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Secondary School Examination - 2020

Marking Scheme- MATHEMATICS BASIC

Subject Code : 241 Paper Code: 430/5/1,2,3

General Instructions:

1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.**Evaluation is a 10-12 days mission for all of us. Hence, it is necessary that you put in your best effortsin this process.**

2. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and marks be awarded to them. In class-X, while evaluating two competency based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, marks should be awarded.**

3. The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.

4. Evaluators will mark(√) wherever answer is correct. For wrong answer 'X"be marked. Evaluators will not put right kind of mark while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**

5. If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.

6. If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.

7. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.

8. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.

9. A full scale of marks 0 - 80 has to be used. Please do not hesitate to award full marks if the answer deserves it.

10. Every examiner has to necessarily do evaluation work for full working hours i.e. 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).

11. Ensure that you do not make the following common types of errors committed by the Examiner in the past:-
    - Leaving answer or part thereof unassessed in an answer book.
    - Giving more marks for an answer than assigned to it.
    - Wrong totaling of marks awarded on a reply.
    - Wrong transfer of marks from the inside pages of the answer book to the title page.
    - Wrong question wise totaling on the title page.
    - Wrong totaling of marks of the two columns on the title page.
    - Wrong grand total.
    - Marks in words and figures not tallying.
    - Wrong transfer of marks from the answer book to online award list.
    - Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)
    - Half or a part of answer marked correct and the rest as wrong, but no marks awarded.

12. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0)Marks.

13. Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.

14. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.

15. Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.

16. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

QUESTION PAPER CODE 430/5/1

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. If a pair of linear equations is consistent, then the lines represented by them are

(A) parallel **(B) intersecting or coincident**

(C) always coincident **(D) always intersecting**

Sol. (B) Intersecting or coincident. 1

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2. The distance between the points (3, – 2) and (– 3, 2) is

(A) $\sqrt{52}$ **units** **(B)** $4\sqrt{10}$ **units** **(C)** $2\sqrt{10}$ **units** **(D) 40 units**

Sol. (A) $\sqrt{52}$ units 1

---

3. $8\cot^2 A - 8\operatorname{cosec}^2 A$ **is equal to**

(A) 8 **(B)** $\frac{1}{8}$ **(C) – 8** **(D)** $-\frac{1}{8}$

Sol. (C) –8 1

---

4. The total surface area of a frustum-shaped glass tumbler is $(r_1 > r_2)$

(A) $\pi r_1 l + \pi r_2 l$ **(B)** $\pi l(r_1 + r_2) + \pi r_2^2$

(C) $\frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$ **(D)** $\sqrt{h^2 + (r_1 - r_2)^2}$

Sol. (B) $\pi l(r_1 + r_2) + \pi r_2^2$ 1

---

5. 120 can be expressed as a product of its prime factors as

(A) $5 \times 8 \times 3$ **(B)** 15×2^3 **(C)** $10 \times 2^2 \times 3$ **(D)** $5 \times 2^3 \times 3$

Sol. (D) $5 \times 2^3 \times 3$ 1

---

6. The discriminant of the quadratic equation $4x^2 - 6x + 3 = 0$ **is**

(A) 12 **(B) 84** **(C)** $2\sqrt{3}$ **(D) – 12**

Sol. (D) –12 1

---

7. If (3, –6) is the mid-point of the line segment joining (0, 0) and (x, y), then the point (x, y) is

(A) (–3, 6) **(B) (6, –6)** **(C) (6, –12)** **(D)** $\left(\frac{3}{2}, -3\right)$

Sol. (C) (6, –12) 1

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8. In the given circle in Figure-1, number of tangents parallel to tangent PQ is

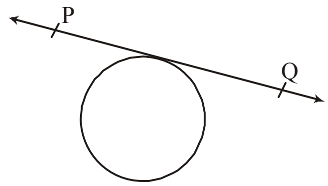

Fig. 1

(A) 0 **(B) many** **(C) 2** **(D) 1**

Sol. (D) 1 1

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9. For the following frequency distribution:

Class:	**0 – 5**	**5 – 10**	**10 – 15**	**15 – 20**	**20 – 25**
Frequency	**8**	**10**	**19**	**25**	**8**

The upper limit of median class is

(A) 15 **(B) 10** **(C) 20** **(D) 25**

Sol. (A) 15 1

---

10. The probability of an impossible event is

(A) 1 **(B)** $\frac{1}{2}$ **(C) not defined** **(D) 0**

Sol. (D) 0 1

Fill in the blanks in question numbers 11 to 15.

11. A line intersecting a circle in two points is called a _______.

Sol. Secant 1

---

12. If 2 is a zero of the polynomial $ax^2 - 2x$, then the value of 'a' is _______.

Sol. 1 1

---

13. All squares are _______ (congruent/similar).

Sol. Similar 1

---

14. If the radii of two spheres are in the ratio 2 : 3, then the ratio of their respective volumes is _______.

Sol. 8/27 or 8 : 27 1

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15. If ar (Δ PQR) is zero, then the points P, Q and R are _______.

Sol. Collinear 1

Answer the following question numbers 16 to 20:

16. In Figure-2, the angle of elevation of the top of a tower AC from a point B on the ground is 60°. If the height of the tower is 20 m, find the distance of the point from the foot of the tower.

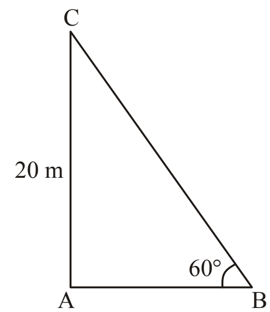

Fig. 2

Sol. $\frac{AC}{AB} = \tan 60°$ $\frac{1}{2}$

$\frac{20}{AB} = \sqrt{3}$

$AB = \frac{20\sqrt{3}}{3}$ or $\frac{20}{\sqrt{3}}$ $\frac{1}{2}$

---

17. Evaluate:

tan 40° × tan 50°

Sol. $\tan 40° \times \cot 40°$ $\frac{1}{2}$

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

OR

If cos A = sin 42°, then find the value of A.

Sol. $\cos A = \sin (90° - 48°)$ $\frac{1}{2}$

$= \cos 48°$

$\Rightarrow \boxed{A = 48°}$ $\frac{1}{2}$

---

18. A coin is tossed twice. Find the probability of getting head both the times.

Sol. Total outcomes = 4 $\frac{1}{2}$

P(getting head both the times) = $\frac{1}{4}$ $\frac{1}{2}$

---

19. Find the height of a cone of radius 5 cm and slant height 13 cm.

Sol. $h = \sqrt{(13)^2 - (5)^2}$ $\frac{1}{2}$

$h = 12$ cm $\frac{1}{2}$

---

20. Find the value of x so that – 6, x, 8 are in A.P.

Sol. $x + 6 = 8 - x$ $\frac{1}{2}$

$\boxed{x = 1}$ $\frac{1}{2}$

OR

Find the 11th term of the A.P. – 27, – 22, –17, –12, ...

Sol. $a = -27$, $d = 5$ $\frac{1}{2}$

$a_{11} = -27 + 50 = 23$ $\frac{1}{2}$

SECTION B

Question numbers 21 to 26 carry 2 marks each.

21. Find the roots of the quadratic equation

$\mathbf{3x^2 - 4\sqrt{3}\,x + 4 = 0.}$

Sol. $3x^2 - 2\sqrt{3}x - 2\sqrt{3}x + 4 = 0$ 1

$\left(\sqrt{3}\,x - 2\right)\left(\sqrt{3}\,x - 2\right) = 0$ $\frac{1}{2}$

$\sqrt{3}x - 2 = 0 \Rightarrow \boxed{x = 2/\sqrt{3}}$ $\frac{1}{2}$

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22. Check whether 6^n can end with the digit '0' (zero) for any natural number n.

Sol. $6^n = (2 \times 3)^n = 2^n \times 3^n$ 1

It is not in form of $2^n \times 5^m$ $\frac{1}{2}$

$\therefore$ 6^n can't end with digit '0' $\frac{1}{2}$

OR

Find the LCM of 150 and 200.

Sol. $150 = 2 \times 3 \times 5^2$ $\frac{1}{2}$

$200 = 2^3 \times 5^2$ $\frac{1}{2}$

$\text{LCM} = 2^3 \times 5^2 \times 3$ $\frac{1}{2}$

$= 600$ $\frac{1}{2}$

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23. **If $\tan(A + B) = \sqrt{3}$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$, $0 < A + B \le 90°$, A > B, then find the value of A and B.**

Sol. $A + B = 60°$ ...(i) 1

$A - B = 30°$ ...(ii) $\frac{1}{2}$

From (i) and (ii)

$\left.\begin{array}{l} A = 45° \\ B = 15° \end{array}\right]$ $\frac{1}{2}$

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24. **In Figure-3, ΔABC and ΔXYZ are shown. If AB = 3 cm BC = 6 cm, AC = $2\sqrt{3}$ cm, $\angle A = 80°$, $\angle B = 60°$, XY = $4\sqrt{3}$ cm YZ = 12 cm and XZ = 6 cm, then find the value of $\angle Y$.**

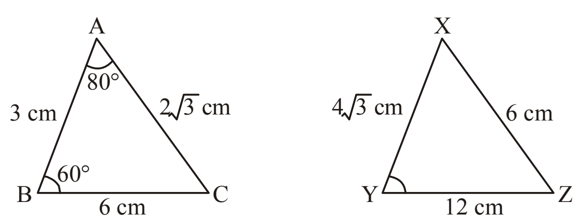

Figure 3

Sol. $\because \frac{AB}{XZ} = \frac{BC}{YZ} = \frac{AC}{XY} = \frac{1}{2}$ 1

$\therefore$ ΔABC ~ ΔXZY $\frac{1}{2}$

$\angle C = \angle Y = 40°$ $\frac{1}{2}$

---

25. 14 defective bulbs are accidentally mixed with 98 good ones. It is not possible to just look at the bulb and tell whether it is defective or not. One bulb is taken out at random from this lot. Determine the probability that the bulb taken out is a good one.

Sol. Total outcomes = 14 + 98 = 112 1

P(good bulb) = $\frac{98}{112}$ or $\frac{7}{8}$ 1

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26. Find the mean for the following distribution:

Classes:	**5 – 15**	**15 – 35**	**25 – 35**	**35 – 45**
Frequency:	**2**	**4**	**3**	**1**

Sol.

Classes	**Freq.**	**Mid value = x**	**f × x**
5-15	2	10	20
15-25	4	20	80
25-35	3	30	90
35-45	1	40	40
	Σf = 10		Σfx = 230

Correct table 1

$\bar{x} = \frac{\Sigma fx}{\Sigma f}$ $\frac{1}{2}$

$= \frac{230}{10} = 23$ $\frac{1}{2}$

OR

The following distribution shows the transport expenditure of 100 employees:

Expenditure (in ₹):	**200 – 400**	**400 – 600**	**600 – 800**	**800 – 1000**	**1000 – 1200**
Number of employees:	**21**	**25**	**19**	**23**	**12**

Find the mode of the distribution.

Sol. Modal class = 400 – 600 $\frac{1}{2}$

Mode = $1+\left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right]\times h$ $\frac{1}{2}$

$= 400+\left[\frac{25-21}{50-21-19}\right]\times 200$ $\frac{1}{2}$

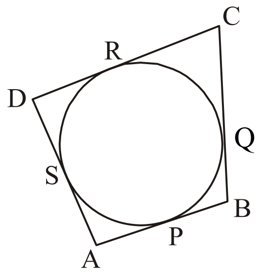
= 400 + 80 = 480 $\frac{1}{2}$

SECTION C

Question numbers 27 to 34 carry 3 marks each.

27. A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC.

Sol.



Correct Figure $\frac{1}{2}$

Proof: $AP = AS$, $BP = BQ$, $CR = CQ$, $DR = DS$ — $4 \times \frac{1}{2} = 2$

$\therefore$ By adding,

AP + BP + CR + DR = AS + BQ + CQ + DS

AB + CD = AD + BC $\frac{1}{2}$

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28. The difference between two numbers is 26 and the larger number exceeds thrice of the smaller number by 4. Find the numbers.

Sol. Let larger No. = x

Let smaller No = y

$x - y = 26$ ...(i) 1

$x - 3y = 4$ ...(ii) 1

By solving (i) & (ii), we get

$\therefore$ $x = 37$ $\frac{1}{2}$

$y = 11$ $\frac{1}{2}$

OR

Solve for x and y:

$$\frac{2}{x} + \frac{3}{y} = 13 \text{ and } \frac{5}{x} - \frac{4}{y} = -2$$

Sol. Let $\frac{1}{x} = p$ & $\frac{1}{y} = q$

$2p + 3q = 13$ ...(i) $\frac{1}{2}$

$5p - 3q = -2$ ...(ii) $\frac{1}{2}$

By solving (i) & (ii), we get

$\therefore \; p = 2, q = 3$ 1

$\therefore \; \frac{1}{x} = 2, \quad \frac{1}{y} = 3$

$\boxed{x = \frac{1}{2}} \quad \boxed{y = \frac{1}{3}}$ 1

---

29. Prove that $\sqrt{3}$ is an irrational number.

Sol. Let $\sqrt{3}$ is rational

$\sqrt{3} = \frac{a}{b}$ (where a & b are +ve integers & co-prime, $b \neq 0$) $\frac{1}{2}$

$a^2 = 3b^2$ ...(i)

3 divides a^2

$\therefore$ 3 divides a also 1

Let a = 3c & put in (i)

$(3c)^2 = 3(b)^2$

$3c^2 = b^2$

$\Rightarrow$ 3 divides b^2

$\therefore$ 3 divides b also 1

$\therefore$ 3 divides a and b both

This contradicts our assumption

Therefore, $\sqrt{3}$ is irrational no. $\frac{1}{2}$

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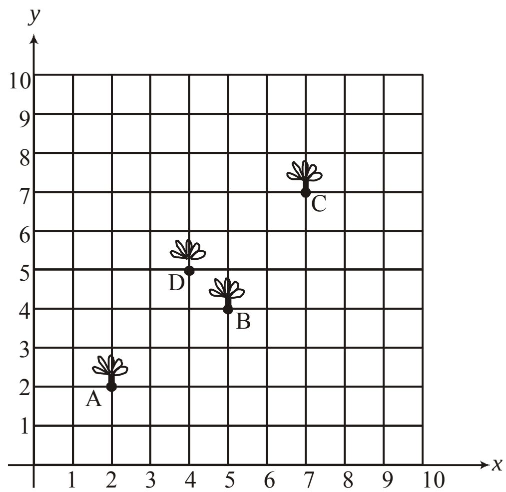
30. Krishna has an apple orchard which has a 10 m × 10 m sized kitchen garden attached to it. She divides it into a 10 × 10 grid and puts soil and manure into it. She grows a lemon plant at A, a coriander plant at B, an onion plant at C and a tomato plant at D. Her husband Ram praised her kitchen garden and points out that on joining A, B, C and D they may form a parallelogram. Look at the below figure carefully and answer the following questions:



(i) Write the coordinates of the points A, B, C and D, using the 10 × 10 grid as coordinate axes.
(ii) Find whether ABCD is a parallelogram or not.

Sol. (i) Coordinates are A(2, 2), B(5, 4), C(7, 7), D(4, 5) $4\times\frac{1}{2}=2$

(ii) $AB = \sqrt{(5-2)^2+(4-2)^2} = \sqrt{13}$

$BC = \sqrt{13}$

$CD = \sqrt{13}$

$DA = \sqrt{13}$ $\left[\begin{array}{l}\because AB = BC = CD = DA \\ \therefore \text{ABCD is a parallelogram}\end{array}\right]$ 1

---

31. If the sum of the first 14 terms of an A.P. is 1050 and its first term is 10 then find the 21st term of the A.P.

Sol. $\frac{n}{2}[2a+(n-1)d]=1050$ $\frac{1}{2}$

$7[20 + 13d] = 1050$ 1

$\therefore$ $d = 10$ $\frac{1}{2}$

$a_{21} = a + 20d = 10 + 20 \times 10 = 210$ 1

---

32. Construct a triangle with its sides 4 cm, 5 cm and 6 cm. Then construct a triangle similar to it whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle.

Sol. For correct construction of Δ 1

For construction of similar Δ 2

OR

Draw a circle of radius 2.5 cm. Take a point P at a distance of 8 cm from its centre. Construct a pair of tangents from the point P to the circle.

Sol. For draw the correct circle & exterior pt. 1

For construction of the pair of tangents 2

---

33. Prove that:

$$(\text{cosec } A - \sin A)(\sec A - \cos A) = \frac{1}{\tan A + \cot A}$$

Sol. LHS $= \left(\frac{1}{\sin A} - \sin A\right)\left(\frac{1}{\cos A} - \cos A\right)$ $\frac{1}{2}$

$= \frac{1-\sin^2 A}{\sin A} \times \frac{1-\cos^2 A}{\cos A}$ $\frac{1}{2}$

$= \frac{\cos^2 A}{\sin A} \times \frac{\sin^2 A}{\cos A}$ $\frac{1}{2}$

$\cos A \,.\, \sin A$ $\frac{1}{2}$

RHS $= \dfrac{1}{\frac{\sin A}{\cos A} + \frac{\cos A}{\sin A}}$ $\frac{1}{2}$

$= \dfrac{1}{\frac{\sin^2 A + \cos^2 A}{\sin A \cdot \cos A}}$

$= \sin A \cdot \cos A$ $\quad \therefore$ LHS = RHS $\frac{1}{2}$

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34. In Figure-4, AB and CD are two diameters of a circle (with centre O) perpendicular to each other and OD is the diameter of the smaller circle.

If OA = 7 cm, then find the area of the shaded region.

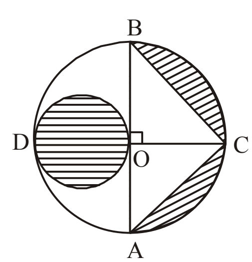


Fig. 4

Sol. Area of smaller circle = $\pi r^2 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = \frac{77}{2} = 38.5\ \text{cm}^2$ 1

Area of Big semi-circle = $\frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 77\ \text{cm}^2$ $\frac{1}{2}$

Area of ΔABC = $\frac{1}{2} \times 14 \times 7 = 49\ \text{cm}^2$ $\frac{1}{2}$

Area of shaded portion = ar. of smaller circle + ar. of big semicircle – ar. of ΔABC

$= 38.5 + 77 - 49 = 66.5\ \text{cm}^2$ 1

OR

In Figure-5, ABCD is a square with side 7 cm. A circle is drawn circumscribing the square. Find the area of the shaded region.

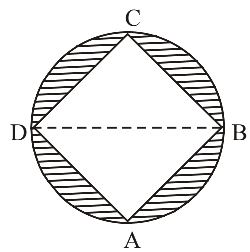


Fig. 5

Sol. Area of sqaure ABCD = $a^2 = 7^2 = 49\ \text{cm}^2$ $\frac{1}{2}$

Diagonal of square = $\sqrt{2}a = 7\sqrt{2}$ cm 1

$\therefore$ Radius of circle = $\frac{7\sqrt{2}}{2}$ cm $\frac{1}{2}$

Area of circle = $\frac{22}{7} \times \left(\frac{7\sqrt{2}}{2}\right)^2 = 77\ \text{cm}^2$ $\frac{1}{2}$

Area of shaded, portion = $77 - 49 = 28\ \text{cm}^2$ $\frac{1}{2}$

SECTION D

Question numbers 35 to 40 carry 4 marks each.

35. Find other zeroes of the polynomial

$p(x) = 3x^4 - 4x^3 - 10x^2 + 8x + 8$,

if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.

Sol. $\left(x-\sqrt{2}\right)$ & $\left(x+\sqrt{2}\right)$ are two factors

i.e. $x^2 - 2$ is a factor 1

$$
\begin{array}{r|l}
 & 3x^2 - 4x - 4 \\
x^2 - 2 & 3x^4 - 4x^3 - 10x^2 + 8x + 8 \\
 & 3x^4 \qquad\quad - 6x^2 \\
 & - \qquad\qquad + \\
\hline
 & -4x^3 - 4x^2 + 8x + 8 \\
 & -4x^3 \qquad\quad + 8x \\
 & + \qquad\qquad\quad - \\
\hline
 & -4x^2 + 8 \\
 & -4x^2 + 8 \\
 & + \qquad - \\
\hline
 & 0
\end{array}
$$

2

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

$\therefore$ –2/3, 2 are other two zeroes. $\frac{1}{2}$

OR

Divide the polynomial $g(x) = x^3 - 3x^2 + x + 2$ by the polynomial $x^2 - 2x + 1$ and verify the division algorithm.

Sol.

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

2

Verify,

$P(x) = q(x) \times g(x) + r(x)$

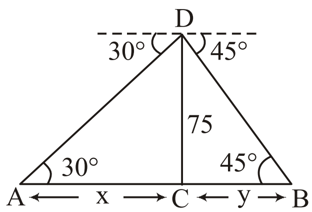
$= (x - 1)(x^2 - 2x + 1) + (-2x + 3)$ 1

$= x^3 - 3x^2 + 3x - 1 - 2x + 3$

$= x^3 - 3x^2 + x + 2$ 1

36. From the top of a 75 m high lighthouse from the sea level, the angles of depression of two ships are 30° and 45°. If the ships are on the opposite sides of the lighthouse, then find the distance between the two ships.

Sol.



Correct figure 1

In ΔACD

$$\frac{75}{x} = \frac{1}{\sqrt{3}}$$

$\therefore\ x = 75\sqrt{3}$ $1\frac{1}{2}$

In ΔBCD

$$\frac{75}{y} = 1$$

$\therefore\ y = 75$ 1

$\therefore$ Distance b/w two ships i.e. AB = x + y

$= 75\sqrt{3} + 75$

$= 75(\sqrt{3} + 1)$ $\frac{1}{2}$

---

37. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio.

Sol. For correct given, To prove, Construction, Figure $4 \times \frac{1}{2} = 2$

For correct proof 2

OR

If Figure-6, in an equilateral triangle ABC, AD ⊥ BC, BE ⊥ AC and CF ⊥ AB. Prove that $4(AD^2 + BE^2 + CF^2) = 9\ AB^2$.

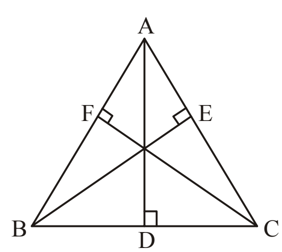


Figure 6

Sol. **Proof**

In ΔABD, $AD^2 = AB^2 - BD^2$ ...(i)

In ΔBCE $BE^2 = BC^2 - CE^2$ ...(ii)

In ΔACF $CF^2 = AC^2 - AF^2$ ...(iii) $3\times\frac{1}{2}=1\frac{1}{2}$

$AD^2 + BE^2 + CF^2 = AB^2 + BC^2 + AC^2 - BD^2 - CE^2 - AF^2$ 1

$$= 3AB^2 - \left(\frac{BC}{2}\right)^2 - \left(\frac{AC}{2}\right)^2 - \left(\frac{AB}{2}\right)^2$$

$$= 3AB^2 - \frac{3}{4}AB^2$$

$$= \frac{9}{4}AB^2$$

$4(AD^2 + BE^2 + CF^2) = 9AB^2$ $1\frac{1}{2}$

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38. A container open at the top and made up of a metal sheet, is in the form of a frustum of a cone of height 14 cm with radii of its lower and upper circular ends as 8 cm and 20 cm, respectively. Find the capacity of the container.

Sol. Vol. of container $= \frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$ $\frac{1}{2}$

$$= \frac{1}{3}\times\frac{22}{7}\times 14[(8)^2 + (20)^2 + 8\times 20]$$ 2

$$= \frac{1}{3}\times\frac{22}{7}\times 14[64 + 400 + 160]$$

$= 9152 \text{ cm}^3$ $1\frac{1}{2}$

---

39. Two water taps together can fill a tank in $9\frac{3}{8}$ hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

Sol. Let smaller diameter tap takes x hours to fill the tank

Then, time taken by larger diameter tap to fill the tank = (x – 10) hr $\frac{1}{2}$

ATQ

$$\frac{1}{x}+\frac{1}{x-10}=\frac{8}{75}$$ $1\frac{1}{2}$

$8x^2 - 230x + 750 = 0$ $\frac{1}{2}$

$(8x - 30)(x - 25) = 0$ $\frac{1}{2}$

$x=\frac{15}{4}$ and $x = 25$ $\frac{1}{2}$

Rejected $x = \frac{15}{4}$,

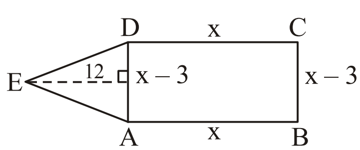
Hence, time taken by smaller diameter tap = 25 hrs

Time taken by larger diameter tap = 25 – 10 = 15 hrs $\frac{1}{2}$

OR

A rectangular park is to be designed whose breadth is 3 m less than its length. Its area is to be 4 square metres more than the area of a park that has already been made in the shape of an isosceles triangle with its base as the breadth of the Rectangular park and of altitude 12 m. Find the length and breadth of the park.

Sol. Correct figure $\frac{1}{2}$



Let length of rectangle = x

$\therefore$ Breadth = x – 3

ar. of reactangle = x(x – 3)

$= x^2 - 3x$ 1

Area of Isosceles ΔADE

$$= \frac{1}{2}(x-3)\times 12$$

$= 6x - 18$ $\frac{1}{2}$

ATQ

$x^2 - 3x = 6x - 18 + 4$ 1

$x^2 - 9x + 14 = 0$

$(x - 7)(x - 2) = 0$

$x = 7, x = 2$ Rejected $\frac{1}{2}$

$\therefore$ Length of rectangle = 7 cm

Breadth of rectangle = 4 cm $\frac{1}{2}$

---

40. Draw a 'less than' ogive for the following frequency distribution:

Classes:	**0 – 10**	**10 – 20**	**20 – 30**	**30 – 40**	**40 – 50**	**50 – 60**	**60 – 70**	**70 – 80**
Frequency:	**7**	**14**	**13**	**12**	**20**	**11**	**15**	**8**

Sol.

getting the pts (10, 7), (20, 21)

(30, 34), (40, 46), (50, 66)

(60, 77), (70, 92), (80, 100) 2

Plotting and Joining the pts to get the correct ogive 2

QUESTION PAPER CODE 430/5/2

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. For the following frequency distribution:

Class:	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
Frequency	8	10	19	25	8

The upper limit of median class is

(A) 15 **(B) 10** **(C) 20** **(D) 25**

Sol. (A) 15 1

---

2. The probability of an impossible event is

(A) 1 **(B) $\frac{1}{2}$** **(C) not defined** **(D) 0**

Sol. (D) 0 1

---

3. If (3, – 6) is the mid-point of the line segment joining (0, 0) and (x, y), then the point (x, y) is

(A) (– 3, 6) **(B) (6, – 6)** **(C) (6, – 12)** **(D) $(\frac{3}{2}, -3)$**

Sol. (C) (6, – 12) 1

---

4. The discriminant of the quadratic equation $4x^2 - 6x + 3 = 0$ is

(A) 12 **(B) 84** **(C) $2\sqrt{3}$** **(D) – 12**

Sol. (D) –12 1

---

5. In the given circle in Figure-1, number of tangents parallel to tangent PQ is

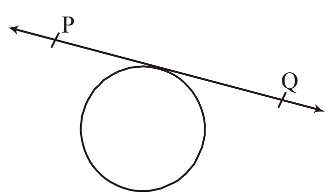


Fig. 1

(A) 0 **(B) many** **(C) 2** **(D) 1**

Sol. (D) 1 1

---

6. $8 \cot^2 A - 8 \operatorname{cosec}^2 A$ is equal to

(A) 8 **(B) $\frac{1}{8}$** **(C) – 8** **(D) $-\frac{1}{8}$**

Sol. (C) –8 1

---

7. The point on x-axis which divides the line segment joining (2, 3) and (6, – 9) in the ratio 1 : 3 is

(A) (4, – 3) (B) (6, 0) (C) (3, 0) (D) (0, 3)

Sol. (C) (3, 0) 1

---

8. If a pair of linear equations is consistent, then the lines represented by them are

(A) parallel (B) intersecting or coincident

(C) always coincident (D) always intersecting

Sol. (B) Intersecting or coincident. 1

---

9. The total surface area of a frustum-shaped glass tumbler is ($r_1 > r_2$)

(A) $\pi r_1 l + \pi r_2 l$ **(B)** $\pi l (r_1 + r_2) + \pi r_2^2$

(C) $\frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$ **(D)** $\sqrt{h^2 + (r_1 - r_2)^2}$

Sol. (B) $\pi l (r_1 + r_2) + \pi r_2^2$ 1

---

10. 120 can be expressed as a product of its prime factors as

(A) $5 \times 8 \times 3$ **(B)** 15×2^3 **(C)** $10 \times 2^2 \times 3$ **(D)** $5 \times 2^3 \times 3$

Sol. (D) $5 \times 2^3 \times 3$ 1

Fill the blank in question number 11 to 15.

11. Area of quadrilateral ABCD = Area of Δ ABC + Area of _______.

Sol. ΔACD 1

---

12. If the radii of two spheres are in the ratio 2 : 3, then the ratio of their respective volumers is _______.

Sol. 8/27 or 8 : 27 1

---

13. If 2 is a zero of the polynomial $ax^2 - 2x$, then the value of 'a' is _______.

Sol. 1 1

---

14. A line intersecting a circle in two points is called a _______.

Sol. Secant 1

---

15. All squares are _______ (congruent/similar).

Sol. Similar 1

Answer the following question number 16 to 20:

16. A dice is thrown once. If getting a six, is a success, then find the probability of a failure.

Sol. Total outcomes = 6 $\frac{1}{2}$

$P(\text{Failure}) = \frac{5}{6}$ $\frac{1}{2}$

---

17. **Find the value of x so that – 6, x, 8 are in A.P.**

Sol. $x + 6 = 8 - x$ $\frac{1}{2}$

$\boxed{x = 1}$ $\frac{1}{2}$

OR

Find the 11th term of the A.P. – 27, – 22, –17, –12, ...

Sol. $a = -27,\ d = 5$ $\frac{1}{2}$

$a_{11} = -27 + 50 = 23$ $\frac{1}{2}$

---

18. **In Figure-2, the angle of elevation of the top of a tower AC from a point B on the ground is 60°. If the height of the tower is 20 m, find the distance of the point from the foot of the tower.**

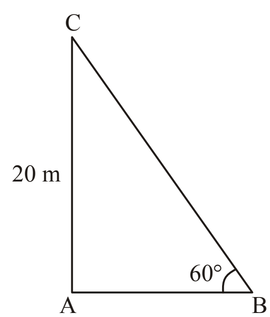


Fig. 2

Sol. $\frac{AC}{AB} = \tan 60°$ $\frac{1}{2}$

$\frac{20}{AB} = \sqrt{3}$ $\frac{1}{2}$

$AB = \frac{20\sqrt{3}}{3}$ or $AB = \frac{20}{\sqrt{3}}$

---

19. **Evaluate:**

tan 40° × tan 50°

Sol. $\tan 40° \times \cot 40°$ $\frac{1}{2}$

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

OR

If cos A = sin 42°, then find the value of A.

Sol. $\cos A = \sin(90° - 48°)$ $\frac{1}{2}$

$= \cos 48°$

$\Rightarrow \boxed{A = 48°}$ $\frac{1}{2}$

---

20. **Find the height of a cone of radius 5 cm and slant height 13 cm.**

Sol. $h = \sqrt{(13)^2 - (5)^2}$ $\frac{1}{2}$

$h = 12$ cm $\frac{1}{2}$

SECTION B

Question numbers 21 to 26 carry 2 mark each.

21. **In Figure-3, ΔABC and ΔXYZ are shown. If AB = 3 cm BC = 6 cm, AC = $2\sqrt{3}$ cm, ∠A = 80°, ∠B = 60° XY = $4\sqrt{3}$ cm YZ = 12 cm and XZ = 6 cm, then find the value of ∠Y.**

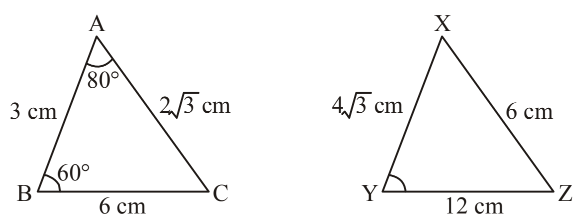


Figure 3

Sol. $\because \frac{AB}{XZ} = \frac{BC}{YZ} = \frac{AC}{XY} = \frac{1}{2}$ 1

$\therefore$ $\Delta ABC \sim \Delta XZY$ $\frac{1}{2}$

$\angle C = \angle Y = 40°$ $\frac{1}{2}$

---

22. **Find the mean for the following distribution:**

Classes:	**5 – 15**	**15 – 35**	**25 – 35**	**35 – 45**
Frequency:	**2**	**4**	**3**	**1**

Sol. Classes	**Freq.**	**Mid value = x**	**f × x**
5-15	2	10	20
15-25	4	20	80
25-35	3	30	90
35-45	1	40	40
	$\Sigma f = 10$		$\Sigma fx = 230$

Correct table 1

$\bar{x} = \frac{\Sigma fx}{\Sigma f}$ $\frac{1}{2}$

$= \frac{230}{10} = 23$ $\frac{1}{2}$

OR

The following distribution shows the transport expenditure of 100 employees:

Expenditure (in (₹):	**200 – 400**	**400 – 600**	**600 – 800**	**800 – 1000**	**1000 – 1200**
Number of employees:	**21**	**25**	**19**	**23**	**12**

Find the mode of the distribution.

Sol. Modal class = 400 – 600 $\frac{1}{2}$

$$\text{Mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$ $\frac{1}{2}$

$$= 400 + \left[\frac{25 - 21}{50 - 21 - 19}\right] \times 200$$ $\frac{1}{2}$

$$= 400 + 80 = 480$$ $\frac{1}{2}$

---

23. Solve for x:

$$\mathbf{2x^2 + 5\sqrt{5}\,x - 15 = 0}$$

Sol. $D = \left(5\sqrt{5}\right)^2 - 4 \times 2 \times (-15)$

$= 245$ $\frac{1}{2}$

$$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{-5\sqrt{5} \pm 7\sqrt{5}}{4}$$ 1

$$x = \frac{\sqrt{5}}{2}, -3\sqrt{5}$$ $\frac{1}{2}$

---

24. Check whether 6^n can end with the digit '0' (zero) for any natural number n.

Sol. $6^n = (2 \times 3)^n = 2^n \times 3^n$ 1

It is not in form of $2^n \times 5^m$ $\frac{1}{2}$

$\therefore$ 6^n can't end with digit '0' $\frac{1}{2}$

OR

Find the LCM of 150 and 200.

Sol. $150 = 2 \times 3 \times 5^2$ $\frac{1}{2}$

$200 = 2^3 \times 5^2$ $\frac{1}{2}$

$\text{LCM} = 2^3 \times 5^2 \times 3$ $\frac{1}{2}$

$= 600$ $\frac{1}{2}$

---

25. If $5 \tan\theta = 4$, show that $\dfrac{5\sin\theta - 3\cos\theta}{5\sin\theta + 3\cos\theta} = \dfrac{1}{7}$.

Sol. $\tan\theta = \frac{4}{5}$ $\frac{1}{2}$

$\text{LHS} = \dfrac{5\tan\theta - 3}{5\tan\theta + 3}$ 1

$\Rightarrow \dfrac{5 \times \frac{4}{5} - 3}{5 \times \frac{4}{5} + 3} = \dfrac{1}{7}$ $\frac{1}{2}$

---

26. 14 defective bulbs are accidentally mixed with 98 good ones. It is not possible to just look at the bulb and tell whether it is defective or not. One bulb is taken out at random from this lot. Determine the probability that the bulb taken out is a good one.

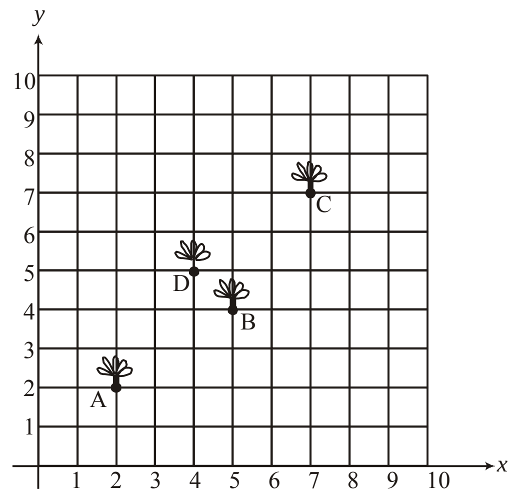
Sol. Total outcomes = 14 + 98 = 112 1

P(good bulb) = $\frac{98}{112}$ or $\frac{7}{8}$ 1

SECTION C

Question number 27 to 34 carry 3 marks each.

27. Krishna has an apple orchard which has a 10 m × 10 m sized kitchen garden attached to it. She divides it into a 10 × 10 grid and puts soil and manure into it. She grows a lemon plant at A, a coriander plant at B, an onion plant at C and a tomato plant at D. Her husband Ram praised her kitchen garden and points out that on joining A, B, C and D they may form a parallelogram. Look at the below figure carefully and answer the following questions:



(i) Write the coordinates of the points A, B, C and D, using the 10 × 10 grid as coordinate axes.

(ii) Find whether ABCD is a parallelogram or not.

Sol. (i) Coordinates are A(2, 2), B(5, 4), C(7, 7), D(4, 5) $4\times\frac{1}{2}=2$

(ii) AB = $\sqrt{(5-2)^2+(4-2)^2}=\sqrt{13}$

BC = $\sqrt{13}$

CD = $\sqrt{13}$

DA = $\sqrt{13}$ $\left[\begin{array}{l}\because AB = BC = CD = DA \\ \therefore \text{ABCD is a parallelogram}\end{array}\right]$ 1

---

28. Prove that $\sqrt{3}$ is an irrational number.

Sol. Let $\sqrt{3}$ is rational

$\sqrt{3}=\frac{a}{b}$ (where a & b are +ve integers & co-prime, b ≠ 0) $\frac{1}{2}$

$a^2 = 3b^2$ ...(i)

3 divides a^2

$\therefore$ 3 divides a also 1

Let a = 3c & put in (i)

$(3c)^2 = 3(b)^2$

$3c^2 = b^2$

$\Rightarrow$ 3 divides b^2

$\therefore$ 3 divides b also 1

$\therefore$ 3 divides a and b both

This contradicts our assumption

Therefore, $\sqrt{3}$ is irrational no. $\frac{1}{2}$

---

29. Prove that:

$$\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta \operatorname{cosec}\theta$$

Sol. LHS $= \dfrac{\frac{\sin\theta}{\cos\theta}}{1-\frac{\cos\theta}{\sin\theta}}+\dfrac{\frac{\cos\theta}{\sin\theta}}{1-\frac{\sin\theta}{\cos\theta}}$ 1

$$= \frac{\sin^2\theta}{\cos\theta(\sin\theta-\cos\theta)}+\frac{\cos^2\theta}{\sin\theta(\cos\theta-\sin\theta)}$$

$= \dfrac{\sin^3\theta-\cos^3\theta}{\sin\theta\cdot\cos\theta(\sin\theta-\cos\theta)}$ 1

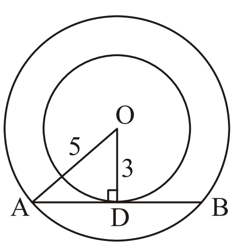
$$= \frac{1+\sin\theta\cdot\cos\theta}{\sin\theta\cos\theta}=\frac{1}{\sin\theta}\times\frac{1}{\cos\theta}+1$$

$= \operatorname{cosec}\theta \cdot \sec\theta + 1 =$ RHS 1

---

30. Two concentric circles are of radii 5 cm and 3 cm. Find the length of chord of the larger circle which touches the smaller circle.

Sol.



Correct figure 1

In ΔAOB, $OA^2 = AD^2 + OD^2$

$(5)^2 = AD^2 + (3)^2$ 1

$\therefore AD^2 = 16$

AD = 4 $\frac{1}{2}$

$\therefore$ Length of chord i.e. AB = 4 × 2 = 8 cm $\frac{1}{2}$

31. The difference between two numbers is 26 and the larger number exceeds thrice of the smaller number by 4. Find the numbers.

Sol. Let larger No. = x

Let smaller No = y

$x - y = 26$ ...(i) 1

$x - 3y = 4$ ...(ii) 1

By solving (i) & (ii), we get

$\therefore \quad x = 37$ $\frac{1}{2}$

$y = 11$ $\frac{1}{2}$

OR

Solve for x and y:

$$\frac{2}{x} + \frac{3}{y} = 13 \text{ and } \frac{5}{x} - \frac{4}{y} = -2$$

Sol. Let $\frac{1}{x} = p$ & $\frac{1}{y} = q$

$2p + 3q = 13$ ...(i) $\frac{1}{2}$

$5p - 3q = -2$ ...(ii) $\frac{1}{2}$

By solving (i) & (ii), we get

$\therefore \quad p = 2, \; q = 3$ 1

$\therefore \quad \frac{1}{x} = 2, \quad \frac{1}{y} = 3$

$\boxed{x = \frac{1}{2}}$ $\boxed{y = \frac{1}{3}}$ 1

32. In Figure-4, AB and CD are two diameters of a circle (with centre O) perpendicular to each other and OD is the diameter of the smaller circle.

If OA = 7 cm, then find the area of the shaded region.

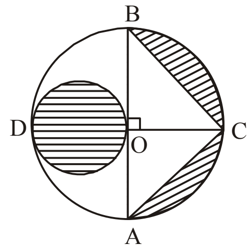


Fig. 4

Sol. Area of smaller circle = $\pi r^2 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = \frac{77}{2} = 38.5 \text{ cm}^2$ 1

Area of Big semi-circle = $\frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 77 \text{ cm}^2$ $\frac{1}{2}$

Area of ΔABC = $\frac{1}{2} \times 14 \times 7 = 49 \text{ cm}^2$ $\frac{1}{2}$

Area of shaded portion = ar. of smaller circle + ar. of big semicircle – ar. of ΔABC

$= 38.5 + 77 - 49 = 66.5 \text{ cm}^2$ 1

OR

In Figure-5, ABCD is a square with side 7 cm. A circle is drawn circumscribing the square. Find the area of the shaded region.

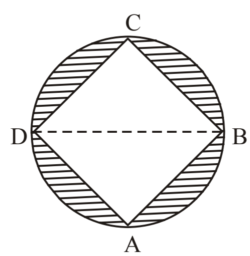


Fig. 5

Sol. Area of sqaure ABCD = $a^2 = 7^2 = 49 \text{ cm}^2$ $\frac{1}{2}$

Diagonal of square = $\sqrt{2}a = 7\sqrt{2} \text{ cm}$ 1

$\therefore$ Radius of circle = $\frac{7\sqrt{2}}{2} \text{ cm}$ $\frac{1}{2}$

Area of circle = $\frac{22}{7} \times \left(\frac{7\sqrt{2}}{2}\right)^2 = 77 \text{ cm}^2$ $\frac{1}{2}$

Area of shaded, portion = 77 – 49 = 28 cm^2 $\frac{1}{2}$

---

33. **Construct a triangle with its sides 4 cm, 5 cm and 6 cm. Then construct a triangle similar to it whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle.**

Sol. For correct construction of Δ 1

For construction of similar Δ 2

OR

Draw a circle of radius 2.5 cm. Take a point P at a distance of 8 cm from its centre. Construct a pair of tangents from the point P to the circle.

Sol. For draw the correct circle & exterior pt. 1

For construction of the pair of tangents 2

---

34. **If the sum of first 7 terms of an A.P. is 49 and that of 17 terms is 289, then find the sum of first n terms.**

Sol. $\because \frac{7}{2}[2a + 6d] = 49$

$a + 3d = 7$ ...(i) 1

$\frac{17}{2}[2a + 16d] = 289$

$a + 8d = 17$ ...(ii) $\frac{1}{2}$

By solving the eq. (i) & (ii)

$a = 1,\ d = 2$ $\frac{1}{2}$

$\therefore\ S_n = \frac{n}{2}[2 + (n-1) \times 2]$

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

SECTION D

Question number 35 to 40 carry 4 marks each.

35. **Two water taps together can fill a tank in $9\frac{3}{8}$ hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.**

Sol. Let smaller diameter tap takes x hours to fill the tank

Then, time taken by larger diameter tap to fill the tank = (x – 10) hr $\frac{1}{2}$

ATQ

$$\frac{1}{x}+\frac{1}{x-10}=\frac{8}{75}$$ $1\frac{1}{2}$

$$8x^2 - 230x + 750 = 0$$ $\frac{1}{2}$

$$(8x - 30)(x - 25) = 0$$ $\frac{1}{2}$

$$x=\frac{15}{4} \text{ and } x=25$$ $\frac{1}{2}$

Rejected $x = \frac{15}{4}$,

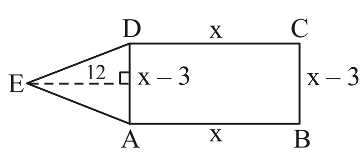
Hence, time taken by smaller diameter tap = 25 hrs

Time taken by larger diameter tap = 25 – 10 = 15 hrs $\frac{1}{2}$

OR

A rectangular park is to be designed whose breadth is 3 m less than its length. Its area is to be 4 square metres more than the area of a park that has already been made in the shape of an isosceles triangle with its base as the breadth of the Rectangular park and of altitude 12 m. Find the length and breadth of the park.

Sol.



Correct figure $\frac{1}{2}$

Let length of rectangle = x

$\therefore$ Breadth = x – 3

ar. of reactangle = x(x – 3)

$= x^2 - 3x$ 1

Area of Isosceles ΔADE

$= \frac{1}{2}(x-3)\times 12$

$= 6x - 18$ $\frac{1}{2}$

ATQ

$x^2 - 3x = 6x - 18 + 4$ 1

$x^2 - 9x + 14 = 0$

$(x - 7)(x - 2) = 0$

$x = 7, x = 2$ Rejected $\frac{1}{2}$

$\therefore$ Length of rectangle = 7 cm

Breadth of rectangle = 4 cm $\frac{1}{2}$

---

36. Find the curved surface area of frustum of a cone of height 12 cm and radii of circular ends are 9 cm and 4 cm.

Sol. $l = \sqrt{(r_1 - r_2)^2 + h^2} = \sqrt{(5)^2 + (12)^2} = 13$ cm $1\frac{1}{2}$

$\therefore$ C.S.A of frustom of cone $= \pi l(r_1 + r_2)$

$= \pi \times 13(9 + 4)$ $1\frac{1}{2}$

$= 169\pi$ or 531.14 cm^2 1

---

37. Draw a 'less than' ogive for the following frequency distribution:

Classes:	**0 – 10**	**10 – 20**	**20 – 30**	**30 – 40**	**40 – 50**	**50 – 60**	**60 – 70**	**70 – 80**
Frequency:	**7**	**14**	**13**	**12**	**20**	**11**	**15**	**8**

Sol.

getting the pts (10, 7), (20, 21)

(30, 34), (40, 46), (50, 66)

(60, 77), (70, 92), (80, 100) 2

Plotting and Joining the points to get the correct ogive 2

38. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio.

Sol. For correct given, To prove, Construction, Figure $4\times\frac{1}{2}=2$

For correct proof 2

OR

If Figure-6, in an equilateral triangle ABC, AD $\perp$ BC, BE $\perp$ AC and CF $\perp$ AB. Prove that $4(AD^2 + BE^2 + CF^2) = 9\,AB^2$.

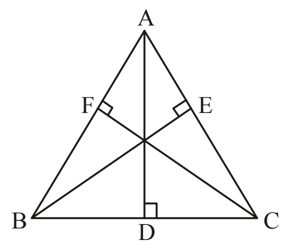


Figure 6

Sol. **Proof**

In ΔABD, $AD^2 = AB^2 - BD^2$ ...(i)

In ΔBCE $BE^2 = BC^2 - CE^2$ ...(ii)

In ΔACF $CF^2 = AC^2 - AF^2$ ...(iii) $3\times\frac{1}{2}=1\frac{1}{2}$

$AD^2 + BE^2 + CF^2 = AB^2 + BC^2 + AC^2 - BD^2 - CE^2 - AF^2$ 1

$$= 3AB^2 - \left(\frac{BC}{2}\right)^2 - \left(\frac{AC}{2}\right)^2 - \left(\frac{AB}{2}\right)^2$$

$$= 3AB^2 - \frac{3}{4}AB^2$$

$$= \frac{9}{4}AB^2$$

$4(AD^2 + BE^2 + CF^2) = 9AB^2$ $1\frac{1}{2}$

---

39. Find other zeroes of the polynomial
$p(x) = 3x^4 - 4x^3 - 10x^2 + 8x + 8$,
if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.

Sol. $\left(x-\sqrt{2}\right)$ & $\left(x+\sqrt{2}\right)$ are two factors

i.e. $x^2 - 2$ is a factor 1

$$
\begin{array}{r|l}
 & 3x^2 - 4x - 4 \\
\hline
x^2 - 2 & \cancel{3x^4} - 4x^3 - 10x^2 + 8x + 8 \\
 & \cancel{3x^4} \qquad\quad - 6x^2 \\
 & - \qquad\qquad + \\
\hline
 & -\cancel{4x^3} - 4x^2 + \cancel{8x} + 8 \\
 & -\cancel{4x^3} \qquad\quad + \cancel{8x} \\
 & + \qquad\qquad\quad - \\
\hline
 & -\cancel{4x^2} + \cancel{8} \\
 & -\cancel{4x^2} + \cancel{8} \\
 & + \qquad - \\
\hline
 & 0 \\
\hline
\end{array}
$$

2

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

$\therefore$ $-2/3, 2$ are other two zeroes. $\frac{1}{2}$

OR

Divide the polynomial $g(x) = x^3 - 3x^2 + x + 2$ by the polynomial $x^2 - 2x + 1$ and verify the division algorithm.

Sol.

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

2

Verify,

$P(x) = q(x) \times g(x) + r(x)$

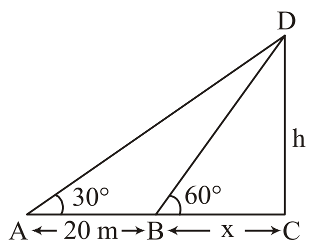
$= (x - 1)(x^2 - 2x + 1) + (-2x + 3)$ 1

$= x^3 - 3x^2 + 3x - 1 - 2x + 3$

$= x^3 - 3x^2 + x + 2$ 1

40. A TV tower stands vertically on the bank of a canal. From a point on the other bank directly opposite the tower, the angle of elevation of the top of the tower is 60°. From another point on the bank, which is 20 m away from this point, on the line joining this point to the foot of the tower, the angle of elevation of the top of the tower is 30°. Find the width of the canal.

Sol.



Correct figure 1

In ΔBCD, $\frac{h}{x} = \sqrt{3}$

$\therefore$ $h = \sqrt{3}x$ 1

In ΔACD, $\frac{h}{x+20} = \frac{1}{\sqrt{3}}$ 1

$\sqrt{3}h = x + 20$

By putting $h = \sqrt{3}x$

$\Rightarrow 3x = x + 20$

$\therefore$ $x = 10$

$\therefore$ width of canal = 10 m 1

QUESTION PAPER CODE 430/5/3
EXPECTED ANSWER/VALUE POINTS
SECTION A

1. If (3, – 6) is the mid-point of the line segment joining (0, 0) and (x, y), then the point (x, y) is

(A) (–3, 6) **(B) (6, – 6)** **(C) (6, – 12)** **(D)** $\left(\frac{3}{2}, -3\right)$

Sol. (C) (6, –12) 1

2. In the given circle in Figure-1, number of tangents parallel to tangent PQ is

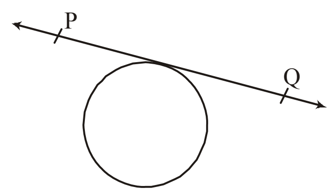


Fig. 1

(A) 0 **(B) many** **(C) 2** **(D) 1**

Sol. (D) 1 1

3. The discriminant of the quadratic equation $4x^2 - 6x + 3 = 0$ is

(A) 12 **(B) 84** **(C)** $2\sqrt{3}$ **(D) – 12**

Sol. (D) –12 1

4. For the following frequency distribution:

Class:	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
Frequency	8	10	19	25	8

The upper limit of median class is

(A) 15 **(B) 10** **(C) 20** **(D) 25**

Sol. (A) 15 1

5. If $\cos A = \frac{\sqrt{3}}{2}$, $0° < A < 90°$, then A is equal to

(A) $\frac{\sqrt{3}}{2}$ **(B) 30°** **(C) 60°** **(D) 1**

Sol. (B) 30° 1

6. The probability of an impossible event is

(A) 1 **(B) $\frac{1}{2}$** **(C) not defined** **(D) 0**

Sol. (D) 0 1

---

7. If a pair of linear equations is consistent, then the lines represented by them are

(A) parallel **(B) intersecting or coincident**

(C) always coincident **(D) always intersecting**

Sol. (B) Intersecting or coincident. 1

---

8. The distance between the points (3, – 2) and (– 3, 2) is

(A) $\sqrt{52}$ units **(B) $4\sqrt{10}$ units** **(C) $2\sqrt{10}$ units** **(D) 40 units**

Sol. (A) $\sqrt{52}$ units 1

---

9. 180 can be expressed as a product of its prime factors as

(A) $10 \times 2 \times 3^2$ **(B) $2^{25} \times 4 \times 3$** **(C) $2^2 \times 3^2 \times 5$** **(D) $4 \times 9 \times 5$**

Sol. (C) $2^2 \times 3^2 \times 5$ 1

---

10. The total surface area of a frustum-shaped glass tumbler is ($r_1 > r_2$)

(A) $\pi r_1 l + \pi r_2 l$ **(B) $\pi l (r_1 + r_2) + \pi r_2^2$**

(C) $\frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$ **(D) $\sqrt{h^2 + (r_1 - r_2)^2}$**

Sol. (B) $\pi l (r_1 + r_2) + \pi r_2^2$ 1

Fill in the blank in question number 11 to 15

11. If 2 is a zero of the polynomial $ax^2 - 2x$, then the value of 'a' is _______.

Sol. 1 1

---

12. If the radii of two spheres are in the ratio 2 : 3, then the ratio of their respective volumers is _______.

Sol. 8/27 or 8 : 27 1

---

13. A line intersecting a circle in two points is called a _______.

Sol. Secant 1

---

14. If ar (Δ PQR) is zero, then the points P, Q and R are _______.

Sol. Collinear 1

---

15. All squares are _______ (congruent/similar).

Sol. Similar 1

Answer the following question number 16 to 20

16. A coin is tossed twice. Find the probability of getting head both the times.

Sol. Total outcomes = 4 $\frac{1}{2}$

P(getting head both the times) = $\frac{1}{4}$ $\frac{1}{2}$

---

17. Find the radius of the sphere whose surface area is 36π cm^2.

Sol. $4\pi r^2 = 36\pi$ $\frac{1}{2}$

$r = 3$ cm $\frac{1}{2}$

---

18. Find the value of x so that – 6, x, 8 are in A.P.

Sol. $x + 6 = 8 - x$ $\frac{1}{2}$

$\boxed{x = 1}$ $\frac{1}{2}$

OR

Find the 11th term of the A.P. – 27, – 22, –17, –12, ...

Sol. $a = -27,\ d = 5$ $\frac{1}{2}$

$a_{11} = -27 + 50 = 23$ $\frac{1}{2}$

---

19. In Figure-2, the angle of elevation of the top of a tower AC from a point B on the ground is 60°. If the height of the tower is 20 m, find the distance of the point from the foot of the tower.

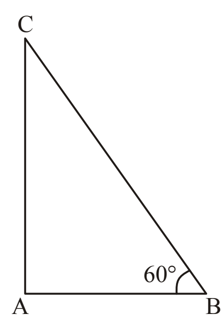


Fig. 2

Sol. $\frac{AC}{AB} = \tan 60°$ $\frac{1}{2}$

$\frac{20}{AB} = \sqrt{3}$

$AB = \frac{20\sqrt{3}}{3}$ or $AB = \frac{20}{\sqrt{3}}$ $\frac{1}{2}$

---

20. **Evaluate:**

tan 40° × tan 50°

Sol. $\tan 40° \times \cot 40°$ $\frac{1}{2}$

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

OR

If cos A = sin 42°, then find the value of A.

Sol. $\cos A = \sin (90° - 48°)$ $\frac{1}{2}$

$= \cos 48°$

$\Rightarrow \boxed{A = 48°}$ $\frac{1}{2}$

SECTION B

Question number 21 to 26 carry 2 mark each.

21. **If $\tan (A + B) = \sqrt{3}$ and $\tan (A - B) = \frac{1}{\sqrt{3}}$, $0 < A + B \le 90°$, $A > B$, then find the value of A and B.**

Sol. $A + B = 60°$ ...(i) 1

$A - B = 30°$ ...(ii) $\frac{1}{2}$

From (i) and (ii)

$\left.\begin{matrix} A = 45° \\ B = 15° \end{matrix}\right]$ $\frac{1}{2}$

---

22. **A letter is selected at random from the set of English alphabets. What is the probability that it is a vowel?**

Sol. Total outcomes = 26 1

P(getting vowel) = $\frac{5}{26}$ 1

---

23. Solve for x:

$$\sqrt{3}x^2 + 14x - 5\sqrt{3} = 0$$

Sol. $\sqrt{3}x^2 + 15x - x - 5\sqrt{3} = 0$ 1

$[x + 5\sqrt{3}][\sqrt{3}x - 1] = 0$ $\frac{1}{2}$

$x = -5\sqrt{3}$ or $x = \frac{1}{\sqrt{3}}$ $\frac{1}{2}$

---

24. Find the mean for the following distribution:

Classes:	**5 – 15**	**15 – 35**	**25 – 35**	**35 – 45**
Frequency:	**2**	**4**	**3**	**1**

Sol.

Classes	**Freq.**	**Mid value = x**	**f × x**
5-15	2	10	20
15-25	4	20	80
25-35	3	30	90
35-45	1	40	40
	$\Sigma f = 10$		$\Sigma fx = 230$

Correct table 1

$\bar{x} = \frac{\Sigma fx}{\Sigma f}$ $\frac{1}{2}$

$= \frac{230}{10} = 23$ $\frac{1}{2}$

OR

The following distribution shows the transport expenditure of 100 employees:

Expenditure (in ₹):	**200 – 400**	**400 – 600**	**600 – 800**	**800 – 1000**	**1000 – 1200**
Number of employees:	**21**	**25**	**19**	**23**	**12**

Find the mode of the distribution.

Sol. Modal class = 400 – 600 $\frac{1}{2}$

Mode = $l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$ $\frac{1}{2}$

$= 400 + \left[\frac{25 - 21}{50 - 21 - 19}\right] \times 200$ $\frac{1}{2}$

= 400 + 80 = 480 $\frac{1}{2}$

25. **Check whether 6^n can end with the digit '0' (zero) for any natural number n.**

Sol. $6^n = (2 \times 3)^n = 2^n \times 3^n$ 1

It is not in form of $2^n \times 5^m$ $\frac{1}{2}$

$\therefore$ 6^n can't end with digit '0' $\frac{1}{2}$

OR

Find the LCM of 150 and 200.

Sol. $150 = 2 \times 3 \times 5^2$ $\frac{1}{2}$

$200 = 2^3 \times 5^2$ $\frac{1}{2}$

$\text{LCM} = 2^3 \times 5^2 \times 3$ $\frac{1}{2}$

$= 600$ $\frac{1}{2}$

---

26. **In Figure-3, ΔABC and ΔXYZ are shown. If AB = 3 cm BC = 6 cm, AC = $2\sqrt{3}$ cm, ∠A = 80°, ∠B = 60°, XY = $4\sqrt{3}$ cm YZ = 12 cm and XZ = 6 cm, then find the value of ∠Y.**

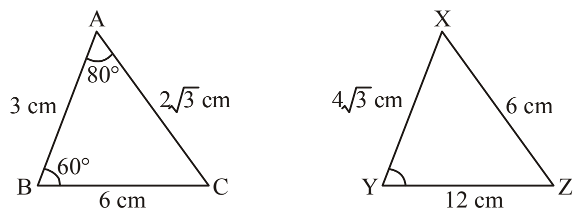


Figure 3

Sol. $\because \frac{AB}{XZ} = \frac{BC}{YZ} = \frac{AC}{XY} = \frac{1}{2}$ 1

$\therefore$ $\Delta ABC \sim \Delta XZY$ $\frac{1}{2}$

$\angle C = \angle Y = 40°$ $\frac{1}{2}$

SECTION C

Question numbers 27 to 34 carry 3 marks each.

27. Construct a triangle with its sides 4 cm, 5 cm and 6 cm. Then construct a triangle similar to it whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle.

Sol. For correct construction of Δ 1

For construction of similar Δ 2

OR

Draw a circle of radius 2.5 cm. Take a point P at a distance of 8 cm from its centre. Construct a pair of tangents from the point P to the circle.

Sol. For draw the correct circle & exterior pt. 1

For construction of the pair of tangents 2

---

28. If the n^{th} terms of two A.P.s 23, 25, 27, ... and 5, 8, 11, 14, ... are equal, then find the value of n.

Sol. nth term of first A.P = nth term of second A.P $\frac{1}{2}$

$23 + (n - 1)2 = 5 + (n - 1)3$ 1

$21 + 2n = 2 + 3n$ 1

$n = 19$ $\frac{1}{2}$

---

29. In Figure-4, AB and CD are two diameters of a circle (with centre O) perpendicular to each other and OD is the diameter of the smaller circle.

If OA = 7 cm, then find the area of the shaded region.

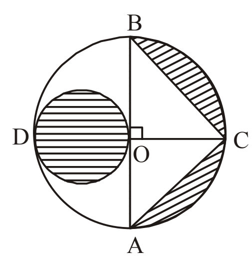


Fig. 4

Sol. Area of smaller circle = $\pi r^2 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = \frac{77}{2} = 38.5 \text{ cm}^2$ 1

Area of Big semi-circle = $\frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 77 \text{ cm}^2$ $\frac{1}{2}$

Area of $\Delta ABC = \frac{1}{2} \times 14 \times 7 = 49 \text{ cm}^2$ $\frac{1}{2}$

Area of shaded portion = ar. of smaller circle + ar. of big semicircle – ar. of ΔABC

$= 38.5 + 77 - 49 = 66.5 \text{ cm}^2$ 1

OR

In Figure-5, ABCD is a square with side 7 cm. A circle is drawn circumscribing the square. Find the area of the shaded region.

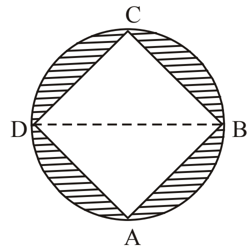


Fig. 5

Sol. Area of sqaure ABCD = $a^2 = 7^2 = 49 \text{ cm}^2$ $\frac{1}{2}$

Diagonal of square = $\sqrt{2}a = 7\sqrt{2}$ cm 1

$\therefore$ Radius of circle = $\frac{7\sqrt{2}}{2}$ cm $\frac{1}{2}$

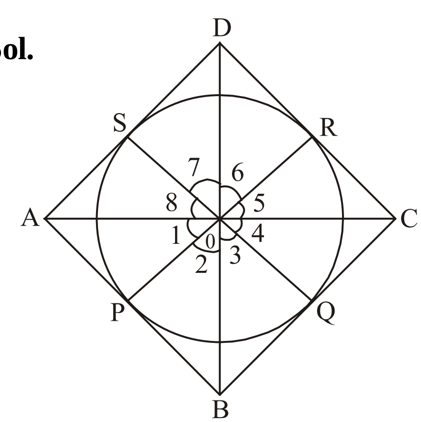
Area of circle = $\frac{22}{7} \times \left(\frac{7\sqrt{2}}{2}\right)^2 = 77 \text{ cm}^2$ $\frac{1}{2}$

Area of shaded, portion = $77 - 49 = 28 \text{ cm}^2$ $\frac{1}{2}$

---

30. Prove that the opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

Sol.



Correct figure $\frac{1}{2}$

$\Delta OAP \cong OAS$ [By SSS] 1

$\angle 1 = \angle 8$

Similarly $\angle 2 = \angle 3$

$\angle 4 = \angle 5 \quad \angle 6 = \angle 7$ $\frac{1}{2}$

Adding all angles

$(\angle 1 + \angle 8) + (\angle 2 + \angle 3) + (\angle 4 + \angle 5) + (\angle 6 + \angle 7) = 360°$ $\frac{1}{2}$

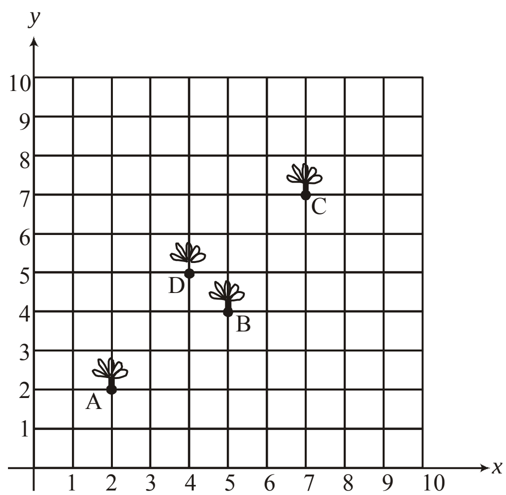
$2\angle 1 + 2\angle 2 + 2\angle 5 + 2\angle 6 = 360°$

$(\angle 1 + \angle 2) + (\angle 5 + \angle 6) = 180°$

$\angle AOB + \angle COD = 180°$ similarly $\angle BOC + \angle DOA = 180°$ $\frac{1}{2}$

---

31. Krishna has an apple orchard which has a 10 m × 10 m sized kitchen garden attached to it. She divides it into a 10 × 10 grid and puts soil and manure into it. She grows a lemon plant at A, a coriander plant at B, an onion plant at C and a tomato plant at D. Her husband Ram praised her kitchen garden and points out that on joining A, B, C and D they may form a parallelogram. Look at the below figure carefully and answer the following questions:



(i) Write the coordinates of the points A, B, C and D, using the 10 × 10 grid as coordinate axes.

(ii) Find whether ABCD is a parallelogram or not.

Sol. (i) Coordinates are A(2, 2), B(5, 4), C(7, 7), D(4, 5) $4\times\frac{1}{2}=2$

(ii) $AB = \sqrt{(5-2)^2 + (4-2)^2} = \sqrt{13}$

$BC = \sqrt{13}$

$CD = \sqrt{13}$

$DA = \sqrt{13}$ $\left[\begin{array}{l} \because AB = BC = CD = DA \\ \therefore \text{ABCD is a parallel gram} \end{array}\right]$ 1

---

32. Prove that:

$$\frac{\cos A}{1+\sin A}+\frac{1+\sin A}{\cos A} = 2 \sec A$$

Sol. LHS $= \dfrac{\cos^2 A+(1+\sin A)^2}{\cos A\,(1+\sin A)}$ 1

$= \dfrac{2(1+\sin A)}{\cos A(1+\sin A)}$ 1

$= \dfrac{2}{\cos A} = 2\sec A = \text{R.H.S}$ 1

---

33. Prove that $\sqrt{3}$ is an irrational number.

Sol. Let $\sqrt{3}$ is rational

$\sqrt{3}=\dfrac{a}{b}$ (where a & b are +ve integers & co-prime, $b \neq 0$) $\frac{1}{2}$

$a^2 = 3b^2$ ...(i)

3 divides a^2

$\therefore$ 3 divides a also 1

Let a = 3c & put in (i)

$(3c)^2 = 3(b)^2$

$3c^2 = b^2$

$\Rightarrow$ 3 divides b^2

$\therefore$ 3 divides b also 1

$\therefore$ 3 divides a and b both

This contradicts our assumption

Therefore, $\sqrt{3}$ is irrational no. $\frac{1}{2}$

---

34. The difference between two numbers is 26 and the larger number exceeds thrice of the smaller number by 4. Find the numbers.

Sol. Let larger No. = x

Let smaller No = y

$x - y = 26$ ...(i) 1

$x - 3y = 4$ ...(ii) 1

By solving (i) & (ii), we get

$\therefore$ $x = 37$ $\frac{1}{2}$

$y = 11$ $\frac{1}{2}$

OR

Solve for x and y:

$$\frac{2}{x} + \frac{3}{y} = 13 \text{ and } \frac{5}{x} - \frac{4}{y} = -2$$

Sol. Let $\frac{1}{x} = p$ & $\frac{1}{y} = q$

$2p + 3q = 13$ ...(i) $\frac{1}{2}$

$5p - 3q = -2$ ...(ii) $\frac{1}{2}$

By solving (i) & (ii), we get

$\therefore$ $p = 2, q = 3$ 1

$\therefore$ $\frac{1}{x} = 2$ $\frac{1}{y} = 3$

$\boxed{x = \frac{1}{2}}$ $\boxed{y = \frac{1}{3}}$ 1

SECTION D

Question numbers 35 to 40 carry 4 marks each.

35. Two water taps together can fill a tank in $9\frac{3}{8}$ hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

Sol. Let smaller diameter tap takes x hours to fill the tank

Then, time taken by larger diameter tap to fill the tank = (x – 10) hr $\frac{1}{2}$

ATQ

$\frac{1}{x}+\frac{1}{x-10}=\frac{8}{75}$ $1\frac{1}{2}$

$8x^2 - 230x + 750 = 0$ $\frac{1}{2}$

$(8x - 30)(x - 25) = 0$ $\frac{1}{2}$

$x=\frac{15}{4}$ and $x=25$ $\frac{1}{2}$

Rejected $x = \frac{15}{4}$,

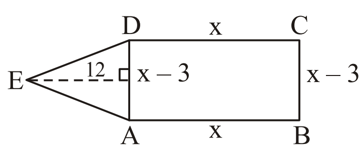
Hence, time taken by smaller diameter tap = 25 hrs

Time taken by larger diameter tap = 25 – 10 = 15 hrs $\frac{1}{2}$

OR

A rectangular park is to be designed whose breadth is 3 m less than its length. Its area is to be 4 square metres more than the area of a park that has already been made in the shape of an isosceles triangle with its base as the breadth of the Rectangular park and of altitude 12 m. Find the length and breadth of the park.

Sol.



Let length of rectangle = x Correct figure $\frac{1}{2}$

$\therefore$ Breadth = x – 3

ar. of reactangle = x(x – 3)

$= x^2 - 3x$ 1

Area of Isosceles ΔADE

$= \frac{1}{2}(x-3)\times 12$

$= 6x - 18$ $\frac{1}{2}$

ATQ

$x^2 - 3x = 6x - 18 + 4$ 1

$x^2 - 9x + 14 = 0$

$(x - 7)(x - 2) = 0$

$x = 7,\ x = 2$ Rejected $\frac{1}{2}$

$\therefore$ Length of rectangle = 7 cm

Breadth of rectangle = 4 cm $\frac{1}{2}$

---

36. A cylindrical bucket, 32 cm high and with radius of base 18 cm, is filled with sand. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of the conical heap is 24 cm, then find the radius and slant height of the heap.

Sol. Volume of sand in cylinderal bucket = Volume of sand in corres. heap $\frac{1}{2}$

$$\pi r_1^2 h_1 = \frac{1}{3}\pi r_2^2 h_2$$

$$\pi \times 18 \times 18 \times 32 = \frac{1}{3} \times \pi \times r_2^2 \times 24 \qquad 2$$

$$r_2^2 = 1296 \qquad \frac{1}{2}$$

$$r_2 = 36 \text{ cm}$$

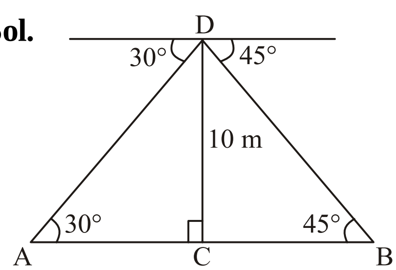
$$l = \sqrt{(36)^2 + (24)^2}$$

$$= \sqrt{1872} = 12\sqrt{13} \text{ cm} \qquad 1$$

---

37. From a point on a bridge across a river, the angles of depression of the banks on opposite sides of the river are 30° and 45°, respectively. If the bridge is at a height of 10 m from the banks, then find the width of the river. (Use $\sqrt{3}$ = 1.73)

Sol.



Correct figure 1

In ΔACD

$$\frac{1}{\sqrt{3}} = \frac{10}{AC}$$

$$AC = 10\sqrt{3} \text{ m} \qquad 1\frac{1}{2}$$

In ΔBCD

$$1 = \frac{10}{BC}$$

BC = 10 m 1

Width of river (AB) = AC + BC = $10\sqrt{3} + 10 = 10(\sqrt{3} + 1)\,m$ $\frac{1}{2}$

---

38. Draw a 'less than' ogive for the following frequency distribution:

Classes:	**0 – 10**	**10 – 20**	**20 – 30**	**30 – 40**	**40 – 50**	**50 – 60**	**60 – 70**	**70 – 80**
Frequency:	**7**	**14**	**13**	**12**	**20**	**11**	**15**	**8**

Sol.

getting the pts (10, 7), (20, 21)

(30, 34), (40, 46), (50, 66) 2

(60, 77), (70, 92), (80, 100)

Plotting and Joining the pts to get the correct ogive 2

---

39. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio.

Sol. For correct given, To prove, Construction, Figure $4\times\frac{1}{2}=2$

For correct proof 2

OR

If Figure-6, in an equilateral triangle ABC, AD $\perp$ BC, BE $\perp$ AC and CF $\perp$ AB.

Prove that $4(AD^2 + BE^2 + CF^2) = 9\,AB^2$.

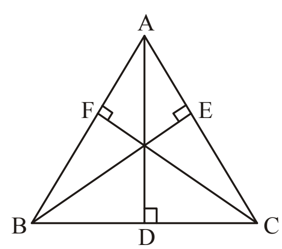


Figure 6

Sol. Proof

In ΔABD, $AD^2 = AB^2 - BD^2$ ...(i)

In ΔBCE $BE^2 = BC^2 - CE^2$ ...(ii)

In ΔACF $CF^2 = AC^2 - AF^2$ ...(iii)

$3\times\frac{1}{2}=1\frac{1}{2}$

$AD^2 + BE^2 + CF^2 = AB^2 + BC^2 + AC^2 - BD^2 - CE^2 - AF^2$ 1

$$= 3AB^2 - \left(\frac{BC}{2}\right)^2 - \left(\frac{AC}{2}\right)^2 - \left(\frac{AB}{2}\right)^2$$

$$= 3AB^2 - \frac{3}{4}AB^2$$

$$= \frac{9}{4}AB^2$$

$4(AD^2 + BE^2 + CF^2) = 9AB^2$ $1\frac{1}{2}$

---

40. Find other zeroes of the polynomial
$p(x) = 3x^4 - 4x^3 - 10x^2 + 8x + 8$,
if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.

Sol. $\left(x - \sqrt{2}\right)$ & $\left(x + \sqrt{2}\right)$ are two factors

i.e. $x^2 - 2$ is a factor 1

$$\begin{array}{r|l} & 3x^2 - 4x - 4 \\ \hline x^2 - 2 & 3x^4 - 4x^3 - 10x^2 + 8x + 8 \\ & 3x^4 \quad\quad\quad - 6x^2 \\ & - \quad\quad\quad\quad + \\ \hline & -4x^3 - 4x^2 + 8x + 8 \\ & -4x^3 \quad\quad\quad + 8x \\ & + \quad\quad\quad\quad - \\ \hline & -4x^2 + 8 \\ & -4x^2 + 8 \\ & + \quad\quad - \\ \hline & 0 \end{array}$$

2

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

$\therefore$ $-2/3$, 2 are other two zeroes. $\frac{1}{2}$

OR

Divide the polynomial g(x) = $x^3 - 3x^2 + x + 2$ by the polynomial $x^2 - 2x + 1$ and verify the division algorithm.

Sol. 2

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

Verify,

$P(x) = q(x) \times g(x) + r(x)$

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

$= x^3 - 3x^2 + 3x - 1 - 2x + 3$

$= x^3 - 3x^2 + x + 2$ 1