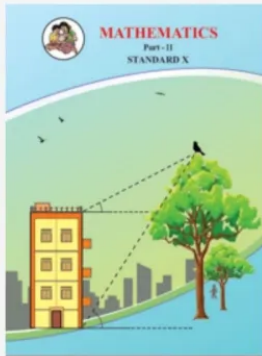


Maharashtra Board Solutions for Class 10-Maths (Part 2): Chapter 2- Pythagoras Theorem

BOOK SOLUTIONS
CLASS 10
MATHEMATICS PART 2

CHAPTER 2
Pythagoras Theorem



Maharashtra Board Solutions→

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Maharashtra Board Solutions for Class 10-Maths (Part 2): Chapter 2- Pythagoras Theorem

Class 10: Maths Chapter 2 solutions. Complete Class 10 Maths Chapter 2 Notes.

Maharashtra Board Solutions for Class 10-Maths (Part 2): Chapter 2- Pythagoras Theorem

Maharashtra Board 10th Maths Chapter 2, Class 10 Maths Chapter 2 solutions

Practice Set 2.1

Question 1.

Identify, with reason, which of the following are Pythagorean triplets.

- i. (3,5,4)
- ii. (4,9,12)
- iii. (5,12,13)
- iv. (24,70,74)
- v. (10,24,27)
- vi. (11,60,61)

Solution:

i. Here, $5^2 = 25$

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

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$$\therefore 5^2 = 3^2 + 4^2$$

The square of the largest number is equal to the sum of the squares of the other two numbers.

$\therefore (3, 5, 4)$ is a Pythagorean triplet.

ii. Here, $12^2 = 144$

$$4^2 + 9^2 = 16 + 81 = 97$$

$$\therefore 12^2 \neq 4^2 + 9^2$$

The square of the largest number is not equal to the sum of the squares of the other two numbers.

$\therefore (4, 9, 12)$ is not a Pythagorean triplet.

iii. Here, $13^2 = 169$

$$5^2 + 12^2 = 25 + 144 = 169$$

$$\therefore 13^2 = 5^2 + 12^2$$

The square of the largest number is equal to the sum of the squares of the other two numbers.

$\therefore (5, 12, 13)$ is a Pythagorean triplet.

iv. Here, $74^2 = 5476$

$$24^2 + 70^2 = 576 + 4900 = 5476$$

$$\therefore 74^2 = 24^2 + 70^2$$

The square of the largest number is equal to the sum of the squares of the other two numbers.

$\therefore (24, 70, 74)$ is a Pythagorean triplet.

v. Here, $27^2 = 729$

$$10^2 + 24^2 = 100 + 576 = 676$$

$$\therefore 27^2 \neq 10^2 + 24^2$$

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The square of the largest number is not equal to the sum of the squares of the other two numbers.

$\therefore (10, 24, 27)$ is not a Pythagorean triplet.

vi. Here, $61^2 = 3721$

$$11^2 + 60^2 = 121 + 3600 = 3721$$

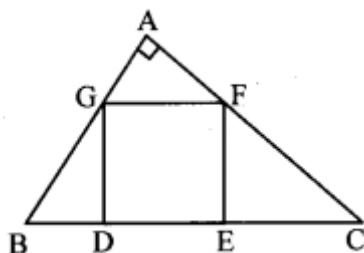
$$\therefore 61^2 = 11^2 + 60^2$$

The square of the largest number is equal to the sum of the squares of the other two numbers.

$\therefore (11, 60, 61)$ is a Pythagorean triplet.

Question 2.

In the adjoining figure, $\angle MNP = 90^\circ$, seg $NQ \perp$ seg MP , $MQ = 9$, $QP = 4$, find NQ .



Solution:

In $\triangle MNP$, $\angle MNP = 90^\circ$ and [Given]

seg $NQ \perp$ seg MP

$$NQ^2 = MQ \times QP \text{ [Theorem of geometric mean]}$$

$$\therefore NQ = \sqrt{MQ \times QP} \text{ [Taking square root of both sides]}$$

$$= \sqrt{9 \times 4}$$

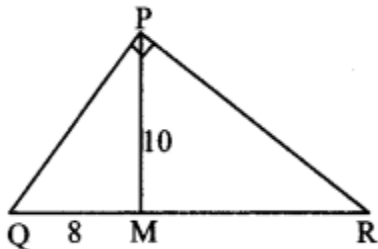
$$= 3 \times 2$$

$$\therefore NQ = 6 \text{ units}$$

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Question 3.

In the adjoining figure, $\angle QPR = 90^\circ$, seg $PM \perp$ seg QR and $Q - M - R$, $PM = 10$, $QM = 8$, find QR .

**Solution:**

In $\triangle PQR$, $\angle QPR = 90^\circ$ and [Given]

seg $PM \perp$ seg QR

$\therefore PM^2 = QM \times MR$ [Theorem of geometric mean]

$$\therefore 10^2 = 8 \times MR$$

$$\therefore MR = 1008$$

$$= 12.5$$

Now, $QR = QM + MR$ [$Q - M - R$]

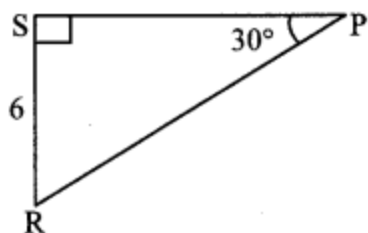
$$= 8 + 12.5$$

$$\therefore QR = 20.5 \text{ units}$$

Question 4.

See adjoining figure. Find RP and PS using the information given in $\triangle PSR$.

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**Solution:**

In $\triangle PSR$, $\angle S = 90^\circ$, $\angle P = 30^\circ$ [Given]

$\therefore \angle R = 60^\circ$ [Remaining angle of a triangle]

$\therefore \triangle PSR$ is a $30^\circ - 60^\circ - 90^\circ$ triangle.

$RS = 12 RP$ [Side opposite to 30°]

$$\therefore 6 = 12 RP$$

$$\therefore RP = 6 \times 2 = 12 \text{ units}$$

Also, $PS = 3\sqrt{2} RP$ [Side opposite to 60°]

$$= 3\sqrt{2} \times 12$$

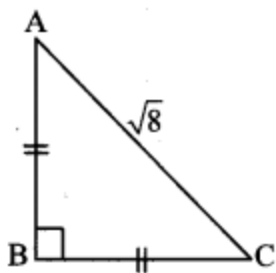
$$= 63\sqrt{2} \text{ units}$$

$$\therefore RP = 12 \text{ units, } PS = 63\sqrt{2} \text{ units}$$

Question 5.

For finding AB and BC with the help of information given in the adjoining figure, complete the following activity.

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Solution:

$AB = BC$ [Given]

$\therefore \angle BAC = \angle BCA$ [Isosceles triangle theorem]

Let $\angle BAC = \angle BCA = x$ (i)

In $\triangle ABC$, $\angle A + \angle B + \angle C = 180^\circ$ [Sum of the measures of the angles of a triangle is 180°]

$\therefore x + 90^\circ + x = 180^\circ$ [From (i)]

$\therefore 2x = 90^\circ$

$\therefore x = 90^\circ / 2$ [From (i)]

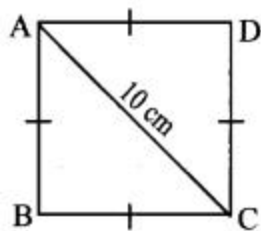
$\therefore x = 45^\circ$

$$\begin{aligned} \therefore AB = BC &= \frac{1}{\sqrt{2}} \times AC && \text{[Side opposite to } 45^\circ\text{]} \\ &= \frac{1}{\sqrt{2}} \times \sqrt{8} \\ &= \frac{1}{\sqrt{2}} \times 2\sqrt{2} \\ \therefore AB = BC &= \boxed{2 \text{ units}} \end{aligned}$$

Question 6.

Find the side and perimeter of a square whose diagonal is 10 cm.

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Solution:

Let ABCD be the given square.

l(diagonal AC) = 10 cm

Let the side of the square be 'x' cm.

In $\triangle ABC$,

$\angle B = 90^\circ$ [Angle of a square]

$\therefore AC^2 = AB^2 + BC^2$ [Pythagoras theorem]

$$\therefore 10^2 = x^2 + x^2$$

$$\therefore 100 = 2x^2$$

$$\therefore x^2 = 100/2$$

$$\therefore x^2 = 50$$

$$\therefore x = \sqrt{50} \text{ [Taking square root of both sides]}$$

$$= \sqrt{25 \times 2} = 5\sqrt{2}$$

$\therefore$ side of square is $5\sqrt{2}$ cm.

$$= 4 \times 5\sqrt{2}$$

$\therefore$ Perimeter of square = $20\sqrt{2}$ cm

Question 7.

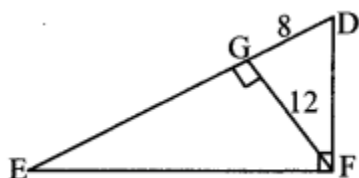
In the adjoining figure, $\angle DFE = 90^\circ$, $FG \perp ED$. If $GD = 8$, $FG = 12$, find

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i. EG

ii. FD, and

iii. EF



Solution:

i. In $\triangle DEF$, $\angle DFE = 90^\circ$ and $FG \perp ED$ [Given]

$\therefore FG^2 = GD \times EG$ [Theorem of geometric mean]

$$\therefore 12^2 = 8 \times EG$$

$$\therefore EG = 1448$$

$$\therefore EG = 18 \text{ units}$$

ii. In $\triangle FGD$, $\angle FGD = 90^\circ$ [Given]

$\therefore FD^2 = FG^2 + GD^2$ [Pythagoras theorem]

$$= 12^2 + 8^2 = 144 + 64$$

$$= 208$$

$\therefore FD = \sqrt{208}$ [Taking square root of both sides]

$$\therefore FD = 4\sqrt{13} \text{ units}$$

iii. In $\triangle EGF$, $\angle EGF = 90^\circ$ [Given]

$\therefore EF^2 = EG^2 + FG^2$ [Pythagoras theorem]

$$= 18^2 + 12^2 = 324 + 144$$

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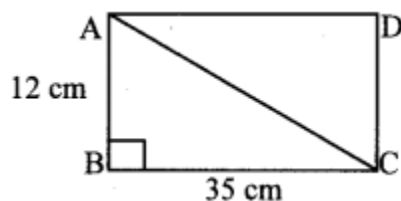
$$= 468$$

$$\therefore EF = 468 \text{ --- } \sqrt{\text{ [Taking square root of both sides]}}$$

$$\therefore EF = 613 \text{ --- } \sqrt{\text{ units}}$$

Question 8.

Find the diagonal of a rectangle whose length is 35 cm and breadth is 12 cm.



Solution:

Let ABCD be the given rectangle.

$$AB = 12 \text{ cm, } BC = 35 \text{ cm}$$

In $\triangle ABC$, $\angle B = 90^\circ$ [Angle of a rectangle]

$$\therefore AC^2 = AB^2 + BC^2 \text{ [Pythagoras theorem]}$$

$$= 12^2 + 35^2$$

$$= 144 + 1225$$

$$= 1369$$

$$\therefore AC = 1369 \text{ --- } \sqrt{\text{ [Taking square root of both sides]}}$$

$$= 37 \text{ cm}$$

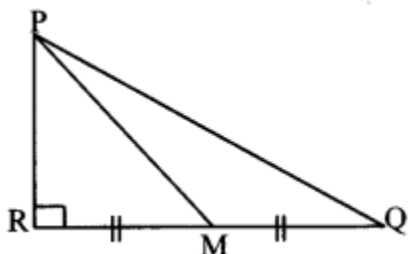
$\therefore$ The diagonal of the rectangle is 37 cm.

Question 9.

In the adjoining figure, M is the midpoint of QR. $\angle PRQ = 90^\circ$.

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Prove that, $PQ^2 = 4 PM^2 - 3 PR^2$.



Solution:

Proof:

In $\triangle PQR$, $\angle PRQ = 90^\circ$ [Given]

$PQ^2 = PR^2 + QR^2$ (i) [Pythagoras theorem]

$RM = \frac{1}{2} QR$ [M is the midpoint of QR]

$\therefore 2RM = QR$ (ii)

$\therefore PQ^2 = PR^2 + (2RM)^2$ [From (i) and (ii)]

$\therefore PQ^2 = PR^2 + 4RM^2$ (iii)

Now, in $\triangle PRM$, $\angle PRM = 90^\circ$ [Given]

$\therefore PM^2 = PR^2 + RM^2$ [Pythagoras theorem]

$\therefore RM^2 = PM^2 - PR^2$ (iv)

$\therefore PQ^2 = PR^2 + 4 (PM^2 - PR^2)$ [From (iii) and (iv)]

$\therefore PQ^2 = PR^2 + 4 PM^2 - 4 PR^2$

$\therefore PQ^2 = 4 PM^2 - 3 PR^2$

Question 10.

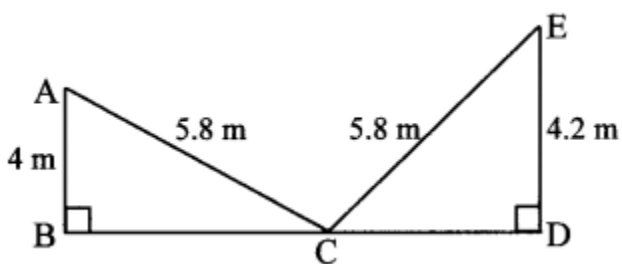
Walls of two buildings on either side of a street are parallel to each other. A ladder 5.8 m long is placed on the street such that its top just reaches the window of a building at the

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height of 4 m. On turning the ladder over to the other side of the street, its top touches the window of the other building at a height 4.2 m. Find the width of the street.

Solution:

Let AC and CE represent the ladder of length 5.8 m, and A and E represent windows of the buildings on the opposite sides of the street. BD is the width of the street.



AB = 4 m and ED = 4.2 m

In $\triangle ABC$, $\angle B = 90^\circ$ [Given]

$AC^2 = AB^2 + BC^2$ [Pythagoras theorem]

$$\therefore 5.8^2 = 4^2 + BC^2$$

$$\therefore 5.8^2 - 4^2 = BC^2$$

$$\therefore (5.8 - 4)(5.8 + 4) = BC^2$$

$$\therefore 1.8 \times 9.8 = BC^2$$

$CE^2 = CD^2 + DE^2$ [Pythagoras theorem]

$$\therefore 5.8^2 = CD^2 + 4.2^2$$

$$\therefore 5.8^2 - 4.2^2 = CD^2$$

$$\therefore (5.8 - 4.2)(5.8 + 4.2) = CD^2$$

$$\therefore 1.6 \times 10 = CD^2$$

$$\therefore CD^2 = 16$$

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$\therefore CD = 4\text{m}$ (ii) [Taking square root of both sides]

Now, $BD = BC + CD$ [B – C – D]

$= 4.2 + 4$ [From (i) and (ii)]

$= 8.2\text{ m}$

$\therefore$ The width of the street is 8.2 metres.

Question 1.

Verify that (3,4,5), (5,12,13), (8,15,17), (24,25,7) are Pythagorean triplets. (Textbook pg. no. 30)

Solution:

i. Here, $5^2 = 25$

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

$$\therefore 5^2 = 3^2 + 4^2$$

The square of the largest number is equal to the sum of the squares of the other two numbers.

$\therefore$ 3,4,5 is a Pythagorean triplet.

ii. Here, $13^2 = 169$

$$5^2 + 12^2 = 25 + 144 = 169$$

$$\therefore 13^2 = 5^2 + 12^2$$

The square of the largest number is equal to the sum of the squares of the other two numbers.

$\therefore$ 5,12,13 is a Pythagorean triplet.

iii. Here, $17^2 = 289$

$$8^2 + 15^2 = 64 + 225 = 289$$

$$\therefore 17^2 = 8^2 + 15^2$$

The square of the largest number is equal to the sum of the squares of the other two numbers.

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$\therefore 8, 15, 17$ is a Pythagorean triplet.

iv. Here, $25^2 = 625$

$$7^2 + 24^2 = 49 + 576 = 625$$

$$\therefore 25^2 = 7^2 + 24^2$$

The square of the largest number is equal to the sum of the squares of the other two numbers.

$\therefore 24, 25, 7$ is a Pythagorean triplet.

Question 2.

Assign different values to a and b and obtain 5 Pythagorean triplets. (Textbook pg. no. 31)

Solution:

i. Let $a = 2, b = 1$

$$a^2 + b^2 = 2^2 + 1^2 = 4 + 1 = 5$$

$$a^2 - b^2 = 2^2 - 1^2 = 4 - 1 = 3$$

$$2ab = 2 \times 2 \times 1 = 4$$

$\therefore (5, 3, 4)$ is a Pythagorean triplet.

ii. Let $a = 4, b = 3$

$$a^2 + b^2 = 4^2 + 3^2 = 16 + 9 = 25$$

$$a^2 - b^2 = 4^2 - 3^2 = 16 - 9 = 7$$

$$2ab = 2 \times 4 \times 3 = 24$$

$\therefore (25, 7, 24)$ is a Pythagorean triplet.

iii. Let $a = 5, b = 2$

$$a^2 + b^2 = 5^2 + 2^2 = 25 + 4 = 29$$

$$a^2 - b^2 = 5^2 - 2^2 = 25 - 4 = 21$$

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$$2ab = 2 \times 5 \times 2 = 20$$

$\therefore (29, 21, 20)$ is a Pythagorean triplet.

iv. Let $a = 4, b = 1$

$$a^2 + b^2 = 4^2 + 1^2 = 16 + 1 = 17$$

$$a^2 - b^2 = 4^2 - 1^2 = 16 - 1 = 15$$

$$2ab = 2 \times 4 \times 1 = 8$$

$\therefore (17, 15, 8)$ is a Pythagorean triplet.

v. Let $a = 9, b = 7$

$$a^2 + b^2 = 9^2 + 7^2 = 81 + 49 = 130$$

$$a^2 - b^2 = 9^2 - 7^2 = 81 - 49 = 32$$

$$2ab = 2 \times 9 \times 7 = 126$$

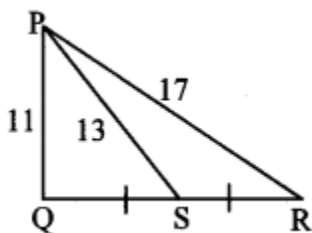
$\therefore (130, 32, 126)$ is a Pythagorean triplet.

Note: Numbers in Pythagorean triplet can be written in any order.

Practice Set 2.2

Question 1.

In $\triangle PQR$, point S is the midpoint of side QR . If $PQ = 11$, $PR = 17$, $PS = 13$, find QR .



Solution:

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In $\triangle PQR$, point S is the midpoint of side QR. [Given]

$\therefore$ seg PS is the median.

$\therefore PQ^2 + PR^2 = 2 PS^2 + 2 SR^2$ [Apollonius theorem]

$\therefore 11^2 + 17^2 = 2 (13)^2 + 2 SR^2$

$\therefore 121 + 289 = 2 (169) + 2 SR^2$

$\therefore 410 = 338 + 2 SR^2$

$\therefore 2 SR^2 = 410 - 338$

$\therefore 2 SR^2 = 72$

$\therefore SR^2 = 72 \div 2 = 36$

$\therefore SR = \sqrt{36} = 6$ [Taking square root of both sides]

= 6 units Now, QR = 2 SR [S is the midpoint of QR]

= 2×6

$\therefore QR = 12$ units

Question 2.

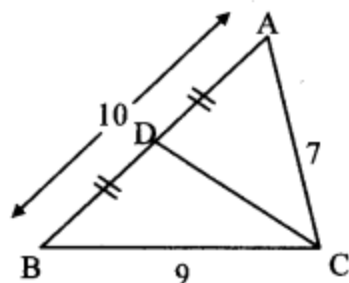
In $\triangle ABC$, AB = 10, AC = 7, BC = 9, then find the length of the median drawn from point C to side AB.

Solution:

Let CD be the median drawn from the vertex C to side AB.

BD = $\frac{1}{2}$ AB [D is the midpoint of AB]

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



In $\triangle ABC$, seg CD is the median. [Given]

$$\therefore AC^2 + BC^2 = 2 CD^2 + 2 BD^2 \text{ [Apollonius theorem]}$$

$$\therefore 7^2 + 9^2 = 2 CD^2 + 2 (5)^2$$

$$\therefore 49 + 81 = 2 CD^2 + 2 (25)$$

$$\therefore 130 = 2 CD^2 + 50$$

$$\therefore 2 CD^2 = 130 - 50$$

$$\therefore 2 CD^2 = 80$$

$$\therefore CD^2 = 80 \div 2 = 40$$

$$\therefore CD = \sqrt{40} \text{ [Taking square root of both sides]}$$

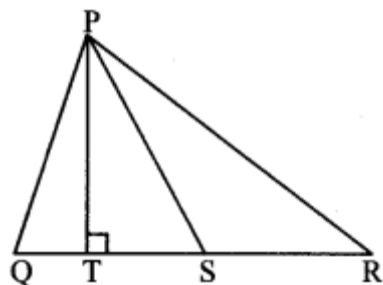
$$= 2\sqrt{10} \text{ units}$$

$\therefore$ The length of the median drawn from point C to side AB is $2\sqrt{10}$ units.

Question 3.

In the adjoining figure, seg PS is the median of $\triangle PQR$ and $PT \perp QR$. Prove that,

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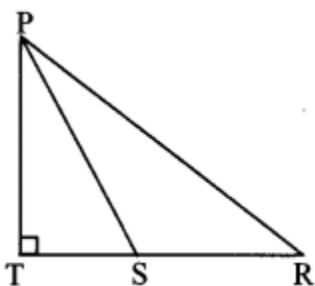


i. $PR^2 = PS^2 + QR \times ST + (QR/2)^2$

ii. $PQ^2 = PS^2 - QR \times ST + (QR/2)^2$

Solution:

i. $QS = SR = \frac{1}{2} QR$ (i) [S is the midpoint of side QR]



$\therefore$ In $\triangle PSR$, $\angle PSR$ is an obtuse angle [Given]

and $PT \perp SR$ [Given, $Q-S-R$]

$\therefore PR^2 = SR^2 + PS^2 + 2 SR \times ST$ (ii) [Application of Pythagoras theorem]

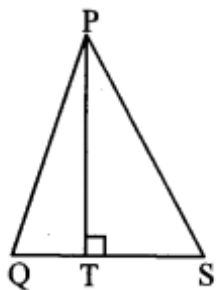
$\therefore PR^2 = (1/2 QR)^2 + PS^2 + 2 (1/2 QR) \times ST$ [From (i) and (ii)]

$\therefore PR^2 = (QR/2)^2 + PS^2 + QR \times ST$

$\therefore PR^2 = PS^2 + QR \times ST + (QR/2)^2$

ii. In $\triangle PQS$, $\angle PSQ$ is an acute angle and [Given]

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$PT \perp QS$ [Given, Q-S-R]

$\therefore PQ^2 = QS^2 + PS^2 - 2 QS \times ST$ (iii) [Application of Pythagoras theorem]

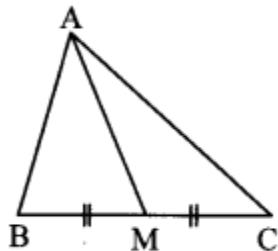
$\therefore PR^2 = (12 QR)^2 + PS^2 - 2 (12 QR) \times ST$ [From (i) and (iii)]

$\therefore PR^2 = (QR^2)^2 + PS^2 - QR \times ST$

$\therefore PR^2 = PS^2 - QR \times ST + (QR^2)^2$

Question 4.

In $\triangle ABC$, point M is the midpoint of side BC. If $AB^2 + AC^2 = 290$ cm, $AM = 8$ cm, find BC.



Solution:

In $\triangle ABC$, point M is the midpoint of side BC. [Given]

$\therefore$ seg AM is the median.

$\therefore AB^2 + AC^2 = 2 AM^2 + 2 MC^2$ [Apollonius theorem]

$\therefore 290 = 2 (8)^2 + 2 MC^2$

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$$\therefore 145 = 64 + MC^2 \text{ [Dividing both sides by 2]}$$

$$\therefore MC^2 = 145 - 64$$

$$\therefore MC^2 = 81$$

$$\therefore MC = \sqrt{81} \text{ [Taking square root of both sides]}$$

$$MC = 9 \text{ cm}$$

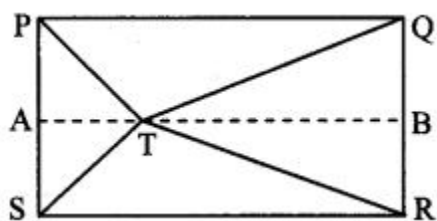
$$\text{Now, } BC = 2 MC \text{ [M is the midpoint of BC]}$$

$$= 2 \times 9$$

$$\therefore BC = 18 \text{ cm}$$

Question 5.

In the adjoining figure, point T is in the interior of rectangle PQRS. Prove that, $TS^2 + TQ^2 = TP^2 + TR^2$. (As shown in the figure, draw seg AB || side SR and A – T – B)



Given: PQRS is a rectangle.

Point T is in the interior of PQRS.

To prove: $TS^2 + TQ^2 = TP^2 + TR^2$

Construction: Draw seg AB || side SR such that A – T – B.

Solution:

Proof:

PQRS is a rectangle. [Given]

$\therefore PS = QR$ (i) [Opposite sides of a rectangle]

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In ASRB,

$\angle S = \angle R = 90^\circ$ (ii) [Angles of rectangle PQRS]

side AB || side SR [Construction]

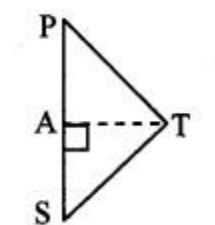
Also $\angle A = \angle S = 90^\circ$ [Interior angle theorem, from (ii)]

$\angle B = \angle R = 90^\circ$

$\therefore \angle A = \angle B = \angle S = \angle R = 90^\circ$ (iii)

$\therefore$ ASRB is a rectangle.

$\therefore AS = BR$ (iv) [Opposite sides of a rectangle]



In $\triangle PTS$, $\angle PST$ is an acute angle

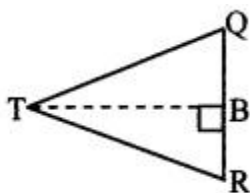
and seg AT $\perp$ side PS [From (iii)]

$\therefore TP^2 = PS^2 + TS^2 - 2 PS \cdot AS$ (v) [Application of Pythagoras theorem]

In $\triangle TQR$, $\angle TRQ$ is an acute angle

and seg BT $\perp$ side QR [From (iii)]

$\therefore TQ^2 = RQ^2 + TR^2 - 2 RQ \cdot BR$ (vi) [Application of pythagoras theorem]



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$$TP^2 - TQ^2 = PS^2 + TS^2 - 2PS \cdot AS$$

$$-RQ^2 - TR^2 + 2RQ \cdot BR \text{ [Subtracting (vi) from (v)]}$$

$$\therefore TP^2 - TQ^2 = TS^2 - TR^2 + PS^2$$

$$-RQ^2 - 2PS \cdot AS + 2RQ \cdot BR$$

$$\therefore TP^2 - TQ^2 = TS^2 - TR^2 + PS^2$$

$$-PS^2 - 2PS \cdot BR + 2PS \cdot BR \text{ [From (i) and (iv)]}$$

$$\therefore TP^2 - TQ^2 = TS^2 - TR^2$$

$$\therefore TS^2 + TQ^2 = TP^2 + TR^2$$

Question 1.

In $\triangle ABC$, $\angle C$ is an acute angle, seg AD lseg BC. Prove that: $AB^2 = BC^2 + AC^2 - 2BC \times DC$.
(Textbook pg. no. 44)

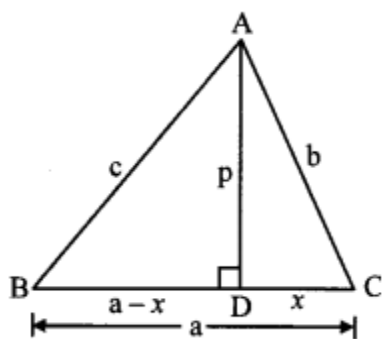
Given: $\angle C$ is an acute angle, seg AD $\perp$ seg BC.

To prove: $AB^2 = BC^2 + AC^2 - 2BC \times DC$

Solution:

Proof:

$\therefore$ Let $AB = c$, $AC = b$, $AD = p$,



$\therefore BC = a$, $DC = x$

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$$BD + DC = BC \text{ [B - D - C]}$$

$$\therefore BD = BC - DC$$

$$\therefore BD = a - x$$

In $\triangle ABD$, $\angle D = 90^\circ$ [Given]

$$AB^2 = BD^2 + AD^2 \text{ [Pythagoras theorem]}$$

$$\therefore c^2 = (a - x)^2 + [P^2] \text{ (i)}$$

$$\therefore c^2 = a^2 - 2ax + x^2 + [P^2]$$

In $\triangle ADC$, $\angle D = 90^\circ$ [Given]

$$AC^2 = AD^2 + CD^2 \text{ [Pythagoras theorem]}$$

$$\therefore b^2 = p^2 + [X^2]$$

$$\therefore p^2 = b^2 - [X^2] \text{ (ii)}$$

$$\therefore c^2 = a^2 - 2ax + x^2 + b^2 - x^2 \text{ [Substituting (ii) in (i)]}$$

$$\therefore c^2 = a^2 + b^2 - 2ax$$

$$\therefore AB^2 = BC^2 + AC^2 - 2 BC \times DC$$

Question 2.

In $\triangle ABC$, $\angle ACB$ is an obtuse angle, seg $AD \perp$ seg BC . Prove that: $AB^2 = BC^2 + AC^2 + 2 BC \times CD$. (Textbook pg. no. 40 and 4.1)

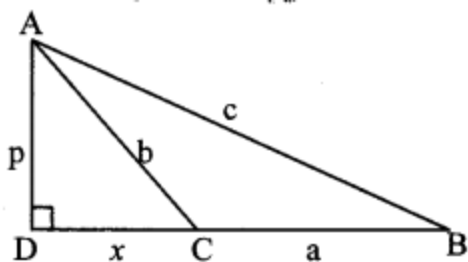
Given: $\angle ACB$ is an obtuse angle, seg $AD \perp$ seg BC .

To prove: $AB^2 = BC^2 + AC^2 + 2BC \times CD$

Solution:

Proof:

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Let $AD = p$, $AC = b$, $AB = c$,

$BC = a$, $DC = x$

$BD = BC + DC$ [B – C – D]

$\therefore BD = a + x$

In $\triangle ADB$, $\angle D = 90^\circ$ [Given]

$AB^2 = BD^2 + AD^2$ [Pythagoras theorem]

$\therefore c^2 = (a + x)^2 + p^2$ (i)

$\therefore c^2 = a^2 + 2ax + x^2 + p^2$

Also, in $\triangle ADC$, $\angle D = 90^\circ$ [Given]

$AC^2 = CD^2 + AD^2$ [Pythagoras theorem]

$\therefore b^2 = x^2 + p^2$

$\therefore p^2 = b^2 - x^2$ (ii)

$\therefore c^2 = a^2 + 2ax + x^2 + b^2 - x^2$ [Substituting (ii) in (i)]

$\therefore c^2 = a^2 + b^2 + 2ax$

$\therefore AB^2 = BC^2 + AC^2 + 2 BC \times CD$

Question 3.

In $\triangle ABC$, if M is the midpoint of side BC and seg $AM \perp$ seg BC , then prove that

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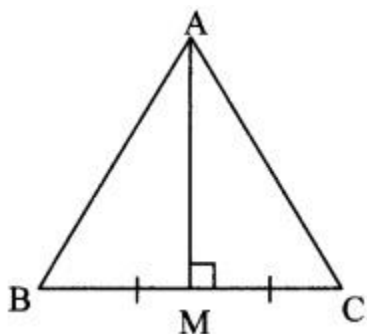
$AB^2 + AC^2 = 2 AM^2 + 2 BM^2$. (Textbook pg, no. 41)

Given: In $\triangle ABC$, M is the midpoint of side BC and $\text{seg } AM \perp \text{seg } BC$.

To prove: $AB^2 + AC^2 = 2 AM^2 + 2 BM^2$

Solution:

Proof:



In $\triangle AMB$, $\angle M = 90^\circ$ [$\text{seg } AM \perp \text{seg } BC$]

$\therefore AB^2 = AM^2 + BM^2$ (i) [Pythagoras theorem]

Also, in $\triangle AMC$, $\angle M = 90^\circ$ [$\text{seg } AM \perp \text{seg } BC$]

$\therefore AC^2 = AM^2 + MC^2$ (ii) [Pythagoras theorem]

$\therefore AB^2 + AC^2 = AM^2 + BM^2 + AM^2 + MC^2$ [Adding (i) and (ii)]

$\therefore AB^2 + AC^2 = 2 AM^2 + BM^2 + MC^2$ [$\because BM = MC$ (M is the midpoint of BC)]

$\therefore AB^2 + AC^2 = 2 AM^2 + 2 BM^2$



Maharashtra Board Solutions

Class 10 Maths (Part 2)

- Chapter 1- Similarity
- Chapter 2- Pythagoras Theorem
- Chapter 3- Circle
- Chapter 4- Geometric Constructions
- Chapter 5- Co-ordinate Geometry
- Chapter 6- Trigonometry
- Chapter 7- Mensuration

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About About Maharashtra State Board (MSBSHSE)

The Maharashtra State Board of Secondary and Higher Secondary Education or MSBSHSE (Marathi: महाराष्ट्र राज्य माध्यमिक आणि उच्च माध्यमिक शिक्षण मंडळ), is an **autonomous and statutory body established in 1965**. The board was amended in the year 1977 under the provisions of the Maharashtra Act No. 41 of 1965.

The Maharashtra State Board of Secondary & Higher Secondary Education (MSBSHSE), Pune is an independent body of the Maharashtra Government. There are more than 1.4 million students that appear in the examination every year. The Maha State Board conducts the board examination twice a year. This board conducts the examination for SSC and HSC.

The Maharashtra government established the Maharashtra State Bureau of Textbook Production and Curriculum Research, also commonly referred to as Ebalbharati, in 1967 to take up the responsibility of providing quality textbooks to students from all classes studying under the Maharashtra State Board. MSBHSE prepares and updates the curriculum to provide holistic development for students. It is designed to tackle the difficulty in understanding the concepts with simple language with simple illustrations. Every year around 10 lakh students are enrolled in schools that are affiliated with the Maharashtra State Board.

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How many state boards are there in Maharashtra?

The Maharashtra State Board of Secondary & Higher Secondary Education, conducts the HSC and SSC Examinations in the state of Maharashtra through its nine Divisional Boards located at Pune, Mumbai, Aurangabad, Nasik, Kolhapur, Amravati, Latur, Nagpur and Ratnagiri.

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