CBSE Class 09 Mathematics

Sample Paper 05 (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. Evaluate: $(125)^{\frac{1}{3}}$.

   OR

   Rationalise the denominator of the following : $\frac{\sqrt{2}+\sqrt{5}}{\sqrt{3}}$

2. Whether the following are zero of the polynomial, indicated against them.p(x) = $3x^2 - 1$, x = $-\frac{1}{\sqrt{3}}, \frac{2}{3}$.
3. Two coins are tossed 400 times and we get

two heads: 112 times;

one head: 160 times;

0 head: 128 times.

When two coins are tossed at random, what is the probability of getting 0 heads?

4. Construct a triangle ABC such that BC = 6 cm, AB = 6 cm and median AD = 4 cm.
5. Find the area of a triangle whose sides are 13 cm, 14 cm and 15 cm.

OR

Find the area of the triangle whose base measures 24 cm and the corresponding height measures 14.5 cm.

6. In which quadrant does the point (-1, -2) lie?
7. Simplify: $(\sqrt[3]{8})^{\frac{-1}{2}}$

OR

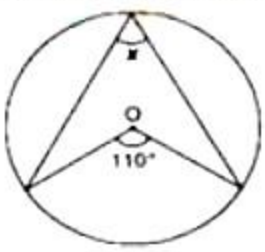
Multiply $3\sqrt{8}$ by $3\sqrt{2}$.

8. Check whether (4, 0) is solutions of the equation 5x - 4y = 20
9. Find the surface area of a sphere having diameter 30 cm.

OR

Find the amount of water displaced by a solid spherical ball of diameter 4.2 cm, when it is completely immersed in water.

10. Factorise: $x^4 + 4$
11. Express the given statement in the form of a linear equation in two variables. The sum of the ordinate and abscissa of a point is 6.
12. Is it polynomial? In case of a polynomial, write its degree: $\frac{1}{\sqrt{5}}x^{1/2} + 1$
13. Find an angle marked as x in given figure where O is the centre of the circle:



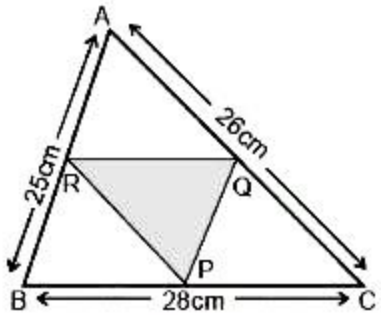
14. Write the equation in the form ax + by + c = 0 and indicate the values of a, b, c in case: $\pi x + y = 6$
15. Express equation in the form ax + by + c = 0 and indicate the values of a, b, c in case: $4x = 5y$
16. Solve the equation for x: $2^{x+1} = 4^{x-3}$

OR

Simplify: $\sqrt[12]{(x^4)^{\frac{1}{3}}}$.

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

There is a Diwali celebration in the DPS school Janakpuri New Delhi. Girls are asked to prepare Rangoli in a triangular shape. They made a rangoli in the shape of triangle ABC. Dimensions of $\triangle$ABC are 26 cm, 28 cm, 25 cm.



i. In fig, R is mid-point of AB and RQ || BC then AQ is equal to
   a. BC
   b. RB
   c. QC
   d. AD

ii. In fig R and Q are mid-points of AB and AC respectively. The length of RQ is:
   a. 14
   b. 13
   c. 12.5

d. 13.5

iii. If Garland is to be placed along the side of $\triangle$QPR which is formed by joining midpoint, what is the length of garland

a. 79 cm

b. 39.5 cm

c. 35 cm

d. 79.5 cm

iv. In the following figure R, P and Q are the mid-points of AB, BC, and AC respectively. Which of the following is the area of ΔPQR?

a. $\frac{1}{2}$ ar(ABC)

b. $\frac{1}{3}$ ar(ABC)

c. $\frac{1}{4}$ ar(ABC)

d. $\frac{1}{6}$ ar(ABC)

v. R, P, Q are the mid-points of corresponding sides AB, BC, CA in ΔABC, the figure so obtained BPQR will be:

a. parallelogram

b. trapezium

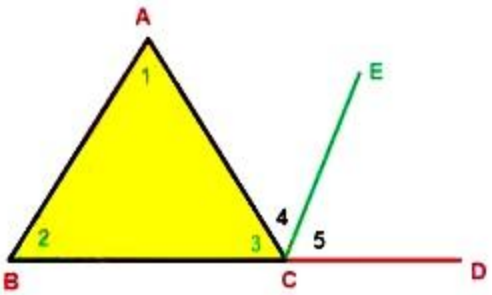
c. quadrilateral

d. none of these

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

Once the Maths teacher of class IX D told students that today we will prove that the sum of all three angles is 180°. As shown in the figure, he told to draw any triangle ABC in the notebook.

Further side BC was extended to D.



Now the teacher said to draw CE || BA.

Further angles were named 1 to 5 as shown in the figure.

Now answer the following questions:

i. BA||CE and AC is the transverse line, So $\angle$ 1 is equal to which angle?

a. $\angle 2$
b. $\angle 3$
c. $\angle 4$
d. $\angle 5$

ii. $\angle 2$ is equal to which angle?
a. $\angle 2$
b. $\angle 3$
c. $\angle 4$
d. $\angle 5$

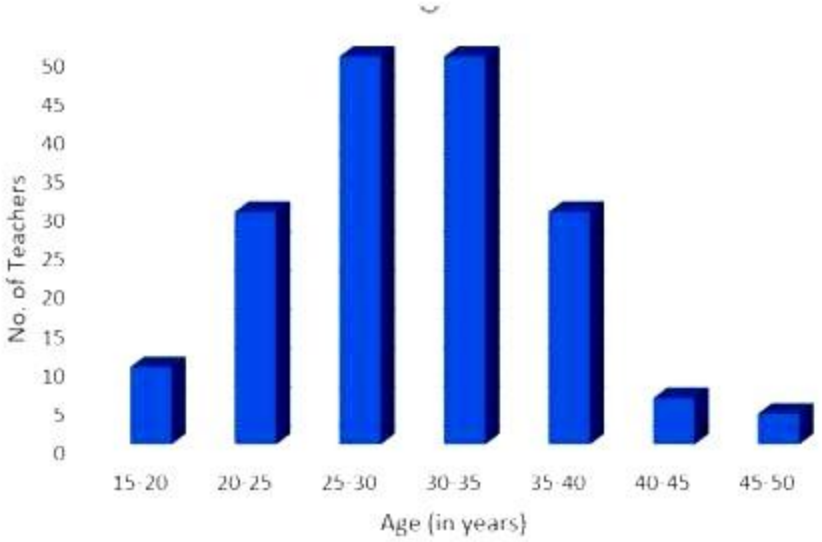
iii. What is value of $\angle 3 + \angle 4 + \angle 5$?
a. 180°
b. 120°
c. 200°
d. 360°

iv. What is value of $\angle ECD = \angle 4 + \angle 5$?
a. $\angle 3 + \angle 5$
b. $\angle 1 + \angle 2$
c. $\angle 2 + \angle 3$
d. $\angle 3 + \angle 4$

v. What is value of $\angle 1 + \angle 2 + \angle 3$?
a. $\angle 3 + \angle 4 + \angle 5 = 180°$
b. 360°
c. $\angle 3 + \angle 4 = 100°$
d. 280°

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

A teacher is a person whose professional activity involves planning, organizing, and conducting group activities to develop students' knowledge, skills, and attitudes as stipulated by educational programs. Teachers may work with students as a whole class, in small groups or one-to-one, inside or outside regular classrooms. In this indicator, teachers are compared by their average age and work experience measured in years. For the same in 2015, the following distribution of ages (in years) of primary school teachers in a district was collected to evaluate the teacher on the above-mentioned criterion.



i. Write the lower limit of the first-class interval.
   a. 15
   b. 20
   c. 17.5
   d. 5

ii. Determine the class limits of the fourth class interval.
   a. 25 - 30
   b. 30 - 35
   c. 40 - 45
   d. 45 - 50

iii. Find the class mark of class 45 – 50.
   a. 45.5
   b. 47.5
   c. 54.5
   d. 55.5

iv. Determine the class size.
   a. 4
   b. 5.5
   c. 5
   d. 6

v. Facts or figures collected with a definite purpose are called _____
   a. Data
   b. Sample

c. Information

d. statistics

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

In Agra in a grinding mill, there were installed 5 types of mills. These mills used steel balls of radius 5 mm, 7 mm,10 mm, 14 mm and 16 mm respectively. All the balls were in the spherical shape.

For repairing purpose mills need 10 balls of 7 mm radius and 20 balls of 3.5 mm radius. The workshop was having 20000 mm^3 steel.

This 20000 mm^3 steel was melted and 10 balls of 7 mm radius and 20 balls of 3.5 mm radius were made and the remaining steel was stored for future use.

Answer the following questions:

i. What was the volume of 10 balls of radius 7 mm?

a. 14373.3 mm^3

b. 14000 mm^3

c. 7000 mm^3

d. 20000 mm^3

ii. What was the volume of 20 balls of radius 3.5 mm ?

a. 2000 mm^3

b. 1800 mm^3

c. 1796.6 mm^3

d. 3593.3 mm^3

iii. How much steel was kept for future use ?

a. 1250 mm^3

b. 2033.3 mm^3

c. 1300 mm^3

d. 2200 mm^3

iv. What was the surface area of one ball of 7 mm radius ?

a. 600 mm^2

b. 616 mm²

c. 308 mm²

d. 400 mm²

v. What was the surface area of one ball of 3.5 mm radius ?

a. 600 mm²

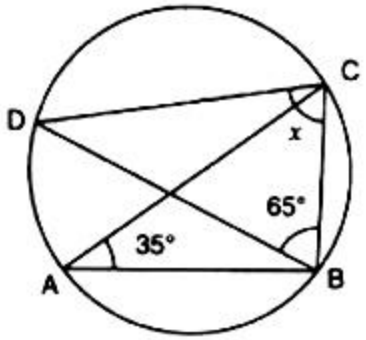
b. 616 mm²

c. 308 mm²

d. 154 mm²

Part - B

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



22. Write the decimal form : $\frac{11}{24}$

OR

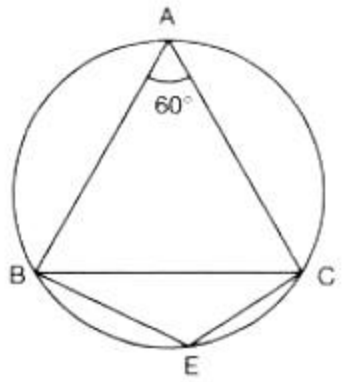
Simplify: $\sqrt{45} - 3\sqrt{20} + 4\sqrt{5}$

23. Classify as linear, quadratic and cubic polynomial: $y^3 - y$
24. A cone, a hemisphere and a cylinder stand on equal bases and have the same height. Find the ratio of their volume.
25. Find the area of an isosceles triangle, the measure of one of Its equal side being b and the third side a.

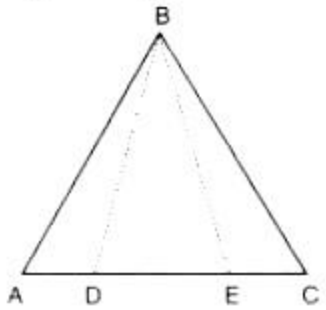
OR

Find the area of equilateral triangle whose side is 12 cm using Heron's formula.

26. In Fig., $\triangle$ABC is an equilateral triangle. Find $\angle$BEC.



27. In Fig., it is given that AB = BC and AD = EC. Prove that



i. $\Delta ABE \cong \Delta CBD$

ii. BD = BE

28. Construct a triangle ABC in which BC = 8 cm, $\angle B = 45°$ and AB – AC = 3.5 cm.

OR

Construct the angle of the measurements $22\frac{1}{2}°$

29. Plot the following points and check whether they are collinear or not: (1, 1), (2, -3), (-1, -2)

30. If $x^2 + \frac{1}{x^2} = 98$, find the value of $x^3 + \frac{1}{x^3}$.

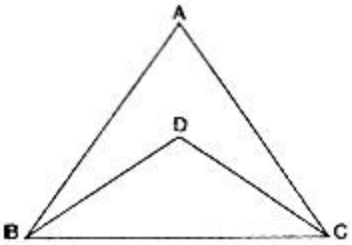
OR

Factorise :$2y^3 + y^2 - 2y - 1$

31. Find the cost of leveling the ground in the form of equilateral triangle whose side is 12 m at Find the cost of leveling the ground at the rate of Rs 5 per square meter.

32. Solve the following equations for x: $5^{2x+1} = 6.5^x - 1$

33. In figure, ABC and DBC are two triangles on the same base BC such that AB = AC and DB = DC. Prove that $\angle ABD = \angle ACD$.



34. Draw graphs of the equations:

$3x - 2y = 4$ and $x + y - 3 = 0$

in the same graph and find the coordinates of the point where two lines intersect.

OR

If the cost of a pen and a pencil be "x" and "y" respectively. A girl pays Rs.16 for buying 2 pens and 3 pencils. Write the given data in the form of a linear equation in two variables. Also represent the same graphically.

35. Two dice are thrown simultaneously 500 times. Each time the sum of two numbers appearing on their tops is noted and recorded as given in the following table:

Sum	Frequency
2	14
3	30
4	42
5	55
6	72
7	75
8	70
9	53
10	46
11	28
12	15

If the dice are thrown once more, what is the probability of getting a sum

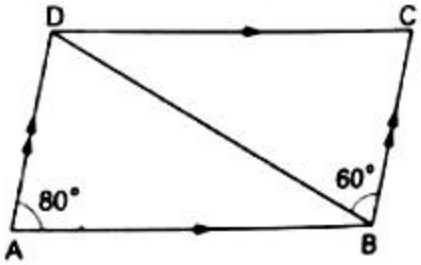
i. 3?

ii. more than 10?

iii. less than or equal to 5?

iv. between 8 and 12?

36. In the adjoining figure, ABCD is a parallelogram in which $\angle DAB = 80^o$ and $\angle DBC = 60^o$. Calculate $\angle CDB$ and $\angle ADB$.



CBSE Class 09 Mathematics

Sample Paper 05 (2020-21)

Solution

Part - A

1. $125^{\frac{1}{3}}$

   It can be written as

   $= (5^3)^{\frac{1}{3}}$

   $= 5^{3\times\frac{1}{3}}$

   So we get

   $= 5^1$

   = 5.

   OR

   It is given that,

   $\frac{\sqrt{2}+\sqrt{5}}{\sqrt{3}} = \frac{(\sqrt{2}+\sqrt{5})}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ (rationalising given expression by $\sqrt{3}$)

   $= \frac{\sqrt{2}\times\sqrt{3}+\sqrt{5}\times\sqrt{3}}{(\sqrt{3})^2}$

   $= \frac{\sqrt{6}+\sqrt{15}}{3}$

   $\therefore \frac{\sqrt{2}+\sqrt{5}}{\sqrt{3}} = \frac{\sqrt{6}+\sqrt{15}}{3}$

2. $P\left(-\frac{1}{\sqrt{3}}\right) = 3\left(-\frac{1}{\sqrt{3}}\right)^2 - 1 = 3(\frac{1}{3}) - 1 = 1 - 1 = 0$

   $p\left(\frac{2}{3}\right) = 3\left(\frac{2}{3}\right)^2 - 1 = 3\left(\frac{4}{9}\right) - 1 = \frac{4}{3} - 1 = \frac{1}{3} \neq 0$

   $\therefore -\frac{1}{\sqrt{3}}$ is a zero of p(x) but $\frac{2}{3}$ is not a zero of p(x).

3. We have Total number of tosses = 400

   Number of times 2 heads appear = 112

   Number of times 1 head appears = 160

   Number of times 0 head appears = 128

   In a random toss of two coins, let E be the events of getting 0 head.

   Therefore we have,

   P(getting 0 head)

$= P(E) = \frac{\text{Number of times 0 head appears}}{\text{Total number of trials}} = \frac{128}{400} = 0.32$

4. Given: In triangle ABC, BC = 6 cm, AB = 6 cm and median AD = 4 cm.

   Required: To construct the triangle ABC.

   Steps of construction :

   i. Draw a line segment BC = 6 cm.

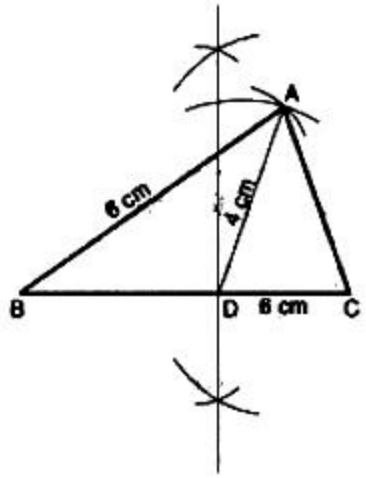
   ii. Draw the perpendicular bisector of BC which intersects BC at some point name it D. D is the mid-point of BC.

   iii. With D as centre and radius 4 cm, Draw an arc.

   iv. With B as centre and radius 6 cm, draw another arc intersecting the above arc at a point A.

   v. Join AB and AC.

   ABC is the required triangle.



5. If a, b, c are the sides of a triangle and s is the semi-perimeter, then its area is given by

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

   Here, a = 13, b = 14 and c = 15

   $\therefore s = \frac{1}{2}(a + b + c) = \frac{1}{2}(13 + 14 + 15) = 21$ cm

   $\Rightarrow A = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{21 \times (21-13) \times (21-14) \times (21-15)}$

   $\Rightarrow A = \sqrt{21 \times 8 \times 7 \times 6} = 84 \text{ cm}^2$

OR

We have

Base = 24 cm

Height = 14.5 cm

Now,

Area of triangle $= \frac{1}{2} \times$ Base $\times$ Height

Area of triangle $= \frac{1}{2} \times 24 \times 14.5$

Area of triangle = 174 cm^2

6. Points of the type (-, -) lie in the 3rd quadrant. Hence, the point (-1, -2) lies in 3rd quadrant.
7. We have ,

$$(\sqrt[3]{8})^{\frac{-1}{2}} = \left(8^{\frac{1}{3}}\right)^{\frac{-1}{2}} = \left\{(2^3)^{\frac{1}{3}}\right\}^{\frac{-1}{2}} = \left\{2^{3\times\frac{1}{3}\times\frac{-1}{2}}\right\}$$

$$= 2^{\frac{-1}{2}} = \frac{1}{2^{\frac{1}{2}}} = \left(\frac{1}{2}\right)^{\frac{1}{2}} = \left(\frac{2}{2^2}\right)^{\frac{1}{2}}$$

OR

Product $= 3\sqrt{8} \times 3\sqrt{2} = (3 \times 3)(\sqrt{16}) = 9 \times 4 = 36$

8. Given equation is 5x - 4y = 20

   Substituting x = 4 and y = 0 in

   L.H.S. of given equation, we get

   L.H.S. = 5x - 4y

   = 5(4) - 4(0) = 20 - 0

   = 20 = R.H.S.

   Hence, (4, 0) is the solution of the given equation
9. Given, diameter of the sphere = 30 cm

   $\therefore$ Radius of the sphere = $\frac{30}{2}$ = 15 cm

   Now, surface area of the sphere = $4\pi r^2$

   = $4 \times \frac{22}{7} \times (15)^2 = 4 \times \frac{22}{7} \times 15 \times 15 = 2828.57$ cm^2

OR

Amount of water displaced by a solid spherical ball = Volume of solid spherical ball.

Volume of spherical ball $= \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times (2.1)^3$

$= \frac{88}{21} \times \frac{21}{10} \times \frac{21}{10} \times \frac{21}{10} = 38.808 cm^3$

Hence, the amount of water displaced by solid spherical ball when it completely

immersed in water = 38.808 cm^3

10. We have,

    $x^4 + 4$

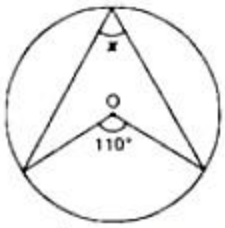
    $= (x^4 + 4x^2 + 4) - 4x^2$

    $= (x^2 + 2)^2 - (2x)^2 = (x^2 + 2 - 2x)(x^2 + 2 + 2x) = (x^2 - 2x + 2)(x^2 + 2x + 2)$

11. $x + y = 6$

12. $\frac{1}{\sqrt{5}} x^{1/2} + 1$

    The given expression contains a term containing $x^{1/2}$, where ½ is not a non-negative integer. Therefore, it is not a polynomial.

13. 

    $x = \frac{1}{2} \times 110° = 55°$

    [$\because$ Angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point of the remaining part of the circle.]

14. We have $\pi x + y = 6 \Rightarrow \pi x + y - 6 = 0$

    This is of the form $ax + by + c = 0$, where $a = \pi$, $b = 1$ and $c = -6$

15. We have,

    $4x = 5y$

    $\Rightarrow 4x - 5y = 0$

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

    $a = 4$, $b = -5$ and $c = 0$

16. We have.

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

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

    $\Rightarrow 2^{x+1} = 2^{2x-6}$

    Comparing powers

    $\Rightarrow x + 1 = 2x - 6$

    $\Rightarrow x - 2x = -6 - 1$

    $\Rightarrow -x = -7$

$\Rightarrow$ x = 7

OR

$$\sqrt[12]{(x^4)^{\frac{1}{3}}} = \left[(x^4)^{\frac{1}{3}}\right]^{\frac{1}{12}} = x^{4\times\frac{1}{3}\times\frac{1}{12}} = x^{\frac{1}{9}}.$$

17. i. (c) QC
    ii. (a) 14
    iii. (b) 39.5
    iv. (c) $\frac{1}{4}$ ar(ABC)
    v. (a) parallelogram
18. i. (c) $\angle 4$
    ii. (d) $\angle 5$
    iii. (a) 180°
    iv. (b) $\angle 1 + \angle 2$
    v. (a) $\angle 3 + \angle 4 + \angle 5 = 180°$
19. i. (a) 15
    ii. (b) 30 - 35
    iii. (b) 47.5
    iv. (c) 5
    v. (a) Data
20. i. (a) 14373.3 mm^3
    ii. (c) 3593.3 mm^3
    iii. (b) 2033.3 mm^3
    iv. (a) 24 mm^2
    v. (c) 8 mm^2

Part - B

21. We have, $\angle BAC = 35°$

    $\angle BDC = \angle BAC = 35°$ ... (Angle in same segment)

    In triangle BCD, by angle sum property

    $\angle BDC + \angle BCD + \angle DBC = 180°$

    $35° + x + 65° = 180°$

    $x = 80°$.

22. By actual division method we get:

$$
\begin{array}{r}
0.45833.. \\
24\overline{)\,11.00} \\
\underline{96} \\
140 \\
\underline{120} \\
200 \\
\underline{192} \\
80 \\
\underline{72} \\
80
\end{array}
$$

Thus $\frac{11}{24}$ = 0.45833...

OR

$\sqrt{45} - 3\sqrt{20} + 4\sqrt{5} = \sqrt{9 \times 5} - 3\sqrt{4 \times 5} + 4\sqrt{5}$
$= 3\sqrt{5} - 3 \times 2\sqrt{5} + 4\sqrt{5} = (3 - 6 + 4)\sqrt{5} = \sqrt{5}$

23. Polynomial y^3 - y is a cubic polynomial, since maximum exponent of y is 3.

24. V_1 (volume of cone) = $\frac{1}{3}\pi r^2 r$

V_2 (volume of hemisphere) = $\frac{2}{3}\pi r^3$

V_3 (volume of cylinder) = $\pi r^2 \cdot r$

$V_1 : V_2 : V_3 = \frac{1}{3}\pi r^3 : \frac{2}{3}\pi r^3 : \pi r^3 = \frac{1}{3} : \frac{2}{3} : 1$

$V_1 : V_2 : V_3 = 1 : 2 : 3.$

25. for isosceles triangle two of it`s are same,so sides are a, b, b

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

$\therefore$ Area of triangle = $\sqrt{\frac{a+2b}{2} \times \left(\frac{a+2b}{2} - a\right)\left(\frac{a+2b}{2} - b\right)\left(\frac{a+2b}{2} - b\right)}$ units

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

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

OR

in equilateral triangle,all sides are equal.let`s sides are a=12

S = $\frac{12+12+12}{2}$ cm

= $\frac{36}{2}$ cm = 18 cm

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

$= \sqrt{18\,(18-12)\,(18-12)\,(18-12)}$

$= \sqrt{18 \times 6 \times 6 \times 6}$

$= 36\sqrt{3}$ sq cm

26. Since, $\triangle$ABC is and equilateral triangle.

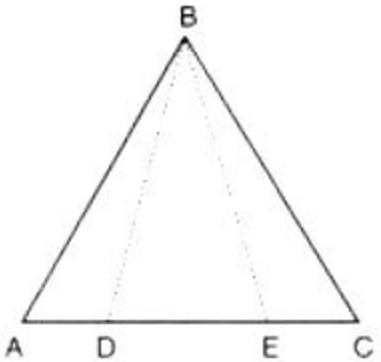
Then, $\angle BAC = 60^o$

$\therefore$, $\angle BAC + \angle BEC = 180^o$ [Opposite angles of a cyclic quad.]

$\Rightarrow 60^o + \angle BEC = 180^o$

$\Rightarrow m\angle BEC = 180^o - 60^o = 120^o$

27.



Given: In Fig. AB = BC and AD = EC.

i. In $\triangle$ABC, we have

BA = BC (given)

$\Rightarrow \angle BCA = \angle BAC$.....(i) [$\because$ Angles opp. to equal sides are equal]

AD = EC (given)

$\Rightarrow$ AD + DE = DE + EC [Adding DE on both sides]

$\Rightarrow$ AE = CD ...(ii)

Thus, In $\triangle$ABE and $\triangle$CBD, we have

AB = BC [Given]

$\angle BAE = \angle BCD$ [From (i)]

and, AE = CD [From (ii)]

$\triangle ABE \cong \triangle CBD$ [By SAS criterion of congruence]

Hence Proved.

ii. As $\triangle ABE \cong \triangle CBD$

$\Rightarrow$ BE = BD [CPCT]

Hence Proved.

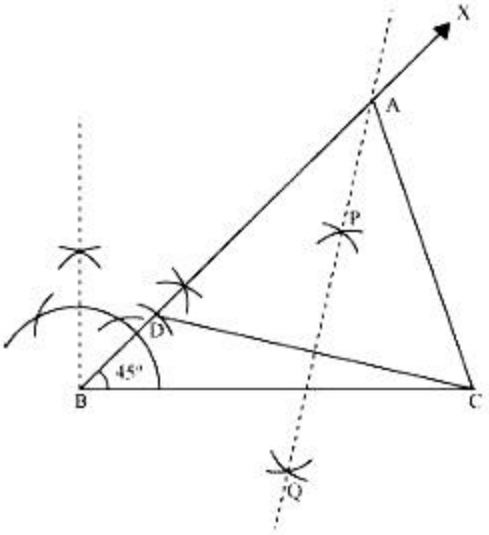
28. The below given steps will be followed to draw the required triangle.

Step I: Draw the line segment BC = 8 cm and at point B, make an angle of 45°, say ∠XBC.

Step II: Cut the line segment BD = 3.5 cm (equal to AB − AC) on ray BX.

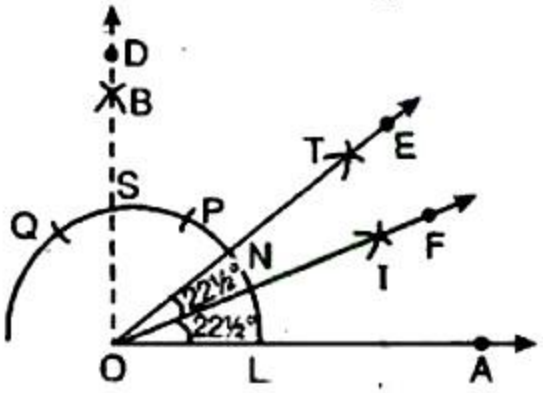
Step III: Join DC and draw the perpendicular bisector PQ of DC.

Step IV: Let it intersect BX at point A. Join AC. △ABC is the required triangle.



OR

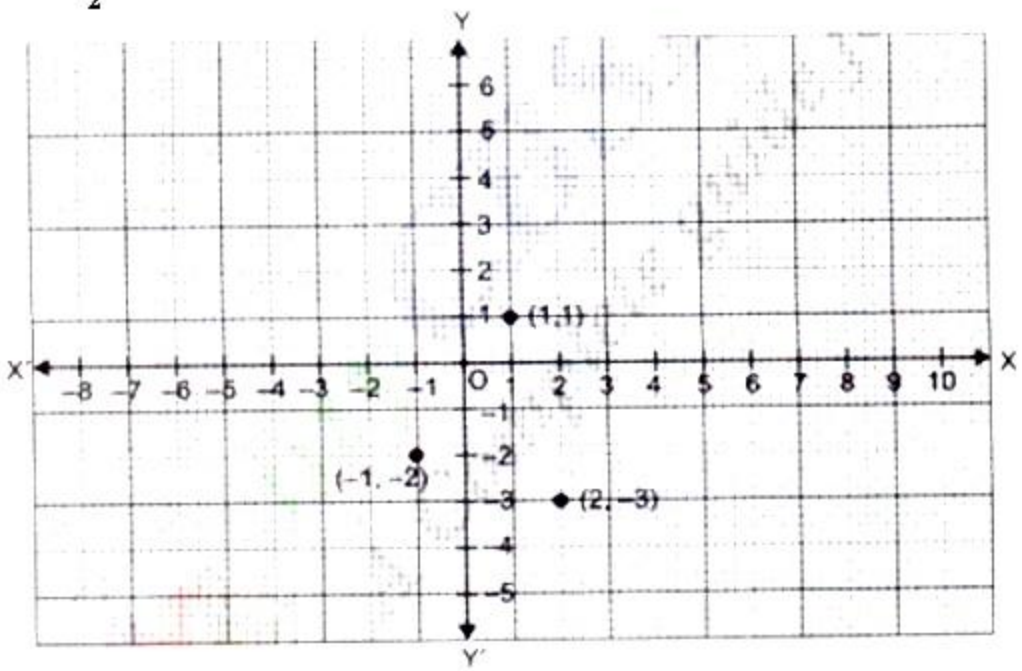
Steps of construction: $22\frac{1}{2}°$



1. Draw a ray OA.
2. With O as centre and convenient radius, draw an arc LM cutting OA at L.
3. Now with L as centre and radius OL, draw an arc cutting the arc LM at P.
4. Then taking P as centre and radius OL, draw an arc cutting arc PM at the point Q.
5. Join OP to draw the ray OB. Also join O and Q to draw the OC. We observe that: ∠AOB = ∠BOC = $60°$
6. Now we have to bisect ∠BOC. For this, with P as centre and radius greater than $\frac{1}{2}$ PQ draw an arc.

7. Now with Q as centre and the same radius as in step (f), draw another arc cutting the arc drawn in step 6 at R.
8. Join O and R and draw ray OD. Then $\angle AOD$ is the required angle of 90°.
9. With L as centre and radius greater than $\frac{1}{2}$ LS, draw an arc.
10. Now with S as centre and the same radius as in step 2, draw another arc cutting the arc draw in step (i) at T.
11. Join O and T and draw ray OE. Thus OE bisects $\angle AOD$ and therefore $\angle AOE = \angle DOE = 45^{\circ}$
12. Let ray OE intersect the arc of circle at N.
13. Now with L as centre and radius greater than $\frac{1}{2}$ LN, draw an arc.
14. With N as centre and same radius as in above step and draw another arc cutting arc drawn in above step at I.
15. Join O and I and draw ray OF. Thus OF bisects $\angle AOE$ and therefore $\angle AOF = \angle EOF = 22\frac{1}{2}^{\circ}$

29.



From the graph, we find that all the three points do not lie on the same straight line.
Hence, the given points are not collinear.

30. We know that,

$(x + \frac{1}{x})^3 = x^3 + \frac{1}{x^3} + 3 \times x \times \frac{1}{x}(x + \frac{1}{x})$

$\Rightarrow (x + \frac{1}{x})^3 = x^3 + \frac{1}{x^3} + 3(x + \frac{1}{x})$ ....(i)

Now,

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

$\Rightarrow (x + \frac{1}{x})^2 = 98 + 2$ [$\because x^2 + \frac{1}{x^2} = 98$]

$\Rightarrow (x + \frac{1}{x})^2 = 100$

$\Rightarrow (x + \frac{1}{x})^2 = (10)^2$

$\Rightarrow (x + \frac{1}{x}) = 10$ ....(ii)

Using equation (i) and equation (ii) we get,

$(10)^3 = x^3 + \frac{1}{x^3} + 3 \times 10$

$\Rightarrow 1000 = x^3 + \frac{1}{x^3} + 30$

$\Rightarrow x^3 + \frac{1}{x^3} = 1000 - 30$

$\Rightarrow x^3 + \frac{1}{x^3} = 970$

OR

Let $p(y) = 2y^3 + y^2 - 2y - 1$

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

$= 0$

$\therefore$ By Factor Theorem, $(y - 1)$ is a factor of $p(y)$.

$2y^3 + y^2 - 2y - 1$

$= 2y^2(y - 1) + 3y(y - 1) + 1(y - 1)$

$= (y - 1)(2y^2 + 3y + 1) = (y - 1)(2y^2 + 2y + y + 1)$

$= (y - 1)\{2y(y + 1) + 1(y + 1)\} = (y - 1)(y + 1)(2y + 1)$

31. Here, sides are 12 m, 12 m, 12 m,

$\therefore S = \frac{12+12+12}{2}$

$= 18$ cm

And,

$\therefore$ Area of equilateral triangle $= \sqrt{s\,(s-a)\,(s-b)\,(s-c)}$ sq m

$= \sqrt{18\,(18-12)\,(18-12)\,(18-12)}$ sq m

$= \sqrt{18 \times 6 \times 6 \times 6}$ sq m

$= \sqrt{6 \times 3 \times 6 \times 6 \times 6}$ sq m

$= 36\sqrt{3}$ sq m

$\therefore$ Cost of leveling ground = ₹$(5 \times 36 \times 1.73)$

= ₹311.4

32. We have,

$5^{2x+1} = 6(5^x) - 1$

$\Rightarrow 5(5^{2x}) = 6\,(5^x) - 1$

$\Rightarrow 5(5^x)^2 - 6(5^x) + 1 = 0$

$\Rightarrow 5y^2 - 6y + 1 = 0$, where $y = 5^x$

$\Rightarrow 5y^2 - 5y - y + 1 = 0$

$\Rightarrow 5y(y - 1) - (y - 1) = 0$

$\Rightarrow (5y - 1)(y - 1) = 0$

$\Rightarrow 5y - 1 = 0$ or $y - 1 = 0$

$\Rightarrow y = \frac{1}{5}$ or $y = 1$

$\Rightarrow 5^x = 5^{-1}$ or $5^x = 5^0$

$\Rightarrow x = -1$ or $x = 0$

33. In ABC,

AB = AC . . . [Given]

$\angle ACB = \angle ABC$ . . . [$\angle$s opposite to equal side of a $\triangle$ ABC] .....(1)

In $\triangle$ DBC,

DB = DC

$\therefore \angle DCB = \angle DBC$ . . . [$\angle$s opposite to equal side of a $\triangle$ DBC] ..... (2)

$\angle ACB - \angle DCB = \angle ABC - \angle DBC$ . . . [Subtracting (2) from (1)]

$\therefore \angle ACD = \angle ABD$

$\therefore \angle ABD = \angle ACD$.

34. Graph of the equation 3x - 2y = 4

We have, $3x - 2y = 4 \Rightarrow y = \frac{3x-4}{2}$

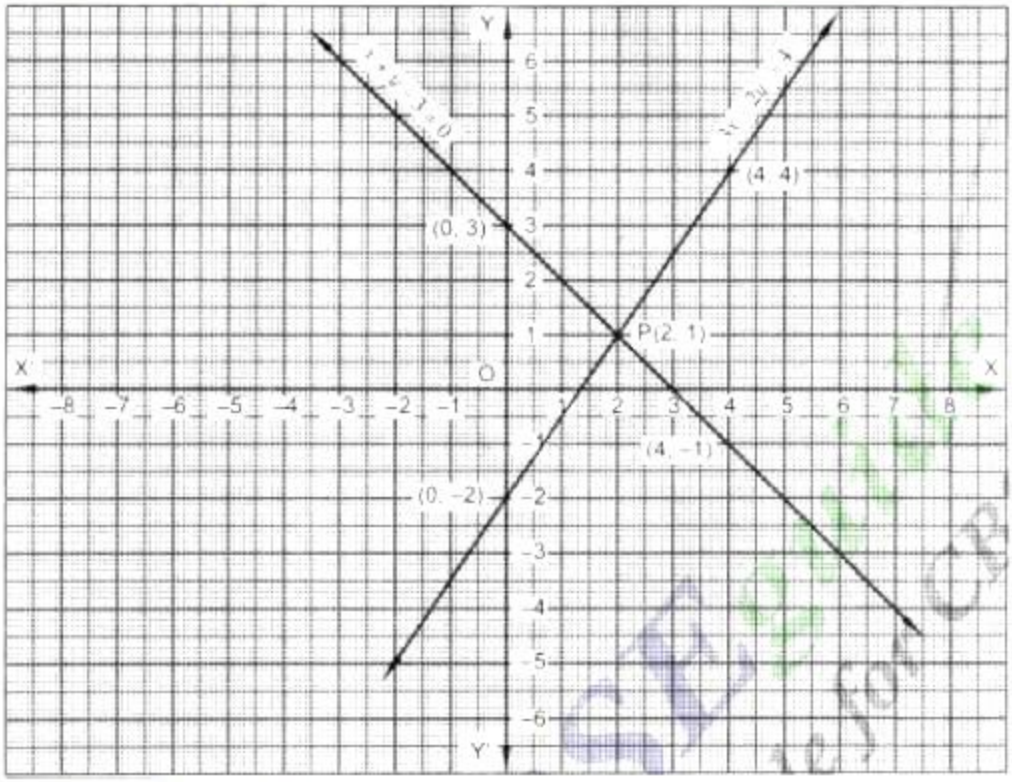
Now,

$x = 0 \Rightarrow y = \frac{0-4}{2} = -2$ and $x = 4 \Rightarrow y = \frac{12-4}{2} = 4$

Thus, the abscissae and ordinates of two points on the line represented by the equation 3x - 2y = 4 are as given in the following table:

x	0	4
y	-2	4

By plotting the points (0, - 2) and (4, 4) on the graph paper and drawing a line passing through these points, we obtain the graph of the equation 3x - 2y = 4.



Graph of the equation: x + y - 3 = 0

We have,

x + y - 3 = 0 ⇒ y = 3 - x

Now,

x = 0 ⇒ y = 3 and, x = 4 ⇒ y = -1

Thus, the abscissa and ordinates of two points on the line represented by the given equation are as shown in the following table:

x	0	4
y	3	-1

By plotting the points (0, 3) and (4, - 1) and joining them by a line, we obtain graph of the equation x + y - 3 = 0

Clearly, lines represented by the equations 3x - 2y = 4 and x + y - 3 = 0 intersect at point P whose coordinates are (2,1).

OR

Let the cost of a pen = Rs.x and cost of a pencil = Rs. y

According to the given condition,

2x + 3y = 16

$\Rightarrow x = \frac{16-3y}{2}$ or 3y = - 2x + 16

	P	Q	R
x	5	2	8
y	2	4	0

Let y = 2, put in equation (i)

$x = \frac{16-3(2)}{2} = \frac{16-6}{2} = \frac{10}{2} = 5$

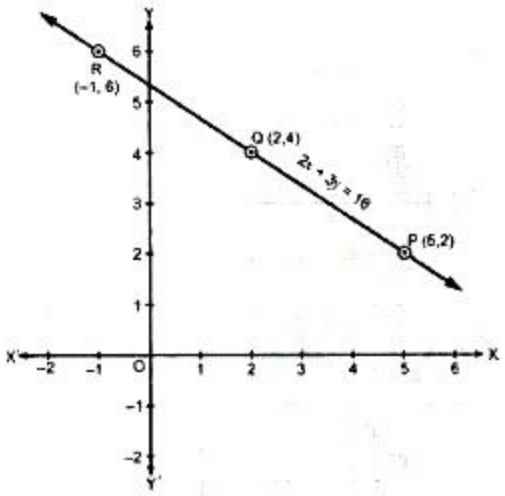
Let y = 4, put in equation (i)

$x = = \frac{16-3(4)}{2} = \frac{16-12}{2} = \frac{4}{2} = 2$

Let y = 0, put in equation (i)

2x = 16 - 3(0) = 16 - 0

2x= 16 = x =8



the above fig. represents the equation 2x + 3y = 16

35. i. Let E be the event that sum of two numbers appearing on the uppermost faces of two dice be 3. Number of times in which the event happened is 30

$= \frac{30}{500} - \frac{3}{50} = 0.06$

ii. Let E be the event that sum of two numbers appearing on the uppermost face of two dice be more than 10 sum 11 or 12.number of times in which the event happened = 28+ 15 =43, Therefore we have, $\frac{43}{500}$ = 0.086

iii. Let E be the event that sum of two numbers appearing on the uppermost face of two

dice be less than or equal to 5.

Number of times in which the event happened = 14 + 30 + 42 + 55 = 141

$= \frac{141}{500} = 0.282$

iv. Let E the event that sum of two numbers appearing on the uppermost face of two dice be between 8 and 12

Number of times in which the event happend = 53 + 46 + 28 =127,

Therefore we have ,$= \frac{127}{500} = 0.254$

36. It is given that ABCD is parallelogram and $\angle DAB = 80^o$ and $\angle DBC = 60^o$

We need to find measure of $\angle CDB$ and $\angle ADB$

In ABCD, AD || BC, BD as transversal,

$\angle DBC = \angle ADB = 60^o$ ... Alternate interior angles

$\Rightarrow \angle ADB = 60^o$ .....(i)

As $\angle DAB$ and $\angle ADC$ are adjacent angles,

$\angle DAB + \angle ADC = 180^o$

$\Rightarrow \angle ADC = 180^o - \angle DAB$

$\Rightarrow \angle ADC = 180^o - 80^o = 100^o$

Also,

$\angle ADC = \angle ADB + \angle CDB$

$\therefore \angle ADC = 100^o$

$\angle ADB + \angle CDB = 100^o$ ..... (ii)

From (i) and (ii), we get:

$60^o + \angle CDB = 100^o$

$\Rightarrow \angle CDB = 100^o - 60^o = 40^o$

Hence, $\angle CDB = 40^o$ and $\angle ADB = 60^o$