Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2024
SUBJECT NAME MATHEMATICS (BASIC) (Q.P. CODE 430/5/3)

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. Its 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 (0-80) (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.

This section comprises Multiple Choice Questions (MCQ) of one mark each.

SECTION A 20×1=20

1. It is given that $\Delta ABC \sim \Delta DEF$. If $\angle A = 55°$, $\angle E = 45°$, then $\angle C$ is :

(A) 80° (B) 90°

(C) 55° (D) 45°

Ans1. (A) 80^0 1

2. The area of a sector of a circle of radius 16 cm cut off by an arc, which is 18·5 cm long, is :

(A) 168 cm^2 (B) 148 cm^2

(C) 154 cm^2 (D) 176 cm^2

Ans2. (B) 148 cm^2 1

3. If $\tan^2 \theta = 3$, where θ is an acute angle, then the value of θ is :

(A) 30° (B) 60°

(C) 0° (D) 45°

Ans3. (B) 60^0 1

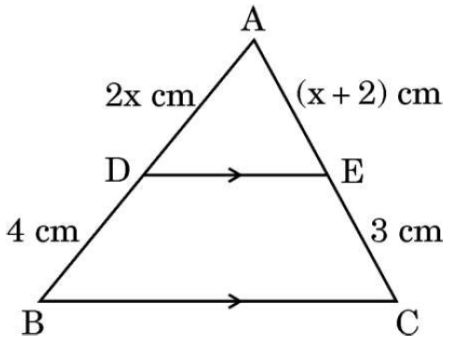
4. If x is a whole number, then 8^x ends with an even digit, except for which value of x ?

(A) 6 (B) 4

(C) 2 (D) 0

Ans4. (D) 0 1

5. In the given figure, in Δ ABC, DE || BC. If AD = 2x cm, AE = (x + 2) cm, DB = 4 cm, EC = 3 cm, then the value of x is :



(A) 3 (B) 2

(C) 6 (D) 4

Ans5. (D) 4 1

6. A lamp post 15 m high, casts a shadow $5\sqrt{3}$ m long on the ground. The Sun's elevation at this moment is :

(A) 90° (B) 60°

(C) 45° (D) 30°

Ans6. (B) 60° 1

7. If $x = 4 \sin \theta$, $y = 4 \cos \theta$, then the value of $(x^2 + y^2)$ is :

(A) 4 (B) $\frac{1}{4}$

(C) $\frac{1}{16}$ (D) 16

Ans7. (D)16 1

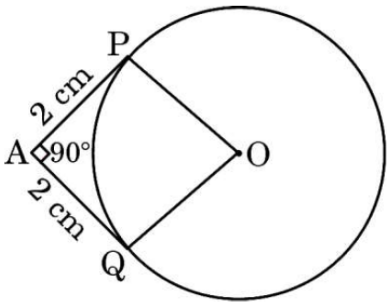
8. The roots of the quadratic equation $x^2 + 3x - 10 = 0$ are :

(A) 5, 2 (B) – 5, 2

(C) 5, – 2 (D) – 5, – 2

Ans8. (B) −5, 2 1

9. AP and AQ are tangents drawn from an external point A to a circle with centre O and inclined to each other at an angle of 90°. If the length of each tangent is 2 cm, then the radius of the circle is :



(A) 4 cm (B) 2 cm

(C) $2\sqrt{2}$ cm (D) 1 cm

Ans9. (B) 2 cm 1

10. HCF × LCM for the numbers 40 and 30 is :

(A) 12 (B) 120

(C) 1200 (D) 40

Ans10. (C) 1200 1

11. In a frequency distribution, the mid-value of a class is 10 and the width of the class is 6. The lower limit of the class is :

(A) 6 (B) 7

(C) 8 (D) 12

Ans11. (B) 7 1

12. Prime factorisation of 424 is :

(A) $2 \times 53 \times 4$ (B) $2 \times 53 \times 2$

(C) $2^3 \times 53$ (D) $2^4 \times 53$

Ans12. (C) $2^3 \times 53$ 1

13. The pair of linear equations $2kx + 5y = 7$, $6x + 5y = 11$ have a unique solution, if

(A) $k \neq 3$ (B) $k \neq -3$

(C) $k \neq \frac{1}{3}$ (D) $k \neq -\frac{1}{3}$

Ans13. (A) $k \neq 3$ 1

14. The roots of the quadratic equation $ax^2 + bx + c = 0$ are real and distinct, if :

(A) $b^2 - 4ac > 0$ (B) $b^2 - 4ac = 0$

(C) $b^2 - 4ac < 0$ (D) $b^2 - 4ac \geq 0$

Ans14. (A) $b^2 - 4ac > 0$ 1

15. If the angle between the two radii of a circle is 130°, then the angle between the tangents at the ends of these radii, is :

(A) 50° (B) 60°

(C) 90° (D) 130°

Ans15. (A) 50^0 1

16. The length of an arc of a circle with radius 12 cm is 10π cm. The central angle subtended by this arc at the centre, is :

(A) 120° (B) 6°

(C) 75° (D) 150°

Ans16. (D) 150^0 1

17. The mid-point of the line segment AB joining A(– 2, 8) and B(– 6, 4) is :

(A) (2, 6) (B) (– 4, 12)

(C) (– 4, 6) (D) (4, – 6)

Ans17. (C) (−4, 6) 1

18. A letter is chosen at random from the word 'MATHEMATICS'. What is the probability that it will be a 'vowel' ?

(A) $\frac{3}{11}$ (B) $\frac{4}{11}$

(C) $\frac{5}{11}$ (D) $\frac{7}{11}$

Ans18. (B) $\frac{4}{11}$ 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 probability of getting number 8 on rolling a die is zero (0).

Reason (R) : The probability of an impossible event is zero (0).

Ans19. (A) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). 1

20. *Assertion (A) :* Common difference of the A.P. 5, 1, – 3, – 7 .... is 4.

Reason (R) : Common difference of the A.P. a_1, a_2, a_3 ...., a_n is obtained by $d = a_n - a_{n-1}$.

Ans20. (D) Assertion(A) is false, but Reason(R) is true. 1

SECTION B

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

21. The length of a tangent drawn to a circle from a point A, at a distance of 10 cm from the centre of the circle, is 6 cm. Find the radius of the circle.

Sol.21. Radius of circle
$= \sqrt{10^2 - 6^2}$ 1
$= 8$ cm 1

22. If $\frac{2}{3}$ is a root of the quadratic equation $kx^2 - x - 2 = 0$, then find the value of k.

Sol.22. $\frac{2}{3}$ is a root of quadratic equation $kx^2 - x - 2 = 0$
$\therefore k\left(\frac{2}{3}\right)^2 - \frac{2}{3} - 2 = 0$ $\frac{1}{2}$
$\Rightarrow \frac{4}{9}k = \frac{8}{3}$ 1
$k = 6$ $\frac{1}{2}$

23. (a) If α, β are zeroes of the quadratic polynomial $2x^2 + 7x + 5$, then find the value of $\alpha^2 + \beta^2 + \alpha\beta$.

OR

(b) If one zero of the quadratic polynomial $6x^2 + 37x - (p - 2)$ is reciprocal of the other, then find the value of p.

Sol.23. (a) As α, β are zeroes of $2x^2 + 7x + 5$
$\therefore \alpha + \beta = \frac{-7}{2}, \quad \alpha\beta = \frac{5}{2}$ 1
$\alpha^2 + \beta^2 + \alpha\beta = (\alpha + \beta)^2 - \alpha\beta$

$\left(\frac{-7}{2}\right)^2 - \frac{5}{2} = \frac{39}{4}$ 1

OR

(b) Let $p(x) = 6x^2 + 37x - (p - 2)$ and $a = 6, b = 37, c = -(p - 2)$

$\alpha, \frac{1}{\alpha}$ be zeroes of $p(x)$ $\frac{1}{2}$

$\therefore \alpha \times \frac{1}{\alpha} = \frac{c}{a} = \frac{-(p-2)}{6}$ 1

$1 = \frac{-p+2}{6}$

$p = -4$ $\frac{1}{2}$

24. If $x = \sin 60° \cos 30° + \cos 60° \sin 30°$, then find the value of x.

Sol.24. $x = \sin 60° \cos 30° + \cos 60° \sin 30°$

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

25. (a) Find the ratio in which the point (3, y), divides the line segment joining the points (– 2, – 5) and (6, 3). Also, find the value of y.

OR

(b) Find a point on y-axis which is equidistant from the points A(6, 5) and B(– 4, 3).

Sol.25. (a) Let P (3, y) divides the given line segment in the ratio k : 1

$\therefore 3 = \frac{6k+(1)(-2)}{k+1}$, $y = \frac{k(3)+1(-5)}{k+1}$ 1

$3k + 3 = 6k - 2 \Rightarrow 5 = 3k$

$k = \frac{5}{3} \Rightarrow y = 0$ $\frac{1}{2} + \frac{1}{2}$

$\therefore$ ratio is 5 : 3

OR

(b) Let point on y-axis be P(0, y) $\frac{1}{2}$

$PA = PB \Rightarrow PA^2 = PB^2$

$(0 - 6)^2 + (y - 5)^2 = (0 + 4)^2 + (y - 3)^2$ 1

$36 + y^2 - 10y + 25 = 16 + y^2 - 6y + 9$

$y = 9$ $\frac{1}{2}$

$\therefore$ point P(0, 9)

SECTION C

This section comprises Short Answer (SA) type questions of 3 marks each. $6\times3=18$

26. Find the zeroes of the polynomial $3x^2 - 5x - 2$ and verify the relationship between the zeroes and the coefficients of the polynomial.

Sol.26. Let $p(x) = 3x^2 - 5x - 2$

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

$\therefore$ zeroes are $-\frac{1}{3}, 2$ 1

Sum of zeroes $= -\frac{1}{3} + 2 = \frac{5}{3} = -\frac{\text{Coeff. of } x}{\text{Coeff. of } x^2}$ $\frac{1}{2}$

Product of zeroes $= -\frac{1}{3} \times 2 = -\frac{2}{3} = \frac{\text{Constant term}}{\text{Coeff. of } x^2}$ $\frac{1}{2}$

27. Find the coordinates of the points of trisection of the line segment joining the points A(5, – 3) and B(– 4, 3).

Sol.27. Let P and Q divide the line segment joining A(5, – 3) and B(– 4, 3) in three equal parts such that AP : PB = 1 : 2

$P\left(\frac{1\times-4+2\times5}{1+2}, \frac{1\times3+2\times-3}{1+2}\right)$ $\frac{1}{2}+\frac{1}{2}$

i.e., P(2, – 1) $\frac{1}{2}$

AQ : QB = 2 : 1

$Q\left(\frac{2\times-4+1\times5}{2+1}, \frac{2\times3+1\times-3}{2+1}\right)$ $\frac{1}{2}+\frac{1}{2}$

Q(– 1, 1) $\frac{1}{2}$

28. (a) Prove that the parallelogram circumscribing a circle is a rhombus.

OR

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

Sol.28. (a) Let ABCD be a parallelogram touching the circle at P, Q, R and S $\frac{1}{2}$ **for Fig.**

To prove: ABCD is a rhombus.

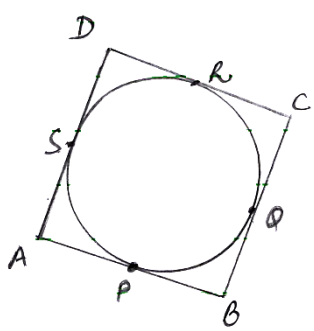
Proof: We know that tangents drawn from the external point to the circle are equal.

$\therefore$ AP = AS – (i)

PB = BQ – (ii)

CR = CQ – (iii)

DR = DS – (iv)



1

Adding (i), (ii), (iii) and (iv)

$AP + PB + CR + DR = AS + BQ + CQ + DS$ $\frac{1}{2}$

$\Rightarrow AB + CD = AD + BC$ (v)

Now $AB = CD$ and $AD = BC$ (Opposite sides of parallelogram)

From (v), we get $AB + AB = AD + AD$ $\frac{1}{2}$

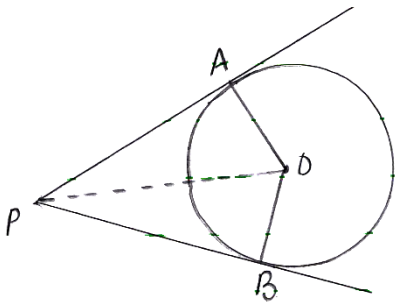
$\Rightarrow 2\,AB = 2\,AD$

$\Rightarrow AB = AD$ $\frac{1}{2}$

Hence ABCD is a rhombus.

OR

(b) Given PA and PB are tangents drawn from the external point P to the circle with centre O.



$\frac{1}{2}$ **for Fig.**

To prove: $PA = PB$

Construction: Join OA, OB and OP $\frac{1}{2}$

Proof: In ΔAOP and ΔBOP

$OA = OB$ (radii)

$OP = OP$ (common)

$\angle OAP = \angle OBP$ (each $90°$ as radius $\perp$ tangent) 1

$\therefore \Delta AOP \cong \Delta BOP$ (RHS cong.) $\frac{1}{2}$

$\Rightarrow PA = PB$ (c.p.c.t.) $\frac{1}{2}$

29. (a) A horse is tied with a 14 m long rope at one corner of an equilateral triangular field having side 20 m. Find the area of the field where the horse cannot graze.

OR

(b) The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand between 8:00 am and 8:05 am.

Sol. 29. (a) Side of equilateral triangle = 20 m

Length of rope = 14 m

$\theta = 60°$ $\frac{1}{2}$

Area grazed by horse $= \frac{\pi r^2 \theta}{360°}$

$= \frac{60°}{360°} \times \frac{22}{7} \times 14 \times 14 = \frac{308}{3}\ m^2$ or $102{\cdot}67\ m^2$ 1

Area of $\Delta = \frac{\sqrt{3} \times 400}{4} = 100\sqrt{3}\ m^2$ or $173\ m^2$ $\frac{1}{2} + \frac{1}{2}$

Required area = $(100\sqrt{3} - 102{\cdot}67)$ m^2 or 70·33 m^2 $\frac{1}{2}$

OR

(b) Angle swept by minute hand in 60 minutes = 360°
Angle swept by minute hand in 5 minutes = 30° 1
r = 14 cm
Area swept = $\frac{\pi r^2\theta}{360^\circ} = \frac{30^\circ}{360^\circ} \times \frac{22}{7} \times 14 \times 14$ $\frac{1}{2}+1$
$= \frac{154}{3}$ cm^2 or 51.33 cm^2 $\frac{1}{2}$

30. Prove that $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$.

Sol.30. LHS $= \sqrt{\frac{1+\sin A}{1-\sin A}} = \sqrt{\frac{(1+\sin A)(1+\sin A)}{(1-\sin A)(1+\sin A)}}$ 1

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

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

$= \sec A + \tan A$ $\frac{1}{2}$

31. Prove that $6 + 3\sqrt{2}$ is an irrational number, given that $\sqrt{2}$ is an irrational number.

Sol.31. Let us assume that $6 + 3\sqrt{2}$ is a rational number

$\therefore 6 + 3\sqrt{2} = x$, say 1

$\Rightarrow \sqrt{2} = \frac{x-6}{3}$ 1

Now $\frac{x-6}{3}$ is a rational number

$\Rightarrow \sqrt{2}$ is a rational number

But this contradicts the given fact that $\sqrt{2}$ is an irrational number 1

$\therefore$ Our assumption is wrong

$\Rightarrow 6 + 3\sqrt{2}$ is an irrational number.

SECTION D

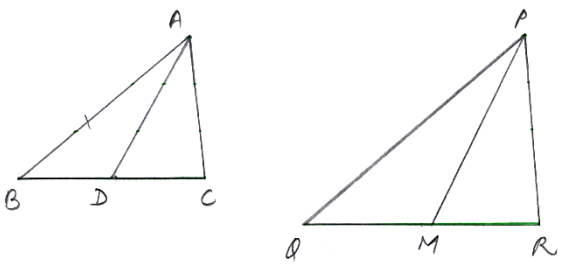
This section comprises Long Answer (LA) type questions of 5 marks each. *4×5=20*

32. (a) Sides AB, BC and median AD of Δ ABC are respectively proportional to sides PQ, QR and median PM of Δ PQR. Show that Δ ABC ~ Δ PQR.

OR

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

Sol.32.



$\frac{1}{2}$ for Fig.

(a) Given: In Δ ABC and Δ PQR,

$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AD}{PM}$ where AD, PM are medians. 1

To prove: Δ ABC ~ Δ PQR

Proof: In Δ ABC and Δ PQR

$\frac{AB}{PQ} = \frac{\frac{1}{2}BC}{\frac{1}{2}QR} = \frac{AD}{PM}$

$\Rightarrow \frac{AB}{PQ} = \frac{BD}{QM} = \frac{AD}{PM}$ 1

$\Rightarrow$ Δ ABD ~ Δ PQM (SSS similarity) $\frac{1}{2}$

$\Rightarrow \angle B = \angle Q$ $\frac{1}{2}$

In Δ ABC and Δ PQR,

$\frac{AB}{PQ} = \frac{BC}{QR}$ (given)

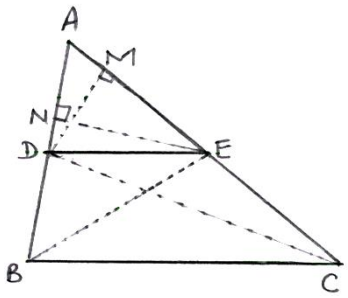
$\angle B = \angle Q$ (Proved above) $1\frac{1}{2}$

$\therefore$ Δ ABC ~ Δ PQR (SAS similarity)

OR

(b) Given: In Δ ABC, DE || BC

To Prove: $\frac{AD}{DB} = \frac{AE}{EC}$ $\frac{1}{2}$ for Fig.



Construction: Join BE, DC

Draw DM ⊥ AC and EN ⊥ AB 1

Proof:

$$\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{\frac{1}{2}\times AD\times EN}{\frac{1}{2}\times DB\times EN}$$

$$\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{AD}{DB} \quad \text{(i)} \qquad 1$$

and $$\frac{ar(\Delta ADE)}{ar(\Delta CDE)} = \frac{\frac{1}{2}\times AE\times DM}{\frac{1}{2}\times EC\times DM}$$

$$\frac{ar(\Delta ADE)}{ar(\Delta CDE)} = \frac{AE}{EC} \quad \text{(ii)} \qquad \mathbf{1}$$

Δ BDE and Δ CDE are on the same base DE and between the same parallels DE and BC.

∴ ar (Δ BDE) = ar (Δ CDE) (iii) 1

From (i), (ii) and (iii)

$\frac{AD}{DB} = \frac{AE}{EC}$ $\frac{1}{2}$

33. The following data gives the information about the lifetimes (in hours) of 225 neon lamps :

Lifetime (in hours)	Number of lamps
1500 – 2000	10
2000 – 2500	35
2500 – 3000	52
3000 – 3500	61
3500 – 4000	38
4000 – 4500	29

Find the median lifetime of a lamp.

Sol.33.

Lifeline (in hours)	Frequency	cf
1500 – 2000	10	10
2000 – 2500	35	45
2500 – 3000	52	97
3000 – 3500	61	158
3500 – 4000	38	196
4000 – 4500	29	225

2 for table

$\frac{N}{2} = \frac{225}{2} = 112{\cdot}5$

$l = 3000$, c.f. $= 97$, f $= 61$, h $= 500$ 1

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

$= 3000 + \frac{(112{\cdot}5 - 97)}{61} \times 500$ $1\frac{1}{2}$

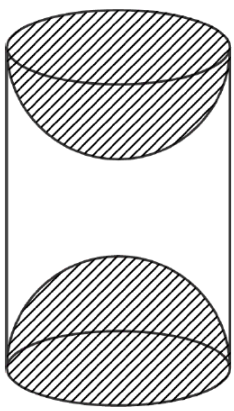
$= 3000 + \frac{7750}{61} = 3127{\cdot}05$ $\frac{1}{2}$

Note: No marks to be deducted in case student substitutes the values correctly in the formula without writing values of *l*, cf, etc.

34. (a) A toy is in the form of a cone of radius 7 cm mounted on a hemisphere of same radius. The total height of the toy is 31 cm. Find the surface area of the toy.

OR

(b) A wooden article was made by scooping out a hemisphere from each end of a solid cylinder. If the height of the cylinder is 15 cm and its base is of radius 4·2 cm, then find the total surface area of the article.



Sol.34. (a) Radius of cone = Radius of hemisphere 'r' = 7 cm

Total height of toy = 31 cm

$\therefore$ height of cone $= 31 - 7 = 24$ cm 1

Slant height $l = \sqrt{\mathbf{r^2 + h^2}}$

$= \sqrt{(7)^2 + (24)^2}$

$= 25$ cm 1

Total surface area of toy = CSA of hemisphere + CSA of cone $\frac{1}{2}$

$= 2\pi r^2 + \pi r l = \pi r(2r + l)$

$= \frac{22}{7} \times 7 \times (14 + 25)$ 2

$= 22 \times 39$

$= 858 \text{ cm}^2$ $\frac{1}{2}$

OR

(b) Height of cylinder = 15 cm

Radius of cylinder = Radius of hemisphere = 4·2 cm 1

Total surface area = CSA of cylinder + CSA of 2 hemispheres 1

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

$= 2\pi r(h + 2r)$

$= 2 \times \frac{22}{7} \times 4{\cdot}2 \times (15 + 2 \times 4{\cdot}2)$ 2

$= 617.76 \text{ cm}^2$ 1

35. The sum of the digits of a 2-digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number.

Sol.35. Let the digit at unit's place be y and digit at ten's place be x

$\therefore$ the two-digit number is $10x + y$ $\frac{1}{2}$

ATQ. $9(10x + y) = 2(10y + x)$ 1

$90x + 9y = 20y + 2x$

$88x - 11y = 0$

$8x - y = 0$ (i) 1

Also $x + y = 9$ (ii) 1

Solving to get $x = 1, y = 8$ 1

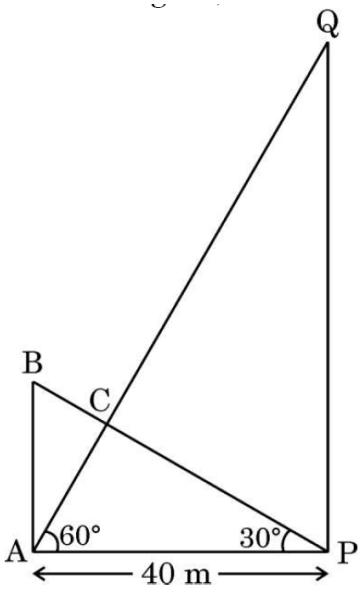
$\therefore$ two-digit number = 18 $\frac{1}{2}$

SECTION E

This section comprises 3 case study based questions of 4 marks each. *3×4=12*

Case Study – 1

36. Two poles of different heights stand on level ground and at a distance of 40 m. Both poles are supported by wires attached from the top of each pole to the bottom of the other. A coupling is placed at point C, where the two wires cross (as shown in the figure).



Based on the above information, answer the following questions :

(i) Find the height of pole AB. *1*

(ii) Find the height of pole PQ. *1*

(iii) (a) If the angle of elevation of the top of the pole PQ from the top of the pole AB is 30°, find the distance BQ. *2*

OR

(b) If the coupling is at a height of 20 m from the ground, how far down the wire from the smaller pole AB is the coupling ? *2*

Sol.36. (i) In right Δ ABP,

$\tan 30° = \frac{AB}{AP}$ $\frac{1}{2}$

$\frac{1}{\sqrt{3}} = \frac{AB}{40} \Rightarrow AB = \frac{40}{\sqrt{3}} = \frac{40\sqrt{3}}{3}$ m $\frac{1}{2}$

(ii) In right Δ APQ,

$\tan 60° = \frac{PQ}{AP}$ $\frac{1}{2}$

$\sqrt{3} = \frac{PQ}{40} \Rightarrow PQ = 40\sqrt{3}$ m $\frac{1}{2}$

(iii)(a) In Δ BQM,

$\cos 30° = \frac{BM}{BQ}$ $\frac{1}{2}$

$\frac{\sqrt{3}}{2} = \frac{40}{BQ}$ $\frac{1}{2}$ **for Fig.**

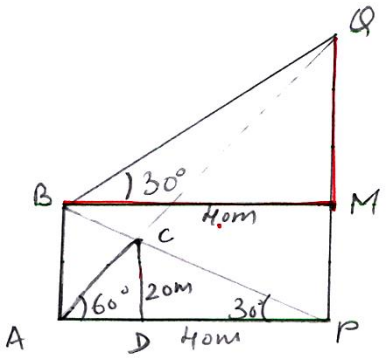
$BQ = \frac{80}{\sqrt{3}} = \frac{80\sqrt{3}}{3}$ 1

OR

(iii) (b) CD = 20 m $\frac{1}{2}$ **for Fig.**

In right Δ ACD, $\sin 60° = \frac{CD}{AC}$ $\frac{1}{2}$

$\frac{\sqrt{3}}{2} = \frac{20}{AC} \Rightarrow AC = \frac{40}{\sqrt{3}} = \frac{40\sqrt{3}}{3}$ m 1



Note: In case students find BC correctly, full marks may be awarded.

Case Study- 2

37. ***Family structure :*** In a recent survey of this year, 51% of the families in the United States of America had no children, 20% had one child, 19% had two children, 7% had three children and 3% had four or more children.

A family is selected at random.

Based on the above information, answer the following questions :

(i) Find the probability that the selected family has two or three children. *1*

(ii) Find the probability that the selected family has more than one child. *1*

(iii) (a) Find the probability that the selected family has less than three children. *2*

OR

(b) Find the probability that the selected family has more than two children. *2*

Sol.37. (i) P(2 or 3 children) $= \frac{19+7}{100}$ $\frac{1}{2}$

$= \frac{26}{100}$ or $\frac{13}{50}$ $\frac{1}{2}$

(ii) P(more than one child) $= \frac{19+7+3}{100}$ $\frac{1}{2}$

$= \frac{29}{100}$ $\frac{1}{2}$

(iii)(a) P(less than 3 children) $= \frac{51+20+19}{100}$ $1\frac{1}{2}$

$= \frac{90}{100}$ or $\frac{9}{10}$ $\frac{1}{2}$

OR

(iii)(b) P(more than 2 children) $= \frac{7+3}{100}$ $1\frac{1}{2}$

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

Case Study – 3

38. Sumant's mother started a new shoe shop. To display the shoes, she put 3 pairs of shoes in the 1st row, 5 pairs in the 2nd row, 7 pairs in the 3rd row and so on.

Based on the above information, answer the following questions :

(i) How many pairs of shoes are displayed in the 6^{th} row ? *1*

(ii) What is the difference of pairs of shoes in the 1^{st} row and the 6^{th} row ? *1*

(iii) (a) Find the total number of pairs of shoes displayed in the first 15 rows. *2*

OR

(b) If the pairs of shoes displayed in the 4^{th} row are 'on sale' at price of ₹ 500 for each pair, then find the total amount (money) earned by Sumant's mother if all shoes displayed in the 4^{th} row are sold out. *2*

Sol.38. (i) $a = 3, d = 2$ $\frac{1}{2}$

Pair of shoes in 6^{th} row $= 3 + (5)2 = 13$ $\frac{1}{2}$

(ii) Difference of pairs of shoes in 6^{th} and 1^{st} row $= 13 - 3 = 10$ 1

(iii) (a) $n = 15$

Total pair of shoes in 15 rows $= \frac{n}{2}[2a + (n-1)d]$

$= \frac{15}{2}[2 \times 3 + 14 \times 2]$ 1

$= \frac{15}{2} \times \mathbf{34} = 255$ 1

OR

(iii) (b) Pair of shoes in 4^{th} row $= 3 + (3)2 = 9$ 1

Money earned $= 500 \times 9 =$ ₹ 4500 1