Secondary School Examination-2020

Marking Scheme - Mathematics 30/C/1, 30/C/2, 30/C/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 80 (example 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.

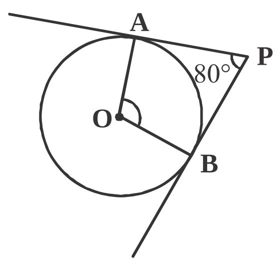
QUESTION PAPER CODE 30/C/1

EXPECTED ANSWER/VALUE POINTS

SECTION – A

Q. No. 1 to 10 are multiple choice type question of 1 mark each. Select the correct option.

Q.No.		Marks
1.	The pair of equations $x = 5$ and $y = 5$ has	
	(a) no solution **(b)** unique solution	
	(c) many solutions **(d)** only solution (0, 0)	
	Ans: (b) unique solution	1
2.	The value(s) of k for which the quadratic equation $3x^2 - kx + 3 = 0$ has equal roots, is (are)	
	(a) 6 **(b)** -6 **(c)** ± 6 **(d)** 9	
	Ans: (c) ± 6	1
	OR	
	The discriminant of the quadratic equation $3\sqrt{3}x^2 + 10x + \sqrt{3} = 0$	
	(a) ± 8 **(b)** 8 **(c)** $100 - 4\sqrt{3}$ **(d)** 64	
	Ans: (d) 64	1
3.	If $\sin \theta = \cos \theta$, then the value of $\tan^2 \theta + \cot^2 \theta$ is	
	(a) 2 **(b)** 4 **(c)** 1 **(d)** $\frac{10}{3}$	
	Ans: (a) 2	1
4.	The mean and median of a distribution are 14 and 15 respectively. The value of mode is	
	(a) 16 **(b)** 17 **(c)** 13 **(d)** 18	
	Ans: (b) 17	1
5.	A frustum of a right circular cone which is of height 8 cm with radii of its circular ends as 10 cm and 4 cm, has its slant height equal to	
	(a) 14 cm **(b)** 28 cm **(c)** 10 cm **(d)** $\sqrt{260}$ cm	
	Ans: (c) 10 cm	1
6.	Two dice are thrown simultaneously. The probability that the sum of two numbers appearing on the top of the dice is less than 12, is	
	(a) $\frac{1}{36}$ **(b)** $\frac{35}{36}$ **(c)** 0 **(d)** 1	
	Ans: (b) $\frac{35}{36}$	1

7.	If $-\frac{5}{7}, a, 2$ are consecutive terms in an Arthimetic Progression, then the value of 'a' is **(a)** $\frac{9}{7}$ **(b)** $\frac{9}{14}$ **(c)** $\frac{19}{7}$ **(d)** $\frac{19}{14}$ **Ans:** (b) $\frac{9}{14}$	1
8.	The distance between the points (0, 0) and (a – b, a + b) is **(a)** $2\sqrt{ab}$ **(b)** $\sqrt{2a^2 + ab}$ **(c)** $2\sqrt{a^2 + b^2}$ **(d)** $\sqrt{2a^2 + 2b^2}$ **Ans:** (d) $\sqrt{2a^2 + 2b^2}$	1
9.	A solid spherical ball fits exactly inside the cubical box of side 2a. The volume of the ball is **(a)** $\frac{16}{3}\pi a^3$ **(b)** $\frac{1}{6}\pi a^3$ **(c)** $\frac{32}{3}\pi a^3$ **(d)** $\frac{4}{3}\pi a^3$ **Ans:** (d) $\frac{4}{3}\pi a^3$	1
10.	In Figure-1, if tangents PA and PB from an external point P to a circle with centre O, are inclined to each other at an angle of 80°, then $\angle$AOB is equal to  Figure-1 **(a)** 100° **(b)** 60° **(c)** 80° **(d)** 50° **Ans:** (a) 100°	1
	In Q. Nos. 11 to 15, fill in the blanks. Each question is of 1 mark.	
11.	If α, β are zeroes of the polynomial $2x^2 - 5x - 4$; then $\frac{1}{\alpha} + \frac{1}{\beta} =$ __________. **Ans:** $-\frac{5}{4}$	1
12.	A line intersecting a circle at two points is called a __________. **Ans:** secant	1
	OR	
	The tangents drawn at the ends of a diameter of a circle are __________. **Ans:** parallel	1

13. The probability of an impossible event is _______.

Ans: 0 — **1**

14. $5\tan^2\theta - 5\sec^2\theta =$ _______.

Ans: -5 — **1**

15. The value of m which makes the points (0, 0), (2m, – 4) and (3, 6) collinear, is _________.

Ans: -1 — **1**

Q. Nos. 16 to 20 are short answer type questions of 1 mark each.

16. After how many decimal places will the decimal expansion of the rational number $\frac{359}{2^6 \times 5^3}$ terminate?

Ans: 6 places — **1**

17. It is given that $\Delta ABC \sim \Delta PQR$ with $\frac{BC}{QR} = \frac{1}{3}$, then find the value of $\frac{ar(PRQ)}{ar(ACB)}$.

Ans: $\frac{ar(PRQ)}{ar(ACB)} = \left(\frac{QR}{BC}\right)^2 = \frac{9}{1}$ — **1/2+1/2**

18. In Figure-2, a tower stands vertically on the ground. From a point on the ground, which is 80 m away from the foot of the tower, the angle of elevation of the tower is found to be 30°. Find the height of the tower.

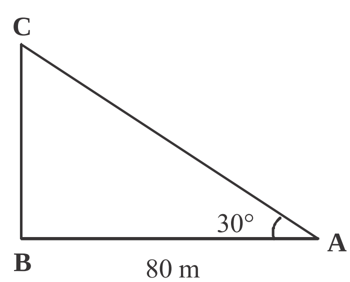


Figure-2

Ans: $\frac{BC}{AB} = \tan 30°$ — **1/2**

$\therefore BC = \frac{80m}{\sqrt{3}}$ or $\frac{80\sqrt{3}}{3}$m — **1/2**

19. A circle has its centre at (4, 4). If one end of a diameter is (4, 0), then find the coordinates of the other end.

Ans: Let the coordinates of other end be (x, y)

$$\left(\frac{x+4}{2}, \frac{y+0}{2}\right) = (4, 4)$$ — **1/2**

$\therefore x = 4, y = 8$

So, coordinates of other end are (4, 8) — **1/2**

20.	The capacity of a cylindrical glass tumbler is $125 \cdot 6$ cm^3. If the radius of the glass tumbler is 2 cm, then find its height. (Use $\pi = 3.14$)	
	Ans: $3.14 \times 2^2 \times h = 125 \cdot 6$	1/2
	$\therefore$ h = 10 cm	1/2
	SECTION – B	
	Q. Nos. 21 to 26 carry 2 marks each.	
21.	Solve for x: $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$	
	Ans: $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$	
	$4\sqrt{3}x^2 + 8x - 3x - 2\sqrt{3} = 0$	1
	$\left(4x - \sqrt{3}\right)\left(\sqrt{3}x + 2\right) = 0$	
	$x = \frac{\sqrt{3}}{4}$ or $\frac{-2}{\sqrt{3}}$	
	So, $x = \frac{\sqrt{3}}{4}$ or $\frac{-2\sqrt{3}}{3}$	1
22.	Show that cos 38° cos 52° – sin 38° sin 52° = cos 90°.	
	Ans: LHS $= \cos 38° \cos 52° - \sin 38° \sin 52°$	1
	$= \sin 52° \sin 38° - \sin 38° \sin 52°$	
	= 0 = cos 90° = RHS	1
	OR	
	Given 15 cot A = 8, find the values of sin A and sec A.	
	Ans: $\cot A = \frac{8}{15} = \frac{B}{P}$	
	Let B = 8 k, P = 15K $\Rightarrow$ H = 17 k	
	$\therefore \sin A = \frac{15}{17}$ and $\sec A = \frac{17}{8}$	1+1
23.	Show that any positive odd integer is of the form 4q + 1 or 4q + 3 for some integer q.	
	Ans: Let a be any posiotive integer and b = 4	
	$\therefore$ By Euclid's division lemma, $a = 4q + r, 0 \le r < 4$	

	Case-I: r = 0 a = 4q which is even.	1/2
	Case-II: r = 1 a = 4q + 1 which is odd	for each
	Case-III: r = 2 a = 4q + 2 which is even	case = 2
	Case-IV: r = 3 a = 4q + 3 which is odd	
	$\therefore$ Any positive odd integer is of the form 4q + 1 or 4q + 3	
24.	Find the mode of the following distribution	

Classes:	10-15	15-20	20-25	25-30	30-35	35-40
Frequency:	45	30	75	20	35	15

Ans: 20 – 25 is the modal class — 1/2

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

$$= 20 + \frac{75-30}{2\times 75 - 30 - 20} \times 5$$ — 1

$$= 20 + 2.25 = 22.25$$ — 1/2

25. In Figure-3, PQ || BC, PQ = 3 cm, BC = 9 cm and AC = 7·5 cm. Find the length of AQ.

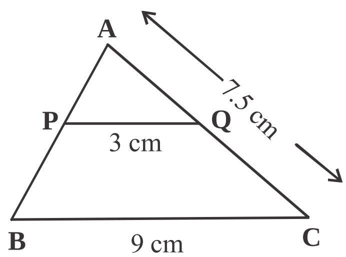


Figure-3

Ans: PQ || BC

$$\therefore \frac{PQ}{BC} = \frac{AQ}{AC}$$ — 1

$$\Rightarrow \frac{3}{9} = \frac{AQ}{7.5}$$

$\therefore$ AQ = 2.5 cm — 1

26. A jar contains 18 marbles. Some are red and others are yellow. If a marble is drawn at random from the jar, the probability that it is red is $\frac{2}{3}$. Find the number of yellow marbles in the jar.

Ans: Let the number of red marbles be x.

$\therefore \quad \frac{x}{18} = \frac{2}{3} \Rightarrow x = 12$ 1

So, number of yellow marbles = (18 – 12) = 6 1

OR

A die is thrown twice. What is the probability that

(i) 5 will come up at least once, and

(ii) 5 will not come up either time ?

Ans: Total number of outcomes = 36

(i) Favourable outcomes are (1, 5), (2,5), (3,5), (4,5), (5,5), (6,5), (5,1), (5,2), (5,3), (5,4), (5,6) *i.e.*, 11

$\therefore$ P(5 will come up at least one) = $\frac{11}{36}$ 1

(ii) P(5 will not come up either time) = $1 - \frac{11}{36} = \frac{25}{36}$ 1

SECTION – C

Question numbers 27 to 34 carry 3 marks each.

27. Prove that $\sqrt{2}$ is an irrational number.

Ans: Let us assume, to the contrary, that $\sqrt{2}$ be a rational number.

$\therefore \sqrt{2} = \frac{p}{q}$, where p and q are co-prime and q $\neq$ 0 1

$\Rightarrow \quad 2q^2 = p^2 \qquad$ .... (i)

$\therefore$ 2 divides p^2 and hence 2 divides p also.

Let p = 2 m, where m is an integer 1

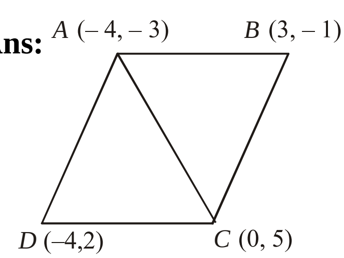
from (i), $2q^2 = 4m^2$

$\therefore \qquad q^2 = 2m^2$

$\Rightarrow$ 2 divides q^2 and hence 2 divides q also.

So, 2 is a common factor of p and q both which is a contradiction to our assumption. 1

Hence $\sqrt{2}$ is an irrational number.

28.	Find the sum of first 16 terms of an Arithmetic Progression whose 4^{th} and 9^{th} terms are – 15 and – 30 respectively.	
	Ans: $a_4 = -15 \Rightarrow a + 3d = -15$	1/2
	$a_9 = -30 \Rightarrow a + 8d = -30$	1/2
	Solving the two, we get $a = -6, d = -3$	1
	$S_{16} = \frac{16}{2}[2(-6) + 15(-3)]$	
	$= 8 \times (-57) = -456$	1
	OR	
	If the sum of first 14 terms of an Arithmetic Progression is 1050 and its fourth term is 40, find its 20^{th} term.	
	Ans: $S_{14} = 1050 \Rightarrow \frac{14}{2}(2a + 13d) = 1050$	
	$\Rightarrow \quad 2a + 13d = 150 \quad \ldots \text{(i)}$	1/2
	$a_4 = 40$	
	$\Rightarrow \quad a + 3d = 40 \quad \ldots \text{(ii)}$	1/2
	Solving (i) & (ii), we get a = 10, d = 10	1
	$a_{20} = a + 19d = 200$	1
29.	Prove that the lengths of tangents drawn from an external point to a circle are equal.	
	Ans: For correct given, to prove, figure and construction	1/2×4=2
	For correct proof.	1
30.	Find the area of the quadrilateral ABCD whose vertices are A(– 4, – 3), B(3, – 1), C(0, 5) and D(– 4, 2).	
	Ans: 	
	$ar(ABC) = \frac{1}{2}\lvert -4(-6) + 3(8) + 0 \rvert = 24$ sq units.	1
	$ar(ACD) = \frac{1}{2}\lvert -4 \times 3 + 0 - 4(-8) \rvert = 10$ sq units.	1
	$ar(ABCD) = ar(ABC) + ar(ACD) = 34$ sq units.	1
	OR	
	If the points A(2, 0), B(6, 1) and C(p, q) form a triangle of area 12 sq. units (positive only) and 2p + q = 10, then find the values of p and q.	

Ans: $ar(ABC) = 12$ sq units

$\therefore \quad \frac{1}{2}[2(1-q)+6q+p(-1)] = 12$ **1**

$\Rightarrow \; 4q - p = 22 \qquad \text{...(i)}$ **1**

Given $\; 2p + q = 10 \qquad \text{...(ii)}$

Solving (i) & (ii), we get $p = 2$, $q = 6$ **1**

31. Prove that : $\dfrac{1+\tan A}{2\sin A} + \dfrac{1+\cot A}{2\cos A} = \operatorname{cosec} A + \sec A$

Ans: LHS $= \dfrac{1+\tan A}{2\sin A} + \dfrac{1+\cot A}{2\cos A}$

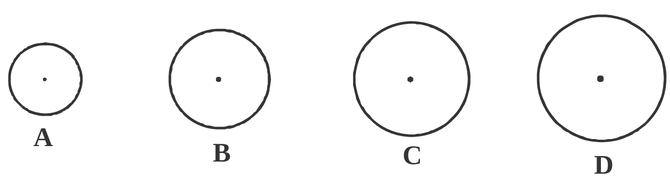
$= \dfrac{\cos A + \sin A}{2\sin A\cos A} + \dfrac{\sin A + \cos A}{2\cos A\sin A}$ **2**

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

$= \operatorname{cosec} A + \sec A$ **1**

$=$ RHS

32. A mint moulds four types of copper coins A, B, C and D whose diameters vary from 0·5 cm to 5 cm. The first coin A has a diameter of 0·7 cm. The second coin B has double the diameter of coin A and from then onwards the diameters increase by 50%. Thickness of each coin is 0·25 cm.



After reading the above, answer the following questions :

(i) Fill in the diameters of the coins required in the following table :

Type of Coin	Diameter (in cm)
A	0·7
B	---

(ii) Complete the following table :

Type of Coin	Area (in cm^2) of one face	Volume (in cm^3)
A	0·335	0·09625
B	---	---

$\left[\text{Use } \pi = \frac{22}{7}\right]$

Ans: (i) **1**

Type of coin	*Diameter* (in cm)
A	0.7
B	1.4

(ii) **1+1**

Type of coin	*Area* (cm^2) of one face	*Volume* (cm^3)
A	0.385	0.09625
B	$\frac{22}{7} \times 0.7 \times 0.7 = 1.54$	$1.54 \times 0.25 = 0.385$

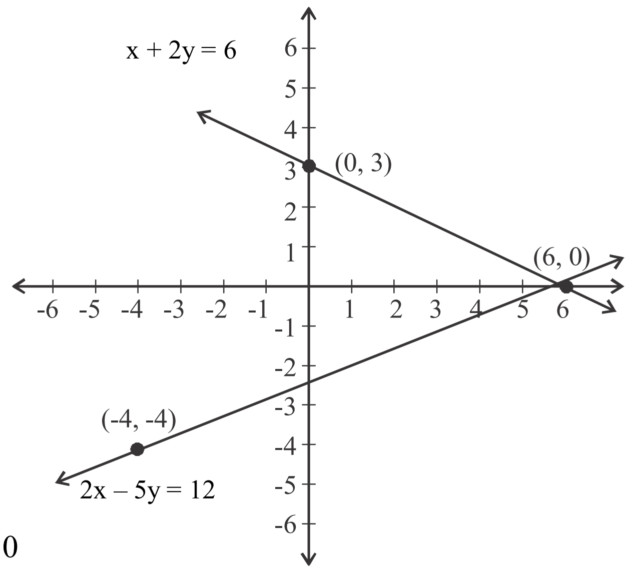
33. Solve the equations x + 2y = 6 and 2x – 5y = 12 graphically.

Ans: $x + 2y = 6$

x	0	6
y	3	0

$2x - 5y = -12$

x	6	-4
y	0	-4



1 for each line = 2

Solution is $x = 6$, $y = 0$ **1**

OR

Solve the following equations for x and y using cross-multiplication method :

(ax – by) + (a + 4b) = 0

(bx + ay) + (b – 4a) = 0

Ans: $ax - by + (a + 4b) = 0$

$bx + ay + (b - 4a) = 0$

$$\frac{x}{-b^2 + 4ab - a^2 - 4ab} = \frac{y}{ab + 4b^2 - ab + 4a^2} = \frac{1}{a^2 + b^2}$$ **1**

$$x = \frac{-(a^2 + b^2)}{a^2 + b^2}, y = \frac{4(a^2 + b^2)}{a^2 + b^2}$$ **1**

$x = -1$, $y = 4$ **1**

34. Construct an equilateral triangle ABC of side length 6 cm. Then construct a triangle whose sides are $\frac{3}{4}$ of the corresponding sides of ΔABC.

Ans: Correct construction of ΔABC **1**

Correct construction of triangle similar to ΔABC with scale facor $\frac{3}{4}$. **2**

SECTION – D

Question numbers 35 to 40 carry 4 marks each.

35. If the polynomial f(x) = $3x^4 - 9x^3 + x^2 + 15x + k$ is completely divisible by $3x^2 - 5$, then find the value of k. Using the quotient, so obtained, find two zeroes of the polynomial.

Ans:

$$
\begin{array}{r|l|l}
3x^2-5 & 3x^4 - 9x^3 + x^2 + 15x + k & x^2 - 3x + 2 \\
 & \underline{\cancel{\pm 3x^4} \quad \mp 5x^2} & \\
 & -9x^3 + 6x^2 + 15x + k & \\
 & \underline{\cancel{\mp 9x^3} \quad \cancel{\pm 15x}} & \\
 & 6x^2 \quad + k & \\
 & \underline{\cancel{\pm 6x^2} \quad \mp 10} & \\
 & \underline{10 + k} &
\end{array}
$$

2

$10 + k = 0 \Rightarrow k = -10$ **1**

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

$= (x - 1)(x - 2)$ **1**

Two zeroes of polynomial are 1 and 2

OR

Find all the zeroes of the polynomial $x^4 - 8x^3 + 23x^2 - 28x + 12$ if two of its zeroes are 2 and 3.

Ans: $p(x) = x^4 - 8x^3 + 23x^2 - 28x + 12$

$(x-2)(x-3) = x^2 - 5x + 6$ is a factor of $p(x)$ **1**

$$
\begin{array}{l}
x^2-5x+6\overline{\big)\,x^4-8x^3+23x^2-28x+12\,}\big(\,x^2-3x+2 \\
\qquad\qquad\;\; \cancel{x^4}-5x^3+6x^2 \\
\qquad\qquad\;\; -\quad\;\; +\quad\;\; - \\
\hline
\qquad\qquad\qquad -3\cancel{x^3}+17x^2-28x+12 \\
\qquad\qquad\qquad -3\cancel{x^3}+15x^2-18x \\
\qquad\qquad\qquad +\qquad\; -\qquad\; + \\
\hline
\qquad\qquad\qquad\qquad\quad \cancel{2x^2}-\cancel{10x}+\cancel{12} \\
\qquad\qquad\qquad\qquad\quad \cancel{2x^2}-\cancel{10x}+\cancel{12} \\
\qquad\qquad\qquad\qquad\quad -\qquad\; +\qquad\; - \\
\hline
\qquad\qquad\qquad\qquad\qquad\quad \times \\
\hline
\end{array}
$$ **2**

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

$\therefore$ All zeroes of $p(x)$ are 2,3,1 and 2.

36. A well of diameter 3 m is dug 14 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 4 m to form a platform. Find the height of the platform. $\left[\text{Take } \pi=\frac{22}{7}\right]$

Ans: Volume of earth dug out from the well = Volume of platform. **1**

$$\pi\times\frac{3}{2}\times\frac{3}{2}\times 14=\pi\left[\left(\frac{11}{2}\right)^2-\left(\frac{3}{2}\right)^2\right]\times h$$ **2**

$$\Rightarrow h=\frac{9}{8}\text{ m or } 1.125\text{ m}$$ **1**

OR

In Figure-4, a solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. $\left[\text{Take } \pi=\frac{22}{7}\right]$

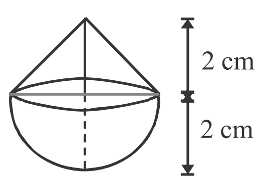


Figure-4

Ans: Volume of toy = Volume of cone + Volume of hemisphere **1**

$$=\frac{1}{3}\pi r^2 h+\frac{2}{3}\pi r^3$$

$$=\frac{3.14\times 2\times 2}{3}\times(2+4)\text{ cm}^3$$ **2**

$$=25.12\text{ cm}^3$$ **1**

37. A train travels at a certain average speed for a distance of 360 km. It would have taken 48 minutes less to travel the same distance if its speed was 5 km/hour more. Find the original speed of the train.

Ans: Let the speed of train be x km/hr.

$$\frac{360}{x} - \frac{360}{x+5} = \frac{48}{60}$$ **2**

$\therefore\ x^2 + 5x - 2250 = 0$ **1**

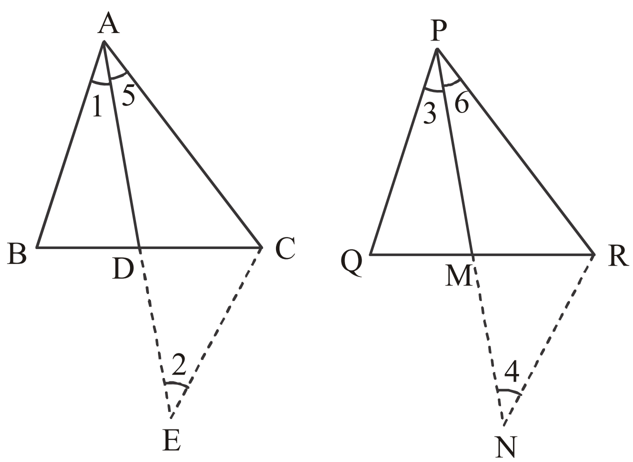
$(x + 50)\ (x - 45) = 0$

$x = -50$ (rejected), $x = 45$ **1**

$\therefore$ Speed of train is 45 km/hr.

38. Sides AB and AC and median AD of ΔABC are respectively proportional to sides PQ and PR and median PM of Δ PQR. Show that Δ ABC ~ Δ PQR.

Ans:



$$\frac{AB}{PQ} = \frac{AC}{PR} = \frac{AD}{PM} \quad \ldots(i)$$

Construction: Extend AD to E such that AD = DE and join DE.

Extend PM to N such that PM = MN and join RN **1/2**

ΔABD $\cong$ ΔECD (SAS)

ΔPQM $\cong$ ΔNRM (SAS) **1**

$\therefore\ \angle 1 = \angle 2$, CE = AB ...(ii)

and $\angle 3 = \angle 4$, PQ = NR ...(iii) **1/2**

$\Rightarrow$ from (i), $\dfrac{CE}{RN} = \dfrac{AC}{PR} = \dfrac{2AD}{2PM}$

$$\Rightarrow \frac{CE}{RN} = \frac{AC}{PR} = \frac{AE}{PN}$$

$\therefore\ \Delta AEC \sim \Delta PNR$ (SSS) **1**

$\Rightarrow \angle 2 = \angle 4 \quad \ldots$(iv)

and $\angle 5 = \angle 6$

From (ii), (iii), & (iv), $\angle 1 = \angle 3$

$\Rightarrow \angle 1 + \angle 5 = \angle 3 + \angle 6$

$\Rightarrow \angle BAC = \angle QPR$

Also $\frac{AB}{PQ} = \frac{AC}{PR}$

$\therefore\ \Delta ABC \sim \Delta PQR$ (SAS) **1**

OR

In Figure-5, BN and CM are medians of a Δ ABC right-angled at A. Prove that $4(BN^2 + CM^2) = 5\ BC^2$.

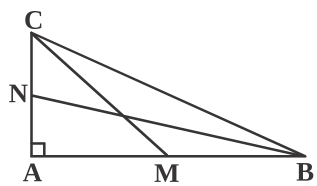


Figure-5

Ans: In $\Delta ABC,\ AB^2 + AC^2 = BC^2$ ... (i) **1/2**

In $\Delta AMC,\ AM^2 + AC^2 = CM^2$ ... (ii) **1/2**

In $\Delta ANB,\ AN^2 + AB^2 = BN^2$ ... (iii) **1/2**

Adding (ii) & (iii), $AM^2 + AN^2 + AC^2 + AB^2 = CM^2 + BN^2$ **1**

$$\Rightarrow \left(\frac{AB}{2}\right)^2 + \left(\frac{AC}{2}\right)^2 + AC^2 + AB^2 = CM^2 + BN^2$$ **1**

$$\Rightarrow 5\left(AB^2 + AC^2\right) = 4(CM^2 + BN^2)$$

$$\therefore 5BC^2 = 4(CM^2 + BN^2) \quad \text{[using (i)]}$$ **1/2**

39.	Draw 'less than' ogive for the following distribution and hence find its median.	

Class	Frequency
20-30	10
30-40	8
40-50	12
50-60	24
60-70	6
70-80	25
80-90	15

Ans:

Classes	Cumulative frequency
Less than 30	10
Less than 40	18
Less than 50	30
Less than 60	54
Less than 70	60
Less than 80	85
Less than 90	100

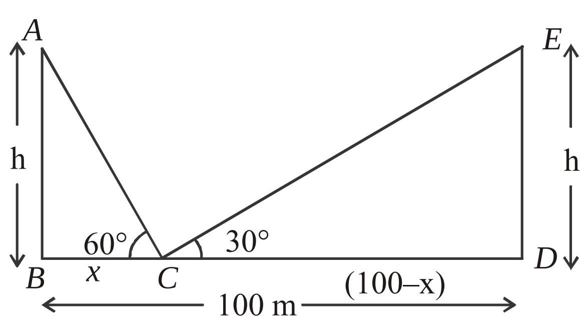
$1\frac{1}{2}$

Plotting the points (30,10), (40,18), (50,30), (60,54), (70,60), (80,85), (90,100) and joining them. $1\frac{1}{2}$

Median = 58.5 (approx) **1**

40. Two poles of equal heights are standing opposite each other on either side of the road, which is 100 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles and the distances of the point from the poles.

Ans:



Correct figure. **1**

In ΔABC, $\frac{h}{x} = \tan 60°$

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

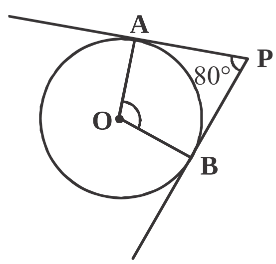
	In ΔCDE, $\frac{h}{100-x}=\tan 30°$	
	$\therefore\ h\sqrt{3}=100-x$	
	$x\sqrt{3}\times\sqrt{3}=100-x$	1
	$\therefore\ x=25$	
	From (i), $h=25\sqrt{3}$	
	$\therefore$ Height of poles = $25\sqrt{3}$ m	1/2
	and distances of point from poles are 25 m and 75 m.	1/2

QUESTION PAPER CODE 30/C/2

EXPECTED ANSWER/VALUE POINTS

SECTION – A

Q. No. 1 to 10 are multiple choice type question of 1 mark each.
Select the correct option.

Q.No.		Marks
1.	A solid spherical ball fits exactly inside the cubical box of side 2a. The volume of the ball is **(a)** $\frac{16}{3}\pi a^3$ **(b)** $\frac{1}{6}\pi a^3$ **(c)** $\frac{32}{3}\pi a^3$ **(d)** $\frac{4}{3}\pi a^3$ **Ans:** (d) $\frac{4}{3}\pi a^3$	1
2.	In Figure-1, if tangents PA and PB from an external point P to a circle with centre O, are inclined to each other at an angle of 80°, then $\angle AOB$ is equal to  Figure-1 **(a)** 100° **(b)** 60° **(c)** 80° **(d)** 50° **Ans:** (a) 100°	1
3.	The distance between the points (0, 0) and (a – b, a + b) is **(a)** $2\sqrt{ab}$ **(b)** $\sqrt{2a^2 + ab}$ **(c)** $2\sqrt{a^2 + b^2}$ **(d)** $\sqrt{2a^2 + 2b^2}$ **Ans:** (d) $\sqrt{2a^2 + 2b^2}$	1
4.	Two dice are thrown simultaneously. The probability that the sum of two numbers appearing on the top of the dice is less than 12, is **(a)** $\frac{1}{36}$ **(b)** $\frac{35}{36}$ **(c)** 0 **(d)** 1 **Ans:** (b) $\frac{35}{36}$	1
5.	If $-\frac{5}{7}, a, 2$ are consecutive terms in an Arthimetic Progression, then the value of ‘a’ is **(a)** $\frac{9}{7}$ **(b)** $\frac{9}{14}$ **(c)** $\frac{19}{7}$ **(d)** $\frac{19}{14}$ **Ans:** (b) $\frac{9}{14}$	1

6.	The pair of equations x = 5 and y = 5 has **(a)** no solution **(b)** unique solution **(c)** many solutions **(d)** only solution (0, 0) **Ans:** (b) unique solution	1
7.	If tan θ = 0, then the value of sin θ + cos θ is **(a)** 1 **(b)** $\frac{1}{2}$ **(c)** 0 **(d)** not defined **Ans:** (a) 1	1
8.	The mean and median of a distribution are 14 and 15 respectively. The value of mode is **(a)** 16 **(b)** 17 **(c)** 13 **(d)** 18 **Ans:** (b) 17	1
9.	The value(s) of k for which the quadratic equation $3x^2 - kx + 3 = 0$ has equal roots, is (are) **(a)** 6 **(b)** –6 **(c)** ±6 **(d)** 9 **Ans:** (c) ±6	1
	OR	
	The discriminant of the quadratic equation $3\sqrt{3}x^2 + 10x + \sqrt{3} = 0$ **(a)** ±8 **(b)** 8 **(c)** $100 - 4\sqrt{3}$ **(d)** 64 **Ans:** (d) 64	1
10.	A frustum of a right circular cone which is of height 8 cm with radii of its circular ends as 10 cm and 4 cm, has its slant height equal to **(a)** 14 cm **(b)** 28 cm **(c)** 10 cm **(d)** $\sqrt{260}$ cm **Ans:** (c) 10 cm	1
	In Q. Nos. 11 to 15, fill in the blanks. Each question is of 1 mark.	
11.	The probability of an impossible event is _______. **Ans:** 0	1
12.	The value of m which makes the points (0, 0), (2m, – 4) and (3, 6) collinear, is _________. **Ans:** –1	1
13.	A line intersecting a circle at two points is called a __________. **Ans:** secant	1

OR

The tangents drawn at the ends of a diameter of a circle are __________.

Ans: parallel **1**

14. If α, β are zeroes of the polynomial $-3x^2 + x - 5$, then the value of $\frac{1}{\alpha}+\frac{1}{\beta}$ is ________.

Ans: $\frac{1}{5}$ **1**

15. $5\tan^2\theta - 5\sec^2\theta =$ ________.

Ans: -5 **1**

Q. Nos. 16 to 20 are short answer type questions of 1 mark each.

16. In Figure-2, a tower stands vertically on the ground. From a point on the ground, which is 80 m away from the foot of the tower, the angle of elevation of the tower is found to be 30°. Find the height of the tower.

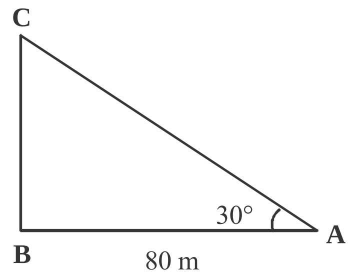


Figure-2

Ans: $\frac{BC}{AB} = \tan 30°$ **1/2**

$\therefore BC = \frac{80m}{\sqrt{3}}$ or $\frac{80\sqrt{3}}{3}$ m **1/2**

17. A circle has its centre at (4, 4). If one end of a diameter is (4, 0), then find the coordinates of the other end.

Ans: Let the coordinates of other end be (x, y)

$$\left(\frac{x+4}{2}, \frac{y+0}{2}\right) = (4, 4)$$ **1/2**

$\therefore x = 4, y = 8$

So, coordinates of other end are (4, 8) **1/2**

18. The capacity of a cylindrical glass tumbler is $125 \cdot 6$ cm^3. If the radius of the glass tumbler is 2 cm, then find its height. (Use $\pi = 3.14$)

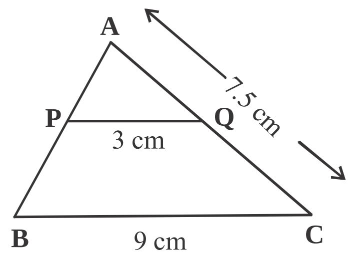
Ans: $3.14 \times 2^2 \times h = 125 \cdot 6$ **1/2**

$\therefore h = 10$ cm **1/2**

19. Is $3 \times 5 \times 7 \times 11$ a composite number ? Give reason for your answer.

Ans: Yes, as it has more than two factors. **1**

20.	It is given that $\Delta ABC \sim \Delta PQR$ with $\frac{BC}{QR}=\frac{1}{3}$, then find the value of $\frac{ar(PRQ)}{ar(ACB)}$.	
	Ans: $\frac{ar(PRQ)}{ar(ACB)}=\left(\frac{QR}{BC}\right)^2=\frac{9}{1}$	1/2+1/2
	SECTION – B	
	Q. Nos. 21 to 26 carry 2 marks each.	
21.	Without actually performing long division method, find if the rational number $\frac{549}{225}$ will have terminating or non-terminating repeating decimal expansion.	
	Ans: $\frac{549}{225}=\frac{61}{25}=\frac{61}{5^2}$	1
	The denominator is of the form 2^n5^m.	
	$\therefore$ The given rational number has terminating decimal expansion.	1
22.	A jar contains 18 marbles. Some are red and others are yellow. If a marble is drawn at random from the jar, the probability that it is red is $\frac{2}{3}$. Find the number of yellow marbles in the jar.	
	Ans: Let the number of red marbles be x.	
	$\therefore \frac{x}{18}=\frac{2}{3} \Rightarrow x=12$	1
	So, number of yellow marbles = (18 – 12) = 6	1
	OR	
	A die is thrown twice. What is the probability that (i) 5 will come up at least once, and (ii) 5 will not come up either time ?	
	Ans: Total number of outcomes = 36	
	(i) Favourable outcomes are (1, 5), (2,5), (3,5), (4,5), (5,5), (6,5), (5,1), (5,2), (5,3), (5,4), (5,6) *i.e.,* 11	
	$\therefore$ P(5 will come up at least one) = $\frac{11}{36}$	1
	(ii) P(5 will not come up either time) = $1-\frac{11}{36}=\frac{25}{36}$	1

23.	In Figure-3, PQ ∥ BC, PQ = 3 cm, BC = 9 cm and AC = 7·5 cm. Find the length of AQ.	
	 Figure-3	
	Ans: PQ ∥ BC	
	$\therefore \frac{PQ}{BC} = \frac{AQ}{AC}$	1
	$\Rightarrow \frac{3}{9} = \frac{AQ}{7.5}$	
	$\therefore$ AQ = 2.5 cm	1
24.	Find the nature of roots of the quadratic equation $3x^2 - 4\sqrt{3}x + 4 = 0$. If the roots are real, find them.	
	Ans: $D = \left(4\sqrt{3}\right)^2 - 4 \times 3 \times 4 = 0$	1
	$\therefore$ Roots are real and equal.	
	$x = \frac{4\sqrt{3}}{6}, \frac{4\sqrt{3}}{6}$	1
	$= \frac{2}{3}\sqrt{3}, \frac{2}{3}\sqrt{3}$	
25.	Find the mode of the following distribution	

Classes:	10-15	15-20	20-25	25-30	30-35	35-40
Frequency:	45	30	75	20	35	15

Ans: 20 – 25 is the modal class **1/2**

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

$$= 20 + \frac{75 - 30}{2 \times 75 - 30 - 20} \times 5$$ **1**

$$= 20 + 2.25 = 22.25$$ **1/2**

26. Show that cos 38° cos 52° – sin 38° sin 52° = cos 90°.

Ans: LHS $= \cos 38° \cos 52° - \sin 38° \sin 52°$ **1**

$= \sin 52° \sin 38° - \sin 38° \sin 52°$

$= 0 = \cos 90° = \text{RHS}$ **1**

OR

Given 15 cot A = 8, find the values of sin A and sec A.

Ans: $\cot A = \dfrac{8}{15} = \dfrac{B}{P}$

Let B = 8 k, P = 15K $\Rightarrow$ H = 17 k

$\therefore \ \sin A = \dfrac{15}{17}$ and $\sec A = \dfrac{17}{8}$ **1+1**

SECTION – C

Question numbers 27 to 34 carry 3 marks each.

27. Prove that $\dfrac{1+\sec\theta-\tan\theta}{1+\sec\theta+\tan\theta} = \dfrac{1-\sin\theta}{\cos\theta}$

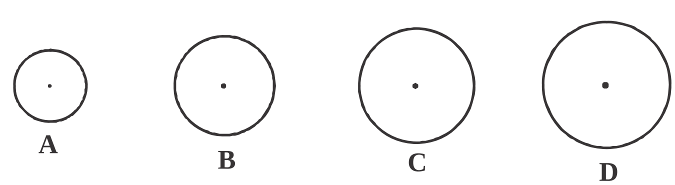
Ans: $\text{LHS} = \dfrac{1+\sec\theta-\tan\theta}{1+\sec\theta+\tan\theta}$

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

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

$= \sec\theta-\tan\theta = \dfrac{1-\sin\theta}{\cos\theta} = \text{RHS}$ **1**

28. A mint moulds four types of copper coins A, B, C and D whose diameters vary from 0·5 cm to 5 cm. The first coin A has a diameter of 0·7 cm. The second coin B has double the diameter of coin A and from then onwards the diameters increase by 50%. Thickness of each coin is 0·25 cm.



After reading the above, answer the following questions :

(i) Fill in the diameters of the coins required in the following table :

Type of Coin	Diameter (in cm)
A	0·7
B	---

(ii) Complete the following table :

Type of Coin	Area (in cm^2) of one face	Volume (in cm^3)
A	0·335	0·09625
B	---	---

$\left[\text{Use } \pi = \frac{22}{7}\right]$

Ans: (i) 1

Type of coin	*Diameter* (in cm)
A	0.7
B	1.4

(ii) 1+1

Type of coin	*Area* (cm^2) of one face	*Volume* (cm^3)
A	0.385	0.09625
B	$\frac{22}{7} \times 0.7 \times 0.7 = 1.54$	$1.54 \times 0.25 = 0.385$

29. Prove that $\sqrt{2}$ is an irrational number.

Ans: Let us assume, to the contrary, that $\sqrt{2}$ be a rational number.

$\therefore \sqrt{2} = \frac{p}{q}$, where p and q are co-prime and $q \neq 0$ 1

$\Rightarrow \ 2q^2 = p^2$ .... (i)

$\therefore$ 2 divides p^2 and hence 2 divides p also.

Let p = 2 m, where m is an integer 1

from (i), $2q^2 = 4m^2$

$\therefore \quad q^2 = 2m^2$

$\Rightarrow$ 2 divides q^2 and hence 2 divides q also.

So, 2 is a common factor of p and q both which is a contradiction to our assumption. 1

Hence $\sqrt{2}$ is an irrational number.

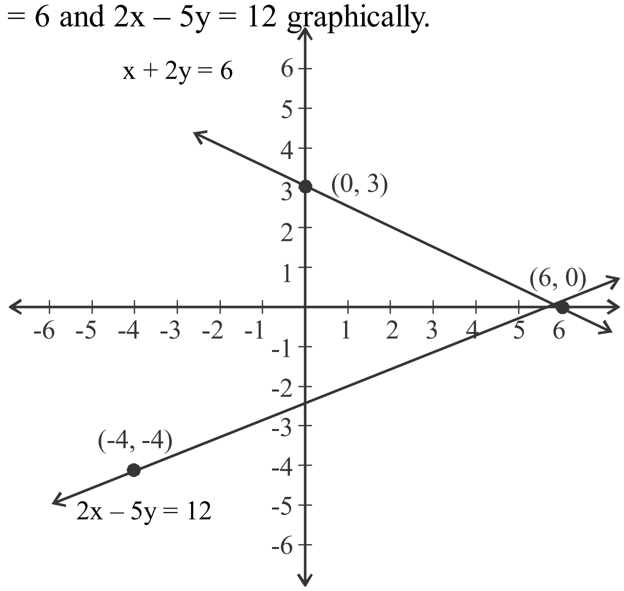
30. Solve the equations x + 2y = 6 and 2x – 5y = 12 graphically.

Ans: $x + 2y = 6$

x	0	6
y	3	0

$2x - 5y = -12$

x	6	–4
y	0	–4



1 for each line = 2

Solution is $x = 6$, $y = 0$ **1**

OR

Solve the following equations for x and y using cross-multiplication method :

(ax – by) + (a + 4b) = 0

(bx + ay) + (b – 4a) = 0

Ans: $ax - by + (a + 4b) = 0$

$bx + ay + (b - 4a) = 0$

$$\frac{x}{-b^2 + 4ab - a^2 - 4ab} = \frac{y}{ab + 4b^2 - ab + 4a^2} = \frac{1}{a^2 + b^2}$$ **1**

$$x = \frac{-(a^2 + b^2)}{a^2 + b^2}, y = \frac{4(a^2 + b^2)}{a^2 + b^2}$$ **1**

$x = -1$, $y = 4$ **1**

31. Find the sum of first 16 terms of an Arithmetic Progression whose 4th and 9th terms are – 15 and – 30 respectively.

Ans: $a_4 = -15 \Rightarrow a + 3d = -15$ **1/2**

$a_9 = -30 \Rightarrow a + 8d = -30$ **1/2**

Solving the two, we get $a = -6, d = -3$ **1**

$$S_{16} = \frac{16}{2}[2(-6) + 15(-3)]$$

$= 8 \times (-57) = -456$ **1**

OR

If the sum of first 14 terms of an Arithmetic Progression is 1050 and its fourth term is 40, find its 20th term.

Ans: $S_{14} = 1050 \Rightarrow \frac{14}{2}(2a + 13d) = 1050$

$\Rightarrow \quad 2a + 13d = 150 \quad \ldots \text{(i)}$ **1/2**

$a_4 = 40$

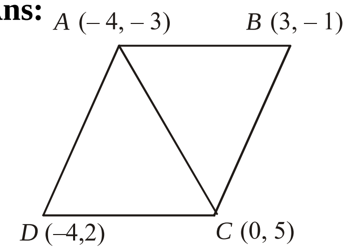
$\Rightarrow \quad a + 3d = 40 \quad \ldots \text{(ii)}$ **1/2**

Solving (i) & (ii), we get a = 10, d = 10 **1**

$a_{20} = a + 19d = 200$ **1**

32. Find the area of the quadrilateral ABCD whose vertices are A(– 4, – 3), B(3, – 1), C(0, 5) and D(– 4, 2).

Ans:



$ar(ABC) = \frac{1}{2}\left|-4(-6) + 3(8) + 0\right| = 24$ sq units. **1**

$ar(ACD) = \frac{1}{2}\left|-4 \times 3 + 0 - 4(-8)\right| = 10$ sq units. **1**

$ar(ABCD) = ar(ABC) + ar(ACD) = 34$ sq units. **1**

OR

If the points A(2, 0), B(6, 1) and C(p, q) form a triangle of area 12 sq. units (positive only) and 2p + q = 10, then find the values of p and q.

Ans: $ar(ABC) = 12$ sq units

$\therefore \quad \frac{1}{2}\left[2(1-q) + 6q + p(-1)\right] = 12$ **1**

$\Rightarrow \; 4q - p = 22 \quad \ldots \text{(i)}$ **1**

Given $\; 2p + q = 10 \quad \ldots \text{(ii)}$

Solving (i) & (ii), we get $p = 2$, $q = 6$ **1**

33. Draw an equilateral triangle of side length 7 cm. Then construct a triangle whose sides are $\frac{2}{3}$ of the corresponding sides of ΔABC.

Ans: Correct construction of given triangle. **1**

Correct construction of similar triangle. **2**

34. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.

Ans: For correct Given, To prove, construction and figure. $\frac{1}{2} \times 4 = 2$

For correct proof. **1**

SECTION – D

Question numbers 35 to 40 carry 4 marks each.

35. Amisha bought a number of books for ₹1,800. If she had bought 10 more books for the same amount, each book would have cost her ₹30 less. How many books did she buy originally ?

Ans: Let the number of books bought be x.

$$\frac{1800}{x} - \frac{1800}{x+10} = 30$$ **2**

$\therefore\ x^2 + 10x - 600 = 0$ **1**

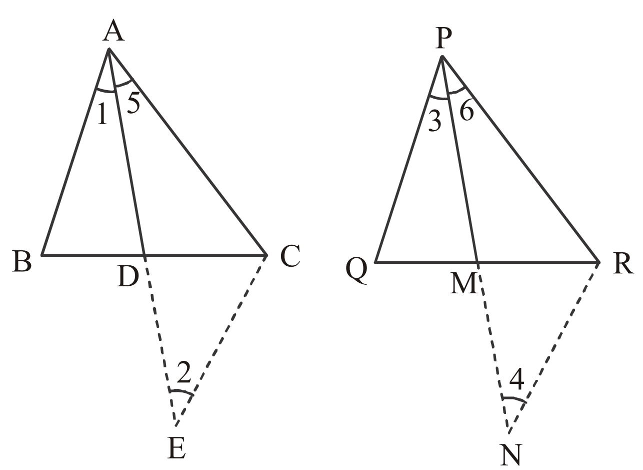
$(x + 30)(x - 20) = 0$

$x = -30$ (Rejected), 20 **1**

$\therefore$ Number of books bought = 20

36. Sides AB and AC and median AD of Δ ABC are respectively proportional to sides PQ and PR and median PM of Δ PQR. Show that Δ ABC ~ Δ PQR.

Ans:



$$\frac{AB}{PQ} = \frac{AC}{PR} = \frac{AD}{PM} \quad \ldots(i)$$

Construction: Extend AD to E such that AD = DE and join DE.

Extend PM to N such that PM = MN and join RN **1/2**

$\left.\begin{array}{l}\Delta ABD \cong \Delta ECD \ (SAS) \\ \Delta PQM \cong \Delta NRM \ (SAS)\end{array}\right]$ **1**

$\therefore \angle 1 = \angle 2$, CE = AB ...(ii)
and $\angle 3 = \angle 4$, PQ = NR ...(iii) **1/2**

$\Rightarrow$ from (i), $\frac{CE}{RN} = \frac{AC}{PR} = \frac{2AD}{2PM}$

$\Rightarrow \frac{CE}{RN} = \frac{AC}{PR} = \frac{AE}{PN}$

$\therefore \Delta AEC \sim \Delta PNR$ (SSS) **1**

$\Rightarrow \angle 2 = \angle 4$ ...(iv)

and $\angle 5 = \angle 6$

From (ii), (iii), & (iv), $\angle 1 = \angle 3$

$\Rightarrow \angle 1 + \angle 5 = \angle 3 + \angle 6$

$\Rightarrow \angle BAC = \angle QPR$

Also $\frac{AB}{PQ} = \frac{AC}{PR}$

$\therefore \Delta ABC \sim \Delta PQR$ (SAS) **1**

OR

In Figure-5, BN and CM are medians of a Δ ABC right-angled at A. Prove that 4 ($BN^2 + CM^2$) = 5 BC^2.

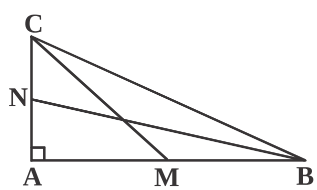


Figure-5

Ans: In ΔABC, $AB^2 + AC^2 = BC^2$ ... (i) **1/2**

In ΔAMC, $AM^2 + AC^2 = CM^2$ ... (ii) **1/2**

In ΔANB, $AN^2 + AB^2 = BN^2$ ... (iii) **1/2**

Adding (ii) & (iii), $AM^2 + AN^2 + AC^2 + AB^2 = CM^2 + BN^2$ **1**

$$\Rightarrow \left(\frac{AB}{2}\right)^2 + \left(\frac{AC}{2}\right)^2 + AC^2 + AB^2 = CM^2 + BN^2$$ **1**

$$\Rightarrow 5\left(AB^2 + AC^2\right) = 4(CM^2 + BN^2)$$

$$\therefore 5BC^2 = 4(CM^2 + BN^2) \quad \text{[using (i)]}$$ **1/2**

37.	Draw 'less than' ogive for the following distribution and hence find its median.	

Class	Frequency
20-30	10
30-40	8
40-50	12
50-60	24
60-70	6
70-80	25
80-90	15

Ans:

Classes	Cumulative frequency
Less than 30	10
Less than 40	18
Less than 50	30
Less than 60	54
Less than 70	60
Less than 80	85
Less than 90	100

$1\frac{1}{2}$

2

Plotting the points (30,10), (40,18), (50,30), (60,54), (70,60),

(80,85), (90,100) and joining them. $1\frac{1}{2}$

Median = 58.5 (approx) **1**

38. If the polynomial $f(x) = 3x^4 - 9x^3 + x^2 + 15x + k$ is completely divisible by $3x^2 - 5$, then find the value of k. Using the quotient, so obtained, find two zeroes of the polynomial.

Ans:

$$3x^2 - 5 \overline{\big)\, \cancel{3x^4} - 9x^3 + x^2 + 15x + k \,\big(}\; x^2 - 3x + 2$$

$$\underline{\overset{-}{\cancel{3x^4}} \qquad \mp 5x^2}$$

$$-9\cancel{x^3} + 6x^2 + 15\cancel{x} + k$$

$$\underline{\overset{-}{\underset{+}{\cancel{9x^3}}} \qquad \overset{+}{\underset{-}{\cancel{15x}}}}$$

$$6\cancel{x^2} \qquad +k$$

$$\underline{\underset{-}{\cancel{6x^2}} \qquad \underset{+}{-10}}$$

$$\underline{10 + k}$$

$10 + k = 0 \Rightarrow k = -10$ **1**

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

$= (x - 1)(x - 2)$ **1**

Two zeroes of polynomial are 1 and 2

OR

Find all the zeroes of the polynomial $x^4 - 8x^3 + 23x^2 - 28x + 12$ if two of its zeroes are 2 and 3.

Ans: $p(x) = x^4 - 8x^3 + 23x^2 - 28x + 12$

$(x-2)(x-3) = x^2 - 5x + 6$ is a factor of $p(x)$ **1**

$$
\begin{array}{r|l|l}
x^2 - 5x + 6 & x^4 - 8x^3 + 23x^2 - 28x + 12 & x^2 - 3x + 2 \\
 & \underline{\cancel{x^4} - 5x^3 + 6x^2} & \\
 & \quad -\;\;\;\;+\;\;\;\;- & \\
 & -\cancel{3x^3} + 17x^2 - 28x + 12 & \\
 & \underline{-\cancel{3x^3} + 15x^2 - 18x} & \\
 & \quad +\;\;\;\;-\;\;\;\;+ & \\
 & \cancel{2x^2} - \cancel{10x} + \cancel{12} & \\
 & \underline{\cancel{2x^2} - \cancel{10x} + \cancel{12}} & \\
 & \quad -\;\;\;\;+\;\;\;\;- & \\
 & \times &
\end{array}
$$

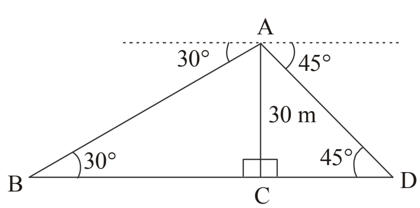
2

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

$\therefore$ All zeroes of $p(x)$ are 2,3,1 and 2.

39. 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 30 m from sea level, then find the width of the river. $\left(\text{Use } \sqrt{3} = 1.73\right)$

Ans:



Correct figure **1**

In ΔABC, $\dfrac{AC}{BC} = \tan 30°$

$\Rightarrow BC = 30\sqrt{3}$ m **1**

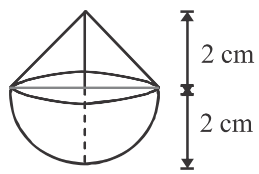
In ΔACD, $\dfrac{AC}{CD} = \tan 45°$

$\Rightarrow CD = 30$ m **1**

Width of river $=$ BD

$=$ BC + CD

$= 30\left(\sqrt{3} + 1\right)\text{m} = 30 \times 2.73\text{m} = 81.9\text{m}$ **1**

40.	A well of diameter 3 m is dug 14 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 4 m to form a platform. Find the height of the platform. $\left[\text{Take } \pi = \frac{22}{7}\right]$	
	Ans: Volume of earth dug out from the well = Volume of platform.	1
	$\pi \times \frac{3}{2} \times \frac{3}{2} \times 14 = \pi\left[\left(\frac{11}{2}\right)^2 - \left(\frac{3}{2}\right)^2\right] \times h$	2
	$\Rightarrow h = \frac{9}{8}$ m or 1.125 m	1
	OR	
	In Figure-4, a solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. $\left[\text{Take } \pi = \frac{22}{7}\right]$	
	 Figure-4	
	Ans: Volume of toy = Volume of cone + Volume of hemisphere	1
	$= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$	
	$= \frac{3.14 \times 2 \times 2}{3} \times (2+4)$ cm^3	2
	$= 25.12$ cm^3	1

QUESTION PAPER CODE 30/C/3

EXPECTED ANSWER/VALUE POINTS

SECTION – A

Q. No. 1 to 10 are multiple choice type question of 1 mark each. Select the correct option.

Q.No.		Marks
1.	If $\sin\theta = \cos\theta$, then the value of $\tan^2\theta + \cot^2\theta$ is	
	(a) 2 **(b)** 4 **(c)** 1 **(d)** $\frac{10}{3}$	
	Ans: (a) 2	1
2.	If $-\frac{5}{7}, a, 2$ are consecutive terms in an Arthimetic Progression, then the value of 'a' is	
	(a) $\frac{9}{7}$ **(b)** $\frac{9}{14}$ **(c)** $\frac{19}{7}$ **(d)** $\frac{19}{14}$	
	Ans: (b) $\frac{9}{14}$	1
3.	The distance between the points (0, 0) and (a – b, a + b) is	
	(a) $2\sqrt{ab}$ **(b)** $\sqrt{2a^2+ab}$ **(c)** $2\sqrt{a^2+b^2}$ **(d)** $\sqrt{2a^2+2b^2}$	
	Ans: (d) $\sqrt{2a^2+2b^2}$	1
4.	A solid spherical ball fits exactly inside the cubical box of side 2a. The volume of the ball is	
	(a) $\frac{16}{3}\pi a^3$ **(b)** $\frac{1}{6}\pi a^3$ **(c)** $\frac{32}{3}\pi a^3$ **(d)** $\frac{4}{3}\pi a^3$	
	Ans: (d) $\frac{4}{3}\pi a^3$	1
5.	In Figure-1, if tangents PA and PB from an external point P to a circle with centre O, are inclined to each other at an angle of 80°, then $\angle AOB$ is equal to	

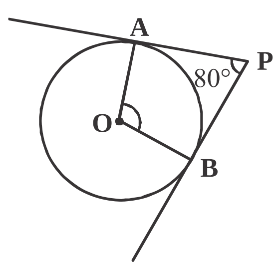


Figure-1

	(a) 100° **(b)** 60° **(c)** 80° **(d)** 50°	
	Ans: (a) 100°	1

6.	The mean and median of a distribution are 10 and 14 respectively. The value of mode is **(a)** 6 **(b)** 22 **(c)** 2 **(d)** 20 **Ans:** (b) 22	1
7.	The pair of equations x = a and y = b graphically represent lines which are **(a)** Intersecting at (a, b) **(b)** Intersecting at (b, a) **(c)** Coincident **(d)** Parallel **Ans:** (a) Intersecting at (a, b)	1
8.	The value(s) of k for which the quadratic equation $3x^2 - kx + 3 = 0$ has equal roots, is (are) **(a)** 6 **(b)** -6 **(c)** ± 6 **(d)** 9 **Ans:** (c) ± 6	1
	OR	
	The discriminant of the quadratic equation $3\sqrt{3}x^2 + 10x + \sqrt{3} = 0$ **(a)** ± 8 **(b)** 8 **(c)** $100 - 4\sqrt{3}$ **(d)** 64 **Ans:** (d) 64	1
9.	Two dice are thrown simultaneously. The probability that the sum of two numbers appearing on the top of the dice is less than 12, is **(a)** $\frac{1}{36}$ **(b)** $\frac{35}{36}$ **(c)** 0 **(d)** 1 **Ans:** (b) $\frac{35}{36}$	1
10.	A frustum of a right circular cone which is of height 8 cm with radii of its circular ends as 10 cm and 4 cm, has its slant height equal to **(a)** 14 cm **(b)** 28 cm **(c)** 10 cm **(d)** $\sqrt{260}$ cm **Ans:** (c) 10 cm	1
	In Q. Nos. 11 to 15, fill in the blanks. Each question is of 1 mark.	
11.	The probability of an impossible event is _______. **Ans:** 0	1
12.	$5\tan^2\theta - 5\sec^2\theta =$ _______. **Ans:** -5	1
13.	A line intersecting a circle at two points is called a __________. **Ans:** secant	1

	OR	
	The tangents drawn at the ends of a diameter of a circle are __________.	
	Ans: parallel	1
14.	The value of m which makes the points (0, 0), (2m, – 4) and (3, 6) collinear, is _________.	
	Ans: -1	1
15.	If α, β are zeroes of the polynomial $2x^2 - 5x - 4$; then $\frac{1}{\alpha} + \frac{1}{\beta} =$ __________.	
	Ans: $-\frac{5}{4}$	1
	Q. Nos. 16 to 20 are short answer type questions of 1 mark each.	
16.	The capacity of a cylindrical glass tumbler is $125 \cdot 6$ cm^3. If the radius of the glass tumbler is 2 cm, then find its height. (Use $\pi = 3.14$)	
	Ans: $3.14 \times 2^2 \times h = 125 \cdot 6$	1/2
	$\therefore\ h = 10$ cm	1/2
17.	A circle has its centre at (4, 4). If one end of a diameter is (4, 0), then find the coordinates of the other end.	
	Ans: Let the coordinates of other end be (x, y)	
	$\left(\frac{x+4}{2}, \frac{y+0}{2}\right) = (4, 4)$	1/2
	$\therefore\ x = 4,\ y = 8$	
	So, coordinates of other end are (4, 8)	1/2
18.	If two positive integers p and q can be expressed as $p = ab^3$ and $q = a^2b$; a and b being prime numbers, then find LCM of (p, q).	
	Ans: LCM (p, q) = a^2b^3	1
19.	It is given that $\Delta ABC \sim \Delta PQR$ with $\frac{BC}{QR} = \frac{1}{3}$, then find the value of $\frac{ar(PRQ)}{ar(ACB)}$.	
	Ans: $\frac{ar(PRQ)}{ar(ACB)} = \left(\frac{QR}{BC}\right)^2 = \frac{9}{1}$	1/2+1/2

20. In Figure-2, a tower stands vertically on the ground. From a point on the ground, which is 80 m away from the foot of the tower, the angle of elevation of the tower is found to be 30°. Find the height of the tower.

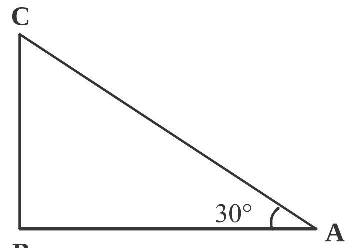


Figure-2

Ans: $\frac{BC}{AB} = \tan 30°$ **1/2**

$\therefore BC = \frac{80m}{\sqrt{3}}$ or $\frac{80\sqrt{3}}{3}$ m **1/2**

SECTION – B

Q. Nos. 21 to 26 carry 2 marks each.

21. Show that any positive odd integer is of the form 4q + 1 or 4q + 3 for some integer q.

Ans: Let a be any posiotive integer and b = 4

$\therefore$ By Euclid's division lemma, $a = 4q + r, 0 \le r < 4$

Case-I: r = 0 a = 4q which is even. **1/2**

Case-II: r = 1 a = 4q + 1 which is odd **for each**

Case-III: r = 2 a = 4q + 2 which is even **case = 2**

Case-IV: r = 3 a = 4q + 3 which is odd

$\therefore$ Any positive odd integer is of the form 4q + 1 or 4q + 3

22. In Figure-3, PQ || BC, PQ = 3 cm, BC = 9 cm and AC = 7·5 cm. Find the length of AQ.

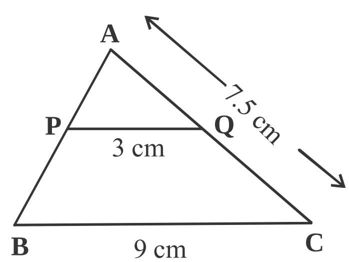


Figure-3

Ans: PQ || BC

$\therefore \frac{PQ}{BC} = \frac{AQ}{AC}$ **1**

$\Rightarrow \frac{3}{9} = \frac{AQ}{7.5}$

$\therefore$ AQ = 2.5 cm **1**

23.	Solve $9x^2 - 6a^2 x + a^4 - b^4 = 0$ using quadratic formula. **Ans:** $9x^2 - 6a^2 x + a^4 - b^4 = 0$ $D = 36a^4 - 36a^4 + 36b^4 = 36b^4$ $x = \frac{6a^2 \pm \sqrt{36b^4}}{18} = \frac{a^2 \pm b^2}{3}$	 1 1
24.	A jar contains 18 marbles. Some are red and others are yellow. If a marble is drawn at random from the jar, the probability that it is red is $\frac{2}{3}$. Find the number of yellow marbles in the jar. **Ans:** Let the number of red marbles be x. $\therefore \frac{x}{18} = \frac{2}{3} \Rightarrow x = 12$ So, number of yellow marbles = (18 – 12) = 6 **OR** A die is thrown twice. What is the probability that (i) 5 will come up at least once, and (ii) 5 will not come up either time ? **Ans:** Total number of outcomes = 36 (i) Favourable outcomes are (1, 5), (2,5), (3,5), (4,5), (5,5), (6,5), (5,1), (5,2), (5,3), (5,4), (5,6) *i.e.*, 11 $\therefore$ P(5 will come up at least one) $= \frac{11}{36}$ (ii) P(5 will not come up either time) $= 1 - \frac{11}{36} = \frac{25}{36}$	 1 1 1 1
25.	Show that cos 38° cos 52° – sin 38° sin 52° = cos 90°. **Ans:** LHS $= \cos 38° \cos 52° - \sin 38° \sin 52°$ $= \sin 52° \sin 38° - \sin 38° \sin 52°$ = 0 = cos 90° = RHS **OR** Given 15 cot A = 8, find the values of sin A and sec A. **Ans:** $\cot A = \frac{8}{15} = \frac{B}{P}$ Let B = 8 k, P = 15K ⇒ H = 17 k $\therefore \sin A = \frac{15}{17}$ and $\sec A = \frac{17}{8}$	 1 1 1+1

26. Find the mode of the following distribution

Classes:	25-30	30-35	35-40	40-45	45-50	50-55
Frequency:	20	36	53	40	28	14

Ans: 35-40 is the median class **1/2**

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

$$= 35 + \frac{53-36}{2\times 53 - 36 - 40} \times 5 \qquad \mathbf{1}$$

$$= 37.83 \text{ (approx)} \qquad \mathbf{1/2}$$

SECTION – C

Question numbers 27 to 34 carry 3 marks each.

27. Prove that $\dfrac{\sin\theta}{\cot\theta + \operatorname{cosec}\theta} = 2 + \dfrac{\sin\theta}{\cot\theta - \operatorname{cosec}\theta}$

Ans: $\text{LHS} = \dfrac{\sin\theta}{\cot\theta + \operatorname{cosec}\theta}$ **$1\frac{1}{2}$**

$$= \frac{\sin^2\theta}{\cos\theta + 1} = \frac{1-\cos^2\theta}{1+\cos\theta} = 1 - \cos\theta$$

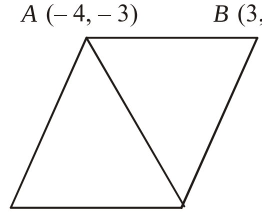
$$\text{RHS} = 2 + \frac{\sin^2\theta}{\cos\theta - 1} = 2 - (1+\cos\theta) \qquad \mathbf{1\tfrac{1}{2}}$$

$$= 1 - \cos\theta$$

$\therefore$ LHS = RHS

28. Find the area of the quadrilateral ABCD whose vertices are A(– 4, – 3), B(3, – 1), C(0, 5) and D(– 4, 2).

Ans:



$$ar(ABC) = \frac{1}{2}\left|-4(-6) + 3(8) + 0\right| = 24 \text{ sq units.} \qquad \mathbf{1}$$

$$ar(ACD) = \frac{1}{2}\left|-4\times 3 + 0 - 4(-8)\right| = 10 \text{ sq units.} \qquad \mathbf{1}$$

$$ar(ABCD) = ar(ABC) + ar(ACD) = 34 \text{ sq units.} \qquad \mathbf{1}$$

OR

If the points A(2, 0), B(6, 1) and C(p, q) form a triangle of area 12 sq. units (positive only) and 2p + q = 10, then find the values of p and q.

Ans: $ar(ABC) = 12$ sq units

$$\therefore \quad \frac{1}{2}\left[2(1-q) + 6q + p(-1)\right] = 12 \qquad \mathbf{1}$$

$\Rightarrow \; 4q - p = 22 \qquad ...(i)$ **1**

Given $\; 2p + q = 10 \qquad ...(ii)$

Solving (i) & (ii), we get $p = 2$, $q = 6$ **1**

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

Ans: Let us assume, to the contrary, that $\sqrt{5}$ is rational

$\therefore \; \sqrt{5} = \frac{p}{q}$, where p and q are coprime and $q \neq 0$ **1**

$\Rightarrow \; 5q^2 = p^2 \; \ldots$ (i)

$\therefore$ 5 divides p^2 and hence p also

Let p = 5m, where m is an integer. **1**

$\therefore$ from (i) $q^2 = 5m^2$

$\therefore$ 5 divides q^2 and hence q also.

So, 5 divides p and q both, which is a contraction to our assumption. **1**

Hence $\sqrt{5}$ is irrational

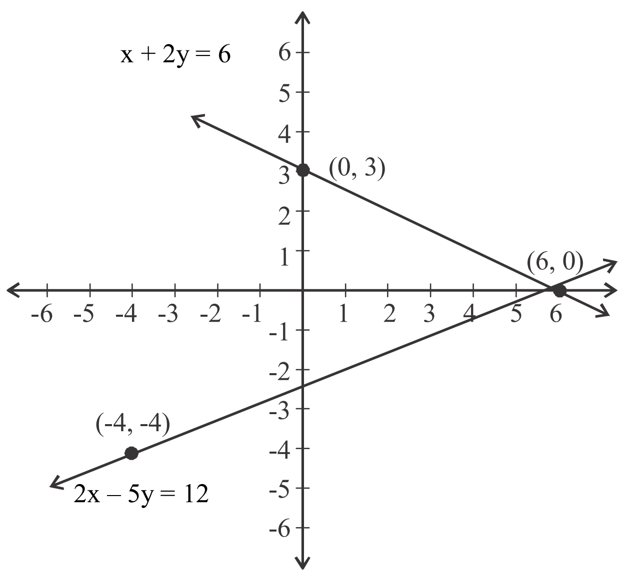
30. Solve the equations x + 2y = 6 and 2x – 5y = 12 graphically.

Ans: $x + 2y = 6$

x	0	6
y	3	0

$2x - 5y = -12$

x	6	–4
y	0	–4



1 for each line = 2

Solution is $x = 6$, $y = 0$ **1**

OR

Solve the following equations for x and y using cross-multiplication method :

(ax – by) + (a + 4b) = 0

(bx + ay) + (b – 4a) = 0

Ans: $ax - by + (a + 4b) = 0$

$bx + ay + (b - 4a) = 0$

$$\frac{x}{-b^2+4ab-a^2-4ab}=\frac{y}{ab+4b^2-ab+4a^2}=\frac{1}{a^2+b^2}$$ 1

$$x=\frac{-(a^2+b^2)}{a^2+b^2},\ y=\frac{4(a^2+b^2)}{a^2+b^2}$$ 1

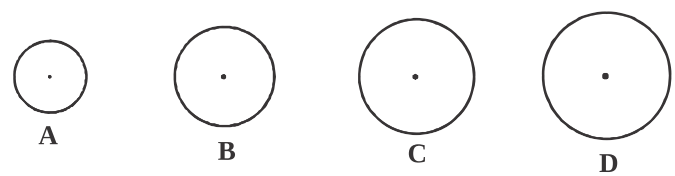
$x=-1,\ y=4$ 1

31. Draw a circle of radius 2·5 cm. Take a point P outside the circle at a distance of 7 cm from the centre. Then construct a pair of tangents to the circle from point P.

Ans: Correct construction of circle of radius 2.5 cm. 1

Correct construction of tangents 2

32. A mint moulds four types of copper coins A, B, C and D whose diameters vary from 0·5 cm to 5 cm. The first coin A has a diameter of 0·7 cm. The second coin B has double the diameter of coin A and from then onwards the diameters increase by 50%. Thickness of each coin is 0·25 cm.



After reading the above, answer the following questions :

(i) Fill in the diameters of the coins required in the following table :

Type of Coin	Diameter (in cm)
A	0·7
B	---

(ii) Complete the following table :

Type of Coin	Area (in cm^2) of one face	Volume (in cm^3)
A	0·335	0·09625
B	---	---

$\left[\text{Use } \pi=\frac{22}{7}\right]$

Ans: (i) 1

Type of coin	*Diameter* (in cm)
A	0.7
B	1.4

	(ii)			1+1

Type of coin	*Area* (cm^2) of one face	*Volume* (cm^3)
A	0.385	0.09625
B	$\frac{22}{7}\times 0.7\times 0.7 = 1.54$	$1.54\times 0.25 = 0.385$

33. Prove that the lengths of tangents drawn from an external point to a circle are equal.

Ans: For correct given, to prove, figure and construction **1/2×4=2**

For correct proof. **1**

34. Find the sum of first 16 terms of an Arithmetic Progression whose 4^{th} and 9^{th} terms are – 15 and – 30 respectively.

Ans: $a_4 = -15 \Rightarrow a + 3d = -15$ **1/2**

$a_9 = -30 \Rightarrow a + 8d = -30$ **1/2**

Solving the two, we get $a = -6, d = -3$ **1**

$S_{16} = \frac{16}{2}\left[2(-6)+15(-3)\right]$

$= 8 \times (-57) = -456$ **1**

OR

If the sum of first 14 terms of an Arithmetic Progression is 1050 and its fourth term is 40, find its 20^{th} term.

Ans: $S_{14} = 1050 \Rightarrow \frac{14}{2}(2a + 13d) = 1050$

$\Rightarrow \quad 2a + 13d = 150 \quad \ldots$ (i) **1/2**

$a_4 = 40$

$\Rightarrow \quad a + 3d = 40 \quad \ldots$ (ii) **1/2**

Solving (i) & (ii), we get a = 10, d = 10 **1**

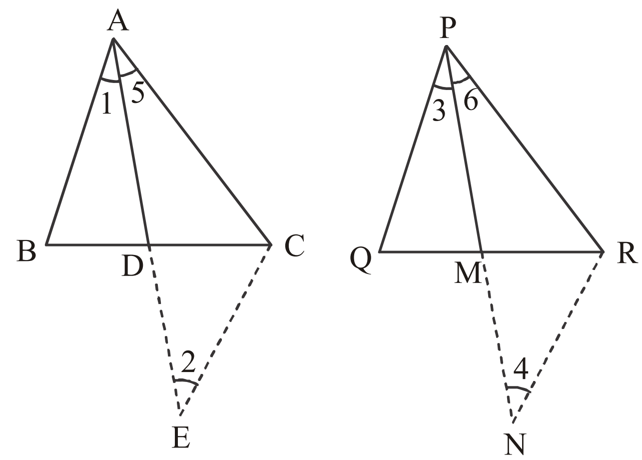
$a_{20} = a + 19d = 200$ **1**

SECTION – D

Question numbers 35 to 40 carry 4 marks each.

35. Sides AB and AC and median AD of Δ ABC are respectively proportional to sides PQ and PR and median PM of Δ PQR. Show that Δ ABC ~ Δ PQR.

Ans:



$$\frac{AB}{PQ} = \frac{AC}{PR} = \frac{AD}{PM} \quad \ldots(i)$$

Construction: Extend AD to E such that AD = DE and join DE.

Extend PM to N such that PM = MN and join RN **1/2**

$\Delta ABD \cong \Delta ECD$ (SAS)

$\Delta PQM \cong \Delta NRM$ (SAS) **1**

$\therefore \angle 1 = \angle 2$, CE = AB ...(ii)

and $\angle 3 = \angle 4$, PQ = NR ...(iii) **1/2**

$\Rightarrow$ from (i), $\dfrac{CE}{RN} = \dfrac{AC}{PR} = \dfrac{2AD}{2PM}$

$\Rightarrow \dfrac{CE}{RN} = \dfrac{AC}{PR} = \dfrac{AE}{PN}$

$\therefore \Delta AEC \sim \Delta PNR$ (SSS) **1**

$\Rightarrow \angle 2 = \angle 4$ ...(iv)

and $\angle 5 = \angle 6$

From (ii), (iii), & (iv), $\angle 1 = \angle 3$

$\Rightarrow \angle 1 + \angle 5 = \angle 3 + \angle 6$

$\Rightarrow \angle BAC = \angle QPR$

Also $\dfrac{AB}{PQ} = \dfrac{AC}{PR}$

$\therefore \Delta ABC \sim \Delta PQR$ (SAS) **1**

OR

In Figure-5, BN and CM are medians of a Δ ABC right-angled at A. Prove that 4 ($BN^2 + CM^2$) = 5 BC^2.

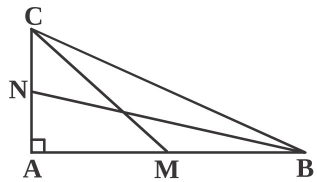


Figure-5

Ans: In ΔABC, $AB^2 + AC^2 = BC^2$ ... (i) **1/2**

In ΔAMC, $AM^2 + AC^2 = CM^2$ ... (ii) **1/2**

In ΔANB, $AN^2 + AB^2 = BN^2$ ... (iii) **1/2**

Adding (ii) & (iii), $AM^2 + AN^2 + AC^2 + AB^2 = CM^2 + BN^2$ **1**

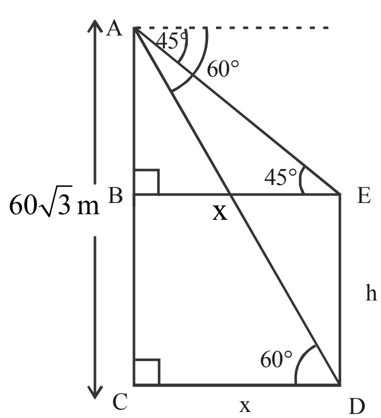
$\Rightarrow \left(\frac{AB}{2}\right)^2 + \left(\frac{AC}{2}\right)^2 + AC^2 + AB^2 = CM^2 + BN^2$ **1**

$\Rightarrow 5\left(AB^2 + AC^2\right) = 4(CM^2 + BN^2)$

$\therefore 5BC^2 = 4(CM^2 + BN^2)$ [using (i)] **1/2**

36. The angles of depression of the top and bottom of a tower as seen from the top of a $60\sqrt{3}$ m high cliff are 45° and 60° respectively. Find the height of the tower. $\left(\text{Use } \sqrt{3} = 1.73\right)$

Ans:



Correct figure **1**

In ΔACD, $\frac{60\sqrt{3}}{x} = \tan 60°$

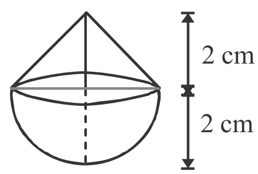
$\therefore x = 60$ **1**

In ΔABE, $\frac{60\sqrt{3} - h}{x} = \tan 45°$ **1**

$\therefore 60\sqrt{3} - h = 60$

$\therefore h = 60\left(\sqrt{3} - 1\right)$m

$\therefore$ height of tower = $60\left(\sqrt{3} - 1\right)$m = 60 × 0.73 = 43.8m **1**

37.	A well of diameter 3 m is dug 14 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 4 m to form a platform. Find the height of the platform. $\left[\text{Take } \pi = \frac{22}{7}\right]$	
	Ans: Volume of earth dug out from the well = Volume of platform.	1
	$\pi \times \frac{3}{2} \times \frac{3}{2} \times 14 = \pi\left[\left(\frac{11}{2}\right)^2 - \left(\frac{3}{2}\right)^2\right] \times h$	2
	$\Rightarrow h = \frac{9}{8}$ m or 1.125 m	1
	OR	
	In Figure-4, a solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. $\left[\text{Take } \pi = \frac{22}{7}\right]$	
	 Figure-4	
	Ans: Volume of toy = Volume of cone + Volume of hemisphere	1
	$= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$	
	$= \frac{3.14 \times 2 \times 2}{3} \times (2+4)$ cm^3	2
	$= 25.12$ cm^3	1
38.	A and B jointly finish a piece of work in 15 days. When they work separately, A takes 16 days less than the number of days taken by B to finish the same piece of work. Find the number of days taken by B to finish the work.	
	Ans: Let the number of days taken by B be x days.	
	$\therefore$ number of days taken by A = (x – 16) days	1/2
	$\frac{1}{x} + \frac{1}{x-16} = \frac{1}{15}$	1
	$\therefore x^2 - 46x + 240 = 0$	1
	$(x - 40)(x - 6) = 0$	1
	x = 40, 6 Rejected ($\because$ 6 – 16 is –ve)	
	$\therefore$ Number of days taken by B = 40 days	1/2

39. If the polynomial $f(x) = 3x^4 - 9x^3 + x^2 + 15x + k$ is completely divisible by $3x^2 - 5$, then find the value of k. Using the quotient, so obtained, find two zeroes of the polynomial.

Ans:

$$
\begin{array}{r|l|l}
3x^2-5 & 3x^4-9x^3+x^2+15x+k & x^2-3x+2 \\
 & \underline{\cancel{3x^4} \qquad \mp 5x^2} & \\
 & -9x^3+6x^2+15x+k & \\
 & \underline{\mp 9x^3 \qquad \pm 15x} & \\
 & 6x^2 \qquad +k & \\
 & \underline{6x^2 \qquad -10} & \\
 & 10+k & \\
\end{array}
$$

2

2

$10 + k = 0 \Rightarrow k = -10$ 1

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

$= (x-1)(x-2)$ 1

Two zeroes of polynomial are 1 and 2

OR

Find all the zeroes of the polynomial $x^4 - 8x^3 + 23x^2 - 28x + 12$ if two of its zeroes are 2 and 3.

Ans: $p(x) = x^4 - 8x^3 + 23x^2 - 28x + 12$

$(x-2)(x-3) = x^2 - 5x + 6$ is a factor of $p(x)$ 1

$$
\begin{array}{r|l|l}
x^2-5x+6 & x^4-8x^3+23x^2-28x+12 & x^2-3x+2 \\
 & \underline{x^4 - 5x^3 + 6x^2} & \\
 & -3x^3+17x^2-28x+12 & \\
 & \underline{-3x^3+15x^2-18x} & \\
 & 2x^2-10x+12 & \\
 & \underline{2x^2-10x+12} & \\
 & \times & \\
\end{array}
$$

2

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

$\therefore$ All zeroes of $p(x)$ are 2,3,1 and 2.

40.	Draw 'less than' ogive for the following distribution and hence find its median.	

Class	Frequency
20-30	10
30-40	8
40-50	12
50-60	24
60-70	6
70-80	25
80-90	15

Ans:

Classes	Cumulative frequency
Less than 30	10
Less than 40	18
Less than 50	30
Less than 60	54
Less than 70	60
Less than 80	85
Less than 90	100

$1\frac{1}{2}$

Plotting the points (30,10), (40,18), (50,30), (60,54), (70,60),

(80,85), (90,100) and joining them. $1\frac{1}{2}$

Median = 58.5 (approx) **1**