Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2023
SUBJECT NAME MATHEMATICS (BASIC) (For Visually Impaired Candidates Only)
(SUBJECT CODE J4396A) (PAPER CODE 430(B))

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)
(For Visually Impaired Candidates Only)

SECTION A

1. If two positive integers x and y are written as $x = a^3b^2$ and $y = ab^3$, where a and b are prime numbers, then their HCF (x, y) is :

(a) ab (b) ab^2

(c) a^3b^3 (d) a^2b^2

Answer (b) ab^2 1

---

2. The product of the HCF and LCM of two numbers 50 and 20 is :

(a) 10 (b) 100

(c) 1000 (d) 20

Answer (c) 1000 1

---

3. The product of a non-zero rational number and an irrational number is :

(a) always irrational

(b) always rational

(c) rational or irrational

(d) always positive

Answer (a) always irrational 1

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4. A quadratic polynomial whose zeroes are 2 and 3 is :

(a) $x^2 + 5x + 6$

(b) $x^2 - 5x - 6$

(c) $x^2 + x - 6$

(d) $x^2 - 5x + 6$

Answer (d) $x^2 - 5x + 6$ 1

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5. The pair of linear equations $3x - 5y - 2 = 0$ and $-9x + 15y - 5 = 0$ has :

(a) a unique solution

(b) exactly two solutions

(c) infinitely many solutions

(d) no solution

Answer (d) no solution 1

---

6. If the equation $9x^2 + 12x + k = 0$ has equal roots, then both the roots are equal to :

(a) $\frac{2}{3}$

(b) $-\frac{2}{3}$

(c) $\frac{3}{2}$

(d) $-\frac{3}{2}$

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

---

7. The distance of the point $(3, -5)$ from x-axis is :

(a) 3 (b) -3

(c) -5 (d) 5

Answer (d) 5 1

---

8. If $(-3, a)$ is the mid-point of the line segment joining the points $P(-5, 7)$ and $Q(-1, 5)$, then the value of 'a' is :

(a) 1 (b) 6

(c) 12 (d) -3

Answer (b) 6 1

---

9. The perimeters of two similar triangles are 28 cm and 35 cm respectively. If one side of the first triangle is 8 cm, then the corresponding side of the second triangle is :

(a) 10 cm

(b) 8 cm

(c) 16 cm

(d) 5 cm

Answer (a) 10 cm 1

---

10. If in triangles ABC and PQR, $\angle B = \angle Q$, $\angle R = \angle C$ and AB = 2PQ, then the two triangles are :

(a) congruent but not similar

(b) similar but not congruent

(c) neither congruent nor similar

(d) congruent as well as similar

Answer (b) similar but not congruent 1

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11. If a parallelogram circumscribes a circle, then the parallelogram is a :

(a) square

(b) rectangle

(c) rhombus

(d) trapezium

Answer (c) rhombus 1

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12. If $\tan \theta = \frac{3}{4}$, then the value of $\cos \theta$ is :

(a) $\frac{3}{5}$ (b) $\frac{4}{5}$

(c) $\frac{3}{7}$ (d) $\frac{4}{7}$

Answer (b) $\frac{4}{5}$ 1

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13. If $2 \sin A = \text{cosec } A$, then $\angle A$ is equal to :

(a) $30°$ (b) $60°$

(c) $45°$ (d) $90°$

Answer (c) 45° 1

---

14. If the angle of elevation of the top of a tower from a point at a distance of 75 m from its foot is 60°, then the height of the tower is :

(a) $75\sqrt{2}$ m (b) $50\sqrt{3}$ m

(c) $25\sqrt{3}$ m (d) $75\sqrt{3}$ m

Answer (d) $75\sqrt{3}$ m 1

---

15. If the radii of two concentric circles are 15 m and 13 m, then the area of the circulating ring (in sq. m) is :

(a) 176 (b) 178

(c) 180 (d) 200

Answer (a)176 1

---

16. A number is chosen at random from numbers 1 to 20. The probability that it is a prime number, is :

(a) $\frac{7}{20}$ (b) $\frac{3}{10}$

(c) $\frac{1}{2}$ (d) $\frac{2}{5}$

Answer (d) $\frac{2}{5}$ 1

---

17. If the classes of a frequency distribution are 1 – 9, 10 – 18, 19 – 27, ... etc., then the class size is :

(a) 8 (b) 9

(c) 10 (d) 7

Answer (b) 9 1

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18. If the median and mode of a frequency distribution are 26 and 29 respectively, then the mean is :

(a) 23·5 (b) 24

(c) 24·5 (d) 27·5

Answer (c) 24·5 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 Assertion (A) and the other labelled Reason (R). Select the correct answer 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 and Reason (R) is false.

(d) Assertion (A) is false and Reason (R) is true.

19. *Assertion (A) :* The area of the sector of a circle of radius 14 cm and central angle 90° is 154 cm^2.

Reason (R) : The area of the sector of a circle of radius r and central angle θ is $\pi r^2 \frac{\theta}{360}$.

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

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20. *Assertion (A) :* The diameter of a sphere, whose surface area is 616 cm^2, is 7 cm.

Reason (R) : The surface area of a sphere of radius r is $4\pi r^2$.

Answer (d) Assertion (A) is false and Reason (R) is true. 1

SECTION B

21. Find two numbers whose sum is 75 and the difference is 25.

Solution $x + y = 75$
$x - y = 25$ } 1
$\Rightarrow x = 50, y = 25$ 1

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22. A vertical pole 30 m high casts a shadow 15 m long on the ground. At the same time, a tower casts a shadow 70 m long on the ground. Find the height of the tower.

Solution $\frac{30}{15} = \frac{x}{70}$ $1\frac{1}{2}$
$\Rightarrow x = 140$ m. $\frac{1}{2}$

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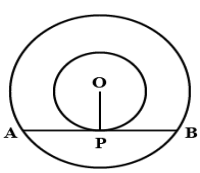
23. Prove that in two concentric circles, the chord of the larger circle, which touches the smaller circle, is bisected at the point of contact.



Solution OP ⊥ AB, (tangent ⊥ radius at the point of contact) 1
∴ perpendicular from centre bisects the chord. 1

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24. (a) The length of an arc of a circle of radius 18 cm is 10π cm. Find the angle subtended by this arc at the centre of the circle.

Solution $10\pi = 2\pi(18)\frac{\theta}{360}$ $1\frac{1}{2}$
$\Rightarrow \theta = 10 \times 10 = 100°$ $\frac{1}{2}$

OR

(b) The diameter of a wheel of a bus is 140 cm. Find the number of revolutions the wheel will make in one minute to keep the speed of the bus at 66 km/h.

Solution Distance travelled in 1minute $= \frac{66 \times 1000}{60} = 1100$ m $= 110000$ cm 1

Distance travelled in 1 revolution $= 2 \times \frac{22}{7} \times 70 = 440$ cm 1/2

$\therefore$ Number of revolutions $= \frac{110000}{440} = 250$ 1/2

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25. (a) If $\tan\theta = \frac{8}{7}$, evaluate :

$$\frac{(1-\sin\theta)(1+\sin\theta)}{(1-\cos\theta)(1+\cos\theta)}$$

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

$= \left(\frac{7}{8}\right)^2 = \frac{49}{64}$ 1

OR

(b) In a right-angled triangle ABC, right angled at C, if $\tan A = \sqrt{3}$, evaluate $\sin A \cos B + \cos A \sin B$.

Solution $A = 60° \Rightarrow B = 30°$ 1

$\sin 60^0 \cos 30^0 + \cos 60° \sin 30°$

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

SECTION C

26. Show that $5 + 2\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

Solution Let us assume that $5 + 2\sqrt{3}$ is a rational number

$5 + 2\sqrt{3} = \frac{p}{q}$; $q \neq 0$ and p, q are integers 1

$\Rightarrow \sqrt{3} = \frac{p-5q}{2q}$ 1

RHS is rational but LHS is irrational

$\therefore$ Our assumption is wrong.

Hence $5 + 2\sqrt{3}$ is an irrational 1

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27. Find the zeroes of the quadratic polynomial $x^2 - 5x - 6$ and verify the relationship between the zeroes and the coefficients.

Solution $x^2 - 5x - 6 = 0 \Rightarrow (x - 6)(x + 1) = 0$ 1

$\Rightarrow$ Zeroes are 6, – 1 1

Sum = $6 + (-1) = 5 = -\frac{-5}{1} = -\frac{coefficient\ of\ x}{coefficient\ of\ x^2}$ $\frac{1}{2}$

Product = $6(-1) = -6 = \frac{-6}{1} = \frac{constant\ term}{coefficient\ of\ x^2}$ $\frac{1}{2}$

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

$8x + 5y = 9;\ 3x + 2y = 4$

Solution Solving to get $x = -2$ 2

$y = 5$ 1

OR

(b) The ratio of incomes of two persons is 9 : 7 and the ratio of their expenditures is 4 : 3. If each of them saves ₹ 2,000 yearly, find their annual incomes.

Solution Let the incomes be 9x, 7x and expenditures be 4y, 3y 1/2

ATQ , $9x - 4y = 2000$

$7x - 3y = 2000$ } 1

On solving we get, $x = 2000$ 1

$\Rightarrow$ annual incomes are ₹18000 and ₹14000 1/2

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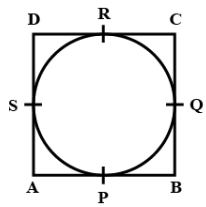
29. (a) A circle touches all the four sides of a quadrilateral ABCD. Prove that AB + CD = BC + AD.

Solution



AP = AS
BP = BQ
CR = CQ
DR = DS
} (tangents drawn from an external point of a circle are equal) 1

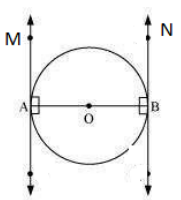
$\Rightarrow$ (AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ) 1

$\Rightarrow$ AB + CD = AD + BC 1

OR

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

Solution



$\angle$ MAO = 90° = $\angle$ NBO (tangent $\perp$ radius at the point of contact) 1

i.e. $\angle$ MAO + $\angle$ NBO = 180° 1

$\Rightarrow$AM || BN 1

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30. Prove that :

$$(\text{cosec } A - \sin A)(\sec A - \cos A)(\tan A + \cot A) = 1$$

Solution (cosec A – sin A) (sec A – cos A) (tan A + cot A)

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

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

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31. Two dice are thrown simultaneously. Find the probability that the sum of the two numbers appearing on the top of the two dice is less than or equal to 10.

Solution Total outcomes =36 1

Favourable outcomes =33 1

Required probability = $\frac{33}{36}$ or $\frac{11}{12}$ 1

SECTION D

32. (a) The sum of first 9 terms of an AP is 171 and the sum of its first 24 terms is 996. Find the 20^{th} term of the AP.

Solution $\frac{9}{2}(2a + 8d) = 171 \Rightarrow a + 4d = 19$ $1+\frac{1}{2}$

$\frac{24}{2}(2a + 23d) = 996 \Rightarrow 2a + 23d = 83$ $1+\frac{1}{2}$

Solving to get d = 3 and a = 7 1

$a_{20} = 7 + 19 \times 3 = 64$ 1

OR

(b) Three consecutive natural numbers are such that the sum of the square of the first and the product of the other two is 154. Find the numbers.

Solution Let the natural numbers be x – 1, x and x + 1 1

$(x - 1)^2 + x(x + 1) = 154$ 1

$2x^2 - x - 153 = 0$ 1

$(x - 9)(2x + 17) = 0$ 1

$x = 9$ 1/2

$\therefore$ numbers are 8, 9, 10. 1/2

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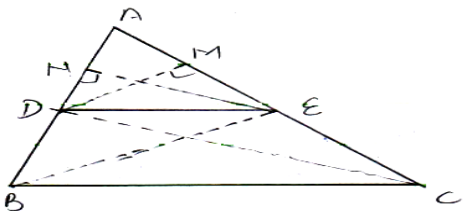
33. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio.



Solution

Given: In Δ ABC, DE // BC 1/2

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

Construction: Join BE, CD. Draw DM ⊥ AC and EN ⊥ AB 1

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

Similarly $\frac{ar(\Delta \text{ ADE})}{ar(\Delta \text{ CDE})} = \frac{AE}{EC}$ _____ (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

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34. (a) **A race track is in the form of a ring enclosed by two concentric circles. The outer and inner circumferences are 616 m and 528 m respectively. Find the width and the area of the track.**

Solution Let R and r be the radii of the outer and the inner track respectively.

$2 \times \frac{22}{7} \times R = 616 \Rightarrow R = 98$ m. 1

$2 \times \frac{22}{7} \times r = 528 \Rightarrow r = 84$ m. 1

Width of the track= 98 – 84 = 14 m. 1/2

Area of the track = $\frac{22}{7}[98^2 - 84^2]$ 2

$= 8008 \text{ m}^2$ 1/2

OR

(b) **A solid toy is in the form of a hemisphere surmounted by a right circular cone, the diameter of both is 14 cm and the height of cone is 24 cm. Find the total surface area and the volume of the toy.**

Solution r = 7 cm
h = 24 cm $\Rightarrow l$ = 25 cm } 1

Surface Area of the toy = $2\pi r^2 + \pi rl = \pi r(2r + l)$

$= \frac{22}{7} \times 7 \times (14 + 25)$ $1\frac{1}{2}$

$= 22 \times 39 = 858 \text{ cm}^2$ 1/2

Volume of a toy= $\frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi r^2 [2r + h]$

$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 38$ $1\frac{1}{2}$

$= \frac{1852}{3} \text{ cm}^3$ or $1950{\cdot}66 \text{ cm}^3$ 1/2

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35. Find the mode of the following distribution :

Marks Obtained	*Number of Students*
0 – 20	15
20 – 40	18
40 – 60	21
60 – 80	29
80 – 100	17

Given the mean of the above distribution is 53, using empirical formula, find its median.

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

$= 60 + \frac{29 - 21}{58 - 21 - 17} \times 20$ 2

$= 60 + \frac{8 \times 20}{20} = 68$ 1

3 Median = Mode + 2 Mean

$=68 + 2(53)$ $1\frac{1}{2}$

Median = 58 1/2

SECTION E

36. A factory is manufacturing cars and is increasing its production by a fixed number every year. The factory produced 80,000 cars in the fourth year and 1,10,000 cars in the seventh year.

Based on the above, answer the following questions :

(a) Taking 'a' as the number of cars produced in the first year and 'd' the fixed number by which the production is increasing every year, write a relation between 'a' and 'd' for the fourth year.

(b) Write the relation between 'a' and 'd' for the seventh year.

(c) Solving the above two equations, find 'a'.

OR

(c) Solving the above two equations, find 'd'.

Solution

(i) $a + 3d = 80000$ 1

(ii) $a + 6d = 110000$ 1

(iii) (a) Solving to get $a = 50,000$. 2

OR

(iii) (b) Solving to get $d = 10,000$. 2

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37. A flagstaff stands on the top of a 5 m high tower. From a point on the ground, the angle of elevation of the top of the flagstaff is 60° and from the same point the angle of elevation of the top of tower is 45°.

Based on the above, answer the following questions :

(a) What is the distance of the point from the foot of the tower ?

(b) What is the height of the flagstaff ?

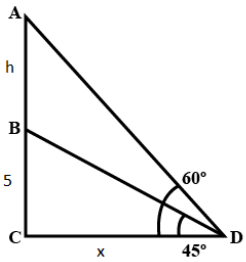
(c) If at some other point, the top of tower's angle of elevation is 30°, then find the distance of this new point from the foot of the tower.

OR

(c) Find the distance between the top of the tower and the point at which the angle of elevation of the top of tower is 30°.

Solution (i)Let x be the required distance

$\frac{5}{x} = \tan 45^0 = 1 \quad \Rightarrow x = 5$ m 1



(ii) Let h be the height of flag staff

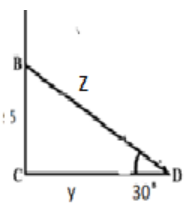
$\frac{5+h}{5} = \sqrt{3} \Rightarrow h = 5(\sqrt{3} - 1)$ m 1

(iii) (a) Let y be the required distance

$\frac{5}{y} = \tan 30^0 \Rightarrow \frac{5}{y} = \frac{1}{\sqrt{3}}$ $1\frac{1}{2}$

$y = 5\sqrt{3}$ m $\frac{1}{2}$

OR



(iii) (b) Let z be the required distance

$\frac{5}{z} = \sin 30^0 = \frac{1}{2} \Rightarrow z = 10$ m 1+1

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38. **The coordinates of the vertices of a quadrilateral ABCD are given as A(3, – 1), B(4, 4), C(– 1, 3) and D(– 2, – 2). Find the following to know what type of quadrilateral it is :**

(a) Find the lengths of AB and CD.

(b) Find the lengths of BC and AD.

(c) Find the lengths of AC and BD.

OR

(c) Find the mid-points of AC and BD.

Solution (i) $AB = \sqrt{1 + 25} = \sqrt{26}$ $CD = \sqrt{1 + 25} = \sqrt{26}$ $\frac{1}{2}+\frac{1}{2}$

(ii) $BC = \sqrt{25 + 1} = \sqrt{26}$ $AD = \sqrt{25 + 1} = \sqrt{26}$ $\frac{1}{2}+\frac{1}{2}$

(iii) (a)$AC = \sqrt{16 + 16} = 4\sqrt{2}$ $BD = \sqrt{36 + 36} = 6\sqrt{2}$ 1+1

OR

(iii) (b)Mid point of AC is (1, 1) 1

Mid point of BD is (1,1) 1
