Practice Set 3.1

1. In figure 3.8, ∠is an exterior angle of △ ABC. ∠B = 40°, ∠A = 70°. Find the measure of ∠ACD.

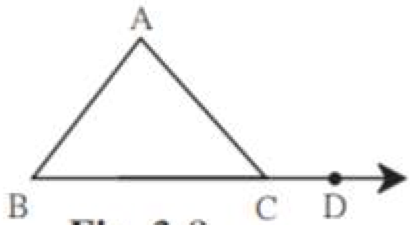


Fig. 3.8

Solution:
Given ∠B = 40˚
∠A =70˚
∴∠ACD = ∠A+∠B [Exterior angle]
∴∠ACD = 70+40 = 110˚.
Hence measure of ∠ACD is 110˚.

2. In △ PQR, ∠P = 70°, ∠Q = 65° then find ∠R.

Solution:
Given ∠P = 70°
∠Q = 65°
∠P+∠Q+∠R = 180˚ [Angle sum property of triangle]
70+65+∠R = 180
∴∠R = 180-(70+65)
= 180-135 = 45˚
Hence measure of ∠R is 45˚ .

3. The measures of angles of a triangle are x°, (x-20)°, (x-40)°. Find the measure of each angle.

Solution:
Given measures of angles of a triangle are x˚, (x-20)˚, (x-40)˚.
The sum of angles of a triangle is equal to 180˚.
∴x+x-20+x-40 = 180
∴3x-60 = 180
3x = 180+60 = 240
x = 240/3 = 80˚
∴x-20 = 80-20 = 60˚
∴x-40 = 80-40 = 40˚
Hence the measures of angles of a triangle are 80˚, 60˚ and 40˚.

4. The measure of one of the angles of a triangle is twice the measure of its smallest angle and the measure of the other is thrice the measure of the smallest angle. Find the measures of the three angles.

Solution:
Let the smallest angle be x.

Then measure of second angle = 2x [Given measure of one angle is twice the smallest angle]
Measure of third angle = 3x. [Given measure of other angle is thrice the smallest angle]
$\therefore x+2x+3x = 180^\circ$ [Angle sum property of a triangle]
$6x = 180^\circ$
$x = 180/6 = 30^\circ$
$\therefore 2x = 2\times30 = 60^\circ$
$\therefore 3x = 3\times30 = 90^\circ$
Hence the measures of the angles are 30˚, 60˚ and 90˚.

5. In figure 3.9, measures of some angles are given. Using the measures find the values of x, y, z.

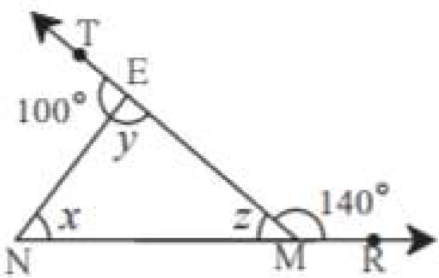


Fig. 3.9

Solution:
Given $\angle EMR = 140^\circ$
$\therefore \angle z + \angle EMR = 180^\circ$ [Linear pair]
$\therefore \angle z + 140^\circ = 180^\circ$
$\therefore \angle z = 180-140 = 40^\circ$
Given $\angle TEN = 100^\circ$
$\angle TEN + \angle y = 180^\circ$ [Linear pair]
$100^\circ + \angle y = 180^\circ$
$\therefore \angle y = 180-100 = 80^\circ$
$\therefore \angle x + \angle y + \angle z = 180^\circ$ [Angle sum property of triangle]
$\therefore \angle x + 80^\circ + 40^\circ = 180^\circ$
$\angle x + 120^\circ = 180^\circ$
$\angle x = 180^\circ - 120^\circ = 60^\circ$
Hence the measures of the angles x, y and z are 60˚, 80˚ and 40˚ respectively.

6. In figure 3.10, line AB || line DE. Find the measures of ∠DRE and ∠ARE using given measures of some angles.

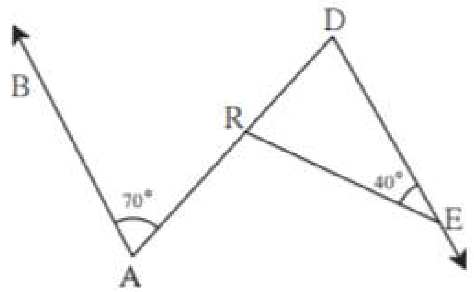
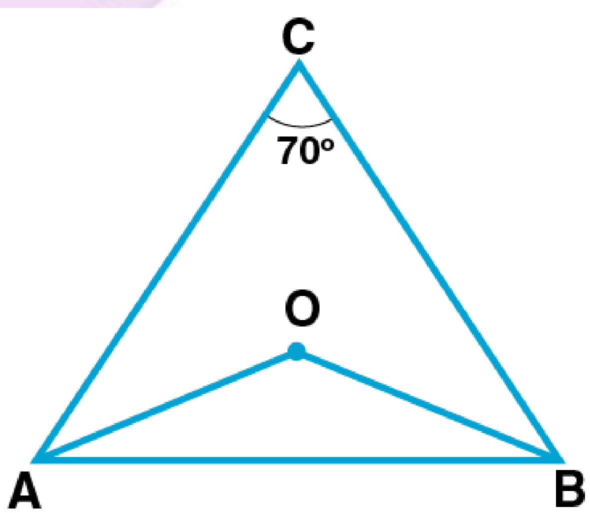


Fig. 3.10

Solution:
Given AB ∥ DE.
∴ AD is the transversal.
Given ∠BAD = 70°
∴ ∠RDE = 70° [Alternate interior angles]
Given ∠DER = 40°
In △RDE
∠RDE+∠DRE+∠DER = 180° [Angle Sum Property of triangle]
70°+∠DRE+40° = 180°
110°+∠DRE = 180°
∴ ∠DRE = 180-110 = 70°
∠ARE+∠DRE = 180° [Linear pair]
∠ARE+70° = 180°
∠ARE = 180-70 = 110°
Hence measures of ∠DRE and ∠ARE are 70° and 110° respectively.

7. In △ ABC, bisectors of ∠A and ∠B intersect at point O. If ∠C = 70°. Find measure of ∠AOB.

Solution:



Given ∠C = 70°
∠OAB = ½ ∠CAB …….(i) [AO is the bisector of ∠CAB]
∠OBA = ½ ∠CBA …….(ii) [BO is the bisector of ∠CBA]
In △ABC
∠CAB+∠CBA+∠C = 180° [Angle sum property of triangle]
∠CAB+∠CBA+70° = 180°
∠CAB+∠CBA = 180°-70°
∠CAB+∠CBA = 110
Multiply both sides by ½
½ ∠CAB+½ ∠CBA = 55°
∴∠OAB+∠OBA = 55° ….(iii) [From (i) and (ii)]
In △AOB
∠AOB+∠OAB+∠OBA = 180° [Angle sum property of triangle]
∠AOB+55° = 180° [From (iii)]
∴∠AOB = 180°-55° = 125°
Hence measure of ∠AOB is 125°.

8. In Figure 3.11, line AB || line CD and line PQ is the transversal. Ray PT and ray QT are bisectors of ∠BPQ and ∠PQD respectively. Prove that m∠PTQ = 90°.

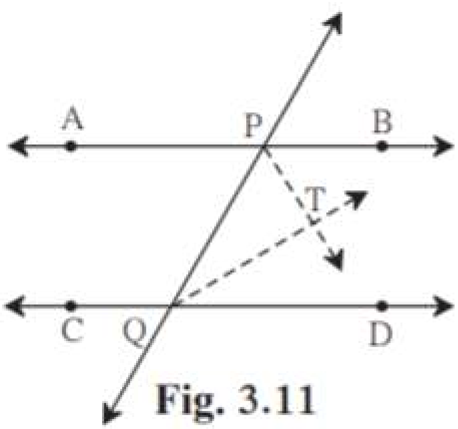


Fig. 3.11

Solution:
Given : AB ‖ CD . PQ is the transversal.
To prove: m∠PTQ = 90°
Proof:
∠QPT = ½ ∠BPQ …….(i) [PT is the bisector of ∠BPQ]
∠PQT = ½ ∠PQD …….(ii) [QT is the bisector of ∠PQD]
Given AB ‖ CD . PQ is the transversal.
∴∠BPQ+∠PQD = 180° [Interior angles on same side of transversal are supplementary]
Multiply both side by ½ .
½ ∠BPQ+ ½ ∠PQD = 90°
∴∠QPT+∠PQT = 90° ……(iii) [From (i) and (ii)]
In △PTQ

$\angle QPT+\angle PQT+\angle PTQ = 180^\circ$ [Angle sum property of triangle]
$\therefore 90^\circ+\angle PTQ = 180^\circ$ [From (iii)]
$\Rightarrow \angle PTQ = 180^\circ-90^\circ$
$\Rightarrow \angle PTQ = 90^\circ$
Hence proved.

9. Using the information in figure 3.12, find the measures of ∠a, ∠b and ∠c.

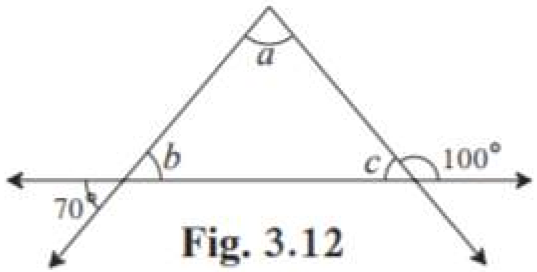


Fig. 3.12

Solution:
$\angle b = 70^\circ$ [Vertically opposite angles]
$\angle c+100^\circ = 180^\circ$ [Linear pair]
$\therefore \angle c = 180-100 = 80^\circ$
$\angle a+\angle b+\angle c = 180^\circ$ [Angle sum property of triangle]
$\therefore \angle a+70^\circ+80^\circ = 180^\circ$
$\therefore \angle a +150^\circ = 180^\circ$
$\Rightarrow \angle a = 180-150 = 30^\circ$
Hence $\angle a = 30^\circ$, $\angle b = 70^\circ$ and $\angle c = 80^\circ$.

10. In figure 3.13, line DE || line GF ray EG and ray FG are bisectors of ∠DEF and ∠DFM respectively. Prove that,
(i) ∠DEG = ½ ∠EDF
(ii) EF = FG

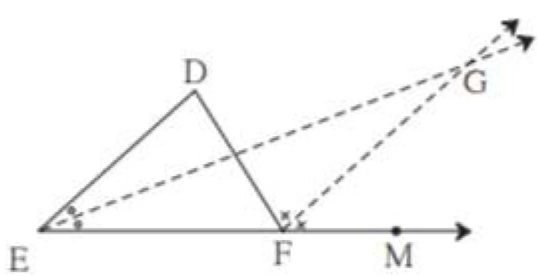


Fig. 3.13

Solution:
(i)Given DE || GF
$\angle DEG = \angle GEF = \frac{1}{2} \angle DEF$…….(i) [Ray EG bisects ∠DEF]
$\angle DFG = \angle GFM = \frac{1}{2} \angle DFM$……(ii) [Ray FG bisects ∠DFM]

ED ∥ FG
$\therefore \angle DFG = \angle EDF$ …..(iii) [Alternate interior angles]
In $\triangle DEF$
$\angle DFM = \angle DEF + \angle EDF$ [Exterior angle of a triangle is equal to the sum of remote interior angles]
$2\angle EDF = \angle DEF + \angle EDF$ [From (ii) and (iii)]
$2\angle EDF - \angle EDF = \angle DEF$
$\angle EDF = \angle DEF$
$\therefore \angle EDF = 2\angle DEG$ [From (i)]
$\therefore \angle DEG = \frac{1}{2} \angle EDF$
Hence proved.

(ii) Given DE ∥ GF.
EG is the transversal.
$\therefore \angle DEG = \angle EGF$ ….(iv) [Alternate interior angles]
$\therefore \angle EGF = \angle GEF$ [From (i) and (iv)]
$\therefore EF = FG$ [Sides opposite to equal angles of a triangle are equal]
Hence proved.

Practice Set 3.2 Page 31

1. In each of the examples given below, a pair of triangles is shown. Equal parts of triangles in each pair are marked with the same signs. Observe the figures and state the test by which the triangles in each pair are congruent.

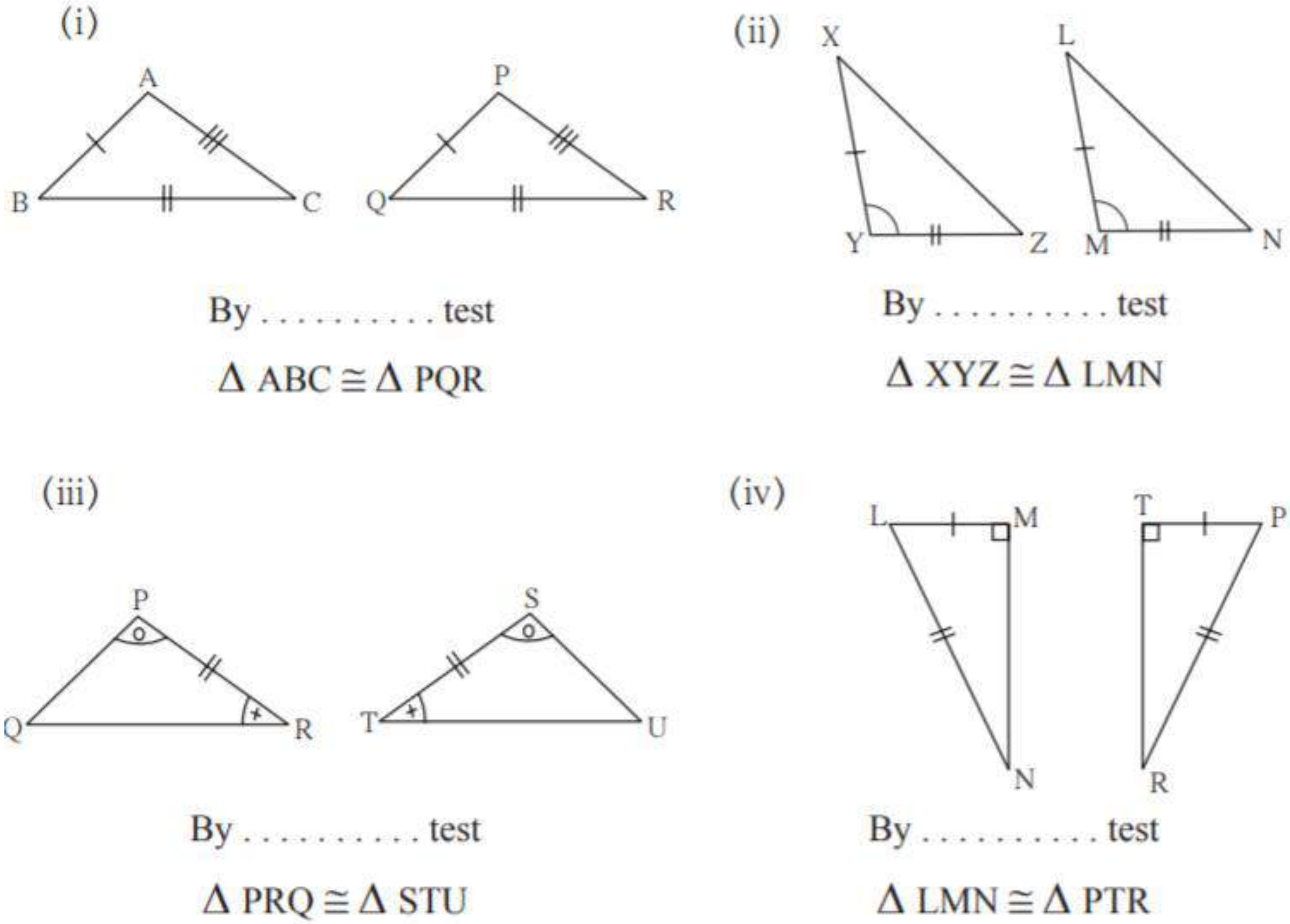


Fig. 3.19

Solution:

(i)From the figure , we know that the three sides of △ABC are equal to the three sides of △PQR.

∴By SSS test, △ABC ≅ △PQR

(ii)From the figure , we know that the two sides and the included angle of △XYZ are equal to the two sides and the included angle of △LMN.

∴By SAS test, △XYZ ≅ △LMN.

(iii) From the figure , we know that the two angles and the included side of △PRQ are equal to the two angles and the included side of △STU.

∴By ASA test, △PRQ ≅ △STU.

(iv) From the figure , we know that the right angles ,hypotenuse and a side of △LMN are equal to the right angle, hypotenuse and a side of △PTR.

∴By Hypotenuse side test, △LMN ≅ △PTR.

2. Observe the information shown in pairs of triangles given below. State the test by which the two triangles are congruent. Write the remaining congruent parts of the triangles.

(i)

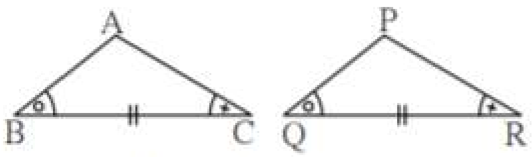


Fig. 3.20

From the information shown in the figure, in △ABC and △PQR
∠ABC ≅ ∠PQR
seg BC ≅ seg QR
∠ACB ≅ ∠PRQ
△ ABC ≅ △ PQR…… _____ test
∴∠BAC ≅ _____ corresponding angles of congruent triangles.
seg AB ≅ _____
and ______ ≅ seg PR {corresponding sides of congruent triangles}

Solution:
From the information shown in the figure, in △ABC and △PQR
∠ABC ≅ ∠PQR
seg BC ≅ seg QR
∠ACB ≅ ∠PRQ
△ ABC ≅ △ PQR…… ASA test
∴∠BAC ≅ ∠QPR corresponding angles of congruent triangles.
seg AB ≅ seg PQ
and seg AC ≅ seg PR {corresponding sides of congruent triangles}

(ii)

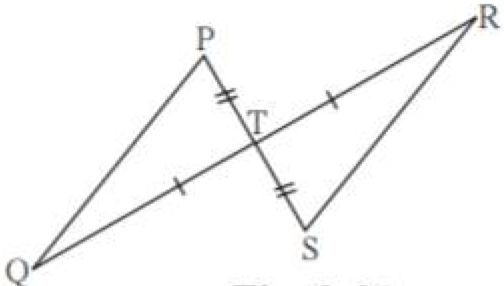


Fig. 3.21

From the information shown in the figure,,
In △ PTQ and △ STR
seg PT ≅ seg ST
∠PTQ ≅ ∠STR....vertically opposite angles
seg TQ ≅ seg TR

∴ △ PTQ ≅ △ STR…… _____ test
∴∠TPQ ≅ _____
and ____ ≅ ∠TRS {corresponding angles of congruent triangles.}
seg PQ ≅ _____corresponding sides of congruent triangles.

Solution:
From the information shown in the figure,,
In △ PTQ and △ STR
seg PT ≅ seg ST
∠PTQ ≅ ∠STR....vertically opposite angles
seg TQ ≅ seg TR
∴ △ PTQ ≅ △ STR……. SAS test
∴∠TPQ ≅ ∠TSR
and ∠TQP ≅ ∠TRS {corresponding angles of congruent triangles.}
seg PQ ≅ seg SR corresponding sides of congruent triangles.

3. From the information shown in the figure, state the test assuring the congruence of △ ABC and △ PQR. Write the remaining congruent parts of the triangles.

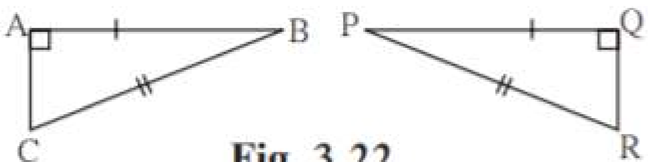


Fig. 3.22

Solution:
From given figure,
seg AB ≅ seg QP
seg BC ≅ seg PR
$\angle A = \angle Q = 90^\circ$
∴By Hypotenuse side test, △ABC ≅ △QPR
∴seg AC ≅ seg QR [c.s.c.t]
$\angle C = \angle R$ [c.a.c.t]
$\angle B = \angle P$ [c.a.c.t]

4. As shown in the following figure, in △ LMN and △ PNM, LM = PN, LN = PM. Write the test which assures the congruence of the two triangles. Write their remaining congruent parts.

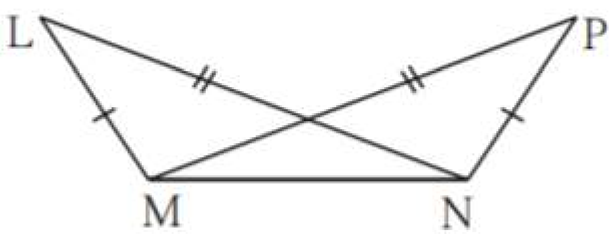


Fig. 3.23

Solution:

Given LM = PN
LN = PM
MN ≅ NM [Common side]
∴By SSS test △LMN ≅ △PNM
∴∠LMN ≅ ∠PNM [c.a.c.t]
∠MNL ≅ ∠NMP [c.a.c.t]
∠NLM ≅ ∠MPN [c.a.c.t]

5. In figure 3.24, seg AB ≅ seg CB and seg AD ≅ seg CD. Prove that △ABD ≅ △CBD

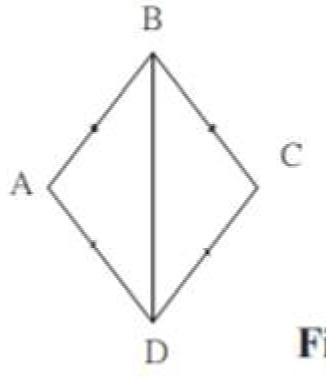


Fig. 3.24

Solution:
Proof:
seg AB ≅ seg CB [Given]
seg AD ≅ seg CD [Given]
seg BD ≅ seg BD [Common side]
∴By SSS test, △ABD ≅ △CBD
Hence proved.

6. In figure 3.25, ∠P ≅ ∠R, seg PQ ≅ seg RQ Prove that, △ PQT ≅ △ RQS

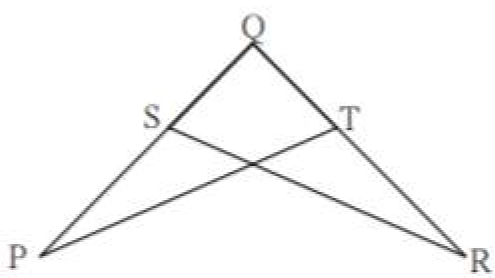


Fig. 3.25

Solution:
∠P ≅ ∠R [Given]
seg PQ ≅ seg RQ [Given]
∠Q = ∠Q [common angle]
∴By ASA test, △ PQT ≅ △ RQS
Hence proved.

Practice Set 3.3 Page 38

1. Find the values of x and y using the information shown in figure 3.37. Find the measure of ∠ABD and ∠ACD.

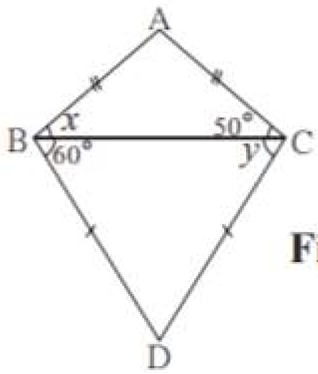


Fig. 3.37

Solution:

In △ABC

seg AB ≅ seg AC [Given]

∠ACB = 50˚ [Given]

∴∠x = ∠ACB = 50˚ [Isoceles angle theorem]

In △BCD

seg BD ≅ seg CD [Given]

∠CBD = 60˚ [Given]

∴∠y = ∠CBD = 60˚ [Isoceles angle theorem]

Hence measure of x and y are 50˚ and 60˚ respectively.

∠ABD = ∠x+∠CBD [Angle addition property]

∴∠ABD = 50˚+60˚ = 110˚

Hence measure of ∠ABD is 110˚.

∠ACD = ∠ACB+∠y [Angle addition property]

∴∠ACD = 50˚+60˚ = 110˚

Hence measure of ∠ACD is 110˚.

2. The length of hypotenuse of a right angled triangle is 15. Find the length of median of its hypotenuse.

Solution:

In a right angled triangle, the length of the median on its hypotenuse is half the length of the hypotenuse.

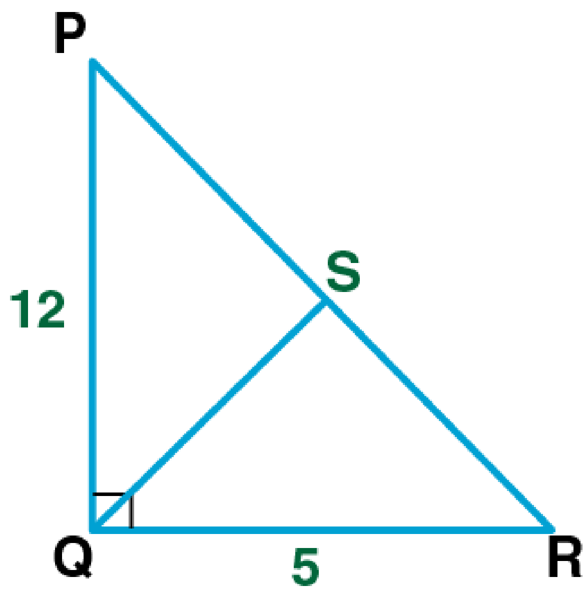
Given length of hypotenuse = 15

∴Length of median on its hypotenuse = 15/2 = 7.5

Hence the length of median on its hypotenuse is 7.5 units.

3. In △ PQR, ∠Q = 90°, PQ = 12, QR = 5 and QS is a median. Find *l*(QS).

Solution:



In △PQR
Given PQ = 12
QR = 5
∠Q = 90˚
$\therefore PR^2 = PQ^2+QR^2$ [Pythagoras theorem]
$\therefore PR^2 = 12^2+5^2$
$\therefore PR^2 = 144+25 = 169$
Taking square root
PR = √169 = 13
In a right angled triangle, the length of the median on its hypotenuse is half the length of the hypotenuse.
∴QS = ½ PR
= ½ ×13 = 6.5
∴l(QS) is 6.5 units.

4. In figure 3.38, point G is the point of concurrence of the medians of △ PQR . If GT = 2.5, find the lengths of PG and PT.

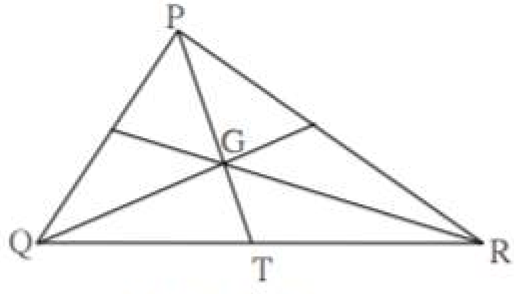


Fig. 3.38

Solution:
Given G is the point of concurrence of the medians of △PQR.
The point of concurrence of medians of a triangle divides each median in the ratio 2 : 1.

$\therefore$ PG:GT = 2:1
PG/GT = 2/1
PG/2.5 = 2/1 [Given GT = 2.5]
$\Rightarrow$ PG = 2.5×2 = 5
PT = PG+GT [P-G-T]
$\therefore$ PT = 5+2.5 = 7.5
Hence length of PG and PT are 5 and 7.5 units respectively.

Practice Set 3.4 Page 43

1. In figure 3.48, point A is on the bisector of ∠XYZ. If AX = 2 cm then find AZ.

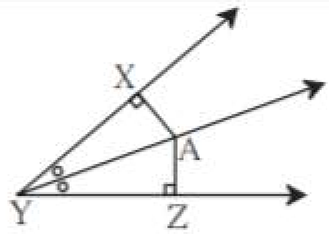


Fig. 3.48

Solution:

Given AX = 2 cm

Point A is on the bisector of ∠XYZ.

Every point on the bisector of an angle is equidistant from the sides of the angle.

∴ AZ = AX = 2cm.

Hence length of AZ is 2cm.

2. In figure 3.49, ∠RST = 56°, seg PT ⊥ ray ST, seg PR ⊥ ray SR and seg PR ≅ seg PT Find the measure of ∠RSP. State the reason for your answer.

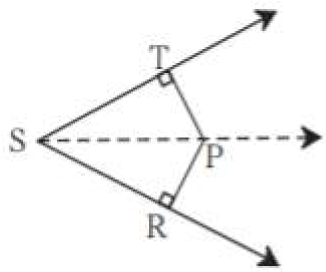


Fig. 3.49

Solution:

Given seg PT ⊥ ray ST

seg PR ⊥ ray SR

seg PR ≅ seg PT

Any point equidistant from sides of an angle is on the bisector of the angle.

∴ P is a point on the bisector of ∠TSR.

∠RST = 56˚ [Given]

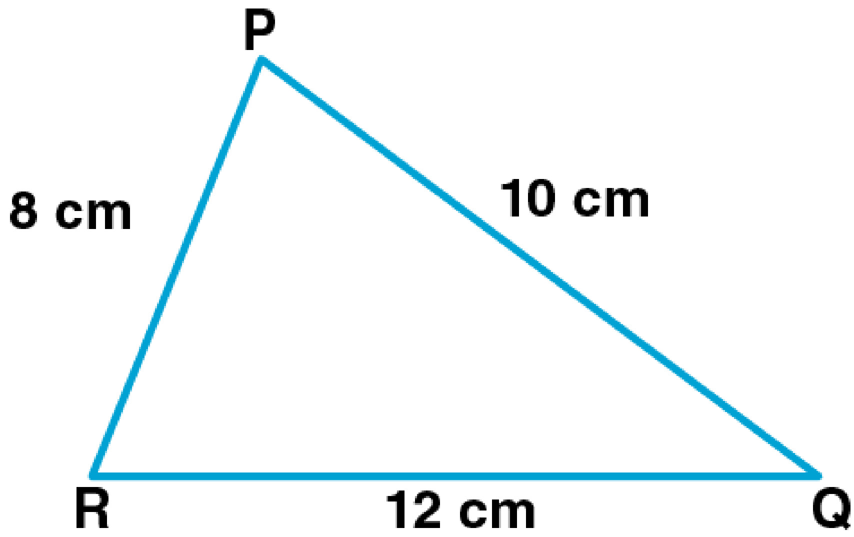
∴ ∠RSP = ½ ∠RST [Bisector of an angle divides it into two equal angles]

∴ ∠RSP = ½ ×56˚ = 28˚

Hence measure of ∠RSP is 28˚.

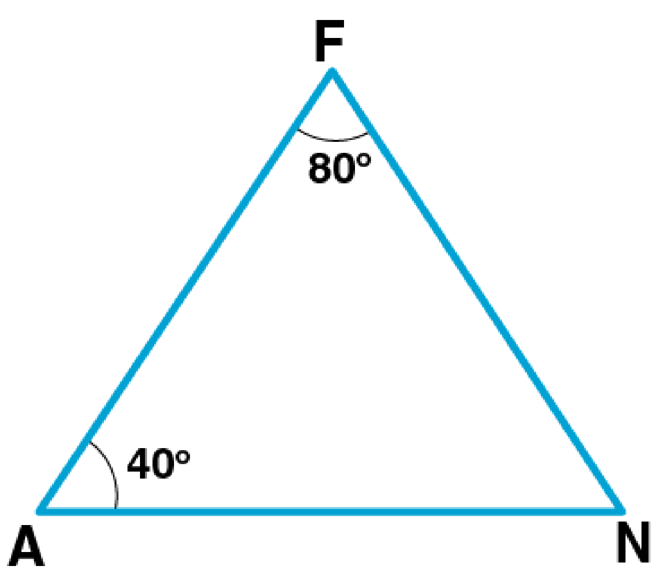
3. In △ PQR, PQ = 10 cm, QR = 12 cm, PR = 8 cm. Find out the greatest and the smallest angle of the triangle.

Solution:



Given PQ = 10 cm, QR = 12 cm, PR = 8 cm.
Here QR is the longest side and PR is the shortest side.
The angle opposite to the longest side is the largest angle and the angle opposite to the smallest side is the smallest angle .
$\therefore \angle RPQ$ is the largest angle and $\angle PQR$ is the smallest angle.

4. In $\triangle$ FAN, $\angle F = 80°$, $\angle A = 40°$. Find out the greatest and the smallest side of the triangle. State the reason.
Solution:



Given $\angle F = 80°$

$\angle A = 40°$

$\angle F+\angle A+\angle N = 180^\circ$ [Angle sum property of triangle]

$80^\circ+40^\circ+\angle N = 180^\circ$

$120^\circ+\angle N = 180^\circ$

$\therefore \angle N = 180^\circ-120^\circ = 60^\circ$

The side opposite to the largest angle is the largest side and the side opposite to the smallest angle is the smallest side.

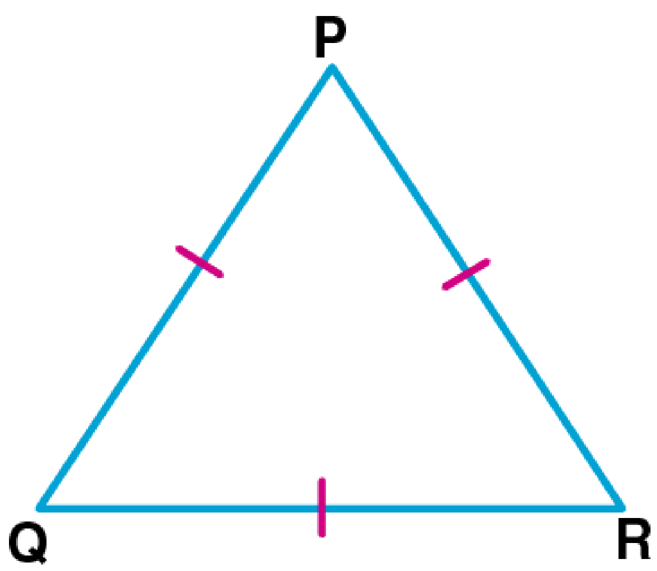
Since $80^\circ>60^\circ>40^\circ$

$\angle F>\angle N>\angle A$

$\therefore$ AN is the largest side and FN is the smallest side.

5. Prove that an equilateral triangle is equiangular.

Solution:



Given: $\triangle$PQR is an equilateral triangle.

To prove : $\triangle$PQR is equiangular.

Proof:

seg PQ = seg PR ….(i) [Sides of equilateral triangle]

$\therefore \angle R = \angle Q$…..(i) [Isoceles triangle theorem]

seg PQ = seg QR [Sides of equilateral triangle]

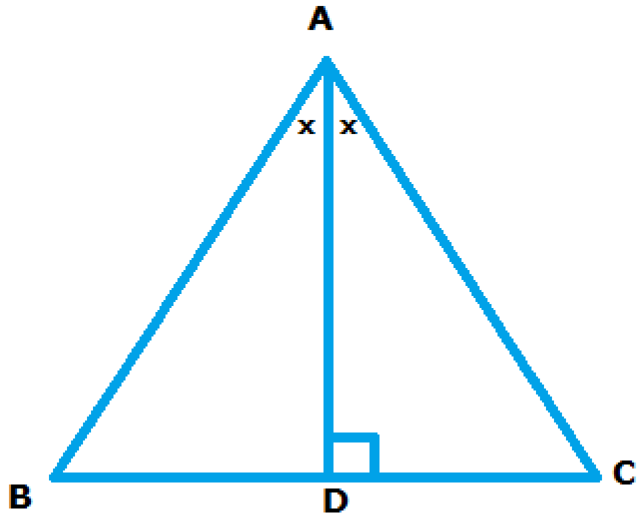
$\therefore \angle R = \angle P$…….(ii) [Isoceles triangle theorem]

$\therefore \angle R = \angle Q = \angle P$ [From (i) and (ii)]

Hence $\triangle$PQR is equiangular.

6. Prove that, if the bisector of $\angle$BAC of $\triangle$ABC is perpendicular to side BC, then $\triangle$ ABC is an isosceles triangle.

Solution:



Given AD bisects ∠BAC.
AD⊥BC
In △ADB and △ADC,

∠BAD ≅ ∠CAD	[AD bisects ∠BAC]
AD ≅ AD	[Common side]
∠ADB ≅ ∠ADC	[∵ AD⊥BC]

∴ By ASA test , △ADB ≅△ADC.
∴ AB ≅ AC [c.s.c.t]
∴ △ABC is an isosceles triangle.
Hence proved.

7. In figure 3.50, if seg PR ≅ seg PQ, show that seg PS > seg PQ.

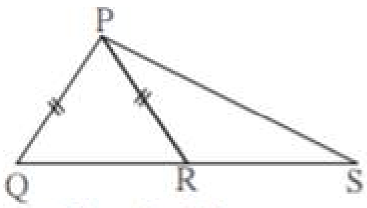


Fig. 3.50

Solution:
Given: seg PR ≅ seg PQ
To prove: seg PS > seg PQ
Proof:

seg PQ ≅ seg PR	[Given]
∠PQR ≅ ∠PRQ….(i)	[Isoceles triangle theorem]

$\angle PRQ$ is the exterior angle of $\triangle PRS$.
$\therefore \angle PRQ > \angle PSR$….(ii) [Property of Exterior angle of a triangle]
$\therefore \angle PQR > \angle PSR$ [From (i) and (ii)]
$\therefore \angle Q > \angle S$ ….(iii)
In $\triangle PQS$,
$\angle Q > \angle S$
$\therefore$ seg PS > seg PQ [The side opposite to the largest angle is the largest side]
Hence proved.

8. In figure 3.51, in $\triangle$ ABC, seg AD and seg BE are altitudes and AE = BD. Prove that seg AD $\cong$ seg BE.

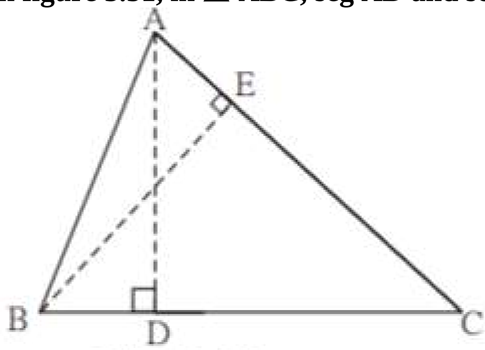


Fig. 3.51

Solution:
Proof:
In $\triangle BAE$ and $\triangle ABD$,
seg AE $\cong$ seg BD [Given]
$\angle BEA \cong \angle ADB \cong 90^\circ$ [Given]
seg BA $\cong$ seg AB [Common side]
$\therefore \triangle BAE \cong \triangle ABD$ [By Hypotenuse side test]
$\therefore$ seg AD $\cong$ seg BE [c.s.c.t]
Hence proved.

Practice Set 3.5 Page 47

1. If △ XYZ ~ △ LMN, write the corresponding angles of the two triangles and also write the ratios of corresponding sides.

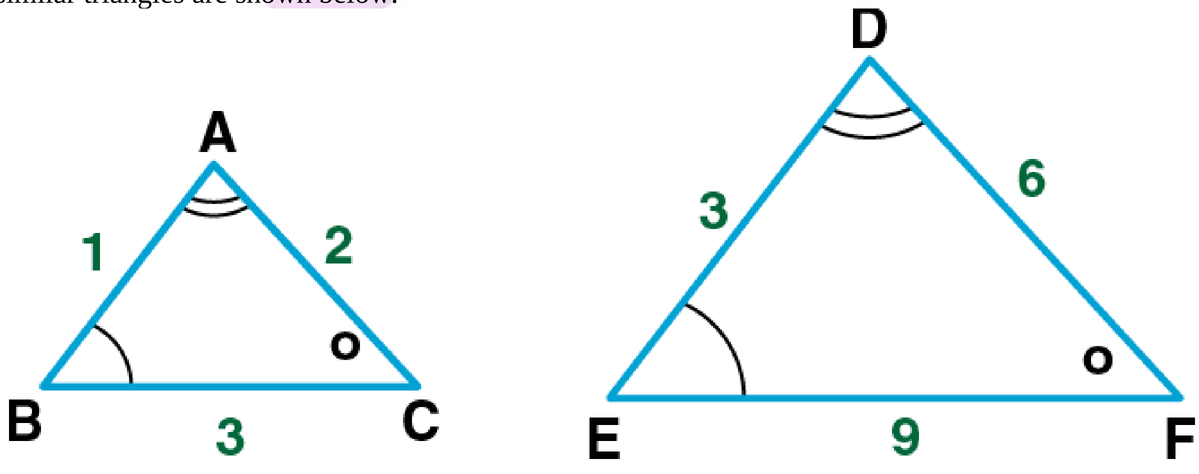
Solution:
Given △XYZ ~△LMN
∴Corresponding angles are ∠X ≅ ∠L
∠Y ≅ ∠M
∠Z ≅ ∠N
Ratio of corresponding sides = XY/LM = YZ/MN = XZ/LN

2. In △ XYZ, XY = 4 cm, YZ = 6 cm, XZ = 5 cm, If △ XYZ ~ △ PQR and PQ = 8 cm then find the lengths of remaining sides of △ PQR.

Solution:
Given △XYZ ~ △PQR
If two triangles are similar then their corresponding sides are in proportion and corresponding angles are congruent.
∴XY/PQ = YZ/QR = XZ/PR [Corresponding sides of similar triangles]
4/8 = 6/QR = 5/PR…..(i)
4/8 = 6/QR
∴4×QR = 8×6
⇒ QR = 8×6/4 = 48/4 = 12cm
Also, 4/8= 5/PR [From (i)]
∴4× PR = 8×5
⇒PR = 8×5/4 = 40/4 = 10cm
Hence measure of QR and PR are 12cm and 10cm respectively.

3. Draw a sketch of a pair of similar triangles. Label them. Show their corresponding angles by the same signs. Show the lengths of corresponding sides by numbers in proportion.

Solution:
Two similar triangles are shown below.



△ABC ~ △DEF

Problem Set 3 Page 49

1. Choose the correct alternative answer for the following questions.
(i) If two sides of a triangle are 5 cm and 1.5 cm, the length of its third side cannot be . . . .
(A) 3.7 cm (B) 4.1 cm (C) 3.8 cm (D) 3.4 cm

Solution:
The sum of any two sides of a triangle is greater than the third side.
Here $1.5 + 3.4 = 4.9 < 5$.
$\therefore$ 3.4cm cannot be length of third side.
Hence Option D is the answer.

(ii) In $\triangle$ PQR, If $\angle R > \angle Q$ then . . . .
(A) QR > PR (B) PQ > PR (C) PQ < PR (D) QR < PR

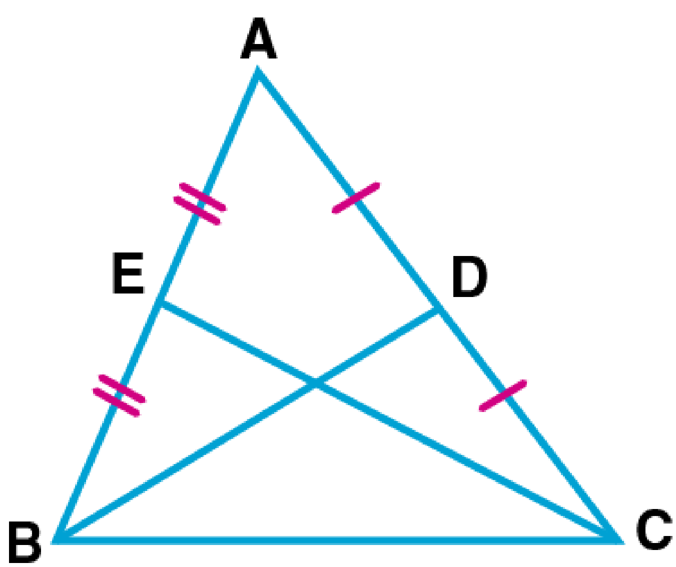
Solution:
The side opposite to the largest angle is the largest side.
$\therefore$ If $\angle R > \angle Q$, then PQ>PR.
Hence Option B is the answer.

(iii) In $\triangle$ TPQ, $\angle T = 65°$, $\angle P = 95°$ which of the following is a true statement ?
(A) PQ < TP (B) PQ < TQ (C) TQ < TP < PQ (D) PQ < TP < TQ

Solution:
The angle opposite to the largest side is the largest angle.
$\therefore$ PQ < TQ
Hence Option B is the answer.

2. $\triangle$ ABC is isosceles in which AB = AC. Seg BD and seg CE are medians. Show that BD = CE.

Solution:



Given: △ABC is an isosceles triangle.
AB = AC
BD and CE are the medians.
To Prove: BD = CE
Proof:
AD = ½ AC …..(i) [D is the midpoint of AC]
AE = ½ AB …..(ii) [E is the midpoint of AB]
Given AB = AC….(iii)
∴AE = AD…. (iv) [From (i), (ii) and (iii)]
In △ABD and △ACE
seg AB = seg AC [Given]
∠BAD = ∠CAE [Common angle]
seg AE = seg AD [From (iv)]
∴By SAS test △ABD ≅ △ACE.
∴BD = CE [c.s.c.t]
Hence proved.

3. In △ PQR, If PQ > PR and bisectors of ∠Q and ∠R intersect at S. Show that SQ > SR.

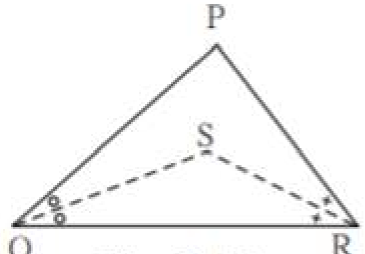


Fig. 3.58

Solution:
Given: In △PQR, PQ > PR and bisectors of ∠Q and ∠R intersect at S.
To prove: SQ > SR
Proof:
∠SQR = ½ ∠PQR ….(i) [QS is the bisector of ∠Q]
∠SRQ = ½ ∠PRQ ….(ii) [RS is the bisector of ∠R]
In △PQR,
PQ > PR [Given]
∴∠R > ∠Q [Angle opposite to larger side is larger.]
Multiply both sides by ½
∴ ½ (∠R) > ½ (∠Q)
∴∠SRQ > ∠SQR ….(iii) [From (i) and (ii)]
In △SQR, from (iii)
∴ SQ > SR [Side opposite to larger angle is larger]
Hence proved.

4. In figure 3.59, point D and E are on side BC of △ ABC, such that BD = CE and AD = AE. Show that △ ABD ≅ △ ACE.

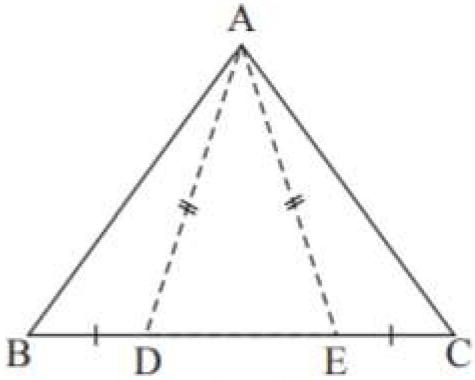


Fig. 3.59

Solution:

Given : Point D and E are on side BC of △ ABC
BD = CE
AD = AE
To Prove: ABD ≅ △ ACE
Proof:
In △ADE
Given seg AD = seg AE
∴∠ADE = ∠AED ….(i) [Isoceles triangle theorem]
∠ADB+∠ADE = 180˚….(ii) [Linear Pair]
∠AED+∠AEC = 180˚….(iii) [Linear Pair]
Equate (ii) and (iii)
∠ADB+∠ADE = ∠AED+∠AEC….(iv)
Substitute (i) in (iv)
∠ADB+∠AED = ∠AED+∠AEC
⇒∠ADB = ∠AEC ….(v)
In △ABD and △ACE,
seg BD ≅ seg CE [Given]
∠ ADB = ∠AEC [from(v)]
seg AD ≅ seg AE [Given]
∴By SAS test, ABD ≅ △ ACE.
Hence proved.

5. In figure 3.60, point S is any point on side QR of △ PQR Prove that : PQ + QR + RP > 2PS.

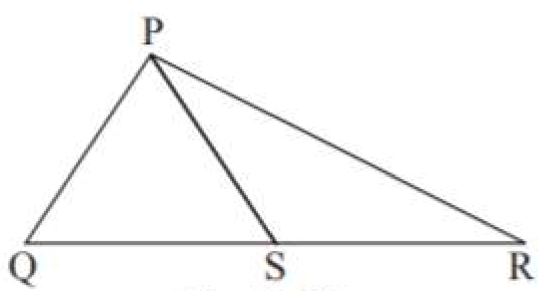


Fig. 3.60

Solution:

In $\triangle PSR$,
$RP+SR > PS$ …(i) [Sum of any two sides of a triangle is greater than the third side]
In $\triangle PQS$,
$PQ+QS > PS$ …(ii) [Sum of any two sides of a triangle is greater than the third side]
Adding (i) and (ii)
$\therefore$ $RP+SR+PQ+QS > PS+PS$
$\therefore RP+PQ+QR > 2PS$ [$QS+SR = QR$ Q-S-R]
Re-arranging the terms
$PQ+QR+RP > 2PS$
Hence proved.

6. In figure 3.61, bisector of ∠BAC intersects side BC at point D. Prove that AB > BD

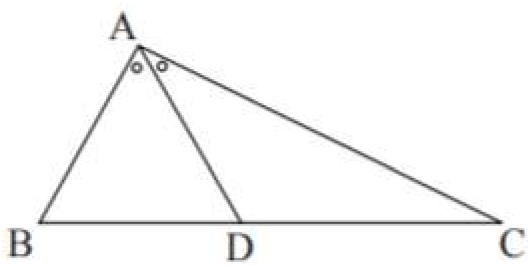


Fig. 3.61

Solution:
Given: Bisector of $\angle BAC$ intersects side BC at point D.
To prove : $AB>BD$
Proof:
$\angle DAB = \angle CAD$ …..(i) [AD bisects $\angle BAC$]
$\angle ADB$ is the exterior angle of $\triangle ADC$.
$\therefore \angle ADB > \angle CAD$ ………(ii) [Property of exterior angle of triangle]
Also $\angle ADB > \angle DAB$ ….(iii) [From (i) and (ii)]
In $\triangle ABD$,
$\angle ADB > \angle DAB$ [From (iii)]
$\therefore AB > BD$ [Side opposite to larger angle is larger]
Hence proved.

7.In figure 3.62, seg PT is the bisector of ∠QPR. A line through R intersects ray QP at point S. Prove that PS = PR

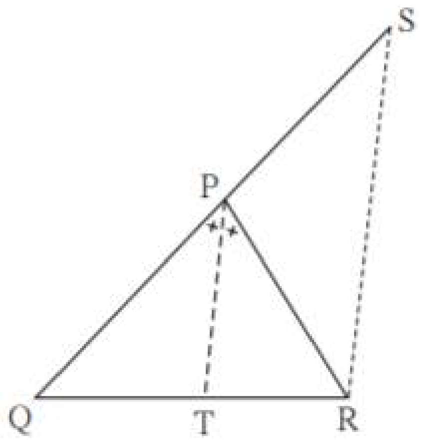


Fig. 3.62

Solution:
Given : seg PT is the bisector of ∠QPR
To Prove : PS =PR
Proof:
PT ∥ SR, PR is the transversal. [From figure]
∴∠RPT = ∠PRS ……(i) [Alternate interior angles]
PT ∥ SR, PS is the transversal. [From figure]
∴∠TPQ = ∠PSR ….(ii) [Corresponding angles]
Given seg PT is the bisector of ∠QPR.
∴∠TPQ = ∠RPT ….(iii)
From (i) and (ii)
∠PSR = ∠PRS
∴PR = PS
⇒PS = PR
Hence proved.

8. In figure 3.63, seg AD ⊥ seg BC. seg AE is the bisector of ∠CAB and C - E - D. Prove that ∠DAE = ½ (∠C -∠B).

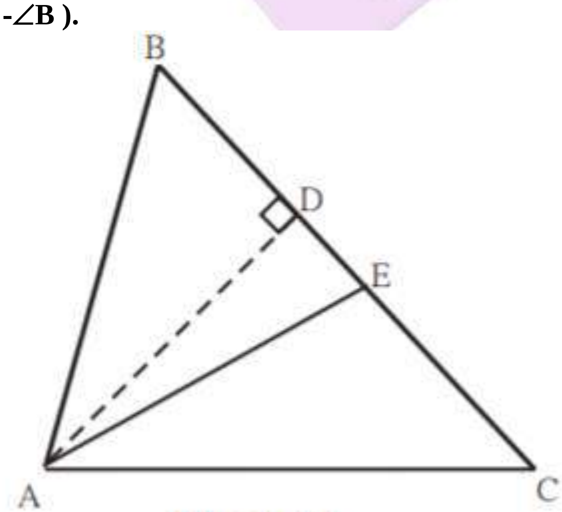


Fig. 3.63

Solution:

$\angle CAE = \frac{1}{2} \angle A$ ……(i)

In $\triangle DAE$,

$\angle DAE+\angle AED+90^\circ = 180^\circ$

$\angle DAE = 180^\circ-90^\circ-\angle AED$

$= 90^\circ-\angle AED$ ……(ii)

In $\triangle ACE$,

$\angle ACE+\angle CEA+\angle CAE = 180^\circ$

$\angle C+ \frac{1}{2} \angle A+\angle AED = 180^\circ$ [AED = AEC Since C-D-E]

$\angle AED = 180^\circ-\angle C- \frac{1}{2} \angle A$ …..(iii)

Substitute $\angle AED$ in (ii)

$\angle DAE = 90^\circ-(180^\circ-\angle C- \frac{1}{2} \angle A)$

$= -90^\circ+\angle C+ \frac{1}{2} \angle A$ …..(iv)

In $\triangle ABC$,

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

Divide both sides by 2.

$\frac{1}{2} (\angle A+\angle B+\angle C) = 90^\circ$

$\frac{1}{2} \angle A = 90^\circ- \frac{1}{2} \angle B - \frac{1}{2} \angle C$ …(v)

Substitute (v) in (iv)

$\angle DAE = -90^\circ+\angle C+ 90^\circ- \frac{1}{2} \angle B - \frac{1}{2} \angle C$

$= \frac{1}{2} \angle C - \frac{1}{2} \angle B$

$= \frac{1}{2} (\angle C-\angle B)$

Hence proved.