Solution

TRIANGLES

Class 10 - Mathematics

Section A

1.

(b) 5

Explanation:

In △ADE and ABC

angle A common

angle D=B angle (DE || BC then, d = b)

by AA similarity criteria

△ADE similar △ABC.

$\frac{AD}{DB} = \frac{DE}{BC}$

$\frac{2}{3} = \frac{DE}{7.5}$

DE= 5 cm.

2.

(c) $\frac{6}{7}$

Explanation:

Given: $\triangle ABC \sim \triangle PQR$

Therefore,

$\frac{\text{Perimeter of } \triangle ABC}{\text{Perimeter of } \triangle POR} = \frac{AB}{PQ}$

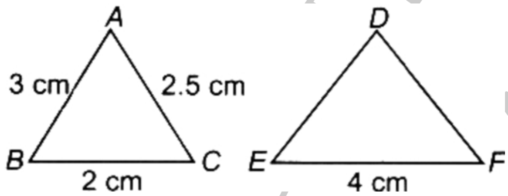
$= \frac{56}{48} = \frac{AB}{PQ}$

$\Rightarrow \frac{PQ}{AB} = \frac{6}{7}$

3.

(d) 15 cm

Explanation:



Since, △DEF ~ △ABC [Given]

$\Rightarrow \frac{AB}{DE} = \frac{BC}{EF} \Rightarrow \frac{3}{DE} = \frac{2}{4} \Rightarrow$ DE = 6 cm

Also, $\frac{AC}{DF} = \frac{BC}{EF} \Rightarrow \frac{2.5}{DF} = \frac{2}{4} \Rightarrow$ DF = 5 cm

∴ Perimeter of △DEF = DE + EF + FD

= 6 cm + 4 cm + 5 cm = 15 cm

4.

(b) Statements (ii) is correct.

Explanation:

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

5.

(d) ∠B = ∠P

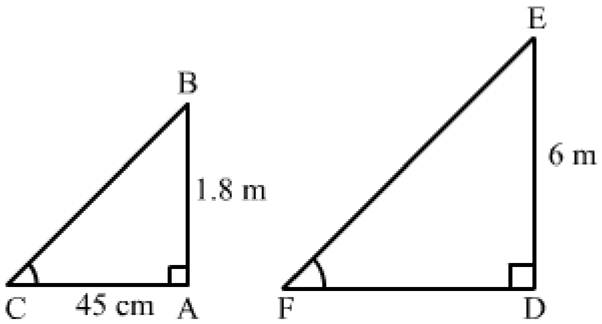
Explanation:

∠B = ∠P

6.

(c) 1.5 m

Explanation:



Let AB and AC be the vertical stick and its shadow, respectively.

According to the question:

AB = 1.8 m

AC = 45 cm = 0.45 m

Again, let DE and DF be the pole and its shadow, respectively.

According to the question:

DE = 6 m

DF = ?

Now, in right-angled triangles ABC and DEF, we have:

$\angle$BAC = $\angle$EDF = 90°

$\angle$ACB = $\angle$DFE (Angular elevation of the Sun at the same time)

Therefore, by AA similarity theorem,

we get:$\triangle$ABC$\sim$ $\triangle$DEF

$\Rightarrow \frac{AB}{AC} = \frac{DE}{DF} \Rightarrow \frac{1.8}{0.45} = \frac{6}{DF} \quad \Rightarrow DF = \frac{6 \times 0.45}{1.8} = 1.5\text{m}$

7.

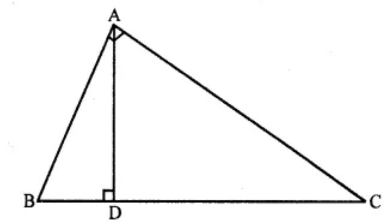
(d) $\left(\frac{AB}{AC}\right)^2$

Explanation:

In right angled $\triangle$ABC, $\angle \mathrm{A} = 90^\circ$

$\mathrm{AD} \perp \mathrm{BC}$

$\therefore \triangle ABD \sim \triangle ABC$



$\frac{AB}{BC} = \frac{BD}{AB} \Rightarrow AB^2 = BD \times BC$ .....(i)

Similarly $\triangle$ACD $\sim \Delta\mathrm{ABC}$

DC$\times$BC = AC^2 ....(ii)

Dividing (ii) by (i)

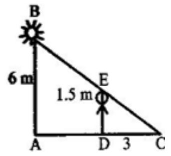
$\frac{BD \times BC}{DC \times BC} = \frac{AB^2}{AC^2} \Rightarrow \frac{BD}{DC} = \frac{AB^2}{AC^2}$

Hence $\frac{\mathrm{BD}}{\mathrm{DC}} = \frac{\mathrm{AB}^2}{\mathrm{AC}^2}$

8.

(b) 9 m

Explanation:



In triangles ABC and DEC,

$\angle A = \angle D$ [Each 90^o]

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

Therefore, $\Delta ABC \sim \Delta DEC$ [AA similarity]

$\Rightarrow \frac{AB}{DE} = \frac{AC}{DC}$

$\Rightarrow \frac{6}{1.5} = \frac{AC}{3}$

$\Rightarrow$ AC = 12 m

Therefore, the distance between the woman and pole is 12 - 3 = 9 m

9.

(b) 5.4 cm.

Explanation:

Given: $\triangle PQR \sim \triangle XYZ$

$\therefore \frac{\text{Perimeter of } \Delta PQR}{\text{Perimeter of } \Delta XYZ} = \frac{QR}{YZ}$

$\Rightarrow \frac{30}{18} = \frac{9}{YZ}$

$\Rightarrow$YZ = 5.4 cm

10.

(b) 2 cm

Explanation:

In $\triangle ABP$ and $\triangle CDP$

$\angle A = \angle C$ (given)

$\angle APB = \angle CPD$ (Vert. oppo. angle)

$\therefore \triangle ABP \sim \triangle CDP$ (by AA criteria)

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

CD = $\frac{AB \times CP}{AP}$

= $\frac{6 \times 4}{12}$ = 2 cm

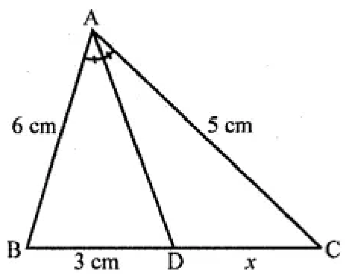
11.

(d) 2.5 cm

Explanation:

In $\triangle ABC$, AD is the bisector of $\angle BAC$

AB = 6 cm, AC = 5 cm, BD = 3 cm



Let DC = x

In $\triangle ABC$

$\because$ AD is the bisector of $\angle A$

$\therefore \frac{AB}{AC} = \frac{BD}{DC} \Rightarrow \frac{6}{5} = \frac{3}{x}$

$\Rightarrow x = \frac{3 \times 5}{6} = \frac{5}{2} = 2.5$

$\therefore DC = 2.5cm$

12. **(a)** 80^{o}

Explanation:

Given:

$\therefore \triangle ABC \sim \triangle DEF$,

$\angle A = \angle D$ (by CPST)

$\angle B = \angle E$ (by CPST)

$\angle C = \angle F$ (by CPST)

And, In $\triangle$ABC,

$\angle A + \angle B + \angle C = 180^{\circ}$

$\angle A + \angle E + \angle C = 180^{\circ}$

$55 + 45 + \angle C = 180$

$100 + \angle C = 180$

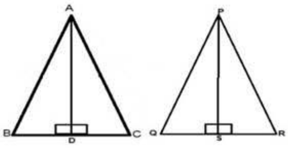
$\angle C = 180 - 100$

$= 80^{\circ}$

13.

(c) 35 cm

Explanation:



Given: $\Delta ABC \sim \Delta PQR$

$\therefore \frac{\text{Perimeter of } \Delta\text{ABC}}{\text{Perimeter of } \Delta\text{PQR}} = \frac{\text{AB}}{\text{PQ}}$

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

$\Rightarrow$ Perimeter of ΔABC = 35 cm

14. **(a)** $\angle$B = $\angle$D

Explanation:

We know that,

By the **SAS similarity criterion**, if one angle of a triangle is equal to one angle of another triangle and the sides including these angles are in the same ratio, then the triangles are similar.

Since the angle formed by AB and BC is $\angle$B.

And, the angle formed by DE and DF is $\angle$D.

So, $\angle$B = $\angle$D By [SAS similarity criterion]

Therefore, the given triangles will be similar when $\angle$B = $\angle$D.

15.

(d) 5.4 cm

Explanation:

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

$\therefore \frac{\text{AB}}{\text{DE}} = \frac{\text{BC}}{\text{EF}} = \frac{\text{AC}}{\text{DF}}$

$= \frac{AB+BC+AC}{DE+EF+DF} = \frac{30}{18}$

$BC = 9cm$

$\therefore \frac{9}{\text{EF}} = \frac{30}{18} \Rightarrow \text{EF} = \frac{9\times18}{30} = \frac{27}{5}$

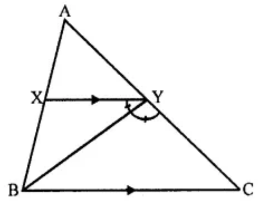
$\therefore \text{EF} = 5.4\text{cm}$

16. **(a)** BC = CY

Explanation:

In $\triangle$ ABC, XY || BC

Also BY is the bisector $\angle XYC$



$\angle XYB = \angle CYB$...... (i)

$XY \| BC$

$\angle XYB = \angle YBC$ (Alternate angles are equal).......(ii)

$\angle CYB = \angle YBC$

BC = CY

17.

(b) (i) 8.75 m, (ii) 12 m

Explanation:

i. Since, CD ∥ AB [Given]

$\therefore$ In $\triangle$RCD and $\triangle$RBA, we have

$\angle$BAR = $\angle$RDC [Alternate interior angles]

$\angle$ABR = $\angle$RCD

$\therefore$ $\triangle$RCD ~ $\triangle$RBA [By AA similarity]

$\Rightarrow \frac{RB}{RC} = \frac{AB}{DC}$

$\Rightarrow \frac{7.5}{1.2} = \frac{AB}{1.4} \Rightarrow$ AB = $\frac{7.5 \times 1.4}{1.2}$ = 8.75 m

i.e., Distance between the parks through town is 8.75 m.

ii. In right $\triangle$CRD, we have

$(CD)^2 = (CR)^2 + (RD)^2$

$\Rightarrow RD^2 = (1.4)^2 - (1.2)^2 = 0.52 \Rightarrow$ RD = 0.72 m

Since, $\triangle$RCD $\sim$ $\triangle$RBA

$\therefore \frac{RB}{RC} = \frac{AR}{DR} \Rightarrow \frac{7.5}{1.2} = \frac{AR}{0.72}$

$\Rightarrow$ AR = $\frac{7.5 \times 0.72}{1.2}$ = 4.5 m

i.e., Distance from Park A to Park B through point R = AR + RB = 4.5 m + 7.5 m = 12 m

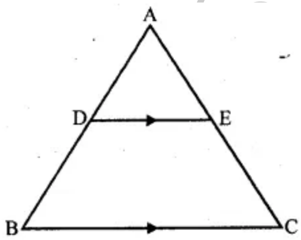
18.

(d) 4.4 cm

Explanation:

In ΔABC, DE ∥ BC

AD : DB = 3 : 1, EA = 3.3 cm



Let EC = x

$\because$ In $\triangle$ABC, DE ∥ BC

$\frac{\mathrm{AD}}{\mathrm{DB}} = \frac{\mathrm{AE}}{\mathrm{EC}} \Rightarrow \frac{3}{1} = \frac{3.3}{x}$

$\Rightarrow x = \frac{3.3}{3} = 1.1\mathrm{cm}$

$\therefore$ AC = AE + EC = 3.3 + 1.1 = 4.4 cm

19.

20.

(d) A is false but R is true.

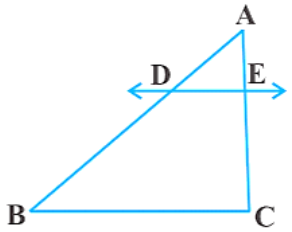
Explanation:

Similar triangles are not always congruent.

21. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

We know that if a line is parallel to one side of a triangle then it divides the other two sides in the same ratio. This is the Basic Proportionality theorem. So, the Reason is correct.



By Basic Proportionality theorem, we have $\frac{AD}{DB} = \frac{AE}{EC}$

$\Rightarrow \frac{DB}{AD} = \frac{EC}{AE} \Rightarrow \frac{DB}{AD} + 1 = \frac{EC}{AE} + 1$

$\Rightarrow \frac{DB+AD}{AD} = \frac{EC+AE}{AE} \Rightarrow \frac{AB}{AD} = \frac{AC}{AE} \quad \Rightarrow \frac{AD}{AB} = \frac{AE}{AC}$

So, the Assertion is correct.

22.

(c) A is true but R is false.

Explanation:

A is true but R is false.

23.

(d) A is false but R is true.

Explanation:

We have,

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

$\frac{7x-4}{3x+4} = \frac{5x-2}{3x}$

$21x^2 - 12x = 15x^2 + 20x - 6x - 8$

$6x^2 - 26x + 8 = 0$

$3x^2 - 13x + 4 = 0$

$3x^2 - 12x - x + 4 = 0$

3x(x - 4) - 1(x - 4) = 0

(x - 4)(3x - 1) = 0

x = 4, $\frac{1}{3}$

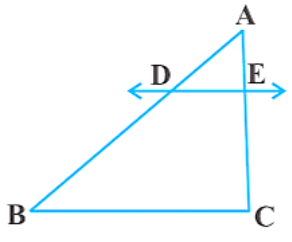
So, A is false but R is true.

24.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

We know that if a line is parallel to one side of a triangle then it divides the other two sides in the same ratio. This is the Basic Proportionality theorem.



So, Reason is correct.

DB = 10.8 - 6.3 = 4.5 cm and AE = 9.6 - 4 = 5.6 cm

Now, $\frac{AD}{DB} = \frac{6.3}{4.5} = \frac{63}{45} = \frac{7}{5}$ and $\frac{AE}{EC} = \frac{5.6}{4} = \frac{56}{40} = \frac{7}{5}$

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

By Converse of Basic Proportionality theorem, DE||BC

So, Assertion is correct.

But reason (R) is not the correct explanation of assertion (A).

25.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

Two similar triangles of equal area are always congruent.

26.

(d) A is false but R is true.

Explanation:

If a line divides any two sides of a triangle in the same ratio then it is parallel to the third side. This is the Converse of the Basic Proportionality theorem.

So, the Reason is correct.

Now, $\frac{AD}{DB} = \frac{5.7}{9.5} = \frac{57}{95} = \frac{3}{5}$

and $\frac{AE}{EC} = \frac{4.8}{8} = \frac{48}{80} = \frac{3}{5}$

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

By Converse of Basic Proportionality theorem, DE||BC

So, the Assertion is not correct.

27.

(c) A is true but R is false.

Explanation:

A is true but R is false.

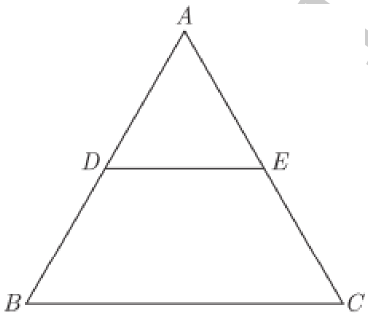
28. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Reason is true: [This is Thale's Theorem]

For Assertion

Since, DE || BC by Thale's Theorem



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

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

$1 + \frac{DB}{AD} = 1 + \frac{EC}{AE}$

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

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

Assertion is true.

Since, reason gives Assertion.

29.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

If a line divides any two sides of a triangle in the same ratio then it is parallel to the third side. This is the Converse of the Basic Proportionality theorem.

So, the Reason is correct.

By Basic Proportionality theorem, we have $\frac{AD}{DB} = \frac{AE}{EC} \Rightarrow \frac{4}{x-4} = \frac{8}{3x-19}$

$\Rightarrow$ 4(3x - 19) = 8(x - 4)

$\Rightarrow$ 12x - 76 = 8x - 32

$\Rightarrow$ 4x = 44 $\Rightarrow$ x = 11 cm

So, Assertion is correct.

But reason (R) is not the correct explanation of assertion (A).

Section B

30. 30

Explanation:

In the given figure, EF II BD and CE is the transversal.

$\therefore \angle \mathrm{CAD} = \angle \mathrm{AEF}$ (Pair of corresponding angles)

$\Rightarrow \angle CAD = 55^{\circ}$

In $\triangle ABC$

$\angle \mathrm{CAD} = \angle \mathrm{ABC} + \angle \mathrm{ACB}$ (Exterior angle of a triangle is equal to the sum of the two interior opposite angles)

$\Rightarrow 55^{\circ} = \angle ABC + 25^{\circ}$

$\Rightarrow \angle ABC$ = 55^{o} - 25^{o} = 30^{o}

Thus, the measure of $\angle ABC$ is 30^{o}

31. 16

Explanation:

According to question it is given that triangles ABC and PQR are similar.

Also, perimeter of $\triangle$ABC = 32 & Perimeter of $\triangle$PQR = 24

Therefore,

$\frac{\text{Perimeter } (\triangle ABC)}{\text{Perimeter } (\triangle PQR)} = \frac{AB}{PQ}$

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

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

= 16 cm

32. 4

Explanation:

According to question it is given that ABC is a triangle in which DE||BC.

Also, AD = 8 cm, AB = 15 cm, EC = 3.5 cm

Applying Thales' theorem, we get:

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

$\Rightarrow \frac{8}{15} = \frac{AE}{AE+EC}$

$\Rightarrow \frac{8}{15} = \frac{AE}{AE+3.5}$

$\Rightarrow$ 8AE + 28 = 15AE

$\Rightarrow$ 7AE = 28

$\Rightarrow$ AE = 4 cm

33. 1.5

Explanation:

Given XY || BC

AX = 1 cm, XB = 3 cm, and BC = 6 cm

AB = AX + XB

= 1 + 3 = 4 cm

In ΔAXY and ΔABC

$\angle A = \angle A$ [Common]

$\angle AXY = \angle ABC$ [Corresponding angles]

Then, $\triangle$AXY $\sim$ $\triangle$ABC [By AA similarity]

$\therefore \frac{AX}{AB} = \frac{XY}{BC}$ [Corresponding parts of similar $\triangle$are proportional]

$\Rightarrow \frac{1}{4} = \frac{XY}{6}$
$\Rightarrow XY = \frac{6}{4} = 1.5cm$

34. 18

Explanation:

According to question It is given that in △ABC, AE is the bisector of the $\angle CAD$.

Also, BE = BC + CE = 12 + x

CE= x, AB = 10, AC = 6

Since, We know that, the external bisector of an angle of a triangle divides the opposite side internally in the ratio of the sides containing the angle.

$\therefore \frac{BE}{CE} = \frac{AB}{AC}$
$\Rightarrow \frac{12+x}{x} = \frac{10}{6}$
⇒ 6(12 + x) = 10x
⇒ 72 + 6x = 10x
⇒ 4x = 72
$\Rightarrow x = \frac{72}{4}$
= 18 cm
⇒ CE = 18 cm

35. 1.5

Explanation:

According to question it is given that

DE || BC, AB = 6 cm and $AE = \frac{1}{4}AC$

In △ADE and △ABC

$\angle A = \angle A$ [Common]

$\angle ADE = \angle ABC$ [Corresponding angles]

Then, △ADE ∼ △ABC [By AA similarity]

$\Rightarrow \frac{AD}{AB} = \frac{AE}{AC}$ [because in similar triangles Corresponding parts of similar △ are proportional]

$\Rightarrow \frac{AD}{6} = \frac{\frac{1}{4}AC}{AC}$ $\left[\because AE = \frac{1}{4}AC \text{ given}\right]$

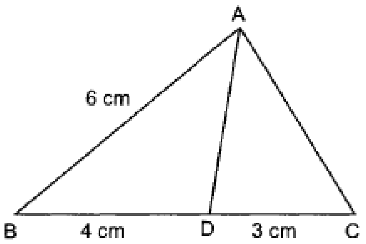
$\Rightarrow \frac{AD}{6} = \frac{1}{4}$

$\Rightarrow AD = \frac{6}{4} = 1.5cm$

36. 4.5

Explanation:

In Δ ABC, AD is the bisector of ∠ A.



According to question it is given that

BD = 4 cm, CD = 3 cm and AB = 6 cm

We know that, the bisector of an angle of a triangle divides the opposite side internally in the ratio of the sides containing the angle.

$\therefore \quad \frac{BD}{DC} = \frac{AB}{AC}$
$\Rightarrow \frac{4}{3} = \frac{6}{AC}$
⇒ 4 AC = 18
$\Rightarrow AC = \frac{9}{2}\text{cm} = 4.5\text{cm}$.

37. According to question it is given that triangles ABC and PQR are similar.

Also, perimeter of Δ ABC = 32 & Perimeter of Δ PQR = 24

Therefore,

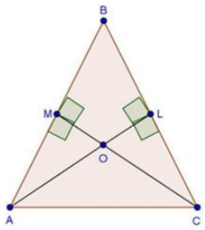
$\frac{\text{Perimeter }(\triangle ABC)}{\text{Perimeter }(\triangle PQR)} = \frac{AB}{PQ}$

$\Rightarrow \frac{32}{24}=\frac{AB}{12}$
$\Rightarrow AB=\frac{32\times12}{24}$
= 16 cm

38. According to question,
it is given that In $\triangle ABC$, $LM \| CB$
Therefore, by Thales' theorem
$\Rightarrow \frac{AM}{AB}=\frac{AL}{AC}$ ...(i)
In $\triangle ACD$, $LN \| CD$
Therefore by Thales theorem
$\Rightarrow \frac{AL}{AC}=\frac{AN}{AD}$ ....(ii)
From (i) and (ii) we get
$\frac{AM}{AB}=\frac{AN}{AD}$

39. We have,
$\frac{AD}{DB}=\frac{2}{3}$ and $DE \mathbb{I} BC$
Therefore, by basic proportionality theorem, we have,
$\frac{AD}{DB}=\frac{AE}{EC}$
Taking reciprocal on both sides, we get
$\frac{DB}{AD}=\frac{EC}{AE}$
$\Rightarrow \quad \frac{3}{2}-\frac{EC}{M}$
Adding 1 on both sdies, we get
$\frac{3}{2}+1=\frac{EC}{AE}+1$
$\Rightarrow \quad \frac{3+2}{2}-\frac{EC+AE}{AE}$
$\Rightarrow \quad \frac{5}{2}=\frac{AC}{AE}$ [∵ AE + EC = AC]
$\Rightarrow \quad \frac{5}{2}=\frac{18}{AE}$ [∵ AC = 18]
$\Rightarrow \quad AE=\frac{18\times2}{5}$
$\Rightarrow \quad AE=\frac{36}{5}=7.2\text{cm}$

40. We have,

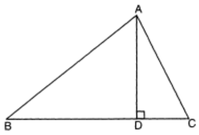


We are given that,
$AL \perp BC$ and $CM \perp AB$

i. In △OMA and △OLC
$\angle MOA=\angle LOC$ [Vertically opposite angles]
$\angle AMO=\angle CLO$ [Each 90°]

ii. Then, △OMA ~ △OLC [By AA similarity]
$\therefore \frac{OA}{OC}=\frac{OM}{OL}$ [Corresponding parts of similar △ are proportional]

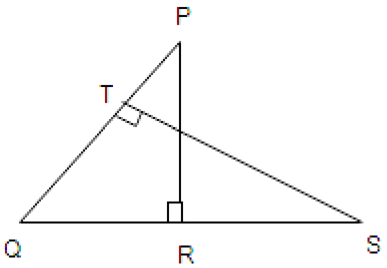
41.



AD^2 = BD × CD
or, $\frac{AD}{CD}=\frac{BD}{AD}$
Therefore, $\triangle ADC \sim \triangle BDA$ (by SAS)
or, ∠BAD = ∠ACD;
∠DAC = ∠DBA (Corresponding angles of similar triangles)
∠BAD + ∠ACD + ∠DAC + ∠DBA = 180^o [sum of angles of Δ]
or, 2∠BAD + 2∠DAC = 180^o

or, ∠BAD + ∠DAC = 90^o

Therefore, ∠A = 90^o

42. 

In $\triangle PRQ$ and $\triangle STQ$,

$\angle PRQ = \angle STQ$ [∵ Each 90^o]

$\angle PQR = \angle SQT$ [∵common angle]

So, $\Delta PRQ \sim \Delta STQ$ [By AA similarity criterion]

$\Rightarrow \frac{QR}{QT} = \frac{QP}{QS}$

[since, corresponding sides of similar triangles are proportional]

$\Rightarrow QR \times QS = QP \times QT$

Hence proved.

43. In △ABC and △AMP

∠ABC = ∠AMP ...(i) [Each equal to 90^o]

∠BAC=∠MAP ...(ii) [Common angle]

△ABC ∼ △AMP (AA similarity criterion)

44. We have

PQ = 1.28 cm, PR = 2.56 cm, PE = 0.18 cm, PF = 0.36 cm

EQ = PQ - PE = 1.28 - 0.18 = 1.10 cm

and FR = PR - PF = 2.56 - 0.36 = 2.20 cm

Now we can find

$\frac{PE}{EQ} = \frac{0.18}{1.10} = \frac{9}{55}$

$\frac{PF}{PR} = \frac{0.36}{2.20} = \frac{9}{55}$

$\therefore \frac{PE}{EQ} = \frac{PF}{FR}$

$\therefore EF || QR$ (By converse of basic proportionality theorem)

45. We have

$\frac{DE}{QR} = \frac{2.5}{5} = \frac{1}{2}$

$\frac{EF}{PQ} = \frac{2}{4} = \frac{1}{2}$

$\frac{DF}{PR} = \frac{3}{6} = \frac{1}{2}$

$\Longrightarrow \frac{DE}{QR} = \frac{EF}{PQ} = \frac{DF}{PR}$

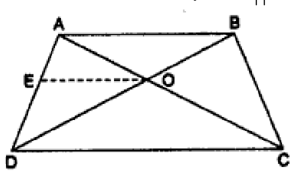
Therefore, by SSS similarity theorem, $\triangle \mathrm{FED} - \triangle \mathrm{PQR}$.

46. Given: The diagonals of a quadrilateral ABCD intersect each other at the point O such that $\frac{AO}{BO} = \frac{CO}{DO}$

To prove: ABCD is trapezium.

Construction: Through O draw a line OE||BA intersecting AD at E.

Proof: In $\triangle DBA \because OE || BA$



$\therefore \frac{DO}{BO} = \frac{DE}{AE} \Rightarrow \frac{CO}{AO} = \frac{DE}{AE}$

$\because \frac{AO}{BO} = \frac{CO}{DO} [Given]$

$\Rightarrow \frac{DO}{BO} = \frac{CO}{AO} \Rightarrow \frac{AO}{CO} = \frac{AE}{DE}$ ....[Taking reciprocals]

∴In $\triangle ADC$

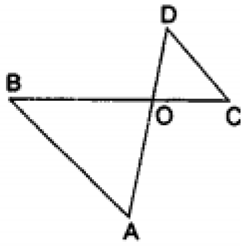
OE ∥ CD ....[By converse basic proportionality theorem]

But OE ∥ BA

BA ∥ CD........[By construction]

The quadrilateral ABCD is a Trapezium.

Section C

47. 

i. Let OA be x cm

Since it is given that $\triangle \mathrm{OAB} \sim \triangle \mathrm{OCD}$

Therefore, $\frac{OA}{OC} = \frac{AB}{CD}$

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

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

= 5.6

Hence, OA = 5.6 cm.

ii. Let OD be Y cm

Since it is given that $\triangle \mathrm{OAB} \sim \triangle \mathrm{OCD}$

$\therefore \frac{AB}{CD} = \frac{OB}{OD}$

$\Longrightarrow \frac{8}{5} = \frac{6.4}{y}$

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

= 4

Hence, DO = 4 cm

48. It is given $DE \| BC$

Applying Thales' theorem, we get:

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

$\Rightarrow \frac{7x-4}{3x+4} = \frac{5x-2}{3x}$

$\Rightarrow$ 3x(7x - 4) = (5x - 2) (3x + 4)

$\Rightarrow 21x^2 - 12x = 15x^2 + 20x^2 - 6x - 8$

$\Rightarrow 21x^2 - 12x = 15x^2 + 14x - 8$

$\Rightarrow 6x^2 - 26x + 8 = 0$

$\Rightarrow 2(3x^2 - 13x + 4) = 0$

$\Rightarrow 3x^2 - 13x + 4 = 0$

$\Rightarrow 3x^2 - 12x - x + 4 = 0$

$\Rightarrow 3x^2 (x - 4) - 1 (x - 4) = 0$

$\Rightarrow$ (x - 4) (3x - 1) = 0

$\Rightarrow$ x - 4 = 0 or 3x - 1 = 0

$\Rightarrow$ x - 4 or x = $\frac{1}{3}$

If x = $\frac{1}{3}$, 7x - 4 = $-\frac{5}{3}$ < 0 ; It is not possible.

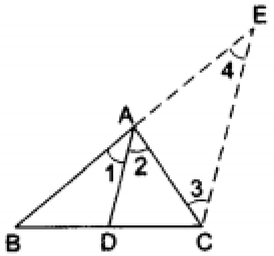
Therefore, x = 4

49. In ΔRPQ and ΔRTS,

∠R = ∠R (common)

∠P = ∠RTS (given)

$\Rightarrow$ ΔRPQ $\sim$ ΔRTS (AA similarity)

50. 

It is given that in $\triangle ABC$, D is a point on BC such that $\frac{BD}{DC}=\frac{AB}{AC}$.

To Prove: AD is the bisector of $\angle A$.

Construction: Produce BA to E such that AE = AC and Join EC.

Proof: $\frac{BD}{DC}=\frac{AB}{AC}$ ....(given)

$\Rightarrow$ $\frac{BD}{DC}=\frac{AB}{AE}$ .... [$\because$ AC = AE]

$\Rightarrow$ $DA \| CE$ [by the converse of Thales' theorem]

$\therefore$ $\angle 2=\angle 3$ ....(i) [alternate interior angle]

and $\angle 1=\angle 4$ ....(ii) [corresponding angle]

Also, AE = AC

$\Rightarrow \angle 3=\angle 4$ ....(iii)

$\therefore$ $\angle 1=\angle 2$ [from (i), (ii) and (iii)].

Hence, AD is the bisector of $\angle A$.

51. Given: Right triangles $\triangle ABC$ and $\triangle DBC$ are drawn on the same hypotenuse BC on the same side of BC.

Also, AC and BD intersect at P.

We have to show: $AP \times PC = BP \times PD$

Now, In $\triangle BAP$ and $\triangle CDP$, we have

$\angle BAP=\angle CDP=90^{\circ}$

$\angle BPA=\angle CPD$ (vertically opposite angles)

$\therefore$ $\triangle BAP \sim \triangle CDP$ [by AA-similarity]

$\therefore$ $\frac{AP}{DP}=\frac{BP}{CP}$

$\Rightarrow AP \times CP=BP \times DP$

$\Rightarrow AP \times PC=BP \times PD$

Hence, $AP \times PC=BP \times PD$.

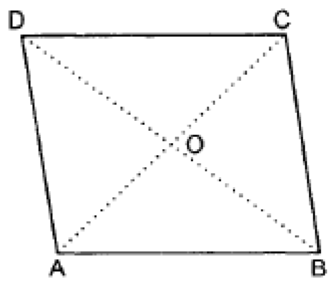
52. **GIVEN** A quadrilateral ABCD in which the diagonal BD bisects $\angle$B and $\angle$D.

TO PROVE $\frac{AB}{BC}=\frac{AD}{CD}$

CONSTRUCTION Join AC intersecting BD in O.

PROOF We know that the internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the sides containing the angle.

In ΔABC, BO is the bisector of $\angle$B.



$\therefore$ $\frac{AO}{OC}=\frac{BA}{BC}$

$\Rightarrow$ $\frac{OA}{OC}=\frac{AB}{BC}$ ....(1)

In ΔADC, DO is the bisector of $\angle$D.

$\therefore$ $\frac{AO}{OC}=\frac{DA}{DC}$

$\Rightarrow$ $\frac{OA}{OC}=\frac{AD}{CD}$ ....(2)

From (1) and (2), we get $\frac{AB}{BC}=\frac{AD}{CD}$

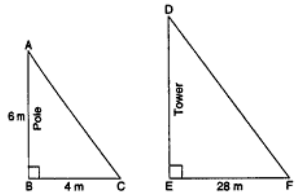
53. Let AB denoted the vertical pole of length 6m.BC is the shadow of the pole on the ground BC = 4m.

Let DE denote the tower.

EF is shadow of the tower on the ground.

EF = 28 m.

Let the height of the tower be h m.



In $\triangle$ABC and $\triangle$DEF,

$\angle$ B = $\angle$E ......[Each equal to 90^o because pole and tower are standing vertical to the ground]

$\angle$ C = $\angle$ F .....[Same elevation]

$\angle$ A = $\angle$ D $\because$ shadows are cast at the same time

$\therefore$ $\triangle$ABC and $\triangle$DEF,

$\angle$ B= $\angle$ E ....[Each equal to 90^o because pole and tower are standing vertical to the ground.]

$\angle$A=$\angle$D ($\because$shadows are cast at the same time)

$\therefore$ $\triangle$ ABC ~ $\triangle$DEF ......(AA similarity criterion)

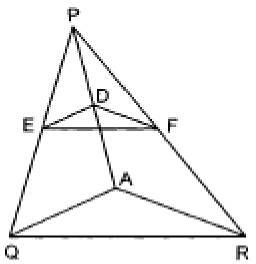
$\therefore \frac{AB}{DE} = \frac{BC}{EF}$ ....[$\because$ corresponding sides of two similar triangles are proportional]

$\Rightarrow \frac{6}{h} = \frac{4}{28}$

$\Rightarrow h = \frac{6\times28}{4} \Rightarrow h = 42$

Hence, the height of the tower is 42 m

54.



$DE \| AQ$ [Given]

Therefore, by basic proportionality theorem, we have

$\frac{PE}{EQ} = \frac{PD}{DA}$ ....(1)

In Δ PAR, we have

$DF \| AR$ [Given]

Therefore, by basic proportionality theorem, we have

$\frac{PD}{DA} = \frac{PF}{FR}$ ....(2)

From (1) and (2), we have

$\frac{PE}{EQ} = \frac{PF}{FR}$

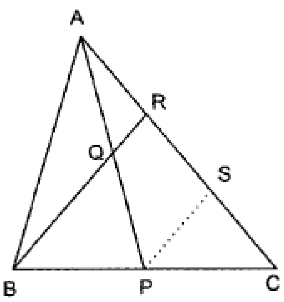
$\Rightarrow$ $EF \| QR$ [By the converse of Basic Proportionality Theorem]

55. **GIVEN**: A ΔABC in which P is the mid-point of BC, Q is the mid-point of BR and, Q is also the mid-point of AP such that BQ produced meets AC at R.

TO PROVE $RA = \frac{1}{3}CA$.

CONSTRUCTION: Draw $PS || BR$, meeting AC at S.

PROOF: In ΔBCR, P is the mid-point of BC and $PS \| BR$.



$\therefore$ S is the mid-point of CR.

$\Rightarrow$ CS = SR ...(i)

In ΔAPS, Q is the mid-point of AP and $QR \| PS$.

$\therefore$ R is the mid-point of AS.

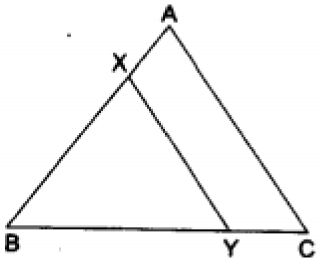
$\Rightarrow$ AR = RS ...(ii)

From (i) and (ii), we get

AR = RS = SC

$\Rightarrow$ AC = AR + RS + SC = 3 AR

$\Rightarrow \quad AR = \frac{1}{3}AC = \frac{1}{3}CA$

56. 

Since $XY \| AC$, we have

$\angle A = \angle BXY$ and $\angle C = \angle BYX$ (corresponding angles)

$\therefore \quad \triangle ABC \sim \triangle XBY$

$\Rightarrow \quad \frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle XBY)} = \frac{AB^2}{XB^2}$ ....(i)

But, $\text{ar}(\triangle ABC) = 2 \times \text{ar}(\triangle XBY)$ [Given]

$\Rightarrow \quad \frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle XBY)} = 2$ ....(ii)

From (i) and (ii), we have

$\frac{AB^2}{XB^2} = 2$

$\Rightarrow \left(\frac{AB}{XB}\right)^2 = 2$

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

$\Rightarrow AB = \sqrt{2}(XB)$

$\Rightarrow \quad AB = \sqrt{2}(AB - AX)$

$\Rightarrow \sqrt{2}AX = (\sqrt{2} - 1)AB$

$\Rightarrow \quad \frac{AX}{AB} = \frac{(\sqrt{2}-1)}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{(2-\sqrt{2})}{2}$

or $AX : AB = (2 - \sqrt{2}) : 2$.

Section D

57. i. Figures A and C are similar.
 ii. Only Figure C is congruent.
 iii. All congruent figures are similar but all similar figures are not congruent.

 For example, a pair of triangles that are similar by the A.A.A. test of similarity are not congruent pairs of triangles since the exact lengths of the sides are unknown.

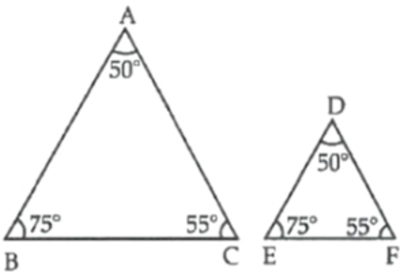
 In $\triangle$ABC and $\triangle$DEF,

 $\angle$A = $\angle$D = 50^o,

 $\angle$B = $\angle$E = 75^o

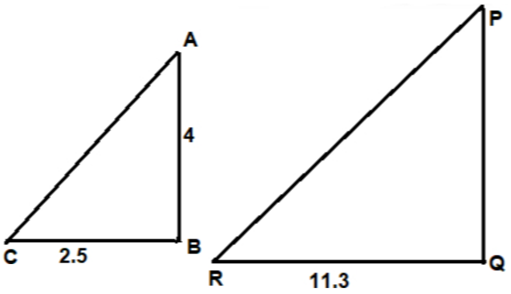
 and $\angle$C = $\angle$F = 55^o.

 Hence, $\triangle$ABC $\sim$ $\triangle$DEF but they are not congruent.



 OR

 The length of corresponding sides must be equal.

58. i. 

Let AB be a wall and PQ is a tree

BC and QR are their shadow respectively at 3 p.m.

$\therefore \triangle ABC \sim \triangle PQR$

$\therefore \frac{AB}{PQ} = \frac{BC}{QR}$

$\frac{4}{PQ} = \frac{2.5}{11.3}$

2.5 $\times$ PQ = 4 $\times$ 11.3

PQ = 18.08

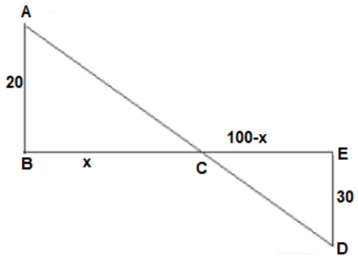
$\therefore$ height of tree = 18.08 feet

ii. 0

iii. Right triangle

OR

Zero

59. i. 

$\triangle ABC \sim \triangle DEC$

$\frac{20}{30} = \frac{x}{100-x}$

2000 - 20x = 30x

2000 = 50x

x = 40 m

ii. AA

iii. 60 metres

OR

AD = AC + CD

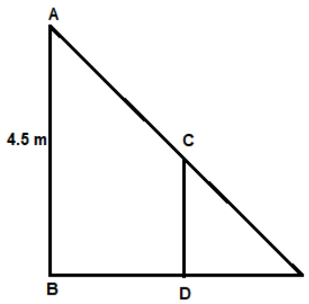
$= \sqrt{20^2 + 40^2} + \sqrt{60^2 + 30}^2$

$= \sqrt{400 + 1600} + \sqrt{3600 + 900}$

$= \sqrt{2000} + \sqrt{4500}$

$\Rightarrow 20\sqrt{5} + 30\sqrt{5}$

$\Rightarrow 50\sqrt{5}$ m

60. i. 

Distance covered in 2 sec = 2 m

length of shadow = 1 m

Total distance from base = 2 + 1 = 3m

$\frac{1}{3} = \frac{\text{height of Rohan}}{4.5}$

height of Rohan = 1.5 m

= 150 cm

ii. When x > 1.5 m

distance walked = d m

$\Rightarrow \frac{x}{d+x} = \frac{1.5}{4.5}$

$\Rightarrow \frac{x}{d+x} = \frac{1}{3}$

2x = d

d > 3

hence, the time must be 3 sec

$\therefore$ minimum time after which his shadow become larger than his original height = 3 s

iii. 3 metres

OR

After 4 and distance = 4 m

Shadow length = y m

$\frac{y}{4+y} = \frac{1.5}{4.5}$

3y = 4 + y

y = 2 m

$\therefore$ After 4 sec, the shadow length will be 2 m

61. i. tan30^o = $\frac{1}{\sqrt{3}}$ = $\frac{75}{\text{AB}}$

$\Rightarrow$ AB = $75\sqrt{3}$ cm

ii. sin 30^o = $\frac{1}{2}$ = $\frac{75}{OB}$

$\Rightarrow$ OB = 150 cm

iii. QB = 150 - 75 = 75 cm

$\Rightarrow$ Q is mid point of OB

Since PQ ∥ AO therefore P is mid pint of AB

Hence AP = $\frac{75\sqrt{3}}{2}$ cm.

OR

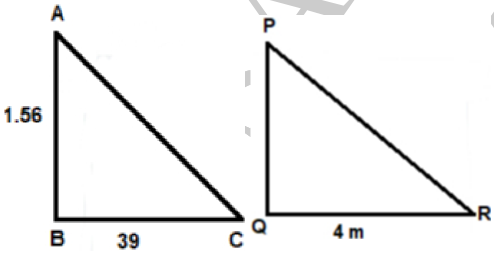
QB = 150 - 75 = 75 cm

Now, $\triangle$BQP $\sim$ $\triangle$BOA

$\Rightarrow \frac{QB}{OB} = \frac{PQ}{OA}$

$\Rightarrow \frac{1}{2} = \frac{PQ}{75}$

$\Rightarrow$ PQ = $\frac{75}{2}$ cm

62. i. 

$\triangle$ABC $\sim$ $\triangle$PQR

$\frac{1.56}{0.39} = \frac{PQ}{4}$

$\frac{1.56\times4}{0.39}$ = PQ

PQ = 16 m

$\therefore$ height of Pine apple = 16 m.

ii. Height of Kavita = 1.56 m

iii. Right triangle

OR

AA criteria

63. i. Since $\angle$D = $\angle$C and $\angle$B = $\angle$A (Alternate interior angles)

$\therefore$ $\triangle$OAC $\sim$ $\triangle$OBD (By AA similarity)

ii. $\triangle$OAC $\sim$ $\triangle$OBD $\Rightarrow \frac{\text{OA}}{\text{OB}} = \frac{\text{AC}}{\text{BD}}$ or $\frac{\text{OA}}{\text{AC}} = \frac{\text{OB}}{\text{BD}}$

iii. a. $\triangle OAC \sim \triangle OBD \Rightarrow \frac{OA}{OB} = \frac{OC}{OD}$

$\Rightarrow \frac{3x+4}{x} = \frac{3x+19}{x+3} \Rightarrow$ x = 2

$\therefore$ OC = 25

OR

b. $\triangle OBD \sim \triangle OAC \Rightarrow \frac{OB}{OA} = \frac{OD}{OC} = \frac{BD}{AC}$

$\Rightarrow \frac{x}{3x+4} = \frac{x+3}{3x+19} \Rightarrow$ x = 2

$\therefore \frac{BD}{AC} = \frac{2}{10}$ or $\frac{1}{5}$

64. i. Isosceles Triangle

ii. Let 2x be the width of window, then 3x will be height of window because ratio is 2 : 3 now width of single curtain will be x because it is half of the window.

Length of single curtain is equal to height of the window.

$\therefore$ Ratio = $\frac{x}{3x}$ = 1 : 3

iii. Area = 3x $\times$ 2x

9600 = $6x^2$

x = 40 cm

breadth = 80 cm

length = 120 cm

OR

Perimeter = 2(l + b)

= 2(120 + 80)

= 400 cm

65. i. $\therefore$ AF = h (Given)

$\therefore$ AF = AH + HF

h = AH + $\frac{h}{4}$

AH = h - $\frac{h}{4}$

AH = $\frac{3h}{4}$

ii. $\because$ AF = h (Given)

$\therefore$ AG = $\frac{2}{3}$ AF

$\because$ centroid divide the median in 2 : 1

iii. AH = $\frac{3h}{4}$

J is centroid of $\triangle$ADE

AJ : JH = 2 : 1

let AJ = 2x and JH = x

2x + x = $\frac{3h}{4}$

x = $\frac{h}{4}$

AJ = 2 $\times$ $\frac{h}{4}$ = $\frac{h}{2}$

AG = AJ + GJ

$= \frac{h}{2} + \frac{h}{6}$

$= \frac{2h}{3}$

But AJ = $\frac{h}{2} \times \frac{2}{3}$

AJ = $\frac{3}{4}$ AG

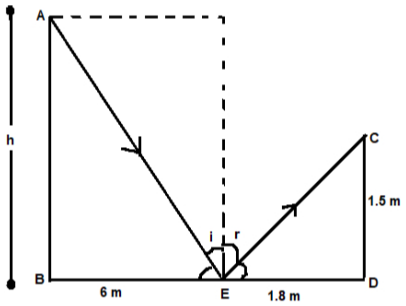
OR

GJ = AG - AJ

= AG - $\frac{3}{4}$ AG

GJ = $\frac{1}{4}$ AG

66. i. AA criterion

ii. 

$\triangle$ABE $\sim$ $\triangle$CDE (by AA criteria)

$\frac{AB}{CD} = \frac{BE}{DE}$

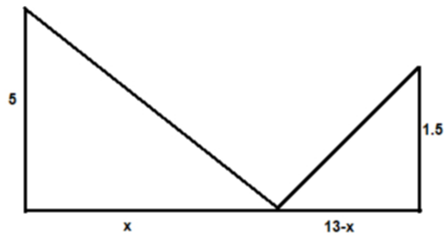
h = $\frac{6 \times 1.5}{1.8}$

h = 5

i.e., height of pole = 5 m.

iii. tan i = $\frac{6}{5}$

OR



$\frac{1.5}{5} = \frac{13-x}{x}$

1.5x = 65 - 5x

6.5x = 65

x = $\frac{65}{6.5}$

= 10

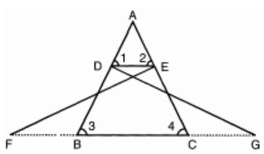
$\therefore$ distance of Suresh from mirror

= 13 - x

= 13 - 10

= 3 m

Section E

67. 

$\because \triangle FEC \cong \triangle GBD$

or, EC = BD ......(i)

It is given that $\angle 1 = \angle 2$

or, AE = AD ($\because$ Isosceles triangle property)...(ii)

From ,eqns. (i) and (ii),

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

or, DE || BC, ($\because$ converse of B.PT)

or, $\angle 1 = \angle 3$ and $\angle 2 = \angle 4$ ($\because$ Corresponding angles)

Thus in $\triangle ADE$ and $\triangle ABC$,

$\angle$A $=$ $\angle$A

$\angle 1 = \angle 3$

$\angle 2 = \angle 4$

$\triangle ADE \sim \triangle ABC$ ($\because$ AAA criterion of similarity)

$\triangle ADE \sim \triangle ABC$ Hence proved

68. In $\triangle$AOF and $\triangle$BOD

$\angle$O = $\angle$O (Same angle) and $\angle$A = $\angle$B (each 90°)

Therefore, $\triangle$AOF $\sim$ $\triangle$BOD (AA similarity)

So, $\frac{\text{OA}}{\text{OB}} = \frac{\text{FA}}{\text{DB}}$

Also, in $\triangle$FAC and $\triangle$EBC, $\angle$A = $\angle$B (Each 90°)

and $\angle$FCA = $\angle$ECB (Vertically opposite angles).

Therefore, $\triangle$FAC $\sim$ $\triangle$EBC (AA similarity).

So, $\frac{\mathrm{FA}}{\mathrm{EB}}=\frac{\mathrm{AC}}{\mathrm{BC}}$

But EB = DB (B is mid-point of DE)

So, $\frac{\mathrm{FA}}{\mathrm{DB}}=\frac{\mathrm{AC}}{\mathrm{BC}}$ (2)

Therefore, from (1) and (2), we have:

$\frac{\mathrm{AC}}{\mathrm{BC}}=\frac{\mathrm{OA}}{\mathrm{OB}}$

i.e. $\frac{\mathrm{OC}-\mathrm{OA}}{\mathrm{OB}-\mathrm{OC}}=\frac{\mathrm{OA}}{\mathrm{OB}}$

or OB . OC – OA . OB = OA . OB – OA . OC

or OB . OC + OA . OC = 2 OA . OB

or (OB + OA). OC = 2 OA . OB

or $\frac{1}{\mathrm{OA}}+\frac{1}{\mathrm{OB}}=\frac{2}{\mathrm{OC}}$ [Dividing both the sides by OA . OB . OC]

69. **Given:** ABCD is a quadrilateral. P, Q, R, and S are the points of trisection of sides AB, BC, CD and DA respectively and are adjacent to A and C.

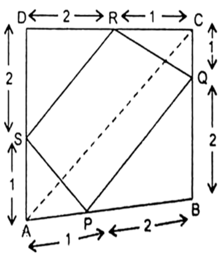
To Prove: PQRS is a parallelogram.

i.e. we have to prove that PQ||SR and QR||PS.

Construction: Join AC.

Proof: Since P, Q, R, and S are the points of trisection of AB, BC, CD, and DA respectively.

$\therefore$ BP = 2 PA, BQ = 2 QC, DR = 2 RC and, DS = 2 SA



In Δ ADC, we have

$\frac{DS}{AS}=\frac{2}{1}$ and, $\frac{DR}{RC}=\frac{2}{1}$

$\Rightarrow \quad \frac{DS}{SA}=\frac{DR}{RC}$

$\Rightarrow \quad SR \| AC$ ------- (i) [by the converse of basic proportionality theorem]

Again,

In ΔABC, we have

$\frac{AP}{PB}=\frac{1}{2}$ and $\frac{CQ}{QB}=\frac{1}{2}$

$\Rightarrow \quad \frac{AP}{AB}=\frac{CQ}{QB}$

$\Rightarrow \quad PQ \| AC$ -------- (ii) [by the converse of basic proportionality theorem]

From (i) and (ii), we obtain,

$SR \| AC$ and $PQ \| AC \Rightarrow SR \| PQ$

Similarly, by joining BD, we can prove that $QR \| PS$.

Thus, PQRS is a parallelogram.

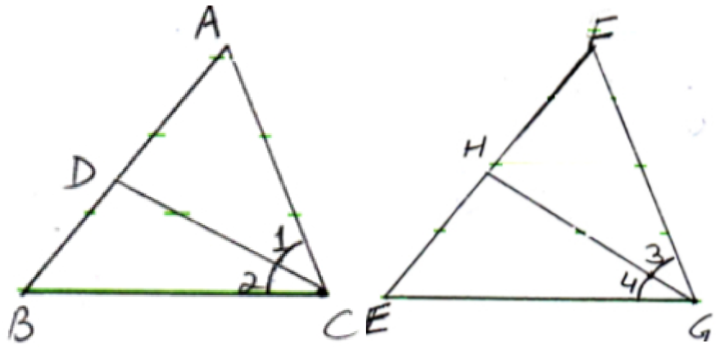
Hence proved.

70. Given: $\triangle \mathrm{ABC} \sim \triangle \mathrm{FEG}$ and CD, GH are bisectors of $\angle$ACB and $\angle$EGF respectively.

To Prove

i. $\frac{\mathrm{CD}}{\mathrm{GH}}=\frac{\mathrm{AC}}{\mathrm{FG}}$

ii. $\triangle DCB \sim \triangle HGE$



Proof:

i. $\angle ACB = \angle FGE (\triangle ABC \sim \triangle FEG)$

$\Rightarrow \frac{1}{2}\angle ACB = \frac{1}{2}\angle FGE$ (CD and GH are bisectors of ∠ACB and ∠EGF)

$\Rightarrow \angle 1 = \angle 3$ and $\angle 2 = \angle 4$

In $\triangle ACD$ and $\triangle FGH$

$\angle A = \angle F (\triangle ABC \sim \triangle FEG)$

$\angle 1 = \angle 3$ (proved above)

$\Rightarrow \triangle ACD \sim \triangle FGH$ (AA criteria)

$\Rightarrow \frac{CD}{GH} = \frac{AC}{FG}$

ii. In $\triangle DCB$ and $\triangle HGE$

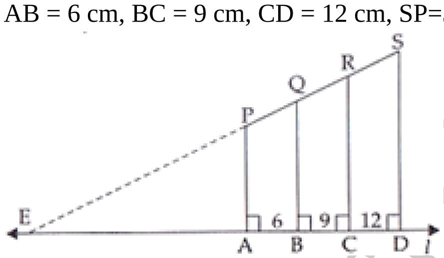
$\angle B = \angle E (\triangle ABC \sim \triangle FEG)$

$\angle 2 = \angle 4$ (proved above)

$\therefore \triangle DCB \sim \triangle$ HGE (AA criteria)

71. **Given:** PA, QB, RC and SD are perpendicular on line l.

AB = 6 cm, BC = 9 cm, CD = 12 cm, SP=36 cm



To find: PQ, QR and RS.

Construction: we produce SP so that it joins l at E.

Proof: In ΔEDS,

AP || BQ || CR || SD [Given]

∴ PQ : QR : RS = AB : BC : CD

PQ : QR : RS = 6 : 9 : 12

Let PQ = 6x

then QR = 9x

and RS = 12x

Now, PQ + QR + RS = 36 cm (given)

⇒ 6x + 9x + 12x = 36

⇒ 27x = 36

$\Rightarrow x = \frac{36}{27} = \frac{4}{3}$

Therefore, PQ = 6 × $\frac{4}{3}$ = 8 cm

QR = 9 × $\frac{4}{3}$ = 12 cm

RS = 12 × $\frac{4}{3}$ = 16 cm

72. GF || DE (DEFG is square)

∴ ∠AGF = ∠ABC (Corresponding angles)

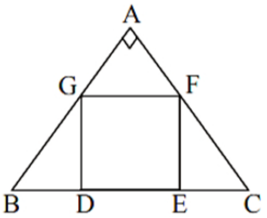
∴ ∠A = ∠GDB = 90^o

∴ ∠AGF ~ ∠DBG (By AA similarity)

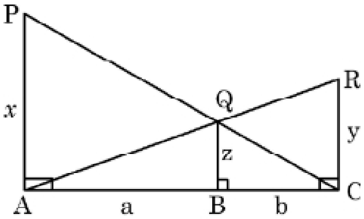
Again DEFG being a square ∠AFG = ∠ACB (corresponding angles)

$\therefore \angle A = \angle CEF$ (each 90^o)

$\angle AGF \sim \angle EFC$ (By AA similarity)



73.



In the given figure we have $PA \perp AC$ and $QB \perp AC$

$\Rightarrow QB \| PA$

In $\triangle PAC$ and $\triangle QBC$, we have

$\angle QCB = \angle PCA$ (Common)

$\angle QBC = \angle PAC$ (both are 90^o).

So by AA similarity rule , $\triangle QBC \sim \triangle PAC$

$\therefore \frac{QB}{PA} = \frac{BC}{AC}$

$\Rightarrow \frac{z}{x} = \frac{b}{a+b}$ ...(i) [by the property of similar triangles]

In $\triangle RAC$, $QB \| RC$.

So, $\triangle QBA \sim \triangle RCA$.

$\therefore \frac{QB}{RC} = \frac{AB}{AC}$

$\Rightarrow \frac{z}{y} = \frac{a}{a+b}$ ...(ii) [by the property of similar triangles]

Form (i) and (ii), we obtain

$\frac{z}{x} + \frac{z}{y} = \left(\frac{b}{a+b} + \frac{a}{a+b}\right) = 1$

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

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

or $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$.

Hence proved.

74. Given, AC = 8 cm, AD = 3 cm

and $\angle ADC = \angle BCA$

From the figure in $\triangle ADC$ and $\triangle BCA$

$\angle A = \angle A$ ...(Common)

$\angle ADC = \angle BCA$ ...(Given)

So, by AA similarity criteria

$\triangle ADC \sim \triangle BCA$

$\because$ Corresponding sides are in the same ratio

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

$\frac{8}{3} = \frac{AB}{8}$

AB = $\frac{8\times8}{3}$

$= \frac{64}{3}$ cm

Now from the figure,

BD = AB - AD

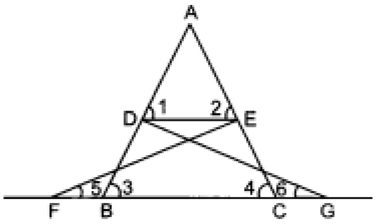
= $\frac{64}{3}$ - 3

$= \frac{64-9}{3}$

$= \frac{55}{3}$

BD = $18\frac{1}{3}$ cm.

75. Given: $\triangle \mathrm{FEC} \cong \triangle \mathrm{GBD}$ and $\angle 1 = \angle 2$



To prove: $\triangle \mathrm{ADE} \sim \triangle \mathrm{ABC}$

Proof: In $\Delta \mathrm{ADE}$, $\angle 1 = \angle 2$ (Given)

$\Rightarrow$ AE = AD ....(i) (sides opposite to equal angles are equal)

Also, $\Delta \mathrm{FEC} \cong \Delta \mathrm{GBD}$ (Given)

$\Rightarrow$ BD = EC (by CPCT) ....(ii)

$\angle 3 = \angle 4$ [By CPCT]

Also AE + EC = AD + BD

AC = AB ....(iii)

Dividing (i) and (iii), we get

$\frac{AD}{AB} = \frac{AE}{AC}$ and $\angle A = \angle A$ (common)

$\therefore$ $\triangle ADE \sim \triangle ABC$ (SAS similarity)