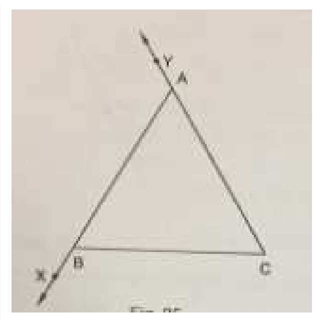
RD SHARMA
Solutions
Class 7 Maths
Chapter 15
Ex 15.3

1. $\angle CBX$ is an exterior angle of $\triangle ABC$ at B. Name

(i) the interior adjacent angle

(ii) the interior opposite angles to exterior $\angle CBX$

Also, name the interior opposite angles to an exterior angle at A.

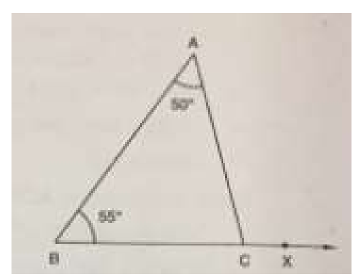


(i) $\angle ABC$

(ii) $\angle BAC and \angle ACB$

Also the interior angles opposite to exterior are $\angle ABC$ and $\angle ACB$

2. In the fig, two of the angles are indicated. What are the measures of $\angle ACX$ and $\angle ACB$?



In $\triangle ABC$, $\angle A = 50°$ and $\angle B = 55°$

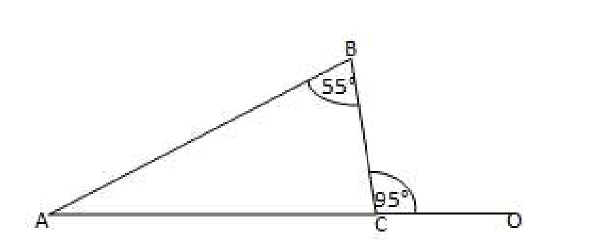
Because of the angle sum property of the triangle, we can say that

$\angle A + \angle B + \angle C = 180°$
$50° + 55° + \angle C = 180°$

Or

$\angle C = 75°$ $\angle ACB = 75°$ $\angle ACX = 180° - \angle ACB = 180° - 75° = 105°$

3. In a triangle, an exterior angle at a vertex is $95°$ and its one of the interior opposite angles is $55°$. Find all the angles of the triangle.



We know that the sum of interior opposite angles is equal to the exterior angle.

Hence, for the given triangle, we can say that :

$\angle ABC + \angle BAC = \angle BCO$

$55° + \angle BAC = 95°$

Or,

$\angle BAC = 95° - 95°$

$= \angle BAC = 40°$

We also know that the sum of all angles of a triangle is $180°$.

Hence, for the given $\triangle ABC$, we can say that :

$\angle ABC + \angle BAC + \angle BCA = 180°$

$55° + 40° + \angle BCA = 180°$

Or,

$\angle BCA = 180° - 95°$

$= \angle BCA = 85°$

4. One of the exterior angles of a triangle is $80°$, and the interior opposite angles are equal to each other. What is the measure of each of these two angles?

Let us assume that A and B are the two interior opposite angles.

We know that $\angle A$ is equal to $\angle B$.

We also know that the sum of interior opposite angles is equal to the exterior angle.

Hence, we can say that :

$\angle A + \angle B = 80°$

Or,

$\angle A + \angle A = 80°$ ($\angle A = \angle B$)

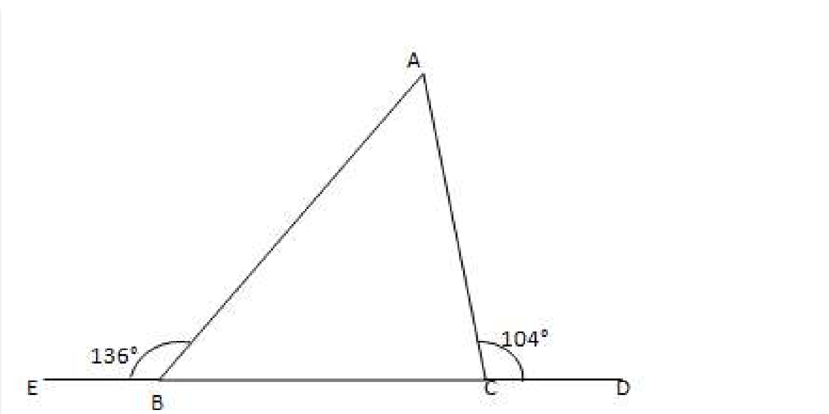
$2\angle A = 80°$

$\angle A = \frac{40°}{2} = 40°$

$\angle A = \angle B = 40°$

Thus, each of the required angles is of $40°$.

5. The exterior angles, obtained on producing the base of a triangle both ways are $104°$ and $136°$. Find all the angles of the triangle.



In the given figure, $\angle ABE$ and $\angle ABC$ form a linear pair.

$\angle ABE + \angle ABC = 180°$

$\angle ABC = 180° - 136°$

$\angle ABC = 44°$

We can also see that $\angle ACD$ and $\angle ACB$ form a linear pair.

$\angle ACD + \angle ACB = 180°$

$\angle AUB = 180° - 104°$

$\angle ACB = 76°$

We know that the sum of interior opposite angles is equal to the exterior angle.

Therefore, we can say that :

$\angle BAC + \angle ABC = 104°$

$\angle BAC = 104° - 44° = 60°$

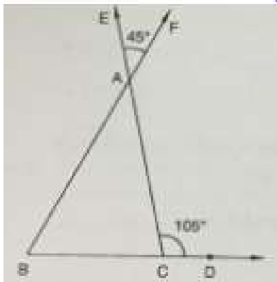
Thus,

$\angle ACE = 76°$

and

$\angle BAC = 60°$

6. In Fig, the sides BC, CA and BA of a $\triangle ABC$ have been produced to D, E and F respectively. If $\angle ACD = 105°$ and $\angle EAF = 45°$; find all the angles of the $\triangle ABC$



In a $\triangle ABC$, $\angle BAC$ and $\angle EAF$ are vertically opposite angles.

Hence, we can say that :

$\angle BAC = \angle EAF = 45°$

Considering the exterior angle property, we can say that :

$\angle BAC + \angle ABC = \angle ACD = 105°$

$\angle ABC = 105° - 45° = 60°$

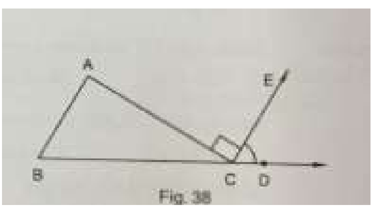
Because of the angle sum property of the triangle, we can say that :

$\angle ABC + \angle ACS + \angle BAC = 180°$

$\angle ACB = 75°$

Therefore, the angles are $45°$, $65°$ and $75°$.

7. In Fig, AC perpendicular to CE and C $\angle A : \angle B : \angle C$=3:2:1. Find the value of $\angle ECD$.



In the given triangle, the angles are in the ratio 3 : 2 : 1.

Let the angles of the triangle be 3x, 2x and x.

Because of the angle sum property of the triangle, we can say that :

$3x+2x+x = 180°$

$6x = 180°$

Or,

$x = 30°$ … (i)

Also, $\angle ACB + \angle ACE + \angle ECD = 180°$

$x + 90° + \angle ECD = 180°$ ($\angle ACE = 90°$)

$\angle ECD = 60°$ [From (i)]

8 A student when asked to measure two exterior angles of $\triangle ABC$ observed that the exterior angles at A and B are of $103°$ and $74°$ respectively. Is this possible? Why or why not?

Here,

Internal angle at A+ External angle at A = $180°$

Internal angle at A + $103° = 180°$

Internal angle at A = $77°$

Internal angle at B + External angle at B = $180°$

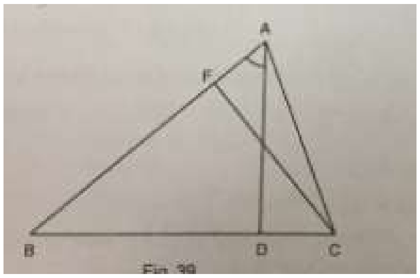
Internal angle at B + $74° = 180°$

Internal angle at B = $106°$

Sum of internal angles at A and B = $77° + 106° = 183°$

It means that the sum of internal angles at A and B is greater than $180°$, which cannot be possible.

9. In Fig, AD and CF are respectively perpendiculars to sides BC and AB of $\triangle ABC$. If $\angle FCD = 50°$, find $\angle BAD$



We know that the sum of all angles of a triangle is $180°$

Therefore, for the given ΔFCB, we can say that :

$\angle FCB + \angle CBF + \angle BFC = 180°$

$50° + \angle CBF + 90° = 180°$

Or,

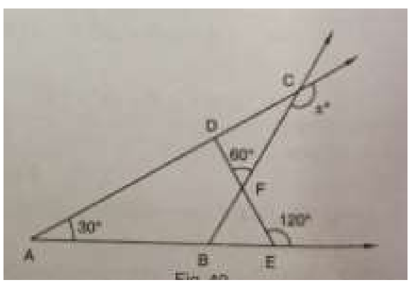
$\angle CBF = 180° - 50° - 90° = 40°$ ... (i)

Using the above rule for ΔABD, we can say that :

$\angle ABD + \angle BDA + \angle BAD = 180°$

$\angle BAD = 180° - 90° - 40° = 50°$ [from (i)]

10. In Fig, measures of some angles are indicated. Find the value of x.



Here,

$\angle AED + 120° = 180°$ (Linear pair)

$\angle AED = 180° - 120° = 60°$

We know that the sum of all angles of a triangle is $180°$.

Therefore, for ΔADE, we can say that :

$\angle ADE + \angle AED + \angle DAE = 180°$

$60° + \angle ADE + 30° = 180°$

Or,

$\angle ADE = 180° - 60° - 30° = 90°$

From the given figure, we can also say that :

$\angle FDC + 90° = 180°$ (Linear pair)

$\angle FDC = 180° - 90° = 90°$

Using the above rule for ΔCDF, we can say that :

$\angle CDF + \angle DCF + \angle DFC = 180°$

$90° + \angle DCF + 60° = 180°$

$\angle DCF = 180° - 60° - 90° = 30°$

Also,

$\angle DCF + x = 180°$ (Linear pair)

$30° + x = 180°$

Or,

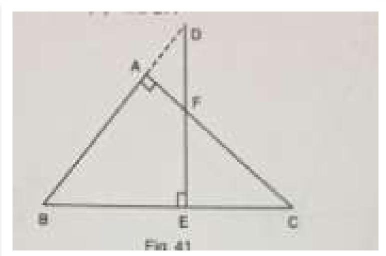
$x = 180° - 30° = 150°$

11. In Fig, ABC is a right triangle right angled at A. D lies on BA produced and DE perpendicular to BC intersecting AC at F. If $\angle AFE = 130°$, ***find***

(i) $\angle BDE$

(ii) $\angle BCA$

(iii) $\angle ABC$



(i)

Here,

$\angle BAF + \angle FAD = 180°$ (Linear pair)

$\angle FAD = 180° - \angle BAF = 180° – 90° = 90°$

Also,

$\angle AFE = \angle ADF + \angle FAD$ (Exterior angle property)

$\angle ADF + 90° = 130°$

$\angle ADF = 130° - 90° = 40°$

(ii) We know that the sum of all the angles of a triangle is $180°$.

Therefore, for $\triangle BDE$, we can say that :

$\angle BDE + \angle BED + \angle DBE = 180°$.

$\angle DBE = 180° – \angle BDE \angle BED = 180° - 90° - 40° = 50°$——(i)

Also,

$\angle FAD = \angle ABC + \angle ACB$ (Exterior angle property)

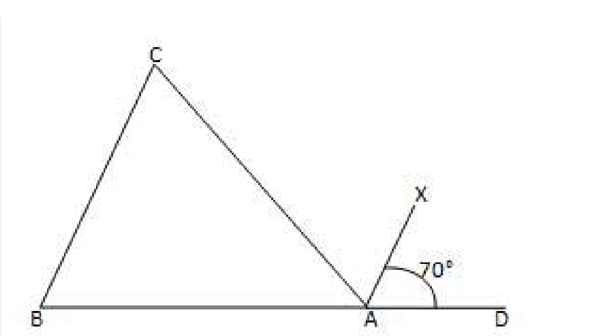
$90° = 50° + \angle ACB$

Or,

$\angle ACB = 90° – 50° = 40°$

(iii) $\angle ABC = \angle DBE = 50°$ [From (i)]

12. ABC is a triangle in which $\angle B = \angle C$ ***and ray AX bisects the exterior angle DAC. If*** $\angle DAX = 70°$. ***Find*** $\angle ACB$.



Here,

$\angle CAX = \angle DAX$ (AX bisects $\angle CAD$)

$\angle CAX = 70°$

$\angle CAX + \angle DAX + \angle CAB = 180°$

$70° + 70° + \angle CAB = 180°$

$\angle CAB = 180° – 140°$

$\angle CAB = 40°$

$\angle ACB + \angle CBA + \angle CAB = 180°$ (Sum of the angles of $\triangle ABC$)

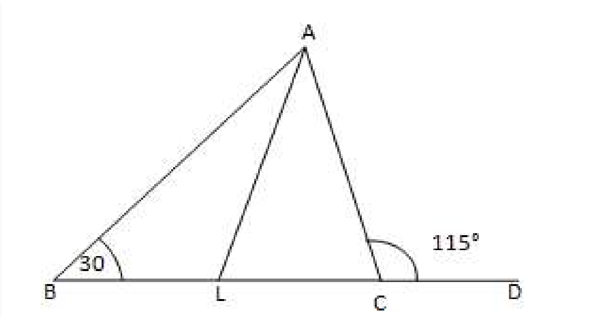
$\angle ACB + \angle ACB + 40° = 180°$ ($\angle C = \angle B$)

$2\angle ACB = 180° - 40°$

$\angle ACB = \frac{140°}{2}$

$\angle ACB = 70°$

13. The side BC of $\triangle ABC$ is produced to a point D. The bisector of $\angle A$ meets side BC in L. If $\angle ABC = 30°$ and $\angle ACD = 115°$, find $\angle ALC$



$\angle ACD$ and $\angle ACL$ make a linear pair.

$\angle ACD + \angle ACB = 180°$

$115° + \angle ACB = 180°$

$\angle ACB = 180° - 115°$

$\angle ACB = 65°$

We know that the sum of all angles of a triangle is $180°$.

Therefore, for $\triangle ABC$, we can say that :

$\angle ABC + \angle BAC + \angle ACB = 180°$

$30° + \angle BAC + 65° = 180°$

Or,

$\angle BAC = 85°$

$\angle LAC = \frac{\angle BAC}{2} = \frac{85°}{2}$

Using the above rule for $\triangle ALC$, we can say that :

$\angle ALC + \angle LAC + \angle ACL = 180°$

$\angle ALC + \frac{82°}{2} + 65° = 180°$ ($\angle ACL = \angle ACB$)

Or,

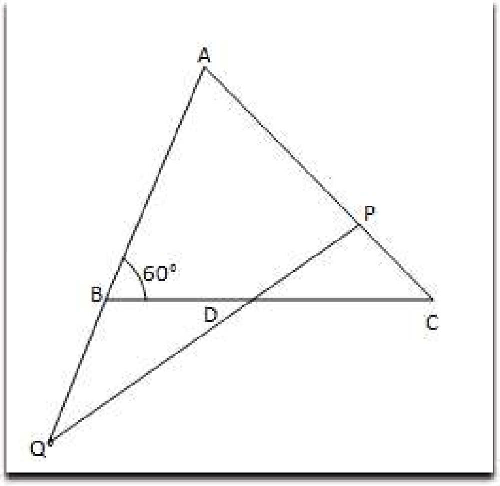
$\angle ALC = 180° - \frac{85°}{2} - 65°$

$\angle ALC = \frac{145°}{2} = 72\frac{1}{2}°$

14. D is a point on the side BC of $\triangle ABC$. A line PDQ through D, meets side AC in P and AB produced at Q. If $\angle A = 80°$, $\angle ABC = 60°$ and $\angle PDC = 15°$, find

(i) $\angle AQD$

(ii) $\angle APD$



∠ABD and ∠QBD form a linear pair.

$\angle ABC + \angle QBC = 180°$

$60° + \angle QBC = 180°$

$\angle QBC = 120°$

$\angle PDC = \angle BDQ$ (Vertically opposite angles)

$\angle BDQ = 75°$

In $\triangle QBD$:

$\angle QBD + \angle QDB + \angle BDQ = 180°$ (Sum of angles of $\triangle QBD$)

$120° + 15° + \angle BQD = 180°$

$\angle BQD = 180° - 135°$

$\angle BQD = 45°$
$\angle AQD = \angle BQD = 45°$

In $\triangle AQP$:

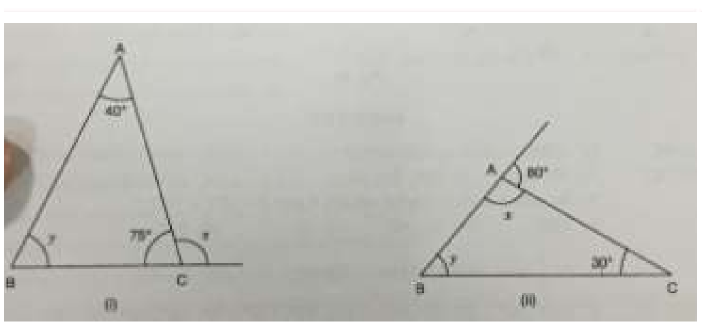
$\angle QAP + \angle AQP + \angle APQ = 180°$ (Sum of angles of $\triangle AQP$)

$80° + 45° + \angle APQ = 180°$

$\angle APQ = 55°$

$\angle APD = \angle APQ$

15. Explain the concept of interior and exterior angles and in each of the figures given below. Find x and y



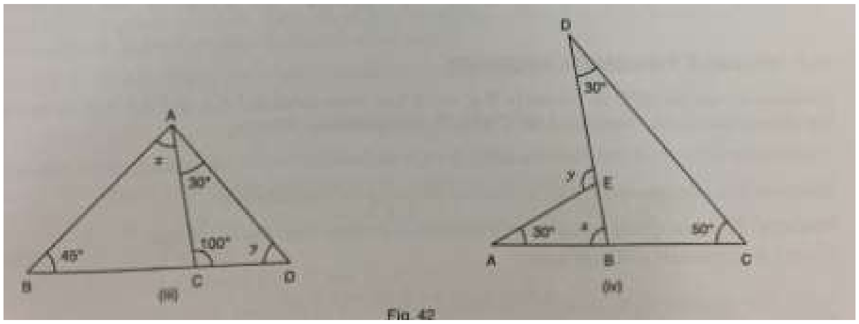


Fig 42

The interior angles of a triangle are the three angle elements inside the triangle.

The exterior angles are formed by extending the sides of a triangle, and if the side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles.

Using these definitions, we will obtain the values of x and y.

(I) From the given figure, we can see that:

$\angle ACB + x = 180°$ (Linear pair)

$75° + x = 180°$

Or,

$x = 105°$

We know that the sum of all angles of a triangle is $180°$.

Therefore, for $\triangle ABC$, we can say that :

$\angle BAC + \angle ABC + \angle ACB = 180°$

$40° + y + 75° = 180°$

Or,

$y = 65°$

(ii)

$x + 80° = 180°$ (Linear pair)

$= x = 100°$

In $\triangle ABC$:

$x + y + 30° = 180°$ (Angle sum property)

$100° + 30° + y = 180°$

$= y = 50°$

(iii)

We know that the sum of all angles of a triangle is $180°$.

Therefore, for $\triangle ACD$, we can say that :

$30° + 100° + y = 180°$

Or,

$y = 50°$

$\angle ACB + 100° = 180°$

$\angle ACB = 80°$ … (i)

Using the above rule for $\triangle ACD$, we can say that :

$x + 45° + 80° = 180°$

$= x = 55°$

(iv)

We know that the sum of all angles of a triangle is $180°$.

Therefore, for $\triangle DBC$, we can say that :

$30° + 50° + \angle DBC = 180°$

$\angle DBC = 100°$