# Secondary School Examination-2020

# Marking Scheme - MATHEMATICS STANDARD

## Subject Code: 041 Paper Code: 30/4/1, 30/4/2, 30/4/3

***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** marks as given in Question Paper) 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 30/4/1

## EXPECTED ANSWER/VALUE POINTS

### SECTION A

**Question numers 1 to 20 carry 1 mark each.**

**Question numbers 1 to 10 are multiple choice questions. Choose the correct option.**

**1. The number of zeroes for a polynomial p(x) where graph of y = p(x) is given in Figure-1, is**

**(A) 3** **(B) 4** **(C) 0** **(D) 5**

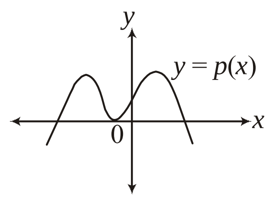



**Fig. 1**

**Sol.** (A) 3 1

---

**2. The first term of an A.P. is 5 and the last term is 45. If the sum of all the terms is 400, the number of terms is**

**(A) 20** **(B) 8** **(C) 10** **(D) 16**

**Sol.** (D) 16 1

**OR**

**The 9$^{th}$ term of the A.P. – 15, –11, –7, ..., 49 is**

**(A) 32** **(B) 0** **(C) 17** **(D) 13**

**Sol.** (C) 17 1

---

**3. It is being given that the points A(l, 2), B(0, 0) and C(a, b) are collinear. Which of the following relations between a and b is true?**

**(A) a = 2b** **(B) 2a = b** **(C) a + b = 0** **(D) a – b = 0**

**Sol.** (B) 2a = b 1

---

**4. In Figure-2, TP and TQ are tangents drawn to the circle with centre at O. If ∠POQ = 115° then ∠PTQ is**

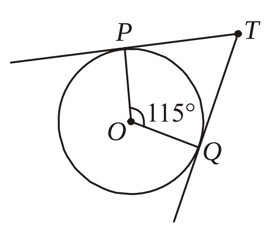



**Fig. 2**

**(A) 115°** **(B) 57.5°** **(C) 55°** **(D) 65°**

**Sol.** (D) 65º 1

---

**OR**

**From an external point Q, the length of the tangent to a circle is 5 cm and the distance of Q from the centre is 8 cm. The radius of the circle is**

**(A) 39 cm** **(B) 3 cm** **(C) $\sqrt{39}$ cm** **(D) 7 cm**

**Sol.** (C) $\sqrt{39}$ cm 1

---

**5.** **The value of θ for which cos (10° + θ) = sin 30°, is**

**(A) 50°** **(B) 40°** **(C) 80°** **(D) 20°**

**Sol.** (A) 50° 1

---

**6.** **A bag contains 3 red, 5 black and 7 white balls. A ball is drawn from the bag at random. The probability that the drawn is not black, is**

**(A)** $\frac{1}{3}$ **(B)** $\frac{9}{15}$ **(C)** $\frac{5}{10}$ **(D)** $\frac{2}{3}$

**Sol.** (D) 2/3 1

---

**7.** **The pair of linear equations y = 0 and y = –6 has**

**(A) a unique solution** **(B) no solution**

**(C) infinetly many solutions** **(D) only solution (0, 0)**

**Sol.** (B) No solution 1

---

**8.** **The mean and median of a distribution are 14 and 15 respectively. The value of mode is**

**(A) 16** **(B) 17** **(C) 18** **(D) 13**

**Sol.** (B) 17 1

---

**9.** **The quadratic equation $x^2 - 4x + k = 0$ has distinct real roots if**

**(A) k = 4** **(B) k > 4** **(C) k =16** **(D) k < 4**

**Sol.** (D) K < 4 1

---

**10.** **Point $P\left(\frac{a}{8}, 4\right)$ is the mid-point of the line segment joining the points A(– 5, 2) and B(4, 6). The value of 'a' is**

**(A) –4** **(B) 4** **(C) –8** **(D) –2**

**Sol.** (A) –4 1

---

**Fill in the blanks in question numbers 11 to 15.**

**11.** $\left(\frac{2+\sqrt{5}}{3}\right)$ **is _______ number.**

**Sol.** irrational 1

---

**12.** **Let ΔABC ~ ΔDEF and their areas be respectively 81 $cm^2$ and 144 $cm^2$. If EF = 24 cm, then length of side BC is _______ cm.**

**Sol.** 18 1

---

**13.** **The distance between the points (a, b) and (– a, – b) is _______.**

**Sol.** $2\sqrt{a^2+b^2}$ 1

---

**14.** **If tan A = 1, then 2 sin A cos A = _______.**

**Sol.** 1 1

---

**15.** **A spherical metal ball of radius 8 cm is melted to make 8 smaller identical balls. The radius of each new ball is _______ cm.**

**Sol.** 4 1

---

**Answer the following question numbers 16 to 20.**

**16.** **Given that HCF (135, 225) = 45, find the LCM (135, 225).**

**Sol.** $\text{LCM} = \frac{135\times 225}{45}$ $\frac{1}{2}$

$= 675$ $\frac{1}{2}$

---

**17.** **In Figure-3, a tightly stretched rope of length 20 m is tied from the top of a vertical pole to the ground. Find the height of the pole if the angle made by the rope with the ground is 30°.**

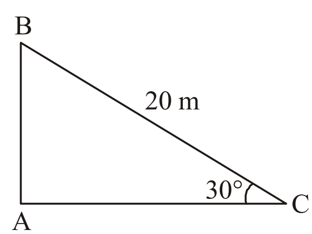



**Fig. 3**

**Sol.** $\sin 30° = \frac{AB}{20}$ $\frac{1}{2}$

$AB = 10 \text{ m}$ $\frac{1}{2}$

---

**18.** **Two dice are thrown simultaneously. What is the probability that the sum of the two numbers appearing on the top is 13?**

**Sol.** P(E) = 0 1

**19.** **After how many decimal places will the decimal representation of the rational number $\frac{229}{2^2 \times 5^7}$ terminate?**

**Sol.** After 7 decimal places 1

**20.** **In Figure-4, AB and CD are common tangents to circle which touch each other at D. If AB = 8 cm, then find the length of CD.**

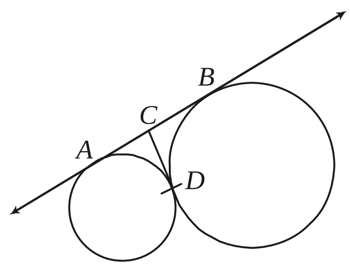



**Fig. 4**

**Sol.** AC = CD = BC $\frac{1}{2}$

CD = 4 cm $\frac{1}{2}$

## SECTION B

**Question numbers 21 to 26 carry 2 marks each.**

**21.** **Solve for x:**

**$6x^2 + 11x + 3 = 0$**

**Sol.** $6x^2 + 11x + 3 = 0$

$6x^2 + 9x + 2x + 3 = 0$ 1

$(2x + 3)(3x + 1) = 0$ $\frac{1}{2}$

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

**22. The perimeters of two similar triangles are 30 cm and 20 cm respectively. If one side of the first triangle is 9 cm long, find the length of the corresponding side of the second triangle.**

**Sol.** Let the side of other triangle be x cm

∵ Ratio of perimeters of two similar triangles is equal to ratio of their corresponding sides $\frac{1}{2}$

$$\therefore \quad \frac{9}{x} = \frac{30}{20}$$ 1

$$x = 6 \text{ cm}$$ $\frac{1}{2}$

**OR**

**In Figure-5, ΔPQR is right-angled at P. M is a point on QR such that PM is perpendicular to QR. Show that $PQ^2 = QM \times QR$.**

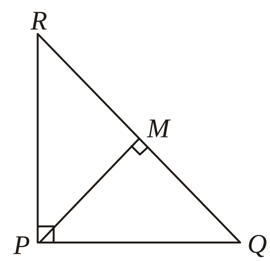



**Fig. 5**

**Sol.** ΔPQM ~ ΔRQP [By AA similarity] 1

$$\therefore \quad \frac{PQ}{RQ} = \frac{QM}{PQ}$$

$\Rightarrow \quad PQ^2 = QM \times QR$ 1

---

**23. Evaluate:**

$$\left(\frac{\sin 47°}{\cos 43°}\right)^2 + \left(\frac{\cos 30°}{\cot 30°}\right)^2 - (\sin 60°)^2$$

**Sol.** $$\left[\frac{\cos(90° - 47°)}{\cos 43°}\right]^2 + \left(\frac{\sqrt{3}/2}{\sqrt{3}}\right)^2 - \left(\frac{\sqrt{3}}{2}\right)^2$$ 1

$$= 1 + \frac{1}{4} - \frac{3}{4} = \frac{1}{2}$$ 1

---

**24. Find the mode of the following distribution:**

| **Classes:** | **10 – 20** | **20 – 40** | **40 – 60** | **60 – 80** | **80 – 100** |
|---|---|---|---|---|---|
| **Frequency:** | **10** | **8** | **12** | **16** | **4** |

**Sol.** Modal class = 60 – 80 $\frac{1}{2}$

Mode $= l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 60 + \left(\frac{16 - 12}{32 - 12 - 4}\right) \times 20$ 1

$= 65$ $\frac{1}{2}$

**OR**

**From the following distribution, find the median:**

| **Classes:** | **500 – 600** | **600 – 700** | **700 – 800** | **800 –900** | **900 – 1000** |
|---|---|---|---|---|---|
| **Frequency:** | **36** | **32** | **32** | **20** | **30** |

**Sol.** Median class: 700 – 800 $\frac{1}{2}$

Median $= l + \frac{\left(\frac{N}{2} - cf\right)}{f} \times h$

$= 700 + \frac{75 - 68}{32} \times 100$ 1

$= 721.88$ $\frac{1}{2}$

---

**25. In Figure-6, a tent is in the shape of a cylinder surmounted by a conical top. The cylindrical part is 2.1 m high and conical part has slant height 2.8 m. Both the parts have same radius 2 m. Find the area of the canvas used to make the tent. (Use $\pi = \frac{22}{7}$)**

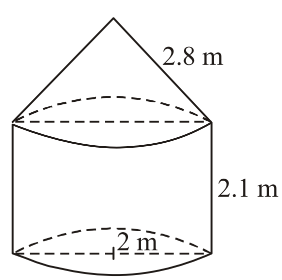



**Fig. 6**

**Sol.** Area of canvas = $\pi r(2h + l)$

$$= \frac{22}{7} \times 2\,(2 \times 2.1 + 2.8)$$ 1

$$= 44\ m^2$$ 1

---

**26. Tree Plantation Drive**

**A group Housing Society has 600 members, who have their houses in the campus and decided to hold a Tree Plantation Drive on the occasion of New Year. Each household was given he choice of planting a sampling of its choice. The number of different types of sampings planted were:**

**(i) Neem – 125**

**(ii) Peepal – 165**

**(iii) Creepers – 50**

**(iv) Fruit plants – 150**

**(v) Flowering plants – 110**

**On the opening ceremony, one of the plants is selected randomly for a prize. After reading the above passage, answer the following questions.**

**What is the probability that the selected plant is**

**(i) A fruit plant or a flowering plant?**

**(ii) Either a Neem plant or a Peepal plant?**

**Sol.** Total outcomes = 600

(i) P(Fruit plant or a flowering plant) = $\frac{260}{600}$ or $\frac{13}{30}$ 1

(ii) P(either neem plant or a peepal plant) = $\frac{290}{600}$ or $\frac{29}{60}$ 1

---

## SECTION C

**Question numbers 27 to 34 carry 3 marks each.**

**27. Prove that $\sqrt{5}$ is an irrational number.**

**Sol.** Let $\sqrt{5}$ be a rational number

$$\sqrt{5} = \frac{a}{b} \quad b \neq 0 \quad \text{HCF } (a, b) = 1$$ $\frac{1}{2}$

$\Rightarrow \; 5 = \frac{a^2}{b^2}, \; a^2 = 5b^2$

5 divides a 1

Put a = 5c (for some integer c)

$\Rightarrow \; 25c^2 = 5b^2 \Rightarrow b^2 = 5c^2$

then we get, 5 divides b $\frac{1}{2}$

Contradiction arises as HCF (a, b) = 1

$\therefore$ Our assumption is wrong

$\therefore$ $\sqrt{5}$ is irrational number 1

---

**28. The sum of the First 30 terms of an A.P. is 1920. If the fourth term is 18, find its 11th term.**

**Sol.** $\frac{30}{2}[2a + 29d] = 1920$

$\Rightarrow \; 2a + 29d = 128$ ...(i) 1

Also, $a_4 = 18 \Rightarrow a + 3d = 18$ ...(ii) $\frac{1}{2}$

From equation (i) & (ii)

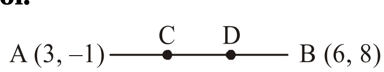
$\boxed{a = 6}$ $\boxed{d = 4}$ 1

$\therefore \; a_{11} = a + 10d = 46$ $\frac{1}{2}$

---

**29. Find the co-ordinates of the points of trisection of the line segment joining the points (3, – 1) and (6,8).**

**Sol.**




Case I: If C and D trisect AB

then C divides AB in the ratio 1 : 2 $\frac{1}{2}$

Co-ordinates of C: $x = \frac{1 \times 6 + 2 \times 3}{3} = 4$ $\frac{1}{2}$

and $y = \frac{1 \times 8 + 2(-1)}{3} = 2$ $\frac{1}{2}$

$\therefore$ Co-ordinates of C(4, 2)

Case II: Coordinates of D if D divides AB in the ratio 2 : 1 $\frac{1}{2}$

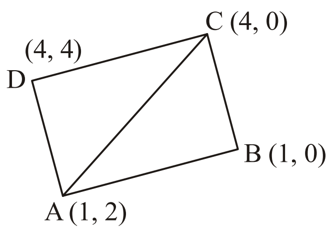
Co-ordinates of D: $x' = \frac{2\times 6+1\times 3}{3} = 5$ $\frac{1}{2}$

$y' = \frac{2\times 8+1\times(-1)}{3} = 5$ $\frac{1}{2}$

Coordinates of D = (5, 5)

**OR**

**Find the area of a quadrilateral ABCD having vertices at A(l, 2), B(l, 0), C(4, 0) and D(4, 4).**




ar (ΔABC) = $\frac{1}{2}[1(0-0)+1(0-2)+4(2-0)]$

= 3 sq. units $1\frac{1}{2}$

ar (ΔACD) = $\frac{1}{2}[1(0-4)+4(4-2)+4(2-0)]$

= 6 sq. units 1

∴ Area of quadrialteral = 3 + 6 = 9 sq. units $\frac{1}{2}$

---

**30. In Figure-7, XY and MN are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and MN at B. Prove that ∠AOB = 90°.**

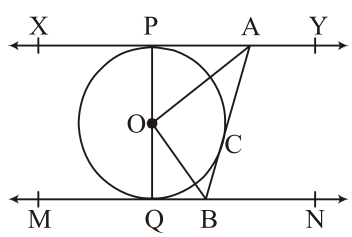
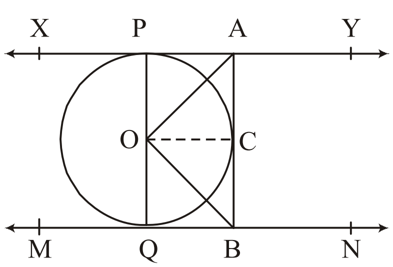



**Fig. 7**

**Sol.**




Join OC (In given figure)

ΔAPO ≅ ΔACO [By RHS congruence] 1

∴ ∠OAP = ∠OAC = x (let) $\frac{1}{2}$

Similarly, ΔOQB ≅ ΔOCB

$\therefore$ $\angle OBC = \angle OBQ = y$ (let)

$\because$ $XY \parallel MN$

$\therefore$ $\angle PAB + \angle ABQ = 180°$ 1

$\Rightarrow$ $x + y = 90°$

$\therefore$ $\angle AOB = 180° - (x + y) = 90°$

$\therefore$ $\boxed{\angle AOB = 90°}$ $\frac{1}{2}$

---

**31. Solve the pair of equations:**

$$\frac{2}{x} + \frac{3}{y} = 11, \quad \frac{5}{x} - \frac{4}{y} = -7$$

**Hence, find the value of 5x – 3y.**

**Sol.** $\frac{2}{x} + \frac{3}{y} = 11$ ...(i)

$\frac{5}{x} - \frac{4}{y} = -7$ ...(ii)

On solving equation (i) & (ii)

$x = 1$ 1+1

& $y = 1/3$

$\therefore$ $5x - 3y = 4$ 1

**OR**

**Taxi charges in a city consist of fixed charges and the remainings charges depend upon the distance travelled. For a journey of 10 km, the charge paid is ₹ 75 and for a journey of 15 km, the charge paid is ₹ 110. Find the fixed charge and charges per km. Hence, find the charge of covering a distance of 35 km.**

Let fixed charge be ₹ x and charges per km be ₹ y $\frac{1}{2}$

$x + 10y = 75$ ...(i)

$x + 15y = 110$ ...(ii) 1

Solve equation (i) & (ii)

$x = 5$

& $y = 7$ $\frac{1}{2}+\frac{1}{2}$

$\therefore$ Total charge for 35 km = $x + 35y$ = ₹ 250 $\frac{1}{2}$

---

**32. Prove that:**

$$\frac{\sin\theta - \cos\theta + 1}{\cos\theta + \sin\theta - 1} = \frac{1}{\sec\theta - \tan\theta}$$

**Sol.** L.H.S $= \dfrac{\sin\theta - \cos\theta + 1}{\cos\theta + \sin\theta - 1}$

Dividing $N^r$ and $D^r$ by $\cos\theta$

$$= \frac{\tan\theta - 1 + \sec\theta}{1 + \tan\theta - \sec\theta} \quad 1$$

$$= \frac{\tan\theta + \sec\theta - 1}{(\sec^2\theta - \tan^2\theta) + \tan\theta - \sec\theta} \quad 1$$

$$= \frac{\tan\theta + \sec\theta - 1}{(\sec\theta - \tan\theta)(\sec\theta + \tan\theta - 1)}$$

$$= \frac{1}{\sec\theta - \tan\theta} = \text{R.H.S} \quad 1$$

---

**33. In Figure-8, find the area of the shaded region where a circular arc of radius 7 cm has been drawn with vertex O of an equilateral traiangle OAB of side 14 cm as centre. (Use $\pi = \frac{22}{7}$ and $\sqrt{3} = 1.73$)**

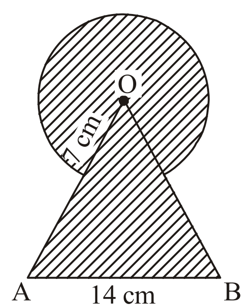



**Fig. 8**

**Sol.** Area of shaded ragion $= \dfrac{\pi r^2\theta}{360°} + \dfrac{\sqrt{3}}{4}a^2$ 1

$$= \frac{\pi \times 7^2 \times 300°}{360°} + \frac{\sqrt{3}}{4} \times 14^2 \quad 1$$

$= 213.1\ \text{cm}^2$ 1

---

**34.** **Construct a triangle with sides 5 cm, 6 cm and 7 cm. Now construct another triangle whose sides are $\frac{2}{3}$ times the corresponding sides of the first triangle.**

**Sol.** Correct construction of given triangle 1

Correct constriction of similar triangle with scale 2/3. 2

**OR**

**Draw a pair of tangents to a circle of radius 3 cm which are inclined to each other at an angle of 60°.**

**Sol.** Correct construction of circle with radius 3 cm. 1

Correct constrcution of two tangents. 2

## SECTION D

**Question numbers 35 to 40 carry 4 marks each.**

**35.** **In a flight of 600 km, the speed of the aircraft was slowed down due to bad weather. The average speed of the trip was decreased by 200 km/hr and thus the time of flight increased by 30 minutes. Find the average speed of the aircraft originally.**

**Sol.** Let average speed of aircraft be x km/h

$$\frac{600}{x-200}-\frac{600}{x}=\frac{1}{2}$$ 2

$x^2 - 200x - 240000 = 0$ 1

$(x - 600)(x + 400) = 0$

$x = 600$ km/h 1

$\therefore$ Original speed = 600 km/h

**OR**

**₹ 9,000 were divided equally among a certain number of persons. Had there been 20 more persons, each would have got ₹ 160 less. Find the original number of persons.**

Let original number of persons be x

$$\frac{9000}{x}-\frac{9000}{x+20}=160$$ 2

$x^2 + 20x - 1125 = 0$ 1

$(x + 45)(x - 25) = 0$

$x = 25$

$\therefore$ Number of persons = 25 1

**36.** **Draw a 'more than' cumulative frequency curve for the following distribution. Also, find the median from the graph.**

| **Weight (in kg):** | **40 – 44** | **44 – 48** | **48 – 52** | **52 – 56** | **56 – 60** | **60 – 64** | **64 – 68** |
|---|---|---|---|---|---|---|---|
| **Number of Students:** | **7** | **12** | **33** | **47** | **20** | **11** | **5** |

**Sol.** Points to be plotted for more than ogive are

(40, 135), (44, 128), (48, 116), (52, 83), (56, 36), (60, 16), (64, 5) 2

For drawing correct ogive $1\frac{1}{2}$

For correct median = 53.3 (Approx.) $\frac{1}{2}$

---

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

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

For correct proof 2

**OR**

**In a right-angled triangle, prove that the square of the hypotenuse is equal to the sum of the squares of the other two sides.**

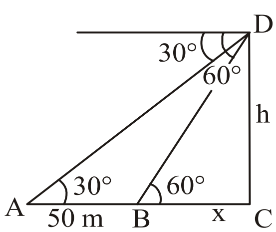
**Sol.** For correct given, To prove, construction & figure $4\times\frac{1}{2}=2$

For correct proof 2

---

**38.** **A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30°, which is approaching the foot of the tower with a uniform speed. After covering a distance of 50 m, the angle of depression of the car becomes 60°. Find the height of the tower. (Use $\sqrt{3}$ = 1-73).**

**Sol.**




Let height of tower be h m and BC = x m Correct figure 1

$$\tan 60° = \frac{h}{x}$$

$\Rightarrow h = \sqrt{3}x$ ...(i) 1

$$\tan 30° = \frac{h}{x+50}$$

$x + 50 = \sqrt{3}\,h$ ...(ii) 1

From equation (i) & (ii)

$x = 25\ \text{m},\ h = 25\sqrt{3}\ \text{m}$

$= 43.25\ \text{m}$ 1

---

**39. A bucket open at the top has top and bottom radii of circular ends as 40 cm and 20 cm respectively. Find the volume of the bucket if its depth is 21 cm. Also find the area of the tin sheet required for making the bucket. (Use $\pi = \frac{22}{7}$)**

**Sol.** Volume $= \frac{\pi h}{3}[R^2 + r^2 + Rr]$

$= \frac{22}{7} \times \frac{21}{3}[40^2 + 20^2 + 40 \times 20]$ 1

$= 61600\ \text{cm}^3$ $\frac{1}{2}$

$l = \sqrt{h^2 + (R - r)^2} = 29\ \text{cm}$ 1

Area of tin $= \pi l(R + r) + \pi r^2$

$= \pi[29 \times 60 + 400]$ 1

$= 6725.7\ \text{cm}^2$ $\frac{1}{2}$

---

**40. Obtain other zeroes of the polynomial**

**$f(x) = 2x^4 + 3x^3 - 5x^2 - 9x - 3$**

**if two of its zeroes are $\sqrt{3}$ and $-\sqrt{3}$**

**Sol.** $f(x) = 2x^4 + 3x^3 - 5x^2 - 9x - 3$

$\because$ $\sqrt{3}$ and $-\sqrt{3}$ and zeroes of f(x)

$\therefore$ $(x - \sqrt{3})$ and $(x + \sqrt{3})$ are factors of f(x) $\frac{1}{2}$

$\therefore$ $x^2 - 3$ is a factor of f(x) $\frac{1}{2}$

$q(x) = \frac{2x^4 + 3x^3 - 5x^2 - 9x - 3}{x^2 - 3}$ 2

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

For zeroes q(x) = 0

$\therefore \quad 2x^2 + 3x + 1 = 0$

$(x + 1)(2x + 1) = 0$ $\frac{1}{2}$

$x = -1, -1/2$

$\therefore$ Remaining zeroes are $-1$ & $-1/2$ $\frac{1}{2}$

**OR**

**Without actually calculating the zeroes, form a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $5x^2 + 2x - 3$.**

Let zeroes of given quadratic polynomial be $\alpha$ and $\beta$

$$\left.\begin{aligned}\alpha + \beta &= \frac{-2}{5} \\ \alpha\beta &= \frac{-3}{5}\end{aligned}\right]$$ 1

Now,

$$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta + \alpha}{\alpha\beta} = \frac{\frac{-2}{5}}{\frac{-3}{5}} = \frac{2}{3}$$ 1

$$\frac{1}{\alpha\beta} = \frac{-5}{3}$$ 1

Required Polynomial is

$$x^2 - \frac{2}{3}x - \frac{5}{3}$$ 1

or

$$3x^2 - 2x - 5$$

# QUESTION PAPER CODE 30/4/2

## EXPECTED ANSWER/VALUE POINTS

### SECTION A

**Question numers 1 to 20 carry 1 mark each.**

**Question numbers 1 to 10 are multiple choice questions. Choose the correct option.**

**1. It is being given that the points A(l, 2), B(0, 0) and C(a, b) are collinear. Which of the following relations between a and b is true?**

**(A) a = 2b (B) 2a = b (C) a + b = 0 (D) a – b = 0**

**Sol.** (B) 2a = b 1

---

**2. In Figure-2, TP and TQ are tangents drawn to the circle with centre at O. If ∠POQ = 115° then ∠PTQ is**

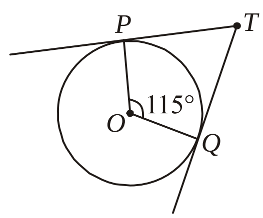



**Fig. 2**

**(A) 115° (B) 57.5° (C) 55° (D) 65°**

**Sol.** (D) 65º 1

**OR**

**From an external point Q, the length of the tangent to a circle is 5 cm and the distance of Q from the centre is 8 cm. The radius of the circle is**

**(A) 39 cm (B) 3 cm (C) $\sqrt{39}$ cm (D) 7 cm**

**Sol.** (C) $\sqrt{39}$ cm 1

---

**3. The mean and median of a distribution are 14 and 15 respectively. The value of mode is**

**(A) 16 (B) 17 (C) 18 (D) 13**

**Sol.** (B) 17 1

---

**4. The equation $x^2 - 8x + k = 0$ has real and distinct roots if**

**(A) k = 16 (B) k > 16 (C) k = 8 (D) k < 16**

**Sol.** (D) k < 16 1

---

**5.** **The first term of an A.P. is 5 and the last term is 45. If the sum of all the terms is 400, the number of terms is**

**(A) 20** **(B) 8** **(C) 10** **(D) 16**

**Sol.** (D) 16 1

**OR**

**The $9^{th}$ term of the A.P. – 15, –11, –7, ..., 49 is**

**(A) 32** **(B) 0** **(C) 17** **(D) 13**

**Sol.** (C) 17 1

---

**6.** **The number of zeroes for a polynomial p(x) where graph of y = p(x) is tgiven in Figure-1, is**

**(A) 3** **(B) 4** **(C) 0** **(D) 5**

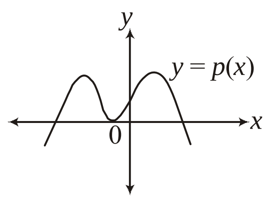



**Fig. 1**

**Sol.** (A) 3 1

---

**7.** **A bag contains 3 red, 5 black and 7 white balls. A ball is drawn from the bag at random. The probability that the drawn is not black, is**

**(A)** $\frac{1}{3}$ **(B)** $\frac{9}{15}$ **(C)** $\frac{5}{10}$ **(D)** $\frac{2}{3}$

**Sol.** (D) 2/3 1

---

**8.** **The value of $\theta$ for which $\cos(10° + \theta) = \sin 30°$, is**

**(A) 50°** **(B) 40°** **(C) 80°** **(D) 20°**

**Sol.** (A) 50° 1

---

**9.** **Point $P\left(\frac{a}{8}, 4\right)$ is the mid-point of the line segment joining the points A(– 5, 2) and B(4, 6). The value of 'a' is**

**(A) –4** **(B) 4** **(C) –8** **(D) –2**

**Sol.** (A) –4 1

---

**10. The pair of equations, x = 0 and x = –4 has**

**(A) a unique solution** **(B) no solution**

**(C) infinitely many solutions** **(D) only solution (0, 0)**

**Sol.** (B) No solution 1

---

**Fill in the blanks in question numbers 11 to 15.**

**11. The distance between the points (a, b) and (– a, – b) is _______.**

**Sol.** $2\sqrt{a^2 + b^2}$ 1

---

**12. If tan A = 1, then 2 sin A cos A = _______.**

**Sol.** 1 1

---

**13.** $\left(\frac{2+\sqrt{5}}{3}\right)$ **is _______ number.**

**Sol.** irrational 1

---

**14. A spherical metal ball of radius 8 cm is melted to make 8 smaller identical balls. The radius of each new ball is _______ cm.**

**Sol.** 4 1

---

**15. Let ΔABC ~ ΔDEF and their areas be respectively 81 cm$^2$ and 144 cm$^2$. If EF = 24 cm, then length of side BC is _______ cm.**

**Sol.** 18 1

---

**Answer the following question numbers 16 to 20.**

**16. After how many decimal places will the decimal representation of the rational number** $\frac{229}{2^2 \times 5^7}$ **terminate?**

**Sol.** After 7 decimal places 1

---

**17. Given that HCF (120, 160) = 40, find LCM (120, 160).**

**Sol.** LCM = $\frac{120 \times 160}{40}$ $\frac{1}{2}$

= 480 $\frac{1}{2}$

---

**18.** **In Figure-4, AB and CD are common tangents to circle which touch each other at D. If AB = 8 cm, then find the length of CD.**

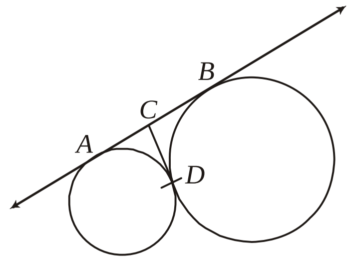



**Fig. 4**

**Sol.** AC = CD = BC $\frac{1}{2}$

CD = 4 cm $\frac{1}{2}$

---

**19.** **Two dice are thrown simultaneously. What is the probability that the sum of the two numbers appearing on the top is 13?**

**Sol.** P(E) = 0 1

---

**20.** **In Figure-3, a tightly stretched rope of length 20 m is tied from the top of a vertical pole to the ground. Find the height of the pole if the angle made by the rope with the ground is 30°.**

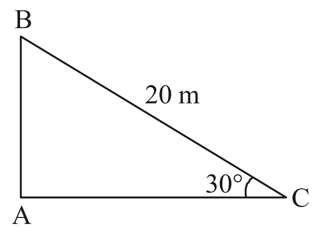



**Fig. 3**

**Sol.** $\sin 30° = \frac{AB}{20}$ $\frac{1}{2}$

AB = 10 m $\frac{1}{2}$

---

## SECTION B

**Question numbers 21 to 26 carry 2 marks each.**

**21.** **Tree Plantation Drive**

**A group Housing Society has 600 members, who have their houses in the campus and decided to hold a Tree Plantation Drive on the occasion of New Year. Each household was given he choice of planting a sampling of its choice. The number of different types of sampings planted were:**

**(i) Neem – 125**

**(ii) Peepal – 165**

**(iii) Creepers – 50**

**(iv) Fruit plants – 150**

**(v) Flowering plants – 110**

**On the opening ceremony, one of the plants is selected randomly for a prize. After reading the above passage, answer the following questions.**

**What is the probability that the selected plant is**

**(i) A fruit plant or a flowering plant?**

**(ii) Either a Neem plant or a Peepal plant?**

**Sol.** Total outcomes = 600

(i) P(Fruit plant or a flowering plant) = $\frac{260}{600}$ or $\frac{13}{30}$ 1

(ii) P(either neem plant or a peepal plant) = $\frac{290}{600}$ or $\frac{29}{60}$ 1

---

**22. Find the mode of the following distribution:**

| **Classes:** | **10 – 20** | **20 – 40** | **40 – 60** | **60 – 80** | **80 – 100** |
|---|---|---|---|---|---|
| **Frequency:** | **10** | **8** | **12** | **16** | **4** |

**Sol.** Model class = 60 – 80 $\frac{1}{2}$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 60 + \left(\frac{16-12}{32-12-4}\right) \times 20$$ 1

$= 65$ $\frac{1}{2}$

**OR**

**From the following distribution, find the median:**

| **Classes:** | **500 – 600** | **600 – 700** | **700 – 800** | **800 –900** | **900 – 1000** |
|---|---|---|---|---|---|
| **Frequency:** | **36** | **32** | **32** | **20** | **30** |

Median class: 700 – 800 $\frac{1}{2}$

$$\text{Median} = l + \frac{\left(\frac{N}{2} - cf\right)}{f} \times h$$

$$= 700 + \frac{75 - 68}{32} \times 100$$ 1

$$= 721.88$$ $\frac{1}{2}$

---

**23.** **In Figure-6, a tent is in the shape of a cylinder surmounted by a conical top. The cylindrical part is 2.1 m high and conical part has slant height 2.8 m. Both the parts have same radius 2 m. Find the area of the canvas used to make the tent. (Use $\pi = \frac{22}{7}$)**

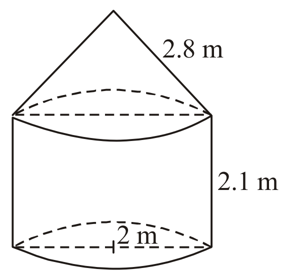



**Fig. 6**

**Sol.** Area of canvas = $\pi r(2h + l)$

$$= \frac{22}{7} \times 2\,(2 \times 2.1 + 2.8)$$ 1

$$= 44\ m^2$$ 1

---

**24.** **Solve for x:**

$\mathbf{8x^2 - 2x - 3 = 0}$

**Sol.** $8x^2 - 6x + 4x - 3 = 0$ 1

$(4x - 3)\,(2x + 1) = 0$ $\frac{1}{2}$

$x = \frac{3}{4},\ x = -\frac{1}{2}$ $\frac{1}{2}$

---

**25. The perimeters of two similar triangles are 30 cm and 20 cm respectively. If one side of the first triangle is 9 cm long, find the length of the corresponding side of the second triangle.**

**Sol.** Let the side of other triangle be x cm

∵ Ratio of perimeters of two similar triangles is equal to ratio of their corresponding sides $\frac{1}{2}$

$$\therefore \quad \frac{9}{x} = \frac{30}{20} \qquad 1$$

$$x = 6 \text{ cm} \qquad \frac{1}{2}$$

**OR**

**In Figure-5, ΔPQR is right-angled at P. M is a point on QR such that PM is perpendicular to QR. Show that $PQ^2 = QM \times QR$.**

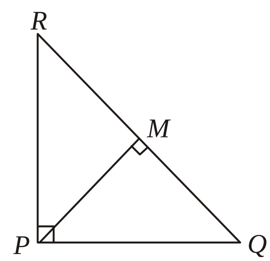



**Fig. 5**

ΔPQM ~ ΔRQP [By AA similarity] 1

$$\therefore \quad \frac{PQ}{RQ} = \frac{QM}{PQ}$$

$$\Rightarrow \quad PQ^2 = QM \times QR \qquad 1$$

---

**26. Evaluate:**

$$\frac{\cos 72^\circ}{\sin 18^\circ} + \frac{\sin 11^\circ}{\cos 79^\circ} - \tan 15^\circ \tan 75^\circ$$

**Sol.** $\frac{\cos(90^\circ - 18^\circ)}{\sin 18^\circ} + \frac{\sin(90^\circ - 79^\circ)}{\cos 79^\circ} - \tan(90^\circ - 75^\circ) . \tan 75^\circ$ $1\frac{1}{2}$

$$= \frac{\sin 18^\circ}{\sin 18^\circ} + \frac{\cos 79^\circ}{\cos 79^\circ} - \cot 75^\circ \tan 75^\circ$$

$$= 1 + 1 - 1 = 1 \qquad \frac{1}{2}$$

---

## SECTION C

**Question numbers 27 to 34 carry 3 marks each.**

**27. In Figure-7, two tangents PA and PB are drawn to a circle with centre O from an external point P. Prove that $\angle APB = 2\angle OAP$.**

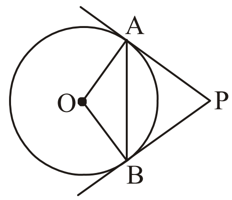



**Fig. 7**

**Sol.** $\angle AOB = 180° - \angle APB$ 1

In $\Delta AOB$, $\angle AOB + \angle OAB + \angle OBA = 180°$ 1

$\Rightarrow \; 180° - \angle APB + \angle OAB + \angle OBA = 180°$

$\Rightarrow \; \angle APB = 2\angle AOB$ 1

---

**28. Solve the pair of equations:**

$$\frac{2}{x}+\frac{3}{y} = 11, \quad \frac{5}{x}-\frac{4}{y} = -7$$

**Hence, find the value of 5x – 3y.**

**Sol.** $\frac{2}{x}+\frac{3}{y}=11$ ...(i)

$\frac{5}{x}-\frac{4}{y}=-7$ ...(ii)

On solving equation (i) & (ii)

$x = 1$ 1+1

& $y = 1/3$

$\therefore \; 5x - 3y = 4$ 1

**OR**

**Taxi charges in a city consist of fixed charges and the remainings charges depend upon the distance travelled. For a journey of 10 km, the charge paid is ₹ 75 and for a journey of 15 km, the charge paid is ₹ 110. Find the fixed charge and charges per km. Hence, find the charge of covering a distance of 35 km.**

Let fixed charge be ₹ x and charges per km be ₹ y $\frac{1}{2}$

$$\left.\begin{aligned} x + 10y &= 75 \quad ...(i) \\ x + 15y &= 110 \quad ...(ii) \end{aligned}\right\}$$ 1

Solve equation (i) & (ii)

$$\left.\begin{aligned} x &= 5 \\ \& \ y &= 7 \end{aligned}\right]$$ $\frac{1}{2}+\frac{1}{2}$

$\therefore$ Total charge for 35 km = x + 35y = ₹ 250 $\frac{1}{2}$

---

**29. Construct a triangle with side 5 cm, 6 cm and 7 cm. Now construct another triangle whose side are $\frac{2}{3}$ times the corresponding sides of the first triangle.**

**Sol.** Correct construction of given triangle 1

Correct constriction of similar triangle with scale 2/3. 2

**OR**

**Draw a pair of tangents to a circle of radius 3 cm which are inclined to each other at an angle of 60°.**

**Sol.** Correct construction of circle with radius 3 cm. 1

Correct constrcution of two tangents. 2

---

**30. Prove that $\sqrt{5}$ is an irrational number.**

**Sol.** Let $\sqrt{5}$ be a rational number

$\sqrt{5} = \frac{a}{b}$ $\quad b \neq 0 \quad$ HCF (a, b) = 1 $\frac{1}{2}$

$\Rightarrow \ 5 = \frac{a^2}{b^2}, \ a^2 = 5b^2$

5 divides a 1

Put a = 5c (for some integer c)

$\Rightarrow \ 25c^2 = 5b^2 \Rightarrow b^2 = 5c^2$

then we get, 5 divides b $\frac{1}{2}$

Contradiction arises as HCF (a, b) = 1

∴ Our assumption is wrong

∴ $\sqrt{5}$ is irrational number 1

**31. If the sum of the first 6 terms of an A.P. is 36 and that of the first 16 terms is 256, find the sum of the first 11 terms.**

**Sol.** Let a be first term and d be common difference

Sum of first 6 terms = 36 $\Rightarrow$ 2a = 12 – 5d 1

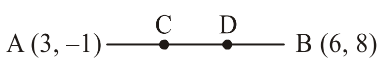
Sum of first 16 terms = 256 $\Rightarrow$ 2a = 32 – 15d $\frac{1}{2}$

Getting a = 1, d = 2 1

Getting the sum of first 11 terms = 121 $\frac{1}{2}$

**32. Find the co-ordinates of the points of trisection of the line segment joining the points (3, – 1) and (6,8).**

**Sol.**




Case I: If C and D trisect AB

then C divides AB in the ratio 1 : 2 $\frac{1}{2}$

Co-ordinates of C: $x = \frac{1 \times 6 + 2 \times 3}{3} = 4$ $\frac{1}{2}$

and $y = \frac{1 \times 8 + 2(-1)}{3} = 2$ $\frac{1}{2}$

∴ Co-ordinates of C(4, 2)

Case II: Coordinates of D if D divides AB in the ratio 2 : 1 $\frac{1}{2}$

Co-ordinates of D: $x' = \frac{2 \times 6 + 1 \times 3}{3} = 5$ $\frac{1}{2}$

$y' = \frac{2 \times 8 + 1 \times (-1)}{3} = 5$ $\frac{1}{2}$

Coordinates of D = (5, 5)

**OR**

**Find the area of a quadrilateral ABCD having vertices at A(l, 2), B(l, 0), C(4, 0) and D(4, 4).**

$$\text{ar }(\Delta ABC) = \frac{1}{2}[1(0-0)+1(0-2)+4(2-0)]$$

$$= 3 \text{ sq. units} \qquad 1\frac{1}{2}$$

$$\text{ar }(\Delta ACD) = \frac{1}{2}[1(0-4)+4(4-2)+4(2-0)]$$

$$= 6 \text{ sq. units} \qquad 1$$

$$\therefore \text{ Area of quadrialteral} = 3 + 6 = 9 \text{ sq. units} \qquad \frac{1}{2}$$

---

**33. Prove that:**

$$\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \operatorname{cosec} A + \cot A$$

**Sol.** Dividing $N^r$ & $D^r$ by sin A in LHS

$$= \frac{\cot A - 1 + \operatorname{cosec} A}{\cot A + 1 - \operatorname{cosec} A} \qquad 1$$

$$= \frac{\cot A + \operatorname{cosec} A - (\operatorname{cosec}^2 A - \cot^2 A)}{\cot A + 1 - \operatorname{coscec} A} \qquad 1$$

$$= \operatorname{cosec} A + \cot A \qquad 1$$

---

**34. In Figure-8, find the area of the shaded region where a circular arc of radius 7 cm has been drawn with vertex O of an equilateral traiangle OAB of side 14 cm as centre. (Use $\pi = \frac{22}{7}$ and $\sqrt{3} = 1.73$)**

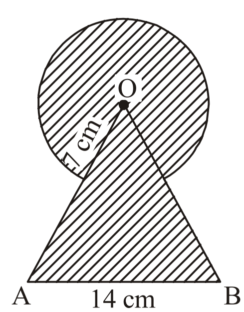



**Fig. 8**

**Sol.** Area of shaded region = $\frac{\pi r^2 \theta}{360°} + \frac{\sqrt{3}}{4} a^2$ 1

$= \frac{\pi \times 7^2 \times 300°}{360°} + \frac{\sqrt{3}}{4} \times 14^2$ 1

$= 213.1 \text{ cm}^2$ 1

---

**SECTION D**

**Question numbers 35 to 40 carry 4 marks each.**

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

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

For correct proof 2

**OR**

**In a right-angled triangle, prove that the square of the hypotenuse is equal to the sum of the squares of the other two sides.**

**Sol.** For correct given, To prove, construction & figure $4 \times \frac{1}{2} = 2$

For correct proof 2

---

**36. A bucket open at the top has top and bottom radii of ciecular ends as 40 cm and 20 cm respectively. Find the volume of the bucket if its depth is 21 cm. Also find the area of the tin sheet required for making the bucket. (Use $\pi = \frac{22}{7}$)**

**Sol.** Volume = $\frac{\pi h}{3}[R^2 + r^2 + Rr]$

$= \frac{22}{7} \times \frac{21}{3}[40^2 + 20^2 + 40 \times 20]$ 1

$= 61600 \text{ cm}^3$ $\frac{1}{2}$

$l = \sqrt{h^2 + (R - r)^2} = 29 \text{ cm}$ 1

Area of tin = $\pi l(R + r) + \pi r^2$

$= \pi[29 \times 60 + 400]$ 1

$= 6725.7 \text{ cm}^2$ $\frac{1}{2}$

---

**37. Obtain other zeroes of the polynomial**

**$f(x) = 2x^4 + 3x^3 - 5x^2 - 9x - 3$**

**if two of its zeroes are $\sqrt{3}$ and $-\sqrt{3}$**

**Sol.** $f(x) = 2x^4 + 3x^3 - 5x^2 - 9x - 3$

$\because$ $\sqrt{3}$ and $-\sqrt{3}$ and zeroes of f(x)

$\therefore$ $(x-\sqrt{3})$ and $(x+\sqrt{3})$ are factors of f(x) $\frac{1}{2}$

$\therefore$ $x^2 - 3$ is a factor of f(x) $\frac{1}{2}$

$$q(x) = \frac{2x^4 + 3x^3 - 5x^2 - 9x - 3}{x^2 - 3}$$ 2

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

For zeroes q(x) = 0

$\therefore$ $2x^2 + 3x + 1 = 0$

$(x + 1)(2x + 1) = 0$ $\frac{1}{2}$

$x = -1, -1/2$

$\therefore$ Remaining zeroes are $-1$ & $-1/2$ $\frac{1}{2}$

**OR**

**Without actually calculating the zeroes, form a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $5x^2 + 2x - 3$.**

Let zeroes of given quadratic polynomial be $\alpha$ and $\beta$

$\alpha + \beta = \frac{-2}{5}$

$\alpha\beta = \frac{-3}{5}$ 1

Now,

$$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta + \alpha}{\alpha\beta} = \frac{\frac{-2}{5}}{\frac{-3}{5}} = \frac{2}{3}$$ 1

$$\frac{1}{\alpha\beta} = \frac{-5}{3}$$ 1

Required Polynomial is

$$x^2 - \frac{2}{3}x - \frac{5}{3}$$ 1

or

$3x^2 - 2x - 5$

---

**38. Draw a 'less than ogive for the following distribution. Hence, find median from the graph.**

| Marks | Number of Students |
|---|---|
| 0 – 10 | 2 |
| 10 – 20 | 8 |
| 20 – 30 | 12 |
| 30 – 40 | 10 |
| 40 – 50 | 16 |
| 50 – 60 | 8 |
| 60 – 70 | 3 |
| 70 – 80 | 1 |

**Sol.** Plotting the points (10, 2), (20, 10), (30, 22)

(40, 32), (50, 48), (60, 56), (70, 59), (80, 60) 2

Drawing the correct Ogive $1\frac{1}{2}$

Finding correct Median = 38 $\frac{1}{2}$

---

**39. In a flight of 600 km, the speed of the aircraft was slowed down due to bad weather. The average speed of the trip was decreased by 200 km/hr and thus the time of flight increased by 30 minutes. Find the average speed of the aircraft originally.**

**Sol.** Let average speed of aircraft be x km/h

$$\frac{600}{x-200} - \frac{600}{x} = \frac{1}{2}$$ 2

$x^2 - 200x - 240000 = 0$ 1

$(x - 600)(x + 400) = 0$

$x = 600$ km/h 1

$\therefore$ Original speed = 600 km/h

**OR**

**₹ 9,000 were divided equally among a certain number of persons. Had there been 20 more persons, each would have got ₹ 160 less. Find the original number of persons.**

Let original number of persons be x

$$\frac{9000}{x} - \frac{9000}{x+20} = 160$$ 2

$x^2 + 20x - 1125 = 0$ 1

$(x + 45)(x - 25) = 0$

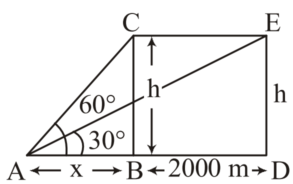
$x = 25$

$\therefore$ Number of persons = 25 1

---

**40. The angle of elevation of an airplane from point A on the ground is 60°. After a flight of 10 seconds, on the same height, the angle of elevation from point A becomes 30°. If the airplane is flying at the speed of 720 km/hr, find the constant height at which the airplane is flying.**

**Sol.**




Correct figure 1

Distance travelled in 10 seconds = 2000 m $\frac{1}{2}$

Getting $x = \frac{h}{\sqrt{3}}$ (In $\Delta ABC$) 1

In $\Delta EDA$ $\tan 30° = \frac{ED}{AD} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+2000}$ 1

Getting correct value of $h = 1000\sqrt{3}$ m. $\frac{1}{2}$

---

# QUESTION PAPER CODE 30/4/3
## EXPECTED ANSWER/VALUE POINTS
### SECTION A

**Question numers 1 to 20 carry 1 mark each.**

**Question numbers 1 to 10 are multiple choice questions. Choose the correct option.**

**1. The mean and median of a distribution are 14 and 15 respectively. The value of mode is**

**(A) 16** **(B) 17** **(C) 18** **(D) 13**

**Sol.** (B) 17 1

---

**2. The quadratic equation $x^2 - 4x + k = 0$ has distinct real roots if**

**(A) $k = 4$** **(B) $k > 4$** **(C) $k = 16$** **(D) $k < 4$**

**Sol.** (D) $K < 4$ 1

---

**3. The first term of an A.P. is 5 and the last term is 45. If the sum of all the terms is 400, the number of terms is**

**(A) 20** **(B) 8** **(C) 10** **(D) 16**

**Sol.** (D) 16 1

**OR**

**The 9th term of the A.P. – 15, –11, –7, ..., 49 is**

**(A) 32** **(B) 0** **(C) 17** **(D) 13**

**Sol.** (C) 17 1

---

**4. Point $P\left(\frac{a}{8}, 4\right)$ is the mid-point of the line segment joining the points A(– 5, 2) and B(4, 6). The value of ‘a’ is**

**(A) –4** **(B) 4** **(C) –8** **(D) –2**

**Sol.** (A) –4 1

---

**5. The number of zeroes for a polynomial p(x) whose graph is given in Figure-1, is**

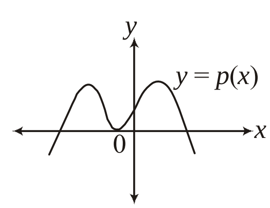



**Fig. 1**

**(A) 4** **(B) 3** **(C) 5** **(D) 1**

**Sol.** (B) 3 1

---

**6.** **It is being given that the points A(l, 2), B(0, 0) and C(a, b) are collinear. Which of the following relations between a and b is true?**

**(A) a = 2b** **(B) 2a = b** **(C) a + b = 0** **(D) a – b = 0**

**Sol.** (B) 2a = b 1

---

**7.** **The value of θ for which sin (44° + θ) = cos 30°, is**

**(A) 46°** **(B) 60°** **(C) 16°** **(D) 90°**

**Sol.** (C) 16° 1

---

**8.** **The pair of linear equations y = 0 and y = –6 has**

**(A) a unique solution** **(B) no solution**

**(C) infinetly many solutions** **(D) only solution (0, 0)**

**Sol.** (B) No solution 1

---

**9.** **A bag contains 3 red, 5 black and 7 white balls. A ball is drawn from the bag at random. The probability that the drawn is not black, is**

**(A)** $\frac{1}{3}$ **(B)** $\frac{9}{15}$ **(C)** $\frac{5}{10}$ **(D)** $\frac{2}{3}$

**Sol.** (D) 2/3 1

---

**10.** **In Figure-2, TP and TQ are tangents drawn to the circle with centre at O. If ∠POQ = 115° then ∠PTQ is**

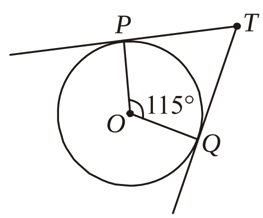



**Fig. 2**

**(A) 115°** **(B) 57.5°** **(C) 55°** **(D) 65°**

**Sol.** (D) 65º 1

**OR**

**From an external point Q, the length of the tangent to a circle is 5 cm and the distance of Q from the centre is 8 cm. The radius of the circle is**

**(A) 39 cm** **(B) 3 cm** **(C)** $\sqrt{39}$ **cm** **(D) 7 cm**

**Sol.** (C) $\sqrt{39}$ cm 1

---

**Fill in the blanks in question numbers 11 to 15.**

**11.** **The distance between the points (a, b) and (– a, – b) is _______.**

**Sol.** $2\sqrt{a^2 + b^2}$ 1

**12.** **A spherical metal ball of radius 8 cm is melted to make 8 smaller identical balls. The radius of each new ball is _______ cm.**

**Sol.** 4 1

**13.** $\left(\frac{2+\sqrt{5}}{3}\right)$ **is _______ number.**

**Sol.** irrational 1

**14.** **Let $\Delta ABC \sim \Delta DEF$ and their areas be respectively 81 $cm^2$ and 144 $cm^2$. If EF = 24 cm, then length of side BC is _______ cm.**

**Sol.** 18 1

**15.** **If tan A = 1, then 2 sin A cos A = _______.**

**Sol.** 1 1

**Answer the following question numbers 16 to 20.**

**16.** **After how many decimal places will the decimal representation of the rational number $\frac{229}{2^2 \times 5^7}$ terminate?**

**Sol.** After 7 decimal place 1

**17.** **In Figure-4, AB and CD are common tangents to circle which touch each other at D. If AB = 8 cm, then find the length of CD.**

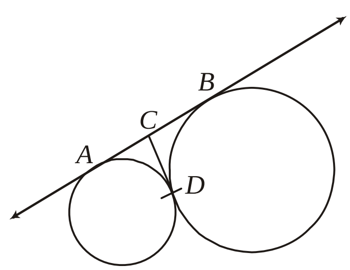



**Fig. 4**

**Sol.** AC = CD = BC $\frac{1}{2}$

CD = 4 cm $\frac{1}{2}$

**18. Given that HCF (135, 225) = 45, find the LCM (135, 225).**

**Sol.** LCM $= \dfrac{135 \times 225}{45}$ $\quad \frac{1}{2}$

$= 675$ $\quad \frac{1}{2}$

---

**19. In Figure-3, a tightly stretched rope of length 20 m is tied from the top of a vertical pole to the ground. Find the height of the pole if the angle made by the rope with the ground is 30°.**

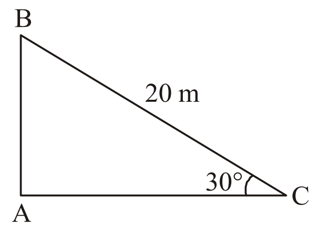



**Fig. 3**

**Sol.** $\sin 30° = \dfrac{AB}{20}$ $\quad \frac{1}{2}$

AB = 10 m $\quad \frac{1}{2}$

---

**20. Two dice are thrown similtaneously. What is the probability that the product of the numbers appearing on the top is 1?**

**Sol.** Total outcomes = 36 $\quad \frac{1}{2}$

Number of favourable outcomes = 1

Required probability $= \dfrac{1}{36}$ $\quad \frac{1}{2}$

---

## SECTION B

**Question numbers 21 to 26 carry 2 marks each.**

**21. Find the mode of the following distribution:**

| **Classes:** | **10 – 20** | **20 – 40** | **40 – 60** | **60 – 80** | **80 – 100** |
|---|---|---|---|---|---|
| **Frequency:** | **10** | **8** | **12** | **16** | **4** |

**Sol.** Modal class = 60 – 80 $\quad \frac{1}{2}$

Mode $= l + \left(\dfrac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 60 + \left(\dfrac{16-12}{32-12-4}\right) \times 20$ $\quad 1$

$= 65$ $\quad \frac{1}{2}$

**From the following distribution, find the median:**

| **Classes:** | **500 – 600** | **600 – 700** | **700 – 800** | **800 –900** | **900 – 1000** |
|---|---|---|---|---|---|
| **Frequency:** | **36** | **32** | **32** | **20** | **30** |

Median class: 700 – 800 $\frac{1}{2}$

Median = $l + \frac{\left(\frac{N}{2} - cf\right)}{f} \times h$

$= 700 + \frac{75 - 68}{32} \times 100$ 1

$= 721.88$ $\frac{1}{2}$

---

**22.** **In Figure-6, a tent is in the shape of a cylinder surmounted by a conical top. The cylindrical part is 2.1 m high and conical part has slant height 2.8 m. Both the parts have same radius 2 m. Find the area of the canvas used to make the tent. (Use $\pi = \frac{22}{7}$)**

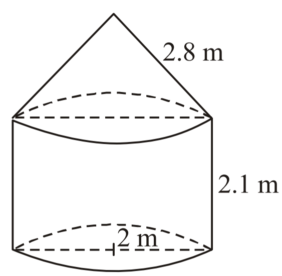



**Fig. 6**

**Sol.** Area of canvas = $\pi r(2h + l)$

$= \frac{22}{7} \times 2\,(2 \times 2.1 + 2.8)$ 1

$= 44\ m^2$ 1

---

**23.** **Sovle for x:**

**$14x^2 + 17x - 6 = 0$**

**Sol.** $14x^2 + 21x - 4x - 6 = 0$ 1

$\Rightarrow (2x + 3)(7x - 2) = 0$ $\frac{1}{2}$

$\Rightarrow x = \frac{-3}{2}, x = \frac{2}{7}$ $\frac{1}{2}$

**24. The perimeters of two similar triangles are 30 cm and 20 cm respectively. If one side of the first triangle is 9 cm long, find the length of the corresponding side of the second triangle.**

**Sol.** Let the side of other triangle be x cm

∵ Ratio of perimeters of two similar triangles is equal to ratio of their corresponding sides $\frac{1}{2}$

$\therefore \frac{9}{x} = \frac{30}{20}$ 1

$x = 6$ cm $\frac{1}{2}$

**OR**

**In Figure-5, ΔPQR is right-angled at P. M is a point on QR such that PM is perpendicular to QR. Show that $PQ^2 = QM \times QR$.**

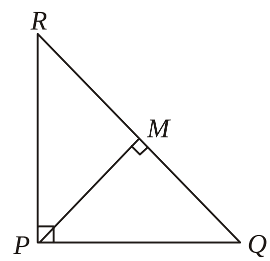



**Fig. 5**

ΔPQM ~ ΔRQP [By AA similarity] 1

$\therefore \frac{PQ}{RQ} = \frac{QM}{PQ}$

$\Rightarrow PQ^2 = QM \times QR$ 1

---

**25. Tree Plantation Drive**

**A group Housing Society has 600 members, who have their houses in the campus and decided to hold a Tree Plantation Drive on the occasion of New Year. Each household was given he choice of planting a sampling of its choice. The number of different types of sampings planted were:**

**(i) Neem – 125**

**(ii) Peepal – 165**

**(iii) Creepers – 50**

**(iv) Fruit plants – 150**

**(v) Flowering plants – 110**

**On the opening ceremony, one of the plants is selected randomly for a prize. After reading the above passage, answer the following questions.**

**What is the probability that the selected plant is**

**(i) A fruit plant or a flowering plant?**

**(ii) Either a Neem plant or a Peepal plant?**

**Sol.** Total outcomes = 600

(i) P(Fruit plant or a flowering plant) = $\frac{260}{600}$ or $\frac{13}{30}$ 1

(ii) P(either neem plant or a peepal plant) = $\frac{290}{600}$ or $\frac{29}{60}$ 1

---

**26. Evaluate:**

$$\frac{2\sin 68°}{\cos 22°} - \frac{2\cot 15°}{\tan 75°} - 3\tan 40° \tan 45° \tan 50°$$

**Sol.** $\frac{2\sin(90° - 22°)}{\cos 22°} - \frac{2\cot(90° - 75°)}{\tan 75°} - 3\tan(90° - 50°) . \tan 50°$ $1\frac{1}{2}$

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

---

## SECTION C

**Question numbers 27 to 34 carry 3 marks each.**

**27. Solve the pair of equations:**

$$\frac{2}{x} + \frac{3}{y} = 11, \quad \frac{5}{x} - \frac{4}{y} = -7$$

**Hence, find the value of 5x – 3y.**

**Sol.** $\frac{2}{x} + \frac{3}{y} = 11$ ...(i)

$\frac{5}{x} - \frac{4}{y} = -7$ ...(ii)

On solving equation (i) & (ii)

$x = 1$ 1+1

& $y = 1/3$

$\therefore$ $5x - 3y = 4$ 1

**OR**

**Taxi charges in a city consist of fixed charges and the remainings charges depend upon the distance travelled. For a journey of 10 km, the charge paid is ₹ 75 and for a journey of 15 km, the charge paid is ₹ 110. Find the fixed charge and charges per km. Hence, find the charge of covering a distance of 35 km.**

Let fixed charge be ₹ x and charges per km be ₹ y $\frac{1}{2}$

$x + 10y = 75$ ...(i)

$x + 15y = 110$ ...(ii) 1

Solve equation (i) & (ii)

$\left.\begin{array}{r} x = 5 \\ \& \ y = 7 \end{array}\right]$ $\frac{1}{2}+\frac{1}{2}$

$\therefore$ Total charge for 35 km = x + 35y = ₹ 250 $\frac{1}{2}$

---

**28. In Figure-7, AB is the diameter of a circle with centre O and AC is its chord such that ∠BAC = 30°. If the tangent drawn at C intersects extended AB at D, then show that BC = BD.**

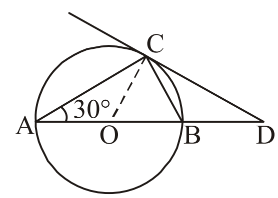



**Fig. 7**

**Sol.** OA = OC

$\Rightarrow \angle OCA = 30°$ $\frac{1}{2}$

$\angle OCB = \angle ACB - \angle ACO$

$= 90° - 30° = 60°$ 1

$\angle BCD = 90° - \angle OCB$

$= 90° - 60° = 30°$ ...(i) $\frac{1}{2}$

In ΔACD,

$\angle ACD + \angle CAD + \angle CDA = 180°$

$90° + 30° + 30° + \angle CDA = 180°$

$\angle CDA = 30°$ ...(ii) $\frac{1}{2}$

From (i) and (ii)

$\angle BCD = \angle CDA$

$\Rightarrow$ BC = BD (In $\Delta CBD$) $\frac{1}{2}$

---

**29. Prove that:**

$$\frac{\sin\theta - \cos\theta + 1}{\cos\theta + \sin\theta - 1} = \frac{1}{\sec\theta - \tan\theta}$$

**Sol.** L.H.S $= \dfrac{\sin\theta - \cos\theta + 1}{\cos\theta + \sin\theta - 1}$

Dividing $N^r$ and $D^r$ by $\cos\theta$

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

$$= \frac{\tan\theta + \sec\theta - 1}{(\sec^2\theta - \tan^2\theta) + \tan\theta - \sec\theta}$$ 1

$$= \frac{\tan\theta + \sec\theta - 1}{(\sec\theta - \tan\theta)(\sec\theta + \tan\theta - 1)}$$

$$= \frac{1}{\sec\theta - \tan\theta} = \text{R.H.S}$$ 1

---

**30. Construct a triangle with side 5 cm, 6 cm and 7 cm. Now construct another triangle whose side are $\frac{2}{3}$ times the corresponding sides of the first triangle.**

**Sol.** Correct construction of given triangle 1

Correct constriction of similar triangle with scale 2/3. 2

**OR**

**Draw a pair of tangents to a circle of radius 3 cm which are inclined to each other at an angle of 60°.**

**Sol.** Correct construction of circle with radius 3 cm. 1

Correct constrcution of two tangents. 2

---

**31. Calculate the area of the shaded region common between two quadrants of circles of radius 7 cm each (as shown in Figure-8).**

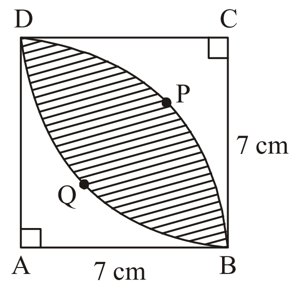



**Fig. 8**

**Sol.** Area of Shaded Region

= 2 (Area of one sector ABPD) – Area of square ABCD 1

$$= 2\left(\frac{90° \times \pi \times 7^2}{360°}\right) - 7 \times 7$$ $1\frac{1}{2}$

$= 28\ cm^2$ $\frac{1}{2}$

---

**32. Prove that $\sqrt{5}$ is an irrational number.**

**Sol.** Let $\sqrt{5}$ be a rational number

$\sqrt{5} = \frac{a}{b}$ $\quad b \neq 0 \quad$ HCF (a, b) = 1 $\frac{1}{2}$

$\Rightarrow\ 5 = \frac{a^2}{b^2},\ a^2 = 5b^2$

5 divides a 1

Put a = 5c (for some integer c)

$\Rightarrow\ 25c^2 = 5b^2 \Rightarrow b^2 = 5c^2$

then we get, 5 divides b $\frac{1}{2}$

Contradiction arises as HCF (a, b) = 1

$\therefore$ Our assumption is wrong

$\therefore$ $\sqrt{5}$ is irrational number 1

---

**33. If 6 times the $6^{th}$ term of an A.P. is equal of 9 times the $9^{th}$ term, show that its $15^{th}$ term is zero.**

**Sol.** Let a be the first term and d be the common difference

$6(a + 5d) = 9(a + 8d)$ $1\frac{1}{2}$

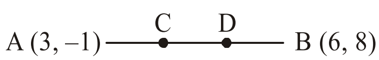
$a = -14d$ 1

$a + 14d = 0 \Rightarrow 15^{th}$ term $= 0$ $\frac{1}{2}$

---

**34. Find the co-ordinates of the points of trisection of the line segment joining the points (3, – 1) and (6,8).**

**Sol.**




Case I: If C and D trisect AB

then C divides AB in the ratio 1 : 2 $\frac{1}{2}$

Co-ordinates of C: $x = \frac{1 \times 6 + 2 \times 3}{3} = 4$ $\frac{1}{2}$

and $y = \frac{1 \times 8 + 2(-1)}{3} = 2$ $\frac{1}{2}$

$\therefore$ Co-ordinates of C(4, 2)

Case II: Co-ordinates of D if D divides AB in the ratio 2 : 1 $\frac{1}{2}$

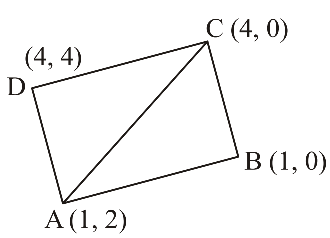
Co-ordinates of D: $x' = \frac{2 \times 6 + 1 \times 3}{3} = 5$ $\frac{1}{2}$

$y' = \frac{2 \times 8 + 1 \times (-1)}{3} = 5$ $\frac{1}{2}$

Co-ordinates of D = (5, 5)

**OR**

**Find the area of a quadrilateral ABCD having vertices at A(l, 2), B(l, 0), C(4, 0) and D(4, 4).**




$\text{ar}(\Delta ABC) = \frac{1}{2}[1(0-0) + 1(0-2) + 4(2-0)]$

$= 3$ sq. units $1\frac{1}{2}$

$$\text{ar}(\Delta ACD) = \frac{1}{2}[1(0-4)+4(4-2)+4(2-0)]$$

$= 6$ sq. units 1

$\therefore$ Area of quadrialteral = 3 + 6 = 9 sq. units $\frac{1}{2}$

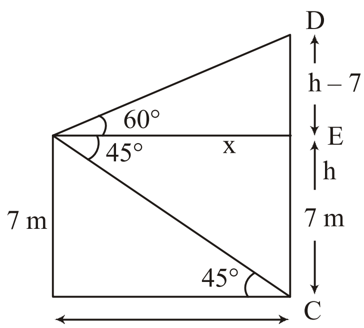
---

## SECTION D

**Question numbers 35 to 40 carry 4 marks each.**

**35. From the top of a 7 m building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower. (Use $\sqrt{3}$ = 1.73)**

**Sol.**




For correct figure 1

$\tan 45° = \frac{7}{x} \Rightarrow x = 7$ 1

$\tan 60° = \frac{h-7}{x}$ 1

$7(\sqrt{3}+1) = h$ $\frac{1}{2}$

$h = 7 \times 2.73 = 19.11$ m $\frac{1}{2}$

---

**36. Obtain other zeroes of the polynomial**

**$f(x) = 2x^4 + 3x^3 - 5x^2 - 9x - 3$**

**if two of its zeroes are $\sqrt{3}$ and $-\sqrt{3}$**

**Sol.** $f(x) = 2x^4 + 3x^3 - 5x^2 - 9x - 3$

$\because$ $\sqrt{3}$ and $-\sqrt{3}$ and zeroes of f(x)

$\therefore$ $(x-\sqrt{3})$ and $(x+\sqrt{3})$ are factors of f(x) $\frac{1}{2}$

$\therefore$ $x^2 - 3$ is a factor of f(x) $\frac{1}{2}$

$$q(x) = \frac{2x^4+3x^3-5x^2-9x-3}{x^2-3}$$

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

For zeroes q(x) = 0

$\therefore$ $2x^2 + 3x + 1 = 0$

$(x + 1)(2x + 1) = 0$ $\frac{1}{2}$

$x = -1, -1/2$

$\therefore$ Remaining zeroes are $-1$ & $-1/2$ $\frac{1}{2}$

**OR**

**Without actually calculating the zeroes, form a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $5x^2 + 2x - 3$.**

Let zeroes of given quadratic polynomial be $\alpha$ and $\beta$

$$\left.\begin{aligned} \alpha + \beta &= \frac{-2}{5} \\ \alpha\beta &= \frac{-3}{5} \end{aligned}\right] \quad 1$$

Now,

$$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta + \alpha}{\alpha\beta} = \frac{\frac{-2}{5}}{\frac{-3}{5}} = \frac{2}{3} \quad 1$$

$$\frac{1}{\alpha\beta} = \frac{-5}{3} \quad 1$$

Required Polynomial is

$$x^2 - \frac{2}{3}x - \frac{5}{3} \quad 1$$

or

$3x^2 - 2x - 5$

---

**37. A bucket open at the top has top and bottom radii of circular ends as 40 cm and 20 cm respectively. Find the volume of the bucket if its depth is 21 cm. Also find the area of the tin sheet required for making the bucket. (Use $\pi = \frac{22}{7}$)**

**Sol.** Volume $= \frac{\pi h}{3}[R^2 + r^2 + Rr]$

$$= \frac{22}{7} \times \frac{21}{3}[40^2 + 20^2 + 40 \times 20] \quad 1$$

$$= 61600 \text{ cm}^3 \quad \frac{1}{2}$$

$l = \sqrt{h^2 + (R - r)^2} = 29\,\text{cm}$ 1

Area of tin = $\pi l(R + r) + \pi r^2$

$= \pi[29 \times 60 + 400]$ 1

$= 6725.7\ \text{cm}^2$ $\frac{1}{2}$

---

**38. In a flight of 600 km, the speed of the aircraft was slowed down due to bad weather. The average speed of the trip was decreased by 200 km/hr and thus the time of flight increased by 30 minutes. Find the average speed of the aircraft originally.**

**Sol.** Let average speed of aircraft be x km/h

$$\frac{600}{x - 200} - \frac{600}{x} = \frac{1}{2}$$ 2

$x^2 - 200x - 240000 = 0$ 1

$(x - 600)(x + 400) = 0$

$x = 600$ km/h 1

$\therefore$ Original speed = 600 km/h

**OR**

**₹ 9,000 were divided equally among a certain number of persons. Had there been 20 more persons, each would have got ₹ 160 less. Find the original number of persons.**

**Sol.** Let original number of persons be x

$$\frac{9000}{x} - \frac{9000}{x + 20} = 160$$ 2

$x^2 + 20x - 1125 = 0$ 1

$(x + 45)(x - 25) = 0$

$x = 25$

$\therefore$ Number of persons = 25 1

---

**39. Change the following distribution into 'less than' type distribution and draw its ogive. Hence find the median of the distribution.**

| Marks | Number of Students |
|---|---|
| 20 – 30 | 4 |
| 30 – 40 | 10 |
| 40 – 50 | 12 |
| 50 – 60 | 14 |
| 60 – 70 | 8 |
| 70 – 80 | 3 |
| 80 – 90 | 4 |
| 90 – 100 | 5 |

**Sol.** Less than type distribution table is:

| Marks | fi | cf |
|---|---|---|
| Less than 30 | 4 | 4 |
| Less than 40 | 10 | 14 |
| Less than 50 | 12 | 26 |
| Less than 60 | 14 | 40 |
| Less than 70 | 8 | 48 |
| Less than 80 | 3 | 51 |
| Less than 90 | 4 | 55 |
| Less than 100 | 5 | 60 |

Correct Table 2

For Drawing the correct Ogive $1\frac{1}{2}$

Getting correct median = 52.86 $\frac{1}{2}$

---

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

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

For correct proof 2

**OR**

**In a right-angled triangle, prove that the square of the hypotenuse is equal to the sum of the squares of the other two sides.**

**Sol.** For correct given, To prove, construction & figure $4\times\frac{1}{2}=2$

For correct proof 2

---