

HI-TECH ACADEMY



MATHEMATICS SA-1 (SUMMATIVE ASSESSMENT - 1)



⚡ VSAQ'S - 2 MARKS GUN SHOT QUESTIONS ⚡

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★ IF YOU WANT TO SCORE 60 / 60 ★

Class 10 Telangana SSC & Andhra Pradesh Board | Guaranteed Revision Question Bank & Official Solutions

SET 1: Questions & Detailed Solutions

QUESTION 1 Divya says "The set of prime numbers and the set of even numbers are disjoint sets." Do you agree with her? Give reasons.

ANSWER & EXPLANATION

No, I do not agree with Divya.

Reason:

- Let P = Set of prime numbers = $\{2, 3, 5, 7, 11, \dots\}$
 - Let E = Set of even numbers = $\{2, 4, 6, 8, 10, \dots\}$
 - Two sets are disjoint if and only if their intersection is empty ($P \cap E = \emptyset$).
 - Here, the number 2 is both an even number and a prime number (the only even prime).
- Therefore, $P \cap E = \{2\} \neq \emptyset$. Hence, they are **not disjoint sets**.

QUESTION 2 Write $4 \log 3 + 2 \log 5 - 3 \log 2$ as a single logarithm.

SOLUTION

Using the power law: $m \log a = \log(a^m)$:

- $4 \log 3 = \log(3^4) = \log 81$
- $2 \log 5 = \log(5^2) = \log 25$
- $3 \log 2 = \log(2^3) = \log 8$

Applying product and quotient laws:

$$4 \log 3 + 2 \log 5 - 3 \log 2 = \log 81 + \log 25 - \log 8 = \log (81 \times 25 / 8) = \log (2025 / 8)$$

Final Answer: $\log (2025 / 8)$ (or $\log 253.125$)

QUESTION 3 Find the median of $\sin 90^\circ$, $\cos 60^\circ$ and $\tan 45^\circ$.

SOLUTION

Evaluating the standard values: $\sin 90^\circ = 1$, $\cos 60^\circ = 1/2 = 0.5$, and $\tan 45^\circ = 1$.

Arranging in ascending order: $1/2, 1, 1$.

With $n = 3$ (odd), the median is the 2nd (middle) observation.

Final Answer: Median = 1

QUESTION 4 Find the quadratic polynomial whose zeroes are $\sqrt{3}$ and $-\sqrt{3}$.

SOLUTION

Let zeroes be $\alpha = \sqrt{3}$ and $\beta = -\sqrt{3}$.

- Sum of zeroes: $\alpha + \beta = \sqrt{3} + (-\sqrt{3}) = 0$
- Product of zeroes: $\alpha\beta = (\sqrt{3})(-\sqrt{3}) = -3$

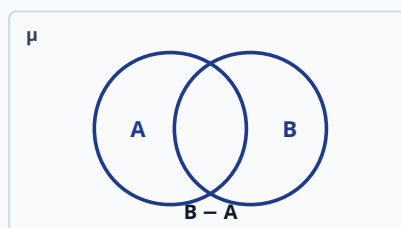
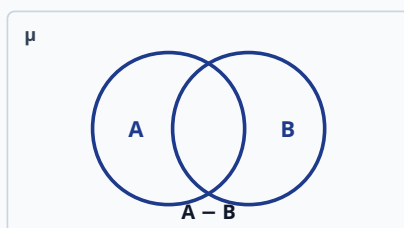
$$p(x) = k[x^2 - (\alpha + \beta)x + \alpha\beta] = k(x^2 - 3)$$

Taking $k = 1$:

Final Answer: $p(x) = x^2 - 3$

QUESTION 5 Draw the Venn diagrams of sets $A - B$ and $B - A$.

SOLUTION & DIAGRAM



QUESTION 6 Find the value of $\sin 15^\circ \sec 75^\circ + \cos 34^\circ \csc 56^\circ$.

SOLUTION

Using complementary angles: $\sec 75^\circ = \csc 15^\circ = 1 / \sin 15^\circ$ and $\csc 56^\circ = \sec 34^\circ = 1 / \cos 34^\circ$.

$$\sin 15^\circ \times (1 / \sin 15^\circ) + \cos 34^\circ \times (1 / \cos 34^\circ) = 1 + 1 = 2$$

Final Answer: 2

SET 2: Questions & Detailed Solutions

QUESTION 1 If $A = \{x / x \text{ is an alphabet of the word TELANGANA}\}$, then find the cardinal number of 'A'.

SOLUTION

Distinct letters in the word TELANGANA: $A = \{T, E, L, A, N, G\}$.

Counting the unique elements gives 6.

Final Answer: Cardinal number $n(A) = 6$

QUESTION 2 Find the H.C.F of 414 and 1098 by prime factorisation method.

SOLUTION

$$\bullet 414 = 2 \times 3^2 \times 23$$

$$\bullet 1098 = 2 \times 3^2 \times 61$$

Common prime factors with least powers: $2^1 \times 3^2 = 2 \times 9 = 18$.

Final Answer: H.C.F = 18

QUESTION 3 Show that $4 \cos^2 30^\circ + 3 \cot^2 60^\circ - \sec^2 60^\circ = 0$.

PROOF

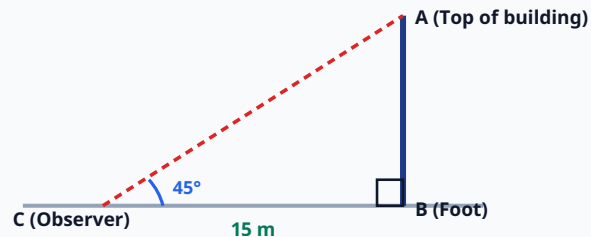
Standard values: $\cos 30^\circ = \sqrt{3}/2 \Rightarrow \cos^2 30^\circ = 3/4$; $\cot 60^\circ = 1/\sqrt{3} \Rightarrow \cot^2 60^\circ = 1/3$; $\sec 60^\circ = 2 \Rightarrow \sec^2 60^\circ = 4$.

$$LHS = 4(3/4) + 3(1/3) - 4 = 3 + 1 - 4 = 0 = RHS$$

Hence proved that $4 \cos^2 30^\circ + 3 \cot^2 60^\circ - \sec^2 60^\circ = 0$.

QUESTION 4 A boy observed the top of his school building at an angle of elevation of 45° , when the point of observation is 15 metres away from the foot of the building. Draw the suitable diagram for the given data.

DIAGRAM & EXPLANATION



QUESTION 5 Check whether -1 and $1/3$ are the zeroes of the polynomial $p(x) = 3x^2 + 2x - 1$ or not.

SOLUTION

- $p(-1) = 3(-1)^2 + 2(-1) - 1 = 3 - 2 - 1 = 0 \Rightarrow -1$ is a zero.
- $p(1/3) = 3(1/9) + 2(1/3) - 1 = 1/3 + 2/3 - 1 = 1 - 1 = 0 \Rightarrow 1/3$ is a zero.

Final Answer: Yes, both -1 and $1/3$ are zeroes of $p(x)$.

QUESTION 6 The larger of the two supplementary angles exceeds the smaller by 26° . Find the angles.

SOLUTION

Let angles be x and y . Then $x + y = 180^\circ$ and $x - y = 26^\circ$.

Adding: $2x = 206^\circ \Rightarrow x = 103^\circ$. Then $y = 180^\circ - 103^\circ = 77^\circ$.

Final Answer: The supplementary angles are 103° and 77° .

SET 3: Questions & Detailed Solutions

QUESTION 1 Find HCF of 168 and 264 by prime factorisation method.

SOLUTION

$$168 = 2^3 \times 3 \times 7 \text{ and } 264 = 2^3 \times 3 \times 11.$$

$$HCF = 2^3 \times 3 = 8 \times 3 = 24$$

Final Answer: HCF = 24

QUESTION 2 Write $\log 81 + \log 64 + \log 5 - \log 72$ in the form of $\log N$.

SOLUTION

$$\log((81 \times 64 \times 5) / 72) = \log((9/8) \times 64 \times 5) = \log(9 \times 8 \times 5) = \log(360).$$

Final Answer: $\log 360$ (where $N = 360$)

QUESTION 3 Write set $A = \{1, 8, 27, 64, 125\}$ in the set builder form.

SOLUTION

Elements are perfect cubes: $1^3, 2^3, 3^3, 4^3, 5^3$.

Final Answer: $A = \{x : x = n^3, n \in \mathbb{N}, 1 \leq n \leq 5\}$

QUESTION 4 Prepare the following table to draw the line $x - y = 5$.

SOLUTION

From $y = x - 5$:

x	-2	-1	0	1	2
y	-7	-6	-5	-4	-3
(x, y)	(-2, -7)	(-1, -6)	(0, -5)	(1, -4)	(2, -3)

QUESTION 5 Find the value of 'k' so that the pair of equations $2x + 5y - 7 = 0$ and $kx - 10y + 14 = 0$ represent coincident lines.

SOLUTION

Condition: $a_1/a_2 = b_1/b_2 = c_1/c_2 \Rightarrow 2/k = 5/(-10) = -7/14 = -1/2$.

$2/k = -1/2 \Rightarrow k = -4$.

Final Answer: $k = -4$

QUESTION 6 Write all the subsets of set $A = \{1, 3, 6\}$.

SOLUTION

Number of subsets $= 2^3 = 8$.

Subsets: $\emptyset, \{1\}, \{3\}, \{6\}, \{1, 3\}, \{1, 6\}, \{3, 6\}, \{1, 3, 6\}$.

SET 4: Questions & Detailed Solutions

QUESTION 1 Find the H.C.F of 72, 110 by using Euclid algorithm.

SOLUTION

$$\bullet 110 = 72 \times 1 + 38$$

$$\bullet 72 = 38 \times 1 + 34$$

$$\bullet 38 = 34 \times 1 + 4$$

$$\bullet 34 = 4 \times 8 + 2$$

$$\bullet 4 = 2 \times 2 + 0$$

Final Answer: H.C.F(72, 110) = 2

QUESTION 2 X Class student Varun said to his friend that $(2 \tan 30^\circ) / (1 + \tan^2 45^\circ) = \tan 30^\circ$. Do you agree with him? Justify your answer.

ANSWER & JUSTIFICATION

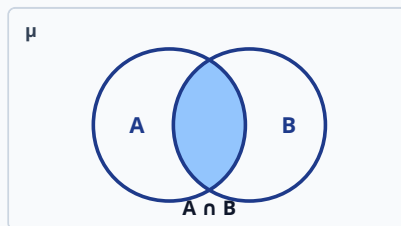
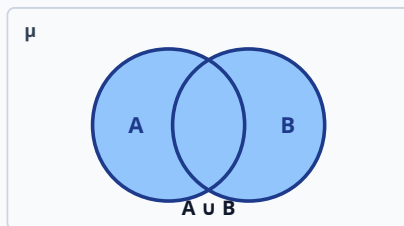
Yes, I agree with Varun.

$$LHS = [2(1/\sqrt{3})] / [1 + 1^2] = (2/\sqrt{3}) / 2 = 1/\sqrt{3}.$$

$RHS = \tan 30^\circ = 1/\sqrt{3}$. Since $LHS = RHS$, his statement is verified.

QUESTION 3 Draw Venn diagrams of $A \cup B$, $A \cap B$.

DIAGRAM



QUESTION 4 We have a linear equation $4x - 6y + 8 = 0$. Write two linear equations in 'x' and 'y', such that each of them forms pair of parallel lines with given equation.

SOLUTION

Condition for parallel lines: $a_1/a_2 = b_1/b_2 \neq c_1/c_2$. Ratio $a/b = 4/(-6) = -2/3$.

1. $4x - 6y + 5 = 0$
2. $2x - 3y - 7 = 0$

QUESTION 5 If $p(x) = 2x^3 - 3x^2 + 4x - 7$, find the value of $p(-2) \cdot p(3)$.

SOLUTION

- $p(-2) = 2(-8) - 3(4) + 4(-2) - 7 = -16 - 12 - 8 - 7 = -43$
- $p(3) = 2(27) - 3(9) + 4(3) - 7 = 54 - 27 + 12 - 7 = 32$

Final Answer: $p(-2) \cdot p(3) = (-43) \times 32 = -1376$

QUESTION 6 $\triangle ABC \sim \triangle DEF$, $BC = 4$ cm, $EF = 5$ cm. The area of $\triangle ABC$ is 64 cm^2 . Determine the area of $\triangle DEF$.

SOLUTION

$$\text{Area}(\triangle ABC) / \text{Area}(\triangle DEF) = (BC / EF)^2 \Rightarrow 64 / \text{Area}(\triangle DEF) = (4/5)^2 = 16/25.$$

$$\text{Area}(\triangle DEF) = (64 \times 25) / 16 = 4 \times 25 = 100 \text{ cm}^2.$$

Final Answer: Area of $\triangle DEF = 100 \text{ cm}^2$

SET 5: Questions & Detailed Solutions

QUESTION 1 Show that the points $A(-6, 10)$, $B(-4, 6)$ and $C(3, -8)$ are collinear.

PROOF / SOLUTION

Method 1: By Slopes

- Slope of $AB = (y_2 - y_1) / (x_2 - x_1) = (6 - 10) / (-4 - (-6)) = -4 / 2 = -2$
- Slope of $BC = (y_3 - y_2) / (x_3 - x_2) = (-8 - 6) / (3 - (-4)) = -14 / 7 = -2$

Since the slope of AB equals the slope of BC and point B is common, the points A, B, C are collinear.

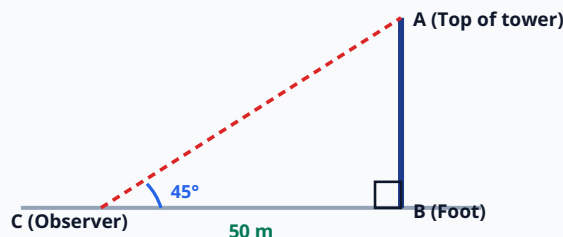
Method 2: Area of Triangle

$$\text{Area} = (1/2) | -6(6 - (-8)) + (-4)(-8 - 10) + 3(10 - 6) | = (1/2) | -84 + 72 + 12 | = 0.$$

Since Area = 0, points A, B, and C are collinear.

QUESTION 2 "An observer standing at a distance of 50 metre from the foot of a tower observes its top at an angle of elevation of 45° ." Draw suitable diagram for this situation.

DIAGRAM & EXPLANATION



QUESTION 3 If the pair of linear equations $(3k + 1)x + 3y - 2 = 0$ and $(k^2 + 1)x + (k - 2)y - 5 = 0$ has no solutions, then find the value of k .

SOLUTION

Condition for no solutions: $a_1/a_2 = b_1/b_2 \neq c_1/c_2$.

$$(3k + 1) / (k^2 + 1) = 3 / (k - 2)$$

$$(3k + 1)(k - 2) = 3(k^2 + 1) \Rightarrow 3k^2 - 5k - 2 = 3k^2 + 3 \Rightarrow -5k = 5 \Rightarrow k = -1.$$

Checking: $b_1/b_2 = 3/(-3) = -1 \neq -2/-5 = 2/5$. Condition holds.

Final Answer: $k = -1$

SET 6: Questions & Detailed Solutions

QUESTION 1 Expand: $\log_{10} [405 / 32]$.

SOLUTION

Prime factors: $405 = 3^4 \times 5$ and $32 = 2^5$.

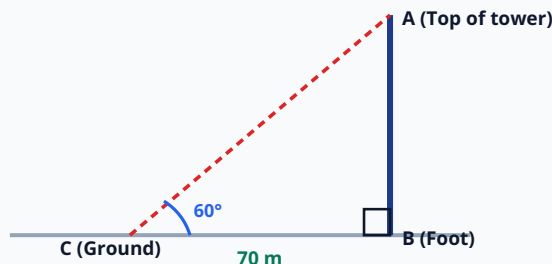
$$\log_{10}(405 / 32) = \log_{10}(3^4 \times 5) - \log_{10}(2^5) = 4 \log_{10} 3 + \log_{10} 5 - 5 \log_{10} 2$$

(Or writing $\log_{10} 5 = 1 - \log_{10} 2$: $4 \log_{10} 3 - 6 \log_{10} 2 + 1$)

Final Answer: $4 \log_{10} 3 + \log_{10} 5 - 5 \log_{10} 2$

QUESTION 3 "The angle of elevation of the top of a tower from a point on the ground at a distance of 70 m from the foot of the tower is 60° ." Draw a suitable diagram for this situation.

DIAGRAM & EXPLANATION



QUESTION 5 $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8, 10\}$. Find $A - B$ and $B - A$.

SOLUTION

$$A - B = \{1, 2, 3, 4\} - \{2, 4, 6, 8, 10\} = \{1, 3\}$$

$$B - A = \{2, 4, 6, 8, 10\} - \{1, 2, 3, 4\} = \{6, 8, 10\}$$

Final Answer: $A - B = \{1, 3\}$ and $B - A = \{6, 8, 10\}$

SET 7: Questions & Detailed Solutions

QUESTION 1 Express 360 as a product of prime factors.

SOLUTION

$$360 = 2 \times 180 = 2^2 \times 90 = 2^3 \times 45 = 2^3 \times 3^2 \times 5.$$

Final Answer: $360 = 2^3 \times 3^2 \times 5$

QUESTION 2 Is the pair of linear equations $3x - 5y = 7$ and $6x - 10y = 13$ inconsistent? Justify your answer.

ANSWER & JUSTIFICATION

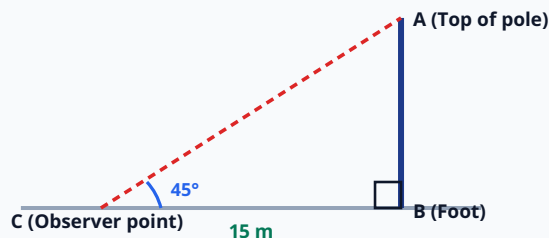
Yes, the pair is inconsistent.

$$\text{Ratios: } a_1/a_2 = 3/6 = 1/2; \quad b_1/b_2 = -5/-10 = 1/2; \quad c_1/c_2 = -7/-13 = 7/13.$$

Since $a_1/a_2 = b_1/b_2 \neq c_1/c_2$, lines are parallel and have no solution. Hence, inconsistent.

QUESTION 3 A flag pole stands vertically on the ground. From a point which is 15 metres away from the foot of the pole, the angle of elevation of the top of the pole is 45° . Draw a suitable diagram for the given data.

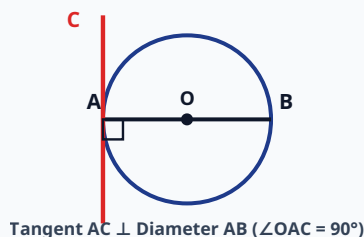
DIAGRAM



QUESTION 4 AOB is the diameter of a circle with centre 'O' and AC is a tangent to the circle at point A. Draw a suitable diagram and state the geometric relationship.

DIAGRAM & PROPERTY

Theorem: The tangent at any point of a circle is perpendicular to the radius through the point of contact. Thus, diameter $AB \perp AC$ at A ($\angle OAC = 90^\circ$).



SET 8: Questions & Detailed Solutions**QUESTION 1** Expand: $\log [243 / 32]$.**SOLUTION**

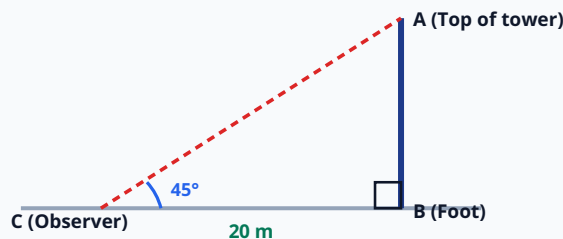
$$243 = 3^5 \text{ and } 32 = 2^5.$$

$$\log(243 / 32) = \log(3^5) - \log(2^5) = 5 \log 3 - 5 \log 2 = 5(\log 3 - \log 2)$$

Final Answer: $5 \log 3 - 5 \log 2$ **QUESTION 2** Whether the following pair of linear equations represents parallel lines? Justify your answer: $2x + 3y = 10$ and $6x + 9y = 15$.**ANSWER & JUSTIFICATION**

Yes, the lines are parallel.

$$\text{Ratios: } a_1/a_2 = 2/6 = 1/3; \quad b_1/b_2 = 3/9 = 1/3; \quad c_1/c_2 = (-10)/(-15) = 2/3.$$

Since $a_1/a_2 = b_1/b_2 \neq c_1/c_2$ ($1/3 = 1/3 \neq 2/3$), the lines represent parallel lines.**QUESTION 3** "The top of the tower is observed at an angle of elevation 45° and the foot of the tower is at the distance of 20 meters from the observer". Draw a suitable diagram for this data.**DIAGRAM****QUESTION 4** Express ' $\tan \theta$ ' in terms of ' $\sin \theta$ '.**SOLUTION**Since $\tan \theta = \sin \theta / \cos \theta$ and $\cos \theta = \sqrt{1 - \sin^2 \theta}$:

$$\tan \theta = \sin \theta / \sqrt{1 - \sin^2 \theta}$$

Final Answer: $\tan \theta = \sin \theta / \sqrt{1 - \sin^2 \theta}$ **SET 9: Questions & Detailed Solutions****QUESTION 3** Find the value of $(\sec 37^\circ / \csc 53^\circ) - 2 \cot 45^\circ + (\sin 60^\circ / \cos 30^\circ)$.**SOLUTION**

$$\bullet \sec 37^\circ = \csc 53^\circ \Rightarrow \sec 37^\circ / \csc 53^\circ = 1$$

$$\bullet \cot 45^\circ = 1 \Rightarrow 2 \cot 45^\circ = 2$$

$$\bullet \sin 60^\circ = \cos 30^\circ = \sqrt{3}/2 \Rightarrow \sin 60^\circ / \cos 30^\circ = 1$$

$$\text{Value} = 1 - 2 + 1 = 0$$

Final Answer: 0

QUESTION 4 If the pair of linear equations $6x - 4y + 10 = 0$ and $3x + ky + 6 = 0$ represents parallel lines graphically, then find the value of 'k'.

SOLUTION

For parallel lines: $a_1/a_2 = b_1/b_2 \neq c_1/c_2$.

$$6/3 = (-4)/k \Rightarrow 2 = (-4)/k \Rightarrow 2k = -4 \Rightarrow k = -2$$

Check: $c_1/c_2 = 10/6 = 5/3 \neq 2$. Valid.

Final Answer: $k = -2$

QUESTION 5 In $\triangle ABC$, DE is a line such that $AD = 3\text{ cm}$, $AB = 5\text{ cm}$, $AE = 6\text{ cm}$ and $AC = 10\text{ cm}$. Is $DE \parallel BC$? Justify.

ANSWER & JUSTIFICATION

Yes, $DE \parallel BC$.

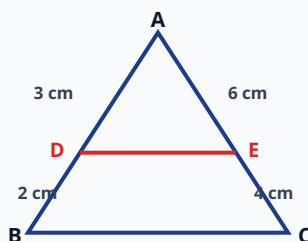
Justification:

- $DB = AB - AD = 5 - 3 = 2\text{ cm}$

- $EC = AC - AE = 10 - 6 = 4\text{ cm}$

Ratios: $AD/DB = 3/2$ and $AE/EC = 6/4 = 3/2$.

Since $AD/DB = AE/EC$, by the **Converse of Basic Proportionality Theorem (Thales' Theorem)**, $DE \parallel BC$.



Hence, DE is parallel to BC .