

My Favorite Guide On **MATHEMATICS**

गणित

Strictly As Per
BOARDS
New Syllabus

Std - 9th - Semi English



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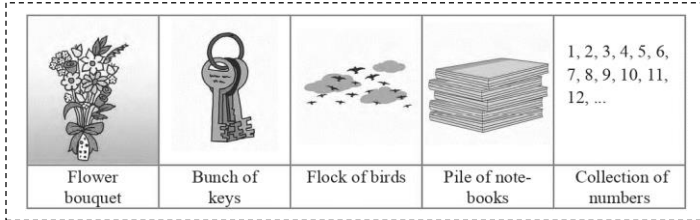
TOPIC – 01

SETS

Sets (संच)

1.1 Introduction

Some pictures are given below. It contains the group of things you know.



We use special word for each of the collection given above. In all the above examples we can clearly list the objects of that collection. We call the collection of such objects as 'Set'.

See the examples given below and decide whether it is a set or not.

- Days of a week
- Months in a year
- Brave children in the class
- First 10 counting numbers
- Strong forts of Maharashtra
- Planets in our solar system.

खाली काही pictures (चित्रे) दिली आहेत. त्यामध्ये आपल्या परिचयाचे वस्तुसमूह आहेत.

वरील प्रत्येक वस्तुसमूहासाठी आपण special word (विशिष्ट शब्द) वापरतो. या सर्व example (उदाहरण) मध्ये समूहांतील घटक आपणांस अचूक व clearly (नेमकेपणाने) सांगता येतात. वस्तूंच्या अशा समूहांना 'Set' ('संच') असे म्हणतात.

आता पुढे काही उदाहरणे दिली आहेत. त्यांतील कोणत्या समूहांना संच म्हणता येईल ते सांगा.

- आठवड्याचे सात वार
- एका वर्षाचे Month (महिने)
- वर्गातील Brave (शूर) मुले
- पहिल्या 10 counting numbers (मोजसंख्या)
- महाराष्ट्रातील Strong (बळकट) forts (गड - किल्ले)
- आपल्या सूर्यमालेतील Planets (ग्रह)

1.2 Sets

- If we can definitely and clearly decide the objects of a given collection then that collection is called a set.
- Generally the name of the set is given using capital letters A, B, C Y, Z
- The members or elements of the set are shown by using small letters a, b, c,
- If a is an element of set A, then we write it as ' $a \in A$ ' and if a is not an element of set A then we write ' $a \notin A$ '.

Now let us observe the set of numbers.

$N = \{1, 2, 3, \dots\}$ is a set of natural numbers.

$W = \{0, 1, 2, 3, \dots\}$ is a set of whole numbers.

$I = \{\dots, -3, -2, -1, 0, 1, 2, \dots\}$ is a set of integers.

Q is a set of rational numbers.

R is a set of real numbers.

Sets (संच) -

ज्या समूहांतील घटक definitely and clearly (अचूक व नेमकेपणाने) सांगता येतात, त्या समूहांना संच असे म्हणतात.

संचाला नाव देण्यासाठी सर्वसाधारणपणे A, B, C,, Z

यांपैकी इंग्रजी वर्णमालेतील पहिल्या लिपीतील अक्षरे वापरतात.

संचाचे elements (घटक) दाखवण्यासाठी a, b, c, यांपैकी इंग्रजी अक्षरे वापरतात.

a हा संच A चा घटक आहे हे ' $a \in A$ ' असे लिहितात आणि a हा संच A चा घटक नाही हे दाखवण्यासाठी

' $a \notin A$ ' असे लिहितात.

आता आपण set of numbers (संख्यांचे संच) पाहू.

$N = \{1, 2, 3, \dots\}$ हा set of natural numbers (नैसर्गिक संख्यासंच)

$W = \{0, 1, 2, 3, \dots\}$ हा set of whole numbers (पूर्ण संख्यासंच)

$I = \{\dots, -3, -2, -1, 0, 1, 2, \dots\}$ हा set of integers (पूर्णांक संख्यासंच)

Q हा सर्व rational (परिमेय) संख्यांचा संच

R हा real (वास्तव) संख्यांचा संच

1.2.1 Methods of Writing Sets

There are two methods of writing set.

1) Listing method or roster method

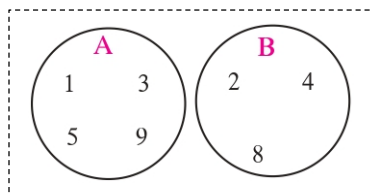
In this method, we write all the elements of a set in curly bracket. Each of the elements is written only once and separated by commas. The order of an element is not important but it is necessary to write all the elements of the set.

- iv) $A \cap B \subseteq A$ and $A \cap B \subseteq B$
 v) $A \cap A' = \phi$
 vi) $A \cap A = A$
 vii) $A \cap \phi = \phi$

Let's learn

1.9.2 Disjoint sets

- i) Let, $A = \{1, 3, 5, 9\}$ and $B = \{2, 4, 8\}$ are given.
 ii) Confirm that not a single element is common in set A and B.
 iii) These sets are completely different from each other. So the set A and B are disjoint sets.
 iv) Observe its Venn diagram.



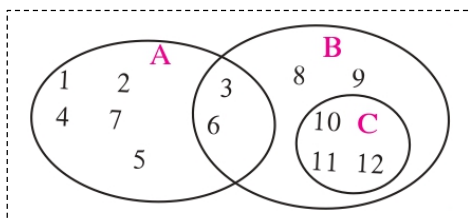
Disjoint sets (विभिन्न संच) -

समजा, $A = \{1, 3, 5, 9\}$

आणि $B = \{2, 4, 8\}$ हे दोन संच दिले आहेत.

संच A व B मध्ये एकही सामाईक घटक नाही. म्हणजेच ते संच completely different (पूर्णपणे भिन्न) किंवा disjoint sets (विभक्त) आहेत. म्हणून त्यांना 'विभक्त' किंवा 'विभिन्न' संच असे म्हणतात. या संचांची वेन आकृती पाहा.

Activity I: Observe the set A, B, C given by Venn diagrams and write which of these are disjoint sets.



Ans:

$A = \{1, 2, 4, 7, 5, 3, 6\}$

$B = \{8, 9, 3, 6, 10, 11, 12\}$

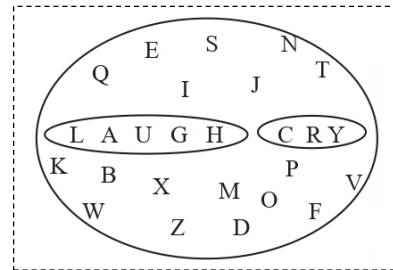
$C = \{10, 11, 12\}$

Sets A and C are disjoint sets, because there is not a single element common in the sets.

Activity II:

Let the set of English alphabets be the Universal set.

Ans: The letters of the word 'LAUGH' is one set and the letter of the word 'CRY' is another set. We can say that these are two disjoint sets. Observe that the intersection of these two sets is empty.



Set A: $\{L, A, U, G, H\}$

Set B: $\{C, R, Y\}$

These two sets do not have any common elements.

$\therefore A \cap B = \phi$.

1.9.3 Union of two sets

Let A and B be two given sets. Then the set of all elements of set A and B is called the Union of two sets. It is written as $A \cup B$ and read as 'A union B'

$A \cup B = \{x \mid x \in A \text{ or } x \in B\}$,

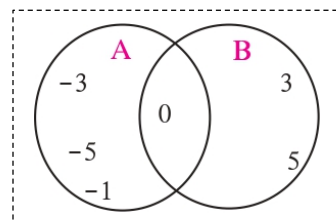
Union of two sets (दोन संचांचा संयोग) -

समजा, A आणि B हे दोन संच आहेत. या दोन्ही संचातील घटकांनी मिळून होणाऱ्या संचाला A आणि B या संचांचा संयोग संच म्हणतात. तो $A \cup B$ असा लिहितात आणि 'A union B' (A संयोग B) असा वाचतात.

Ex 1) $A = \{-1, -3, -5, 0\}$

$B = \{0, 3, 5\}$

$A \cup B = \{-3, -5, 0, -1, 3, 5\}$



Note that, $A \cup B = B \cup A$

So multiplying both the sides by 100

$$100x = 37.\overline{37}$$

$$\therefore 100x - x = 37.\overline{37} - 0.\overline{37}$$

$$\therefore 99x = 37$$

$$\therefore x = \frac{37}{99}$$

$$\text{Ans: } 0.\overline{37} = \frac{37}{99}$$

iii) $3.\overline{17}$

Solution: $3.\overline{17}$

Let $x = 3.\overline{17}$. Here, 1 and 7 are the two recurring digit.

So multiplying both the sides by 100

$$100x = 317.\overline{17}$$

$$\therefore 100x - x = 317.\overline{17} - 3.\overline{17}$$

$$\therefore 99x = 314$$

$$\therefore x = \frac{314}{99}$$

$$\text{Ans: } 3.\overline{17} = \frac{314}{99}$$

iv) $15.\overline{89}$

Solution: $15.\overline{89}$

Let $x = 15.\overline{89}$.

Here, 8 and 9 are the two recurring digit.

So multiplying both the sides by 100

$$100x = 1589.\overline{89}$$

$$\therefore 100x - x = 1589.\overline{89} - 0.\overline{89}$$

$$\therefore 99x = 1574$$

$$\therefore x = \frac{1574}{99}$$

$$\text{Ans: } 15.\overline{89} = \frac{1574}{99}$$

v) $2.\overline{514}$

Solution: $2.\overline{514}$

Let $x = 2.\overline{514}$.

Here, 5, 1 and 4 are the three recurring digit.

So multiplying both the sides by 1000

$$1000x = 2514.\overline{514}$$

$$\therefore 1000x - x = 2514.\overline{514} - 2.\overline{514}$$

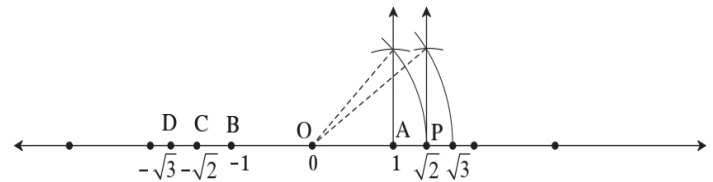
$$\therefore 999x = 2512$$

$$\therefore x = \frac{2512}{999}$$

$$\text{Ans: } 2.\overline{514} = \frac{2512}{999}$$

Let's recall.

i) The numbers $\sqrt{2}$ and $\sqrt{3}$ shown on a number line are not rational numbers means they are irrational numbers.



ii) On a number line $OA = 1$ unit. Point B, which is left to the point O is at a distance of 1 unit. Co-ordinate of point B is -1 . Co-ordinate of point P is $\sqrt{2}$ and its opposite number $-\sqrt{2}$ is shown by point C. The co-ordinate of point C is $-\sqrt{2}$. Similarly, opposite of $\sqrt{3}$ is $-\sqrt{3}$ which is the co-ordinate of point D.

2.4 Irrational and real numbers

Q. Prove that $\sqrt{2}$ is irrational number.

Proof: This can be proved using indirect proof.

Let us assume that $\sqrt{2}$ is a rational number. So $\sqrt{2}$ can be expressed in $\frac{p}{q}$ form.

$\frac{p}{q}$ is a reduced form of rational number. Hence p and q have no common factor other than 1.

$$\sqrt{2} = \frac{p}{q}$$

$$\therefore 2 = \frac{p^2}{q^2} \quad \text{..... (Squaring both the sides)}$$

$$2q^2 = p^2$$

p^2 is even.

p is also even means 2 is a factor of p (i)

$$p = 2t$$

..... (Suppose)

$$\therefore p^2 = 4t^2$$

$$t \in \mathbb{I}$$

$$\therefore 2q^2 = 4t^2 \quad (\because p^2 = 4t^2)$$

$$\therefore q^2 = 2t^2$$

q^2 is even.

q is even.

2 is a factor of q (ii)

From the statements (i) and (ii), 2 is a common factor of p and q both.

This is contradictory because in $\frac{p}{q}$; we have assumed that p and q have no common factor except 1.

$\therefore$ Our assumption that $\sqrt{2}$ is rational is wrong.

$\therefore \sqrt{2}$ is an irrational number.

Irrational and real numbers (अपरिमेय आणि वास्तव संख्या) -

$\sqrt{2}$ ही संख्या अपरिमेय आहे हे indirect (अप्रत्यक्ष) सिद्धता देऊन proof (सिद्ध) करता येते.

$\sqrt{2}$ ही परिमेय संख्या आहे हे गृहीत धरू. ती $\frac{p}{q}$ मानू.

$\frac{p}{q}$ हे त्या परिमेय संख्येचे reduced form (संक्षिप्त रूप) आहे म्हणजेच p व q मध्ये 1 पेक्षा वेगळा common factor (सामाईक विभाजक) नाही, असे मानू.

(दोन्ही बाजूंचा वर्ग करून)

$\therefore p^2$ ही even number (समसंख्या) आहे.

$\therefore p$ सुद्धा समसंख्या आहे, म्हणजेच 2 हा p चा विभाजक आहे.....(I)

$\therefore q^2$ ही सम संख्या आहे.

$\therefore q$ ही सम संख्या आहे.

$\therefore 2$ हा q चा सुद्धा factor (विभाजक) आहे.....(II)

विधान (I) व (II) वरून 2 हा p आणि q यांचा सामाईक विभाजक आहे.

ही contradictory (विसंगती) आहे. कारण $\frac{p}{q}$ मध्ये p आणि q चा 1 व्यतिरिक्त एकही सामाईक विभाजक नाही.

$\therefore \sqrt{2}$ ही परिमेय संख्या आहे हे assumption (गृहीतक) चुकीचे आहे.

$\therefore \sqrt{2}$ ही irrational number (अपरिमेय संख्या) आहे.

Note:-

i) Every point on a number line is associated with a unique a 'Real number' and every real number is associated with a unique point on the number line.

ii) We know that every rational number is a real number. But $\sqrt{2}, \sqrt{3}, -\sqrt{2}, \pi, 3 + \sqrt{2}$ etc. are not rational numbers. It means that Every real number may not be a rational number.

Note (टीप): थोडक्यात, number line (संख्यारेषा) वरील प्रत्येक बिंदूचा निर्देशक ही 'Real number' (वास्तव संख्या) असते आणि प्रत्येक वास्तव संख्येशी निगडीत असणारा point (बिंदू) संख्यारेषेवर असतो.

आपल्याला माहीत आहे, की every rational number (प्रत्येक परिमेय संख्या) वास्तव संख्या असते. परंतु $\sqrt{2}, \sqrt{3}, -\sqrt{2}, \pi, 3 +$

$\sqrt{2}$ अशा वास्तव संख्या परिमेय नाहीत. म्हणून प्रत्येक वास्तव संख्या ही परिमेय असतेच असे नाही हे लक्षात ठेवा.

2.5 Decimal form of irrational numbers

Q. Find the square root of 2 and 3 using division method

Solution:

Square root of 2

$$\begin{array}{r} 1.41421... \\ 1 \overline{) 2.00 \ 00 \ 00 \ 00 \} \\ +1 \quad -1 \\ \hline 24 \quad 100 \\ +4 \quad -96 \\ \hline 281 \quad 400 \\ +1 \quad -281 \\ \hline 2824 \quad 11900 \\ +4 \quad -11296 \\ \hline 28282 \quad 60400 \\ +2 \quad -56564 \\ \hline 282841 \quad 0383600 \end{array}$$

$$\therefore \sqrt{2} = 1.41421 \dots$$

Square root of 3

$$\begin{array}{r} 1.732.... \\ 1 \overline{) 3.00 \ 00 \ 00 \ 00 \} \\ +1 \quad -1 \\ \hline 27 \quad 200 \\ +7 \quad -189 \\ \hline 343 \quad 1100 \\ +3 \quad -1029 \\ \hline 3462 \quad 007100 \\ +2 \quad -6924 \\ \hline 3464 \quad 0176 \end{array}$$

$$\therefore \sqrt{3} = 1.732 \dots$$

$\sqrt{2}, \sqrt{3}$ are irrational numbers hence 1.4142... and 1.732... are irrational numbers too. Moreover, a number whose decimal expansion is non-terminating, non-recurring is irrational.

[Note: In the division by synthetic method, the divisor polynomial is in the index form of $x + a$ or $x - a$ whose degree is 1.]

Remember this!

In the division by synthetic method the divisor polynomial is in the form $x + a$ or $x - a$ whose degree is 1.

Remember this! (हे लक्षात ठेवूया) -

Synthetic method (संश्लेषक पद्धती) ने भागाकार करताना फक्त $x + a$ किंवा $x - a$ या रूपातील ज्या बहुपदीची degree (कोटी) 1 आहे असेच divisor (भाजक) घेतले आहेत.

Practice Set - 3.3

Q.1 Divide each of the following polynomials by synthetic division method and also by linear division method. Write the quotient and the remainder.

i) $(2m^2 - 3m + 10) \div (m - 5)$

Solution: Synthetic division: The coefficient form of the dividend $2m^2 - 3m + 10$ is $(2, -3, 10)$. The divisor is in -5 . Opposite of -5 is 5.

$$\begin{array}{r|rrrr} 5 & 2 & -3 & 10 & \\ & & 10 & 35 & \\ \hline & 2 & 7 & 45 & \text{Remainder} \end{array}$$

The coefficient form of the quotient is $(2, 7)$.
 $\therefore$ The quotient $= 2m + 7$

Ans: The quotient is $2m + 7$ and the remainder is 45.

Linear Method:

$$\begin{aligned} 2m^2 - 3m + 10 &= 2m(m - 5) + 10m - 3m + 10 \\ &= 2m(m - 5) + 7(m - 5) + 35 + 10 \\ &= 2m(m - 5) + 7(m - 5) + 45 \\ &= (m - 5)(2m + 7) + 45 \end{aligned}$$

Ans: The quotient is $2m + 7$ and remainder is 45.

ii) $(x^4 + 2x^3 + 3x^2 + 4x + 5) \div (x + 2)$

Solution: Synthetic division:

The coefficient form of the dividend $x^4 + 2x^3 + 3x^2 + 4x + 5$ is $(1, 2, 3, 4, 5)$. The divisor is $x + 2$. Opposite of 2 is -2 .

$$\begin{array}{r|rrrrrr} -2 & 1 & 2 & 3 & 4 & 5 & \\ & & -2 & 0 & -6 & 4 & \\ \hline & 1 & 0 & 3 & -2 & 9 & \text{Remainder} \end{array}$$

The coefficient form of the quotient is $(1, 0, 3, -2)$.
 $\therefore$ The quotient $= x^3 + 3x - 2$.

Ans: The quotient is $x^3 + 3x - 2$ and the remainder is 9.

Linear Method:

$$\begin{aligned} x^4 + 2x^3 + 3x^2 + 4x + 5 &= x^3(x + 2) - 2x^3 + 2x^3 + 3x^2 + 4x + 5 \\ &= x^3(x + 2) + 3x(x + 2) - 6x + 4x + 5 \\ &= x^3(x + 2) + 3x(x + 2) - 2(x + 2) + 4 + 5 \\ &= (x + 2)(x^3 + 3x - 2) + 9 \end{aligned}$$

Ans: The quotient is $x^3 + 3x - 2$ and remainder is 9.

iii) $(y^3 - 216) \div (y - 6)$

Solution: Synthetic division:

First we write the index form of the dividend. The index form is $y^3 + 0y^2 + 0y - 216$. The coefficient form is $(1, 0, 0, -216)$. The divisor is $y - 6$. Opposite of -6 is 6.

$$\begin{array}{r|rrrrr} 6 & 1 & 0 & 0 & -216 & \\ & & 6 & 36 & 216 & \\ \hline & 1 & 6 & 36 & 0 & \text{Remainder} \end{array}$$

The coefficient form of the quotient is $(1, 6, 36)$.
 $\therefore$ The quotient $= y^2 + 6y + 36$.

Ans: The quotient is $y^2 + 6y + 36$ and the remainder is 0.

Linear Method:

$$\begin{aligned} y^3 - 216 &= y^2(y - 6) + 6y^2 - 216 \\ &= y^2(y - 6) + 6y(y - 6) + 36y - 216 \\ &= y^2(y - 6) + 6y(y - 6) + 36(y - 6) + 216 - 216 \\ &= (y - 6)(y^2 + 6y + 36) \end{aligned}$$

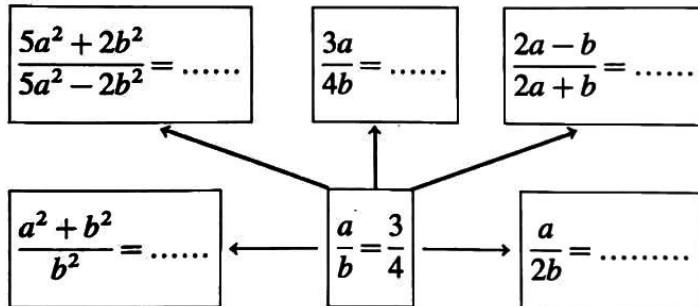
Ans: The quotient is $y^2 + 6y + 36$ and remainder is 0.

iv) $(2x^4 + 3x^3 + 4x - 2x^2) \div (x + 3)$

Solution: Synthetic division: First we write the standard form of the dividend.

Activity

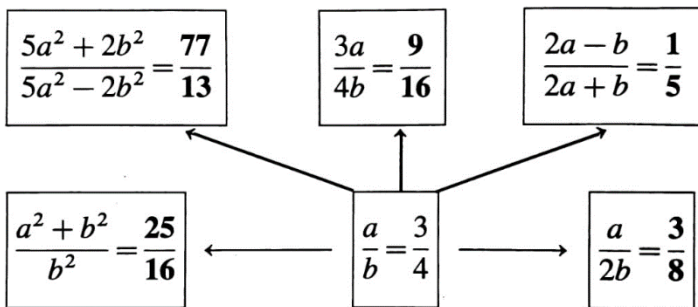
In the following activity, the values of a and b can be changed. That is by changing a : b, we can create many examples.



Solution:

$$\frac{a}{b} = \frac{3}{4} \quad \frac{2a}{b} = \frac{3}{2} \quad \frac{a}{2b} = \frac{3}{8} \quad \frac{a^2}{b^2} = \frac{9}{16}$$

Now using componendo and componendo- dividendo, we fill in the boxes :



4.4.3 Theorem on Equal Ratios

i) If $\frac{a}{b} = \frac{c}{d}$, then $\frac{a}{b} = \frac{c}{d} = \frac{a+c}{b+d}$.

This property is known as theorem on equal ratios.

ii) If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \dots$ (finite terms) and if l, m, n, ... are non-zero numbers such that $lb + md + nf + \dots \neq 0$, then each ratio

$$\frac{la+mc+ne+\dots}{lb+md+nf+\dots}$$

This is the general form of the above theorem.

Theorem on Equal Ratios (समान गुणोत्तरांचा सिद्धांत) -

जर $\frac{a}{b} = \frac{c}{d}$, असे असेल तर $\frac{a}{b} = \frac{c}{d} = \frac{a+c}{b+d}$, असे मिळते तर या गुणधर्माला equal ratio (समान गुणोत्तर) चा सिद्धांत म्हणतात.

याच पद्धतीने विचार करून जर $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \dots$ (सांत पदे) आणि जर l, m, n या non-zero numbers (शून्येतर संख्या) असतील तर each ratio (प्रत्येक गुणोत्तर) $\frac{la+mc+ne+\dots}{lb+md+nf+\dots}$ (सांत पदे) हे समान गुणोत्तरांच्या सिद्धांताचे general form (सामान्य रूप) मिळते.

Use your brain power!

In a certain gymnasium, there are 35 girls and 42 boys in the kid's section, 30 girls and 36 boys in the children's section and 20 girls and 24 boys in the teen's section. What is the ratio of the number of boys to the number of girls in every section?

For physical exercises, all three groups gathered on the ground. Now what is the ratio of number of boys to the number of girls?

From the answers of the above questions, did you verify the theorem of equal ratios?

Solution: The ratio of number of boys to the number of girls in

i) Kid's section = 42:35 = 6:5(1)

ii) Children's section = 36:30 = 6:5(2)

iii) Teen's section = 24:20 = 6:5(3)

The ratio of the number of boys to the number of girls in each group is the same. i.e. $\frac{6}{5}$.

Total number of boys = 42 + 36 + 24 = 102

Total number of girls = 35 + 30 + 20 = 85

The ratio of total number of boys to the total number of girls

= 102 : 85 = 6 : 5(4)

From (1), (2), (3) and (4),

We verify the theorem on equal ratios.

Solved example:

Ex. 1) Fill in the blanks in the following statements.

i) $\frac{a}{3} = \frac{b}{7} = \frac{4a+9b}{12+63}$ ii) $\frac{x}{3} = \frac{y}{5} = \frac{z}{4} = \frac{5x-3y+4z}{-3 \times 5 + 5 \times 4 + 4 \times 3}$

Solution:

i) $\frac{a}{3} = \frac{b}{7} = \frac{4a+9b}{4 \times 3 + 9 \times 7} = \frac{4a+9b}{12+63} = \frac{4a+9b}{75}$

ii) $\frac{x}{3} = \frac{y}{5} = \frac{z}{4} = \frac{5x-3y+4z}{5 \times 3 - 3 \times 5 + 4 \times 4}$

TOPIC - 05 LINEAR EQUATIONS IN TWO VARIABLES

Linear Equations in Two Variables (दोन चलांतील रेखीय समीकरणे)

5.1 Introduction:

We have studied the linear equations in one variable.
e.g. $m + 3 = 5$, $3y + 8 = 22$, etc.

Ex. Solve the following equations.

i) $m + 3 = 5 \quad \therefore m = 5 - 3 \quad \therefore m = 2$

ii) $3y + 8 = 22 \quad \therefore 3y = 22 - 8 \quad \therefore 3y = 14 \quad \therefore y = \frac{14}{3}$

iii) $\frac{x}{3} = 3 \quad \therefore x = 9$

iv) $2p = p + \frac{4}{9} \quad \therefore 2p - p = \frac{4}{9} \quad \therefore p = \frac{4}{9}$

v) Which number should be added to 5 to obtain 14?
 $\therefore x + 5 = 14 \quad \therefore x + 5 = 14 \quad \therefore x = 9$

vi) Which number should be subtracted from 8 to obtain 2?
 $\therefore 8 - y = 2 \quad \therefore -y = 2 - 8 \quad \therefore y = 6$

Definition: In all above equation, degree of the variable is 1. These are called as Linear equation.

We have also studied problems involving one variable.

e.g. i) What should be added to 12 to get 20?

ii) What should be subtracted from 12 to get 5?

This year we will study about linear equations in two variables.

वरील प्रत्येक समीकरणात चलाची degree (घातांक) 1 आहे. या समीकरणांना एका चलातील Linear equation (रेखीय समीकरणे) म्हणतात.

Activity

On the glass of following spectacles, write numbers such that:

 (i) Their sum is 42 and difference is 16.	 (ii) Their sum is 37 and difference is 11.
 (iii) Their sum is 54 and difference is 20.	 (iv) Their sum is 49 and difference is 15.

Use your brain power!

$3x - 4y - 15 = 0$ and $y + x + 2 = 0$, Can these equations be solved by eliminating x ? Is the solution same?

Solution: Yes. Multiply $y + x + 2 = 0$ by -3 .
 $-3y - 3x - 6 = 0$ i.e., $-3y - 3x = 6$ (1)
 $3x - 4y = 15$ (2)
 Solving these equations, $y = -3$ and $x = 1$.

5.2 Linear Equations in Two Variables

$x + 2y = 5$; $3x - 7y = 2$, etc. involve two variables x and y each having degree (index) 1. These are known as linear equations in two variables.

5.2 Linear Equations in Two Variables (दोन चलांतील रेखीय समीकरणे) -

ज्या equations (समीकरणे) मध्ये दोन variable (चल) असतील आणि त्यातील प्रत्येक चलाची degree (घातांक) 1 असेल तर त्याला Linear Equations in two variables (दोन चलांतील रेखीय समीकरणे) म्हणतात.

5.3 General form of Linear Equation in Two Variables:

The general form of the linear equation in two variables is $ax + by + c = 0$, where a, b, c are real numbers and $a \neq 0, b \neq 0$ at the same time.

General form of Linear Equation in Two Variables (दोन चलांतील रेषीय समीकरणांचे सामान्यरूप) -

$ax + by + c = 0$ या समीकरणात a , b , c या real numbers (वास्तव संख्या) असतील आणि a व b हे same time (एकाच वेळी) ला 0 नसतील तर हे समीकरण दोन चलांतील रेषीय समीकरणाचे सामान्य रूप असते.

या समीकरणात दोन्ही चलांचा घातांक 1 आहे. हे समीकरण Linear (रेषीय) आहे.

5.4 Simultaneous equations:

Two or more different linear equations in two variables, having the same variables, taken together form a system of linear equations in two variables. This system is known as

Simultaneous equations (एकसामायिक समीकरणे):

जेव्हा दोन variable (चल) त्यातील दोन linear (रेषीय) समीकरणांचा एकाच वेळी विचार करतात तेव्हा त्या equations (समीकरणे) ला simultaneous (एकसामायिक) समीकरणे असे म्हणतात.

5.4.1 Elimination Method of solving Simultaneous Equations:

i) In this method, we first make the coefficients of any one variable in both the equations numerically equal by multiplying the equations by suitable constants. Then either by adding or subtracting new equations, we eliminate one variable.

ii) So we get a linear equation in one variable. Solving it, we get the value of one variable.

Substituting this value in any one of the given equations, we get the value of the other variable.

Elimination Method of solving Simultaneous Equations (चलाचा लोप करून एकसामायिक समीकरण सोडवण्याची पद्धत) -

या पद्धतीमध्ये सुरुवातीला आपण कोणत्याही एका variable (चल) ची संख्या गुणाकाराची क्रिया करून equal (एकसारखी) करून घेऊ. त्यानंतर त्यावर addition (बेरीज) व subtraction (वजाबाकी) यांसारख्या गणितीय क्रिया करून एक variable (चल) चा लोप करणे. अशापद्धतीने आपल्याला Linear Equations (एकसामायिक समीकरणे) मिळेल. या समीकरणांना सोडविल्यावर आपल्याला एका

variable (चल) ची value (किंमत) मिळेल व ही किंमत समीकरणामध्ये ठेवून दुसऱ्या चलाची किंमत मिळते.

Solved Examples:

Ex. 1) Solve $x + y = 14$ and $x - y = 2$

Solution:

By adding both the equations we get an equation in one variable.

$$x + y = 14 \quad \text{..... (i)}$$

$$+ x - y = 2 \quad \text{..... (ii)}$$

$$\hline 2x + 0 = 16$$

$$2x = 16$$

$$x = 8$$

Substituting $x = 8$ in the equation i)

$$x + y = 14$$

$$\therefore 8 + y = 14$$

$$\therefore y = 6$$

Here (8, 6) is the solution of first equation. Let us check, whether it satisfies the second equation also

$$x - y = 8 - 6 = 2 \text{ is true.}$$

$$\therefore (8, 6) \text{ is the solution for both the equations.}$$

Hence (8, 6) is the solution of simultaneous equations $x + y = 14$ and $x - y = 2$.

Ex.2) Sum of the ages of mother and son is 45 years. If son's age is subtracted from twice of mother's age then we get answer 54. Find the age of mother and son. It becomes easy to solve a problem if we make use of variables.

Solution: Let the mother's today's age be x years and son's today's age be y years.

From the first condition

$$x + y = 45 \quad \text{..... (1)}$$

$$\text{From the second condition } 2x - y = 54 \quad \text{..... (2)}$$

Adding equations (1) and (2)

$$\therefore 3x + 0 = 99$$

$$\therefore 3x = 99$$

$$\therefore x = 33$$

Substituting $x = 33$ in the equation (1)

$$\therefore 33 + y = 45$$

$$\therefore y = 45 - 33$$

$$\therefore y = 12$$

Putting the value $x = 33$ in (2),

$$\text{We get } 2x - y = 54$$

$$\therefore 2(33) - y = 54$$

$$\therefore 66 - y = 54$$

$$\therefore -y = 54 - 66 \quad \therefore -y = -12$$

$$\therefore y = 12$$

Today's age of mother = 33 and today's age of son = 12.

3) Shri Rajendra invested ₹ 3,20,000 in a mutual fund. He received ₹ 67,200 as dividend at the end of the year. How much per cent is this amount of the investment ?

4) Shri Lalbhai invested ₹ 4,00,000 in some industry. After 1 year he received ₹ 5,20,000 from the industry. Putting aside the original investment, he invested his gains in mutual fund and shares in the ratio 3:2. How much did he invested in shares?

Solution: Profit after a year

$$= ₹ \boxed{} - ₹ \boxed{} = ₹ 1,20,000.$$

$$\begin{aligned} \text{The amount invested in shares} &= \frac{2}{5} \times ₹ \boxed{} \\ &= ₹ \boxed{} \end{aligned}$$

Ans.

5) Ram's monthly income is 80% of Shyam's monthly income. What is Ram's monthly income, if Shyam's monthly income is ₹ 15,000 ?

3- Marks Questions

1) Compute the income tax payable by the following individuals.

- Shri Manoj who is 39 years old and has a taxable income of ₹ 9,54,000.
- Mr D'Suoza who is 67 years old and has a taxable income of ₹ 4,20,000.
- Shri Shaikh who is 80 years old and has a taxable income of ₹ 6,00,000.

2) Shri Rane is 71 years old. Last year his annual income was ₹ 15,00,000. How much tax does he have to pay ?

4 - Marks Questions

1) Amit spent 8% children's education, invested 15% in shares, deposited 5% in a bank and used 50% for his daily expenses. He was left with a balance of 13,200. Find his monthly income.

2) Mohmadbhai kept 30,000 in a bank at 9% compound interest for 2 years. Mohsin invested ₹ 95,000 in a mutual fund for 2 years and received ₹ 1,14,000. Whose investment was more profitable?

ANSWERS

1- Mark (Multiple Choice Questions)

Q. 1. A) 2. B) 3. C) 4. D) 5. A)

2 - Marks Questions

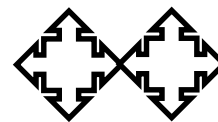
- ₹6,000; ₹10,000; ₹6,000; ₹4,000.
- ₹14,400 3) 21%
- ₹ 5,20,000; ₹4,00,000; ₹1,20,000; ₹48,000.
- ₹ 12,000 6. ₹7,500.

3 - Marks Questions

- i) ₹ 1,06,399 ii) ₹ 6,180 iii) ₹ 30,900.
- ₹ 15,00,000, ₹ 2,67,800.

4 - Marks Questions

- ₹60,000
- Mohmadbhai's interest = 18.81% and Mohsin's profit 20%. Investment by Mohsin was more profit-able.



Solution: The number of persons donating Rs. 350 or more is
 $4 + 4 + 2 + 1 = 11$.

7.7 Cumulative frequency less than the upper class limit and meaning:

Ex.: The following information is regarding marks in mathematics, obtain out of 40 scored by 50 students of 9th standard in the first unit test.

Class Interval	Frequency (no. of students)
0 - 10	02
10 - 20	12
20 - 30	20
30 - 40	16
	Total N = 50

From the table, fill in the blanks in the following statements.

i) For class interval 10- 20 the lower class limit is **10** and upper class limit is **20**.

ii) How many students obtained marks less than 10?

Ans: 2

iii) How many students obtained marks less than 20?

Ans: $2 + 12 = 14$

iv) How many students obtained marks less than 30?

Ans: $14 + 20 = 34$

v) How many students obtained marks less than 40?

Ans: $34 + 16 = 50$

Cumulative frequency less than the upper class limit and meaning:

7.8 Cumulative frequency more than or equal to the lower class limit and meaning:

Ex.: A sports club has organized table tennis tournaments. The following table gives the distribution of player's ages. Find the cumulative frequencies equal to or more than the lower class limit and complete the table.

Solution: Equal to lower limit or more than lower limit type of cumulative table.

Age (Year)	Tally marks	Frequency (no. of students)	Equal to lower limit or more than lower limit
10 - 12		9	50
12 - 14	 	23	$50 - 9 = 41$
14 - 16	 	13	$41 - 23 = 18$
16 - 18		05	$18 - 13 = 05$
		Total N = 50	

Class (marks)	f	cf (more than type)	Meaning
0-20	4	50	50 students got 0 or more than 0 marks
20- 40	8	$50 - 4 = 46$	46 students got 20 or more than 20 marks
40 - 60	20	$46 + 8 = 38$	38 students got 40 or more than 40 marks
60 - 80	12	$38 - 20 = 18$	18 students got 60 or more than 60 marks
80 - 100	6	$18 - 12 = 6$	6 students got 80 or more than 80 marks
Total N = 50			

Remember this!

The sum of the frequency of certain class and all the frequencies of previous classes is called as cumulative frequency less than the upper class limit for that given class. In short, it is also called as 'less than type' cumulative frequency.

Remember this (हे लक्षात ठेवूया) -

एखाद्या विशिष्ट वर्गाची frequency (वारंवारता) आणि त्या वर्गाच्या आधीच्या सर्व वर्गांच्या वारंवारता यांच्या बेरजेला त्या वर्गाची वरच्या

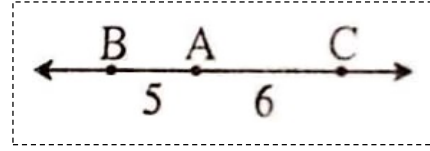
मर्यादपेक्षा Less than cumulative frequency (कमी प्रकारची संचित वारंवारता) म्हणतात. थोडक्यात हिला 'less than type'

ii) point (बिंदू) R हा P आणि Q यांच्या दरम्यान असेल तर ही betweenness (दरम्यानता) $P - R - Q$ अशी दर्शवतात.

iii) बिंदू P हा R आणि Q यांच्या दरम्यान असेल तर ही betweenness (दरम्यानता) $R - P - Q$ अशी दर्शवतात.

जर $d(P, Q) + d(Q, R) = d(P, R)$ असेल तर Q हा बिंदू P आणि R च्या दरम्यान आहे असे म्हणतात. ही दरम्यानता $P-Q-R$ अशी दर्शवतात.

Solution: Which of the points A, B and C is between the other two, can be decided as follows.

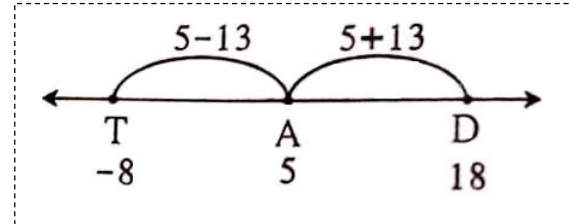


$$\begin{aligned} d(B, C) &= 11 && \dots (i) \\ d(A, B) + d(A, C) &= 5 + 6 = 11 && \dots (ii) \\ \therefore d(B, C) &= d(A, B) + d(A, C) && \dots [\text{from i) and ii)]} \end{aligned}$$

Points A is between point B and point C.

Ex. 2) The co-ordinate points A on number line is 5. Find the coordinates of points on the same number line which are 13 units away from A.

Solution: As shown in the figure, let us take points T and D to the left and right of A respectively, at a distance of 13 units.



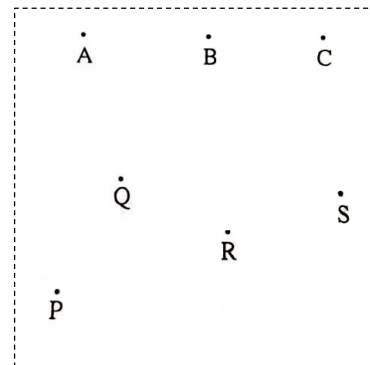
The co-ordinate of point T, which is to the left of A, will be $5 - 13 = -8$

The co-ordinate of point D, which is to the right of A, will be $5 + 13 = 18$

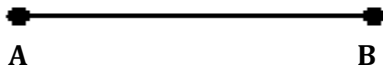
$\therefore$ the co-ordinates of points 13 units away from a will be -8 and 18 .

Verify your answer: $d(A, D) = d(A, T) = 13$.

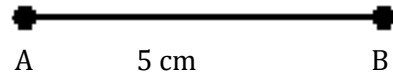
Activity:



1.3.1 Line Segment:



- The union set of point A, point B and points between A and B is called segment AB or seg AB.
- The distance between the endpoints of a segment is called the length of the segment.



In the above figure, the length of segment AB is written as $l(AB) = 5\text{cm}$ or $AB = 5\text{cm}$.

1) Line Segment (रेषाखंड):

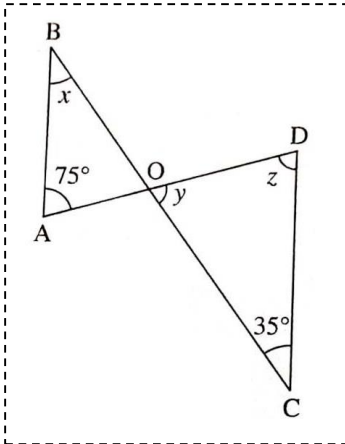
- बिंदू A, बिंदू B आणि या दोन बिंदूंच्या दरम्यानचे सर्व बिंदू यांचा union set (संयोगसंच) म्हणजे रेषाखंड AB असतो. Segment (रेषाखंड) AB हे थोडक्यात seg (रेख) AB असे लिहितात.
- रेषाखंडांच्या अंत्यबिंदूंमधील अंतराला length of the segment (रेषाखंडांची लांबी) म्हणतात.
- length of the segment AB ला $l(AB) = 5$ हे $AB = 5$ असेही लिहितात.

Ex. 1) On a number line points A, B and C are such that $d(A, B) = 5$, $d(B, C) = 11$ and $d(A, C) = 6$ which of the points is between the other two?

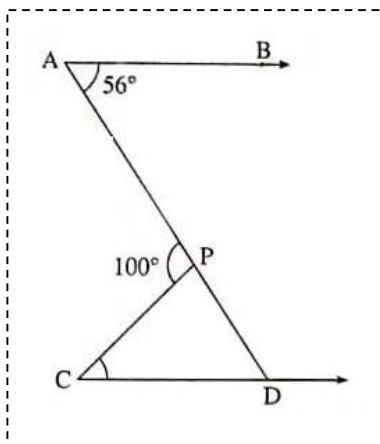
1) Points A, B, C are given aside. Check, with a stretched thread, whether the three points are collinear or not. If they are collinear, write which one of them is between the other two.

Example for Practice – HOME WORK

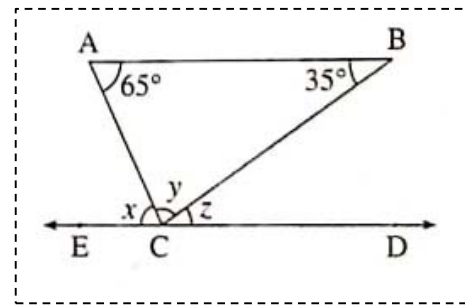
1) In the figure, $\text{seg AB} \parallel \text{seg CD}$, $\angle A = 75^\circ$ and $\angle C = 35^\circ$. Find the value of x , y and z .



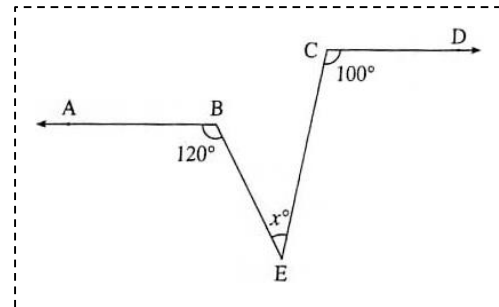
2) In the figure, ray $AB \parallel$ ray CD . Find the measures of $\angle PCD$ and $\angle CPD$.



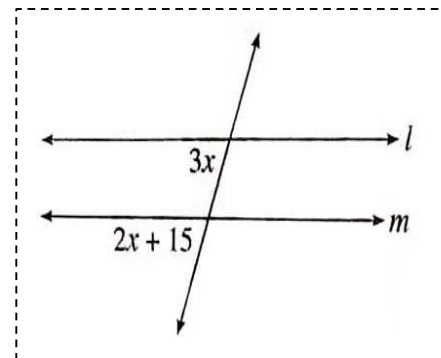
3) In the figure, line $ED \parallel$ seg AB and $E-C-D$. From the information given in the figure, find the values of x , y and z .



4) In the figure, ray $AB \parallel$ ray CD . From the information given in the figure, find the value of x .

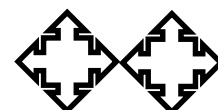


5) In the figure of $l \parallel m$, what is the value of x .



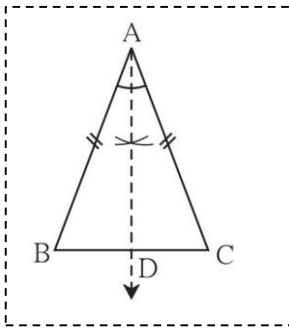
ANSWERS

- 1) $x = 35^\circ$, $y = 70^\circ$, $z = 75^\circ$.
- 2) $\angle PCD = 44^\circ$ and $\angle CPD = 80^\circ$.
- 3) $x = 65^\circ$, $y = 80^\circ$, $z = 35^\circ$.
- 4) $x = 40^\circ$.
- 5) $x = 15$.



Given: In $\triangle ABC$, side $AB \cong$ side AC

To Prove: $\angle ABC \cong \angle ACB$



Construction: Draw the bisector of $\angle BAC$ which intersects side BC at D such that $B - D - C$.

Proof: In $\triangle ABD$ and $\triangle ACD$,

- Seg $AB \cong$ seg AC (Given)
 $\angle BAD \cong \angle CAD$ (Construction)
 Seg $AD \cong$ seg AD (Common side)
 $\therefore \triangle ABD \cong \triangle ACD$ (SAS test of congruence)
 $\therefore \angle ABD \cong \angle ACD$ (c.a.c.t.)
 $\therefore \angle ABC \cong \angle ACB$ (B - D - C)

Corollary: If all sides of a triangle are congruent then it's all angles are congruent.

Corollary (उपप्रमेय): Triangle (त्रिकोण) च्या तिन्ही बाजू congruent (एकरूप) असतील, तर त्याचे तिन्ही angles (कोन) congruent (एकरूप) असतात आणि प्रत्येक कोनाचे माप 60° असते.

3.4.1 Converse of isosceles triangle theorem

Theorem: If two angles of a triangle are congruent, then the sides opposite to them are congruent.

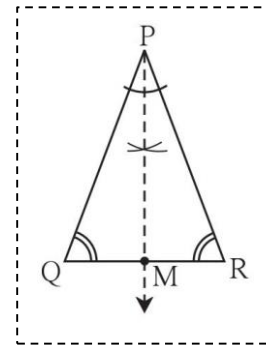
Converse of isosceles triangle theorem (समद्विभुज त्रिकोणाच्या प्रमेयाचा व्युत्पास) -

Theorem (प्रमेय): जर त्रिकोणाचे two angles (दोन कोन) congruent (एकरूप) असतील तर त्या कोनांसमोरील बाजू congruent (एकरूप) असतात.

Given: In $\triangle PQR$, $\angle PQR \cong \angle PRQ$

To Prove: side $PQ \cong$ side PR

Construction: Draw the bisector of $\angle QPR$ intersecting side QR at M such that $Q - M - R$.



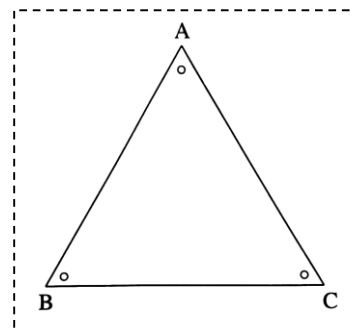
Proof: In $\triangle PQM$ and $\triangle PRM$,

- $\angle PQM \cong \angle PRM$ (Given)
 $\angle QPM \cong \angle RPM$ (Construction)
 Seg $PM \cong$ seg PM (Common side)
 $\triangle PQM \cong \triangle PRM$ (AAS test of congruence)
 $\therefore$ seg $PQ \cong$ seg PR (c.s.c.t.)

Corollary: If three angles of a triangle are congruent, then its three sides also are congruent.

Corollary (उपप्रमेय): त्रिकोणाचे three angles (तीनही कोन) एकरूप असतील तर त्याच्या three sides (तीनही बाजू) congruent (एकरूप) असतात.

Given: In $\triangle ABC$, $\angle A \cong \angle B \cong \angle C$



To Prove: side $AB \cong$ side $BC \cong$ side AC

Proof: In $\triangle ABC$, $\angle B \cong \angle C$ (Given)

$\therefore$ side $AB \cong$ side AC

..... (Converse of isosceles triangle theorem) (1)

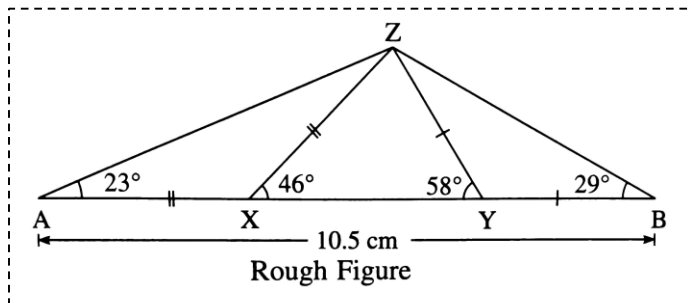
In $\triangle ABC$, $\angle A \cong \angle B$ (Given)

$\therefore$ side $BC \cong$ side AC

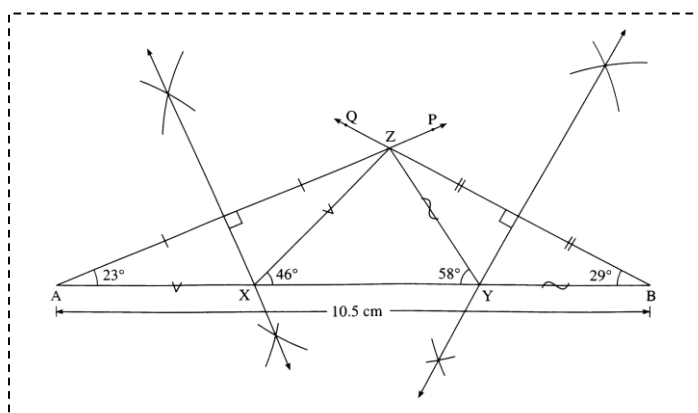
..... (Converse of isosceles triangle theorem) (2)

$\therefore$ side $AB \cong$ side $BC \cong$ side $AC \dots$ (From 1 and 2)

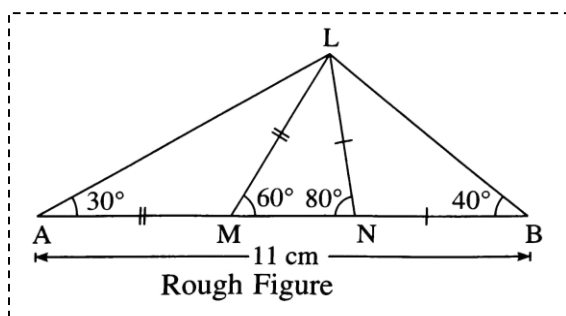
Q. 2 Construct ΔXYZ , in which $\angle Y = 58^\circ$, $\angle X = 46^\circ$ and perimeter of triangle is 10.5 cm.



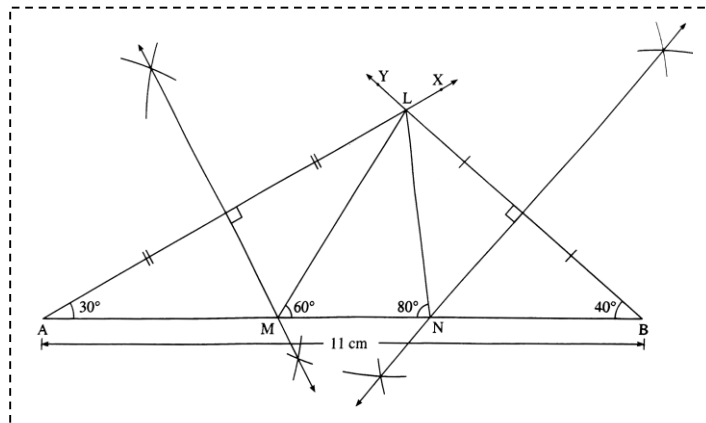
Ans:



Q.3 Construct ΔLMN , in which $\angle M = 60^\circ$, $\angle N = 80^\circ$ and $LM + MN + NL = 11$ cm.

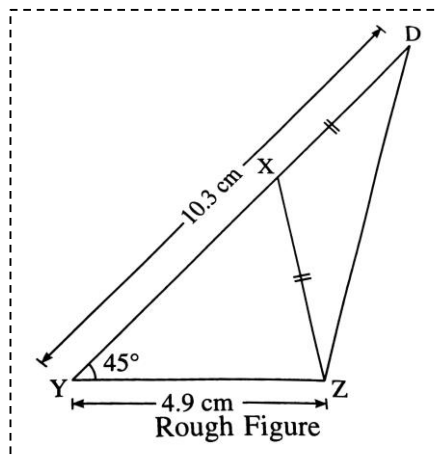


Ans:

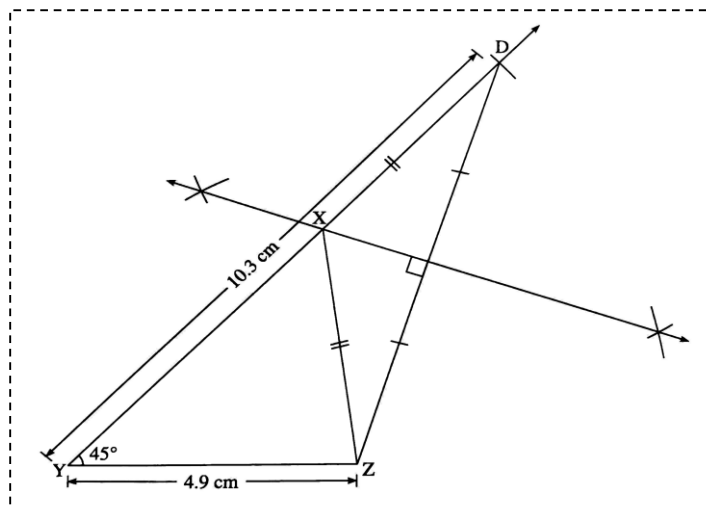


Problem set – 4

Q. 1 Construct ΔXYZ , such that $XY + XZ = 10.3$ cm, $YZ = 4.9$, $\angle XYZ = 45^\circ$.



Ans:



$\text{seg BE} \cong \text{seg DE}$ (Given)
 $\triangle AEB \cong \triangle CED$... (SAS test of congruence)
 $\angle BAE \cong \angle DCE$ (c. a. c. t.)
 i.e. $\angle BAC \cong \angle DCA$ (A - E - C)
 $\text{seg AB} \parallel \text{seg DC}$
 (Alternate angles test for parallel lines) 1)

Similarly, we can prove $\text{seg AD} \parallel \text{seg BC}$ 2)

In $\square ABCD$,

$\text{seg AB} \parallel \text{seg DC}$... [From (1)]

$\text{seg AD} \parallel \text{seg BC}$... [From 2)]

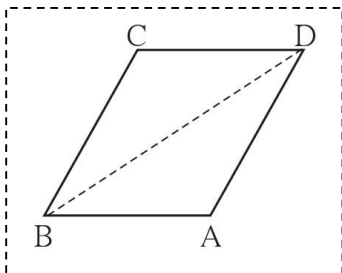
$\square ABCD$ is a parallelogram (By definition)

Note: The three theorems above are useful to prove that a given quadrilateral is a parallelogram. Hence they are called as tests of a parallelogram.

Theorem: A quadrilateral is a parallelogram, if a pair of opposite sides is parallel and congruent.

Theorem (प्रमेय): चौकोनाच्या opposite sides (संमुख बाजू) ची एक जोडी congruent (एकरूप) आणि parallel (समांतर) असेल तर तो quadrilateral (चौकोन) हा समांतरभुज असतो.

Given: In $\square ABCD$, $\text{seg CB} \parallel \text{seg DA}$ and $\text{seg CB} \cong \text{seg DA}$



To prove: $\square ABCD$ is a parallelogram

Construction: Draw diagonal BD.

Proof: $\text{seg CB} \parallel \text{seg DA}$... (Given)
 and line BD is the transversal.
 $\therefore \angle CBD \cong \angle ADB$... (Alternate angles) ... 1)
 In $\triangle CBD$ and $\triangle ADB$,
 $\text{seg CB} \cong \text{seg AD}$... (Opposite sides of parallelogram)
 $\angle CBD \cong \angle ADB$ [From 1)]
 $\text{seg BD} \cong \text{seg DB}$ (Common side)
 $\therefore \angle CBD \cong \angle ADB$ (SAS test of congruence)
 $\therefore \triangle CDB \cong \triangle ABD$ (c.a.c.t.)
 $\therefore \text{seg CD} \parallel \text{seg AB}$

.... (Alternate angles test for parallel lines)... 2)

In $\square ABCD$

$\text{seg CB} \parallel \text{seg DA}$ (Given)

$\text{seg CD} \parallel \text{seg AB}$...[From 2)]

$\therefore \square ABCD$ is a parallelogram (By definition)

Remember this!

- i) A quadrilateral is a parallelogram, if its pairs of opposite angles are congruent,
 - ii) A quadrilateral is a parallelogram, if its pairs of opposite sides are congruent.
 - iii) A quadrilateral is a parallelogram, if its diagonal bisects each other
 - iv) A quadrilateral is a parallelogram, if a pairs of its opposite sides is parallel and congruent.
- These theorems are called tests for parallelogram.

Remember this (हे लक्षात ठेवूया).

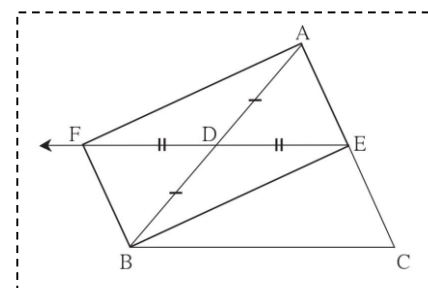
ज्या चौकोनाच्या संमुख कोनांच्या जोड्या एकरूप असतात तो चौकोन parallelogram (समांतरभुज) असतो. ज्या चौकोनाच्या opposite sides (संमुख बाजू) च्या जोड्या एकरूप असतात तो चौकोन समांतरभुज असतो. ज्या चौकोनाचे diagonal (कर्ण) परस्परांना bisects (दुभागणे) करतात तो चौकोन समांतरभुज असतो.

चौकोनाच्या संमुख बाजूंची एक जोडी congruent (एकरूप) आणि parallel (समांतर) असेल तर तो चौकोन समांतरभुज असतो. या प्रमेयांना समांतरभुज चौकोनाच्या कसोट्या म्हणतात.

Solved examples:

Ex.1 Points D and E are the midpoints of side AB and side AC of $\triangle ABC$ respectively. Point F is on ray ED such that $ED = DF$. Prove that $\square AFBE$ is a parallelogram. For this example write 'given' and 'to prove' and complete the proof given below.

Given: $\square AFBE$ is a quadrilateral.



Point C is on the perpendicular bisector of seg QR.

$$\therefore QC = RC \quad \dots (2)$$

$$\therefore PC = QC = RC \quad \dots \text{[From (1) and (2)]}$$

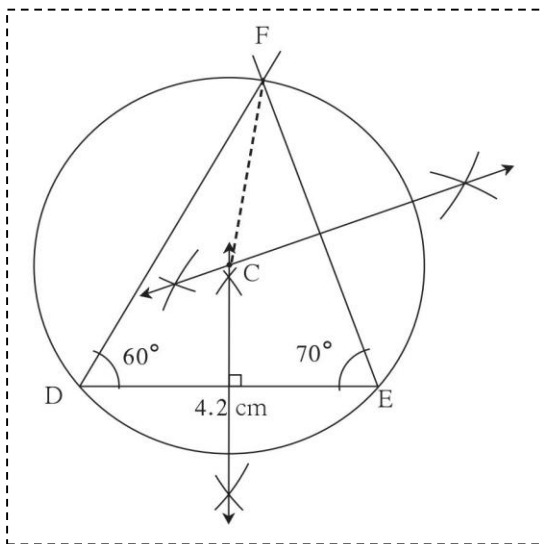
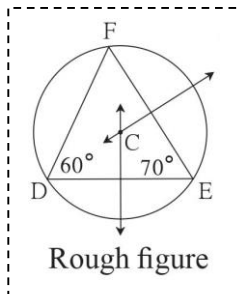
$\therefore$ the circle with centre C and radius PC will pass through all the vertices of $\triangle PQR$. This circle is called as the circumcircle.

Circumcircle (त्रिकोणाचे परिवर्तुळ) -

बिंदू C हा triangle (त्रिकोण) PQR च्या तिन्ही बाजूंच्या perpendicular bisectors (लंबदुभाजक) वरचा बिंदू आहे. PC, QC, RC जोडा. रेषाखंडाच्या लंबदुभाजकावरील every point (प्रत्येक बिंदू) हा त्या segment (रेषाखंड) च्या end point (अंत्यबिंदू) पासून समान अंतरावर असतो. हे आपण अभ्यासले आहे.

6.5.2 To draw the circumcircle of a triangle:

Ex. Construct $\triangle DEF$ such that $DE = 4.2$ cm, $\angle D = 60^\circ$, $\angle E = 70^\circ$ and draw circumcircle of it. Draw rough figure. Write the given measures.



Steps of Construction:

- Draw $\triangle DEF$ of given measures.
- Draw perpendicular bisectors of any two sides of the triangle.

- Name the point of intersection of perpendicular bisectors as C.
- Join seg CF.
- Draw circle with centre C and radius CF.

To draw the circumcircle of a triangle (त्रिकोणाचे परिवर्तुळ काढणे) -

Steps of construction (रचनेच्या पायऱ्या):

- दिलेल्या मापाचा त्रिकोण DEF काढा.
- कोणत्याही two sides (दोन भुजा) चे perpendicular bisectors (लंबदुभाजक) काढा.
- ते लंबदुभाजक जेथे मिळतील त्या बिंदूला C नाव द्या.
- seg (रेख) CF काढा.
- CF ही radius (त्रिज्या) व C हे centre (केंद्र) घेऊन वर्तुळ काढा.

Activity:

Draw different triangles of different measures and draw incircles and circumcircles of them. Complete the table observation and discuss.

Type of triangle	Equilateral triangle	Isosceles triangle	Scalene triangle
Position of incentre	Inside the triangle	Inside the triangle	Inside the triangle
Position of circumcentre	Inside the triangle	Inside, outside on the triangle	
Type of triangle	Acute angled triangle	Right angled triangle	Obtuse angled triangle
Position of incentre			
Position of circumcircle		Midpoint of hypotenuse	

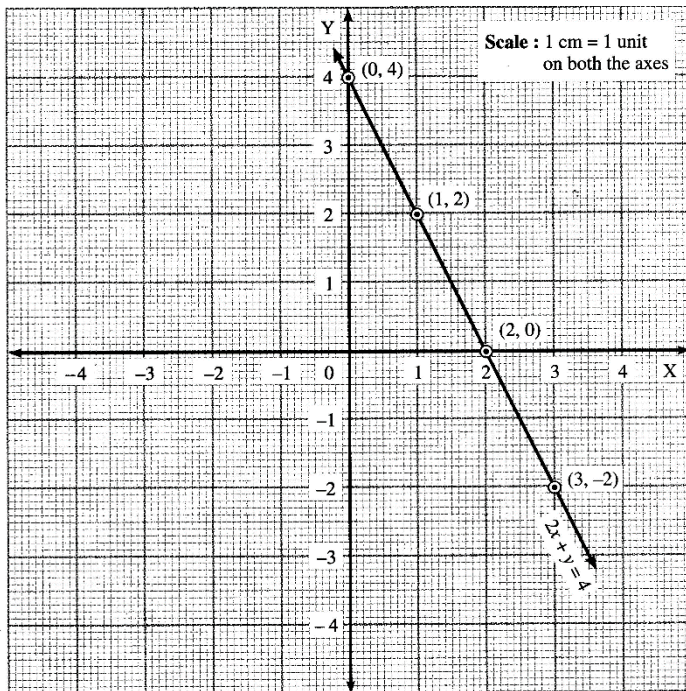
Remember

- Incircle of a triangle touches all sides of the triangle from inside.
- For construction of incircle of a triangle, we have to draw bisectors of any two angles of the triangles.
- Circumcircle of a triangle passes through all the vertices of a triangle.
- For construction of a circumcircle of a triangle, we have to draw perpendicular bisectors of any two sides of the triangle.

v) Circumcentre of an acute angled triangle lies inside the triangle.

$$2x + y = 4.$$

x	2	0	1	3
y	0	4	2	-2
(x, y)	(2, 0)	(0, 4)	(1, 2)	(3, -2)



Ex: $2x - y + 1 = 0$ is a linear equation in two variables in general form. Let us draw the graph of this equation.

Solution: $2x - y + 1 = 0$ means $y = 2x + 1$

Let us assume some values of x and find the corresponding values of y .

For example, If $x = 0$ then substituting this value of x in the equation we get $y = 1$.

Similarly, let us find the values of y when $0, 1, 2, \frac{1}{2}, -2$ are some values of x and write these values in the table below in the form of ordered pairs.

x	0	1	2	$\frac{1}{2}$	-2
y	1	3	5	2	-3
(x, y)	(0, 1)	(1, 3)	(2, 5)	$(\frac{1}{2}, 2)$	$(-2, -3)$

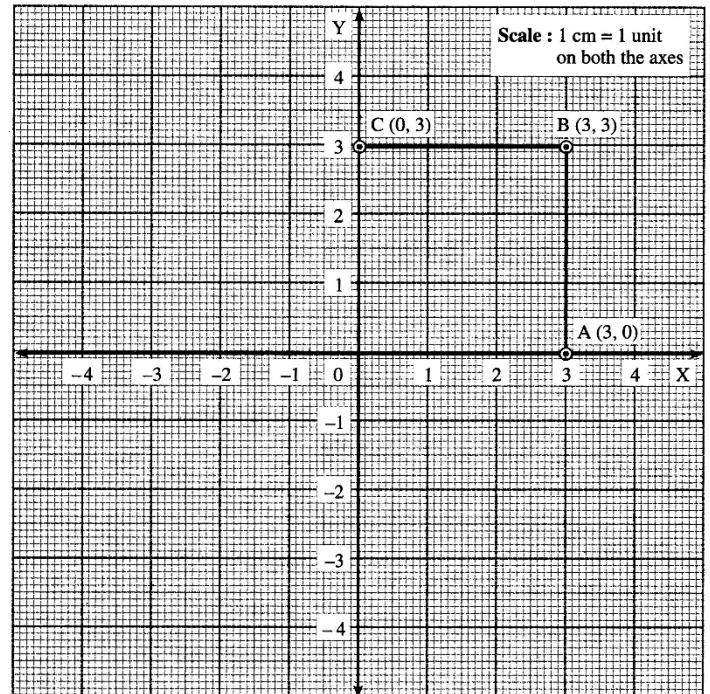
Now let us plot these points. Let us verify that these points are collinear. Let us draw that line.

The line is the graph of the equation $2x - y + 1 = 0$.

Practice Set – 7.2

Q. 1 Plot the points A(3, 0), B(3, 3), C(0, 3) on a graph paper. Join AB and BC. What is the figure formed?

Ans:



The figure formed by joining AB and BC with the axes is a square.

Q. 2 Write the equation of the line parallel to the Y-axis at a distance of 7 units from it to its left.

Ans: The equation of a line parallel to the Y-axis is of the form $x = a$.

The equation of the required line is $x = -7$.

Q. 3 Write the equation of the line parallel to the X-axis at a distance of 5 units from it and below the X-axis.

Ans: The equation of a line parallel to the X-axis is of the form $y = b$.

The equation of the required line is $y = -5$.

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