Marking Scheme Strictly Confidential
(For Internal and Restricted use only) Secondary School Examination, 2025
SUBJECT NAME MATHEMATICS (BASIC) (Q.P. CODE/Set No. 241/430B)

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.
2	**"Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, evaluation done and several other aspects. It's leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc. may invite action under various rules of the Board and IPC."**
3	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 due 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, due marks should be awarded.**
4	The Marking scheme carries only suggested value points for the answers. These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
5	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. If there is any variation, the same should be zero after deliberation and discussion. 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.
6	Evaluators will mark (✓) wherever answer is correct. For wrong answer CROSS 'X" be marked. Evaluators will not put right (✓) while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**
7	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.
8	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.
9	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note **"Extra Question"**.
10	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11	A full scale of marks _(example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
12	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).This is in view of the reduced syllabus and number of questions in question paper.

13	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 an answer. 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/not same. 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.
14	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.
15	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.
16	The Examiners should acquaint themselves with the guidelines given in the "**Guidelines for spot Evaluation**" before starting the actual evaluation.
17	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.
18	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

MARKING SCHEME - 430B
MATHEMATICS (BASIC) (Subject Code 241)

SECTION – A

Question No. **1** to **20** are Multiple Choice Questions (MCQs) of **1** mark each :

1. The product of the H.C.F. and L.C.M. of two numbers 50 and 20 is

(A) 100 (B) 1000

(C) 50 (D) 20

Answer : (B) 1000 **1**

2. If α and β are two zeroes of the quadratic polynomial $p(x) = x^2 - 11x + 30$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ is equal to :

(A) $\frac{30}{11}$ (B) $\frac{11}{30}$

(C) $-\frac{11}{30}$ (D) $-\frac{30}{11}$

Answer : (B) $\frac{11}{30}$ **1**

3. The value of k for which the pair of linear equations $kx - 3y = 5$, $4x - 6y = 10$ has infinitely many solutions, is :

(A) 4 (B) 3

(C) 2 (D) 1

Answer : (C) 2 **1**

4. If $x = \sqrt{3}$ is a solution of the equation $ax^2 + \sqrt{3}x - 12 = 0$, then

(A) a = 3 (B) a = 2

(C) a = 1 (D) $a = \sqrt{3}$

Answer : (A) a = 3 **1**

5. The n^{th} term of an A.P. is 3n + 2. The common difference is :

(A) 8 (B) 2

(C) 5 (D) 3

Answer : (D) 3 **1**

6. The fourth vertex D of a parallelogram ABCD whose three vertices are A(–4, 1), B(4, 5) and C(6, 1) is :

(A) (–2, –3) (B) (3, –2)

(C) (0, –1) (D) (0, 1)

Answer : (A) (–2, –3) **1**

7. The ratio in which the x-axis divides the line segment joining the points A(−8, 4) and B(−6, −2) is :

(A) 5 : 1 (B) 3 : 1

(C) 2 : 1 (D) 1 : 2

Answer : (C) 2 : 1 **1**

8. If two tangents inclined at an angle of 60° are drawn from an external point to a circle of radius 6 cm, then the length of each tangent is :

(A) $3\sqrt{3}$ cm (B) 6 cm

(C) 12 cm (D) $6\sqrt{3}$ cm

Answer : (D) $6\sqrt{3}$ cm **1**

9. If in two triangles ABC and DEF, $\frac{AB}{EF} = \frac{BC}{DE} = \frac{CA}{DF}$; then

(A) $\Delta DEF \sim \Delta BCA$ (B) $\Delta DEF \sim \Delta CBA$

(C) $\Delta ABC \sim \Delta DEF$ (D) $\Delta ABC \sim \Delta DFE$

Answer : (B) $\Delta DEF \sim \Delta CBA$ **1**

10. In ΔABC, P is a point on AB and Q is a point of AC such that PQ $\parallel$ BC. If AP : PB = 3 : 2, then PQ : BC is equal to :

(A) 3 : 2 (B) 2 : 5

(C) 3 : 5 (D) 5 : 3

Answer : (C) 3 : 5 **1**

11. In two concentric circles with centre O, the radius of outer circle is 25 cm. Chord PQ of the outer circle is tangent to the inner circle at R. If PQ = 14 cm, then the radius of the inner circle is :

(A) $\sqrt{429}$ cm (B) 24 cm

(C) $\sqrt{674}$ cm (D) 20 cm

Answer : (B) 24 cm **1**

12. If $\cos A = \frac{3}{5}$, then the value of tan A is :

(A) $\frac{4}{5}$ (B) $\frac{5}{4}$

(C) $\frac{3}{4}$ (D) $\frac{4}{3}$

Answer : (D) $\frac{4}{3}$ **1**

13. If $\sin\theta = \frac{\sqrt{3}}{2}$, then the value of $2\sqrt{3} \cdot \cos\frac{\theta}{2}$ is :

(A) 3 (B) $2\sqrt{3}$

(C) $\frac{3}{2}$ (D) $\sqrt{3}$

Answer : (A) 3 **1**

14. The area (in cm^2) of a sector of a circle of radius 14 cm cut off by an arc of length 22 cm is :

(A) 77 (B) 308

(C) 154 (D) 462

Answer : (C) 154 **1**

15. The minute hand of a clock is 21 cm long. The distance covered by the tip of minute hand from 2:10 pm to 2:25 pm is :

(A) 346.5 cm (B) 33 cm

(C) 66 cm (D) 16.5 cm

Answer : (B) 33 cm **1**

16. Volumes of two spheres are in the ratio 64 : 27. The ratio of their surface areas is :

(A) 4 : 3 (B) 3 : 4

(C) 16 : 9 (D) 9 : 16

Answer : (C) 16 : 9 **1**

17. A card is drawn from a packet of 50 identical cards numbered from 1 to 50. The probability of drawing a number which is a perfect square, is :

(A) $\frac{7}{50}$ (B) $\frac{8}{50}$

(C) $\frac{6}{50}$ (D) $\frac{10}{50}$

Answer : (A) $\frac{7}{50}$ **1**

18. The probability of getting a sum of 7, when two dice are thrown simultaneously, is :

(A) $\frac{1}{9}$ (B) $\frac{1}{12}$

(C) $\frac{1}{6}$ (D) $\frac{5}{36}$

Answer : (C) $\frac{1}{6}$ **1**

*Questions number **19** and **20** are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.*

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is ***not*** the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

19. **Assertion (A) :** If the value of mode and mean for a distribution is 50 and 56 respectively, then the value of median is 54.

Reason (R) : Median $= \frac{1}{3}$ (Mode – 2 Mean)

Answer : (C) Assertion (A) is true, but Reason (R) is false. **1**

20. **Assertion (A) :** The probability that the date of birth of a man is in the month of June is $\frac{1}{12}$.

Reason (R) : There are 12 months in a year.

Answer : (D) Assertion (A) is false, but Reason (R) is true. **1**

SECTION – B

Q. Nos. **21** to **25** are very short answer type questions of **2** marks each.

21. Find the smallest 5-digit number exactly divisible by 24 and 36.

Solution:

LCM : (24, 36) = 72 **1**

$$72\overline{)10000}\ (138$$

72
280
216
640 ½
576
64

∴ Required number is 10000 + 72 – 64 =10008 ½

22. (a) Find the zeroes of the polynomial $p(x) = 15x^2 - 19x + 6$.

OR

(b) If one zero of the polynomial $p(x) = (k - 1)x^2 - (4k + 1)x + 10$ is 5, find the value of k.

Solution:

(a) For zeroes $15x^2 - 19x + 6 = 0$

Zeroes are $\frac{3}{5}$ and $\frac{2}{3}$ **1+1**

OR

(b) Since, 5 is the zero of the given polynomial

$\therefore (k - 1)(5)^2 - (4k + 1)(5) + 10 = 0$ **1**

$\Rightarrow k = 4$ **1**

23. The sum of first n terms of an A.P. is given by $S_n = 4n^2 - n$.

Find the 25th term of this A.P.

Solution:

$S_n = 4n^2 - n$

$a_{25} = S_{25} - S_{24}$ ½

$= [4(25)^2 - 25] - [4(24)^2 - 24]$ **1**

$= 195$ ½

24. (a) Prove that : $\frac{\sin A}{1 + \cos A} + \frac{1 + \cos A}{\sin A} = 2 \operatorname{cosec} A$

OR

(b) If $\sin(A + 2B) = \frac{\sqrt{3}}{2}$ and $\cos(A + 4B) = 0$, $A > B$, find A and B.

Solution:

(a) $\frac{\sin A}{1+\cos A} + \frac{1+\cos A}{\sin A}$

$= \frac{\sin^2 A + 1 + \cos^2 A + 2\cos A}{\sin A(1+\cos A)}$ ½

$= \frac{1+1+2\cos A}{\sin A(1+\cos A)}$ ½

$= \frac{2(1+\cos A)}{\sin A(1+\cos A)}$ ½

$= \frac{2}{\sin A} = 2 \operatorname{cosec} A$ ½

OR

(b) $\sin(A + 2B) = \frac{\sqrt{3}}{2} \Rightarrow A + 2B = 60^\circ$ ½

$\cos(A + 4B) = 0 \Rightarrow A + 4B = 90^\circ$ ½

Solving to get $A = 30^\circ$, $B = 15^\circ$ ½ + ½

25. All the red face cards are removed from a pack of 52 playing cards. The remaining cards are well shuffled and then a card is drawn at random. Find the probability of getting a :

(i) red card

(ii) a king or queen

Solution :

Total number of cards = 52 – 6 = 46

(i) P (a red card) = $\frac{20}{46}$ or $\frac{10}{23}$ **1**

(ii) P (a king or queen) = $\frac{4}{46}$ or $\frac{2}{23}$ **1**

SECTION – C

Q. Nos. **26** to **31** are short answer questions of **3** marks each :

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

Solution:

Let $\sqrt{2}$ be a rational number such that $\sqrt{2} = \frac{a}{b}$, where a and b are coprime and $b \neq 0$ ½

$\sqrt{2}b = a$
$2b^2 = a^2$
2 divides a^2
2 divides a as well } **1**

$a = 2p$ where p is some integer
$a^2 = 4p^2$
$2b^2 = 4p^2$
$b^2 = 2p^2$
2 divides b^2
2 divides b as well } **1**

$\therefore$ 2 is a common factor of a and b which is a contradiction as a and b are coprime ½

$\therefore$ Our assumption is wrong. Hence, $\sqrt{2}$ is an irrational number.

27. (a) Solve the following pair of linear equations :

$31x + 43y - 117 = 0$; $43x + 31y = 105$

OR

(b) When 1 is subtracted from the numerator and 2 is added to the denominator of a fraction, it becomes $\frac{1}{2}$. When 7 is subtracted from the numerator and 2 is subtracted from the denominator, the fraction becomes $\frac{1}{3}$. Find the fraction.

Solution:

(a) $31x + 43y = 117$ ……. (i)

$43x + 31y = 105$ ……. (ii)

Adding (i) and (ii) we get

$74x + 74y = 222 \Rightarrow x + y = 3$ ……. (iii) **1**

Subtracting (i) and (ii) we get

$-12x + 12y = 12$ or $-x + y = 1$ …….. (iv) **1**

Solving (iii) and (iv) $x = 1,\ y = 2$ **1**

OR

(b) Let numerator be x and denominator be y

$\therefore$ fraction is $\frac{x}{y}$

$\frac{x-1}{y+2} = \frac{1}{2} \Rightarrow 2x - y = 4$ ……. (i) **1**

and $\frac{x-7}{y-2} = \frac{1}{3} \Rightarrow 3x - y = 19$ ……(ii) **1**

Solving (i) and (ii), we get $x = 15,\ y = 26$ **½ + ½**

$\Rightarrow$ fraction is $\frac{15}{26}$

28. S is any point on the side QR of a ΔPQR such that $\angle PSR = \angle QPR$.

Prove that $\frac{QR}{RP} = \frac{RP}{RS}$.

Solution:

In ΔPQR and ΔSPR

$\angle QPR = \angle PSR$ (Given)

$\angle R = \angle R$ (common) } **1**

$\Rightarrow$ $\Delta PQR \sim \Delta SPR$ (AA similarity) **1**

$\therefore \frac{QR}{PR} = \frac{PR}{SR}$

or $\frac{QR}{RP} = \frac{RP}{RS}$ **1**

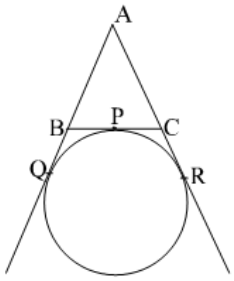
29. (a) A circle touches the side BC of a ΔABC at P and also touches the sides AB and AC produced at Q and R respectively. Prove that AR = $\frac{1}{2}$ (perimeter of ΔABC).

OR

(b) Prove that the tangents drawn to a circle at the end points of a diameter are parallel to each other.

Solution:

(a)



AR = AQ (lengths of tangents from an external point are equal) ½

2AR = AQ + AR

= AB + BQ + AC + CR ½

but BQ = BP
and CR = CP } (lengths of tangents from an external point are equal) ½

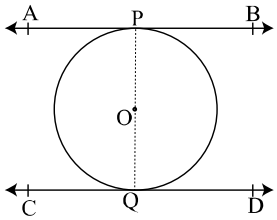
∴ 2AR = AB + BP + AC + CP

= AB + BC+ AC = Perimeter of ΔABC **1**

∴ AR = $\frac{1}{2}$ (Perimeter of ΔABC) ½

OR

(b)



Let APB and CQD are tangents at the end points P and Q of diameter PQ of a circle with centre O.

$\angle APO = \angle DQO = 90^O (tangent\ is\ perpendicular\ to\ radius\ at\ the\ point\ of\ contact)$ **1**

$\angle APO$ and $\angle DQO$ are alternate interior angles **1**

∴ AB || CD **1**

30. If cos θ + sin θ = $\sqrt{2}$ cos θ, then prove that

cos θ – sin θ = $\sqrt{2}$ sin θ.

Solution: $\cos\theta + \sin\theta = \sqrt{2}\ \cos\theta$

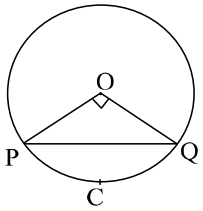
$\Rightarrow \sin\theta = (\sqrt{2} - 1)\cos\theta = \dfrac{(\sqrt{2}-1)(\sqrt{2}+1)}{\sqrt{2}+1}\cos\theta$ **1½**

$\Rightarrow (\sqrt{2} + 1)\sin\theta = \cos\theta$ **1**

$\Rightarrow \sqrt{2}\ \sin\theta = \cos\theta - \sin\theta$ **½**

31. A chord PQ of a circle of diameter 28 cm subtends an angle of 90° at the centre O. Find the area of the sector OPCQ, where C is a point on minor arc PQ. Also, find the area of segment PCQ.

Solution:



Area of sector OPCQ $= \frac{90}{360} \times \frac{22}{7} \times 14 \times 14$ **1**

$= 154\ \text{cm}^2$ **½**

Area of the segment PCQ = Area of sector OPCQ – Area of ΔOPQ

$= 154 - \frac{1}{2} \times 14 \times 14$ **1**

$= 56\ \text{cm}^2$ **½**

SECTION D

*This section has **4** Long Answer (LA) type questions carrying **5** marks each.* *4×5=20*

32. (a) Solve for x : $\dfrac{x-2}{x-3} + \dfrac{x-4}{x-5} = \dfrac{10}{3}$; $x \neq 3, 5$

OR

(b) A motor boat, whose speed in still water is 20 km/h, takes 1 hour more to go 48 km upstream than to return downstream to the same point. Find the speed of the stream.

Solution:

(a) $\dfrac{x-2}{x-3} + \dfrac{x-4}{x-5} = \dfrac{10}{3}$

$\Rightarrow 3[(x-2)(x-5) + (x-3)(x-4)] = 10(x-3)(x-5)$ **1½**

$\Rightarrow 4x^2 - 38x + 84 = 0$ or $2x^2 - 19x + 42 = 0$ **1½**

$\Rightarrow (x-6)(2x-7) = 0$

$\Rightarrow x = 6, x = \dfrac{7}{2}$ **1+1**

OR

(b) Let speed of stream be x km/h

Speed of boat upstream= $(20 - x)$ km/h ½

Speed of boat downstream = $(20 + x)$ km/h ½

$\therefore \frac{48}{20-x} - \frac{48}{20+x} = 1$ **1½**

$x^2 + 96x - 400 = 0$ **1½**

$(x + 100)(x - 4) = 0$

$x = 4$, $x = -100$ (rejected)

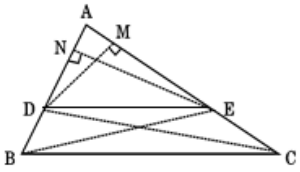
Hence, speed of stream is 4 km/h. **1**

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

Solution**:** Given, To prove, Construction **1**

Given: In Δ ABC, DE ∥ BC

To Prove: $\frac{AD}{DB} = \frac{AE}{EC}$



Construction: Draw DM ⊥ AC, EN ⊥ AB, join BE and CD

Proof : $\frac{ar(\Delta ADE)}{ar(\Delta DBE)} = \frac{\frac{1}{2} \times AD \times EN}{\frac{1}{2} \times DB \times EN} = \frac{AD}{DB}$ ……..(i) **1**

$\frac{ar(\Delta ADE)}{ar(\Delta DCE)} = \frac{\frac{1}{2} \times AE \times DM}{\frac{1}{2} \times EC \times DM} = \frac{AE}{EC}$ ……..(ii) **1**

As ΔDBE and ΔDCE lie on the same base and between same parallels BC and DE

$\therefore$ ar(ΔDBE) = ar(ΔDCE) or $\frac{ar(\Delta ADE)}{ar(\Delta DBE)} = \frac{ar(\Delta ADE)}{ar(\Delta DCE)}$ ……..(iii) **1**

From (i), (ii) and (iii), we get $\frac{AD}{DB} = \frac{AE}{EC}$ **1**

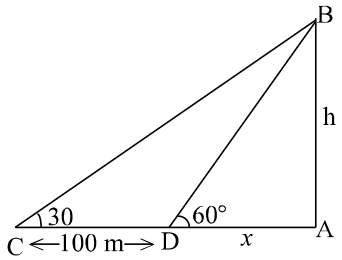
34. (a) The angle of elevation of the top of a tower as observed from a point in a horizontal plane through the foot of the tower is 30°. When the observer moves towards the tower a distance of 100 m, he finds the angle of elevation of the top to be 60°. Find the height of the tower and the distance of first position from the tower.

OR

(b) Two pillars of equal heights stand on either side of a roadway 150 m wide. From a point on the roadway between the pillars, the angles of elevation of the top of the pillars are 60° and 30° respectively. Find the height of the pillars and the position of the point from the pillars.

Solution:

(a)



In ΔDAB,

$\frac{h}{x} = \tan 60^o$ **1**

$h = \sqrt{3}x$ ……..(i) ½

In ΔCAB,

$\frac{h}{x+100} = \tan 30^o$ **1**

$\sqrt{3}\,h = x + 100$ ……..(ii) ½

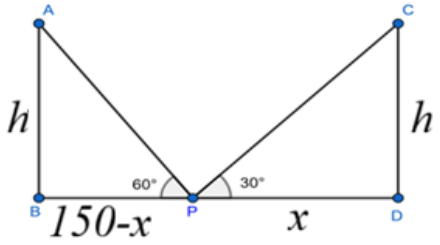
Solving (i) and (ii), we get

$x = 50 \Rightarrow$ AC = 150 m **1**

$h = 50\sqrt{3}$ m or 86.5m **1**

OR

(b)



In ΔPDC

$\frac{h}{x} = \tan 30^o$ **1**

$x = \sqrt{3}h$ …….(i) **½**

In ΔPBA

$\frac{h}{150-x} = \tan 60^o$ **1**

$h = (150 - x)\sqrt{3}$ ……..(ii) **½**

Solving equations (i) and (ii)

h =37.5 ($\sqrt{3}$) m or 64.875 m **1**

x = 112.5 m, 150 – x = 37.5 m **1**

35. Find the mean and the mode for the following frequency distribution :

Class	30 – 35	35 – 40	40 – 45	45 – 50	50 – 55
Frequency	3	9	7	3	2

Solution:

Class	f_i	x_i	u_i	f_iu_i
30 - 35	3	32.5	– 2	– 6
35 - 40	9	37.5	– 1	– 9
40 - 45	7	42.5	0	0
45 - 50	3	47.5	1	3
50 - 55	2	52.5	2	4
	24			**– 8**

Correct Table **1½**

Let assumed mean be 42.5

Mean $= A + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$

$= 42.5 + \frac{(-8)}{24} \times 5$ **1**

$= 40.84$ **½**

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

$= 35 + \frac{9-3}{18-3-7} \times 5$ **1½**

$= 38.75$ **½**

SECTION – E

This section (Q. **36** to **38**) consists of **3** case study based questions of **4** marks each :

36. The best athlete of your school wants to participate in a 300 m. race in a state championship. Presently he can run that distance in 60 seconds but is confident that with each day of practice it will take him 3 seconds less than the previous day. So, first day he will take 60 seconds, 2nd day 57 seconds, third day 54 seconds and so on, to complete the race. He wants to do it in 30 seconds.

Based on the above, answer the following questions :

(i) Write the first five terms of time and show that it forms an A.P.

(ii) How much time he will take on 6th day to complete the race ?

(iii) (a) On which day he will be able to achieve his target of 30 seconds ?

OR

(b) If he devotes more time in practice and that may take him 3.2 seconds less than the previous day in completing the race, then on which day he will be able to complete the race in 28 seconds ?

Solution:

(i) 60, 57, 54, 51, 48 — ½

This is an A.P. as common difference is (-3) — ½

(ii) Required time = 45 seconds — **1**

(iii) (a) $a_n = 60 + (n-1)(-3) = 30$ — **1**

$\Rightarrow$ n = 11 — **1**

OR

(b) $a_n = 60 + (n-1)(-3.2) = 28$ — **1**

$\Rightarrow$ n = 11 — **1**

Case Study – 2

37. In the school garden, Arun (A), Babu (B), Chandra (C) and Daya (D) planted flower plants of Sunflower, Rose, Champa and Jasmine respectively at point A(2, 8), B(7, 8), C(9, 3) and D(2, 3) respectively.

Based on the above, answer the following questions :

(i) Find the distances AB and AD.

(ii) Find BC – CD.

(iii) (a) If Varun wants to plant his flower plant at a point M such that DM : MC = 3 : 2, find the coordinates of M.

OR

(b) If N divides the line segment AC in the ratio 2 : 3, find the coordinates of N.

Solution:

(i) $AB = \sqrt{(7-2)^2+(8-8)^2} = 5$ ½

$AD = \sqrt{(2-2)^2+(3-8)^2} = 5$ ½

(ii) $BC - CD = \sqrt{(9-7)^2+(3-8)^2} - \sqrt{(9-2)^2+(3-3)^2} = \sqrt{29} - 7$ **1**

(iii) (a) Let the coordinates of M be (x, y)

$x = \frac{3\times9+2\times2}{3+2} = \frac{31}{5}$ **1**

$y = \frac{3\times3+2\times3}{3+2} = 3$ **1**

$\therefore$ Coordinates of M are $\left(\frac{31}{5}, 3\right)$

OR

(b) Let the coordinates of N be (x, y)

$x = \frac{2\times9+3\times2}{2+3} = \frac{24}{5}$ **1**

$y = \frac{2\times3+3\times8}{2+3} = 6$ **1**

$\therefore$ Coordinates of N are $\left(\frac{24}{5}, 6\right)$

Case Study – 3

38. In a coffee shop, coffee is served in two types of cups. One is cylindrical shape with each of diameter 8 cm and height 7 cm and the other hemispherical with each of diameter 14 cm.

Based on the above, answer the following questions :

(i) What is the outer curved surface area of the cylindrical cup ?

(ii) What is the inner surface area of the hemispherical cup ?

(iii) (a) Find the difference of the capacities of the two cups.

OR

(b) Find the total volume of coffee in two cylindrical and one hemispherical cup.

Solution:

(i) r = 4 cm

Outer C.S.A. of cylindrical cup = $2 \times \frac{22}{7} \times 4 \times 7 = 176$ cm^2 **1**

(ii) R = 7 cm,

Inner Surface Area of hemispherical cup = $2 \times \frac{22}{7} \times 7 \times 7 = 308$ cm^2 **1**

(iii)

(a) Difference in the capacities = $\frac{2}{3} \times \frac{22}{7} \times 7 \times 7 \times 7 \; - \; \frac{22}{7} \times 4 \times 4 \times 7$ **1**

$= \frac{1100}{3}$ cm^3 or 366.67 cm^3 **1**

OR

(b) Total Volume of coffee = $2 \times \frac{22}{7} \times 4 \times 4 \times 7 \; + \; \frac{2}{3} \times \frac{22}{7} \times 7 \times 7 \times 7$ **1**

$= \frac{4268}{3}$ cm^3 or 1422.67 cm^3 **1**