Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2024
SUBJECT NAME MATHEMATICS (BASIC) (Q.P. CODE 430/2/2)

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.

Set 430/2/2

MARKING SCHEME
MATHEMATICS (BASIC)

SECTION A

1. The difference of the areas of a minor sector of angle 120° and its corresponding major sector of a circle of radius 21 cm, is

(A) 231 cm^2 (B) 462 cm^2

(C) 346.5 cm^2 (D) 693 cm^2

Ans. (B) 462 cm^2 *1*

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2. The annual rainfall record of a city for 66 days is given in the following table :

Rainfall (in cm) :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of days :	22	10	8	15	5	6

The difference of upper limits of modal and median classes is :

(A) 10 (B) 15

(C) 20 (D) 30

Ans. (C) 20 *1*

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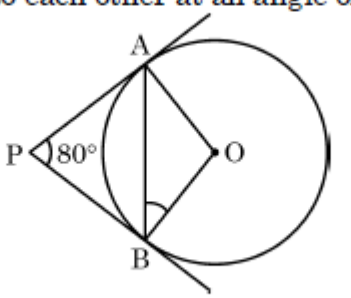
3. In the given figure, tangents PA and PB from a point P to a circle with centre O are inclined to each other at an angle of 80°. ∠ABO is equal to



(A) 40° (B) 80°

(C) 100° (D) 50°

Ans. (A) 40° *1*

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4. $\frac{1+\tan^2 A}{1+\cot^2 A}$ is equal to

(A) $\sec^2 A$ (B) -1

(C) $\cot^2 A$ (D) $\tan^2 A$

Ans. (D) $\tan^2 A$ *1*

---

5. If $\sin^2 \theta = \frac{3}{4}$, then θ is

(A) $30°$ (B) $45°$

(C) $60°$ (D) $90°$

Ans. (C) $60°$ *1*

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6. The zeroes of the polynomial $3x^2 - 5x - 2$, are :

(A) $\frac{1}{3}, 2$ (B) $\frac{-1}{3}, 2$

(C) $\frac{-1}{3}, -2$ (D) $\frac{1}{3}, -2$

Ans. (B) $-\frac{1}{3}, 2$ *1*

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7. A pole $7\sqrt{3}$ m high casts a shadow 21 m long on the ground, then the sun's elevation is :

(A) $30°$ (B) $45°$

(C) $60°$ (D) $90°$

Ans. (A) $30°$ *1*

---

8. The HCF of smallest 2 – digit number and the smallest composite number is :

(A) 2 (B) 20

(C) 40 (D) 4

Ans. (A) 2 *1*

---

9. The total surface area of a solid hemisphere of radius 7 cm is :

(A) $98\ \pi\ cm^2$ (B) $147\ \pi\ cm^2$

(C) $196\ \pi\ cm^2$ (D) $228\frac{2}{3}\pi\ cm^2$

Ans. (B) $147\ \pi\ cm^2$ *1*

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10. If $\sin A = \frac{3}{5}$, then value of cot A is :

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

(C) $\frac{4}{5}$ (D) $\frac{5}{4}$

Ans. (B) $\frac{4}{3}$ *1*

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11. The graph of a pair of linear equations $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$ in two variables x and y represents parallel lines, if

(A) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ (B) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

(C) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$ (D) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

Ans. (D) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ *1*

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12. A line intersecting a circle in two distinct points is called a

(A) secant (B) chord

(C) diameter (D) tangent

Ans. (A) secant *1*

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13. The value of 'k' for which the pair of linear equations $x + y - 4 = 0$ and $2x + ky - 8 = 0$ has infinitely many solutions, is

(A) $k \neq 2$ (B) $k \neq -2$

(C) $k = 2$ (D) $k = -2$

Ans. (C) $k = 2$ *1*

---

14. A quadratic polynomial, the sum of whose zeroes is –5 and their product is 6, is

(A) $x^2 + 5x + 6$ (B) $x^2 - 5x + 6$

(C) $x^2 - 5x - 6$ (D) $-x^2 + 5x + 6$

Ans. (A) $x^2 + 5x + 6$ *1*

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15. If P(A) denotes the probability of an event A, then

(A) $P(A) < 0$ (B) $P(A) > 1$

(C) $0 \leq P(A) \leq 1$ (D) $-1 \leq P(A) \leq 1$

Ans. (C) $0 \leq P(A) \leq 1$ *1*

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16. Which of the following quadratic equations has –1 as a root ?

(A) $x^2 - 4x - 5 = 0$ (B) $-x^2 - 4x + 5 = 0$

(C) $x^2 + 3x + 4 = 0$ (D) $x^2 - 5x + 6 = 0$

Ans. (A) $x^2 - 4x - 5 = 0$ *1*

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17. The distance of the point (3, 4) from the origin is

(A) 25 (B) 5

(C) 7 (D) 1

Ans. (B) 5 *1*

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18. If the first term of an AP is –3 and common difference –2, then the seventh term is

(A) –9 (B) 9

(C) –17 (D) –15

Ans. (D) – 15 *1*

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19. **Assertion (A) :** The point (0, 4) lies on y – axis.

Reason (R) : The x-coordinate of a point, lying on y – axis, is zero.

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

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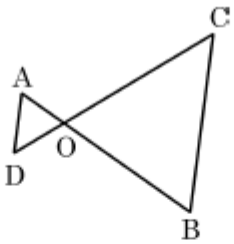
20. **Assertion (A) :** A line drawn parallel to any one side of a triangle intersects the other two sides in the same ratio.

Reason (R) : Parallel lines cannot be drawn to any side of a triangle.

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

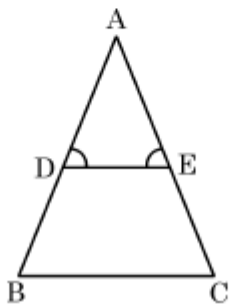
SECTION B

21. (a) In the given figure, OA·OB = OC·OD. Prove that $\Delta AOD \sim \Delta COB$.



OR

(b) In the given figure, $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$. Prove that ΔABC is isosceles.



Solution: (a) OA . OB = OC . OD

$\Rightarrow \frac{OA}{OC} = \frac{OD}{OB}$ _____ (i) $\frac{1}{2}$

In Δ AOD and Δ COB

$\frac{OA}{OC} = \frac{OD}{OB}$ (from (i))

$\angle AOD = \angle BOC$ (Vertically opp. angles) 1

$\therefore \Delta AOD \sim \Delta COB$ (SAS similarity) $\frac{1}{2}$

OR

(b) In Δ ADE,

$\frac{AD}{DB} = \frac{AE}{EC}$ (Given)

$\Rightarrow$ DE // BC (by converse of B. P. T.) $\frac{1}{2}$

$\Rightarrow \angle D = \angle B$ & $\angle E = \angle C$ (Corresponding angles) $\frac{1}{2}$

But $\angle D = \angle E$ (given)

$\therefore \angle B = \angle C$ $\frac{1}{2}$

$\Rightarrow$ AB = AC (sides opposite to equal angles of a triangle) $\frac{1}{2}$

$\Rightarrow \Delta$ ABC is isosceles.

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22. **A lot consists of 165 ball pens of which 30 are defective and the others are good. Rakshita will buy a pen if it is good. The shopkeeper draws one pen at random and gives it to Rakshita. What is the probability that she will buy it ?**

Solution: Total number of good pens = 135 *1*

P(good pen) = $\frac{135}{165}$ *or* $\frac{9}{11}$ *1*

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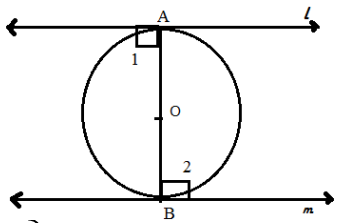
23. **Prove that the tangents drawn at the ends of a diameter of a circle are parallel to each other.**

Solution: Tangents *l* and m are drawn at the end points A & B of diameter of the circle with centre O



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

To prove: *l* || m

Proof → $\angle 1 = 90°$ ($\because$ radius $\perp$ tangent)

$\angle 2 = 90°$ *1*

$\Rightarrow \angle 1 = \angle 2$

But these are alternate interior angles

$\therefore$ *l* || m $\frac{1}{2}$

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24. **Find the HCF of 84 and 144 by prime factorisation method.**

Solution: $84 = 2 \times 2 \times 3 \times 7$ $\frac{1}{2}$

$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$ $\frac{1}{2}$

$\therefore$ HCF $= 2 \times 2 \times 3 = 12$ *1*

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25. (a) **The sum of two natural numbers is 70 and their difference is 10. Find the natural numbers.**

OR

(b) **Solve for x and y :**

$x - 3y = 7$

$3x - 3y = 5$

Solution: (a) Let the numbers be x & y

$x + y = 70$ $\frac{1}{2}$

$x - y = 10$ $\frac{1}{2}$

Solving to get $x = 40$ and $y = 30$ $\frac{1}{2} + \frac{1}{2}$

OR

(b) $x - 3y = 7$ & $3x - 3y = 5$

Solving to get $x = -1$ *1*

$y = -\frac{8}{3}$ *1*

SECTION C

26. **To warn ships for underwater rocks, a light house spreads a red coloured light over a sector of angle 80° to a distance of 16.5 km. Find the area of the sea over which the ships are warned. (Use $\pi = 3.14$)**

Solution: $\theta = 80°$, $r = 16.5$ km $\frac{1}{2}$

$\text{Area} = \frac{\pi r^2 \theta}{360^\circ} = 3{\cdot}14 \times 16.5 \times 16.5 \times \frac{80}{360}$ $1\frac{1}{2}$

$= 189.97 \text{ km}^2$ *1*

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27. (a) Zeroes of the quadratic polynomial $x^2 + x - 6$ are 'α' and 'β'. Construct a quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

OR

(b) Find the zeroes of the polynomial $2x^2 + 3x - 2$ and verify the relationship between the zeroes and the coefficients.

Solution: (a) $\beta + \alpha = -1$ and $\alpha\beta = -6$ $\frac{1}{2} + \frac{1}{2}$

$\therefore$ required sum of zeroes $= \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta + \alpha}{\alpha\beta} = \frac{1}{6}$ $\frac{1}{2}$

Required product of zeroes $= \frac{1}{\alpha} \cdot \frac{1}{\beta} = \frac{1}{-6}$ $\frac{1}{2}$

$\therefore$ required quadratic polynomial is

$k\left(x^2 - \frac{1}{6}x - \frac{1}{6}\right)$ or $(6x^2 - x - 1)$ *1*

OR

(b) $p(x) = 2x^2 + 3x - 2$

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

$\therefore$ zeroes of $p(x)$ are $-2, \frac{1}{2}$ *1*

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

Product of zeroes $= -2 \times \frac{1}{2} = \frac{-2}{2} = \frac{constant\ term}{Coeff.\,of\ x^2}$ $\frac{1}{2}$

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28. Prove that $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta\ \mathrm{cosec}\,\theta$

Solution: LHS $= \frac{\tan^2\theta}{\tan\theta - 1} + \frac{1}{\tan\theta(1 - \tan\theta)}$ $\frac{1}{2}$

$= \frac{\tan^3\theta - 1}{\tan\theta(\tan\theta - 1)}$ $\frac{1}{2}$

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

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

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

$= \sec \theta \operatorname{cosec} \theta + 1 = \text{RHS}$ $\frac{1}{2}$

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29. Two dice are tossed simultaneously. Find the probability of getting
    (a) an even number on both the dice.
    (b) the sum of two numbers more than 9.

Solution: Total outcomes = 36

(i) Even number on both the dice

{(2, 2), (2, 4), (2, 6), (4, 2), (4, 4), (4, 6) (6, 2), (6, 4), (6, 6)}

$\therefore$ Favourable outcomes = 9 *1*

$\therefore$ Required Probability = $\frac{9}{36}$ or $\frac{1}{4}$ $\frac{1}{2}$

(ii) Sum of two numbers more than 9

{(4, 6), (5, 5), (5, 6), (6, 4), (6, 5), (6, 6)}

Favourable outcomes = 6 *1*

Required Probability = $\frac{6}{36}$ or $\frac{1}{6}$ $\frac{1}{2}$

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30. A car has two wipers which do not overlap. Each wiper has a blade of length 21 cm sweeping through an angle of 120°. Find the area cleaned at each sweep of the blades.

Solution: (a) r = 21 cm, $\theta = 120°$ $\frac{1}{2}$

Area cleaned by one wiper = $\frac{\pi r^2 \theta}{360^\circ}$

$= \frac{22}{7} \times 21 \times 21 \times \frac{120}{360}$ $1\frac{1}{2}$

$= 462 \text{ cm}^2$ $\frac{1}{2}$

Hence, total area cleaned by two wipers

$= 2 \times 462 = 924 \text{ cm}^2$ $\frac{1}{2}$

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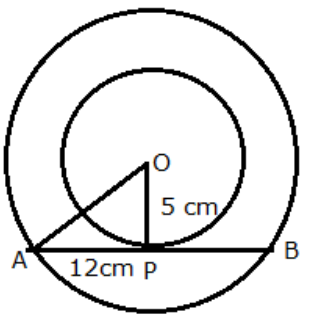
31. (a) In two concentric circles, a chord of length 24 cm of larger circle touches the smaller circle, whose radius is 5 cm. Find the radius of the larger circle.

OR

(b) Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre.

Solution:



For fig. $\frac{1}{2}$

(a) In Δ OAP,

$AP = \frac{1}{2}(24) = 12$ *1*

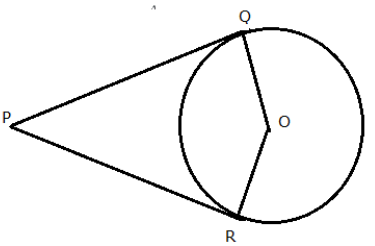
$(OA)^2 = (5)^2 + (12)^2$ *1*

$OA = 13$ $\frac{1}{2}$

$\therefore$ radius of the larger circle is 13 cm

OR

(b)



For fig. $\frac{1}{2}$

Let PQ and PR be the tangents drawn from an external point P to the circle with centre O.

To Prove: $\angle QPR + \angle QOR = 180°$

Proof – $\angle OQP = 90°$

$\angle ORP = 90°$ (radius $\perp$ tangent) } *1*

In Quadrilateral OQPR,

$\angle OQP + \angle QPR + \angle ORP + \angle QOR = 360°$ *1*

$90° + \angle QPR + 90° + \angle QOR = 360°$

$\angle QPR + \angle QOR = 180°$ $\frac{1}{2}$

SECTION D

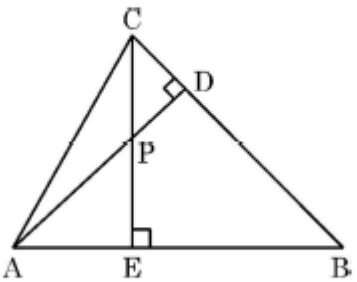
32. (a) In the given figure, altitudes CE and AD of ΔABC intersect each other at the point P. **1+2+2**

Show that

(i) $\Delta AEP \sim \Delta CDP$

(ii) $\Delta ABD \sim \Delta CBE$

(iii) $\Delta AEP \sim \Delta ADB$



OR

(b) AD and PM are medians of triangles ABC and PQR, respectively, where $\Delta ABC \sim \Delta PQR$. Prove that $\frac{AB}{PQ}=\frac{AD}{PM}$. **5**

Solution: (a) (i) In ΔAEP and ΔCDP,

$\angle APE = \angle CPD$ (vertically opposite angles) $\frac{1}{2}$

$\angle AEP = \angle CDP$ (each 90°)

$\therefore \Delta AEP \sim \Delta CDP$ (AA similarity) $\frac{1}{2}$

(ii) In ΔABD and ΔCBE,

$\angle B = \angle B$ (common) $\frac{1}{2}$

$\angle ADB = \angle BEC$ (each 90°) 1

$\therefore \Delta ABD \sim \Delta CBE$ (AA similarity) $\frac{1}{2}$

(iii) In ΔAEP and ΔADB,

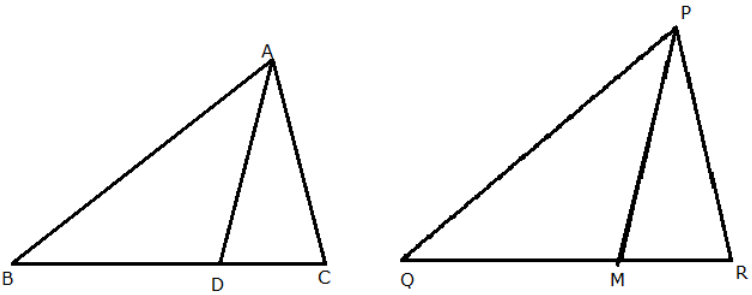
$\angle A = \angle A$ (common) $\frac{1}{2}$

$\angle AEP = \angle ADB$ (each 90°) 1

$\therefore \Delta AEP \sim \Delta ADB$ (AA similarity) $\frac{1}{2}$

OR

(b)



For fig. *1*

Given: Δ ABC ~ Δ PQR. AD and PM are medians of Δ ABC and Δ PQR, respectively

To Prove: $\frac{AB}{PQ} = \frac{AD}{PM}$

Proof: ∵ Δ ABC ~ Δ PQR (Given)

$\therefore \frac{AB}{PQ} = \frac{BC}{QR}$ *1*

$\Rightarrow \frac{AB}{PQ} = \frac{2BD}{2QM}$ (∵ D & E are mid-points of BC & QR, respectively)

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

Now, In Δ ABD and Δ PQM

$\frac{AB}{PQ} = \frac{BD}{QM}$ (Proved above) $\frac{1}{2}$

$\angle B = \angle Q$ (Δ ABC ~ Δ PQR) $\frac{1}{2}$

$\therefore$ Δ ABD ~ Δ PQM (SAS similarity) $\frac{1}{2}$

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

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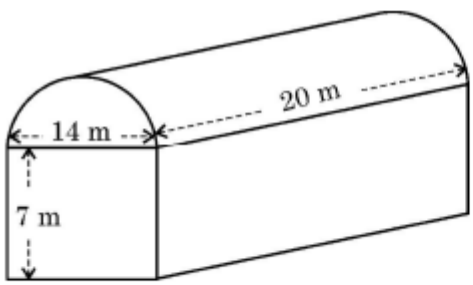
33. (a)



A textile industry runs in a shed. This shed is in the shape of a cuboid surmounted by a half cylinder. If the base of the industry is of dimensions 14 m × 20 m and the height of the cuboidal portion is 7 m, find the volume of air that the industry can hold. Further, suppose the machinery in the industry occupies a total space of 400 m^3. Then, how much space is left in the industry ?

OR

(b) From a solid cylinder of height 8 cm and radius 6 cm, a conical cavity of the same height and same radius is carved out. Find the total surface area of the remaining solid. (Take $\pi = 3.14$)

Solution: (a) Volume of cuboid = $20 \times 14 \times 7 = 1960\ m^3$ *1*

For half cylinder: $r = \frac{14}{2}$ m, h = 20 m *1*

Volume of half cylinder = $\frac{1}{2}\pi r^2 h$

$= \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 \times 20 = 1540\ m^3$ *2*

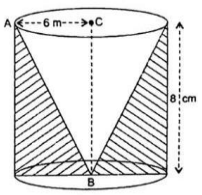
$\therefore$ Required volume of air $= 1960 + 1540 = 3500\ m^3$ $\frac{1}{2}$

Space occupied by machinery = $400\ m^3$

$\therefore$ Space left = $3500 - 400$

$= 3100\ m^3$ $\frac{1}{2}$

(b)



OR

$l = \sqrt{6^2 + 8^2} = 10$ cm *1*

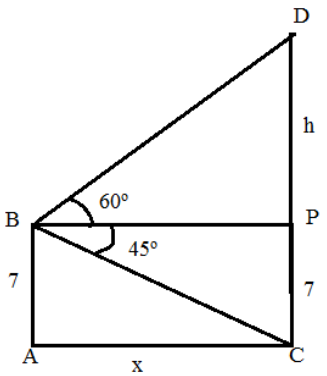
Required Surface Area of the remaining solid = $2\pi rh + \pi r^2 + \pi rl$

$= 2\pi\ (6)\ .\ 8 + \pi\ (6)^2 + \pi \times 6 \times 10$ *2* $\frac{1}{2}$

$= 192\ \pi$ *1*

$= 602.88\ m^2$ $\frac{1}{2}$

34. From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower. (Use $\sqrt{3} = 1.732$)



For correct fig. 1

Solution:

In Δ ABC,

$\tan 45° = \frac{7}{x} \Rightarrow x = 7$ *1+$\frac{1}{2}$*

In Δ BPD, $\tan 60° = \frac{h}{x} \Rightarrow \sqrt{3}x = h$ *1+$\frac{1}{2}$*

$\therefore h = 7\sqrt{3}$

$\therefore$ height of tower $= h + 7 = 7\sqrt{3} + 7$

$= 19{\cdot}124$ m *1*

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35. A cottage industry produces a certain number of pottery articles in a day. It was observed that on a particular day that the cost of production of each article (in rupees) was 3 more than twice the number of articles produced on that day. If the total cost of production on that day was ₹ 90, find the number of articles produced and the cost of each article.

Solution: Let the number of articles produced = x *$\frac{1}{2}$*

A.T.Q. $x(2x + 3) = 90$ *1*

$2x^2 + 3x - 90 = 0$ *1*

$(x - 6)(2x + 15) = 0$ *1*

$x = 6, \; x = -\frac{15}{2}$ (not possible) *1*

Number of articles produced = 6

$\therefore$ cost of each article $= (2x + 3) =$ ₹ 15 *$\frac{1}{2}$*

SECTION E

36. Heart Rate : The heart rate is one of the 'vital signs' of health in the human body. It measures the number of times per minute that the heart contracts or beats. While a normal heart rate does not guarantee that a person is free of health problems, it is a useful benchmark for identifying a range of health issues.

Thirty women were examined by doctors of AIIMS and the number of heart beats per minute were recorded and summarized as follows :

Number of heart beats per minute	Number of Women
65 – 68	2
68 – 71	4
71 – 74	3
74 – 77	8
77 – 80	7
80 – 83	4
83 – 86	2

Based on the above information, answer the following questions :

(i) How many women are having heart beat in the range 68 – 77 ?

(ii) What is the median class of heart beats per minute for these women ?

(iii) (a) Find the modal value of heart beats per minute for these women.

OR

(iii) (b) Find the median value of heart beats per minute for these women.

Solution: (i) Women having heart beat in range 68 – 77

= 4 + 3 + 8 = 15 *1*

(ii) Median class = 74 – 77 *1*

(iii)(a) Mode = $l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

$l = 74, f_1 = 8, f_0 = 3, f_2 = 7, h = 3$

$\therefore$ Modal value $= 74 + \left(\frac{8-3}{16-3-7}\right) \times 3$ $1\frac{1}{2}$

$= 76.5$ $\frac{1}{2}$

OR

(iii) (b)

No. of heart beats	f	cf
65 – 68	2	2
68 – 71	4	6
71 – 74	3	9
74 – 77	8	17
77 – 80	7	24
80 – 83	4	28
83 – 86	2	30

For table: $\frac{1}{2}$

$$\text{Median} = l + \frac{\frac{N}{2} - Cf}{f} \times h$$

$= 74 + \frac{(15-9)}{8} \times 3$ 1

$= 76.25$ $\frac{1}{2}$

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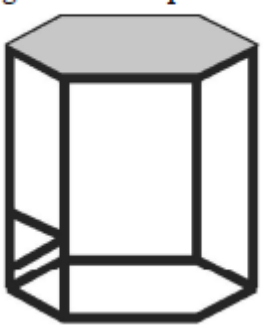
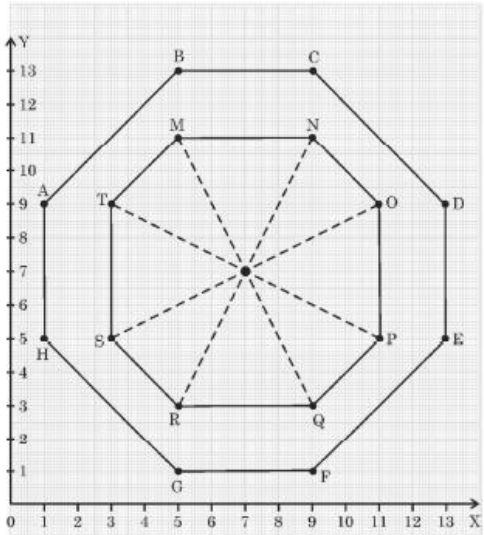
37. The top of a table is hexagonal in shape.





On the basis of the information given above, answer the following questions :

(i) Write the coordinates of A and B.

(ii) Write the coordinates of the mid-point of line segment joining C and D.

(iii) (a) Find the distance between M and Q.

OR

(iii) (b) Find the coordinates of the point which divides the line segment joining M and N in the ratio 1:3 internally.

Solution: (i) A(1, 9) and B(5, 13) $\frac{1}{2}+\frac{1}{2}$

(ii) C(9, 13) and D(13, 9) $\frac{1}{2}$

Mid-point of CD is (11, 11) $\frac{1}{2}$

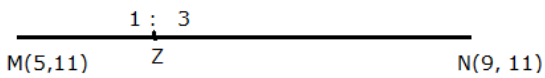
(iii)(a) M(5, 11) and Q(9, 3) *1*

$MQ = \sqrt{(9-5)^2+(3-11)^2} = \sqrt{80}$ or $4\sqrt{5}$ *1*

OR

(iii)(b) M(5, 11) and N(9, 11) *1*

$Z\left(\frac{1\times 9+3\times 5}{1+3}, \frac{1\times 11+3\times 11}{1+3}\right)$



Z (6, 11) *1*

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38. Saving money is a good habit and it should be inculcated in children right from the beginning. Rehan's mother brought a piggy bank for Rehan and puts one ₹ 5 coin of her savings in the piggy bank on the first day. She increases his savings by one ₹ 5 coin daily.

Based on the above information, answer the following questions :

(i) How many coins were added to the piggy bank on 8^{th} day ?

(ii) How much money will be there in the piggy bank after 8 days ?

(iii) (a) If the piggy bank can hold one hundred twenty ₹ 5 coins in all, find the number of days she can contribute to put ₹ 5 coins into it.

OR

(iii) (b) Find the total money saved, when the piggy bank is full.

Solution: (i) 8 coins *1*

(ii) Money in the piggy bank day wise

5, 10, 15, 20 .....

Money after 8 days = ₹180 *1*

(iii) (a) We can have at most 120 coins.

$\frac{n}{2}[2(1) + (n-1)1] = 120$ *1*

$n^2 + n - 240 = 0$ $\frac{1}{2}$

Solving for n, we get, n = 15 as $n \neq -16$ $\frac{1}{2}$

$\therefore$ Number of days = 15

OR

(iii) (b) Total money saved = 120×5= ₹600