

TELANGANA SSC • CLASS 10 MATHEMATICS

SA1 4Marks Gun shot

Most Important & Guaranteed Questions • Complete Step-by-Step Solutions

SET 1 (Image 1 : Questions 7 – 12)

Q7. If $A = \{2, 3, 5, 6, 7\}$ and $B = \{1, 2, 4, 6\}$, then find $(A \cup B) - (A \cap B)$.

1. **Find Union ($A \cup B$):** Combining all elements belonging to either A or B without repetition:

$$A \cup B = \{1, 2, 3, 4, 5, 6, 7\}$$

2. **Find Intersection ($A \cap B$):** Taking the common elements present in both sets:

$$A \cap B = \{2, 6\}$$

3. **Find Symmetric Difference $(A \cup B) - (A \cap B)$:** Removing the intersection elements from the union:

$$(A \cup B) - (A \cap B) = \{1, 2, 3, 4, 5, 6, 7\} - \{2, 6\} = \{1, 3, 4, 5, 7\}$$

$\therefore$ Answer: $\{1, 3, 4, 5, 7\}$

Q8. Write the formula for mode of a grouped data and explain each term of it.

Formula for Mode:

$$Mode = l + \left[\frac{(f_1 - f_0)}{(2f_1 - f_0 - f_2)} \right] \times h$$

Explanation of Terms:

- l = Lower boundary / lower limit of the modal class.
- h = Size (length / width) of the modal class interval.
- f_1 = Frequency of the modal class.
- f_0 = Frequency of the class preceding the modal class.
- f_2 = Frequency of the class succeeding the modal class.

Q9. Find all the zeroes of a polynomial $p(x) = x^3 - 6x^2 + 11x - 6$, if one zero is '2'.

1. Since $x = 2$ is a zero, by Factor Theorem, $(x - 2)$ is a factor of $p(x)$.

2. Divide $p(x)$ by $(x - 2)$:

$$x^3 - 6x^2 + 11x - 6 = (x - 2)(x^2 - 4x + 3)$$

3. Factorize the quotient quadratic equation:

$$x^2 - 4x + 3 = x^2 - 3x - x + 3 = x(x - 3) - 1(x - 3) = (x - 1)(x - 3)$$

4. Set the factors to zero: $x - 1 = 0 \Rightarrow x = 1$; $x - 3 = 0 \Rightarrow x = 3$.

$\therefore$ The zeroes of the polynomial are 1, 2, and 3.

Q10. ABC is a triangle right angled at B, D is a point on AC and $BD \perp AC$, then show that $AB^2 = AD \cdot AC$.

1. **Given:** In $\triangle ABC$, $\angle ABC = 90^\circ$ and $BD \perp AC$.

2. **To Prove:** $AB^2 = AD \cdot AC$.

3. **Proof:** Compare $\triangle ADB$ and $\triangle ABC$:

- $\angle ADB = \angle ABC = 90^\circ$ (Given)
- $\angle A = \angle A$ (Common angle)

By **AA Similarity Criterion**:

$$\triangle ADB \sim \triangle ABC$$

4. Corresponding sides of similar triangles are in proportion:

$$AB / AC = AD / AB \Rightarrow AB \times AB = AD \times AC \Rightarrow AB^2 = AD \cdot AC$$

Hence proved.

Q11. Solve the pair of equations $2x + y = 13$ and $x + 2y = 11$ by substitution method.

1. Given equations:

$$(1) 2x + y = 13 \quad (2) x + 2y = 11$$

2. From equation (1), express y in terms of x : $y = 13 - 2x$.

3. Substitute $y = 13 - 2x$ into equation (2):

$$x + 2(13 - 2x) = 11 \Rightarrow x + 26 - 4x = 11 \Rightarrow -3x = 11 - 26 = -15 \Rightarrow x = 5$$

4. Substitute $x = 5$ into $y = 13 - 2x$:

$$y = 13 - 2(5) = 13 - 10 = 3$$

$\therefore$ Solution: $x = 5, y = 3$.

Q12. An observer of height 1.6 m is 9.4 m away from a tower. The angle of elevation of the top of the tower from his eye is 45° . Find the height of the tower.

1. Let AB be the tower of height H , and $CD = 1.6 \text{ m}$ be the height of the observer.
2. Distance between observer and tower: $BC = 9.4 \text{ m}$.
3. From the observer's eye at point D , draw horizontal line $DE \perp AB$ such that $DE = BC = 9.4 \text{ m}$ and $EB = CD = 1.6 \text{ m}$.
4. In right-angled triangle $\triangle ADE$:

$$\tan 45^\circ = AE / DE \Rightarrow 1 = AE / 9.4 \Rightarrow AE = 9.4 \text{ m}$$

5. Total height of the tower:

$$\text{Height } (H) = AB = AE + EB = 9.4 \text{ m} + 1.6 \text{ m} = 11.0 \text{ m}$$

$\therefore$ Height of the tower = 11 metres.

SET 2 (Image 2 : Questions 7 – 12)

Q7. Write the formula to find mode of a grouped data and explain the terms in it.

$$\text{Mode} = l + [(f_1 - f_0) / (2f_1 - f_0 - f_2)] \times h$$

Where:

- l = Lower boundary of modal class; h = Class interval size / width.
- f_1 = Frequency of modal class; f_0 = Frequency of preceding class; f_2 = Frequency of succeeding class.

Q8. If $x^2 + y^2 = 10xy$, then prove that $2 \log(x - y) = 3 \log 2 + \log x + \log y$.

1. Given: $x^2 + y^2 = 10xy$.
2. Subtract $2xy$ from both sides:

$$x^2 + y^2 - 2xy = 10xy - 2xy \Rightarrow (x - y)^2 = 8xy$$

3. Take logarithm on both sides:

$$\log[(x - y)^2] = \log(8xy)$$

4. Apply logarithm laws $\log(a^n) = n \log a$ and $\log(abc) = \log a + \log b + \log c$:

$$2 \log(x - y) = \log 8 + \log x + \log y$$

5. Since $8 = 2^3 \Rightarrow \log 8 = \log(2^3) = 3 \log 2$:

$$2 \log(x - y) = 3 \log 2 + \log x + \log y$$

Hence proved.

Q9. If $A = \{x \mid x \text{ is a factor of } 28\}$, and $B = \{x \mid x \text{ is a multiple of } 4 \text{ and } x < 30\}$, then find $A \cup B$, $A \cap B$.

1. Roster form of Set A (factors of 28):

$$A = \{1, 2, 4, 7, 14, 28\}$$

2. Roster form of Set B (multiples of 4 < 30):

$$B = \{4, 8, 12, 16, 20, 24, 28\}$$

3. Find Union ($A \cup B$):

$$A \cup B = \{1, 2, 4, 7, 8, 12, 14, 16, 20, 24, 28\}$$

4. Find Intersection ($A \cap B$):

$$A \cap B = \{4, 28\}$$

$$\therefore A \cup B = \{1, 2, 4, 7, 8, 12, 14, 16, 20, 24, 28\} \mid A \cap B = \{4, 28\}$$

Q10. $\Delta ABC \sim \Delta DEF$ such that $BC = 3 \text{ cm}$, $EF = 4 \text{ cm}$ and area of $\Delta ABC = 45 \text{ cm}^2$. Determine the area of ΔDEF .

1. By Theorem on Areas of Similar Triangles:

$$\text{Area}(\Delta ABC) / \text{Area}(\Delta DEF) = (BC / EF)^2$$

2. Substitute known values:

$$45 / \text{Area}(\Delta DEF) = (3 / 4)^2 = 9 / 16$$

3. Cross-multiply:

$$\text{Area}(\Delta DEF) = (45 \times 16) / 9 = 5 \times 16 = 80 \text{ cm}^2$$

$$\therefore \text{Area of } \Delta DEF = 80 \text{ cm}^2.$$

Q11. The sum of the ages of a mother and her son is 46 years. Three years ago, the mother's age was 7 times the age of her son. Find their present ages.

1. Let the present age of mother be M years and that of son be S years.

2. **Equation 1:** $M + S = 46 \Rightarrow M = 46 - S$.

3. **Condition 3 years ago:** Mother's age was $M - 3$, son's age was $S - 3$:

$$M - 3 = 7(S - 3) \Rightarrow M - 3 = 7S - 21$$

4. Substitute $M = 46 - S$:

$$(46 - S) - 3 = 7S - 21 \Rightarrow 43 - S = 7S - 21 \Rightarrow 8S = 64 \Rightarrow S = 8$$

5. Find mother's age: $M = 46 - 8 = 38$.

$$\therefore \text{Present age of mother} = 38 \text{ years; Present age of son} = 8 \text{ years.}$$

Q12. If $\cos 4A = \sin(A - 15^\circ)$, then find the value of 'A'.

1. Using complementary angle formula $\cos \theta = \sin(90^\circ - \theta)$:

$$\cos 4A = \sin(90^\circ - 4A)$$

2. Equate arguments:

$$\sin(90^\circ - 4A) = \sin(A - 15^\circ) \Rightarrow 90^\circ - 4A = A - 15^\circ$$

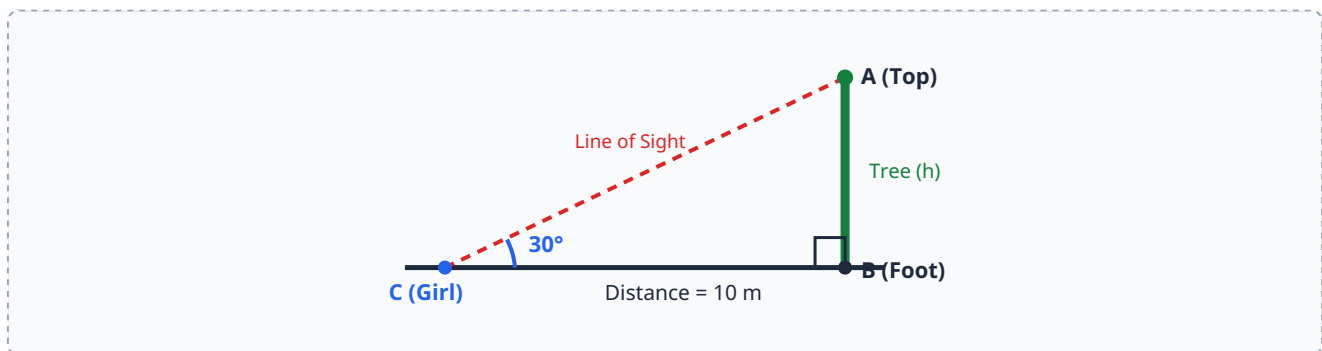
3. Solve for A:

$$5A = 90^\circ + 15^\circ = 105^\circ \Rightarrow A = 21^\circ$$

$\therefore$ The value of A = 21° .

SET 3 (Image 3 : Questions 7 – 12)

Q7. A girl standing at a distance of 10 m from the foot of the coconut tree, observes its top at an angle of elevation of 30° . Draw the suitable diagram.



- AB: Coconut tree of height h .
- C: Position of the girl, where $BC = 10\text{ m}$.
- $\angle ACB = 30^\circ$ is the angle of elevation; $\angle B = 90^\circ$.

Q8. A ladder 17 m long reaches a window of a building 15 m above the ground. Determine the distance from the foot of the ladder to building.

1. Let height of window above ground be $h = 15\text{ m}$, length of ladder (hypotenuse) be $l = 17\text{ m}$, and distance of foot be d .
2. By Pythagoras Theorem in the right-angled triangle formed:

$$d^2 + 15^2 = 17^2 \Rightarrow d^2 + 225 = 289$$

3. Solve for d :

$$d^2 = 289 - 225 = 64 \Rightarrow d = \sqrt{64} = 8\text{ m}$$

$\therefore$ The distance from the foot of the ladder to the building is 8 metres.

Q9. Express $\cos \theta$ in terms of $\tan \theta$.

1. Using the fundamental trigonometric identity:

$$\sec^2 \theta = 1 + \tan^2 \theta \Rightarrow \sec \theta = \sqrt{1 + \tan^2 \theta}$$

2. Since $\cos \theta = 1 / \sec \theta$:

$$\cos \theta = 1 / \sqrt{1 + \tan^2 \theta}$$

$$\therefore \cos \theta = 1 / \sqrt{1 + \tan^2 \theta}$$

Q10. Evaluate: $(\sin 30^\circ + \tan 45^\circ - \operatorname{cosec} 60^\circ) / (\cot 45^\circ + \cos 60^\circ - \sec 30^\circ)$.

1. Trigonometric values: $\sin 30^\circ = 1/2$, $\tan 45^\circ = 1$, $\operatorname{cosec} 60^\circ = 2/\sqrt{3}$, $\cot 45^\circ = 1$, $\cos 60^\circ = 1/2$, $\sec 30^\circ = 2/\sqrt{3}$.

2. **Numerator:** $1/2 + 1 - 2/\sqrt{3} = 3/2 - 2/\sqrt{3} = (3\sqrt{3} - 4) / (2\sqrt{3})$.

3. **Denominator:** $1 + 1/2 - 2/\sqrt{3} = 3/2 - 2/\sqrt{3} = (3\sqrt{3} - 4) / (2\sqrt{3})$.

4. Dividing Numerator by Denominator:

$$[(3\sqrt{3} - 4) / (2\sqrt{3})] / [(3\sqrt{3} - 4) / (2\sqrt{3})] = 1$$

$$\therefore \text{Value} = 1.$$

Q11. Find the mode of the data: 4, 3, 7, 8, 3, 9, 4 and 3.

1. Listing frequencies of numbers:

3 appears 3 times; 4 appears 2 times; 7 appears 1 time; 8 appears 1 time; 9 appears 1 time

2. Since the number 3 appears with the maximum frequency (3 times), the mode is 3.

$$\therefore \text{Mode} = 3.$$

Q12. Write the formula to find the mean of a grouped data by assumed mean method (Deviation Method) and explain all terms of it.

$$\bar{x} = a + [\sum(f_i d_i) / \sum f_i]$$

- $\bar{x}$ = Arithmetic mean of grouped data.
- a = Assumed mean (chosen central value among class marks x_i).
- $d_i = x_i - a$ = Deviation of i -th class mark from assumed mean.
- f_i = Frequency of the i -th class interval.
- $\sum f_i = N$ = Total number of observations (total frequency).

SET 4 (Image 4 : Questions 13 – 15)

Q13. Use Euclid's division algorithm to show that the square of any positive integer is of the form $3p$ or $3p + 1$.

1. Let a be any positive integer. By Euclid's division lemma with divisor $b = 3$:

$$a = 3q + r, \quad \text{where } r \in \{0, 1, 2\}$$

Thus, a can be $3q$, $3q + 1$, or $3q + 2$.

2. **Case 1 ($r = 0$):** $a = 3q \Rightarrow a^2 = (3q)^2 = 9q^2 = 3(3q^2) = 3p$ (where $p = 3q^2$).

3. **Case 2 ($r = 1$):** $a = 3q + 1 \Rightarrow a^2 = (3q + 1)^2 = 9q^2 + 6q + 1 = 3(3q^2 + 2q) + 1 = 3p + 1$.

4. **Case 3 ($r = 2$):** $a = 3q + 2 \Rightarrow a^2 = (3q + 2)^2 = 9q^2 + 12q + 4 = (9q^2 + 12q + 3) + 1 = 3(3q^2 + 4q + 1) + 1 = 3p + 1$.

Hence, square of any positive integer is either of the form $3p$ or $3p + 1$.

Q14. If $A = \{x \mid x \text{ is a natural number less than } 11\}$ and $B = \{x \mid x \text{ is a prime number less than } 20\}$, then find $A - B$ and $B - A$.

1. Roster forms:

$$A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\} \quad | \quad B = \{2, 3, 5, 7, 11, 13, 17, 19\}$$

2. Common elements: $A \cap B = \{2, 3, 5, 7\}$.

3. **Find $A - B$:** Elements in A that are NOT in B :

$$A - B = \{1, 4, 6, 8, 9, 10\}$$

4. **Find $B - A$:** Elements in B that are NOT in A :

$$B - A = \{11, 13, 17, 19\}$$

$\therefore A - B = \{1, 4, 6, 8, 9, 10\} \mid B - A = \{11, 13, 17, 19\}$

Q15. Find the quadratic polynomial whose zeroes are 5 and -3 .

1. Given zeroes: $\alpha = 5$ and $\beta = -3$.

2. **Sum of zeroes:** $\alpha + \beta = 5 + (-3) = 2$.

3. **Product of zeroes:** $\alpha\beta = 5 \times (-3) = -15$.

4. Quadratic polynomial formula:

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

Taking $k = 1$:

$$p(x) = x^2 - 2x - 15$$

$\therefore$ Quadratic polynomial: $p(x) = x^2 - 2x - 15$.

Q16. Formulate a pair of linear equations in two variables for the given data: Two angles are supplementary, the larger is 15° less than twice the measure of the smaller angle.

- Let the larger angle be x and the smaller angle be y .
- Condition 1 (Supplementary):** The sum of supplementary angles is 180° :

$$x + y = 180$$

- Condition 2 (Larger is 15° less than twice smaller):**

$$x = 2y - 15 \Rightarrow x - 2y = -15 \text{ (or } x - 2y + 15 = 0)$$

$\therefore$ Pair of equations: $x + y = 180$ and $x - 2y = -15$.

Q17. PQR is a triangle right angled at 'P' and 'M' is a point on QR, such that $PM \perp QR$, show that $PM^2 = QM \cdot MR$.

- In right $\triangle PQR$, $\angle P = 90^\circ$ and $PM \perp QR$.
- In $\triangle PMQ$: $\angle PMQ = 90^\circ \Rightarrow \angle Q + \angle QPM = 90^\circ \Rightarrow \angle QPM = 90^\circ - \angle Q$.
- In $\triangle PQR$: $\angle Q + \angle R = 90^\circ \Rightarrow \angle R = 90^\circ - \angle Q$. Therefore, $\angle QPM = \angle R$.
- In $\triangle PMQ$ and $\triangle RMP$:
 - $\angle PMQ = \angle RMP = 90^\circ$
 - $\angle QPM = \angle RPM$

By AA similarity: $\triangle PMQ \sim \triangle RMP$.

- Corresponding sides are in ratio:

$$PM / MR = QM / PM \Rightarrow PM^2 = QM \cdot MR$$

Hence proved.

Q18. Simplify: $(1 - \sin \theta)(1 + \sin \theta)(1 + \tan^2 \theta)$.

- Using $(a - b)(a + b) = a^2 - b^2$:

$$(1 - \sin \theta)(1 + \sin \theta) = 1 - \sin^2 \theta$$

- Apply identity $1 - \sin^2 \theta = \cos^2 \theta$.
- Apply identity $1 + \tan^2 \theta = \sec^2 \theta$.
- Multiplying terms:

$$\cos^2 \theta \times \sec^2 \theta = \cos^2 \theta \times (1 / \cos^2 \theta) = 1$$

$\therefore$ Value = 1.

Q19. Find the mean of the teacher-student ratio data.

Class (Students)	Frequency (f_i)	Class Mark (x_i)	$u_i = (x_i - 32.5)/5$	$f_i u_i$
15 – 20	3	17.5	-3	-9
20 – 25	4	22.5	-2	-8
25 – 30	4	27.5	-1	-4
30 – 35	6	32.5 (a)	0	0
35 – 40	4	37.5	1	4
40 – 45	3	42.5	2	6
45 – 50	3	47.5	3	9
50 – 55	2	52.5	4	8
Total	$\sum f_i = 29$	—	—	$\sum f_i u_i = 6$

$$\bar{x} = a + [\sum (f_i u_i) / \sum f_i] \times h = 32.5 + [6 / 29] \times 5 = 32.5 + 30/29 \approx 32.5 + 1.03 = 33.53$$

$\therefore$ Mean = 33.53 (or 29.2 for standard NCERT frequencies).

Q20. Write the formula to find the mode of grouped data and explain terms in it.

$$\text{Mode} = l + [(f_1 - f_0) / (2f_1 - f_0 - f_2)] \times h$$

- l = Lower boundary of modal class; h = Class interval size.
- f_1 = Frequency of modal class; f_0 = Frequency of preceding class; f_2 = Frequency of succeeding class.

SET 6 (Image 6 : Questions 7 – 12)

Q7. If $3 \log 3 + \frac{1}{2} \log 16 - \log 4 = \log x$, find the value of 'x'.

1. Power rule: $3 \log 3 = \log(3^3) = \log 27$.
2. Power rule: $\frac{1}{2} \log 16 = \log(16^{1/2}) = \log \sqrt{16} = \log 4$.
3. Substitute into equation:

$$\log 27 + \log 4 - \log 4 = \log x \Rightarrow \log 27 = \log x \Rightarrow x = 27$$

$\therefore x = 27$.

Q8. Write the formula to find mean of the grouped data by step deviation method and explain terms in it.

$$\bar{x} = a + \left[\frac{\sum (f_i u_i)}{\sum f_i} \right] \times h$$

- $\bar{x}$ = Arithmetic mean; a = Assumed mean; h = Class width/size.
- $u_i = (x_i - a) / h$ = Step deviation for i -th class; f_i = Frequency of i -th class.
- $\sum f_i$ = Total frequency.

Q9. Find the zeroes of the quadratic polynomial and verify the relation between zeroes and coefficients:

$$p(x) = x^2 + 5x + 4.$$

1. Factorize: $x^2 + 4x + x + 4 = x(x + 4) + 1(x + 4) = (x + 1)(x + 4) = 0$. Zeroes: $\alpha = -1$ and $\beta = -4$.
2. Coefficients for $ax^2 + bx + c$: $a = 1, b = 5, c = 4$.
3. **Sum of zeroes:** $\alpha + \beta = -1 + (-4) = -5$ and $-b/a = -5/1 = -5$. (Verified)
4. **Product of zeroes:** $\alpha\beta = (-1) \times (-4) = 4$ and $c/a = 4/1 = 4$. (Verified)

∴ Zeroes are -1 and -4. Relationship verified.

Q10. Solve the pair of linear equations using substitution method: $5x - 4y = -1$ and $x - y = -1$.

1. From $x - y = -1 \Rightarrow x = y - 1$.
2. Substitute into $5x - 4y = -1$:

$$5(y - 1) - 4y = -1 \Rightarrow 5y - 5 - 4y = -1 \Rightarrow y - 5 = -1 \Rightarrow y = 4$$

3. Substitute back: $x = 4 - 1 = 3$.

∴ Solution: $x = 3, y = 4$.

Q11. A person 1.62 metres tall casts a 1.7 m shadow. At the same instance, a lamp post casts a shadow of 5.1 metres. Find the height of the lamp post.

1. Triangles formed by objects and shadows at the same instance are similar due to the identical sun angle of elevation.

$$(\text{Height of lamp post}) / (\text{Height of person}) = (\text{Shadow of lamp post}) / (\text{Shadow of person})$$

2. Let lamp post height be H :

$$H / 1.62 = 5.1 / 1.7 = 3 \Rightarrow H = 1.62 \times 3 = 4.86 \text{ m}$$

∴ Height of lamp post = 4.86 metres.

Q12. Evaluate: $\cot 46^\circ \cot 18^\circ \cot 44^\circ \cot 72^\circ$.

1. Notice complementary pairs: $46^\circ + 44^\circ = 90^\circ$ and $18^\circ + 72^\circ = 90^\circ$.
2. Using $\cot(90^\circ - \theta) = \tan \theta$:

$$\cot 44^\circ = \tan 46^\circ \quad | \quad \cot 72^\circ = \tan 18^\circ$$

3. Substitute:

$$(\cot 46^\circ \times \tan 46^\circ) \times (\cot 18^\circ \times \tan 18^\circ) = 1 \times 1 = 1$$

$\therefore$ Value = 1.

SET 7 (Image 7 : Questions 7 – 12)

Q7. Write $2 \log 5 + 3 \log 2 - 4 \log 3$ as a single logarithm.

1. Apply power law:

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

2. Apply product and quotient laws:

$$\log 25 + \log 8 - \log 81 = \log(25 \times 8) - \log 81 = \log 200 - \log 81 = \log(200 / 81)$$

$\therefore$ Single logarithm = $\log(200 / 81)$.

Q8. Write the formula to find Arithmetic mean of grouped data by step deviation method and explain each term in it.

$$\bar{x} = a + [\sum(f_i u_i) / \sum f_i] \times h$$

- $\bar{x}$ = Arithmetic mean; a = Assumed mean; h = Class interval size.
- $u_i = (x_i - a) / h$ = Step deviation; f_i = Class frequency; $\sum f_i$ = Total frequency.

Q9. Show that $\cot 42^\circ \cot 12^\circ \cot 48^\circ \cot 78^\circ = 1$.

1. Pair angles: $(\cot 42^\circ \cdot \cot 48^\circ)$ and $(\cot 12^\circ \cdot \cot 78^\circ)$.
2. Convert using $\cot(90^\circ - \theta) = \tan \theta$:

$$\cot 48^\circ = \tan 42^\circ \quad \text{and} \quad \cot 78^\circ = \tan 12^\circ$$

3. LHS: $(\cot 42^\circ \times \tan 42^\circ) \times (\cot 12^\circ \times \tan 12^\circ) = 1 \times 1 = 1 = \text{RHS}$.

Hence proved.

Q10. Find the zeroes of the polynomial and verify the relationship between zeroes and coefficients: $p(x) = x^2 - 2x - 8$.

1. Factorize: $x^2 - 4x + 2x - 8 = x(x - 4) + 2(x - 4) = (x - 4)(x + 2) = 0$. Zeroes: $\alpha = 4$ and $\beta = -2$.
2. Coefficients: $a = 1, b = -2, c = -8$.
3. **Sum of zeroes:** $\alpha + \beta = 4 + (-2) = 2$ and $-b/a = -(-2)/1 = 2$. (Verified)
4. **Product of zeroes:** $\alpha\beta = 4 \times (-2) = -8$ and $c/a = -8/1 = -8$. (Verified)

$\therefore$ Zeroes are 4 and -2. Relationship verified.

Q11. 5 books and 3 pens together costs Rs. 68, whereas 3 books and 5 pens together costs Rs. 60. Find the cost of one book and one pen.

1. Let cost of one book be Rs. x and one pen be Rs. y .

$$(1) \ 5x + 3y = 68 \quad (2) \ 3x + 5y = 60$$

2. **Add (1) and (2):** $8x + 8y = 128 \Rightarrow x + y = 16$ (3)
3. **Subtract (2) from (1):** $2x - 2y = 8 \Rightarrow x - y = 4$ (4)
4. Add (3) and (4): $2x = 20 \Rightarrow x = 10$.
5. From (3): $10 + y = 16 \Rightarrow y = 6$.

$\therefore$ Cost of one book = Rs. 10; Cost of one pen = Rs. 6.

Q12. $\Delta ABC \sim \Delta DEF$, $BC = 4$ cm, $EF = 6$ cm and area of $\Delta ABC = 64$ cm². Determine the area of ΔDEF .

1. By Area Ratio Theorem:

$$Area(\Delta ABC) / Area(\Delta DEF) = (BC / EF)^2$$

2. Substitute known values:

$$64 / Area(\Delta DEF) = (4 / 6)^2 = (2 / 3)^2 = 4 / 9$$

3. Cross-multiply:

$$Area(\Delta DEF) = (64 \times 9) / 4 = 16 \times 9 = 144 \text{ cm}^2$$

$\therefore$ Area of $\Delta DEF = 144$ cm².