Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2023
SUBJECT NAME MATHEMATICS (BASIC) (SUBJECT CODE 241) (PAPER CODE 430/4/2)

<u>General Instructions: -</u>

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 the 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"**.

	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)

SECTION A

1. Let E be an event such that P(not E) $= \frac{1}{5}$, then P(E) is equal to :

(a) $\frac{1}{5}$ (b) $\frac{2}{5}$ (c) 0 (d) $\frac{4}{5}$

Ans. (d) $\frac{4}{5}$ 1

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2. If $p(x) = x^2 + 5x + 6$, then $p(-2)$ is :

(a) 20 (b) 0 (c) -8 (d) 8

Ans. (b) 0 1

---

3. The mode of the numbers 2, 3, 3, 4, 5, 4, 4, 5, 3, 4, 2, 6, 7 is :

(a) 2 (b) 3 (c) 4 (d) 5

Ans. (c) 4 *1*

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4. How many tangents can be drawn to a circle from a point on it ?

(a) One (b) Two (c) Infinite (d) Zero

Ans. (a) One *1*

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5. A quadratic equation whose one root is 2 and the sum of whose roots is zero, is :

(a) $x^2 + 4 = 0$ (b) $x^2 - 2 = 0$ (c) $4x^2 - 1 = 0$ (d) $x^2 - 4 = 0$

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

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6. Which of the following is **not** a quadratic equation ?

(a) $2(x-1)^2 = 4x^2 - 2x + 1$ (b) $2x - x^2 = x^2 + 5$

(c) $(\sqrt{2}x + \sqrt{3})^2 + x^2 = 3x^2 - 5x$ (d) $(x^2 + 2x)^2 = x^4 + 3 + 4x^3$

Ans. (c) $(\sqrt{2}\,x + \sqrt{3})^2 + x^2 = 3x^2 - 5x$ *1*

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7. A quadratic polynomial whose sum and product of zeroes are 2 and −1 respectively is :

(a) $x^2 + 2x + 1$ (b) $x^2 - 2x - 1$ (c) $x^2 + 2x - 1$ (d) $x^2 - 2x + 1$

Ans. (b) $x^2 - 2x - 1$ *1*

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8. (HCF × LCM) for the numbers 30 and 70 is :

(a) 2100 (b) 21 (c) 210 (d) 70

Ans. (a) 2100 *1*

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9. The length of the arc of a circle of radius 14 cm which subtends an angle of 60° at the centre of the circle is :

(a) $\frac{44}{3}$ cm (b) $\frac{88}{3}$ cm (c) $\frac{308}{3}$ cm (d) $\frac{616}{3}$ cm

Ans. (a) $\frac{44}{3}$ cm *1*

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10. If the radius of a semi-circular protractor is 7cm, then its perimeter is :

(a) 11 cm (b) 14 cm (c) 22 cm (d) 36 cm

Ans. (d) 36 cm *1*

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11. The angle of elevation of the top of a 15 m high tower at a point $15\sqrt{3}$ m away from the base of the tower is :

(a) 30° (b) 45° (c) 60° (d) 90°

Ans. (a) 30° *1*

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12. $\left(\frac{2}{3}\sin 0^\circ - \frac{4}{5}\cos 0^\circ\right)$ is equal to :

(a) $\frac{2}{3}$ (b) $\frac{-4}{5}$ (c) 0 (d) $\frac{-2}{15}$

Ans. (b) $-\frac{4}{5}$ *1*

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13. From a well-shuffled deck of 52 cards, a card is drawn at random. What is the probability of getting king of hearts ?

(a) $\frac{1}{52}$ (b) $\frac{1}{26}$ (c) $\frac{1}{13}$ (d) $\frac{12}{13}$

Ans. (a) $\frac{1}{52}$ *1*

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14. The number $(5 - 3\sqrt{5} + \sqrt{5})$ is :

(a) an integer (b) a rational number
(c) an irrational number (d) a whole number

Ans. (c) an irrational number *1*

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15. If the pair of linear equations $x - y = 1$, $x + ky = 5$ has a unique solution $x = 2, y = 1$, then the value of k is :

(a) -2 (b) -3 (c) 3 (d) 4

Ans. (c) 3 *1*

---

16. If $\Delta ABC \sim \Delta DEF$ and $\angle A = 47^\circ$, $\angle E = 83^\circ$, then $\angle C$ is equal :

(a) 47° (b) 50° (c) 83° (d) 130°

Ans. (b) 50° *1*

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17. The length of the tangent from an external point A to a circle, of radius 3 cm, is 4 cm. The distance of A from the centre of the circle is :

(a) 7 cm (b) 5 cm (c) $\sqrt{7}$ cm (d) 25 cm

Ans. (b) 5 cm *1*

---

18. The pair of linear equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ has :

(a) a unique solution (b) exactly two solutions
(c) infinitely many solutions (d) no solution

Ans. (d) no solution *1*

In question numbers **19** and **20**, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** Choose the correct option :

(a) Both Assertion (A) and Reason (R) are true and Reason (R) gives the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) does not give 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) :** If one root of the quadratic equation $4x^2 - 10x + (k - 4) = 0$ is reciprocal of the other, then value of k is 8.
Reason (R) : Roots of the quadratic equation $x^2 - x + 1 = 0$ are real.

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

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20. **Assertion (A) :** A tangent to a circle is perpendicular to the radius through the point of contact.
Reason (R) : The lengths of tangents drawn from an external point to a circle are equal.

Ans. (b) Both Assertion (A) and Reason (R) are true but Reason (R) does not give the correct explanation of Assertion (A) *1*

SECTION B

21. **(A)** Find the discriminant of the quadratic equation $3x^2 - 2x + \frac{1}{3} = 0$ and hence find the nature of its roots.

Solution: $3x^2 - 2x + \frac{1}{3} = 0$

$a = 3, b = -2, c = \frac{1}{3}$ *1/2*

Discriminant (D) $= b^2 - 4ac = (-2)^2 - 4(3)\left(\frac{1}{3}\right) = 0$ *1*

$\therefore$ Roots are real and equal *1/2*

OR

(B) Find the roots of the quadratic equation $x^2 - x - 2 = 0$.

Solution: $x^2 - x - 2 = 0$

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

$x = 2, x = -1$ $\frac{1}{2} + \frac{1}{2}$

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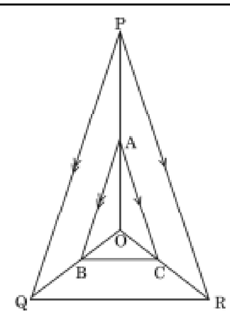
22. In the adjoining figure, A, B and C are points on OP, OQ and OR respectively such that AB||PQ and AC||PR. Show that BC||QR.



Solution: In Δ POQ, AB $\parallel$ PQ

$\Rightarrow \dfrac{OA}{AP} = \dfrac{OB}{BQ}$ (By Thales Theorem) ________ (i) $\frac{1}{2}$

In Δ POR, AC $\parallel$ PR

$\Rightarrow \dfrac{OA}{AP} = \dfrac{OC}{CR}$ (By Thales Theorem)________ (ii) $\frac{1}{2}$

From (i) and (ii) $\dfrac{OB}{BQ} = \dfrac{OC}{CR}$ $\frac{1}{2}$

$\therefore$ In Δ QOR, BC $\parallel$ QR (By converse of Thales theorem) $\frac{1}{2}$

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23. If $\sin\alpha = \frac{1}{2}$, then find the value of $(3\cos\alpha - 4\cos^3\alpha)$.

Solution: $\sin\alpha = \dfrac{1}{2} \quad \Rightarrow \alpha = 30°$ $\frac{1}{2}$

$\therefore 3\cos\alpha - 4\cos^3\alpha = 3\cos 30° - 4\cos^3 30°$

$= 3\left(\dfrac{\sqrt{3}}{2}\right) - 4\left(\dfrac{\sqrt{3}}{2}\right)^3 = \dfrac{3\sqrt{3}}{2} - \dfrac{4(3\sqrt{3})}{8}$ 1

$= \dfrac{3\sqrt{3}}{2} - \dfrac{3\sqrt{3}}{2} = 0$ $\frac{1}{2}$

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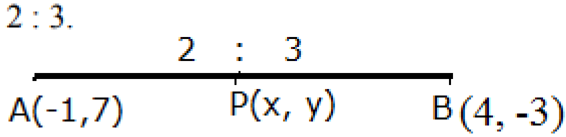
24. **(A)** Find the coordinates of the point which divides the join of A (–1, 7) and B (4, –3) in the ratio 2 : 3.

Solution:



$x = \dfrac{2(4) + 3(-1)}{2+3} = \dfrac{8-3}{5} = 1$ 1

$y = \dfrac{2(-3) + 3(7)}{2+3} = \dfrac{15}{5} = 3$ 1

Coordinates of the required point are (1, 3)

OR

(B) If the points A (2, 3), B (–5, 6), C (6, 7) and D (p, 4) are the vertices of a parallelogram ABCD, find the value of p.

Solution: Mid point of AC = Mid point of BD

$\therefore \left(\frac{2+6}{2}, \frac{3+7}{2}\right) = \left(\frac{-5+p}{2}, \frac{6+4}{2}\right)$ *1*

$\frac{-5+p}{2} = 4 \Rightarrow p = 13$ *1*

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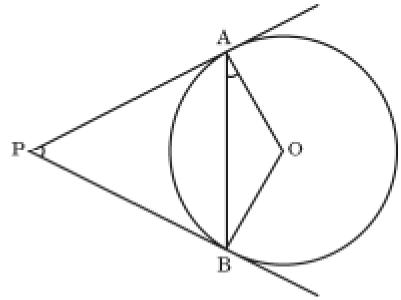
25. PA and PB are tangents drawn to the circle with centre O as shown in the figure.
Prove that $\angle APB = 2\angle OAB$.



Solution: Here, PAOB is a cyclic quadrilateral

So, $\angle AOB = 180° - \angle APB$ *1*

But in Δ AOB,

$\angle AOB = 180° - 2\angle OAB$ *$\frac{1}{2}$*

So, $\angle APB = 2\angle OAB$. *$\frac{1}{2}$*

SECTION C

26. Find the area of the sector of a circle of radius 7 cm and of central angle 90°. Also, find the area of corresponding major sector.

Solution: $r = 7$ cm, $\theta = 90°$

Area of sector $= \frac{\pi r^2\theta}{360} = \frac{22}{7} \times 7 \times 7 \times \frac{90}{360}$ *1*

$= \frac{77}{2}$ cm^2 or 38·5 cm^2 *$\frac{1}{2}$*

Area of circle $= \pi r^2 = \frac{22}{7} \times 7 \times 7 = 154$ cm^2 *1*

Area of major sector = 154 – 38·5 = 115·5 cm^2 *$\frac{1}{2}$*

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27. If α, β are zeroes of the quadratic polynomial $x^2 - 5x + 6$, form another quadratic polynomial whose zeroes are $\frac{1}{\alpha}, \frac{1}{\beta}$.

Solution: Let $p(x) = x^2 - 5x + 6$

α, β are zeroes of p(x)

$\therefore \alpha + \beta = \frac{-(-5)}{1} = 5$ *1/2*

$\alpha\beta = 6$ *1/2*

$\therefore$ Sum of zeroes of the req. polynomial $= \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta+\alpha}{\alpha\beta} = \frac{5}{6}$ *1*

Product of zeroes of the req. polynomial $= \frac{1}{\alpha} \cdot \frac{1}{\beta} = \frac{1}{\alpha\beta} = \frac{1}{6}$ *1/2*

$\therefore$Required Polynomial is

$$k\left(x^2 - \frac{5}{6}x + \frac{1}{6}\right) \quad \text{or} \quad x^2 - \frac{5}{6}x + \frac{1}{6} \quad \text{or} \quad 6x^2 - 5x + 1$$ *1/2*

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28. A die is rolled once. Find the probability of getting :

(i) an even prime number.

(ii) a number greater than 4.

(iii) an odd number.

Solution: S = {1, 2, 3, 4, 5, 6}

(i) P(an even prime number) $= \frac{1}{6}$ *1*

(ii) P(a number greater than 4) $= \frac{2}{6}$ or $\frac{1}{3}$ *1*

(iii) P(an odd number) $= \frac{3}{6}$ or $\frac{1}{2}$ *1*

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29. Prove that $\frac{1+\tan^2 A}{1+\cot^2 A} = \sec^2 A - 1$

Solution: LHS $= \frac{1+\tan^2 A}{1+\cot^2 A} = \frac{1+\frac{\sin^2 A}{\cos^2 A}}{1+\frac{\cos^2 A}{\sin^2 A}}$ *1*

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

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

$$= \frac{1}{\cos^2 A} - 1 = \sec^2 A - 1 = \text{RHS}$$ $\frac{1}{2}$

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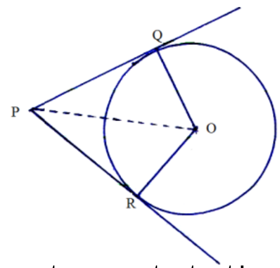
30. (A) Prove that the lengths of tangents drawn from an external point to a circle are equal.

Solution:



1 (For Fig.)

Given: A circle with centre O and PQ, PR are tangents to the circle from an external point P.

To Prove: PQ = PR

Construction: Join OP, OQ, OR $\frac{1}{2}$

Proof : In Δ OPQ and Δ OPR

OP = OP (common)

OQ = OR (radii of the same circle)

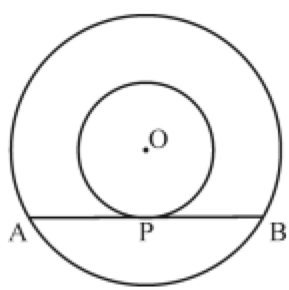
∠ OQP = ∠ ORP (each 90°)

⇒ Δ POQ ≅ Δ POR (RHS congruence) *1*

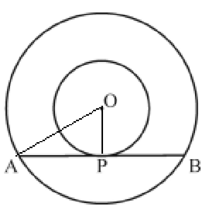
∴ PQ = PR $\frac{1}{2}$

OR

(B) Two concentric circles with centre O are of radii 3 cm and 5 cm. Find the length of chord AB of the larger circle which touches the smaller circle at P.



Solution: Join OA and OP



OP ⊥ AB (radius ⊥ tangent at the point of contact) $\frac{1}{2}$

OP is the radius of smaller circle and AB is tangent at P.

AB is chord of larger circle and OP ⊥ AB

∴ AP = PB (⊥ from centre bisects the chord) *1*

In right Δ AOP, $AP^2 = OA^2 - OP^2$

$= (5)^2 - (3)^2 = 16$ $\frac{1}{2}$

AP = 4 cm = PB $\frac{1}{2}$

$\therefore$ AB = 8 cm $\frac{1}{2}$

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31. (A) If we add 1 to the numerator and subtract 1 from the denominator, a fraction reduces to 1. It becomes $\frac{1}{2}$ if we only add 1 to the denominator. What is the fraction ?

Solution: Let the fraction be $\frac{x}{y}$ $\frac{1}{2}$

ATQ, $\frac{x+1}{y-1} = 1 \Rightarrow x - y = -2$ ———— (i) $\frac{1}{2}$

Also, $\frac{x}{y+1} = \frac{1}{2} \Rightarrow 2x - y = 1$ ———— (ii) $\frac{1}{2}$

Solving (i) and (ii) $x = 3, y = 5$ 1

$\therefore$ Fraction $= \frac{3}{5}$ $\frac{1}{2}$

OR

(B) For which value of '*k*' will the following pair of linear equations have no solution ?

$3x + y = 1$

$(2k - 1)x + (k - 1)y = 2k + 1$

Solution: System has no solution

$\therefore \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\Rightarrow \frac{3}{2k-1} = \frac{1}{k-1} \neq \frac{1}{2k+1}$ $1\frac{1}{2}$

$\Rightarrow \frac{3}{2k-1} = \frac{1}{k-1} \Rightarrow k = 2$ 1

and $\frac{1}{k-1} \neq \frac{1}{2k+1} \Rightarrow k \neq -2$ $\frac{1}{2}$

$\therefore k = 2$

SECTION D

32. **(A)** Find the sum of first 51 terms of an A.P. whose second and third terms are 14 and 18, respectively.

Solution: (a) $a_2 = 14 \Rightarrow a + d = 14$ *1*

$a_3 = 18 \Rightarrow a + 2d = 18$ *1*

$\therefore\ d = 4,\ a = 10$ $\frac{1}{2}+\frac{1}{2}$

$S_{51} = \frac{51}{2}[2(10) + (51 - 1)4]$ *1*

$= \frac{51}{2}[20 + 200] = \frac{51}{2} \times 220 = 5610$ *1*

OR

(B) The first term of an A.P. is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.

Solution: $a = 5,\ a_n = 45,\ S_n = 400$

$\frac{n}{2}[a + a_n] = 400$

$\frac{n}{2}[5 + 45] = 400$ *2*

$\Rightarrow n = 16$ *1*

$a_n = 45 \Rightarrow a + (n - 1)d = 45$

$\Rightarrow 5 + (16 - 1)d = 45$ *1*

$\Rightarrow d = \frac{40}{15}$ or $\frac{8}{3}$ *1*

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33. The distribution below gives the weights of 30 students of a class. Find the median weight of the students :

Weight in kg	40-45	45-50	50-55	55-60	60-65	65-70	70-75
Number of Students	2	3	8	6	6	3	2

Solution:

Weight(in kg)	40 – 45	45 – 50	50 – 55	55 – 60	60 – 65	65 – 70	70 – 75
No. of students	2	3	8	6	6	3	2
c.f.	2	5	13	19	25	28	30

1
(For Table)

$\frac{N}{2} = \frac{30}{2} = 15$

$\Rightarrow$ Median class = 55 – 60 *1*

l = 55, h = 5, cf = 13, f = 6

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

$$= 55 + \left(\frac{15 - 13}{6}\right) \times 5$$ *2*

$$= 56 \cdot 67$$ *1*

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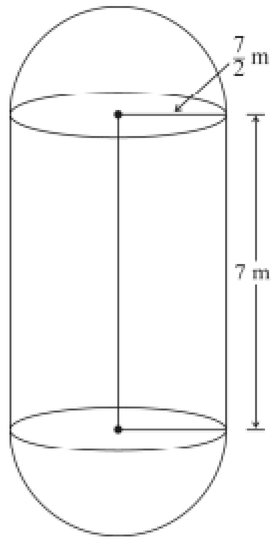
34. The boilers are used in thermal power plants to store water and then used to produce steam. One such boiler consists of a cylindrical part in middle and two hemispherical parts at its both ends.
Length of the cylindrical part is 7m and radius of cylindrical part is $\frac{7}{2}$ m.
Find the total surface area and the volume of the boiler. Also, find the ratio of the volume of cylindrical part to the volume of one hemispherical part.



Solution:

$h = 7$ m, $r = \frac{7}{2}$ m

Total surface area = $2\pi rh + 2(2\pi r^2) = 2\pi r(h + 2r)$

$$= 2 \times \frac{22}{7} \times \frac{7}{2}\left(7 + 2 \times \frac{7}{2}\right)$$ *$1\frac{1}{2}$*

$$= 308 \text{ m}^2$$ *$\frac{1}{2}$*

Volume of the boiler = $\pi r^2 h + 2\left(\frac{2}{3}\pi r^3\right)$

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

$$= \frac{2695}{6} m^3 \text{ or } 449.16\, m^3$$ *$\frac{1}{2}$*

$$\frac{\text{Volume of cylindrical part}}{\text{Volume of one hemispherical part}} = \frac{\pi r^2 h}{\frac{2}{3}\pi r^3}$$ $\frac{1}{2}$

$$= \frac{3h}{2r} = \frac{3(7)}{2 \times \frac{7}{2}} = \frac{3}{1} \text{ or } 3:1$$ $\frac{1}{2}$

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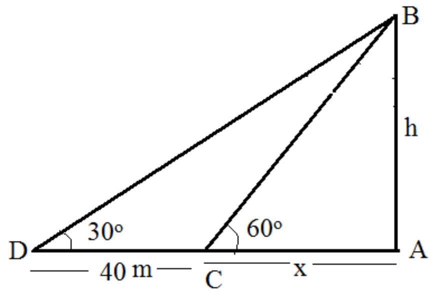
35. (A) The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° than when it was 60°. Find the height of the tower.

Solution:



1 *(For Fig.)*

In Δ ABC, $\tan 60^{\circ} = \frac{h}{x} \Rightarrow h = \sqrt{3}\,x$ $1+\frac{1}{2}$

In Δ ABD, $\tan 30^{\circ} = \frac{h}{x+40} \Rightarrow x + 40 = \sqrt{3}\,h$ $1+\frac{1}{2}$

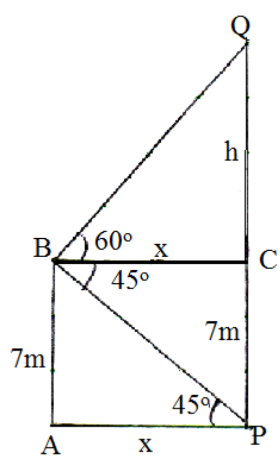
Getting x = 20 m $\frac{1}{2}$

and h= $20\sqrt{3}$ m (Height of tower) $\frac{1}{2}$

OR

(B) 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.

Solution:



1 *(For Fig.)*

In Δ ABP, $\tan 45° = \frac{7}{x} \Rightarrow x = 7$ $1+\frac{1}{2}$

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

$h = 7\sqrt{3}$ m $\frac{1}{2}$

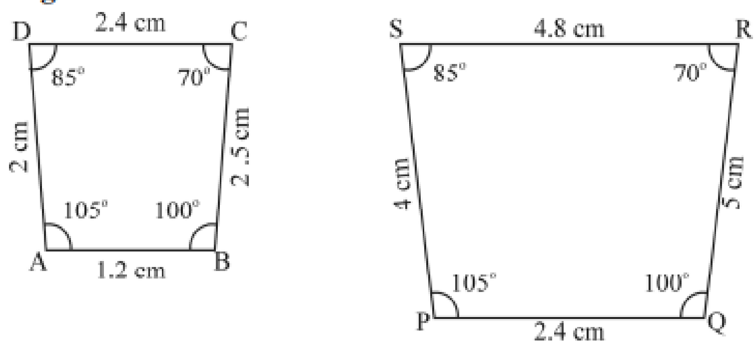
$\therefore$ Height of tower = PQ = 7 + h

$= 7 + 7\sqrt{3} = 7(1 + \sqrt{3})$ m $\frac{1}{2}$

SECTION D

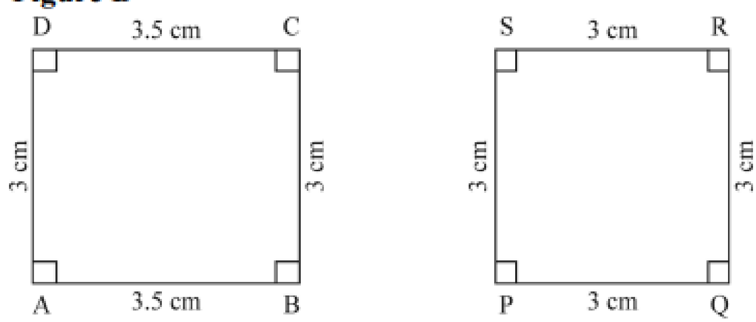
36. Observe the figures given below carefully and answer the questions :

Figure A



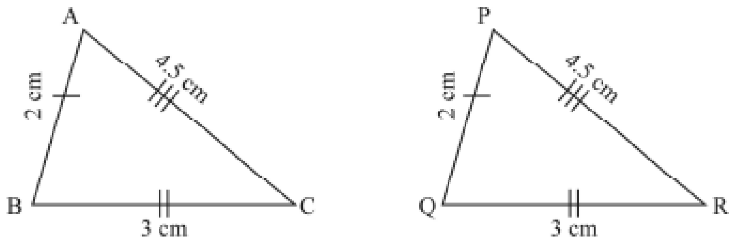
A (i) A (ii)

Figure B



B (iii) B (iv)

Figure C



C (v) C (vi)

(i) Name the figure(s) wherein two figures are similar.

(ii) Name the figure(s) wherein the figures are congruent.

(iii) (a) Prove that congruent triangles are also similar but not the converse.

OR

(b) What more is least needed for two similar triangles to be congruent ?

Solution:

(i) Figure A and Figure C $\frac{1}{2}+\frac{1}{2}$

(ii) Figure C 1

(iii) (a) Triangles are congruent $\Rightarrow$ Corresponding angles are equal 1

$\Rightarrow$ Triangles are similar. $\frac{1}{2}$

Conversely, if triangles are similar then ratio of corresponding sides is same which does not imply corresponding sides are equal

$\therefore$ Triangles may not be congruent. $\frac{1}{2}$

Note: Any suitable counter example can be given

OR

(iii) (b) One pair of corresponding side must be equal 2

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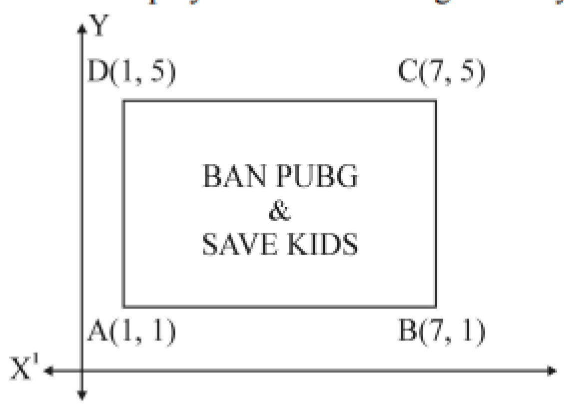
37. Use of mobile screen for long hours makes your eye sight weak and give you headaches. Children who are addicted to play "PUBG" can get easily stressed out. To raise social awareness about ill effects of playing PUBG, a school decided to start 'BAN PUBG' campaign, in which students are asked to prepare campaign board in the shape of a rectangle. One such campaign board made by class X student of the school is shown in the figure.



Based on the above information, answer the following questions :

(i) Find the coordinates of the point of intersection of diagonals AC and BD.

(ii) Find the length of the diagonal AC.

(iii) (a) Find the area of the campaign Board ABCD.

OR

(b) Find the ratio of the length of side AB to the length of the diagonal AC.

Solution:

We know that diagonals of a rectangle bisect each other.

(i) Required point = Mid-point of AC = $\left(\frac{1+7}{2}, \frac{1+5}{2}\right)$ = (4, 3) *1*

(ii) AC = $\sqrt{(7-1)^2 + (5-1)^2} = 2\sqrt{13}$ *1*

(iii) (a) AB = $\sqrt{(7-1)^2 + (1-1)^2} = 6$ *$\frac{1}{2}$*

BC = $\sqrt{(7-7)^2 + (5-1)^2} = 4$ *$\frac{1}{2}$*

Area (ABCD) = AB × BC = 6 × 4 = 24 *1*

OR

(iii) (b) AB = $\sqrt{(7-1)^2 + (1-1)^2} = 6$ *1*

$\frac{AB}{AC} = \frac{6}{2\sqrt{13}} = \frac{3}{\sqrt{13}}$ *1*

$\therefore$ required ratio is $3 : \sqrt{13}$

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38. Khushi wants to organize her birthday party. Being health conscious, she decided to serve only fruits in her birthday party. She bought 36 apples and 60 bananas and decided to distribute fruits equally among all.

Based on the above information, answer the following questions :

(i) How many guests Khushi can invite at the most ?

(ii) How many apples and bananas will each guest get ?

(iii) (a) If Khushi decides to add 42 mangoes, how many guests Khushi can invite at the most ?

OR

(b) If the cost of 1 dozen of bananas is ₹ 60, the cost of 1 apple is ₹ 15 and cost of 1 mango is ₹ 20, find the total amount spent on 60 bananas, 36 apples and 42 mangoes.

Solution:

(i) HCF (36, 60) = 12 *1*

Khushi can invite at the most 12 guests

(ii) $36 \div 12 = 3$, $60 \div 12 = 5$
Each guest will get 3 apples and 5 bananas *1*

(iii) (a) HCF (36, 60, 42) = 6 *2*
Khushi can invite at the most 6 guests

OR

(iii) (b) Total cost $= 5 \times 60 + 36 \times 15 + 42 \times 20$ *1*
$=$ ₹1680 *1*