Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2023
SUBJECT NAME MATHEMATICS (BASIC) (SUBJECT CODE 241) (PAPER 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. 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 the 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"**. However, for MCQs (Q1 to Q20), only first attempt to be evaluated.
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).
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 un assessed 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
MATHEMATICS (BASIC) 430/2/3

SECTION A

1. If the HCF of 360 and 64 is 8, then their LCM is :

(a) 2480 (b) 2780

(c) 512 (d) 2880

Answer (d) 2880 1

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2. The curved surface area of a cone of radius 7 cm is 550 cm^2. Its slant height is :

(a) 24 cm (b) 25 cm

(c) 14 cm (d) 20 cm

Answer (b) 25 cm 1

---

3. Two coins are tossed together. The probability of getting atmost two heads, is :

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$

(c) $\frac{3}{4}$ (d) 1

Answer (d) 1 1

---

4. If the quadratic equation $9x^2 + bx + \frac{1}{4} = 0$ has equal roots, then the value of b is :

(a) 0 (b) – 3 only

(c) 3 only (d) ± 3

Answer (d) ± 3 1

---

5. If $\tan A = \frac{2}{5}$, then the value of $\frac{1-\cos^2 A}{1-\sin^2 A}$ is :

(a) $\frac{25}{4}$ (b) $\frac{4}{25}$

(c) $\frac{4}{5}$ (d) $\frac{5}{4}$

Answer (b) $\frac{4}{25}$ 1

---

6. Median and Mode of a distribution are 25 and 21 respectively. Mean of the data using empirical relationship is :

(a) 27 (b) 29

(c) 18 (d) $\frac{29}{3}$

Answer (a) 27 1

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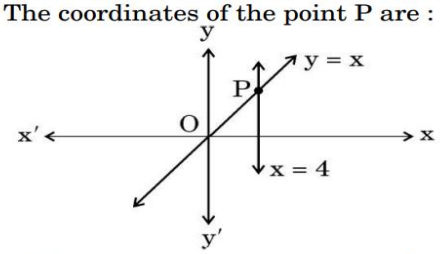
7. The lines represented by the linear equations $y = x$ and $x = 4$ intersect at P. The coordinates of the point P are :



(a) (4, 0) (b) (4, 4)

(c) (0, 4) (d) (– 4, 4)

Answer (b) (4, 4) 1

---

8. The value of $\frac{\sin 90° + \cos 60°}{\sec 45° + \tan 45°}$ is :

(a) 1 (b) $\frac{3}{2}(\sqrt{2}+1)$

(c) $\frac{3}{2}(\sqrt{2}-1)$ (d) $\frac{1+\sqrt{3}}{\sqrt{2}+1}$

Answer (c) $\frac{3}{2}(\sqrt{2}-1)$ 1

---

9. How many terms are there in the A.P. given below ?

14, 19, 24, 29, ..., 119

(a) 18 (b) 14

(c) 22 (d) 21

Answer (c) 22 1

---

10. y-axis divides the line segment joining the points $(-6, 2)$ and $(2, -6)$ in the ratio :

(a) 1 : 3 (b) 3 : 2

(c) 3 : 1 (d) 2 : 3

Answer.(c) 3 : 1 1

---

11. $9 \sec^2 A - 9 \tan^2 A$ is equal to :

(a) 9 (b) 0

(c) 8 (d) $\frac{1}{9}$

Answer (a) 9 1

---

12. The string of a kite in air is 50 m long and it makes an angle of 60° with the horizontal. Assuming the string to be straight, the height of the kite from the ground is :

(a) $50\sqrt{3}$ m (b) $\frac{100}{\sqrt{3}}$ m

(c) $\frac{50}{\sqrt{3}}$ m (d) $25\sqrt{3}$ m

Answer (d) $25\sqrt{3}$ m 1

---

13. The area of a sector of angle α (in degrees) of a circle with radius R is :

(a) $\frac{\alpha}{180} \times 2\pi R$ (b) $\frac{\alpha}{360} \times 2\pi R$

(c) $\frac{\alpha}{180} \times \pi R^2$ (d) $\frac{\alpha}{360} \times \pi R^2$

Answer (d) $\frac{\alpha}{360} \times \pi R^2$ 1

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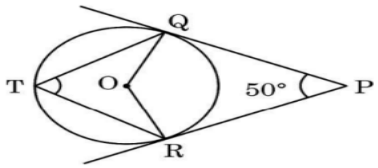
14. From a point P, two tangents PQ and PR are drawn to a circle with centre at O. T is a point on the major arc QR of the circle. If $\angle QPR = 50°$, then $\angle QTR$ equals :



(a) 50° (b) 130°

(c) 65° (d) 90°

Answer (c) 65° 1

---

15. The pair of linear equations $x + 2y - 5 = 0$ and $2x - 4y + 6 = 0$:

(a) is inconsistent

(b) is consistent with many solutions

(c) is consistent with a unique solution

(d) is consistent with two solutions

Answer (c) is consistent with a unique solution 1

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16. Which of the following numbers ***cannot*** be the probability of an event ?

(a) 0·5 (b) 5%

(c) $\frac{1}{0{\cdot}5}$ (d) $\frac{0{\cdot}5}{14}$

Answer (c) $\frac{1}{0{\cdot}5}$ 1

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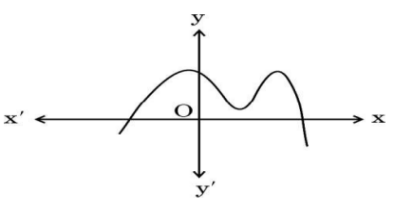
17. Graph of a polynomial p(x) is given in the figure. The number of zeroes of p(x) is :



(a) 2 (b) 3

(c) 4 (d) 5

Answer (a) 2 1

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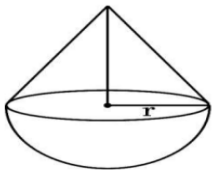
18. A solid is of the form of a cone of radius 'r' surmounted on a hemisphere of the same radius. If the height of the cone is the same as the diameter of its base, then the volume of the solid is :



(a) πr^3 (b) $\frac{4}{3}\pi r^3$

(c) $3\pi r^3$ (d) $\frac{2}{3}\pi r^3$

Answer (b) $\frac{4}{3}\pi r^3$ 1

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*Questions number **19** and **20** are Assertion and Reason based questions carrying 1 mark each. 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 the Assertion (A).

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is ***not*** the correct explanation of the 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 a prime number, when a die is thrown once, is $\frac{2}{3}$.

Reason (R): On the faces of a die, prime numbers are 2, 3, 5.

Answer (d) Assertion (A) is false, but Reason (R) is true 1

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20. *Assertion (A) :* Polynomial $x^2 + 4x$ has two real zeroes.

Reason (R) : Zeroes of the polynomial $x^2 + ax$ $(a \neq 0)$ are 0 and a.

Answer (c) Assertion (A) is true, but Reason (R) is false. 1

SECTION B

21. If (-3) is one of the zeroes of the polynomial $(k-1)x^2 + kx + 1$, find the value of k.

Solution $(k-1)(-3)^2 + k(-3) + 1 = 0$ 1

$\Rightarrow k = \frac{4}{3}$ 1

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22. A box contains 90 discs, numbered from 1 to 90. If one disc is drawn at random, then find the probability that it bears a multiple of 15.

Solution Favourable outcomes are 15, 30, 45, 60, 75,90 1

$\therefore$ P(drawing a multiple of 15) $= \frac{6}{90} = \frac{1}{15}$ 1

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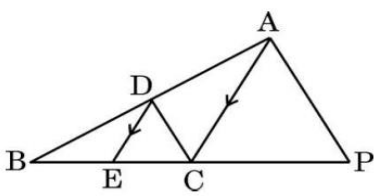
23. In the given figure, DE $\parallel$ AC and $\frac{BE}{EC} = \frac{BC}{CP}$. Prove that DC $\parallel$ AP.



Solution In Δ ABC, DE || AC $\Rightarrow \frac{BE}{EC} = \frac{BD}{DA}$ 1

Also given, $\frac{BE}{EC} = \frac{BC}{CP} \Rightarrow \frac{BD}{DA} = \frac{BC}{CP}$ 1/2

$\therefore$ DC || AP [Converse of BPT] 1/2

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24. (a) Find the HCF of the numbers 540 and 630, using prime factorization method.

Solution (a) $540 = 2^2 \times 3^3 \times 5$ 1/2

$630 = 2 \times 3^2 \times 5 \times 7$ 1/2

HCF $= 2 \times 3^2 \times 5 = 90$ 1

OR

(b) Show that $(15)^n$ cannot end with the digit 0 for any natural number 'n'.

Solution (b) $15^n = (3 \times 5)^n = 3^n \times 5^n$ 1

For a number to end with zero it should have both 2 and 5 in its prime factorization but 15^n has only prime numbers 3 and 5 as its factors so it can not end with zero. 1

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25. (a) Find the value(s) of 'x' so that PQ = QR, where the coordinates of P, Q and R are (6, –1), (1, 3) and (x, 8) respectively.

Solution (a) $PQ = QR \Rightarrow \sqrt{(6-1)^2 + (-1-3)^2} = \sqrt{(x-1)^2 + (8-3)^2}$ 1

$\Rightarrow (x-1)^2 = 16, \quad x - 1 = \pm 4$ 1/2

$\Rightarrow x = -3$ or 5 1/2

OR

(b) The vertices of a triangle are (–2, 0), (2, 3) and (1, –3). Is the triangle equilateral, isosceles or scalene ?

Solution (b) Let vertices of Δ be A(– 2, 0), B(2, 3) and C(1, – 3)

$AB = \sqrt{4^2 + 3^2} = 5$ 1/2

$BC = \sqrt{(-1)^2 + (-6)^2} = \sqrt{37}$ 1/2

$CA = \sqrt{(1+2)^2 + (-3)^2} = 3\sqrt{2}$ 1/2

$\therefore \Delta$ ABC is scalene triangle 1/2

SECTION C

26. Show that the points A(–3, 2), B(–5, –5), C(2, –3) and D(4, 4) are vertices of a rhombus ABCD. Is it also a square ?

Solution $AB = \sqrt{4 + 49} = \sqrt{53}$

$BC = \sqrt{49 + 4} = \sqrt{53}$

$CD = \sqrt{4 + 49} = \sqrt{53}$

$AD = \sqrt{49 + 4} = \sqrt{53}$

$\therefore$ AB = BC = CD = AD therefore ABCD is a rhombus. *2*

Now $AC = \sqrt{25 + 25} = 5\sqrt{2}$

$BD = \sqrt{81 + 81} = 9\sqrt{2}$

As $AC \neq BD$ therefore it is not a square. *1*

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27. Find the zeroes of the polynomial $p(x) = 2x^2 - 7x - 15$ and verify the relationship between its coefficients and zeroes.

Solution $p(x) = 2x^2 - 7x - 15 = 0$

$\Rightarrow (2x + 3)(x - 5) = 0$ 1

$\Rightarrow \alpha = x = -\frac{3}{2}, \beta = x = 5.$ 1

$\therefore \alpha + \beta = -\frac{3}{2} + 5 = \frac{7}{2} = -\frac{(-7)}{2} = \frac{-\text{coefficient of } x}{\text{coefficient of } x^2}$ 1/2

$\alpha\beta = -\frac{3}{2} \times 5 = -\frac{15}{2} = \frac{\text{constant term}}{\text{coefficient of } x^2}$ 1/2

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28. (a) Prove that :

$$\frac{1 - \cos\theta}{1 + \cos\theta} = (\text{cosec}\,\theta - \cot\theta)^2$$

Solution (a) LHS = $\frac{1 - \cos\theta}{1 + \cos\theta}$

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

$= \frac{(1 - \cos\theta)^2}{\sin^2\theta} = \left(\frac{1 - \cos\theta}{\sin\theta}\right)^2$ 1

$= \left(\frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta}\right)^2$ 1/2

$= (\text{cosec}\,\theta - \cot\theta)^2 = \text{RHS}$ 1/2

OR

(b) Prove that :

$$\left(1 + \frac{1}{\tan^2 A}\right)\left(1 + \frac{1}{\cot^2 A}\right) = \frac{1}{\sin^2 A - \sin^4 A}$$

Solution (b)LHS = $\left(1 + \frac{\cos^2 A}{\sin^2 A}\right)\left(1 + \frac{\sin^2 A}{\cos^2 A}\right)$ 1

$= \left(\frac{\sin^2 A + \cos^2 A}{\sin^2 A}\right)\left(\frac{\cos^2 A + \sin^2 A}{\cos^2 A}\right)$

$= \frac{1}{\sin^2 A} \times \frac{1}{\cos^2 A}$ 1

$= \frac{1}{\sin^2 A\,(1 - \sin^2 A)}$ 1/2

$= \frac{1}{\sin^2 A - \sin^4 A} = \text{RHS}$ 1/2

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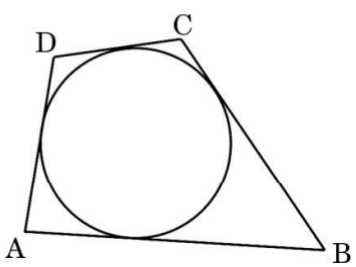
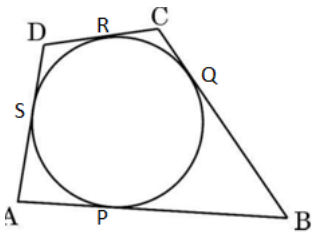
29. (a) A quadrilateral ABCD is drawn to circumscribe a circle, as shown in the figure. Prove that AB + CD = AD + BC.



Solution (a)



Tangents from an external point are equal therefore

AP = AS, BP = BQ, QC = CR and DR = DS 1

AB + CD = (AP + PB) + (CR + RD) 1/2

= (AS + BQ) + (CQ + DS) 1/2

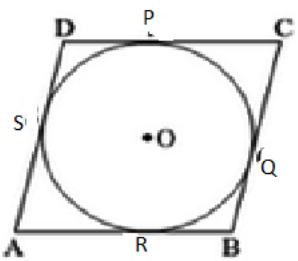
= (AS + DS) + (BQ + CQ) 1/2

= AD + BC 1/2

OR

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

Solution (b)



For figure *1*

Here AS = AR, DS = DP, CP = CQ And BQ = BR 1/2

Now AB + CD = (AR + RB) + (CP + DP) = (AS + BQ) + (CQ + DS)

= (AS + DS) + (BQ + CQ)

= AD + BC 1

Since ABCD is a parallelogram

Therefore 2AB = 2AD or AB = AD 1/2

$\Rightarrow$ ABCD is a rhombus.

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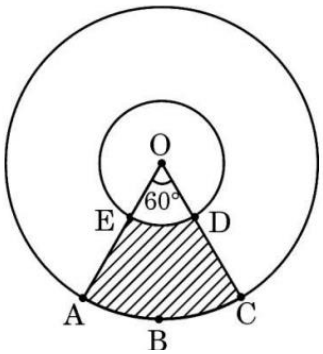
30. In the given figure, two concentric circles with centre O are shown. Radii of the circles are 2 cm and 5 cm respectively. Find the area of the shaded region.



Solution Area of sector OABC = $\frac{\pi \times 5^2 \times 60°}{360°} = \frac{25\pi}{6}$ cm^2 1

Area of sector OED = $\frac{\pi \times 2^2 \times 60°}{360°} = \frac{4\pi}{6}$ cm^2 1

Area of shaded region = $\frac{25\pi}{6} - \frac{4\pi}{6} = \frac{21}{6} \times \frac{22}{7} = 11$ cm^2 *1*

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31. Prove that $10 + 2\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

Solution Let us assume that $10 + 2\sqrt{3}$ is a rational number

$10 + 2\sqrt{3} = \frac{p}{q}$; $q \neq 0$ and p, q are integers 1

$\Rightarrow \sqrt{3} = \frac{p - 10q}{2q}$ 1

RHS is rational but LHS is irrational

$\therefore$ Our assumption is wrong.Hence $10 + 2\sqrt{3}$ is an irrational number 1

SECTION D

32. Find the mean and the median of the marks of 100 students of a class, given in the following table :

Marks	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30
Number of students	4	11	13	15	31	26

Solution Correct table 2

Marks	x	f	$u = \frac{x - 12{\cdot}5}{5}$	fu	cf
0 – 5	2·5	4	– 2	– 8	4
5 – 10	7·5	11	– 1	– 11	15
10 – 15	12·5	13	0	0	28
15 – 20	17·5	15	1	15	43
20 – 25	22·5	31	2	62	74
25 – 30	27·5	26	3	78	100
				136	

Mean = $12{\cdot}5 + 5 \times \frac{136}{100} = 19{\cdot}3$ $1+\frac{1}{2}$

l= 20, cf =43, f=31

Median class : 20-25 1/2

Median = $20 + \frac{5}{31}(50 - 43) = 21{\cdot}1$ 1

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33. (a) The sum of the first 8 terms of an A.P. is 100 and the sum of its first 19 terms is 551. Find the sum of its first 'n' terms.

Solution (a) $\frac{8}{2}(2a + 7d) = 100$ _____ (i) 1

and $\frac{19}{2}(2a + 18d) = 551$ _____ (ii) 1

Solving (i) and (ii), $d = 3$ and $a = 2$ 1+1

$\therefore S_n = \frac{n}{2}[4 + (n - 1) \times 3] = \frac{n}{2}(3n + 1)$ 1/2+1/2

OR

(b) If the sum of the first p terms of an A.P. is the same as the sum of its first q terms, $(p \neq q)$, then show that the sum of its first $(p + q)$ terms is zero.

Solution $\frac{p}{2}[2a + (p - 1)d] = \frac{q}{2}[2a + (q - 1)d]$ 1+1

$\Rightarrow 2ap + (p - 1)pd = 2aq + (q - 1)qd$

$\Rightarrow 2a(p - q) + d[p^2 - p - q^2 + q] = 0$ *1*

$\Rightarrow 2a(p - q) + d[(p^2 - q^2) - (p - q)] = 0$

$\Rightarrow (p - q)(2a + d(p + q - 1)) = 0$ 1/2

$\Rightarrow 2a + (p + q - 1)d = 0 \quad (p \neq q)$ _____ (i) 1/2

Now $S_{p+q} = \frac{p+q}{2}[2a + (p + q - 1)d]$ 1/2

$= 0$ [using eq. (i)] 1/2

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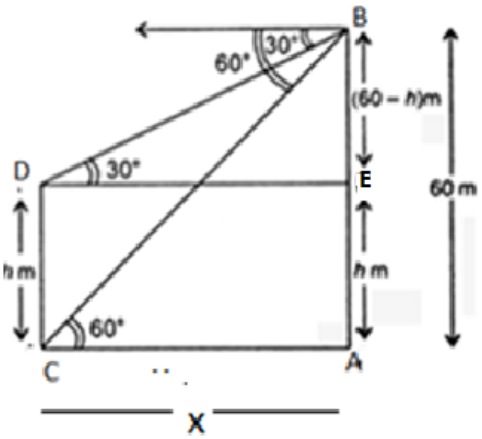
34. (a) From the top of a building 60 m high, the angles of depression of the top and bottom of a tower are observed to be 30° and 60° respectively. Find the height of the tower. Also, find the distance between the building and the tower. (Use $\sqrt{3} = 1{\cdot}732$)

Solution (a)



For figure 1

Let AB be the building and CD be the tower

In ΔBAC, $\tan 60° = \frac{60}{x} \Rightarrow x = \frac{60}{\sqrt{3}} = 20\sqrt{3}$ _____ (i) *1*+1/2

In ΔBED, $\tan 30° = \frac{60-h}{x} \Rightarrow 60 - h = \frac{20\sqrt{3}}{\sqrt{3}}$ _____ (ii) *1*+1/2

using equations (i) and (ii)

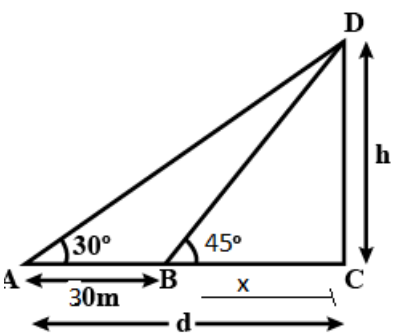
distance between building and the tower = x = $20\sqrt{3}$ = 34·64 m 1/2

and the height of tower = h = 40 m 1/2

OR

(b) The angle of elevation of the top of a building from a point A on the ground is 30°. On moving a distance of 30 m towards its base to the point B, the angle of elevation changes to 45°. Find the height of the building and the distance of its base from point A. (Use $\sqrt{3}$ = 1·732)

Solution (b)



For figure 1

Let CD be the building

In ΔDCA, $\tan 30° = \frac{h}{x+30} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+30}$ _____ (i) *1*+1/2

In ΔDCB, $\tan 45° = \frac{h}{x} \Rightarrow h = x$ _____ (ii) *1*

using equations (i) and (ii), $h = x = 15(\sqrt{3}+1)$ 1/2

$= 15 \times 2{\cdot}732 = 40.98$ m

Height of building h = x = 40·98 m 1/2

Distance(d) of base from point A = x + 30 = 70.98 m 1/2

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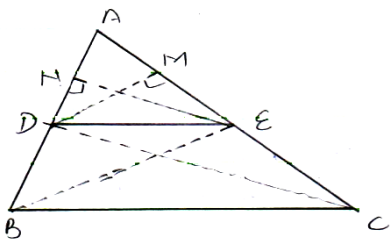
35. **If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.**

Solution



For figure 1

Given In Δ ABC, DE // BC 1/2

To prove : $\frac{AD}{DB} = \frac{AE}{EC}$ 1/2

Const. : Join BE, CD. Draw DM ⊥ AC and EN ⊥ AB 1/2

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

similarly $\frac{ar(\Delta ADE)}{ar(\Delta CDE)} = \frac{AE}{EC}$ _____ (ii) 1/2

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

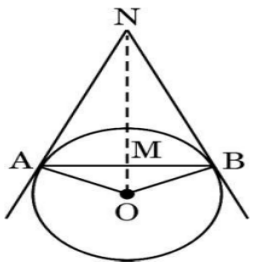
ar(Δ BDE) = ar(Δ CDE) _____ (iii) 1/2

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

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

SECTION E

36. Circles play an important part in our life. When a circular object is hu on the wall with a cord at nail N, the cords NA and NB work l tangents. Observe the figure, given that $\angle ANO = 30°$ and OA = 5 cm.



Based on the above, answer the following questions :

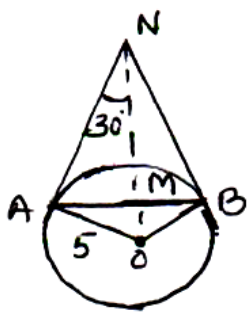
(i) Find the distance AN.

(ii) Find the measure of $\angle AOB$.

(iii) (a) Find the total length of cor ıe chord AB.

Solution (i) $\tan 30° = \frac{5}{AN}$ 1/2

$\Rightarrow AN = 5\sqrt{3}$ cm 1/2



(ii) $\angle BNO = 30° \Rightarrow \angle BNA = 60°$

$\therefore \angle AOB = 180° - 60° = 120°$ 1

(iii) (a) $AN = 5\sqrt{3}$ and in ΔANB, $\angle ANB = 60°$ and NA = NB

$\therefore \angle NAB = \angle NBA = 60°$ or ΔNAB is an equilateral Δ $\frac{1}{2}$

Hence, $AB = 5\sqrt{3}$ cm. *1*

$AN + NB + AB = 3 \times 5\sqrt{3} = 15\sqrt{3}$ cm. $\frac{1}{2}$

OR

(iii) (b) If $\angle ANO$ is 45°, then name the type of quadrilateral OANB. Justify your answer.

(iii) (b) $\angle ANO = 45° \Rightarrow \angle AOB = 90°$ $\frac{1}{2}$

Thus each angle of quad. AOBN is 90°. 1

Also, OA = OB. $\therefore$ OANB is a square. $\frac{1}{2}$

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37. A wooden toy is shown in the picture. This is a cuboidal wooden block of dimensions 14 cm $\times$ 17 cm $\times$ 4 cm. On its top there are seven cylindrical hollows for bees to fit in. Each cylindrical hollow is of height 3 cm and radius 2 cm.

Based on the above, answer the following questions :

(i) Find the volume of wood carved out to make one cylindrical hollow.

(ii) Find the lateral surface area of the cuboid to paint it with green colour.

(iii) (a) Find the volume of wood in the remaining cuboid after carving out seven cylindrical hollows.

OR

(iii) (b) Find the surface area of the top surface of the cuboid to be painted yellow.

Solution (i) Volume of wood carved out to make one hollow

$= \frac{22}{7} \times 2 \times 2 \times 3 = \frac{264}{7}$ cm^3 or 37.7 cm^3 *1*

(ii) LSA of cuboid = $2(14 \times 4 + 17 \times 4) = 248$ cm^2. *1*

(iii)(a) Volume of 7 cylindrical hollows = 264 cm^3. 1/2

Volume of original cuboid = $14 \times 17 \times 4 = 952$ cm^3. *1*

$\therefore$ Volume of remaining solid = $952 - 264 = 688$ cm^3. 1/2

OR

(iii) (b) Area of top surface to be painted = $(l \times b) - 7 \times \pi r^2$

$= (14 \times 17) - (\frac{22}{7} \times 4 \times 7)$ 1

$= 150$ cm^2 1

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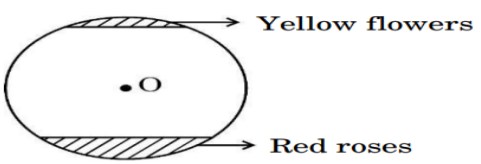
38. Flower beds look beautiful growing in gardens. One such circular park of radius 'r' m, has two segments with flowers. One segment which subtends an angle of 90° at the centre is full of red roses, while the other segment with central angle 60° is full of yellow coloured flowers. [See figure]



It is given that the combined area of the two segments (of flowers) is $256\frac{2}{3}$ sq m.

Based on the above, answer the following questions :

(i) Write an equation representing the total area of the two segments in terms of 'r'.

(ii) Find the value of 'r'.

(iii) (a) Find the area of the segment with red roses.

OR

(iii) (b) Find the area of the segment with yellow flowers.

Solution (i) Total area of two segments = $\frac{1}{4}\pi r^2 - \frac{1}{2} r^2 + \frac{1}{6}\pi r^2 - \frac{\sqrt{3}}{4} r^2 = 256\frac{2}{3}$ 1

(ii) $\left(\frac{1}{4}\pi - \frac{1}{2} + \frac{1}{6}\pi - \frac{\sqrt{3}}{4}\right) r^2 = \frac{770}{3}$ 1

$\Rightarrow$ r = 26.1 cm (approx.)

(iii)(a) Area of segment with red roses = $\frac{1}{4}\pi r^2 - \frac{1}{2} r^2$ sq m 2

= 194.63 sq m (approx.)

OR

(iii)(b) Area of segment with yellow roses = $\frac{1}{6}\pi r^2 - \frac{\sqrt{3}}{4} r^2$ sq m 2

= 62.03 sq m (approx.)

Note: If the student has correctly written the area of two segments in part (i), then 2 marks to be awarded for part (iii), even if the student has not attempted part (iii).
