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Practice Set 1.1 Geometry 10th Std Maths Part 2 Answers Chapter 1 Similarity

Question 1.
Base of a triangle is 9 and height is 5. Base of another triangle is 10 and height is 6. Find the ratio of areas of these triangles.
Solution:
Let the base, height and area of the first triangle be b_1, h_1, and A_1 respectively.
Let the base, height and area of the second triangle be b_2, h_2 and A_2 respectively.

$$\frac{A_1}{A_2} = \frac{b_1 \times h_1}{b_2 \times h_2}$$

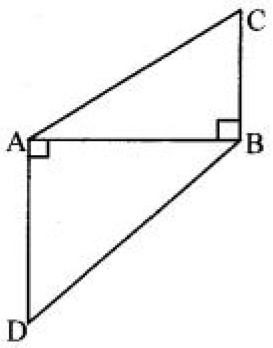
$$\frac{A_1}{A_2} = \frac{9 \times 5}{10 \times 6}$$

$$= \frac{45}{60}$$

$$\therefore \quad \frac{A_1}{A_2} = \frac{3}{4}$$

[Since Ratio of areas of two triangles is equal to the ratio of the product of their bases and corresponding heights]
∴ The ratio of areas of the triangles is 3:4.

Question 2.
In the adjoining figure, BC ± AB, AD _L AB, BC = 4, AD = 8, then find $A(\Delta ABC)A(\Delta ADB)$



Solution:
ΔABC and ΔADB have same base AB.

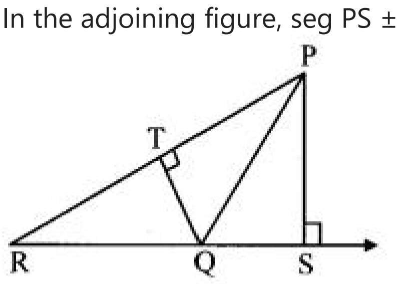
$$\therefore \quad \frac{A(\Delta ABC)}{A(\Delta ADB)} = \frac{BC}{AD}$$

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

$$\therefore \quad \frac{A(\Delta ABC)}{A(\Delta ADB)} = \frac{1}{2}$$

[Since Triangles having equal base]

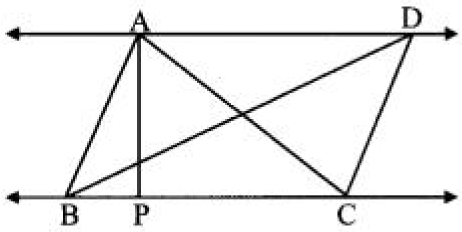
Question 3.
In the adjoining figure, seg PS ± seg RQ, seg QT ± seg PR. If RQ = 6, PS = 6 and PR = 12, then find QT.



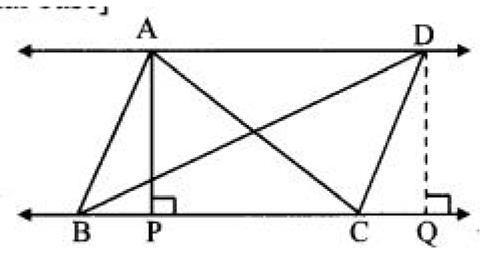
Solution:
In ΔPQR, PR is the base and QT is the corresponding height.
Also, RQ is the base and PS is the corresponding height.
$A(\Delta PQR)A(\Delta PQR)=PR\times QTRQ\times PS$ [Ratio of areas of two triangles is equal to the ratio of the product of their bases and corresponding heights]

∴ $11=PR\times QTRQ\times PS$
∴ PR × QT = RQ × PS
∴ 12 × QT = 6 × 6
∴ QT = 3612
∴ QT = 3 units

Question 4.
In the adjoining figure, AP ⊥ BC, AD || BC, then find A(ΔABC) : A(ΔBCD).



Solution:
Draw DQ ⊥ BC, B-C-Q.



AD || BC [Given]
∴ AP = DQ (i) [Perpendicular distance between two parallel lines is the same]
ΔABC and ΔBCD have same base BC.

$$\therefore \quad \frac{A(\Delta ABC)}{A(\Delta BCD)} = \frac{AP}{DQ} \qquad \text{[Triangles having equal base]}$$

$$= \frac{AP}{AP} \qquad \text{[From (i)]}$$

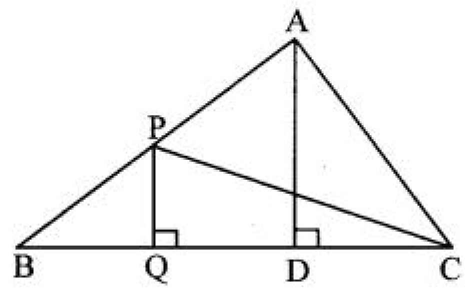
$$= 1$$

$$\therefore \quad \mathbf{A(\Delta ABC) : A(\Delta BCD) = 1 : 1}$$

Question 5.
In the adjoining figure, PQ ⊥ BC, AD ⊥ BC, then find following ratios.

i. $\frac{A(\Delta PQB)}{A(\Delta PBC)}$ ii. $\frac{A(\Delta PBC)}{A(\Delta ABC)}$

iii. $\frac{A(\Delta ABC)}{A(\Delta ADC)}$ iv. $\frac{A(\Delta ADC)}{A(\Delta PQC)}$



Solution:
i. ΔPQB and tPBC have same height PQ.

$$\frac{A(\Delta PQB)}{A(\Delta PBC)} = \frac{\mathbf{BQ}}{\mathbf{BC}} \qquad \text{[Triangles having equal height]}$$

ii. ΔPBC and ΔABC have same base BC.

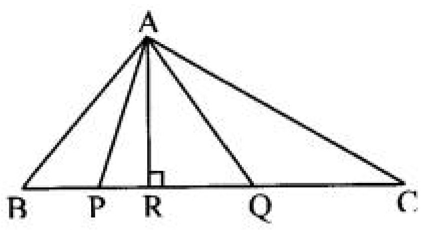
$$\frac{A(\Delta PBC)}{A(\Delta ABC)} = \frac{\mathbf{PQ}}{\mathbf{AD}} \qquad \text{[Triangles having equal base]}$$

iii. ΔABC and ΔADC have same height AD.

$$\frac{A(\Delta ABC)}{A(\Delta ADC)} = \frac{\mathbf{BC}}{\mathbf{DC}} \qquad \text{[Triangles having equal height]}$$

iv. $$\frac{A(\Delta ADC)}{A(\Delta PQC)} = \frac{\mathbf{DC \times AD}}{\mathbf{QC \times PQ}}$$ [Ratio of areas of two triangles is equal to the ratio of the product of their bases and corresponding heights]

Question 1.
Find $A(\Delta ABC)A(\Delta APQ)$



Solution:
In ΔABC, BC is the base and AR is the height.
In ΔAPQ, PQ is the base and AR is the height.

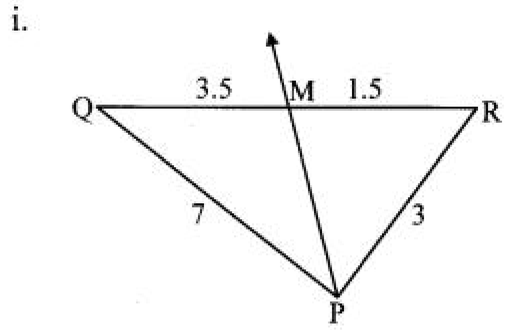
$$\therefore \quad \frac{A(\Delta ABC)}{A(\Delta APQ)} = \frac{\boxed{BC} \times \boxed{AR}}{\boxed{PQ} \times \boxed{AR}}$$ [The ratio of areas of two triangles is equal to the ratio of the product of their bases and corresponding heights]

$$\therefore \quad \frac{A(\Delta ABC)}{A(\Delta APQ)} = \frac{\boxed{BC}}{\boxed{PQ}}$$

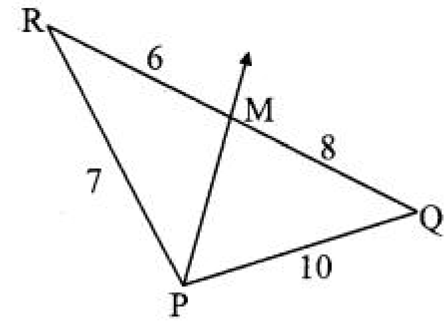
Practice Set 1.2 Geometry10th Std Maths Part 2 Answers Chapter 1 Similarity

Question 1.
Given below are some triangles and lengths of line segments. Identify in which figures, ray PM is the bisector of ∠QPR.

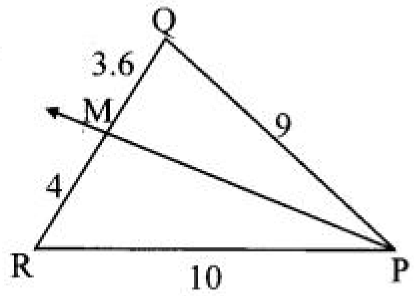
i.



ii.



iii.

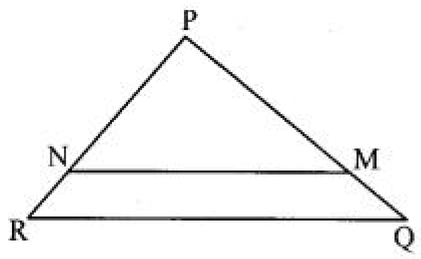


Solution:
In Δ PQR,
PQPR = 73 (i)
QMRM = 3.51.5 = 3515 = 73 (ii)
∴ PQPR = QMRM [From (i) and (ii)]
∴ Ray PM is the bisector of ∠QPR. [Converse of angle bisector theorem]

ii. In ΔPQR,
PQPR = 107 (i)
QMRM = 86 = 43 (ii)
∴ PQPR ≠ QMRM [From (i) and (ii)]
∴ Ray PM is not the bisector of ∠QPR

iii. In ΔPQR,
PQPR = 910 (i)
QMRM = 3.64 = 3640 = 910 (ii)
∴ PQPR = QMRM [From (i) and (ii)]
∴ Ray PM is the bisector of ∠QPR [Converse of angle bisector theorem]

Question 2.
In ΔPQR PM = 15, PQ = 25, PR = 20, NR = 8. State whether line NM is parallel to side RQ. Give reason.



Solution:
PN + NR = PR [P – N – R]
∴ PN + 8 = 20
∴ PN = 20 – 8 = 12
Also, PM + MQ = PQ [P – M – Q]
∴ 15 + MQ = 25

$$\therefore \quad MQ = 25 - 15 = 10$$

$$\frac{PN}{NR} = \frac{12}{8}$$

$$\therefore \quad \frac{PN}{NR} = \frac{3}{2} \qquad \text{(i)}$$

$$\frac{PM}{MQ} = \frac{15}{10}$$

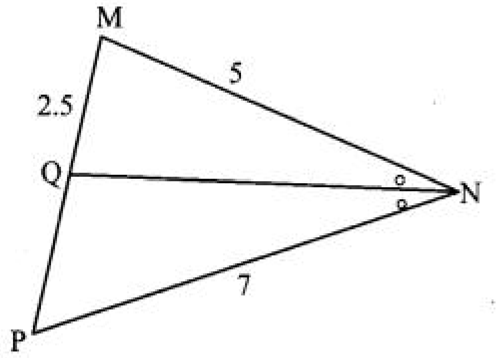
$$\therefore \quad \frac{PM}{MQ} = \frac{3}{2} \qquad \text{(ii)}$$

In ΔPQR,

$$\frac{PN}{NR} = \frac{PM}{MQ} \qquad \text{[From (i) and (ii)]}$$

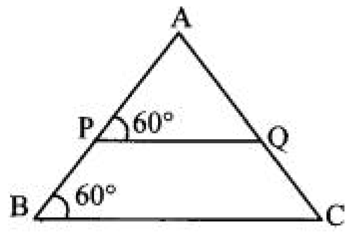
∴ line NM || side RQ [Converse of basic proportionality theorem]

Question 3.
In ΔMNP, NQ is a bisector of ∠N. If MN = 5, PN = 7, MQ = 2.5, then find QP.



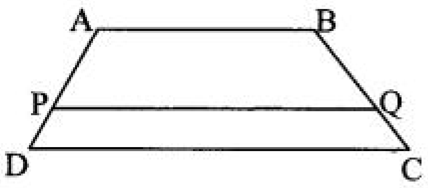
Solution:
In ΔMNP, NQ is the bisector of ∠N. [Given]
$\therefore \frac{PN}{MN} = \frac{QP}{MQ}$ [Property of angle bisector of a triangle]
$\therefore \frac{7}{5} = \frac{QP}{2.5}$
∴ QP = $\frac{7 \times 2.5}{5}$
∴ QP = 3.5 units

Question 4.
Measures of some angles in the figure are given. Prove that $\frac{AP}{PB} = \frac{AQ}{QC}$



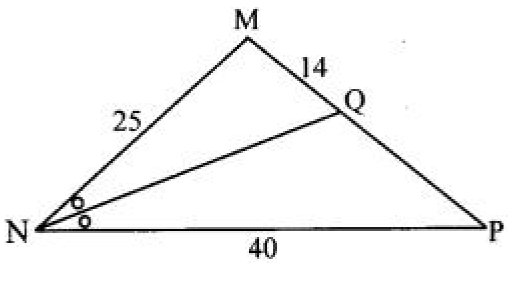
Solution:
Proof
∠APQ = ∠ABC = 60° [Given]
∴ ∠APQ ≅ ∠ABC
∴ side PQ || side BC (i) [Corresponding angles test]
In ΔABC,
sidePQ || sideBC [From (i)]
$\therefore \frac{AP}{PB} = \frac{AQ}{QC}$ [Basic proportionality theorem]

Question 5.
In trapezium ABCD, side AB || side PQ || side DC, AP = 15, PD = 12, QC = 14, find BQ.



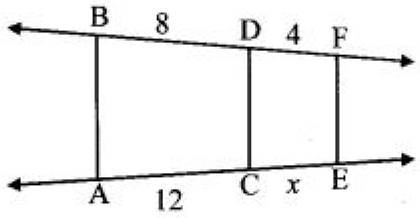
Solution:
side AB || side PQ || side DC [Given]
$\therefore \frac{AP}{PD} = \frac{BQ}{QC}$ [Property of three parallel lines and their transversals]
$\therefore \frac{15}{12} = \frac{BQ}{14}$
∴ BQ = $\frac{15 \times 14}{12}$
∴ BQ = 17.5 units

Question 6.
Find QP using given information in the figure.



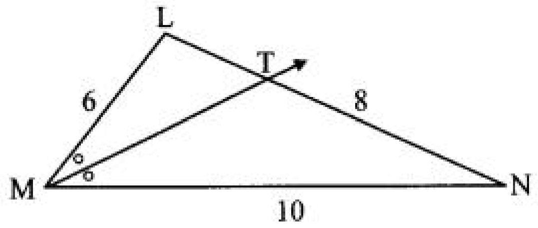
Solution:
In ΔMNP, seg NQ bisects ∠N. [Given]
$\therefore \frac{PN}{MN} = \frac{QP}{MQ}$ [Property of angle bisector of a triangle]
$\therefore \frac{40}{25} = \frac{QP}{14}$
∴ QP = $\frac{40 \times 14}{25}$
∴ QP = 22.4 units

Question 7.
In the adjoining figure, if AB || CD || FE, then find x and AE.



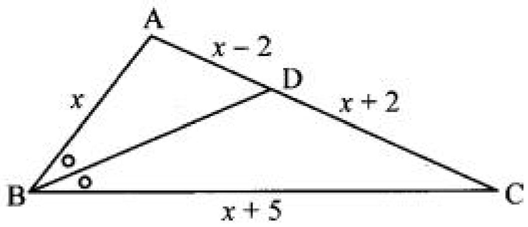
Solution:
line AB || line CD || line FE [Given]
∴BDDF = ACCE [Property of three parallel lines and their transversals]
∴84 = 12X
∴ X = 12×48
∴ X = 6 units
Now, AE AC + CE [A – C – E]
= 12 + x
= 12 + 6
= 18 units
∴ x = 6 units and AE = 18 units

Question 8.
In ΔLMN, ray MT bisects ∠LMN. If LM = 6, MN = 10, TN = 8, then find LT.



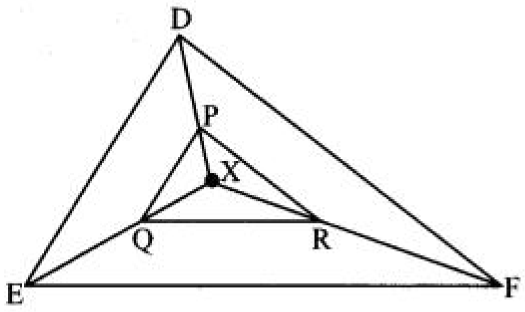
Solution:
In ΔLMN, ray MT bisects ∠LMN. [Given]
∴LMMN = LTTN [Property of angle bisector of a triangle]
∴610 = LT8
∴ LT = 6×810
∴ LT = 4.8 units

Question 9.
In ΔABC,seg BD bisects ∠ABC. If AB = x,BC x+ 5, AD = x – 2, DC = x + 2, then find the value of x.



Solution:
In ΔABC, seg BD bisects ∠ABC. [Given]
∴ABBC = ADCD [Property of angle bisector of a triangle]
∴xx+5 = x−2x+2
∴ x(x + 2) = (x – 2)(x + 5)
∴ x2 + 2x = x2 + 5x – 2x – 10
∴ 2x = 3x – 10
∴ 10 = 3x – 2x
∴ x = 10

Question 10.
In the adjoining figure, X is any point in the interior of triangle. Point X is joined to vertices of triangle. Seg PQ || seg DE, seg QR || seg EF. Fill in the blanks to prove that, seg PR || seg DF.



Solution:

In ΔXDE, PQ || DE | $\boxed{\text{[Given]}}$

$\therefore \dfrac{XP}{\boxed{PD}} = \dfrac{\boxed{XQ}}{QE}$ (i) [Basic proportionality theorem]

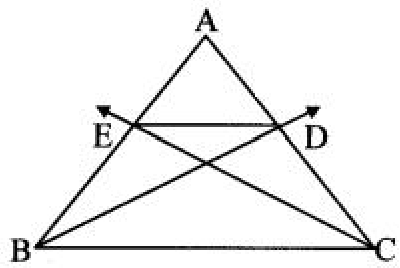
In ΔXEF, QR || EF | $\boxed{\text{[Given]}}$

$\therefore \dfrac{\boxed{XR}}{\boxed{RF}} = \dfrac{\boxed{XQ}}{\boxed{QE}}$ (ii) $\boxed{\text{[Basic proportionality theorem]}}$

$\therefore \dfrac{\boxed{XP}}{\boxed{PD}} = \dfrac{\boxed{XR}}{\boxed{RF}}$ [From (i) and (ii)]

$\therefore$ seg PR || seg DF [Converse of basic proportionality theorem]

Question 11.
In ΔABC, ray BD bisects ∠ABC and ray CE bisects ∠ACB. If seg AB = seg AC, then prove that ED || BC.



Solution:
In ΔABC, ray BD bisects ∠ABC. [Given]
∴$ABBC = AEEB$ (i) [Property of angle bisector of a triangle]
Also, in ΔABC, ray CE bisects ∠ACB. [Given]
∴$ACBC = AEEB$ (ii) [Property of angle bisector of a triangle]
But, seg AB = seg AC (iii) [Given]
∴$ABBC = AEEB$ (iv) [From (ii) and (iii)]
∴$ADDC = AEEB$ [From (i) and (iv)]
∴ ED || BC [Converse of basic proportionality theorem]

Question 1.
i. Draw a ΔABC.
ii. Bisect ∠B and name the point of intersection of AC and the angle bisector as D.
iii. Measure the sides.

AB = $\square$ cm, BC = $\square$ cm,

AD = $\square$ cm, DC = $\square$ cm

iv. Find ratios $ABBC$ and $ADDC$
v. You will find that both the ratios are almost equal.
vi. Bisect remaining angles of the triangle and find the ratios as above. Verify that the ratios are equal. (Textbook pg. no. 8)
Solution:

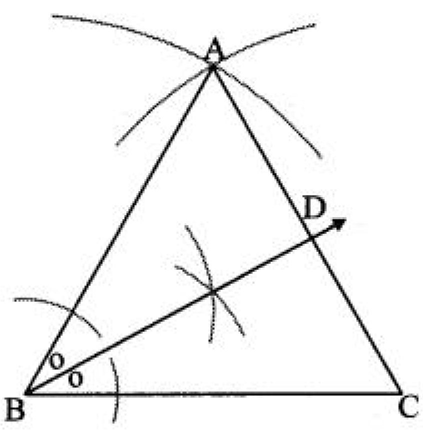
AB = $\boxed{4}$ cm, BC = $\boxed{4}$ cm

AD = $\boxed{2}$ cm, DC = $\boxed{2}$ cm

$\dfrac{AB}{BC} = \dfrac{4}{4} = 1$ ...(i)

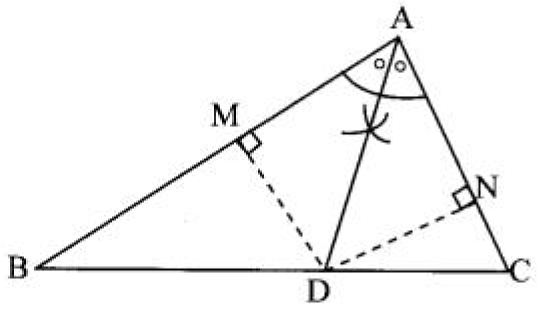
$\dfrac{AD}{DC} = \dfrac{2}{2} = 1$ ...(ii)

$\therefore \dfrac{AB}{BC} = \dfrac{AD}{DC}$ ...[From (i) and (ii)]



Note: Students should bisect the remaining angles and verify that the ratios are equal.

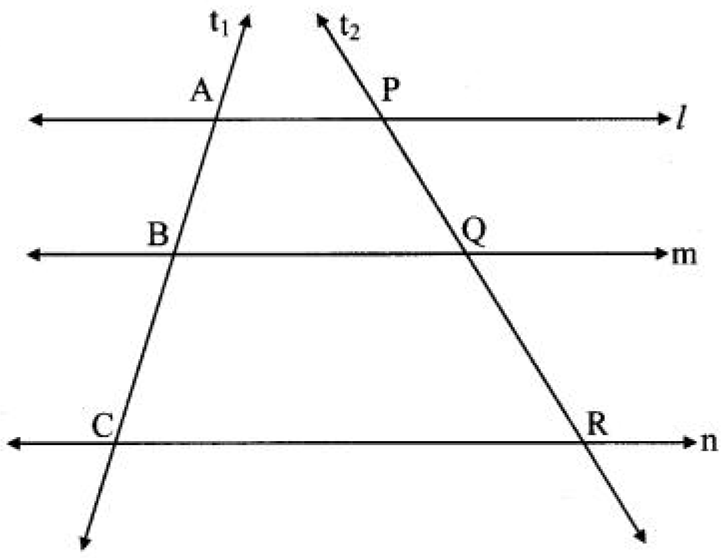
Question 2.
Write another proof of the above theorem (property of an angle bisector of a triangle). Use the following properties and write the proof.
i. The areas of two triangles of equal height are proportional to their bases.
ii. Every point on the bisector of an angle is equidistant from the sides of the angle. (Textbook pg. no. 9)



Given: In ΔCAB, ray AD bisects ∠A.
To prove: $\frac{AB}{AC} = \frac{BD}{DC}$
Construction: Draw seg DM ⊥ seg AB A – M – B and seg DN ⊥ seg AC, A – N – C.
Solution:
Proof:
In ΔABC,
Point D is on angle bisector of ∠A. [Given]
∴DM = DN [Every point on the bisector of an angle is equidistant from the sides of the angle]
$\frac{A(\Delta ABD)}{A(\Delta ACD)} = \frac{AB \times DM}{AC \times DN}$ [Ratio of areas of two triangles is equal to the ratio of the product of their bases and corresponding heights]

∴ $\frac{A(\Delta ABD)}{A(\Delta ACD)} = \frac{AB}{AC}$ (ii) [From (i)]
Also, ΔABD and ΔACD have equal height.
∴ $\frac{A(\Delta ABD)}{A(\Delta ACD)} = \frac{BD}{CD}$ (iii) [Triangles having equal height]
∴$\frac{AB}{AC} = \frac{BD}{DC}$ [From (ii) and (iii)]

Question 3.
i. Draw three parallel lines.
ii. Label them as l, m, n.
iii. Draw transversals t_1 and t_2.
iv. AB and BC are intercepts on transversal t_1.
v. PQ and QR are intercepts on transversal t_2.
vi. Find ratios $\frac{AB}{BC}$ and $\frac{PQ}{QR}$. You will find that they are almost equal. Verify that they are equal.(Textbook pg, no. 10)
Solution:



Here, AB = 1.5 cm, BC = 2.1 cm,
PQ = 1.7 cm, QR = 2.3 cm

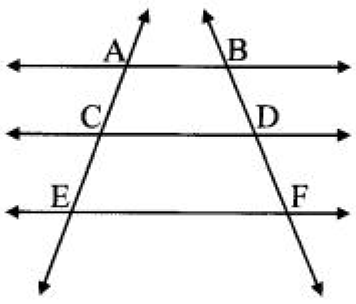
$$\frac{AB}{BC} = \frac{1.5}{2.1} = 0.714 \approx 0.7$$

$$\frac{PQ}{QR} = \frac{1.7}{2.3} = 0.739 \approx 0.7$$

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

(Students should draw figures similar to the ones given and verify the properties.)

Question 4.
In the adjoining figure, AB || CD || EF. If AC = 5.4, CE = 9, BD = 7.5, then find DF.(Textbook pg, no. 12)



Solution:

AB || CD || EF [Given]

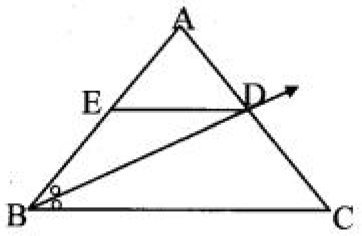
$\therefore \frac{AC}{\boxed{CE}} = \frac{\boxed{BD}}{DF}$ [Property of three parallel lines and their transversals]

$\therefore \frac{5.4}{9} = \frac{\boxed{7.5}}{DF}$

$\therefore DF = \frac{7.5 \times 9}{5.4}$

$\therefore$ **DF =** $\boxed{\textbf{12.5 units}}$

Question 5.
In ΔABC, ray BD bisects ∠ABC. A – D – C, side DE || side BC, A – E – B, then prove that $ABBC = AEEB$ (Textbook pg, no. 13)



Solution:

In ΔABC, ray BD bisects ∠B. [Given]

$\therefore \frac{AB}{BC} = \frac{AD}{DC}$ (i) [Angle bisector theorem]

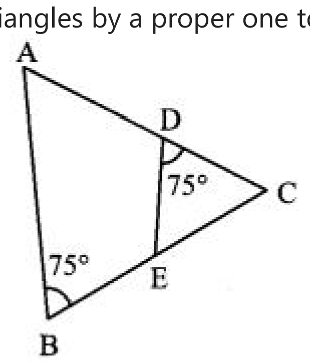
In ΔABC, DE || BC [Given]

$\therefore \frac{AE}{EB} = \frac{AD}{DC}$ (ii) [Basic proportionality theorem]

$\therefore \frac{AB}{\boxed{BC}} = \frac{\boxed{AE}}{EB}$ [From (i) and (ii)]

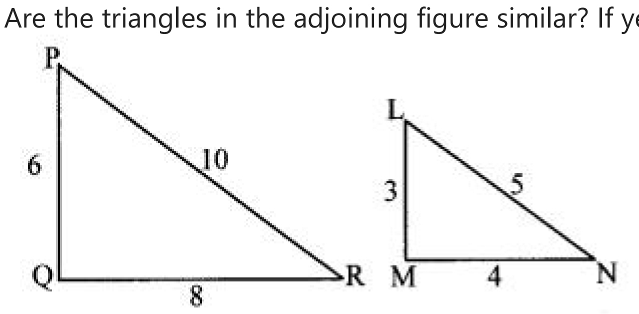
Practice Set 1.3 Geometry 10th Std Maths Part 2 Answers Chapter 1 Similarity

Practice Set 1.3 Question 1.
In the adjoining figure, ∠ABC = 75°, ∠EDC = 75°. State which two triangles are similar and by which test? Also write the similarity of these two triangles by a proper one to one correspondence.



Solution:
In ΔABC and ΔEDC,
∠ABC ≅ ∠EDC [Each angle is of measure 75°]
∠ACB ≅ ∠ECD [Common angle]
∴ ΔABC ~ ΔEDC [AA test of similarity]
One to one correspondence is
ABC ↔ EDC

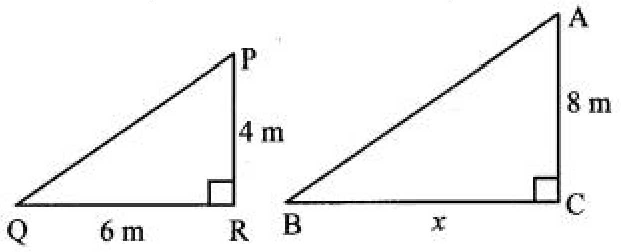
Similarity Class 10 Practice Set 1.3 Question 2.
Are the triangles in the adjoining figure similar? If yes, by which test?



Solution:

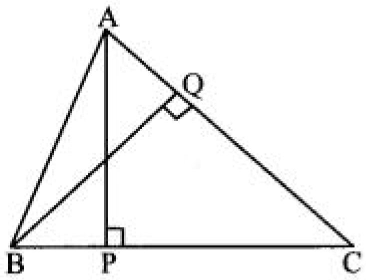
In ΔPQR and ΔLMN,
PQLM = 63 = 21 (i)
QRMN = 84 = 21 (ii)
PRLN = 105 = 21 (iii)
∴ PQLM = QRMN = PRLN [From (i), (ii) and (iii)]
∴ ΔPQR – ΔLMN [SSS test of similarity]

Similarity Practice Set 1.3 Question 3.
As shown in the adjoining figure, two poles of height 8 m and 4 m are perpendicular to the ground. If the length of shadow of smaller pole due to sunlight is 6 m, then how long will be the shadow of the bigger pole at the same time?



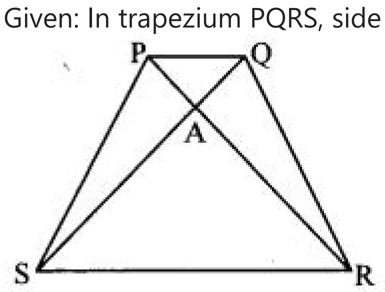
Solution:
Here, AC and PR represents the bigger and smaller poles, and BC and QR represents their shadows respectively.
Now, ΔACB – ΔPRQ [∵ Vertical poles and their shadows form similar figures]
∴ CBRQ = ACPR [Corresponding sides of similar triangles]
∴ x6 = 84
∴ X=8×64
∴ x = 12 m
∴ The shadow of the bigger pole will be 12 metres long at that time.

Practice Set 1.3 Geometry 10th Maharashtra Board Question 4.
In ΔABC, AP ⊥ BC, BQ ⊥ AC, B – P – C, A – Q – C, then prove that ΔCPA – ΔCQB. If AP = 7, BQ = 8, BC = 12, then find AC.



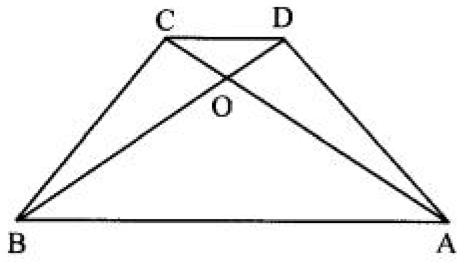
Solution:
In ΔCPA and ΔCQB,
∠CPA ≅ ∠CQB [Each angle is of measure 90°]
∠ACP ≅ ∠BCQ [Common angle]
∴ ΔCPA ~ ΔCQB [AA test of similarity]
∴ACBC = APBQ [Corresponding sides of similar triangles]
∴ AC12 = 78
∴ AC = X=12×78
∴ AC = 10.5 Units

10th Geometry Practice Set 1.3 Question 5.
Given: In trapezium PQRS, side PQ || side SR, AR = 5 AP, AS = 5 AQ, then prove that SR = 5 PQ.



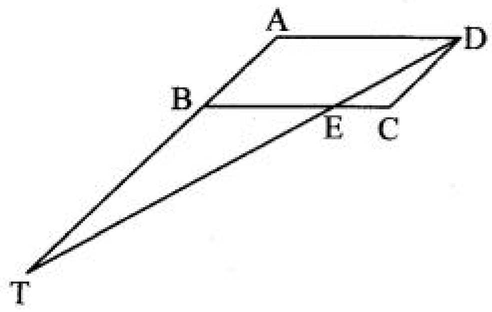
Solution:
side PQ || side SR [Given]
and seg SQ is their transversal.
∴ ∠QSR = ∠SQP [Altemate angles]
∴ ∠ASR = ∠AQP (i) [Q – A – S]
In ΔASR and ΔAQP,
∠ASR = ∠AQP [From (i)]
∠SAR ≅ ∠QAP [Vertically opposite angles]
ΔASR ~ ΔAQP [AA test of similarity]
∴ ASAQ = SRPQ (ii) [Corresponding sides of similar triangles]
But, AS = 5 AQ [Given]
∴ ASAQ = 51 (iii)
∴ SRPQ = 51 [From (ii) and (iii)]
∴ SR = 5 PQ

Practice Set 1.3 Geometry 10th Question 6.
Id trapezium ABCD (adjoining figure), side AB || side DC, diagonals AC and BD intersect in point O. If AB = 20, DC = 6, OB = 15, then find OD.



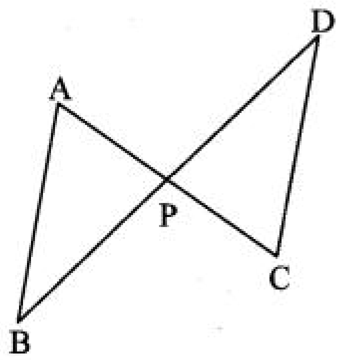
Solution:
side AB || side DC [Given]
and seg BD is their transversal.
∴ ∠DBA ≅ ∠BDC [Alternate angles]
∴ ∠OBA ≅ ∠ODC (i) [D – O – B]
In ΔOBA and ΔODC
∠OBA ≅ ∠ODC [From (i)]
∠BOA ≅ ∠DOC [Vertically opposite angles]
∴ ΔOBA ~ ΔODC [AA test of similarity]
∴ *OBOD* = *ABDC* [Corresponding sides of similar triangles]
∴ *15OD* = *206*
∴ OD = X=*15×620*
∴ OD = 4.5 units

Class 10 Geometry Practice Set 1.3 Question 7.
 ABCD is a parallelogram. Point E is on side BC. Line DE intersects ray AB in point T. Prove that DE × BE = CE × TE.



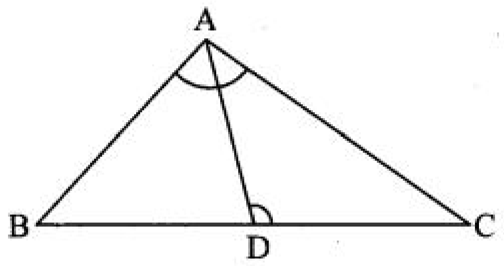
Solution:
Proof:
 ABCD is a parallelogram. [Given]
∴ side AB || side CD [Opposite sides of a parallelogram]
∴ side AT || side CD [A – B – T]
and seg DT is their transversal.
∴ ∠ATD ≅ ∠CDT [Alternate angles]
∴ ∠BTE ≅ ∠CDE (i) [A – B – T, T – E – D]
In ΔBTE and ΔCDE,
∠BTE ≅ ∠CDE [From (i)]
∠BET ≅ ∠CED [Vertically opposite angles]
∴ ΔBTE ~ ΔCDE. [AA test of similarity]
∴ *TEDE* = *BECE* [Corresponding sides of similar triangles]
∴ DE × BE = CE × TE

Geometry Practice Set 1.3 Question 8.
In the adjoining figure, seg AC and seg BD intersect each other in point P and *APCP* = *BPDP* Prove that, ΔABP ~ ΔCDP



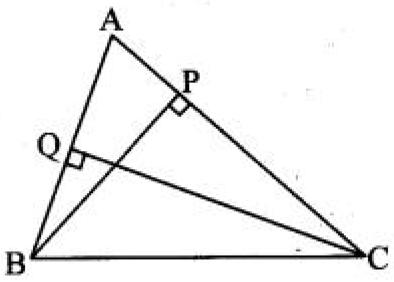
Solution:
Proof:
In ΔABP and ΔCDP,
APCP = *BPDP* [Given]
∠APB ≅ ∠CPD [Vertically opposite angles]
∴ ΔABP ~ ΔCDP [SAS test of similarity]

Math 2 Practice Set 1.3 Question 9.
In the adjoining figure, in ΔABC, point D is on side BC such that, ∠BAC = ∠ADC. Prove that, CA2 = CB × CD,



Solution:
Proof:
In ΔBAC and ΔADC,
∠BAC ≅ ∠ADC [Given]
∠BCA ≅ ∠ACD [Common angle]
∴ ΔBAC ~ ΔADC [AA test of similarity]
∴ $\frac{CA}{CD} = \frac{CB}{CA}$ [Corresponding sides of similar triangles]
∴ CA × CA = CB × CD
∴ CA^2 = CB × CD

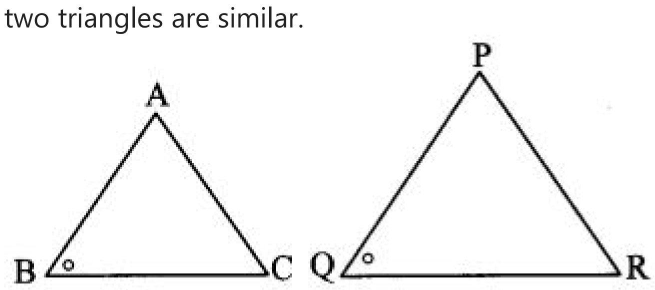
Question 1.
In the adjoining figure, BP ⊥ AC, CQ ⊥ AB, A – P – C, A – Q – B, then prove that ΔAPB and ΔAQC are similar. (Textbook pg. no. 20)



Solution:

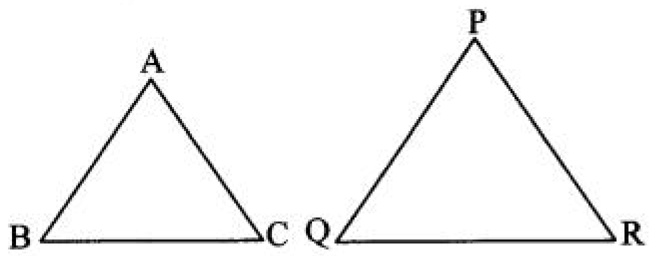
In ΔAPB and ΔAQC,		
∠APB = $\boxed{90°}$	(i)	
∠AQC = $\boxed{90°}$	(ii)	
∴ ∠APB ≅ ∠AQC		[From (i) and (ii)]
∠PAB ≅ ∠QAC		$\boxed{\text{[Common angle]}}$
∴ ΔAPB ~ ΔAQC		[AA test of similarity]

2. SAS test for similarity of triangles:
For a given correspondence, if two pairs of corresponding sides are in the same proportion and the angle between them is congruent, then the two triangles are similar.



In the given figure, if $\frac{AB}{PQ} = \frac{BC}{QR}$, and ∠B ≅ ∠Q, then ΔABC ~ ΔPQR

3. SSS test for similarity of triangles:
For a given correspondence, if three sides of one triangle are in proportion with the corresponding three sides of the another triangle, then the two triangles are similar.



In the given figure, if $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$, then ΔABC ~ ΔPQR

Properties of similar triangles:

1. Reflexivity: ΔABC ~ ΔABC
2. Symmetry : If ΔABC ~ ΔDEF, then ΔDEF ~ ΔABC.
3. Transitivity: If ΔABC ~ ΔDEF and ΔDEF ~ ΔGHI, then ΔABC ~ ΔGHI.

Practice Set 1.4 Algebra 10th Std Maths Part 2 Answers Chapter 1 Similarity

Question 1.
The ratio of corresponding sides of similar triangles is 3 : 5, then find the ratio of their areas.
Solution:
Let the corresponding sides of similar triangles be S_1 and S_2.
Let A_1 and A_2 be their corresponding areas.

$\therefore \; s_1 : s_2 = 3 : 5$

$\therefore \; \frac{s_1}{s_2} = \frac{3}{5}$ ... (i)

$\frac{A_1}{A_2} = \frac{s_1^2}{s_2^2}$ [Theorem of areas of similar triangles]

$= \left(\frac{s_1}{s_2}\right)^2$

$= \left(\frac{3}{5}\right)^2$ [From (i)]

$= \frac{9}{25}$

∴ Ratio of areas of similar triangles = 9 : 25

Question 2.
If ΔABC ~ ΔPQR and AB : PQ = 2:3, then fill in the blanks.
Solution:

$\frac{A(\Delta ABC)}{A(\Delta PQR)} = \frac{AB^2}{\boxed{PQ^2}} = \frac{2^2}{3^2} = \frac{\boxed{4}}{\boxed{9}}$ [Theorem of areas of similar triangles]

Question 3.
If ΔABC ~ ΔPQR, A(ΔABC) = 80, A(ΔPQR) = 125, then fill in the blanks.
Solution:

$\frac{A(\Delta ABC)}{A(\Delta \mathbf{PQR})} = \frac{80}{125} = \frac{16}{25}$ ... (i) [Given]

$\frac{A(\Delta ABC)}{A(\Delta PQR)} = \frac{AB^2}{PQ^2}$ ... (ii) [Theorem of areas of similar triangles]

$\therefore \; \frac{AB^2}{PQ^2} = \frac{16}{25}$ [From (i) and (ii)]

$\therefore \; \frac{AB}{PQ} = \frac{\boxed{4}}{\boxed{5}}$ [Taking square root of both sides]

Question 4.
ΔLMN ~ ΔPQR, 9 × A(ΔPQR) = 16 × A(ΔLMN). If QR = 20, then find MN.
Solution:
9 × A(ΔPQR) = 16 × A(ΔLMN) [Given]
∴ $A(\Delta LMN)A(\Delta PQR)=916$ (i)
Now, ΔLMN ~ ΔPQR [Given]
∴ $A(\Delta LMN)A(\Delta PQR)=MN_2QR_2$ (ii) [Theorem of areas of similar triangles]
∴ $MN_2QR_2=916$ [From (i) and (ii)]
∴ $MNQR=34$ [Taking square root of both sides]
∴ $MN20=34$
∴ MN = 20×34
∴ MN = 15 units

Question 5.
Areas of two similar triangles are 225 sq. cm. and 81 sq. cm. If a side of the smaller triangle is 12 cm, then find corresponding side of the bigger triangle.
Solution:
Let the areas of two similar triangles be A_1 and A_2.
A_1 = 225 sq. cm. A_2 = 81 sq. cm.
Let the corresponding sides of triangles be S_1 and S_2 respectively.
S_1 = 12 cm

$\frac{A_1}{A_2} = \frac{s_1^2}{s_2^2}$ [Theorem of areas of similar triangles]

$\therefore \frac{225}{81} = \frac{s_1^2}{12^2}$

$\therefore s_1^2 = \frac{225 \times 12^2}{81}$

$\therefore s_1 = \frac{15 \times 12}{9}$ [Taking square root of both sides]

$\therefore s_1 = 20$ cm

∴ The length of the corresponding side of the bigger triangle is 20 cm.

Question 6.
ΔABC and ΔDEF are equilateral triangles. If A(ΔABC): A(ΔDEF) = 1:2 and AB = 4, find DE.
Solution:
In ΔABC and ΔDEF,

$\left.\begin{array}{l}\angle A \cong \angle D \\ \angle B \cong \angle E\end{array}\right\}$ [Each angle is of measure 60°]

$\therefore \Delta ABC \sim \Delta DEF$ [AA test of similarity]

$\therefore \frac{A(\Delta ABC)}{A(\Delta DEF)} = \frac{AB^2}{DE^2}$ [Theorem of areas of similar triangles]

$\therefore \frac{1}{2} = \frac{4^2}{DE^2}$

$\therefore DE^2 = 4^2 \times 2$

$\therefore$ **DE = $4\sqrt{2}$ units** [Taking square root of both sides]

Question 7.
In the adjoining figure, seg PQ || seg DE, A(ΔPQF) = 20 sq. units, PF = 2 DP, then find A (□ DPQE) by completing the following activity.
Solution:
A(ΔPQF) = 20 sq.units, PF = 2 DP, [Given]
Let us assume DP = x.
∴ PF = 2x

$DF = DP + \boxed{PF} = \boxed{x} + \boxed{2x} = 3x$ [D – P – F]

In ΔFDE and ΔFPQ,

$\angle FDE \cong \boxed{\angle FPQ}$ [Corresponding angles]

$\angle FED \cong \boxed{\angle FQP}$ [Corresponding angles]

$\therefore \Delta FDE \sim \Delta FPQ$ [AA test of similarity]

$\therefore \frac{A(\Delta FDE)}{A(\Delta FPQ)} = \frac{\boxed{DF^2}}{\boxed{PF^2}} = \frac{(3x)^2}{(2x)^2} = \frac{9}{4}$ [Theorem of areas of similar triangles]

$\therefore A(\Delta FDE) = \frac{9}{4} \times A(\Delta FPQ)$

$= \frac{9}{4} \times \boxed{20} = \boxed{45 \text{ sq. units}}$

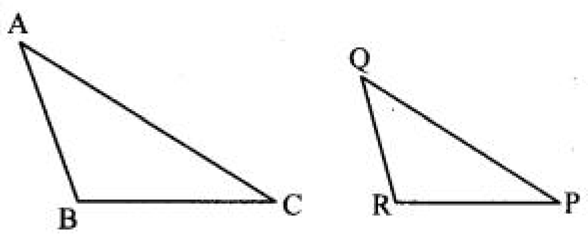
$A(\square DPQE) = A(\Delta FDE) - A(\Delta FPQ)$

$= \boxed{45} - \boxed{20}$

$= \boxed{25 \text{ sq. units}}$

Problem Set 1 Geometry 10th Std Maths Part 2 Answers Chapter 1 Similarity

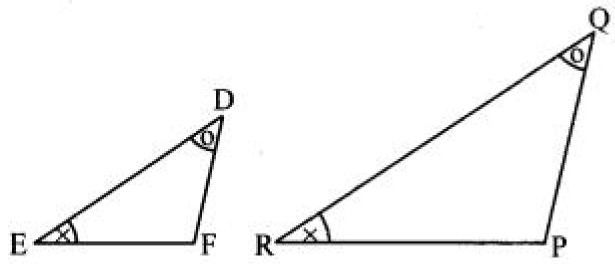
Question 1.
Select the appropriate alternative.
i. In ΔABC and ΔPQR, in a one to one correspondence *ABQR = BCPR = CAPQ*, then



(A) ΔPQR – ΔABC

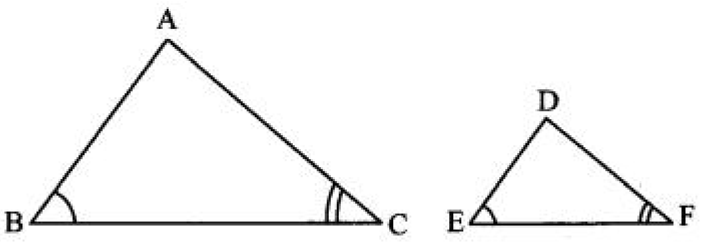
(B) ΔPQR – ΔCAB
(C) ΔCBA – ΔPQR
(D) ΔBCA – ΔPQR
Answer:
(B)

ii. If in ΔDEF and ΔPQR, ∠D ≅ ∠Q, ∠R ≅ ∠E, then which of the following statements is false?



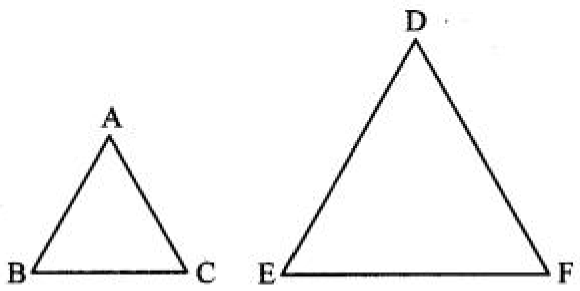
(A) EFPR = DFPQ
(B) DEPQ = EFRP
(C) DEQR = DFPQ
(D) EFRP = DEQR
Answer:
ΔDEF ~ ΔQRP … [AA test of similarity]
∴ DEQR = EFRP = DFPQ …[Corresponding sides of similar triangles]
(B)

iii. In ΔABC and ΔDEF, ∠B = ∠E, ∠F = ∠C and AB = 3 DE, then which of the statements regarding the two triangles is true?



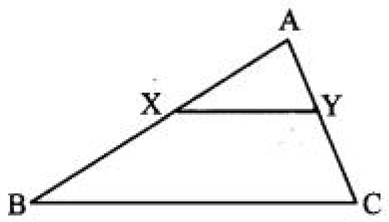
(A) The triangles are not congruent and not similar.
(B) The triangles are similar but not congruent.
(C) The triangles are congruent and similar.
(D) None of the statements above is true.
Answer:
(B)

iv. ΔABC and ΔDEF are equilateral triangles, A(ΔABC) : A(ΔDEF) = 1 : 2. If AB = 4, then what is length of DE?



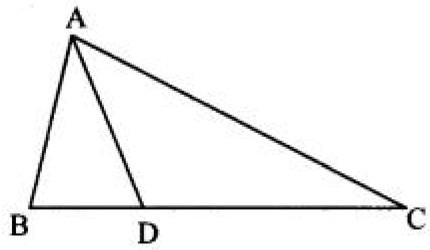
(A) 2√2
(B) 4
(C) 8
(D) 4√2
Answer:
Refer Q. 6 Practice Set 1.4
(D)

v. In the adjoining figure, seg XY || seg BC, then which of the following statements is true?



(A) ABAC = AXAY
(B) AXXB = AYAC
(C) AXYC = AYXB
(D) ABYC = ACXB
Answer:
ΔABC ~ ΔAXY … [AA test of similarity]
∴ ABAX = ACAY …[Corresponding sides of similar triangles]
∴ ABAC = AXAY …[Altemendo]
(A)

Question 2.
In ΔABC, B-D-C and BD = 7, BC = 20, then find following ratios.

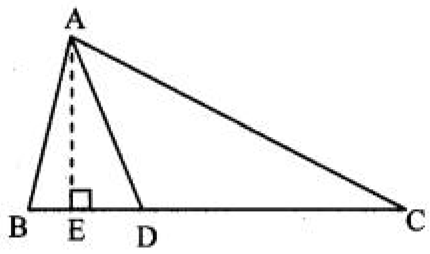


i. $\frac{A(\Delta ABD)}{A(\Delta ADC)}$

ii. $\frac{A(\Delta ABD)}{A(\Delta ABC)}$

iii. $\frac{A(\Delta ADC)}{A(\Delta ABC)}$

Solution:



Draw AE ⊥ BC, B – E – C.
BC = BD + DC [B – D – C]
∴ 20 = 7 + DC
∴ DC = 20 – 7 = 13

i. ΔABD and ΔADC have same height AE.
$\frac{A(\Delta ABD)}{A(\Delta ADC)}=\frac{BD}{DC}$ [Triangles having equal height]

∴ $\frac{A(\Delta ABD)}{A(\Delta ADC)}=\frac{7}{13}$

ii. ΔABD and ΔABC have same height AE.
$\frac{A(\Delta ABD)}{A(\Delta ABC)}=\frac{BD}{BC}$ [Triangles having equal height]

∴ $\frac{A(\Delta ABD)}{A(\Delta ABC)}=\frac{7}{20}$

iii. ΔADC and ΔABC have same height AE.
$\frac{A(\Delta ADC)}{A(\Delta ABC)}=\frac{DC}{BC}$ [Triangles having equal height]

∴ $\frac{A(\Delta ADC)}{A(\Delta ABC)}=\frac{13}{20}$

Question 3.
Ratio of areas of two triangles with equal heights is 2 : 3. If base of the smaller triangle is 6 cm, then what is the corresponding base of the bigger triangle?
Solution:
Let A_1 and A_2 be the areas of two triangles. Let b_1 and b_2 be their corresponding bases.
$A_1 : A_2 = 2 : 3$

$$\therefore \frac{A_1}{A_2} = \frac{2}{3}$$

$$\frac{A_1}{A_2} = \frac{b_1}{b_2} \quad \text{[Triangles having equal height]}$$

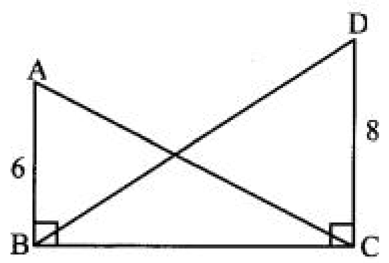
$$\therefore \frac{2}{3} = \frac{6}{b_2}$$

$$\therefore b_2 = \frac{6 \times 3}{2}$$

$$\therefore b_2 = 9 \text{ cm}$$

∴ The corresponding base of the bigger triangle is 9 cm.

Question 4.
In the adjoining figure, ∠ABC = ∠DCB = 90°, AB = 6, DC = 8, then $\frac{A(\Delta ABC)}{A(\Delta DCB)}=?$



Solution:

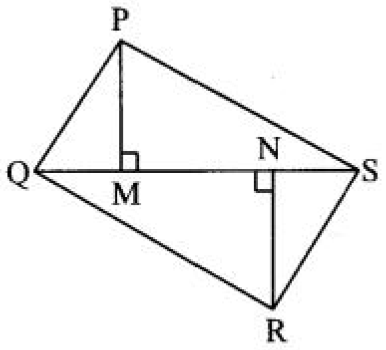
ΔABC and ΔDCB have same base BC.

$$\therefore \quad \frac{A(\Delta ABC)}{A(\Delta DCB)} = \frac{AB}{DC} \qquad \text{[Triangles having equal base]}$$

$$= \frac{6}{8}$$

$$\therefore \quad \frac{A(\Delta ABC)}{A(\Delta DCB)} = \frac{3}{4}$$

Question 5.
In the adjoining figure, PM = 10 cm, A(ΔPQS) = 100 sq. cm,
A(ΔQRS) = 110 sq. cm, then find NR.



Solution:

ΔPQS and ΔQRS have same base QS.

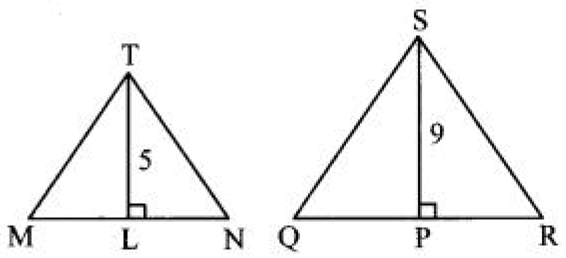
$$\frac{A(\Delta PQS)}{A(\Delta QRS)} = \frac{PM}{NR} \qquad \text{[Triangles having equal base]}$$

$$\therefore \quad \frac{100}{110} = \frac{10}{NR}$$

$$\therefore \quad NR = \frac{110 \times 10}{100}$$

∴ NR = 11 cm

Question 6.
ΔMNT ~ ΔQRS. Length of altitude drawn from point T is 5 and length of altitude drawn from point S is 9. Find the ratio *A(ΔMNT)A(ΔQRS)*



Solution:
ΔMNT- ΔQRS [Given]
∴ ∠M ≅ ∠Q (i) [Corresponding angles of similar triangles]
In ΔMLT and ΔQPS,
∠M ≅ ∠Q [From (i)]
∠MLT ≅ ∠QPS [Each angle is of measure 90°]
∴ ΔMLT ~ ΔQPS [AA test of similarity]

$$\therefore \quad \frac{MT}{QS} = \frac{TL}{SP} \qquad \text{[Corresponding sides of similar triangles]}$$

$$\therefore \quad \frac{MT}{QS} = \frac{5}{9} \qquad \text{(ii)}$$

Now, ΔMNT ~ ΔQRS [Given]

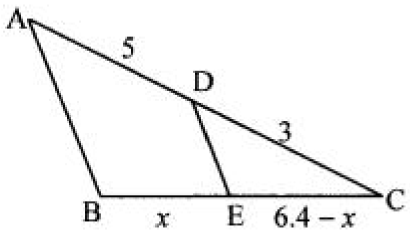
$$\therefore \quad \frac{A(\Delta MNT)}{A(\Delta QRS)} = \frac{MT^2}{QS^2} \qquad \text{[Theorem of areas of similar triangles]}$$

$$= \left(\frac{MT}{QS}\right)^2$$

$$= \left(\frac{5}{9}\right)^2 \qquad \text{[From (ii)]}$$

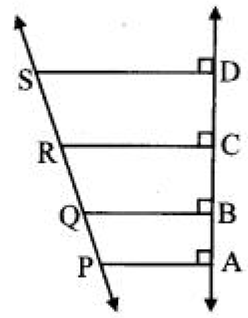
$$\therefore \quad \frac{A(\Delta MNT)}{A(\Delta QRS)} = \frac{25}{81}$$

Question 7.
In the adjoining figure, A – D – C and B – E – C. seg DE || side AB. If AD = 5, DC = 3, BC = 6.4, then find BE.



Solution:
In ΔABC,
seg DE || side AB [Given]
∴ DCAD = ECBE [Basic proportionality theorem]
∴ 34 = 6.4−xx
∴ 3x = 5 (6.4 – x)
∴ 3x = 32 – 5x
∴ 8x = 32
∴ x = 328 =4
∴ BE = 4 units

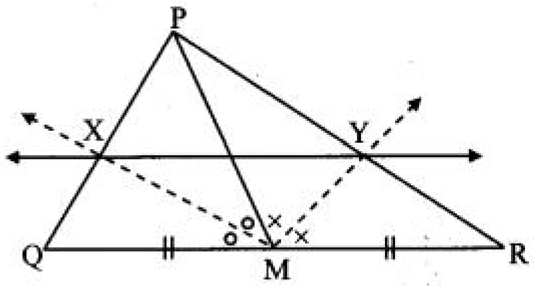
Question 8.
In the adjoining figure, seg PA, seg QB, seg RC and seg SD are perpendicular to line AD. AB = 60, BC = 70, CD = 80, PS = 280, then find PQ, QR and RS.



Solution:
seg PA, seg QB, seg RC and seg SD are perpendicular to line AD. [Given]
∴ seg PA || seg QB || seg RC || seg SD (i) [Lines perpendicular to the same line are parallel to each other]
Let the value of PQ be x and that of QR be y.
PS = PQ + QS [P – Q – S]
∴ 280 – x + QS
∴ QS = 280 – x (ii)
Now, seg PA || seg QB || seg SD [From (i)]
∴ ABBD = PQQS [Property of three parallel lines and their transversals]
∴ABBC+CD = PQQS [B – C – D]
∴ 6070+80 = x280−x
∴ 60150 = x280−x
∴ 25 = x280−x
∴ 5x = 2 (280 – x)
∴ 5x = 560 – 2x
∴ 7x = 560
∴ x = 5607 = 80
∴ PQ = 80 units
QS = 280 – x [From (ii)]
= 280 – 80
= 200 units
But, QS = QR + RS [Q – R – S]
∴ 200 = y + RS
∴ RS = 200 – y (ii)
Now, seg QB || seg RC || seg SD [From (i)]
∴BCCD = QRRS [Property of three parallel lines and their transversals]
∴ 7080 = y200−y
∴ 78 = y200−y
∴ 8y = 7(200 – y)
∴ 8y = 1400 – 7y
∴ 15y = 1400
∴ y = 140015 = 2803
∴ QR = 2803 units
RS = 200 – 7 [From (iii)]
= 200 – 2803
= 200×3−2803
= 600−2803
∴ RS = 3203 units

Question 9.
In ΔPQR, seg PM is a median. Angle bisectors of ∠PMQ and ∠PMR intersect side PQ and side PR in points X and Y respectively. Prove that XY || QR

Complete the proof by filling in the boxes.



Solution:
Proof:
In ΔPMQ, ray MX is bisector of ∠PMQ.

$\therefore \frac{\boxed{MP}}{\boxed{MQ}} = \frac{\boxed{PX}}{\boxed{XQ}}$ (i) [Theorem of angle bisector]

In ΔPMR, ray MY is bisector of ∠PMR.

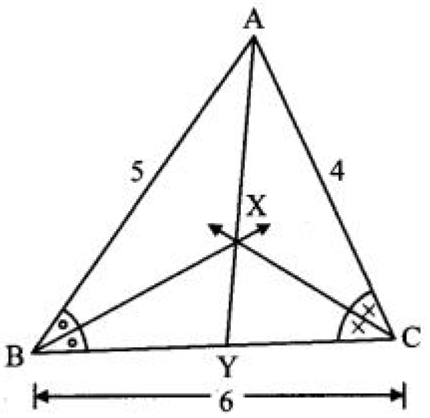
$\therefore \frac{\boxed{MP}}{\boxed{MR}} = \frac{\boxed{PY}}{\boxed{YR}}$ (ii) [Theorem of angle bisector]

But, $\frac{MP}{MQ} = \frac{MP}{MR}$ [M is the midpoint of QR, hence MQ = MR]

$\therefore \frac{PX}{XQ} = \frac{PY}{YR}$

$\therefore$ XY || QR [Converse of basic proportionality theorem]

Question 10.
In the adjoining figure, bisectors of ∠B and ∠C of ΔABC intersect each other in point X. Line AX intersects side BC in point Y.
AB = 5, AC = 4, BC = 6, then find $AXXY$.



Solution:
Let the value of BY be x.
BC = BY + YC [B – Y – C]
∴ 6 = x + YC
∴ YC = 6 – x
in ΔBAY, ray BX bisects ∠B. [Given]
∴ $ABBY = AXXY$ (i) [Property of angle bisector of a triangle]
Also, in ΔCAY, ray CX bisects ∠C. [Given]

$\therefore \frac{AC}{YC} = \frac{AX}{XY}$ (ii) [Property of angle bisector of a triangle]

$\therefore \frac{AB}{BY} = \frac{AC}{YC}$ [From (i) and (ii)]

$\therefore \frac{5}{x} = \frac{4}{6-x}$

$\therefore 5(6-x) = 4x$

$\therefore 30 - 5x = 4x$

$\therefore 9x = 30$

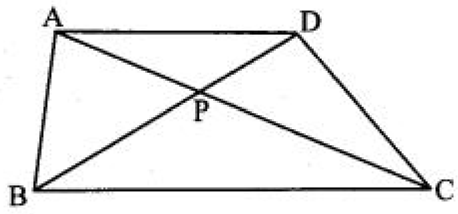
$\therefore x = \frac{30}{9} = \frac{10}{3}$

Now, $\frac{AX}{XY} = \frac{5}{\left(\frac{10}{3}\right)}$ [Substituting the value of x in equation (i)]

$= \frac{5 \times 3}{10}$

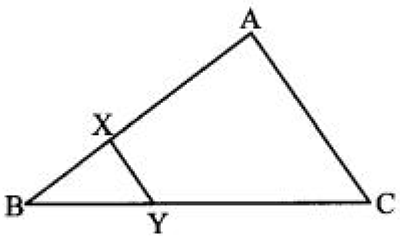
$\therefore \frac{AX}{XY} = \frac{3}{2}$

Question 11.
In ⌡ ABCD, seg AD || seg BC. Diagonal AC and diagonal BD intersect each other in point P. Then show that $APPD = PCBP$



Solution:
proof:
seg AD || seg BC and BD is their transversal. [Given]
∴ ∠DBC ≅ ∠BDA [Alternate angles]
∴ ∠PBC ≅ ∠PDA (i) [D – P – B]
In ΔPBC and ΔPDA,
∠PBC ≅ ∠PDA [From (i)]
∠BPC ≅ ∠DPA [Vertically opposite angles]
∴ ΔPBC ~ ΔPDA [AA test of similarity]
∴ $\frac{BP}{PD} = \frac{PC}{AP}$ [Corresponding sides of similar triangles]
∴ $\frac{AP}{PD} = \frac{PC}{BP}$ [By altemendo]

Question 12.
In the adjoining figure, XY || seg AC. If 2 AX = 3 BX and XY = 9, complete the activity to find the value of AC.



Solution:
2 AX = 3 BX [Given]

∴ $\frac{AX}{BX} = \frac{\boxed{3}}{\boxed{2}}$

∴ $\frac{AX+BX}{BX} = \frac{\boxed{3}+\boxed{2}}{\boxed{2}}$ [By componendo]

∴ $\frac{AB}{BX} = \frac{\boxed{5}}{\boxed{2}}$ (i) [A–X–B]

In ΔBCA and ΔBYX,
∠BCA ≅ ∠BYX
∠BAC ≅ ∠BXY } [Corresponding angles]
∴ ΔBCA ~ ΔBYX [By $\boxed{\text{AA}}$ test of similarity]

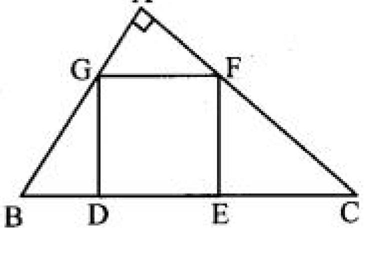
∴ $\frac{BA}{BX} = \frac{AC}{XY}$ [Corresponding sides of similar triangles]

∴ $\frac{\boxed{5}}{\boxed{2}} = \frac{AC}{9}$ [From (i)]

∴ $AC = \frac{9 \times 5}{2}$

∴ AC = $\boxed{\text{22.5 units}}$

Question 13.
In the adjoining figure, the vertices of square DEFG are on the sides of ΔABC. If ∠A = 90°, then prove that DE^2 = BD × EC.
(Hint: Show that ΔGBD is similar to Δ CFE. Use GD = FE = DE.)



Solution:
proof:
∵ DEFG is a square.
∴ DE = EF = GF = GD (i) [Sides of a square]
∠GDE = ∠DEF = 90° [Angles of a square]
∴ seg GD ⊥ side BC, seg FE ⊥ side BC (ii)
In ΔBAC and ΔBDG,
∠BAC ≅ ∠BDG [From (ii), each angle is of measure 90°]
∠ABC ≅ ∠DBG [Common angle]
∴ ΔBAC – ΔBDG (iii) [AA test of similarity]

In ΔBAC and ΔFEC,

∠BAC ≅ ∠FEC [From (ii), each angle is measure 90°]

∠ACB ≅ ∠ECF [Common angle]

∴ ΔBAC – ΔFEC (iv) [AA test of similarity]

∴ ΔBDG – ΔFEC [From (iii) and (iv)]

∴ *BDEF* = *GDEC* (v) [Corresponding sides of similar triangles]

∴ *BDDE* = *DEEC* [From (i) and (v)]

∴ DE^2 = BD × EC