CBSE Class 09 Mathematics

Sample Paper 07 (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. Multiply $3\sqrt{28}$ by $2\sqrt{7}$.

   OR

   Simplify: $\left(\frac{3125}{243}\right)^{4/5}$.
2. Classify as linear, quadratic and cubic polynomials: 3t
3. An organisation selected 2400 families at random and surveyed them to determine a relationship between income level and the number of vehicles in a family. The information gathered is listed in the table below :

Monthly income(in ₹)	Vehicles per family			
	0	1	2	Above 2
Less than 7000	10	160	25	0
7000-10000	0	305	27	2
10000-13000	1	535	29	1
13000-16000	2	469	59	25
16000 or more	1	579	82	88

Find the probability that the family is earning less than ₹ 7000 per month and does not own any vehicle.

4. Construct a triangle ABC where base BC = 4.5 cm. $\angle B = 45^o$ and AB - AC = 2.5 cm.
5. The perimeter of an equilateral triangle is 60 cm. Find its height. Given ($\sqrt{3}$ = 1.732).

OR

Find the cost of leveling the ground in the from of a triangle having Its side as 70 cm, 50 cm, and 60 cm, at ₹7 per square meter.

6. A cuboidal water tank is 6 m long, 5 m wide and 4.5 m deep. How many litres of water can it hold ? (1 m^3 = 1000 l)
7. Examine, whether $\frac{6}{2\sqrt{3}}$ is rational or irrational.

OR

Find a rational number between - 2 and 6.

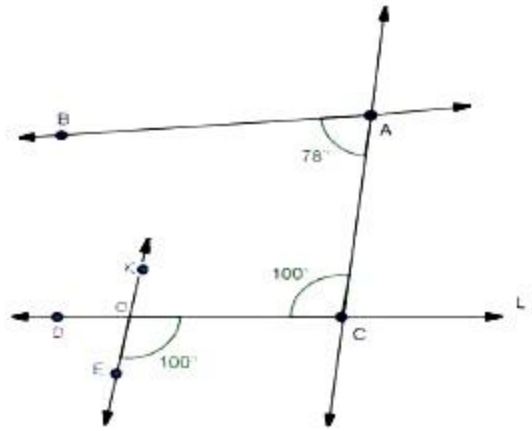
8. Write a solution of the linear equation 5x + 0y + 8 = 0 in two variables.
9. Find the volume of a sphere whose diameter is 3.5 dm.

OR

Find the total surface area of a hemisphere of radius 10 cm.

10. Factorise: 5 - $20x^2$
11. Express the following linear equation in the form ax + by + c = 0:
    y - 5 = 0
12. Is $\frac{1}{7}a^3 - \frac{2}{\sqrt{3}}a^2 + 4a - 7$ a polynomial? Justify your answer.

13. In Fig., state which lines are parallel and why.



14. Express the following linear equation in the form ax + by + c = 0:

    -2x + 3y = 12

15. If x = 1, y = 2 is a solution of the equation $a^2x + ay = 3$, then find the values of a.
16. Insert a rational number and an irrational number between 0 and 0.1

OR

Assuming that x, y, z are positive real number, simplify: $\sqrt[3]{xy^2} \div x^2y$

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

In the above picture, one small square is of size 1 km × 1 km. From the starting point O(0,0) Deepak started to drive towards his home. He first drives 3km in left then he turned to his left and drove 2 km, there he found a temple. He worshipped there and drove 6km in the left direction, there is a zoo and from the zoo, he drives 2km on the right side, then he reached his home.

From O Sanjay drove for his school, he drove 1km to his right then took a left turn and

drives 2km then again took a right turn and drives 2 km. He found a hospital in the way. From Hospital he drove 3 km and finally reached his school.

i. What are the coordinates of the Hospital?
   a. (3, 2)
   b. (2, 3)
   c. (3, 3)
   d. (5, 5)

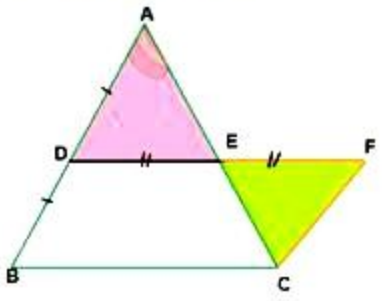
ii. What is common abscissa of school, Hospital, Zoo and Deepak's home?
   a. 3
   b. 5
   c. -3
   d. -5

iii. What is the common ordinate of temple and Zoo?
   a. 3
   b. 5
   c. -3
   d. -2

iv. Deepak Drove in which quadrants?
   i. I & II
   ii. II and III
   iii. III and IV
   iv. IV and I

v. Sanjay Drove in which quadrants?
   a. I only
   b. II and III
   c. III and IV
   d. II and I

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



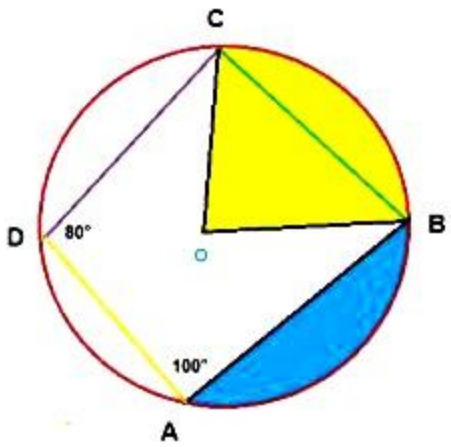
Hareesh and Deep were trying to prove a theorem. For this they did the following;

i. Drew a triangle ABC
ii. D and E are found as the mid points of AB and AC
iii. DE was joined and DE was extended to F so DE = EF
iv. FC was joined.

Answer the following questions:

i. ΔADE and ΔEFC are congruent by which criteria?
   a. SSS
   b. RHS
   c. SAS
   d. ASA
ii. ∠EFC is equal to which angle?
   a. ∠DAE
   b. ∠ADE
   c. ∠AED
   d. ∠B
iii. ∠ECF is equal to which angle?
   a. ∠DAE
   b. ∠ADE
   c. ∠AED
   d. ∠B
iv. CF is equal to which of the following?
   a. BD
   b. CE
   c. AE
   d. EF
v. CF is parallel to which of the following?
   i. AE
   ii. CE
   iii. BD
   iv. EF

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



There was a circular park in Defence colony At Delhi. For fencing purpose Poles A, B, C and D were installed at the circumference of the park.

Ram tied wires From A to B to C and C to D, He managed to measure the ∠A = 100° and ∠D = 80°

The point O in the middle of the park is the center of the circle.

Now answer the following questions:

i. What is the value of ∠B?
   a. 80°
   b. 100°
   c. 90°
   d. 70°

ii. What is the value of ∠C?
   a. 80°
   b. 100°
   c. 90°
   d. 70°

iii. What is the special type of quadrilateral ABCD?
   a. Square
   b. Rectangle
   c. Cyclic quadrilateral
   d. Trapezium

iv. What is the property of cyclic quadrilateral?
   a. Opposite angles are supplementary
   b. Adjacent angles are equal
   c. Opposite angles are equal

d. Adjacent angles are complementary

v. What you will call the yellow shaded shape OBC?

a. Segment

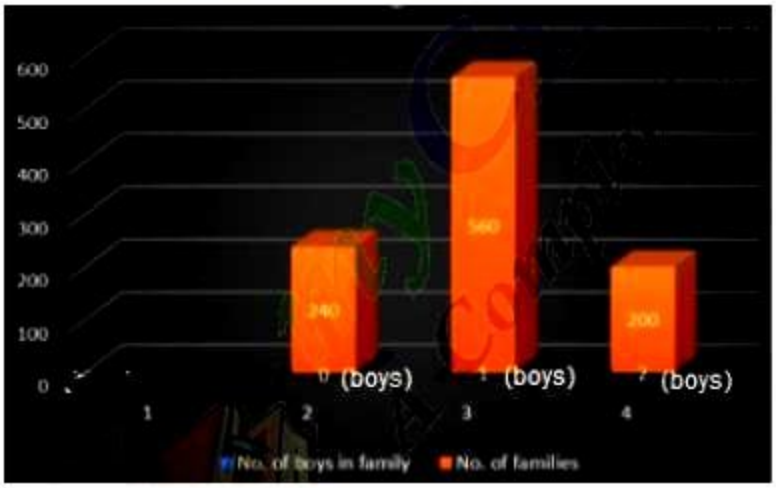
b. Arc

c. Chord

d. Sector

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

In a healthcare survey by the state government of Maharashtra to study the malnutritional problems in children, 1000 families with 2 children were selected randomly from a town and the following data were recorded:



If a family is chosen at random,

i. The probability that it has No boy

a. $-\frac{6}{25}$

b. $\frac{6}{25}$

c. 0

d. $\frac{3}{5}$

ii. The probability that it has One boy

a. $\frac{14}{25}$

b. $\frac{16}{25}$

c. 1

d. $\frac{6}{25}$

iii. The probability that it has 2 boys

a. $\frac{3}{5}$

b. $\frac{4}{5}$

c. $\frac{1}{5}$

d. $\frac{3}{5}$

iv. The probability that it has at least one boy

a. $\frac{16}{25}$

b. $\frac{14}{25}$

c. $\frac{6}{25}$

d. $\frac{19}{25}$

v. The probability that it has at most 1 boy

a. $\frac{4}{5}$

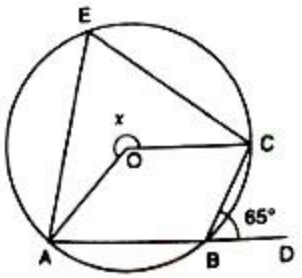
b. $\frac{6}{5}$

c. $\frac{1}{5}$

d. $\frac{1}{5}$

Part - B

21. If O is the centre of the circle, find the value of x in given figure:



22. Express $0.\overline{32}$ in the form $\frac{p}{q}$

OR

Examine, whether $2 + \sqrt{3}$ is rational or irrational.

23. Find the value of $x^2 + \frac{1}{x^2}$, if $x - \frac{1}{x} = \sqrt{3}$.

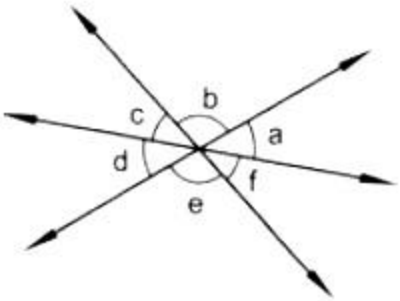
24. The surface area of a cuboid is 758 cm^2. Its length and breadth are 14 cm and 11 cm respectively. Find its height.

25. An isosceles triangle has perimeter 30 cm and each of the equal sides is 12 cm. Find the area of the triangle.

OR

Find the area of in isosceles triangle, the measure of one of Its equals side being 'b' and the third side 'a'.

26. The lengths of the diagonals of a rhombus are 24 cm and 18 cm respectively. Find the length of each side of the rhombus.
27. In the figure, three coplanar lines intersect in a common point, forming angles as shown. Given a = 50^o and b = 90^o; find the values of c, d, e, and f.



28. Construction a triangle with base of length 7.5 cm, the difference of the other two sides 2.5 cm and one base angle of 45^o.

OR

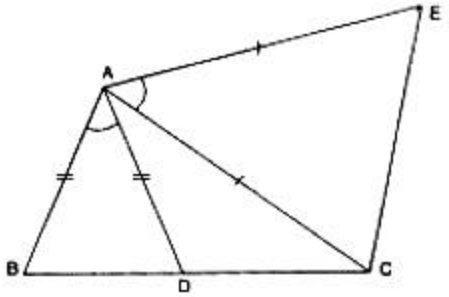
Construct a square of side 3 cm.

29. An underground water tank is in the form of a cuboid of edges 48 m, 36 m and 28 m. Find the volume of the tank.
30. Check whether the polynomial $q(t) = 4t^3 + 4t^2 - t - 1$ is a multiple of 2t + 1 or not.

OR

If x = 2 is a root of the polynomial $f(x) = 2x^2 - 3x + 7a$, find the value of a.

31. The cost of leveling the ground in the form of a triangle having the sides 51m, 37m and 20m at the rate of Rs.3 per m^2 is Rs.918. State whether the statement is true or false and justify your answer.
32. If $x = 1 + \sqrt{2}$, then find the value of $\left(x - \frac{1}{x}\right)^3$
33. In figure, AC = AE, AB = AD and $\angle BAD = \angle EAC$. Prove that BC = DE.



34. The population of four major cities in India in a particular year is given below:

City:	Mumbai	Kolkata	Delhi	Chennai
Number of students:	120	130	150	80

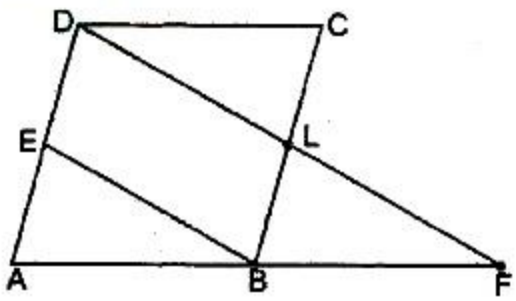
Construct a bar graph to represent the above data.

OR

The path of a train A is given by the equation $3x + 4y - 12 = 0$ and the path of another train B is given by the equation $6x + 8y - 48 = 0$. Represent this situation graphically.

35. The blood groups of 30 students of class IX are recorded as follows:
A, B, O, O, AB, O, A, O, B, A, O, B, A, O, O, A, AB, O, A, A, O, O, AB, B, A, O, B, A, B, O,
A student is selected at random from the class from blood donation. Find the probability that the blood group of the student chosen is:
   i. A
   ii. B
   iii. AB
   iv. O

36. In Figure, ABCD is a parallelogram and E is the mid-point of AD. A line through D, drawn parallel to EB, meets AB produced at F and BC at L. Prove that
   i. AF = 2DC
   ii. DF = 2DL



CBSE Class 09 Mathematics

Sample Paper 07 (2020-21)

Solution

Part - A

1. $3\sqrt{28} \times 2\sqrt{7} = (3 \times 2)(\sqrt{4 \times 7 \times 7}) = 6 \times 2 \times 7 = 84$

   OR

   $\left(\frac{3125}{243}\right)^{4/5}$

   $= \left(\frac{5^5}{3^5}\right)^{\frac{4}{5}}$

   $= \left(\frac{5}{3}\right)^{5 \times \frac{4}{5}}$

   $= \left(\frac{5}{3}\right)^{4}$

   $= \frac{625}{81}$

2. 3t

   We can observe that the degree of the polynomial $(3t)$is 1. Therefore, we can conclude that the polynomial 3t is a linear polynomial.

3. Number of families earning less than Rs.7000 per month and does not own any vehicle = 10

   Therefore required Probability that the family chosen is earning less than Rs.7000 per month and does not own any vehicle $= \frac{10}{2400} = \frac{1}{240}$

4. Given: In triangle ABC, BC = 4.5 cm, $\angle$B = 45° and AB – AC = 2.5 cm.

   Required: To construct the triangle ABC.

   Steps of construction :

   i. Draw the base BC = 4.5 cm.

   ii. At the point B, construct an angle XBC = 45°

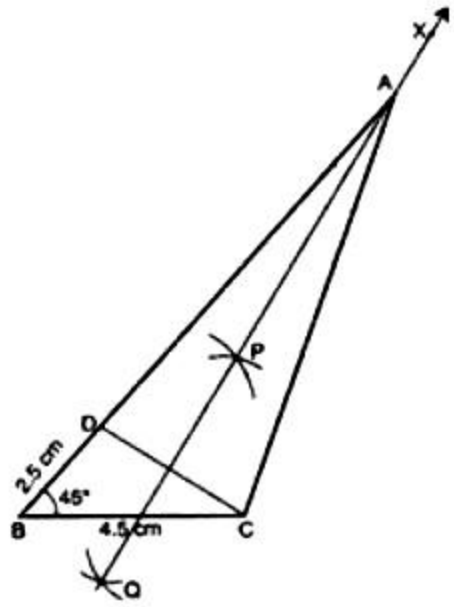
   iii. Cut the line segment BD equal to AB – AC = 2.5 cm. on the ray BX.

   iv. Join DC.

   v. Draw the perpendicular bisector, say PQ of DC.

   vi. Let it intersect BX at a point A.

   vii. Join AC.



ABC is the required triangle.

5. The perimeter of the given equilateral triangle = 60 cm

   As every side of the equilateral triangle is equal.

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

   Area of equilateral triangle = $\frac{\sqrt{3}}{4}$ a^2 = $\frac{1.732}{4}$ (20)^2 = 173.2 cm^2 .....(1)

   Let the height of the given triangle be h cm. Then

   its area = ($\frac{1}{2}\times$ base $\times$ height) $= \left(\frac{1}{2} \times 20 \times h\right)$ cm^2

   $\therefore \frac{1}{2} \times 20 \times h = 173.2$ cm^2 [from (1)]

   $\Rightarrow h = \frac{173.2}{10}$

   $\Rightarrow$ height = 17.32 cm

   Hence, the height of the given triangle is 17.32 cm

OR

$S = \frac{70+50+60}{2} = \frac{180}{2} = 90cm$

$\therefore$ area of triangle =

$= \sqrt{90(90-70)(90-50)(90-60)}$

$= \sqrt{90 \times 20 \times 40 \times 30}$

=1469.693 sq m

$\therefore$ cost of levelling the ground= ₹ (7×1469.693)

= ₹ 10287.851

= ₹ 10287.85

6. Capacity of the tank = volume of cuboid = length× height× width = $6 \times 5 \times 4.5\ m^3 = 135\ m^3$

   $\therefore$ Volume of water it can hold = $135\ m^3$

   $= 135 \times 1000\ l = 135000\ l$

7. Let $x = \frac{6}{2\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3}$, which is irrational.

OR

We know that between two rational numbers x and y such that x< y there is a rational number $\frac{x+y}{2}$. That is, $x < \frac{x+y}{2} < y$.

Therefore, a rational number between -2 and 6 is

$\frac{-2+6}{2} = \frac{4}{2} = 2$ i.e., $-2 < 2 < 6$.

8. According to the question,

   $5x + 0y + 8 = 0$

   i.e., $5x + 8 = 0 \Rightarrow x = \frac{-8}{5}$

   $\therefore$ Required solution is $\left(\frac{-8}{5}, -1\right)$.

   Here, $y =$ any integer because the coefficient of y is 0.

9. D = 3.5 dm

   $\Rightarrow r = \frac{3.5}{2}$ dm

   $\therefore$ volume = $\frac{4}{3}\pi r^3$

   $= \frac{4}{3} \times \frac{22}{7} \times \left(\frac{3.5}{2}\right)^3$

   $= 22.46\ dm^3$

OR

r = 10 cm

Total surface area of the hemisphere = $3\pi r^2$

$= 3 \times 3.14 \times (10)^2 = 942\ cm^2$

10. We have,

    $5 - 20x^2$

    $= 5(1 - 4x^2)$

$= 5[(1)^2 - (2x)^2]$

$= 5[(1 - 2x)(1 + 2x)]$

$= 5(1 - 2x)(1 + 2x)$

11. We have,

    $y - 5 = 0$

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

    On comparing this equation with $ax + by + c = 0$, we get

    $a = 0$, $b = 1$ and $c = -5$

12. $\frac{1}{7}a^3 - \frac{2}{\sqrt{3}}a^2 + 4a - 7$

    In this expression, the exponent of a in each term is a whole number, so this expression is a polynomial.

13. $\angle EOC = \angle DOK = 100^o$ [vertically opposite angles]

    and $\angle DOK = \angle ACO = 100^o$

    Here two lines EK and AC cut by a third line 'L' and the corresponding angles to it are equal.

    $\therefore$ EK || AC

14. We have,

    $-2x + 3y = 12$

    $\Rightarrow -2x + 3y - 12 = 0$

    On comparing this equation with $ax + by + c = 0$, we obtain

    $a = -2$, $b = 3$, and $c = -12$

15. It is given that $x = 1$, $y = 2$ is a solution of $a^2x + ay = 3$.

    $\therefore a^2 \times 1 + a \times 2 = 3$

    $\Rightarrow a^2 + 2a - 3 = 0$

    $\Rightarrow a^2 + 3a - a - 3 = 0$

    $\Rightarrow a(a + 3) - 1(a + 3) = 0$

    $\Rightarrow (a - 1)(a + 3) = 0$

    $\Rightarrow a - 1 = 0$ or, $a + 3 = 0 \Rightarrow a = 1, -3$

16. Rational number : 0.03

    Irrational number: 0.030300300007...

OR

We have,

$$\sqrt[3]{xy^2} \div x^2y = \frac{\sqrt[3]{xy^2}}{x^2y} = \frac{(xy^2)^{\frac{1}{3}}}{x^2y} = \frac{x^{\frac{1}{3}}y^{\frac{2}{3}}}{x^2y}$$

$$= x^{\frac{1}{3}-2}y^{\frac{2}{3}-1} = x^{-\frac{5}{3}}y^{-\frac{1}{3}}$$

17. i. (a) (3,2)
    ii. (a) 3
    iii. (d) -2
    iv. (c) III & IV
    v. (a) I only
18. i. (c) SAS
    ii. (b) ∠ADE
    iii. (a) ∠DAE
    iv. (a) BD
    v. (c) BD
19. i. (b) 100°
    ii. (a) 80
    iii. (c) Cyclic quadrilateral
    iv. (a) Opposite angles are supplementary
    v. (d) Sector
20. i. (b) $\frac{6}{25}$
    ii. (a) $\frac{14}{25}$
    iii. (c) $\frac{1}{5}$
    iv. (d) $\frac{14}{25}$
    v. (a) $\frac{4}{5}$

Part - B

21. We have, ∠CBD = 65°

    Therefore, ∠ABC + ∠CBD = 180° ... (Linear pair)

    ∠ABC + 65° = 180°

    ∠ABC = 115^o

    Therefore, Reflex ∠AOC = 2∠ABC ... (By degree measure theorem)

    x = 2 × 115°

    = 230° .

22. Let x = $0.\overline{32}$

i.e. x = 0.3232... (i)

Multiply eq.(i) by 100, we get,

$\therefore$ 100x = 32.3232... (ii)

subtracting eq (i) from eq.(ii) we get

$\Rightarrow$ 100x - x = 32.3232... - 0.3232...

$\Rightarrow$ 99 x = 32

$\Rightarrow$ x = $\frac{32}{99}$

OR

2 is a rational number, whereas $\sqrt{3}$ is an irrational number. Because, sum of a rational number and an irrational number is an irrational number, so $2+\sqrt{3}$ is an irrational number.

23. According to the question,

$x-\frac{1}{x}=\sqrt{3}$

Squaring both the sides,

$\Rightarrow \left(x-\frac{1}{x}\right)^2=(\sqrt{3})^2$

$\Rightarrow \quad x^2+\frac{1}{x^2}-2\times x\times\frac{1}{x}=3$

$\Rightarrow \quad x^2+\frac{1}{x^2}=3+2$

$\Rightarrow x^2+\frac{1}{x^2}=5$

24. Surface area of cuboid = 758 cm^2

Length of cuboid = 14 cm

Breadth of cuboid = 11 cm

Let height of cuboid = h cm

Total surface area of cuboid = 2 (lb + bh + hl)

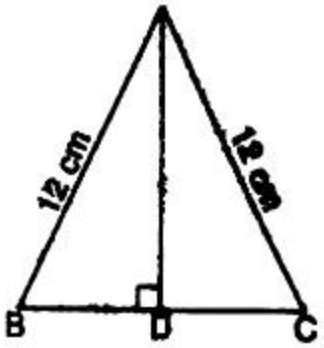
$\Rightarrow$ 758 = 2 (14 $\times$ 11 + 11h + 14h)

$\Rightarrow$ 154 + 25h $=\frac{758}{2}=379$

$\Rightarrow$ 25h = 379 – 154 = 225

$\Rightarrow$ h = $\frac{225}{25}=9$

Height of cuboid = 9 meter

25. 

a = 12 cm, b = 12 cm

Perimeter = 30 cm

a + b + c = 30

$\Rightarrow$ 12 + 12 + c = 30

$\Rightarrow$ 24 + c = 30

$\Rightarrow$ c = 30 – 24

$\Rightarrow$ c = 6 cm

s = $\frac{30}{2}$ cm = 15 cm

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

$= \sqrt{15(15-12)(15-12)(15-6)}$

$= \sqrt{15(3)(3)(9)} = 9\sqrt{15}$ cm^2

OR

Here isosceles triangles two of it`s sides are b,b & a

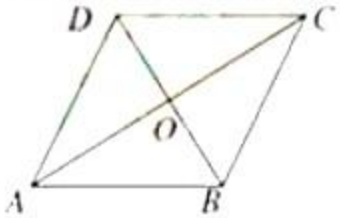
$S = \frac{a+b+b}{2} units = \frac{a+2b}{2}$ units

$\therefore$ area of $\triangle = \sqrt{(\frac{a+2b}{2})(\frac{a+2b}{2}-b)(\frac{a+2b}{2}-b)(\frac{a+2b}{2}-a)}$

$= \sqrt{(\frac{a+2b}{2})(\frac{2b-a}{2})\frac{a}{2} \times \frac{a}{2}}$

$= \frac{a}{4}\sqrt{4b^2-a^2}\ sq$ units

26. Let ABCD be rhombus.



Here, AC and BD are the diagonals of ABCD, where AC = 24 cm and BD = 18 cm.

Let the diagonals intersect each other at O.

We know that the diagonals of a rhombus are perpendicular bisectors of each other.

$\therefore$ $\triangle$AOB is a right angle triangle in which OA = $\frac{24}{2}$ = 12 cm and OB = $\frac{18}{2}$ = 9 cm.

Now, $AB^2 = OA^2 + OB^2$ ...Pythagoras theorem

$\therefore AB^2 = (12)^2 + (9)^2$

$\therefore AB^2 = 144 + 81 = 225$

$\therefore$ AB = 15 cm

Hence, the side of the rhombus is 15 cm.

27. We find that: $\angle a, \angle d$; $\angle b, \angle e$ and $\angle c, \angle f$ are pairs of vertically opposite angles.

$\therefore \angle a = \angle d$ ...(i)

$\angle b = \angle e$ ...(ii)

and $\angle c = \angle f$ ...(iii)

Now, $\angle a = \angle d$ and $\angle a = 50^o$

$\Rightarrow \angle d = 50^o$

and, $\angle b = \angle e$ and $\angle b = 90^o$

$\Rightarrow \angle e = 90^o$

Clearly, $\angle a + \angle b + \angle c = 180^o$

$\Rightarrow 50^o + 90^o + \angle c = 180^o$

$\Rightarrow \angle c = 180^o - 140^o = 40^o$

But, $\angle c = \angle f$ [From (iii]

$\therefore \angle f = 40^o$

Hence, $c = 40^o$, $d = 50^o$, $e = 90^o$ and $f = 40^o$

28. In $\triangle$ABC, base = 7.5 cm, the difference of the other two sides, AB - AC or AC - AB = 2.5 cm.

and one base angle is 45^o.

Required: To construct the $\triangle$ABC

i. AB - AC = 2.5.

Steps of construction :

a. Draw BC = 7.5 cm.

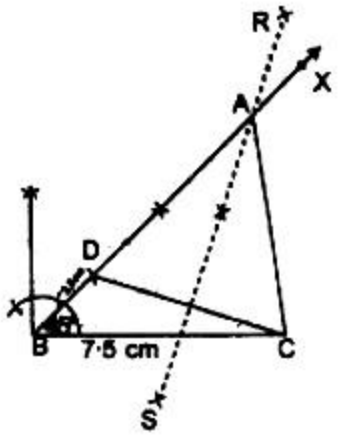
b. At B, construct $\angle CBX = 45^o$

c. On BX, cut off BD = 2.5 cm.

d. Join CD.

e. Draw the perpendicular bisector RS of CD intersecting BX at a point A.

f. Join AC.



ABC is the required triangle.

ii. AC - AB = 2.5 cm.

a. Draw BC = 7.5

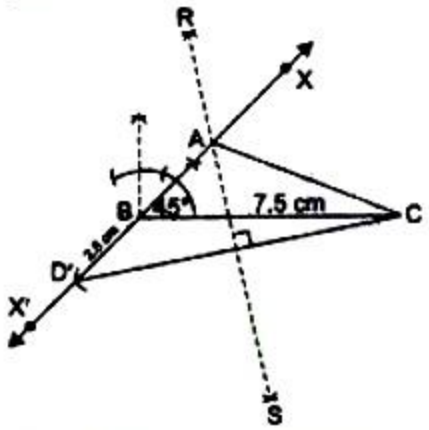
b. At B, construct $\angle CBX = 45^{o}$ and produce XB to form a line XBX'.

c. On BX' cut off BD' = 2.5 cm.

d. Join CD'

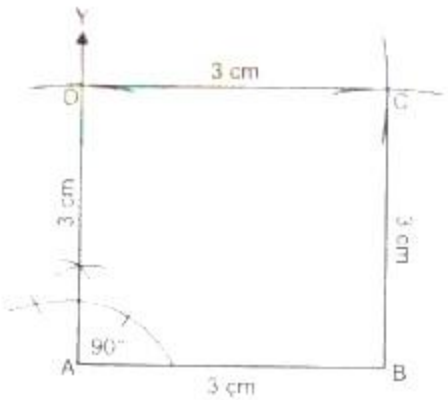
e. Draw perpendicular bisector RS of CD' intersecting BX at a point A.

f. Join AC.



ABC is the required triangle.

OR



Steps of construction:

1. Take AB = 3 cm.
2. At A, draw $AY \perp AB$.
3. With A as centre and radius = 3cm, describe an arc cutting AY at D.
4. With B and D as centres and radii equal to 3 cm, draw arc intersecting at C.
5. Join BC and DC, ABCD is the required square.

29. For water tank : l = 48 m, b = 36 m, h = 28 m

$\therefore$ Volume of the tank = lbh

$= 48 \times 36 \times 28\ m^3$

$= 48384\ m^3$

30. Given polynomial is $q(t) = 4t^3 + 4t^2 - t - 1$

Let g(t) = 2t + 1

For the zero of g(t) put g(t) = 0

$\therefore 2t + 1 = 0 \Rightarrow t = -1/2$

On putting $t = -\frac{1}{2}$ in q(t), we get

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

$= 4\left(\frac{-1}{8}\right) + 4\left(\frac{1}{4}\right) + \frac{1}{2}$-1

$= -\frac{1}{2} + 1 + \frac{1}{2}$-1 = 0

At $t = -\frac{1}{2}$, we get $q\left(-\frac{1}{2}\right) = 0$

i.e. the remainder obtained on dividing q(t) by g(t) is 0.

Hence, (2t +1) is a factor of q(t), i.e. q(t) is a multiple of (2t + 1).

OR

We have, $f(x) = 2x^2 - 3x + 7a$

Given that x = 2 is the root of f(x)

Substitute the value of x in f(x)

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

$= (2 * 4) - 6 + 7a$

$= 8 - 6 + 7a$

$= 7a + 2$

Now, equate 7a + 2 to zero

$\Rightarrow$ 7a + 2 = 0

$\Rightarrow$ 7a = - 2

$\Rightarrow$ a = - $\frac{2}{7}$

31. True, Let a = 51m, b = 37m, c = 20m

$s = \frac{a+b+c}{2} = \frac{51+37+20}{2} = \frac{108}{2} = 54m$

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

$= \sqrt{54(54-51)(54-37)(54-20)}$

$= \sqrt{54 \times 3 \times 17 \times 34}$

$= \sqrt{9 \times 3 \times 2 \times 3 \times 17 \times 17 \times 2}$

= 3 × 3 × 2 × 17

= 306 m^2

Cost of leveling the ground = Rs.3 × 306 = Rs.918.

Hence the cost of leveling the ground in the form of a triangle is Rs 918.

32. Given, x = 1 + $\sqrt{2}$

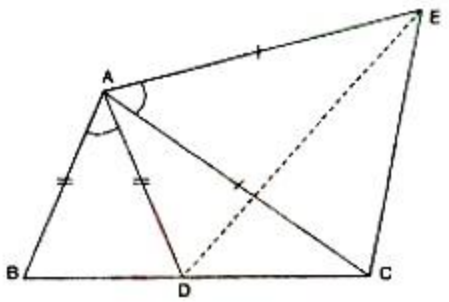
Now, $\frac{1}{x} = \frac{1}{1+\sqrt{2}} = \frac{1}{1+\sqrt{2}} \times \frac{1-\sqrt{2}}{1-\sqrt{2}}$ [by rationalising]

$= \frac{1-\sqrt{2}}{1^2-(\sqrt{2})^2}$ [$\because$ (a - b)(a + b) = $a^2 - b^2$]

$= \frac{1-\sqrt{2}}{1-2} = \frac{1-\sqrt{2}}{-1} = \sqrt{2} - 1$

and $\left(x - \frac{1}{x}\right)$ = (1 + $\sqrt{2}$) - ($\sqrt{2}$ - 1) = 1 + $\sqrt{2}$ - $\sqrt{2}$ + 1 = 2

$\therefore \quad \left(x - \frac{1}{x}\right)^3$ = $(2)^3$ = 8

33. 

Join DE

In DABC and D ADE,

AB = AD, AC = AE and $\angle$BAD = $\angle$EAC ...[Given]

$\angle$BAD + $\angle$DAC = $\angle$DAC + $\angle$EAC ...[Adding $\angle$DAC to both sides]

$\angle$BAC = $\angle$DAE

DABC $\cong$ DADE ...[By SAS property]

BC = DE ...[c.p.c.t.]

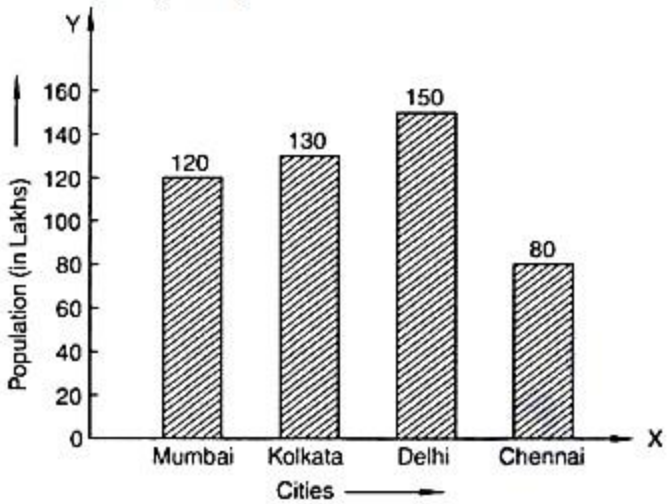
34. To construct the bar graph representing the given data, we follow the following steps:

STEP I: We take a graph paper and draw two mutually perpendicular lines OX and OY.

STEP II: Along the horizontal line OX, we mark 'cities' and along the vertical line, we mark the 'population'.

STEP III: Along the axis OX, we choose equal suitable width of each bar. The gap between the bars is chosen same.

STEP IV: Choose a suitable scale to determine the heights of the bars, according to the availability of space.



Here, we choose 1 big division to represent 20 lakhs population.

Calculate the height of various bars as follows:

The height of the bar for Mumbai = $\frac{120}{20}$ = 6 big divisions.

The height of the bar for Kolkata = $\frac{130}{20}$ = 6.5 big divisions.

The height of the bar for Delhi = $\frac{150}{20}$ = 7.5 big divisions.

The height of the bar for Chennai = $\frac{0}{20}$ = 4 big divisions.

In this way, we have represented the given date in the form of a bar diagram.

OR

We have,

$3x + 4y - 12 = 0$

$\Rightarrow 3x = 12 - 4y$

$\Rightarrow 3x = \frac{12-4y}{3}$

Putting y = 0, we get $x = \frac{12-4\times0}{3} = 4$

Putting y = 3, we get $x = \frac{12-4\times3}{3} = 0$

Thus, we have the following table for the points on the line $3x + 4y - 12 = 0$

x	4	0
y	0	3

We have,

$6x + 8y - 48 = 0$

$\Rightarrow 6x + 8y = 48$

$\Rightarrow 6x = 48 - 8y$

$\Rightarrow x = \frac{48-8y}{6}$

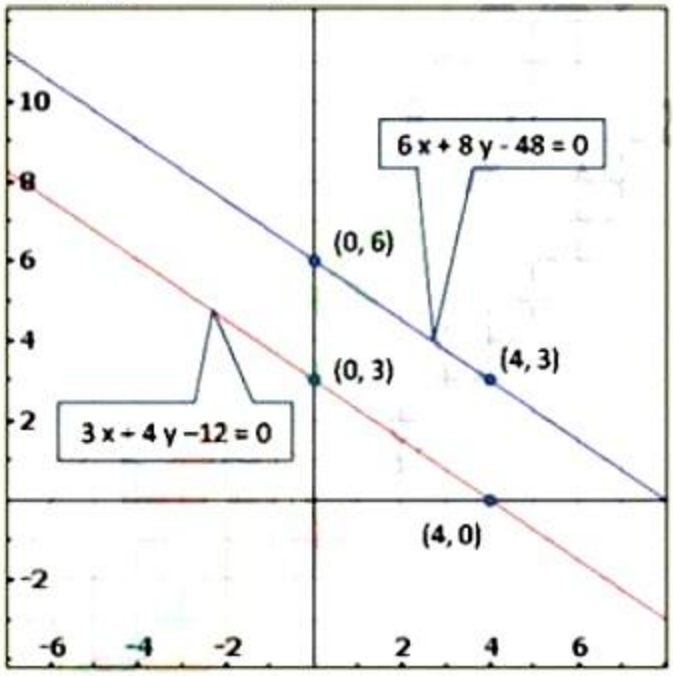
Putting $y = 6$, we get $x = \frac{48-8\times6}{6} = 0$

Putting $y = 3$, we get $x = \frac{48-8\times3}{6} = 4$

Thus, we have the following table for the points on the line $6x + 8y - 48 = 0$.

x	0	4
y	6	3

The graphs of the path of a train A and B are:



35.

Blood group	A	B	O	AB
No. of students	9	6	12	3

i. The probability of a student of blood group A = $\frac{\text{Favourable outcome}}{\text{Total outcome}}$

$= \frac{9}{30} = 0.3$

ii. The probability of a student of blood group B = $\frac{\text{Favourable outcome}}{\text{Total outcome}}$

$= \frac{6}{30} = 0.2$

iii. The probability of a student of blood group AB = $\frac{\text{Favourable outcome}}{\text{Total outcome}}$

$= \frac{3}{30} = 0.1$

iv. The probability of a student of blood group O = $\frac{\text{Favourable outcome}}{\text{Total outcome}}$

$= \frac{12}{30} = 0.4$

36. i. It is given that, EB || DL and ED || BL. Therefore, EBLD is a parallelogram.

$\triangle DCL \cong \triangle FBL$

$\Rightarrow$ DC = BF and DL = FL

Now, BE = DC = AB

$\Rightarrow$ 2AB = 2DC $\Rightarrow$ AF = 2DC

Hence proved.

ii. Since DL = FL (proved above)

$\Rightarrow$ DF = 2DL