CBSE Class 09 Mathematics

Sample Paper 02 (2020-21)

Maximum Marks: 80

Time Allowed: 3 hours

General Instructions:

i. This question paper contains two parts A and B.
ii. Both Part A and Part B have internal choices.

Part – A consists 20 questions

i. Questions 1-16 carry 1 mark each. Internal choice is provided in 5 questions.
ii. Questions 17-20 are based on the case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part – B consists 16 questions

i. Question No 21 to 26 are Very short answer type questions of 2 mark each,
ii. Question No 27 to 33 are Short Answer Type questions of 3 marks each
iii. Question No 34 to 36 are Long Answer Type questions of 5 marks each.
iv. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

Part - A

1. Is 0.5918 a rational number?

   OR

   Multiply $3\sqrt{5}$ by $2\sqrt{5}$.

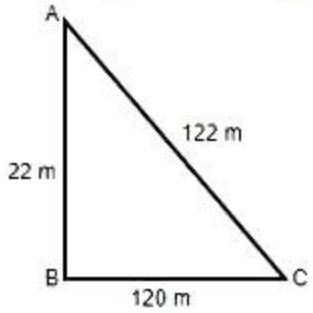
2. Find the value of $513^2 - 512^2$.
3. The distances (in km) of 40 female engineers from their residence to their place of work were found as follows: 5 3 10 20 25 11 13 7 12 31 19 10 12 17 18 11 32 17 16 2 7 9 7 8 3 5 12

15 18 3 12 14 2 9 6 15 15 7 6 2 Find the probability that an engineer lives: at most 15 km from her place of work.

4. Construct a $\triangle ABC$, in which AC = 4 cm, $\angle A = 80°$, $\angle B = 50°$ and $\angle C = 60°$.
5. An isosceles right triangle has area 8 cm^2. Find the length of its hypotenuse.

OR

The triangular side's walls of a flyover have been used for advertisements. The sides of the walls are 122m, 22m and 120m. The advertisement yield on earning of Rs. 5000 per m^2 per year. A company hired one of its walls for 4 months. How much rent did it pay?



6. Which of the following points belong to the x- axis?
   (a) (2, 0) (b) (3, 3)
   (b) (0, 1) (d) (-2, 0)
7. Examine the number rational or irrational: $\sqrt[3]{5} \times \sqrt[3]{25}$.

OR

Simplify: $\frac{8^{1/2}}{8^{2/3}}$.

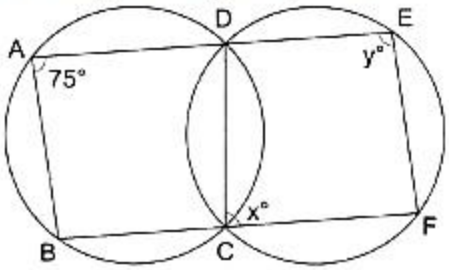
8. Write an equation in two variables: y = 2
9. Find the total surface area of a cylinder having radius of the base 14 cm and height 30 cm.

OR

Find the volume of the hemisphere of radius 3.5 cm.

10. Evaluate: $\{(999)^2 - 1\}$.
11. Write the equation in the form ax + by + c = 0 and indicate the values of a, b, c in case: y = 5

12. Find the value of $f(x) = 2x^2 + 7x + 3$ at $x = -2$.
13. In the given figure, $\angle BAD = 75°$, $\angle DCF = x°$ and $\angle DEF = y°$. Find the values of x and y.



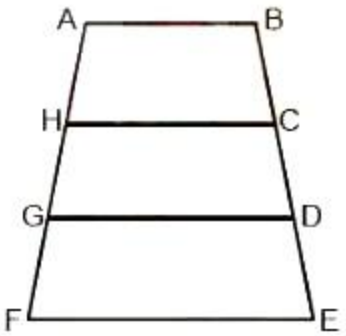
14. If $\pi x + 3y = 25$ and $y = 1$, then find x.
15. Linear equation $x - 2 = 0$ is parallel to which axis?
16. Find three rational numbers between $\frac{1}{4}$ and $\frac{1}{5}$.

OR

Solve the equation: $2^{x-3} = 4^{x-1}$

17. **Read the Source/Text given below and answer any four questions:**

Sohan wants to show gratitude towards his teacher by giving her a card made by him. He has three pieces of trapezium pasted one above the other as shown in fig. These pieces are arranged in a way that AB || HC || GD || FE. Also BC=CD=DE and AH=HG=GF=6 cm. He wants to decorate the card by putting up a colored tape on the nonparallel sides of the trapezium.



i. Find the total length of colored tape required if DE = 4cm.
   a. 20 cm

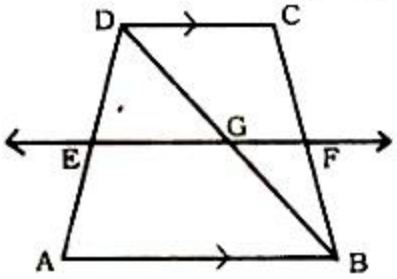
b. 30 cm
c. 40 cm
d. 50 cm

ii. ABHC is a trapezium in which AB || HC and ∠A = ∠B = 45°. Find angles C and H of the trapezium.
a. 135, 130
b. 130, 135
c. 135, 135
d. 130,130

iii. What is the difference between trapezium and parallelogram?
a. Trapezium has 2 sides, and parallelogram has 4 sides
b. Trapezium has 4 sides, and parallelogram has 2 sides
c. Trapezium has 1 pair of parallel sides, and parallelogram has 2 pairs of parallel sides
d. Trapezium has 2 pairs of parallel sides, and parallelogram has 1 pair of parallel sides

iv. Diagonals in isosceles trapezoid are _____.
a. parallel
b. opposite
c. vertical
d. equal

v. ABCD is a trapezium where AB||DC, BD is the diagonal and E is the midpoint of AD. A line is drawn through E parallel to AB intersecting BC at F. Which of these is true?

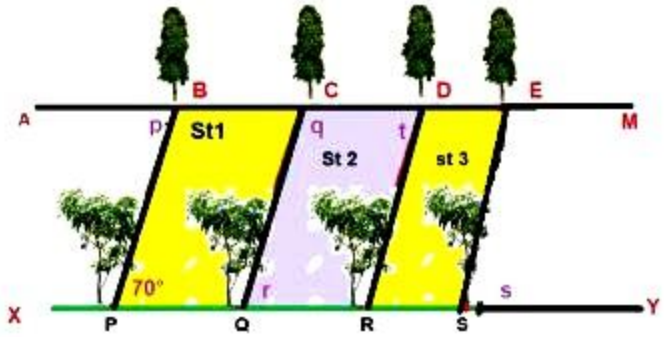


a. BF = FC
b. EA = FB
c. CF = DE
d. None of these

18. **Read the Source/Text given below and answer any four questions:**

There were two parallel roads AM and XY in New Delhi. Due to increasing pollution, MCD planned to get planted trees on these roads.

On the road AM, plants of Ashoka were planted by one company. While on the road XY mango trees were planted by another company.



Between these roads three streets St 1, St 2 and St 3 were situated.

During the survey, ∠BPQ was measured to be 70° and other angles p, q, r, s and t were also measured.

Now answer the following questions:

i. What is the measure of ∠p?
   a. 60°
   b. 70°
   c. 160°
   d. 100°

ii. What is the measure of ∠q?
   a. 60°
   b. 70°
   c. 160°
   d. 110°

iii. What is the value of (p+q+t)/5?
   a. 50°
   b. 70°
   c. 160°
   d. 100°

iv. What is the measure of ∠EsY?
   a. 60°
   b. 140°
   c. 70°

d. 110°

v. What is value of {4p -(q+r)-(r-s)}?

a. 50°

b. 100°

c. 160°

d. 180°

19. **Read the Source/Text given below and answer any four questions:**

The weights of newborn babies (in kg.) are recorded to maintain the health report cards in Apollo hospital on regular basis. On a particular day the weights of newborn recorded are are as follows:

3.1, 3.0, 2.9, 2.9, 2.8, 2.8, 2.7, 2.7, 2.6, 2.5, 2.5, 2.4, 2.3, 2.2, 2.1.

i. Determine the range.

a. 1.0 Kg

b. 2.1 Kg

c. 2.7 Kg

d. 2.0 kg

ii. How many babies were born on that day?

a. 11

b. 15

c. 12

d. 16

iii. How many babies weigh below 2.5 kg?

a. 3

b. 4

c. 5

d. 6

iv. How many babies weigh more than 2.8 kg?

a. 1

b. 2

c. 3

d. 4

v. How many babies weigh 2.8 kg

a. 1

b. 2

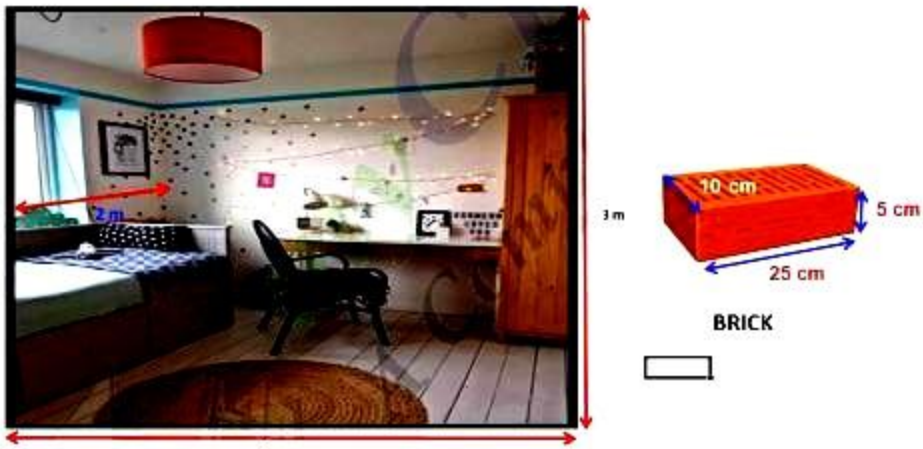
c. 3

d. 4

20. **Read the passage given below and answer any four questions:**

Sohan's house has one bedroom hall with kitchen. His son needed a separate room for study. Thus Sohan planned to construct a new room with length 4m, width 2m and the height 3 m as shown in the following figure.

The room was separate at the roof of the house. The dimensions of the bricks used are: 25 cm $\times$ 10 cm $\times$ 5 cm



i. Total how many bricks will be required? (1 m^3 =1000000 cm^3)

a. 30000

b. 40000

c. 28800

d. 27000

ii. How many bricks will be used on both walls along the length (length=4 m)?

a. 19200

b. 20200

c. 18800

d. 17000

iii. How many bricks will be used on both walls along the width (width=3 m)?

a. 19200

b. 9600

c. 10000

d. 15000

iv. What is the volume of the room?

a. $24m^3$

b. $12m^3$

c. $20m^3$

d. $15\ m^3$

v. What is the area of the floor?

a. $10\ m^2$

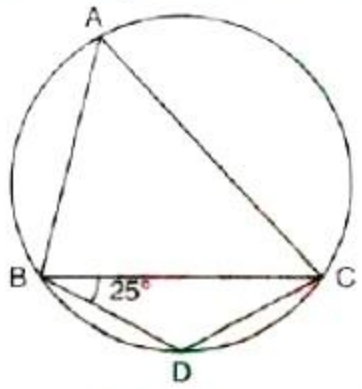
b. $12\ m^2$

c. $8\ m^2$

d. $8\ m^3$

Part - B

21. In the figure, BD = DC and $\angle DBC = 25°$ find the measure of $\angle BAC$.



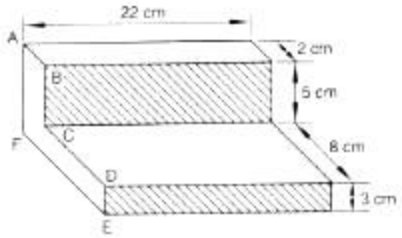
22. Show that $1.272727 = 1.\overline{27}$ can be expressed in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

OR

Simplify the expression:

$(5-\sqrt{2})(5+\sqrt{2})$

23. If a + b = 8 and ab = 6, find the value of $a^3 + b^3$.
24. In a given figure, the shape of a solid copper piece (made of two pieces with dimensions as shown in the figure) is shown. The face ABCDEFA is the uniform cross-section. Assume that the angles at A, B, C, D, E and F are right angles. Calculate the volume of the piece.



25. The sides of a triangle are 8 cm, 15 cm, and 17 cm. Find its area.

OR

The perimeter of an equilateral triangle is 60 cm. Find its area.

26. Find the length of a chord which is at a distance of 5 cm from the centre of a circle of radius 10 cm.
27. ABC is an isosceles triangle in which AB = AC. BE and CF are its two medians. Show that BE = CF.
28. Construct a triangle ABC in which BC = 7 cm, $\angle B = 75^\circ$ and AB + AC = 13 cm.

OR

Draw a line segment AB of 4 cm in length. Draw a line perpendicular to AB through A and B, respectively. Are these lines parallel?

29. Take a rectangle ABCD with A (-6, 4), B (-6, 2), C (-2, 2) and D (-2, 4). Find its mirror image with respect to x- axis.
30. Factorise: $3(x+y)^2 - 5(x+y) + 2$

OR

Find the remainder when $x^3 + 3x^2 + 3x + 1$ is divided by x

31. If the sides of a triangle are 35 cm, 54 cm, and 61 cm, respectively. Then, find the length of its longest altitude.

32. Rationalize the denominator of $\frac{1}{\sqrt{7}-\sqrt{6}}$

33. In $\triangle ABC$, if bisectors of $\angle ABC$ and $\angle ACB$ intersect at O at angle of 120°, then find the measure of $\angle A$.

34. Draw the graph of the equation $2x - 3y = 5$. From the graph, find
    i. the value of y when $x = 4$ and
    ii. the value of x when $y = 3$

OR

Draw the graph of the equation given below. Also, find the coordinate of the points where the graph cuts the coordinate axes.

$6x - 3y = 12$

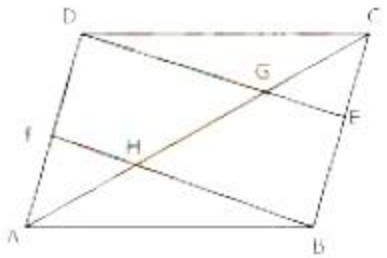
35. A die is thrown 500 times and the outcomes are noted as given below:

Outcome	1	2	3	4	5	6
Frequency	95	80	84	68	70	103

If a die is thrown at random, find the probability of getting

i. 1
ii. 2
iii. 3
iv. 4
v. 5
vi. 6.

36. ABCD is a Parallelogram E and F are the mid-Points of BC and AD respectively. Show that the segments BF and DE trisect the diagonal AC.



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Solution

Part - A

1. 0.5918 is a terminating decimal expansion.

   Hence, it is a rational number.

   OR

   $3\sqrt{5} \times 2\sqrt{5} = (3 \times 2)(\sqrt{5} \times \sqrt{5})$=6×5 = 30

2. $a^2 - b^2 = (a + b)(a - b)$

   $513^2 - 512^2 = (513 + 512)(513 - 512)$

   = 1025 ×1 = 1025

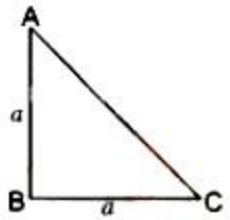
3. Number of engineers living at a distance of 15 km or less away from her place of work = 30

   Probability that an engineer lives at most 15 km away from her place of work $= \frac{30}{40}$ = 0.75

4. Here, ∠A + ∠B + ∠C = (80° + 50° + 60°) = 190°.

   But, we know that the sum of the angles of a triangle is always 180°. but here sum of angles is 190 which is greater than 180.

   Hence, the construction of △ABC is not possible in this case.

5. 

   Let the equal sides of an isosceles right triangle are a cm.

   And its area = 8 cm^2

   So,

   Area $= \frac{1}{2}a^2$

   $\Rightarrow \frac{1}{2}a^2 = 8$

   $\Rightarrow a^2 = 16$

$\Rightarrow$ a = 4 cm

Hypotenuse = $\sqrt{2}$a = $\sqrt{2}$(4) = $4\sqrt{2}$cm.

OR

The lengths of the sides of the walls are AC = 122m, AB = 22m and BC = 120m.

By heron formula

S = (122 + 22 + 120)/2 = 132m

= 14400 + 484

= 14884

= $(122)^2$

$\therefore$ Walls are in the form of right triangles

Area of one wall = $\frac{1}{2}\times$ Base $\times$ height

= $\frac{1}{2} \times 120 \times 22$ sq m

= 1320 sq m.

Rent = Rs 5000/sq m per year

$\therefore$ Rent for 4 month

= Rs. $\left[\frac{5000\times1320\times4}{12}\right]$

= Rs. 22,00,000

6. (2, 0) and (-2, 0) belongs to x- axis.
7. We have, $\sqrt[3]{5} \times \sqrt[3]{25} = \sqrt[3]{5} \times \sqrt[3]{25} = 5^{\frac{1}{3}} \times 5^{2\times\frac{1}{3}}$

   $= 5^{\frac{1}{3}+\frac{2}{3}} = 5^{\frac{3}{3}} = 5$

   Hence, it is a rational number.

   OR

   $\frac{8^{\frac{1}{2}}}{8^{\frac{2}{3}}} = 8^{\left(\frac{1}{2}-\frac{2}{3}\right)} = 8^{\frac{3-4}{6}} = 8^{-\frac{1}{6}}$

8. y = 2 can be written as 0.x + 1.y = 2, or 0.x + 1.y – 2 = 0
9. Here we have , r = 14 cm and h = 30 cm

   Therefore Total surface area of the cylinder

   = $\left(2\pi rh + 2\pi r^2\right)$sq units = $2\pi r(r + h)$ sq units

$= \left\{2 \times \frac{22}{7} \times 14 \times (14 + 30)\right\} cm^2$ = 3872 cm^2

OR

We know that the volume of hemisphere of radius r is given by

V = $\frac{2}{3}\pi r^3$ cubic units

Here, r = 3.5 cm

$\therefore$ V = $\frac{2}{3} \times \frac{22}{7} \times 3.5 \times 3.5$ cm^2

$\Rightarrow$ V = $\frac{2}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2}$ cm^3 = $\frac{11 \times 49}{3 \times 2}$ cm^3 = 89.83 cm^3

10. We have,

    $\{(999)^2 - 1\}$

    $= \{(999)^2 - (1)^2\}$

    $= \{(999 - 1)(999 + 1)\}$

    $= 998 \times 1000$

    = 998000

11. We have y = 5 $\Rightarrow$ y - 5 = 0

    $\Rightarrow 0 \cdot x + 1 \cdot y$ - 5 = 0.

    This is of the form ax + by + c = 0, where a = 0, b = 1 and c = -5

12. $f(x) = 2x^2 + 7x + 3$

    $f(-2) = 2(-2)^2 + 7(-2) + 3$

    = 8 -14 + 3 = 11 - 14 = -3

13. We know that if one side of a cyclic quadrilateral is produced, then the exterior angle is equal to the interior opposite angle.

    i.e., $\angle$BAD = $\angle$DCF = 75°

    $\Rightarrow$ $\angle$DCF = x° = 75° ==> x° = 75°

    Again, the sum of the opposite angles in a cyclic quadrilateral is 180°.

    Thus, $\angle$DCF + $\angle$DEF = 180°

    $\Rightarrow$ 75° + y° = 180°

    $\Rightarrow$ y° = (180° - 75°) = 105° ==> y° = 105°

    Hence, x° = 75° and y° = 105°

14. Put $y = 1$ in $\pi x + 3y = 25$

    $\Rightarrow \pi x + 3y = 25$

$\Rightarrow \pi x = 22$

$\Rightarrow \frac{22}{7}x = 22$

$\Rightarrow x = 7$

15. Here, linear equation is x - 2 = 0 $\Rightarrow$ x = 2

16. $\frac{1}{4} = \frac{1}{4} \times \frac{20}{20} = \frac{20}{80}$ and $\frac{1}{5} = \frac{1}{5} \times \frac{16}{16} = \frac{16}{80}$

Now, $\sqrt{2} \times \sqrt{3}\frac{18}{80}\left(= \frac{9}{40}\right), \frac{19}{80}$ are three rational numbers lying between and $\frac{1}{4}$ and $\frac{1}{5}$.

OR

$2^{x-3} = 4^{x-1}$

$\Rightarrow 2^{x-3} = (2^2)^{x-1}$

$\Rightarrow 2^{x-3} = 2^{2x-2}$

$\Rightarrow$ x + 3 = 2x -2 [Equating the exponent]

$\Rightarrow$ x - 2x = - 2 -3

$\Rightarrow$ - x = -5

$\Rightarrow$ x = 5

17. i. (b) 30 cm
    ii. (c) 135, 135
    iii. (c) Trapezium has 1 pair of parallel sides, and parallelogram has 2 pairs of parallel sides
    iv. (d) equal
    v. (a) BF=CF

18. i. (b) 70°
    ii. (d) 110°
    iii. (a) 50°
    iv. (c) 70°
    v. (b) 100°

19. i. (a) 1.0 Kg
    ii. (b) 15
    iii. (c) 4
    iv. (d) 4
    v. (b) 2

20. i. (c) 28800

ii. (a) 19200

iii. (b) 9600

iv. (a) 24 m^3

v. (c) 8 m^2

Part - B

21. In $\triangle$BCD, we have

BD = DC

$\Rightarrow \angle DCB = \angle DBC$

$\Rightarrow \angle DCB = 25^o$ [$\because \angle DBC = 25°$]

Also, $\angle DCB + \angle DBC + \angle BDC = 180^o$

$\Rightarrow 25° + 25° + \angle BDC = 180°$

$\Rightarrow \angle BDC = 130°$

Since ABDC is a cyclic quadrilateral.

$\therefore \angle BAC + \angle BDC = 180°$

$\angle BAC + 130^o = 180^o$

$\Rightarrow \angle BAC = 50^o$

22. The given number= 1.272727....= $1.\overline{27}$

Let x = $1.\overline{27}$. Then,

x = 1.272727.....(i)

Multiplying both sides by 100 we get

100 x = 127.272727.....(ii)

On subtracting (i) from (ii), we getLet x = $1.\overline{27}$. Then,

99 x = (127.272727...) - (1.272727....) =127-1

99 x = 126

$\mathbf{x} = \frac{126}{99} = \frac{14}{11}$

Therefore, $1.\overline{27}$ = 1.272727..=$\frac{14}{11} = \frac{p}{q}$

Hence $1.\overline{27}$ can be expressed in $\frac{p}{q}$ form where p=14 and q=11

OR

$(\sqrt{5} - \sqrt{2})\,(\sqrt{5} + \sqrt{2})$

We need to apply the formula $(a - b)\,(a + b) = a^2 - b^2$ to find value of $(\sqrt{5} + \sqrt{2})^2$

$(\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2})$

$= [(\sqrt{5})^2 - (\sqrt{2})^2]$

= 5 - 2 = 3

Therefore, on simplifying $(\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2})$,we get 3.

23. We have,

$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

$= (a + b)(a^2 + b^2 - ab)$

$= (a + b)(a^2 + b^2 - ab + 2ab - 2ab)$ [Adding and subtracting ab]

$= (a + b)[(a^2 + b^2 + 2ab) - 3ab]$

$= (a + b)[(a + b)^2 - 3ab]$ [$\because (a + b)^2 = a^2 + b^2 + 2ab$]

$= 8 \times [(8)^2 - 3 \times 6]$ [$\because$ a + b = 8 an ab = 6]

$= 8 \times [64 - 18]$

$= 8 \times 46$

= 368

24. For the horizontal piece, we have

Length = 8 cm, Breadth = 22 cm, Height = 3 cm

$\therefore$ Volume of the horizontal piece = $(8 \times 22 \times 3)$ cm^3 = 528 cm^3

For the vertical piece, we have,

Length = 22 cm, Breadth = 2 cm, Height = (5 + 3) cm = 8 cm

$\therefore$ Volume of the vertical piece = $(22 \times 2 \times 8)$ cm^3 = 352 cm^3

Hence, Volume of the whole piece = (528 + 352) cm^3 = 880 cm^3

25. It is given that the sides of a triangle are 8 cm, 15 cm, and 17 cm.

So, a = 8cm, b = 15cm, c = 17cm

$s = \frac{a+b+c}{2} = \frac{8+15+17}{2} = \frac{40}{2} = 20\text{cm}$

$\therefore Area = \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{20(20-8)(20-15)(20-17)}$

$= \sqrt{20 \times 12 \times 5 \times 3} = 60\text{cm}^2$

Hence the area of given triangle is 60 cm^2.

OR

The perimeter of the given equilateral triangle = 60 cm

As every side of the equilateral triangle is equal.

Length of each of its sides = a = $\frac{60}{3}$cm = 20 cm

Area of the triangle = $(\frac{\sqrt{3}}{4} \times a^2)$ sq units

$= (\frac{\sqrt{3}}{4} \times 20 \times 20)cm^2$

$= (100 \times \sqrt{3})\text{cm}^2$

$= (100 \times 1.732)\text{cm}^2$

= 173.2 cm^2

Hence, the area of the given triangle is 173.2 cm^2.

26. Given that, Distance (OC) = 5 cm

Radius of circle (OA) = 10 cm

In $\triangle$ OCA, by using Pythagoras theorem

$AC^2 + OC^2 = OA^2$

$AC^2 + 5^2 = 10^2$

$AC^2 = 100 - 25$

$AC^2 = 75$

AC = 8.66 cm

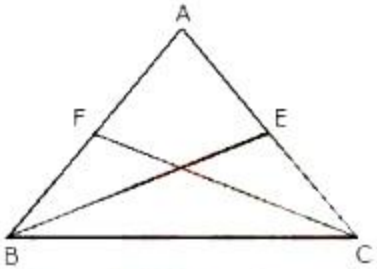
We know that,

The perpendicular from centre to chord bisects the chord

Therefore, AC = BC = 8.66 cm

Then, Chord AB = 8.66 + 8.66

= 17.32 cm.

27. 

Given, ABC is an isosceles triangle

AB = AC

BE and CF are two medians

To prove: BE = CF

Proof: In$\triangle$BEC and $\triangle$CFB

CE = BF (SInce, AC = AB = $\frac{1}{2}$ AC = $\frac{1}{2}$ AB = CE = BF)

$\angle ECB = \angle FBC$ (Angle opposite to equal sides are equal)

BC = BC (Common)

Therefore By SAS theorem

$\triangle BEC \cong \triangle CFB$

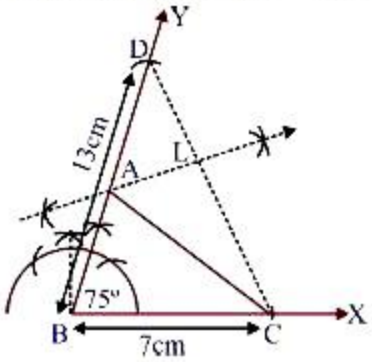
BE = CF (By c.p.c.t.)

28. Given: In $\triangle$ ABC, BC = 7 cm, $\angle B = 75^{\circ}$ and AB + AC = 13 cm.

Required: To construct the triangle ABC.

Steps of construction :

i. Draw the base BC = 7 cm.



ii. At the point B construct an angle YBC = 75°.

iii. Cut an arc from B as centre and radius equal to AB + AC = 13 cm. on the ray BY. Name it D.

iv. Join DC.

v. Draw the perpendicular bisector of line segment DC which intersects BD at some point name it A.

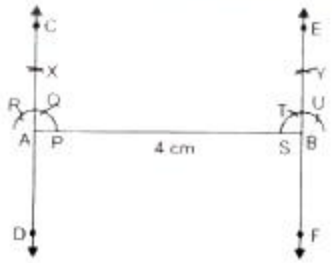
vi. Join AC.

ABC is the required triangle.

OR

Given: A line segment AB of length 4cm.

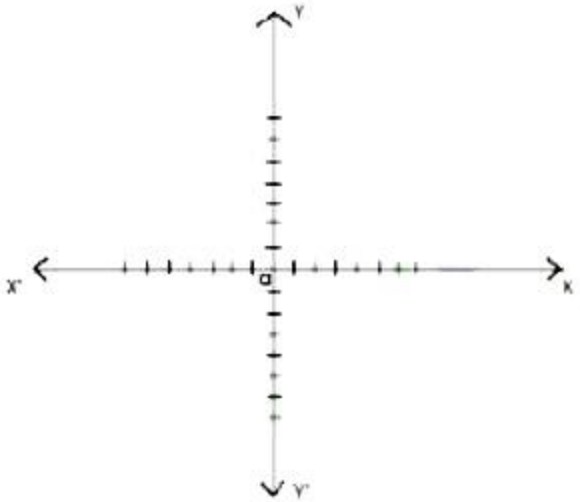
Required: To draw a perpendicular to AB through A and B, respectively.



Steps of construction:

1. Draw AB = 4 cm.
2. With A as a centre and any convenient radius, draw an arc, cutting Ab at P.
3. With P as a centre and the same radius, draw an arc cutting the arc drawn in step 2 at Q.
4. With Q as a centre and the same radius as in steps 2 and 3, draw an arc, cutting the arc drawn in step 3 at R.
5. With Q as a centre and the same radius, draw an arc.
6. With R as a centre and the same radius, draw an arc, cutting the arc drawn in step 5 at X.
7. Draw OX and produced it to C and D.
8. Now, repeat the steps from 2 to 7 to draw the line EF perpendicular through B.
   Yes, these lines are parallel because the sum of the interior angles on the same side of the transversal is 180°.

29. The mirror image of A(-6, 4) is A'(-6, -4) and B(-6, 2) is B'(-6, -2), C(-2, 2) is C'(-2, -2) and D(-2, 4) is D'(-2, -4).



30. $3(x+y)^2 - 5(x+y) + 2$

    Let x + y = z

    Then, $3z^2 - 5z + 2$

    = $3z^2 - 3z - 2z + 2$

    = $3z(z-1) - 2(z-1)$

    = $(3z-2)(z-1)$

    Put z = x+y

    $= [3(x+y) - 2]\,[x + y - 1] = [3x + 3y - 2]\,[x + y - 1]$

OR

We need to find the zero of the polynomial x

x = 0

While applying the remainder theorem, we need to put the zero of the polynomial x polynomial $x^3 + 3x^2 + 3x + 1$, to get

$p(x) = x^3 + 3x^2 + 3x + 1$

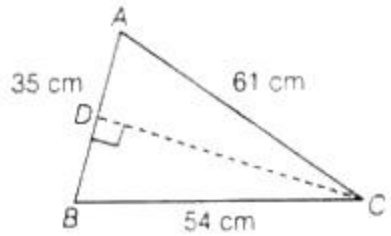
$p(0) = (0)^3 + 3(0)^2 + 3(0) + 1$

= 0 + 0 + 0 + 1

= 1

Therefore, we conclude that on dividing the polynomial $x^3 + 3x^2 + 3x + 1$ by x, we will get the remainder as 1.

31. Let ABC be the given triangle in which sides AB = a = 35 cm, BC = b = 54 cm and CA = c = 61 cm.



Then, semi-perimeter of a triangle,

s = $\frac{a+b+c}{2}$ = $\frac{35+54+61}{2}$ = $\frac{150}{2}$ = 75 cm

Now, area of $\triangle$ABC = $\sqrt{s(s-a)(s-b)(s-c)}$ [by Heron's formula]

= $\sqrt{75(75-35)(75-54)(75-61)}$

= $\sqrt{75 \times 40 \times 21 \times 14}$

= $\sqrt{5 \times 5 \times 3 \times 2 \times 2 \times 2 \times 5 \times 7 \times 3 \times 7 \times 2}$

= $5 \times 2 \times 2 \times 3 \times 7 \times \sqrt{5}$

= $420\sqrt{5}$ cm^2

We take the smallest side AB as base for longest altitude

Hence, area of $\triangle$ABC = $\frac{1}{2}$ $\times$ AB $\times$ Altitude

$\Rightarrow 420\sqrt{5} = \frac{1}{2} \times 35 \times$ CD

$\Rightarrow$ CD = $\frac{420 \times 2\sqrt{5}}{35}$

$\therefore$ CD = $24\sqrt{5}$ cm

Hence, the length of the longest altitude is $24\sqrt{5}$ cm.

32. $\frac{1}{\sqrt{7}-\sqrt{6}}$

We need to multiply the numerator and denominator of $\frac{1}{\sqrt{7}-\sqrt{6}}$ by $\sqrt{7}+\sqrt{6}, toget \frac{1}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}} = \frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7}-\sqrt{6})(\sqrt{7}+\sqrt{6})}$

We need to apply the formula $(a-b)(a+b) = a^2 - b^2$ in the denominator to get

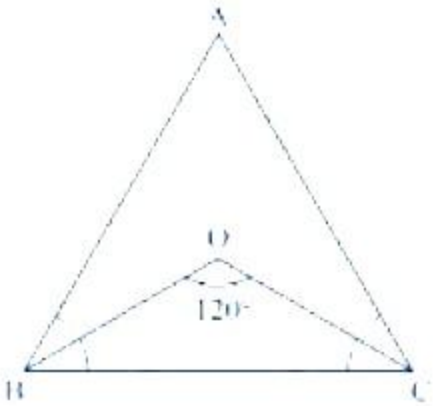
$\frac{1}{\sqrt{7}-\sqrt{6}} = \frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7})^2-(\sqrt{6})^2}$

$= \frac{\sqrt{7}+\sqrt{6}}{7-6}$

$= \sqrt{7} + \sqrt{6}.$

Therefore, we conclude that on rationalizing the denominator of $\frac{1}{\sqrt{7}-\sqrt{6}}$ we get $\sqrt{7} + \sqrt{6}$.

33. We need to find the measure of ∠A



So here, using the corollary, if the bisectors of ∠ABC and ∠ACB of a △ABC meet at a point O, then ∠BOC = $90^\circ + \frac{1}{2}\angle A$

Thus, in △ABC

∠BOC = $90^\circ + \frac{1}{2}\angle A$

$120^\circ = 90^\circ + \frac{1}{2}\angle A$

$120^\circ - 90^\circ + \frac{1}{2}\angle A$

∠A = $2(30^o)$.

∠A = 60^o

34. Given equation :

2x − 3y = 5

⇒ 2x = 3y + 5

⇒ x = $\frac{3y+5}{2}$

When, y = −1, x = $\frac{-3+5}{2} = \frac{2}{2}$ = 1

When, y = −3, x = $\frac{-9+5}{2} = \frac{-4}{2}$ = -2

Thus, we have the following table:

x	1	-2
y	-1	-3

Plot the points (−2, −3), (1, −1), (-2, -3), (1, -1) on the graph paper and extend the line in both directions.

i. When x = 4: $4 = \frac{3y+5}{2}$

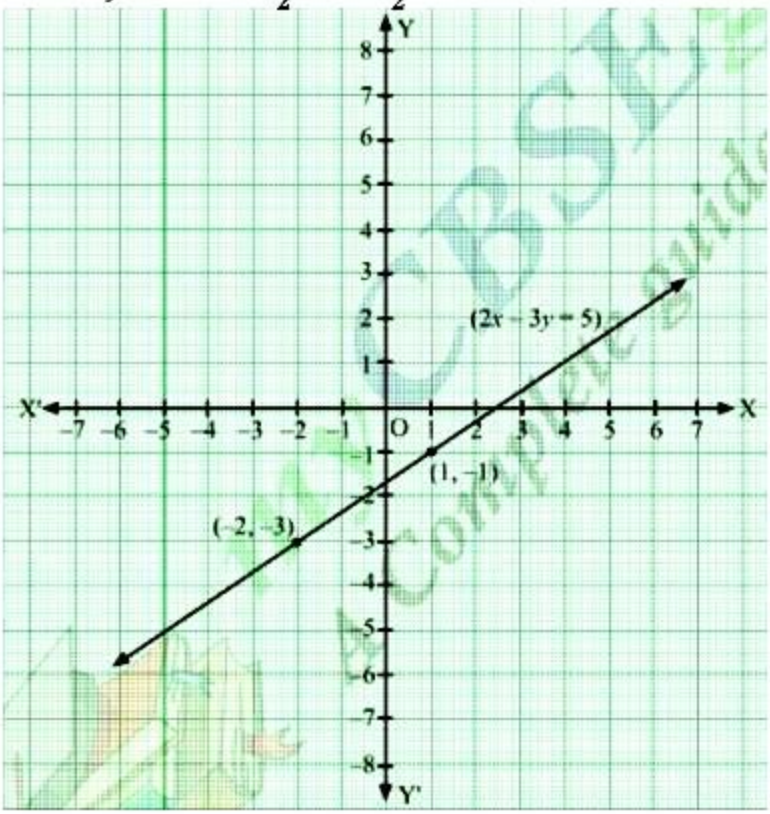
$\Rightarrow 8 = 3y + 5$

$\Rightarrow 3y = 8 - 5 = 3$

$\Rightarrow 3y = 3$

$\Rightarrow y = 1$

ii. When y = 3: $x = \frac{3y+5}{2} = \frac{14}{2} = 7$



OR

We have,

6x - 3y = 12

$\Rightarrow$ 3(2x - y) = 12

$\Rightarrow$ 2x - y = 4

$\Rightarrow 2x - 4 = y$

$\Rightarrow y = 2x - 4$ .....(i)

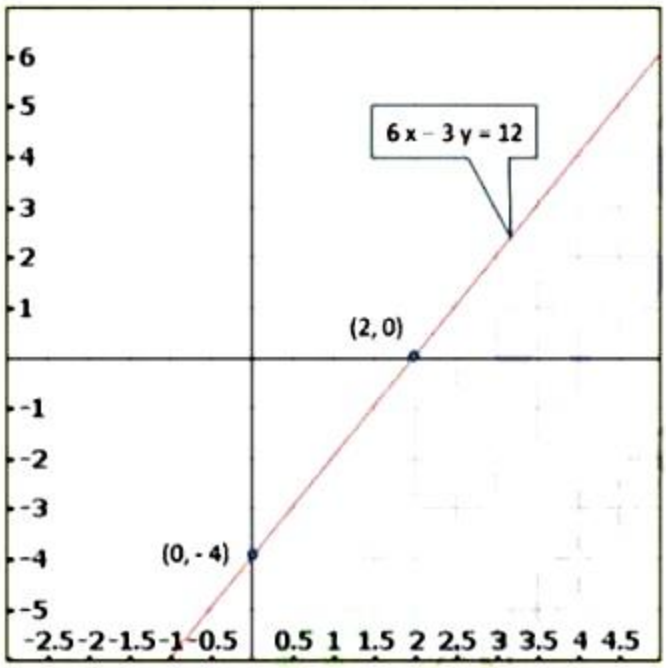
Put x = 0 in (i), we get y = -4

Put x = 2 in (i), we get y = 0

Thus, we obtain the following table giving coordinates of two points on the line represented by the equation 6x - 3y = 12.

x	0	2
y	-4	0

The graph of line 6x - 3y = 12:



Clearly, the line intersects with the coordinate axes at (2, 0) and (0, -4).

35. We have Total number of trials = 500.

In a random throw of a die, let E_1, E_2, E_3, P_4, E_5 and E_6, be the events of getting 1, 2, 3, 4, 5 and 6, respectively. Then,

i. P(getting 1) = P(E_1) = $\frac{\text{number of times 1 appears}}{\text{total number of trials}}$

$= \frac{95}{500} = \frac{19}{100} = 0.19$

ii. P(getting 2) = P(E_2)= $\frac{\text{number of times 2 appears}}{\text{total number of trials}}$

$= \frac{80}{500} = \frac{16}{100} = 0.16$

iii. P(getting 3) = P(E_3)= $\frac{\text{number of times 3 appears}}{\text{total number of trials}}$

$= \frac{84}{500} = 0.168$

iv. P(getting 4) = P(E_4)= $\frac{\text{number of times 4 appears}}{\text{total number of trials}}$

$= \frac{68}{500} = 0.136$

v. P(getting 5) = P(E_5)= $\frac{\text{number of times 5 appears}}{\text{total number of trials}}$

$= \frac{70}{500} = \frac{7}{50} = 0.14$

vi. P(getting 6) = P(E_6) = $\frac{\text{number of times 6 appears}}{\text{total number of trials}}$

$= \frac{103}{500} = 0.206$

36. Taking parallelogram BEDF,

we say that,

FD || BE and FD = BE

$\therefore$ BEDF Is a Parallelogram

EG || BH and E is the mid-Point of BC

$\therefore$ G is the mid-point of HC

Or, HG = GC ...(i)

Similarly AH = HG ...(ii)

From (i) and (ii) we get,

AH = HG = GC

Thus the segments BF and DE bisects the diagonal AC.