# C.B.R. MODERN SR. SEC. SCHOOL

Bahala Rewari

**Test / Exam Name: Wednesday 8 December Exam** | **Standard: 10th** | **Subject: Mathematics**

**Student Name:** ------------------------------------------------------------ **Section:** ------------------------------------ **Roll No.:** ------------------------------------------------

**Questions: 55** | **Time: 150 Mins** | **Marks: 80**

## Instructions

1. All Question are Compulsory
2. Calculators are strictly prohibited
3. Do all questions
4. Best of luck

Q1. The first three terms of an AP respectively are 3y - 1, 3y + 5 and 5y + 1. Then y equals: 1 Mark

1. -3
2. 4
3. 5
4. 2

Ans: 3. 5

**Solution:**

The first three terms of an AP are 3y - 1, 3y + 5 and 5y + 1, respectively.

We need to find the value of y.

We know that if a, b and c are in AP, then:

$\mathrm{b - a = c - b \Rightarrow 2b = a + c}$

$\therefore 2(3y + 5) = 3y - 1 + 5y + 1$

$\Rightarrow 6y + 10 = 8y$

$\Rightarrow 10 = 8y - 6y$

$\Rightarrow 2y = 10$

$\Rightarrow y = 5$

Hence, the correct option is C.

Q2. If the $n^{th}$ term of an A.P. is (2n + 1), then the sum of its first three terms is: 1 Mark

1. 6n + 3
2. 15
3. 12
4. 21

Ans: 2. 15

**Solution:**

Given the $n^{th}$ term of an A.P. is 2n + 1. i.e.,

$T_n = 2n + 1$

So,

$T_1 = 2 \times 1 + 1 = 2 + 1 = 3$

$T_2 = 2 \times 2 + 1 = 4 + 1 = 5$

$T_3 = 2 \times 3 + 1 = 6 + 1 = 7$

Now, sum of its first three term = $T_1 + T_2 + T_3 = 3 + 5 + 7 = 15$

Hence, sum of first three term of an A.P. is 15.

Q3. The roots of the equation $x^2 - 3x - m(m + 3) = 0$, where m is a constant, are: 1 Mark

1. m, m + 3
2. -m, m + 3
3. m, -(m + 3)
4. -m, -(m: 3)

Ans: 2. -m, m + 3

**Solution:**

The given quadratic equation is $x^2 - 3x - m(m + 3) = 0$, where m is a constant.

$x^2 - 3x - m(m + 3) = 0$

$\therefore x^2$ - [(m + 3) - m]x - m(m+ 3) = 0

$\Rightarrow x^2$ - (m + 3)x + mx - m(m + 3) = 0

⇒ x [x - (m +3)] + m[x - (m + 3)] = 0

⇒ [x - (m +3)] (x + m) = 0

⇒ x - (m +3) = 0 or x + m = 0

⇒ x = m + 3 or x = -m

Thus, the roots of the given quadratic equation are m + 3 and m.

Q4. The HCF and the LCM of 12, 21, 15 respectively are: 1 Mark

1. 3, 140
2. 12, 420
3. 3, 420
4. 420, 3

Ans: 3. 3, 420

**Solution:**

12 = 2 × 2 × 3

21 = 3 × 7

15 = 5 × 3

HCF = 3

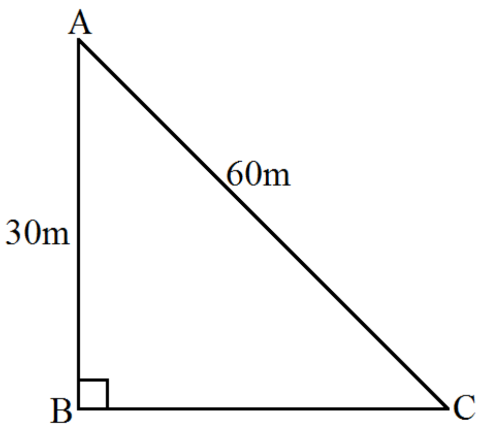
L.C.M = 2 × 2 × 3 × 5 × 7 = 420

Q5. A kite is flying at a height of 30m from the ground. The length of string from the kite to the ground is 60m. Assuming that there is no slack in the string, the angle of elevation of the kite at the ground is: 1 Mark

1. $45^\circ$
2. $30^\circ$
3. $60^\circ$
4. $90^\circ$

Ans: 2. $30^\circ$

**Solution:**




Let AB be the height of the kite above the ground.

Now, AB = 30m

Let the length of the string = AC = 60m

Let $\angle ABC = \theta =$ angle of elevation

Now, $\sin\theta = \frac{AB}{AC}$

$\Rightarrow \sin\theta = \frac{30}{60}$

$\Rightarrow \sin\theta = \frac{1}{2}$

$\Rightarrow \sin\theta = \sin 30^\circ$

$\Rightarrow \theta = 30^\circ$

Q6. Choose the correct answer from the given four options: 1 Mark

In an AP if a = 1, $a_n$ = 20 and $S_n$ = 399, then n is:

1. 19
2. 21
3. 38
4. 42

Ans: 3. 38

**Solution:**

$\because S_n = \frac{n}{2}\left[2a + \left(n - 1\right)d\right]$

$399 = \frac{n}{2}\left[2 \times 1 + \left(n - 1\right)d\right]$

798 = 2n + n(n - 1)d ........(i)

and an = 20 [∵ an = a + (n - 1)d]

⇒ a + (n - 1)d = 20

⇒ (n - 1)d = 19 .......(ii)

Using Eq. (ii) in Eq. (i), we get

⇒ 798 = 2n + 19n

⇒ 798 = 21n

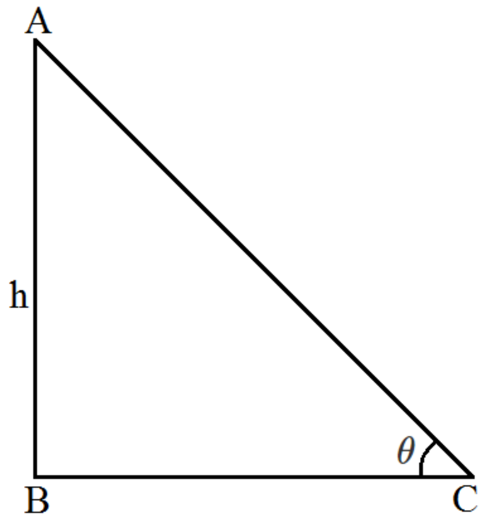
$\therefore \mathrm{n} = \frac{498}{21} = 38$

Q7. The length of shadow of a tower on the plane ground is $\sqrt{3}$ times the height of the tower.The angle of elevation of sun is: 1 Mark

1. 45°
2. 30°
3. 60°
4. 90°

Ans: 2. 30°

**Solution:**




Given that the length of shadow of the tower on the plane ground is $\sqrt{3}$ times the height of the tower.

Let $\theta$ be the angle of elevation.

From the given statement, $\mathrm{BC} = \sqrt{3} \times \mathrm{AB}$

$\Rightarrow \frac{\mathrm{BC}}{\mathrm{AB}} = \sqrt{3}$

$\Rightarrow \frac{\mathrm{BC}}{\mathrm{h}} = \cot\theta$

$\Rightarrow \cot\theta = \frac{\mathrm{BC}}{\mathrm{h}} = \sqrt{3}$

$\Rightarrow \cot\theta = \cot 30^\circ$

$\Rightarrow \theta = 30^\circ$

Q8. The 7$^{\text{th}}$ term of an AP is 4 and its common difference is -4. What is its first term? 1 Mark

1. 16
2. 20
3. 24
4. 28

Ans: 4. 28

**Solution**:

Let a be the frist term.

$a_7 = 4$

⇒ a + 6d = 4

⇒ a + 6(-4) = 4

⇒ a = 4 + 24

⇒ a = 28

Q9. Which term of the AP 72, 63 54, ....is 0? 1 Mark

1. 8$^{\text{th}}$
2. 9$^{\text{th}}$
3. 10$^{\text{th}}$
4. 11$^{\text{th}}$

Ans: 2. 9$^{\text{th}}$

**Solution:**

The given AP is 72, 63, 54, .....

a = 72 and d = 63 - 72 = -9

$a_n = a + (n - 1)d$

⇒ 0 = 72 + (n -1)(-9)

⇒ -72 = (n - 1)(-9)

⇒ 8 = n - 1

⇒ n = 9

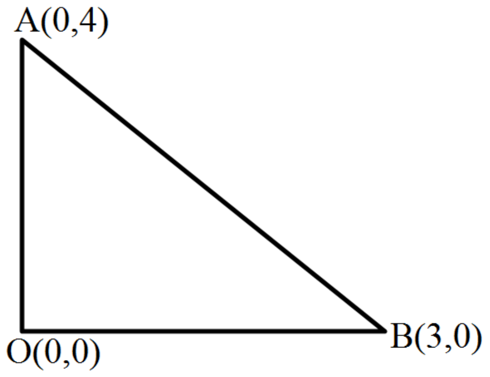
So, the $9^{th}$ term is 0.

Q10. The perimeter of the triangle with vertices (0, 4), (0, 0) and (3, 0) is: 1 Mark

1. $(7 + \sqrt{5})$
2. 5
3. 10
4. 12

Ans: 4. 12

**Solution:**




AO = 4 units

BO = 3 units

Using Distance formula, we get:

$\text{AB} = \sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} = 5$ units

So, the perimeter of the tringle

= AB + AO + BO

= 5 + 4 + 3

= 12 units

Q11. The mid-point of segment AB is P(0, 4). If the coordinates of B are (-2, 3), then the coordinates of A are: 1 Mark

1. (2, 5)
2. (-2, -5)
3. (2, 9)
4. (-2, 11)

Ans: 1. (2, 5)

**Solution:**

Let the mid-point of A be (x, y).

P(0, 4) is given to be mid-point AB.

Using the mid-point formula, we get

$(0, 4) = \left(\frac{-2+x}{2}, \frac{3+y}{2}\right)$

$\Rightarrow\ 0 = \frac{-2+x}{2}$ and $4 = \frac{3+y}{2}$

⇒ -2 + x = 0 and 3 + y = 8

⇒ x = 2 and y = 5

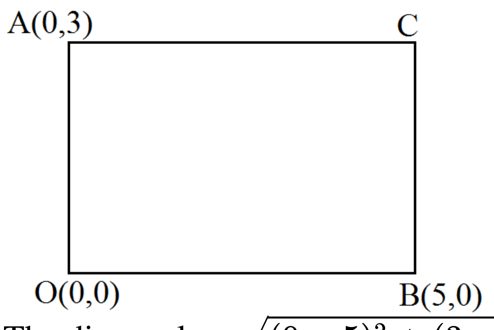
So, the coordinates of A are (2, 5).

Q12. AOBC is a rectangle whose three vertices are A(0, 3), O(0, 0) and B(5, 0). The length of each of its diagonals is: 1 Mark

1. 5 units
2. 3 units
3. 4 units
4. $\sqrt{34}$ units

Ans: 4. $\sqrt{34}$ units

**Solution:**



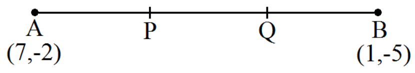

The diagonal $= \sqrt{(0-5)^2 + (3-0)^2}$

$= \sqrt{5^2 + 3^2}$

$= \sqrt{25 + 9}$

$= \sqrt{34}$ units

Q13. In the given figure P(5, -3) and Q(3, y) are the points of teisection of the line segment joining A(7, -2) and B(1, -5). Then y equals: 1 Mark




1. 2
2. 4
3. $-4$
4. $\frac{-5}{2}$

Ans: 3. -4

**Solution:**

Since P and Q are the points of trisection.

This means AP = PQ = QB.

So, Q divides AB in the ratio 2 : 1 and let the coordinates of Q be (x, y).

We know that, the centre is the mid-point of the diameter.

Using the section formula, we get

$(3, y) = \left(\frac{2(1)+1(7)}{2+1}, \frac{2(-5)+1(-2)}{2+1}\right)$

$\Rightarrow\ y = \frac{2(-5)+1(-2)}{2+1}$

$\Rightarrow\ y = -4$

Q14. The distance of the point (4, 7) from the x-axis is: 1 Mark

1. 4
2. 7
3. 11
4. $\sqrt{65}$

Ans: 2. 7

**Solution:**

The distance of the point A(4, 7) from x-axis is B(x, 0) where x = 4

$AB = \sqrt{(4-4)^2 + (0-7)^2}$

$\sqrt{0^2 + 49}$

$= 7$

Q15. The coordinates of the circumcentre of the triangle formed by the points O(0, 0), A(a, 0) and B(0, b) are, 1 Mark

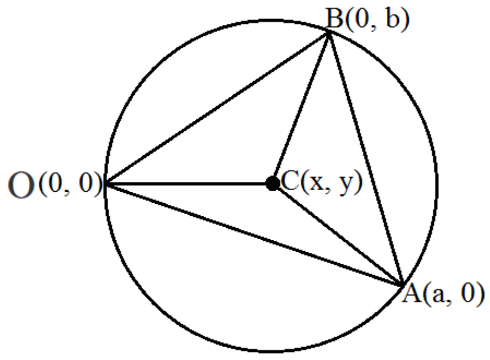
1. (a, b)
2. $\left(\frac{a}{2}, \frac{b}{2}\right)$
3. $\left(\frac{b}{2}, \frac{a}{2}\right)$
4. (b, a)

Ans: 2. $\left(\frac{a}{2}, \frac{b}{2}\right)$

**Solution:**

Let co-ordinates of C be (x, y) which is the centre of the circumcircle of ΔOAB.

Radii of a circle are equal




$\therefore$ OC = CA = CB $\Rightarrow$ $OC^2 = CA^2 = CB^2$

$\therefore (x - 0)^2 + (y - 0)^2 = (x - a)^2 + (y - 0)^2$

$\Rightarrow x^2 + y^2 = (x - a)2 + y^2$

$\Rightarrow x^2 = (x - a)^2$

$\Rightarrow x^2 = x^2 + a^2 - 2ax$

$\Rightarrow a^2 - 2ax = 0$

$\Rightarrow a(a - 2x) = 0$

$\Rightarrow a = 2x$

$\Rightarrow\ x = \frac{a}{2}$

and $(x - 0)^2 + (y - 0)^2 = (x - 0)^2 + (y - b)^2$

$x^2 + y^2 = x^2 + y^2 - 2by + b^2$

$\Rightarrow 2by = b^2$

$\Rightarrow \ y = \frac{b}{2}$

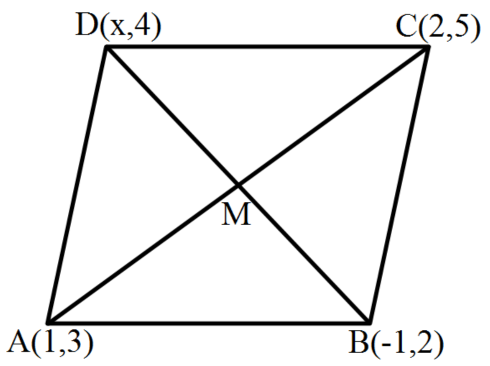
$\therefore$ Co-ordinates of circumcentre are $\left(\frac{a}{2}, \frac{b}{2}\right)$.

Q16. If A(1, 3), B(-1, 2), C(2, 5) and D(x, 4) are the vertices of a ∥ gm ABCD then the value of x is: 1 Mark

1. 3
2. 4
3. 0
4. $\frac{3}{2}$

Ans: 2. 4

**Solution:**




Since ABCD is a ∥gm, the diagonals bisect eachother.

So, Mis the mid-point of BD as well as AC.

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

$\Rightarrow 1 + 2 = x - 1$

$\Rightarrow x = 4$

Q17. If $2\sin 2\theta = \sqrt{3}$ then $\theta = ?$ 1 Mark

1. $30^\circ$
2. $45^\circ$
3. $60^\circ$
4. $90^\circ$

Ans: 1. $30^\circ$

**Solution:**

$2\cos 2\theta = \sqrt{3}$

$\Rightarrow \sin 2\theta = \frac{\sqrt{3}}{2}$

$\Rightarrow \sin 2\theta = \sin 60^\circ$

$\Rightarrow 2\theta = 60^\circ$

$\Rightarrow \theta = 30^\circ$

Q18. If $(\tan\theta + \cot\theta) = 5$ then $(\tan^2\theta + \cot^2\theta) = ?$ 1 Mark

1. 27
2. 25
3. 24
4. 23.

Ans: 4. 23

**Solution:**

$(\tan\theta + \cot\theta) = 5$

$\Rightarrow (\tan\theta + \cot\theta)^2 = 5^2$

$\Rightarrow \tan^2\theta + \cot^2\theta + 2\tan\theta\cot\theta = 25$

$\Rightarrow \tan^2\theta + \cot^2\theta + 2(1) = 25$

$\Rightarrow \tan^2\theta + \cot^2\theta = 23$

Q19. $\sin(45^\circ + \theta) - \cos(45^\circ - \theta) = ?$ 1 Mark

1. $2\sin\theta$
2. $2\cos\theta$
3. 0
4. 1

Ans: 3. 0

**Solution:**

$\sin(45^\circ+\theta)-\cos(45^\circ-\theta)$
$=\sin(45^\circ+\theta)-\cos[90^\circ-(45^\circ+\theta)]$
$=\sin(45^\circ+\theta)-\sin(45^\circ+\theta)$
$=0$

Q20. $\frac{2\tan^2 30^\circ \sec^2 52^\circ \sin^2 38^\circ}{\text{cosec}^2 70^\circ-\tan^2 20^\circ}=?$ 1 Mark

1. 2
2. $\frac{1}{2}$
3. $\frac{2}{3}$
4. $\frac{3}{2}$

Ans: 3. $\frac{2}{3}$

**Solution:**

$\frac{2\tan^2 30^\circ \sec^2 52^\circ \sin^2 38^\circ}{\text{cosec}^2 70^\circ-\tan^2 20^\circ}$
$=\frac{2\times\left(\frac{1}{\sqrt{3}}\right)^2\times\frac{1}{\cos^2 52^\circ}\times\sin^2(90^\circ-52^\circ)}{\text{cosec}^2(90^\circ-20^\circ)-\tan^2 20^\circ}$
$=\frac{2\times\frac{1}{3}\times\frac{1}{\cos^2 52^\circ}\times\cos^2 52^\circ}{\sec^2 20^\circ-\tan^2 20^\circ}$
$=\frac{\frac{2}{3}}{1}$
$=\frac{2}{3}$

Q21. $(\cos 0^\circ+\sin 30^\circ+\sin 45^\circ)(\sin 90^\circ+\cos 60^\circ-\cos 45^\circ)=?$ 1 Mark

1. $\frac{5}{6}$
2. $\frac{5}{8}$
3. $\frac{3}{5}$
4. $\frac{7}{4}$

Ans: 4. $\frac{7}{4}$

**Solution:**

$(\cos 0^\circ+\sin 30^\circ+\sin 45^\circ)(\sin 90^\circ+\cos 60^\circ-\cos 45^\circ)$
$=\left(1+\frac{1}{2}+\frac{1}{\sqrt{2}}\right)\left(1+\frac{1}{2}-\frac{1}{\sqrt{2}}\right)$
$=\left(\frac{3}{2}+\frac{1}{\sqrt{2}}\right)\left(\frac{3}{2}-\frac{1}{\sqrt{2}}\right)$
$=\left(\frac{3}{2}\right)^2-\left(\frac{1}{\sqrt{2}}\right)^2$
$=\frac{9}{4}-\frac{1}{2}$
$=\frac{9-2}{4}$
$=\frac{7}{4}$

Q22. $\cot 1^\circ \cos 2^\circ \cos 3^\circ \ldots \cos 180^\circ=?$ 1 Mark

1. $-1$
2. 1
3. 0
4. $\frac{1}{2}$

Ans: 3. 0

**Solution:**

Since $\cos 90^\circ=0$
$\cos 1^\circ \cos 2^\circ \cos 3^\circ \ldots \cos 90^\circ \ldots \cos 180^\circ=0$

Q23. If $\sin\theta=\frac{1}{2}$ then $\cot\theta=?$ 1 Mark

1. $\frac{1}{\sqrt{3}}$
2. $\sqrt{3}$
3. $\frac{\sqrt{3}}{2}$
4. 1

Ans: 2. $\sqrt{3}$

**Solution:**

$\sin^2\theta+\cos^2\theta=1$
$\Rightarrow\left(\frac{1}{2}\right)^2+\cos^2\theta=1$
$\Rightarrow\cos^2\theta=1-\frac{1}{4}=\frac{3}{4}$
$\Rightarrow\cos\theta=\frac{\sqrt{3}}{2}$

$\therefore \cot\theta = \frac{\cos\theta}{\sin\theta}$

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

Q24. $\sin 2\mathrm{A} = 2\sin\mathrm{A}$ is true when A = 1 Mark

1. $0^\circ$
2. $30^\circ$
3. $45^\circ$
4. $60^\circ$

Ans: 1. $0^\circ$

**Solution:**

We are given $\sin 2\mathrm{A} = 2\sin\mathrm{A}.\cos\mathrm{A}$

So,

$\Rightarrow \sin 2\mathrm{A} = 2\sin\mathrm{A}$

$\Rightarrow 2\sin\mathrm{A}.\cos\mathrm{A} = 2\sin\mathrm{A}$

$\Rightarrow \cos\mathrm{A} = 1$

$\Rightarrow \cos\mathrm{A} = \cos 0^\circ$

As $\mathrm{A} = 0^\circ$

Hence the correct option is (a)

Q25. If $5\theta$ and $4\theta$ are acute angles satisfying $\sin 5\theta = \cos 4\theta$, then $2\sin 3\theta - \sqrt{3}\tan 3\theta$ is equal to: 1 Mark

1. 1
2. 0
3. -1
4. $1+\sqrt{3}$

Ans: 2. 0

**Solution:**

We are given that $5\theta$ and $4\theta$ are acute angles satisfying the following condition

$\sin 5\theta = \cos 4\theta$

We are asked to find $2\sin 3\theta - \sqrt{3}\tan 3\theta$

$\Rightarrow \sin 5\theta = \cos 4\theta$

$\Rightarrow \cos(90^\circ - 5\theta) = \cos 4\theta$

$\Rightarrow 90^\circ - 5\theta = 4\theta$

$\Rightarrow 9\theta = 90^\theta$

Where $5\theta$ and $4\theta$ are acute angles

$\Rightarrow \theta = 10^\circ$

Now we have to find:

$2\sin 3\theta - \sqrt{3}\tan 3\theta$

$= 2\sin 30^\circ - \sqrt{3}\tan 30^\circ$

$= 2 \times \frac{1}{2} - \sqrt{3} \times \frac{1}{\sqrt{3}}$

$= 1 - 1$

$= 0$

Hence the correct option is (b)

Q26. The sum of first 20 odd natural numbers is: 1 Mark

1. 100
2. 210
3. 400
4. 420

Ans: 3. 400

**Solution:**

The frist 20 odd natural numbers will be $1, 3, 5, 7,$ ......

Here,

a = 1

d = 3 - 1 = 2

n = 20

$\mathrm{S_n} = \frac{\mathrm{n}}{2}\left[2\mathrm{a} + (\mathrm{n}-1)\mathrm{d}\right]$

$\Rightarrow \mathrm{S}_{20} = \frac{20}{2}\left[2(1) + 19(2)\right]$

$\Rightarrow \mathrm{S}_{20} = 10[2+38]$

$\Rightarrow \mathrm{S}_{20} = 400$

Q27. If A + B = 90°, then $\frac{\tan A \tan B+\tan A \cot B}{\sin A \sec B} - \frac{\sin^2 B}{\cos^2 A}$ is equal to: 1 Mark

1. $\cot^2 A$
2. $\cot^2 B$
3. $-\tan^2 A$
4. $-\cot^2 A$

Ans: 2. $\cot^2 B$

**Solution:**

We have:

$A+B = 90^\circ$

$\Rightarrow B = 90^\circ - A$

We have to find the value of the following expression

$\frac{\tan A \tan B+\tan A \cot B}{\sin A \sec B} - \frac{\sin^2 B}{\cos^2 A}$

So,

$\frac{\tan A \tan B+\tan A \cot B}{\sin A \sec B} - \frac{\sin^2 B}{\cos^2 A}$

$= \frac{\tan A \tan(90^\circ-A)+\tan A \cot(90^\circ-A)}{\sin A \sec(90^\circ-A)} - \frac{\sin^2(90^\circ-A)}{\cos^2 A}$

$= \frac{\tan A \cot A+\tan A \tan A}{\sin A \operatorname{cosec} A} - \frac{\cos^2 A}{\cos^2 A}$

$= 1 + \tan^2 A - 1$

$= \tan^2 A$

$= \tan^2(90^\circ - B)$

$= \cot^2 B$

Hence the correct option is (b)

Q28. In a cyclic quadrilateral ABCD, it is being given that $\angle A = (x+y+10)^\circ$, $\angle B = (y+20)^\circ$, $\angle C = (x+y-30)^\circ$ and $\angle D = (x+y)$. then, $\angle B = ?$ 1 Mark

1. 70º
2. 80º
3. 100º
4. 110º

Ans: 2. 80º

**Solution:**

Given that in cydic quadrilateral ABCD,

$\angle A = (x+y+10)^\circ, \angle B = (y+20)^\circ,$

$\angle C = (x+y+30)^\circ$ and $\angle D = (x+y)^\circ$

We know that,

Opposite angles of a quadrilateral sum upto 180°.

$\Rightarrow \angle B + \angle D = 180^\circ$

$\Rightarrow (y+20)^\circ + (x+y)^\circ = 180^\circ$

$\Rightarrow x + 2y = 160 \ldots\ldots (i)$

Similarly, $\angle A + \angle C = 180^\circ$

$\Rightarrow (x+y+10)^\circ + (x+y-30)^\circ = 180^\circ$

$\Rightarrow 2x + 2y = 200$

$\Rightarrow x+y = 100 \ldots (ii)$

Subtracting (ii) from (i), we get

$y = 60$

$\angle B = (60+20)^\circ = 80^\circ$

Q29. If $\frac{1}{x} + \frac{2}{y} = 4$ and $\frac{3}{y} + \frac{1}{x} = 11$ then: 1 Mark

1. $x = 2,\ y = 3$
2. $x = -2,\ y = 3$
3. $x = \frac{-1}{2},\ y = 3$
4. $x = \frac{-1}{2},\ y = \frac{1}{3}$

Ans: 1. $x = 2,\ y = 3$

**Solution:**

$\frac{2x}{3} - \frac{y}{2} + \frac{1}{6} = 0$

Multiply by the LCM, 6.

$\Rightarrow$ 4x - 3y + 1 = 0

$\Rightarrow$ 4x - 3y = -1 ....(i)

$\frac{x}{2} + \frac{2y}{3} = 3$

Multiply by the LCM, 6.

3x + 4y = 18 ...(ii)

Multiply equation (i) and (ii) by 4 and 3 respectively.

16x - 12y = -4 ...(iii)

9x + 12y = 54 ...(iv)

Adding equations (iii) and (iv), we get

25x = 50

⇒ x = 2

Substituting x = 2 in (ii), we get y = 3.

Q30. The graphic representation of the equations x + 2y = 3 and 2x + 4y + 7 = 0 gives a pair of: 1 Mark

1. Parallel lines.
2. Intersecting lines.
3. Coincident lines.
4. None of these.

Ans: 1. Parallel lines.

**Solution:**

The given system of equations can be weitten as follows:

x + 2y - 3 = 0 and 2x + 4y + 7 = 0

The given equations are of the following form:

$a_2x + b_1y + c_1 = 2, c_1 = 0$ and $a_2 = 2, b_2x + b_2y + c_2 = 0$

Here, $a_1 = 1, b_1 = 2, c_1 = -3$ and $a_2 = 2$, $b_2 = 4$ and $c_2 = 7$

$\therefore \frac{a_1}{a_2} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{2}{4} = \frac{1}{2}$ and $\frac{c_1}{c_2} = \frac{-3}{7}$

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

So, the given system has no solution.

Hence, the lines are parallel.

Q31. Choose the correct answer from the given four options in the following questions: 1 Mark

For some integer q, every odd integer is of the form:

1. q.
2. q + 1.
3. 2q.
4. 2q + 1.

Ans: 4. 2q + 1.

We know that, odd integers are 1, 3, 5, ...

So, it can be written in the form of 2q + 1.

where, q = integer = Z

or q = ⋯, -1, 0, 1, 2, 3, ...

∴ 2q + 1 = ... -3, -1, 1, 3, 5,

**Alternate Answer**

Let 'a' be given positive integer. On dividing 'a' by 2, let q be the quotient and r be the remainder. Then, by Euclid's division algorithm, we have

a = 2q + r, where

$0 \leq r < 2$

⇒ a = 2q + r, where r = 0 or r = 1

⇒ a = 2q or 2q + 1

when a= 2q + 1 for some integerq, then clearly a is odd.

Q32. Choose the correct answer from the given four options in the following questions: 1 Mark

The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is:

1. 10.
2. 100.
3. 504.
4. 2520.

Ans: 4. 2520.

Factors of 1 to 10 numbers,

1 = 1

2 = 1 × 2

$3 = 1 \times 3$

$4 = 1 \times 2 \times 2$

$5 = 1 \times 5$

$6 = 1 \times 2 \times 3$

$7 = 1 \times 7$

$8 = 1 \times 2 \times 2 \times 2$

$9 = 1 \times 3 \times 3$

$10 = 1 \times 2 \times 5$

$\therefore$ LCM of number 1 to 10 = LCM (1, 2, 3, 4, 5, 6, 7, 8, 9, 10)

$= 1 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 7 = 2520$

Q33. Which of the following has terminating decimal expansion? 1 Mark

1. $\frac{32}{91}$
2. $\frac{19}{80}$
3. $\frac{23}{45}$
4. $\frac{25}{42}$

Ans: 2. $\frac{19}{80}$

**Solution:**

A number is a terminating decimal, if the denominator is of the form $2^m \times 5^n$, where m and n are non-negative integers.

$\frac{32}{91} = \frac{32}{7\times13}$

$\frac{19}{80} = \frac{19}{2^4\times5}$

$\frac{23}{45} = \frac{23}{3^2\times5}$

$\frac{25}{42} = \frac{25}{2\times3\times7}$

Clearly, option (b) is a terminating decimal, since its denominator is of the form $2^m \times 5^n$

Q34. a and b are two positive integers such that the least prime factor of a is 3 and the least prime factor of b is 5. Then, the least prime factor of (a + b) is: 1 Mark

1. 2
2. 3
3. 5
4. 8

Ans: 1. 2

**Solution:**

Since 3 is the least prime factor of a, and 5 is the least prime factor of b, so, 2 cannot be a factor of either.

$\therefore$ a and b are both odd.

We know that, sum of two odd numbers is alwayas even.

So, a + b is even.

$\Rightarrow$ The least prime factor of (a + b) is 2

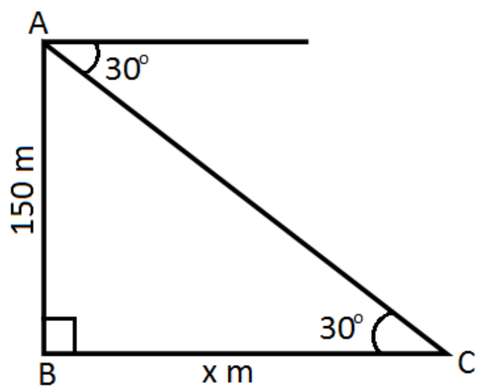
Q35. The angle of depression of a car parked on the road from the top of a 150m high tower is 30°. The distance of the car from the tower (in metres) is: 1 Mark

1. $50\sqrt{3}$
2. $150\sqrt{3}$
3. $150\sqrt{2}$
4. 75

Ans: 2. $150\sqrt{3}$

**Solution:** Let AB be the tower of height 150m.

C is car and angle of depression is 30°




Therefore, $\angle ACB = 30^\circ$ (alternate angle)

In right-angled triangle ABC,

$\frac{BC}{AB} = \cot 30^\circ$

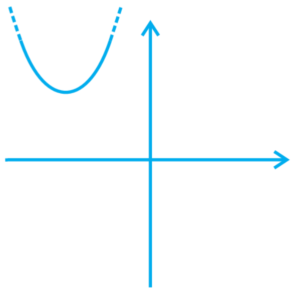
$\Rightarrow \frac{BC}{150} = \sqrt{3} \Rightarrow BC = 150\sqrt{3}m.$

That is, distance of the car from the tower is $150\sqrt{3}m.$

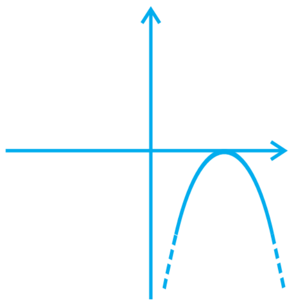
Q36. Choose the correct answer from the given four options in the following questions: 1 Mark

Which of the following is not the graph of a quadratic polynomial?

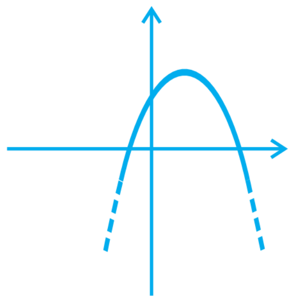
1.



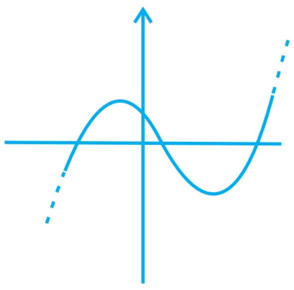
2.



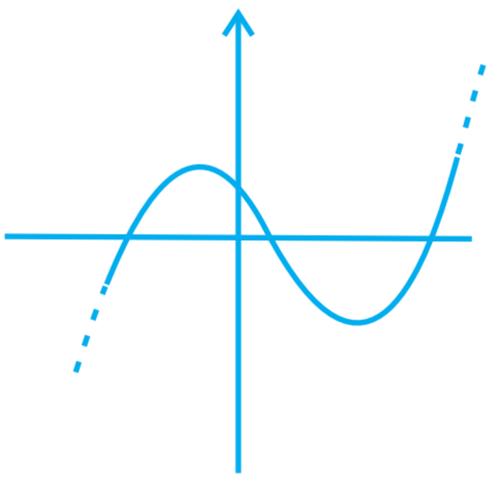
3.



4.



Ans: 4.



**Solution:**

For any quadratic polynomial $ax^2 + bx + c$, $a \neq 0$, the graph of the corresponding equation $y = ax^2 + bx + c$ has one of the two shapes either open upwards like u or open downwards like ∩ depandign on whether $a > 0$ or a $a < 0$. These curves are called parabolas. So, aption (d) cannot be possible. Also, the curve of a quadrativ pilynomial crosses the x-axis on at most two points but in option (d) the curve crosses the x-axis on the three points, so it does not represent the quadratic polynomial.

Q37. Choose the correct answer from the given four options in the following questions: 1 Mark

If one of the zeroes of a quadratic polynomial of the form $x^2+ax + b$ is the negative of the other, then it:

1. Has no linear term and the constant term is negative.
2. Has no linear term and the constant term is positive.
3. Can have a linear term but the constant term is negative.
4. Can have a linear term but the constant term is positive.

Ans: 1. Has no linear term and the constant term is negative.

**Solution:**

Let $p(x) = x^2 + ax + b$.

Put $a = 0$, then, $p(x) = x^2 + b = 0$

$\Rightarrow x^2 = -b$

$\Rightarrow\ x = \pm\sqrt{-b}$

$[\therefore\ b < 0]$

Hence, if one of the zeroes of quadratic polynomial p(x) is the negative of the other, then it has no linear term i.e., a = 0 and the constant term is negative i.e., b < 0.

**Alternate Answer**

Let f(x) $x^2 + ax + b$

and by given condition the zeroes area and $-\alpha$

Sum of the zeroes $= \alpha - \alpha = a$

$\Rightarrow a = 0$

$f(x) = x^2 + b$, which cannot be linear,

and product of zeroes $= \alpha.(-\alpha) = b$

$\Rightarrow\ -\alpha^2 = b$

Which is possible when, b < 0

Hence, it has no linear tern and the constant term is negative.

Q38. Choose the correct answer from the given four options in the following questions: 1 Mark

Given that one of the zeroes of the cubic polynomial $ax^3 + bx^2 + cx + d$ is zero, the product of the other two zeroes is:

1. $-\frac{c}{a}$
2. $\frac{c}{a}$
3. 0
4. $-\frac{b}{a}$

Ans: 2. $\frac{c}{a}$

**Solution:**

Let $p(x) = ax^3 + bx^2 + cx + d$

Given that, one of the zeroes of the cubic polynomial p(x) is zero,

Let $\alpha$, $\beta$ and $\gamma$ are the zeroes of cubic polynomial p(x), where a = 0.

We know that,

Sum of product of two zeroes at a time $= \frac{c}{a}$

$\Rightarrow\ \alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a}$

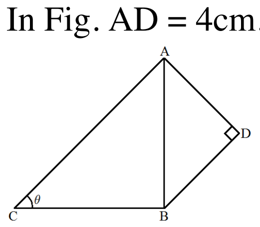
$\Rightarrow\ 0 \times \beta + \beta\gamma + \gamma \times 0 = \frac{c}{a}\ [\because\ \beta = 0, \text{given}]$

$\Rightarrow\ 0 + \beta\gamma + 0 = \frac{c}{a}$

$\Rightarrow\ \beta\gamma = \frac{c}{a}$

Hence, Product of other two zeroes $= \frac{c}{a}$.

Q39. In Fig. AD = 4cm, BD = 3cm and CB = 12cm, find the cot $\theta$. 1 Mark




1. $\frac{12}{5}$
2. $\frac{5}{12}$
3. $\frac{13}{12}$
4. $\frac{12}{13}$

Ans: 1. $\frac{12}{5}$

**Solution:**

We have the following given data in the figure, AD= 4cm, BD = 3cm, CB = 12cm

Now we will use Pythagoras theorem in $\triangle ABD$,

$AB = \sqrt{3^2 + 4^2}$

$= 5cm$

Therefore,

$\cot\theta = \frac{CB}{AB}$

$= \frac{12}{5}$

So the answer is (a)

Q40. The line 2x + y - 4 = 0 divides the line segment joining A(2, -2) and B(3, 7) in the ratio: 1 Mark

1. 2 : 5
2. 2 : 9
3. 2 : 7

4. 2 : 3

Ans: 2. 2 : 9

**Solution:**

Let the required ration be k : 1, and let P be the point of division.

Using section formula, we get:

The point od division to be P$\left(\frac{3k+2}{k+1}, \frac{7k-2}{k+1}\right)$.

Since the point lies on the line 2x + y - 4 = 0, The point satisfies the equation of given line.

$\Rightarrow\ 2\left(\frac{3k+2}{k+1}\right) + \frac{7k-2}{k+1} - 4 = 0$

⇒ 2(3k + 2) + 7k - 2 -4(k + 1) = 0

⇒ 6k + 4 + 7k - 2 - 4k - 4 = 0

⇒ 9k = 2

$\Rightarrow\ k = \frac{2}{9}$

So, the ratio is 2 : 9.

Q41. The sum of the first 7 terms of an AP is 63 and that of its next 7 terms is 161. Find the AP. 2 Marks

Ans: $S_7 = 63 \Rightarrow \frac{7}{2}(2a + 6d) = 63$

$\therefore a + 3d = 9 \ldots (i)$

$S_{14} - S_7 = \frac{14}{2}(2a + 13d) - 63 = 161$

$\Rightarrow 2a + 13d = 32 \ldots (ii)$

Solving (i) and (ii) a = 3, d = 2

∴ AP is 3, 5, 7...

Q42. State whether the following are true or false. Justify your answer. 2 Marks

cot A is the product of cot and A.

Ans: cot A is a trigonometric ratio which means cotangent of angle A.

Hence, cot A is the product of cot and A is False.

Q43. Define degree of a polynomial. 2 Marks

Ans: The exponent of the highest degree term in a polynomial is known as its degree. A polynomial of degree O is called a constant polynomial.

Q44. If the graph of quadratic polynomial $ax^2$ + bx + c cuts negative direction of y-axis, then what is the sign of c? 2 Marks

Ans: Since graph of quadratic polynomial f(x) = $ax^2$ + bx + c cuts negative direction of y-axis

So, put x = 0 to find the intersection point on y-axis y = 0 + 0 + c = c

So, the point is (0, c)

Now it is given that the quadratic polynomial cuts negative direction of y

So, c < 0

Q45. Write the standard form of a quadratic polynomial with real coefficients. 2 Marks

Ans: $ax^2$ + bx + c is a standard form of quadratic polynomial with real co-efficients and a ≠ 0.

Q46. State Euclid's division lemma. 2 Marks

Ans: Euclid's Division Lemma:

Let a and b be any two positive integers.

Then, there exist unique integers q and r such that

a = bq + r, 0 ≤ r < b

If bla then r = 0

Otherwise, *r* satisfies the stronger inequality 0 < r < b.

Q47. State SSS similarity criterion. 2 Marks

Ans: SSS Similarity Criterion: If the corresponding sides of two triangles are proportional, then they are similar.

In $\triangle ABC$ and $\triangle DEF$, if

$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$

Then, $\triangle ABC \sim \triangle DEF$

Q48. state SAS similarity criterion. 2 Marks

Ans: If in two triangles, one pair of coresponding sides are proportional and the included angle are equal then the two triangles are similar.

Q49. What is a composite number? 2 Marks

Ans: A composite number is a positive integer which has a divisor other than one or itself.

In other words a composite number is any positive integer greater than one that is not a prime number.

Q50. If a quadratic polynomial f(x) is factorizable into linear distinct factors, then what is the total number of real and distinct zeros of f(x)? 2 Marks

Ans: In a quadratic polynomial f(x) its degree is 2 and it can be factorised in to two distinct linear factors.

f(x) has two distinct zeros.

Q51. A girl is twice as old as her sister. Four years hence, the product of their ages (in years) will be 160. Find their present ages. 4 Marks

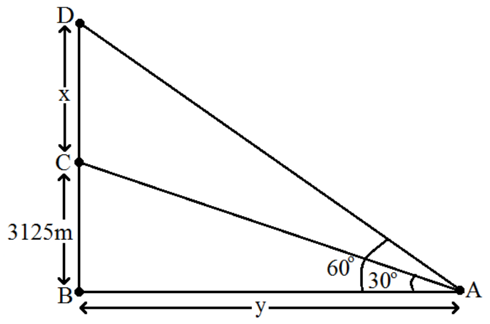
Ans: Let the age of girls sister be x years.
Given that,
Girl is twice as old as her sister.
⇒ Girls age = 2 × x years = 2x years
Given that, after 4 years, the product of their ages will be 160.
⇒ Girls age after 4 years = (2x + 4) years
And sisters age after 4 years = (x + 4) years
Given that,
⇒ Girls age after 4 years = (2x + 4) years
And sisters age after 4 years = (x + 4) years
Give that,
(2x + 4)(x + 4) = 160
⇒ $2x^2 + 8x + 4x + 16 = 0$
⇒ $2x^2 + 12x - 144 = 0$
⇒ $2(x^2 + 6x - 72) = 0$
⇒ $x^2 + 6x - 72 = 0$
⇒ $x^2 + 12x - 6x - 72 = 0$
⇒ x(x + 12) - 6(x + 12) = 0
⇒ (x + 12)(x - 6) = 0
⇒ x + 12 = 0 or x - 6 = 0
⇒ x = -12 or x = 6

Q52. If mth term of an is $\frac{1}{n}$ and nth term is $\frac{1}{m}$ then find the sum of its first mn terms. 4 Marks

Ans: Given that $a_m = \frac{1}{n}$
$\Rightarrow a + (m-1)d = \frac{1}{n}$
$\Rightarrow an + mnd - nd = 1 \ldots (1)$
$a_n = \frac{1}{m}$
$\Rightarrow a + (n-1)d = \frac{1}{m}$
$\Rightarrow am + mnd - md = 1 \ldots (2)$
From (1) and (2) we get
$an + mnd - nd = am + mnd - md$
$\Rightarrow a(n-m) - (n-m)d = 0$
$\Rightarrow a(n-m) = (n-m)d$
$\therefore a = d$
Consider (1), $an + mnd - nd = 1$
$dn + mnd - nd = 1$
$\therefore d = \frac{1}{mn}$
Hence $a = \frac{1}{mn}$
Sum of mn term of AP is $S_{mn} = \frac{mn}{2}\left[2a + (mn-1)d\right]$
$= \frac{mn}{2}\left[\frac{2}{mn} + \frac{(mn-1)}{mn}\right]$
$= \frac{mn}{2mn}\left[2 + mn - 1\right]$
$= \frac{1}{2}(mn+1)$

Q53. An aeroplane when flying at a height, of 3125m from the ground passes vertically below another plane at an instant when the angles of elevation of the two planes from the same point on the ground are $30^o$ and $60^o$ respectively. Find the distance between the two planes at that instant. 4 Marks

Ans:



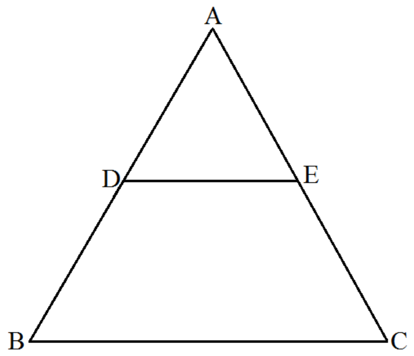

Let CD = x , AB = y
$\therefore \frac{3125}{y} = \tan 30^o = \frac{1}{\sqrt{3}}$
$\Rightarrow y = 3125\sqrt{3}m$
$\frac{x+3125}{y} = \tan 60^o = \sqrt{3}$
$\frac{x+3125}{3125\sqrt{3}} = \sqrt{3} \Rightarrow x = 3(3125) - 3125$

$= 2(3125) = 6250\text{m}.$

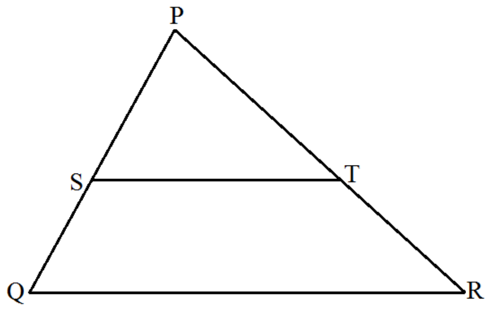
Q54. Prove that, if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio. 4 Marks

Using the above result, do the following:

In Fig. 7, DE||BC and BD = CE. Prove that $\triangle ABC$ is an isosceles triangle.

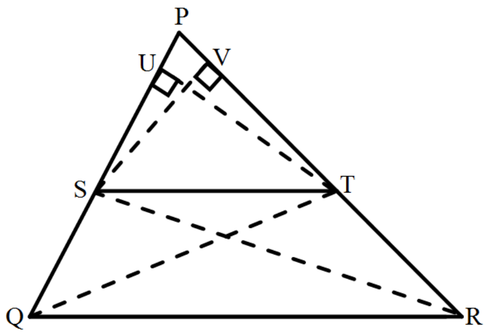



Ans: Let us consider a $\triangle PQR$. A line ST parallel to its base (i.e. QR) is drawn intersecting the sides PQ and PR at point S and T.




Now, line ST divides PQ into two parts i.e., PS and SQ. Line ST similary divides PR into two parts i.e., PT and TR. This information is sufficient to prove this theorem if we can prove that $\frac{PS}{SQ} = \frac{PT}{TR}$

To do this, let us join QT and RS and draw $TU \perp PS$ and $SV \perp PT$.




We know that area of triangle $= \frac{1}{2} \times \text{base} \times \text{height}$

$\Rightarrow \text{ar}(\triangle PST) = \frac{1}{2} \times PS \times TU$

Taking PT as base and SV as height, we can write

$\text{ar}(\triangle PST) = \frac{1}{2} \times PT \times SV$

Similarly, $\text{ar}(\triangle QST) = \frac{1}{2} \times QS \times TU$

And, $\text{ar}(\triangle RST) = \frac{1}{2} \times TR \times SV$

$\frac{\text{ar}(\triangle PST)}{\text{ar}(\triangle QST)} = \frac{\frac{1}{2} \times PS \times TU}{\frac{1}{2} \times QS \times TU}$

Now,

$\Rightarrow \frac{\text{ar}(\triangle PST)}{\text{ar}(\triangle QST)} = \frac{PS}{QS} \ldots . (1)$

$\frac{\text{ar}(\triangle PST)}{\text{ar}(\triangle RST)} = \frac{\frac{1}{2} \times PT \times SV}{\frac{1}{2} \times TR \times SV}$

Now,

$\Rightarrow \frac{\text{ar}(\triangle PST)}{\text{ar}(\triangle RST)} = \frac{PT}{TR} \ldots . (2)$

$\triangle QST$ and $\triangle RST$ on the same base i.e., ST and between the same parallel lines i.e., ST and QR.

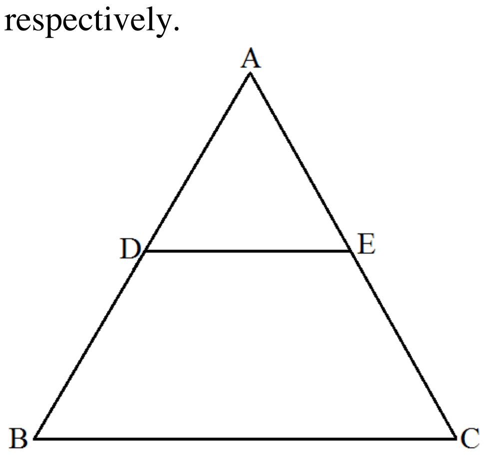
$\therefore\ \text{ar}(\triangle QST) = \text{ar}(\triangle RST) \ldots . (3)$

From equations (1), (2), and (3), we obtain

$\frac{PS}{QS} = \frac{PT}{TR}$

Hence, proved.

Now, consider $\triangle ABC$. Here, a line DE parallel to its base (i.e., BC) is drawn such that it intersects sides AB and BC at points D and E respectively.




By using the above result, we may find that

$\frac{AD}{BD} = \frac{AE}{CE}$

It is given that BD = CE ....(4)

$\therefore$ AD = AE … (5)

On adding equations (4) and (5), we obtain

BD + AD = CE + AE

$\Rightarrow$ AB = AC

Thus, $\triangle ABC$ is an isosceles triangle.

Q55. In a class test, the sum of the marks obtained by P in Mathematics and Science is 28. Had he got 3 more marks in Mathematics and 4 marks less in Science, the product of marks obtained in the two subjects would have been 180. Find the marks obtained in the two subjects separately. 4 Marks

Ans: Let marks in Mathematics be x and those in Science be y

$\therefore$ x + y = 28 ....(1)

Also, (x + 3)(y - 4) = 180 ....(2)

From (1), x = 28 - y

$\therefore$ From (2), (28 - y + 3)(y - 4) = 180

or $y^2 - 35y + 304 = 0$

(y - 16)(y - 19) = 0

y = 16, 9

If she got 16 in Science then she got 28 - 16 = 12 in Maths.

If she got 19 in Science then she got 28 - 19 = 9 in Maths.

$\therefore$ Marks in Mathematics = 12 and Science = 16

or Mathematics = 9, Science = 19.