Class: IX
SESSION : 2022-2023
SUBJECT: Mathematics
SAMPLE QUESTION PAPER - 8
with SOLUTION

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

Section A

1. For what value of 'k', x = 2 and y = -1 is a solution of x + 3y – k = 0? **[1]**

a) 2 b) -2

c) -1 d) 1

2. A point of the form (a, 0) lies on **[1]**

a) quadrant I b) x- axis

c) quadrant IV d) y- axis

3. The simplest rationalisation factor of $(2\sqrt{2}-\sqrt{3})$ is **[1]**

a) $\sqrt{2}+\sqrt{3}$ b) $2\sqrt{2}+\sqrt{3}$

c) $2\sqrt{2}+3$ d) $\sqrt{2}-\sqrt{3}$

4. To draw a histogram to represent the following frequency distribution : **[1]**

Class interval	5-10	10-15	15-25	25-45	45-75
Frequency	6	12	10	8	15

The adjusted frequency for the class 25-45 is

a) 6 b) 5

c) 2 d) 3

5. Euclid stated that all right angles are equal to each other in the form of **[1]**

a) A postulate

b) A proof

c) An axiom

d) A definition

6. The cost of 2 kg of apples and 1 kg of grapes on a day was found to be ₹160. A linear equation in two variables to represent the above data is **[1]**

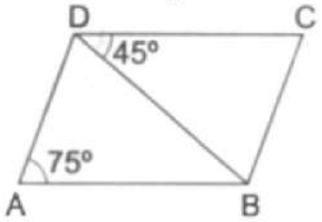
a) x - 2y = 160

b) 2x + y = 160

c) x + y = 160

d) 2x - y = 160

7. In the given figure, ABCD is a parallelogram in which ∠BDC = 45° and ∠BAD = 75°. Then, ∠CBD = ? **[1]**



a) 60^o

b) 45^o

c) 75^o

d) 55^o

8. Two planes intersect each other to form a : **[1]**

a) point

b) plane

c) angle

d) Straight line

9. The factors of $x^4 + x^2 + 25$, are **[1]**

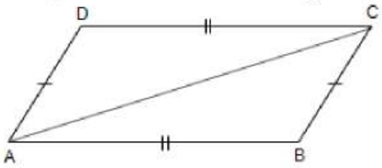
a) $(x^2 + 3x + 5)(x^2 + 3x - 5)$

b) $(x^2 + 3x + 5)(x^2 - 3x + 5)$

c) none of these

d) $(x^2 + x + 5)(x^2 - x + 5)$

10. In the adjoining figure, ABCD is a quadrilateral in which AD = CB and AB = CD, then ∠ACB is equal to **[1]**



a) ∠BAC

b) ∠BAD

c) ∠CAD

d) ∠ACD

11. The equation y = 2x - 7 has **[1]**

a) no solution

b) two solutions

c) one solution

d) many solutions

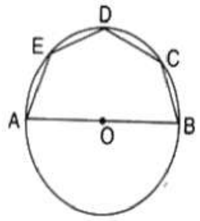
12. If APB and CQD are two parallel lines, then the bisectors of the angles APQ, BPQ, CQP and PQD form **[1]**

a) any other parallelogram
b) a rhombus
c) a square
d) a rectangle

13. $\sqrt{12} \times \sqrt{15} =$ **[1]**

a) 5
b) $5\sqrt{6}$
c) $6\sqrt{5}$
d) 6

14. AOB is a diameter of the circle and C, D, E are any three points on the semicircle. Then $\angle AED + \angle BCD$ is equal to **[1]**



a) 250^o
b) 270^o
c) 280^o
d) 260^o

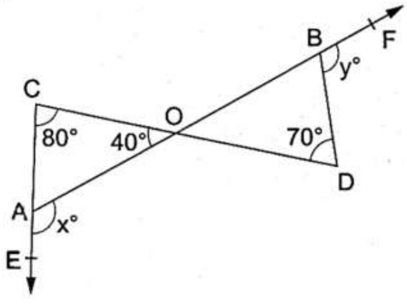
15. The zeros of the quadratic polynomial $x^2 + 88x + 125$ are **[1]**

a) both negative
b) both positive
c) both equal
d) one positive and one negative

16. The factors of $a^2 - 1 - 2x - x^2$, are **[1]**

a) none of these
b) (a + x - 1) (a - x + 1)
c) (a + x + 1) (a - x - 1)
d) (a - x + 1) (a - x - 1)

17. In the given figure, lines AB and CD intersect at a point O. The sides CA and OB have been produced to E and F respectively such that $\angle OAE = x^\circ$ and $\angle DBF = y^\circ$. **[1]**



If $\angle OCA = 80^\circ$, $\angle COA = 40^\circ$ and $\angle BDO = 70^\circ$ then $x^o + y^o = ?$

a) 210^o

b) 190^o

c) 270^o

d) 230^o

18. The curved surface area of a cylinder and a cone is equal. If their base radius is same, then the ratio of the slant height of the cone to the height of the cylinder is **[1]**

a) 1 : 1

b) 2 : 3

c) 1 : 2

d) 2 : 1

19. **Assertion (A):** The point (1, 1) is the solution of x + y = 2. **[1]**
Reason (R): Every point which satisfy the linear equation is a solution of the equation.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

20. **Assertion (A):** If the area of an equilateral triangle is $81\sqrt{3}$ cm^2, then the semi perimeter of triangle is 20 cm. **[1]**
Reason (R): Semi perimeter of a triangle is s = $\frac{a+b+c}{2}$, where a, b, c are sides of triangle.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

21. Factorise: $a^3(b - c)^3 + b^3(c - a)^3 + c^3(a - b)^3$. **[2]**

22. Find the area of a triangle two side of the triangle are 18 cm, and 12 cm. and the perimeter is 40 cm. **[2]**

23. Find the volume of a sphere whose surface area is 154 cm^2. **[2]**

24. Find the value of k, if x = 2, y = 1 is a solution of the equation 2x + 3y =k. **[2]**

OR

Write four solutions of the equation: $\pi x + y = 9$

25. Verify that 2 and -3 are the zeros of the polynomial, $q(x) = x^2 + x - 6$ **[2]**

OR

Is (x + 1) is a factor of given polynomial $p(x) = x^3 - x^2 - (2 + \sqrt{2})x + \sqrt{2}$?

Section C

26. Factorise : $x^3 - 23x^2 + 142x - 120$ **[3]**

27. Simplify: $(256)^{-\left(4^{-\frac{3}{2}}\right)}$. **[3]**

28. The sides of a triangular field are 41m, 40m and 9m. Find the number of rose beds that can be prepared in the field, if each rose bed on an average needs 900 cm^2 space. **[3]**

OR

The sides of a triangular plot are in the ratio of 3 : 5 : 7 and its perimeter is 300 m. Find its area.

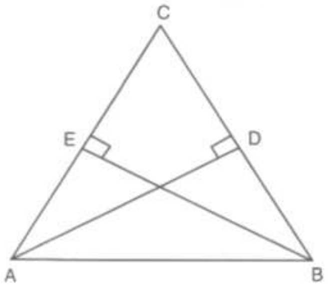
29. Find solutions of the form x = a, y = 0 and x = 0, y = b for the following pairs of equations. Do they have any common such solution for equations 9x + 7y = 63 and x + y = 10 **[3]**

30. How will you describe the position of a table lamp on your study table to another person? **[3]**

31. $\triangle$ABC 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. **[3]**

OR

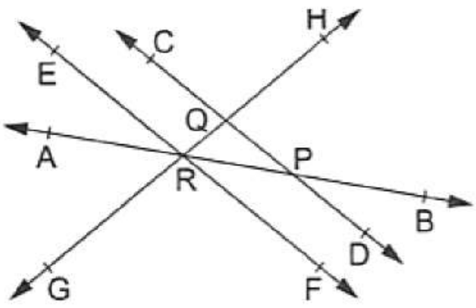
In given figure, AD and BE are respectively altitudes of a triangle ABC such that AE = BD. Prove that AD = BE.



Section D

32. In the adjoining figure, name: **[5]**

i. Two pairs of intersecting lines and their corresponding points of intersection
ii. Three concurrent lines and their points of intersection
iii. Three rays
iv. Two line segments

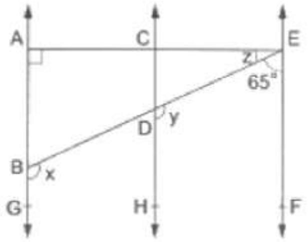


33. Visualize the representation of $2.3\overline{2}$ on the number line up to 4 decimal places. **[5]**

OR

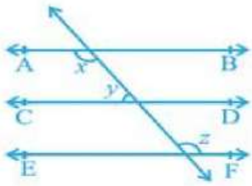
Represent each of the numbers $\sqrt{5}, \sqrt{6}$ and $\sqrt{7}$ the real line.

34. In the given figure, AB || CD || EF, $\angle DBG = x, \angle EDH = y$, $\angle AEB = z$, $\angle EAB = 90^\circ$ and $\angle BEF = 65^\circ$. Find the values of x, y and z. **[5]**



OR

In the given figure, if AB || CD, CD || EF and y: z = 3: 7, find x.



35. The daily wages of 50 workers in a factory are given below: **[5]**

Daily wages (in ₹)	340-380	380-420	420-460	460-500	500-540	540-580
Number of workers	16	9	12	2	7	4

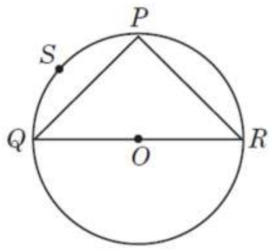
Construct a histogram to represent the above frequency distribution.

Section E

36. **Read the text carefully and answer the questions:** **[4]**

Sanjay and his mother visited in a mall. He observes that three shops are situated at P, Q, R as shown in the figure from where they have to purchase things according to their need. Distance between shop P and Q is 8 m and between shop P and R is 6 m.

Considering O as the center of the circles.



(i) Find the Measure of ∠QPR.

(ii) Find the radius of the circle.

(iii) Find the Measure of ∠QSR.

OR

Find the area of ΔPQR.

37. **Read the text carefully and answer the questions:** **[4]**

Harish makes a poster in the shape of a parallelogram on the topic SAVE ELECTRICITY for an inter-school competition as shown in the follow figure.

(i) If $\angle A = (4x + 3)^{\circ}$ and $\angle D = (5x - 3)^{\circ}$, then find the measure of ∠B.

(ii) If $\angle B = (2y)^{\circ}$ and $\angle D = (3y - 6)^{\circ}$, then find the value of y.

OR

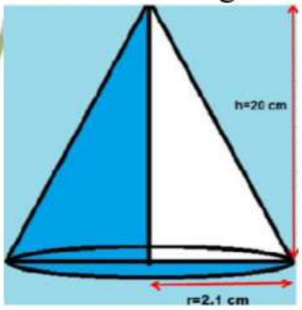
If AB = (2y - 3) and CD = 5 cm then what is the value of y?

(iii) If $\angle A = (2x - 3)^{\circ}$ and $\angle C = (4y + 2)^{\circ}$, then find how x and y relate.

38. **Read the text carefully and answer the questions:** **[4]**

Once upon a time in Ghaziabad was a corn cob seller. During the lockdown period in the year 2020, his business was almost lost.
So, he started selling corn grains online through Amazon and Flipcart. Just to understand how many grains he will have from one corn cob, he started counting them.
Being a student of mathematics let's calculate it mathematically. Let's assume that one corn cob (see Fig.), shaped somewhat like a cone, has the radius of its

broadest end as 2.1 cm and length as 20 cm.



(i) Find the curved surface area of the corn cub.

(ii) What is the volume of the corn cub?

OR

How many such cubs can be stored in a cartoon of size 20 cm $\times$ 25 cm $\times$ 20 cm.

(iii) If each 1 cm^2 of the surface of the cob carries an average of four grains, find how many grains you would find on the entire cob?

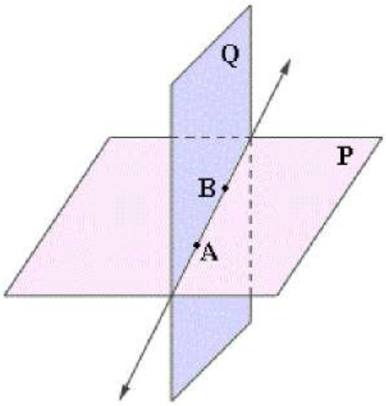
SOLUTION

Section A

1. **(c)** -1
   Explanation: For finding value of ‘k’, we put x = 2 and y = -1 iin a equation x + 3y – k = 0
   x+3 y-k=0
   2+3(-1)=k
   2-3=k
   k=-1
2. **(b)** x- axis
   Explanation: The given point of the form = (a, 0)
   Here, x-co-ordinate = a and y-co-ordinate = 0
   ∴ The point of the form (a, 0) always lies on x-axis.
   Thus, the point of the form (a, 0) always lies on x-axis.
3. **(b)** $2\sqrt{2}+\sqrt{3}$
   Explanation: $2\sqrt{2}+\sqrt{3}$
4. **(c)** 2
   Explanation: Adjusted frequency = $\left(\frac{\text{frequency of the class}}{\text{width of the class}}\right) \times 5$
   Therefore, Adjusted frequency of 25 - 45 = $\frac{8}{20} \times 5 = 2$
5. **(a)** A postulate
   Explanation: Eucid's fourth postulate states that all right angles are equal to one another.
6. **(b)** 2x + y = 160
   Explanation: Let the cost of apples be ₹x per Kg and cost of grapes be ₹y per Kg. The cost of 2 kg of apples and 1 kg of grapes on a day was found to be ₹160.
   So the equation will be
   2x + y = 160
7. **(a)** 60^{o}
   Explanation: As per the question
   $\angle BAD = \angle BCD = 75^{o}$ (opposite angles of parallelogram)
   Now, in $\triangle BCD$,
   $\angle BCD + \angle CBD + \angle BCD = 180^{o}$
   $45^{o} + \angle CBD + 75^{o} = 180^{o}$
   $\angle CBD = 60^{o}$

8. **(d)** Straight line

Explanation:



As can be seen from the above diagram, the two planes "P" and "Q" are intersecting in a line, which is AB.

9. **(b)** $(x^2 + 3x + 5)(x^2 - 3x + 5)$

Explanation: The given expression to be factorized is $x^4 + x^2 + 25$

This can be written in the form

$x^4 + x^2 + 25 = (x^2)^2 + 2.\ x^2.5 + (5)^2 - 9x^2$

$= \left\{(x^2)^2 + 2x^2.5 + (5)^2\right\} - (3x)^2$

$= (x^2 + 5)^2 - (3x)^2$

$= (x^2 + 5)^2 - (3x)^2$

$= (x^2 + 5 + 3x)\ (x^2 + 5 - 3x)$

10. **(c)** ∠CAD

Explanation:

As AB = CD, so ,∠ACB = ∠CAD (alternate angles)

11. **(d)** many solutions

Explanation: y = 2x - 7

Has many solution because for different value of x we have different value of y for example.

At x = 1

y = 2 (1) - 7

y = 2 - 7

y = -5

at x = 2

y = 2(2) - 7

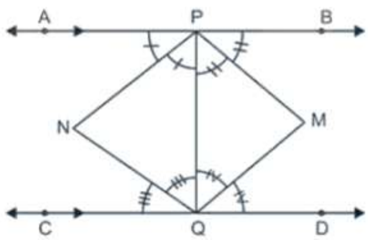
y = 4 - 7

y = -3

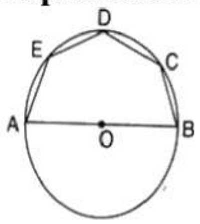
So we can say for many value of x there is many value of y.

12. **(d)** a rectangle

Explanation:



PNQM is a rectangle.

13. **(c)** $6\sqrt{5}$
Explanation: $\sqrt{12}=\sqrt{3\times 2^2}=2\sqrt{3}$ and $\sqrt{15}=\sqrt{5}\times\sqrt{3}$
so, $\sqrt{12}\times\sqrt{15}=2\sqrt{3}\times\sqrt{3}\times\sqrt{5}$
$=2\times 3\sqrt{5}=6\sqrt{5}$
14. **(b)** 270^o
Explanation:


Join OE, OD, OC.
We get four triangles, namely, $\triangle AOE, \triangle EOD, \triangle DOC, \triangle COB$
Now, all these triangles are isosceles triangles.
So,
$\angle 1 = \angle 2$
$\angle 3 = \angle 4$
$\angle 5 = \angle 6$
$\angle 7 = \angle 8$
Now, required angle $\angle AED+\angle BCD=\angle 2+\angle 3+\angle 6+\angle 7$
Now sum of all the angles must be 720^0 (as they are the angles of four triangles $\therefore Sum=180^0\times 4=720^0$)
Therefore,
$\angle 1+\angle 2+\angle 3+\angle 4+\angle 5+\angle 6+\angle 7+\angle 8+\angle 9+\angle 11+\angle 12=720^0$
$\Rightarrow 2\angle 2+2\angle 3+2\angle 6+2\angle 7+\angle 9+\angle 10+\angle 11+\angle 12=720^\circ$
$\Rightarrow 2(\angle 2+\angle 3+\angle 6+\angle 7)+\angle 9+\angle 10+\angle 11+\angle 12=720^\circ$
$\Rightarrow 2(\angle 2+\angle 3+\angle 6+\angle 7)+180^0=720$
$\Rightarrow 2(\angle 2+\angle 3+\angle 6+\angle 7)=540^\circ$
$\Rightarrow (\angle 2+\angle 3+\angle 6+\angle 7)=\frac{540^\circ}{2}=270^\circ$
Thus, the required angle is equal to 270^0
15. **(a)** both negative
Explanation: Given; $x^2+88x+125=0$
$D=(88)^2-4(1)(125)$
$D=7244$
Now,
$x=\frac{-(88)\pm\sqrt{7244}}{2(1)}$
$\Rightarrow x=\frac{-88+2\sqrt{1811}}{2}$
There roots are $x=-44+\sqrt{1811},-44-\sqrt{1811}$
Which are both negative.
16. **(c)** (a + x + 1) (a - x - 1)
Explanation: The given expression to be factorized is $a^2 - 1 - 2x - x^2$
Take common -1 from the last three terms and then we have
$a^2 - 1 - 2x - x^2 = a^2 - (1 + 2x + x^3)$
$= a^2 - \{(1)^2 + 2.1.x + (x)^2\}$

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

17. **(d)** 230^o

Explanation: In the given figure, ∠ BOD = ∠COA (Vertically opposite angles)
$\therefore \angle BOD = 40^\circ$ ....(1)
In △ACO
$\angle OAE = \angle OCA + \angle COA$ (Exterior angle of a triangle is equal to the sum of two opposite interior angles)
$\Rightarrow x^\circ = 80^\circ + 40^\circ = 120^\circ$ .....(2)
In $\angle BDO$,
$\angle DBF = \angle BDO + \angle BOD$ (Exterior angle of a triangle is equal to the sum of two opposite interior angles)
$\Rightarrow y^\circ = 70^\circ + 40^\circ = 110^\circ$ [Unsing (1)] ...(3)
Adding (2) and (3) we get
$x^\circ + y^\circ = 120^\circ + 110^\circ = 230^\circ$

Hence the correct option is 230^o

18. **(d)** 2 : 1

Explanation: CSA of cone = CSA of cylinder
$\pi rl = 2\pi rh$
l = 2h
l : h = 2 : 1

19. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation: Putting (1, 1) in the given equation, we have
L.H.S = 1 + 1 = 2 = R.H.S
L.H.S = R.H.S
Hence (1, 1) satisfy the x + y = 2. So it is the solution of x + y = 2.

20. **(d)** A is false but R is true.

Explanation: Area of an equilateral triangle = $\frac{\sqrt{3}}{4}a^2$, where a is side of triangle
$81\sqrt{3} = \frac{\sqrt{3}}{4}a^2$
$81 \times 4 = a^2$
$324 = a^2$
a = 18 cm
$s = \frac{18+18+18}{2} = 27$ cm

Section B

21. $a^3(b - c)^3 + b^3(c - a)^3 + c^3(a - b)^3$
$= [a(b - c)]^3 + [b(c - a)]^3 + [c(a - b)]^3$
Now, since, a (b - c) + b (c -a) + c (a - b)
= ab - ac + bc - ba + ca - bc = 0
So, $a^3 (b - c)^3 + b^3 (c - a)^3 + c^3 (a - b)^3$
= 3a (b - c) b (c - a) c (a - b)
= 3abc (a - b) (b - c) (c - a)

This is the required factorisation.

22. Perimeter = 40cm

Let $a = 18cm, b = 12cm, c = ?$

So, a+b+c=40 cm

18+12+C=40

C=(40-30) cm =10cm

$\therefore$ S=$\frac{18+12+10}{2}$ =20 cm

$\therefore$ area of triangle= $\sqrt{20(20-18)(20-12)(20-10)}$

=$\sqrt{20 \times 2 \times 8 \times 10}$ sq cm

=56.56 sq cm

23. Let the radius of the sphere be r cm.

Surface area = 154 cm^2

$\Rightarrow\ 4\pi r^2 = 154$

$\Rightarrow\ 4 \times \frac{22}{7} \times r^2 = 154$

$\Rightarrow\ r^2 = \frac{154\times7}{4\times22} \Rightarrow r^2 = \frac{49}{4}$

$\Rightarrow r = \sqrt{\frac{49}{4}} \Rightarrow r = \frac{7}{2}$ cm

$\therefore$Volume of the sphere =$\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times (\frac{7}{2})^2 = \frac{539}{3}\ cm^3$

$= 179\frac{2}{3}\ cm^3$

24. Given linear equation is

2x+3y=k

take x=2 & y=1 then,

2(2)+3(1)

=4+3

=7

so, k=7

OR

πx + y = 9

$\Rightarrow$ y = 9 – πx

Put x = 0, we get y = 9 – π(0) = 9 – 0 = 9

put x = 1, we get y = 9 – π(1) = 9 – π

Put x = –1, we get y = 9 – π(–1) = 9 + π

Put x = $\frac{9}{\pi}$, we get $y = 9 - \pi\left(\frac{9}{\pi}\right) = 9 - 9 = 0$

$\therefore$ Four solutions are (0, 9), (1, 9 – π), (–1, 9 + π) and $\left(\frac{9}{\pi}, 0\right)$.

25. The given polynomial is,

p(x) = x^2 + x - 6

Then, p(2) = 2^2 + 2 - 6

= 4 + 2 - 6

= 6 - 6 = 0

$\Rightarrow$ 2 is a zero of the polynomial p(x)

Also, p(-3) = $(-3)^2$ - 3 - 6

= 9 - 3 - 6 = 0

$\Rightarrow$ -3 is a zero of the polynomial p(x)
Therefore, 2 and -3 are the zeros of the polynomial p(x)

OR

Let $p(x) = x^3 - x^2 - (2 + \sqrt{2})x + \sqrt{2}$
The zero of x + 1 is -1
$p(-1) = (-1)^3 - (-1)^2 - (2 + \sqrt{2})(-1) + \sqrt{2} = -1 - 1 + 2 + \sqrt{2} + \sqrt{2} = 2 + 2^{\sqrt{2}} \neq 0$
$\therefore$ By factor theorem, x + 1 is not a factor of $x^3 - x^2 - (2 + \sqrt{2})x + \sqrt{2}$

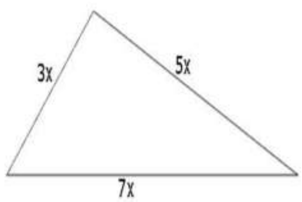
Section C

26. Let $p(x) = x^3 - 23x^2 + 142x - 120$
We shall now look for all the factors of –120. Some of these are ±1, ±2, ±3, ±4, ±5, ±6, ±8, ±10, ±12, ±15, ±20, ±24, ±30, ±60.
By hit and trial, we find that p(1) = 0. Therefore, x – 1 is a factor of p(x).
Now we see that $x^3 - 23x^2 + 142x - 120 = x^3 - x^2 - 22x^2 + 22x + 120x - 120$
$= x^2 (x - 1) - 22x(x - 1) + 120(x - 1)$
$= (x - 1)(x^2 - 22x + 120)$ [Taking (x – 1) common]
Now $x^2 - 22x + 120$ can be factorised either by splitting the middle term or by using the Factor theorem. By splitting the middle term, we have: $x^2 - 22x + 120 = x^2 - 12x - 10x + 120$
$= x(x - 12) - 10(x - 12)$
$= (x - 12)(x - 10)$
Therefore, $x^3 - 23x^2 - 142x - 120 = (x - 1)(x - 10)(x - 12)$

27. $(256)^{-\left(4^{-\frac{3}{2}}\right)} = \left(2^8\right)^{-\left(4^{-\frac{3}{2}}\right)} = \left(2^8\right)^{-\left(2^{2\times-\frac{3}{2}}\right)} = \left(2^8\right)^{-\left(2^{-3}\right)}$
$= \left(2^8\right)^{-\left(\frac{1}{8}\right)} = 2^{8\times\left(-\frac{1}{8}\right)} = 2^{-1} = \frac{1}{2}$

28. Let a = 41m, b = 40m, c = 9m.
$s = \frac{a+b+c}{2} = \frac{41+40+9}{2} = \frac{90}{2}$
s = 45m
Area of triangular field= $\sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{45(45-41)(45-40)(45-9)}$
$= \sqrt{45 \times 4 \times 5 \times 36}$
$=180 \text{ m}^2$
$=1800000 \text{ cm}^2$
Number of rose beds= $\frac{\text{Total area}}{\text{Area needed for one rose bed}} = \frac{1800000}{900} = 2000$

OR

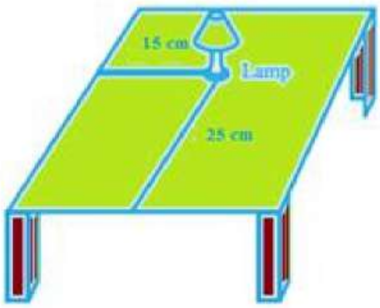


Suppose that the sides in metres are 3x, 5x and 7x.
Then, we know that 3x + 5x + 7x = 300 (Perimeter of the triangle)
Therefore, 15x = 300, which gives x = 20.
So the sides of the triangles are 3×20 m, 5×20 m and 7×20 m

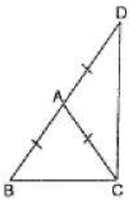
i.e., 60m, 100m and 140m.
We have $s = \frac{60+100+140}{2} = 150$ m
and area will be = $\sqrt{150(150-60)(150-100)(150-140)}$
= $\sqrt{150 \times 90 \times 50 \times 10}$
= $1500\sqrt{3}$ m^2

29. 9x + 7y = 63
put x = 0, we get
9(0) + 7y = 63
⇒ 7y = 63
$\Rightarrow y = \frac{63}{7} = 9$
∴ (0, 9) is a solution.
9x + 7y = 63
Put y = 0, we get
9x + 7(0) = 63
⇒ 9x = 63
$\Rightarrow x = \frac{63}{9} = 7$
∴ (7, 0) is a solution.
x + y = 10
Put x = 0, we get
0 + y = 10
⇒ y = 10
∴ (0, 10) is a solution.
x + y = 10
Put y = 0, we get
x + 0 = 10
⇒ x = 10
∴ (10, 0) is a solution.
The given equations do not have any common solution.

30. Let us consider the given below figure of a study stable, on which a study lamp is placed.



Let us consider the lamp on the table as a point and the table as a plane. From the figure, we can conclude that the table is rectangular in shape, when observed from the top. The table has a short edge and a long edge. Let us measure the distance of the lamp from the shorter edge and the longer edge. Let us assume that the distance of the lamp from the shorter edge is 15 cm and from the longer edge, its 25 cm. Therefore, we can conclude that the position of the lamp on the table can be described in two ways depending on the order of the axes as $(15, 25)$ or $(25, 15)$.

31. 

Given : $\triangle ABC$ is an isosceles triangle in which AB = AC.
Side BA is produced to D such that AD = AB.
To Prove : $\angle BCD$ is a right angle.
Proof : As ABC is an isosceles triangle
$\angle ABC = \angle ACB$ ...... (1)
AC = AD .... [As given : AB = AC and AD = AB]
In $\triangle ACD$,
$\angle CDA = \angle ACD$ .... [$\angle$s opposite to equal side of a $\triangle$]
$\angle CBD = \angle ACD$ . . . (2)
$\angle ABC + \angle CDB = \angle ACB + \angle ACD$ .... [Adding corresponding sides from (1) and (2)]
$\angle ABC + \angle CDB = \angle BCD$ . . . (3)
In $\triangle BCD$
$\angle BCD + \angle DBC + \angle CDB = 180^o$ . . .[Sum of three angles of a triangle]
$\therefore \angle BCD + \angle ABC + \angle CDB = 180^o$
$\angle BCD + \angle BCD = 180^o$ . . .[From (3)]
$\therefore 2\angle BCD = 180^o$
$\therefore \angle BCD = 90^o$
$\therefore \angle BCD$ is a right angle proved.

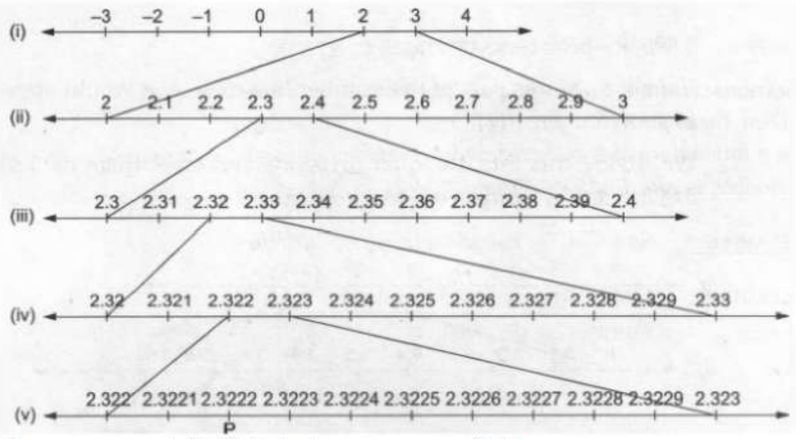
OR

In DPDB and DPEA,
$\angle PDB = \angle PEA$ . . . . [Each 90^o]
$\angle BPD = \angle APE$ . . . [Vertically opposite angles]
AE = BD . . . . [Given]
$\therefore$ DPDB $\cong$ DPEA . . . .[By AAS property]
$\therefore$ PA = PB . . . [c.p.c.t.] . . . . (1)
PD = PE . . . [c.p.c.t.] . . . . (2)
PA + PD = PB + PE
$\Rightarrow$ AD = BE . . . [By adding (1) and (2)]

Section D

32. i. $\overleftrightarrow{EF}$, $\overleftrightarrow{GH}$ and their corresponding point of intersection is R.
$\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$ and their corresponding point of intersection is P.
ii. $\overleftrightarrow{AB}$, $\overleftrightarrow{EF}$, $\overleftrightarrow{GH}$ and their point of intersection is R.
iii. Three rays are: $\overrightarrow{RB}$, $\overrightarrow{RH}$, $\overrightarrow{RG}$
iv. Two line segments are: $\overline{RQ}, \overline{RP}$.

33.



To represent 2.3222 steps are as follows:

Step 1 2.3222 lies between 2 and 3

We divide this portion of the number line into 10 equal divisions and mark them as 2.1, 2.2, 2.3,..., and so on, as shown in Fig. (ii).

Step 2 2.3222 lies between 2.3 and 2.4.

If we look at this part of the number line closely, as through a lens, it would appear as shown in Fig. (iii).

We divide this into 10 equal division and label them as 2.31, 2.32, 2.33.. .., and so on.

Step 3 2.3222 lies between 2.32 and 2.33.

If we look at this part of the number line closely, it would appear as shown in Fig. (iv).

We divide this into 10 equal divisions and label them as 2.321, 2.322.2.323.2.324.. .., and so on

Step 4 2.3222 lies between 2.322 and 2.323.

If we look at this part of the number line closely, it would appear as shown in Fig. (v).

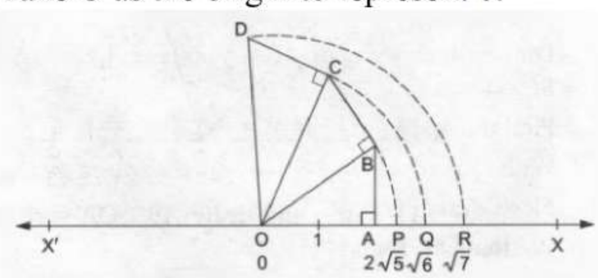
We divide this into 10 equal divisions and label them as 2.3221, 2.3222,2.3223,..., and so on. Mark the division representing 2.3222 as P

Clearly, point P on the number line represents 2.3222.

OR

Draw a horizontal line X'OX, taken as the x-axis.

Take O as the origin to represent 0.



Let OA =2 units and let AB $\perp$OA such that AB = 1 unit

Join OB. Then, by Pythagoras Theorem

$OB = \sqrt{OA^2 + AB^2}$

$= \sqrt{2^2 + 1^2}$

$= \sqrt{5}$

With O as centre and OB as radius, draw an arc, meeting OX at P.

Then, OP = OB = $\sqrt{5}$

Thus, P represents $\sqrt{5}$ or the real line.

Now, draw BC $\perp$OB and set off BC = 1 unit.

Join OC. Then, by Pythagoras Theorem

$OC = \sqrt{OB^2 + BC^2} = \sqrt{(\sqrt{5})^2 + 1^2} = \sqrt{6}$

With O as centre and OC as radius, draw an arc, meeting OX at Q

Then, OQ = OC = $\sqrt{6}$

Thus, Q represents $\sqrt{6}$ on the real line.

Now, draw CD $\perp$ OC and set off CD = 1 unit.

Join OD. Then,by Pythagoras Theorem

$OD = \sqrt{OC^2 + CD^2} = \sqrt{(\sqrt{6})^2 + 1^2} = \sqrt{7}$

With O as centre and OD as radius, draw an arc, meeting OX at R. Then

OR = OD =$\sqrt{7}$

Thus, the points P, Q, R represent the real numbers $\sqrt{5}, \sqrt{6}$ and $\sqrt{7}$ respectively

34. EF $\parallel$ CD and ED is the transversal.

$\therefore \quad \angle FED + \angle EDH = 180^\circ$ [co-interior angles]

$\Rightarrow$ 65° + y = 180°

$\Rightarrow$ y = (180° - 65°) = 115°.

Now CH $\parallel$ AG and DB is the transversal

$\therefore$ x = y = 115° [corresponding angles]

Now, ABG is a straight line.

$\therefore \angle ABE + \angle EBG = 180^\circ$ [sum of linear pair of angles is 180°]

$\Rightarrow \angle ABE + x = 180^\circ$

$\Rightarrow \angle ABE + 115^\circ = 180^\circ$

$\Rightarrow \angle ABE = (180^\circ - 115^\circ) = 65^\circ$

We know that the sum of the angles of a triangle is 180°.

From $\triangle$EAB, we get

$\angle EAB + \angle ABE + \angle BEA = 180^\circ$

$\Rightarrow$ 90° + 65° + z = 180°

$\Rightarrow$ z = (180° - 155°) = 25°

$\therefore$ x = 115°, y = 115° and z = 25°

OR

We are given that $AB \parallel CD, CD \parallel EF$ and $y : z = 3 : 7$

We need to find the value of x in the figure given below.

We know that lines parallel to the same line are also parallel to each other.

We can conclude that $AB \parallel EF$

Let $y = 3a$ and $z = 7a$

We know that angles on the same side of a transversal are supplementary.

$\therefore x + y = 180^\circ$

$x = z$ Alternate interior angles

$z + y = 180^\circ$

or $7a + 3a = 180^\circ$

$\Rightarrow 10a = 180^\circ$

$a = 18^\circ.$

$z = 7a = 126^\circ$

$y = 3a = 54^\circ.$

Now, as $x = z$

=> $x = 126^\circ.$

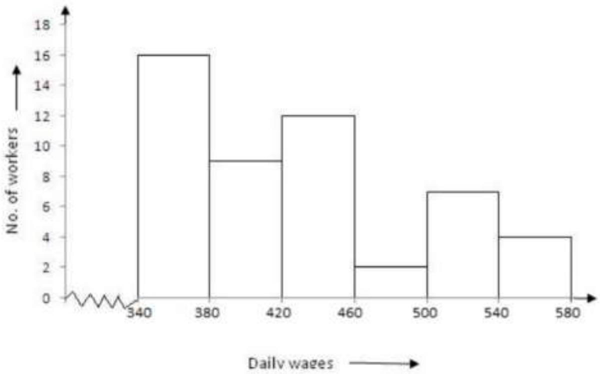
Therefore, we can conclude that $x = 126^\circ$

35. Given frequency distribution is as below:

Daily wages (in ₹)	340-380	380-420	420-460	460-500	500-540	540-580

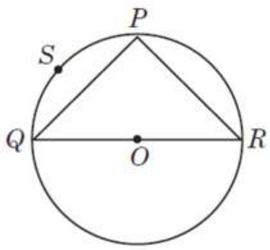
Number of workers	16	9	12	2	7	4

Clearly, the given frequency distribution is in the exclusive form.
To draw the required histogram , take class intervals , i.e. daily wages (in ₹) along x-axis and frequencies i.e.no.of workers alongy-axisand draw rectangles . So, we get the requiredhistogram.
Since the scale on X-axis starts at 340, a kink(break) is indicated near the origin to show that the graph is drawn to scale beginning at 340.



Section E

36. **Read the text carefully and answer the questions:**
Sanjay and his mother visited in a mall. He observes that three shops are situated at P, Q, R as shown in the figure from where they have to purchase things according to their need. Distance between shop P and Q is 8 m and between shop P and R is 6 m. Considering O as the center of the circles.



(i) We know that angle in the semicircle = 90^o
Here QR is a diameter of circle and ∠QPR is angle in semicircle.
Hence ∠QPR = 90^o

(ii) ∠QPR = 90^o
$\Rightarrow QR^2 = PQ^2 + PR^2$
$\Rightarrow QR^2 = 8^2 + 6^2$
$\Rightarrow QR = \sqrt{64+36}$
$\Rightarrow QR = 10$ m

(iii) Measure of ∠QSR = 90^o
Angles in the same segment are equal. ∠QSR and ∠QPR are in the same segment.

OR

Area ΔPQR = $\frac{1}{2} \times PQ \times PR$
$\Rightarrow$ Area ΔPQR = $\frac{1}{2} \times 8 \times 6 = 24$ sqm

37. **Read the text carefully and answer the questions:**

Harish makes a poster in the shape of a parallelogram on the topic SAVE ELECTRICITY for an inter-school competition as shown in the follow figure.

(i) Since, ABCD is a parallelogram.

$\angle A + \angle D = 180^o$ (adjacent angles of a quadrilateral are equal)

$(4x + 3)^o + (5x + 3)^o = 180^o$

$9x = 180^o$

$x = 20$

$\angle D = (5x - 3)^o = 97^o$

$\angle D = \angle B$ (opposite angles of a parallelogram are equal)

Thus, $\angle B = 97^o$

(ii) $\angle B = \angle D$ (opposite angles of a parallelogram are equal)

$\Rightarrow 2y = 3y - 6$

$\Rightarrow 2y - 3y = -6$

$\Rightarrow -y = -6$

$\Rightarrow y = 6$

OR

AB = CD

$\Rightarrow 2y - 3 = 5$

$\Rightarrow 2y = 8$

$\Rightarrow y = 4$

(iii) $\angle A = \angle C$ (opposite angles of a parallelogram are equal)

$\Rightarrow 2x - 3 = 4y + 2$

$\Rightarrow 2x = 4y + 5$

$\Rightarrow x = 2y + \frac{5}{2}$

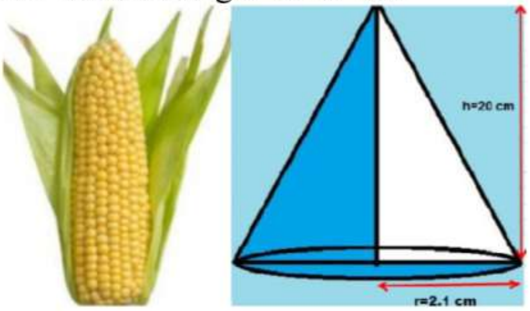
38. **Read the text carefully and answer the questions:**

Once upon a time in Ghaziabad was a corn cob seller. During the lockdown period in the year 2020, his business was almost lost.

So, he started selling corn grains online through Amazon and Flipcart. Just to understand how many grains he will have from one corn cob, he started counting them.

Being a student of mathematics let's calculate it mathematically. Let's assume that one corn cob (see Fig.), shaped somewhat like a cone, has the radius of its broadest end as

2.1 cm and length as 20 cm.



(i) First we will find the curved surface area of the corn cob.
We have, r = 2.1 and h = 20
Let l be the slant height of the conical corn cob. Then,
l = $\sqrt{r^2+h^2} = \sqrt{(2.1)^2+(20)^2} = \sqrt{4.41+400} = \sqrt{404.41}$ = 20.11 cm
$\therefore$ Curved surface area of the corn cub = πrl
= $\frac{22}{7} \times 2.1 \times 20.11$ cm^2
= 132.726 cm^2 = 132.73 cm^2

(ii) The volume of the corn cub
$= \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 20$
= 92.4 cm^3

OR

Volume of a corn cub = 92.4 cm^3
Volume of the cartoon = 20 $\times$ 25 $\times$ 20 = 10,000 cm^3
Thus no. of cubs which can be stored in the cartoon
$\frac{10000}{92.4} \approx 108$ cubs

(iii) Now
Total number of grains on the corn cob = Curved surface area of the corn cob $\times$ Number of grains of corn on 1 cm^2
Hence, Total number of grains on the corn cob = 132.73 $\times$ 4 = 530.92
So, there would be approximately 531 grains of corn on the cob.