CBSE Class 09

Mathematics

Sample Paper 7 (2019-20)

Maximum Marks: 80

Time Allowed: 3 hours

General Instructions:

i. All the questions are compulsory.
ii. The question paper consists of 40 questions divided into 4 sections A, B, C, and D.
iii. Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 8 questions of 3 marks each. Section D comprises of 6 questions of 4 marks each.
iv. There is no overall choice. However, an internal choice has been provided in two questions of 1 mark each, two questions of 2 marks each, three questions of 3 marks each, and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.
v. Use of calculators is not permitted.

Section A

1. The value of $\left(\frac{12^{\frac{1}{5}}}{27^{\frac{1}{5}}}\right)^{\frac{5}{2}}$

   a. none of these

   b. $\frac{2}{3}$

   c. $\frac{12}{27}$

   d. $\frac{4}{9}$

2. The degree of the polynomial $4x^4 + 0x^3 + 0x^5 + 5x + 7$ is

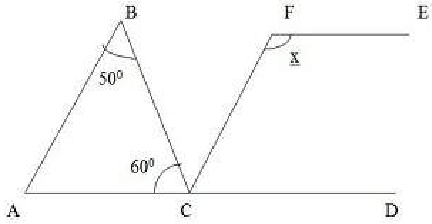
   a. 5

b. 4

c. 7

d. 6

3. In figure, if AB $\parallel$ CF, CD $\parallel$ EF, then the value of x is :



a. 100°

b. 120°

c. 140°

d. 110°

4. It is not possible to construct a $\triangle ABC$ with $BC = 5\ cm, \angle B = 75^0\ and\ AB + AC$ equal to________.

a. 7.5 cm

b. 4.5 cm

c. 8 cm

d. 9 cm

5. The value of $\dfrac{(0.87)^3+(0.13)^3}{(0.87)^2-(0.87\times0.13)+(0.13)^2}$ is

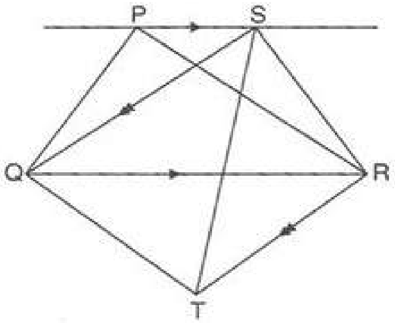
a. 0.13

b. 0.87

c. 0

d. 1

6. PQR is a triangle. S is any point on a line through P parallel to QR. If T is any point on a line through R parallel to SQ, then the three triangles equal in area are



   a. $\triangle PQR$, $\triangle QSR$, $\triangle QRT$.

   b. $\triangle QSR$, $\triangle TSR$, $\triangle PQR$.

   c. $\triangle QRT$, $\triangle SRT$, $\triangle QSR$.

   d. $\triangle PQR$, $\triangle QSR$, $\triangle QST$.

7. Which of the following polynomials has (-3) as a zero?

   a. $x^2 - 3x$

   b. (x – 3)

   c. $x^2 - 9$

   d. $x^2 + 3$

8. The area of a rhombus of 96cm^2. If one of its diagonals is 16 cm, then the length of its side is

   a. 10 cm

   b. 8 cm

   c. 12 cm

   d. 6 cm

9. If the lateral surface area of a cylinder is 132 cm^2 and its height is 7 cm, then its base diameter is

a. 4 cm.

b. 3 cm.

c. 5 cm.

d. 6 cm.

10. A die is thrown once. The probability of getting a number 3 or 4 is

a. 0

b. $\frac{2}{3}$

c. $\frac{1}{3}$

d. 1

11. Fill in the blanks:

The smallest natural number is ________.

12. Fill in the blanks:

The graph of every linear equation in two variables is a __________ .

OR

Fill in the blanks:

Any pair of values of x and y which satisfies the given equation in x and y, is called its ________.

13. Fill in the blanks:

The signs of abscissa and ordinate of a point in quadrant IV are ________.

14. Fill in the blanks:

The sum of either pair of opposite angles of a cyclic quadrilateral is ________.

15. Fill in the blanks:

Opposite faces of a cuboid are _________ and ________.

16. Rationalise the denominator of $\frac{\sqrt{40}}{\sqrt{3}}$

17. Find the following product: (1 + x)(1 - x + x^2)

18. The length of a hall is 18 m and the width 12 m. The sum of the areas of the floor and the flat roof is equal to the sum of the areas of the four walls. Find the height of the hall.

OR

A cylindrical container with a diameter of base 56 cm contains sufficient water to submerge a rectangular solid of iron with dimensions 32 cm $\times$ 22 cm $\times$ 14 cm. Find the rise in the level of the water when the solid is completely submerged.

19. All the angles of a quadrilateral are equal. What special name is given to this quadrilateral?

20. Write the equation of the line parallel to the x-axis at distance 3 units above x-axis.

21. Express the number in decimal form: $\frac{1}{9}$

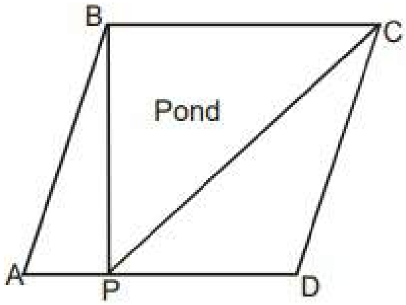
22. Determine the point on the graph of the linear equation x + y = 6, whose ordinate is 2 times its abscissa.

23. Verify whether are zeroes of the polynomial, indicated against them.
(ii) $p\left(x\right) = 5x - \pi,\, x = \frac{4}{5}$

OR

If a - b = 4 and ab = 21, find the value of a^3 - b^3.

24. There was a deserted land near a colony where people used to throw garbage. Colony people united to develop a pond in triangular shape as shown in the fig. The land is the shape of ||gm ABCD. In rest of the portion, medicinal plants were grown. If area of parallelogram ABCD is 200 m^2. Calculate the area where medicinal plants were grown.



25. The mean weight per student in a group of 7 students is 55 kg. The individual weights of 6 of them (in kg) are 52, 54, 55, 53, 56 and 54. Find the weight of the seventh student.

OR

The scores (out of 100) obtained by 33 students in a mathematics test are as follows:
69, 48, 84, 58, 48, 73, 83, 48, 66, 58, 84, 66, 64, 71, 64, 66, 69, 66, 83, 66, 69, 71 81, 71, 73, 69, 66, 66, 64, 58, 64, 69, 69
Represent this data in the form of a frequency distribution.

26. 50 students of class X planned a visit to an old age home and to spend the whole day with its inmates. Each one prepared a cylindrical flower vase using cardboard to gift the inmates. The radius of cylinder is 4.2 cm and the height is 11.2 cm. What is the amount spent for purchasing the cardboard at the rate of Rs. per 100 m^2?

27. Prove that $\sqrt{2}$ is not a rational number.

OR

Construct the "square root spiral".

28. Write the answer of each of the following questions:

    i. What is the name of horizontal and the vertical lines drawn to determine the position of any point in the Cartesian plane?
    ii. What is the name of each part of the plane formed by these two lines?
    iii. Write the name of the point where these two lines intersect.

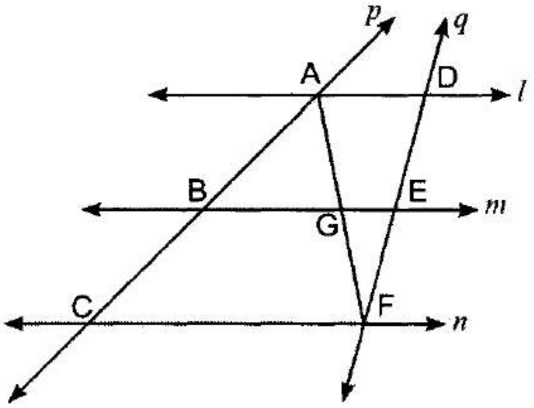
29. Find four solutions for the following equation: $2(x - 3) - 3(y - 1) = 0$

OR

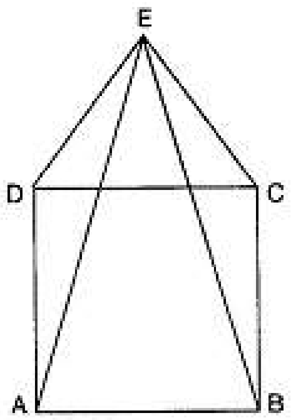
Draw the graph of the following linear equation in two variables: x + y = 4

30. Construct a $\triangle$ABC whose perimeter is 12 cm and sides are in the ratio 3 : 4 : 5.

31. l, m and n are three parallel lines intersected by transversal p and q such that l, m and n cut-off equal intercepts AB and BC on p Show that l, m and n cut-off equal intercepts DE and EF on q also.



32. ABCD is a square and DEC is an equilateral triangle. Prove that AE = BE.



OR

ABC is a triangle in which $\angle$A = 72^0, the internal bisectors of angle B and C meet in O. Find the magnitude of $\angle$BOC.

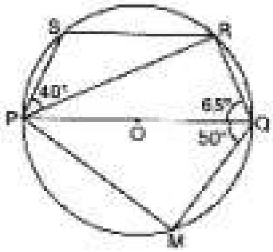
33. The perimeter of an isosceles triangle is 32 cm. The ratio of the equal side to its base is 3: 2. Find the area of the triangle.

34. A die is thrown once. Find the probability of getting

(i) a prime number

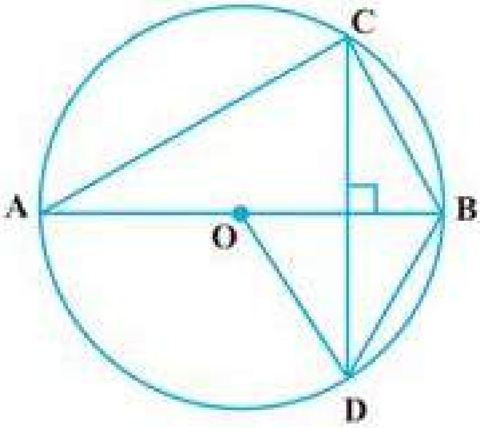
(ii) a number less then 5

35. In figure, PQ is a diameter of a circle with centre O. If $\angle PQR = 65^\circ, \angle SPR = 40^\circ, \angle PQM = 50^\circ$ find $\angle QPR, \angle PRS$ and $\angle QPM$

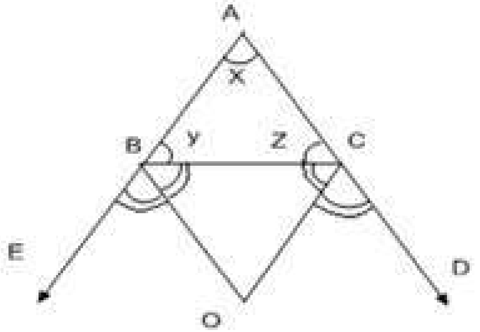


OR

In the figure, O is the centre of the circle, BD = OD and CD $\perp$ AB. Find $\angle$CAB.



36. In fig the side AB and AC of $\triangle$ ABC are produced to point E And D respectively. If bisector BO and CO of $\angle$CBE And $\angle$BCD respectively meet at point O, then prove that $\angle$ BOC $= 90^\circ - \frac{1}{2}\angle$ BAC



37. If $x + \frac{1}{x} = \sqrt{5}$, find the value of $x^2 + \frac{1}{x^2}$ and $x^4 + \frac{1}{x^4}$

OR

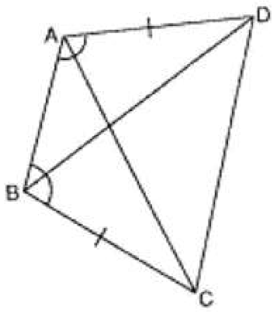
Divide p(x) by g(x), where $p(x) = 3x + 4x^2 + 1$ and $g(x) = -1 + x$.

38. A cylinder of same height and radius is placed on the top of a hemisphere. Find the curved surface area of the shape if the length of the shape be 7 cm.

OR

The difference between outside and inside surfaces of a cylindrical metallic pipe 14 cm long is 44 cm^2. If the pipe is made of 88 cm^3 of metal. Find outer and inner radii of the pipe.

39. ABCD is a quadrilateral in which AD = BC and $\angle$DAB = $\angle$CBA.



Prove that:

i. DABD $\cong$ DBAC
ii. BD = AC
iii. $\angle$ABD = $\angle$BAC

40. Explain, by taking a suitable example, how the arithmetic mean alters by

i. adding a constant k to each term,
ii. subtracting a constant k from each them,
iii. multiplying each term by a constant k and
iv. dividing each term by a non-zero constant k.

CBSE Class 09

Mathematics

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Solution

Section A

1. (b) $\frac{2}{3}$

   Explanation: $\left(\frac{12\frac{1}{5}}{27\frac{1}{5}}\right)^{\frac{5}{2}}$

   $\Rightarrow \left(\frac{12}{27}\right)^{\frac{1}{5}\times\frac{5}{2}}$

   $\Rightarrow \left(\frac{12}{27}\right)^{\frac{1}{2}}$

   $\Rightarrow \frac{2\sqrt{3}}{3\sqrt{3}}$

   $\Rightarrow \frac{2}{3}$

2. (b) 4

   Explanation:

   $4x^4 + 0x^3 + 0x^5 + 5x + 7$

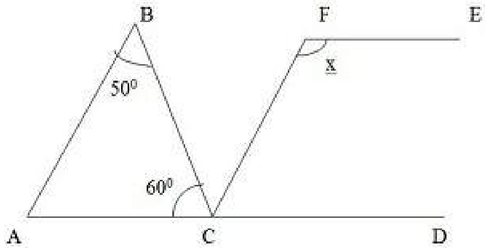
   = $4x^4 + 5x + 7$

   Here, the height power is 4.

   Therefore, the degree of given polynomial is 4.

3. (d) 110°

   Explanation:

   In the above figure, ∠B = ∠BCF (Alternate Interior angles)

   Now ∠FCA = ∠BCA + ∠FCB

   = 60° + 50° = 110°

Now $\angle$FCA = $\angle$x (Alternate interior angles)
Therefore $\angle$x = 110°

4. (b) 4.5 cm

   Explanation: To construct a triangle whose base, base angle and sum of other two sides are given, the sum of other two sides should be more than its base.

   But in this case, AB+AC< BC, so it is impossible to construct the $\triangle ABC$, when AB+AC= 4.5 cm.

5. (d) 1

   Explanation:

   $$\frac{(0.87)^3+(0.13)^3}{(0.87)^2-(0.87\times0.13)+(0.13)^2}$$

   $$= \frac{(0.87+0.13)\left[(0.87)^2-(0.87\times0.13)+(0.13)^2\right]}{(0.87)^2-(0.87\times0.13)+(0.13)^2}$$

   = $0.87 + 0.13$

   = 1

6. (d) $\triangle PQR,\ \triangle QSR,\ \triangle QST.$

   Explanation: Since triangles PQR and SQR are on the same base QR and between the same parallels, then

   $\text{area}\left(\triangle\text{PQR}\right) = \text{area}\left(\triangle\text{SQR}\right)$ ....(i)
   Similarly, $\text{area}\left(\triangle\text{SQR}\right) = \text{area}\left(\triangle\text{SRT}\right)$ ....(ii)
   $\text{area}\left(\triangle\text{SRT}\right) = \text{area}\left(\triangle\text{QRT}\right)$ ....(iii)
   $\text{area}\left(\triangle\text{QRS}\right) = \text{area}\left(\triangle\text{QST}\right)$ ....(iv)
   From eq.(i), (ii), (iii) and (iv) we get
   $\text{area}\left(\triangle\text{PQR}\right) = \text{area}\left(\triangle\text{SQR}\right) = \text{area}\left(\triangle\text{QST}\right)$

7. (c) $x^2 - 9$

   Explanation: $x^2 - 9$

   = $x^2 - 3^2$

= $(x+3)(x-3)$ [Using identity $a^2-b^2=(a+b)(a-b)$

Then the zeroes are $x+3=0$ and $x-3=0$

$\Rightarrow x=-3$ and $x=3$

8. (a) 10 cm

   Explanation:

   Area of rhombus = $\frac{1}{2}$ x Product of diagonal

   $\Rightarrow$ 96 = $\frac{1}{2}(16\times d_2)$

   $\Rightarrow d_2=\frac{96\times2}{16}$ = 12 cm

   Since diagonals of rhombus bisect each other at right angle.

   Therefore, side of the rhombus is hypotenuse of a triangle.

   side = $\sqrt{8^2+6^2}=10$ cm

9. (d) 6 cm.

   Explanation: LSA of cylinder=2πrh

   132 = 2×22/7 × r × 7

   r=132/44

   = 3 cm

   so, diameter would be 3×2=6cm

10. (c) $\frac{1}{3}$

    Explanation:

    Number of possible outcomes = 6

    Possibility of getting 3 or 4 = 2

    Probability of getting a number 3 or 4 = 2 / 6 = 1 / 3

11. 1

12. straight line

OR

Solution

13. (+, -)

14. 180^o

15. equal, parallel

16. $\frac{\sqrt{40}}{\sqrt{3}} = \frac{\sqrt{40}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{30}}{3}$

17. We have,

$(1 + x)(1 - x + x^2)$

$= (1 + x)[(1)^2 - 1 \times x + (x)^2]$

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

$= 1 + x^3$

18. Length of hall = 18 m

Width of hall = 12 m

Now, given,

Areas of the floor and the float roof = Sum of the area of the four walls.

$\Rightarrow$ 2lb = 2lh + 2bh

$\Rightarrow$ lb = lh + bh

$\Rightarrow$ h = $\frac{lb}{l+b}$ = $\frac{18\times12}{18+12}$ = $\frac{216}{30}$ = 7.2 m

OR

Let the rise in the level of water be h cm.

Then,

The volume of the cylinder of height h and base radius 28 cm = Volume of iron solid

$\Rightarrow \frac{22}{7} \times 28 \times 28 \times h = 32 \times 22 \times 14$

$\Rightarrow$ h = 4 cm

19. All the angle of a quadrilateral are equal. Also, the sum of angles of a quadrilateral is 360°. Therefore, each angle of quadrilateral is 90°.
So, the given quadrilateral is a rectangle.
Hence, special name given quadrilateral is rectangle.

20. The equation of any line parallel to the x-axis at a distance b units is given by y = b.
Here, b = 3 (above x-axis represent positive direction)
$\Rightarrow$ Required equation is y = 3.

21. $\frac{1}{9}$ = 0.111 ... $= 0.\overline{1}$

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9 )1.000 ( 0.111.....
   9
  ----
   10
    9
  ----
    10
     9
   ----
     1
```

22. Ordinate means y-coordinate and abscissa means x-coordinate.It is given that ordinate is two times of abscissa which means
y = 2x,
putting y = 2x in the equation x + y = 6, we get
$x + 2x = 6 \Rightarrow \ 3x = 6$
$\Rightarrow \ x = \frac{6}{3} \ \Rightarrow \ x = 2$
Putting x = 2 in the equation y = 2x we get,
y = 2 $\times$ 2 = 4
$\therefore$ the required point is (2, 4).

23. $p\left(x\right) = 5x - \pi$, $x = \frac{4}{5}$
We need to check whether $p\left(x\right) = 5x - \pi$ at $x = \frac{4}{5}$ is equal to zero or not, i.e., $p\left(\frac{4}{5}\right)$ is equal to zero or not.
$p\left(\frac{4}{5}\right) = 5\left(\frac{4}{5}\right) - \pi \ = 4 - \pi$
Therefore, $x = \frac{4}{5}$ is not a zero of the polynomial $p\left(x\right) = 5x - \pi$

OR

We know that,

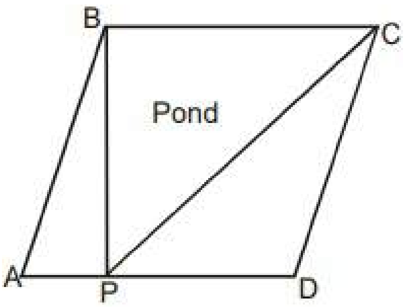
$(a - b)^3 = a^3 - b^3 - 3ab(a - b)$

$\Rightarrow (4)^3 = a^3 - b^3 - 3 \times 21 \times 4$ [$\because$ a - b = 4 and ab = 21]

$\Rightarrow 64 = a^3 - b^3 - 252$

$\Rightarrow a^3 - b^3 = 252 + 64$

$\Rightarrow a^3 - b^3 = 316$

24. 

Area of parallelogram = Base $\times$ altitude = 200 m^2

Since PB is an altitude drawn to the base BC, hence

Area of the parallelogram = BC $\times$ PB = 200

Also, the pond is a triangle-shaped with BC as base and PB an altitude.

Hence, area of the pond

= $\frac{1}{2} \times$ Base $\times$ altitude

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

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

= 100 m^2

Area of the medicinal plant = Area of the land - Area of the pond

= 200 - 100 = 100 m^2

Hence the area where the medicinal plants were grown is 100 m^2.

25. The mean weight per student in a group of 7 students = 55 kg.

Weights of 6 students (in kg) = 52, 54, 55, 53, 56 and 54.

Let Weight of 7^{th} student = x kg

$\therefore$ Mean = $\frac{Sum\ of\ all\ weights}{Total\ students}$

$\Rightarrow 55 = \frac{52+54+55+53+56+54+x}{7}$

$\Rightarrow 385 = 324 + x$

$\Rightarrow x = 385 - 324$

$\Rightarrow$ x = 61 kg

$\therefore$ Weight of 7^{th} student = 61 kg

OR

Frequency distribution table

Scores	Frequency
48	3
58	3
64	4
66	7
69	6
71	3
73	2
81	1
83	2
84	2

26. r = 4.2 cm, h = 11.2 cm

S.A. of cylindrical vase = CSA + Area of base

$= 2\pi rh + \pi r^2 = 2\pi \times 4.2 \times 11.2 \times + \pi \times (4.2)^2$

$= 4.2\pi(22.4 + 4.2)$

$= 4.2 \times \frac{22}{7} \times 26.6$ = 351.12 cm^2

Surface Area of 50 cylinders = 50 $\times$ 351.12 = 17556 cm^2

Total cost $= 17556 \times \frac{20}{100}$ = Rs. 3511.20

27. Let us find the square root of 2 by long division method as shown below:

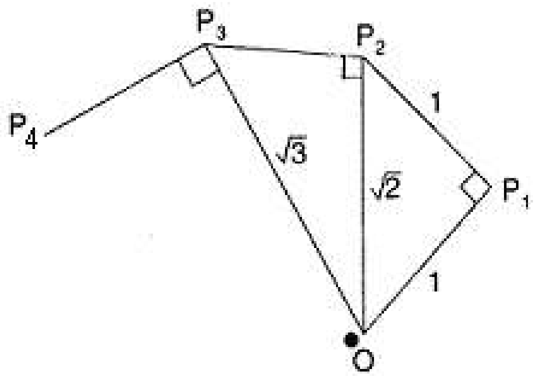
	1.4142135
1	2.00000000000000
	1
24	100
	96
281	400
	281
2824	11900
	11296
28282	60400
	56564
282841	383600
	282841
2828423	10075900
	8485269
28284265	159063100
	141421325
28284270	17611775

$\Rightarrow \sqrt{2} = 1.4142135.$

Clearly, the decimal representation of $\sqrt{2}$ is neither terminating nor repeating. Hence, it is not a rational number.

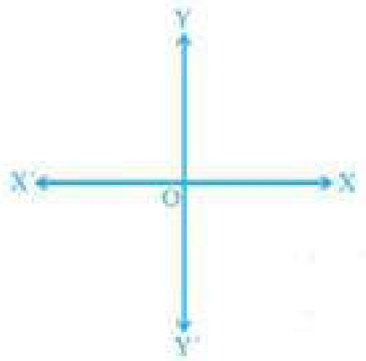
OR

Take a point O and draw a line segment OP_1 of unit length. Draw a line segment P_1P_2 perpendicular to OP_1 of unit length. Now draw a line segment P_2P_3 perpendicular to OP_2. Then draw a line segment P_3P_4 perpendicular to OP_3. Continuing in this manner, get the line segment $P_{n-1}P_n$ by drawing a line segment of unit length perpendicular to OP_{n-1}. In such a way create the point: P_1, P_2, P_3, ... P_n, ... and join them to create a spiral depicting $\sqrt{2}$, $\sqrt{3}$, $\sqrt{4}$, ...

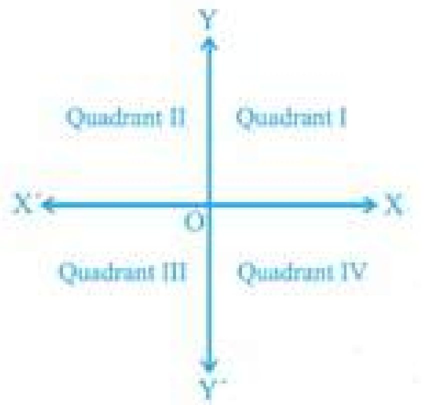


28. i. The horizontal line that is drawn to determine the position of any point in the Cartesian plane is called as x-axis. The vertical line that is drawn to determine the

position of any point in the Cartesian plane is called as y-axis



ii. The name of each part of the plane that is formed by x-axis and y-axis is called as quadrant.



iii. The point, where the x-axis and the y-axis intersect is called as origin.

29. $2(x - 3) - 3(y - 1) = 0$

$\Rightarrow 2x - 6 - 3y + 3 = 0$

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

$\Rightarrow 3y = 2x - 3$

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

Put x = 0, then $y = \frac{2(0)-3}{3} = -1$

Put x = –3, then $y = \frac{2(-3)-3}{3} = -3$

Put x = 3, then $y = \frac{2(3)-3}{3} = 1$

Put x = 6, then $y = \frac{2(6)-3}{3} = 3$

∴ (0, –1), (–3, –3), (3, 1) and (6, 3) are the four solutions of the equation $2(x - 3) - 3(y - 1) = 0$.

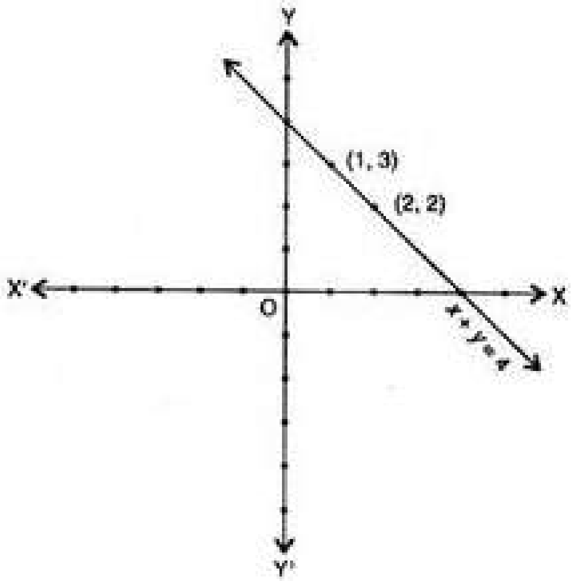
OR

x + y = 4

⇒ y = 4 – x

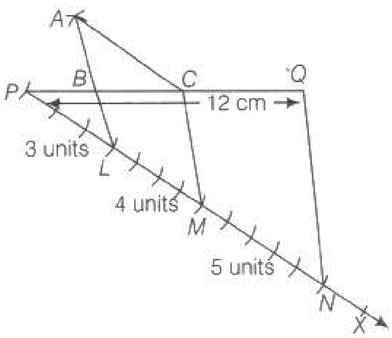
x	1	2
y	3	2

We plot the points (1, 3) and (2, 2) on the graph paper and join the same by a ruler to get the line which is the graph of the equation x + y = 4.



30. **Steps of Construction:**

i. Draw a line segment PQ = 3 + 4 + 5 = 12 cm.
ii. Draw a ray PX in the downward direction making an acute angle with PQ.



iii. From P, cut (3 + 4 + 5) = 12, equal distance marks on PX.
iv. Denote the points L, M and N on PX such that PL = 3 units, LM = 4 units and MN = 5

units.

v. Join NQ.

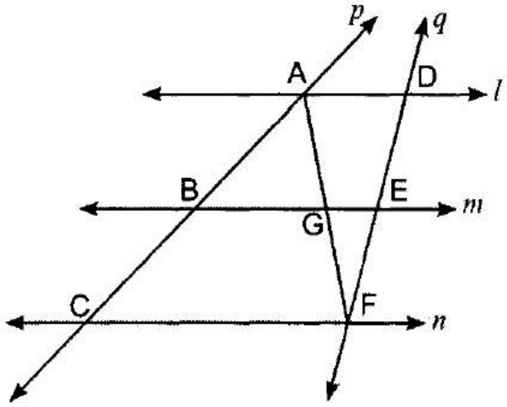
vi. Through L and M, draw LB || NQ and MC || NQ, cutting PQ at B and C, respectively.

vii. With B as centre and radius BP, draw an arc and with C as centre and radius CQ, draw another arc cutting the previous arc at A on the upward side of PQ.

viii. Join AB and AC. Thus, ABC is the required triangle.

31. It is given that AB = BC and we need to prove that DE = EF.

Construction: Join A to F which intersects m at G as shown below.



The trapezium ACFD is divided into two triangles; namely $\triangle$ACF and $\triangle$AFD.

In $\triangle$ACF, it is given that B is the mid-point of AC (AB = BC)

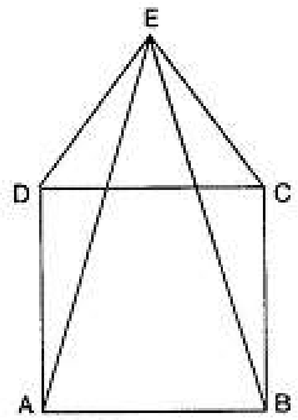
and BG $\parallel$ CF (Since m$\parallel$n)

So, By the converse of Mid-point Theorem, G is the mid-point of AF.

Now, in $\triangle$AFD, by applying the same argument as G is the mid-point of AF, we have GE $\parallel$ AD so E is the mid-point of DF,

i.e., DE = EF

In other words /, m and n cut-off equal intercepts on q also.

32. 

In DEDA and DECB,

DE = CE . . . . [Sides of an equilateral triangle]

AD = BC . . . . [Sides of a square]

$\angle$EDA = $\angle$ECB . . . .[As $\angle$EDC = $\angle$ECD and $\angle$ADC = $\angle$BCD]

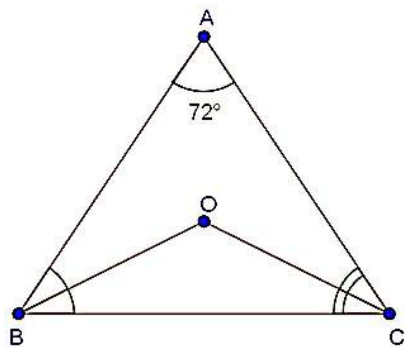
$\angle$EDC + $\angle$ADC = $\angle$ECD + $\angle$BCD . . . .[By addition]

$\Rightarrow$ $\angle$EDA = $\angle$ECB

$\therefore$ DEDA $\cong$ DECB . . . [By SAS property]

$\therefore$ AE = BE . . . [c.p.c.t.]

OR



In $\triangle$ABC,

$\angle A + \angle B + \angle C = 180^o$

$\Rightarrow 72^o + \angle B + \angle C = 180^o$

$\Rightarrow \angle B + \angle C = 108^o$

$\Rightarrow \frac{1}{2}\angle B + \frac{1}{2}\angle C = \frac{1}{2} \times 108^o$

$\Rightarrow \angle OBC + \angle OCB = 54^o$ .....(i)

Now, in $\triangle$BOC,

$\angle OBC + \angle OCB + \angle BOC = 180^o$

$\Rightarrow 54^{o} + \angle BOC = 180^{o}$

$\Rightarrow \angle BOC = 180^{o} - 54^{o} = 126^{o}$

33. As the sides of the equal to the base of an isosceles triangle is 3 : 2, so let the sides of an isosceles triangle be 3x, 3x and 2x.

Now, perimeter of triangle = 3x + 3x + 2x = 8x

Given Perimeter of triangle = 32 m

$\therefore 8x = 32; x = 32 \div 8 = 4$

So, the sides of the isosceles triangle are $(3 \times 4)cm, (3 \times 4)cm, (2 \times 4)cm$ i.e., 12 cm, 12 cm and 8cm

$\therefore \; s = \frac{12+12+8}{2} = \frac{32}{2} = 16cm$

$= \sqrt{16(16-12)(16-12)(16-18)}$

$= \sqrt{16 \times 4 \times 4 \times 8} = \sqrt{4 \times 4 \times 4 \times 4 \times 4 \times 2}$

$= 4 \times 4 \times 2\sqrt{2} = 32\sqrt{2}cm^2$

34. When a die is thrown, then outcomes are 1, 2, 3, 4, 5, 6

(i)Prime numbers are = 2, 3, 5

$\therefore$ Frequency of happening prime number is 3

$\therefore$ The probability of getting prime number = $\frac{3}{6} = \frac{1}{2}$

(ii)Numbers less than 5 are 1, 2, 3, 4

$\therefore$ Frequency of happening of a no. less than 5 is 4

$\therefore$Probability of getting a number less than 5

= $\frac{4}{6} = \frac{2}{3}$

35. i. $\angle QPR$

$\because$ PR is a diameter

$\therefore \angle PRQ = 90^\circ$ |Angle in a semi-circle is 90^{o}

In $\triangle$PQR

$\angle QPR + \angle PRQ + \angle PQR = 180^\circ$ |Angle sum property of a triangle

$\Rightarrow \angle QPR + 90^\circ + 65^\circ = 180^\circ$

$\Rightarrow \angle QPR + 155^\circ = 180^\circ$

$\Rightarrow \angle QPR = 180^\circ - 155^\circ$

$\Rightarrow \angle QPR = 25^\circ$

ii. $\angle$PRS

$\because$ PQRS is a cyclic quadrilateral

$\therefore \angle PSR + \angle PQR = 180^\circ$

$|\because$ Opposite angles of a cyclic quadrilateral are supplementary

$\Rightarrow \angle PSR + 65^\circ = 180^\circ$

$\Rightarrow \angle PSR = 180^\circ - 65^\circ$

$\Rightarrow \angle \mathrm{PSR} = 115^\circ$

In $\triangle PSR$

$\angle PSR + \angle SPR + \angle PRS = 180^\circ$ |Angles sum property of a triangle

$\Rightarrow 115^\circ + 40^\circ + \angle PRS = 180^\circ$

$\Rightarrow 155^\circ + \angle PRS = 180^\circ$

$\Rightarrow \angle PRS = 180^\circ - 155^\circ$

$\Rightarrow \angle PRS = 25^\circ$

iii. $\angle QPM$

$\therefore$ PQ is a diameter

$\therefore \angle \mathrm{PMQ} = 90^\circ$ $|\because$ Angle is a semi-circle is 90^o

In $\triangle PMQ$

$\angle PMQ + \angle PQM + \angle QPM = 180^\circ$ |Angle sum property of a triangle

$\Rightarrow 90^\circ + 50^\circ + \angle QPM = 180^\circ$

$\Rightarrow 140^\circ + \angle QPM = 180^\circ$

$\Rightarrow \angle QPM = 180^\circ - 140^\circ$

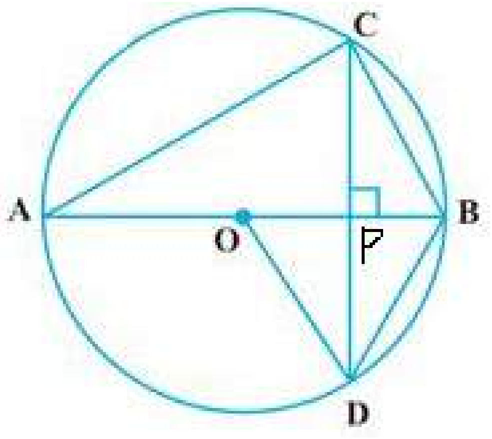
$\Rightarrow \angle QPM = 40^\circ$

OR

From the figure shown below, In ΔBOD, we have

BD = OD [Given]

$\therefore \angle DOB = \angle DBO$ ....[$\because$ Angles opp. to equal sides of triangle are equal]



Let CD intersect AB at P.

Now in ΔODP and ΔBDP, we have

$\angle DOP = \angle DBP$ [$\because \angle DOB = \angle DBO$]

$\angle DPO = \angle DPB$ ......[Each is 90^{0}]

OD = BD ......[Given]

$\therefore \Delta ODP \cong \Delta BDP$ [By AAS congruence rule]

$\therefore \angle ODP = \angle BDP$ ...(1) [By C.P.C.T.]

Now, OD = OB [Radii of the same circle]

And OD = BD [Given]

$\therefore$ OB = OD = BD, so ΔOBD is an equilateral triangle.

$\therefore \angle ODB = 60^\circ$ [$\because$ Each angle of equilateral triangle is 60^{0}]

Now,$\angle BDP = \frac{1}{2} \times 60^\circ = 30^\circ$ or $\angle CDB = 30^\circ$

Since, angles in the same segment of a circle are equal, so we have

So, $\angle CAB = \angle CDB = 30^\circ$

36. Ray BO bisects $\angle$CBE

$\therefore\ \angle \mathrm{CBO} = \frac{1}{2}\ \angle \mathrm{CBE}$

$= \frac{1}{2}(180^\circ - y)$ $\ (\because\ \angle \mathrm{CBE} + \mathrm{y} = 180^\circ \therefore \angle CBE = 180^\circ - y)$

$= 90^{\circ} - \frac{y}{2}$ ...(i)

Similarly, ray CO bisects $\angle BCD$

$\angle \mathrm{BCO} = \frac{1}{2}\angle BCD$

$= \frac{1}{2}(180^{\circ} - z)$

$= 90^{\circ} - \frac{Z}{2}$...(ii)

$In\ \triangle\ \mathrm{BOC}$ In $\triangle$BOC

$\angle \mathrm{BOC} + \angle \mathrm{BCO} + \angle \mathrm{CBO} = 180^{\circ}$

$\angle \mathrm{BOC} = \frac{1}{2}(y + z)$

But x + y + z = 180°

y + z = 180°-x

$\angle \mathrm{BOC} = \frac{1}{2}(180^{\circ} - x) = 90^{\circ} - \frac{x}{2}$

$\angle \mathrm{BOC} = 90^{\circ} - \frac{1}{2}\ \angle \mathrm{BAC}$

37. We have,

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

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

$\Rightarrow (\sqrt{5})^2 = x^2 + \frac{1}{x^2} + 2$ $[\because x + \frac{1}{x} = \sqrt{5}]$

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

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

$\Rightarrow x^2 + \frac{1}{x^2} = 3$ .....(i)

Now, $(x^2 + \frac{1}{x^2})^2 = x^4 + \frac{1}{x^4} + 2 \times x^2 \times \frac{1}{x^2}$

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

$\Rightarrow (3)^2 = x^4 + \frac{1}{x^4} + 2$ [Using equation 1]

$\Rightarrow 9 = x^4 + \frac{1}{x^4} + 2$

$\Rightarrow x^4 + \frac{1}{x^4} = 9 - 2$

$\Rightarrow x^4 + \frac{1}{x^4} = 7$

OR

Given, p(x) = 3x + 4x^2+1 and g(x) = -1 + x.

On arranging p (x) and q (x) in descending order of their degrees and then writing it in standard form,

we get p(x) = $4x^2 + 3x + 1$ and g (x) = x - 1.

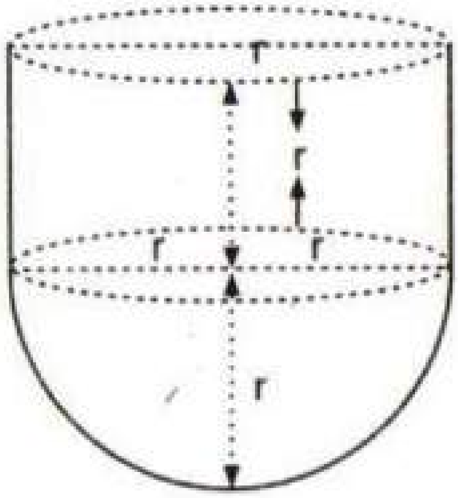
Now, by long division,

$$
\begin{array}{r|l}
 & \quad\ \ 4x+7 \\ \hline
x-1 & 4x^2+3x+1 \\
 & 4x^2-4x \\
 & -\quad + \\ \hline
 & \qquad\ \ 7x+1 \\
 & \qquad\ \ 7x-7 \\
 & \qquad\ \ -\quad + \\ \hline
 & \qquad\qquad\ 8
\end{array}
$$

Thus, $4x^2 + 3x + 1 = (x - 1)(4x + 7) + 8$

i.e. Dividend = (Divisor $\times$ Quotient) + Remainder

38.



Given: Lenght of the shape = 7 cm

But Length = r + r

$\Rightarrow$ r + r = 7 cm

$\Rightarrow$ r = 3.5 cm

Also, h = r

$\therefore$ Total surface area of shapr = $2\pi rh + 2\pi r^2$

= $2\pi r \times$ r + $2\pi r^2$

= $2\pi r^2 + 2\pi r^2$

= $4\pi r^2$

= $4 \times \frac{22}{7} \times 3.5 \times 3.5$

= 154 cm^2

OR

Let R cm and r cm be the external and internal radii of the metallic pipe, respectively.

Height/length of the pipe (h) = 14 cm

According to the question,

Outside surface area - Inside surface area = 44 cm^2

$2\pi Rh - 2\pi rh = 44$

$\Rightarrow 2 \times \frac{22}{7}(R - r) \times 14 = 44$

$\Rightarrow R - r = \frac{1}{2}$ ....(i)

Volume of the metal used for making the pipe = 88 cm^3. Thus,

$\pi R^2h - \pi r^2h = 88$

$\Rightarrow \frac{22}{7} \times (R + r)(R - r) \times 14 = 88$

$\Rightarrow R + r = \frac{88}{22} \Rightarrow R + r = 4$.....(ii)

On adding Eqs. (i) and (ii), we get

$R - r + R + r = \frac{1}{2} + 4 = 0.5 + 4 = 4.5$

$\Rightarrow 2R = 4.5$

$\Rightarrow R = \frac{4.5}{20} = 2.25$ cm

On putting R = 2.25 cm in Eq.(ii), we get

r = 4 - 2.25 = 1.75 cm

Hence, outer and inner radii of the pipe are 2.25 cm and 1.75 cm, respectively.

39. Given: ABCD is a quadrilateral in which AD = BC and $\angle DAB = \angle CBA$

To prove:

i. DABD $\cong$ DBAC
ii. BD = AC
iii. $\angle ABD = \angle BAC$

Proof:

i. In DABD and DBAC,
AD = BC ...[Given]
$\angle DAB = \angle CBA$ ...[Given]

AB = BA ...[Common]

$\therefore$ DABD $\cong$ DBAC proved ...[By SAS Property] ...(i)

ii. DABD $\cong$ DBAC ...[From (i)]

$\therefore$ BD = AC ...[c.p.c.t.]

iii. DABD $\cong$ DBAC ...[From (i)]

$\therefore$ $\angle$ABD = $\angle$BAC ...[c.p.c.t.]

40. Suppose numbers be 3, 4, 5

$\therefore$ Mean = $\frac{\text{Sum of numbers}}{\text{Total number}} = \frac{3+4+5}{3}$

$= \frac{12}{3} = 4$

i. Adding constant term k = 2 in each term

New numbers are = 5, 6, 7

$\therefore$ New mean = $\frac{5+6+7}{3} = \frac{18}{3} = 6 = 4 = 2$

$\therefore$ New mean will be 2 more than the original mean.

ii. Subtracting constant term k = 2 in each term

New numbers are = 1, 2, 3

$\therefore$ New mean = $\frac{1+2+3}{3} = \frac{6}{3} = 2 = 4 - 2$

$\therefore$ New mean will be 2 less than the original mean.

iii. Multiply by constant term k = 2 in each term

New numbers are = 6, 8, 10

$\therefore$ New mean = $\frac{6+8+10}{3} = \frac{24}{3} = 8 = 4 \times 2$

$\therefore$ New mean will be 2 times of the original mean.

iv. Divide by constant term k = 2 in each term

New numbers are = 1.5, 2, 2.5

$\therefore$ New mean = $\frac{1.5+2+2.5}{3} = \frac{6}{3} = 2 = \frac{4}{2}$

$\therefore$ New mean will be half of the original mean.