TRIANGLES

CLASS X (BASIC & STANDARD)

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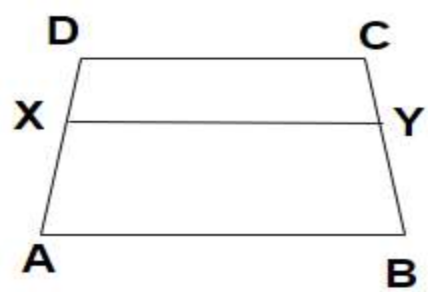
1 Which of the following statements is false? CBSE 2025 AJMER

(A) Two right triangles are always similar.
(B) Two squares are always similar.
(C) Two equilateral triangles are always similar.
(D) Two circles are always similar.

ANS: (A) Two right triangles are always similar.

2 In the adjoining figure, ABCD is a trapezium in which $XY \parallel AB \parallel CD$. If $AX = \frac{2}{3}AD$, then $CY : YB =$_____ CBSE 2025 AJMER

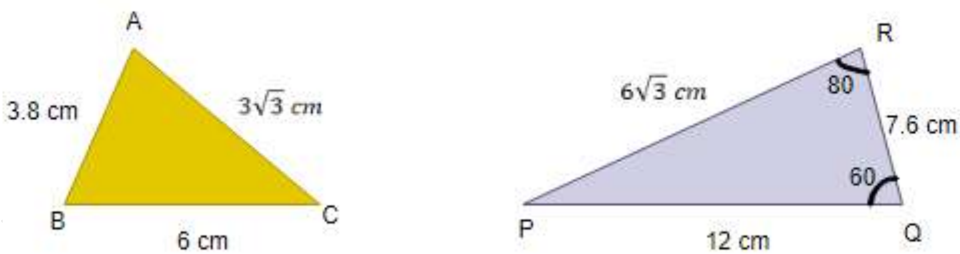


(A) 2: 3 (B) 3: 2
(C) 1: 3 (D) 1: 2

ANS: (D) 1: 2

3 $\Delta\, ABC\ and\ \Delta PQR$ are shown in the adjoining figure. $\angle C = is$ _____ CBSE 2025 DELHI

(A) 140° (B) 80° (C) 60° (D) 40°



ANS: (D) 40°

4 $E\ and\ F$ are points on sides $AB\ and\ AC$ respectively of a triangle ABC such that $\frac{AE}{EB} = \frac{AF}{FC} = \frac{1}{2}$, which of the following relation is true. CBSE 2025 DELHI

(A) $EF = 2\,BC$ (B) $BC = 2\,EF$
(C) $EF = 3\,BC$ (D) $BC = 3\,EF$

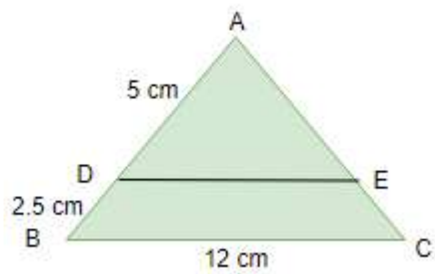
ANS: (D) $BC = 3\,EF$

5 If in two triangles $ABC\ and\ PQR$, $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$, then

(A) $\Delta PQR \sim \Delta CAB$ (B) $\Delta PQR \sim \Delta ABC$
(C) $\Delta CBA \sim \Delta PQR$ (D) $\Delta BCA \sim \Delta PQR$

(A) $\Delta PQR \sim \Delta CAB$

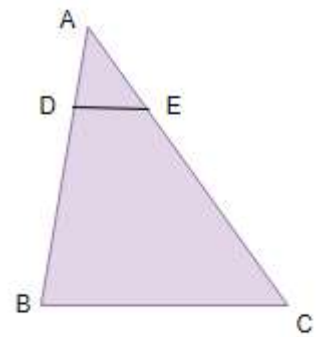
6 In the given figure, ΔABC is shown. $DE \parallel BC$. If $AD = 5\ cm, DB = 2.5\ cm\ and\ BC = 12cm$ then $DE =$ ____



(A) 10 cm (B) 6 cm
(C) 8 cm (D) 7.5 cm

ANS: (C) 8 cm

7 In figure, D and E are points on AB and AC respectively, such that DE || BC. If AD = $\frac{1}{3}$ BD, AE = 4.5 cm, find AC.



(A) 13.5 cm (B) 9 cm
(C) 18 cm (D) None of this

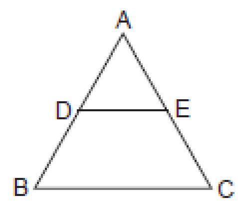
ANS: (C) 18 cm

18 D and E are respectively the points on the sides AB and AC of a triangle ABC such that AD = 2 cm, BD = 3 cm, BC = 7.5 cm and DE ∥ BC. Then, length of DE (in cm) is ____

(A) 2.5 (B) 3 (C) 5 (D) 6

ANS: (B) 3

9 In the given figure, $\frac{AD}{BD} = \frac{AE}{EC}$ and ∠ ADE = 70°, ∠ BAC = 50°, then angle ∠ BCA =

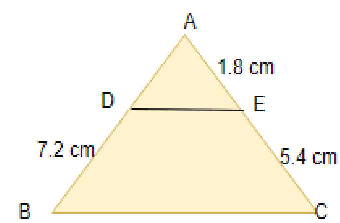


(A) 70° (B) 50° (C) 80° (D) 60°

ANS: (D) 60°

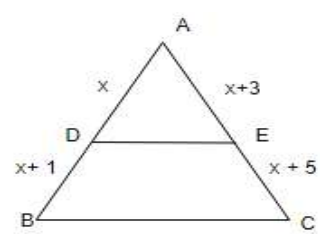
10 In the given figure, ΔABC given DE || B.C, Find AD.

(A) 2.4 (B) 4.2
(C) 2.2 (D) 1.2



(A) 2.4 cm

11 In $\Delta ABC, DE \parallel BC$, find the value of x.

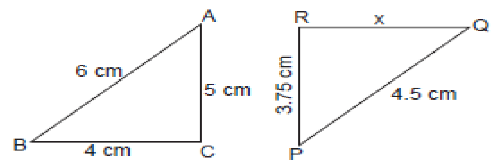


ANS: $DE \parallel BC$

$\frac{x}{x+1} = \frac{x+3}{x+5} \Rightarrow x^2 + 5x = x^2 + 4x + 3$

$\Rightarrow x = 3$

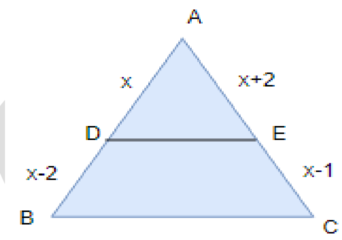
12 In the given figure, if ΔABC ~ ΔPQR The value of x is_____.



(A) 10 (B) 3.5 (C) 4.5 (D) 3

ANS: (D) 3

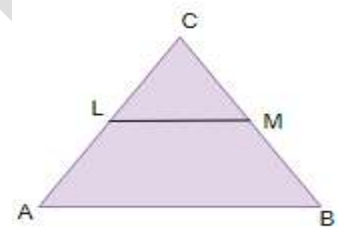
13 Given that in $\Delta\, ABC$, $DE \parallel BC$, find the value of x .



(A) 2 (B) 3 (C) 4 (D) 6

ANS: (C) 4

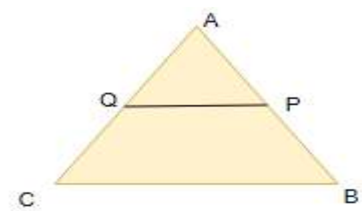
14 In the figure, $LM \parallel AB$. If $AL = x - 3, AC = 2x, BM = x - 2$
$BC = 2x + 3$, find the length of AC



A) 9 (B) 11 (C) 18 (D) 6

ANS: (C) 18

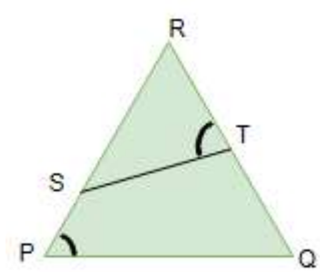
15 In the fig., P and Q are points on the sides AB and AC respectively of ΔABC such that AP = 3.5 cm, PB = 7 cm, AQ = 3 cm and QC = 6 cm. I f PQ = 4.5 cm, find BC.



ANS: 13.5 cm.

16 In the figure, $\angle P = \angle RTS$. Which one of the following is true?

(A) $\Delta RPQ \cong \Delta RTS$ (B) $\Delta RQP \cong \Delta RTS$
(C) $\Delta RPQ \cong \Delta RST$ (D) $\Delta PQR \cong \Delta RTS$



ANS: (A) $\Delta RPQ \cong \Delta RTS$

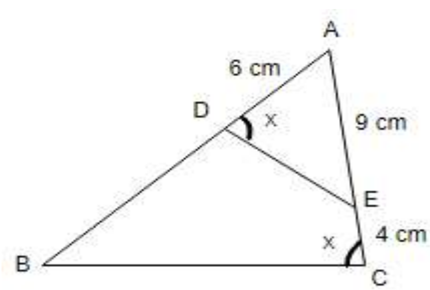
17 In triangles ABC and DEF, $\frac{AB}{DE} = \frac{BC}{FD}$, then they will be similar, when

(A) ∠ B = ∠ E (B) ∠ A = ∠ D (C) ∠ B = ∠ D (D) ∠ A = ∠ F

ANS: (C) ∠ B = ∠ D

18 In the given figure, $AD = 6\ cm, AE = 9\ cm$ and $= 4\ cm$, then value of $2BD =$ ______.

(A) 9 cm (B) 18 cm
(C) 27 cm (D) 36 cm

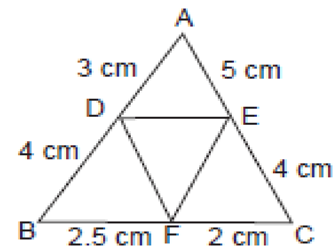


ANS: (C) 27 cm

19 In given figure, AD = 3 cm, AE = 5 cm, BD = 4 cm, CE = 4 cm, CF = 2 cm, BF = 2.5 cm, then

(A) DE || BC (B) DF || AC

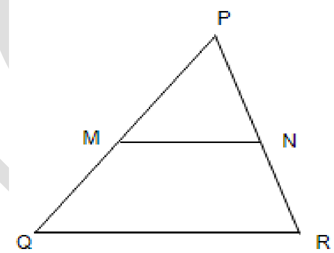
(C) EF || AB (D) none of these



(C) EF || AB $\frac{CF}{FB} = \frac{CE}{AE}$

20 In the given figure, MN || QR and PM = 3 cm, MQ = 4 cm, PN = 6 cm, PR = x cm, then x = __________.

(A) 6 (B) 8 (C) 14 (D) 4



ANS: ∵ MN || QR

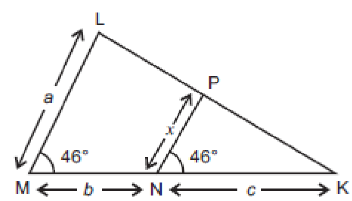
$\frac{PM}{MQ} = \frac{PN}{NR} \Rightarrow \frac{3}{4} = \frac{6}{NR}$

⇒ NR= 8 cm ⇒ $x = 8 + 6 = 14\ cm$

21 The perimeter of two similar triangles ABC and LMN are 60 cm and 48 cm respectively. If LM = 8 cm, then what is the length of AB ?

ANS: AB = 10 cm

22 In fig. ∠ M = ∠ N = 46°, express *x* in terms of *a*, *b* and *c*, where *a*, *b* and *c* are lengths of LM, MN and NK respectively

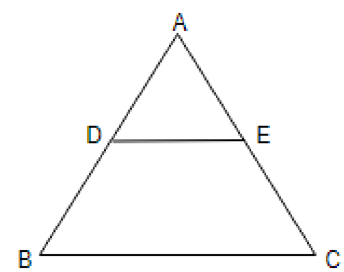


ANS: $\frac{ac}{b+c}$

23 In ΔABC , DE || BC. If $\frac{AD}{DB} = \frac{3}{5}$, $AC = 5.6\ cm$ then AE =____

A) $3.5\ cm$ B) $2.1\ cm$

C) $3\ cm$ D) $4\ cm$

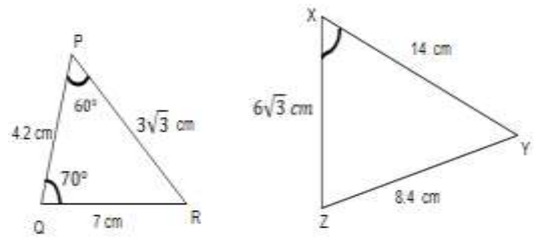


ANS: B) $2.1\ cm$

$DE\ ||\ BC$

$\frac{AB}{AD} = \frac{AC}{AE}$ (by B.P.T.) $\frac{8}{3} = \frac{5.6}{AE}$, AE = 2.1

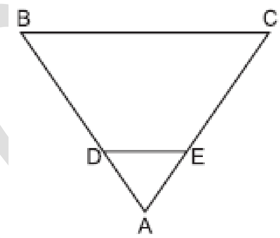
24 In the given figure, find the measure of $\angle X$.



A) 70° B) 60°
C) 40° D) 50°

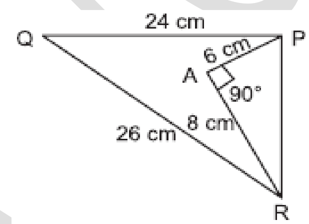
ANS: $\angle X = 50°$

25 In figure, DE || BC in ΔABC such that BC = 8 cm, AB = 6 cm and DA = 1.5 cm. Find DE



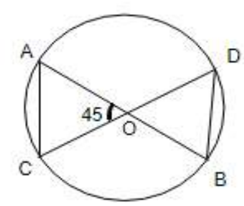
ANS: 2 cm

26 In the fig., PQ = 24 cm, QR = 26 cm, ∠ PAR = 90°, PA = 6 cm and AR = 8 cm. Find ∠ QPR.



ANS: ∠ QPR = 90°

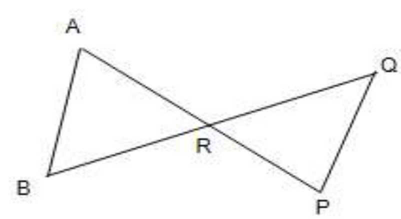
27 O is the point of intersection of two chords AB and CD such that OB = OD, then triangles OAC and ODB are______.



A) equilateral but not similar B) isosceles but not similar
C) equilateral and similar D) isosceles and similar

ANS: D) isosceles and similar

28 In the figure $\Delta ABR \sim \Delta PQR$,If PQ= 30 cm, AR = 45 cm, AP = 72 cm and QR = 42 cm the BR = ______



(A) 27 cm (B) 70 cm
(C) 45 cm (D) 42 cm

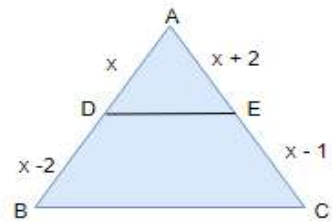
ANS: (B) 70 cm

29 In Δ ABC, D and E are points on the sides AB and AC respectively, such that DE || BC. If $AD = x$, $DB = x - 2$, $AE = x + 2$ and $EC = x - 1$, the value of *x* is ______.

(A) 1 (B) 2 (C) 3 (D) 4

ANS: (D) 4

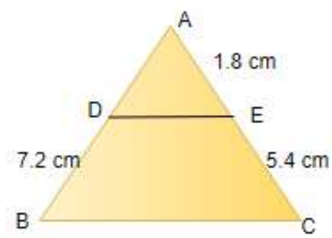
30 In ΔABC, D and E are points on the sides AB and AC respectively, such that DE || BC. If $AD = x, DB = x - 2$, $AE = x + 2$ and $EC = x - 1$, Find the value of x.



(A) 1 (B) 2
(C) 3 (D) 4

ANS: (D) 4 In ΔABC, DE || BC (Given)
$\frac{AD}{DB} = \frac{AE}{EC}$
(By BPT)
$\Rightarrow \frac{x}{x-2} = \frac{x+2}{x-1}$
$\Rightarrow x(x-1) = (x+2)(x-2)$
$\Rightarrow x^2 - x = x_2 - 2^2 \Rightarrow x^2 - x = x^2 - 4$
$\Rightarrow x = 4$

31 In the given figure, DE || BC, Find AD.



ANS: 2.4 cm

32 If in triangles ABC and DEF, $\frac{AB}{DE} = \frac{BC}{FD}$, then they will be similar, when _______
(A) $\angle B = \angle E$ (B) $\angle A = \angle D$ (C) $\angle B = \angle D$ (D) $\angle A = \angle F$
ANS: C) $\angle B = \angle D$
Then the triangles are similar by (SAS similarity)

33 If Δ ABC and Δ DEF are similar triangles such that ∠ A = 57° and ∠ E = 83°. Find ∠ C.
ANS: 40°

34 The perimeters of two similar triangles are 25 cm and 15 cm respectively. If one side of first triangle is 9 cm., what is the corresponding side of the other triangle ?
ANS; 5.4 cm

35 The lengths of the diagonals of a rhombus are 30 cm and 40 cm. Find the side of the rhombus.
(A) 10 (B) 20 (C) 25 (D) 15
ANS: 25 cm.

36 If D is a point on the side BC of a triangle ABC, such that $\angle ADC = \angle BAC$. then $CA^2 = CB \times$ _____
(A) CD (B) CB (C) AC (D) AB
Ans: in ΔACB and ΔDCA, $\angle BAC = \angle ADC$, given $\angle C = \angle C$ Common
∴ $\Delta ACB \sim \Delta DCA$ (AA) ∴ $\frac{CB}{CA} = \frac{CA}{CD}$ $\Rightarrow CA^2 = CB.CD$

37 In Δ ABC, D and E are points on the sides AB and AC respectively, such that DE || BC. If AD = x, DB = x – 2, AE = x + 2 and EC = x – 1, the value of x is _______.
(A) 4 (B) 3 (C) 2 (D) 1
(A) 4

38 The sides of two similar triangles are in the ratio 4 : 7 . The ratio of their perimeters is ___ (CBSE 2023)
(A) 4:7 (B) 12: 21 (C) 16: 49 (D) 7:4
ANS: (A) 4:7

39 If ΔABC and Δ DEF are similar triangles such that ∠ A = 57° and ∠ E = 83°. Then ∠ C = ______

A) 40° B) 57° C) 83° D) 50°

ANS: A) 40°

In ΔABC and ΔDEF,

ΔABC ~ ΔDEF (Given)

∠ A = ∠ D, ∠ B = ∠ E and ∠ C = ∠ F

∠ A = 57°, ∠ B = 83°

But ∠ A + ∠ B + ∠ C = 180° (Angle sum property of triangle)

∠ C = 180° – ∠ A – ∠ B = 180° – 57° – 83°

∠ C = 180° – 140° = 40°

40 In Δ ABC , D and E are points on the sides AB and AC respectively, such that DE ∥ BC. If AD $= x$, DB $= x - 2$,AE $= x + 2$ and EC $= x - 1$ then $x =$ _____

(A) 2 (B) 3 (C) 4 (D) 6

ANS: (C) 4

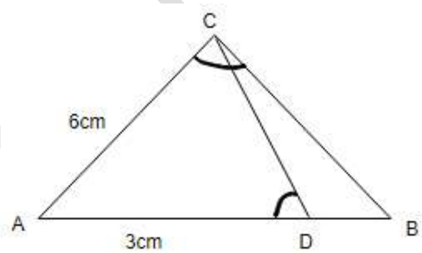
41 In Δ ABC , D and E are points on the sides AB and AC respectively, such that DE ∥ BC.

$\frac{AD}{DB} = \frac{4}{13}$ $and\ AC = 20.4\ cm,$ find AE.

(A) 2.2 (B) 4.8 (C) 4.6 (D) 2.4

ANS: 4.8

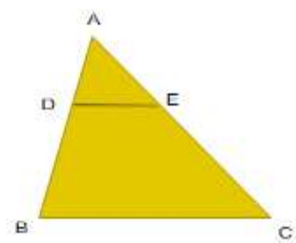
42 In the figure ∠ ACB = ∠CDA , AC = 6 cm and AD = 3 cm, then AB = ______



(A) 12 (B) 24 (C) 6 (D) 8

ANS: AB = 12 cm

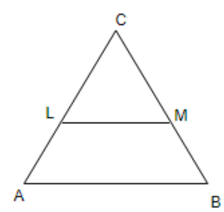
43 In the figure, AD = 6 cm, DB = 9 cm, AE = 8 cm and EC = 12 cm and ∠ADE = 48°, find ∠ABC = ___



(A) 48° (B) 52° (C) 44° (D) 58°

ANS: 48°

44 In the figure , $LM \parallel AB$. If $AL = x - 3, AC = 2x, BM = x - 2$ $BC = 2x + 3,$ find the value of x.



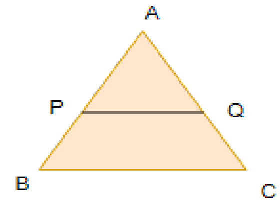
(A) 10 (B) 9 (C) 6 (D) 8

ANS: $LM \parallel AB$, $\therefore$ $\frac{AL}{LC} = \frac{BM}{MC}$ $(By\ BPT)$

$\frac{x-3}{2x-(x-3)} = \frac{x-2}{(2x+3)-(x-2)}$

$\frac{x-3}{x+3} = \frac{x-2}{x+5} \Rightarrow x^2 + 5x - 3x - 15 = x^2 + 3x - 2x - 6 \Rightarrow x = 9$

45 In Δ ABC , $PQ \parallel BC$, if $AP = 4x-3, PB = 3x-1, AQ = 8x-7, QC = 5x-3$. Find x.



(A) $1 \ and \ \frac{1}{2}$ (B) $-1 \ and \ 1$

(C) $1 \ and \ -\frac{1}{2}$ (D) $-\frac{1}{2} \ and \ \frac{1}{2}$

ANS:

$\frac{AP}{PB} = \frac{AQ}{QC} \Rightarrow \frac{4x-3}{3x-1} = \frac{8x-7}{5x-3}$

$20x^2 - 12x - 15x + 9 = 24x^2 - 21x - 8x + 7$

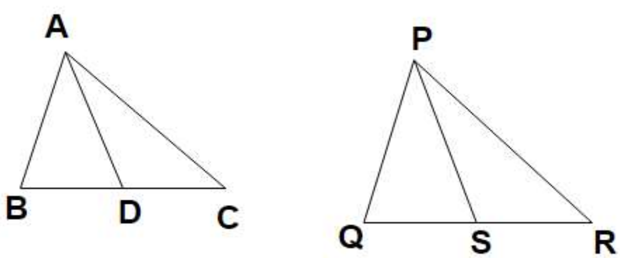
$4x^2 - 29x + 27x - 2 = 0 \Rightarrow 4x^2 - 2x - 2 = 0 \Rightarrow 2x^2 - x - 1 = 0$

$2x^2 - x - 1 = 0 \Rightarrow 2x^2 - 2x + x - 1 = 0 = 2x(x-1) + x - 1 = 0$

$(2x+1)(x-1) = 0 \quad x = 1 , x = -\frac{1}{2} \ (Discarded)$

46 AD and PS are medians of triangles ABC and PQR respectively such that $\Delta ABD \sim \Delta PQS$. Prove that $\Delta ABC \sim \Delta PQR$.

ANS:



Given

$\Delta ABD \sim \Delta PQS$, $AD \ and \ PS \ are \ medians$ $\Rightarrow$ D and S are midpoints

$\Rightarrow \frac{AB}{PQ} = \frac{BD}{QS} \ and \ \angle B = \angle Q$

$\frac{AB}{PQ} = \frac{2BD}{2QS} = \frac{BC}{QR}$

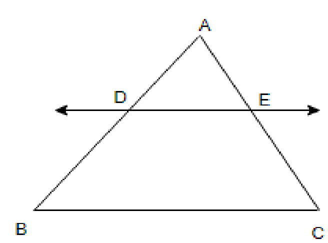
In $\Delta ABC, \ \Delta PQR \ \frac{AB}{PQ} = \frac{BC}{QR} \ and \ \angle B = \angle Q \Rightarrow \Delta ABC \sim \Delta PQR$ by SAS similarity

47 In Δ ABC, D and E are points on the sides AB and AC respectively, such that DE || BC. If AD = x, DB = x – 2, AE = x + 2 and EC = x – 1, the value of x is _______.

(A) 3 (B) 4 (C) 6 (D) 8

ANS: x = 4

48 In ΔABC , DE || BC. If $\frac{AD}{DB} = \frac{3}{5}$, $AC = 5.6 \ cm$ then AE =______



(A) 3.5 cm (B) 2.1 cm

(C) 3 cm (D) 4 cm

ANS: B) 2.1 cm

$DE \parallel BC$

$\frac{AB}{AD} = \frac{AC}{AE}$ (from B.P.T.) $\frac{8}{3} = \frac{5.6}{AE}$, AE = 2.1

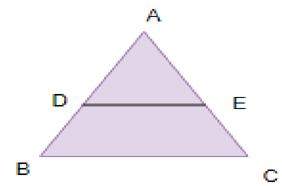
49 If in two triangles $ABC \ and \ PQR$, $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$, then

(A) $\Delta PQR \sim \Delta CAB$ (B) $\Delta PQR \sim \Delta ABC$

(C) $\Delta CBA \sim \Delta PQR$ (D) $\Delta BCA \sim \Delta PQR$

(A) $\Delta PQR \sim \Delta CAB$

50 In the given figure, $\frac{AD}{BD} = \frac{AE}{EC}$ and ∠ ADE = 70°, ∠BAC = 50°, then ∠BCA =

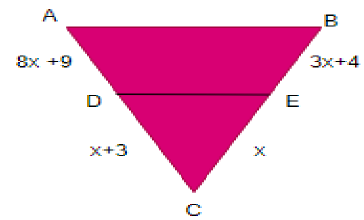


(A) 70° (B) 50° (C) 80° (D) 60°

ANS: (d) ∵ DE || BC ∴ ∠ABC = 70º. (Corresponding angles)

Using angle sum property of triangle ∠ABC + ∠BCA + ∠BAC = 180° ∠BCA = 60º

51 In the figure, given DE || AB , then the value of x = _____.



ANS: $x + 3) (3x + 4) = x(8x + 9)$

$3x^2 + 9x + 4x + 12 = 8x^2 + 9x$

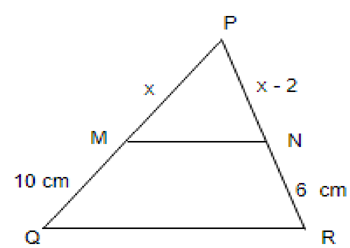
$5x^2 - 4x - 12 = 0$ $5x^2 - 10x + 6x - 12 = 0$

$5x(x - 2) + 6(x - 2) = 0$ $(x - 2)(5x + 6) = 0$

either $x = 2$ or $5x = -6$

$x = 2$ if $x = 2$ then DE || AB.

52 In the given figure, MN || QR. If PM = x cm, MQ = 10 cm, PN = (x – 2) cm, NR = 6 cm, then find the value of x.

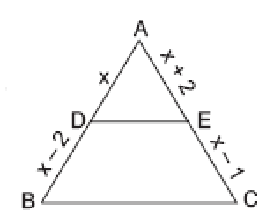


ANS: $\frac{PM}{MQ} = \frac{PN}{NR}$ ⇒

$\frac{x}{10} = \frac{x-2}{6}$

⇒ x = 5 cm

53 In Δ ABC, D and E are points on the sides AB and AC respectively, such that DE || BC. If AD = x, DB = $x - 2$, AE = $x + 2$ and EC = $x - 1$, Find the value of x.



In ΔABC, $DE \,||\, BC$ (Given)

$\frac{AD}{BD} = \frac{AE}{CE}$ (from B.P.T.)

$\frac{x}{x-2} = \frac{x+2}{x-1}$

$x = 4$

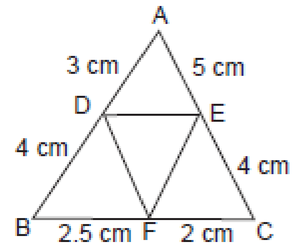
54 If D is a point on the side BC of a triangle ABC, such that $\angle ADC = \angle BAC$. Show that $CA^2 = CB.CD$

Ans: in $\Delta\, ACB$ and $\Delta DCA,$ $\angle BAC = \angle ADC,$ $given$ $\angle C = \angle C$ $Common$

$\therefore$ $\Delta\, ACB \sim \Delta DCA$ (AA) $\therefore$ $\frac{CB}{CA} = \frac{CA}{CD}$ $\Rightarrow CA^2 = CB.CD$

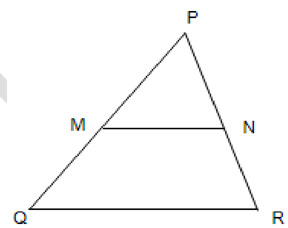
55 In given figure, AD = 3 cm, AE = 5 cm, BD = 4 cm, CE = 4 cm, CF = 2 cm, BF = 2.5 cm, then

(a) DE || BC (b) DF || AC (c) EF || AB (d) none of these



(c) EF || AB $\frac{CF}{FB} = \frac{CE}{AE}$

56 In the given figure, MN || QR and PM = 3 cm, MQ = 4 cm, PN = 6 cm, PR = x cm, then x = _________.



ANS: $\because$ MN || QR

$\frac{PM}{MQ} = \frac{PN}{NR} \Rightarrow \frac{3}{4} = \frac{6}{NR} \Rightarrow NR = 8$ cm

$\therefore$ $x = 8 + 6 = 14$ cm.

57 If $\Delta ABC \sim \Delta EDF$ and $\Delta\, ABC$ is not $similar$ to ΔDEF, then which of the following is not true?

(A) $BC\,.\,EF = AC\,.\,FD$ (B) $AB\,.\,EF = AC\,.\,DE$

(C) $BC\,.\,DE = AB\,.\,EF$ (D) $BC\,.\,DE = AB\,.\,FD$

ANS: (C) $\because$ ΔABC ~ ΔEDF

Then, $\frac{AB}{ED} = \frac{BC}{DF} = \frac{AC}{EF} \Rightarrow AB.DF = ED.BC$

$or\ AB.EF = AC.ED$

$or\ BC.EF = DF.AC$

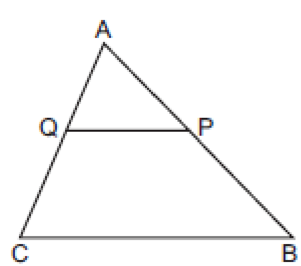
$\therefore\ BC.DE \neq AB.EF$

58 In two triangles DEF and $PQR, \angle D = \angle Q$ and $\angle R = \angle E$, then which of the following is not true?

A) $\frac{EF}{PR} = \frac{DF}{PQ}$ B) $\frac{DF}{PR} = \frac{EF}{QP}$ C) $\frac{DE}{QR} = \frac{DF}{PQ}$ D) $\frac{EF}{RP} = \frac{DE}{QR}$

ANS: B) $\frac{DF}{PR} = \frac{EF}{QP}$

59 In the fig., P and Q are points on the sides AB and AC respectively of ΔABC such that AP = 3.5 cm, PB = 7 cm, AQ = 3 cm and QC = 6 cm. I f PQ = 4.5 cm, find BC.



ANS: $\frac{AP}{PB} = \frac{3.5}{7} = \frac{1}{2}$ ...(i)

$\frac{AQ}{QC} = \frac{3}{6} = \frac{1}{2}$ ...(ii)

From (i) and (ii), we have $\frac{AP}{PB} = \frac{AQ}{QC}$

PQ || BC

AQP = ACB

and ∠ APQ = ∠ ABC (Corresponding angles)

ΔAQP ~ ΔACB (AA similarity)

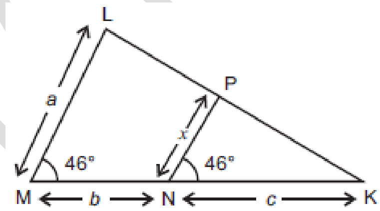
$\frac{PQ}{BC} = \frac{AQ}{AC} = \frac{AQ}{AQ+QC}$

(By definition of SSS similarity)

$\frac{4.5}{BC} = \frac{3}{9}$ ⇒ BC = 13.5 cm

BC = 13.5 cm.

60 In fig. ∠ M = ∠ N = 46°, express *x* in terms of *a*, *b* and *c*, where *a*, *b* and *c* are lengths of LM, MN and NK respectively.



ANS: In ΔLMK and ΔPNK

∠ M = ∠ N (each 46°)

∠ K = ∠ K (common)

ΔLMK ~ ΔPNK (AA similarity)

$\frac{LM}{PN} = \frac{MK}{NK} = \frac{LK}{PK} \Rightarrow \frac{a}{x} = \frac{b+c}{c}$

$\Rightarrow x = \frac{ac}{b+c}$

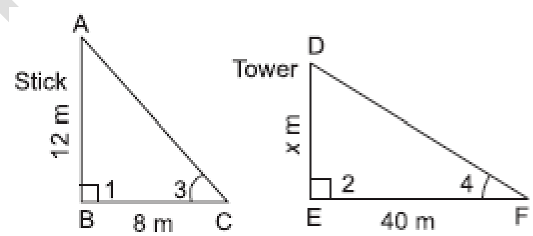
61 A vertical stick 12 m long casts a shadow 8 m long on the ground. At the same time a tower casts the shadow 40 m long on the ground. Determine the height of the tower.

Let height of the tower be *x* m.

∠ 1 = ∠ 2 = (90° each)

∠ 3 = ∠ 4 (Angle of inclination at the same time)

⇒ ΔABC ~ ΔDEF (AA similiarity)

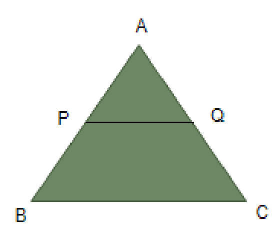


$$\Rightarrow \frac{AB}{BC} = \frac{DE}{EF} \Rightarrow \frac{12}{8} = \frac{x}{40}$$

$$\Rightarrow x = 60\ m$$

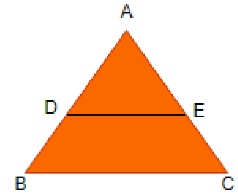
Height of the tower DE = 60

62 In the fig., P and Q are points on the sides AB and AC respectively of ΔABC such that $AP = xcm$, $PB = 10\ \ cm$ $AQ = (x-2)cm, QC = 6\ cm\ then\ x = ?$



ANS: $x = 5cm$

63 In Δ ABC, D and E are points on sides AB and AC respectively such that $DE \parallel BC$ and $AD : DB = 3 : 1$. If $EA = 6.6\ cm$ then find AC.

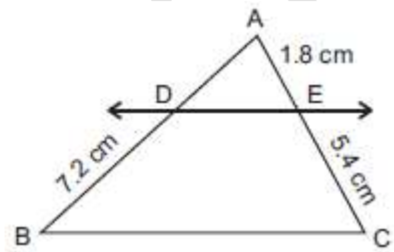


AD : DB = 3 : 1

In ΔABC, DE || BC

$\frac{AD}{DB} = \frac{AE}{EC} \quad \Rightarrow \frac{3}{1} = \frac{6.6}{EC} \quad \Rightarrow \quad EC = 2.2 \quad AC = 8.8\ cm$

64 In the given figure, DE || B.C. Find AD.



ANS: DE || BC

$\frac{AD}{BD} = \frac{AE}{CE}$ (from B.P.T.)

$\frac{AD}{7.2} = \frac{1.8}{5.4} = AD = 2.4\ cm$

AD = 2.4 cm

65 The perimeters of two similar triangles are 25 cm and 15 cm respectively. If one side of first triangle is 9 cm., what is the corresponding side of the other triangle ?

ANS: Let corresponding sides of two similar Δ's are *a*, *b*, *c* and *d*, *e*, *f* respectively, let a = 9 cm.

Δ's are similar

$\frac{a}{d} = \frac{b}{e} = \frac{c}{f} \Rightarrow \frac{a+b+c}{d+e+f} = \frac{a}{d}$

(Using property of proportion) $\frac{25}{15} = \frac{9}{d}$

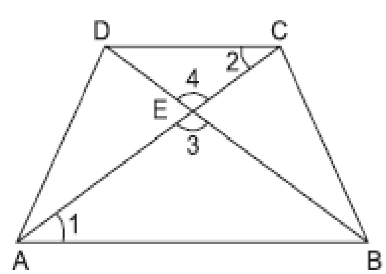
$d = \frac{27}{5} = 5.4\ cm$

⇒ *d* = 5.4 cm

66 If one diagonal of a trapezium divides the other diagonal in the ratio 1 : 3. Prove that one of the parallel sides is three times the other.

DE = EB = 1 : 3

In Δ AEB and ΔCED, ∠ 1 = ∠ 2 (alt. angles)



∠ 3 = ∠ 4 (V-O-A)

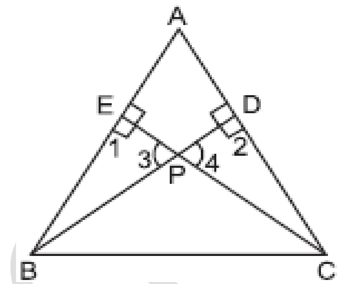
ΔAEB ~ ΔCED

$$\frac{AB}{CD} = \frac{BE}{DE} \Rightarrow \frac{AB}{CD} = \frac{3}{1}$$

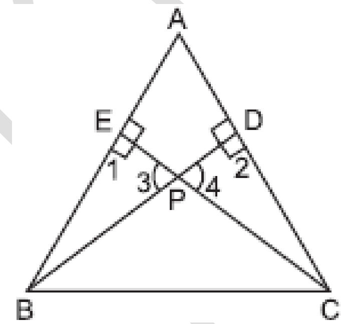
[DE : BE = 1 : 3]

⇒ AB = 3CD

67 In the given figure, considering triangles BEP and CPD, prove that BP × PD = EP × PC.



ANS: Given : ΔBEP and ΔCDP
To prove : BP × PD = EP × PC
Proof : In ΔBEP and ΔCPD
∠ 1 = ∠ 2 = 90°
∠ 3 = ∠ 4 (V.O.A)
⇒ ΔBEP ~ ΔCDP (By AA similarity)



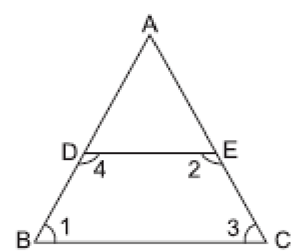
$$\frac{BP}{CP} = \frac{EP}{DP}$$

or $\frac{BP}{EP} = \frac{CP}{DP}$

⇒ BP × PD = EP × CP Hence proved.

68 In the given figure, ABC is a triangle in which AB = AC, D and E are points on the sides AB and AC respectively, such that AD = AE. Show that the points B, C, E and D are concyclic

Given : In ΔABC, AB = AC, AD = AE
To prove : Points B, C, E and D are concyclic
Proof : To prove that points B, C, E and D are concyclic only we need to prove
∠ 1 + ∠ 2 = 180° and ∠ 3 + ∠ 4 = 180°
In ΔABC, AB = AC
∠ 1 = ∠ 3 (Opp. angles of equal sides are equal) ...(i)
and AD = AE ...(ii)
Subtracting (ii) from (i) we get
AB – AD = AC – AE ⇒ DB = EC ...(iii) [AB – AD = DB and AC – AE = EC]
Dividing (ii) by (iii) we get $\frac{AD}{DB} = \frac{AE}{EC}$



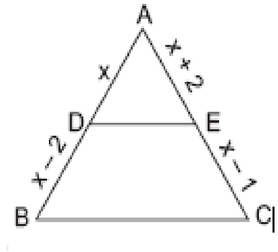
DE || BC (By converse of BPT)
∠ 1 + ∠ 4 = 180° [Cointerior angles are supplementary]
∠ 3 + ∠ 4 = 180°
∠ 1 = ∠ 3 (Proved above)
But ∠ 1 + ∠ 2 + ∠ 3 + ∠ 4 = 360° ... (iv) (Sum of the angles of a quadrilateral)
from (iii) and (iv), ∠ 1 + ∠ 2 + 180° = 360° ∠ 1 + ∠ 2 = 180°
Points B, C, D and E are concyclic. Hence proved.

69 In ΔABC, D and E are points on the sides AB and AC respectively, such that DE || BC. If AD = *x*,

DB = $x - 2$, AE = $x + 2$ and EC = $x - 1$, Find the value of x.

ANS:

In ΔABC, DE || BC (Given)



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

(By BPT)

$$\Rightarrow \frac{x}{x-2} = \frac{x+2}{x-1}$$

$\Rightarrow x(x - 1) = (x + 2)(x - 2)$

$\Rightarrow x^2 - x = x_2 - 2^2 \Rightarrow \quad x^2 - x = x^2 - 4$

$\Rightarrow x = 4$

70 If D and E are respectively the points on the side AB and AC of a triangle ABC such that AD = 6 cm, BD = 9 cm, AE = 8 cm and EC = 12 cm, then show that DE || BC.

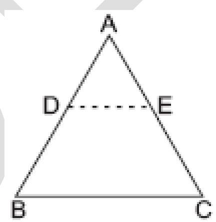
ANS:

Now $\frac{AD}{BD} = \frac{6}{9} = \frac{2}{3}$ …(1)

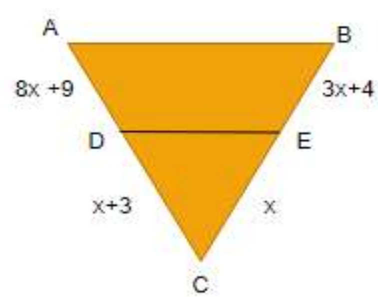
$\frac{AE}{EC} = \frac{8}{12} = \frac{2}{3}$ --------(ii)

From (i) and (ii) BD

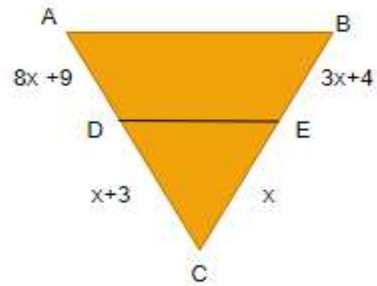
DE || BC (Using converse of B.P.T.)



71 What value(s) of x will make DE || AB in the given figure?

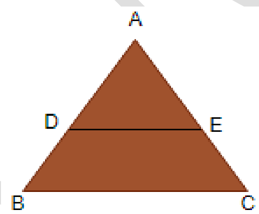


Given : ΔABC
Proof : DE will be parallel to AB
Only, if $\frac{CD}{AD} = \frac{CE}{BE}$ [Converse of BPT]

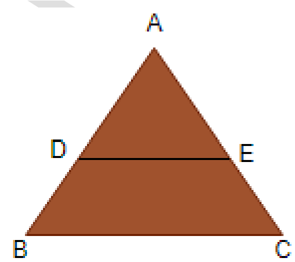


$\Rightarrow \frac{x+3}{8x+9} = \frac{x}{3x+4}$
$(x + 3)(3x + 4) = x(8x + 9)$
$3x^2 + 9x + 4x + 12 = 8x^2 + 9x$
$\Rightarrow 5x^2 - 4x - 12 = 0$
$\Rightarrow 5x^2 - 10x + 6x - 12 = 0$
$\Rightarrow 5x(x - 2) + 6(x - 2) = 0$
$\Rightarrow (x - 2)(5x + 6) = 0$
$\Rightarrow$ either $x = 2$ or $5x = -6$ $\Rightarrow x = -\frac{6}{5}$
(Impossible) $\Rightarrow x = 2$
if $x = 2$ then DE || AB.

72 In figure, D and E are points on AB and AC respectively, such that DE || BC. If AD = $\frac{1}{3}$ BD, AE = 4.5 cm, find AC.



ANS: Here AD = $\frac{1}{3}$ BD,
AE = 4.5 cm, DE || BC



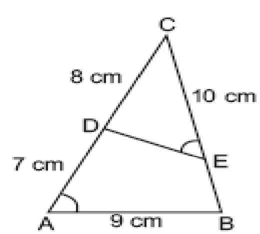
$$\frac{AD}{BD} = \frac{AE}{EC}$$

(using B.P.T.)

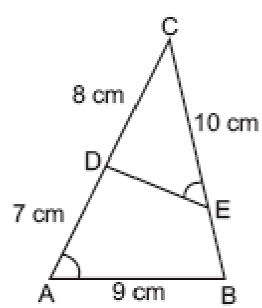
$$\frac{\frac{1}{3}BD}{BD} = \frac{4.5}{EC} \Rightarrow \frac{1}{3} = \frac{4.5}{EC}$$

$\Rightarrow$ EC = 4.5 × 3 cm
EC = 13.5 cm
Now AC = AE + EC = 4.5 + 13.5 = 18 cm

73 In the figure, if ∠ A = ∠ CED, AB = 9 cm, AD = 7 cm, CD = 8 cm and CE = 10 cm. Find DE.



ANS: Given : In ΔCAB,
∠ A = ∠ CED, AB = 9 cm,
AD = 7 cm, CD = 8 cm and CE = 10 cm
To find : DE

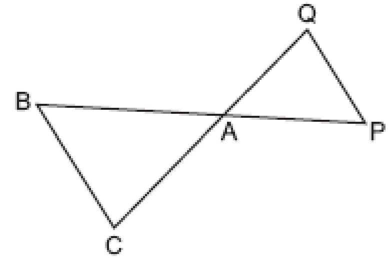


Proof : In ΔCED and ΔCAB
C = C (Common)
CED = CAB (Given)
Using AA similarity rule
ΔCAB ~ ΔCED

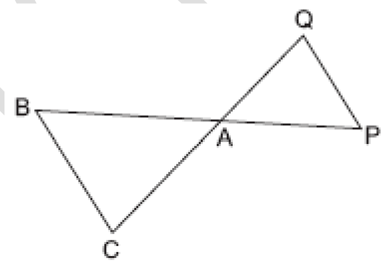
$\frac{AB}{DE} = \frac{AC}{CE}$ $\quad \frac{9}{DE} = \frac{AD+CD}{10}$

$\frac{9}{DE} = \frac{8+7}{10} \Rightarrow \quad DE = 6\,cm$ $\Rightarrow$ DE = 6 cm

74 In the given figure, ΔACB ~ ΔAQP. If BC = 8 cm, PQ = 4 cm, BA = 6.5 cm. AQ = 2.8 cm, find CA and PA.



ANS: ΔACB ~ ΔAQP



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

$$\frac{AC}{AQ} = \frac{BC}{PQ}$$

$$\frac{AC}{2.8} = \frac{8}{4}$$

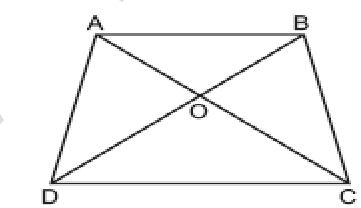
AC = 5.6 cm

Also $\quad \frac{BC}{PQ} = \frac{AB}{AP}$

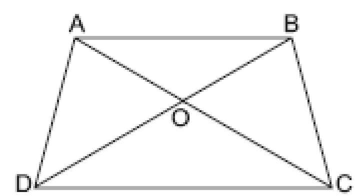
$\frac{8}{4} = \frac{6.5}{AP}$

AP = $\frac{6.5}{2}$= 3.25 cm

75 In the given figure , $\frac{AO}{OC} = \frac{BO}{OD} = \frac{1}{2}$ and AB = 4 cm. Find the value of DC.



ANS: Given : $\frac{AO}{OC} = \frac{BO}{OD} = \frac{1}{2}$ and AB = 4 cm



To find : DC

Proof : In ΔAOB and ΔCOD,

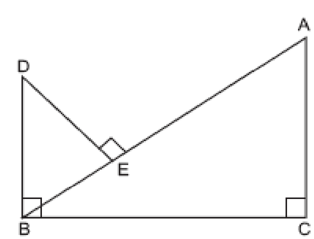
$\frac{AO}{OC} = \frac{BO}{OD}$ and ∠ AOB = ∠ COD

ΔAOB ~ ΔCOD (SAS similarity)

$$\frac{AO}{OC} = \frac{BO}{OD} = \frac{AB}{CD} \Rightarrow \quad \frac{1}{2} = \frac{4}{CD}$$

CD = 8 cm

76 In fig., DB ⊥ BC, DE ⊥ AB and AC ⊥ BC. Prove that $\frac{BE}{DE} = \frac{AC}{BC}$



ANS: Given : DB ⊥ BC, AC ⊥ BC and DE ⊥ AB.

To Prove : $\frac{BE}{DE} = \frac{AC}{BC}$

Proof : ∠ DEB = ∠ ACB [Each 90°] ...(i)

∠ DBE = 90° – ∠ ABC [Also, ∠ DBE + ∠ BDE = 90°]

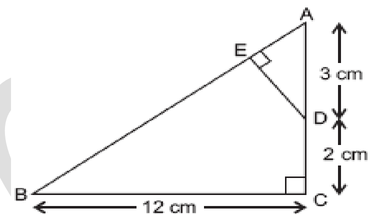
∠ ABC = ∠ BDE ...(ii)

From (i) and (ii), we get

ΔABC ~ ΔBDE [By AA Similarity]

$\frac{BE}{DE} = \frac{AC}{BC}$

77 In figure, Δ ABC is right angled at C and DE ⊥ AB. Prove that ΔABC ~ ΔADE and hence find the lengths of AE and DE.



ANS: Given : ΔABC and ΔADE right angled at C and E.

Proof : In ΔABC and ΔADE

∠ C = ∠ E = 90° [each]

∠ A = ∠ A (Common angle)

ΔABC ~ ΔADE (By AA similarity)

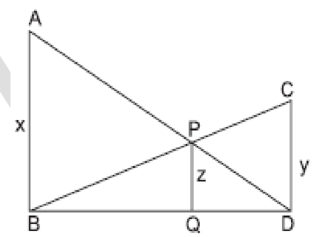
In ΔABC, $AB^2 = AC^2 + BC^2$ (By Pythagoras theorem)

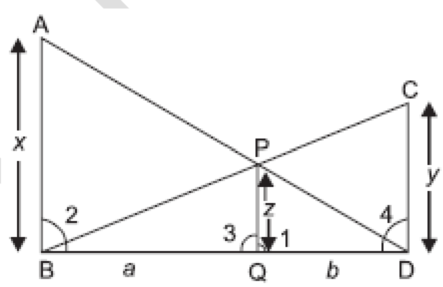
$AB^2 = 25 + 144 = 169$ AB = 13

then, $\frac{AB}{AD} = \frac{BC}{DE} = \frac{AC}{AE}$

$\frac{13}{3} = \frac{12}{DE} = \frac{5}{AE}$ then, AE = $\frac{15}{13}$ cm $DE = \frac{36}{13}$ cm

78 In figure AB || PQ || CD, AB = x units, CD = y units and PQ = z units, prove that $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$





ANS: Let BQ = a units, DQ = b units PQ || AB ∠ 1 = ∠ 2,

and ADB = PDQ

ΔADB ~ ΔPDQ

Similarily ΔBCD ~ ΔBPQ

ΔADB ~ ΔPDQ $\frac{AB}{PQ} = \frac{BD}{DQ}$ $\frac{x}{z} = \frac{a+b}{b}$

$\frac{x}{z} = \frac{a}{b} + 1 \Rightarrow \frac{x}{z} - 1 = \frac{a}{b}$ ... (i)

Also ΔBCD ~ ΔBPQ

$\frac{BD}{BQ} = \frac{CD}{PQ} \Rightarrow \frac{a+b}{a} = \frac{y}{z}$

$$1+\frac{b}{a} = \frac{y}{z} \Rightarrow \frac{b}{a} = \frac{y}{z}-1$$

$$\frac{b}{a} = \frac{y-z}{z} \Rightarrow \frac{a}{b} = \frac{z}{y-z} \quad ...(ii)$$

From (i) and (ii)

$$\frac{x}{z}-1 = \frac{z}{y-z} \Rightarrow \frac{x}{z} = \frac{z}{y-z}+1$$

$$\frac{x}{z} = \frac{z+y-z}{y-z}$$

$$\frac{x}{z} = \frac{y}{y-z} \Rightarrow \frac{z}{x} = \frac{y-z}{y}$$

$$\frac{z}{x} = 1-\frac{z}{y}$$

$$z\left(\frac{1}{x}\right) = z\left(\frac{1}{z}-\frac{1}{y}\right) \Rightarrow \frac{1}{x} = \frac{1}{z}-\frac{1}{y}$$

$\frac{1}{x}+\frac{1}{y}=\frac{1}{z}$ (Hence proved)

79 Match the Following :

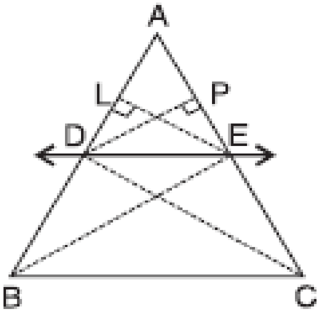
1. In ΔABC and ΔPQR $\frac{AB}{PQ}=\frac{AC}{PR}, \angle A = \angle P \Rightarrow \Delta ABC \sim \Delta PQR$	SSS similarity
2. In ΔABC and ΔPQR $\angle A = \angle P, \angle B = \angle Q \Rightarrow \Delta ABC \sim \Delta PQR$	SAS similarity
3. In ΔABC and ΔPQR $\frac{AB}{PQ}=\frac{AC}{PR}=\frac{BC}{QR} \Rightarrow \Delta ABC \sim \Delta PQR$	Basic Proportionality Theorem (BPT)
4. In ΔABC $DE \parallel BC$ $\Rightarrow \frac{AD}{BD}=\frac{AE}{CE}$	AAA similarity
5. In ΔABC $DE \parallel BC \Rightarrow$ $\frac{AB}{DB}=\frac{AC}{EC}$	

80 D and E are respectively the points on the sides AB and AC of a ΔABC (fig2) such that $AB = 5.6 cm, AD = 1.4\ cm,\ AC = 7.2\ cm$ and $AE = 1.8\ cm$, show that $DE \parallel BC$

If a line is drawn parallel to one side of a triangle, intersecting the other two sides distinct points then it divides the two sides in the same ratio, prove it.

Also state the converse of the above statement. CBSE 2025 AJMER

ANS: Statement: *If a line is drawn parallel to one side of a triangle to intersect the other two sides, then these two sides are divided in the same ratio (Basic Proportionality Theorem).*



Given : A triangle ABC, DE || BC, meeting AB at D and AC at E.

To Prove : $\frac{AD}{BD} = \frac{AE}{EC}$

Construction : Join BE, CD and draw EL ⊥ AD.

Proof : ΔBDE and ΔCDE are on the same base and between the same parallel BC and DE, hence equal in area, i.e.,

ar(ΔBDE) = ar(ΔCDE) ...(i)

$$\frac{area\ (\Delta\ ADE)}{area\ (\Delta BDE)} = \frac{\frac{1}{2} AD\ .EL}{\frac{1}{2} BD\ .EL} = \frac{AD}{BD}$$

$$\frac{area\ (\Delta\ ADE)}{area\ (\Delta CDE)} = \frac{\frac{1}{2} AE\ .DL}{\frac{1}{2} EC\ .DP} = \frac{AE}{EC}$$

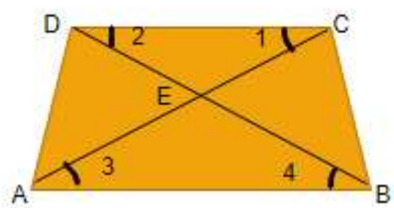
$$\frac{area\ (\Delta\ ADE)}{area\ (\Delta BDE)} = \frac{area\ (\Delta\ ADE)}{area\ (\Delta CDE)}$$

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

Converse of BPT

If a line divides any two side of a triangle in the same ratio , then the line is parallel to third side

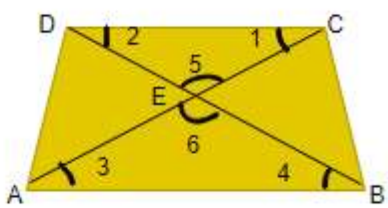
81 In fig ∠ 1 = ∠ 3, ∠ 2 = ∠ 4 , DE = 4, CE = x + 1,
AE = 2x + 4; BE = 4x – 2. Find x.



ANS: ∠ 1 = ∠ 3, ∠ 2 = ∠ 4 (given) ∠ 5 = ∠ 6 (V.O.A.)

$\Delta CDE \sim \Delta ABE$ Using AAA similarity rule

$\frac{DE}{BE} = \frac{EC}{EA}$



$\frac{4}{4x-2} = \frac{x+1}{2x+4}$

⇒ $8x + 16 = 4x^2 - 2x + 4x - 2$

⇒ $4x^2 + 2x - 8x - 2 - 16 = 0$

⇒ $4x^2 - 6x - 18 = 0$

⇒ $2x^2 - 3x - 9 = 0$

⇒ $2x^2 - 6x + 3x - 9 = 0$

⇒ $2x(x - 3) + 3(x - 3) = 0$

⇒ $(x - 3)(2x + 3) = 0$

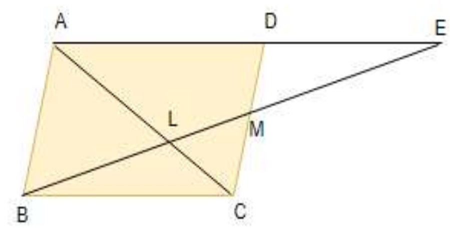
Either $x - 3 = 0$, $x = 3$

or $2x + 3 = 0$

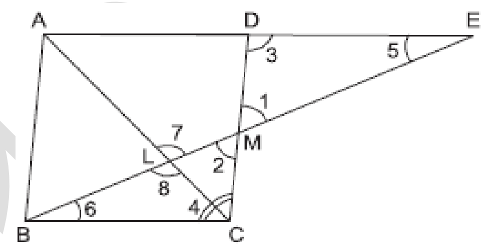
$x = -\frac{3}{2}$ is not possible

Hence, $x = 3$

82 In figure, M is mid-point of side CD of a parallelogram ABCD. The line BM is drawn intersecting AC at L and AD produced at E. Prove that $EL = 2BL$.



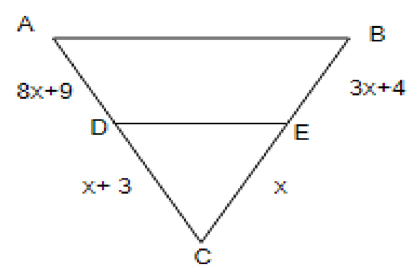
Proof : In ΔMDE and ΔMCB
DM = CM (Given)
∠ 1 = ∠ 2 (Vertically opposite)
∠ 3 = ∠ 4 (BC || AE and DC is a transversal) (Alt. int ∠ s)
$\Delta MDE \cong \Delta MCB$ (ASA Congruency)
DE = BC (CPCT) ... (i)
Also BC = AD ... (ii)
(Opposite sides of the parallelogram)
AD = DE [On equating (i) and (ii)]
Now, AE = AD + DE ⇒ AE = 2 AD (Put DE = AD)
In ΔBLC and ΔELA,
∠ 5 = ∠ 6 (Alt. int. angles)
and ∠ 7 = ∠ 8 (Vertically opposite angles)
$\Delta BLC \sim \Delta ELA$ (AA similarity)



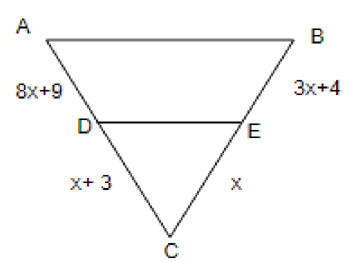
$$\frac{BL}{EL} = \frac{LC}{LA} = \frac{BC}{AE} \Rightarrow \frac{BL}{EL} = \frac{BC}{AE} \Rightarrow \frac{BL}{EL} = \frac{BC}{2AD}$$

$\frac{BL}{EL} = \frac{AD}{2AD}$ (BC = AD) $EL = 2BL$

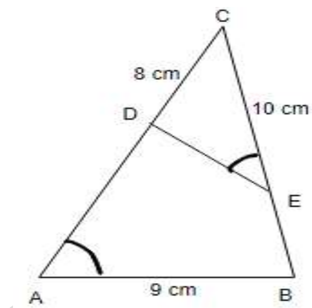
83 What value(s) of x will make DE || AB in the given figure?



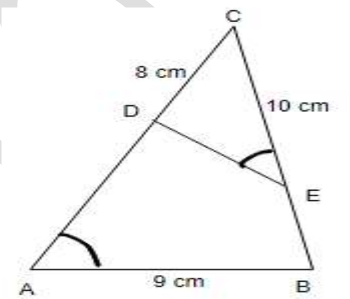
Given : ΔABC
Proof : DE will be parallel to AB
Only, if $\frac{CD}{AD} = \frac{CE}{BE}$ [Converse of BPT]
⇒ $\frac{x+3}{8x+9} = \frac{x}{3x+4}$
$(x + 3)(3x + 4) = x(8x + 9)$
$3x^2 + 9x + 4x + 12 = 8x^2 + 9x$
⇒ $5x^2 - 4x - 12 = 0$
⇒ $5x^2 - 10x + 6x - 12 = 0$
⇒ $5x(x - 2) + 6(x - 2) = 0$
⇒ $(x - 2)(5x + 6) = 0$ ⇒ either $x = 2$ or $5x = -6$
⇒ $x = -\frac{6}{5}$ (Impossible) ⇒ $x = 2$ if $x = 2$ then DE || AB.



84 b) In the figure, if $\angle A = \angle CED, AB = 9\ cm, AD = 7\ cm,$
$CD = 8\ cm\ and\ CE = 10\ cm$. Find DE.



ANS: a) Statement, figure, Construction etc.



b) Given : In $\Delta CAB,$

$\angle A = \angle CED, AB = 9\ cm,$

AD = 7 cm, CD = 8 cm and CE = 10 cm

To find : DE

Proof : In ΔCED and ΔCAB

∠ C = ∠ C (Common)

$\angle CED = \angle CAB$ (Given)

Using AA similarity rule

$\Delta CAB \sim \Delta CED$

$\frac{AB}{DE} = \frac{AC}{CE} \Rightarrow \frac{9}{DE} = \frac{AD+CD}{10}$

$\frac{9}{DE} = \frac{8+7}{10} \Rightarrow DE = 6\ cm \Rightarrow$ DE = 6 cm

85 In the figure, $PQ \parallel XY \parallel SR$. Show that $\frac{PX}{XS} = \frac{QY}{YR}$