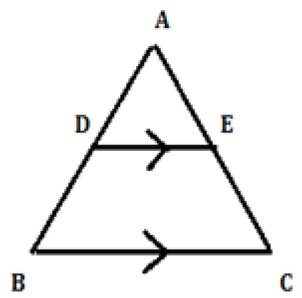
Practice Questions - Term 1

Date: 19/11/2021

Subject: Mathematics

Topic : Triangles   Class: X

1. $In\ \Delta ABC,\ DE \mid\mid BC\ and\ \frac{AD}{DB} = \frac{3}{5}$. If $AC = 5.6\ cm$, then $AE =$ _____.

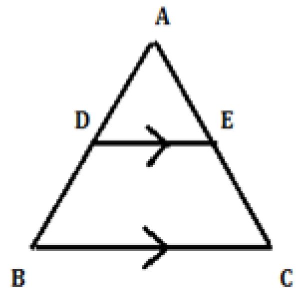


A. 2.1 cm

B. 2.4 cm

C. 3.2 cm

D. 3.6 cm



$In\ \Delta ABC,$

$DE \parallel BC \qquad (Given)$

$\frac{AD}{AB} = \frac{AE}{AC} \quad [Basic\ Proportionality\ Theorem]$

$\because AB = (3+5), AD = 3$

$AC = 5.6\ cm\ (Given)$

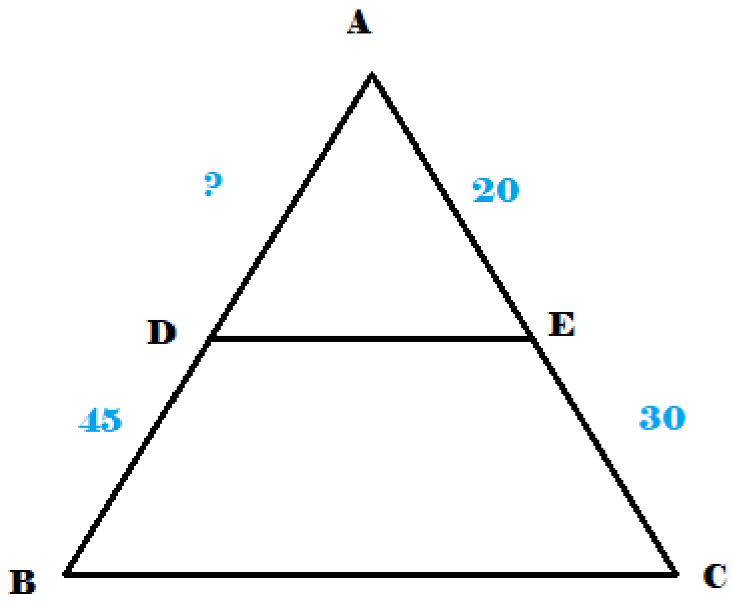
$\frac{3}{3+5} = \frac{AE}{5.6}$

$\frac{3}{8} = \frac{AE}{5.6}$

$AE = \frac{3 \times 5.6}{8} = 3 \times 0.7 = 2.1\ cm$

$\Rightarrow AE = 2.1\ cm$

2. In the given figure, if DE || BC then find AD.



A. 30 units

B. 50 units

C. 40 units

D. 10 units

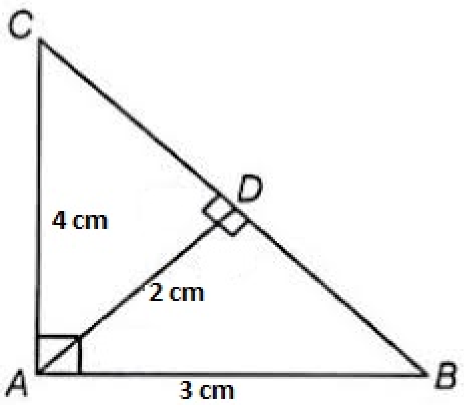
By Basic Proportionality Theorem,

$\frac{AD}{DB} = \frac{AE}{EC}$

$\Rightarrow \frac{AD}{45} = \frac{20}{30}$

$\Rightarrow AD = \frac{20 \times 45}{30} = 30\ units$

3. Find CD, if AC = 4 cm, AB = 3 cm and AD = 2 cm.



A. $\frac{8}{3}cm$

B. $\frac{3}{8}cm$

C. $\frac{4}{3}cm$

D. $\frac{3}{4}cm$

Perpendicular from right angle to hypotenuse divides the triangle into two similar triangles and these are similar to the whole triangle also.

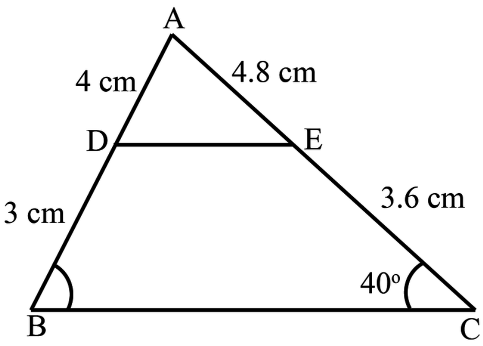
$\therefore \triangle CAB \sim \triangle CDA$

$\Rightarrow \frac{AB}{DA} = \frac{CA}{CD}$

$\Rightarrow \frac{3}{2} = \frac{4}{CD}$

$\Rightarrow CD = \frac{8}{3}cm$

4. In ΔABC, point D and E lies on the line AB and AC respectively as shown in the figure. Find the measure of $\angle AED$.



A. 65°

B. 40°

C. 75°

D. 70°

In ΔABC,

$\frac{AD}{DB} = \frac{4}{3}$ and $\frac{AE}{EC} = \frac{4.8}{3.6} = \frac{4}{3}$

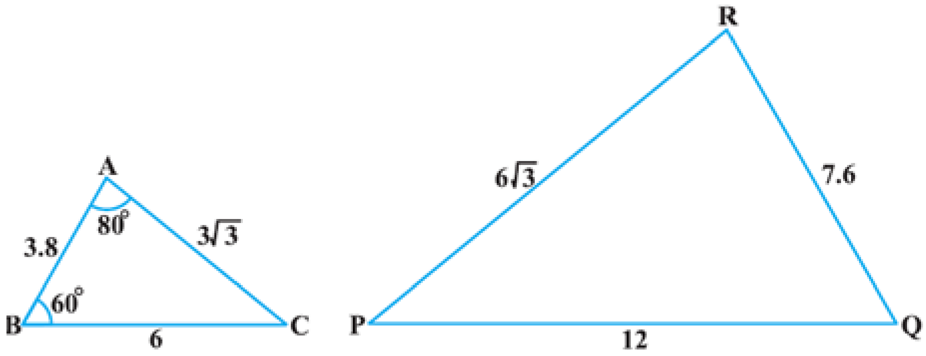
$\therefore \frac{AD}{DB} = \frac{AE}{EC} = \frac{4}{3}$

We know that in a triangle, if a line segment intersects two sides and divides them in the same ratio, then it will be parallel to the third side.

$\therefore$ DE || BC

So, $\angle AED = \angle ACB = 40^\circ$
(Corresponding angles are equal)

5. Observe the given triangles and find the value of $\angle P$.



A. 60°

B. 40°

C. 50°

D. 65°

In ΔABC and ΔRQP,

$\frac{AB}{RQ} = \frac{3.8}{7.6} = \frac{1}{2}$

$\frac{BC}{QP} = \frac{6}{12} = \frac{1}{2}$

and $\frac{CA}{PR} = \frac{3\sqrt{3}}{6\sqrt{3}} = \frac{1}{2}$

$\Rightarrow \frac{AB}{RQ} = \frac{BC}{QP} = \frac{CA}{PR}$

So, $\Delta ABC \sim \Delta RQP$
(By SSS similarity criterion)

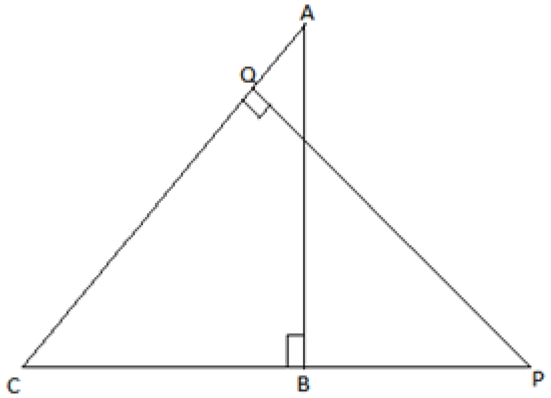
$\therefore \angle C = \angle P$
(Corresponding angles of similar triangles are equal)

But, $\angle C = 180^\circ - \angle A - \angle B$
(By angle sum property)

$\angle C = 180^\circ - 80^\circ - 60^\circ = 40^\circ$

So, $\angle P = 40^\circ$

6. In the figure, AC = 10cm, PC = 15cm, PQ = 12 cm, find PB.



A. 6 cm

B. 7 cm

C. 8 cm

D. 9 cm

$In\ \Delta ABC\ and\ \Delta PQC,$

$\angle PQC = \angle ABC = 90^\circ$

$\angle C = \angle C$ (common angle)

$Therefore,\ \Delta ABC \sim \Delta PQC$ By AA similarity

$\frac{AC}{PC} = \frac{AB}{PQ} = \frac{BC}{QC} \Rightarrow \frac{10}{15} = \frac{AB}{12} = \frac{BC}{QC}$

$\Rightarrow AB = 8cm$

$In\ \Delta ABC,$

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

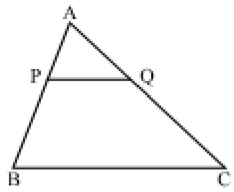
$\Rightarrow 8^2 + BC^2 = 10^2$

$\Rightarrow BC = 6cm$

$PB = PC - BC = 15 - 6 = 9cm$

$\therefore PB = 9cm.$

7. In a $\triangle ABC$, points P and Q are on sides AB and AC respectively. If AP = 3 cm, PB = 6 cm. AQ = 5 cm and QC = 10 cm, then BC = ____.



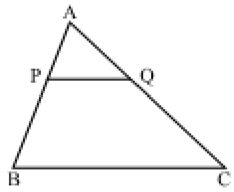
A. 4PQ

B. $\frac{PQ}{2}$

C. 3PQ ✔

D. PQ^2

Given: AP = 3 cm, PB = 6 cm,
AQ = 5 cm and QC = 10 cm



We have, AB = AP + PB = (3 + 6) cm = 9 cm
and, AC = AQ + QC = (5 + 10) cm = 15 cm

$\therefore \frac{AP}{AB} = \frac{3}{9} = \frac{1}{3}$

and $\frac{AQ}{AC} = \frac{5}{15} = \frac{1}{3}$

$\Rightarrow \frac{AP}{AB} = \frac{AQ}{AC}$

Thus, in $\triangle PAQ$ and $\triangle BAC$,

$\frac{AP}{AB} = \frac{AQ}{AC}$

$\angle PAQ = \angle BAC$
(Common in both triangles)

$\therefore \triangle APQ \sim \triangle ABC$ (by SAS similarity criterion)

$\Rightarrow \frac{AP}{AB} = \frac{PQ}{BC} = \frac{AQ}{AC}$

$\Rightarrow \frac{PQ}{BC} = \frac{AQ}{AC} = \frac{1}{3}$

$\Rightarrow BC = 3PQ$

8. Two isosceles triangles have equal angles and their areas are in the ratio 16 : 25. The ratio of corresponding heights is :

A. 4: 5

B. 5: 4

C. 3: 2

D. 5: 7

For similar triangles,

$$\frac{Area\ of\ 1st\ triangle}{Area\ of\ 2nd\ triangle} = \frac{(Corresponding\ length\ of\ 1st\ triangle)^2}{(Corresponding\ length\ of\ 2nd\ triangle)^2}$$

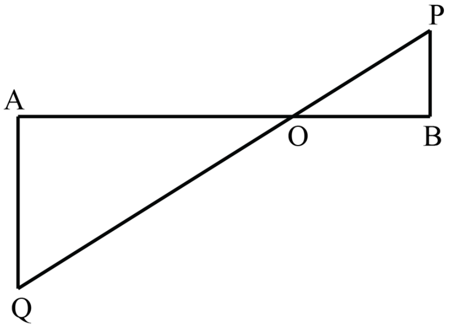
$$\frac{Area\ (\Delta_1)}{Area\ (\Delta_2)} = \frac{(h_1)^2}{(h_2)^2}$$

$$\frac{16}{25} = \frac{(h_1)^2}{(h_2)^2}$$

$$\frac{h_1}{h_2} = \frac{4}{5}$$

9. In the figure given below, sides PB and QA are perpendiculars drawn to the line segment AB.

If PO = 6 cm, QO = 9 cm and area of $\Delta POB = 120\ cm^2$, then the area of ΔQOA is



A. $360\ cm^2$

B. $270\ cm^2$

C. $240\ cm^2$

D. $290\ cm^2$

In ΔPOB and ΔQOA,

$\angle PBO = \angle QAO = 90^\circ$

$\angle POB = \angle QOA$
(Since vertically opposite angles are equal)

$\Delta POB\ \sim\ \Delta QOA$
(by AA similarity criterion)

$\Rightarrow \frac{ar(\Delta POB)}{ar(\Delta QOA)} = \frac{PO^2}{QO^2}$

(The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides).

$\Rightarrow \frac{120\ cm^2}{ar(QOA)} = \frac{6^2}{9^2}$

$\Rightarrow ar(QOA) = \frac{120\ cm^2 \times 81}{36} = 270\ cm^2$

10. If D is a point on the side BC of a triangle ABC such that $\angle ADC = \angle BAC$ then, CA^2 = _____.

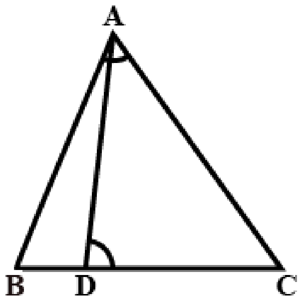
A. $BC.CD$

B. $BD.DC$

C. $BC.BC$

D. $AD.DC$

Given: $\angle ADC = \angle BAC$



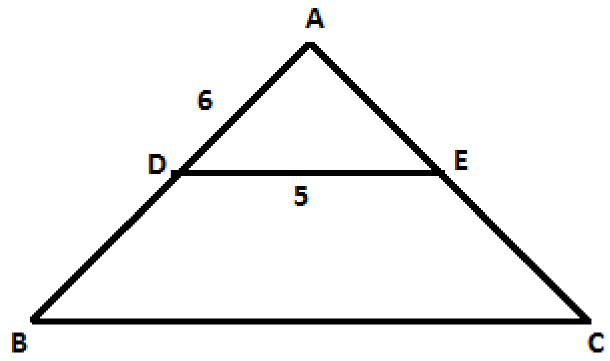
In $\triangle BAC$ and $\triangle ADC$,
$\angle ACB = \angle ACD$ .... (common angles)
$\angle BAC = \angle ADC$ .... (Given)
$\therefore \triangle BAC \sim \triangle ADC$ .... (AA simlilarity)

$\Rightarrow \frac{BA}{AD} = \frac{AC}{CD} = \frac{BC}{AC}$

$\Rightarrow \frac{AC}{CD} = \frac{BC}{AC}$

$\Rightarrow AC^2 = BC.CD$

11.



In the given figure, DE || BC. If AD = 6 cm, AB = 24 cm and DE = 5 cm, then BC = _____ cm.

A. 5

B. 10

C. 20

D. 24

Consider $\triangle ADE$ and $\triangle ABC$,

Given, DE || BC

∠ ADE = ∠ ABC
∠ AED =∠ ACB
(Since corresponding angles are equal)

$\therefore \triangle\ ADE \sim \triangle\ ABC$ (by AA similarity criterion)

$\Rightarrow \frac{DE}{BC} = \frac{AD}{AB}$
(corresponding sides of similar triangles are in same ratio)

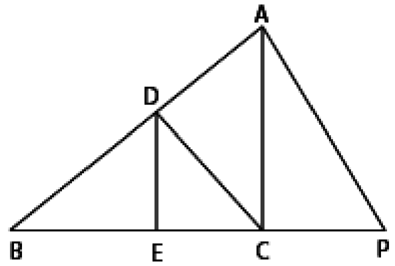
$\Rightarrow BC = \frac{DE \times AB}{AD}$

$\Rightarrow BC = \frac{5 \times 24}{6}$

$\Rightarrow BC = 20\ cm$

12. In the given figure, $DE||AC,\ DC||AP$, $BC = 4$ cm and $BP = 6$ cm.

Find the value of $\frac{BE}{EC}$.



A. 1 : 2

B. 2 : 1

C. 1 : 3

D. 3 : 1

Given: $DE \mid\mid AC$.

Applying BPT to $\triangle BAC$ we get ,

$\frac{BE}{EC} = \frac{BD}{DA} \cdots (i)$

Also, it is given that $DC \mid\mid AP$.

Applying BPT to $\triangle BAP$ we get ,

$\frac{BC}{CP} = \frac{BD}{DA} \cdots (ii)$

From (i) and (ii), we get

$\frac{BE}{EC} = \frac{BC}{CP}$

We know that, CP = BP - BC

$\Rightarrow \frac{BE}{EC} = \frac{BC}{BP - BC}$

Given: $BC = 4$ cm and $BP = 6$ cm.

$\Rightarrow \frac{BE}{EC} = \frac{4}{6-4} = \frac{2}{1}$

$\therefore BE : EC = 2 : 1$

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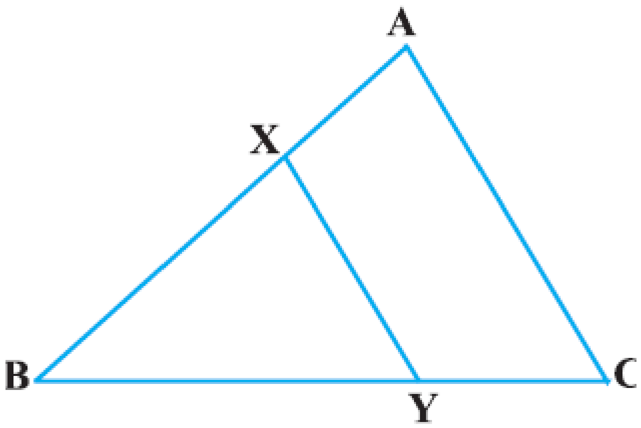
13. The line segment XY is parallel to side AC of Δ ABC and it divides the triangle into two parts of equal areas. Find the ratio $\frac{BX}{AB}$.



- A. $\frac{1}{\sqrt{2}}$
- B. $\frac{1}{2}$
- C. $\frac{4}{1}$
- D. $\frac{\sqrt{2}}{1}$

We have XY || AC (given)

So, $\angle$ BXY = $\angle$ A and $\angle$ BYX = $\angle$ C (since corresponding angles are equal)

$\therefore \triangle$ ABC $\sim \triangle$ XBY (AA similarity criterion)

The ratio of the area of two similar triangles are equal to the ratio of the squares of their corresponding sides.

So, $\frac{ar(\triangle ABC)}{ar(\triangle XBY)} = \left(\frac{AB}{XB}\right)^2$

Also, $ar(\triangle ABC) = 2 \times ar(\triangle XBY)$

So, $\frac{ar(\triangle ABC)}{ar(\triangle XBY)} = \frac{2}{1}$

Therefore, $(\frac{AB}{XB})^2 = \frac{2}{1}$

$\Rightarrow \frac{AB}{XB} = \frac{\sqrt{2}}{1}$

Taking reciprocal on both sides, we get

$\frac{BX}{AB} = \frac{1}{\sqrt{2}}$

14. A tower of height 24 m casts a shadow 50 m and at the same time, a girl of height 1.8 m casts a shadow. Find the length of her shadow.

A. 3 m

B. 3.25 m

C. 3.5 m

D. 3.75 m

Let AB be the height of tower, BC be the length of the shadow of the tower, ED be the height of the girl and EC = x be the length of her shadow.

In $\triangle ABC$ and $\triangle DEC$,

$\angle ABC = \angle DEC = 90^\circ$
$\angle BCA = \angle ECD$ (common in both triangles)

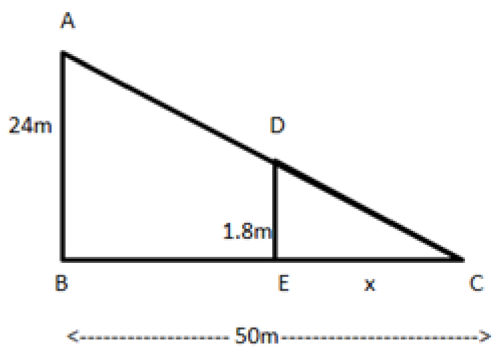
Therefore, $\triangle ABC \sim \triangle DEC$ (by AA similarity criterion)

$\Rightarrow \frac{DE}{AB} = \frac{EC}{BC}$ (corresponding sides of similar triangles are in same ratio)

$\Rightarrow EC = DE \times \frac{BC}{AB}$

$\Rightarrow EC = 1.8 \times \frac{50}{24}$

$\Rightarrow EC = 3.75\ m$



Hence, length of the her shadow is 3.75 m.

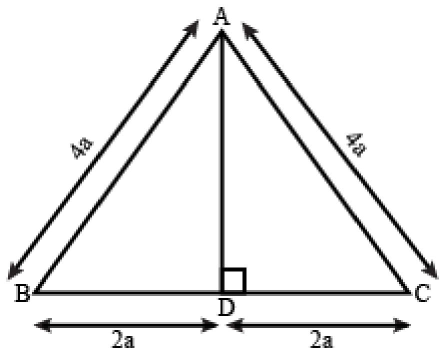
15. If ABC is an equilateral triangle of side 4a, then the length of its altitude is ________.

A. $2\sqrt{3}a$

B. $7\sqrt{9}a$

C. $4\sqrt{3}a$

D. $5\sqrt{2}a$



Given: Length of each side of the equilateral triangle = 4a
Construction: Draw a perpendicular from A to BC. Let this meeting point be D.

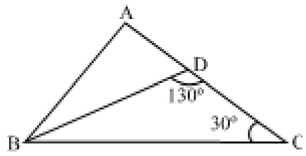
In $\triangle ABD$ and $\triangle ACD$,
AB = AC
($\because$ All sides of an equilateral triangle are equal)
AD = AD (Common)
$\angle ADB = \angle ADC = 90^\circ$
$\therefore \triangle ABD \cong \triangle ACD$
(By RHS congruency)

$\Rightarrow$ BD = DC = 2a (by cpct)

In $\triangle ABD$,
$AB^2 = AD^2 + BD^2$ (By pythagoras theorm)
$\Rightarrow AD^2 = AB^2 - BD^2$
$\Rightarrow AD^2 = (4a)^2 - (2a)^2$
$\Rightarrow AD^2 = 16a^2 - 4a^2$
$\Rightarrow AD^2 = 12a^2$
$\Rightarrow AD = 2\sqrt{3}a$
$\therefore$ Altitude of an equilateral triangle with side 4a will be $2\sqrt{3}a$.

Practice Questions - Term 1

16. In the adjoining figure, AB = 10 cm, BC =15 cm AD : DC = 2 : 3, then ∠ABC is equal to -



- **A.** 30°
- **B.** 40°
- **C.** 45°
- **D.** 110°

Clearly, $\frac{AD}{DC} = \frac{2}{3}$ and $\frac{AB}{BC} = \frac{10}{15} = \frac{2}{3}$

So, $\frac{AD}{DC} = \frac{AB}{BC}$

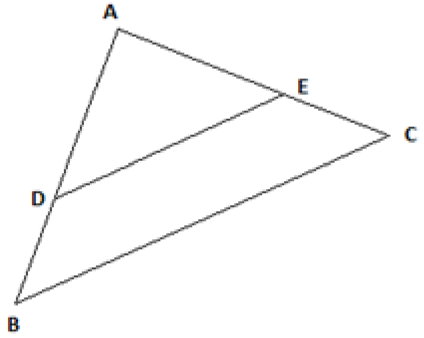
Thus, BD divides AC in the ratio of the other two sides.

By Converse of Angular Bisector theorem,
BD is the bisector of ∠B
∴ ∠ABC = 2 (∠CBD)

Now, ∠CBD = 180° - (130° + 30°) .... (Angle Sum Property)
= 20°

But , ∠ABC = 2 (∠CBD)
= 2 x 20
= 40°

17. In ΔABC, AC = 15 cm and DE || BC. If $\frac{AD}{DB} = \frac{2}{1}$, then EC = ______.



A. 5 cm

B. 10 cm

C. 7.5 cm

D. 12.5 cm

Given: AC = 15 cm
DE|| BC
$\frac{AD}{DB} = \frac{2}{1}$

In Δ ADE and Δ ABC,
$\angle DAE$ = $\angle BAC$ [Common]
$\angle ADE$ = $\angle ABC$ and $\angle AED$ = $\angle ACB$
[∵ DE|| BC, corresponding angles are equal]
$\Rightarrow \Delta ADE \sim \ \Delta ABC$ [AA similarity]
From Basic Proportionality theorem,

$\frac{AD}{DB} = \frac{AE}{EC}$

$\Rightarrow \frac{AE}{EC} = \frac{2}{1}$

$\Rightarrow AE = 2EC$

$Given: \ AC = 15cm$

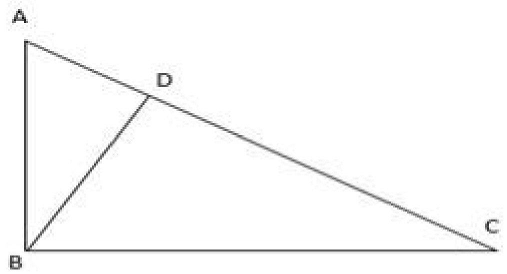
$\Rightarrow AE + EC = 15cm$

$\Rightarrow 3EC = 15cm$

$\Rightarrow EC = 5cm$

Practice Questions - Term 1

18. $\triangle$ABC is a right angled triangle, right angled at B. BD is perpendicular to AC. What is AC . DC?



A. $BC.AB$

B. BC^2

C. BD^2

D. $AB.AC$

Consider $\triangle ADB$ and $\triangle ABC$

∠BAD = ∠BAC [common angle]

∠BDA = ∠ABC [90°]

Therefore by AA similarity criterion, $\triangle ADB$ and $\triangle ABC$ are similar.

So, $\frac{AB}{AC} = \frac{AD}{AB} \Rightarrow AB^2$ = AC.AD ---(I)

Similarly, $\triangle BDC$ and $\triangle ABC$ are similar.

So, $\frac{BC}{AC} = \frac{DC}{BC} \Rightarrow BC^2$ = AC.DC ---(II)

Dividing (I) and (II) and cancelling out AC, we get, $\left(\frac{AB}{BC}\right)^2 = \frac{AD}{DC}$ ----(III)

Also, In $\triangle ADB$, $AB^2 = AD^2 + DB^2$ and in $\triangle BDC$, $CB^2 = CD^2 + DB^2$ [Pythagoras theorem]

Subtracting these two equations above and cancelling off DB^2 on both sides, we get

$AB^2 - BC^2 = AD^2 - CD^2 \Rightarrow AB^2 + CD^2 = AD^2 + BC^2$ --------------(IV)

Dividing this equation with BC^2 on both sides, $\frac{AB^2}{BC^2} + \frac{CD^2}{BC^2} = \frac{AD^2}{BC^2} + \frac{BC^2}{BC^2}$

$\Rightarrow \frac{AB^2}{BC^2} + \frac{CD^2}{BC^2} = \frac{AD^2}{BC^2} + 1$

$\Rightarrow \frac{AB^2}{BC^2} - 1 = \frac{AD^2}{BC^2} - \frac{CD^2}{BC^2}$

Practice Questions - Term 1

From (III), we know that $\left(\frac{AB}{BC}\right)^2 = \frac{AD}{DC}$

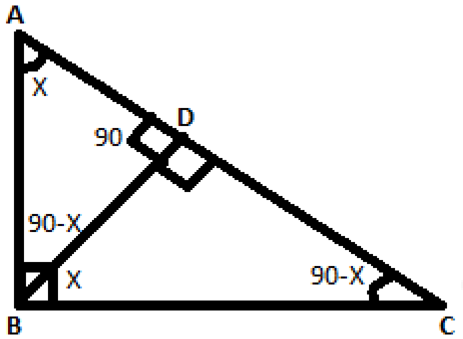
$\Rightarrow \frac{AD}{DC} - 1 = \frac{AD^2 - CD^2}{BC^2}$ [Using (III)]

$\Rightarrow \frac{AD - DC}{DC} = \frac{(AD - CD)(AD + CD)}{BC^2}$

$\Rightarrow \frac{1}{DC} = \frac{AC}{BC^2}$

$\Rightarrow BC^2 = AC.DC$

Alternatively,



Consider $\triangle ABC$ and $\triangle BDC$,

$\angle ABC = \angle BDC = 90^\circ$

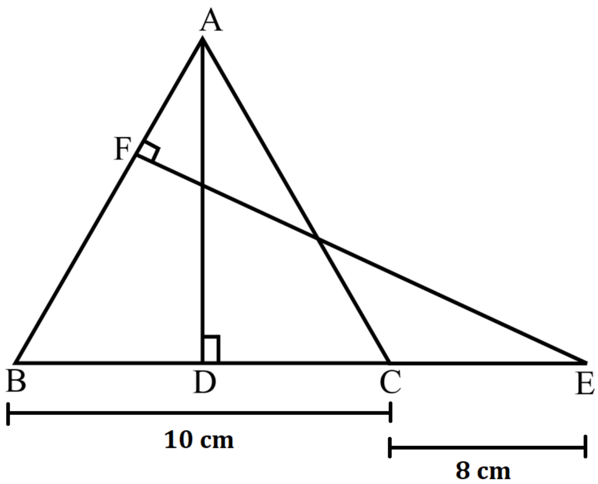
$\angle C = \angle C$ [Common angle]

Therefore by AA similarity criterion, $\triangle ABC$ and $\triangle BDC$ are similar.

$\frac{AC}{BC} = \frac{BC}{DC}$

$BC^2 = AC \times DC$

19. $\triangle ABC$ is an isosceles triangle in which AB = AC = 13 cm. If area of $\triangle ADC$ is $169\ cm^2$, then area of $\triangle EFB$ is equal to



A. $196\ cm^2$

B. $324\ cm^2$

C. $169\ cm^2$

D. $396\ cm^2$

In ΔADC and ΔEFB,

$\angle ACD = \angle EBF$
(Since base angles of an isosceles triangle are equal)

$\angle ADC = \angle EFB \quad (given\ \ 90^\circ)$

$\Delta ADC \sim \Delta EFB$ (by AA similarity criterion)

So, $\frac{ar(\Delta ADC)}{ar(\Delta EFB)} = \frac{AC^2}{(EB)^2}$

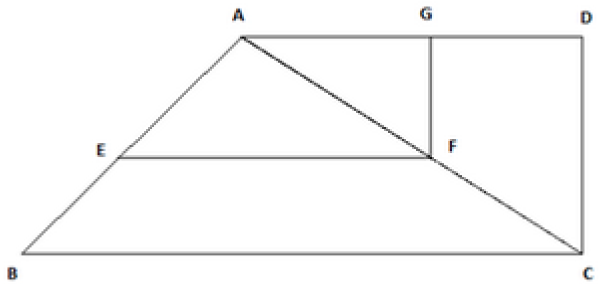
(Since the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides).

$\Rightarrow \frac{169\ cm^2}{ar(\Delta EFB)} = \frac{13^2}{(EC+CB)^2}$

$\Rightarrow \frac{169\ cm^2}{ar(\Delta EFB)} = \frac{13^2}{(8+10)^2}$

$\Rightarrow ar(\Delta EFB) = \frac{(18\times18)\times169}{(13)^2} = 324\ cm^2$

20. If $BC \| EF$ and $FG \| CD$ then, $\frac{AE}{AB} =$ ______.



A. $\frac{AG}{CD}$

B. $\frac{GD}{AC}$

C. $\frac{AG}{AD}$

D. $\frac{CF}{AF}$

In ΔABC,

$EF \parallel BC$

$\therefore \frac{AE}{AB} = \frac{AF}{AC} \ldots (1)$

(Basic proportionality theorem)

In ΔACD,

$FG \parallel CD$

$\therefore \frac{AF}{AC} = \frac{AG}{AD} \ldots (2)$

(Basic proportionality theorem)

From 1 & 2,

$\frac{AE}{AB} = \frac{AF}{AC} = \frac{AG}{AD}$

$\Rightarrow \frac{AE}{AB} = \frac{AG}{AD}$