

RD Sharma
Solutions

Class 7

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Exercise 15.2

Q.1 Two angles of a triangle are of measures 105° and 30° . Find the measure of the third angle.

Solution: let measure of third angle be x° .

$$\therefore 105^\circ + 30^\circ + x^\circ = 180^\circ \text{ (Angle sum property of triangle)}$$

$$\Rightarrow 135^\circ + x^\circ = 180^\circ$$

$$\Rightarrow x^\circ = 180^\circ - 135^\circ$$

$$= 45^\circ$$

Q.2 one of the angles of a triangle is 130° , and the other two angles are equal. what is the measure of each of these equal angles?

Solution: let other two equal angles = x°
one angle = 130°

$$\therefore 130^\circ + x^\circ + x^\circ = 180^\circ$$

$$\Rightarrow 2x^\circ = 180^\circ - 130^\circ$$

$$\Rightarrow 2x = 50^\circ$$

$$\Rightarrow x = \frac{50^\circ}{2} = 25^\circ$$

$\therefore$ Measure of each equal angle is 25° .

Q.3 The three angles of a triangle are equal to one another. what is the measure of each of the angles?

Solution: let measure of each angle = x°

$$\therefore x + x + x = 180^\circ \quad (\text{By Angle Sum property})$$

$$\Rightarrow 3x = 180^\circ$$

$$\Rightarrow x = \frac{180}{3} = 60^\circ$$

$\therefore$ measure of each angle = 60°

Q.4 If the angles of a triangle are in the ratio 1:2:3, determine these angles.

Solution: let angles be $x^\circ, 2x^\circ, 3x^\circ$

$$\therefore x + 2x + 3x = 180^\circ$$

$$\Rightarrow 6x = 180^\circ \Rightarrow x = \frac{180}{6} = 30^\circ$$

$\therefore$ angles are $x = 30^\circ$

$$2x = 2 \times 30^\circ = 60^\circ$$

$$3x = 3 \times 30^\circ = 90^\circ$$

Q.5 The angles of a triangle are $(x-40)^\circ, (x-20)^\circ$ and $(\frac{1}{2}x-10)^\circ$. Find the value of x .

Solution: $\therefore (x-40) + (x-20) + (\frac{1}{2}x-10) = 180^\circ$

$$= \frac{5x}{2} - 70^\circ = 180^\circ$$

$$\Rightarrow \frac{5x}{2} = 180 + 70^\circ$$

$$\Rightarrow \frac{5x}{2} = 250^\circ$$

$$\Rightarrow 5x = 500^\circ$$

$$x = \frac{500}{5} = 100$$

$$\therefore x = 100$$

Q6 The angles of triangle are arranged in ascending order of magnitude. If the difference between two consecutive angles is 10° . Find the three angles.

Solution: Let angles are x° , $(x+10)^\circ$, $(x+20)^\circ$

$$\text{then } x^\circ + (x+10)^\circ + (x+20)^\circ = 180^\circ$$

$$\Rightarrow 3x^\circ + 30^\circ = 180^\circ$$

$$\Rightarrow 3x^\circ = 180^\circ - 30^\circ$$

$$\Rightarrow 3x^\circ = 150 \Rightarrow x = \frac{150}{3} = 50^\circ$$

then angles are 50° , 60° and 70°

Q7 Two angles of a triangle are equal and the third angle is greater than each of those angles by 30° . Determine all the angles of the triangle.

Solution: Let two equal angles be x°

$$\text{third angle} = x + 30^\circ$$

$$\therefore x^\circ + x^\circ + (x+30)^\circ = 180^\circ$$

$$3x + 30^\circ = 180^\circ$$

$$\Rightarrow 3x = 180^\circ - 30^\circ = 150^\circ$$

$$\Rightarrow x = \frac{150}{3} = 50^\circ$$

hence angles are 50° , 50° and $50^\circ + 30^\circ = 80^\circ$.

Q.8 If one angle of a triangle is equal to the sum of other two, show that the triangle is right triangle?

Solution: let two angles are x and y .

$$\text{Third angle} = x + y$$

$$\text{Now, } x + y + (x + y) = 180^\circ \text{ (Angle Sum property)}$$

$$\Rightarrow 2x + 2y = 180^\circ$$

$$\Rightarrow 2(x + y) = 180^\circ$$

$$\Rightarrow x + y = \frac{180}{2} = 90^\circ$$

$\therefore$ third angle is 90° .

hence, triangle is right angled triangle.

Q.9 If each angle of a triangle is less than the sum of other two. Show that the triangle is acute angled?

Solution: let Measure of angles be x, y, z .

It is given that

$$x < y + z$$

$$y < x + z$$

$$z < x + y$$

$\therefore$ triangle is acute triangle.

Q.10 In each of the following, the measure of three angles are given. State in which cases, the angles can be possibly be those of a triangle.

(i) $63^\circ, 37^\circ, 80^\circ$

(ii) $45^\circ, 61^\circ, 73^\circ$

(iii) $59^\circ, 72^\circ, 61^\circ$

(iv) $45^\circ, 45^\circ, 90^\circ$

(v) $30^\circ, 20^\circ, 125^\circ$

Solution (i) $63^\circ + 37^\circ + 80^\circ = 180^\circ$, forms a triangle.

(ii) $45^\circ + 61^\circ + 73^\circ = 179^\circ$, which is not equal to 180°
Not forms a triangle.

(iii) $59^\circ + 72^\circ + 61^\circ = 192^\circ > 180^\circ$, Not forms a triangle.

(iv) $45^\circ + 45^\circ + 90^\circ = 180^\circ$, forms a triangle.

(v) $30^\circ + 20^\circ + 125^\circ = 175^\circ \neq 180^\circ$, Not forms a triangle.

Q.11 The angles of a triangle are in the ratio 3:4:5. Find the smallest angle.

Sol: let angles are $3x$, $4x$ and $5x$

$$\therefore 3x + 4x + 5x = 180^\circ \text{ (Angle sum property)}$$

$$= 12x = 180^\circ$$

$$\Rightarrow x = \frac{180}{12} = 15$$

$$\therefore \text{Smallest angle} = 3x = 3 \times 15 = 45^\circ$$

Q.12 Two acute angles of a right triangle are equal. Find the two angles.

Solution: let two equal angles = x

$$\therefore x + x + 90^\circ = 180^\circ$$

$$\Rightarrow 2x = 180^\circ - 90^\circ$$

$$\Rightarrow x = \frac{90}{2} = 45^\circ$$

$\therefore$ equal angles measures 45° each.

Q.13 one angle of a triangle is greater than the sum of the other two. What can you say about the measure of this angle? What type of triangle is this.

Solution: If one angle of triangle is greater than the sum of other two.

Then this angle will be a greater than 90° .

Hence, this triangle will be obtuse.

Q.14 In the six cornered figure (fig. 20), AC, AD and AE are joined. Find

$$\angle FAB + \angle ABC + \angle BCD + \angle CDE + \angle DEF + \angle EFA$$

Solution:

In $\triangle ABC$

$$\angle CAB + \angle ABC + \angle BCA = 180^\circ \quad \text{--- ①}$$

In $\triangle ADC$

$$\angle DAC + \angle ACD + \angle CDA = 180^\circ \quad \text{--- ②}$$

In $\triangle AED$

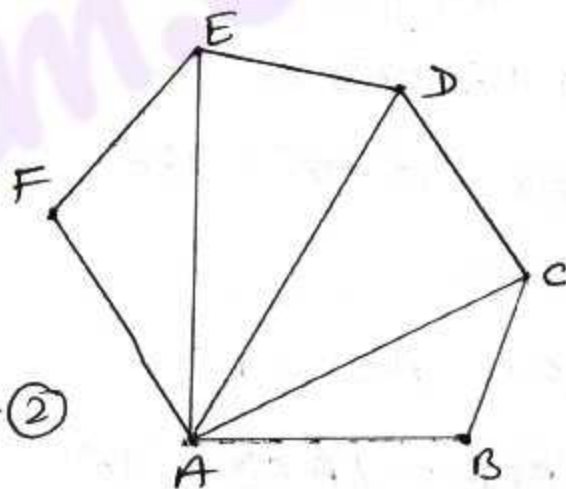
$$\angle EAD + \angle ADE + \angle DEA = 180^\circ \quad \text{--- ③}$$

In $\triangle AFE$

$$\angle AFE + \angle FEA + \angle EAF = 180^\circ \quad \text{--- ④}$$

Adding ①, ②, ③ and ④

$$\begin{aligned} &\angle CAB + \angle ABC + \angle BCA + \angle DAC + \angle ACD + \angle CDA + \angle EAD \\ &+ \angle ADE + \angle DEA + \angle AFE + \angle FEA + \angle EAF = 180 + 180 + 180 \\ &\quad + 180 \end{aligned}$$

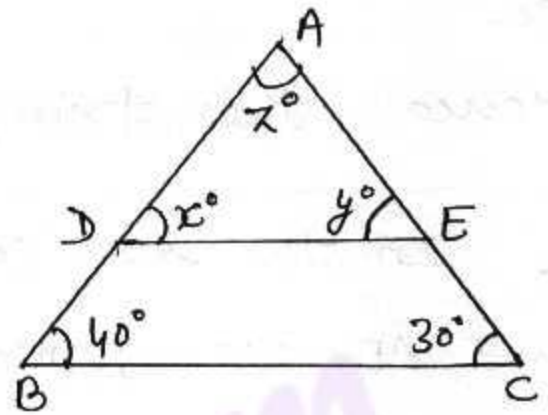


$$\therefore \angle FAB + \angle ABC + \angle BCD + \angle CDE + \angle DEF + \angle EFA = 720^\circ$$

Q.15 Find x, y, z (whichever is required) in the figures (fig. 21) given below.

(i)

here $x = 40^\circ$
 $y = 30^\circ$ { corresponding angles }



In $\triangle ADE$

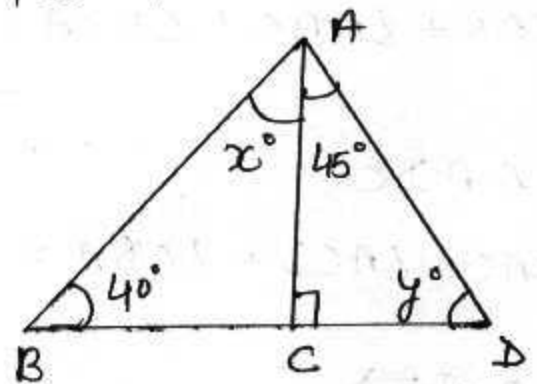
$$x + y + z = 180^\circ \text{ (Angle sum property)}$$

$$\Rightarrow 40^\circ + 30^\circ + z = 180^\circ$$

$$\Rightarrow 70^\circ + z = 180^\circ \Rightarrow z = 180^\circ - 70^\circ = 110^\circ$$

(ii) here $AC \perp BD$

$$\Rightarrow \angle ACB = \angle ACD = 90^\circ$$



In $\triangle ABC$

$$x^\circ + 40^\circ + \angle ACB = 180^\circ \text{ (By Angle sum property)}$$

$$\Rightarrow x + 40^\circ + 90^\circ = 180^\circ$$

$$\Rightarrow x = 180 - 130 = 50^\circ$$

$$\text{also, In } \triangle ACD, 45^\circ + y + \angle ACD = 180^\circ$$

$$\Rightarrow 45^\circ + y + 90^\circ = 180^\circ$$

$$y = 180 - 135 = 45^\circ$$

(iii)

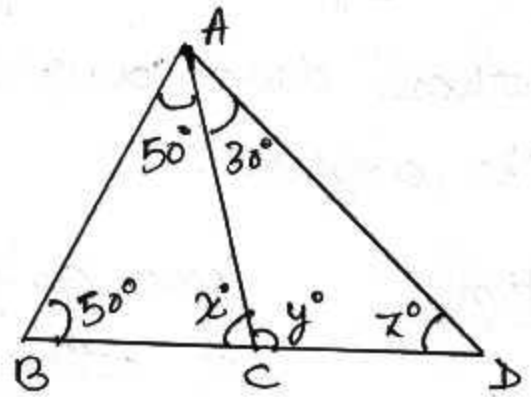
In $\triangle ABC$

$$50^\circ + 50^\circ + x = 180^\circ$$

$$\Rightarrow 100 + x = 180^\circ$$

$$\Rightarrow x = 180^\circ - 100^\circ$$

$$\Rightarrow x = 80^\circ$$



$$\therefore x + y = 180^\circ \text{ (linear pair)}$$

$$\Rightarrow 80^\circ + y = 180^\circ$$

$$\Rightarrow y = 180^\circ - 80^\circ = 100^\circ$$

Now, In $\triangle ACD$, $y + z + 30^\circ = 180^\circ$

$$\Rightarrow 100^\circ + z + 30^\circ = 180^\circ$$

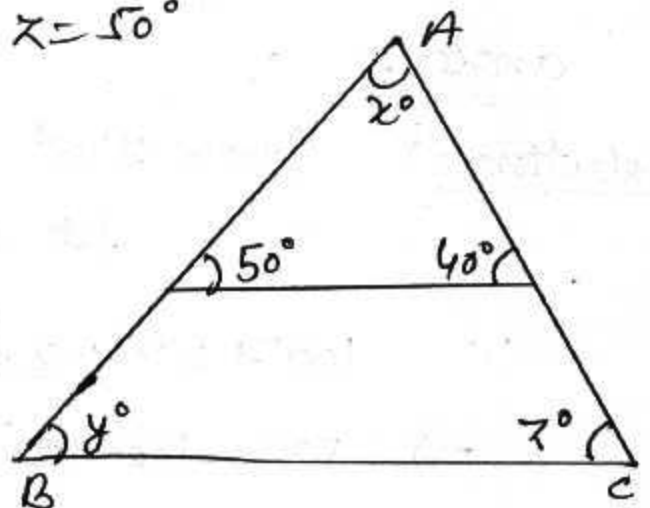
$$\Rightarrow z = 180 - 130^\circ$$

$$= 50^\circ$$

$$\therefore x = 80^\circ, y = 100^\circ, z = 50^\circ$$

(iv)

here $y^\circ = 50^\circ$
 $z^\circ = 40^\circ$ { corresponding angles }

In $\triangle ABC$

$$x + y + z = 180$$

$$\Rightarrow x + 50 + 40 = 180 \Rightarrow x + 90 = 180$$

$$\Rightarrow x = 180^\circ - 90^\circ = 90^\circ$$

Q.16 If one angle of triangle is 60° and the other two angles are in the ratio 1:2. Find the angles.

Solution: one angle = 60°
 let other two angles are x and $2x$
 $\therefore x + 2x + 60 = 180$ (Angle sum property)
 $\Rightarrow 3x = 180 - 60$
 $\Rightarrow 3x = 120$
 $\Rightarrow x = \frac{120}{3} = 40^\circ$

then other two angles are $x = 40^\circ$
 $2x = 2 \times 40^\circ = 80^\circ$

Q.17 If one angle of a triangle is 100° and the other two angles are in the ratio 2:3. Find the angles.

Solution: Given that one angle = 100°
 let other angles are $2x$ and $3x$
 $\therefore 100 + 2x + 3x = 180$ (Angle sum property)
 $\Rightarrow 5x = 180 - 100$
 $\Rightarrow 5x = 80^\circ \Rightarrow x = \frac{80}{5} = 16^\circ$

here angles are $2x = 2 \times 16 = 32^\circ$
 $3x = 3 \times 16 = 48^\circ$

Q.18 In a $\triangle ABC$, if $3\angle A = 4\angle B = 6\angle C$. Calculate the angles.

Solution: Here $3\angle A = 6\angle C$
 $\therefore \angle A = 2\angle C$

Let $\angle C = x$, then $\angle A = 2x$

also $3\angle A = 4\angle B$

$$\Rightarrow \angle B = \frac{3}{4} \angle A = \frac{3}{4} \times 2x = \frac{3}{2}x$$

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

$$\Rightarrow 2x + \frac{3}{2}x + x = 180^\circ$$

$$\Rightarrow \frac{4x + 3x + 2x}{2} = 180^\circ$$

$$\Rightarrow 9x = 180 \times 2 \Rightarrow 9x = 360^\circ$$

$$\Rightarrow x = 40^\circ$$

$$\therefore \angle A = 2x = 2 \times 40 = 80^\circ$$

$$\angle B = \frac{3}{2}x = \frac{3}{2} \times 40 = 60^\circ$$

$$\angle C = x = 40^\circ$$

Q.19 Is it possible to have a triangle, in which

(i) two of the angles are right?

(ii) Two of the angles are obtuse?

(iii) two of the angles are acute?

- (iv) each angle is less than 60°
- (v) each angle is greater than 60°
- (vi) each angle is equal to 60° .

Give reasons in support of your answers in each case.

Solution (i) No, If sum of two angles become 180° , then the third angle must be zero, which is not possible.

(ii) No, If two angles are obtuse then sum of two angles become more than 180° .

(iii) Yes, In right triangle and acute triangles, it is possible.

(iv) No, because if each angle is less than 60° , then sum of all angles will be less than 180° .

(v) No, in this case sum of all angles become greater than 180° .

(vi) Yes, in equilateral triangle it is possible.

Q-20 In $\triangle ABC$, $\angle A = 100^\circ$, AD bisects $\angle A$ and $AD \perp BC$. Find $\angle B$.

Solution:

$\therefore$ AD bisects $\angle A$

$$\begin{aligned}\therefore \angle BAD &= \angle CAD = \frac{\angle A}{2} \\ &= \frac{100}{2} = 50^\circ\end{aligned}$$

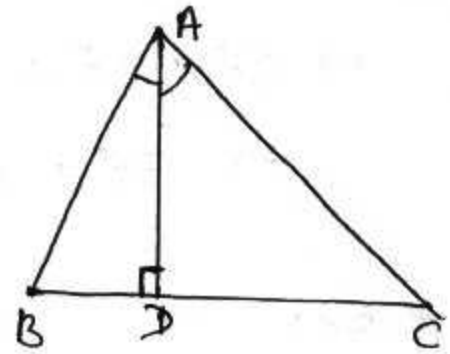
also as $AD \perp BC \Rightarrow \angle ADB = 90^\circ$

Now In $\triangle ABC$, $\angle B + \angle BAD + \angle ADB = 180^\circ$

$$\Rightarrow \angle B + 50^\circ + 90^\circ = 180^\circ \text{ (Angle sum prop.)}$$

$$\Rightarrow \angle B + 140^\circ = 180^\circ$$

$$\Rightarrow \angle B = 180^\circ - 140^\circ = 40^\circ$$



Q-21 In $\triangle ABC$, $\angle A = 50^\circ$, $\angle B = 70^\circ$ and bisector of $\angle C$ meets AB in D. Find the angles of the triangles ADC and BDC.

Solution: In $\triangle ABC$

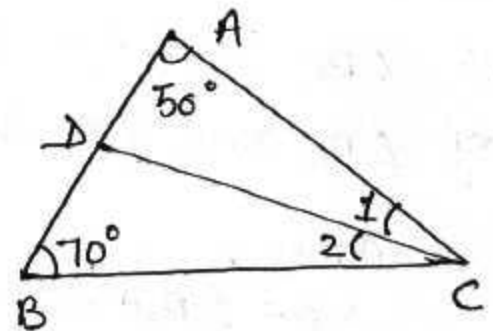
$$\angle A + \angle B + \angle C = 180^\circ$$

$$\Rightarrow 50^\circ + 70^\circ + \angle C = 180^\circ$$

$$\Rightarrow 120^\circ + \angle C = 180^\circ \Rightarrow \angle C = 180 - 120 = 60^\circ$$

$\therefore$ CD is bisector of $\angle C$

$$\therefore \angle 1 = \angle 2 = \frac{60^\circ}{2} = 30^\circ$$



In $\triangle ADC$

$$\angle A + \angle 1 + \angle ADC = 180^\circ \text{ (Angle sum property)}$$

$$\Rightarrow 50^\circ + 30^\circ + \angle ADC = 180^\circ$$

$$\Rightarrow 80^\circ + \angle ADC = 180^\circ \Rightarrow \angle ADC = 180 - 80^\circ = 100^\circ$$

In $\triangle BCD$

$$\angle B + \angle 2 + \angle BDC = 180^\circ \text{ (Angle sum property)}$$

$$\Rightarrow 70^\circ + 30^\circ + \angle BDC = 180^\circ$$

$$\Rightarrow 100^\circ + \angle BDC = 180^\circ$$

$$\Rightarrow \angle BDC = 180 - 100 = 80^\circ$$

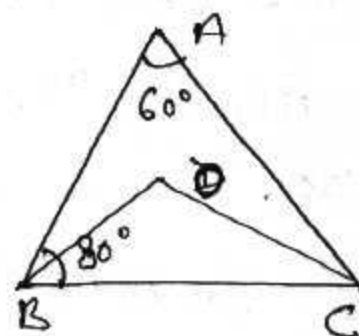
Thus In $\triangle ADC$, $\angle A = 50^\circ$, $\angle D = 100^\circ$, $\angle C = 30^\circ$

In $\triangle BDC$, $\angle B = 70^\circ$, $\angle D = 80^\circ$, $\angle C = 30^\circ$

Q22 In $\triangle ABC$, $\angle A = 60^\circ$, $\angle B = 80^\circ$ and the bisectors of $\angle B$ and $\angle C$ meet at O . Find (i) $\angle C$ (ii) $\angle BOC$

Solution:

Let OB and OC are bisectors of $\angle B$ and $\angle C$ respectively.



In $\triangle ABC$,
 $\angle A + \angle B + \angle C = 180^\circ$

$$\Rightarrow 60^\circ + 80^\circ + \angle C = 180^\circ$$

$$\Rightarrow 140^\circ + \angle C = 180^\circ \Rightarrow \angle C = 180 - 140^\circ = 40^\circ$$

Now $\therefore \angle OCB = \frac{1}{2} \angle C$ ($\because OC$ is a bisector) (23)
 $\Rightarrow \angle OCB = \frac{1}{2} \times 40^\circ = 20^\circ$

also $\angle OBC = \frac{1}{2} \angle B$ ($\because OB$ is a bisector of $\angle B$)
 $= \frac{1}{2} \times 80^\circ = 40^\circ$

Now In $\triangle BOC$

$\angle OCB + \angle OBC + \angle BOC = 180^\circ$ (Angle sum property)

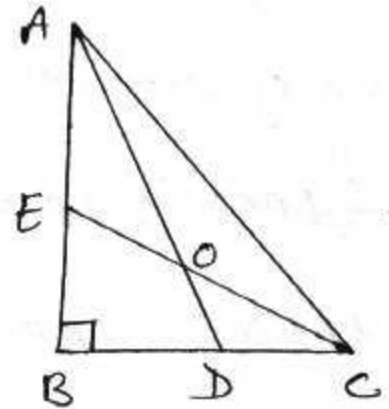
$\Rightarrow 20^\circ + 40^\circ + \angle BOC = 180^\circ$

$\Rightarrow 60^\circ + \angle BOC = 180^\circ \Rightarrow \angle BOC = 180 - 60^\circ$
 $= 120^\circ$

23 The bisector of the acute angles of a right triangle meet at O . Find the angle at O between the two bisectors.

Solution: Let ABC is a right triangle right angled at O .

AD and CE are bisectors of $\angle A$ and $\angle C$ meeting at O .



In $\triangle ABC$, $\angle A + \angle B + \angle C = 180^\circ$
 $\Rightarrow \angle A + 90^\circ + \angle C = 180^\circ$

$\Rightarrow \angle A + \angle C = 90^\circ$
 $\begin{cases} \angle A = 2\angle OAC \\ \angle C = 2\angle OCA \end{cases}$

$\Rightarrow 2\angle OAC + 2\angle OCA = 90^\circ$

$\Rightarrow 2(\angle OAC + \angle OCA) = 90^\circ$

$\Rightarrow \angle OAC + \angle OCA = 45^\circ$ — (1)

Now In $\triangle AOC$

(24)

$$\angle OAC + \angle OCA + \angle AOC = 180^\circ \text{ (By angle sum property)}$$

$$\Rightarrow 45^\circ + \angle AOC = 180^\circ \text{ (By using ①)}$$

$$\Rightarrow \angle AOC = 180^\circ - 45^\circ \\ = 135^\circ$$

Q.24 In $\triangle ABC$, $\angle A = 50^\circ$ and BC is produced to a point D . The bisectors of $\angle ABC$ and $\angle ACD$ meet at E . Find $\angle E$.

Solution: $\angle A = 50^\circ$

As, we know that

$$\angle ACD = \angle A + \angle B$$

(By exterior angle is equal to the sum of interior opposite angles)

$$\Rightarrow \frac{1}{2} \angle ACD = \frac{1}{2} \angle A + \frac{1}{2} \angle B$$

$$\Rightarrow \angle ECD = \frac{1}{2} \angle A + \frac{1}{2} \angle B \quad \left\{ \because \angle ECD = \frac{1}{2} \angle ACD \right\} \text{--- ①}$$

Again In $\triangle BEC$

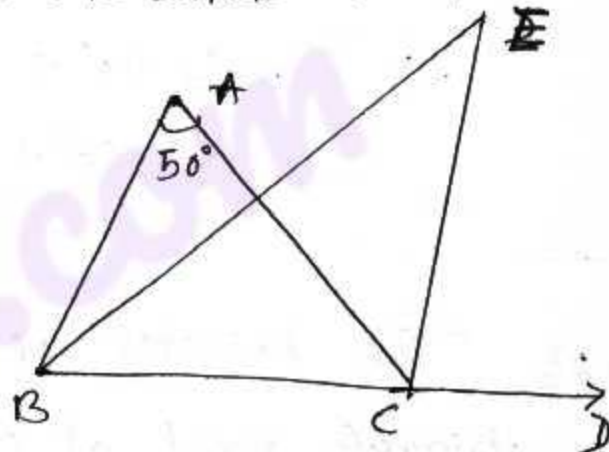
$$\angle ECD = \angle EBC + \angle E$$

$$\Rightarrow \angle ECD = \frac{1}{2} \angle B + \angle E \text{--- ②}$$

By using ① and ②

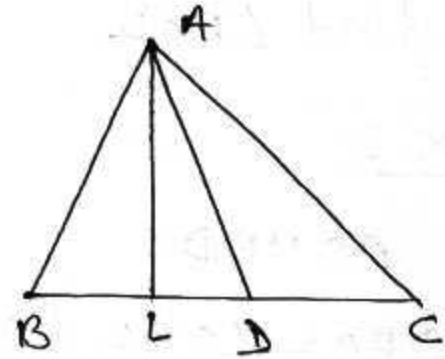
$$\frac{1}{2} \angle A + \frac{1}{2} \angle B = \frac{1}{2} \angle B + \angle E$$

$$\Rightarrow \angle E = \frac{1}{2} \angle A = \frac{1}{2} \times 50^\circ = 25^\circ$$



Q.25 In $\triangle ABC$, $\angle B = 60^\circ$, $\angle C = 40^\circ$, $AL \perp BC$ and AD bisects $\angle A$ such that L and D lie on side BC . find $\angle LAD$.

Solution!



In $\triangle ABC$,
 $\angle A + \angle B + \angle C = 180^\circ$ (Angle sum property)
 $\Rightarrow \angle A + 60 + 40 = 180$
 $\Rightarrow \angle A = 80^\circ$

$\therefore AD$ bisects $\angle A$.

$$\begin{aligned}\angle DAC &= \angle A / 2 \\ &= \frac{80}{2} = 40^\circ\end{aligned}$$

Again in $\triangle ADC$

$$\begin{aligned}\angle ADC + \angle DCA + \angle DAC &= 180^\circ \\ \Rightarrow \angle ADC + 40^\circ + 40^\circ &= 180^\circ \\ \Rightarrow \angle ADC &= 180 - 80 = 100^\circ\end{aligned}$$

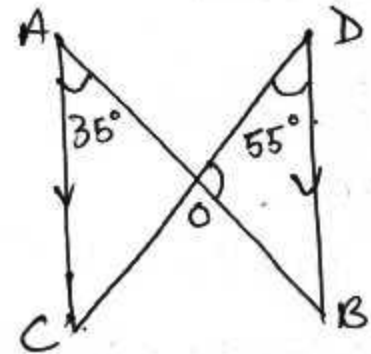
Now By Applying exterior angle property, we have.

In $\triangle ALD$,

$$\begin{aligned}\angle ADC &= \angle ALD + \angle LAD \\ \Rightarrow 100^\circ &= 90^\circ + \angle LAD\end{aligned}$$

$$\Rightarrow \angle LAD = 100 - 90 = 10^\circ$$

Q.26 Line segments AB and CD intersect at O such that $AC \parallel BD$. If $\angle CAB = 35^\circ$ and $\angle CDB = 55^\circ$ find $\angle BOD$.



Solution:

$$\therefore AC \parallel BD$$

$$\angle DBO = \angle CAO \text{ (alternate int. } \angle\text{s)}$$

$$\Rightarrow \angle DBO = 35^\circ$$

Now In $\triangle BOD$

$$\angle DOB + \angle OBD + \angle ODB = 180^\circ$$

$$\Rightarrow \angle DOB + 35^\circ + 55^\circ = 180^\circ$$

$$\Rightarrow \angle DOB + 90^\circ = 180^\circ$$

$$\Rightarrow \angle BOD = 90^\circ$$

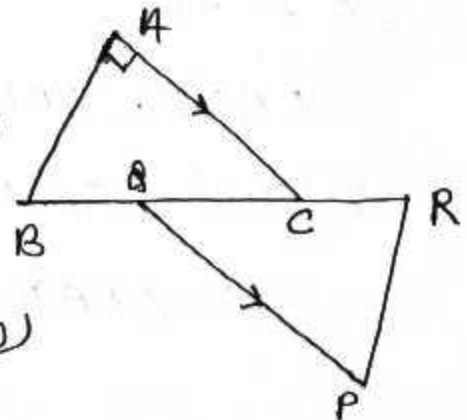
Q.27 In fig. 22, $\triangle ABC$ is right angled at A. Q and R are points on line BC and P is a point such that $QP \parallel AC$ and $RP \parallel AB$. Find $\angle P$.

Solution: $\therefore AC \parallel QP$

$$\Rightarrow \angle QCA = \angle QCP \text{ (alternate angles)}$$

also $PR \parallel AB$

$$\angle ABC = \angle PRB \text{ (alternate angles)}$$



Now In $\triangle ABC$

$$\angle ABC + \angle ACB + \angle CAB = 180^\circ$$

$$\Rightarrow \angle ABC + \angle ACB + 90^\circ = 180^\circ$$

$$\Rightarrow \angle ABC + \angle ACB = 180^\circ - 90^\circ = 90^\circ \quad \text{--- (1)}$$

Again, In ΔPQR

$$\angle PQR + \angle PRQ + \angle QPR = 180^\circ$$

$$\Rightarrow \angle ABC + \angle ACB + \angle QPR = 180^\circ \quad (\because \angle ACB = \angle PQR) \\ \angle ABC = \angle PRQ)$$

or

$$90^\circ + \angle QPR = 180^\circ \quad (\text{using (1)})$$

$$\Rightarrow \angle QPR = 180^\circ - 90^\circ \\ = 90^\circ$$

$$\therefore \angle QPR = \underline{90^\circ}$$

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