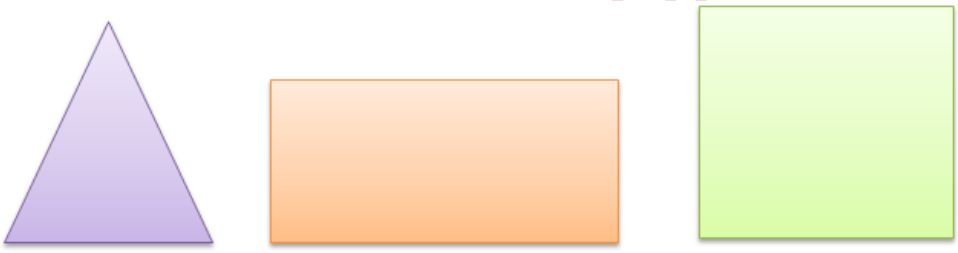
(a) Open curve (b) Closed curve.

Sol:

Open curve Closed curve

3. **Draw any polygon and shade its interior.**

Sol:



Triangle Rectangle Square

4. Consider the given figure and answer the questions :

(a) Is it a curve? (b) Is it closed?

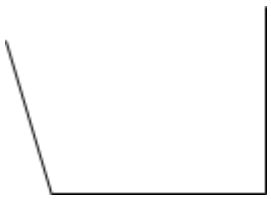
Sol: (a) Yes, it is a curve. (b) Yes, it is closed.

5. Illustrate, if possible, each one of the following with a rough diagram:

(a) A closed curve that is not a polygon.

Closed curve

(b) An open curve made up entirely of line segments.

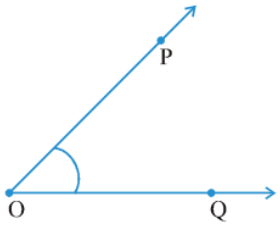


(c) A polygon with two sides.

Sol: Not possible.

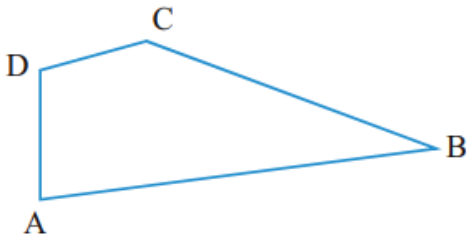
Angles

1. An angle is made up of two rays starting from a common starting/initial point.
2. The two rays forming the angle are called the arms or sides of the angle.
3. The common initial point is the vertex of the angle.
4. Two rays **$\overrightarrow{OP}$ and $\overrightarrow{OQ}$ make $\angle$POQ**(or also called **$\angle$QOP).** O is vertex.
5. An angle leads to three divisions of a region: On the angle, the interior of the angle and the exterior of the angle.



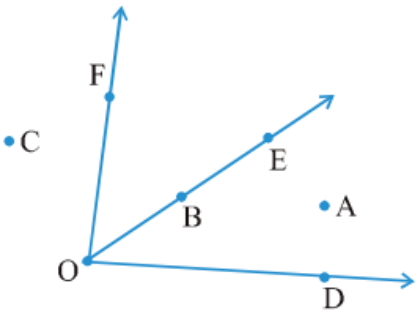
EXERCISE 4.3

1. Name the angles in the given figure



Sol: $\angle$ABC, $\angle$BCD, $\angle$CDA, $\angle$DAB

2. In the given diagram, name the point(s)



(a) In the interior of $\angle$DOE

Sol: A

(b) In the exterior of $\angle$EOF

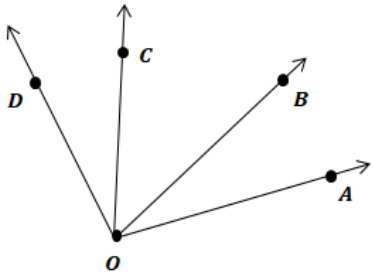
Sol: A,D,C

(c) On $\angle$EOF

Sol: E,B,O,F

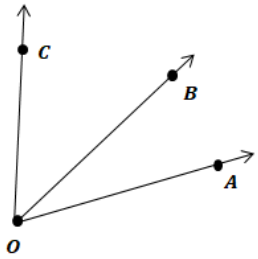
3. Draw rough diagrams of two angles such that they have.

(a) One point in common.



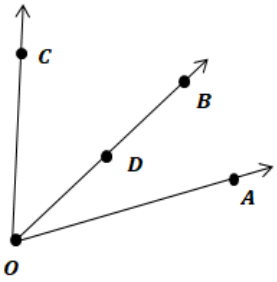
$\angle$AOB and $\angle$COD have one common point O

(b) Two points in common.



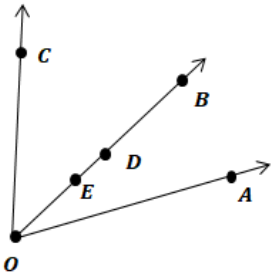
∠AOB and ∠COD have two common points O, B

(c) Three points in common.



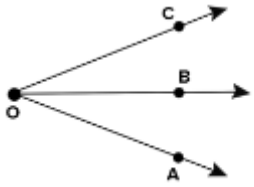
∠AOB and ∠COD have three common points O, B, *D*

(d) Four points in common.



∠AOB and ∠COD have four common points O, B, D, E

(e) One ray in common.



∠AOB and ∠COD have one ray $\overrightarrow{OB}$ in common.

1. All the shapes we see around us are formed using curves or lines.
2. The ruler is marked along one of its edges. It is divided into 15 parts. Each of these 15 parts is of length 1cm.
3. Millimetre= mm; Centimetre=cm.
4. 10 mm=1 cm.
5. 1mm=0.1 cm.
6. 2.3 cm=2 cm and 3 mm.
7. length of $\overline{AB}$=5.8 cm then we write AB=5.8 cm

EXERCISE 5.1

1. What is the disadvantage in comparing line segments by mere observation?

Sol: The disadvantage of comparing the lengths of two line segments by mere observation is that the lengths might not be accurate. Hence, a divider is used to compare the lengths of the line segments

2. **Why is it better to use a divider than a ruler, while measuring the length of a line segment?**

Sol: The thickness of the ruler may cause difficulties in reading off the marks on it. Errors can happen due to angular viewing. So, it is better to use a divider than a ruler, while measuring the length of a line segment.

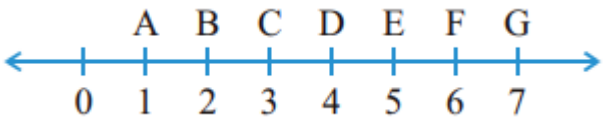
3. **Draw any line segment, say AB. Take any point C lying in between A and B. Measure the lengths of AB, BC and AC. Is AB = AC + CB?**

Sol: Yes, **AB = AC + CB**

4. **If A,B,C are three points on a line such that AB = 5 cm, BC = 3 cm and AC = 8 cm, which one of them lies between the other two?**

Sol: B lie between A and C.

5. Verify, whether D is the mid-point of AG



Sol: AD= DG=3 units . So, D is the mid-point of AG.

6. **If B is the mid point of $\overline{AC}$ and C is the mid point of $\overline{BD}$, where A,B,C,D lie on a straight line, say why AB = CD?**

Sol: If B is the mid-point of $\overline{AC}$ then AB=BC→(1)

If C is the mid-point of $\overline{BD}$ then BC=CD→(2)

From (1) and (2) : AB=CD.

7. **Draw five triangles and measure their sides. Check in each case, if the sum of the lengths of any two sides is always less than the third side.**

Sol: The sum of the lengths of any two sides of a triangle can never be less than the length of the third side.

Angles – 'Right' and 'Straight'

Try These

1. **What is the angle name for half a revolution?**

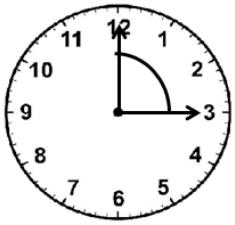
Sol: straight angle.

2. **What is the angle name one-fourth revolution?**

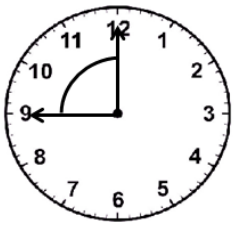
Sol: Right angle.

3. **Draw five other situations of one-fourth, half and three-fourth revolution on a clock**

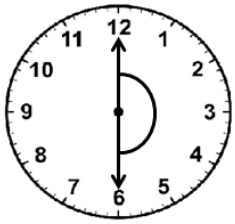
Sol:



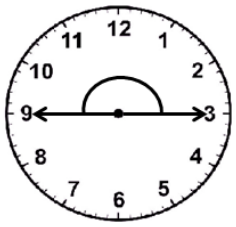
One-fourth revolution



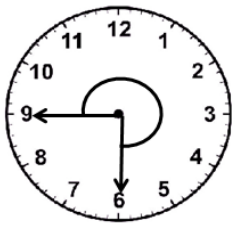
One-fourth revolution



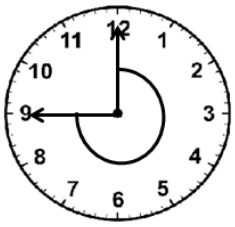
Half revolution



Half revolution



Three-fourth revolution



Three-fourth revolution

EXERCISE 5.2

1. **What fraction of a clockwise revolution does the hour hand of a clock turn through, when it goes from.**

(a) 3 to 9 (A) $\frac{1}{2}$

(b) 4 to 7 (A) $\frac{1}{4}$

(c) 7 to 10 (A) $\frac{1}{4}$

(d) 12 to 9 (A) $\frac{3}{4}$

(e) 1 to 10 (A) $\frac{3}{4}$

(f) 6 to 3 (A) $\frac{3}{4}$

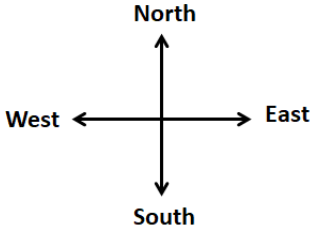
2. **Where will the hand of a clock stop if it**

(a) starts at 12 and makes $\frac{1}{2}$ of a revolution, clockwise?

Sol: 6

(b) starts at 2 and makes $\frac{1}{2}$ of a revolution, clockwise?

Sol: 8



(c) starts at 5 and makes $\frac{1}{4}$ of a revolution, clockwise?

Sol: 8

(d) starts at 5 and makes $\frac{3}{4}$ of a revolution, clockwise?

Sol: 2

3. **Which direction will you face if you start facing**

(a) east and make $\frac{1}{2}$ of a revolution clockwise?

Sol: West.

(b) east and make $1\frac{1}{2}$ of a revolution clockwise?

Sol: West.

(c) west and make $\frac{3}{4}$ of a revolution anti − clockwise?

Sol: North.

(d) south and make one full revolution?

Sol: South.

4. **What part of a revolution have you turned through if you stand facing.**

(a) east and turn clockwise to face north?

Sol: $\frac{3}{4}$

(b) south and turn clockwise to face east?

Sol: $\frac{3}{4}$

(c) west and turn clockwise to face east?

Sol: $\frac{1}{2}$

5. **Find the number of right angles turned through by the hour hand of a clock when it goes from**

(a) 3 to 6 (A) 1 right angle.

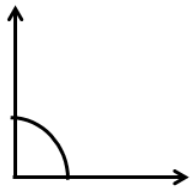
(b) 2 to 8 (A) 2 right angles.

(c) 5 to 11 (A) 2 right angles.

(d) 10 to 1 (A) 1 right angle.

(e) 12 to 9 (A) 3 right angles.

(f) 12 to 6 (A) 2 right angles.



Right angle

6. **How many right angles do you make if you start facing**

(a) south and turn clockwise to west?

Sol: 1 right angle.

(b) north and turn anti-clockwise to east?

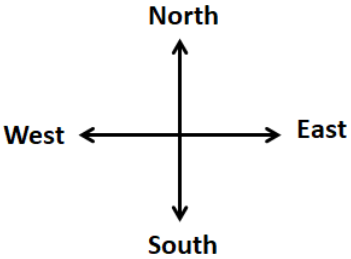
Sol: 3 right angles.

(c) west and turn to west?

Sol: 4 right angles.

(d) south and turn to north?

Sol: 2 right angles.



7. **Where will the hour hand of a clock stop if it starts.**

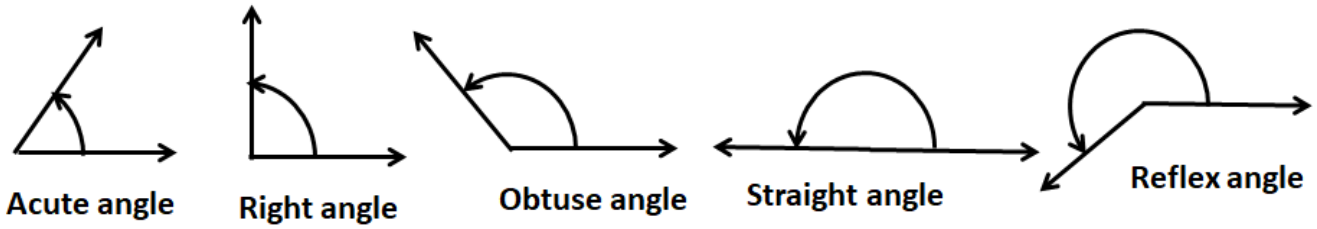
(a) from 6 and turns through 1 right angle?

Sol: 9

(b) from 8 and turns through 2 right angles?
Sol: 2
(c) from 10 and turns through 3 right angles?
Sol: 7
(d) from 7 and turns through 2 straight angles?
Sol: 7

Angles – 'Acute', 'Obtuse' and 'Reflex

1. An angle smaller than a right angle is called an acute angle.
2. If an angle is larger than a right angle, but less than a straight angle, it is called an obtuse angle.
3. A reflex angle is larger than a straight angle.



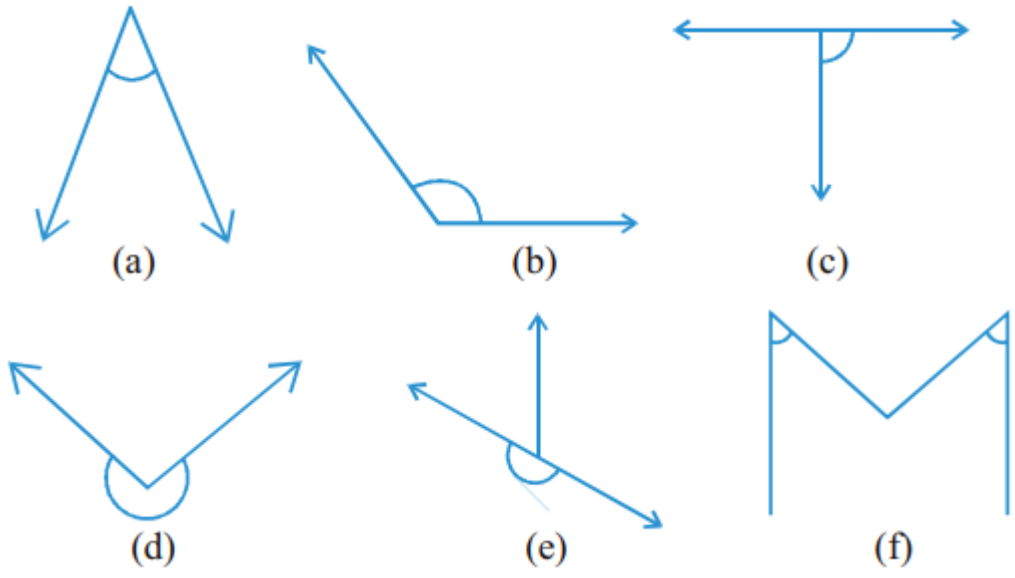
EXERCISE 5.3

1. **Match the following** :

(i) Straight angle	(a) Less than one-fourth of a revolution
(ii) Right angle	(b) More than half a revolution
(iii) Acute angle	(c) Half of a revolution
(iv) Obtuse angle	(d) One-fourth of a revolution
(v) Reflex angle	(e) Between $\frac{1}{4}$ and $\frac{1}{2}$ of a revolution
	(f) One complete revolution

Sol: (i)→(c); (ii)→(d); (iii)→(a); (iv)→(e); (v)→(b)

2. **Classify each one of the following angles as right, straight, acute, obtuse or reflex :**

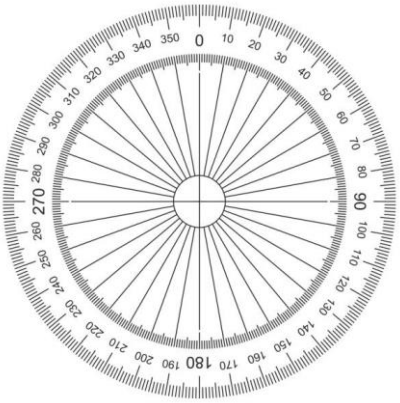


Sol: (a)→Acute angle; (b)→Obtuse angle; (c) →Right angle; (d) →Reflex angle;

(e) →Straight angle; (f) →Acute angle.

The measure of angle

One complete revolution is divided into 360 equal parts. Each part is a degree. We write 360° to say 'three hundred sixty degrees'.



1. Right angle=90^0
2. Straight angle=180^0
3. We use Protractor to measure angles

EXERCISE 5.4

1. What is the measure of (i) a right angle? (ii) a straight angle?

Sol: (i) 90^0 (ii) 180^0.

2. Say True or False :

(a) The measure of an acute angle < 90°.(True)

(b) The measure of an obtuse angle < 90°. (False)

(c) The measure of a reflex angle > 180°. (True)

(d) The measure of one complete revolution = 360°. (True)

(e) If m ∠A = 53° and m ∠B = 35°, then m ∠A > m ∠B (True)

3. Write down the measures of

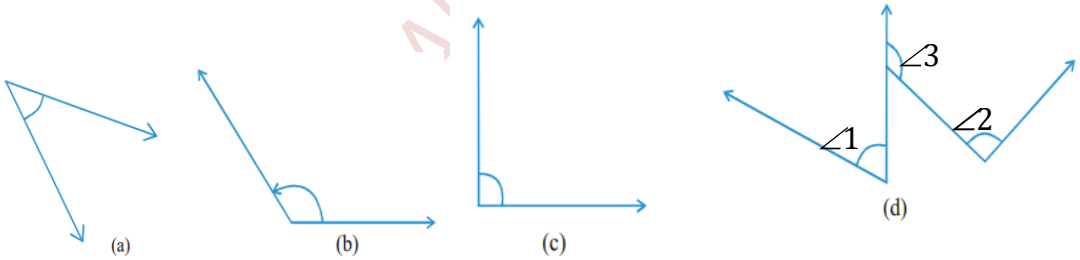
(a) Some acute angles.

Sol:40^0, 60^0,89^0

(b) Some obtuse angles

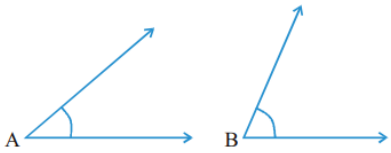
Sol:145^0, 120^0,160^0

4. **Measure the angles given below using the Protractor and write down the measure**.



Sol: (a) 45^0; (b) 120^0; (c) 90^0; (d) ∠1 = 60°, ∠2 = 90°, ∠3 = 125°

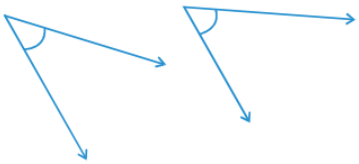
5. **Which angle has a large measure? First estimate and then measure.**



Measure of Angle A = 40^0

Measure of Angle B = 50^0

6. **From these two angles which has larger measure? Estimate and then confirm by measuring them.**



Sol: (i) 45^0; (ii) 60^0

7. **Fill in the blanks with acute, obtuse, right or straight :**

(a) An angle whose measure is less than that of a right angle is **acute**.

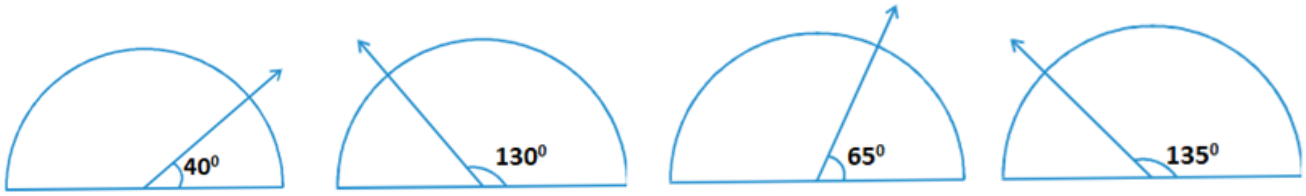
(b) An angle whose measure is greater than that of a right angle is **obtuse**.

(c) An angle whose measure is the sum of the measures of two right angles is **straight**.

(d) When the sum of the measures of two angles is that of a right angle, then each one of them is **acute**.

(e) When the sum of the measures of two angles is that of a straight angle and if one of them is acute then the other should be **an obtuse angle**..

8. Find the measure of the angle shown in each figure. (First estimate with your eyes and then find the actual measure with a protractor).

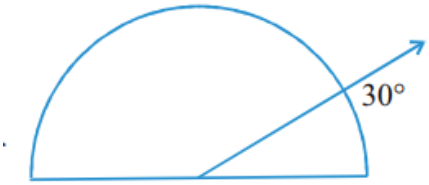


9. Find the angle measure between the hands of the clock in each figure :

9.00 a.m. 1.00 p.m. 6.00 p.m.

Sol: (i) 90^0 ; (ii) 30^0 ; (iii) 180^0.

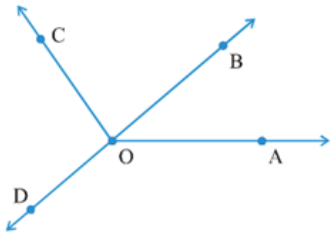
10. In the given figure, the angle measures 30°. Look at the same figure through a magnifying glass. Does the angle becomes larger? Does the size of the angle change?



Sol: The measure of angle does not change.

11. Measure and classify each angle :

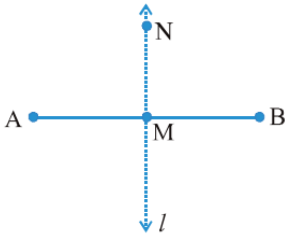
Angle	Measure	Type
∠AOB	40^0	Acute angle
∠AOC	125^0	Obtuse angle
∠BOC	85^0	Acute angle
∠DOC	95^0	Obtuse angle
∠DOA	140^0	Obtuse angle
∠DOB	180^0	Straight angle



Perpendicular Lines

1. When two lines intersect and the angle between them is a right angle, then the lines are said to be perpendicular
2. If a line AB is perpendicular to CD, we write AB ⊥CD .

3. If AB ⊥CD , then CD ⊥AB also.
4. $\overleftrightarrow{MN} \perp \overline{AB}$ *and* MN divide AB into two equal parts. we say MN is the perpendicular bisector of $\overline{AB}$



EXERCISE 5.5

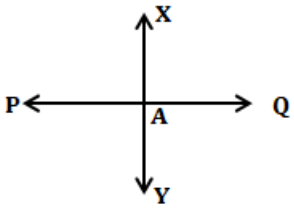
1. Which of the following are models for perpendicular lines :

(a) The adjacent edges of a table top.
(b) The lines of a railway track.
(c) The line segments forming the letter 'L'.
(d) The letter V.

Sol: (a) and (c) are models for perpendicular lines

2. Let $\overline{PQ}$ be the perpendicular to the line segment $\overline{XY}$. Let $\overline{PQ}$ and XY intersect in the point A. What is the measure of ∠PAY ?

Sol: ∠PAY=90^0.

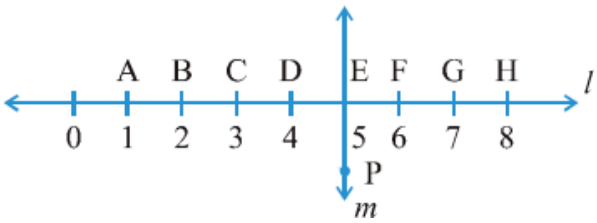


3. There are two set-squares in your box. What are the measures of the angles that are formed at their corners? Do they have any angle measure that is common?

Sol: (i) 30^0, 60^0, 90^0.

(ii) 45^0, 45^0, 90^0

4. Study the diagram. The line *l* is perpendicular to line *m*



(a) Is CE = EG?

Sol: Yes, CE = EG.

(b) Does PE bisect CG?

Sol: Yes, CE=EG=2 units

(c) Identify any two line segments for which PE is the perpendicular bisector.

Sol: $\overline{DF}$; $\overline{CG}$; $\overline{BH}$

(d) Are these true?

(i) AC > FG

Sol: AC =2 unit, FG=1 unit.
Hence, AC> FG is true.

(ii) CD = GH

Sol: CD =1 unit, GH=1 unit.
Hence CD = GH is true.

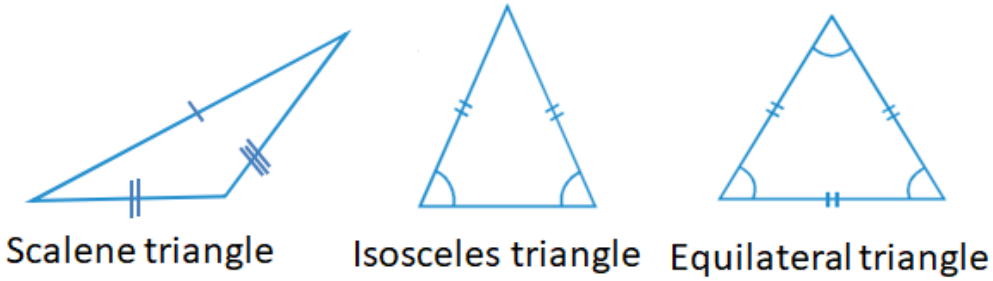
(iii) BC < EH

Sol: BC =1 unit, EH=3 units .
Hence BC < EH is true.

Classification of Triangles

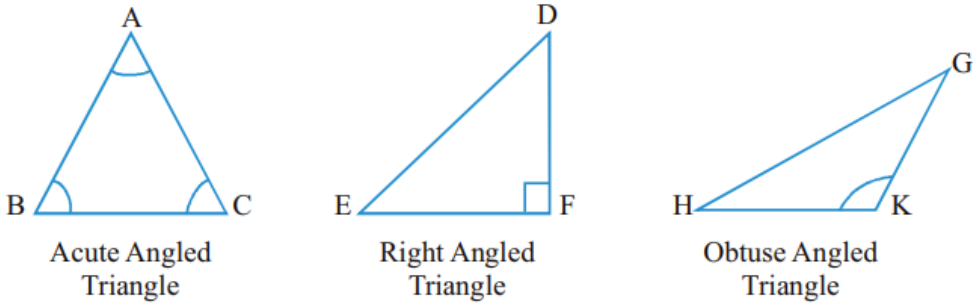
Naming triangles based on sides.

(i) A triangle having all three unequal sides is called **a Scalene Triangle.**
(ii) A triangle having two equal sides is called an **Isosceles Triangle.**
(iii) A triangle having three equal sides is called an **Equilateral Triangle**



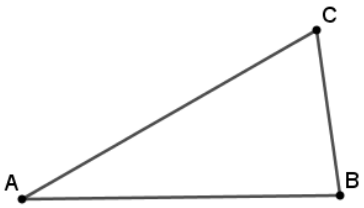
Naming triangles based on angles

(i) If each angle is less than 90°, then the triangle is called an **acute angled triangle**
(ii) If anyone angle is a right angle then the triangle is called a **right angled triangle**.
(iii) If anyone angle is greater than 90°, then the triangle is called an **obtuse angled triangle.**

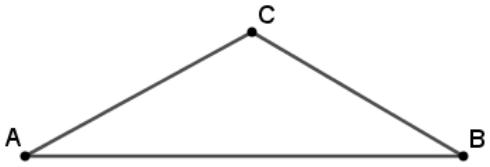


Do This

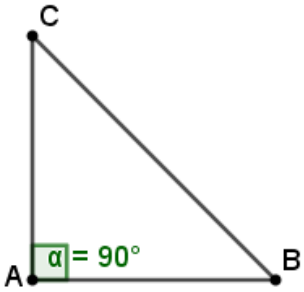
Try to draw rough sketches of
(a) a scalene acute angled triangle.



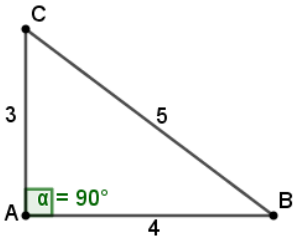
(b) an obtuse angled isosceles triangle.



(c) a right angled isosceles triangle.



(d) a scalene right angled triangle.



Do you think it is possible to sketch Think, discuss and write your conclusions.

(a) an obtuse angled equilateral triangle ?

Sol: Not possible.

(b) a right angled equilateral triangle ?

Sol: Not possible

(c) a triangle with two right angles?

Sol: Not possible

EXERCISE 5.6

1. Name the types of following triangles :

(a) Triangle with lengths of sides 7 cm, 8 cm and 9 cm.

Sol: Scalene triangle.

(b) ΔABC with AB = 8.7 cm, AC = 7 cm and BC = 6 cm.

Sol: Scalene triangle.

(c) ΔPQR such that PQ = QR = PR = 5 cm.

Sol: Equilateral triangle.

(d) ΔDEF with m∠ D = 90°

Sol: Right angled triangle.

(e) ΔXYZ with m∠ Y = 90° and XY = YZ.

Sol: Isosceles right triangle.

(f) ΔLMN with m ∠L = 30°, m ∠M = 70° and m ∠N = 80°

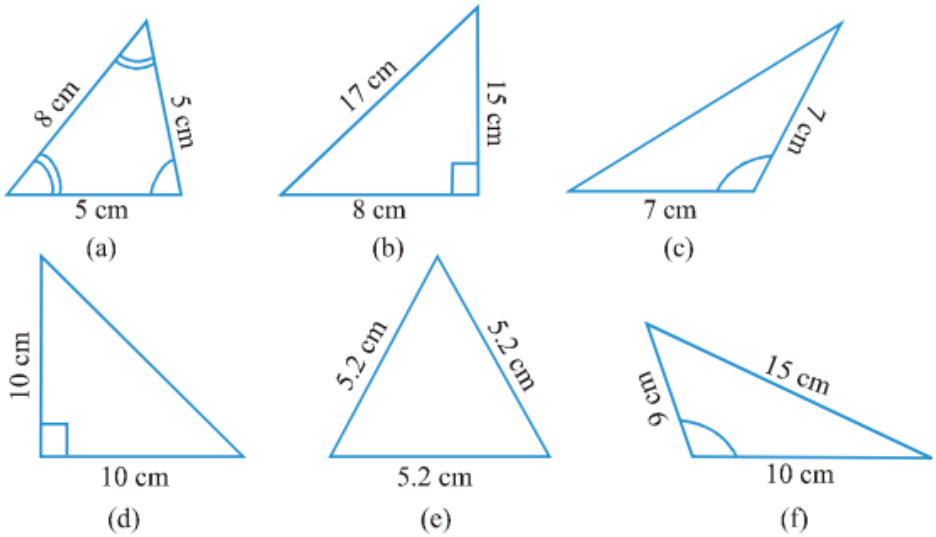
Sol: Acute-angled triangle.

2. Match the following :

Measures of Triangle	**Type of Triangle**
(i) 3 sides of equal length	(e) Equilateral
(ii) 2 sides of equal length	(g) Isosceles
(iii) All sides are of different length	(a) Scalene
(iv) 3 acute angles	(f) Acute angled
(v) 1 right angle	(d) Right angled
(vi) 1 obtuse angle	(c) Obtuse angled

(vii) 1 right angle with two sides of equal length (b) Isosceles right triangled

3. **Name each of the following triangles in two different ways: (you may judge the nature of the angle by observation)**

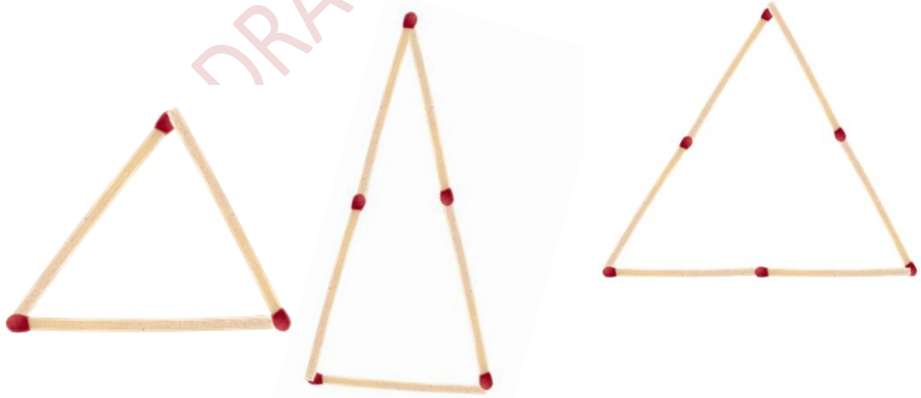


Sol: (a) Acute-angled and isosceles. (b) Right-angled and scalene. (c) Obtuse-angled and isosceles.

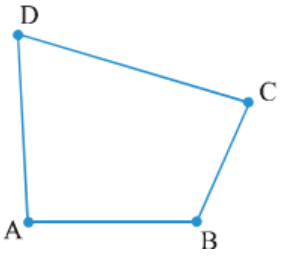
(d) Right-angled and isosceles triangle. (e) Equilateral and acute angled. (f) Obtuse-angled and Scalene.

4. **Try to construct triangles using match sticks. Some are shown here. Can you make a triangle with given and name the type of triangle in each case. If you cannot make a triangle, think of reasons for it.**

(a) 3 matchsticks?
Sol: Equilateral triangle.
(b) 4 matchsticks?
Sol: Not possible.
(c) 5 matchsticks?
Sol: Isosceles triangle.
(d) 6 matchsticks?
Sol: Equilateral triangle.



Quadrilaterals



A quadrilateral is a polygon which has four sides.

(i) The sides of the quadrilateral are AB, BC , CD,DA.
(ii) The 4 angles of quadrilateral are ∠BAD , ∠ADC, ∠DCB and ∠ABC.
(iii) The diagonals are AC and BD.

1. Using four unequal sticks, as you did in the above activity, see if you can form a quadrilateral such that

(a) all the four angles are acute.
Sol: Not possible.
(b) one of the angles is obtuse.
Sol: Yes.
(c) one of the angles is right angled.

Sol: Yes.

(d) two of the angles are obtuse.

Sol: Yes.

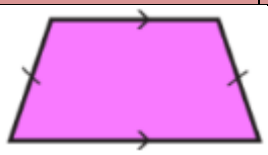
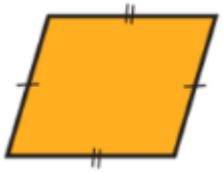
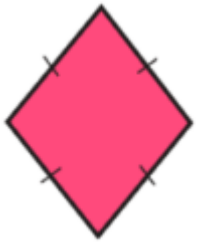
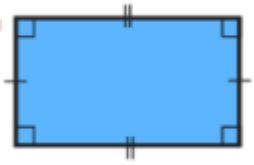
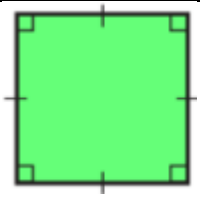
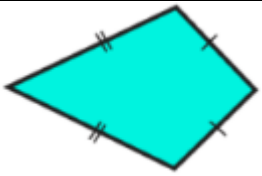
(e) two of the angles are right angled.

Sol: Yes.

(f) the diagonals are perpendicular to one another.

Sol: Not possible.

Types of Quadrilaterals:

Quadrilateral	Figure	Properties
Trapezium A quadrilateral with a pair of parallel sides.		1. One pair of parallel lines
Parallelogram: A quadrilateral with each pair of opposite sides parallel		1. Opposite sides are equal. 2. Opposite angles are equal. 3. Diagonals not equal and bisect one another. 4. Adjacent angles are supplementary
Rhombus: A parallelogram with sides of equal length.		1. All sides are equal. 2. Opposite angles are equal 3. Diagonals are not equal and perpendicularly bisect one another. 4. Adjacent angles are supplementary
Rectangle: A parallelogram with a right angle		1. Opposite sides are equal 2. All angles are equal(right angle=90^0). 3. Diagonals are equal and bisect one another.
Square: A rectangle with sides of equal length.		1. All sides are equal. 2. Each of the angles is a right angle. 3. Diagonals are equal and perpendicularly bisect one another.
Kite: A quadrilateral with exactly two pairs of equal consecutive sides		1. The diagonals are perpendicular to one another. 2. One of the diagonals bisects the other.

Quadrilateral	Opposite sides		All sides	Opposite Angles	Diagonals	
	Parallel	Equal	Equal	Equal	Equal	Perpen-dicular
Parallelogram	Yes	Yes	No	Yes	No	No
Rectangle	Yes	Yes	No	Yes	Yes	No
Square	Yes	Yes	Yes	Yes	Yes	Yes
Rhombus	Yes	Yes	Yes	Yes	No	Yes
Trapezium	No	No	No	No	No	No

EXERCISE 5.7

1. Say True or False :

(a) Each angle of a rectangle is a right angle.

Sol: True.

(b) The opposite sides of a rectangle are equal in length.

Sol: True.

(c) The diagonals of a square are perpendicular to one another.

Sol: False.

(d) All the sides of a rhombus are of equal length.

Sol: True.

(e) All the sides of a parallelogram are of equal length.

Sol: False.

(f) The opposite sides of a trapezium are parallel.

Sol: False

2. **Give reasons for the following :**

(a) A square can be thought of as a special rectangle.

Sol: A rectangle with all sides equal becomes a square.

(b) A rectangle can be thought of as a special parallelogram.

Sol: A parallelogram with each angle a right angle becomes a rectangle.

(c) A square can be thought of as a special rhombus.

Sol: A rhombus with each angle a right angle becomes a square.

(d) Squares, rectangles, parallelograms are all quadrilaterals.

Sol: All these are four-sided polygons made of line segments.

(e) Square is also a parallelogram.

Sol: The opposite sides of a square are parallel, so it is a parallelogram.

3. **A figure is said to be regular if its sides are equal in length and angles are equal in measure. Can you identify the regular quadrilateral?**

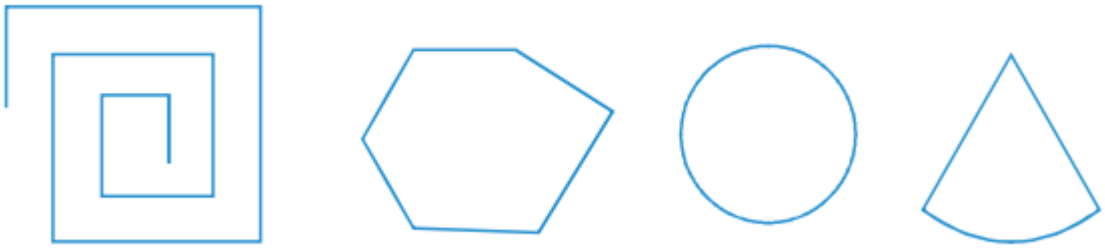
Sol: A square is a 'regular' quadrilateral

Polygons

Number of sides	Name	Illustration
3	Triangle	
4	Quadrilateral	
5	Pentagon	
6	Hexagon	
8	Octagon	

EXERCISE 5.8

1. **Examine whether the following are polygons. If any one among them is not, say why?**



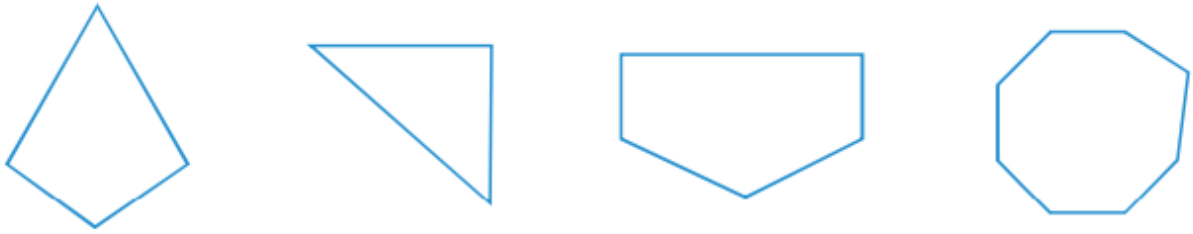
(a) (b) (c) (d)

Sol: (a) is not a closed figure and hence is not a polygon.

(b) is a polygon of six sides.

(c) and (d) are not polygons since they are not made of line segments

2. **Name each polygon and Make two more examples of each of these.**

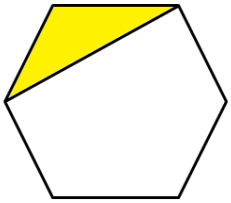


(a) (b) (c) (d)

Sol: (a) A Quadrilateral (b) A Triangle (c) A Pentagon (5-sided) (d) An Octagon (8-sided)

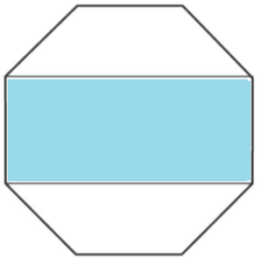
3. **Draw a rough sketch of a regular hexagon. Connecting any three of its vertices, draw a triangle. Identify the type of the triangle you have drawn.**

Sol: An isosceles triangle can be drawn.



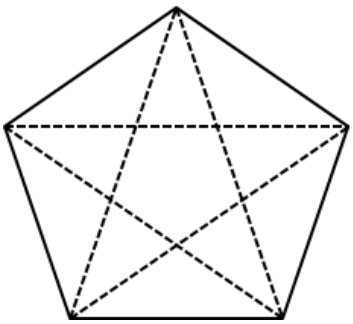
4. **Draw a rough sketch of a regular octagon. (Use squared paper if you wish). Draw a rectangle by joining exactly four of the vertices of the octagon.**

Sol:



5. **A diagonal is a line segment that joins any two vertices of the polygon and is not a side of the polygon. Draw a rough sketch of a pentagon and draw its diagonals.**

Sol:



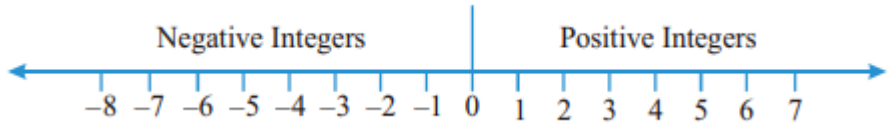
CHAPTER 6

VI-MATHEMATICS-NCERT(2023-24)

6 INTEGERS (Notes)

REPARED BY: BALABHADRA SURESH

1. The collection of numbers..., – 4, – 3, – 2, – 1, 0, 1, 2, 3, 4, ... is called integers. So, – 1, – 2, – 3, – 4, ... called negative numbers are negative integers and 1, 2, 3, 4, ... called positive numbers are the positive integers.
2. Representation of integers on a number line



3. One more than given number gives a successor and one less than given number gives predecessor

Do This

Write the succeeding number of the following : (Successor= Just After number)

Number	Successor
10	11
8	9
−5	−4
−3	−2
0	1

Now write the preceding number of the following :(Predecessor=Just before number)

Number	Predecessor
10	9
8	7
5	4
3	2
0	-1

Tag me with a sign

Profit and loss are opposite situations and if profit is represented by '+' sign, loss can be represented by '–' sign.

Name of items	**Profit**	**Loss**	**Representation with proper sign**
Mustard oil	₹ 150		**₹ 150**
Rice		₹ 250	**−₹ 250**
Black pepper	₹ 225		**₹ 225**
Wheat	₹ 200		**₹ 200**
Groundnut oil		₹ 330	**−₹ 330**

Try These

Write the following numbers with appropriate signs :

(a) 100 m below sea level. Ans: $-100m$

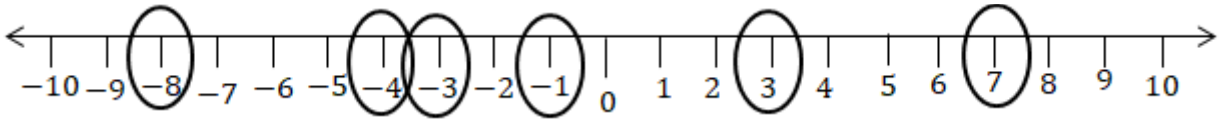
(b) 25°C above 0°C temperature. Ans: **+25⁰C**

(c) 15°C below 0°C temperature. Ans: **−150C**

(d) Any five numbers less than 0 Ans: $-5, -4, -3, -2, -1$

Try These

Mark 3, 7, –4, –8, –1 and – 3 on the number line.



4. Fill in the boxes using > and < signs.

0	>	– 1	– 100	>	–101
– 50	>	– 70	50	>	–51
– 53	<	– 5	–7	<	1

Try These

Compare the following pairs of numbers using > or<

0	>	– 8;	– 1	>	– 15
5	>	– 5;	11	<	15
0	<	6;	– 20	<	2

From the above exercise, Rohini arrived at the following conclusions : Do you agree with her? Give examples.

(a) Every positive integer is larger than every negative integer.

Sol: Yes, the positive integers are right to negative integers and every right integer is larger to left integer on number line.

(b) Zero is less than every positive integer.

Sol: Yes, zero is left to all positive integers

(c) Zero is larger than every negative integer.

Sol: Yes, zero is right to all negative integers.

(d) Zero is neither a negative integer nor a positive integer.

Sol: Yes.

(e) Farther a number from zero on the right, larger is its value.

Sol: Yes,

(f) Farther a number from zero on the left, smaller is its value.

Sol: Yes.

Example 1 : By looking at the number line, answer the following questions : Which integers lie between – 8 and – 2? Which is the largest integer and the smallest integer among them?

Solu: Integers between – 8 and – 2 are – 7, – 6, – 5, – 4, – 3.

The integer – 3 is the largest and – 7 is the smallest.

Example 2 : (a) One button is kept at – 3. In which direction and how many steps should we move to reach at – 9?

(b) Which number will we reach if we move 4 steps to the right of – 6.

Solu : (a) We have to move six steps to the left of – 3

(b) We reach – 2 when we move 4 steps to the right of – 6.

EXERCISE 6.1

1. Write opposites of the following :

(a) Increase in weight

Sol: Decrease in weight

(b) 30 km north

Sol: 30 km south

(c) 80 m east

Sol: 80 m west

(d) Loss of Rs 700

Sol: Profit of Rs 700

(e) 100 m above sea level

Sol: 100 m below sea level

2. Represent the following numbers as integers with appropriate signs.

(a) An aeroplane is flying at a height two thousand metre above the ground.

Sol: $+2000$ m

(b) A submarine is moving at a depth, eight hundred metre below the sea level.

Sol: $-800m$

(c) A deposit of rupees two hundred.

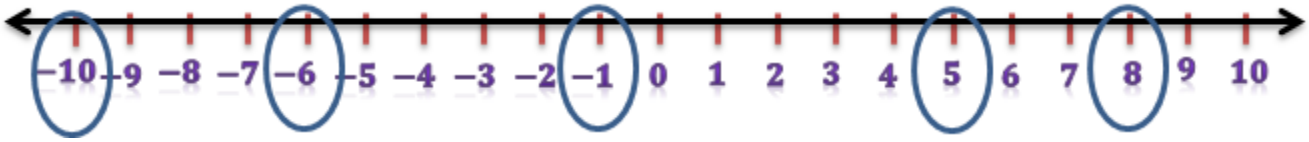
Sol: +₹700

(d) Withdrawal of rupees seven hundred.

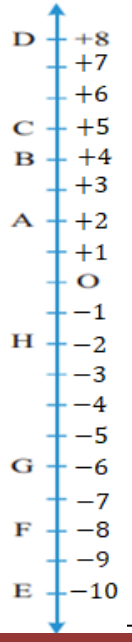
Sol:−₹700

3. Represent the following numbers on a number line :

(a) + 5 (b) – 10 (c) + 8 (d) – 1 (e) – 6



4. **Adjacent figure is a vertical number line, representing integers. Observe it and locate the following points :**



(a) If point D is + 8, then which point is – 8?

Sol: F

(b) Is point G a negative integer or a positive integer?

Sol: Negative integer.

(c) Write integers for points B and E.

Sol: B is $+4$ and E is -10

(d) Which point marked on this number line has the least value?

Sol: E

(e) Arrange all the points in decreasing order of value.

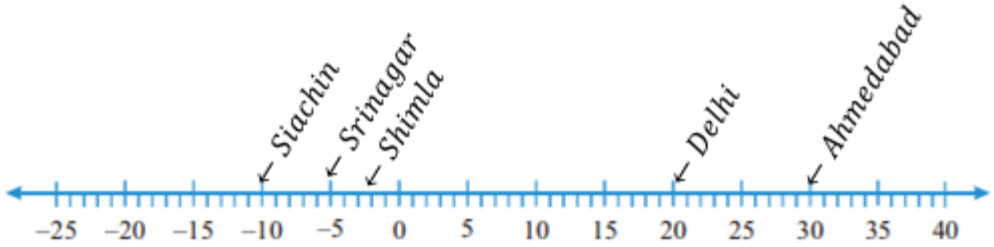
Sol: D, C, B, A, H, G, F, E.

5. Following is the list of temperatures of five places in India on a particular day of the year

(a) Write the temperatures of these places in the form of integers in the blank column.

Place	Temperature	
Siachin	10°C below 0°C	$-10°C$
Shimla	2°C below 0°C	$-2°C$.
Ahmedabad	30°C above 0°C	$+30°C$
Delhi	20°C above 0°C	$20°C$
Srinagar	5°C below 0°C	$-5°C$

(b) Following is the number line representing the temperature in degree Celsius. Plot the name of the city against its temperature.



(c) Which is the coolest place?

Sol: Siachin is the coolest place.

(d) Write the names of the places where temperatures are above 10°C.

Sol: Delhi and Ahmedabad.

6. In each of the following pairs, which number is to the right of the other on the number line?

(a) 2, 9 (b) – 3, – 8 (c) 0, – 1 (d) – 11, 10 (e) – 6, 6 (f) 1, – 100

Sol: (a) 9 (b) -3 (c) 0 (d) 10 (e) 6 (f) 1

7. Write all the integers between the given pairs (write them in the increasing order.)

(a) 0 and – 7

Sol: $-6, -5, -4, -3, -2, -1$

(b) – 4 and 4

Sol: $-3, -2, -1, 0, 1, 2, 3$

(c) – 8 and – 15

Sol: $-14, -13, -12, -11, -10, -9$

(d) – 30 and – 23

Sol: $-29, -28, -27, -26, -25, -24$

8. **(a) Write four negative integers greater than – 20.**

Sol: $-19, -18, -17, -16, -15, -14, -13, -12, -11, -10, ..(any\ four)$

(b) Write four integers less than – 10.

Sol: $-11, -12, -13, -14, -15, -16, -17, -18, -19, ...(any\ four)$

9. For the following statements, write True (T) or False (F). If the statement is false, correct the statement.

(a) – 8 is to the right of – 10 on a number line.

Sol: True

(b) – 100 is to the right of – 50 on a number line.

Sol: False.

Correct statement:– 100 is to the left of – 50 on number line.

(c) Smallest negative integer is – 1.

Sol: False.

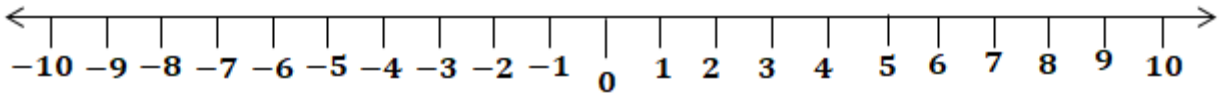
Correct statement: Greatest negative integer is – 1.

(d) – 26 is greater than – 25.

Sol: False.

Correct statement: – 26 is smaller than – 25.

10. Draw a number line and answer the following :



(a) Which number will we reach if we move 4 numbers to the right of – 2.

Sol: 2

(b) Which number will we reach if we move 5 numbers to the left of 1.

Sol: −4

(c) If we are at – 8 on the number line, in which direction should we move to reach – 13?

Sol: To the left.

(d) If we are at – 6 on the number line, in which direction should we move to reach – 1?

Sol: To the right.

Additon of Integers

(i) **When two positive integers are added, we get a positive integer**

[e.g. (+ 3) + (+ 2) = + 5]

(ii) **When two negative integers are added, we get a negative integer**

[e.g. (–2) + (– 1) = – 3].

(iii) **When you have one positive and one negative integer, you must subtract, but answer will take the sign of the bigger integer.**

Try These

Find the answers of the following additions:

$(a)\ (-11) + (-12) = -23$

$(b)\ (+10) + (+4) = +14$

$(c)\ (-32) + (-25) = -57$

$(d)\ (+23) + (+40) = +63$

$(a)\ (-7) + (+8) = +1$

$(b)\ (-9) + (+13) = +4$

$(c)\ (+7) + (-10) = -3$

$(d)\ (+12) + (-7) = +5$

Addition of integers on a number line

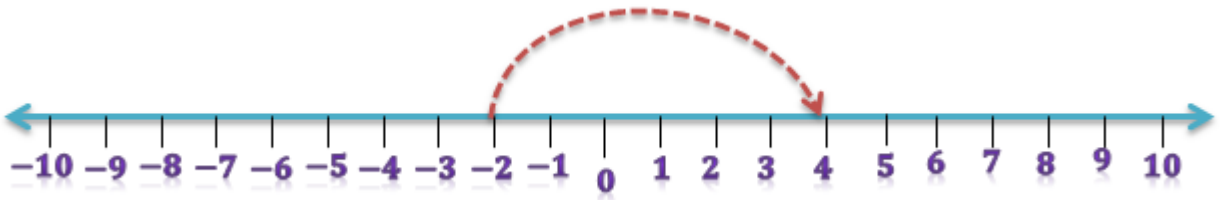
To add a positive integer we move towards the right on a number line and for adding a negative integer we move towards left.

Try These

1. Find the solution of the following additions using a number line :

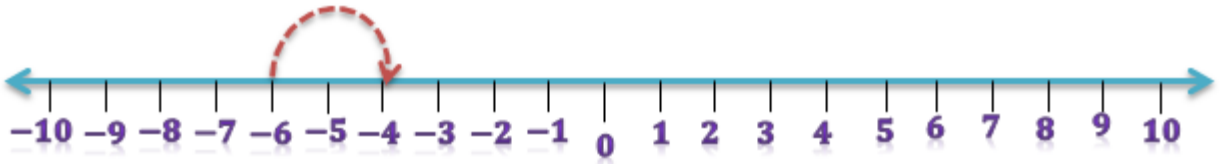
$(a)\ (-\ 2)\ +\ 6\ = 4$

Start at -2 and move 6 steps to right



$(b)\ (-\ 6) + \ 2 = -4$

Start at -6 and move 2 steps to right



2. Find the solution of the following without using number line :

$(a)\ (+\ 7) + \ (-\ 11) = -4$

$(b)\ \ (-\ 13) + \ (+\ 10) = -3$

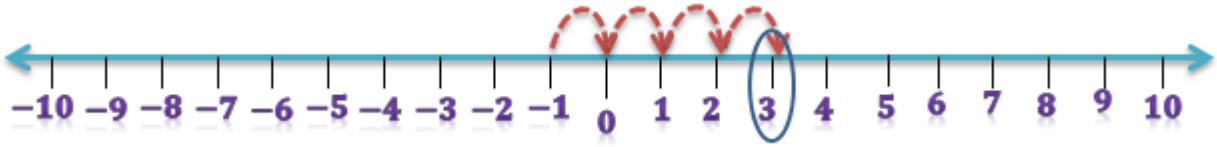
$(c)\ (-\ 7) + \ (+\ 9) = +2$

$(d)\ (+\ 10) + \ (-\ 5) = +5$

Example 3 : Using the number line, write the integer which is

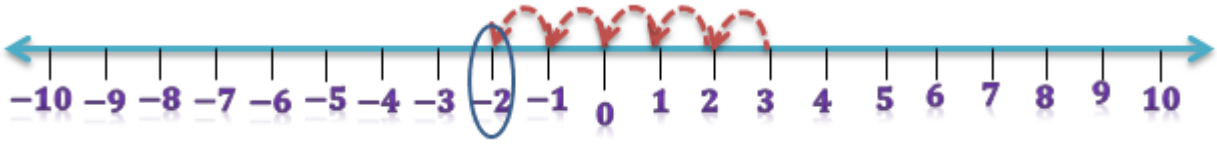
(a) 4 more than –1

Sol: $(-1) + 4 = 3$



(b) 5 less than 3

Sol: $3 + (-5) = -2$



Example 4 : Find the sum of (– 9) + (+ 4) + (– 6) + (+ 3)

Sol: $(-9) + (+4) + (-6) + (+3)$

$= (-9) + (-6) + (+3) + (+4)$

$= (-15) + (+7) = -8$

Example 5 : Find the value of (30) + (– 23) + (– 63) + (+ 55)

Solution : $(30) + (+55) + (-23) + (-63)$

$= 85 + (-86) = -1$

Example 6 : Find the sum of (– 10), (92), (84)and (– 15)

Solution : $(-10) + (92) + (84) + (-15)$

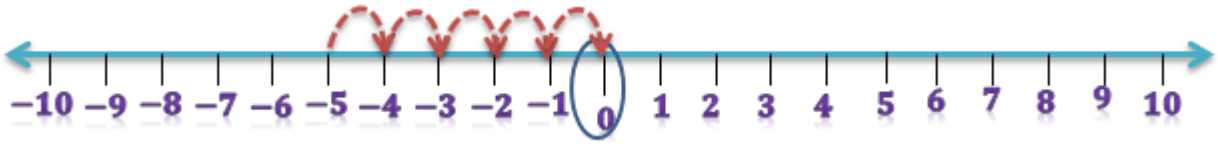
$= (-10) + (-15) + 92 + 84$

$= (-25) + 176 = 151$

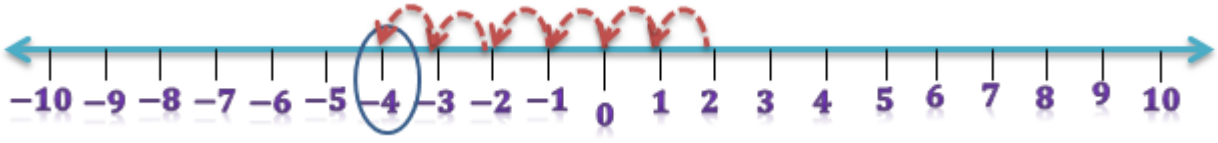
EXERCISE 6.2

1. Using the number line write the integer which is :
   (a) 3 more than 5

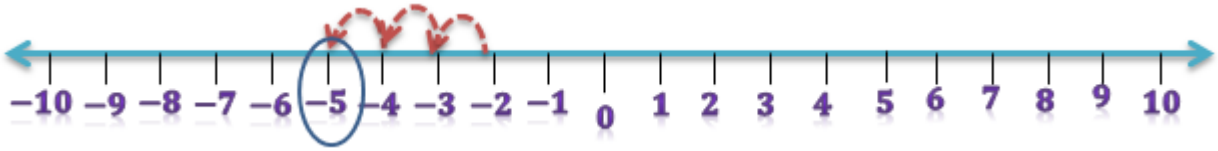
   (b) 5 more than –5



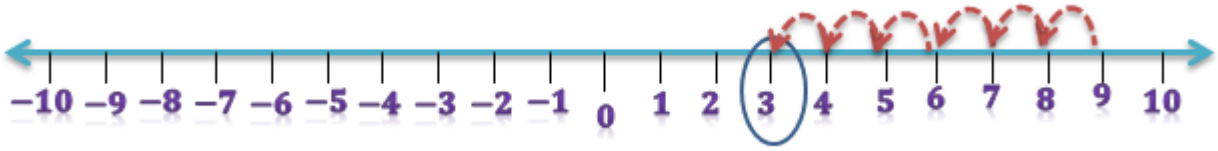
   (c) 6 less than 2



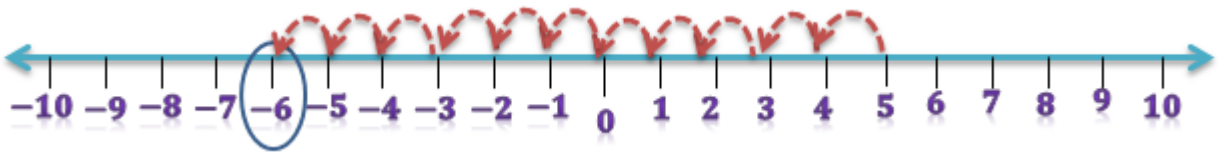
   (d) 3 less than –2



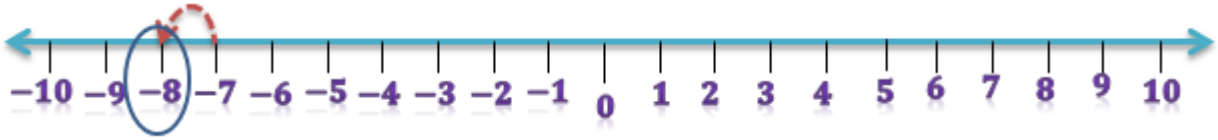
2. Use number line and add the following integers :
   $(a)\ 9 + (-6) = 3$



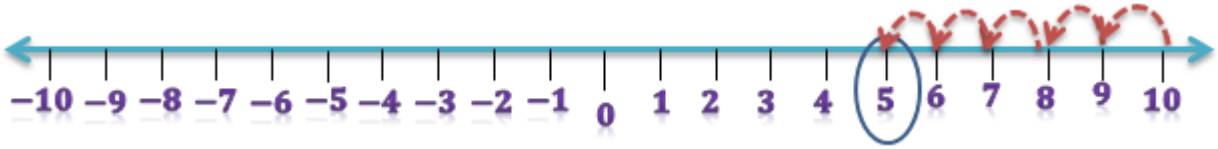
$(b)\mathbf{5} + (-\mathbf{11}) = -6$



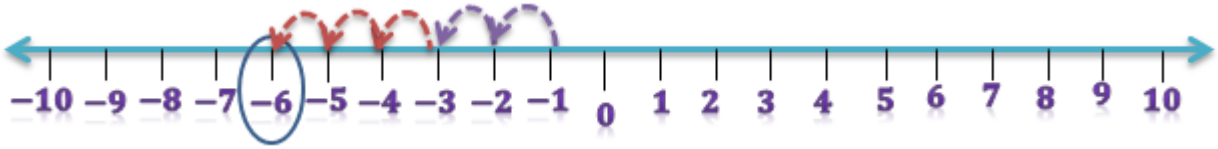
$(c)\ (-\mathbf{1}) + (-\mathbf{7}) = -8$



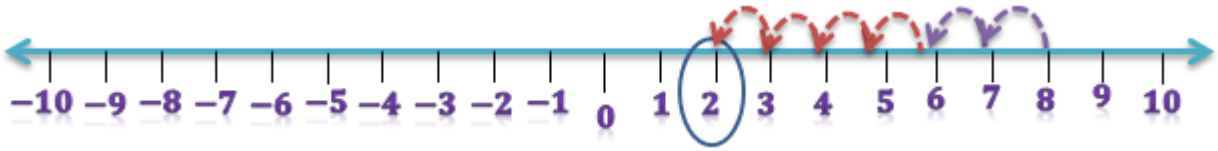
$(d)\ (-\mathbf{5}) + \mathbf{10} = 5$



$(e)\ (-\mathbf{1}) + (-\mathbf{2}) + (-\mathbf{3}) = -6$



$(f)\ (-\mathbf{2}) + \mathbf{8} + (-\mathbf{4}) = 2$



3. **Add without using number line :**

$(a)\ \mathbf{11} + (-\mathbf{7}) = 4$

$(b)\ (-\mathbf{13}) + (+\mathbf{18}) = +5$

$(c)\ (-\mathbf{10}) + (+\mathbf{19}) = +9$

$(d)\ (-\mathbf{250}) + (+\mathbf{150}) = -100$

$(e)\ (-\mathbf{380}) + (-\mathbf{270}) = -650$

$(f)\ (-\mathbf{217}) + (-\mathbf{100}) = -317$

4. **Find the sum of :**

(a) **137 *and* − 354**

Sol: $137 + (-354) = -217$

(b) **− 52 *and* 52**

Sol: $(-52) + 52 = 0$

(c) **− 312, 39 *and* 192**

Sol: $(-312) + 39 + 192$

$= (-312) + 231 = -81$

(d) **− 50, − 200 *and* 300**

Sol: $(-50) + (-200) + 300$

$= (-250) + 300 = 50$

5. **Find the sum :**

(a) $(-\ 7) + (-\ 9) + 4 + 16$

Sol: $(-\ 7) + (-\ 9) + 4 + 16$

$= (-16) + 20 = 4$

(b) $(37) + (-\ 2) + (-\ 65) + (-\ 8)$

Sol: $(37) + (-\ 2) + (-\ 65) + (-\ 8)$

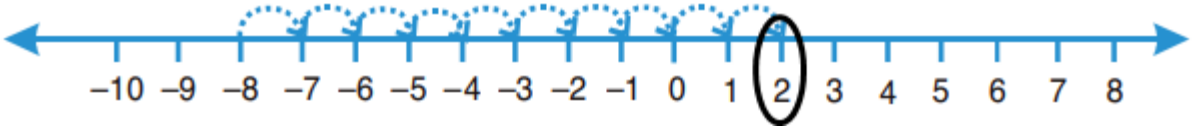
$= 37 + (-75) = -38$

Subtraction of Integers with the help of a Number Line

$-(-) = +$

Example 7 : Find the value of – 8 – (–10) using number line

Sol: $-\ 8 - (-\ 10) = -8 + 10 = 2$



Example 8 : Subtract (– 4) from (– 10)

sol: $(-10) - (-4) = -10 + 4 = -6$

EXERCISE 6.3

1. Find

(a) $35 - (20)$

$= 35 - 20 = 15$

(b) $72 - (90)$

$= 72 - 90 = -18$

(c) $(-\ 15) - (-\ 18)$

$= -15 + 18 = 3$

(d) $(-20) - (13)$

$= -20 - 13 = -33$

(e) $23 - (-\ 12)$

$= 23 + 12 = 35$

(f) $(-32) - (-\ 40)$

$= -32 + 40 = 8$

2. Fill in the blanks with >, < or = sign

(a) $(-\ 3) + (-\ 6)\ <\ (-\ 3) - (-\ 6)$

Sol: $(-\ 3) + (-\ 6) = -9$

$(-\ 3) - (-\ 6) = -3 + 6 = 3$

(b) $(-\ 21) - (-\ 10) > (-\ 31) + (-\ 11)$

sol: $(-\ 21) - (-\ 10) = -21 + 10 = -11$

$(-\ 31) + (-\ 11) = -41$

(c) $45 - (-11) > 57 + (-\ 4)$

Sol: $45 - (-11) = 45 + 11 = 56$

$57 + (-\ 4) = 53$

(d) $(-\ 25) - (-\ 42) > (-\ 42) - (-\ 25)$

Sol: $(-\ 25) - (-\ 42) = -25 + 42 = 17$

$(-\ 42) - (-\ 25) = -42 + 25 = -17$

3. **Fill in the blanks.**

$(\boldsymbol{a})$ $(-\ \mathbf{8}) + \_\_\_\_ = \mathbf{0}$

Sol: $(-8) + 8 = 0$

$(\boldsymbol{b})$ $\mathbf{13} + \_\_ = \mathbf{0}$

Sol: $13 + (-13) = 0$

$(\boldsymbol{c})$ $\mathbf{12} + (-\ \mathbf{12}) = \_\_$

Sol: $12 + (-\ 12) = 0$

$(\boldsymbol{d})$ $(-\ \mathbf{4}) + \_\_\_ = -\ \mathbf{12}$

Sol: $(-\ 4) + (-8) = -\ 12$

$(\boldsymbol{e})$ $\_\_\_ -\ \mathbf{15} = -\ \mathbf{10}$

Sol: $5 -\ 15 = -\ 10$

4. **Find**

$(\boldsymbol{a})$ $(-\ \mathbf{7}) -\ \mathbf{8} - (-\ \mathbf{25})$

Sol: $(-\ 7) -\ 8 - (-\ 25)$

$= -7 - 8 + 25$

$= -15 + 25 = 10$

$(\boldsymbol{b})$ $(-\ \mathbf{13}) + \mathbf{32} - \mathbf{8} - \mathbf{1}$

Sol: $(-\ 13) + 32 - 8 - 1$

$= (-\ 13) - 8 - 1 + 32$

$= -22 + 32 = 10$

$(\boldsymbol{c})$ $(-\ \mathbf{7}) + (-\ \mathbf{8}) + (-\ \mathbf{90})$

Sol: $(-\ 7) + (-\ 8) + (-\ 90)$

$= (-15) + (-90)$

$= -105$

$(\boldsymbol{d})$ $\mathbf{50} - (-\ \mathbf{40}) - (-\ \mathbf{2})$

Sol: $50 - (-\ 40) -\ (-\ 2)$

$= 50 + 40 + 2$

$= 92$

CHAPTER 7

VI-MATHEMATICS-NCERT

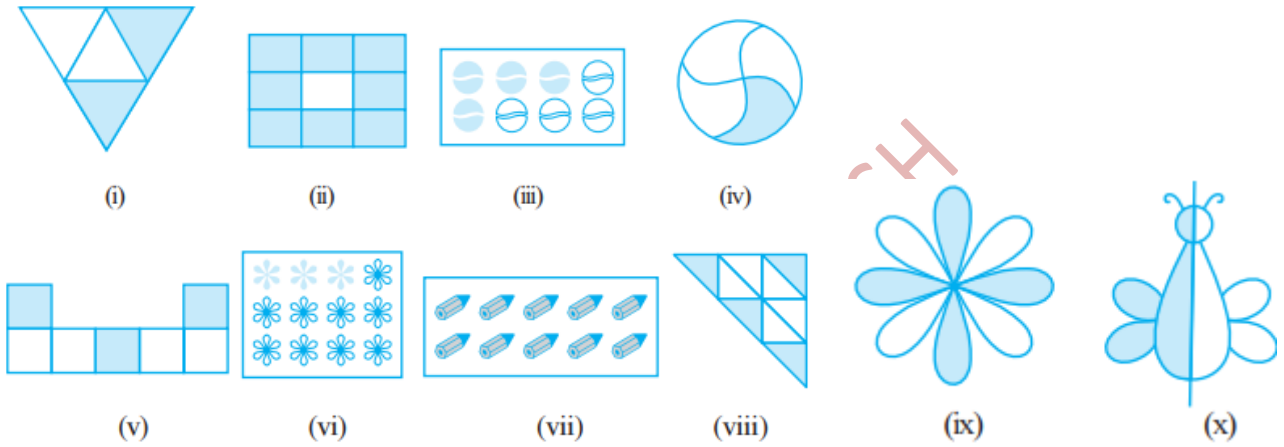
7. FRACTIONS (Notes)

PREPARED BY: BALABHADRA SURESH

1. A fraction is a number representing a part of a whole. This whole may be a single object or a group of objects
2. When expressing a situation of counting parts to write a fraction, it must be ensured that all parts are equal.
3. In $\frac{5}{7}$, 5 is called the numerator and 7 is called the denominator.

EXERCISE 7.1

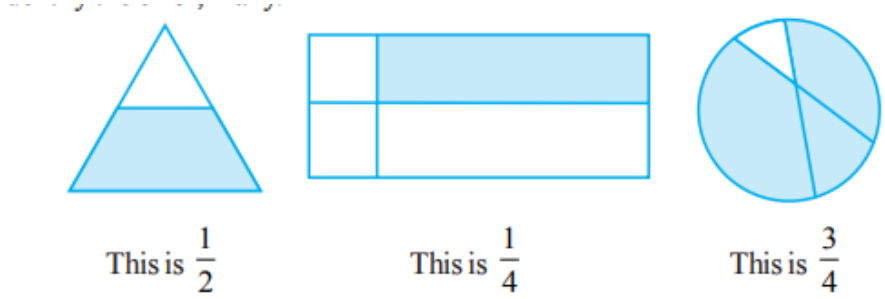
1. Write the fraction representing the shaded portion.



Sol: $(i)\ \frac{2}{4}$ $(ii)\ \frac{8}{9}$ $(iii)\ \frac{4}{8}$ $(vi)\ \frac{1}{4}$ $(v)\ \frac{3}{7}$ $(vi)\ \frac{3}{12}$ $(vii)\ \frac{10}{10}$ $(viii)\ \frac{4}{9}$ $(ix)\ \frac{4}{8}$ $(x)\ \frac{1}{2}$

2. Colour the part according to the given fraction.

3. Identify the error, if any.



Sol: Each figure not divided equal parts. So, shaded portions do not represent the given fractions.

4. What fraction of a day is 8 hours?

Sol: 1 day=24 hours

Fraction of a day is 8 hours $= \frac{8}{24}$

5. What fraction of an hour is 40 minutes?

Sol: 1 hour=60 minutes.

Fraction of an hour is 40 minutes $= \frac{40}{60}$

6. Arya, Abhimanyu, and Vivek shared lunch. Arya has brought two sandwiches, one made of vegetable and one of jam. The other two boys forgot to bring their lunch. Arya agreed to share his sandwiches so that each person will have an equal share of each sandwich.
(a) How can Arya divide his sandwiches so that each person has an equal share?
(b) What part of a sandwich will each boy receive?

Sol: (a) Arya will divide each sandwich into 3 equal parts, and give one part of each sandwich to each one of them.

(b)Each boy receive $\frac{1}{3}$ part of sand wich.

7. Kanchan dyes dresses. She had to dye 30 dresses. She has so far finished 20 dresses. What fraction of dresses has she finished?

Sol: Total number of dresses Kanchan has to dye=30

Number of dresses she has finished=20

Required fraction $= \frac{20}{30} = \frac{2}{3}$

8. Write the natural numbers from 2 to 12. What fraction of them are prime numbers?

Sol: Natural numbers from 2 to 12 are 2,3,4,5,6,7,8,9,10,11,12

Prime numbers are 2,3,5,7,11

Required fraction $= \frac{\text{Total given natural numbers}}{\text{Number of prime numbers}} = \frac{5}{11}$

9. Write the natural numbers from 102 to 113. What fraction of them are prime numbers?

Sol: Natural numbers from 102 to 113 are 102, 103, 104, 105, 106, 107, 108, 109, 110,111,112,113

Prime numbers are 103,107,109,113

Required fraction $= \frac{\text{Total given natural numbers}}{\text{Number of prime numbers}} = \frac{4}{12}$

10. What fraction of these circles have X's in them?

Sol: Total number of circles=8

Number of circles having X's in them=4

The required fraction $= \frac{4}{8}$

11. Kristin received a CD player for her birthday. She bought 3 CDs and received 5 others as gifts. What fraction of her total CDs did she buy and what fraction did she receive as gifts?

Sol: Number of CDs Kristin buy=3

Number of CDs received as gift=5

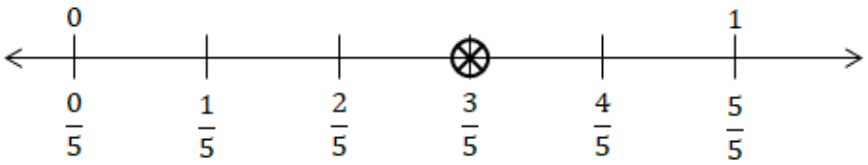
Total number of CDs Kristin has=3+5=8

Fraction of CDs she bought $= \frac{3}{8}$; Fraction of CDs received as gifts $= \frac{5}{8}$

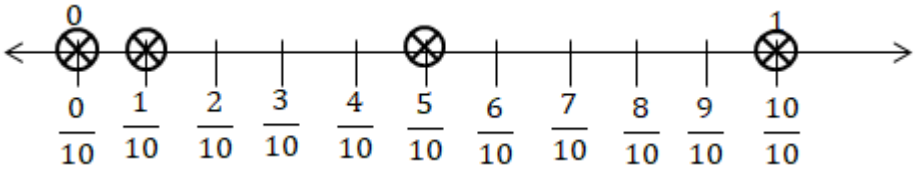
Fraction on the Number Line.

Try These

1. Show $\frac{3}{5}$ on a number line

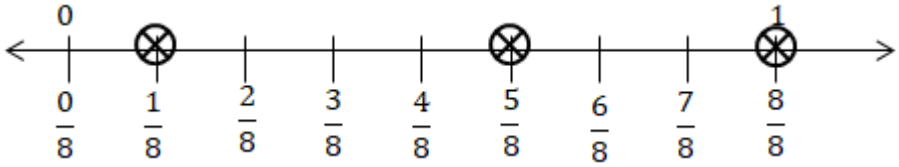


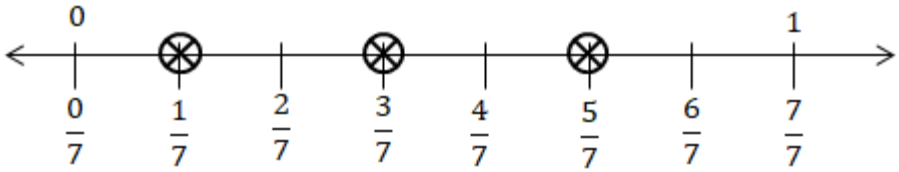
2. Show $\frac{1}{10}, \frac{0}{10}, \frac{5}{10}, and\ \frac{10}{10}$ on a number line.

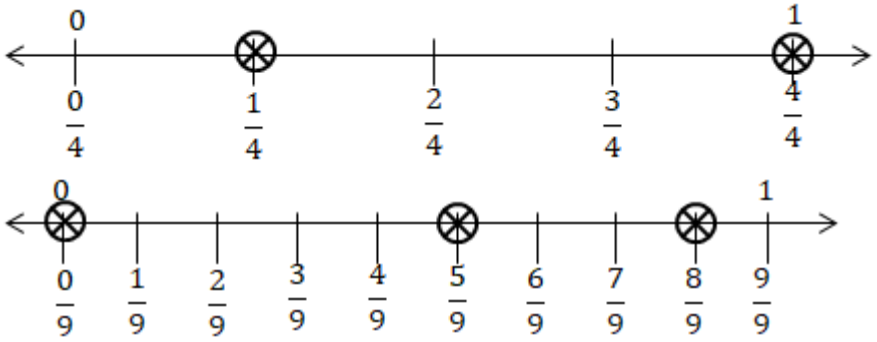


3. Can you show any other fraction between 0 and 1? Write five more fractions that you can show and depict them on the number line

(a)Show $\frac{3}{7}, \frac{5}{7}, \frac{1}{7}$ on a number line







4. How many fractions lie between 0 and 1? Think, discuss and write your answer?

Sol: There are infinite number of fractions lie between 0 and 1.

Proper Fractions:

In a fraction the numerator is always less than the denominator is called Proper fraction.

Proper fraction value always less than 1.

Try These

1. Give a proper fraction :

(a) whose numerator is 5 and denominator is 7.

Sol: $\frac{5}{7}$

(b) whose denominator is 9 and numerator is 5.

Sol: $\frac{5}{9}$

(c) whose numerator and denominator add up to 10. How many fractions of this kind can you make?

Sol: $\frac{1}{9}, \frac{2}{8}, \frac{3}{7}, \frac{4}{6}, \frac{5}{5}, \frac{6}{4}, \frac{7}{3}, \frac{8}{2}, \frac{9}{1}$

$There\ are\ 9\ fractions$

(d) whose denominator is 4 more than the numerator. (Give any five. How many more can you make?)

Sol: $\frac{1}{5}, \frac{2}{6}, \frac{3}{7}, \frac{4}{8}, \frac{5}{9}, \frac{6}{10}, \ldots\ldots$ We write infinite fractions.

2. A fraction is given. How will you decide, by just looking at it, whether, the fraction is (a) less than 1? (b) equal to 1?

Sol: (a) If the numerator is less than denominator then the fraction is less than 1.

(b)If the numerator and denominator are equal then the fraction is equal to 1.

3. Fill up using one of these : '>', '<' or '='

$(a)\ \frac{1}{2} < 1\ \ (b)\ \frac{3}{5} < 1\ \ (c)\ 1 > \frac{7}{8}\ \ (d)\ \frac{4}{4} = 1\ \ (e)\ \frac{2005}{2005} = 1$

Improper and Mixed Fractions

The fractions, where the numerator is bigger than the denominator are called improper fractions.

Ex: $\frac{3}{2}, \frac{12}{7}, \frac{15}{9}, ..$

1. **Write five improper fractions with denominator 7.**

Sol: $\frac{10}{7}, \frac{11}{7}, \frac{12}{7}, \frac{13}{7}, \frac{14}{7}$

2. **Write five improper fractions with numerator 11.**

Sol: $\frac{11}{2}, \frac{11}{3}, \frac{11}{4}, \frac{11}{5}, \frac{11}{6},$

Mixed Fractions:

A mixed fraction has a combination of a whole and a part (Whole number and proper fraction)

$Ex: 2\frac{3}{5}, 3\frac{5}{9}, \ 4\frac{7}{11}, \ldots ..$

The mixed fraction will be written as Quotient $\frac{\text{Remainder}}{\text{Divisor}}$.

Example 1 : Express the following as mixed fractions :

$Sol: (a) \ \frac{17}{4} = 4\frac{1}{4}$

$$\begin{array}{r} 4 \\ 4\overline{)17} \\ (-)16 \\ \hline 1 \end{array}$$

$(b) \ \frac{11}{3} = 3\frac{2}{3}$

$$\begin{array}{r} 3 \\ 3\overline{)11} \\ (-)9 \\ \hline 5 \end{array}$$

$(c) \ \frac{27}{5} = 5\frac{2}{5}$

$$\begin{array}{r} 5 \\ 5\overline{)27} \\ (-)25 \\ \hline 2 \end{array}$$

$(d) \ \frac{7}{3} = 2\frac{1}{3}$

$$\begin{array}{r} 2 \\ 3\overline{)7} \\ (-)6 \\ \hline 1 \end{array}$$

Alternate method:

$(a) \ \frac{17}{4} = \frac{16+1}{4} = \frac{16}{4} + \frac{1}{4} = 4 + \frac{1}{4} = 4\frac{1}{4}$

$(b) \ \frac{11}{3} = \frac{9+2}{3} = \frac{9}{3} + \frac{2}{3} = 3 + \frac{2}{3} = 3\frac{2}{3}$

$(c)\ \frac{27}{5}=\frac{25+2}{5}=\frac{25}{5}+\frac{2}{5}=5+\frac{2}{5}=5\frac{2}{5}$

$(d)\ \frac{7}{3}=\frac{6+1}{3}=\frac{6}{3}+\frac{1}{3}=2+\frac{1}{3}=2\frac{1}{3}$

Mixed fractions as improper fraction:

$$\text{Whole}\frac{\text{Numerator}}{\text{Denominator}}=\frac{(\text{Whole}\times\text{Denominator})+\text{Numerator}}{\text{Denominator}}$$

Example 2 : Express the following mixed fractions as improper fractions:

$Sol: (a)\ 2\frac{3}{4}=\frac{(2\times4)+3}{4}=\frac{8+3}{4}=\frac{11}{4}.$

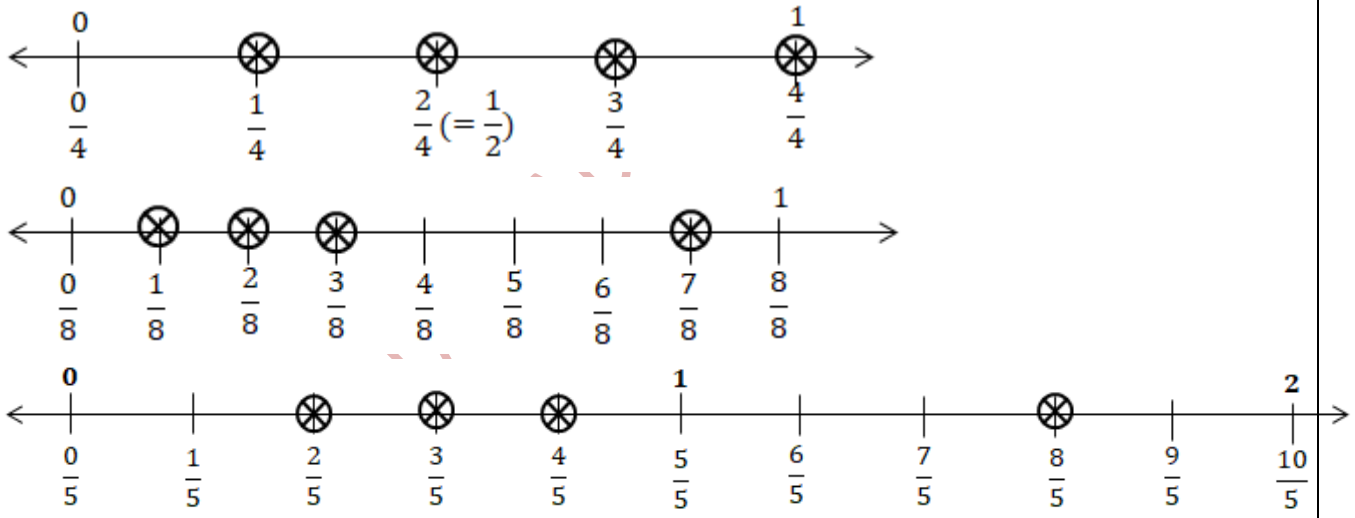
$(b)\ 7\frac{1}{9}=\frac{(7\times9)+1}{9}=\frac{63+1}{9}=\frac{64}{9}$

$(b)\ 5\frac{3}{7}=\frac{(5\times7)+3}{7}=\frac{35+3}{7}=\frac{38}{7}$

EXERCISE 7.2

1. **Draw number lines and locate the points on them :**

$(a)\ \frac{1}{2},\frac{1}{4},\frac{3}{4},\frac{4}{4}$ $(b)\ \frac{1}{8},\frac{2}{8},\frac{3}{8},\frac{7}{8}$ $(c)\ \frac{2}{5},\frac{3}{5},\frac{8}{5},\frac{4}{5}$



2. Express the following as mixed fractions :

$Sol:\ (a)\ \frac{20}{3}=6\frac{2}{3}$

$$3\overline{)20}\ (6,\ (-)18,\ 2$$

$(b)\ \frac{11}{5}=2\frac{1}{5}$

$$5\overline{)11}\ (2,\ (-)10,\ 1$$

$(c)\ \frac{17}{7}=2\frac{3}{7}$

$$7\overline{)17}\ (2,\ (-)14,\ 3$$

$(d)\ \frac{28}{5}=5\frac{3}{5}$

$$5\overline{)28}\ (5,\ (-)25,\ 3$$

$(e)\ \frac{19}{6}=3\frac{1}{6}$

$$6\overline{)19}\quad 3,\ (-)18,\ 1$$

$$9\overline{)35}\quad 3,\ (-)27,\ 8$$

(f) $\frac{35}{9} = 3\frac{8}{9}$

3. Express the following as improper fractions :

Sol: (a) $7\frac{3}{4} = \frac{(7\times 4)+3}{4} = \frac{28+3}{4} = \frac{31}{4}$

(b) $5\frac{6}{7} = \frac{(5\times 7)+6}{7} = \frac{35+6}{7} = \frac{41}{7}$

(c) $2\frac{5}{6} = \frac{(2\times 6)+5}{6} = \frac{12+5}{6} = \frac{17}{6}$

(d) $10\frac{3}{5} = \frac{(10\times 5)+3}{5} = \frac{50+3}{5} = \frac{53}{5}$

(e) $9\frac{3}{7} = \frac{(9\times 7)+3}{7} = \frac{63+3}{7} = \frac{66}{7}$

(f) $8\frac{4}{9} = \frac{(8\times 9)+4}{9} = \frac{72+4}{9} = \frac{76}{9}$

Equivalent Fractions

To find an equivalent fraction of a given fraction, you may multiply or divide both the numerator and the denominator of the given fraction by the **same number**.

Try These

Find five equivalent fractions of each of the following:

(i) $\frac{2}{3}$

Sol: $\frac{2}{3} = \frac{2\times 2}{3\times 2} = \frac{2\times 3}{3\times 3} = \frac{2\times 4}{3\times 4} = \frac{2\times 5}{3\times 5} = \frac{2\times 6}{3\times 6} = \cdots.$

$\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12} = \frac{10}{15} = \frac{12}{18} = \cdots$

(ii) $\frac{1}{5}$

Sol: $\frac{1}{5} = \frac{1\times 2}{5\times 2} = \frac{1\times 3}{5\times 3} = \frac{1\times 4}{5\times 4} = \frac{1\times 5}{5\times 5} = \frac{1\times 6}{5\times 6} = \cdots.$

$\frac{1}{5} = \frac{2}{10} = \frac{3}{15} = \frac{4}{20} = \frac{5}{25} = \frac{6}{30} = \cdots$

(iii) $\frac{3}{5}$

Sol: $\frac{3}{5} = \frac{3\times 2}{5\times 2} = \frac{3\times 3}{5\times 3} = \frac{3\times 4}{5\times 4} = \frac{3\times 5}{5\times 5} = \frac{3\times 6}{5\times 6} = \cdots.$

$$\frac{3}{5}=\frac{6}{10}=\frac{9}{15}=\frac{12}{20}=\frac{15}{25}=\frac{18}{30}=\cdots$$

(iv) $\frac{5}{9}$

Sol: $\frac{5}{9}=\frac{5\times 2}{9\times 2}=\frac{5\times 3}{9\times 3}=\frac{5\times 4}{9\times 4}=\frac{5\times 5}{9\times 5}=\frac{5\times 6}{9\times 6}=\cdots.$

$$\frac{5}{9}=\frac{10}{18}=\frac{15}{27}=\frac{20}{36}=\frac{25}{45}=\frac{30}{54}=\cdots$$

Example 3 : Find the equivalent fraction of $\frac{2}{5}$ with numerator 6.

Sol: $\frac{2}{5}=\frac{2\times 3}{5\times 3}=\frac{6}{15}$

Example 4 : Find the equivalent fraction of $\frac{15}{35}$ with denominator 7.

Sol: $\frac{15}{35}=\frac{15\div 5}{35\div 5}=\frac{3}{7}$

Example 5 : Find the equivalent fraction of $\frac{2}{9}$ with denominator 63.

Sol: $\frac{2}{9}=\frac{x}{63}$

$9\times x=63\times 2$

$9\times x=9\times 7\times 2$

$9\times x=9\times 14$

$x=14$

$\frac{2}{9}=\frac{14}{63}$

Simplest Form of a Fraction:

A fraction is said to be in the simplest (or lowest) form if its numerator and denominator have no common factor except 1.

Try These

1. Write the simplest form of :

Sol: (i) $\frac{15}{75}=\frac{15\div 5}{75\div 5}=\frac{3\div 3}{15\div 3}=\frac{1}{5}$

(ii) $\frac{16}{72}=\frac{16\div 8}{72\div 8}=\frac{2}{9}$

(iii) $\frac{17}{51}=\frac{17\div 17}{51\div 17}=\frac{1}{3}$

(iv) $\frac{42}{28}=\frac{42\div 2}{28\div 2}=\frac{21\div 7}{14\div 7}=\frac{3}{2}$

(v) $\frac{80}{24}=\frac{80\div 8}{24\div 8}=\frac{10}{3}$

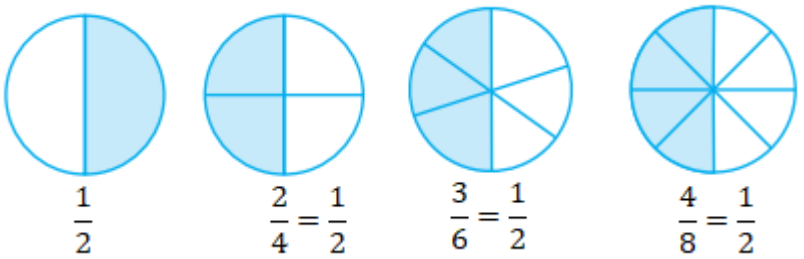
2. Is $\frac{49}{64}$ in its simplest form?

Sol: $\frac{49}{64}$ is in simplest form.

Because there is no common factor to 49 and 64 except 1.

EXERCISE 7.3

1. Write the fractions. Are all these fractions equivalent?

(a) 

$\frac{1}{2}$ $\quad \frac{2}{4}=\frac{1}{2}$ $\quad \frac{3}{6}=\frac{1}{2}$ $\quad \frac{4}{8}=\frac{1}{2}$

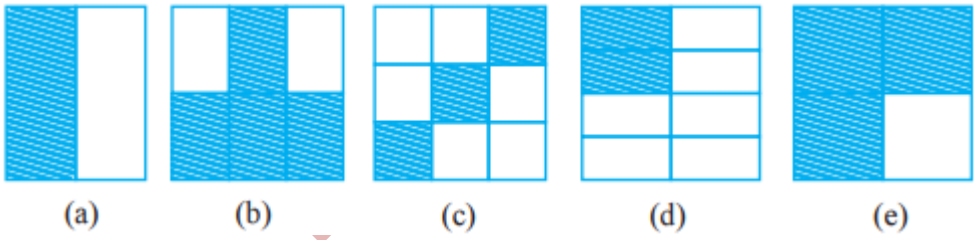
All fractions are equivalent

(b) 

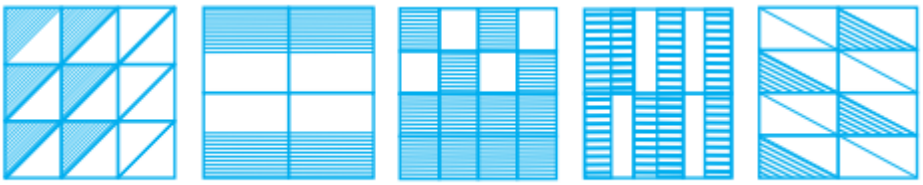
$\frac{4}{12}=\frac{1}{3}$ $\quad \frac{3}{9}=\frac{1}{3}$ $\quad \frac{2}{6}=\frac{1}{3}$ $\quad \frac{1}{3}$ $\quad \frac{6}{15}=\frac{2}{5}$

Expect 5th fraction remaining are all equivalent fractions

2. Write the fractions and pair up the equivalent fractions from each row.



(a) (b) (c) (d) (e)



(i) (ii) (iii) (iv) (v)

Sol: $(a)\frac{1}{2}$ $\quad (b)\ \frac{4}{6}=\frac{2}{3}$ $\quad (c)\ \frac{3}{9}=\frac{1}{3}$ $\quad (d)\frac{2}{8}=\frac{1}{4}$ $\quad (e)\ \frac{3}{4}$

$(i)\ \frac{6}{18}=\frac{1}{3}$ $\quad (ii)\frac{4}{8}=\frac{1}{2}$ $\quad (iii)\frac{12}{16}=\frac{3}{4}$ $\quad (iv)\frac{8}{12}=\frac{2}{3}$ $\quad (v)\frac{4}{16}=\frac{1}{4}$

Pair of equivalent fractions : (a), (ii); (b), (iv); (c), (v); (d), (v); (e), (iii)

3. Replace $\square$ in each of the following by the correct number :

Sol: (a) $\frac{2}{7}=\frac{2\times4}{7\times4}=\frac{8}{\boxed{28}}$

(b) $\frac{5}{8}=\frac{5\times2}{8\times2}=\frac{10}{\boxed{16}}$

(c) $\frac{3}{5}=\frac{3\times4}{5\times4}=\frac{\boxed{12}}{20}$

(d) $\frac{45}{60}=\frac{45\div3}{60\div3}=\frac{15}{\boxed{20}}$

(e) $\frac{18}{24}=\frac{18\div6}{24\div6}=\frac{\boxed{3}}{4}$

4. Find the equivalent fraction of $\frac{3}{5}$ having.

(a) Denominator 20

Sol: $\frac{3}{5}=\frac{3\times4}{5\times4}=\frac{12}{20}$

(b) Numerator 9

Sol: $\frac{3}{5}=\frac{3\times3}{5\times3}=\frac{9}{15}$

(c) Denominator 30

Sol: $\frac{3}{5}=\frac{3\times6}{5\times6}=\frac{18}{30}$

(d) Numerator 27

Sol: $\frac{3}{5}=\frac{3\times9}{5\times9}=\frac{27}{45}$

5. Find the equivalent fraction of $\frac{36}{48}$ with

(a) numerator 9 (b) denominator 4

Sol: $(a)\ \frac{\mathbf{36}}{\mathbf{48}}=\frac{36\div4}{48\div4}=\frac{9}{12}$

$(b)\ \frac{\mathbf{36}}{\mathbf{48}}=\frac{36\div12}{48\div12}=\frac{3}{4}$

6. Check whether the given fractions are equivalent :

$(a)\ \frac{\mathbf{5}}{\mathbf{9}},\frac{\mathbf{30}}{\mathbf{54}}\quad (b)\ \frac{\mathbf{3}}{\mathbf{10}},\frac{\mathbf{12}}{\mathbf{50}}\quad (c)\ \frac{\mathbf{7}}{\mathbf{13}},\frac{\mathbf{5}}{\mathbf{11}}$

sol:

$(a)\ \frac{5}{9}=\frac{5\times6}{9\times6}=\frac{30}{54}$

$\frac{5}{9}=\frac{30}{54}$

$(b)\ \frac{3}{10}=\frac{3\times4}{10\times4}=\frac{12}{40}$

$\frac{3}{10}\neq\frac{12}{50}$

$(c)\ \frac{7}{13}=\frac{7\times5}{13\times5}=\frac{35}{65},$

$\frac{5}{11}=\frac{5\times7}{11\times7}=\frac{35}{77}$

$\frac{7}{13}\neq\frac{5}{11}$

7. Reduce the following fractions to simplest form :

$(a)\ \frac{48}{60}\quad (b)\ \frac{150}{60}\quad (c)\ \frac{84}{98}\quad (d)\ \frac{12}{52}\quad (e)\ \frac{7}{28}$

Sol: $(a)\ \frac{48}{60}=\frac{48\div12}{60\div12}=\frac{4}{5}$

$(b)\ \frac{150}{60}=\frac{150\div10}{60\div10}=\frac{15\div3}{6\div3}=\frac{5}{2}$

$(c)\ \frac{84}{98}=\frac{84\div2}{98\div2}=\frac{42\div7}{49\div7}=\frac{6}{7}$

$(d)\ \frac{12}{52}=\frac{12\div4}{52\div4}=\frac{3}{13}$

$(e)\ \frac{7}{28}=\frac{7\div 7}{28\div 7}=\frac{1}{4}$

8. Ramesh had 20 pencils, Sheelu had 50 pencils and Jamaal had 80 pencils. After 4 months, Ramesh used up 10 pencils, Sheelu used up 25 pencils and Jamaal used up 40 pencils. What fraction did each use up? Check if each has used up an equal fraction of her/his pencils?

Sol:

	Ramesh	Sheelu	Jammal
Used pencils	10	25	40
Total pencils	20	50	80

Fraction of pencils uesd by Ramesh $=\frac{10}{20}=\frac{1}{2}$

Fraction of pencils uesd by Sheelu $=\frac{25}{50}=\frac{1}{2}$

Fraction of pencils uesd by Jammal $=\frac{40}{80}=\frac{1}{2}$

All students used equal fraction of pencils.

9. Match the equivalent fractions and write two more for each.

(i) $\frac{250}{400}$ (a) $\frac{2}{3}$ (iv) $\frac{180}{360}$ (d) $\frac{5}{8}$

(ii) $\frac{180}{200}$ (b) $\frac{2}{5}$ (v) $\frac{220}{550}$ (e) $\frac{9}{10}$ (iii) $\frac{660}{990}$ (c) $\frac{1}{2}$

Sol: $(i)\frac{25\cancel{0}}{40\cancel{0}}=\frac{25}{40}=\frac{5}{8}$ $(ii)\ \frac{18\cancel{0}}{20\cancel{0}}=\frac{18}{20}=\frac{9}{10}$ $(iii)\frac{66\cancel{0}}{99\cancel{0}}=\frac{66}{99}=\frac{6}{9}=\frac{2}{3}$

$(iv)\frac{18\cancel{0}}{36\cancel{0}}=\frac{18}{36}=\frac{2}{4}=\frac{1}{2}$, $(v)\frac{22\cancel{0}}{55\cancel{0}}=\frac{22}{55}=\frac{2}{5}$

$(i)\ \rightarrow (d);\ (ii)\rightarrow (e);\ (iii)\rightarrow (a);\ (iv)\rightarrow (c);\ (v)\rightarrow (b)$

Like Fractions and unlike fractions.

Fractions with same denominators are called like fractions.

Ex: $\frac{1}{15},\frac{2}{15},\frac{3}{15},\frac{8}{15},\ldots$

Fractions with different denominators are called unlike fractions.

Ex: $\frac{2}{9},\frac{7}{27},\frac{5}{28},..$

Comparing Like Fractions:

In two like fractions (the denominators are same) the greater numerator fraction is greater.

Ex: $(i)\ \frac{3}{5} > \frac{2}{5}$ $(ii)\ \frac{3}{7} < \frac{5}{7}$

Try These

1. Which is the larger fraction? Why are these comparisons easy to make?

Sol: $(i)\ \mathbf{\frac{7}{10}}$ ***or*** $\mathbf{\frac{8}{10}}$ *Ans*: $\frac{8}{10}$ $(ii)\ \mathbf{\frac{11}{24}}$ ***or*** $\mathbf{\frac{13}{24}}$ *Ans*: $\frac{13}{24}$ $(iii)\ \mathbf{\frac{17}{102}}$ ***or*** $\mathbf{\frac{12}{102}}$ *Ans*: $\frac{17}{102}$

These are like fractions.

2. Write these in ascending and also in descending order.

$(a)\ \mathbf{\frac{1}{8}, \frac{5}{8}, \frac{3}{8}}$

Sol: Ascending order: $\frac{1}{8}, \frac{3}{8}, \frac{5}{8}$

Descending order: $\frac{5}{8}, \frac{3}{8}, \frac{1}{8}$

$(b)\ \mathbf{\frac{1}{5}, \frac{11}{5}, \frac{4}{5}, \frac{3}{5}, \frac{7}{5}}$

Sol: Ascending order: $\frac{1}{5}, \frac{3}{5}, \frac{4}{5}, \frac{7}{5}, \frac{11}{5}$.

Descending order: $\frac{11}{5}, \frac{7}{5}, \frac{4}{5}, \frac{3}{5}, \frac{1}{5}$.

$(c)\ \mathbf{\frac{1}{7}, \frac{3}{7}, \frac{13}{7}, \frac{11}{7}, \frac{7}{7}}$

Sol: Ascending order: $\frac{1}{7}, \frac{3}{7}, \frac{7}{7}, \frac{11}{7}, \frac{13}{7}$.

Descending order: $\frac{13}{7}, \frac{11}{7}, \frac{7}{7}, \frac{3}{7}, \frac{1}{7}$.

Comparing unlike fractions

(i) If the numerator is the same in two fractions, the fraction with the smaller denominator is greater of the two'

Ex: $(i)\ \frac{3}{5} > \frac{3}{7}$ $(ii)\ \frac{4}{11} < \frac{4}{9}$

Try These

1. Arrange the following in ascending and descending order :

$(a)\ \mathbf{\frac{1}{12}, \frac{1}{2}, \frac{1}{5}, \frac{1}{7}, \frac{1}{50}, \frac{1}{9}, \frac{1}{17}}$.

Sol: Ascending order: $\frac{1}{50}, \frac{1}{17}, \frac{1}{12}, \frac{1}{9}, \frac{1}{7}, \frac{1}{5}, \frac{1}{2}$

$(b)\ \mathbf{\frac{3}{7}, \frac{3}{11}, \frac{3}{5}, \frac{3}{2}, \frac{3}{13}, \frac{3}{4}, \frac{3}{17}}$.

Sol: Ascending order: $\frac{3}{17}, \frac{3}{13}, \frac{3}{11}, \frac{3}{7}, \frac{3}{5}, \frac{3}{4}, \frac{3}{2}$.

$(c)\ \mathbf{\frac{5}{7}, \frac{5}{8}, \frac{5}{5}, \frac{5}{6}, \frac{5}{19}, \frac{5}{4}, \frac{5}{17}}$.

Sol: Ascending order: $\frac{5}{19}, \frac{5}{17}, \frac{5}{8}, \frac{5}{7}, \frac{5}{16}, \frac{5}{5}, \frac{5}{4}$

(*d*) $\frac{2}{7}, \frac{2}{11}, \frac{2}{5}, \frac{2}{3}, \frac{2}{13}, \frac{2}{15}, \frac{2}{17}$.

Sol: Ascending order: $\frac{2}{17}, \frac{2}{15}, \frac{2}{13}, \frac{2}{11}, \frac{2}{7}, \frac{2}{5}, \frac{2}{3}$

When we compare two unlike fractions, we first get their equivalent fractions with a denominator which is a common multiple (prefer LCM) of the denominators of both the fractions.

Example 6 : Compare $\frac{4}{5}$ and $\frac{5}{6}$.

Sol: LCM of $5,6 = 30$

$\frac{4}{5} = \frac{4 \times 6}{5 \times 6} = \frac{24}{30}$; $\frac{5}{6} = \frac{5 \times 5}{6 \times 5} = \frac{25}{30}$

$\frac{25}{30} > \frac{24}{30}$ so, $\frac{5}{6} > \frac{4}{5}$

Example 7 : Compare $\frac{5}{6}$ and $\frac{13}{15}$.

Sol: LCM of 6,15=30

$\frac{5}{6} = \frac{5 \times 5}{6 \times 5} = \frac{25}{30}$; $\frac{13}{15} = \frac{13 \times 2}{15 \times 2} = \frac{26}{30}$

$\frac{26}{30} > \frac{25}{30}$ $So, \frac{13}{15} > \frac{5}{6}$

EXERCISE 7.4

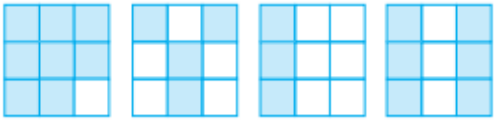
1. **Write shaded portion as fraction. Arrange them in ascending and descending order using correct sign '<', '=', '>' between the fractions:**

(a) 

Sol: Fractions: $\frac{3}{8}, \frac{6}{8}, \frac{4}{8}, \frac{1}{8}$

Ascending order: $\frac{1}{8} < \frac{3}{8} < \frac{4}{8} < \frac{6}{8}$

Descending order: $\frac{6}{8} > \frac{4}{8} > \frac{3}{8} > \frac{1}{8}$

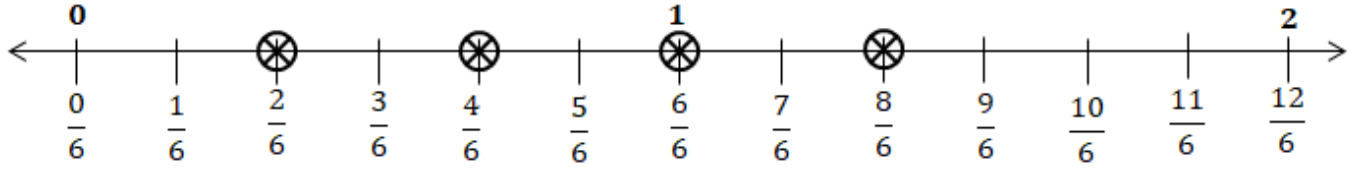
(b) 

Sol: Fractions: $\frac{8}{9}, \frac{4}{9}, \frac{3}{9}, \frac{6}{9}$

Ascending order: $\frac{3}{9} < \frac{4}{9} < \frac{6}{9} < \frac{8}{9}$

Descending order: $\frac{8}{9} > \frac{6}{9} > \frac{4}{9} > \frac{3}{9}$

(c) Show $\frac{2}{6}, \frac{4}{6}, \frac{8}{6}, and\ \frac{6}{6}$ on the number line. Put appropriate signs between the fractions given



$\frac{5}{6} > \frac{2}{6}$, $\frac{3}{6} > 0$, $\frac{1}{6} < \frac{6}{6}$, $\frac{8}{6} > \frac{5}{6}$

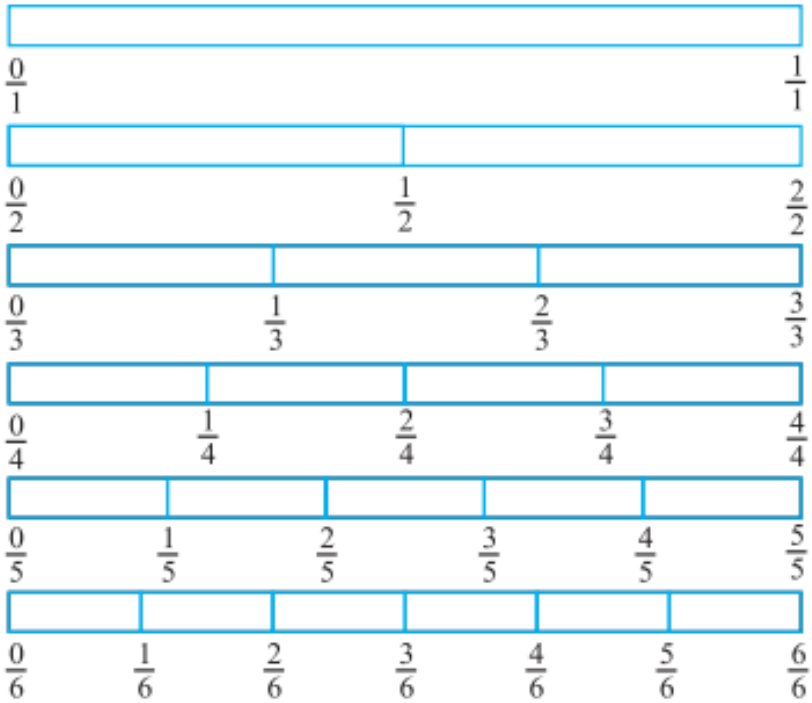
2. **Compare the fractions and put an appropriate sign.**

$(a)\ \frac{3}{6}<\frac{5}{6}$ $(b)\ \frac{1}{7}<\frac{1}{4}$ $(c)\ \frac{4}{5}<\frac{5}{5}$ $(d)\ \frac{3}{5}>\frac{3}{7}$

3. Make five more such pairs and put appropriate signs.

Sol:

4. Look at the figures and write '<' or '>', '=' between the given pairs of fractions.



$(a)\frac{1}{6}<\frac{1}{3}$ $(b)\ \frac{3}{6}=\frac{2}{4}$ $(c)\ \frac{2}{3}>\frac{2}{4}$ $(d)\ \frac{6}{6}=\frac{3}{3}$ $(e)\ \frac{5}{6}<\frac{5}{5}$

5. How quickly can you do this? Fill appropriate sign. ('<','=','>')

$*\ \frac{a}{b},\frac{x}{y}$ are two fractions $(i)\ If\ a\times y=b\times x\ then\ \frac{a}{b}=\frac{x}{y}$

$(ii) a\times y>b\times x\ then\ \frac{a}{b}>\frac{x}{y}$ $(iii)\ a\times y<b\times x\ then\ \frac{a}{b}<\frac{x}{y}$

$(a)\ \frac{1}{2}>\frac{1}{5}$	$(e)\ \frac{3}{5}<\frac{6}{5}$	$(i)\ \frac{3}{4}<\frac{7}{8}$
$(b)\ \frac{2}{4}=\frac{3}{6}$	$(f)\ \frac{7}{9}>\frac{3}{9}$	$(j)\ \frac{6}{10}=\frac{3}{5}$
$(c)\ \frac{3}{5}<\frac{2}{3}$	$(g)\ \frac{1}{4}=\frac{2}{8}$	$(k)\ \frac{5}{7}=\frac{15}{21}$
$(d)\ \frac{3}{4}>\frac{2}{8}$	$(h)\ \frac{6}{10}<\frac{4}{5}$	

6. The following fractions represent just three different numbers. Separate them into three groups of equivalent fractions, by changing each one to its simplest form.

$(a)\ \frac{2}{12}=\frac{2\div 2}{12\div 2}=\frac{1}{6}$

$(b)\ \frac{3}{15}=\frac{3\div 3}{15\div 3}=\frac{1}{5}$

$(c)\ \frac{8}{50}=\frac{8\div 2}{50\div 2}=\frac{4}{25}$

$(d)\ \frac{16}{100}=\frac{16\div 4}{100\div 4}=\frac{4}{25}$

$(e)\ \frac{10}{60}=\frac{10\div 10}{60\div 10}=\frac{1}{6}$

$(f)\ \frac{15}{75}=\frac{15\div 15}{75\div 15}=\frac{1}{5}$

$(g)\ \frac{12}{60}=\frac{12\div 12}{60\div 12}=\frac{1}{5}$

$(h)\ \frac{16}{96}=\frac{16\div 16}{96\div 16}=\frac{1}{6}$

$(i)\ \frac{12}{75}=\frac{12\div 3}{75\div 3}=\frac{4}{25}$

$(j)\ \frac{12}{72}=\frac{12\div 12}{72\div 12}=\frac{1}{6}$

$(k)\ \frac{3}{18}=\frac{3\div 3}{18\div 3}=\frac{1}{6}$

$(l)\ \frac{4}{25}$

Group 1: (a), (e), (h),(j),(k)

Group 2: (b), (f), (g)

Group 3: (c), (d), (i), (l)

7. **Find answers to the following. Write and indicate how you solved them.**

Sol:

$*\ \frac{a}{b},\frac{x}{y}\ are\ two\ fractions\ (i)\ If\ a\times y=b\times x\ then\ \frac{a}{b}=\frac{x}{y}$

(a) Is $\frac{5}{9}$ equal to $\frac{4}{9}$

Sol: $5\times 9=45$ and $9\times 4=36$ are not equal.

$So,\frac{5}{9}\neq\frac{4}{9}$

(b) Is $\frac{9}{16}$ equal to $\frac{5}{9}$

Sol: $9\times 9=81\ and\ 16\times 5=80\ are\ not\ equal.$

$So,\frac{9}{16}\neq\frac{5}{9}$

(c) Is $\frac{4}{5}$ equal to $\frac{16}{20}$

Sol: $4\times 20=80\ and\ 5\times 16=80\ are\ \ equal.$

$So,\frac{4}{5}=\frac{16}{20}$

(d) Is $\frac{1}{15}$ equal to $\frac{4}{30}$

Sol: $1\times 30=30\ and\ 4\times 15=60\ are\ not\ equal.$

$So,\frac{1}{15}\neq\frac{4}{30}$

8. **Ila read 25 pages of a book containing 100 pages. Lalita read $\frac{2}{5}$ of the same book. Who read less?**

Sol: Total pages in book=100

Number of pages read by Ila=25

Ila read by $\frac{25}{100}=\frac{1}{4}$ of the book

Lalita read by $\frac{2}{5}$ *of the book*

We know that $\frac{1}{4}<\frac{2}{5}$. So, Ila read less than lalita.

9. Rafiq exercised for $\frac{3}{6}$ of an hour, while Rohit exercised for $\frac{3}{4}$ of an hour. Who exercised for a longer time?

Sol: We know that $\frac{3}{4}>\frac{3}{6}$. So, Rohit exercised for a longer time.

10. In a class A of 25 students, 20 passed with 60% or more marks; in another class B of 30 students, 24 passed with 60% or more marks. In which class was a greater fraction of students getting with 60% or more marks?

Sol: Fraction of class A $=\frac{20}{25}=\frac{4}{5}$

Fraction of class B $=\frac{24}{30}=\frac{4}{5}$

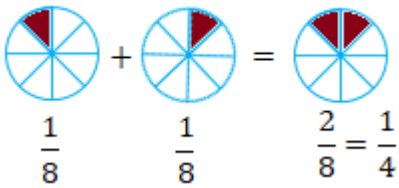
Two fractions are equal.

Addition and Subtraction of Fractions

Try These

1. Add with the help of a diagram

$(i)\ \frac{1}{8}+\frac{1}{8}$

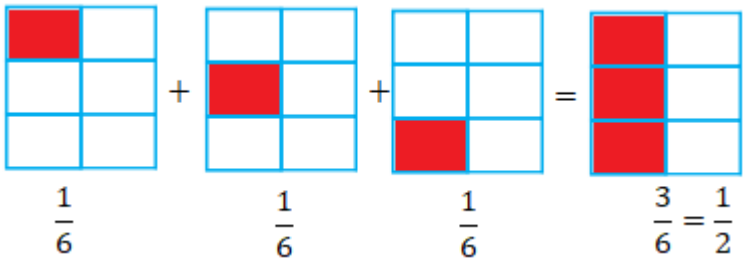


$\frac{1}{8}$ $\frac{1}{8}$ $\frac{2}{8}=\frac{1}{4}$

$(ii)\ \frac{2}{5}+\frac{3}{5}$

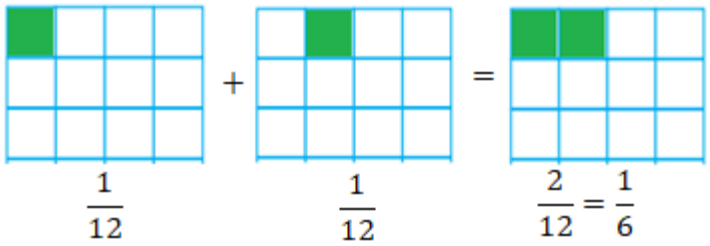
$\frac{2}{5}$ $\frac{3}{5}$ $\frac{5}{5}=1$

$(iii)\ \frac{1}{6}+\frac{1}{6}+\frac{1}{6}$



2. Add $\frac{1}{12}+\frac{1}{12}$.How will we show this pictorially? Using paper folding? (use grid paper)

Sol:



3. Make 5 more examples of problems given in 1 and 2 above . Solve them with your friends

Adding or subtracting like fractions

(i) For adding two like fractions, the numerators are added and the denominator remains the same

$\frac{x}{a}+\frac{y}{a}=\frac{x+y}{a}$ $Ex: \frac{1}{5}+\frac{2}{5}=\frac{1+2}{5}=\frac{3}{5}$

(ii) For subtraction of two like fractions, the numerators are subtracted and the denominator remains the same

$\frac{x}{a}-\frac{y}{a}=\frac{x-y}{a}$ $Ex: \frac{5}{7}-\frac{2}{7}=\frac{5-2}{7}=\frac{3}{7}$

Try These

1. Find the difference between $\frac{7}{8}$ and $\frac{3}{8}$.

Sol: $\frac{7}{8}-\frac{3}{8}=\frac{7-3}{8}=\frac{4}{8}$

2. Mother made a gud patti in a round shape. She divided it into 5 parts. Seema ate one piece from it. If I eat another piece then how much would be left?

Sol: Seema ate $=\frac{1}{5}$ and I ate $=\frac{1}{5}$

Total part eaten $=\frac{1}{5}+\frac{1}{5}=\frac{2}{5}$

The left part $= 1 - \frac{2}{5} = \frac{5}{5} - \frac{2}{5} = \frac{3}{5}$

3. **My elder sister divided the watermelon into 16 parts. I ate 7 out them. My friend ate 4. How much did we eat between us? How much more of the watermelon did I eat than my friend? What portion of the watermelon remained?**

Sol: I ate $= \frac{7}{16}$, My friend ate $= \frac{4}{16}$

We both eat $= \frac{7}{16} + \frac{4}{16} = \frac{11}{16}$

More I eat than my friend $= \frac{7}{16} - \frac{4}{16} = \frac{3}{16}$

Remaining portion $= 1 - \frac{11}{16} = \frac{16}{16} - \frac{11}{16} = \frac{5}{16}$

4. . **Make five problems of this type and solve them with your friends.**

EXERCISE 7.5

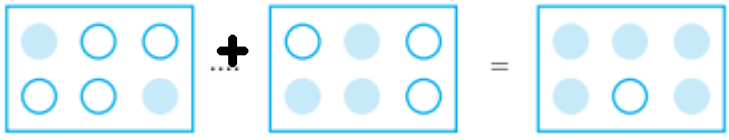
1. Write these fractions appropriately as additions or subtractions :

(a) 

Sol: $\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$

(b) 

Sol: $\frac{5}{5} - \frac{3}{5} = \frac{2}{5}$

(c) 

Sol: $\frac{2}{6} + \frac{3}{6} = \frac{5}{6}$

2. **Solve :**

$(a)\ \frac{1}{18} + \frac{1}{18} = \frac{1+1}{18} = \frac{2}{18} = \frac{1}{9}$

$(b)\ \frac{8}{15} + \frac{3}{15} = \frac{8+3}{15} = \frac{11}{15}$

$(c)\ \frac{7}{7}-\frac{5}{7}=\frac{7-5}{7}=\frac{2}{7}$

$(d)\ \frac{1}{22}+\frac{21}{22}=\frac{1+21}{22}=\frac{22}{22}=1$

$(e)\ \frac{12}{15}-\frac{7}{15}=\frac{12-7}{15}=\frac{5}{15}=\frac{1}{3}$

$(f)\ \frac{5}{8}+\frac{3}{8}=\frac{5+3}{8}=\frac{8}{8}=1$

$(g)\ 1-\frac{2}{3}=\frac{3}{3}-\frac{2}{3}=\frac{3-2}{3}=\frac{1}{3}$

$(h)\ \frac{1}{4}+\frac{0}{4}=\frac{1+0}{4}=\frac{1}{4}$

$(i)\ 3-\frac{12}{5}=\frac{15}{5}-\frac{12}{5}=\frac{15-12}{5}=\frac{3}{5}$

3. Shubham painted $\frac{2}{3}$ of the wall space in his room. His sister Madhavi helped and painted $\frac{1}{3}$ of the wall space. How much did they paint together?

Sol: Shubham painted $=\frac{2}{3}$ and Madhavi painted $=\frac{1}{3}$

Total painted together $=\frac{2}{3}+\frac{1}{3}=\frac{3}{3}=1$

So, they painted complete wall together

4. Fill in the missing fractions.

$(a)\ \frac{7}{10}-\frac{4}{10}=\frac{3}{10}$ $(b)\ \frac{8}{21}-\frac{3}{21}=\frac{5}{21}$ $(c)\ \frac{6}{6}(=1)-\frac{3}{6}=\frac{3}{6}$ $(d)\ \frac{7}{27}+\frac{5}{27}=\frac{12}{27}$

5. Javed was given $\frac{5}{7}$ of a basket of oranges. What fraction of oranges was left in the basket?

Sol: Fraction of oranges given $=\frac{5}{7}$

Fraction of oranges left $=1-\frac{5}{7}=\frac{7}{7}-\frac{5}{7}=\frac{2}{7}$

Adding and subtracting unlike fractions:

For adding and subtracting unlike fractions first we convert in to like fractions and follow like fractions rule.

Example 8 : Subtract $\frac{3}{4}$ from $\frac{5}{6}$.

Sol: LCM of 4,6=12

$\frac{5}{6}-\frac{3}{4}=\frac{5\times 2}{6\times 2}-\frac{3\times 3}{4\times 3}=\frac{10}{12}-\frac{9}{12}=\frac{10-9}{12}=\frac{1}{12}$

Example 9 : Add $\frac{2}{5}$ to $\frac{1}{3}$

Sol: LCM of 5 and 3 =15

$\frac{2}{5}+\frac{1}{3}=\frac{2\times 3}{5\times 3}+\frac{1\times 5}{3\times 5}=\frac{6}{15}+\frac{5}{15}=\frac{6+5}{15}=\frac{11}{15}$

Example 10 : Simplify $\frac{3}{5}-\frac{7}{20}$

Sol: LCM of 5,20=20

$$\frac{3}{5}-\frac{7}{20}=\frac{3\times 4}{5\times 4}-\frac{7}{20}=\frac{12}{20}-\frac{7}{20}=\frac{12-7}{20}=\frac{5}{20}=\frac{1}{4}$$

Try These

1. Add $\frac{2}{5}$ and $\frac{3}{7}$.

Sol: LCM of 5,7=35

$$\frac{2}{5}+\frac{3}{7}=\frac{2\times 7}{5\times 7}+\frac{3\times 5}{7\times 5}=\frac{14}{35}+\frac{15}{35}=\frac{14+15}{35}=\frac{29}{35}$$

2. Subtract $\frac{2}{5}$ from $\frac{5}{7}$.

Sol: LCM of 5,7=35

$$\frac{5}{7}-\frac{2}{5}=\frac{5\times 5}{7\times 5}-\frac{2\times 7}{5\times 7}=\frac{25}{35}-\frac{14}{35}=\frac{25-14}{35}=\frac{11}{35}$$

Example 11 : Add $2\frac{4}{5}$ and $3\frac{5}{6}$

Sol: LCM of 5,6=30

$$\frac{4}{5}+\frac{5}{6}=\frac{4\times 6}{5\times 6}+\frac{5\times 5}{6\times 5}=\frac{24}{30}+\frac{25}{30}=\frac{24+25}{30}=\frac{49}{30}=1+\frac{19}{30}$$

$$2\frac{4}{5}+3\frac{5}{6}=2+3+\left(\frac{4}{5}+\frac{5}{6}\right)=5+1+\frac{19}{30}=6+\frac{19}{30}=6\frac{19}{30}$$

Example 12 : Find $4\frac{2}{5}-2\frac{1}{5}$.

sol: $4\frac{2}{5}-2\frac{1}{5}=(4-2)+\left(\frac{2}{5}-\frac{1}{5}\right)=2+\frac{1}{5}=2\frac{1}{5}$

Example 13 : Simplify: $8\frac{1}{4}-2\frac{5}{6}$

Sol: *Since* $\frac{1}{4}<\frac{5}{6}$

$$8\frac{1}{4}-2\frac{5}{6}=\frac{33}{4}-\frac{17}{6}=\frac{33\times 3}{4\times 3}-\frac{17\times 2}{6\times 2}=\frac{99}{12}-\frac{34}{12}=\frac{99-34}{12}=\frac{65}{12}=5\frac{5}{12}$$

EXERCISE 7.6

1. Solve

(a) $\frac{2}{3}+\frac{1}{7}$

Sol: LCM of 3,7=21

$$\frac{2}{3}+\frac{1}{7}=\frac{2\times 7}{3\times 7}+\frac{1\times 3}{7\times 3}=\frac{14}{21}+\frac{3}{21}=\frac{14+3}{21}=\frac{17}{21}$$

(b) $\mathbf{\frac{3}{10}+\frac{7}{15}}$

Sol: LCM of 10,15=30

$$\frac{3}{10}+\frac{7}{15}=\frac{3\times 3}{10\times 3}+\frac{7\times 2}{15\times 2}=\frac{9}{30}+\frac{14}{30}=\frac{9+14}{30}=\frac{23}{30}$$

(c) $\mathbf{\frac{4}{9}+\frac{2}{7}}$

Sol: LCM of 9,7=63

$$\frac{4}{9}+\frac{2}{7}=\frac{4\times 7}{9\times 7}+\frac{2\times 9}{7\times 9}=\frac{28}{63}+\frac{18}{63}=\frac{28+18}{63}=\frac{46}{63}$$

(d) $\mathbf{\frac{5}{7}+\frac{1}{3}}$

Sol: LCM of 7,3=21

$$\frac{5}{7}+\frac{1}{3}=\frac{5\times 3}{7\times 3}+\frac{1\times 7}{3\times 7}=\frac{15}{21}+\frac{7}{21}=\frac{15+7}{21}=\frac{22}{21}=1\frac{1}{21}$$

(e) $\mathbf{\frac{2}{5}+\frac{1}{6}}$

Sol: LCM of 5,6=30

$$\frac{2}{5}+\frac{1}{6}=\frac{2\times 6}{5\times 6}+\frac{1\times 5}{6\times 5}=\frac{12}{30}+\frac{5}{30}=\frac{17}{30}$$

(f) $\mathbf{\frac{4}{5}+\frac{2}{3}}$

Sol: LCM of 5,3=15

$$\frac{4}{5}+\frac{2}{3}=\frac{4\times 3}{5\times 3}+\frac{2\times 5}{3\times 5}=\frac{12}{15}+\frac{10}{15}=\frac{22}{15}$$

(g) $\mathbf{\frac{3}{4}-\frac{1}{3}}$

Sol: LCM of 4,3=12

$$\frac{3}{4}-\frac{1}{3}=\frac{3\times 3}{4\times 3}-\frac{1\times 4}{3\times 4}=\frac{9}{12}-\frac{4}{12}=\frac{5}{12}$$

(h) $\mathbf{\frac{5}{6}-\frac{1}{3}}$

Sol: LCM of 6,3=6

$$\frac{5}{6}-\frac{1}{3}=\frac{5}{6}-\frac{1\times 2}{3\times 2}=\frac{5}{6}-\frac{2}{6}=\frac{3}{6}=\frac{1}{2}$$

(i) $\mathbf{\frac{2}{3}+\frac{3}{4}+\frac{1}{2}}$

Sol: LCM of 3,4,2=12

$$\frac{2}{3}+\frac{3}{4}+\frac{1}{2}=\frac{2\times 4}{12}+\frac{3\times 3}{12}+\frac{1\times 6}{12}=\frac{8}{12}+\frac{9}{12}+\frac{6}{12}=\frac{23}{12}=1\frac{11}{12}$$

(j) $\mathbf{\frac{1}{2}+\frac{1}{3}+\frac{1}{6}}$

Sol: LCM of 2,3,6=6

$$\frac{1}{2}+\frac{1}{3}+\frac{1}{6}=\frac{1\times 3}{6}+\frac{1\times 2}{6}+\frac{1}{6}=\frac{3}{6}+\frac{2}{6}+\frac{1}{6}=\frac{6}{6}=1$$

(k) $\mathbf{1\frac{1}{3}+3\frac{2}{3}}$

Sol: $\frac{1}{3}+\frac{2}{3}=\frac{3}{3}=1$

$1\frac{1}{3}+3\frac{2}{3}=1+3+\left(\frac{1}{3}+\frac{2}{3}\right)=4+1=5$

(l) $\mathbf{4\frac{2}{3}+3\frac{1}{4}}$

Sol: $\frac{2}{3}+\frac{1}{4}=\frac{2\times4}{12}+\frac{1\times3}{12}=\frac{8}{12}+\frac{3}{12}=\frac{11}{12}$

$4\frac{2}{3}+3\frac{1}{4}=4+3+\left(\frac{2}{3}+\frac{1}{4}\right)=7+\frac{11}{12}=7\frac{11}{12}=\frac{95}{12}$

(m) $\mathbf{\frac{16}{5}-\frac{7}{5}}$

Sol: $\frac{16}{5}-\frac{7}{5}=\frac{9}{5}$

(n) $\mathbf{\frac{4}{3}-\frac{1}{2}}$

Sol: $\frac{4}{3}-\frac{1}{2}=\frac{4\times2}{6}-\frac{1\times3}{6}=\frac{8}{6}-\frac{3}{6}=\frac{5}{6}$

2. Sarita bought $\frac{2}{5}$ metre of ribbon and Lalita $\frac{3}{4}$ metre of ribbon. What is the total length of the ribbon they bought?

Sol: Sarita $=\frac{2}{5}$ m

Lalita $=\frac{3}{4}$ m

Total length of the ribbon they bought $=\frac{2}{5}+\frac{3}{4}$

$=\frac{2\times4}{20}+\frac{3\times5}{20}=\frac{8}{20}+\frac{15}{20}=\frac{23}{20}\ m$

3. **Naina was given $1\frac{1}{2}$ piece of cake and Najma was given $1\frac{1}{3}$ piece of cake. Find the total amount of cake was given to both of them.**

Sol: Naina $=1\frac{1}{2}$ piece of cake; Najma $=1\frac{1}{3}$ piece of cake.

Total amount of cake given to both $=1\frac{1}{2}+1\frac{1}{3}=1+1+\left(\frac{1}{2}+\frac{1}{3}\right)$

$=2+\frac{1\times3+1\times2}{6}=2+\frac{5}{6}=2\frac{5}{6}$

4. Fill in the boxes :

$(a)\quad x-\frac{5}{8}=\frac{1}{4}$

$x-\frac{5}{8}=\frac{2}{8}$

$$\frac{7}{8}-\frac{5}{8}=\frac{2}{8}$$

Required fraction $=\frac{7}{8}$

(b) $x-\frac{1}{5}=\frac{1}{2}$

$$x-\frac{1\times 2}{5\times 2}=\frac{1\times 5}{2\times 5}$$

$$x-\frac{2}{10}=\frac{5}{10}$$

$$\frac{7}{10}-\frac{2}{10}=\frac{5}{10}$$

Required fraction $=\frac{7}{10}$

(c) $\frac{1}{2}-x=\frac{1}{6}$

$$\frac{1\times 3}{2\times 3}-x=\frac{1}{6}$$

$$\frac{3}{6}-x=\frac{1}{6}$$

$$\frac{3}{6}-\frac{2}{6}=\frac{1}{6}$$

Required fraction $=\frac{2}{6}=\frac{1}{3}$

5. Complete the addition-subtraction box.

(a)

$\frac{2}{3}$	$\frac{4}{3}$	$\frac{6}{3}=2$
$\frac{1}{3}$	$\frac{2}{3}$	$\frac{3}{3}=1$
$\frac{1}{3}$	$\frac{2}{3}$	$\frac{3}{3}=1$

(b)

$\frac{1}{2}$	$\frac{1}{3}$	$\frac{5}{6}$
$\frac{1}{3}$	$\frac{1}{4}$	$\frac{7}{12}$
$\frac{1}{6}$	$\frac{1}{12}$	$\frac{3}{12}$

(a) Addition

$$\frac{2}{3}+\frac{4}{3}=\frac{2+4}{3}=\frac{6}{3}=2$$

$$\frac{1}{3}+\frac{2}{3}=\frac{1+2}{3}=\frac{3}{3}=1$$

$$\frac{1}{3}+\frac{2}{3}=\frac{1+2}{3}=\frac{3}{3}=1$$

Subtraction

$$\frac{2}{3}-\frac{1}{3}=\frac{2-1}{3}=\frac{1}{3}$$

$$\frac{4}{3}-\frac{2}{3}=\frac{4-2}{3}=\frac{2}{3}$$

$$\frac{6}{3}-\frac{3}{3}=\frac{6-3}{3}=\frac{3}{3}=1$$

(b) Addition

$$\frac{1}{2}+\frac{1}{3}=\frac{1\times 3}{2\times 3}+\frac{1\times 2}{3\times 2}=\frac{3}{6}+\frac{2}{6}=\frac{5}{6}$$

$$\frac{1}{3}+\frac{1}{4}=\frac{1\times 4}{3\times 4}+\frac{1\times 3}{4\times 3}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$$

$$\frac{1}{6}+\frac{1}{12}=\frac{1\times 2}{6\times 2}+\frac{1}{12}=\frac{2}{12}+\frac{1}{12}=\frac{3}{12}$$

Subtraction

$$\frac{1}{2}-\frac{1}{3}=\frac{1\times 3}{2\times 3}-\frac{1\times 2}{3\times 2}=\frac{3}{6}-\frac{2}{6}=\frac{1}{6}$$

$$\frac{1}{3}-\frac{1}{4}=\frac{1\times 4}{3\times 4}-\frac{1\times 3}{4\times 3}=\frac{4}{12}-\frac{3}{12}=\frac{1}{12}$$

$$\frac{1}{6}-\frac{1}{12}=\frac{1\times 2}{6\times 2}-\frac{1}{12}=\frac{2}{12}-\frac{1}{12}=\frac{3}{12}$$

6. A piece of wire $\frac{7}{8}$ metre long broke into two pieces. One piece was $\frac{1}{4}$ metre long. How long is the other piece?

Sol: Total length of wire $=\frac{7}{8}$ m

Length of one piece $= \frac{1}{4}$ m

Length of other piece $= \frac{7}{8} - \frac{1}{4} = \frac{7}{8} - \frac{1 \times 2}{4 \times 2} = \frac{7}{8} - \frac{2}{8} = \frac{5}{8}\ m$

7. Nandini's house is $\frac{9}{10}$km from her school. She walked some distance and then took a bus for $\frac{1}{2}$km to reach the school. How far did she walk?

Sol: Total distance $= \frac{9}{10}\ km$

Distance covered by bus $= \frac{1}{2}$ km

Distance walked by Nandini $= \frac{9}{10} - \frac{1}{2} = \frac{9}{10} - \frac{1 \times 5}{2 \times 5} = \frac{9}{10} - \frac{5}{10} = \frac{4}{10} = \frac{2}{5}$ km

8. Asha and Samuel have bookshelves of the same size partly filled with books. Asha's shelf is $\frac{5}{6}$ th full and Samuel's shelf is $\frac{2}{5}$ th full. Whose bookshelf is more full? By what fraction?

Sol: Fraction of books in Asha's shelf $= \frac{5}{6}$

Fraction of books in Samuel's shelf $= \frac{2}{5}$

We know that $\frac{5}{6} > \frac{2}{5}$

$\frac{5}{6} \times \frac{2}{5}$

$25 > 12$

$\frac{5}{6} > \frac{2}{5}$

$\therefore$ Asha's bookshelf is more full.

Fraction $= \frac{5}{6} - \frac{2}{5} = \frac{5 \times 5 - 6 \times 2}{30} = \frac{25 - 12}{30} = \frac{13}{30}$

9. Jaidev takes $2\frac{1}{5}$ minutes to walk across the school ground. Rahul takes $\frac{7}{4}$ minutes to do the same. Who takes less time and by what fraction?

Sol: Time taken by Jaidev $= 2\frac{1}{5} = \frac{11}{5}$ minutes

Time taken by Rahul $= \frac{7}{4}$ minutes

we know that $\frac{11}{5} > \frac{7}{4}$

$\frac{11}{5} \times \frac{7}{4}$

$44 > 35$

$\frac{11}{5} > \frac{7}{4}$

Rahul takes less time.

Fraction $= \frac{11}{5} - \frac{7}{4} = \frac{11 \times 4 - 7 \times 5}{20} = \frac{44 - 35}{20} = \frac{9}{20}$

Rahul takes $\frac{9}{20}$ minutes less than Jaidev.

8 .DECIMALS (NOTES)

PREPARED BY: BALABHADRA SURESH

1. Fractions with denominator 10, 100, 1000, etc. (known as decimal fractions) can be written in a form using a decimal point.
2. A decimal has two parts-whole number part and decimal part. ...

$\frac{2}{10} = 0.2,$ $\frac{13}{10} = 1.3,$ $\frac{257}{10} = 2.57$

$\frac{4}{100} = 0.04,$ $\frac{27}{100} = 0.27,$ $\frac{358}{100} = 3.58.$

$\frac{4857}{1000} = 485.7$ $\frac{756}{1000} = 0.756,$ $\frac{5642}{1000} = 5.642$

$$32.58 = 30 + 2 + \frac{5}{10} + \frac{8}{100}$$

Whole part → 32.58 ← *Decimal part*

COMPARING DECIMALS

First we compare the whole part, if whole parts are equal we compare decimal part.

Example 1 : Which is greater?

(a) 1 or 0.99

Sol: 1.00 > 0.99 .

So, 1 *is greater*

(b) 1.09 or 1.093

Sol: 1.090 < 1.093 .

So, 1.093 is greater

EXERCISE 8.1

1. Which is greater?

(a) $\mathbf{0.3\ or\ 0.4}$

Sol: 0.3 < 0.4

So, 0.4 is greater

(b) $\mathbf{0.07\ or\ 0.02}$

Sol: 0.07 > 0.02

So, 0.07 is greater

(c) $\mathbf{3\ or\ 0.8}$

Sol: 3.0 > 0.8

So, 3.0 is greater

(d) $\mathbf{0.5\ or\ 0.05}$

Sol: 0.50 > 0.05

So, 0.5 is greater

(e) $\mathbf{1.23\ or\ 1.2}$

Sol: 1.23 > 1.20

So, 1.23 is greater

(f) $\mathbf{0.099\ or\ 0.19}$

Sol: 0.099 < 0.190

So, 0.190 is greater

(g) $\mathbf{1.5\ or\ 1.50}$

Sol: 1.50 = 1.50

(h) $\mathbf{1.431\ or\ 1.490}$

Sol: 1.431 < 1.490

So, 1.490 is greater

(i) $\mathbf{3.3\ or\ 3.300}$

$Sol: 3.300 = 3.300$

(j) **5.64 *or* 5.603**

$Sol: 5.640 > 5.603$

So, 5.640 is greater

Money:

$100 \text{ paise} = ₹ 1$

$1\ paise = ₹\frac{1}{100} = ₹\ 0.01$

$65\ paise = ₹\frac{65}{100} = ₹\ 0.65$

$105\ paise = ₹1\ and\ 5\ paise = ₹1.05$

Try These

(i) Write 2 rupees 5 paise and 2 rupees 50 paise in decimals.

Sol: 2 rupees 5 paise= ₹2.05

2 rupees 50 paise=₹2.50

(ii) Write 20 rupees 7 paise and 21 rupees 75 paise in decimals?

Sol: 20 rupees 7 paise=₹20.07

21 rupees 75 paise=₹21.75

Length: (mm=millimetre, cm= centimetre, m= metre, km=kilometre)

$1\ cm = 10\ mm$

$1\ mm = \frac{1}{10}\ cm$

$1m = 100\ cm$

$1\ cm = \frac{1}{100}\ m = 0.01\ m$

$156\ cm\ =\ 100\ cm\ +\ 56\ cm = 1\ m + \frac{56}{100}\ m = 1.56\ m$

$1000\ m = 1\ km$

$1\ m = \frac{1}{1000}\ km$

Try These

1. **Can you write 4 mm in 'cm' using decimals?**

Sol: $1\ mm = \frac{1}{10}\ cm = 0.1\ cm$; $4 \text{ mm} = \frac{4}{10}\ cm = 0.4\ cm$

2. **How will you write 7cm 5 mm in 'cm' using decimals?**

Sol: $7\text{cm } 5 \text{ mm} = 7 \text{ cm} + \frac{5}{10}\ cm = 7.5\ cm$

3. **Can you now write 52 m as 'km' using decimals? How will you write 340 m as 'km' using decimals? How will you write 2008 m in 'km'?**

$1\ m = \frac{1}{1000}\ km$

$Sol: 52\ m = \frac{52}{1000}\ km = 0.052\ km$

Weight: (g= gram ,kg=kilogram)

$1000\ \text{g} = 1\ \text{kg}$

$1\ \text{g} = \frac{1}{1000}\ \text{kg} = 0.001\ \text{kg}$

$2350\ g\ =\ 2000\ g\ +\ 350\ g = 2\ kg + \frac{350}{1000}\ g = 2.350\ kg$

Try These

1. **Can you now write 456g as 'kg' using decimals?**

Sol: $456\text{g} = \frac{456}{1000}\ g = 0.456\ g$

2. **How will you write 2kg 9g in 'kg' using decimals?**

Sol: $2\text{kg}\ 9\text{g} = 2\ \text{kg} + 9\ \text{g} = 2\ \text{kg} + \frac{9}{1000} g = 2.009\ g$

EXERCISE 8.2

1. Express as rupees using decimals.

$(a)\mathbf{5\ paise} = ₹\frac{5}{100} = ₹\ 0.05$

$(b)\mathbf{75\ paise} = ₹\frac{75}{100} = ₹\ 0.75$

$(c)\mathbf{20\ paise} = ₹\frac{20}{100} = ₹\ 0.20$

$(d)\mathbf{50\ rupees\ 90\ paise} = ₹\ 50.90$

$(e)\mathbf{725\ paise} = 700\ paise + 25\ paise$

$= ₹7 + ₹\frac{25}{100} = ₹7.25$

2. **Express as metres using decimals.**

$(a)\mathbf{15\ cm} = \frac{15}{100}\ m = 0.15\ m$

$(b)\mathbf{6\ cm} = \frac{6}{100}\ m = 0.06\ m$

$(c)\mathbf{2\ m\ 45\ cm} = 2\ m + \frac{45}{100}\ m = 2m + 0.45m = 2.45\ m$

$(d)\mathbf{9\ m\ 7\ cm} = 9\ m + 7\ cm = 9m + \frac{7}{100}\ m = 9m + 0.07\ m = 9.07\ m$

$(e)\mathbf{419\ cm} = 400\ cm + 19\ cm = 4\ m + \frac{19}{100} cm = 4\ m + 0.19\ m = 4.19\ m$

3. **Express as cm using decimals.**

$(a)\mathbf{5\ mm} = \frac{5}{10}\ cm = 0.5\ cm$

$(b)\mathbf{60\ mm} = \frac{60}{10}\ cm = 6\ cm$

$(c)\mathbf{164\ mm} = \frac{164}{10}\ cm = 16.4\ cm$

$(d)\mathbf{9\ cm\ 8\ mm} = 9cm + \frac{8}{10}\ cm$

$= 9cm + 0.8\ cm = 9.8\ cm$

$(e)\mathbf{93\ mm} = \frac{93}{10}\ cm = 9.3\ cm$

4. Express as km using decimals.

$(a)\mathbf{8\ m} = \frac{8}{1000}\ km = 0.008\ km$

$(b)\mathbf{88\ m} = \frac{88}{1000}\ km = 0.088\ km$

$(c)\mathbf{8888\ m} = \frac{8888}{1000}\ km = 8.888\ km$

$(d)\mathbf{70\ km\ 5\ m} = 70\ km + \frac{5}{1000}\ km$

$= 70\ km + 0.005\ km$

$= 70.005\ km$

5. Express as kg using decimals.

$(a)\mathbf{2\ g} = \frac{2}{1000}\ kg = 0.002\ kg$

$(b)\mathbf{100\ g} = \frac{100}{1000}\ kg = 0.100\ kg$

$(c)\mathbf{3750\ g} = \frac{3750}{1000}\ kg = 3.750\ kg$

$(d)\mathbf{5\ kg\ 8\ g} = 5\ kg + 8\ g$

$= 5\ kg + \frac{8}{1000}\ g = 5.008\ kg$

$(e)\mathbf{26\ kg\ 50\ g} = 26\ kg + \frac{50}{1000}\ kg$

$= 26.050\ kg$

Addition of Numbers with Decimals

To add two or more unlike decimals, we first have to convert them into like decimals and write one by one having same place.

Try These Find

$(i)0.29\ +\ 0.36 = 065$

$$\begin{array}{r} {\scriptstyle 1} \\ 0.29 \\ 0.36 \\ \hline 0.65 \\ \hline \end{array}$$

$(ii)0.7\ +\ 0.08 = 078$

$$\begin{array}{r} 0.70 \\ 0.08 \\ \hline 0.78 \\ \hline \end{array}$$

$(iii)1.54\ +\ 1.80 = 3.34$

$$\begin{array}{r} {\scriptstyle 1} \\ 1.54 \\ 1.80 \\ \hline 3.34 \\ \hline \end{array}$$

$(iv)2.66\ +\ 1.85 = 4.51$

$$\begin{array}{r} {\scriptstyle 1\ 1} \\ 2.66 \\ 1.85 \\ \hline 4.51 \\ \hline \end{array}$$

Example 2 : Lata spent₹9.50 for buying a pen and₹2.50 for one pencil. How much money did she spend?

Solu : Money spent for pen =₹9.50

Money spent for pencil =₹2.50

$$\begin{array}{r} {\scriptstyle 1} \\ 9.50 \\ 2.50 \\ \hline 12.00 \\ \hline \end{array}$$

Total money spent =₹12.00

Example 3 : Samson travelled 5 km 52 m by bus, 2 km 265 m by car and the rest 1km 30 m he walked. How much distance did he travel in all?

Solu: Distance travelled by bus = 5 km 52 m = 5.052 km

Distance travelled by car = 2 km 265 m = 2.265 km

Distance travelled on foot = 1 km 30 m = 1.030 km

Total distance travelled is= 8.347 km

$$\begin{array}{rr} & 5.052 \text{ km} \\ & 2.265 \text{ km} \\ + & 1.030 \text{ km} \\ \hline & 8.347 \text{ km} \end{array}$$

Example 4 : Rahul bought 4 kg 90 g of apples, 2 kg 60 g of grapes and 5 kg 300 g of mangoes. Find the total weight of all the fruits he bought.

Solu : Weight of apples = 4 kg 90 g = 4.090 kg

Weight of grapes = 2 kg 60 g = 2.060 kg

Weight of mangoes = 5 kg 300 g = 5.300 kg

Total weight of the fruits bought = 11.450 kg

$$\begin{array}{r} {\scriptstyle 1} \\ 4.090 \text{ kg} \\ 2.060 \text{ kg} \\ 5.300 \text{ kg} \\ \hline 11.450 \text{ kg} \end{array}$$

EXERCISE 8.3

1. Find the sum in each of the following :

(a) 0.007 + 8.5 + 30.08 =38.587

$$\begin{array}{r} 0.007 \\ 8.500 \\ 30.080 \\ \hline 38.587 \end{array}$$

(b) 15 + 0.632 + 13.8 =29.432

$$\begin{array}{r} {\scriptstyle 1} \\ 15.000 \\ 0.632 \\ 13.800 \\ \hline 29.432 \end{array}$$

(c) 27.076 + 0.55 + 0.004=27.630

$$\begin{array}{r} {\scriptstyle 1} \\ 27.076 \\ 0.550 \\ 0.004 \\ \hline 27.630 \end{array}$$

(d) 25.65 + 9.005 + 3.7=38.355

$$\begin{array}{r} {\scriptstyle 1\,1} \\ 25.650 \\ 9.005 \\ 3.700 \\ \hline 38.355 \end{array}$$

(e) 0.75 + 10.425 + 2 =13.175

$$\begin{array}{r} {\scriptstyle 1} \\ 0.750 \\ 10.425 \\ 2.000 \\ \hline 13.175 \end{array}$$

(f) 280.69 + 25.2 + 38=343.89

$$\begin{array}{r} {\scriptstyle 1\,1} \\ 280.690 \\ 25.200 \\ 38.000 \\ \hline 343.890 \end{array}$$

2. **Rashid spent₹35.75 for Maths book and₹32.60 for Science book. Find the total amount spent by Rashid.**

Sol: Maths book=₹35.75

Science book=₹32.60

The total amount spent by Rashid= ₹ 68.35

$$\begin{array}{r} {\scriptstyle 1} \\ 35.75 \\ 32.60 \\ \hline 68.35 \end{array}$$

3. **Radhika's mother gave her₹10.50 and her father gave her₹15.80, find the total amount given to Radhika by the parents.**

Sol: Mother given amount=₹10.50

Father given amount=₹ 15.80

The total amount given to Radhika by the parents=₹ 26.30

$$\begin{array}{r} {\scriptstyle 1} \\ 10.50 \\ 15.80 \\ \hline 26.30 \end{array}$$

4. **Nasreen bought 3 m 20 cm cloth for her shirt and 2 m 5 cm cloth for her trouser. Find the total length of cloth bought by her.**

Sol: Shirt cloth= 3.20 m

Trouser cloth= 2.05 m

The total length of cloth bought by Nasreen= 5.25 m= 5 m 25 cm

$$\begin{array}{r} 3.20 \\ 2.05 \\ \hline 5.25 \end{array}$$

5. **Naresh walked 2 km 35 m in the morning and 1 km 7 m in the evening. How much distance did he walk in all?**

Sol: Distance walked in the morning=2 km 35 m=2.035 km

Distance walked in the evening=1 km 7 m=1.007 km

Total distance walked in all= 3.042 km=3 km 42 m

$$\begin{array}{r} {\scriptstyle 1} \\ 2.035 \\ 1.007 \\ \hline 3.042 \end{array}$$

6. **Sunita travelled 15 km 268 m by bus, 7 km 7 m by car and 500 m on foot in order to reach her school. How far is her school from her residence?**

Sol: Distance travelled by bus=15 km 268 m=15.268 km

Distance travelled by car=7 km 7 m=7.007 km

Distance travelled on foot= 500 m=0.500 km

Total distance from school and residence=22 km 775 m

$$\begin{array}{r} {\scriptstyle 1} \\ 15.268 \\ 7.007 \\ 0.500 \\ \hline 22.775 \end{array}$$

7. **Ravi purchased 5 kg 400 g rice, 2 kg 20 g sugar and 10 kg 850g flour. Find the total weight of his purchases.**

Sol: Weight of rice=5 kg 400 g=5.400 kg

Weight of sugar=2 kg 20 g=2.020 kg

Weight of flower=10 kg 850g=10.850 kg

The total weight of his purchases= 18.270 kg=18 kg 270 g

$$\begin{array}{r} {\scriptstyle 1} \\ 5.400 \\ 2.002 \\ 10.850 \\ \hline 18.270 \end{array}$$

Subtraction of Decimals

Write the decimals in column with the decimal points directly below each other. So, those tenths come under tenths, hundredths come under hundredths and so on.

Try These

1. Subtract 1.85 from 5.46 ;

Sol: 5.46-1.85= 3.61

$$\begin{array}{r} {\scriptstyle 4\ \ 14} \\ 5.\not{4}\,\not{6} \\ -1.85 \\ \hline 3.61 \end{array}$$

2. Subtract 5.25 from 8.28 ;

Sol: 8.28-5.25=3.03

$$\begin{array}{r} 8.28 \\ -5.25 \\ \hline 3.03 \end{array}$$

3. Subtract 0.95 from 2.29 ;

Sol: 2.29-0.95=1.34

$$\begin{array}{r} {\scriptstyle 1\ \ 12} \\ 2.\not{2}\,9 \\ -0.95 \\ \hline 1.34 \end{array}$$

4. Subtract 2.25 from 5.68.

Sol: 5.68-2.25=3.43

$$\begin{array}{r} 5.68 \\ -2.25 \\ \hline 3.43 \end{array}$$

Example 5 :Abhishek had₹7.45. He bought toffees for₹5.30. Find the balance amount left with Abhishek.

Solution : Total amount of money =₹7.45

Amount spent on toffees =₹5.30

Balance amount of money =₹7.45 –₹5.30 =₹2.15

$$\begin{array}{r} 7.45 \\ -5.30 \\ \hline 2.15 \end{array}$$

Example 6 : Urmila's school is at a distance of 5 km 350 m from her house. She travels 1 km 70 m on foot and the rest by bus. How much distance does she travel by bus?

Solution : Total distance of school from the house = 5.350 km

Distance travelled on foot = 1.070 km

Therefore, distance travelled by bus = 5.350 km – 1.070 km = 4.280 km

$$\begin{array}{r} {\scriptstyle 2\ \ 15} \\ 5.\not{3}\,\not{5}0 \\ -1.070 \\ \hline 4.280 \end{array}$$

Example 7 : Kanchan bought a watermelon weighing 5 kg 200 g. Out of this she gave 2 kg 750 g to her neighbour. What is the weight of the watermelon left with Kanchan?

Solution : Total weight of the watermelon = 5.200 kg

$$\begin{array}{r} {}^{4}\not{5}.{}^{11}\not{2}{}^{10}\not{0}0 \\ -2.750 \\ \hline 2.450 \end{array}$$

Watermelon given to the neighbour = 2.750 kg

Therefore, weight of the remaining watermelon = 5.200 kg – 2.750 kg

= 2.450 kg

EXERCISE 8.4

1. Subtract :

(a) ₹18.25 from₹20.75

Sol: ₹20.75 − ₹18.25 = ₹2.50

$$\begin{array}{r} {}^{1}\not{2}{}^{10}\not{0}.75 \\ -18.25 \\ \hline 2.50 \end{array}$$

(b) 202.54 m from 250 m

Sol: $250m - 202.54m = 47.46\ m$

$$\begin{array}{r} {}^{4}2{}^{9}\not{5}{}^{9}\not{0}{}^{10}\not{0}.\not{0}\not{0} \\ -202.54 \\ \hline 47.46 \end{array}$$

(c) ₹5.36 from₹8.40

Sol: 8.40 − 5.36 = ₹3.04

$$\begin{array}{r} 8.{}^{3}\not{4}{}^{10}\not{0} \\ -5.36 \\ \hline 3.04 \end{array}$$

(d) 2.051 km from 5.206 km

Sol: $5.206\ km - 2.051km = 3.155\ km$

$$\begin{array}{r} 5.{}^{1}\not{2}{}^{10}\not{0}6 \\ -2.051 \\ \hline 3.155 \end{array}$$

(e) 0.314 kg from 2.107 kg

Sol: $2.107kg - 0.314\ kg = 1.793\ kg$

$$\begin{array}{r} {}^{1}\not{2}.{}^{10}\not{1}{}^{10}\not{0}7 \\ -0.314 \\ \hline 1.793 \end{array}$$

2. Find the value of :

(a) 9.756 – 6.28 = 3.476

$$\begin{array}{r} 9.{}^{6}\not{7}{}^{15}\not{5}6 \\ -6.280 \\ \hline 3.476 \end{array}$$

(b) 21.05 – 15.27 =5.78

$$\begin{array}{r} {}^{1}\not{2}1.{}^{10}\not{0}{}^{9}\not{5}{}^{15} \\ -15.27 \\ \hline 5.78 \end{array}$$

(c) 18.5 – 6.79 =11.71

$$\begin{array}{r} {\scriptstyle 7\ \ 14\ 10} \\ 1\,\not{8}.\,\not{5}\,\not{0} \\ -\ \ 6.79 \\ \hline 11.71 \end{array}$$

$$\begin{array}{r} {\scriptstyle 10\ \ 15\ \ 9\ 10} \\ \not{1}\not{1}.\,\not{6}\,\not{0}\,\not{0} \\ -\ \ 9.847 \\ \hline 1.753 \end{array}$$

(d) 11.6 – 9.847=1.753

3. **Raju bought a book for₹35.65. He gave₹50 to the shopkeeper. How much money did he get back from the shopkeeper?**

Sol: Money given to the shopkeeper=₹50

Cost of book=₹ 35.65

$$\begin{array}{r} {\scriptstyle 4\ 9\ \ 9\ 10} \\ \not{5}\not{0}.\,\not{0}\,\not{0} \\ -35.65 \\ \hline 14.35 \end{array}$$

Money get back from the shopkeeper=₹50-₹ 35.65=₹ 14.35

4. **Rani had₹18.50. She bought one ice-cream for₹11.75. How much money does she have now?**

Sol: Money with Rani=₹18.50

Cost of ice-cream=₹11.75

$$\begin{array}{r} {\scriptstyle 7\ \ 14\ 10} \\ 1\,\not{8}.\,\not{5}\,\not{0} \\ -11.75 \\ \hline 6.75 \end{array}$$

Money left with Rani=₹18.50-₹11.75=₹ 6.75

5. **Tina had 20 m 5 cm long cloth. She cuts 4 m 50 cm length of cloth from this for making a curtain. How much cloth is left with her?**

Sol: Total length of cloth=20 m 5 cm=20.05 m

Length of cloth used=4 m 50 cm=4.50 m

$$\begin{array}{r} {\scriptstyle 1\ \ 9\ 10} \\ 2\,\not{0}.\,\not{0}\,5 \\ -4.50 \\ \hline 15.55 \end{array}$$

Cloth left with Tina=$20.05\ m - 4.50\ m = 15.55\ m$

6. **Namita travels 20 km 50 m every day. Out of this she travels 10 km 200 m by bus and the rest by auto. How much distance does she travel by auto?**

Sol: Total distance travel by Namita=20 km 50 m=20.050k m

Distance travelled by bus= 10 km 200 m=10.200 km

Distance travelled by auto= $20.050\ km - 10.200\ km = 9.850\ km$

$$\begin{array}{r} {\scriptstyle 1\ \ 9\ 10} \\ 2\,\not{0}.\,\not{0}\,50 \\ -10.200 \\ \hline 9.850 \end{array}$$

7. **Aakash bought vegetables weighing 10 kg. Out of this, 3 kg 500 g is onions, 2 kg 75 g is tomatoes and the rest is potatoes. What is the weight of the potatoes?**

Sol: Total weight of vegetables bought by Aakash=10 kg=10.000 kg

Total weight of onions and tomatoes=3 kg 500 g+2 kg 75 g

=5 kg 575 g=5.575 kg

The weight of the potatoes $=10.000-5.575=4.425\ kg$

$$\begin{array}{r} {}^{9}\not{1}\,{}^{9}\not{0}\,{}^{9}\not{.}\,{}^{10}\not{0}\not{0}\not{0} \\ -\ 5.575 \\ \hline 4.425 \end{array}$$

CHAPTER 9

VI-MATHEMATICS-NCERT (2023-24)

9. DATA HANDLING (Notes)

REPARED BY: BALABHADRA SURESH

1. **Data**: A data is a collection of numbers gathered to give some information.
2. To get a particular information from the given data quickly, the data can be arranged in a tabular form using tally marks

Example 2 : Ekta is asked to collect data for size of shoes of students in her Class VI. Her finding are recorded in the manner shown below

5	4	7	5	6	7	6	5	6	6	5
4	5	6	8	7	4	6	5	6	4	6
5	7	6	7	5	7	6	4	8	7	

Sol:

Shoe size	Tally marks	Number of students
4	𝍸	5
5	𝍸 | | |	8
6	𝍸 𝍸	10
7	𝍸 | |	7
8	| |	2

Pictograph

A pictograph represents data through pictures of objects.

Example 3 : The following pictograph shows the number of absentees in a class of 30 students during the previous week :

Days	Number of absentees	- 1 Absentee
Monday	5	
Tuesday	4	
Wednesday	2	
Thursday	0	
Friday	1	
Saturday	8	

(a) On which day was the maximum number of students absent?

Sol: Saturday.

(b) Which day had full attendance?

Sol: Thursday

(c) What was the total number of absentees in that week?

Sol: Total number of absentees=5+4+2+0+1+8=20

Example 4 : The colours of fridges preferred by people living in a locality are shown by the following pictograph.

Colours	Number of people	- 10 People
Blue		
Green		
Red		
White		

(a) Find the number of people preferring blue colour.

Sol: Blue colour is preferred by $5 \times 10 = 50$ people

(b) How many people liked red colour?

Sol: Number of people preferring red colour $= 5 \times 10 + 5 = 50 + 5 = 55$

Example 5 : A survey was carried out on 30 students of class VI in a school. Data about the different modes of transport used by them to travel to school was displayed as pictograph. What can you conclude from the pictograph?

Modes of travelling	Number of students	- 1 Student
Private car		
Public bus		
School bus		
Cycle		
Walking		

Sol: From the pictograph we find that

(a) The number of students coming by private car is 4.

(b) Maximum number of students use the school bus. This is the most popular way.

(c) Cycle is used by only three students.

(d) The number of students using the other modes can be similarly found.

Example 6 : Following is the pictograph of the number of wrist watches manufactured by a factory in a particular week.

Days	Number of wrist watches manufactured	-100 Wrist watches
Monday		(600)
Tuesday		(750)
Wednesday		(650)
Thursday		(800)
Friday		(600)
Saturday		(550)

(a) On which day were the least number of wrist watches manufactured?

Sol: Saturday

(b) On which day was the maximum number of wrist watches manufactured?

Sol: Thursday

(c) Find out the approximate number of wrist watches manufactured in the particular week?

Sol: The approximate number of wrist watches manufactured in the particular week
=600+750+650+800+600+550=3950

EXERCISE 9.1

1. In a Mathematics test, the following marks were obtained by 40 students. Arrange these marks in a table using tally marks.

8	1	3	7	6	5	5	4	4	2
4	9	5	3	7	1	6	5	2	7
7	3	8	4	2	8	9	5	8	6
7	4	5	6	9	6	4	4	6	6

Sol:

Marks	Tally marks	Number of students
1	||	2
2	|||	3
3	|||	3
4	𝍸 ||	7
5	𝍸 |	6
6	𝍸 ||	7
7	𝍸	5
8	||||	4
9	|||	3
	Total	40

(a) Find how many students obtained marks equal to or more than 7.

Sol: 5+4+3=12

(b) How many students obtained marks below 4?

Sol: 2+3+3=8

2. Following is the choice of sweets of 30 students of Class VI.

Ladoo, Barfi, Ladoo, Jalebi, Ladoo, Rasgulla, Jalebi, Ladoo, Barfi, Rasgulla, Ladoo, Jalebi, Jalebi, Rasgulla, Ladoo, Rasgulla, Jalebi, Ladoo, Rasgulla, Ladoo, Ladoo, Barfi, Rasgulla, Rasgulla, Jalebi, Rasgulla, Ladoo, Rasgulla, Jalebi, Ladoo.

(a) Arrange the names of sweets in a table using tally marks.

Sol:

Sweet	Tally marks	Number of students
Ladoo	𝍸 𝍸 |	11
Barfi	|||	3
Jalebi	𝍸 ||	7
Rasgulla	𝍸 ||||	9
	Total	30

(b) Which sweet is preferred by most of the students?

Sol: Ladoo.

3. Catherine threw a dice 40 times and noted the number appearing each time as shown below :

1	3	5	6	6	3	5	4	1	6
2	5	3	4	6	1	5	5	6	1
1	2	2	3	5	2	4	5	5	6
5	1	6	2	3	5	2	4	1	5

Make a table and enter the data using tally marks. Find the number that appeared.

Sol:

Number on dice	Tally marks	Number of times
1	𝍸 ||	7
2	𝍸 |	6
3	𝍸	5
4	||||	4
5	𝍸 𝍸 |	11
6	𝍸 ||	7
	Total	40

(a) The minimum number of times

Sol: 4

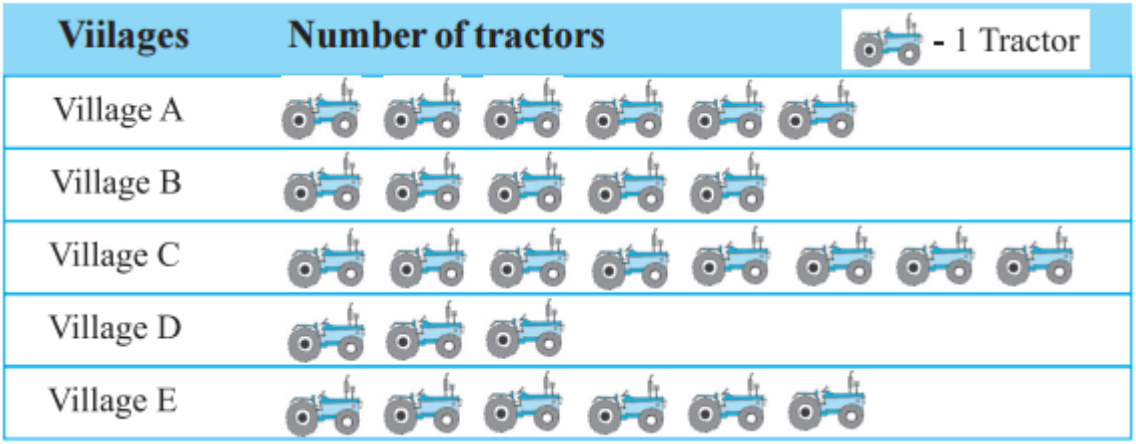
(b) The maximum number of times

Sol: 5

(c) Find those numbers that appear an equal number of times.

Sol:1 and 6

4. Following pictograph shows the number of tractors in five villages.



Observe the pictograph and answer the following questions.

(i) Which village has the minimum number of tractors?

Sol: Village D

(ii) Which village has the maximum number of tractors?

Sol: Village C

(iii) How many more tractors village C has as compared to village B.

Sol: 8-5=3

(iv) What is the total number of tractors in all the five villages?

Sol: 6+5+8+3+6=28

5. The number of girl students in each class of a co-educational middle school is depicted by the pictograph :

Classes	Number of girl students	- 4 Girls
I		(24)
II		(18)
III		(20)
IV		(14)
V		(10)
VI		(16)
VII		(12)
VIII		(6)

Observe this pictograph and answer the following questions :

(a) Which class has the minimum number of girl students?

Sol: VIII class.

(b) Is the number of girls in Class VI less than the number of girls in Class V?

Sol: No.

(c) How many girls are there in Class VII?

Sol: 12

6. The sale of electric bulbs on different days of a week is shown below :

Days	Number of electric bulbs	- 2 Bulbs
Monday		(12)
Tuesday		(16)
Wednesday		(8)
Thursday		(10)
Friday		(14)
Saturday		(8)
Sunday		(18)

Observe the pictograph and answer the following questions :

(a) How many bulbs were sold on Friday?

Sol: 14

(b) On which day were the maximum number of bulbs sold?

Sol: Sunday.

(c) On which of the days same number of bulbs were sold?

Sol: Wednesday and Saturday (8 bulbs)

(d) On which of the days minimum number of bulbs were sold?

Sol: Wednesday and Saturday (8 bulbs)

(e) If one big carton can hold 9 bulbs. How many cartons were needed in the given week?

Sol: Total number of bulbs sold in the given week=12+16+8+10+14+8+18=86

If one big carton can hold 9 bulbs

$\frac{86}{9} = 9\frac{5}{9}$

Required number of cartons=10

7. **In a village six fruit merchants sold the following number of fruit baskets in a particular season :**

Name of fruit merchants	Number of fruit baskets (🧺 - 100 Fruit baskets)
Rahim	(400)
Lakhanpal	(550)
Anwar	(700)
Martin	(950)
Ranjit Singh	(800)
Joseph	(450)

Observe this pictograph and answer the following questions :

(a) Which merchant sold the maximum number of baskets?

Sol: Martin

(b) How many fruit baskets were sold by Anwar?

Sol: 700

(c) The merchants who have sold 600 or more number of baskets are planning to buy a godown for the next season. Can you name them?

Sol: Anwar, Martin and Ranjit Singh.

CHAPTER 10

VI-MATHEMATICS-NCERT (2023-24)

10 .MENSURATION (notes)

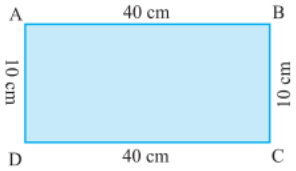
REPARED BY: BALABHADRA SURESH
https://sureshmathsmaterial.com/

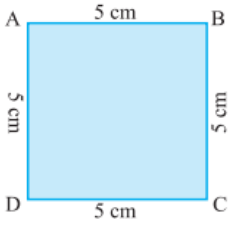
Perimeter: Perimeter is the distance covered along the boundary forming a closed figure. When you go round the figure once.

1. **Meera went to a park 150 m long and 80 m wide. She took one complete round on its boundary. What is the distance covered by her?**

Sol: The distance covered by Meera=150 m+80 m+150 m+80 m=460 m

2. **Find the perimeter of the following figures:**





(a) Perimeter = AB + BC + CD + DA

=40 cm+10 cm+40 cm+10 cm=100 cm

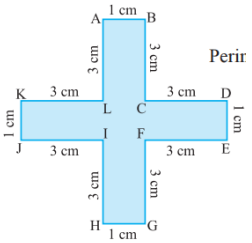
(b) Perimeter = AB + BC + CD + DA

=5 cm+5 cm+ 5 cm+ 5 cm= 20 cm

(C) Perimeter = AB + BC + CD + DE + EF + FG + GH +HI + IJ + JK + KL + LA

=1 cm+ 3 cm+ 3 cm+ 1 cm+3 cm+ 3 cm+1 cm+3 cm+ 3 cm +1 cm+ 3 cm+ 3cm

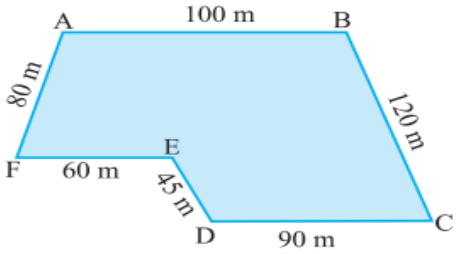
= 28 cm



(d) Perimeter = AB + BC + CD + DE + EF + FA

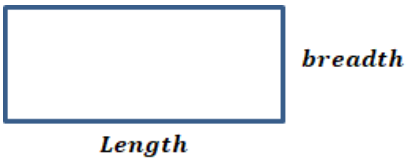
=100 cm+ 120 cm + 90 cm+ 45 cm+60 cm+80 cm

=495 cm



Perimeter of a rectangle:

Perimeter of a rectangle = 2 × (length + breadth)=2(l + b)



Try These

Find the perimeter of the following rectangles:

(i) Length=25 cm, Breadth= 12 cm

Perimeter by adding all the sides=25 cm+12 cm+25 cm+12 cm=74 cm

Perimeter by 2×(Length +Breadth)= 2×(25 cm+12 cm)=2×(37 cm)=74 cm

(ii) Length=0.5 cm, Breadth= 0.25 cm

Perimeter by adding all the sides=0.5 cm+0.25 cm+0.5 cm+0.25 cm=1.5 cm

Perimeter by 2×(Length + Breadth)= 2×(0.5 cm+0.25 cm)=2×(0.75 cm)=1.5 cm

(iii) Length=18 cm, Breadth= 15 cm

Perimeter by adding all the sides=18 cm+15 cm+18 cm+15 cm=66 cm

Perimeter by 2×(Length +Breadth)= 2×(18 cm+15 cm)=2×(33 cm)=66 cm

(iv) Length=10.5 cm, Breadth= 8.5 cm

Perimeter by adding all the sides=10.5 cm+8.5 cm+10.5 cm+8.5 cm=38 cm

Perimeter by 2×(Length +Breadth)= 2×(10.5 cm+8.5 cm)=2×(19 cm)=38 cm

Example 1 : Shabana wants to put a lace border all around a rectangular table cover 3 m long and 2 m wide. Find the length of the lace required by Shabana.

Sol: Length= 3 m , Breadth=2 m

Perimeter =2 × (length + breadth)

= 2 × (3 m + 2 m) = 2 × 5 m = 10 m

So, required length of the lace is 10 m.

Example 2 : An athlete takes 10 rounds of a rectangular park, 50 m long and 25 m wide. Find the total distance covered by him.

Sol: Length of the rectangular park = 50 m

Breadth of the rectangular park = 25 m

Perimeter of the rectangular park= = 2 × (length + breadth)

= 2 × (50 m + 25 m)

= 2 × 75 m = 150 m

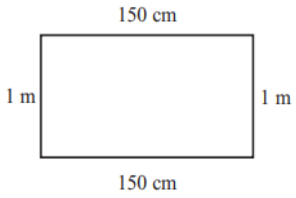
The distance covered by the athlete in one round=150 m.

Distance covered in 10 rounds = 10 × 150 m = 1500 m.

The total distance covered by the athlete is 1500 m.

Example 3 : Find the perimeter of a rectangle whose length and breadth are 150 cm and 1 m respectively.

Sol: Length = 150 cm, Breadth = 1m = 100 cm.

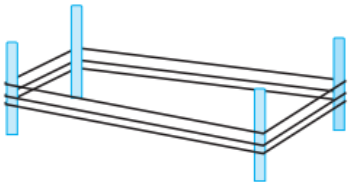


Perimeter of the rectangle= 2 × (length + breadth)

= 2 × (150 cm + 100 cm)

= 2 × (250 cm) = 500 cm = 5 m.

Example 4 :A farmer has a rectangular field of length and breadth 240 m and 180 m respectively. He wants to fence it with 3 rounds of rope as shown in figure 10.4. What is the total length of rope he must use?



Sol: Length=240 m, Breadth=180 m.

Perimeter of the field = 2 × (length + breadth)

= 2 × (240 m + 180 m)

= 2 × 420 m = 840 m

Total length of rope required = 3 × 840 m = 2520 m.

Example 5 : Find the cost of fencing a rectangular park of length 250 m and breadth 175 m at the rate of ₹ 12 per metre.

Sol: Length of the rectangular park = 250 m

Breadth of the rectangular park = 175 m

Perimeter of the rectangle = 2 × (length + breadth)

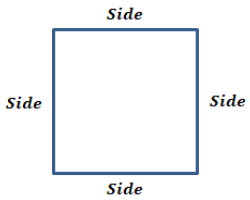
= 2 × (250 m + 175 m) = 2 × (425 m) = 850 m

Cost of fencing 1m of park = ₹ 12

The total cost of fencing the park = ₹ 12 × 850 = ₹ 10200

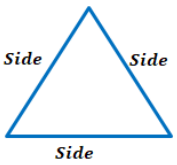
Perimeter of a square:

Perimeter of a square = 4 × side



Perimeter of an equilateral triangle:

Perimeter of an equilateral triangle = 3 × side



Example 6 : Find the distance travelled by Shaina if she takes three rounds of a square park of side 70 m.

Sol: Length of side=70 m

Perimeter of the square park = 4 × length of a side = 4 × 70 m = 280 m

Distance covered in one round = 280 m.

Distance travelled in three rounds=3×280m = 840m.

Example 7 : Pinky runs around a square field of side 75 m, Bob runs around a rectangular field with length 160 m and breadth 105 m. Who covers more distance and by how much?

Sol: Perimeter of the square = 4 × length of a side= = 4 × 75 m = 300 m

Distance covered by Pinky in one round=300 m.

Perimeter of the rectangle= 2 × (length + breadth)

= 2 × (160 m + 105 m)

= 2 × 265 m = 530 m.

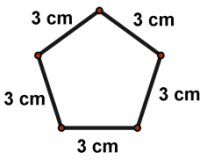
Difference in the distance covered = 530 m – 300 m = 230 m.

Therefore, Bob covers more distance by 230 m.

Example 8 : Find the perimeter of a regular pentagon with each side measuring 3 cm.

Sol: Side=3 cm,

Perimeter of the regular pentagon=5× side=5×3 cm=15 cm.



Example 9 : The perimeter of a regular hexagon is 18 cm. How long is its one side?

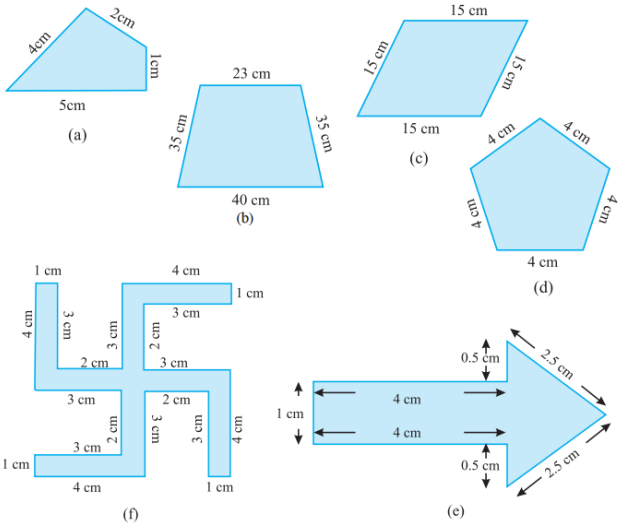
Sol: perimeter of a regular hexagon = 18 cm

6×Side=18 cm

$$\text{Side} = \frac{18}{6} = 3\ cm$$

EXERCISE 10.1

1. Find the perimeter of each of the following figures :



(a) Perimeter=2+1+5+4=12cm

(b) Perimeter=23+35+40+35=133 cm

(c) Perimeter=15+15+15+15=60 cm

(d) Perimeter=4+4+4+4+4=20 cm

(e) Perimeter=2.5+2.5+0.5+4+1+4+0.5=15 cm

2. The lid of a rectangular box of sides 40 cm by 10 cm is sealed all round with tape. What is the length of the tape required?

Sol: Length of lid=40 cm, Breadth of lid=10 cm

Perimeter=2 × (length + breadth)

= 2 × (40 + 10)=2×50=100 cm

The length of the tape required=100 cm. =1 m.

3. A table-top measures 2 m 25 cm by 1 m 50 cm. What is the perimeter of the table-top?

Sol: Length =2 m 25 cm=2.25 m, Breadth=1 m 50 cm=1.50 m

Perimeter=2 × (length + breadth)

=2×(2.25+1.50)

=2×3.75=7.50 m=7 m 50 cm

4. What is the length of the wooden strip required to frame a photograph of length and breadth 32 cm and 21 cm respectively?

Sol: Length of frame=32 cm

Breadth of frame=21 cm

Perimeter of the frame=2× (length + breadth)

=2×(32+21)=2×53=106 cm

∴ The length of the wooden strip required=106 cm.

5. A rectangular piece of land measures 0.7 km by 0.5 km. Each side is to be fenced with 4 rows of wires. What is the length of the wire needed?

Sol: Length of land=0.7 km

Breadth of land=0.5 km

Perimeter of the land=2× (length + breadth)

=2×(0.7+0.5)=2×1.2=2.4 km

The length of the wire needed to fence=4×2.4 km=9.6 km.

6. Find the perimeter of each of the following shapes :

(a) A triangle of sides 3 cm, 4 cm and 5 cm.

Sol: Perimeter of triangle= 3 cm+4 cm+5 cm=12 cm.

(b) An equilateral triangle of side 9 cm.

Sol: Perimeter of An equilateral triangle=3×side=3×9 cm=27 cm.

(c) An isosceles triangle with equal sides 8 cm each and third side 6 cm

Sol: Perimeter of An isosceles triangle=8 cm+8 cm+6 cm=22 cm

7. Find the perimeter of a triangle with sides measuring 10 cm, 14 cm and 15 cm.

Sol: The perimeter of triangle=10+14+15=39 cm.

8. Find the perimeter of a regular hexagon with each side measuring 8 m.

Sol: The perimeter of regular hexagon=6×side=6×8 m=48 m.

9. Find the side of the square whose perimeter is 20 m.

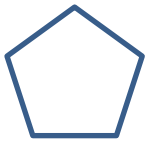
Sol: Perimeter of square= 20 m

4×side =20 m

Side of the square $= \frac{20\ m}{4} = 5\ m$

10. The perimeter of a regular pentagon is 100 cm. How long is its each side?

Sol: The perimeter of a regular pentagon = 100 cm



5× side of pentagon=100 cm

Side of pentagon $= \frac{100 \text{ cm}}{5} = 20 \text{ cm}$

11. A piece of string is 30 cm long. What will be the length of each side if the string is used to form :

(a) a square?

Sol: Perimeter of square=30 cm

4× side of square=30 cm

Side of square $= \frac{30\ cm}{4} = 7.5\ cm$

(b) an equilateral triangle?

Sol: Perimeter of an equilateral triangle =30 cm

3× side of an equilateral triangle =30 cm

Side of an equilateral triangle $= \frac{30 \text{ cm}}{3} = 10 \text{ cm}$

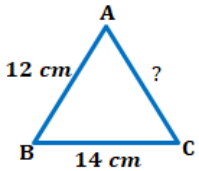
(c) a regular hexagon?

Sol: Perimeter of a regular hexagon =30 cm

6× side of a regular hexagon =30 cm

Side of a regular hexagon $= \frac{30\ cm}{6} = 5\ cm$

12. Two sides of a triangle are 12 cm and 14 cm. The perimeter of the triangle is 36 cm. What is its third side?



Sol: The perimeter of the triangle = 36 cm

AB+BC+CA=36 cm

12 cm+14 cm + CA=36 cm

26 cm + CA=36 cm

CA = 36 cm − 26cm = 10 cm

The third side=10 cm.

13. Find the cost of fencing a square park of side 250 m at the rate of ₹ 20 per metre.

Sol: side of the square park=250 m

Perimeter of the square park=4×side=4×250 m=1000 m.

Cost of fencing per 1 m=₹ 20

Total cost of fencing =₹20×1000=₹ 20,000

14. Find the cost of fencing a rectangular park of length 175 m and breadth 125 m at the rate of ₹ 12 per metre.

Sol: length =175 m and breadth =125 m

Perimeter of rectangular park=2×(Length + Breadth)=2×(175+125)=2×300=600 m

The cost of fencing per 1 m=₹ 12

Total cost of fencing= ₹ 12×600=₹ 7200

15. Sweety runs around a square park of side 75 m. Bulbul runs around a rectangular park with length 60 m and breadth 45 m. Who covers less distance?

Sol: Side of square park=75 m.

Perimeter of the square park=4×side=4×75 m=300 m.

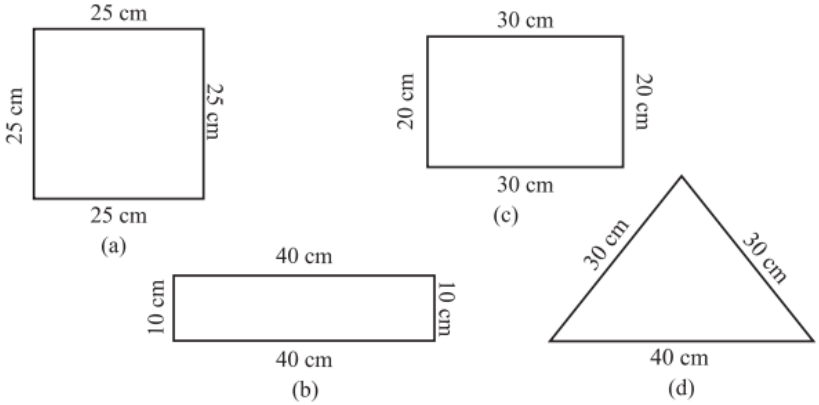
Rectangular park : Length=60m , Breadth=45 m

Perimeter of rectangular park=2× (Length+Breadth)=2×(60 m+45 m)=2×105m=210 m.

Sweety covers 300 m and Bulbul covers 210 m.

∴ Bulbul covers less distance.

16. What is the perimeter of each of the following figures? What do you infer from the answers?



(a) Side of the square=25 cm.

Perimeter of the square=4×side=4×25 cm=100 cm.

(b) Length=40 cm, Breadth=10 cm.

Perimeter of rectangular =2×(Length + Breadth)=2×(40cm+10cm)=2×50 cm=100 cm

(c) Length=30 cm, Breadth=20 cm.

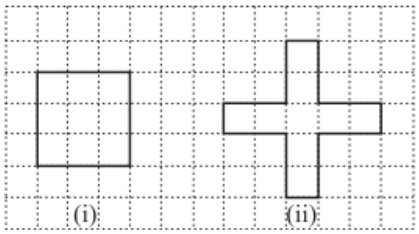
Perimeter of rectangular =2×(Length + Breadth)=2×(30cm+20cm)=2×50 cm=100 cm

(d) Perimeter of triangle=Sum of all sides=30 cm+30 cm+40 cm=100 cm.

We observe all the figures have same perimeter.

17. Avneet buys 9 square paving slabs, each with a side of $\frac{1}{2}$m. He lays them in the form of a square.

(a) What is the perimeter of his arrangement [Fig 10.7(i)]?



Sol: Side of square $= 3 \times \frac{1}{2}$m. $= \frac{3}{2}\ m = 1.5\ m$

Perimeter of the square $= 4 \times 1.5$ m $= 6$ m

(b) Shari does not like his arrangement. She gets him to lay them out like a cross. What is the perimeter of her arrangement [(Fig 10.7 (ii)]?

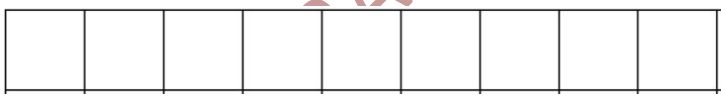
Sol: Perimeter of the cross figure $= 20 \times \frac{1}{2} m = 10\ m$

(c) Which has greater perimeter?

Sol: The cross figure has greater perimeter.

(d) **Avneet wonders if there is a way of getting an even greater perimeter. Can you find a way of doing this? (The paving slabs must meet along complete edges i.e. they cannot be broken.)**

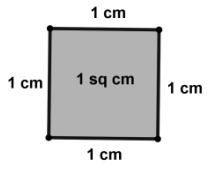
Sol:



Length=9×0.5=4.5 m, Breadth=0.5 m

Perimeter=2×(4.5 m+0.5 m)=2×5 m=10 m.

Area



The amount of surface enclosed by a closed figure is called its area.

(i) The area of one full square is taken as 1 sq unit.

(ii)The area of one full square with side 1 cm will be 1 sq cm.

Example 10 : Find the area of the shape shown in the figure 10.10.

Sol: Fully-filled squares = 3

Area covered by full squares = 3 × 1 sq units = 3 sq units

Half-filled squares = 3

Area covered by half squares $= 3 \times \frac{1}{2}$ sq units $= \frac{3}{2} = 1\frac{1}{2}$ sq units

Total area $= 3 + 1\frac{1}{2} = 4\frac{1}{2}$ sq units

Example 11 : By counting squares, estimate the area of the figure

Sol: Full-filled squares =11

More than half-filled squares=7

Half-filled squares=3

Total area $= (11 + 7) \times 1$ sq unit $+ 3 \times \frac{1}{2}$ sq unit

$= 18 + 1\frac{1}{2} = 19\frac{1}{2}$ sq units

Example 12 : By counting squares, estimate the area of the figure 10.9 a.

Sol: Full-filled squares =1

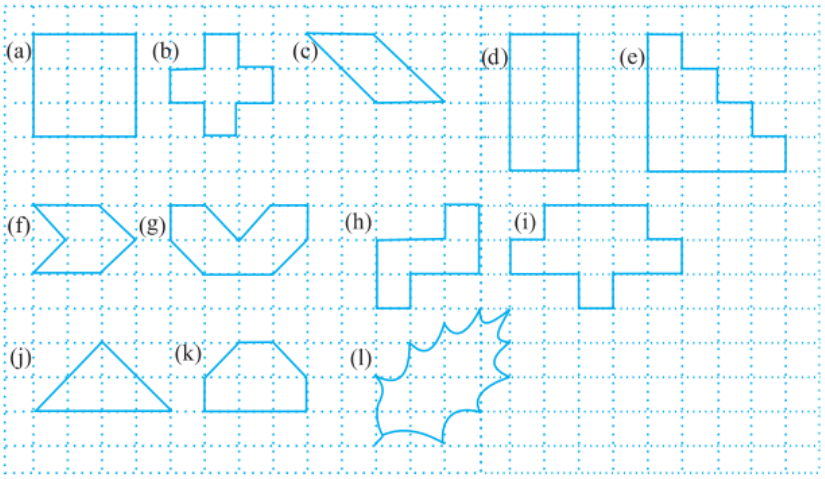
More than half-filled squares=7

Half-filled squares=0

Total area $= (1 + 7) \times 1$ sq unit $= 8$ sq unit.

EXERCISE 10.2

1. Find the areas of the following figures by counting square:



(a) Full filled squares=9

Area of the figure=9×1sq unit=9 sq units.

(b) Full filled squares=5

Area of the figure=5×1sq unit=5 sq units.

(c) Full filled squares=2

Half-filled squares=4

Area of the figure $= 2 \times 1 + 4 \times \frac{1}{2} = 2 + 2 = 4$ sq units.

(d) Full filled squares=8

Area of the figure=8×1sq unit=8 sq units

(e) Full filled squares=10

Area of the figure=10×1sq unit=10 sq units.

(f) Full filled squares=2

Half-filled squares=4

Area of the figure $= 2 \times 1 + 4 \times \frac{1}{2} = 2 + 2 = 4$ sq units.

(g) Full filled squares=4

Half-filled squares=4

Area of the figure $= 4 \times 1 + 4 \times \frac{1}{2} = 4 + 2 = 6$ sq units.

(h) Full filled squares=5

Area of the figure=5×1sq unit=5 sq units.

(i) Full filled squares=9

Area of the figure=9×1sq unit=9 sq units.

(j) Full filled squares=2

Half-filled squares=4

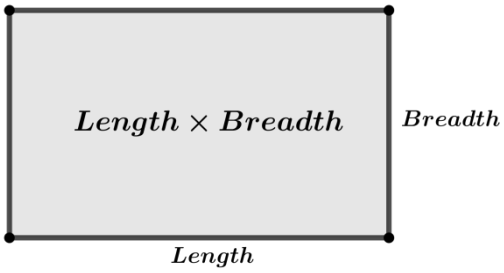
Area of the figure $= 2 \times 1 + 4 \times \frac{1}{2} = 2 + 2 = 4$ sq units.

Area of a rectangle:

Area of a rectangle = length × breadth

Area of a square:

Area of the square = side × side



Example 13 : Find the area of a rectangle whose length and breadth are 12 cm and 4 cm respectively.

Sol: Length=12 cm, Breadth=4 cm.

Area of the rectangle = length × breadth

= 12 cm × 4 cm = 48 sq cm.

Example 14 : Find the area of a square plot of side 8 m.

Sol: Side = 8 m

Area of the square = side × side

$= 8\text{ m} \times 8\text{ m} = 64\text{ sq m.}$

Example 15 : The area of a rectangular piece of cardboard is 36 sq cm and its length is 9 cm. What is the width of the cardboard?

Sol: Length = 9 cm, Width= ?

Area of the rectangle = 36 sq cm

length × width=36 sq cm

9 × width=36

$\text{Width} = \frac{36}{9} = 4\text{ cm}$

$\therefore$ The width of the rectangular cardboard is 4 cm.

Example 16 : Bob wants to cover the floor of a room 3 m wide and 4 m long by squared tiles. If each square tile is of side 0.5 m, then find the number of tiles required to cover the floor of the room.

Sol: Length = 4 m, Breadth=3m

Area of the floor = length × breadth = 4 m × 3 m = 12 sq m

Area of one square tile = side × side=0.5 m×0.5 m=0.25 sq m

$\text{Number of tiles required} = \frac{\text{Area of the floor}}{\text{Area of one tile}} = \frac{12 \times 100}{0.25 \times 100} = \frac{1200}{25} = 48$

Example 17 : Find the area in square metre of a piece of cloth 1m 25 cm wide and 2 m long.

Sol: Length=2 m, Breadth=1 m 25 cm=1.25 m

Area of the cloth = length × breadth

=2 m×1.25 m=2.50 sq.m

EXERCISE 10.3

1. Find the areas of the rectangles whose sides are :

(a) 3 cm and 4 cm

Sol: Length=3 cm, Breadth=4 cm.

Area of the rectangle = length × breadth =3 cm×4 cm=12 sq cm

(b) 12 m and 21 m

Sol: Length=12 m, Breadth=21 m.

Area of the rectangle = length × breadth =12 cm×21 cm=252 sq m

(c) 2 km and 3 km

Sol: Length=2 km, Breadth=3 km.

Area of the rectangle = length × breadth =2 km ×3 km =6 sq km

(d) 2 m and 70 cm

Sol: Length=2 m, Breadth=70 cm=0.70 m.

Area of the rectangle = length × breadth =2 m×0.70 m=1.40 sq cm

2. Find the areas of the squares whose sides are :

(a) 10 cm

Sol: Side= 10 cm

Area of the square=side × side

=10 cm×10 cm=100 sq cm

(b) 14 cm

Sol: Side= 14 cm

Area of the square=side × side

=14 cm×14 cm=196 sq cm

(c) 5 m

Sol: Side= 5 m

Area of the square=side × side

=5 m×5 m=25 sq m

3. The length and breadth of three rectangles are as given below : Which one has the largest area and which one has the smallest?

(a) 9 m and 6 m, (b) 17 m and 3 m. (c) 4 m and 14 m

Sol: Area of the rectangle (a) =9 m×6 m=54 sq m

Area of the rectangle (b) =17 m×3 m=51 sq m

Area of the rectangle(c) =4 m×14 m=56 sq m

The rectangle (c) has the largest area and (b) has the smallest area.

4. The area of a rectangular garden 50 m long is 300 sq m. Find the width of the garden.

Sol: The area of a rectangular garden =300 sq m.

long × width = 300 sqm

50 × width = 300

$$\text{width} = \frac{300}{50} = 6\ m$$

The width of the garden=6 m

5. What is the cost of tiling a rectangular plot of land 500 m long and 200 m wide at the rate of ₹ 8 per hundred sq m.?

Sol: Length=500m, Breadth=200 m

Area of rectangular plot=length × breadth =500 m× 200 m=100000 sq m

Cost of tiling per 100 sq m=₹8

Cost of tiling per 100000 $sq\ m = \frac{100\cancel{00} \times 8}{1\cancel{00}} = ₹\ 8000$

The cost of tiling a rectangular plot of land=₹ 8000

6. A table-top measures 2 m by 1 m 50 cm. What is its area in square metres?

Sol: Length=2 m, Breadth=1 m 50 cm=1.50 m

Area of table top= length × breadth=2 m×1.50 m=3 sq m

7. A room is 4 m long and 3 m 50 cm wide. How many square metres of carpet is needed to cover the floor of the room?

Sol: Length =4 m, Bredth=3 m 50 cm=3.50 m

Area of room= length × breadth=4 m×3.50 m=14 sq m

The area of required carpet=14 sq m

8. A floor is 5 m long and 4 m wide. A square carpet of sides 3 m is laid on the floor. Find the area of the floor that is not carpeted.

Sol: Length =5 m, breadth =4 m

Area of floor= length × breadth=5 m×4 m=20 sq m

Side of square carpet=3 m

Area of square carpet=side × side=3 m× 3 m=9 sq m

The area of the floor that is not carpeted =20 sq m − 9 sq m = 11 sq m

9. Five square flower beds each of sides 1 m are dug on a piece of land 5 m long and 4 m wide. What is the area of the remaining part of the land?

Sol: Side of square flower bed=1 m

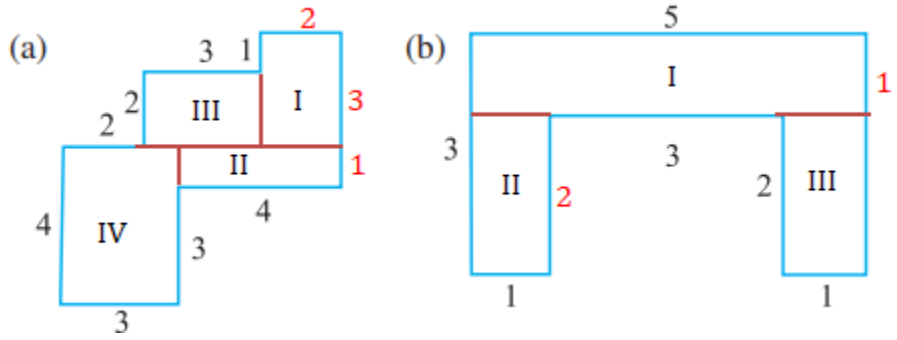
Area of flower bed=side × side=1 m×1 m=1 sq m

Area of 5 flower beds=5×1 sq m=5 sq m

Area of land=5 m× 4 m=20 sq m

The area of the remaining part of the land = 20 sq m − 5 sq m = 15 sq m

10. By splitting the following figures into rectangles, find their areas (The measures are given in centimetres).



Sol: (a) Area of rectangle (I)=2×3=6 sq cm

Area of rectangle (II)=4×1=4 sq cm

Area of rectangle (III)=2×3=6 sq cm

Area of rectangle (IV)=4×3=12 sq cm

Total area of the figure(a)=6+4+6+12=28 sq cm

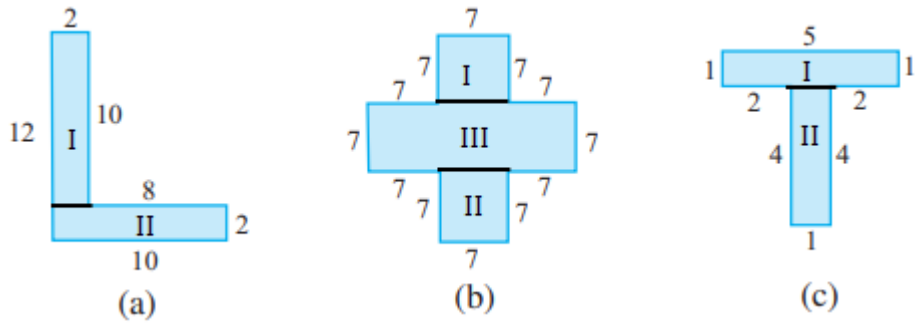
(b) Area of rectangle (I)=5×1=5 sq cm

Area of rectangle (II)=2×1=2 sq cm

Area of rectangle (III)=2×1=2 sq cm

Total area of the figure(b)=5+2+2=9 sq cm

11. Split the following shapes into rectangles and find their areas. (The measures are given in centimetres)



Sol: (a) Area of rectangle (I)=10×2=20 sq cm

Area of rectangle (II)=10×2=20 sq cm

Total area of the figure=20+20=40 sq cm

(b) Area of square (I)=7×7=49 sq cm

Area of square (II)=7×7=49sq cm

Area of rectangle (III)=21×7=147 sq cm

Total area of the figure=49+49+147=245 sq cm

(c) Area of rectangle (I)=5×1=5 sq cm

Area of rectangle (II)=4×1=4 sq cm

Total area of the figure=5+4=9 sq cm

12. How many tiles whose length and breadth are 12 cm and 5 cm respectively will be needed to fit in a rectangular region whose length and breadth are respectively: (a) 100 cm and 144 cm (b) 70 cm and 36 cm.

Sol: Area of tile=12 cm×5 cm

(a) Area of rectangular region=100 cm×144 cm

$$\text{The number of tiles needed} = \frac{\text{Area of rectangular region}}{\text{Area of tile}} = \frac{100 \times 144}{12 \times 5} = 20 \times 12 = 240$$

(b) Area of rectangular region=70 cm×36 cm

$$\text{The number of tiles needed} = \frac{\text{Area of rectangular region}}{\text{Area of tile}} = \frac{\cancel{70}^{14} \times \cancel{36}^{3}}{\cancel{12} \times \cancel{5}} = 14 \times 3 = 42$$

CHAPTER 11

VI-MATHEMATICS-NCERT-2023-24

11. ALGEBRA (Notes)

REPARED BY: BALABHADRA SURESH

1. Variable: A variable takes on different values, its value is not fixed.
2. We may use any letter n, l, m, p, x, y, z, etc. to show a variable.
3. A variable allows us to express relations in any practical situation.
4. Using different operations we can form expressions with variables.

$Ex: x + 5, \quad 2y - 7, \quad 5m + \frac{1}{2}, \quad \frac{n}{3} - 15, \ldots$

EXERCISE 11.1

1. Find the rule which gives the number of matchsticks required to make the following matchstick patterns. Use a variable to write the rule.

(a) A pattern of letter T as 

Sol: To make a T , 2 match sticks required.

Rule =2×n=2n (n= number of T)

(b) A pattern of letter Z as 

Sol: : To make a Z , 3 match sticks required.

Rule =3×n=3n (n= number of Z)

(c) A pattern of letter U as 

Sol: : To make a Z , 3 match sticks required.

Rule =3×n=3n (n= number of Z)

(d) A pattern of letter V as 

Sol: : To make a V , 3 match sticks required.

Rule =3×n=3n (n= number of V)

(e) A pattern of letter E as 

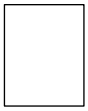
Sol: To make a E , 5 match sticks required.

Rule =5×n=5n (n= number of E)

(f) A pattern of letter S as 

Sol: : To make a S , 5 match sticks required.

Rule =5×n=3n (n= number of S)

(g) A pattern of letter A as 

Sol: To make a A , 6 match sticks required.

Rule =6×n=6n (n= number of Z)

2. **We already know the rule for the pattern of letters L, C and F. Some of the letters from Q.1 (given above) give us the same rule as that given by L. Which are these? Why does this happen?**

Sol: (a) T and (d) V; The number of matchsticks required in each of them is 2

3. Cadets are marching in a parade. There are 5 cadets in a row. What is the rule which gives the number of cadets, given the number of rows? (Use n for the number of rows.)

Sol: Number of cadets in a row =5

Number of rows=n

Total number of cadets=5×n=5n

4. If there are 50 mangoes in a box, how will you write the total number of mangoes in terms of the number of boxes? (Use b for the number of boxes.)

Sol: Number of mangoes in a box=50

Number of boxes=b

The total number of mangoes=50×b=50b

5. The teacher distributes 5 pencils per student. Can you tell how many pencils are needed, given the number of students? (Use s for the number of students.)

Sol: Number of pencils distributed per student=5

Number of students=s

Total number of pencils needed=5×s=5s

6. A bird flies 1 kilometer in one minute. Can you express the distance covered by the bird in terms of its flying time in minutes? (Use t for flying time in minutes.)

Sol: A bird flies in 1 minute=1 km

The distance covered by the bird in t minutes=t×1 km=t km

7. Radha is drawing a dot Rangoli (a beautiful pattern of lines joining dots) with chalk powder. She has 9 dots in a row. How many dots will her Rangoli have for r rows? How many dots are there if there are 8 rows? If there are 10 rows?

Sol: Number of dots in a row=9

Number of dots in **r** rows =9×r=9r

Number of dots in 8 rows=9×8=72

Number of dots in 10 rows=9×10=90

8. **Leela is Radha's younger sister. Leela is 4 years younger than Radha. Can you write Leela's age in terms of Radha's age? Take Radha's age to be x years.**

Sol: Radha's age=x years

Leela's age=$(x-4)$ years

9. **Mother has made laddus. She gives some laddus to guests and family members; still 5 laddus remain. If the number of laddus mother gave away is l, how many laddus did she make?**

Sol: Number of laddus given to guests and family members =l

Number of remaining laddus=5

Total number of laddus made by mother=$l+5$

10. **Oranges are to be transferred from larger boxes into smaller boxes. When a large box is emptied, the oranges from it fill two smaller boxes and still 10 oranges remain outside. If the number of oranges in a small box are taken to be x, what is the number of oranges in the larger box?**

Sol: The number of oranges in the small box=x

The number of oranges in two smaller boxes=$2x$

Remaining oranges=10

The number of oranges in the larger box=$2x+10$

11. (a) **Look at the following matchstick pattern of squares (Fig 11.6). The squares are not separate. Two neighbouring squares have a common matchstick. Observe the patterns and find the rule that gives the number of matchsticks** in terms of the number of squares. (Hint : If you remove the vertical stick at the end, you will get a pattern of Cs.)

(a) (b) (c) (d)

Sol: Number of sticks are 4,7,10,13

3+1,6+1,9+1,12+1

3×1+1, 3×2+1, 3×3+1, 3×4+1

If the number of squares=n

Then the rule for the pattern=3×n+1=3n+1

(b) Fig 11.7 gives a matchstick pattern of triangles. As in Exercise 11 (a) above, find the general rule that gives the number of matchsticks in terms of the number of triangles.

(a) (b) (c) (d)

Sol: Number of sticks are 3,5,7,9

$2\times1+1, 2\times2+1, 2\times3+1, 2\times4+1$

If number of triangles=n

Then the rule for the pattern=$2\times n+1=2n+1$

Exemplar

1. $4a$ is equals to $\mathbf{4 \times a}$
2. 8 more than three times the number x can be represented as $\mathbf{3x + 8}$
3. If each match box contains 50 matchsticks, the number of matchsticks required to fill n such boxes is $\mathbf{50n}$
4. Amulya is x years of age now. 5 years ago her age was $\boldsymbol{(x - 5)\ years}$
5. If x takes the value 2, then the value of $x + 10$ is **12**
6. If the perimeter of a regular hexagon is x metres, then the length of each of its sides is $\mathbf{(x \div 6)}$ **metres**
7. "Variable" means that it can **take different values.**
8. $(10 - x)$means **x is subtracted from 10**
9. Savitri has a sum of Rs x. She spent Rs 1000 on grocery, Rs 500 on clothes and Rs 400 on education, and received Rs 200 as a gift. How much money (in Rs) is left with her? (A) $\boldsymbol{x - 1700}$
10. If $7x + 4 = 25$, then the value of x is **3**
11. 'x exceeds y by 7' can be expressed as $\boldsymbol{x = y + 7}$
12. The number of days in w weeks is $\mathbf{7w}$
13. x metres $=\mathbf{100x}$ centimetres
14. r rupees $= \mathbf{100r}$ paise
15. If the present age of Ramandeep is n years, then her age after 7 years will be $\boldsymbol{n + 7}$

CHAPTER 12

VI-MATHEMATICS-NCERT-2023-24

12 .RATIO AND PROPORTION(Notes)

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1. We compare the two quantities in terms of 'how many times'. This comparison is known as the Ratio. We denote ratio using symbol ':'(is to)
2. Two quantities can be compared only if they are in the same unit.
3. The ratio of two quantities a to b is $a: b = \frac{a}{b}$

Try These

1. In a class, there are 20 boys and 40 girls. What is the ratio of the number of boys to the number of girls?

Sol: The ratio of boys to girls $= 20: 40 = \frac{\cancel{20}}{\cancel{40}} = \frac{1}{2} = 1: 2$

2. Ravi walks 6 km in an hour while Roshan walks 4 km in an hour. What is the ratio of the distance covered by Ravi to the distance covered by Roshan?

Sol: The ratio of the distance covered by Ravi to the distance covered by Roshan $= 6: 4 = \frac{6}{4} = \frac{3}{2}$

$= 3: 2$

3. Saurabh takes 15 minutes to reach school from his house and Sachin takes one hour to reach school from his house. Find the ratio of the time taken by Saurabh to the time taken by Sachin.

Sol: The ratio of the time taken by Saurabh to the time taken by Sachin $=$ 15 minutes: 1 hour

$= 15$ minutes: 60 minutes $= \frac{15}{60} = \frac{1}{4} = 1: 4$

1 hour=60 minutes

4. Cost of a toffee is 50 paise and cost of a chocolate is ₹ 10. Find the ratio of the cost of a toffee to the cost of a chocolate.

Sol: The ratio of the cost of a toffee to the cost of a chocolate

1 rupee=100 paise

$= 50$ paise: 10 rupees $= 50$ paise: 1000 paise $= \frac{50}{1000} = \frac{1}{20} = 1: 20$

5. In a school, there were 73 holidays in one year. What is the ratio of the number of holidays to the number of days in one year?

Sol: The ratio of the number of holidays to the number of days in one year

$= 73: 365 = \frac{73}{365} = \frac{1}{5} = 1: 5$

Example 1 : Length and breadth of a rectangular field are 50 m and 15 m respectively. Find the ratio of the length to the breadth of the field.

Sol: Length=50 m , Breadth=15 m

The ratio of the length to the breadth $= 50:15 = \frac{50}{15} = \frac{10}{3} = 10:3$

$\therefore$ Required ratio=10:3

Example 2 : Find the ratio of 90 cm to 1.5 m.

Sol: 1 m=100 cm

1.5 m=1.5×100 cm $= 150$ cm

Required ratio $= 90:150 = \frac{\cancel{90}}{\cancel{150}} = \frac{3}{5} = 3:5$

Example 3 : There are 45 persons working in an office. If the number of females is 25 and the remaining are males, find the ratio of: (a) The number of females to number of males. (b) The number of males to number of females.

Sol : Total number of workers $= 45$

Number of females $= 25$

Number of males $= 45 - 25 = 20$

(a)The ratio of number of females to the number of males $= 25 : 20 = 5 : 4$

(b) The ratio of number of males to the number of females $= 20 : 25 = 4 : 5$.

Equivalent ratio:

We can get equivalent ratios by multiplying or dividing the numerator and denominator by the same number.

Example 4 : Give two equivalent ratios of 6 : 4.

Sol: $6:4 = \frac{6}{4} = \frac{6 \times 2}{4 \times 2} = \frac{6 \times 3}{4 \times 3} = \frac{6 \times 4}{4 \times 4}$

$6:4 = \frac{6}{4} = \frac{12}{8} = \frac{18}{12} = \frac{24}{16}$

$6:4 = 12:8 = 18:12 = 24:16$

Example 5 : Fill in the missing numbers :

$\frac{14}{21} = \frac{\square}{3} = \frac{6}{\square}$

Sol: $\frac{14}{21} = \frac{14 \div 7}{21 \div 7} = \frac{2}{3}$

$\frac{2}{3} = \frac{2 \times 3}{3 \times 3} = \frac{6}{9}$

$$\frac{14}{21}=\frac{\boxed{2}}{3}=\frac{6}{\boxed{9}}$$

Example 6 : Ratio of distance of the school from Mary's home to the distance of the school from John's home is 2 : 1. (a) Who lives nearer to the school? (b) Complete the following table which shows some possible distances that Mary and John could live from the school.

Distance from Mary's home to school (in km.)	10		4		
Distance from John's home to school (in km.)	5	4		3	1

(c) If the ratio of distance of Mary's home to the distance of Kalam's home from school is 1 : 2, then who lives nearer to the school?

Sol: $2:1=\frac{2}{1}=\frac{2\times 2}{1\times 2}=\frac{2\times 3}{1\times 3}=\frac{2\times 4}{1\times 4}=\frac{2\times 5}{1\times 5}$

$$\frac{2}{1}=\frac{4}{2}=\frac{6}{3}=\frac{8}{4}=\frac{10}{5}$$

Distance from Mary's home to school (in km.)	10	8	4	6	2
Distance from John's home to school (in km.)	5	4	2	3	1

(c) Since the ratio is 1 : 2, so Mary lives nearer to the school.

Example 7 : Divide ₹ 60 in the ratio 1 : 2 between Kriti and Kiran.

Sol: Ratio=1:2

Total parts=1+2=3

Kriti's share $=\frac{1}{3}\times 60=₹\,20$

Kiran's share $=\frac{2}{3}\times 60=₹\,40.$

EXERCISE 12.1

1. **There are 20 girls and 15 boys in a class.**
   (a) What is the ratio of number of girls to the number of boys? (b) What is the ratio of number of girls to the total number of students in the class?

Sol: Number of girls=20

Number of boy=15

Total number of students=20+15=35

(a) The ratio of girls to boys=20:15=4:3

(b) The ratio girls to the total number of students in the class=20:35=4:7

2. Out of 30 students in a class, 6 like football, 12 like cricket and remaining like tennis. Find the ratio of
(a) Number of students liking football to number of students liking tennis. (b) Number of students liking cricket to total number of students.

Sol: Total number of students=30

Football=6, Cricket=12

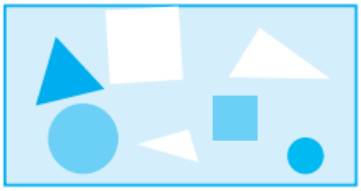
Tennis=30-(6+12)=30-18=12

(a) The ratio of number of students liking football to number of students liking tennis=6:12=1:2

(b) The ratio of number of students liking cricket to total number of students=12:30=2:5

3. See the figure and find the ratio of

Number of triangles=3, Number of squares=2, number of circles=2,
Number of all figures=3+2+2=7



(a) Number of triangles to the number of circles inside the rectangle.

Sol: The ratio of triangles to circles=3:2

(b) Number of squares to all the figures inside the rectangle.

Sol: The ratio of squares to all the figures=2:7

(c) Number of circles to all the figures inside the rectangle.

Sol: The ratio of circles to all the figures=2:7

4. **Distances travelled by Hamid and Akhtar in an hour are 9 km and 12 km. Find the ratio of speed of Hamid to the speed of Akhtar.**

Sol: Speed of Hamid $= \frac{\text{Diatance}}{\text{Time}} = \frac{9\text{ km}}{1\text{ h}} = 9\text{km/h}$

Speed of Akhtar $= \frac{\text{Diatance}}{\text{Time}} = \frac{12\text{ km}}{1\text{ h}} = 12\text{ km/h}$

The ratio of speed of Hamid to the speed of Akhtar=9:12=3:4

5. Fill in the following blanks:

$\frac{\mathbf{15}}{\mathbf{18}} = \frac{}{\mathbf{6}} = \frac{\mathbf{10}}{} = \frac{}{\mathbf{30}}$ **[Are these equivalent ratios?]**

Sol: $\frac{15}{18} = \frac{15 \div 3}{18 \div 3} = \frac{5 \times 2}{6 \times 2} = \frac{5 \times 5}{6 \times 5}$

$\frac{15}{18} = \frac{5}{6} = \frac{10}{12} = \frac{25}{30}$

Are these equivalent ratios?

Sol: Yes, these are equivalent ratios.

6. Find the ratio of the following :
(a) 81 to 108 (b) 98 to 63 (c) 33 km to 121 km (d) 30 minutes to 45 minutes.

Sol: (a) $81:108 = \frac{81}{108} = \frac{9}{12} = \frac{3}{4} = 3:4$

(b) $98:63 = \frac{98}{63} = \frac{14}{9} = 14:9$

(c) $33:121 = \frac{33}{121} = \frac{3}{11} = 3:11$

(d) $30:45 = \frac{30}{45} = \frac{6}{9} = \frac{2}{3} = 2:3$

7. Find the ratio of the following:
(a) 30 minutes to 1.5 hours
Sol: 1.5 hours=1.5×60 minutes=90 minutes
Required ratio=30:90=1:3
(b) 40 cm to 1.5 m
Sol: 1.5 m=1.5×100 cm=150 cm
Required ratio=40:150=4:15
(c) 55 paise to ₹1
Sol: ₹1=100 paise
Required ratio=55:100=11:20
(d) 500 mL to 2 litres
Sol: 2 litres=2×1000 mL=2000 mL
Required ratio=500:2000=5:20=1:4

8. **In a year, Seema earns ₹ 1, 50, 000 and saves ₹ 50,000. Find the ratio of (a) Money that Seema earns to the money she saves. (b) Money that she saves to the money she spends.**

Sol: Money earned by Seema=₹ 1,50,000

Money saved by Seema=₹50,000

Money spent by Seema=₹1,50,000-₹ 50,000=₹1,00,000

(a) The ratio of money earns to money saves $= 1,5\cancel{0,000}:5\cancel{0,000} = 15:5 = 3:1$

(b) The ratio of money saves to money spends $= 5\cancel{0,000}:1,0\cancel{0,000} = 5:10 = 1:2$

9. **There are 102 teachers in a school of 3300 students. Find the ratio of the number of teachers to the number of students.**

Sol: Number of teachers=102

Number of students=3300

The ratio of teachers to students $= 102:3300(\div 6) = 17:550$

10. In a college, out of 4320 students, 2300 are girls. Find the ratio of

(a) Number of girls to the total number of students. (b) Number of boys to the number of girls. (c) Number of boys to the total number of students.

Sol: Number of students=4320

Number of girls=2300

Number of boys=4320-2300=2020

(a)Ratio of number of girls to the total number of students=230~~0~~:432~~0~~ = 230:432=115:216

(b) Ratio of number of boys to the number of girls=202~~0~~:230~~0~~=202:230=101:115

(c) Ratio of number of boys to the total number of students=202~~0~~:432~~0~~=202:432=101:216

11. . Out of 1800 students in a school, 750 opted basketball, 800 opted cricket and remaining opted table tennis. If a student can opt only one game, find the ratio of
(a) Number of students who opted basketball to the number of students who opted table tennis. (b) Number of students who opted cricket to the number of students opting basketball. (c) Number of students who opted basketball to the total number of students.

Sol: Total number of students=1800

Number of students opted basketball=750

Number of students opted cricket=800

Number of students opted table tennis=1800-750-800=1800-1550=250

(a) Ratio of students opted basketball to students opted table tennis=75~~0~~:25~~0~~=75:25=3:1

(b) Ratio of students opted cricket to students opted basketball =80~~0~~:75~~0~~=80:75=16:15

(a) Ratio of students opted basketball to total number of students
=75~~0~~:180~~0~~=75:180=15:36=5:12

12. Cost of a dozen pens is ₹ 180 and cost of 8 ball pens is ₹ 56. Find the ratio of the cost of a pen to the cost of a ball pen.

Sol: Cost of 12 pens =₹ 180

Cost of a pen $= \frac{180}{12} = ₹15$

Cost of 8 ball pens = ₹ 56

Cost of a ball pen $= \frac{56}{8} = ₹7$

The ratio of the cost of a pen to the cost of a ball pen=15:7

13. Consider the statement: Ratio of breadth and length of a hall is 2 : 5. Complete the following table that shows some possible breadths and lengths of the hall.

Sol: Ratio of breadth and length of a hall=2:5

$$2:5=\frac{2}{5}=\frac{2\times5}{5\times5}=\frac{2\times10}{5\times10}=\frac{2\times20}{5\times20}$$

$$2:5=\frac{2}{5}=\frac{10}{25}=\frac{20}{50}=\frac{40}{100}$$

Breadth of the hall (in metres)	10	20	40
Length of the hall (in metres)	25	50	100

14. Divide 20 pens between Sheela and Sangeeta in the ratio of 3 : 2.

Sol: Ratio of Sheela to Sangeeta=3:2

Total parts=3+2=5

Total pens=20

Number of pens to Sheela $=\frac{3}{\cancel{5}}\times\cancel{20}^{4}=3\times4=12$

Number of pens to Samgeeta $=\frac{2}{\cancel{5}}\times\cancel{20}^{4}=2\times4=8$

15. **Mother wants to divide ₹ 36 between her daughters Shreya and Bhoomika in the ratio of their ages. If age of Shreya is 15 years and age of Bhoomika is 12 years, find how much Shreya and Bhoomika will get.**

Sol: Ratio of Shreya's age to Bhoomika's age=15:12=5:4

Total parts=5+4=9

Total money=₹ 36

Money that Shreya will get $=\frac{5}{\cancel{9}}\times\cancel{36}^{4}=5\times4=₹20$

Money that Bhoomika will get $=\frac{4}{9}\times36=4\times4=₹16$

16. Present age of father is 42 years and that of his son is 14 years. Find the ratio of
(a) Present age of father to the present age of son. (b) Age of the father to the age of son, when son was 12 years old. (c) Age of father after 10 years to the age of son after 10 years. (d) Age of father to the age of son when father was 30 years old.

Sol: Present age of father = 42 years

Present age of son = 14 years

(a) Ratio of present age of father to the present age of son=42:14=3:1

(b) When son was 12 years old , age of father =42-2=40 years

Ratio of Age of the father to the age of son, when son was 12 years old=40:12=10:3

(c) Ratio of age of father after 10 years to the age of son after 10 years =(42+10):(14+10)
=52:24=13:6

(c) When father was 30 years old, age of son=14-12=2 years

Ratio of age of father to the age of son when father was 30 years old.= 30:2=15:1

Proportion:

If two ratios are equal, we say that they are in proportion and use the symbol '::' or '=' to equate the two ratios.

If two ratios are not equal, then we say that they are not in proportion.

In a statement of proportion, the four quantities involved when taken in order are known as respective terms. First and fourth terms are known as extreme terms. Second and third terms are known as middle terms.

In **a : b : : c : d**; (**a** is to **b** as **c** is to **d**)a, b, c, d are the four terms.

a and **d** are the extreme terms. **b** and **c** are the middle terms.

Example 8 : Are the ratios 25g : 30g and 40 kg : 48 kg in proportion?

Sol: $25\ g : 30\ g = \frac{25}{30} = \frac{5}{6} = 5:6$

$40\ \text{kg} : 48\ \text{kg} = \frac{40}{48} = \frac{5}{6} = 5:6$

$25\ g : 30\ g = 40\ kg : 48\ kg$

$\therefore$ The ratios 25 g : 30 g and 40 kg : 48 kg are in proportion.

Example 9 : Are 30, 40, 45 and 60 in proportion?

Sol: $30:40 = \frac{30}{40} = 3:4$

$45:60 = \frac{45}{60} = \frac{3}{4}$

Since, 30 : 40 = 45 : 60.

Therefore, 30, 40, 45, 60 are in proportion.

Example 10 : Do the ratios 15 cm to 2 m and 10 sec to 3 minutes form a proportion?

Sol: $15\ \text{cm} : 2\ \text{m} = 15\ \text{cm} : 200\ \text{cm} = 15:200 = 3:40$

$10\ \text{sec} : 3\ \text{min} = 10\ \text{sec} : 180\ \text{sec} = 10:180 = 1:18$

1 m=100 cm
1 min=60 sec

Since, $3 : 40 \neq 1 : 18$

The given ratios do not form a proportion.

EXERCISE 12.2

1. **Determine if the following are in proportion.**

(a) 15, 45, 40, 120

Sol: $15:45=\frac{15}{45}=\frac{1}{3}=1:3$

$40:120=\frac{40}{120}=\frac{1}{3}=1:3$

$15:45=40:120$

15, 45, 40, 120 are in proportion

(b) 33, 121, 9,96

Sol: $33:121=\frac{33}{121}=\frac{3}{11}=3:11$

$9:96=\frac{9}{96}=\frac{3}{32}=3:32$

$33:121\neq 9:96$

33, 121, 9,96 are not in proportion.

(c) 24, 28, 36, 48

Sol: $24:28=\frac{24}{28}=\frac{6}{7}=6:7$

$36:48=\frac{36}{48}=\frac{3}{4}=3:4$

$24:28\neq 36:48$

24, 28, 36, 48 are not in proportion.

(d) 32, 48, 70, 210

Sol: $32:48=\frac{32}{48}=\frac{2}{3}=2:3$

$70:210=\frac{70}{210}=\frac{1}{3}=1:3$

$32:48\neq 70:210$

32, 48, 70, 210 are not in proportion.

(e) 4, 6, 8, 12

Sol: $4:6=2:3$

$8:12=2:3$

$4:6=8:12$

4, 6, 8, 12 are in proportion

(f) 33, 44, 75, 100

Sol: $33:44=3:4$

$75:100=3:4$

$33:44=75:100$

33, 44, 75, 100 are in proportion

2. **Write True (T) or False (F) against each of the following statements.**

(a) 16 : 24 :: 20 : 30 (T)

Sol: $16:24=2:3$

$20:30=2:3$

(b) 21: 6 :: 35 : 10 (T)

Sol: $21:6=7:2$

$35:10=7:2$

(c) 12 : 18 :: 28 : 12(F)

Sol: $12:18=2:3$

$28:12=7:3$

(d) 8 : 9 :: 24 : 27 (T)

Sol: $8:9=8:9$

$24:27=8:9$

(e) 5.2 : 3.9 :: 3 : 4(F)

Sol: $5.2:3.9=52:39=4:3$

$3:4=3:4$

(f) 0.9 : 0.36 :: 10 : 4 (T)

Sol: $0.9:0.36=90:36=10:4=5:2$

$10:4=5:2$

3. **Are the following statements true?**

(a) 40 persons : 200 persons = ₹ 15 : ₹ 75

Sol: 40 persons : 200 persons $=40:200=1:5$

₹ 15 : ₹ 75$=15:75=1:5$

Hence given statement is true

(b) 7.5 litres : 15 litres = 5 kg : 10 kg

Sol: 7.5 litres : 15 litres $= 7.5:15=75:150=1:2$

5 kg : 10 kg$=5:10=1:2$

Hence given statement is true

(c) 99 kg : 45 kg = ₹ 44 : ₹ 20

Sol: 99 kg : 45 kg$=99:45=11:5$

₹ 44 : ₹ 20$=44:20=11:5$

Hence given statement is true

(d) 32 m : 64 m = 6 sec : 12 sec

Sol: 32 m : 64 m$=32:64=1:2$

6 sec : 12 sec$=6:12=1:2$

Hence given statement is true

(e) 45 km : 60 km = 12 hours : 15 hours

Sol: 45 km : 60 km=45:60=3:4

12 hours : 15 hours=12:15=4:5

Hence given statement is false.

4. **Determine if the following ratios form a proportion. Also, write the middle terms and extreme terms where the ratios form a proportion.**

(a) 25 cm : 1 m and ₹ 40 : ₹ 160

Sol: 25 cm : 1 m=25 cm:100 cm=25:100=1:4

₹ 40 : ₹ 160=40:160=4:16=1:4

25 cm : 1 m = ₹ 40 : ₹ 160

Hence given ratios are in proportion

(b) 39 litres : 65 litres and 6 bottles : 10 bottles

Sol: 39 litres : 65 litres=39:65=3:5

6 bottles : 10 bottles=6:10=3:5

39 litres : 65 litres = 6 bottles : 10 bottles

Hence given ratios are in proportion

(c) 2 kg : 80 kg and 25 g : 625 g

Sol: 2 kg : 80 kg=2:80=1:40

25 g : 625 g = 25: 625 = 1: 25

2 kg : 80 kg ≠ 25 g : 625 g

Hence given ratios are not in proportion.

(d) 200 mL : 2.5 litre and ₹ 4 : ₹ 50

Sol: 200 mL : 2.5 litre=200 mL : 2500 mL=2:25

₹ 4 : ₹ 50=4:50=2:25

200 mL : 2.5 litre = ₹ 4 : ₹ 50

Hence given ratios are in proportion

Unitary Method

In unitary method first we find the value of one unit and then the value of required number of units.

1. Read the table and fill in the boxes.

Time	Distance travelled by Karan	Distance travelled by Kriti
2 hours	8 km	6 km
1 hour	4 km	3 km
4 hours	16 km	12 km

Example 11 : If the cost of 6 cans of juice is ₹ 210, then what will be the cost of 4 cans of juice?

Sol : Cost of 6 cans of juice = ₹ 210

Cost of one can of juice $= \frac{210}{6} = ₹ 35$

Cost of 4 cans of juice = ₹ 35 × 4 = ₹ 140.

Example 12 : A motorbike travels 220 km in 5 litres of petrol. How much distance will it cover in 1.5 litres of petrol?

Sol: In 5 litres of petrol, motorbike can travel =220 km

In 1 litre of petrol, motor bike travels $= \frac{220}{5} = 44$ km

In 1.5 litres of petrol, motorbike travels $= 1.5 \times 44$ km $= 66$ km

Example 13 : If the cost of a dozen soaps is ₹ 153.60, what will be the cost of 15 such soaps?

Sol: cost of 12 soaps = ₹ 153.60

1 dozen=12

Cost of 1 soap $= \frac{153.60}{12} =$ ₹ 12.80

Cost of 15 soaps = ₹ 12.80 × 15 = ₹ 192

$$12\overline{)153.60}\ (12.80)$$
$$12$$
$$33$$
$$24$$
$$96$$
$$96$$
$$0$$

$$\begin{array}{r} 12.80 \\ \times\ 15 \\ \hline 6400 \\ 1280 \\ \hline 192.00 \end{array}$$

Example 14 : Cost of 105 envelopes is ₹ 350. How many envelopes can be purchased for ₹ 100?

Sol: Number of envelopes can be purchased for ₹350 = 105

Number of envelopes can be purchased for ₹1 $= \frac{105}{350}$

Number of envelopes can be purchased for ₹100 $= \frac{105}{350} \times 100 = 3 \times 10 = 30$

Example 15 : A car travels 90 km in 2 $\frac{1}{2}$ hours.

(a) How much time is required to cover 30 km with the same speed? (b) Find the distance covered in 2 hours with the same speed.

Sol: $(a) 2\frac{1}{2}$ hours $= \frac{5}{2} \times 60$ minutes $= 150$ minutes

Time is required for 90 km = 150 minutes

Time is required for 1 km $= \frac{150}{90}$ minutes

Time is required for 30 km $= \frac{\cancel{150}^{50}}{\cancel{90}_{3}} \times \cancel{30}^{1} = 50$minutes

(b)The distance covered in 150 minutes = 90 km

The distance covered in 1 minute $= \frac{90}{150}$ km

The distance covered in 120 minutes(2 hours) $= \frac{\cancel{90}^{18}}{\cancel{150}_{5}} \times \cancel{120}^{4}\ km = 18 \times 4 = 72$ km

EXERCISE 12.3

1. If the cost of 7 m of cloth is ₹ 1470, find the cost of 5 m of cloth.

Sol: The cost of 7 m of cloth = ₹ 1470

The cost of 1 m of cloth $= \frac{₹\ 1470}{7} = ₹\ 210$

The cost of 5 m of cloth $= ₹\ 210 \times 5 = ₹\ 1050$

2. Ekta earns ₹ 3000 in 10 days. How much will she earn in 30 days?

Sol: Money earned by Ekta in 10 days=₹ 3000

Money earned by Ekta in 1 day $= \frac{₹\ 3000}{10} = ₹300$

Ekta will earn in 30 days $= ₹300 \times 30 = ₹9000$

3. **If it has rained 276 mm in the last 3 days, how many cm of rain will fall in one full week (7 days)? Assume that the rain continues to fall at the same rate.**

Sol: Rain in 3 days=276 mm

$1\ mm = \frac{1}{10}\ cm$

Rain in 1 day $= \frac{276}{3} = 92\ mm$

Rain will fall in 7 days $= 7 \times 92\ mm = 644\ mm = \frac{644}{10} cm = 64.4\ cm$

4. Cost of 5 kg of wheat is ₹ 91.50

(a) What will be the cost of 8 kg of wheat? (b) What quantity of wheat can be purchased in ₹ 183?

Sol: (a) Cost of 5 kg of wheat =₹ 91.50

Cost of 1 kg of wheat $= \frac{₹\ 91.50}{5} = ₹\ 18.30$

Cost of 8 kg of wheat $= ₹\ 18.30 \times 8 = ₹146.40$

(b) Quantity of wheat can be purchased in ₹ 91.50=5 kg

Quantity of wheat can be purchased in ₹ 1 $= \frac{5}{91.50} = \frac{500}{9150} = \frac{50}{915} = \frac{10}{183}$ kg

Quantity of wheat can be purchased in ₹ 183 $= 183 \times \frac{10}{183}$ kg $= 10$ kg

5. The temperature dropped 15 degree celsius in the last 30 days. If the rate of temperature drop remains the same, how many degrees will the temperature drop in the next ten days?

Sol: The temperature dropped in the last 30 days $= 15^0C$

Temperature drop in 1 day $= \frac{15^0C}{30}$

The temperature drop in the next 10 days $= 10 \times \frac{15^0C}{30} = 5^0C$

6. Shaina pays ₹ 15000 as rent for 3 months. How much does she has to pay for a whole year, if the rent per month remains same?

Sol: Rent for 3 months=₹15000

Rent for 1 month $= \frac{₹15000}{3} = ₹5000$

1 year=12 months

Rent for a whole year(12 months) $= ₹5000 \times 12 = ₹60{,}000$

7. Cost of 4 dozen bananas is ₹ 180. How many bananas can be purchased for ₹ 90?

Sol: 4 dozen=4×12=48

Number of bananas purchased for ₹180=48

Number of bananas purchased for ₹1 $= \frac{48}{180}$

Number of bananas purchased for ₹90 $= 90 \times \frac{48}{180} = 24$

8. The weight of 72 books is 9 kg. What is the weight of 40 such books?

Sol: The weight of 72 books = 9 kg

The weight of 1 book $= \frac{9}{72}$ kg

The weight of 40 book $= 40 \times \frac{9}{72}$ kg $= 5$ kg

9. A truck requires 108 litres of diesel for covering a distance of 594 km. How much diesel will be required by the truck to cover a distance of 1650 km?

Sol: Diesel requires for covering a distance of 594 km=108 L

Diesel required for covering a distance of 1 km $= \frac{108}{594} = \frac{2}{11}$ L

Diesel required for covering a distance of 1650 km $= 1650 \times \frac{2}{11}$ L $= 150 \times 2$ L $= 300$ litres

10. Raju purchases 10 pens for ₹ 150 and Manish buys 7 pens for ₹ 84. Can you say who got the pens cheaper?

Sol: Raju purchases 10 pens for ₹ 150

Raju purchased 1 pen for $\frac{₹\ 150}{10} = ₹15$

Manish buys 7 pens for ₹ 84

Manish buy 1 pen for $\frac{₹\ 84}{7} = ₹\ 12$

Manish got the pens cheaper.

11. Anish made 42 runs in 6 overs and Anup made 63 runs in 7 overs. Who made more runs per over?

Sol: Number of runs made by Anish in 6 overs=42

Number of runs made by Anish in 1 over $= \frac{42}{6} = 7$

Number of runs made by Anup in 7 overs=63

Number of runs made by Anup in 1 over $= \frac{63}{7} = 9$

Anup made more runs per over than Anish.

CHAPTER 13

VI-MATHEMATICS-NCERT-2023-24

13. BRAIN-TEASERS

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1. **From a basket of mangoes when counted in twos there was one extra, counted in threes there were two extra, counted in fours there were three extra, counted in fives there were four extra, counted in sixes there were five extra. But counted in sevens there were no extra. Atleast how many mangoes were there in the basket?**

Sol: In each case remainder is 1(and is divisible by 7)

(LCM of 2,3,4,5,6) $= 60$

Multiples of 60 are 60,120,180, ...

Now $60 - 1 = 59$ which is not divisible by 7

$120 - 1 = 119 = 7 \times 14$ is divisible by 7

Required number $= 119$

2. **A boy was asked to find the LCM of 3, 5, 12 and another number. But while calculating, he wrote 21 instead of 12 and yet came with the correct answer. What could be the fourth number?**

Sol: Let the fourth number $= x$

LCM of 3,5,12, x = LCM of 3,5,21, x

$12 = 2 \times 2 \times \underline{3}$ *and* $21 = \underline{3} \times 7$

x should contain the factors $2 \times 2 \times 7$

$\therefore x = 2 \times 2 \times 7 = 28$

LCM of 3,5,12,28 $= 3 \times 5 \times 2 \times 2 \times 7 = 420$

LCM of 3,5,21,28 $= 3 \times 5 \times 2 \times 2 \times 7 = 420$

The fourth number=28

3	3, 5, 12, 28
5	1, 5, 4, 28
2	1, 1, 4, 28
2	1, 1, 2, 14
7	1, 1, 1, 7
	1, 1, 1, 1

3	3, 5, 21, 28
5	1, 5, 7, 28
2	1, 1, 7, 28
2	1, 1, 7, 14
7	1, 1, 7, 7
	1, 1, 1, 1

3. **There were five pieces of cloth of lengths 15 m, 21 m, 36 m, 42 m, 48 m. But all of them could be measured in whole units of a measuring rod. What could be the largest length of the rod?**

Sol: $15 = \boxed{3} \times 5$

$21 = \boxed{3} \times 7$

$36 = 2 \times 2 \times \boxed{3} \times 3$

$42 = 2 \times \boxed{3} \times 7$

$48 = 2 \times 2 \times 2 \times 2 \times \boxed{3}$

The largest length of the rod = HCF of $(15,21,36,42)$=3 m

4. There are three cans. One of them holds exactly 10 litres of milk and is full. The other two cans can hold 7 litres and 3 litres respectively. There is no graduation mark on the cans. A customer asks for 5 litres of milk. How would you give him the amount he ask? He would not be satisfied by eye estimates.

Sol: The man takes an empty vessel other than these.

With the help of 3 litres can he takes out 9 litres of milk from the 10 litres can and pours it in the extra can.

So, 1 litre milk remains in the 10 litres can. With the help of 7 litres can he takes out 7 litres of milk from the extra can and pours it in the 10 litres can.

The 10 litres can now has $1 + 7 = 8$ litres of milk. With the help of 3 litres can he takes out 3 litres milk from the 10 litres can.

The 10 litres can now has $8 - 3 = 5$ litres of milk, which he gives to the customer.

5. Which two digit numbers when added to 27 get reversed?

Sol: Let the number $= 10x + y$

The number reversed the digits $= 10y + x$

$10x + y + 27 = 10y + x$

$10x + y + 27 - 10y - x = 0$

$9x + 27 - 9y = 0$

$9x - 9y = -27$

$9(x - y) = -27$

$x - y = \frac{-27}{9} = -3$

$x - y = -3$

$1 - 4 = -3\ or\ 2 - 5 = -3\ or\ 3 - 6 = -3\ or\ 4 - 7 = -3\ \ or\ 5 - 8 = -3\ or\ 6 - 9 = -3$

The numbers are 14, 25, 36, 47, 58, 69

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Verification:

$14 + 27 = 41, 25 + 27 = 52, 36 + 27 = 63, 47 + 27 = 74, 58 + 27 = 85, 69 + 27 = 96$

6. Cement mortar was being prepared by mixing cement to sand in the ratio of 1:6 by volume. In a cement mortar of 42 units of volume, how much more cement needs to be added to enrich the mortar to the ratio 2:9?

Sol: Cement: sand = 1:6

Total volume $= 42\ units$

Cement $= \frac{1}{7} \times 42 = 6$ units and sand $= \frac{6}{7} \times 42 = 36$ units

Let the added more cement=x

$6 + x : 36 = 2 : 9$

$\frac{6 + x}{36} = \frac{2}{9}$

$54 + 9x = 72$

$9x = 72 - 54 = 18$

$x = \frac{18}{9} = 2$ units

Shortcut: 2+9=11

Multiples of 11 are 22,33,44,..

Volume of mortar=42 units

Required more cement $= 44 - 42 = 2\ units$

7. In a solution of common salt in water, the ratio of salt to water was 30:70 as per weight. If we evaporate 100 grams of water from one kilogram of this solution, what will be the ratio of the salt to water by weight?

Sol: Total solution =1000 gr

The ratio of salt to water = 30:70=3:7

Weight of salt $= \frac{3}{10} \times 1000\ gr = 300\ gr$

weight of water $= \frac{7}{10} \times 1000\ gr = 700\ gr$

If we evaporate 100 grams of water

Remaining weight of water=700-100=600 gr

The ratio of the salt to water by weight $= 300: 600 = 1: 2$

Shortcut: Solution =1000 gr

S : W= 30:70=300:700

If evaporate 100 grams of water

S : W= 300:(700-100)=300:600=1:2

8. Half a swarm of bees went to collect honey from a mustard field. Three fourth of the rest went to a rose garden. The rest ten were still undecided. How many bees were there in all?

Sol: Let the number of bees $= x$

Number of bees went to collect honey $= \frac{x}{2}$

Number of bees went to a rose garden $= \frac{3}{4} \times \frac{x}{2} = \frac{3x}{8}$

Number of bees undecided $= 10$

From problem

$\frac{x}{2} + \frac{3x}{8} + 10 = x$

$8 \times \frac{x}{2} + 8 \times \frac{3x}{8} + 8 \times 10 = 8 \times x$

$4x + 3x + 80 = 8x$

$8x - 7x = 80$

$x = 80$

9. Fifteen children are sitting in a circle. They are asked to pass a handkerchief to the child next to the child immediately after them. The game stops once the handkerchief returns to the child it started from. This can be written as follows : 1→3→5→7→9→11→13→15→2→4→6→8 → 10→12 →14→1. Here, we see that every child gets the handkerchief.

(i) What would happen if the handkerchief were passed to the left leaving two children in between? Would every child get the handkerchief?

(ii) What if we leave three children in between? What do you see? In which cases every child gets the handkerchief and in which cases not? Try the same game with 16, 17, 18, 19, 20 children. What do you see?

Sol: (i) $1\to4\to7\to10\to13\to1$

No, all children would not get it.

(ii) $1\to5\to9\to13\to2\to6\to10\to14\to3\to7\to11\to15\to4\to8\to12\to1$

All would get it.

10. Take two numbers 9 and 16. Divide 9 by 16 to get the remainder. What is the remainder when 2 × 9 is divided by 16, 3 × 9 divided by 16, 4 × 9 divided by 16, 5 × 9 divided by 16... 15 × 9 divided by 16. List the remainders. Take the numbers 12 and 14. List the remainders of 12, 12 × 2, 12 × 3, 12 × 4, 12 × 5, 12 × 6, 12 × 7, 12 × 8, 12 × 9, 12 × 10, 12 × 11, 12 × 12, 12 × 13 when divided by 14. Do you see any difference between above two cases?

Sol:

$\text{Rem}(9\div16)=9$, $\text{Rem}(2\times9\div16)=2$, $\text{Rem}(3\times9\div16)=11$, $\text{Rem}(4\times9\div16)=4$, $\text{Rem}(5\times9\div16)=13$, $\text{Rem}(6\times9\div16)=6$, $\text{Rem}(7\times9\div16)=15$, $\text{Rem}(8\times9\div16)=8$, $\text{Rem}(9\times9\div16)=1$, $\text{Rem}(10\times9\div16)=10$, $\text{Rem}(11\times9\div16)=3$, $\text{Rem}(12\times9\div16)=12$, $\text{Rem}(13\times9\div16)=5$, $\text{Rem}(14\times9\div16)=14$, $\text{Rem}(15\times9\div16)=7$.

Remainders are 9, 2, 11, 4, 13, 6, 15, 8, 1, 10, 3, 12, 5, 14, 7.

$\text{Rem}(12\div14)=12$, $\text{Rem}(2\times12\div14)=10$, $\text{Rem}(3\times12\div14)=8$, $\text{Rem}(4\times12\div14)=6$, $\text{Rem}(5\times12\div14)=4$, $\text{Rem}(6\times12\div14)=2$, $\text{Rem}(7\times12\div14)=0$, $\text{Rem}(8\times12\div14)=12$, $\text{Rem}(9\times12\div14)=10$, $\text{Rem}(10\times12\div14)=8$, $\text{Rem}(11\times12\div14)=6$, $\text{Rem}(12\times12\div14)=4$.

Remainders are 12, 10, 8, 6, 4, 2, 0, 12, 10, 8, 6, 4.

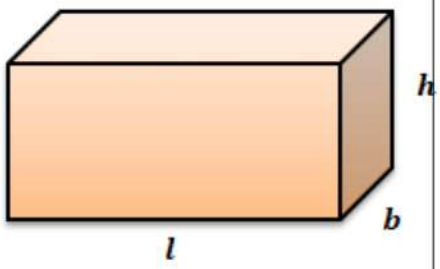
In first case remainders are not in a sequence, but in second case remainders are in a sequence

11. You have been given two cans with capacities 9 and 5 litres respectively. There is no graduation marks on the cans nor is eye estimation possible. How can you collect 3 litres of water from a tap? (You are allowed to pour out water from the can). If the cans had capacities 8 and 6 litres respectively, could you collect 5 litres?

Sol: Fill the 9 litres can. Remove 5 litres from it using the 5 litres can. Empty the 5 litres can. Pour 4 litres remaining in the 9 litres can to the 5 litres can.

Fill the 9 litres can again. Fill the remaining 5 litres can from the water in it. This leaves 8 litres in the 9 litres can. Empty the 5 litres can. Fill it from the 9 litres can. You now have 3 litres left in the 9 litres can.

12. The area of the east wall of an auditorium is 108 sq m, the area of the north wall is 135 sq m and the area of the floor is 180 sq m. Find the height of the auditorium.



Sol: Height = 9m

Area of the east wall $= b \times h = 108\ sq\ m$

$$b = \frac{108}{h}$$

Area of the north wall $= l \times h = 135\ sq\ m$

$$l = \frac{135}{h}$$

Area of the floor $= l \times b = 180\ sq\ m$

$$\frac{108}{h} \times \frac{135}{h} = 180$$

$$h^2 = \frac{108 \times 135}{180} = 81$$

$$h = 9\ m$$

13. If we subtract 4 from the digit at the units place of a two digit number and add 4 to the digit at the tens place then the resulting number is doubled. Find the number.

Sol: Let the number $= 10x + y$

Tens Digit	Units Digit	Number
x	y	$10x + y$

From problem

$$10(x + 4) + (y - 4) = 2(10x + y)$$

$$10x + 40 + y - 4 = 20x + 2y$$

$$20x + 2y - 10x - y = 36$$

$$10x + y = 36$$

Required number=36

14. Two boatmen start simultaneously from the opposite shores of a river and they cross each other after 45 minutes of their starting from the respective shores. They rowed till they reached the opposite shore and returned immediately after reaching the shores. When will they cross each other again?

Sol: 90 minutes

The two boatmen covers same distance in same time.

They cross each other at centre point.

They will cross next time =45+45= 90

15. Three girls are climbing down a staircase. One girl climbs down two steps at one go. The second girl three steps at one go and the third climbs down four steps. They started together from the beginning of the staircase leaving their foot marks. They all came down in complete steps and had their foot marks together at the bottom of the staircase. In how many steps would there be only one pair of foot mark? Are there any steps on which there would be no foot marks.

Sol:

	Steps with Foot marks	Steps with one pair of foot marks	Steps with no foot marks
Girl 1	2,4,6,8,10,12	2,3,9,10	1,5,7,11
Girl 2	3,6,9,12		
Girl 3	4,8,12		

16. A group of soldiers was asked to fall in line making rows of three. It was found that there was one soldier extra. Then they were asked to stand in rows of five. It was found there were left 2 soldiers. They were asked to stand in rows of seven. Then there were three soldiers who could not be adjusted. At least how many soldiers were there in the group?

Sol: First type: 4,7,10,13,16,19,22,25,28,31,34,37,40,43,46,49,52,55,58,..

Second type: 7,12,17,22,27,32,37,42,47,52,57,62,...

Third type:10,17,24,31,38,45,52,59,...

Number of soldiers=52

17. Get 100 using four 9's and some of the symbols like +, −, ×, , etc.

Sol: $99+\frac{9}{9}=99+1=100$

18. How many digits would be in the product $2\times2\times2$ ..... $\times 2$ (30 times)?

Sol: $2\ \times\ 2\ \times\ 2\ \ldots.\times\ 2\ (30\ times)=2^{30}=(2^2)^{15}=4^{15}=4^3\times4^3\times4^3\times4^3\times4^3$

$=(64\times64)\times(64\times64)\times64\rightarrow(4\ digits)\times(4\ digits)\times(2digits)\rightarrow10\ digits$

19. A man would be 5 minutes late to reach his destination if he rides his bike at 30 km. per hour. But he would be 10 minutes early if he rides at the speed of 40 km per hour. What is the distance of his destination from where he starts?

Sol: Distance $=x\ km$

From problem

$\frac{x}{30}-\frac{x}{40}=\frac{15}{60}$

$120\times\frac{x}{30}-120\times\frac{x}{40}=120\times\frac{15}{60}$

$4x-3x=30$

$x=30km$

20. The ratio of speeds of two vehicles is 2:3. If the first vehicle covers 50 km in 3 hours, what distance would the second vehicle covers in 2 hours?

Sol: Let the distance covers second vehicle $=x\ km$

Speed of first vehicle $=\frac{50}{3}\ km/h$

Speed of first vehicle $=\frac{x}{2}\ km/h$

From problem

$\frac{50}{3}:\frac{x}{2}=2:3$

$6\times\frac{50}{3}:6\times\frac{x}{2}=6\times2:6\times3$

$100:3x=12:18$

$$\frac{100}{3x} = \frac{12}{18}$$

$$3x \times 12 = 100 \times 18$$

$$x = \frac{100 \times 18}{3 \times 12} = 50\ km$$

21. The ratio of income to expenditure of Mr. Natarajan is 7:5. If he saves ₹ 2000 a month, what could be his income?

Sol: Income: Expenditure=7:5

Let income $= 7x\ and$ expenditure $= 5x$

Savings $= 7x - 5x = 2x = ₹2000$

$x = ₹1000$

Income $= 7 \times 1000 = ₹7000$

22. The ratio of the length to breadth of a lawn is 3:5. It costs ₹ 3200 to fence it at the rate of ₹ 2 a metre. What would be the cost of developing the lawn at the rate of ₹10 per square metre.

Sol: ₹ 15,00,000

Length: Breadth=3:5

Length $= 3x$ and breadth $= 5x$

Perimetre $= 2(3x + 5x) = 16x$

Cost of fencing=₹3200

$16x \times ₹2 = ₹3200$

$$x = \frac{3200}{16 \times 2} = 100$$

Length $= 3x = 300m$ and breadth $= 5x = 500m$

The cost of developing the lawn at the rate of ₹10 per square metre $= ₹\ 300 \times 500 \times 10$

$= ₹1500000$

23. If one counts one for the thumb, two for the index finger, three for the middle finger, four for the ring finger, five for the little finger and continues counting backwards, six for the ring finger, seven for the middle finger, eight for the index finger, 9 for the thumb, ten for the index finger, eleven for the middle finger, twelve for the ring finger, thirteen for the little finger, fourteen for the ring finger and so on. Which finger will be counted as one thousand?

Sol: Index finger

Thumb	Index finger	Middle finger	Ring finger	Little finger
1	2	3	4	5
9	8	7	6	
	10	11	12	13
17	16	15	14	
	18	19	20	21

$$
\begin{array}{r|l}
 & 124 \\
\hline
8 & 999 \\
 & 8 \\
\hline
 & 19 \\
 & 16 \\
\hline
 & 39 \\
 & 32 \\
\hline
 & 7
\end{array}
$$

Thumb: 1,9,17,25,...(8n+1)

$8n + 1 \rightarrow 1000$

$8n \rightarrow 999$

$8 \times 124 + 7 = 999$

$1 + 7 = 8 \rightarrow Index\ finger$

24. Three friends plucked some mangoes from a mango grove and collected them together in a pile and took nap after that. After some time, one of the friends woke up and divided the mangoes into three equal numbers. There was one mango extra. He gave it to a monkey nearby, took one part for himself and slept again. Next the second friend got up unaware of what has happened, divided the rest of the mangoes into three equal shares. There was an extra mango. He gave it to the monkey, took one share for himself and slept again. Next the third friend got up not knowing what happened and divided the mangoes into three equal shares. There was an extra mango. He gave it to the monkey, took one share for himself and went to sleep again. After some time, all of them got up together to find 30 mangoes. How many mangoes did the friends pluck initially?

Sol: Last step: 10+10+10=30

Third step: 30+15+1=46

Second step: 46+23+1=70

First step :70+35+1=106

The friends pluck initially 106 mangoes.

25. The peculiar number :There is a number which is very peculiar. This number is three times the sum of its digits. Can you find the number?

Sol: $10x + y = 3(x + y)$

$10x + y = 3x + 3y$

$7x = 2y$

$x = 2$ and $y = 7$

Required number=27

26. Ten saplings are to be planted in straight lines in such way that each line has exactly four of them.

Sol: One arrangement could be 

27. What will be the next number in the sequence?

(a) 1, 5, 9, 13, 17, 21, ...

Sol: 25 (+4)

(b) 2, 7, 12, 17, 22, ...

Sol: 27 (+5)

(c) 2, 6, 12, 20, 30, ...

Sol: 42 (+4,+6,+ 8,+10,+12)

(d) 1, 2, 3, 5, 8, 13, ...

Sol: 21 (1+2=3,2+3=5,3+5=8,5+8=13,8+13=21)

(e) 1, 3, 6, 10, 15, ...

Sol: 21 (1+2=3,3+3=6,6+4=10,10+5=15,15+6=21)

28. Observe the pattern in the following statement:

$31 \times 39 = 13 \times 93$ The two numbers on each side are co-prime and are obtained by reversing the digits of respective numbers. Try to write some more pairs of such numbers.

Sol: $13 \times 62 = 31 \times 26$.

$23 \times 96 = 32 \times 69$