MATHEMATICS CLASS 9th
FEDERAL BOARD 2026 & ONWARDS
PREMIUM MODEL PAPER SOLVED

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Federal Board SSC-I Examination
Model Question Paper Mathematics
(Curriculum 2022-23)

ROLL NUMBER

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Version No.

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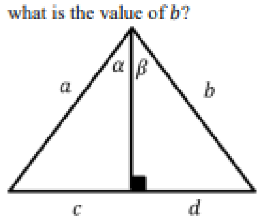
Section - A (Marks 15)

Time Allowed: 20 minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. *Do not use lead pencil.*

Candidate Sign. _________ **Invigilator Sign. ____________**

Q1. Fill the relevant bubble against each question. Each part carries one mark.

Sr no.	Question	A	B	C	D	A	B	C	D
i.	The radical form of $x^{-\frac{3}{2}}$ is:	$\sqrt[3]{x^2}$	$\frac{1}{\sqrt{x^3}}$	$\sqrt{x^3}$	$\frac{1}{\sqrt[3]{x^2}}$	○	○	○	○
ii.	Which of the given options represents the scientific notation of 0.25^2 ?	625×10^{-4}	62.5×10^{-3}	6.25×10^{-2}	0.625×10^{-1}	○	○	○	○
iii.	If $A = \{2,4,6\}$ and $B = \{0,1\}$, then find number of elements in $A \times B$.	5	6	8	9	○	○	○	○
iv.	What is the least common multiple of $7x - 6xy$ and $5xy^3 - 3x^2$?	$(7-6y) \times (5x^3 - 3x)$	$(7x - 6xy) \times (5y^3x - 3x^2)$	$x(7-6y)$	$x(7-6y) \times (5y^3 - 3x)$	○	○	○	○
v.	Solution of inequality $-2x - \frac{1}{2} \leq \frac{3}{2}$ is:	$x > -1$	$x < -1$	$x \geq -1$	$x \leq -1$	○	○	○	○
vi.	What is the radian measure of $15^o 50'$?	$\frac{19\pi}{216}$	$\frac{19\pi}{36}$	$\frac{19\pi}{180}$	$\frac{216\pi}{19}$	○	○	○	○
vii.	If a navigator gives bearing $0°$, in which direction should he travel?	North	South	East	West	○	○	○	○
viii.	In the figure, if $\alpha = \beta$ then what is the value of b? 	$\frac{cd}{a}$	$\frac{c}{ad}$	$\frac{ad}{c}$	$\frac{ac}{d}$	○	○	○	○

ix.	What is the value of $-3-3\tan^2\theta$ in a single trigonometric function?	$3cosec^2\theta$	$-3\sec^2\theta$	$3\sec^2\theta$	$-3cosec^2\theta$	O O O O
x.	Which of the following points is the intersection of the angle bisectors of a triangle?	circumcenter	orthocenter	incentre	centroid	O O O O
xi.	Each of the internal angle of a regular hexagon is:	60^o	72^o	108^o	120^o	O O O O
xii.	Locus of points equidistant from $P(5,4)$ and $Q(5,-6)$ is:	$x=0$	$x=5$	$y=-1$	$y=1$	O O O O
xiii.	The mean of 11 numbers is 7. One of the numbers 13 is deleted. What is the mean of the remaining 10 numbers?	7.7	6.4	6.0	5.8	O O O O
xiv.	What is the probability of picking a king from well-shuffled 52 playing cards?	$\frac{1}{52}$	$\frac{1}{13}$	$\frac{4}{13}$	$\frac{1}{26}$	O O O O
xv.	A fair coin is tossed twice, then the frequency of appearing head twice is:	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{3}{4}$	O O O O

MCQS:-

Question i

Statement:

The radical form of

$$x^{-\frac{2}{3}}$$

is:

Options:

A) $\sqrt[3]{x^2}$

B) $\frac{1}{\sqrt{x^3}}$

C) $\sqrt{x^3}$

D) $\frac{1}{\sqrt[3]{x^2}}$

Correct Option: D

Reason & Explanation:

To solve this, we use two basic rules of exponents.

1) Negative Exponent Rule

$$x^{-n} = \frac{1}{x^n}$$

Applying this rule:

$$x^{-\frac{2}{3}} = \frac{1}{x^{\frac{2}{3}}}$$

---

2) Fractional Exponent Rule

$$x^{\frac{m}{n}} = \sqrt[n]{x^m}$$

Here:

- $x$is the base.
- $m$is the power inside the radical.
- $n$is the index of the root.

So,

$$x^{\frac{2}{3}} = \sqrt[3]{x^2}$$

Putting everything together:

$$x^{-\frac{2}{3}} = \frac{1}{\sqrt[3]{x^2}}$$

This matches **Option D**.

Question ii

Statement:

Which of the given options represents the scientific notation of

$$0.25^2$$

Options:

A) 625×10^{-4}
B) 62.5×10^{-3}
C) 6.25×10^{-2}
D) 0.625×10^{-1}

Correct Option: C

Reason & Explanation:

Step 1: Calculate the square

$$0.25^2 = 0.25 \times 0.25 = 0.0625$$

Step 2: Scientific Notation Format

$$A \times 10^B$$

Where:

$$1 \leq A < 10$$

Convert:

$$0.0625 = 6.25 \times 10^{-2}$$

(Decimal moved 2 places to the right, so exponent is -2)

Correct answer: **Option C**

Question iii

Statement:

If

$$A = \{2,4,6\}$$

and

$$B = \{0,1\}$$

find the number of elements in

$$A \times B$$

Options:

A) 5

B) 6

C) 8

D) 9

Correct Option: B

Reason & Explanation:

$$n(A \times B) = n(A) \times n(B)$$
$$n(A) = 3$$
$$n(B) = 2$$

$$3 \times 2 = 6$$

Question iv

Statement:

Find the LCM of

$$7x - 6xy$$

and

$$5xy^3 - 3x^2$$

Options:

A) $(7 - 6y)(5x^3 - 3x)$
B) $(7x - 6xy)(5y^3x - 3x^2)$
C) $x(7 - 6y)$
D) $x(7 - 6y)(5y^3 - 3x)$

Correct Option: D

Reason & Explanation:

Factor first expression:

$$7x - 6xy = x(7 - 6y)$$

Factor second expression:

$$5xy^3 - 3x^2 = x(5y^3 - 3x)$$

LCM = common factor × remaining factors

Common factor: x

Final answer:

$$x(7 - 6y)(5y^3 - 3x)$$

Question v

Statement:

Solve the inequality:

$$-2x - \frac{1}{2} \leq \frac{3}{2}$$

Options:

A) $x > -1$

B) $x < -1$

C) $x \geq -1$

D) $x \leq -1$

Correct Option: C

Reason & Explanation:

Add $\frac{1}{2}$ to both sides:

$$-2x \leq \frac{3}{2} + \frac{1}{2}$$
$$-2x \leq \frac{4}{2}$$
$$-2x \leq 2$$

Divide by -2(reverse inequality):

$$x \geq -1$$

Question vi

Statement:

Convert

$$15°50'$$

into radians.

Options:

A) $\frac{19\pi}{216}$
B) $\frac{19\pi}{36}$
C) $\frac{19\pi}{180}$
D) $\frac{216\pi}{19}$

Correct Option: A

Convert minutes to degrees:

$$15 + \frac{50}{60} = 15 + \frac{5}{6}$$
$$= \frac{95}{6}$$

Convert to radians:

$$\frac{95}{6} \times \frac{\pi}{180} = \frac{95\pi}{1080} = \frac{19\pi}{216}$$

Question vii

Statement:

If a navigator gives bearing 0°, in which direction should he travel?

Options:

A) North
B) South
C) East
D) West

Correct Option: A

$$0^\circ = \text{North}$$

Question viii

Statement:

If $\alpha = \beta$, find b.

Options:

A) $\frac{cd}{a}$
B) $\frac{c}{ad}$
C) $\frac{ad}{c}$
D) $\frac{ac}{d}$

Correct Option: C

$$\sin\ \alpha = \frac{c}{a}$$
$$\sin\ \beta = \frac{d}{b}$$

Since $\alpha = \beta$:

$$\frac{c}{a} = \frac{d}{b}$$
$$cb = ad$$
$$b = \frac{ad}{c}$$

Question ix

Statement:

Simplify:

$$-3 - 3\tan^2\theta$$

Correct Option: B

Factor:

$$-3(1 + \tan^2\theta)$$

Identity:

$$1 + \tan^2\theta = \sec^2\theta$$

Result:

$$-3\sec^2\theta$$

Question x

Statement:

Intersection of angle bisectors of a triangle is called:

Correct Option: C (Incentre)

Question xi

Statement:

Each interior angle of a regular hexagon is:

$$\frac{(n-2)\times 180^\circ}{n}$$

For $n = 6$:

$$= 120^\circ$$

Correct Option: **D**

Question xii

Statement:

Locus equidistant from $P(5,4)$and $Q(5,-6)$:

Midpoint:

$$\frac{4 + (-6)}{2} = -1$$

$$y = -1$$

Correct Option: **C**

Question xiii

Mean of 11 numbers = 7

Total sum:

$$11 \times 7 = 77$$

Remove 13:

$$77 - 13 = 64$$

New mean:

$$\frac{64}{10} = 6.4$$

Correct Option: **B**

Question xiv

$$P = \frac{4}{52} = \frac{1}{13}$$

Correct Option: **B**

Question xv

Possible outcomes:

$$HH, HT, TH, TT$$
$$P(HH) = \frac{1}{4}$$

Correct Option: **A**

SECTION B:-

Q.2 (i) – Main Option

Simplify:

$$\left[\frac{(125)^{\frac{1}{3}} \times (25)^{\frac{1}{2}} + (64)^{\frac{1}{3}} \times 6}{(8)^{\frac{2}{3}}}\right]^{\frac{-2}{3}}$$

Step 1: Convert fractional powers into roots

$$\boldsymbol{(125)^{\frac{1}{3}}}$$

Cube root of 125

$$= 5(5 \times 5 \times 5 = 125)$$

$$\boldsymbol{(25)^{\frac{1}{2}}}$$

Square root of 25

$$= 5$$

$$\left(\mathbf{64}\right)^{\frac{1}{3}}$$

Cube root of 64

$$= 4(4 \times 4 \times 4 = 64)$$

$$\left(\mathbf{8}\right)^{\frac{2}{3}}$$

First cube root of 8:

$$\sqrt[3]{8} = 2$$

Now square it:

$$2^2 = 4$$

Step 2: Substitute values

$$\left[\frac{5 \times 5 + 4 \times 6}{4}\right]^{\frac{-2}{3}}$$

Step 3: Multiply

$$5 \times 5 = 25$$
$$4 \times 6 = 24$$
$$\left[\frac{25 + 24}{4}\right]^{\frac{-2}{3}}$$
$$\left[\frac{49}{4}\right]^{\frac{-2}{3}}$$

Step 4: Remove negative power

Negative power means reciprocal:

$$\left[\frac{4}{49}\right]^{\frac{2}{3}}$$

✅ Final Answer

$$\boxed{\left(\frac{4}{49}\right)^{\frac{2}{3}}}$$

Q.2 (i) – OR Option

Given:

$$X = \{1,3,9\}$$
$$Y = \{3,5,7\}$$
$$Z = \{3,5,7,9,11\}$$

Prove:

$$X \cup (Y \cap Z) = (X \cup Y) \cap (X \cup Z)$$

Left Side

Step 1: Find $Y \cap Z$

Common elements:

$$Y \cap Z = \{3,5,7\}$$

Step 2: Union with X

$$X \cup (Y \cap Z)$$
$$\{1,3,9\} \cup \{3,5,7\}$$
$$= \{1,3,5,7,9\}$$

Right Side

Step 1: $\boldsymbol{X \cup Y}$

$$\{1,3,9\} \cup \{3,5,7\}$$
$$= \{1,3,5,7,9\}$$

Step 2: $\boldsymbol{X \cup Z}$

$$\{1,3,9\} \cup \{3,5,7,9,11\}$$
$$= \{1,3,5,7,9,11\}$$

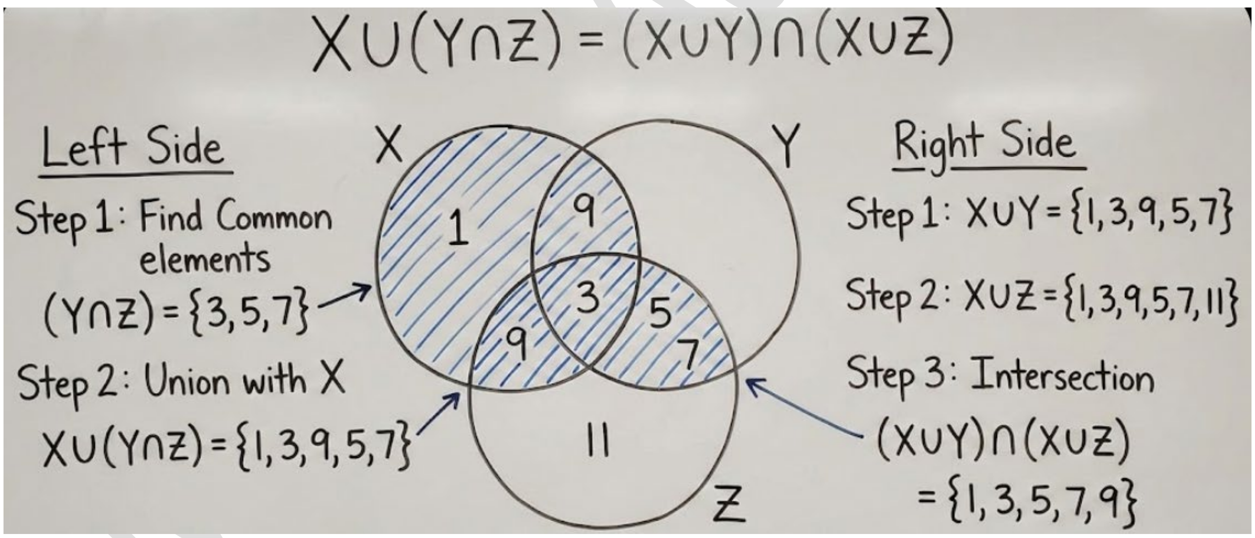
Step 3: Intersection

$$\{1,3,5,7,9\} \cap \{1,3,5,7,9,11\}$$
$$= \{1,3,5,7,9\}$$

✅ **LHS = RHS**

$$\boxed{\{1,3,5,7,9\}}$$

Proved.



Q.2 (ii) – Main Option (Bearings)

Rules:

- Start from North (0°)
- Move clockwise
- Always write in 3 digits

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1 Bearing of B from A

$$\boxed{040^\circ}$$

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2 Bearing of A from B

$$180^\circ + 40^\circ = 220^\circ$$

$$\boxed{220^\circ}$$

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3 Bearing of C from B

$$220^\circ - 110^\circ = 110^\circ$$

$$\boxed{110^\circ}$$

---

4 Bearing of B from C

$$110^\circ + 180^\circ = 290^\circ$$
$$\boxed{290^\circ}$$

Q.2 (ii) – OR Option

Given:

$$A = \{1,2,3\}$$
$$B = \{3,4\}$$

(a) Cartesian Product $\boldsymbol{A \times B}$

$$\{(1,3), (1,4), (2,3), (2,4), (3,3), (3,4)\}$$

(b) Relation $\boldsymbol{x < y}$

Keep only valid pairs:

$$R = \{(1,3), (1,4), (2,3), (2,4), (3,4)\}$$

(c) Domain and Range

Domain:

$$\{1, 2, 3\}$$

Range:

$$\{3, 4\}$$

Q.2 (iii) – Main Option

Given:

$$P(t) = P_0 e^{rt}$$
$$25000 = 10000e^{0.025t}$$

Step 1

$$2.5 = e^{0.025t}$$

Step 2 (Take ln)

$$\ln(2.5) = 0.025t$$
$$0.9163 = 0.025t$$

Step 3

$$t = \frac{0.9163}{0.025}$$
$$t = 36.65$$

Step 4

$$2015 + 36.65 = 2051.65$$

✅ **Final Answer**

$$\boxed{2051}$$

Q.2 (iii) – OR Option

Intersection of:

$$x + 2y - 10 = 0$$
$$2x + y - 2 = 0$$

Solving:

$$y = 6$$
$$x = -2$$

Intersection:

$$(-2,6)$$

Family formula:

$$(x + 2y - 10) + k(2x + y - 2) = 0$$

Put (5,2):

$$-1 + 10k = 0$$
$$k = \frac{1}{10}$$

Multiply by 10:

$$12x + 21y - 102 = 0$$

Divide by 3:

$$\boxed{4x + 7y - 34 = 0}$$

Q.2 (iv) – Main Option

Multiply whole equation by 6:

$$2(x - 2) + 3(2 - 3x) = x + 5$$

Expand:

$$2x - 4 + 6 - 9x = x + 5$$
$$-7x + 2 = x + 5$$
$$-3 = 8x$$
$$\boxed{x = \frac{-3}{8}}$$

Q.2 (iv) – OR Option

Factor:

$$5 + p - 18p^2 = (5 - 9p)(1 + 2p)$$
$$2 + 5p + 2p^2 = (2p + 1)(p + 2)$$

Rewrite:

$$\frac{5}{(5 - 9p)(2p + 1)} - \frac{2}{(p + 2)(2p + 1)}$$

Combine:

$$\frac{5(p + 2) - 2(5 - 9p)}{(5 - 9p)(2p + 1)(p + 2)}$$

Expand numerator:

$$5p + 10 - 10 + 18p$$
$$23p$$

✅ **Final Answer**

$$\boxed{\frac{23p}{(5-9p)(2p+1)(p+2)}}$$

Q.2 (v) – Main Option

$$\frac{1}{1+\cos\ x}+\frac{1}{1-\cos\ x}$$

Common denominator:

$$(1+\cos\ x)(1-\cos\ x)=1-\cos^2 x$$

Numerator:

$$1-\cos\ x+1+\cos\ x=2$$
$$\frac{2}{1-\cos^2 x}$$

Use identity:

$$1-\cos^2 x=\sin^2 x$$
$$\frac{2}{\sin^2 x}=2\csc^2 x$$
$$\csc^2 x=1+\cot^2 x$$

$$2(1+\cot^2 x)$$

✅ **Final Answer**

$$\boxed{2+2\cot^2 x}$$

Q.2 (v) – OR Option

Given:

Base = 6 cm

Half base = 3 cm

Hypotenuse = 5 cm

Step 1 (Height)

$$3^2+h^2=5^2$$
$$9+h^2=25$$
$$h^2=16$$
$$h=4$$

Step 2 (Area of one triangle)

$$\frac{1}{2} \times 6 \times 4 = 12$$

Step 3 (Total Area)

$$6 \times 12 = 72$$

✅ **Final Answer**

$$\boxed{72 \text{ cm}^2}$$

Question Q.2 vi (Main Option)

Statement: A hiking trail rises 500 meters over a horizontal distance of 2 kilometers. What is the slope of a trail? Express the slope in percentage.

Step-by-Step Answer:

Step 1: Understand the formula for Slope.

The formula for slope is very simple:

$$\text{Slope} = \frac{\text{Rise}}{\text{Run}}$$

Rise means how high up you go (the vertical distance). Here, it is **500 meters**.

Run means how far forward you go (the horizontal distance). Here, it is **2 kilometers**.

Step 2: Make the units match.

In math, we cannot mix meters and kilometers in the same fraction. We must change kilometers into meters.

We know that:

$$1 \text{ kilometer} = 1000 \text{ meters}$$

So,

$$2 \text{ kilometers} = 2 \times 1000 = 2000 \text{ meters}$$

Our new “Run” is **2000 meters**.

Step 3: Calculate the fraction.

$$\text{Slope} = \frac{500}{2000}$$

Let’s make this fraction simpler. Cross out the two zeros on top and the two zeros on the bottom:

$$\text{Slope} = \frac{5}{20}$$

Both numbers can be divided by 5:

$$5 \div 5 = 1$$
$$20 \div 5 = 4$$

So, the slope as a fraction is:

$$\frac{1}{4}$$

Step 4: Turn it into a percentage.

To turn any fraction into a percentage, you just multiply it by 100.

$$\frac{1}{4} \times 100 = \frac{100}{4}$$

What is 100 divided by 4?
Imagine 100 rupees split among 4 friends — everyone gets 25 rupees.

$$100 \div 4 = 25$$

Answer:

The slope is $\frac{1}{4}$, which is **25%**.

Question Q.2 vi (OR Option)

Statement: A decagonal die labeled 4,4,4,4,5,5,6,7,8,8 is rolled once. Find the probability of an odd number, an even number, and a factor of 12.

Step-by-Step Answer:

A “decagonal die” is just a 10-sided dice.

The formula for Probability (chance) is always:

$$\frac{\text{Number of winning outcomes}}{\text{Total number of possible outcomes}}$$

Our Total number of outcomes is **10** (because there are 10 numbers on the dice).

Part 1: Probability of an odd number

Numbers: 4, 4, 4, 4, 5, 5, 6, 7, 8, 8

Odd numbers (not divisible perfectly by 2):
5, 5, 7

Count = **3**

$$\text{Probability} = \frac{3}{10}$$

Part 2: Probability of an even number

Even numbers (end in 0,2,4,6,8):
Four 4s, one 6, two 8s

$$4 + 1 + 2 = 7$$

$$\text{Probability} = \frac{7}{10}$$

Part 3: Probability of a factor of 12

Factors of 12:

1, 2, 3, 4, 6, 12

From dice: 4, 4, 4, 4, 6

Count = 4 + 1 = **5**

$$\text{Probability} = \frac{5}{10}$$

Simplify:

$$\frac{5}{10} = \frac{1}{2}$$

Answer:

Odd = **3/10**
Even = **7/10**
Factor of 12 = **1/2**

Question Q.2 vii (Main Option)

Statement: A triangular garden XYZ shows corners $X(-4,-4)$, $Y(12,0)$ and $Z(4,8)$. Find locus of the corners equidistant from XZ and YZ.

Step-by-Step Answer:

Locus = a path made of points following a rule.
Equidistant = same distance away.

Sides XZ and YZ meet at corner Z.

In geometry:

The path of points that are equal distance from two intersecting lines is the **Angle Bisector**.

Answer:

The locus is the **Angle Bisector of Angle Z**.

Question Q.2 vii (OR Option)

Statement: Given the equation $y = 4x - 2$ and point (1,2), find equation of perpendicular line.

Step 1: Old slope

From $y = 4x - 2$

Old slope $m = 4$

Step 2: Perpendicular slope

Flip 4 → $\frac{1}{4}$

Change sign → $-\frac{1}{4}$

New slope $m = -\frac{1}{4}$

Step 3: Use Point-Slope Formula

$$y - y_1 = m(x - x_1)$$

$$y - 2 = -\frac{1}{4}(x - 1)$$

Step 4: Convert to slope form

$$y - 2 = -\frac{1}{4}x + \frac{1}{4}$$

$$y = -\frac{1}{4}x + \frac{1}{4} + 2$$

$$2 = \frac{8}{4}$$

$$\frac{1}{4}+\frac{8}{4}=\frac{9}{4}$$

Answer:

$$y=-\frac{1}{4}x+\frac{9}{4}$$

Question Q.2 viii (Main Option)

Statement: In similar figures, find value of $x$and ratio of volumes $v_1$and v_2.

Similar = same shape, different size.

Height: 2 cm → 4 cm

Scale factor = 2

Small length = 4 cm

$$4\times 2=8$$

$$\boldsymbol{x=8}\ \textbf{cm}$$

Volume Rule:

$$\text{Volume Ratio} = (\text{Side Ratio})^3$$

Side ratio = 2 : 1

$$2^3 = 8$$
$$1^3 = 1$$

Answer:

$$v_1 : v_2 = 8 : 1$$

Question Q.2 viii (OR Option)

Statement: Die rolled 75 times. 5 appears 20 times. Find relative frequency of not 5.

Total rolls = 75

5 appeared = 20

Not 5 =

$$75 - 20 = 55$$
$$\text{Relative Frequency} = \frac{55}{75}$$

Divide by 5:

$$\frac{11}{15}$$

Answer:

$$\frac{11}{15}$$

Question Q.2 ix (Main Option)

Statement: Find HCF of

$$x^3 + 2x^2 - 4x - 8$$
$$2x^3 + 7x^2 + 4x - 4$$

First Polynomial:

Group:

$$(x^3 + 2x^2) + (-4x - 8)$$
$$x^2(x + 2) - 4(x + 2)$$
$$(x^2 - 4)(x + 2)$$

Difference of squares:

$$(x - 2)(x + 2)(x + 2)$$

Second Polynomial:

Test $x = -2$:

$$2(-2)^3 + 7(-2)^2 + 4(-2) - 4$$
$$-16 + 28 - 12 = 0$$

So $(x+2)$is factor.

Divide → $2x^2 + 3x - 2$

Factor:

$$2x^2 + 4x - x - 2$$
$$(2x - 1)(x + 2)$$

So:

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

Common Factors:

Both share:

$$(x+2)(x+2)$$

Answer:

$$(x+2)^2$$

Question Q.2 ix (OR Option)

Statement: 50-over cricket match averages given.

Overs 1–10: 12 per over

$$10 \times 12 = 120$$

Overs 11–35: 25 overs

$$25 \times 6 = 150$$

Overs 36–50: 15 overs

$$15 \times 13 = 195$$

Total Runs:

$$120 + 150 + 195 = 465$$

Total Overs:

$$10 + 25 + 15 = 50$$

Overall Average:

$$\frac{465}{50}$$

$$465 \div 50 = 9.3$$

Answer:

Average runs per over = **9.3**

SECTION C:-

QUESTION Q3 (MAIN OPTION)

Statement:

For what value of k, the expression

$y^4 + 4y^2 + k + 8/y^2 + 4/y^4$

becomes a perfect square?

Step-by-Step Solution

A perfect square means the expression can be written in the form:

$(A + B + C)^2$

Formula:

$(A + B + C)^2 = A^2 + B^2 + C^2 + 2AB + 2BC + 2CA$

Given expression:

$y^4 + 4y^2 + k + 8/y^2 + 4/y^4$

Step 1: Identify A and C from the first and last terms

First term: y^4
Since $(y^2)^2 = y^4$
Therefore, $\mathbf{A = y^2}$

Last term: $4/y^4$
Since $(2/y^2)^2 = 4/y^4$
Therefore, $\mathbf{C = 2/y^2}$

Step 2: Find B using the middle term

From formula:

$2AB = 4y^2$

Substitute $A = y^2$:

$2(y^2)(B) = 4y^2$

Divide both sides by $2y^2$:

$B = 2$

Step 3: Form the perfect square

Therefore the expression must be:

$(y^2 + 2 + 2/y^2)^2$

Step 4: Expand completely

$A^2 = (y^2)^2 = y^4$
$B^2 = (2)^2 = 4$
$C^2 = (2/y^2)^2 = 4/y^4$

$2AB = 2(y^2)(2) = 4y^2$
$2BC = 2(2)(2/y^2) = 8/y^2$
$2CA = 2(2/y^2)(y^2) = 4$

Write the full expansion:

$y^4 + 4 + 4/y^4 + 4y^2 + 8/y^2 + 4$

Combine constants:

$4 + 4 = 8$

Final expanded form:

$y^4 + 4y^2 + 8 + 8/y^2 + 4/y^4$

Comparing with given expression:

$y^4 + 4y^2 + k + 8/y^2 + 4/y^4$

Therefore,

k = 8

ANSWER: k = 8

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QUESTION Q3 (OR OPTION)

Statement:
Slopes of triangle ABC are

$m_1 = 3/2$
$m_2 = -3/2$
$m_3 = 2$

Find interior angles of triangle ABC.

Formula:

$\tan\theta = | (m_1 - m_2) / (1 + m_1 m_2) |$

STEP 1: Angle A (between m_1 and m_2)

$m_1 = 3/2$
$m_2 = -3/2$

tan A = | (3/2 − (−3/2)) / (1 + (3/2 × −3/2)) |

Numerator:

3/2 + 3/2 = 6/2 = 3

Denominator:

1 + (−9/4)
= 4/4 − 9/4
= −5/4

Therefore:

tan A = | 3 ÷ (−5/4) |

= | 3 × (−4/5) |

= | −12/5 |

= 12/5

= 2.4

A = $\tan^{-1}(2.4)$

A ≈ 67.38°

STEP 2: Angle B (between m_2 and m_3)

$m_2 = -3/2$
$m_3 = 2$

tan B = | (−3/2 − 2) / (1 + (−3/2 × 2)) |

Numerator:

−1.5 − 2 = −3.5

Denominator:

1 + (−3) = −2

tan B = | −3.5 / −2 |

= 1.75

$B = \tan^{-1}(1.75)$

B ≈ 60.26°

STEP 3: Angle C (between m_3 and m_1)

$m_3 = 2$
$m_1 = 3/2 = 1.5$

tan C = | (2 − 1.5) / (1 + (2 × 1.5)) |

Numerator:

0.5

Denominator:

1 + 3 = 4

tan C = 0.5 / 4

= 0.125

C = $\tan^{-1}(0.125)$

C ≈ 7.13°

STEP 4: Triangle Check

67.38 + 60.26 + 7.13 = 134.77°

Not 180° because formula gives acute angle.

Correct obtuse angle:

180° − 67.38° = 112.62°

Now check:

112.62 + 60.26 + 7.13 = 180.01°

(Rounding difference)

ANSWER:

Interior angles are:

112.62°

60.26°

7.13°

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QUESTION Q4 (MAIN OPTION)

Given formula:

$H = H_0 + A \sin(2\pi t / T)$

Given:

$H_0 = 2$

$A = 1$

$T = 24$

Substitute:

$H = 2 + \sin(2\pi t / 24)$

Simplify:

$2/24 = 1/12$

$H = 2 + \sin(\pi t / 12)$

When $t = 0$

$H = 2 + \sin(0)$

$= 2 + 0$

$= 2$ meters

When $t = 6$

$H = 2 + \sin(\pi \times 6 / 12)$

$= 2 + \sin(\pi/2)$

$\sin 90° = 1$

$H = 2 + 1$

$= 3$ meters

When $t = 18$

$H = 2 + \sin(\pi \times 18 / 12)$

$= 2 + \sin(3\pi/2)$

$\sin 270° = -1$

$H = 2 - 1$

$= 1$ meter

ANSWERS:

At $t = 0 \rightarrow 2$ m
At $t = 6 \rightarrow 3$ m
At $t = 18 \rightarrow 1$ m

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QUESTION Q4 (OR OPTION)

Given equation:

$-2x + 5y = 10$

Find intercept points:

If $x = 0$

$5y = 10$
$y = 2$

Point (0, 2)

If $y = 0$

$-2x = 10$
$x = -5$

Point (−5, 0)

(i) **Two Point Form**

$(y - y_1)/(x - x_1) = (y_2 - y_1)/(x_2 - x_1)$

Using points (0,2) and (−5,0):

$(y - 2)/(x - 0) = (0 - 2)/(-5 - 0)$

$(y - 2)/x = 2/5$

(ii) **Intercept Form**

Divide whole equation by 10:

$-2x/10 + 5y/10 = 1$

$x/(-5) + y/2 = 1$

(iii) **Symmetric Form**

Using point (−5,0)
Slope = 2/5

$(x + 5)/5 = y/2$

(iv) **Normal Form**

$\sqrt{A^2 + B^2}$

$= \sqrt{(-2)^2 + 5^2}$

$= \sqrt{4 + 25}$

$= \sqrt{29}$

Divide entire equation by √29:

$(-2/\sqrt{29})x + (5/\sqrt{29})y = 10/\sqrt{29}$

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QUESTION Q5 (MAIN OPTION)

Given:

AB = 4.8 cm
BC = 3.5 cm
AC = 4 cm

Construction Steps:

Draw AB = 4.8 cm

With center A, radius 4 cm, draw arc

With center B, radius 3.5 cm, cut arc at C

Join AC and BC

From C draw perpendicular to AB

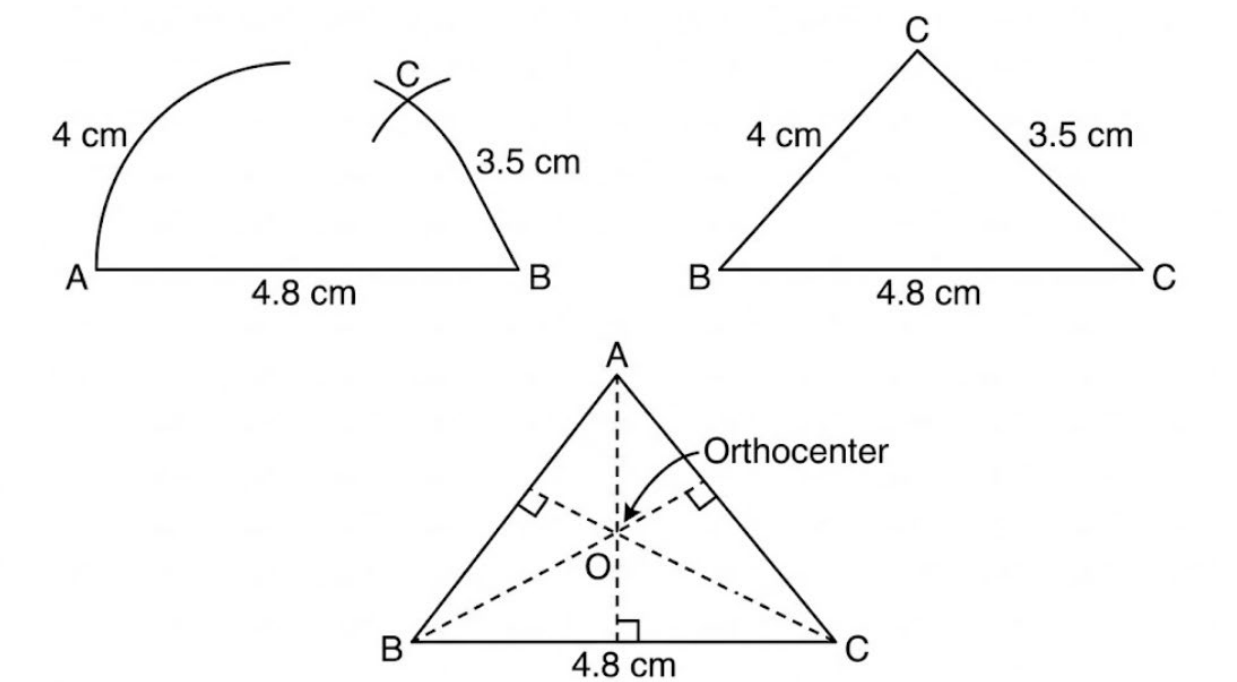
From A draw perpendicular to BC

From B draw perpendicular to AC

All three altitudes meet at one point O

Therefore, altitudes are concurrent

Point O is called **Orthocenter**



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QUESTION Q5 (OR OPTION)

Total N = 24

Class boundaries:

139.5 – 149.5 → f = 3 → cf = 3
149.5 – 159.5 → f = 7 → cf = 10
159.5 – 169.5 → f = 5 → cf = 15
169.5 – 179.5 → f = 9 → cf = 24

MEDIAN

$N/2 = 24/2 = 12$

Median class: 159.5 – 169.5

Formula:

$\text{Median} = l + (h/f)(N/2 - c)$

$= 159.5 + (10/5)(12 - 10)$

$= 159.5 + 2 \times 2$

$= 159.5 + 4$

$= 163.5$

Median = 163.5 million rupees

MODE

Modal class: 169.5 – 179.5

Formula:

$\text{Mode} = l + [(f_m - f_1) / (2f_m - f_1 - f_2)] \times h$

$= 169.5 + [(9 - 5)/(18 - 5 - 0)] \times 10$

$= 169.5 + (4/13) \times 10$

$= 169.5 + 40/13$

$= 169.5 + 3.0769$

= 172.58

Mode ≈ 172.58 million rupees

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