# RBSE Class 10th Maths Question Paper With Solution 2017

## QUESTION PAPER CODE S–09–Mathematics

**PART - A**

**Question 1: HCF and LCM of two integers are 12 and 336 respectively. If one integer is 48, then find another integer.**

**Solution:**

HCF and LCM of two integers are 12 and 336.

First number × Second number = HCF × LCM

Let another integer be a

⇒ 48 × a = 12 × 336

⇒ a = [12 × 336] / [48]

a = 84

Hence, the second integer is 84.

**Question 2: Find the sum of the first 20 terms of the AP: 13, 8, 3, .....**

**Solution:**

a = 13

d = 8 - 13 = -5

n = 20

$S_n$ = [n / 2] [2a + [n - 1] d]

= [20 / 2] (2 * 13 + [20 - 1] * (-5)]

= [10] [26 - 95]

= 10 * [-69]

= -690

**Question 3: If cosec A = 17 / 8, then calculate tan A.**

**Solution:**

cosec A = 17 / 8

h = 17

p = 8

b = ?

$p^2 + b^2 = h^2$

$8^2 + b^2 = 17^2$

$b^2 = 17^2 - 8^2$

$b^2 = 289 - 64$

$b^2 = 225$

b = 15

tan A = p / b

= 8 / 15

**Question 4: Write the trigonometric ratio of sin A in terms of cot A.**

**Solution:**

sinA= 1 / cosecA

$= 1 / \sqrt{(1 + \cot^2 A)}$

$\cot^2 A + 1 = \operatorname{cosec}^2 A$

$\operatorname{cosec} A = \sqrt{(1 + \cot^2 A)}]$

**Question 5: If the ratio of corresponding medians of two similar triangles is 9:16, then find the ratio of their areas.**

**Solution:**

The theorem states that "the ratio of the areas of two triangles is equal to the square of the ratio of their corresponding medians".

Thus, we have,

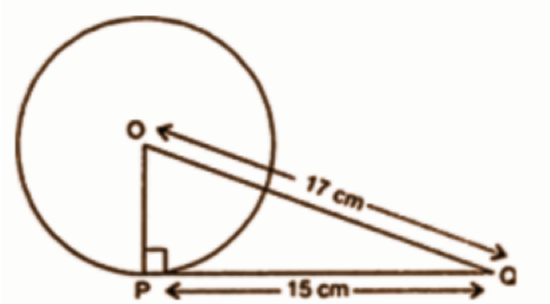
Ratio of medians = 9:16 = 9 / 16

Ratios of their areas = $[9 / 16]^2$

= 81 / 256

**Question 6: From a point Q, the length of the tangent to a circle is 15 cm and the distance of Q from the centre of the circle is 17 cm, then find the radius of the circle.**

**Solution:**




PQ = 15cm

OQ = 17cm

To find the radius OP

$OQ^2 = OP^2 + PQ^2$

$17^2 = OP^2 + 15^2$

$17^2 - 15^2 = OP^2$

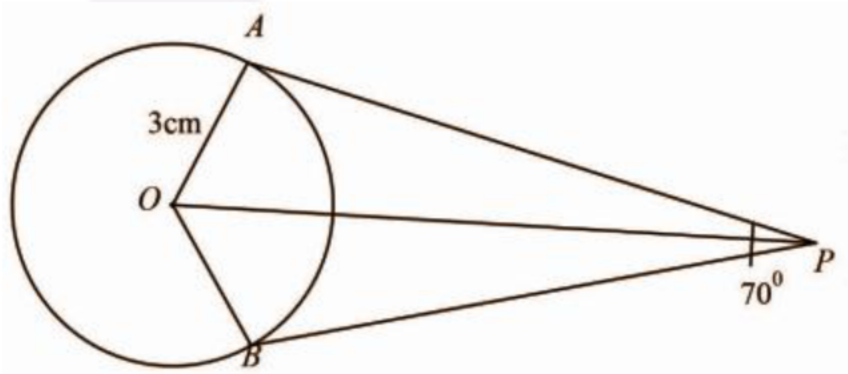
$289 - 225 = OP^2$

$64 = OP^2$

OP = 8cm

**Question 7: Draw a pair of tangents to a circle of radius 5 cm which is inclined to each other at an angle of 70°.**

**Solution:**



**Question 8: If the circumference and the area of a circle are numerically equal, then find the radius of the circle.**

**Solution:**

Area of circle = circumference of the circle

=> $\pi r^2 = 2\pi r$

=> Dividing by $\pi r$ on both the sides

=> r = 2

=> So the radius of the circle is 2 units.

**Question 9: Find the area of a quadrant of a circle whose circumference is 44 cm.**

**Solution:**

Let radius be r cm.

Circumference, $2\pi r = 44$

$\pi r = 22$

[22 / 7] * r = 22

r = 7 cm

Area of Quadrant = [1 / 4] * $\pi r^2$

= [1 / 4] * [22 / 7] * 7 * 7

= [22 * 7] / 4

= 154 / 4

= 38.5 $cm^2$

**Question 10: If the probability of "not E" = 0.95, then find P(E).**

**Solution:**

P (not E) = 0.95

Thus P (E) = 1 – P (not E)

⇒ P (E) = 1 – 0.95

⇒ P (E) = 0.05

**PART - B**

**Question 11: Name the type of quadrilateral formed by the points (4, 5), (7, 6), (4, 3), (1, 2).**

**Solution:**

Let the points (4, 5), (7, 6), (4, 3), and (1, 2) be representing the vertices A, B, C, and D of the given quadrilateral respectively.

$AB = \sqrt{(4 - 7)^2 + (5 - 6)^2} = \sqrt{(-3)^2 + (-1)^2} = \sqrt{9 + 1} = \sqrt{10}$

$BC = \sqrt{(7 - 4)^2 + (6 - 3)^2} = \sqrt{(3)^2 + (3)^2} = \sqrt{9 + 9} = \sqrt{18}$

$CD = \sqrt{(4 - 1)^2 + (3 - 2)^2} = \sqrt{(3)^2 + (1)^2} = \sqrt{9 + 1} = \sqrt{10}$

$AD = \sqrt{(4 - 1)^2 + (5 - 2)^2} = \sqrt{(3)^2 + (3)^2} = \sqrt{9 + 9} = \sqrt{18}$

Diagonal $AC = \sqrt{(4 - 4)^2 + (5 - 3)^2} = \sqrt{(0)^2 + (2)^2} = \sqrt{0 + 4} = 2$

Diagonal $CD = \sqrt{(7 - 1)^2 + (6 - 2)^2} = \sqrt{(6)^2 + (4)^2} = \sqrt{36 + 16} = \sqrt{52}$

The opposite sides of this quadrilateral are of the same length. However, the diagonals are of different lengths.

Therefore, the given points are the vertices of a parallelogram.

**Question 12: A vessel is in the form of a hollow hemisphere. The diameter of the hemisphere is 14 cm. Find the inner surface area of the vessel.**

**Solution:**

D = 14cm (given)

R = 14 / 2 = 7cm

CSA of hemisphere = $2\pi r^2$

$= 2 \times [22 / 7] \times 7 \times 7$

$= 44 \times 7$

$= 308\ cm^2$

**Question 13: The following distribution shows the daily pocket allowance of children of a locality.**

| **Daily pocket** | **10 - 20** | **20 - 30** | **30 - 40** | **40 - 50** | **50 - 60** |
|---|---|---|---|---|---|

| allowance | | | | | |
|---|---|---|---|---|---|
| **Number of children** | **3** | **5** | **4** | **7** | **6** |

**Find the mean daily pocket allowance by using the appropriate method.**

**Solution:**

| Daily pocket allowance | 10 - 20 | 20 - 30 | 30 - 40 | 40 - 50 | 50 - 60 |
|---|---|---|---|---|---|
| Number of children ($f_i$) | 3 | 5 | 4 | 7 | 6 |
| Midpoint ($x_i$) | 15 | 25 | 35 | 45 | 55 |
| $f_ix_i$ | 45 | 125 | 140 | 315 | 330 |

Mean = $\sum f_ix_i / \sum f_i$

= 955 / 25

= 38.2

**Question 14: A car travels 260 km distance from a place A to place B, at a uniform speed 65 km/hr passes through all thirteen green traffic signals, 4 minutes at the first signal, 7 minutes at the second signal, 10 minutes at a third signal and so on stops for 40 minutes at the thirteenth signal. How much total time does it take to reach place B? Solve by suitable Mathematical Method.**

**Solution:**

Time sequence forms an A.P: 4, 7, 10......

a = 4

d = 7 − 4 = 3

For the $13^{th}$ station, time = 40

Total time is the sum of the first thirteen terms of the sequence

$S = [n / 2] \{2a + (n - 1) d\}$

$S = [13 / 2] \{2(4) + (13 - 1) 3\}$

$S = [13 / 2] [8 + 36]$

$S = [13 / 2] \times 44$

$S = 286$

$S = [286 / 60]$ hour

$= 4 + [286 / 60]$

$= [240 + 286] / 60$

$= 526 / 60$

$= 8.76$ hours

**Question 15: For traffic control, a CCTV camera is fixed on a straight and vertical pole. The camera can see 113 m distance straight from the top. If the area visible by the camera around the pole is 39424 $m^2$, then find the height of the pole.**

**Solution:**

The height of the pole = 15m

As the area visible by the camera around the pole would form a circle.

Thus, the area visible by the camera around the pole = $\pi r^2$

Here, the correct area visible by the camera around the pole = 39424 $m^2$

=> 39424 $m^2$ = $(22 / 7) * r^2$

=> $r^2$ = 12544

=> r = 112 m

Thus, the radius of circle = 112 m

Also, the camera can see 113 m distance from the top.

So, A right triangle is formed whose base is 112 m and the hypotenuse is 113 m.

Thus, perpendicular = $\sqrt{\text{hypotenuse}^2 - \text{base}^2}$

$= \sqrt{113^2 - 112^2}$

$= \sqrt{225}$

= 15 m

Thus, the height of the pole = 15 m.

## PART - C

**Question 16: Prove that $\sqrt{3}$ is an irrational number.**

**Solution:**

Let us assume that $\sqrt{3}$ is a rational number.

A rational number should be in the form of p / q, where p and q are a coprime number.

$\sqrt{3} = p / q$ { where p and q are co- prime}

$\sqrt{3}q = p$

Now, by squaring both the side we get,

$(\sqrt{3}q)^2 = p^2$

$3q^2 = p^2$ ........ (i)

So, if 3 is the factor of $p^2$ then, 3 is also a factor of p ..... (ii)

=> Let p = 3m { where m is any integer }

Squaring both sides,

$p^2 = (3m)^2$

$p^2 = 9m^2$

Putting the value of $p^2$ in equation (i)

$3q^2 = p^2$

$3q^2 = 9m^2$

$q^2 = 3m^2$

So, if 3 is a factor of $q^2$, then, 3 is also a factor of q.

Since 3 is the factor of p & q both, our assumption that p & q are coprime is wrong.

Hence $\sqrt{3}$ is an irrational number.

**Question 17: Divide $x^3 – 6x^2 + 11x – 6$ by x – 2, and verify the division algorithm.**

**Solution:**

$$
\begin{array}{r l}
 & x^2 - 4x + 3 \\
x - 2 \,\big) & x^3 - 6x^2 + 11x - 6 \\
 & \underline{x^3 - 2x^2} \\
 & -4x^2 + \frac{1}{x} \\
 & \underline{-4x^2 \pm 8x} \\
 & 3x - 6 \\
 & \underline{3x \mp 6} \\
 & 0
\end{array}
$$

Dividend = Quotient * Divisor + Remainder
= (x - 2) ($x^2$ - 4x + 3) + 0
= $x^3$ - $4x^2$ + 3x - $2x^2$ + 8x - 6
= $x^3 - 6x^2 + 11x - 6$

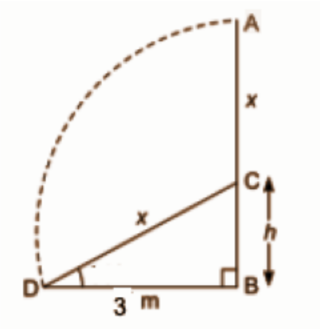
**Question 18: A manufacturer of TV sets produced 720 sets in the fourth year and 1080 sets in the sixth year. Assuming that the production increases uniformly by a fixed number every year, then find total production in the first 9 years.**

**Solution:**
Simplify the expression,
720 set in the fourth year
1080 set in the sixth year
2-year difference value of the sixth year - 4 year = 1080 - 720 = 360
2 difference = 360
1 year produced is = 360 / 2 = 180
Then, 1 year produced is 180
9-year total production are = 180 * 9 = 1620
9 year total production are = 180 * 9 = 1620
9 year total production are = 180 * 9 = 1620
9 year total production are = 1620
Hence, the total production of 9 years is 1620.

**Question 19: A tree breaks due to a storm and the broken part bends so that the top of the tree touches the ground making an angle 60° with it. The**

**distance between the foot of the tree to the point where the top touches the ground is 3 m. Find the height of the tree.**

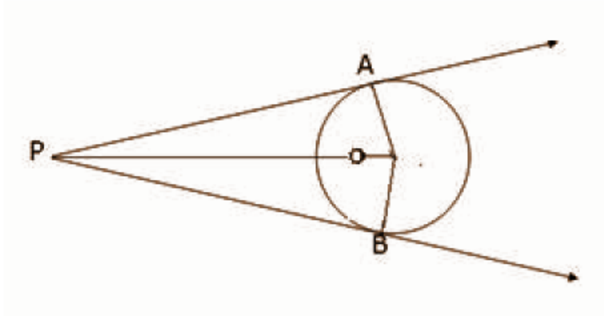
**Solution:**




Let the height of the tree before the storm is AB.
Due to the storm, it breaks from C such that its top touches the ground at D and makes an angle of 60º.
Let AC = DC = x and BC = h, BD = 3m
Height of the tree = BC = x + h ---- (1)
In triangle BCD,
CD / BD = sec 60º and BC / BD = tan 60º
$x / 3 = 2$ and $h / 3 = \sqrt{3}$
$x = 6$ and $h = 3\sqrt{3}$
Substitute the value of x and h in (1)
$BC = 6 + 3\sqrt{3}$
= 11.1m

**Question 20: Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre.**

**Solution:**




Consider a circle with centre O.

Let P be an external point from which two tangents PA and PB are drawn to the circle which are touching the circle at point A and B respectively and AB is the line segment, joining point of contacts A and B together such that it subtends $\angle AOB$ at centre O of the circle.

It can be observed that

$OA \perp PA$

$\therefore \angle OAP = 90^\circ$

Similarly, $OB \perp PB$

$\therefore \angle OBP = 90^\circ$

In quadrilateral OAPB,

Sum of all interior angles = 360º

$\angle OAP + \angle APB + \angle PBO + \angle BOA = 360^\circ$

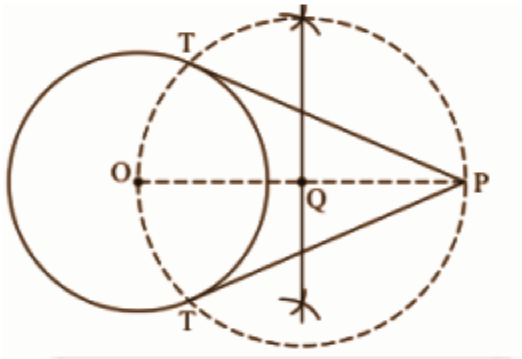
$\Rightarrow 90^\circ + \angle APB + 90^\circ + \angle BOA = 360^\circ$

$\Rightarrow \angle APB + \angle BOA = 180^\circ$

$\therefore$ The angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre.

**Question 21: Draw a circle of radius 5 cm. From a point 13 cm away from its centre, construct the pair of tangents to the circle and measure their length. Also, verify the measurement by actual calculation.**

**Solution:**




Steps of construction:

- Draw a circle of radius OP = 13cm.
- Make a point P at a distance of OP = 13cm.
- Join OP.
- Taking Q as centre and radius OQ = PQ, draw a circle to intersect the given circle at T and T'.
- Join PT and PT' to obtain the required tangents.
- Thus, PT and P'T' are the required tangents.

Finding the length of tangents.
We know that OT ⊥ PT and in triangle OPT,
$PT^2 = OP^2 - OT^2$
$= 13^2 - 5^2$
= 169 - 25
= 144
= 12
The length of the tangents are 12cm each.

**Question 22: If an arc of a circle subtends an angle of 60° at the centre and if the area of the minor sector is 231 cm$^2$, then find the radius of the circle.**

**Solution:**
Area of the sector = 231cm$^2$
The angle subtended = 60°
$A = \pi r^2\theta / 360°$
$231 = (22 / 7) * r^2 * 60° / 360°$

$231 = (22 / 7)\ r^2 * 0.1666$

$231 = 0.5236\ r^2$

$r^2 = 441$

r = 21cm

**Question 23: A well of diameter 7 m is dug and earth from digging is evenly spread out to form a platform 22 m × 14 m × 2.5 m. Find the depth of the well.**

**Solution:**

The diameter of the well = 7 m

The radius of the well = 7 / 2 m

$L * B * H = \pi r^2 h$

22 * 14 * 2.5 = 22 / 7 × 7 / 2 × 7 / 2 × h

770 / 38.485 = h

h = 20cm

**Question 24: The following data gives information on the observed lifetimes (in hours) of 200 electrical components.**

| Lifetime (in hours) | 40 - 60 | 60 - 80 | 80 - 100 | 100 - 120 | 120 - 140 | 140 - 160 |
|---|---|---|---|---|---|---|
| Frequency | 25 | 38 | 65 | 24 | 31 | 17 |

**Determine the modal lifetimes of the components.**

**Solution:**

As the lifetime (in hours) 80 -100 has a maximum frequency, so it is the modal lifetime in hours.

$$\text{Mode} = \ell + \frac{fm - f(m-1)}{2fm - f(m-1) - f(m+1)} \times 1$$

Class size h = 20

l = 80

$f_m = 65$

$f_{m-1} = 38$

$f_{m+1} = 24$
Mode = 80 + {[65 - 38] / [2 * 65 - 38 - 24]} * 20
= 80 + {27 / 68} * 20
= 87.94

**Question 25: A box contains 7 red marbles, 10 white marbles and 5 green marbles. One marble is taken out of the box at random. What is the probability that the marble is taken out will be**
**(i) not red?**
**(ii) white?**
**(iii) green?**

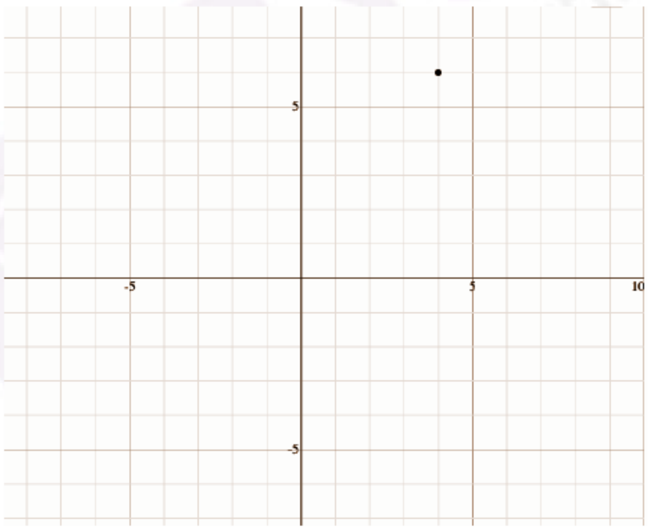
**Solution:**
Number of red marbles = 7
Number of white marbles = 10
Number of green marbles = 5
Total marbles = 7 + 10 + 5 = 22
Probability of getting not red marble = 15 / 22
Probability of getting white marble = 10 / 22
Probability of getting green marble = 5 / 22

## PART - D

**Question 26: The cost of 7 erasers and 5 pencils is Rs. 58 and the cost of 5 erasers and 6 pencils are Rs. 56. Formulate this problem algebraically and solve it graphically.**

**Solution:**
Let the cost of erasers be x and the cost of pencils be y.
Then,
7x + 5y = 58 ---- (1)
5x + 6y = 56 ---- (2)
Multiply equation (1) by 5
7x + 5y = 58 .......... (6)
5x + 6y = 56 .......... (5)

42x + 30y = 348
25x + 30y  = 280
Subtract equation (1) of equation (2)
42x + 30y = 348
25x + 30y  = 280
17x = 68
x = 68 / 17
x = 4
Putting the value of x in equation (1),
7 * 4 + 5y = 58
28 + 5y = 58
5y = 58 - 28
5y = 30
y = 30 / 5
y = 6
Hence, one cost of erasers is 4 and one cost of pencils is 6.




**Question 27: [i] A train travels 300 km at a uniform speed. If the speed had been 10 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.**

**OR**

**[ii] The diagonal of a rectangular field is 25 metres more than the shorter side. If the longer side is 23 metres more than the shorter side, find the sides of the field.**

**Solution:**

[i] Let the constant speed of the train be x km / h.

Time is taken by train to cover = 300 / x hrs.

Increased speed = 10 km / h

Time taken to cover 300 km when speed is increased = 300 / (x + 10) hrs.

According to the question,

$\Rightarrow 300 / x - 300 / (x + 10) = 1$

$\Rightarrow 300 (x + 10) - 300x / x(x + 10) = 1$

$\Rightarrow 300x + 3000 - 300x / x^2 + 10x = 1$

$\Rightarrow x^2 + 10x = 3000$

$\Rightarrow x^2 + 10x - 3000 = 0$

By using the factorization method, we get

$\Rightarrow x^2 + 60x - 50x - 3000 = 0$

$\Rightarrow x(x + 60) - 50(x + 60) = 0$

$\Rightarrow (x + 60) (x - 50) = 0$

$\Rightarrow x + 60 = 0$ or $x - 50 = 0$

$\Rightarrow x = -60, 50$ (As x can't be negative)

$\Rightarrow x = 50$ km/h

Hence, the original speed of the train is 50 km / h.

**OR**

[ii] Let the shorter side of the rectangular field be 'x' meters.

Therefore the longer side will be (x + 23) meters and the length of the diagonal will be (x + 25) meters.

The diagonal divides the rectangular into two right-angled triangles and the diagonal is the common side of the two triangles and it is also the longest side of the triangles i.e. the hypotenuse.

By Pythagoras Theorem,

$(\text{Diagonal})^2 = (\text{Smaller Side})^2 + (\text{Longer Side})^2$

$(x + 25)^2 = (x)^2 + (x + 23)^2$

$x^2 + 50x + 625 = x^2 + x^2 + 46x + 529$

$x^2 + 50x - 46x + 625 - 529 = 2x^2$

$x^2 + 4x + 96 = 2x^2$

$x^2 - 4x - 96 = 0$

$x^2 - 12x + 8x - 96 = 0$

$x(x - 12) + 8(x - 12) = 0$

$x = 12, -8$

x = 12m as length cannot be possible.

So the length of the shorter side is 12 meters and the length of the longer side is 12 + 23 = 35 meters.

**Question 28:**

**[i] Evaluate, $(1 + \tan\theta + \sec\theta)(1 + \cot\theta - \text{cosec}\,\theta)$.**

**[ii] Prove that [tan A – sin A] / [tan A + sin A] = [sec A – 1] / [sec A + 1].**

**Solution:**

[i] $(1 + \tan\theta + \sec\theta)(1 + \cot\theta - \text{cosec}\,\theta)$

$= (1 + [\sin\theta / \cos\theta] + [1 / \cos\theta]) * (1 + [\cos\theta / \sin\theta] - [1 / \sin\theta])$

$= \{[\cos\theta + \sin\theta + 1][\sin\theta + \cos\theta - 1]\} / [\cos\theta * \sin\theta]$

$= (\cos\theta + \sin\theta)^2 - 1 / [\cos\theta * \sin\theta]$

$= [\cos^2\theta + \sin^2\theta + 2\cos\theta\sin\theta - 1] / \cos\theta\sin\theta$

$= [1 - 1 + 2\sin\theta\cos\theta] / [\cos\theta\sin\theta]$

$= 2$

[ii] LHS = [tan A – sin A] / [tan A + sin A]

= [sin A / cos A] - sin A / [sin A / cos A] + sin A

= sin A [(1 / cos A) - 1] / sin A [(1 / cos A) + 1]

= [sec A - 1] / [sec A + 1]

**Question 29: Find the area of that triangle whose vertices are (–3, –2), (5, –2) and (5, 4). Also, prove that it is a right-angle triangle.**

**Solution:**

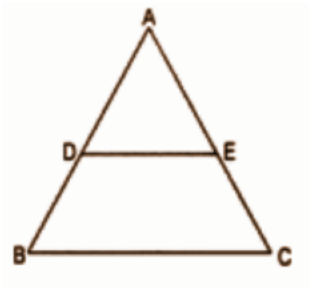
Area of a triangle = [1 / 2] [$x_1$ ($y_2$ - $y_3$) + $x_2$ ($y_3$ - $y_1$) + $x_3$ ($y_1$ - $y_2$)]
= [1 / 2] [-3 (- 2 - 4) + 5 (4 + 2) + (- 2 + 2)]
= [1 / 2] [18 + 30 + 0]
= [1 / 2] [48]
= 24
The triangle ABC consists of vertices A (–3, –2), B (5, –2) and C (5, 4).
By distance formula,
$AC^2 = (-3 - 5)^2 + (-2 - 2)^2$
AC = 8
$AB^2 = (-3 - 5)^2 + (-2 - 4)^2$
AB = 10
$BC^2 = (5 - 5)^2 + (4 + 2)^2$
BC = 6
Since, the value of the right-angle triangle is (8, 6, and 10).
It is a right-angle triangle.

**Question 30: [i] Prove that a line drawn through the midpoint of one side of a triangle parallel to the second side bisects the third side.**

**OR**

**[ii] PQRS is a trapezium in which PQ || RS and its diagonals intersect each at the point O. Prove that PO / QO = RO / SO.**

**Solution:**
[i]




In ΔABC, D is the midpoint of AB and E is a point on AC such that DE || BC.

Since, DE || BC [given]
Therefore, Using the Basic proportionality theorem,
AD / DB = AE / EC .....(1)
But D is the midpoint of AB
Therefore, AD = DB
=> AD / DB = 1 .....(2)
From (1) and (2),
1 = AE / EC => EC = AE
=> E is the midpoint of AC.
Hence, it is proved that a line through the midpoint of one side of a triangle parallel to another side bisects the third side.

**OR**

[ii] As PQ || RS and PR and QS are transversals,
$\angle OSR = \angle OQP$ [alternate angles]
$\angle ORS = \angle OPQ$ [alternate angles]
$\triangle SOR \sim \triangle OPQ$
SO / PO = RO / QO = SR / PQ
SO / PO = RO / QO
QO / PO = RO / SO