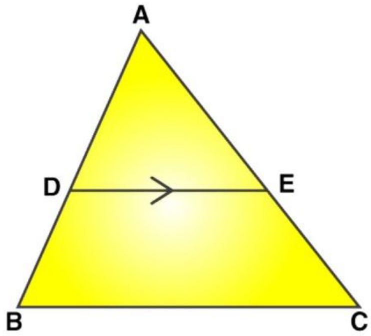
RS Aggarwal Solutions for Class 10 Maths Chapter 7 Triangles

Exercise 7A Page No: 368

Question 1: D and E are points on the sides AB and AC respectively of a ΔABC such that DE || BC.

(i) If AD = 3.6 cm, AB = 10 cm and AE = 4.5 cm, find EC and AC.
(ii) If AB = 13.3 cm, AC = 11.9 cm and EC = 5.1 cm, find AD.
(iii) If AD/DB = 4/7 and AC = 6.6 cm, find AE.
(iv) if AD/AB = 8/15 and EC = 3.5 cm, find AE.



Solution:

From given triangle, points D and E are on the sides AB and AC respectively such that DE || BC.

(i)AD = 3.6 cm, AB = 10 cm and AE = 4.5 cm.

By Thale's Theorem:

AD/DB = AE/EC

Here DB = AB - AD = 10 – 3.6 = 6.4

=> EC = 4.6/3.6 x 6.4

or EC = 8

And, AC = AE + EC

AC = 4.5 + 8 = 12.5

(ii) If AB = 13.3 cm, AC = 11.9 cm and EC = 5.1 cm, find AD.

By Thale's Theorem:

AD/DB = AE/EC

Add 1 on both sides

AD/DB + 1 = AE/EC + 1

(AD + DB)/DB = (AE + EC)/EC

AB/DB = AC/EC

or DB = (ABxEC)/ AC

= (13.3 x 5.1)/11.90

= 5.7

=> BD = 5.7

And, AD = AB – DB
AD = 13.3 – 5.7

AD = 7.6 cm

(iii) AD/DB = 4/7 or AD = 4 cm, DB = 7 cm, and AC = 6.6

By Thale's Theorem:

AD/DB = AE/EC

Add 1 on both sides

AD/DB + 1 = AE/EC + 1

(AD + DB)/DB = (AE + EC)/EC

(4+7)/7 = AC/EC = 6.6/EC

EC = (6.6 x 7)/11

= 4.2

And, AE = AC – EC

AE = 6.6 – 4.2

AE = 2.4 cm

(iv)
AD/AB = 8/15 or AD = 8 cm, AB = 15 cm, and EC = 3.5 cm
By Thale's Theorem:

AD/AB = AE/AC

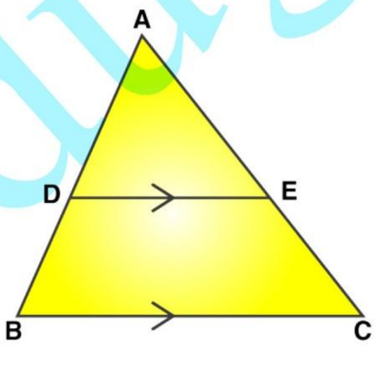
8/15 = AE/(AE+EC) = AE/(AE+3.5)

8(AE + 3.5) = 15AE

7 AE = 28

or AE = 4 cm

Question 2: D and E are points on the sides AB and AC respectively of a ΔABC such that DE || BC. Find the value of x, when
(i) AD = x cm, DB = (x – 2) cm, AE = (x + 2) cm and EC = (x – 1) cm.
(ii) AD = 4 cm, DB = (x – 4) cm, AE = 8 cm and EC = (3x – 19) cm.
(iii) AD = (7x – 4) cm, AE = (5x – 2) cm, DB = (3x + 4) and EC = 3x cm.



Solution:

From figure, D and E are the points on the sides AB and AC respectively and DE || BC
then AD/DB = AE/EC

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(i) AD = x cm, DB = (x – 2) cm, AE = (x + 2) cm and EC = (x – 1) cm.

x/(x-2) = (x+2)/(x-1)
x(x-1) = (x+2)(x-2)
Solving above equation, we get

x = 4 cm

(ii) AD = 4 cm, DB = (x – 4) cm, AE = 8 cm and EC = (3x – 19) cm.

AD/DB = AE/EC

4/(x-4) = 8/(3x-19)
4(3x-19) = 8(x-4)

Solving, we get x = 11 cm

(iii)
AD = (7x – 4) cm, AE = (5x – 2) cm, DB = (3x + 4) and EC = 3x cm.

AD/DB = AE/EC

(7x-4)/(3x + 4) = (5x – 2)/3x

(7x – 4) (3x) = (5x – 2) (3x + 4)
$21x^2 – 12x – 15x^2 – 20x + 6x = -8$
$6x^2 – 26x + 8 = 0$
(x – 4) (3x – 1) = 0

Either x – 4 = 0 or (3x – 1) = 0

=> x = 4 or 1/3 (not possible)
So, x = 4

Question 3: D and E are points on the sides AB and AC respectively of a ΔABC. In each of the following cases, determine whether DE || BC or not.
(i) AD = 5.7 cm, DB = 9.5 cm, AE = 4.8 cm and EC = 8 cm
(ii) AB = 11.7 cm, AC = 11.2 cm, BD = 6.5 cm and AE = 4.2 cm.
(iii) AB = 10.8 cm, AD = 6.3 cm, AC = 9.6 cm and EC = 4 cm.
(iv) AD = 7.2 cm, AE = 6.4 cm, AB = 12 cm and AC = 10 cm.

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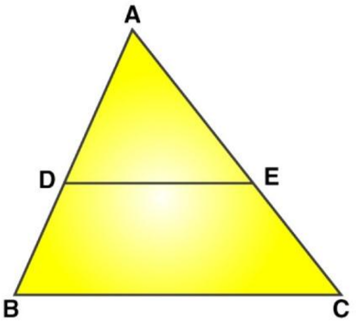


Solution:

From figure, D and E are the points on the sides AB and AC of ΔABC

(i) AD = 5.7 cm, DB = 9.5 cm, AE = 4.8 cm and EC = 8 cm

AD/DB = 5.7/9.8 = 3/5

and AE/EC = 4.8/8 = 3/5

=> AD/DB = AE/EC

=> DE || BC

(ii) AB = 11.7 cm, AC = 11.2 cm, BD = 6.5 cm and AE = 4.2 cm.

AD = AB - BD = 11.7 - 6.5 = 5.2 cm and
EC = AC - AE = 11.2 - 4.2 = 7 cm

AD/DB = 5.2/7 = 4/5
AE/EC = 4.2/7 = 3/5

=> AD/DB ≠ AE/EC

=> DE is not parallel to BC

(iii) AB = 10.8 cm, AD = 6.3 cm, AC = 9.6 cm and EC = 4 cm.
DB = AB - AD = 10.8 - 6.3 = 4.5 cm
AE =AC - EC = 9.6 - 4 = 5.6 cm

AD /DB = 6.3/4.5 = 7/5

AE/EC = 5.6/4 = 7/5

=> AD/DB = AE/EC

=> DE || BC

(iv) AD = 7.2 cm, AE = 6.4 cm, AB = 12 cm and AC = 10 cm.

DB = AB - AD = 12 - 7.2 = 4.8 cm and

EC = AC - AE = 10 - 6,4 =3.6 cm

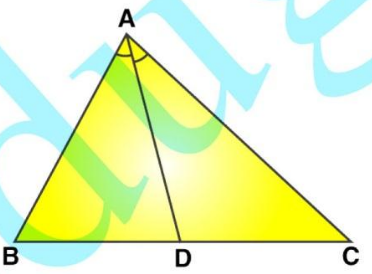
AD /DB = 7.2/4.8 = 3/2 and

AE/EC = 6.4/3.6 = 16/9

=> AD/DB ≠ AE/EC

=> DE is not parallel to BC

Question 4: In a ΔABC, AD is the bisector of ∠A.
(i) If AB = 6.4 cm, AC = 8 cm and BD = 5.6 cm, find DC.
(ii) If AB = 10 cm, AC = 14 cm and BC – 6 cm, find BD and DC.
(iii) If AB = 5.6 cm, BD = 3.2 cm and BC = 6 cm, find AC.
(iv) If AB = 5.6 cm, AC = 4 cm and DC = 3 cm, find BC.



Solution:
(i) If AB = 6.4 cm, AC = 8 cm and BD = 5.6 cm, find DC.

AD bisects ∠A, we can apply angle-bisector theorem in ΔABC,
BD/DC = AB/AC

Substituting given values, we get

5.6/DC = 6.4/8

DC = 7 cm

(ii) If AB = 10 cm, AC = 14 cm and BC – 6 cm, find BD and DC.

By angle-bisector theorem

BD/DC = AB/AC = 10/14

Let BD = x cm and DC = (6-x) (As BC = 6 cm given)

x/(6-x) = 10/14
14x = 10(6 – x)

14x = 60 – 10x

14x + 10x = 60
or x = 2.5

Or BD = 2.5

Then DC = 6 - 2.5 = 3.5 cm

(iii) If AB = 5.6 cm, BD = 3.2 cm and BC = 6 cm, find AC.

BD/DC = AB/AC

Here DC = BC – BD = 6 – 3.2 = 2.8

=> DC = 2.8

3.2/2.8 = 5.6/AC

=> AC = 4.9 cm

(iv) If AB = 5.6 cm, AC = 4 cm and DC = 3 cm, find BC.

BD/DC = AB/AC

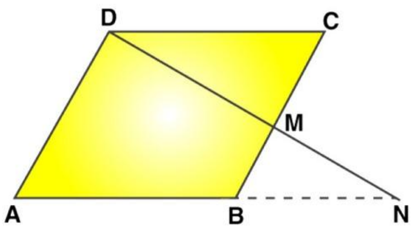
BD/3 = 5.6/4

=> BD = 4.2

Now, BC = BD + DC = 4.2 + 3 = 7.2
BC is 7.2 cm.

Question 5: M is a point on the side BC of a parallelogram ABCD. DM when produced meets AB produced at N. Prove that

(i) DM/MN = DC/BN (ii) DN/DM = AN/DC



Solution:

M is a point on the side BC of a parallelogram ABCD

(i)Consdier ΔDMC and ΔNMB,

∠DCM = ∠NBM	alternate angles
∠DMC = ∠NMB	vertically opposite angles
∠CDM = ∠MNB	alternate angles

By By AAA-similarity:
ΔDMC ~ ΔNMB

From similarity of the triangle:

DM/MN = DC/BN

(ii)
From (i), DM/MN = DC/BN

Add 1 on both sides

DM/MN + 1 = DC/BN + 1

(DM+MN)/MN = (DC+BN)/BN

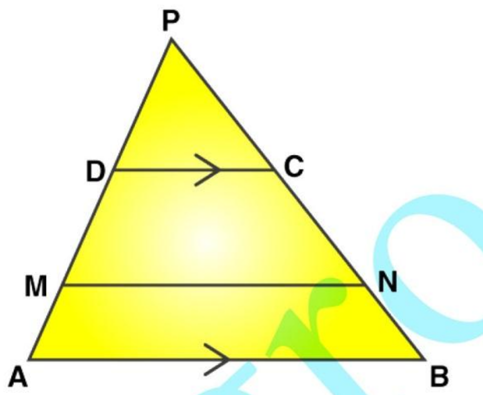
Since AB = CD

(DM+MN)/MN = (AB+BN)/BN

DN/DM = AN/DC
Hence proved.

Question 6: Show that the line segment which joins the midpoints of the oblique sides of a trapezium is parallel to the parallel sides.

Solution:



Here, AB || DC
M and N are the mid points of sides AD and BC respectively.
MN is joined.
To prove : MN || AB or DC.

Produce AD and BC to meet at P.
Now, In ΔPAB
DC ||AB

PD/DA = PC/CB

PD/2PM = PC/2CN

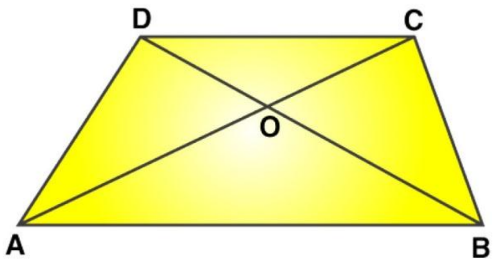
M and N are midpoints of AD and BC respectively.

PD/PM = PC/CN

MN||DC But DC ||AB

Therefore, MN || DC ||AB

Question 7: In the adjoining figure, ABCD is a trapezium in which CD || AB and its diagonals intersect at O. If AO = (5x – 7) cm, OC = (2x + 1) cm, BO = (7x – 5) cm and OD = (7x + 1) cm, find the value of x.



Solution:

From given statement:

In Δ ADC
EO || AB || DC

By thales theorem: AE/ED = AO/OC ...(1)

In Δ DAB,
EO || AB

So, By thales theorem: DE/EA = DO/OB ...(2)

From (1) and (2)

AO/OC = DO/OB

(5x - 7) / (2x + 1) = (7x-5) / (7x+1)

(5x – 7)(7x + 1) = (7x – 5)(2x + 1)

35x^2 + 5x – 49x – 7 = 14x^2 – 10x + 7x – 5

35x^2 – 14x^2 – 44x + 3x – 7 + 5 = 0

21x^2 – 42x + x – 2 = 0

21(x – 2) + (x – 2) = 0

(21x + 1)(x – 2) = 0

Either (21x + 1) = 0 or (x – 2) = 0

x = -1/21 (does not satisfy) or x = 2

=> x = 2.

Question 8: In a ΔABC, M and N are points on the sides AB and AC respectively such that BM = CN. If ∠B = ∠C then show that MN || BC.

Solution:

In ΔABC, M and N are points on the sides AB and AC respectively such that BM = CN and if ∠B = ∠C.
We know that, sides opposite to equal angles are equal.

AB = AC
BM = CN (given)

AB - BM = AC - CN

=> AM = An

From ΔABC

AM/MB = AN/NC

Therefore, MN ||BN

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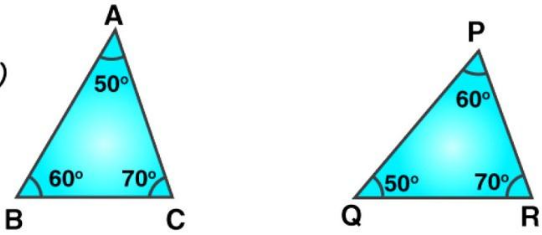
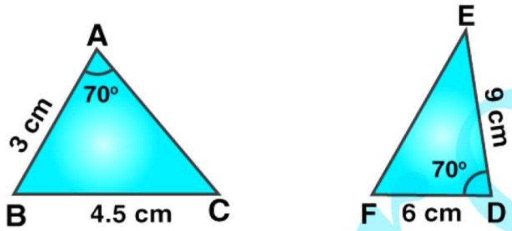
Exercise 7B | Page No: 395

Question 1: In each of the given pairs of triangles, find which pair of triangles are similar. State the similarity criterion and write the similarity relation in symbolic form:

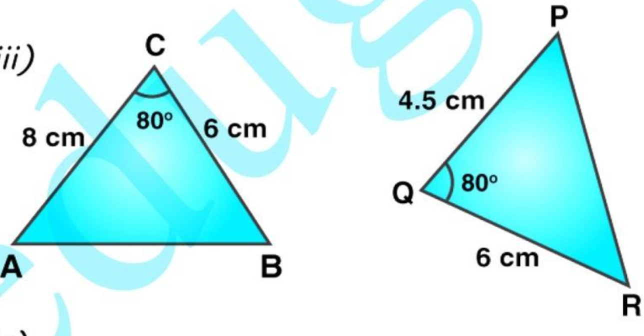
(i)



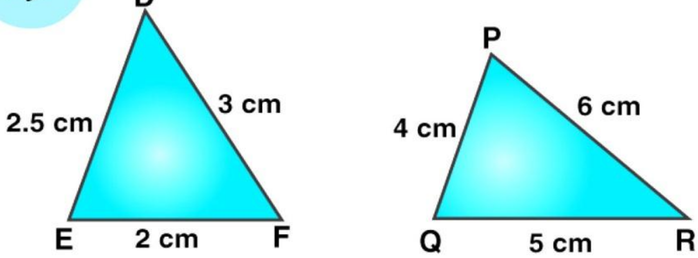
(ii)



(iii)



(iv)



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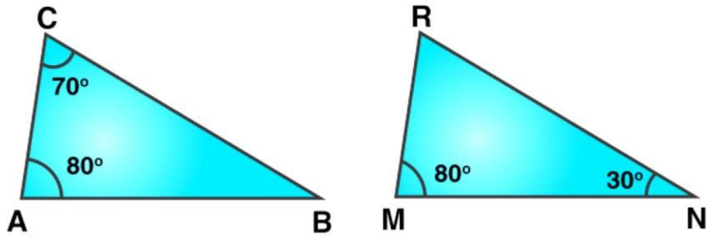
(v)



Solution:

Two triangles are similarity of their corresponding angles are equal and corresponding sides are proportional.

(i) In ΔABC and ΔPQR
∠A = ∠Q = 50°
∠B = ∠P = 60° and
∠C = ∠R = 70°
ΔABC ~ ΔQPR (By AAA)

(ii) In ΔABC and ΔDEF

In ΔABC and ΔDEF
AB = 3 cm, BC = 4.5

DF = 6 cm, DE = 9 cm

ΔABC is not similar to ΔDEF

(iii) In ΔABC and ΔPQR

In ΔABC and ΔPQR
AC = 8 cm BC = 6 cm
Included ∠C = 80°

PQ = 4.5 cm, QR = 6 cm
and included ∠Q = 80°

AC/QR = 8/6 = 4/3

and BC/PQ = 6/4.5 = 4/3

=> AC/QR = BC/PQ

and ∠C = ∠Q = 80°

ΔABC ~ ΔPQR (By SAS)

(iv) In ΔDEF and ΔPQR

DE = 2.5, DF = 3 and EF = 2
PQ = 4, PR = 6 and QR = 5
DE/QR = 2.5/5 = 1/2

DF/PR = 3/6 = 1/2

and EF/PQ = 2/4 = 1/2

ΔDEF ~ ΔPQR (By SSS)

(v) In ΔABC and ΔMNR
∠A = 80°, ∠C = 70°
So, ∠B = 180° – (80° + 70°) = 30°

∠M = 80°, ∠N = 30°, and ∠R = 180° – (80° + 30°) = 70°

Now, in ΔABC
∠A = ∠M – 80°, ∠B = ∠N = 30°
and ∠C = ∠R = 70°

ΔABC ~ ΔMNR (By AAA or AA)

Question 2: In the given figure, ΔODC ~ ΔOBA, ∠BOC = 115° and ∠CDO = 70°. Find:
(i) ∠DOC
(ii) ∠DCO
(iii) ∠OAB
(iv) ∠OBA

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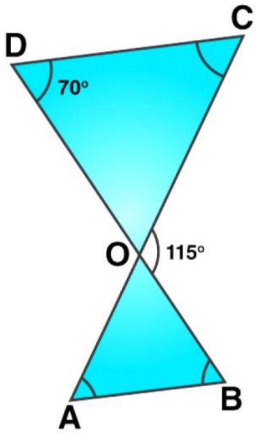


Solution:

Here ΔODC ~ ΔOBA, so
∠D = ∠B = 70°
∠C = ∠A
∠COD = ∠AOB

(i) But ∠DOC + ∠BOC = 180° (Linear pair)
∠DOC + 115°= 180°
∠DOC = 180° – 115° = 65°

(ii) ∠DOC + ∠CDO + ∠DCO = 180° (Angles of a triangle)

65° + 70° + ∠DCO = 180°

135° + ∠DCO = 180°

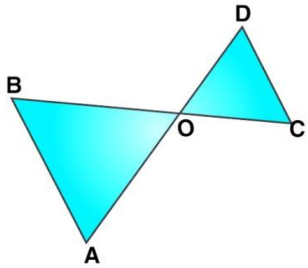
∠DCO = 180° – 135° = 45°

(iii) ∠AOB = ∠DOC = 65° (vertically opposite angles)

∠OAB = ∠DCO = 45° (Since ΔODC ~ ΔOBA)

(iv) ∠OBA = ∠CDO = 70° (Since ΔODC ~ ΔOBA)

Question 3: In the given figure, ΔOAB ~ ΔOCD. If AB = 8 cm, BO = 6.4 cm, OC = 3.5 cm and CD = 5 cm, find (i) OA (ii) DO.



Solution:

Since ΔOAB ~ ΔOCD
AB = 8 cm, BO = 6.4 cm OC = 3.5 cm, CD = 5 cm

Let OD = y and OA = x

$$\frac{AB}{CD} = \frac{OA}{OC} = \frac{BO}{DO}$$

$$\frac{8}{5} = \frac{x}{3.5} = \frac{6.4}{y}$$

$$\frac{x}{3.5} = \frac{8}{5} \Rightarrow x = \frac{8 \times 3.5}{5} = 5.6$$

$$\text{and } \frac{6.4}{y} = \frac{8}{5} \Rightarrow y = \frac{6.4 \times 5}{8} = 4.0$$

OA = 5.6 cm and DO = 4.0 cm

Question 4: In the given figure, if ∠ADE = ∠B, show that ΔADE ~ ΔABC. If AD = 3.8 cm, AE = 3.6 cm, BE = 2.1 cm and BC = 4.2 cm, find DE.

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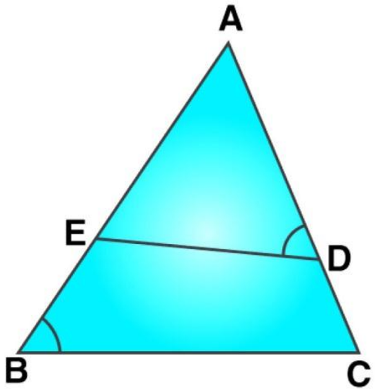


Solution:

From given figure,
∠ADE = ∠B
To prove:
ΔADE ~ ΔABC and
find DE

Given: AD = 3.8 cm, AE = 3.6 cm, BE = 2.1 cm and BC = 4.2 cm

Now, In ΔADE and ΔABC
∠ADE = ∠B (given)
∠A = ∠A (common)
ΔADE ~ ΔABC (By AA)

Again,

AD/AB = DE/BC

$$\frac{AD}{AE+EB} = \frac{x}{4.2}$$

$$\frac{3.8}{3.6+2.1} = \frac{x}{4.2}$$

$$\frac{3.8}{5.7} = \frac{x}{4.2}$$

$x = 2.8$

DE = 2.8 cm

RS Aggarwal Solutions for Class 10 Maths Chapter 7 Triangles

Question 5: The perimeters of two similar triangles ABC and PQR are 32 cm and 24 cm respectively. If PQ = 12 cm, find AB.

Solution:

Form given statement: ΔABC ~ ΔPQR,
PQ = 12 cm

Perimeter of ΔABC = AB + BC + CA = 32 cm
Perimeter of ΔPQR = PQ + QR + RP = 24 cm
Now,

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{RP}$$

$$= \frac{AB+BC+CA}{PQ+QR+RP} = \frac{32}{24}$$

$$\frac{AB}{12} = \frac{32}{24}$$

$$AB = \frac{32\times12}{24} = 16 \text{ cm}$$

Question 6: The corresponding sides of two similar triangles ABC and DEF are BC = 9.1 cm and EF = 6.5 cm. If the perimeter of ΔDEF is 25 cm, find the perimeter of ΔABC.

Solution:

Form given statement: ΔABC ~ ΔDEF
BC = 9.1 cm, EF = 6.5 cm and Perimeter of ΔDEF = 25 cm

$$\frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta DEF} = \frac{BC}{EF}$$

$$\frac{\text{Perimeter of } \Delta ABC}{25} = \frac{9.1}{6.5}$$

$$\text{Perimeter of } \Delta ABC = \frac{9.1\times25}{6.5}$$

$$= \frac{91\times25}{65}$$

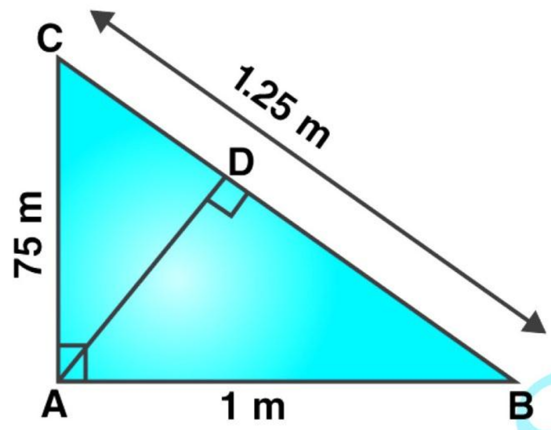
$$= 35$$

Perimeter of ΔABC is 35 cm

EDUGROSS
WISDOMISING KNOWLEDGE

RS Aggarwal Solutions for Class 10 Maths Chapter 7 Triangles

Question 7: In the given figure, ∠CAB = 90° and AD ⊥ BC. Show that ΔBDA ~ ΔBAC. If AC = 75 cm, AB = 1 m and BC = 1.25 m, find AD.



Solution:

∠CAB = 90° and AD ⊥ BC

If AC = 75 cm, AB = 1 m or 100 cm, BC = 1.25 m or 125 cm

∠BDA = ∠BAC = 90°
∠DBA = ∠CBA [common angles]
By AA
ΔBDA ~ ΔBAC
And,

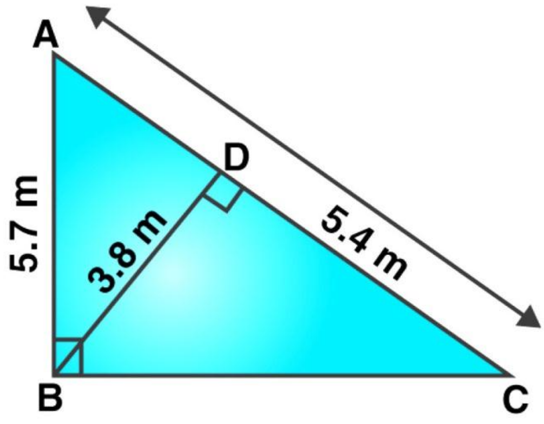
$$\frac{AB}{BC} = \frac{BD}{AB} = \frac{AD}{AC}$$

$$\frac{100}{125} = \frac{AD}{75}$$

$$AD = \frac{100 \times 75}{125} = 60$$

AD = 60 cm

Question 8: In the given figure, ∠ABC = 90° and BD ⊥ AC. If AB = 5.7 cm, BD = 3.8 cm and CD = 5.4 cm, find BC.



Solution:

From given:
∠ABC = 90°, BD ⊥ AC.
AB = 5.7 cm, BD = 3.8 cm, CD = 5.4 cm

In ΔABC and ΔBDC,
∠ABC = ∠BDC (each 90°)
∠BCA = ∠BCD (common angles)
ΔABC ~ ΔBDC (AA axiom)

So, corresponding sides are proportional

AB/BD = BC/CD

=> 5.7/3.8 = BC/5.4

=> BC = 8.1

Exercise 7C

Question 1: ΔABC ~ ΔDEF and their areas are respectively 64 cm² and 121 cm². If EF = 15.4 cm, find BC.

Solution:

Area of ΔABC = 64 cm² and
area of ΔDEF = 121 cm²
EF = 15.4 cm

$$\frac{\text{area of } \Delta ABC}{\text{area of } \Delta DEF} = \frac{BC^2}{EF^2}$$

$$\frac{64}{121} = \frac{BC^2}{(15.4)^2}$$

$$\left(\frac{8}{11}\right)^2 = \left(\frac{BC}{15.4}\right)^2$$

$$\frac{8}{11} = \frac{BC}{15.4}$$

$$BC = \frac{8 \times 15.4}{11} = 11.2$$

$$BC = 11.2 \text{ cm}$$

Question 2: The areas of two similar triangles ABC and PQR are in the ratio 9 : 16. If BC = 4.5 cm, find the length of QR.

Solution:

The areas of two similar triangles ABC and PQR are in the ratio 9 : 16.
BC = 4.5 cm

$$\frac{\text{area } \Delta ABC}{\text{area } \Delta PQR} = \frac{(BC)^2}{(EF)^2} = \frac{9}{16}$$

$$\frac{\text{area } \Delta ABC}{\text{area } \Delta PQR} = \frac{BC^2}{QR^2}$$

$$\frac{9}{16} = \frac{(4.5)^2}{QR^2}$$

$$\left(\frac{3}{4}\right)^2 = \left(\frac{4.5}{QR}\right)^2$$

$$\frac{3}{4} = \frac{4.5}{QR}$$

QR = 6 cm

Question 3: ΔABC ~ ΔPQR and ar (ΔABC) = 4ar (ΔPQR). If BC = 12 cm, find QR.

Solution:

ΔABC ~ ΔPQR
ar (ΔABC) = 4ar (ΔPQR)

$$\frac{\text{area } \Delta ABC}{\text{area } \Delta PQR} = \frac{4}{1}$$

$$\frac{\text{area } (\Delta ABC)}{\text{area } (\Delta PQR)} = \frac{BC^2}{QR^2}$$

$$\frac{4}{1} = \frac{BC^2}{QR^2} \Rightarrow \left(\frac{2}{1}\right)^2 = \left(\frac{12}{QR}\right)^2$$

$$\frac{2}{1} = \frac{12}{QR} \Rightarrow QR = \frac{12 \times 1}{2} = 6$$

QR = 6 cm

Question 4: The areas of two similar triangles are 169 cm² and 121 cm² respectively. If the longest side of the larger triangle is 26 cm, find the longest side of the smaller triangle.

Solution:
Areas of two similar triangles are 169 cm^2 and 121 cm^2 (given)
Longest side of largest triangle = 26 cm

Let longest side of smallest triangle is x cm

$$\frac{\text{Area of largest triangle}}{\text{area of smallest triangle}} = \frac{(\text{longest side of longest } \Delta)}{\text{longest side of smallest } \Delta}$$

$$\frac{169}{121} = \frac{(26)^2}{x^2}$$

$$\left(\frac{13}{11}\right)^2 = \left(\frac{26}{x}\right)^2$$

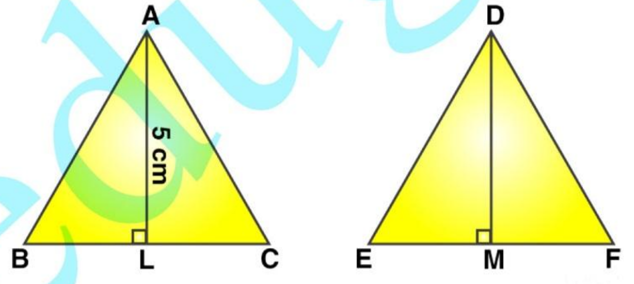
$$\frac{13}{11} = \frac{26}{x}$$

$$x = \frac{11 \times 26}{13} = 22$$

Longest side of smallest triangle is 22 cm

Question 5: ΔABC ~ ΔDEF and their areas are respectively 100 cm² and 49 cm². If the altitude of ΔABC is 5 cm, find the corresponding altitude of ΔDEF.

Solution:
Area of ΔABC = 100 cm²
area of ΔDEF = 49 cm²
Altitude of ΔABC is 5 cm



AL ⊥ BC and DM ⊥ EF

Let DM = x cm

$$\frac{\text{area of } \Delta ABC}{\text{area of } \Delta DEF} = \frac{AL^2}{DM^2}$$

$$\frac{100}{49} = \frac{(5)^2}{(x)^2}$$

$$\left(\frac{10}{7}\right)^2 = \left(\frac{5}{x}\right)^2$$

$$\frac{10}{7} = \frac{5}{x}$$

Or x = 3.5

Altitude of smaller triangle is 3.5 cm

Question 6: The corresponding altitudes of two similar triangles are 6 cm and 9 cm respectively. Find the ratio of their areas.

Solution:
Corresponding altitudes of two similar triangles are 6 cm and 9 cm (given)

We know that the areas of two similar triangles are in the ratio of the squares of their corresponding altitudes.

Ratio in the areas of two similar triangles = $(6)^2 : (9)^2$ = 36 : 81 = 4 : 9

Question 7: The areas of two similar triangles are 81 cm² and 49 cm² respectively. If the altitude of the first triangle is 6.3 cm, find the corresponding altitude of the other.

Solution:
Areas of two similar triangles are 81 cm^2 and 49 cm^2
Altitude of the first triangle = 6.3 cm
Let altitude of second triangle = x cm

Area of ΔABC = 81 cm^2 and area of ΔDEF = 49cm^2

Altitude AL = 6 – 3 cm

Let altitude DM = x cm

$$\frac{\text{area of } \Delta ABC}{\text{area of } \Delta DEF} = \frac{AL^2}{DM^2}$$

$$\frac{81}{49} = \frac{(6.3)^2}{x^2}$$

$$\left(\frac{9}{7}\right)^2 = \left(\frac{6.3}{x}\right)^2$$

$$\frac{9}{7} = \frac{6.3}{x}$$

$$x = 4.9$$

Altitude of second triangle is 4.9 cm

Question 8: The areas of two similar triangles are 100 cm² and 64 cm² respectively. If a median of the smaller triangle is 5.6 cm, find the corresponding median of the other.

Solution:

Areas of two similar triangles are 100 cm² and 64 cm²

Median DM of ΔDEF = 5.6 cm
Let median AL of ΔABC = x

$$\frac{\text{area of } \Delta ABC}{\text{area of } \Delta DEF} = \frac{AL^2}{DM^2}$$

$$\frac{100}{64} = \frac{x^2}{(5.6)^2}$$

$$\left(\frac{10}{8}\right)^2 = \left(\frac{x}{5.6}\right)^2$$

$$\frac{10}{8} = \frac{x}{5.6}$$

$$x = 7$$

Corresponding median of the other triangle is 7 cm.

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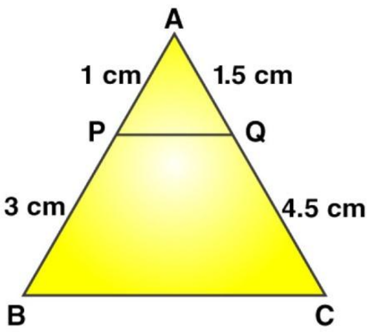
Question 9: In the given figure, ABC is a triangle and PQ is a straight line meeting AB in P and AC in Q. If AP = 1 cm, PB = 3cm, AQ = 1.5 cm, QC = 4.5 cm, prove that area of ΔAPQ is 1/16 of the area of ΔABC.



Solution:
In ΔABC, PQ is a line which meets AB in P and AC in Q.
Given: AP = 1 cm, PB = 3 cm, AQ = 1.5 cm QC = 4.5 cm

Now, AP/PB = 1/3 and AQ/QC = 1.5/4.5 = 1/3

=> AP/PB = AQ/QC

From figure: AB = AP + PB = 1+3 = 4 cm
AC = AQ + QC = 1.5 + 4.5 = 6 cm

In ΔAPQ and ΔABC,

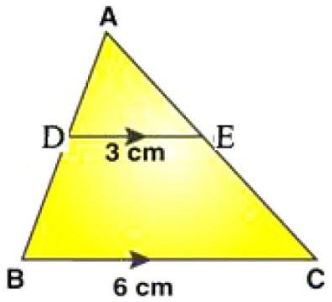
AP/AB = AQ/AC

angle A (common)
ΔAPQ and ΔABC are similar triangles.
Now,

$$\frac{\text{area of }(\Delta APQ)}{\text{area of }(\Delta ABC)} = \frac{AP^2}{AB^2} = \frac{(1)^2}{(4)^2} = \frac{1}{16}$$

Which implies,
area of ΔAPQ = 1/16 of the area of ΔABC
Hence Proved.

Question 10: In the given figure, DE || BC. If DE = 3 cm, BC = 6 cm and ar (ΔADE) = 15 cm², find the area of ΔABC.



Solution:

DE || BC
DE = 3 cm, BC = 6 cm
area (ΔADE) = 15 cm²

Now,
In ΔABC
DE ||BC. Therefore triangles, ΔADE and ΔABC are similar.

$$\frac{\text{area of } (\Delta ADE)}{\text{area of } (\Delta ABC)} = \frac{DE^2}{BC^2}$$

$$\frac{15}{\text{Area of } \Delta ABC} = \frac{(3)^2}{(6)^2} = \frac{9}{36}$$

$$\text{Area of } \Delta ABC = \frac{15 \times 36}{9} = 60$$

Area of ΔABC is 60 cm^2.

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Exercise 7D Page No: 437

Question 1: The sides of certain triangles are given below. Determine which of them are right triangles.
(i) 9 cm, 16 cm, 18 cm
(ii) 1 cm, 24 cm, 25 cm
(iii) 1.4 cm, 4.8 cm, 5 cm
(iv) 1.6 cm, 3.8 cm, 4 cm
(v) (a – 1) cm, $2\sqrt{a}$ cm, (a + 1) cm

Solution:
A given triangle to be right-angled, if it satisfies Pythagorean Theorem. That is, the sum of the squares of the two smaller sides must be equal to the square of the largest side.

(i) 9 cm, 16 cm, 18 cm
Longest side = 18
Now $(18)^2 = 324$
and $(9)^2 + (16)^2 = 81 + 256 = 337$
$324 \neq 337$
It is not a right triangle.

(ii) 1 cm, 24 cm, 25 cm
Longest side = 25 cm
$(25)^2 = 625$
and $(7)^2 \times (24)^2 = 49 + 576 = 625$
$625 = 625$
It is a right triangle.

(iii) 1.4 cm, 4.8 cm, 5 cm
Longest side = 5 cm
$(5)^2 = 25$
and $(1.4)^2 + (4.8)^2 = 1.96 + 23.04 = 25.00 = 25$
$25 = 25$
It is a right triangle.

(iv) 1.6 cm, 3.8 cm, 4 cm
Longest side = 4 cm
$(4\ )^2 = 16$
and $(1.6)^2 + (3.8)^2 = 2.56 + 14.44 = 17.00 = 17$
$16 \neq 17$
It is not a right triangle.

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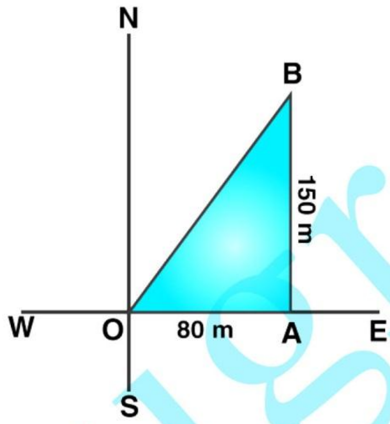
(v) (a- 1) cm, 2√a cm, (a + 1) cm
Longest side = (a + 1) cm
$(a + 1)^2 = a^2 + 2a + 1$
and $(a - 1)^2 + (2\sqrt{a})^2 = a^2 - 2a + 1 + 4a = a^2 + 2a + 1$
$a^2 + 2a + 1 = a^2 + 2a + 1$
It is a right triangle.

Question 2: A man goes 80 m due east and then 150 m due north. How far is he from the starting point?
Solution:
A man goes 80 m from O to east side and reaches A, then he goes 150 m due north from A and reaches B.
Draw a figure based on given instructions:



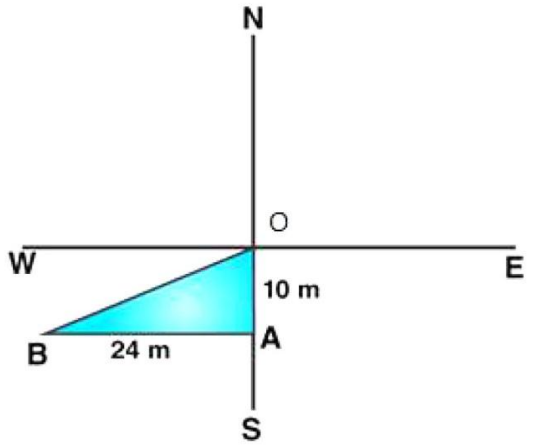
From right ΔOAB,
By Pythagoras Theorem:
OB^2 = OA^2+ AB^2
$= (80)^2 + (150)^2$
= 6400 + 22500
= 28900
or OB = √28900 = 170

Man is 170 m away from the starting point.

Question 3: A man goes 10 m due south and then 24 m due west. How far is he from the starting point?

Solution:
A man goes 10 m due south from O and reaches A and then 24 m due west from A and reaches B.

Draw a figure based on given instructions:



From right ΔOAB,
By Pythagoras Theorem:

$OB^2 = OA^2 + AB^2$
$= (10)^2 + (24)^2$

$= 676$

or OB = 26

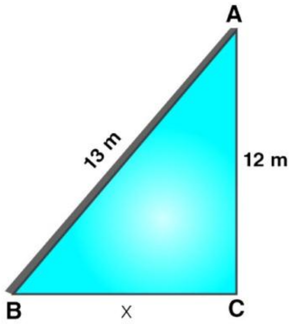
Man is 26 m away from the starting point.

Question 4: A 13-m-long ladder reaches a window of a building 12 m above the ground. Determine the distance of the foot of the ladder from the building.

Solution:
Height of the window = 12 m
Length of a ladder = 13 m

In the figures,

RS Aggarwal Solutions for Class 10 Maths Chapter 7 Triangles



Let AB is ladder, A is window of building AC
By Pythagoras Theorem:

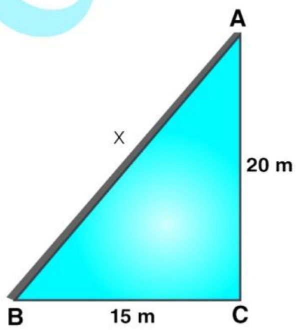
$AB^2 = AC^2 + BC^2$
$(13)^2 = (12)^2 + x^2$
$169 = 144 + x^2$
$x^2 = 169 - 144 = 25$
or $x = 5$

Distance between foot of ladder and building = 5 m.

Question 5: A ladder is placed in such a way that its foot is at a distance of 15 m from a wall and its top reaches a window 20 m above the ground. Find the length of the ladder.

Solution:
Height of window AC = 20 m
Let length of ladder AB = x m

Distance between the foot of the ladder and the building (BC) = 15 m
In the figure:



By Pythagoras Theorem:

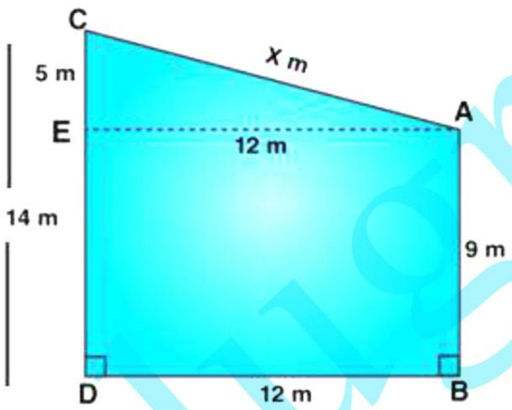
AB^2 = AC^2 + BC^2

$x^2 = 20^2 + 15^2$
= 400 + 225
= 625
or x = 25
Length of ladder is 25 m

Question 6: Two vertical poles of height 9 m and 14 m stand on a plane ground. If the distance between their feet is 12 m, find the distance between their tops.

Solution:
Height of first pole AB = 9 m and

Height of second pole CD = 14 m
Let distance between their tops CA = x m



From A, draw AE || BD meeting CD at E.

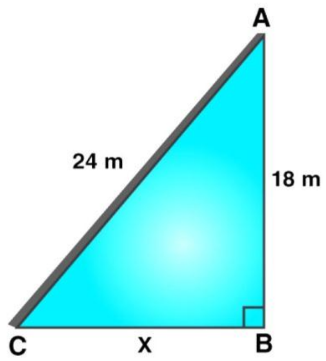
Then EA = DB = 12 m CE = CD – ED = CD – AB = 14-9 = 5 m

In right ΔAEC,

$AC^2 = AE^2 + CE^2$
= 122 + 52
= 144 + 25
= 169
or AC = 13
Distance between pole's tops is 13 m

Question 7: A guy wire attached to a vertical pole of height 18 m is 24 m long and has a stake attached to the other end. How far from the base of the pole should the stake be driven so that the wire will be taut?

Solution:
Length of wire = AC = 24 m
Height of the pole = AB = 18 m
Let Distance between the base of the pole and other end of the wire = BC = x m



In right ΔABC,
By Pythagoras Theorem:
AC^2 = AB^2 + BC^2

$(24)^2 = (18)^2 + x^2$

$576 = 324 + x^2$

$x^2 = 576 – 324 = 252$

or x = 6v7

BC is 6v7m

Question 8: In the given figure, O is a point inside a ΔPQR such that ∠POR = 90°, OP = 6 cm and OR = 8 cm. If PQ = 24 cm and QR = 26 cm, prove that ΔPQR is right-angled.

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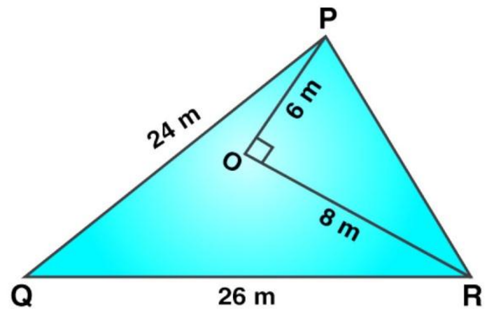

Solution:

In ΔPQR, O is a point in it such that
OP = 6 cm, OR = 8 cm and ∠POR = 90°
PQ = 24 cm, QR = 26 cm

Now,
In ΔPOR, ∠O = 90°
$PR^2 = PO^2 + OR^2$
$= (6)^2 + (8)^2$
= 36 + 64
= 100
PR = 10

Greatest side QR is 26 cm

$QR^2 = (26)^2 = 676$

and $PQ^2 + PR^2 = (24)^2 + (10)^2$
= 576 + 100
= 676

Which implies, 676 = 676

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

ΔPQR is a right angled triangle and right angle at P.

Question 9: ΔABC is an isosceles triangle with AB = AC = 13 cm. The length of altitude from A on BC is 5 cm. Find BC.
Solution:
In isosceles ΔABC, AB = AC = 13 cm

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Consider AL is altitude from A to BC and AL = 5 cm

Now, in right ΔALB
AB^2 = AL^2 + BL^2

$(13)^2 = (5)^2 + BL^2$

$169 = 25 + BL^2$

$BL^2 = 169 – 25 = 144$
or BL = 12

Since L is midpoint of BC, then
BC = 2 x BC = 2 x 12 = 24

BC is 24 cm

Question 10: Find the length of altitude AD of an isosceles ΔABC in which AB = AC = 2a units and BC = a units.

Solution:
In an isosceles ΔABC in which AB = AC = 2a units, BC = a units

AD is the altitude. Therefore, D is the midpoint of BC

=> BD = a/2

We have two right triangles: ΔADB and ΔADC

By Pythagoras theorem,

AB^2 = BD^2 + AD^2

(2a)^2 = (a/2)^2 + AD^2

$$(2a)^2 = \frac{a^2}{4} + AD^2$$

$$AD^2 = \frac{16a^2 - a^2}{4} = \frac{15a^2}{4}$$

$$AD = \frac{a\sqrt{15}}{2}$$

RS Aggarwal Solutions for Class 10 Maths Chapter 7 Triangles

Exercise 7E Page No: 442

Question 1: State the two properties which are necessary for given two triangles to be similar.
Solution:
Two properties for similarity of two triangles are:
(i) Angle-Angle-Angle (AAA) property.
(ii) Angle-Side-Angle (ASA) property.

Question 2: State the basic proportionality theorem.
Solution:
In a triangle, if a line parallel to one side is drawn, it will divide the other two sides proportionally.
Question 3: State the converse of Thales' theorem.
Solution:
If a line divides any two sides of a triangle in the same ratio. Then, the line must be parallel to the third side.
Question 4: State the midpoint theorem.
Solution:
The line joining the midpoints of two sides of a triangle, is parallel to the third side.
Question 5: State the AAA-similarity criterion.
Solution:
In two triangles, if three angles of the one triangle are equal to the three angles of the other, the triangles are similar.
Question 6: State the AA-similarity criterion.
Solution:
In two triangles, if two angles of the one triangle are equal to the corresponding angles of the other triangle, then the triangles are similar.
Question 7: State the SSS-criterion for similarity of triangles.
Solution:
In two triangles, if three sides of the one are proportional to the corresponding sides of the other, the triangles are similar.
Question 8: State the SAS-similarity criterion.
Solution:
In two triangles, if two sides of the one are proportional to the corresponding sides of the other and their included angles are equal, the two triangles are similar.
Question 9: State Pythagoras' theorem.
Solution:
In a right angled triangle, the square on the hypotenuse is equal to the sum of squares on the other two sides.
Question 10: State the converse of Pythagoras theorem.
Solution:
In a triangle, if the square on the longest side is equal to the sum of the squares on the other two sides,

then the angle opposite to the hypotenuse is a right angle.

Question 11: If D, E and F are respectively the midpoints of sides AB, BC and CA of ΔABC then what is the ratio of the areas of ΔDEF and ΔABC?
Solution:
The ratio of their areas will be 1 : 4.

Question 12: Two triangles ABC and PQR are such that AB = 3 cm, AC = 6 cm, ∠A = 70°, PR = 9 cm, ∠P = 70° and PQ = 4.5 cm. Show that ΔABC ~ ΔPQR and state the similarity criterion.

Solution:
In two triangles ΔABC and ΔPQR,
AB = 3 cm, AC = 6 cm, ∠A = 70°
PR = 9 cm, ∠P = 70° and PQ= 4.5 cm
Now,
∠A = ∠P = 70° (Same)
AC/PR = 6/9 = 2/3 and
AB/PQ = 3/4.5 = 2/3

=> AC/PR = AB/PQ

Both ΔABC and ΔPQR are similar.

Question 13: If ΔABC ~ ΔDEF such that 2AB = DE and BC = 6 cm, find EF.

Solution:
ΔABC ~ ΔDEF (given)
2AB = DE, BC = 6 cm (given)

∠E = ∠B and ∠D = ∠A and ∠F = ∠C

2AB = DE

=> AB/DE = 1/2

Therefore,

AB/DE = BC/EF

1/2 = 6/EF

or EF = 12 cm

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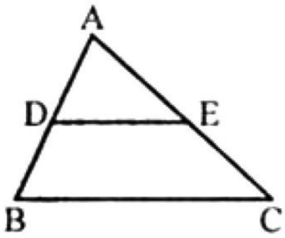
Question 14: In the given figure, DE || BC such that AD = x cm, DB = (3x + 4) cm, AE = (x + 3) cm and EC = (3x + 19) cm. Find the value of x.



Solution:

From figure:
DE || BC
AD = x cm, DB = (3x + 4) cm

AE = (x + 3) cm and EC = (3x + 19) cm

In ΔABC

AD/DB = AE/EC

x/(3x+4) = (x+3)/(3x+19)
3x^2 + 19x - 3x^2- 9x - 4x = 12
x = 2

Question 15: A ladder 10 m long reaches the window of a house 8 m above the ground. Find the distance of the foot of the ladder from the base of the wall.

Solution:
Let AB is the ladder and A is window.
Then, AB = 10 m and AC = 8 m

Let BC = x

In right ΔABC,
By Pythagoras Theorem:

AB^2 = AC^2 + BC^2

$(10)^2 = 8^2 + x^2$
$100 = 64 + x^2$
$x^2 = 100 – 64 = 36$
or x = 6
Therefore, Distance between foot of ladder and base of the wall is 6 m.