Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2025
SUBJECT NAME MATHEMATICS (BASIC) (Q.P. CODE 430/2/3)

General Instructions: -

1	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
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.

Set 430/2/3

MARKING SCHEME MATHEMATICS (BASIC) 430/2/3

SECTION A

This section has ***20*** *Multiple Choice Questions (MCQs) carrying* ***1*** *mark each. 20×1=20*

1. The ratio of the area of a quadrant of a circle to the area of a circle is :

(A) 2 : 1 (B) 1 : 2

(C) 1 : 4 (D) 4 : 1

Ans: (C) 1:4	1

2. A cone of height 'h' and radius 'r' is surmounted on a hemisphere of same radius. The total surface area of the entire solid will be :

(A) $\pi rh + \pi r^2$

(B) $\pi r\sqrt{h^2+r^2} + \pi r^2$

(C) $\pi r\sqrt{h^2+r^2} + 2\pi r^2$

(D) $\pi r\sqrt{h^2+r^2} + 3\pi r^2$

Answer (C) $\pi r\sqrt{h^2+r^2} + 2\pi r^2$	1

3. In the formula of mode given by mode = $l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$,

f_1 denotes the :

(A) frequency of the modal class

(B) frequency of class preceding modal class

(C) frequency of class succeeding modal class

(D) cumulative frequency of modal class

Ans: (A) frequency of the modal class	1

4. For a distribution, if mean = median = a, then its mode is :

(A) 3a (B) 2a

(C) a (D) 0

Ans: (C) a	1

5. The total number of outcomes in the experiment of simultaneous throw of three dice is :

(A) 6 (B) 18

(C) 36 (D) 216

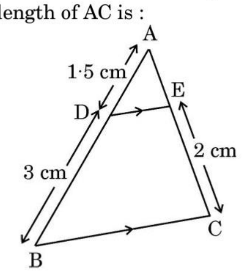
Ans: (D) 216	1

6. The value of (HCF – LCM) for the two numbers 3 and 5 is :

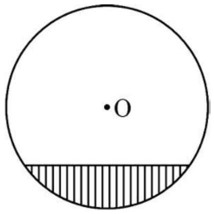
(A) 2 (B) 4

(C) 14 (D) – 14

Ans: (D) -14	1
7. If the number a^n, where n is a natural number, always ends with digit a, then the possible value of 'a' is : (A) 2 (B) 4 (C) 6 (D) 8	
Answer (C) 6	1
8. The number of solutions of the system of equations x = a, x = b ($a \neq b$) is : (A) 0 (B) 1 (C) 2 (D) Infinite	
Answer (A) 0	1
9. One of the values of 'p' for which $px^2 + 4x + p = 0$ has real and equal roots is : (A) 4 (B) – 4 (C) 2 (D) 0	
Answer (C) 2	1
10. Which of the following equations is a quadratic equation ? (A) $x^2 = (x + 1)^2$ (B) $(x - 1)(x + 2) = 2x + 1$ (C) $(x + 2)^3 = 2x(x^2 - 1)$ (D) $\sqrt{x} = x^2$	
Ans: (B) $(x-1)(x+2) = 2x+1$	1
11. The distance of the point (2, 3) from the origin is : (A) 2 (B) 3 (C) 5 (D) $\sqrt{13}$	
Ans: (D) $\sqrt{13}$	1
12. The mid-point of the line segment joining points (1, 3) and (1, – 3) lies : (A) at the origin (B) in the second quadrant (C) on x-axis (D) on y-axis	
Ans: (C) on x-axis	1

13. In the given figure, if DE || BC, AD = 1·5 cm, DB = 3 cm and EC = 2 cm, the length of AC is :  (A) 1·5 cm (B) 3 cm (C) 3·5 cm (D) 4·5 cm	
Ans: (B) 3 cm	1
14. In two concentric circles, a tangent to the smaller circle will intersect the larger circle at : (A) zero point (B) one point (C) two points (D) three points	
Ans: (C) two points	1
15. The value of $\dfrac{2\tan 60^\circ}{1-\tan^2 60^\circ}$ is : (A) -3 (B) $\sqrt{3}$ (C) $-\dfrac{1}{\sqrt{3}}$ (D) $-\sqrt{3}$	
Ans: (D) $-\sqrt{3}$	1
16. $(\sec\theta - \cos\theta)^2 + \sin^2\theta - \tan^2\theta = ?$ (A) 0 (B) 1 (C) 2 (D) 4	
Ans: (A) 0	1
17. The length of the shadow of a tower when the sun's altitude changes from 30° to 60° will : (A) become shorter (B) become longer (C) remain same (D) be doubled	
Ans: (A) become shorter	1

18. In the given figure, the shaded region represents :



(A) minor sector (B) major sector
(C) minor segment (D) major segment

Ans: (C) minor segment	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) :* The prime numbers which divide 36 also divide 6.

Reason (R) : Any number which divides p^2 also divides p.

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

20. *Assertion (A) :* All congruent triangles are similar.

Reason (R) : In congruent triangles, the ratio of corresponding sides is 1 : 1.

Ans: (A)Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).	1

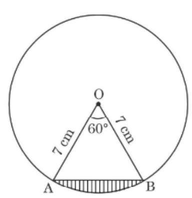
SECTION B

*This section has **5** Very Short Answer (VSA) type questions carrying **2** marks each.* *5×2=10*

21. (a) The area of a smaller circle is equal to the area of a sector of a larger circle with central angle 120°. The radii of the smaller and larger circles are 'r' and 'R' respectively. Find r : R.

OR

(b) In the given figure, O is the centre of a circle of radius 7 cm. AB is a chord of the circle. Find the perimeter of the shaded region.



Solution:(a) A.T.Q.	
$\pi r^2 = \frac{120}{360}\pi R^2$	1
$\frac{r^2}{R^2} = \frac{1}{3}$	½
$r : R = 1 : \sqrt{3}$	½
OR	
(b) Δ AOB is an equilateral triangle as $\angle AOB = 60^0$	
$\therefore$ AB = 7 cm	½
Length of minor arc AB $= \frac{60}{360} \times 2 \times \frac{22}{7} \times 7 = \frac{22}{3}$	½
$\therefore$ Perimeter of the shaded region $= \frac{22}{3} + 7$	½
$= \frac{43}{3}$ cm or 14.33 cm	½

22. (a) Find the value of c for which the following pair of linear equations has infinitely many solutions :

$cx + 3y = c - 3$

$12x + cy = c$

OR

(b) Solve for x and y :

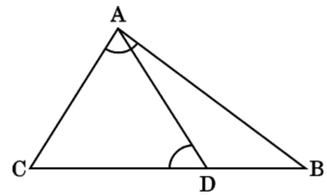
$3x + 2y = 65$

$2x + 3y = 60$

Solution: (a) $\frac{c}{12} = \frac{3}{c} = \frac{c-3}{c}$	1
$\Rightarrow c^2 = 36$ and $c^2 - 6c = 0$	
$\Rightarrow c = \pm 6$ and $c = 0,6$	½
$\therefore c = 6$	½
OR	
(b) Solving the given equations to get x = 15	1
and y =10	1

23. D is a point on side BC of Δ ABC such that $\angle$ ADC = $\angle$ BAC. Prove that $(CA)^2 = CB \cdot CD$.

Solution:



Correct figure: ½

In ΔADC and ΔBAC,

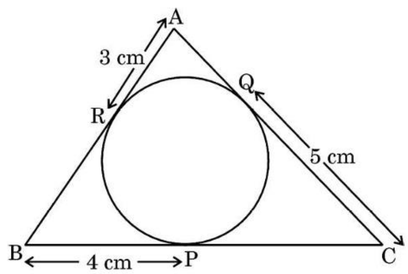
$\angle$ADC = $\angle$BAC (given) ½

$\angle$C = $\angle$C (common) ½

ΔADC ~ ΔBAC (By AA similarity criterion) ½

$$\Rightarrow \frac{CA}{CB} = \frac{CD}{CA} \Rightarrow (CA)^2 = CB.CD$$ ½

24. In the given figure, Δ ABC circumscribes a circle. If AR = 3 cm, BP = 4 cm and QC = 5 cm, find the perimeter of Δ ABC.



Solution: As the length of tangents from an external point to a circle are equal

$$\left.\begin{array}{l} BP = BR = 4\ cm \\ CQ = CP = 5\ cm \\ AR = AQ = 3\ cm \end{array}\right\}$$ 1

Perimeter of ΔABC = AB + BC + AC

= 7 + 9 + 8 ½

= 24 cm ½

25. Evaluate :

$$\frac{\sin^2 45^\circ}{\operatorname{cosec}^2 30^\circ - \tan^2 45^\circ}$$

Solution:

$$\frac{\sin^2 45^0}{cosec^2 30^0 - \tan^2 45^0} = \frac{\left(\frac{1}{\sqrt{2}}\right)^2}{(2)^2 - (1)^2}$$ 1½

$= \frac{1}{6}$	½

SECTION C

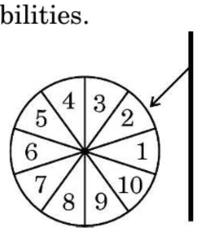
*This section has **6** Short Answer (SA) type questions carrying **3** marks each.* *6×3=18*

26. Prove the following trigonometric identity :

$$\frac{\cos A - 2\cos^3 A}{2\sin^3 A - \sin A} = \cot A$$

Solution:	
$\text{LHS} = \frac{\cos A\,(1 - 2\cos^2 A)}{\sin A\,(2\sin^2 A - 1)}$	½
$= \frac{\cos A\,[1 - 2\,(1 - \sin^2 A)]}{\sin A\,(2\sin^2 - 1)}$	1
$= \frac{\cos A\,(-1 + 2\sin^2 A)}{\sin A\,(2\sin^2 A - 1)}$	1
$= \cot A$	½

27. A game of chance consists of spinning a wheel which comes to rest at one of the numbers from 1 to 10 (as shown in the given figure) with equal probabilities.



What is the probability that the wheel stops at

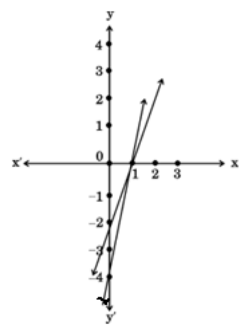
(i) a prime number greater than 2 ?

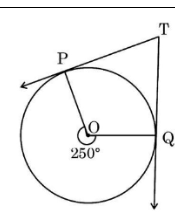
(ii) an odd number less than 9 ?

(iii) a multiple of 4 ?

Solution:(i) P (a prime number greater than 2) = $\frac{3}{10}$	1
(ii) P (an odd number less than 9) = $\frac{4}{10}$ or $\frac{2}{5}$	1
(iii) P (a multiple of 4) = $\frac{2}{10}$ or $\frac{1}{5}$	1

28. (a) Prove that $\sqrt{5}$ is an irrational number. **OR** (b) **State the "Fundamental Theorem of Arithmetic" and use it to find** LCM of 36 and 54.	
Solution: (a)Let $\sqrt{5}$ be a rational number such that $\sqrt{5} = \frac{p}{q}$ (p and q are co-prime numbers, $q \neq 0$)	½
$\sqrt{5}\, q = p \Rightarrow 5q^2 = p^2$ 5 divides p^2 $\Rightarrow$ 5 divides p as well	1
$p = 5m$ (for some integer m) $5q^2 = 25m^2 \quad \Rightarrow q^2 = 5m^2$ 5 divides q^2 $\Rightarrow$ 5 divides q as well p and q have a common factor 5 which is a contradiction as p and q are co-prime.	1
$\therefore$ our assumption is wrong Hence, $\sqrt{5}$ is an irrational number	½
OR	
(b)Statement: "Every composite number can be factorized as a product of primes, and this factorization is unique, apart from the order in which the prime factors occur."	1
$36 = 2^2 \times 3^2$	½
$54 = 2 \times 3^3$	½
$LCM(36, 54) = 2^2 \times 3^3 \quad or \quad 108$	1
29. Find the zeroes of the polynomial $q(x) = 6x^2 - 5x - 1$ and verify the relationship between the zeroes of q(x) and its coefficients.	
Solution: $q(x) = 6x^2 - 5x - 1$ $(6x + 1)(x - 1) = 0$ Zeroes are $x = -\frac{1}{6}, 1$	1
Sum of zeroes = $-\frac{1}{6} + 1 = \frac{5}{6} = \frac{-\text{Coefficient of } x}{\text{Coefficient of } x^2}$	1

Product of zeroes = $-\frac{1}{6} \times 1 = -\frac{1}{6} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$	1
30. (a) Solve graphically the following pair of linear equations : $2x - y = 2$ and $4x - y = 4$ Also, write the coordinates of the points where the lines represented by these equations cut the y-axis. **OR** (b) An academy offering cricket coaching bought 10 bats and 5 balls for ₹ 32,500. Later, the academy bought 2 bats and 8 balls for ₹ 10,000. If there is no change in the cost of the bat and of the ball, find the cost of 1 bat and 1 ball.	
Solution:(a) Correct graph of each equation  Solution is x=1, y=0 or (1, 0) Lines cut y axis at (0, – 2) and (0, – 4) **OR** (b) Let the cost of 1 bat be ₹x and the cost of 1 ball be ₹y A.T.Q. $10x + 5y = 32500$ or $2x + y = 6500$ -------(i) $2x + 8y = 10000$ or $2x + 8y = 10000$ ----(ii) Solving (i) and (ii) to get x = 3000 and y = 500 Cost of 1 bat = ₹3,000 Cost of 1 ball = ₹500	1+1 ½ ½ 1 1 ½+½
31. In the given figure, TP and TQ are tangents at points P and Q of the circle respectively. If reflex ∠ POQ = 250°, find the measure of each angle of quadrilateral POQT.	



Solution: $\angle POQ = 360° - 250° = 110°$ As tangent is perpendicular to the radius through the point of contact. $\angle OPT = \angle OQT = 90°$ In Quadrilateral OPTQ $\angle OPT + \angle OQT + \angle POQ + \angle PTQ = 360°$ $\angle PTQ = 70°$	1 1 1

SECTION D

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

32. (a) The lengths of 40 leaves of a plant are measured, correct to the nearest millimetre and data obtained is represented in the following table :

Length in (mm)	*Number of leaves*
100 – 120	8
120 – 140	9
140 – 160	12
160 – 180	5
180 – 200	6

Find the median length (in mm) of the leaves.

OR

(b) A class teacher has the following absentees record of 30 students of a class.

Number of days	0 – 4	4 – 8	8 – 12	12 – 16	16 – 20	20 – 24
Number of Absent students	1	8	x	6	5	y

If the mean number of days a student was absent is 12, find the values of x and y.

Solution:(a)

C.I.	f	CF
100 – 120	8	8
120 – 140	9	17
140 – 160	12	29
160 – 180	5	34
180 – 200	6	40
	40	

Correct table: 2

median class: 140 – 160

$$\text{Median} = \ell + \frac{\frac{N}{2} - cf}{f} \times h$$

$$= 140 + \frac{20 - 17}{12} \times 20$$ 2

$$= 145$$ 1

∴ The median length of the leaves is 145 mm

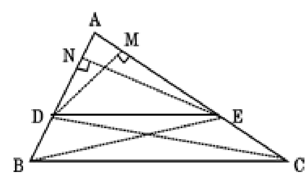
(b) **OR** C.I. | f_i | x_i | $f_i x_i$ 0 – 4 | 1 | 2 | 2 4 – 8 | 8 | 6 | 48 8 – 12 | x | 10 | 10x 12 – 16 | 6 | 14 | 84 16 – 20 | 5 | 18 | 90 20 – 24 | y | 22 | 22y | 20 + x + y | | 224 + 10x + 22y	Correct Table: 2
$x + y + 20 = 30 \Rightarrow x + y = 10$ – (i)	
$12 = \frac{10x + 22y + 224}{30} \Rightarrow 5x + 11y = 68$ – (ii)	1
Solving (i) and (ii) we get	1
x = 7	½
y = 3	½

33. (a) The sum of areas of two squares is 2650 cm^2. If the sum of their perimeters is 280 cm, find the sides of the two given squares. **OR** (b) Express the equation $\frac{1}{x} - \frac{1}{x-2} = 3$, $(x \neq 0, 2)$ as a quadratic equation in standard form. Hence, find the roots of the quadratic equation so obtained.	

Solution:	
(a) Let the sides of squares be x and y	
A.T.Q.	
$x^2 + y^2 = 2650$ ---------- (i)	1
$4x + 4y = 280 \Rightarrow x + y = 70$ --- (ii)	1
getting $2x^2 - 140x + 2250 = 0$ *or* $x^2 - 70x + 1125 = 0$	1
$\Rightarrow (x-25)(x-45) = 0$	
$\Rightarrow x = 25$ *and* $x = 45$	1
$\therefore y = 45$ *and* $y = 25$	1
sides of square are 25*cm and* 45*cm.*	

OR	
(b)	
$\frac{x-2-x}{x(x-2)} = 3$	1
$\Rightarrow 3x^2 - 6x + 2 = 0$	1
Discriminant = 36 – 24 = 12	1
Roots are $\frac{6+\sqrt{12}}{6}$ *and* $\frac{6-\sqrt{12}}{6}$ *or* $1+\frac{\sqrt{3}}{3}$ *and* $1-\frac{\sqrt{3}}{3}$	1+1

34. State and prove "Basic Proportionality Theorem."

Solution: Statement: 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.	Statement: 1 mark
Given: In Δ ABC, DE $\parallel$ BC To Prove: $\frac{AD}{DB} = \frac{AE}{EC}$  Construction: Draw DM $\perp$ AC, EN $\perp$ AB, join BE and CD	Given + To prove + Construction + Figure: **1 mark**
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)	½
From (i), (ii) and (iii), we get $\frac{AD}{DB} = \frac{AE}{EC}$	½

35. A spherical glass vessel has a cylindrical neck which is 7 cm long and 2 cm in diameter. The diameter of the spherical part is 14 cm. Find the capacity of the entire glass vessel. (Use $\pi = \frac{22}{7}$)

Solution: Radius of sphere = R = 7 cm

Radius of cylinder = r = 1 cm

Capacity of the entire glass vessel $= \pi r^2 h + \frac{4}{3}\pi R^3$

$$= \frac{22}{7}\times 1\times 1\times 7+\frac{4}{3}\times\frac{22}{7}\times 7\times 7\times 7$$ 2+2

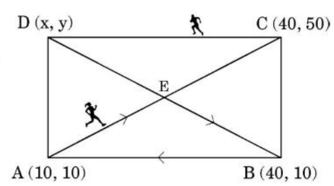
$$= \frac{4378}{3}\text{ cu.cm or } 1459.33\text{ cu.cm}$$ 1

SECTION E

*This section has **3** case study based questions carrying **4** marks each.* *3×4=12*

Case Study – 1

36. A field is in the form of a rectangle. The coordinates of the rectangular field ABCD are A(10, 10), B(40, 10), C(40, 50) and D(x, y). Anil and Anita, two friends decided to have a race. Anita started from point A and moved to point E along the diagonal AC, where E is the point of intersection of both the diagonals of ABCD. From point E, she moved to point B along the other diagonal DB and then moved back to point A along BA. While Anil started from point C and ran to point A via D along the boundary of the field.



Based on the above information, answer the following questions :

(i) Find the coordinates of point E. *1*

(ii) Find the distance between the points B and C. *1*

(iii) (a) Find the coordinates of point D and the distance BD. *2*

OR

(b) Find the total distance travelled by Anita. *2*

Solution: (i) Coordinates of E are (25, 30) 1

(ii) Distance BC = $\sqrt{(40-40)^2+(50-10)^2} = 40$ 1

(iii) (a) Co-ordinates of D

$$\left(\frac{x+40}{2},\frac{y+10}{2}\right) = (25,30)$$

By comparing we get, x = 10 and y = 50 ½+½

Co-ordinates of D are (10, 50)

BD = $\sqrt{(30)^2+(-40)^2} = 50$ 1

OR

(iii) (b)Distance travelled by Anita = AE + EB + BA

$= \sqrt{(15)^2 + (20)^2} + \sqrt{(-15)^2 + (20)^2} + \sqrt{(30)^2 + (0)^2}$ 1½

$= 80$ ½

Case Study – 2

37. Kite festival is a popular festival in India which takes place during Makar Sankranti. The festival is celebrated by people flying kites from their rooftops. Reena and Ravi are also flying kites to enjoy the festival. The height of Reena's kite is 60 m above the ground. The string attached to the kite is temporarily tied to a point on the ground, and the inclination of the string with the ground is 30°. Ravi is flying a kite from a 10 m high building. His kite is also flying 60 m above the ground and the length of the string used by Ravi is same as that of Reena's. θ is the angle of elevation of Ravi's kite from a point on the rooftop.

Based on the above information, answer the following questions :

(i) Find the length of string used by Reena. *1*

(ii) Find the value of sin θ. *1*

(iii) (a) If θ changes to 60°, without changing the length of the string, what will be the height of Ravi's kite above the ground ? (Use $\sqrt{3} = 1{\cdot}7$) *2*

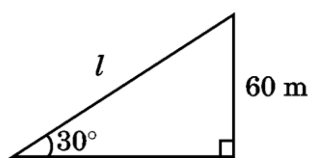
OR

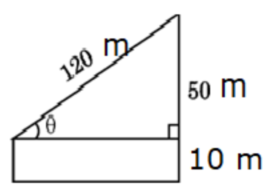
(b) What would have been the height of Ravi's kite above the ground, if the string had an inclination of 30° with the ground, assuming that the length of the string does not change ? *2*

Solution: (i)

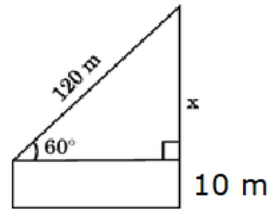
$\frac{60}{l} = \sin 30°$

$l = 120$ m 1





(ii) $\sin\theta = \frac{50}{120}$ *or* $\frac{5}{12}$ 1



(iii) (a) $\dfrac{x}{120} = \sin 60^0$

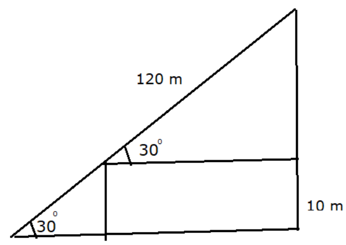
$\Rightarrow x = 60\sqrt{3}$ 1

Height of Ravi's kite = $60\sqrt{3} + 10$ ½

= 102 + 10

= 112 m ½

OR



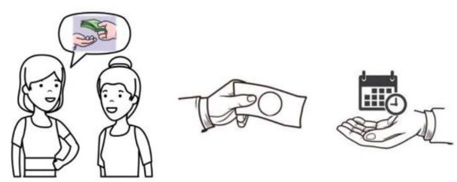
(iii) (b) $\dfrac{x}{120} = \sin 30^0$

x = 60 m 1

Height of Ravi's kite = 60 + 10 = 70 m 1

Case Study – 3

38. A woman borrowed ₹ 10,00,000 from her friend and promised to return the borrowed money in monthly instalments beginning from the next month. After one month, she returned ₹ 10,000, the next month she returned ₹ 15,000, the third month she returned ₹ 20,000 and so on, thereby increasing the monthly instalment uniformly.



Based on the above information, answer the following questions :

(i) Find the amount of instalment paid in the tenth month. *1*

(ii) In which instalment did she pay ₹ 40,000 ? *1*

(iii) (a) If she returned ₹ 11,50,000 in all, how many instalments did she pay ? *2*

OR

(b) By which instalment has she returned a total amount of ₹ 3,25,000 ? *2*

Solution: (i) $a_{10} = 10000 + 5000 \times 9$

= 55000 1

$\Rightarrow$ Amount of instalment paid in the tenth month =₹55,000

(ii) $40000 = 10000 + (n-1)\,5000$ $\Rightarrow n = 7$ $\Rightarrow$ In the 7th instalment she paid ₹40,000	1
(iii) (a) $1150000 = \frac{n}{2}[20000 + (n-1)\,5000]$	1
$5n^2 + 15n - 2300 = 0$ or $n^2 + 3n - 460 = 0$	½
$(n-20)(n+23) = 0$ $n = 20, n = -23$ (rejected)	½
$\Rightarrow$ She paid 20 instalments in order to return ₹11,50,000	
OR	
(iii) (b) $325000 = \frac{n}{2}[20000 + (n-1)\,5000]$	1
$5n^2 + 15n - 650 = 0$ or $n^2 + 3n - 130 = 0$	½
$(n-10)(n+13) = 0$ $n = 10, n = -13$ (rejected)	½
$\Rightarrow$ She returned ₹3,25,000 by the 10th instalment.	