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[AGRA REGION]

SESSION ENDING EXAMINATION 2018

SUBJECT : MATHEMATICS

CLASS–IX

(SOLVED PAPER)

Time : 3 Hrs. **M.M. : 80**

Instructions :

1. *All questions are compulsory.*
2. *The question paper consists of 30 questions divided into 4* ***sections-A, B, C*** *and* ***D****.*
3. ***Section-A*** *comprises of 6 question of 1 mark each,* ***Section-B*** *comprises of* ***6*** *questions of* ***2 marks*** *each.* ***Section-C*** *comprises of* ***10*** *questions of* ***3 marks*** *each,* ***Section-D*** *comprises of* ***8*** *questions of* ***4 marks*** *each.*
4. *There is no overall choice in this question paper. However, an internal choice has been provided in four question of 3 marks each and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.*
5. *Use of calculator is not permitted.*

SECTION-A

1. What is the degree of the polynomial $p(x) = 2x + \frac{3}{2}x^3 - 7$.

2. Find the value of a,for which the polynomial $2x^2 + ax + \sqrt{2}$ has 1 as its zero.

3. If a point is on negative side of x axis at distance of 5 units from origin, then find the coordinate of the point.

4. Express $x = 3y$ in the form $ax + by + c = 0$ and indicate the values of a, b and c.

5. In ΔABC, ∠A = 65° and ∠B = 30°, which side of the triangle is the longest ? Give reason for your answer.

6. Find the cured surface area of a right circular cone whose slant height is 10 cm and base radius is 7 cm.

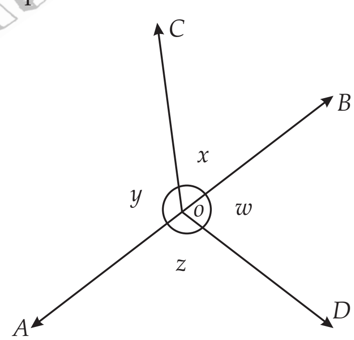
SECTION-B

7. (a) $(125)^{\frac{-1}{3}}$

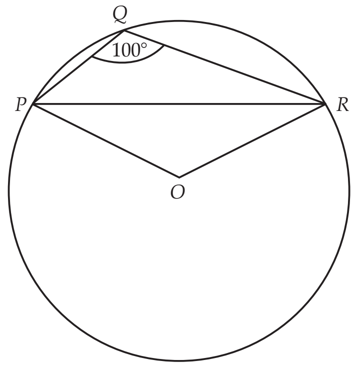
(b) $2^{\frac{1}{4}} \times 8^{\frac{1}{4}}$

8. In a conversation, Anand said his savings of the month is same as that of Raju, Pankaj replied he also saves as much his monthly savings of Anand and Pankaj ? Write the Euclid's axiom for this situation.

9. In the given fig. If $x + y = w + z$, then prove that AOB is line



10. In the fig., ∠PQR = 100°, where P, Q and R are points on the circle with centre O. Find ∠OPR.



11. If a wooden box of dimensions 8m × 7m × 6m is to carry boxes of dimensions 8 Cm × 7 Cm × 6 Cm, then find the maximum number of boxes that can be carried in the wooden box.

12. Eleven bags of wheat flour, each marked 5-kg actually contained the following weights of flour (in kg).

4·97, 5·05, 5·08, 5·03, 5·00, 5·06, 5·08, 4·98, 5·04, 5·07, 5·00

Find the probability that any one of these bags chosen at random contains

(a) More than 5 kg.

(b) Equal to 5 kg.

SECTION-D

13. Write $0\cdot2\overline{35}$ in the form of p/q, q ≠ 0, p and q are integers.

14. Locate $\sqrt{3}$ on the number line.

15. Factorize $2x^2 + 3\sqrt{5}\,x + 5$.

OR

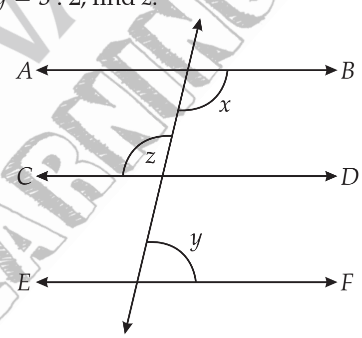
Factorize $x^3 - 2x^2 - x + 2$

16. Draw the graph of the linear equation

$$x + y = 7$$

At what points, does the graph cut the x axis and the y axis.

17. In fig., if AB || CD, CD || EF and $x : y = 3 : 2$, find z.

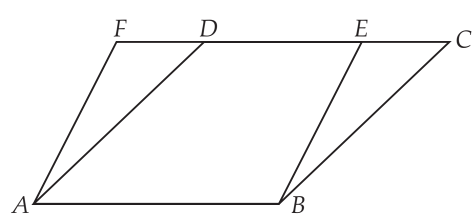


18. In fig., ABCD and ABEF are parallelograms. The area of the Parallelogram ABCD is 90 sq cm. Find

(a) ar (ABEF)

(b) ar (ABD)

(c) ar (BEF)



OR

Show that a median of a triangle divides it into two triangles of equal area.

19. Plot the following points and check whether these are collinear or not.

(4, –4), (3, –3), (–2, 2), (–1, 1)

20. Construct a ΔABC in which BC = 5 cm, B = 60° and AB + AC = 7·5 cm.

21. Find the area of triangular region two sides of which are 18 m and 10 m and the perimeter is 42 m.

OR

Sides of a triangle are in the ratio 12:17:25 and its perimeter is 540cm. Find its area.

22. A shot putt is a metallic sphere of radius 4·9 cm. If the density of the metal is 7·8 gm per cu cm, find the mass of the shot-putt.

OR

How many litres of milk can a hemispherical bowl of diameter 10·5cm hold ?

SECTION-D

23. In countries like USA and Canada, temperature is measured in Fahrenheit, whereas in countries like India, it measured in Celsius. Here is a linear that converts Fahrenheit to Celsius.

$$F = \frac{9}{5} C + 32$$

(a) If the temperature is 30°C, what is the temperature in Fahrenheit ?

(b) If the temperature is 95°F, what is the temperature in Celsius ?

(c) Suggest a measure to control global warming.

24. Evaluate the following using suitable identities.

(a) $(102)^3$ (b) 104 x 96

25. Prove that "The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part the circle".

OR

If the non parallel sides of a trapezium are equal, prove that it is cyclic.

26. ΔABC is an isosceles triangle in which AB = AC. Side BA is produced to D such that AD = AB. Show that $\angle BCD$ is a right angle.

27. ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse AB and parallel to BC intersect AC to D. Show that

(a) D is the midpoint of AC.

(b) $MD \perp AC$

(c) $CM = MA = \frac{1}{2} AB$

OR

Prove that the line segment joining the mid points of two sides of a triangle is parallel to the third side and is half of it.

28. Curved surface area of right circular cylinder is 4·4 sq m. If the radius of the base of the cylinder is 0·7 m. Find its height. Also, find its volume.

29. The points scored by a basketball team is a series of 16 matches are as follows :

17, 2, 7, 27, 25, 5, 14, 18, 10, 24, 48, 10, 8, 7, 10, 28.

Find the Median and Mode for the data.

OR

Find the mean salary of 60 workers of a factory from the following table.

Salary (Rs.)	No. of Workers
3000	16
4000	12
5000	10
6000	8
7000	6
8000	4
9000	3
10000	1
TOTAL	**60**

30. The table given below show the age of 80 teachers in a school.

Age (in years)	18-29	30-39	40-49	50-59
No. of Teachers	11	32	30	7

The teacher from this school is chosen at random. What is the probability that the age of the selected teachers is :

(a) 18 years or more ?

(b) Between 30-39 years (including both) ?

(c) Above 60 years ?

(d) 40 or more than 40 years ?

SOLUTIONS

SECTION-A

1. Degree of the polynomial $p(x) = 3$

2. $p(x) = 2x^2 + ax + \sqrt{2}$

1 as its zero (Given)

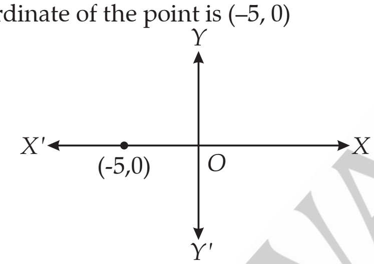
$\therefore \quad p(1) = 0$

$2(1)^2 + a(1) + \sqrt{2} = 0$

$2 + a + \sqrt{2} = 0$

$a = -\left(2+\sqrt{2}\right)$

3. Coordinate of the point is (–5, 0)



4. $x = 3y$

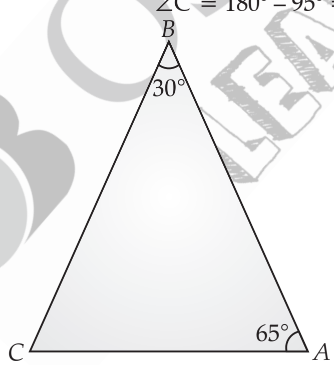
$x - 3y + 0 = 0$

$\therefore \quad a = 1, b = -3 \text{ and } c = 0$

5. $\because \quad \angle A + \angle B + \angle C = 180°$

$65° + 30° + \angle C = 180°$

$\angle C = 180° - 95° = 85°$



30° ∠65° ∠85°

∠B < ∠A < ∠C

AC ∠BC ∠AB

∴ AB is the longest side of ΔABC

6. Given : Slant height $(l) = 10$cm

base radius $(r) = 7$cm

curved surface area of cone $= \pi rl$

$= \frac{22}{7} \times 7 \times 10$

∴ Curved surface area of cone $= 220 \text{ cm}^2$

7. **(a)** $(125)^{\frac{-1}{3}}$ $\left[a^{-m} = \frac{1}{a^m}\right]$

$= \left(\frac{1}{125}\right)^{\frac{1}{3}} = \left(\frac{1}{5^3}\right)^{\frac{1}{3}}$

$= \left(\frac{1}{5}\right)^{3\times\frac{1}{3}}$ $[(a^m)^n = a^{mn}]$

$\therefore \quad (125)\frac{-1}{3} = \frac{1}{5}$

(b) $2^{\frac{1}{4}} \times 8^{\frac{1}{4}}$

$= (2\times8)^{\frac{1}{4}}$

$[a^m \times b^m = (a \times b)^m]$

$= (2^4)^{\frac{1}{4}}$

$= 2^{4\times\frac{1}{4}} = 2$

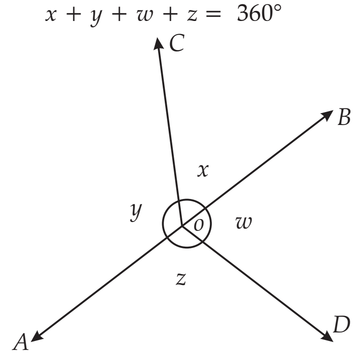
$\therefore \quad 2^{\frac{1}{4}} \times 8^{\frac{1}{4}} = 2$

8. Euclid's axiom state that things which are equal to the same thing are equal, to one another.

∴ Anand's saving = Raju saving = Pankaj's Saving

9. Given, $x + y = w + z$ ...(i)

$x + y + w + z = 360°$



[Since the sum of all the angles around a point is 360°]

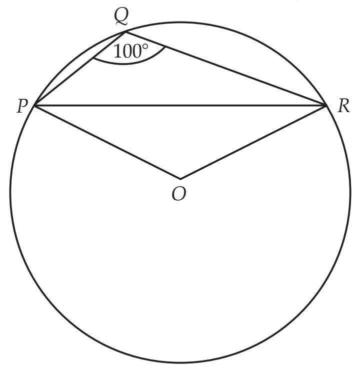
$x + y + x + y = 360°$

$$2(x + y) = 360°$$
$$x + y = 180°$$
$$\angle BOC + \angle AOC = 180°$$
$$\angle AOB = 180°$$

$\therefore$ ∠AOB is a straight line **Hence Proved.**

10. Reflex

$$\angle POR = 2\,\angle PQR$$



Reflex

$$\angle POR = 2 \times 100 = 200°$$

$\because$ ∠POR + Reflex ∠POR = 360°

$$\angle POR + 200 = 360°$$
$$\angle POR = 360 - 200 = 160°$$

ΔPOR

∠POR + ∠OPR + ∠ORP= 180°

[Sum of all agles of Δ]

$$160° + \angle OPR + \angle OPR = 180° \quad (\because\ OP = OR)$$
$$2\angle OPR = 180° - 160°$$
$$\angle OPR = \frac{20°}{2}$$

$\therefore$ $\angle OPR = 10°$

11. Volume of Wooden box = $l \times b \times h$ unit^3

$$= 8 \times 7 \times 6 \text{ m}^3$$
$$= 8 \times 7 \times 6 \times 1000000 \text{ cm}^3$$

Volume of small box = $8 \times 7 \times 6$ cm^3

Number of boxes that can be carried in the wooden box.

$$= \frac{\text{Volume of wooden box}}{\text{Volume of small box}}$$
$$= \frac{8 \times 7 \times 6 \times 1000000}{8 \times 7 \times 6}$$

$\therefore$ Number of boxes = 10,00,000

12. S = {4·97, 5·05, 5·08, 5·03, 5·00, 5·06, 5·08, 4·98, 5·04, 5·07, 5·00}

$\therefore$ n(S) = 11

(a) more than 5kg bag = {5·05, 5·08, 5·03, 5·06, 5·08, 5·04, 5·07}

$\therefore$ n(E) = 7

Probability of beg which contains more than 5kg

$$\frac{n(E)}{n(S)} = \frac{7}{11}$$

(b) Equal to 5 kg

E = {5·00, 5·00}

n(E) = 2

Probability of beg which contains 5kg

$$\frac{n(E)}{n(S)} = \frac{2}{11}$$
$$= \frac{2}{11}$$

13. $0{\cdot}2\overline{35}$

Let $x = 0{\cdot}2\overline{35}$

$x = 0{\cdot}23\ 53\ 53\ 535$ ...(i)

Multiply by 10

$10x = 2{\cdot}35\ 35\ 35\ 35$ ...(ii)

Multiply by 100

$1000x = 235{\cdot}35\ 35\ 35$ ...(iii)

$10x = 2{\cdot}35\ 35\ 35$ ...(i)

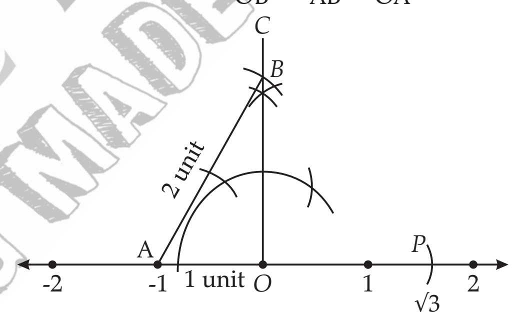
(–) (–)

$$990x = 233$$
$$x = \frac{233}{990}$$

$\therefore$ $0{\cdot}2\overline{35} = \dfrac{233}{990}$

14.

$$3 = 4 - 1$$
$$3 = (2)^2 - (1)^2$$
$$OB^2 = AB^2 - OA^2$$



Step of construction :

(i) Draw the number line

(ii) Mark the point A such that OA = 1 unit

(iii) Draw OC perpendicular on the number line.

(iv) Draw an arc taking centre A and radius 2 unit which intersect OC at the point B.

(v) Draw an arc taking centre O and radius equal to OB which intersect the number line at the point P.

(vi) Point Pis the position of the $\sqrt{3}$ on the number line.

15.

$$2x^2 + 3\sqrt{5}\ x + 5 = 2x^2 + 2\sqrt{5}\ x + \sqrt{5}\ x + 5$$
$$= 2x\left(x+\sqrt{5}\right)+\sqrt{5}\left(x+\sqrt{5}\right)$$
$$2x^2 + 3\sqrt{5}\ x + 5 = \left(x+\sqrt{5}\right)\left(2x+\sqrt{5}\right)$$

OR

$$x^3 - 2x^2 - x + 2$$
$$x^2(x-2) - 1(x-2) \qquad [\because a^2 - b^2 = (a-b)(a+b)]$$
$$(x-2)(x^2-1)$$
$$(x-2)(x-1)(x+1)$$

16. $x + y = 7$

When $x = 0$ then $y = 7$

When $y = 0$ then $x = 7$

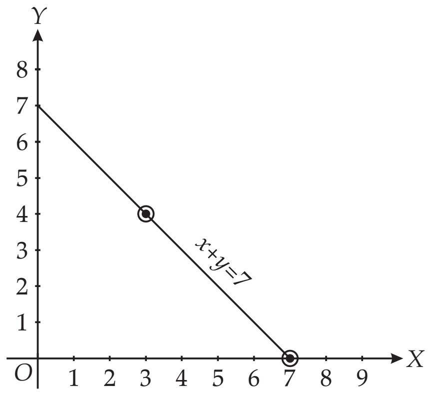
When $x = 3$ then $y = 4$

$x + y = 7$

x	0	7	3
y	7	0	4
(x, y)	(0, 7)	(7, 0)	(3, 4)

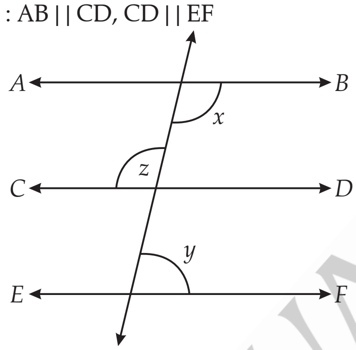
Intercept on × axis and y-axis = 7 units.

OR



On graph paper Intercept on x axis and y axis = 7 units.

17. Given : AB | | CD, CD | | EF



and $x : y = 3 : 2$

∴ AB | | CD and AB | | EF

$x : y = 3 : 2$

∴ $x = 3k$ and $y = 2k$

AB | | EF

∴ $x + y = 180°$

[Co. Int. angles of parallel lines]

$3k + 2k = 180°$

$$k = \frac{180°}{5} = 36°$$

AB | | CD

∴ $\angle x = \angle z$

[Alternative in interior angle]

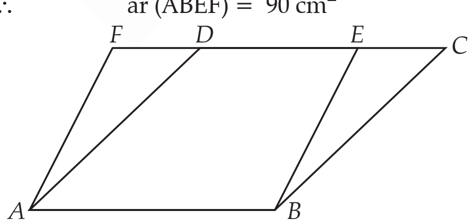
$z = 3k$

$= 3 \times 36$

∴ $z = 108°$

18. (a) ar (ABEF) = $||^{gm}$ (ABCD)

∴ ar (ABEF) = 90 cm^2



[Both parallelogram having common base (AB) and lying between two parallel lines AB and CF]

(b) ∵ ΔABD and $||^{gm}$ ABCD having common base (AB) and lying between two parallel lines AB and CD

$$\therefore \quad \text{ar } \Delta ABD = \frac{1}{2} \, ||^{gm} \text{ ABCD}$$

$$= \frac{1}{2} \times 90 = 45 \text{ cm}^2$$

(c) ∵ ΔBFE and $||^{gm}$ ABEF having common base (EF) and lying between two parallel line EF and AB

$$\therefore \quad \text{ar } \Delta BEF = \frac{1}{2} \, ||^{gm} \text{ ABEF}$$

$$= \frac{1}{2} \, ||^{gm} \text{ ABCD [from (a) part]}$$

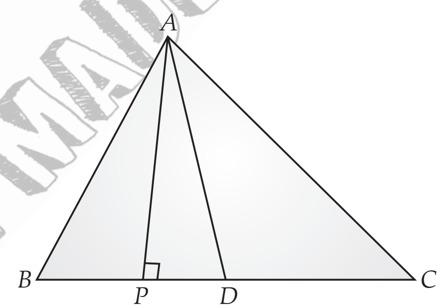
$$= \frac{1}{2} \times 90 = 45 \text{ cm}^2$$

OR

Given : In ΔABC, AD is the median of the triangle.

To prove : ar ΔABD = ar ΔADC

Construction : Draw AP ⊥ BC



Proof : ar ΔABC = $\frac{1}{2} \times BC \times AP$ ...(i)

ar ΔABD = $\frac{1}{2} \times BD \times AP$

$= \frac{1}{2} \times \frac{BC}{2} \times AP$

[AD is the median of ΔABC]

ar ΔABD = $\frac{1}{2} \times$ ar ΔABC ...(ii)

ar ΔADC = $\frac{1}{2} \times DC \times AP$

$= \frac{1}{2} \times \frac{BC}{2} \times AP$

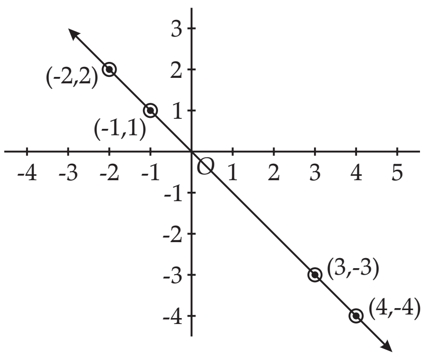
$= \frac{1}{2} \times$ ar ΔABC ...(iii)

from equation (i), (ii), and (iii)

$$\text{ar }\Delta ABD = \text{ar }\Delta ADC = \frac{1}{2}\text{ ar }\Delta ABC$$

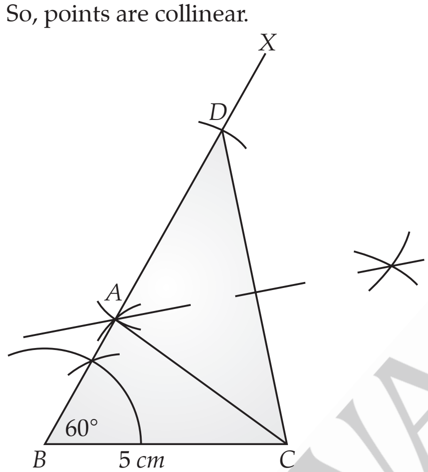
Hence Proved.

19.



So, points are collinear.

20.



Step of construction :

(i) Draw a line segment BC = 5cm

(ii) Make the ∠CBX = 60°

(iii) Draw a arc, taking Centre as B and radius is 7·5 cm which intersect BX at the point D.

(iv) Join CD

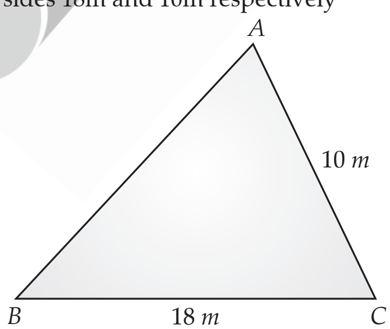
(v) Draw perpendicular bisector of CD which intersect the line segment BD at the point A.

(vi) Join AC

Hence ABC is required triangle.

21. Given : Perimeter of Δ = 42 m

Two sides 18m and 10m respectively



Perimeter of

$$\Delta ABC = a + b + c$$

$$42 = 18 + 10 + c$$

$$\therefore \quad c = 42 - 28 = 14 \text{ m}$$

$$s = \frac{a+b+c}{2} = \frac{42}{2} = 21 \text{ m}$$

$$\text{ar }\Delta ABC = \left|\sqrt{s(s-a)(s-b)(s-c)}\right|$$

$$= \left|\sqrt{21(21-18)(21-10)(21-14)}\right|$$

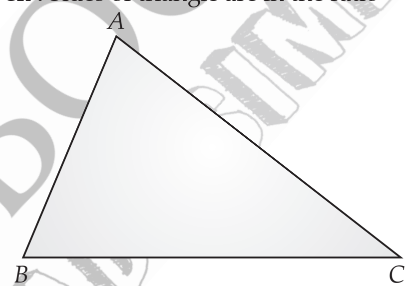
$$= \left|\sqrt{21\times3\times11\times7}\right|$$

$$\text{ar }\Delta ABC = \left|\sqrt{7\times7\times3\times3\times11}\right|$$

$$\text{ar }\Delta ABC = 21\sqrt{11}\, m^2$$

OR

Given : Sides of triangle are in the ratio = 12:17:25



∴ Sides are $12x$, $17x$ and $25x$ respectively.

$$\text{Perimeter} = 540\text{cm}$$

$$12x + 17x + 25x = 540$$

$$54x = 540$$

$$\therefore \quad x = 10$$

$$s = \frac{a+b+c}{2}$$

$$= \frac{12x+17x+25x}{2}$$

$$s = 27x$$

$$\text{ar }\Delta ABC = \left|\sqrt{s(s-a)(s-b)(s-c)}\right|$$

$$= \left|\sqrt{27x(27x-12x)(27x-17x)(27x-25x)}\right|$$

$$= \left|\sqrt{27x\times15x\times10x\times2x}\right|$$

$$= \left|\sqrt{3\times3\times3\times3\times5\times5\times2\times2\times x^4}\right|$$

$$\text{ar }\Delta ABC = 3\times3\times5\times2\times x^2$$

$$= 90x^2\text{ cm}^2$$

$$\text{ar }\Delta ABC = 90(10)^2 = 9000\text{ cm}^2$$

22. Given : Radius of metallic Sphere = 4·9 cm

and Density of the metal = 7·8 gm/cm^3

$$\text{Volume of Sphere} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3}\times\frac{22}{7}\times 4{\cdot}9\times4{\cdot}9\times4{\cdot}9$$

$$= \frac{4}{3} \times 22 \times 0{\cdot}7 \times 4{\cdot}9 \times 4{\cdot}9 \text{ cm}^3$$

$$= \frac{1479{\cdot}016}{3}$$

Mass of the shot putt Sphere = Volume × density Sphere

$$= \frac{1479{\cdot}016}{3} \times 7{\cdot}8 \text{ gm}$$

$$= 1479{\cdot}016 \times 2{\cdot}6 \text{ gm}$$

$$= 3845{\cdot}44 \text{ gm}$$

Mass of Shot Putt Sphere = 3·845 kg (Appro)

OR

Given : diameter of hemispherical bowl = 10·5 cm

Volume of hemisphere $= \frac{2}{3}\pi r^3$

$$= \frac{2}{3} \times \frac{22}{7} \times \frac{10{\cdot}5}{2} \times \frac{10{\cdot}5}{2} \times \frac{10{\cdot}5}{2}$$

$$= 5{\cdot}5 \times 0{\cdot}5 \times 10{\cdot}5 \times 10{\cdot}5 \text{ cm}^3$$

$$= 303{\cdot}18 \text{ cm}^3$$

$$= 0{\cdot}303 \text{ litre}$$

[$1000 \text{ cm}^3 = 1$ litre]

23. Given : $F = \frac{9}{5} C + 32$

(a) when $C = 30°$, $F = \frac{9}{5} \times 30 + 32$

$$F = 54 + 32$$

$$= 86°$$

(b) If F = 95°

$$F = \frac{9}{5} C + 32$$

$$95 = \frac{9}{5} C + 32$$

$$95 - 32 = 63 = \frac{9}{5} C$$

$$\therefore \quad C = \frac{63 \times 5}{9} = 35$$

$$C = 35°$$

(c) Burring of fossil fuels increases green house gasses, such as carbon dionicle, which trap heat and change the planet's climate in many ways.

24. (a) $(102)^3$

$(100 + 2)^3$

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

$(100 + 2)^3 = (100)^3 + (2)^3 + 3 \times 100 \times 2(100 + 2)$

$102^3 = 10{,}00{,}000 + 8 + 600\,(102)$

$= 10{,}00{,}000 + 8 + 61200$

$102^3 = 1061208$

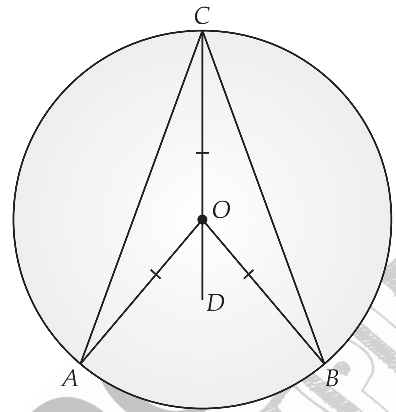
(b) $104 \times 96 = (100 + 4)(100 - 4)$

$= (100)^2 - (4)^2$

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

$104 \times 96 = 10000 - 16 = 9984$

25.



Given : An arc AB of a circle subtend ∠AOB at the centre O and ∠ACB at a point C on the remaining part of circle.

To Prove : ∠AOB = 2∠ACB

Construction : Extend CO to the point D.

AO = OC = OB

(radius of circle having centre O)

∵ AO = OC

∴ ∠ACO = ∠OAC ...(i)

[opposite angle of equal sides in ΔAOC]

∵ OB = OC

∴ ∠OBC = ∠OCB ...(ii)

[opposite angle of equal sides in ΔOBC]

∠AOD = ∠OAC + ∠ACO

[Exterior angle of ΔAOC]

∠AOD = ∠ACO + ∠ACO

[From eqn. (i)]

∠AOD = 2∠ACO ...(iii)

Similarly ∠DOB = ∠OCB + ∠OBC

∠DOB = ∠OCB + ∠OCB

[From eqn. (ii)]

∠DOB = 2∠OCB ...(iv)

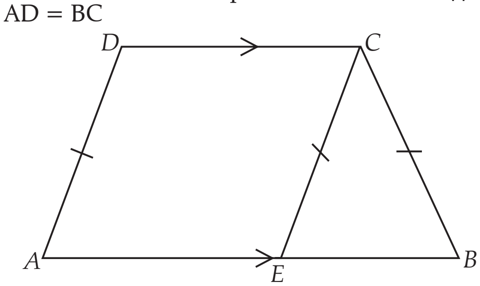
∠AOD + ∠DOB = 2(∠ACO + ∠OCB)

[From eqn. (iii) and (iv)]

∠AOB = 2∠ACB **Hence Proved.**

OR

Given : ABCD is a trapezium in which AB || CD and AD = BC



To prove : Trapezium ABCD is a cyclic Quadrilateral.

Construction : Draw CE || AD

Proof AD || CE (By Construction)

To know about more useful books for class-9 click here and $AE \,||\, CD$ (given)

$\therefore$ AECD is a parallelogram.

$\therefore$ $\angle A = \angle DCE$

[opposite angle of $||^{gm}$]

$\angle A = \angle BEC$

[Corresponding angles]

$\angle A = \angle B$[AD = BC = CE Given]

$AB \,||\, CD$

$\therefore$ $\angle B + \angle BCD = 180°$

[Cointerior angle of parallel sides]

$\angle A + \angle BCD = 180°$

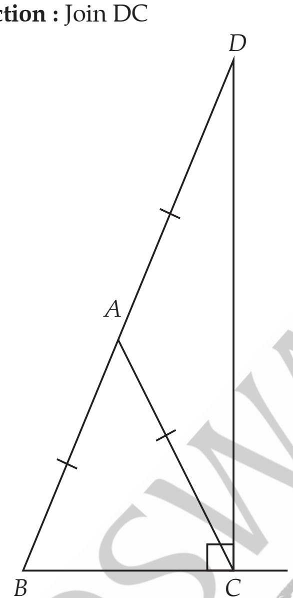
Similarly $\angle B + \angle D = 180°$

$\therefore$ ABCD is a cyclic trapezium **Hence Proved**

26. Given : In ΔABC, AB = AC and Extend AB to the point D such that BA = AD

To prove : $\angle BCD = 90°$

Construction : Join DC



Proof : In ΔABC,

$AB = AC$

$\therefore$ $\angle ABC = \angle ACB$ ...(i)

In ΔACD $AC = CD$

$\therefore$ $\angle ACD = \angle ADC$ ...(ii)

$\therefore$ $\angle BAC = \angle ACD + \angle ADC$

(Exterior angle property)

$\angle BAC = 2\angle ACD$ ...(iii)

Similarly $\angle CAD = 2\angle ACB$(from equ. (i)) ...(iv)

From equ. (iii) & (iv)

$\angle BAC + \angle CAD = 2\angle ACD + 2\angle ACB$

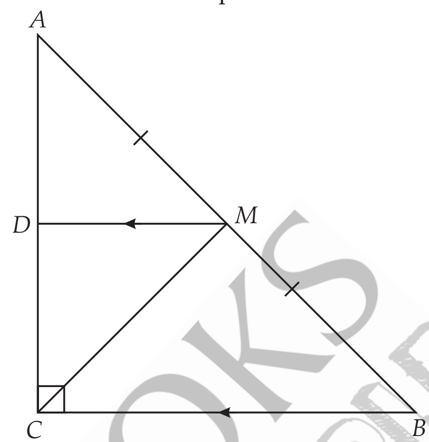
$\angle BAD = 2[\angle ACD + \angle ACB]$

$\frac{180}{2} = \angle BCD$

$\angle BCD = 90°$ **Hence Proved.**

27. Given : ABC is a right angle triangle M is the mid point of AB and $DM \,||\, BC$.

To Prove : D is the mid point of AC



(a) Proof : M is the mid point of AB (Given)

$MD \,||\, BC$ (Given)

$\therefore$ D is the mid point of side AC by converse of mid point theorem. **Hence Proved.**

(b) To Prove $MD \perp AC$

Proof $MD \,||\, BC$ (Given)

$\therefore$ $\angle D = \angle C$ (Corresponding angles)

$\angle D = 90°$

$\therefore$ $MD \perp AC$ **Hence Proved.**

(c) To prove : $CM = AM = \frac{1}{2}AB$

ΔADM and ΔCDM

side $AD = DC$ (Proved)

$DM = DM$ (Common)

$\angle ADM = \angle CDM = 90°$

$\Delta ADM \cong \Delta CDM$ (SAS congruency rule)

$\therefore$ $AM = CM$ (c.p.c.t.)

$AB = AM + BM$

$AB = AM + AM$ (AM = BM)

$AB = 2AM$

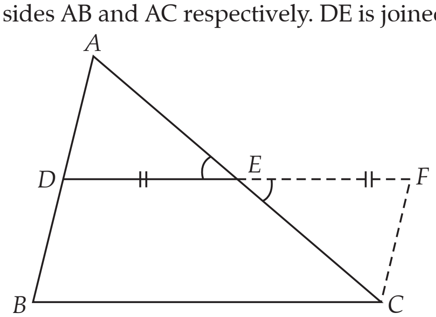
$AB = 2CM$ (AM = CM)

$\therefore$ $\frac{1}{2}AB = CM$

$AM = CM = \frac{1}{2}AB$ **Hence Proved.**

OR

Given : A ΔABC in which D and E are the mid-points of sides AB and AC respectively. DE is joined.



To Prove : DE || BC and DE = $\frac{1}{2}$BC

Construction : Produce the segment DE to F, such that DE = EF. Join FC.

Proof : In Δs AED and CEF, we have

AE = CE [∵ E is the mid-point of AC]

∠AED = ∠CEF [Vertically opposite angles]

and DE = EF [By construction]

So, by SAS criterion of congruence, we have

ΔAED ≅ ΔCEF [SAS Congruency rule]

⇒ AD = CF [c.p.c.t] ...(i)

∠ADE = ∠CFE [c.p.c.t] ...(ii)

Now, D is the mid-point of AB

⇒ AD = DB

⇒ DB = CF [From (i) AD = CF] ...(iii)

∠ADE = ∠CFE [From (ii)]

i.e., alternate interior angles are equal.

∴ AD || FC

⇒ DB || CF ...(iv)

From (iii) and (iv), we find that DBCF is a quadrilateral such that one pair of sides are equal and parallel.

∴ DBCF is a parallelogram

∴ DF || BC and DF = BC

[∵ Opposite sides of a $||^{gm}$ are equal and parallel]

But, D, E, F are collinear and DE = EF.

∴ DE || BC and DE = $\frac{1}{2}$BC

28. Curved surface area of cylinder = 4·4 m^2

$$2\pi rh = 4{\cdot}4$$

$$2\times\frac{22}{7}\times 0{\cdot}7\times h = 4{\cdot}4$$

$$4{\cdot}4\,h = 4{\cdot}4$$

$$h = 1$$

∴ height of the cylinder = 1 m

$$\text{Volume of cylinder} = \pi r^2 h$$

$$= \frac{22}{7}\times 0{\cdot}7\times 0{\cdot}7\times 1$$

$$= 22 \times 0{\cdot}1 \times 0{\cdot}7$$

Volume of cylinder = 1·54 m^3

29. Arrange the data in ascending order.

2, 5, 7, 7, 8, 10, 10, 10, 14, 17, 18, 24, 25, 27, 28, 48

N = 16, which in even

$$\text{median} = \frac{\frac{N}{2}^{th}\ term + \left(\frac{N}{2}+1\right)^{th}\ term}{2}$$

$$= \frac{\frac{16}{2}^{th}\ term + \left(\frac{16}{2}+1\right)^{th}\ term}{2}$$

$$= \frac{8^{th}\ term + 9^{th}\ term}{2}$$

$$= \frac{10+14}{2}$$

median = 12

Mode = The most frequently occurring observation = 10 i, e 4 times occurring 10

∴ Mode = 10

OR

Salary (₹) (x_i)	No. of worker (f_i)	$f_i \times x_i$
3000	16	48000
4000	12	48000
5000	10	50000
6000	8	48000
7000	6	42000
8000	4	32000
9000	3	27000
10000	1	10000
Total	60	305000

$$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{305000}{60}$$

$$= \frac{30500}{6} = 5083{\cdot}33$$

∴ Mean salary of 60 workers = ₹ 5083.33

∴ Mode = 10

30.

Age	No. of teachers
18-29	11
30-39	32
40-49	30
50-59	7

(a) Probability of teachers of 18 years of more

$$= \frac{\text{Favourable No. of Outcomes}}{\text{Total No. of Outcomes}}$$

$$= \frac{11+32+30+7}{80} = \frac{80}{80} = 1$$

(b) Probability of teachers of 30-39 years age

$$= \frac{\text{Favourable No. of Outcomes}}{\text{Total No. of Outcomes}}$$

$$= \frac{32}{80} = \frac{2}{5}$$

(c) Since there is no teacher available above 60 years So, No. of favourable outcomes = 0

Probability of teachers above 60 years

$$= \frac{\text{Favourable No. of Outcomes}}{\text{Total No. of Outcomes}}$$

$$= \frac{0}{80} = 0$$

(d) Probability of teachers of 40 or more than 40 years

$$= \frac{\text{Favourable No. of Outcomes}}{\text{Total No. of Outcomes}}$$

$$= \frac{30+7}{80} = \frac{37}{80}$$

❑❑❑

KENDRIYA VIDYALAYA SANGATHAN
[JAMMU REGION]
SESSION ENDING EXAMINATION 2018
SUBJECT : MATHEMATICS
CLASS–IX
(SOLVED PAPER)

Time : 3 Hrs. **M.M. : 80**

Instructions :

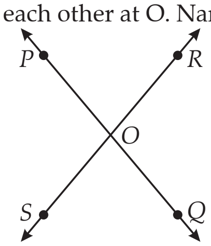
1. *All questions are compulsory.*
2. *The question paper consists of 30 questions divided into 4* ***sections-A, B, C*** *and* ***D****.* ***Section-A*** *comprises of 6 question of 1 mark each,* ***Section-B*** *comprises of* ***6*** *questions of* ***2 marks*** *each.* ***Section-C*** *comprises of* ***10*** *questions of* ***3 marks*** *each,* ***Section-D*** *comprises of* ***8*** *questions of* ***4 marks*** *each.*
3. *There is no overall choice.*

SECTION-A

1. The total surface area of a cube is 726 cm^2 Find the length if its edge.

2. Factorise : $y^2 - 8y + 16$.

3. In the figure two lines PQ and RS intersect each other at O. Name pairs of vertically opposite angles.



4. A die is thrown six times and number on it is noted as given below :

Number on Die	1	2	3	4	5	6
Frequency	1	1	1	1	1	1

What is the probability that it is a prime number ?

5. Identify an irrational number among the following numbers : $\sqrt{0\cdot 09}, \frac{5}{3}, \sqrt{5}, 6\cdot\bar{3}$

6. In $\angle ABC$, if $AB = AC$ and $B = 70°$, Find $\angle A$.

SECTION-B

7. Find the mean mode of given data :
2, 3, 4, 5, 0, 1, 3, 3, 4, 3

8. Find the area of a triangle whose sides are 11 m, 60 m and 61 m.

9. Write the shape of the quadrilateral formed by joining (1, 1), (6, 1), (4, 5) and (3, 5) on graph paper.

10. If $p + q = 12$ and $pq = 27$, find the value of $p^3 + q^3$?

11. An isosceles right triangle has area 200 cm^2. Find the length of its hypotenuse.

12. Write the answer of each :
(i) What is the name of each part of the plane formed by two intersecting axes on the Cartesian plane ?
(ii) Write the name of point where these two lines intersect.

SECTION-C

13. Find the value of k, if (1, –1) is a solution of the equation $3x - ky = 8$. Also find the coordinates of another point lying on its graph.

14. If two circles intersect in two points, prove that the line through their centre is the perpendicular bisector of the common chord.

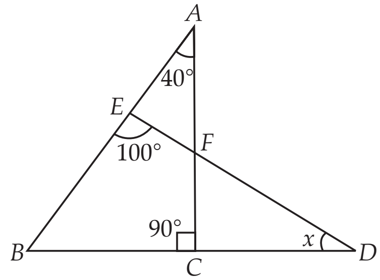
15. Represent $\sqrt{5}$ on the number line.

OR

Represent $\sqrt{9 \cdot 3}$ on the number line.

16. If $p(x) = x^3 - 3x^2 + 4x - 5$ and $s(x) = x - 2$, find the quotient and remainder when $p(x)$ is divided by $s(x)$.

17. In the given figure, find x.



OR

Prove that sum of angles in a triangle is 180°.

18. The volume of a cylindrical pipe is 748 cm^3. Its length is 0·14 m and its internal radius is 0·09 m. Find thickness of the pipe.

OR

A conical tent is 10m high and radius of its base is 24 m. Find
(i) slant height of the tent.
(ii) Cost of canvas required to make the tent if cost of 1m^2 canvas is Rs. 70.

19. Write Euclid's fifth postulate. Does Euclid's fifth postulate imply the existence of parallel lines ? Explain.

20. Find the area of the triangle whose permeter is 180 cm and two of its sides are of lengths 80 cm and 18 cm. Also, calculate the altitude of the triangle corresponding to the shortest side.

21. ABCD is a parallelogram and line segments AX, CY bisect the angles A and C, respectively. Show that AX || CY.

22. Two dice are thrown simultaneously 500 times. Each time the sum of two numbers appearing on them is noted and recorded in the following table :

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

From the above data, what is the probability of getting a sum :
(i) More than 10. (ii) Between 8 and 12.

23. Express $23 \cdot \overline{43}$ and $\frac{p}{q}$ from, where p, q are integers and $q \neq 0$.

24. A right-angled ΔABC with side 3 cm, 4 cm and 5 cm is revolved about the fixed side of 4 cm. Find the volume of the solid generated. Also, find the total surface area of the solid.

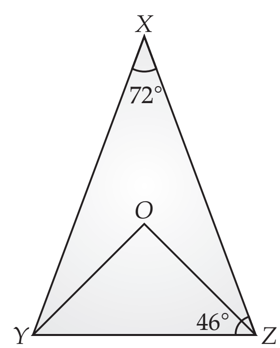
OR

Find the volume of a sphere whose surface area is 154 cm^2.

25. Construct a ΔABC such the BC = 7 cm, ∠B = 45° and AB + AC = 13 cm.

26. Cost of 1 pen is (₹)x and that of 1 pencil is (₹)y. Cost of 2 pens and 3 pencils together is (₹)18. Write a linear equation which satisfies this data. Draw the graph for the same.

27. In the figure, ∠X = 72°, ∠XZY = 46°. If YO and ZO are bisectors of ∠XYZ and ∠XZY respectively of ΔXYZ, find ∠OYZ and ∠YOZ.



OR

Prove that angles opposite to equal sides of an isosceles triangle are equal.

28. Factorise : $6x^3 - 5x^2 - 13x + 12$.

29. Draw a histogram of the weekly expenses of 125 students of a school given below :

Weekly Pocket Expenses (in ₹)	Number of Students
0 – 10	10
10 – 20	20
20 – 30	10
30 – 40	15
40 – 70	30
70 – 100	40

30. If each diagonal of a quadrilateral divides it into two triangles of equal areas, then prove that quadrilateral is a parallelogram.

OR

The angle subtended by an arc at the centre is double the angle subtended by it any point on the remaining part of the circle.

SOLUTIONS

SECTION-A

1. Total surface area of a cube $= 6\text{ (sides)}^2$

$\therefore \quad 6(\text{side})^2 = 726$

$(\text{side})^2 = \dfrac{726}{6} = 121$

$\therefore \quad \text{side} = \sqrt{121} = 11$ cm

$\therefore$ Length of side of cube = 11 cm

2.
$$y^2 - 8y + 16$$
$$y^2 - 4y - 4y + 16$$
$$y(y-4) - 4(y-4)$$
$$(y-4)(y-4) = (y-4)^2$$

3. ∠POR and ∠QOS are pair of vertically opposite angles respectively

∠QOR and ∠POS are also pair of vertically opposite angles respectively.

4. Prime numbers are 2, 3 and 5

$\therefore$ Probability of getting a prime number

$= \dfrac{\text{Total favourable events}}{\text{Total events}}$

$= \dfrac{3}{6} = \dfrac{1}{2}$

Probability of Prime numbers

$= \dfrac{1}{2}$

5. $\sqrt{0{\cdot}09} = 0{\cdot}3 = \dfrac{3}{10}$

is rational number

$\dfrac{5}{3}$ is rational number because 5 and 3 are integers.

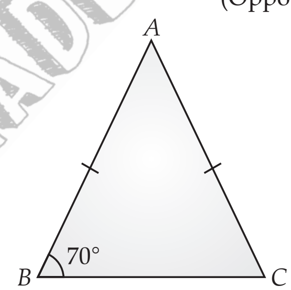
$6{\cdot}\bar{3} = \dfrac{19}{3}$ or we can says that $6{\cdot}\bar{3}$ is a recurring non terminating numbers.

$\therefore \sqrt{5}$ is irrational number because square root. of any prime number is always irrational number.

6. In ΔABC, AB = AC (Given)

∠ABC = ∠ACB

(Opposite angle sides)



In ΔABC

$\angle A + \angle B + \angle C = 180°$

(Sum of all angle of Δ)

$\angle A + 70° + 70° = 180°$

$\angle A = 180° - 140°$

$\therefore \quad \angle A = 40°$

SECTION-B

7. Mean $= \dfrac{2+3+4+5+0+1+3+3+4+3}{10}$

$= \dfrac{28}{10} = 2{\cdot}8$

$\therefore$ Mean = 2·8

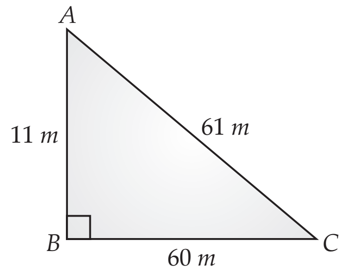
We find that the data 3 occurs frequently maximum number of times i.e. 4 times.

Hence Mode is 3.

8. In ΔABC, a = 60 m, c = 11 m and b = 61 m

$S = \dfrac{a+b+c}{2}$

$S = \dfrac{60+61+11}{2}$



$$S = \frac{132}{2} = 66 \text{ m}$$

$$\text{ar } \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{66(66-60)(66-61)(66-11)}$$

$$\text{ar } \Delta ABC = \sqrt{66 \times 55 \times 6 \times 5}$$

$$= \sqrt{6 \times 11 \times 5 \times 11 \times 5 \times 6}$$

$$\Delta ABC = 6 \times 5 \times 11$$

$$= 330 \text{ m}^2$$

Short Method : $AC^2 = 61^2 = 3721$

$$AB^2 + BC^2 = 11^2 + 60^2$$

$$= 121 + 3600$$

$$= 3721 = AC^2$$

$\therefore$ ΔABC is a right triangle at right angle at B.

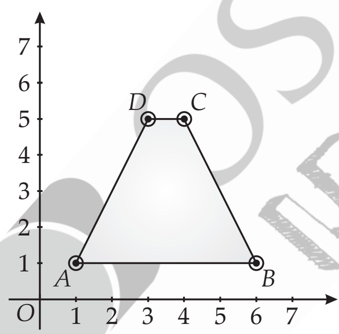
$$\therefore \quad \text{ar } \Delta ABC = \frac{1}{2} \text{base} \times \text{height}$$

$$= \frac{1}{2} \times 60 \times 11$$

$$= 330$$

$$\therefore \quad \text{ar } \Delta ABC = 330 \text{ m}^2$$

9.



10. $p + q = 12$ and $pq = 27$ (Given)

$$(p + q) = 12$$

$$(p + q)^3 = 12^3$$

$$p^3 + q^3 + 3pq(p + q) = 1728$$

$$p^3 + q^3 + 3 \times 27(12) = 1728$$

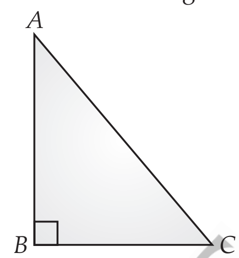
$$p^3 + q^3 + 81 \times 12 = 1728$$

$$p^3 + q^3 = 1728 - 972$$

$$p^3 + q^3 = 756$$

$$\therefore \quad p^3 + q^3 = 756$$

11. Given : ABC is an isosceles right triangle.



$\because$ Hypotenuse (AC) is the longest side of ΔABC

$$\therefore \quad \angle B = 90^\circ \text{ and } AB = BC$$

$$\text{or} \quad \Delta ABC = 200 \text{ cm}^2$$

$$\frac{1}{2} \times BC \times AB = 200$$

$$BC^2 = 400$$

$$\therefore \quad BC = \sqrt{400} = 20 \text{ cm}$$

$$AC^2 = AB^2 + BC^2$$

$$= BC^2 + BC^2 \quad (AB = BC)$$

$$AC = \sqrt{2}\, BC$$

$$AC = 20\sqrt{2} \text{ cm}$$

$$AC = 20 \times 1{\cdot}414 = 28{\cdot}280 \text{ cm}$$

$$\therefore \quad AC = 28{\cdot}28 \text{ cm}$$

12. (i) Quadrant
(ii) Origin

SECTION-C

13. $(1, -1)$ is a solution of the equation $3x - ky = 8$

$$\therefore \quad 3(1) - k(-1) = 8$$

$$3 + k = 8$$

$$\therefore \quad k = 5$$

Given equation $3x - 5y = 8$

if $x = -4$ then $3(-4) - 5y = 8$

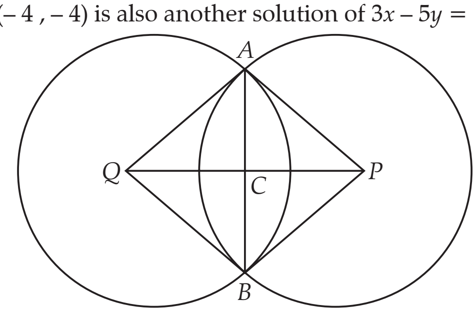
$$-12 - 5y = 8$$

$$-5y = 8 + 12$$

$$y = \frac{20}{-5} = -4$$

$\therefore$ $(-4, -4)$ is also another solution of $3x - 5y = 8$

14.



Given : Two circles having centre P and Q respectively.

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To Prove : PQ ⊥ AB and AC = BC

Construction : Join AQ, BQ, AP and BP

Proof : ΔAQP and ΔBPQ

PQ = PQ (common side)

AQ = BQ (radius of circle)

AP = BP (radius of circle)

∴ ΔAQP ≅ ΔBQP (SSS congrencyrule)

∴ ΔAQP ≅ ΔBQP (c.p.c.t.)

ΔAQC and ΔBQC

∠AQP = ∠BQP (proved)

AQ = BQ (radius of circle)

QC = QC (common side)

∴ ΔAQC ≅ ΔBQC (SAS congruency rule)

∴ AC = BC (c.p.c.t.) ...(i)

Hence common chord bisect by the line segment PQ.

ΔAQC ≅ ΔBQC

∠ACQ = ∠BCQ (c.p.c.t.)

∠ACQ + ∠BCQ = 180° (Linear pair)

2∠ACQ = 180°

∠ACQ = 90°

∴ AB ⊥ PQ ...(ii)

Thus line through their centre is the perpendicular bisector of the common chord.

Hence Proved.

15. $5 = 4 + 1$

$5 = 2^2 + 1^2$

$OB^2 = OA^2 + AB^2$

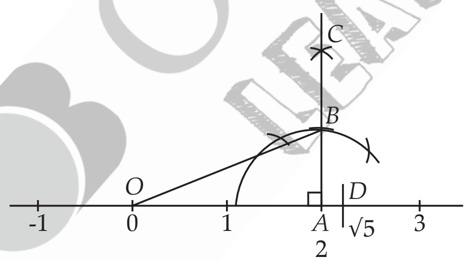
Where OA = 2 unit

AB = 1 unit

$OB^2 = 5$ unit

∴ OB = $\sqrt{5}$ unit

Point D represents $\sqrt{5}$ on number line



Step of Construction :

On the number line, in figure, we have marked two points O and A representing numbers 0 and 2 respectively.

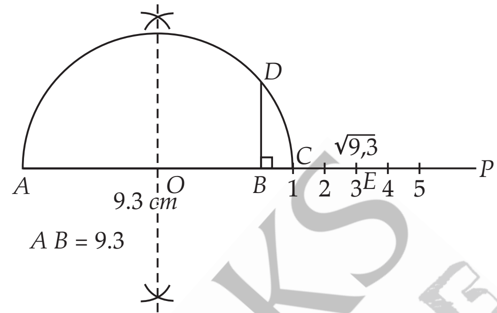
We draw AB = 1 unit and AC ⊥ OA.

Now Join OB

We draw an arc which taking centre as O and radius equal to OB which intersect the number line at the point D.

∴ Point D represent $\sqrt{5}$ on the number line.

OR



Step of construction :

(i) Draw the line segment AB = 9·3 cm.

(ii) Extend the line segment and mark the point C such that BC = 1 unit.

(iii) Draw perpendicular bisector of line segment AC.

(iv) Draw a semicircle taking OA a radius and centre O.

(v) Draw perpendicular at the point B which intersect semicircle at the point D.

(vi) Draw arc taking B as centre and radius BD which intersect the number line at the point E.

OE = $\sqrt{9{\cdot}3}$ unit

Point E represents on $\sqrt{9{\cdot}3}$ the number line.

16. $p(x) = x^3 - 3x^2 + 4x - 5$

$s(x) = x - 2$

$x - 2\,)\,x^3 - 3x^2 + 4x - 5\,(x^2 - x + 2$

$x^3 - 2x^2$

(–) (+)

$-x^2 + 4x - 5$

$-x^2 + 2x$

(+) (–)

$2x - 5$

$2x - 4$

(–) (+)

-1

Quotient = $x^2 - x + 2$

Remainder = – 1

17. In ΔABC,

∠A + ∠B + ∠C = 180°

40° + ∠B + 90° = 180°

∠B = 180° – 130° = 50°

In ΔBDE

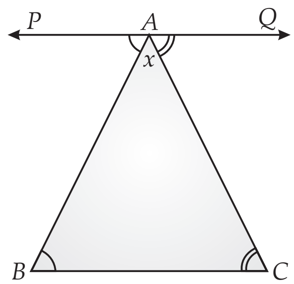
∠B + ∠D + ∠E = 180° (Sum of all angle of Δ)

50° + x° + 100 = 180°

x = 180 – 150 = 30

x = 30°

OR



Given : ABC is a triangle

To Prove : $\angle A + \angle B + \angle C = 180°$

Construction : Draw PQ parallel to line segment BC such that passing through the point A.

Proof : line PQ || BC

$\therefore$ $\angle B = \angle PAB$ (Alternative interior angle)

$\angle C = \angle CAQ$

$\therefore$ $\angle B + \angle C = \angle PAB + \angle CAQ$

$\angle B + \angle C + \angle A = \angle PAB + \angle CAQ + \angle A$

$\angle B + \angle C + \angle A = \angle PAQ$

$\angle B + \angle C + \angle A = 180°$ **Hence Proved.**

18. **Given :** Volume of pipe is 748 cm^3

Length of pipe (h) = 0·14 m = 14 cm

Internal radius (r_1) = 0·09 m = 9 cm

Let the outer radius be r_2 cm

Volume of pipe = 748 cm^3

$$\pi(r_2^2 - r_1^2)h = 748$$

$$\pi(r_2^2 - r_1^2) \times 14 = 748$$

$$\frac{22}{7}(r_2^2 - r_1^2) = \frac{748}{14}$$

$$r_2^2 - r_1^2 = \frac{748 \times 7}{22 \times 14}$$

$$r_2^2 - (9)^2 = \frac{34 \times 7}{14} = 17$$

$$r_2^2 - 81 = 17$$

$$r_2^2 = 81 + 17 = 98$$

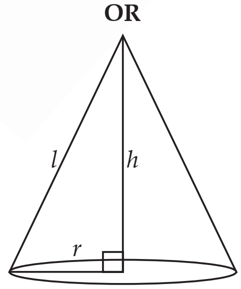
$$r_2 = \sqrt{98} = 7\sqrt{2} \text{ cm}$$

$$r_2 = 7 \times 1·414$$

$$r_2 = 9·898 \text{ cm}$$

Thickness of the pipe = $r_2 - r_1$ = 9·898 – 9 = 0·898 cm

OR



Given : Tent Conical shape

Height (h) = 10 m

Radius of base (r) = 24 m

Let the slant height be l m

$\therefore$ $l^2 = r^2 + h^2$

$= 24^2 + 10^2$

$= 576 + 100 = 676$

$\therefore$ $l = \sqrt{676} = 26$ m

$\therefore$ Slant height of the tent = 26 m

(ii) C.S.A of cone = πrl

$$= \frac{22}{7} \times 24 \times 26 \text{ m}^2$$

$$= \frac{22 \times 624}{7} \text{ m}^2$$

Canvas required to make the tent

$$= \frac{13728}{7} \text{ m}^2$$

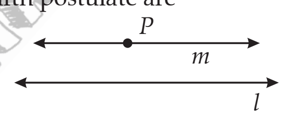
Cost of canvas required to make the tent

= Area × Rate

$$= \frac{13728}{7} \times 70$$

= ₹ 137280

19. Euclid's fifth postulate are



(i) For every line l and for every point P not lying on l, there exists a unique line passing through P and parallel to P or we can say that

Two distinct intersecting lines cannot be parallel to the same line.

Take any line l and a point P, not on l. Then we know that their is unique line m through P which is parallel to l.

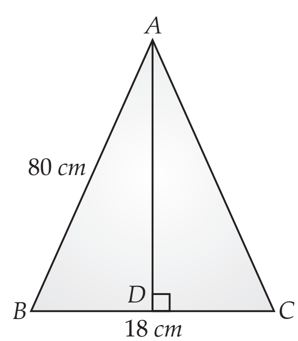
20. Perimeter of ΔABC = 180 cm

$a + b + c = 180$

$18 + b + 80 = 180$

$b = 180 - 98 = 82$ cm

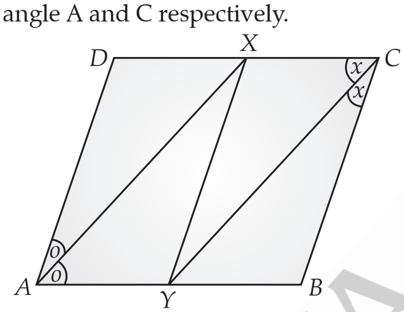
$$S = \frac{a+b+c}{2} = \frac{180}{2} = 90 \text{ cm}$$



$$\text{ar } \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{90(90-80)(90-82)(90-18)}$$
$$= \sqrt{90\times10\times8\times72}$$
$$= \sqrt{9\times10\times10\times8\times8\times9}$$
$$= 9 \times 8 \times 10$$
$$\text{ar } \Delta ABC = 720 \text{ cm}^2$$
$$\text{ar } \Delta ABC = 720 \text{ cm}^2$$
$$\frac{1}{2}\times BC\times AD = 720$$
$$\frac{1}{2}\times 18\times AD = 720$$
$$AD = \frac{720}{9}$$
$$= 80 \text{ cm}$$

Altitude of the triangle corresponding to the short side = 80 cm

21. **Given :** ABCD is a parallelogram. AX and CY bisect the angle A and C respectively.



To Prove : AX || CY

Construction : Join XY

Proof : ABCD is a parallelogram

$\therefore$ $\angle A = \angle C$ (opposite angles of $\|^{gm}$)

$$\frac{\angle A}{2} = \frac{\angle C}{2}$$
$$\angle XAY = \angle XCY$$

ΔXAY and ΔXCY

$\angle XAY = \angle XCY$ (Proved)

$\angle XYA = \angle YXC$ (Alternative angles)

$XY = XY$ (Common sides)

$\therefore$ $\Delta AXY \cong \Delta CYX$ (AAS congruency rule)

$\therefore$ $AX = CY$ (c.p.c.t.)

$\therefore$ $\angle AXY = \angle CYX$ (c.p.c.t.)

These are alternative angles

$\therefore$ AX || CY **Hence Proved.**

22. **(i)** Total events $n(S) = 500$

Favourable events $n(E) = n(E) > 10$

$= 28 + 15$

$\therefore$ $n(E) = 43$

(i) Probability of getting a sum more than 10

$$= \frac{n(E)}{n(S)}$$
$$= \frac{43}{500}$$

(ii) Favourable events $n(E) = 8 < n(E) < 12$

$\therefore$ $n(E) = 53 + 46 + 28 = 127$

Probability getting a sum between 8 and 12

$$= \frac{127}{500}$$

23. Let $x = 23{\cdot}\overline{43}$

$x = 23{\cdot}43434343$ ...(i)

Multiply of 100 both sides

$100x = 2343{\cdot}434343$ ...(ii)

From equation (i) and (ii)

$$99x = 2343 - 23$$
$$x = \frac{2320}{99}$$
$$\therefore \quad 23{\cdot}\overline{43} = \frac{2320}{99}$$

24. A right triangle ΔABC is revolved about the fixed side of 4 cm then solid generated a cone shape

Which is radius $(r) = 3$ cm, height $(h) = 4$ cm and slant height $(l) = 5$ cm

Volume of solid generated

$$= \frac{1}{3}\pi r^2 h$$
$$= \frac{1}{3}\times\frac{22}{7}\times3\times3\times4$$
$$= \frac{264}{7} \text{ cm}^3$$
$$= 37{\cdot}714 \text{ cm}^3 \text{ (Approx)}$$
$$\text{T.S.A. of solid} = \pi r(r + l)$$
$$= \pi \times 3(3 + 5)$$
$$= \frac{22}{7}\times 24$$
$$= \frac{528}{7} \text{ cm}^2$$
$$\text{T.S.A. of solid} = 75{\cdot}43 \text{ cm}^2$$

OR

Find volume of sphere if

$$\text{Surface Area} = 154 \text{ cm}^2$$
$$4\pi r^2 = 154$$
$$4\times\frac{22}{7}\times r^2 = 154$$
$$r^2 = \frac{154\times7}{4\times22} = \frac{7\times7}{4}$$
$$r = \sqrt{\frac{49}{4}} = \frac{7}{2} \text{ cm}$$
$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$
$$= \frac{4}{3}\times\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}\times\frac{7}{2}$$
$$= \frac{11\times7\times7}{3} \text{ cm}^3$$

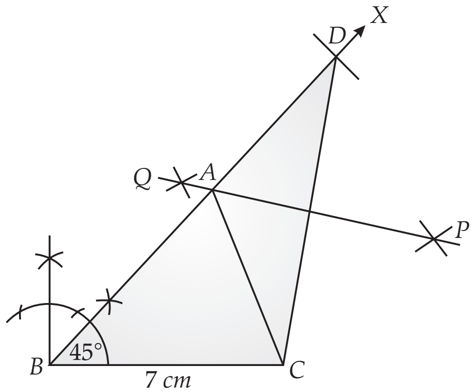
$$= \frac{539}{3} \text{ cm}^3$$

$\therefore$ Volume of sphere $= 179\frac{2}{3}$ cm^3

25. Step of Construction :

(i) Draw a line segment BC = 7 cm.

(ii) Make the ∠XBC = 45°.



(iii) Draw a arc taking centre B and radius 13 cm which intersect the line BX at the point D.

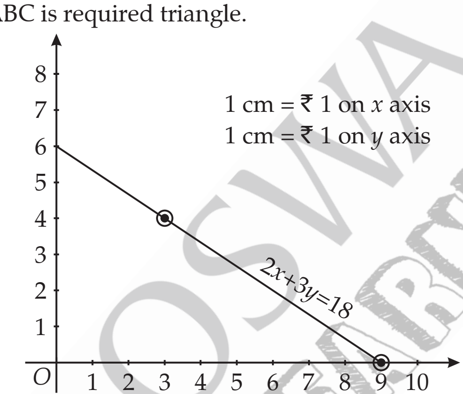
(iv) Join DC.

(v) Draw a perpendicular bisector PQ on the line segment DC.

(vi) Join AC.

ΔABC is required triangle.

26.



$2x + 3y = 18$

x	9	0	3
y	0	6	4

27. In ΔXYZ

∠XYZ + ∠YZX + ∠ZXY = 180°

[Sum of all angles of Δ]

∠XYZ + 46 + 72 = 180°

∠XYZ = 180 – 118

$\therefore$ ∠XYZ = 62°

$$\angle OYZ = \frac{\angle XYZ}{2} = \frac{62}{3} = 31°$$

In ΔOYZ,

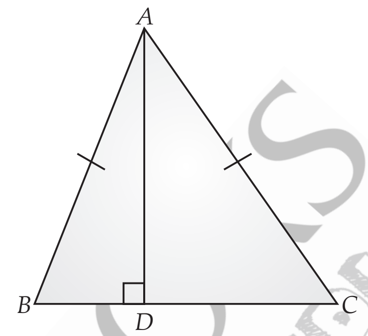
∠YOZ + ∠OYZ + ∠OZY = 180°

$$\angle YOZ + 31° + \frac{46}{2} = 180°$$

∠YOZ = 180 – 54

∠YOZ = 126°

OR



Given : In ΔABC, side AB = AC

To Prove : ∠B = ∠C

Construction : Draw AD ⊥ BC

Proof : In ΔABD and ΔACD

∠ADB = ∠ADC = 90°

(By construction)

Side AB = AC (Given)

Side AD = AD (Common side)

$\therefore$ ΔADB ≅ ΔADC

(RHS congruency rule)

$\therefore$ ∠B = ∠C (c.p.c.t.)

Hence Proved.

28. $p(x) = 6x^3 - 5x^2 - 13x + 12$

If $x = 1$

Then $p(1) = 6(1)^3 - 5(1)^2 - 13(1) + 12$

$= 6 - 5 - 13 + 12$

$= 18 - 18 = 0$

$\therefore$ $(x - 1)$ is a factor of given polynomial $p(x)$

$x - 1\ )\ 6x^3 - 5x^2 - 13x + 15\ (6x^2 + x - 12$

$6x^3 - 6x^2$

(–) (+)

$x^2 - 13x + 12$

$x^2 - x$

(–) (+)

$-12x + 12$

$-12x + 12$

(+) (–)

×

$6x^3 - 5x^2 - 13x + 12 = (x - 1)(6x^2 + x - 12)$

$= (x - 1)\{(6x^2 + 9x - 8x - 12)\}$

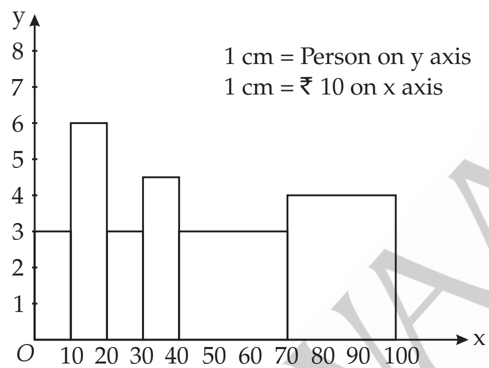
$= (x - 1)\{3x(2x + 3) - 4(2x + 3)\}$

$= (x - 1)(2x + 3)(3x - 4)$

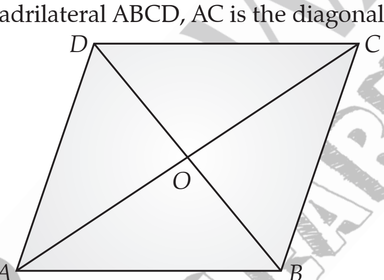
$\therefore$ $6x^3 - 5x^2 - 13x + 12 = (x - 1)(2x + 3)(3x - 4)$

29.

Weekly Pocket expenses (in ₹)	Number of Persons	Length of rectangle
0–10	10	$\frac{10}{10} \times 3 = 3$
10–20	20	$\frac{20}{10} \times 3 = 6$
20–30	10	$\frac{20}{10} \times 3 = 3$
30–40	15	$\frac{15}{10} \times 3 = 4{\cdot}5$
40–70	30	$\frac{30}{30} \times 3 = 3$
70–100	40	$\frac{40}{30} \times 3 = 4$



30. In quadrilateral ABCD, AC is the diagonal



$\therefore$ ar ΔABC = ar ΔADC

ar ΔAOB + ar ΔBOC = ar ΔAOD + ar ΔDOC ...(i)

In Quadrilateral ABCD, BD is the diagonal

$\therefore$ ar ΔABD = ar ΔBCD

ar ΔAOD + ar ΔAOB = ar ΔBOC + ar ΔCOD ...(ii)

ar ΔAOB + ar ΔBOC = ar ΔAOD + ar ΔDOC ...(i)

From eq. (ii)—(i), we have

ar ΔAOD – ar ΔBOC = ar ΔBOC – ar ΔAOD

2ar ΔAOD = 2 ar ΔBOC

ar ΔAOD = ar ΔBOC

ar ΔAOD + ar ΔAOB = ar ΔAOB + ar ΔBOC

ar ΔADB = ar ΔABC

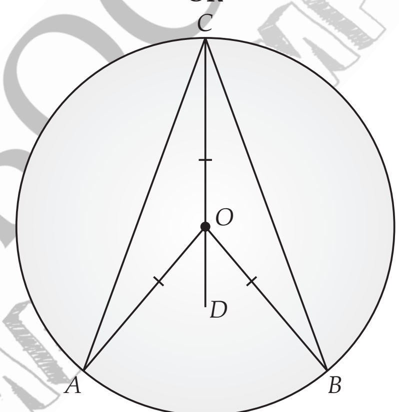
ΔADB and ΔABC having common base AB and lying between two lines AB and DC

$\therefore$ AB || DC

Similarly we can prove that AD || BC

$\therefore$ ABCD is a parallelogram **Hence Proved.**

OR



Given : An arc AB of a circle subtend ∠AOB at the centre O and ∠ACB at a point C on the remaining part of circle.

To Prove : ∠AOB = 2∠ACB

Construction : Extend CO to the point D.

AO = OC = OB

(radius of circle having centre O)

AO = OC

$\therefore$ ∠ACO = ∠OAC ...(i)

[opposite angle of equal sides in ΔAOC]

OB = OC

$\therefore$ ∠OBC = ∠OCB ...(ii)

[opposite angle of equal sides in ΔOBC]

∠AOD = ∠OAC + ∠ACO

[Exterior angle of ΔAOC]

∠AOD = ∠ACO + ∠ACO

[From eqn. (i)]

∠AOD = 2∠ACO ...(iii)

Similarly ∠DOB = ∠OCB + ∠OBC

∠DOB = ∠OCB + ∠OCB

[From eqn. (ii)]

∠DOB = 2∠OCB ...(iv)

∠AOD + ∠DOB = 2(∠ACO + ∠OCB)

[From eqn. (iii) and (iv)]

∠AOB = 2∠ACB **Hence Proved.**

❑❑❑