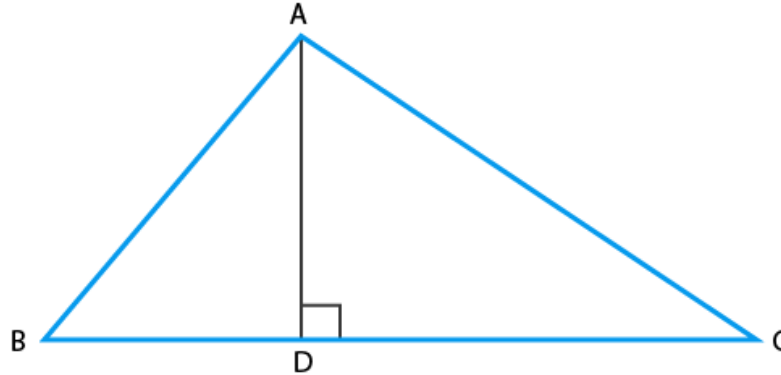


EXERCISE 6.1

PAGE NO: 60

1. In figure, if $\angle BAC = 90^\circ$ and $AD \perp BC$. Then,

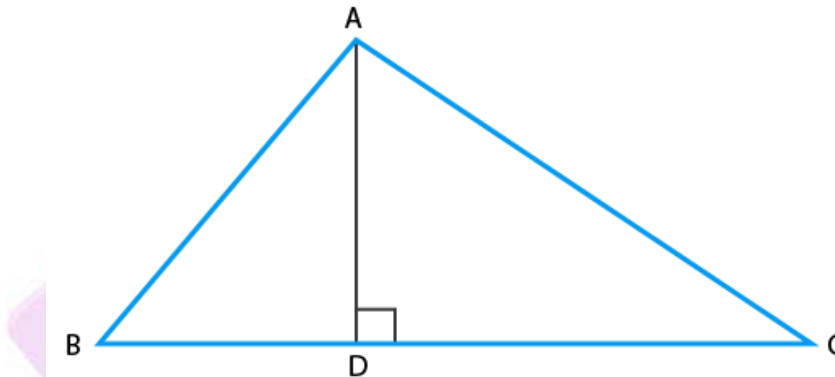
- (a) $BD \cdot CD = BZC^2$ (b) $AB \cdot AC = BC^2$ (c) $BD \cdot CD = AD^2$ (d) $AB \cdot AC = AD^2$



Solution:

(c) $BD \cdot CD = AD^2$

Explanation:



From $\triangle ADB$ and $\triangle ADC$,

According to the question, we have,

$\angle D = \angle D = 90^\circ$ ($\because AD \perp BC$)

$\angle DBA = \angle DAC$ [each angle = $90^\circ - \angle C$]

Using AAA similarity criteria,

$\triangle ADB \sim \triangle ADC$

$BD/AD = AD/CD$

$BD \cdot CD = AD^2$

2. If the lengths of the diagonals of rhombus are 16 cm and 12 cm. Then, the length of the sides of the rhombus is

- (a) 9 cm (b) 10 cm (c) 8 cm (d) 20 cm

Solution:

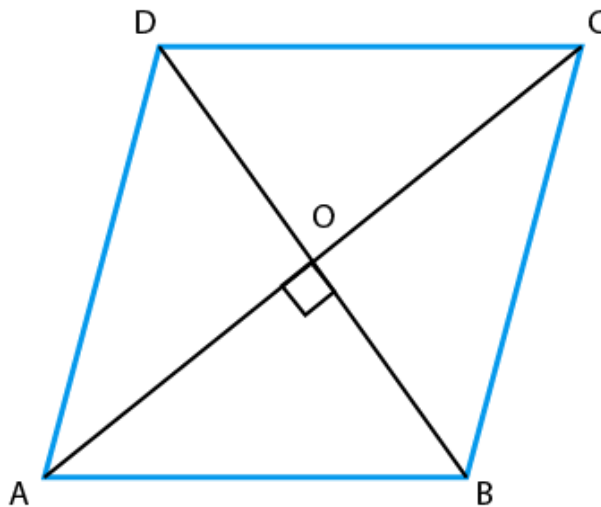
(b) 10 cm

Explanation:

We know that,

A rhombus is a simple quadrilateral whose four sides are of same length and diagonals are perpendicular bisector of each other.

According to the question, we get,



According to the question,

$AC = 16 \text{ cm}$ and $BD = 12 \text{ cm}$

$\angle AOB = 90^\circ$

$\therefore AC$ and BD bisect each other

$AO = \frac{1}{2} AC$ and $BO = \frac{1}{2} BD$

Then, we get,

$AO = 8 \text{ cm}$ and $BO = 6 \text{ cm}$

Now, in right angled $\triangle AOB$,

Using the Pythagoras theorem,

We have,

$$AB^2 = AO^2 + OB^2$$

$$AB^2 = 8^2 + 6^2 = 64 + 36 = 100$$

$$\therefore AB = \sqrt{100} = 10 \text{ cm}$$

We know that the four sides of a rhombus are equal.

Therefore, we get,

one side of rhombus = 10 cm.

3. If $\triangle ABC \sim \triangle EDF$ and $\triangle ABC$ is not similar to $\triangle DEF$, then which of the following is not true?

(a) $BC \cdot EF = AC \cdot FD$

(b) $AB \cdot EF = AC \cdot DE$

(c) $BC \cdot DE = AB \cdot EF$

(d) $BC \cdot DE = AB \cdot FD$

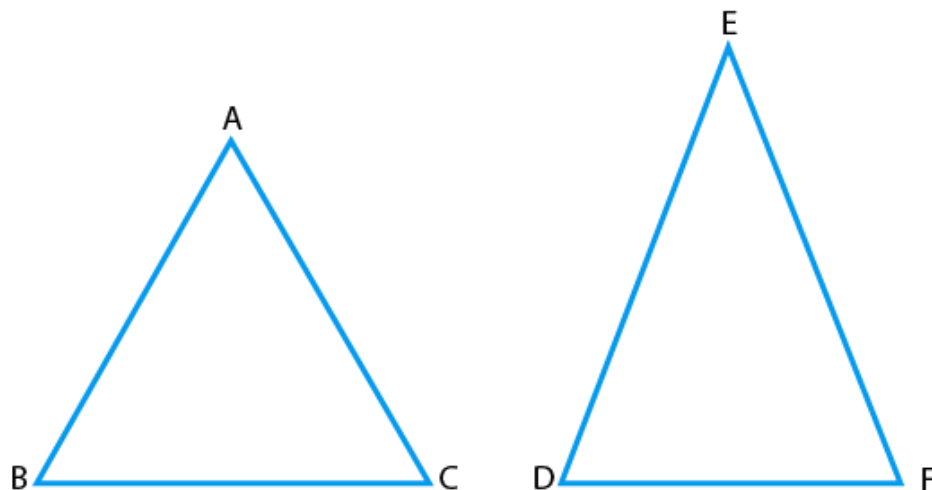
Solution:

(c) $BC \cdot DE = AB \cdot EF$

Explanation:

We know that,

If sides of one triangle are proportional to the side of the other triangle, and the corresponding angles are also equal, then the triangles are similar by SSS similarity.



So, $\triangle ABC \sim \triangle EDF$

Using similarity property,

$$AB/ED = BC/DF = AC/EF$$

Taking $AB/ED = BC/DF$, we get

$$AB/ED = BC/DF$$

$$AB \cdot DF = ED \cdot BC$$

So, option (d) $BC \cdot DE = AB \cdot FD$ is true

Taking $BC/DF = AC/EF$, we get

$$BC/DF = AC/EF$$

$$\Rightarrow BC \cdot EF = AC \cdot DF$$

So, option (a) $BC \cdot EF = AC \cdot FD$ is true

Taking $AB/ED = AC/EF$, we get,

$$AB/ED = AC/EF$$

$$AB \cdot EF = ED \cdot AC$$

So, option (b) $AB \cdot EF = AC \cdot DE$ is true.

4. If in two $\triangle PQR$, $AB/QR = BC/PR = CA/PQ$, then

(a) $\triangle PQR \sim \triangle CAB$

(b) $\triangle PQR \sim \triangle ABC$

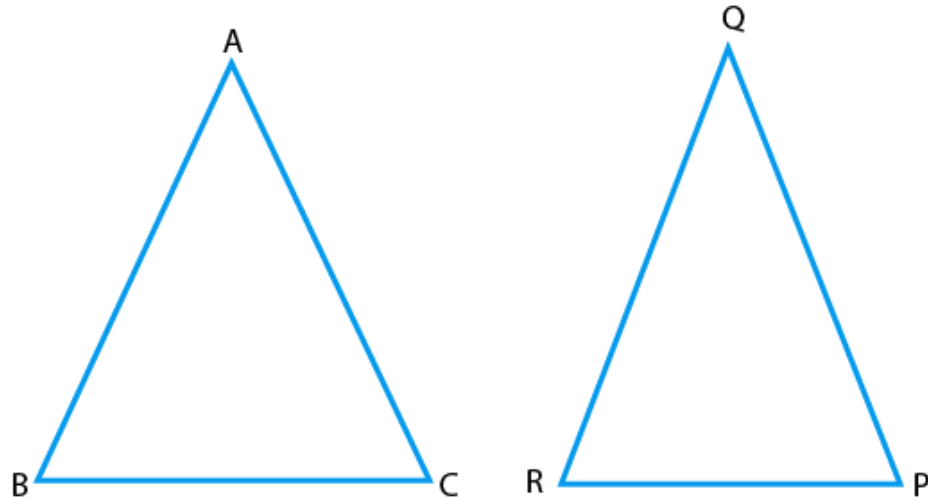
(c) $\triangle CBA \sim \triangle PQR$

(d) $\triangle BCA \sim \triangle PQR$

Solution:

(a) $\triangle PQR \sim \triangle CAB$

Explanation:



From $\triangle ABC$ and $\triangle PQR$, we have,

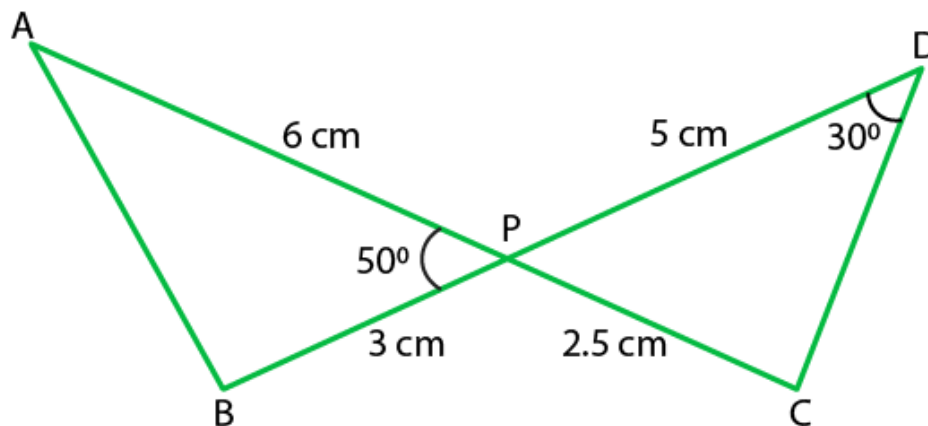
$$AB/QR = BC/PR = CA/PQ$$

If sides of one triangle are proportional to the side of the other triangle, and their corresponding angles are also equal, then both the triangles are similar by SSS similarity.

Therefore, we have,

$$\triangle PQR \sim \triangle CAB$$

5. In figure, two line segments AC and BD intersect each other at the point P such that $PA = 6$ cm, $PB = 3$ cm, $PC = 2.5$ cm, $PD = 5$ cm, $\angle APB = 50^\circ$ and $\angle CDP = 30^\circ$. Then, $\angle PBA$ is equal to
 (a) 50° (b) 30° (c) 60° (d) 100°



Solution:

(d) 100°

Explanation:

From $\triangle APB$ and $\triangle CPD$,

$\angle APB = \angle CPD = 50^\circ$ (since they are vertically opposite angles)

$$AP/PD = 6/5 \dots (i)$$

$$\text{Also, } BP/CP = 3/2.5$$

$$\text{Or } BP/CP = 6/5 \dots (ii)$$

From equations (i) and (ii),

We get,

$$AP/PD = BP/CP$$

So, $\triangle APB \sim \triangle DPC$ [using SAS similarity criterion]

$$\therefore \angle A = \angle D = 30^\circ \text{ [since, corresponding angles of similar triangles]}$$

Since, Sum of angles of a triangle = 180° ,

In $\triangle APB$,

$$\angle A + \angle B + \angle APB = 180^\circ$$

$$\text{So, } 30^\circ + \angle B + 50^\circ = 180^\circ$$

$$\text{Then, } \angle B = 180^\circ - (50^\circ + 30^\circ)$$

$$\angle B = 180 - 80^\circ = 100^\circ$$

$$\text{Therefore, } \angle PBA = 100^\circ$$

EXERCISE 6.2

PAGE NO: 63

1. Is the triangle with sides 25 cm, 5 cm and 24 cm a right triangle? Give reason for your answer.

Solution:

False

According to the question,

Let us assume that,

$$A = 25 \text{ cm}$$

$$B = 5 \text{ cm}$$

$$C = 24 \text{ cm}$$

Now, Using Pythagoras Theorem,

We have,

$$A^2 = B^2 + C^2$$

$$B^2 + C^2 = (5)^2 + (24)^2$$

$$B^2 + C^2 = 25 + 576$$

$$B^2 + C^2 = 601$$

$$A^2 = 600$$

$$600 \neq 601$$

$$A^2 \neq B^2 + C^2$$

Since the sides does not satisfy the property of Pythagoras theorem, triangle with sides 25cm, 5cm and 24cm is not a right triangle.

2. It is given that $\triangle DEF \sim \triangle RPQ$. Is it true to say that $\angle D = \angle R$ and $\angle F = \angle P$? Why?

Solution:

False

We know that,

Corresponding angles are equal in similar triangles.

So, we get,

$$\angle D = \angle R$$

$$\angle E = \angle P$$

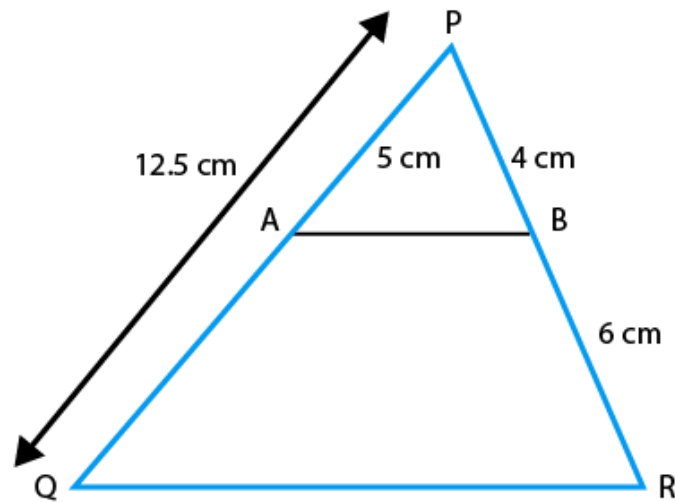
$$\angle F = \angle Q$$

3. A and B are respectively the points on the sides PQ and PR of a $\triangle PQR$ such that PQ = 12.5 cm, PA = 5 cm, BR = 6 cm and PB = 4 cm. Is AB \parallel QR? Give reason for your answer.

Solution:

True

According to the question,



$$PQ = 12.5 \text{ cm}$$

$$PA = 5 \text{ cm}$$

$$BR = 6 \text{ cm}$$

$$PB = 4 \text{ cm}$$

Then,

$$QA = QP - PA = 12.5 - 5 = 7.5 \text{ cm}$$

So,

$$PA/AQ = 5/7.5 = 50/75 = 2/3 \dots (i)$$

$$PB/BR = 4/6 = 2/3 \dots (ii)$$

From Equations (i) and (ii).

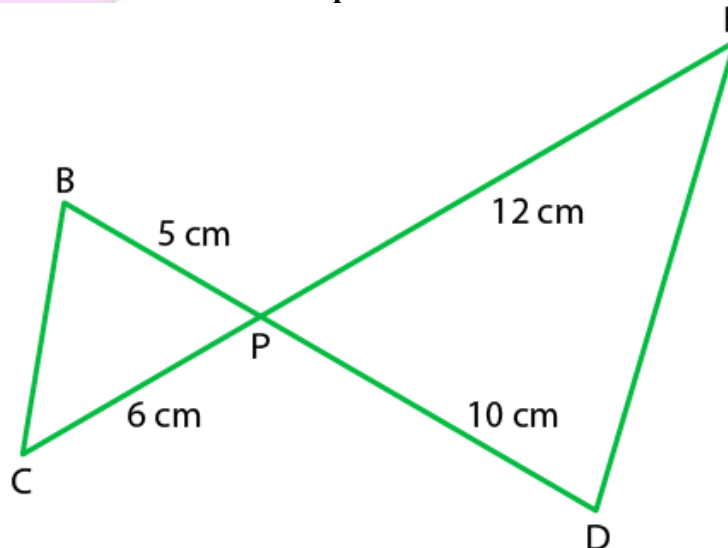
$$PA/AQ = PB/BR$$

We know that, if a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.

Therefore,

$$AB \parallel QR.$$

4. In figure, BD and CE intersect each other at the point P. Is $\Delta PBC \sim \Delta PDE$? Why?



Solution:

True

In $\triangle PBC$ and $\triangle PDE$,

$\angle BPC = \angle EPD$ [vertically opposite angles]

$PB/PD = 5/10 = \frac{1}{2} \dots (i)$

$PC/PE = 6/12 = \frac{1}{2} \dots (ii)$

From equation (i) and (ii),

We get,

$$PB/PD = PC/PE$$

Since, $\angle BPC$ of $\triangle PBC = \angle EPD$ of $\triangle PDE$ and the sides including these.

Then, by SAS similarity criteria

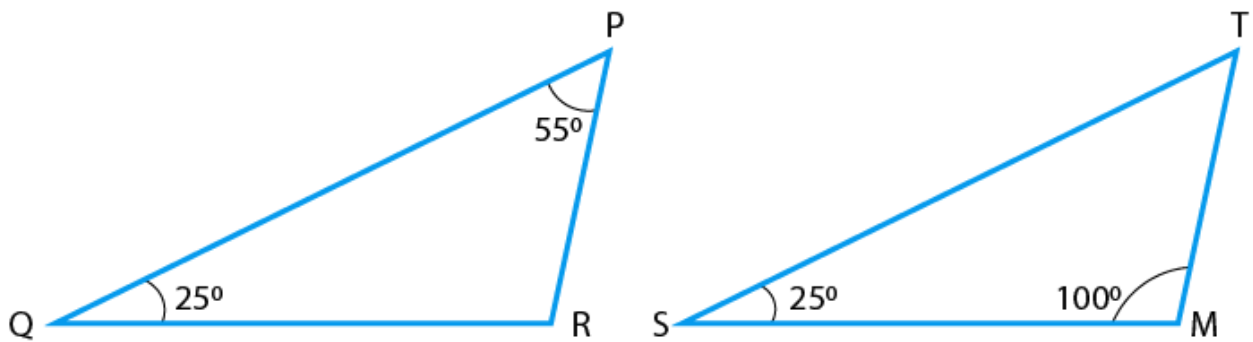
$\triangle PBC \sim \triangle PDE$

5. In $\triangle PQR$ and $\triangle MST$, $\angle P = 55^\circ$, $\angle Q = 25^\circ$, $\angle M = 100^\circ$ and $\angle S = 25^\circ$. Is $\triangle QPR \sim \triangle TSM$? Why?

Solution:

We know that,

Sum of the three angles of a triangle = 180° .



Then, from $\triangle PQR$,

$$\angle P + \angle Q + \angle R = 180^\circ$$

$$55^\circ + 25^\circ + \angle R = 180^\circ$$

So, we get,

$$\angle R = 180^\circ - (55^\circ + 25^\circ) = 180^\circ - 80^\circ = 100^\circ$$

Similarly, from $\triangle TSM$,

$$\angle T + \angle S + \angle M = 180^\circ$$

$$\angle T + 25^\circ + 100^\circ = 180^\circ$$

So, we get,

$$\angle T = 180^\circ - (\angle 25^\circ + 100^\circ)$$

$$\angle T = 180^\circ - 125^\circ = 55^\circ$$

In $\triangle PQR$ and $\triangle TSM$,

We have,

$$\angle P = \angle T,$$

$$\angle Q = \angle S$$

$$\angle R = \angle M$$

Hence, $\triangle PQR \sim \triangle TSM$

Since, all corresponding angles are equal,

$\triangle QPR$ is similar to $\triangle TSM$,

6. Is the following statement true? Why?

“Two quadrilaterals are similar, if their corresponding angles are equal”.

Solution:

False

Two quadrilaterals cannot be similar, if only their corresponding angles are equal



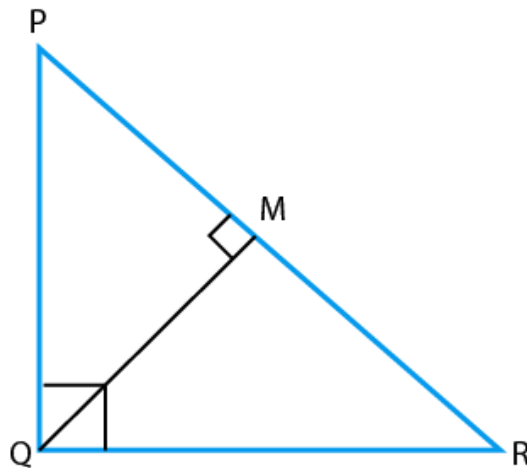
EXERCISE 6.3

PAGE NO: 66

1. In a ΔPQR , $PR^2 - PQ^2 = QR^2$ and M is a point on side PR such that $QM \perp PR$.
Prove that $QM^2 = PM \times MR$.

Solution:

According to the question,



In ΔPQR ,

$PR^2 = PQ^2$ and $QM \perp PR$

Using Pythagoras theorem, we have,

$$PR^2 = PQ^2 + QR^2$$

ΔPQR is right angled triangle at Q.

From ΔQMR and ΔPMQ , we have,

$$\angle M = \angle M$$

$$\angle MQR = \angle QPM [= 90^\circ - \angle R]$$

So, using the AAA similarity criteria,

We have,

$$\Delta QMR \sim \Delta PMQ$$

Also, we know that,

Area of triangles = $\frac{1}{2} \times \text{base} \times \text{height}$

So, by property of area of similar triangles,

$$\frac{\text{ar}(\Delta QMR)}{\text{ar}(\Delta PMQ)} = \frac{(QM)^2}{(PM)^2}$$

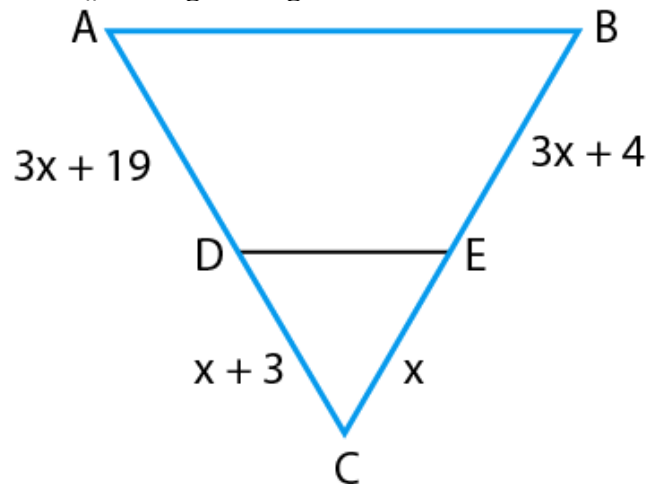
$$\frac{\text{ar}(\Delta QMR)}{\text{ar}(\Delta PMQ)} = \frac{\frac{1}{2} \times RM \times QM}{\frac{1}{2} \times PM \times QM}$$

$$\frac{\text{ar}(\Delta QMR)}{\text{ar}(\Delta PMQ)} = \frac{(QM)^2}{(PM)^2}$$

$$QM^2 = PM \times RM$$

Hence proved.

2. Find the value of x for which $DE \parallel AB$ in given figure.



Solution:

According to the question,

$DE \parallel AB$

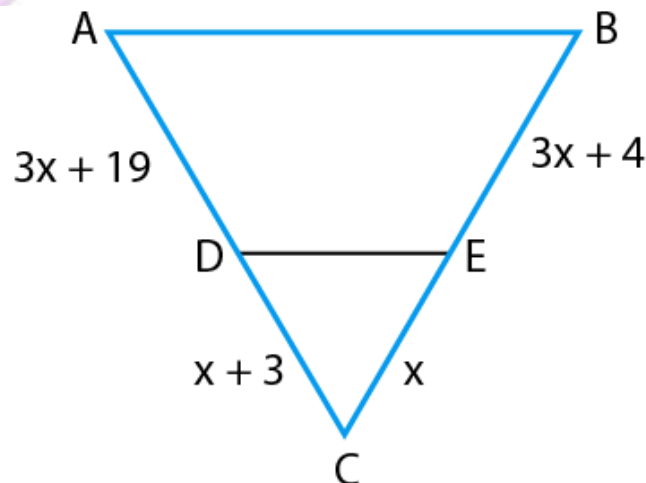
Using basic proportionality theorem,

$$CD/AD = CE/BE$$

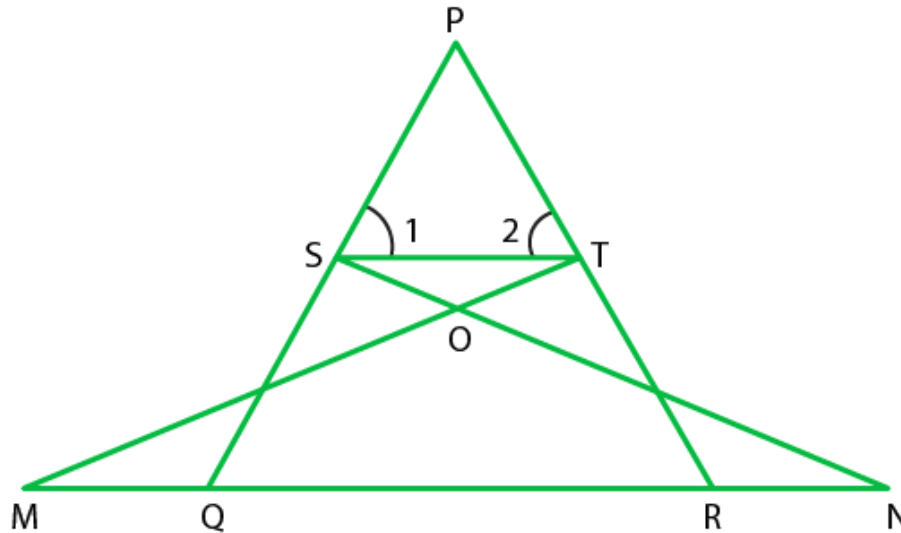
\therefore If a line is drawn parallel to one side of a triangle such that it intersects the other sides at distinct points, then, the other two sides are divided in the same ratio.

Hence, we can conclude that, the line drawn is equal to the third side of the triangle.

$$\begin{aligned} \frac{x+3}{3x+19} &= \frac{x}{3x+4} \\ (x+3)(3x+4) &= x(3x+19) \\ 3x^2 + 4x + 9x + 12 &= 3x^2 + 19x \\ 19x - 13x &= 12 \\ 6x &= 12 \\ \therefore x &= 12/6 = 2 \end{aligned}$$



3. In figure, if $\angle 1 = \angle 2$ and $\triangle NSQ \cong \triangle MTR$, then prove that $\triangle PTS \sim \triangle PRQ$.



Solution:

According to the question,

$$\triangle NSQ \cong \triangle MTR$$

$$\angle 1 = \angle 2$$

Since,

$$\triangle NSQ \cong \triangle MTR$$

So,

$$SQ = TR \dots (i)$$

Also,

$$\angle 1 = \angle 2 \Rightarrow PT = PS \dots (ii)$$

[Since, sides opposite to equal angles are also equal]

From Equation (i) and (ii).

$$PS/SQ = PT/TR$$

$$\Rightarrow ST \parallel QR$$

By converse of basic proportionality theorem, If a line is drawn parallel to one side of a triangle to intersect the other sides in distinct points, the other two sides are divided in the same ratio.

$$\therefore \angle 1 = \angle PQR$$

And

$$\angle 2 = \angle PRQ$$

In $\triangle PTS$ and $\triangle PRQ$.

$$\angle P = \angle P \text{ [Common angles]}$$

$$\angle 1 = \angle PQR \text{ (proved)}$$

$$\angle 2 = \angle PRQ \text{ (proved)}$$

$$\therefore \triangle PTS \sim \triangle PRQ$$

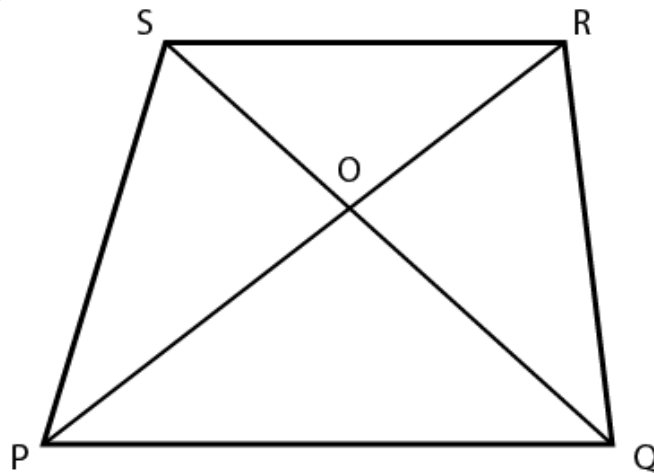
[By AAA similarity criteria]

Hence proved.

4. Diagonals of a trapezium PQRS intersect each other at the point O, $PQ \parallel RS$ and $PQ = 3 RS$. Find the ratio of the areas of $\triangle POQ$ and $\triangle ROS$.

Solution:

According to the question,
PQRS is a trapezium in which $PQ \parallel RS$ and $PQ = 3RS$
 $PQ/RS = 3/1 = 3 \dots(i)$



In ΔPOQ and ΔROS ,
 $\angle SOP = \angle QOP$ [vertically opposite angles]
 $\angle SRP = \angle RPQ$ [alternate angles]
 $\therefore \Delta POQ \sim \Delta ROS$ [by AAA similarity criterion]

By property of area of similar triangle,

$$\frac{\text{Ar}(\Delta POQ)}{\text{ar}(\Delta ROS)} = \left(\frac{PQ}{RS}\right)^2 = \left(\frac{3}{1}\right)^2 = 9$$

$$\Rightarrow \frac{\text{ar}(\Delta POQ)}{\text{ar}(\Delta ROS)} = \frac{9}{1}$$

Therefore, the required ratio = 9:1.

5. In figure, if $AB \parallel DC$ and AC, PQ intersect each other at the point O . Prove that $OA.CQ = OC.AP$.

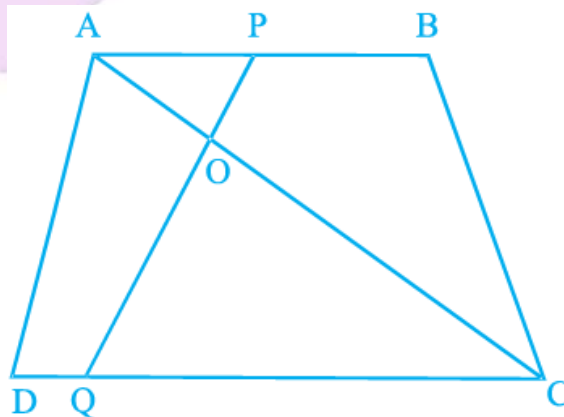


Fig. 6.10

Solution:

According to the question,

AC and PQ intersect each other at the point O and $AB \parallel DC$.

From $\triangle AOP$ and $\triangle COQ$,

$\angle AOP = \angle COQ$ [Since they are vertically opposite angles]

$\angle APO = \angle CQO$ [since, $AB \parallel DC$ and PQ is transversal, the angles are alternate angles]

$\therefore \triangle AOP \sim \triangle COQ$ [using AAA similarity criterion]

Then, since, corresponding sides are proportional

We have,

$$OA/OC = AP/CQ$$

$$OA \times CQ = OC \times AP$$

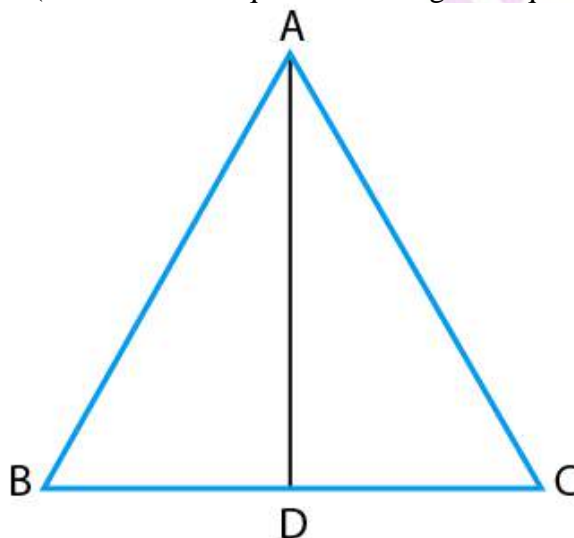
Hence Proved.

6. Find the altitude of an equilateral triangle of side 8 cm.

Solution:

Let ABC be an equilateral triangle of side 8 cm

$AB = BC = CA = 8$ cm. (all sides of an equilateral triangle is equal)



Draw altitude AD which is perpendicular to BC.

Then, D is the mid-point of BC.

$$\therefore BD = CD = \frac{1}{2}$$

$$BC = 8/2 = 4 \text{ cm}$$

Now, by Pythagoras theorem

$$AB^2 = AD^2 + BD^2$$

$$\Rightarrow (8)^2 = AD^2 + (4)^2$$

$$\Rightarrow 64 = AD^2 + 16$$

$$\Rightarrow AD = \sqrt{48} = 4\sqrt{3} \text{ cm.}$$

Hence, altitude of an equilateral triangle is $4\sqrt{3}$ cm.

7. If $\triangle ABC \sim \triangle DEF$, $AB = 4$ cm, $DE = 6$, $EF = 9$ cm and $FD = 12$ cm, then find the perimeter of $\triangle ABC$.

Solution:

According to the question,

$$AB = 4 \text{ cm,}$$

$$DE = 6 \text{ cm}$$

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

$$FD = 12 \text{ cm}$$

Also,

$$\triangle ABC \sim \triangle DEF$$

We have,

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

$$\frac{4}{6} = \frac{BC}{9} = \frac{AC}{12}$$

By taking first two terms, we have

$$\frac{4}{6} = \frac{BC}{9}$$

$$BC = \frac{(4 \times 9)}{6} = 6 \text{ cm}$$

And by taking last two terms, we have,

$$\frac{BC}{9} = \frac{AC}{12}$$

$$\frac{6}{9} = \frac{AC}{12}$$

$$AC = \frac{6 \times 12}{9} = 8 \text{ cm}$$

Now,

$$\begin{aligned} \text{Perimeter of } \triangle ABC &= AB + BC + AC \\ &= 4 + 6 + 8 = 18 \text{ cm} \end{aligned}$$

Thus, the perimeter of the triangle is 18 cm.

EXERCISE 6.4

PAGE NO: 73

1. In Fig. 6.16, if $\angle A = \angle C$, $AB = 6$ cm, $BP = 15$ cm, $AP = 12$ cm and $CP = 4$ cm, then find the lengths of PD and CD .

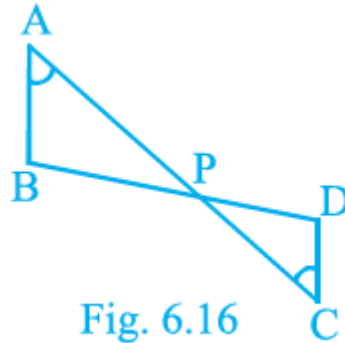


Fig. 6.16

Solution:

According to the question,

$$\angle A = \angle C,$$

$$AB = 6 \text{ cm}, BP = 15 \text{ cm},$$

$$AP = 12 \text{ cm}$$

$$CP = 4 \text{ cm}$$

From $\triangle APB$ and $\triangle CPD$,

$$\angle A = \angle C$$

$$\angle APB = \angle CPD \text{ [vertically opposite angles]}$$

\therefore By AAA similarity criteria,

$$\triangle APB \sim \triangle CPD$$

Using basic proportionality theorem,

$$\frac{AP}{CP} = \frac{PB}{PD} = \frac{AB}{CD}$$

$$\frac{12}{4} = \frac{15}{PD} = \frac{6}{CD}$$

Considering $AP/CP = PB/PD$, we get,

$$\frac{12}{4} = \frac{15}{PD}$$

$$PD = \frac{15 \times 4}{12} = \frac{60}{12} = 5 \text{ cm}$$

Considering, $AP/CP = AB/CD$

$$CD = \frac{(6 \times 4)}{12} = 2 \text{ cm}$$

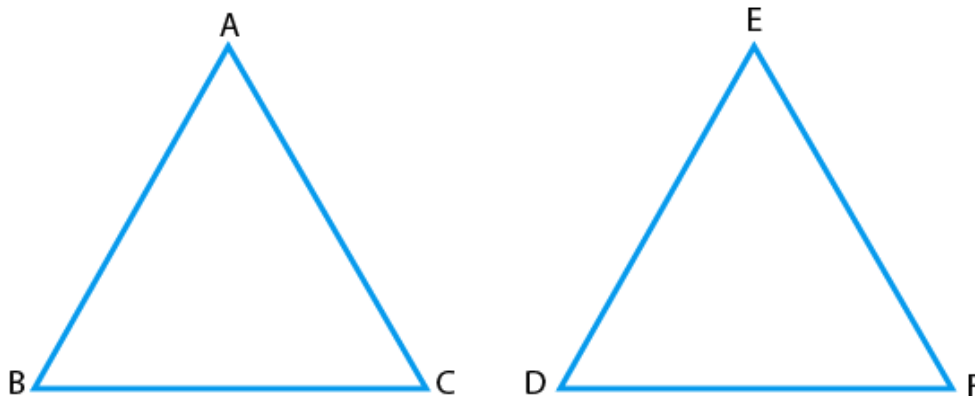
Therefore,

Length of $PD = 5$ cm

Length of CD = 2 cm

2. It is given that $\triangle ABC \sim \triangle EDF$ such that $AB = 5$ cm, $AC = 7$ cm, $DF = 15$ cm and $DE = 12$ cm. Find the lengths of the remaining sides of the triangles.

Solution:



According to the question,

$\triangle ABC \sim \triangle EDF$

From property of similar triangle,

We know that, corresponding sides of $\triangle ABC$ and $\triangle EDF$ are in the same ratio.

$AB/ED = AC/EF = BC/DF$ (i)

According to the question,

$AB = 5$ cm, $AC = 7$ cm

$DF = 15$ cm and $DE = 12$ cm

Substituting these values in Equation (i), we get,

$$\frac{5}{12} = \frac{7}{EF} = \frac{BC}{15}$$

On taking $5/12 = 7/EF$, we get,

$$\frac{5}{12} = \frac{7}{EF}$$

$$EF = \frac{12 \times 7}{5} = 16.8 \text{ cm}$$

On taking $5/12 = BC/15$, we get,

$$\frac{5}{12} = \frac{BC}{15}$$

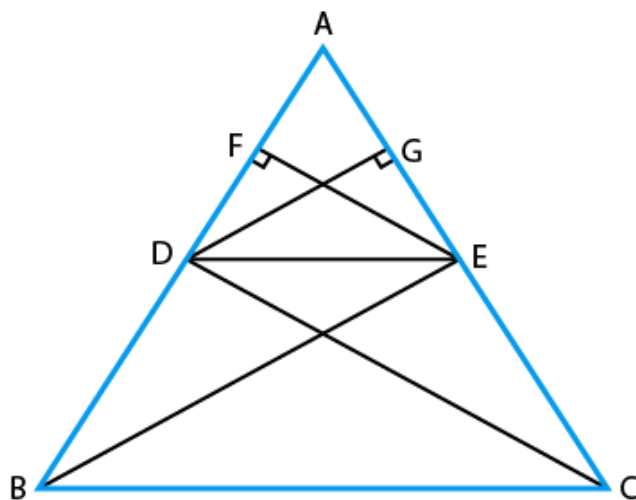
$$BC = \frac{5 \times 15}{12} = 6.25 \text{ cm}$$

Hence, lengths of the remaining sides of the triangles are $EF = 16.8$ cm and $BC = 6.25$ cm

3. Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides, then the two sides are divided in the same ratio.

Solution:

Let a $\triangle ABC$ in which a line DE parallel to BC intersects AB at D and AC at E .
To prove DE divides the two sides in the same ratio.
 $AD/DB = AE/EC$



Construction:

Join BE , CD

Draw $EF \perp AB$ and $DG \perp AC$.

We know that,

Area of triangle = $\frac{1}{2} \times \text{base} \times \text{height}$

Then,

$$\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle BDE)} = \frac{\frac{1}{2} \times AD \times EF}{\frac{1}{2} \times DB \times EF}$$

$$\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle BDE)} = \frac{AD}{DB} \quad \dots(i)$$

$$\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle DEC)} = \frac{\frac{1}{2} \times AE \times DG}{\frac{1}{2} \times EC \times DG}$$

$$\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle DEC)} = \frac{AE}{EC} \quad \dots(ii)$$

Since,

$\triangle BDE$ and $\triangle DEC$ lie between the same parallel DE and BC and are on the same base DE .

We have,

$$\text{area}(\triangle BDE) = \text{area}(\triangle DEC) \quad \dots(iii)$$

From Equation (i), (ii) and (iii),

We get,

$$AD/DB = AE/EC$$

Hence proved.

4. In Fig 6.17, if PQRS is a parallelogram and $AB \parallel PS$, then prove that $OC \parallel SR$.

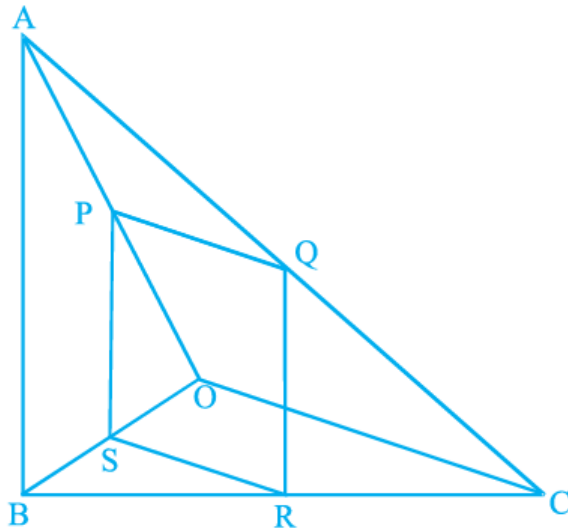
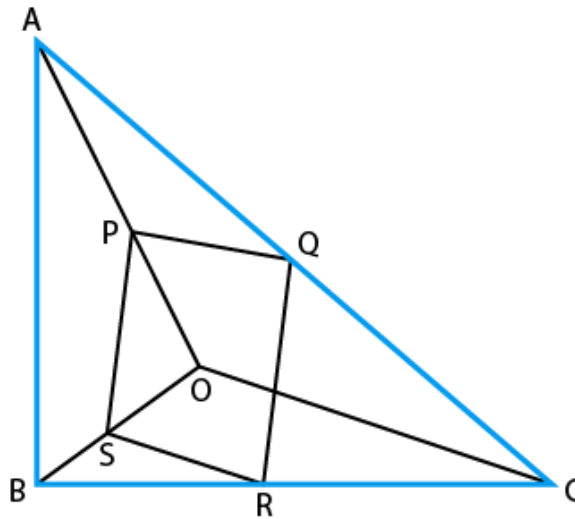


Fig. 6.17

Solution:

According to the question,
PQRS is a parallelogram,
Therefore, $PQ \parallel SR$ and $PS \parallel QR$.
Also given, $AB \parallel PS$.



To prove:

$OC \parallel SR$

From $\triangle OPS$ and OAB ,

$PS \parallel AB$

$\angle POS = \angle AOB$ [common angle]

$\angle OSP = \angle OBA$ [corresponding angles]

$\triangle OPS \sim \triangle OAB$ [by AAA similarity criteria]

Then,

Using basic proportionality theorem,

We get,

$$PS/OB = OS/OA \dots(i)$$

From $\triangle CQR$ and $\triangle CAB$,

$$QR \parallel PS \parallel AB$$

$$\angle QCR = \angle ACB \text{ [common angle]}$$

$$\angle CRQ = \angle CBA \text{ [corresponding angles]}$$

$$\triangle CQR \sim \triangle CAB$$

Then, by basic proportionality theorem

$$\frac{QR}{AB} = \frac{CR}{CB}$$

$$\frac{PC}{AB} = \frac{CR}{CB} \dots(ii)$$

[PS \cong QR Since, PQRS is a parallelogram,]

From Equation (i) and (ii),

$$\frac{OS}{OB} = \frac{CR}{CB}$$

$$\frac{OS}{OB} = \frac{CR}{CB}$$

Subtracting 1 from L.H.S and R.H.S, we get,

$$\frac{OS}{OB} - 1 = \frac{CR}{CB} - 1$$

$$\frac{OS - OB}{OB} = \frac{CR - CB}{CB}$$

$$\frac{BS}{OB} = \frac{BR}{CB}$$

SR \parallel OC [By converse of basic proportionality theorem]

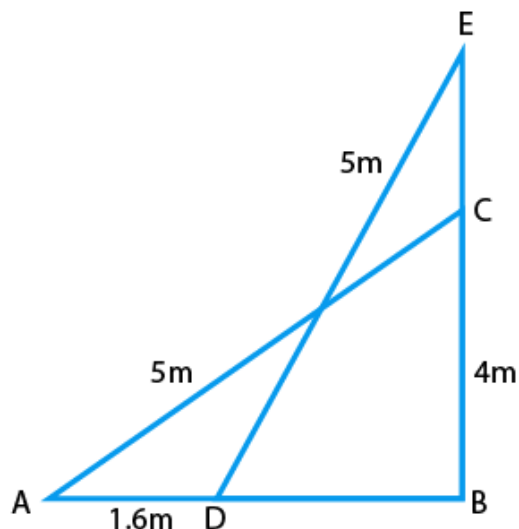
Hence proved.

5. A 5 m long ladder is placed leaning towards a vertical wall such that it reaches the wall at a point 4 m high. If the foot of the ladder is moved 1.6 m towards the wall, then find the distance by which the top of the ladder would slide upwards on the wall.

Solution:

Let the length of the ladder = AC = 5 m

Let the height of the wall on which ladder is placed = BC = 4m.



From right angled $\triangle EBD$,
Using the Pythagoras Theorem,
 $ED^2 = EB^2 + BD^2$
 $(5)^2 = (EB)^2 + (1.6)^2$ [$BD = 1.6$]
 $25 = (EB)^2 + 2.56$
 $(EB)^2 = 25 - 2.56 = 22.44$
 $EB = \sqrt{22.44} = 4.74$

Now, we have,

$$EC = EB - BC = 4.74 - 4 = 0.74$$

Hence, the top of the ladder would slide upwards on the wall by a distance of 0.74 m.

6. For going to a city B from city A, there is a route via city C such that $AC \perp CB$, $AC = 2x$ km and $CB = 2(x + 7)$ km. It is proposed to construct a 26 km highway which directly connects the two cities A and B. Find how much distance will be saved in reaching city B from city A after the construction of the highway.

Solution:

According to the question,

$$AC \perp CB,$$

$$AC = 2x \text{ km},$$

$$CB = 2(x + 7) \text{ km and } AB = 26 \text{ km}$$

Thus, we get $\triangle ACB$ right angled at C.

Now, from $\triangle ACB$,

Using Pythagoras Theorem,

$$AB^2 = AC^2 + BC^2$$

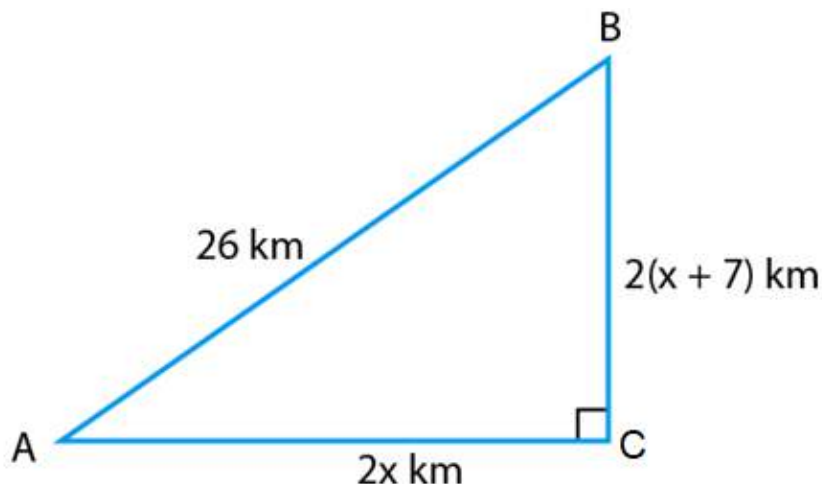
$$\Rightarrow (26)^2 = (2x)^2 + \{2(x + 7)\}^2$$

$$\Rightarrow 676 = 4x^2 + 4(x^2 + 196 + 14x)$$

$$\Rightarrow 676 = 4x^2 + 4x^2 + 196 + 56x$$

$$\Rightarrow 676 = 8x^2 + 56x + 196$$

$$\Rightarrow 8x^2 + 56x - 480 = 0$$



Dividing the equation by 8, we get,

$$x^2 + 7x - 60 = 0$$

$$x^2 + 12x - 5x - 60 = 0$$

$$x(x + 12) - 5(x + 12) = 0$$

$$(x + 12)(x - 5) = 0$$

$$\therefore x = -12 \text{ or } x = 5$$

Since the distance can't be negative, we neglect $x = -12$

$$\therefore x = 5$$

Now,

$$AC = 2x = 10 \text{ km}$$

$$BC = 2(x + 7) = 2(5 + 7) = 24 \text{ km}$$

Thus, the distance covered to city B from city A via city C = $AC + BC$

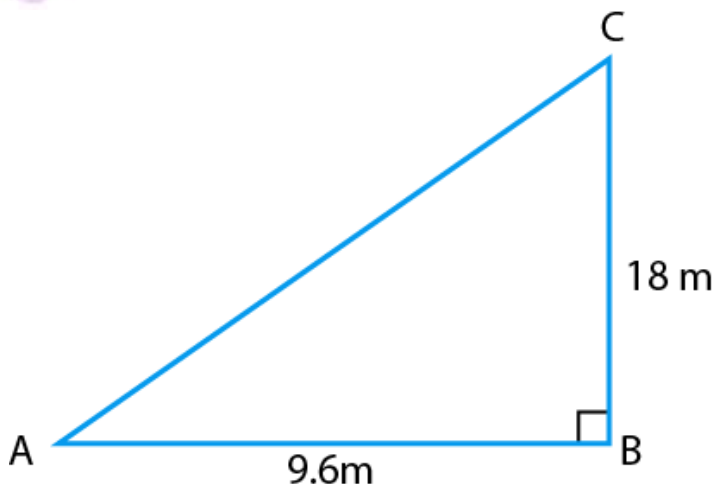
$$\begin{aligned} AC + BC &= 10 + 24 \\ &= 34 \text{ km} \end{aligned}$$

Distance covered to city B from city A after the highway was constructed = $BA = 26 \text{ km}$

Therefore, the distance saved = $34 - 26 = 8 \text{ km}$.

7. A flag pole 18 m high casts a shadow 9.6 m long. Find the distance of the top of the pole from the far end of the shadow.

Solution:



Let $MN = 18$ m be the flag pole and its shadow be $LM = 9.6$ m.

The distance of the top of the pole, N from the far end, L of the shadow is LN.

In right angled $\triangle LMN$,

$$LN^2 = LM^2 + MN^2 \text{ [by Pythagoras theorem]}$$

$$\Rightarrow LN^2 = (9.6)^2 + (18)^2$$

$$\Rightarrow LN^2 = 9.216 + 324$$

$$\Rightarrow LN^2 = 416.16$$

$$\therefore LN = \sqrt{416.16} = 20.4 \text{ m}$$

Hence, the required distance is 20.4 m

