RD Sharma Solutions for Class 9 Chapter 9 Triangle and its Angles

Question 1: In a ΔABC, if $\angle A = 55^0$, $\angle B = 40^0$, find $\angle C$.

Solution:

Given: $\angle A = 55^0$, $\angle B = 40^0$

We know, sum of all angles of a triangle is 180^0

$\angle A + \angle B + \angle C = 180^0$

$55^0 + 40^0 + \angle C = 180^0$

$95^0 + \angle C = 180^0$

$\angle C = 180^0 - 95^0$

$\angle C = 85^0$

Question 2: If the angles of a triangle are in the ratio 1:2:3, determine three angles.

Solution:

Angles of a triangle are in the ratio 1:2:3 (Given)

Let the angles be x, 2x, 3x

Sum of all angles of triangles = 180^0

$x + 2x + 3x = 180^0$

$6x = 180^0$

$x = 180^0/6$

$x = 30^0$

Answer:

$x = 30^0$

$2x = 2(30)^0 = 60^0$

$3x = 3(30)^0 = 90^0$

Question 3: The angles of a triangle are $(x - 40)^0$, $(x - 20)^0$ and $(1/2\ x - 10)^0$. Find the value of x.

Solution:

The angles of a triangle are $(x - 40)^0$, $(x - 20)^0$ and $(1/2\ x - 10)^0$

Sum of all angles of triangle = 180^0

$(x - 40)^0 + (x - 20)^0 + (1/2\ x - 10)^0 = 180^0$

$5/2\ x - 70^0 = 1800$

$5/2\ x = 180^0 + 70^0$

$5x = 2(250)^0$

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$x = 500^0/5$

$x = 100^0$

Question 4: The angles of a triangle are arranged in ascending order of magnitude. If the difference between two consecutive angles is 10^0, find the three angles.

Solution:

The difference between two consecutive angles is 10^0 (given)

Let x, $x + 10^0$, $x + 20^0$ be the consecutive angles

$x + x + 10^0 + x + 20^0 = 180^0$

$3x + 30^0 = 180^0$

$3x = 180^0 – 30^0$

$3x = 150^0$

or $x = 50^0$

Again,

$x + 10^0 = 50^0 + 10^0 = 60^0$

$x+20^0 = 50^0 + 20^0 = 70^0$

Answer: Three angles are 50^0,60^0 and 70^0.

Question 5: Two angles of a triangle are equal and the third angle is greater than each of those angles by 30^0. Determine all the angles of the triangle.

Solution:

Two angles of a triangle are equal and the third angle is greater than each of those angles by 30^0. (Given)

Let x, x, $x + 30^0$ be the angles of a triangle.

Sum of all angles in a triangle = 180^0

$x + x + x + 30^0 = 180^0$

$3x + 30^0 = 180^0$

$3x = 150^0$

or $x = 50^0$

And $x + 30^0 = 50^0 + 30^0 = 80^0$

Answer: Three angles are 50^0, 50^0 and 80^0.

Question 6: If one angle of a triangle is equal to the sum of the other two, show that the triangle is a right angle triangle.

Solution:

One angle of a triangle is equal to the sum of the other two angles (given)

To Prove: One of the angles is 90^0

Let x, y and z are three angles of a triangle, where

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$z = x + y$ …(1)

Sum of all angles of a triangle = 180^0

$x + y + z = 180^0$

$z + z = 180^0$ (Using equation (1))

$2z = 180^0$

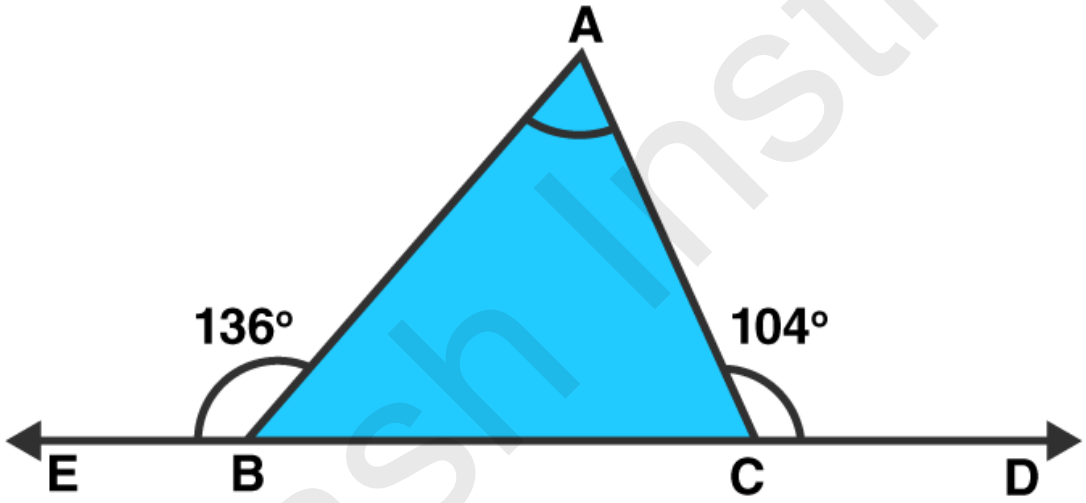
$z = 90^0$ (Proved)

Therefore, triangle is a right angled triangle.

Exercise 9.2 Page No: 9.18

Question 1: The exterior angles, obtained on producing the base of a triangle both ways are 104^0 and 136^0. Find all the angles of the triangle.

Solution:



$\angle ACD = \angle ABC + \angle BAC$ [Exterior angle property]

Find $\angle ABC$:

$\angle ABC + \angle ABE = 180^0$ [Linear pair]

$\angle ABC + 136^0 = 180^0$

$\angle ABC = 44^0$

Find $\angle ACB$:

$\angle ACB + \angle ACD = 180^0$ [Linear pair]

$\angle ACB + 104^0 = 180^0$

$\angle ACB = 76^0$

Now,

Sum of all angles of a triangle = 180^0

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$\angle A + 44^0 + 76^0 = 180^0$

$\angle A = 180^0 - 44^0 - 76^0$

$\angle A = 60^0$

Answer: Angles of a triangle are $\angle A = 60^0$, $\angle B = 44^0$ and $\angle C = 76^0$

Question 2: In a $\triangle ABC$, the internal bisectors of $\angle B$ and $\angle C$ meet at P and the external bisectors of $\angle B$ and $\angle C$ meet at Q. Prove that $\angle BPC + \angle BQC = 180^0$.

Solution:

In triangle ABC,

BP and CP are internal bisector of $\angle B$ and $\angle C$ respectively

=> External $\angle B = 180^\circ - \angle B$

BQ and CQ are external bisector of $\angle B$ and $\angle C$ respectively.

=> External $\angle C = 180^\circ - \angle C$

In triangle BPC,

$\angle BPC + 1/2\angle B + 1/2\angle C = 180^\circ$

$\angle BPC = 180^\circ - 1/2(\angle B + \angle C)$ …. (1)

In triangle BQC,

$\angle BQC + 1/2(180^\circ - \angle B) + 1/2(180^\circ - \angle C) = 180^\circ$

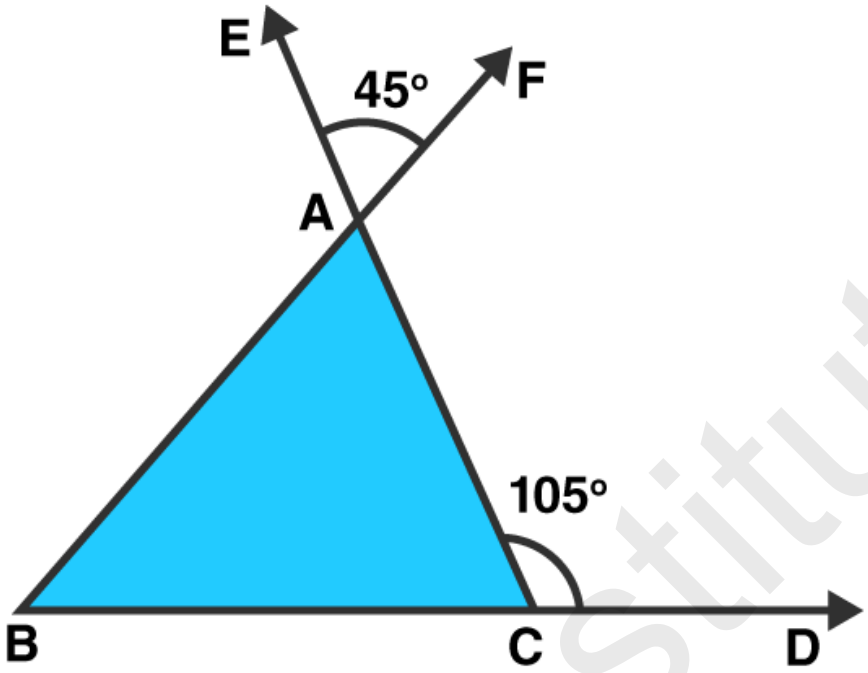
$\angle BQC + 180^\circ - 1/2(\angle B + \angle C) = 180^\circ$

$\angle BPC + \angle BQC = 180^\circ$ [Using (1)]

Hence Proved.

Question 3: In figure, the sides BC, CA and AB of a $\triangle ABC$ have been produced to D, E and F respectively. If $\angle ACD = 105^0$ and $\angle EAF = 45^0$, find all the angles of the $\triangle ABC$.

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Solution:

$\angle BAC = \angle EAF = 45^0$ [Vertically opposite angles]

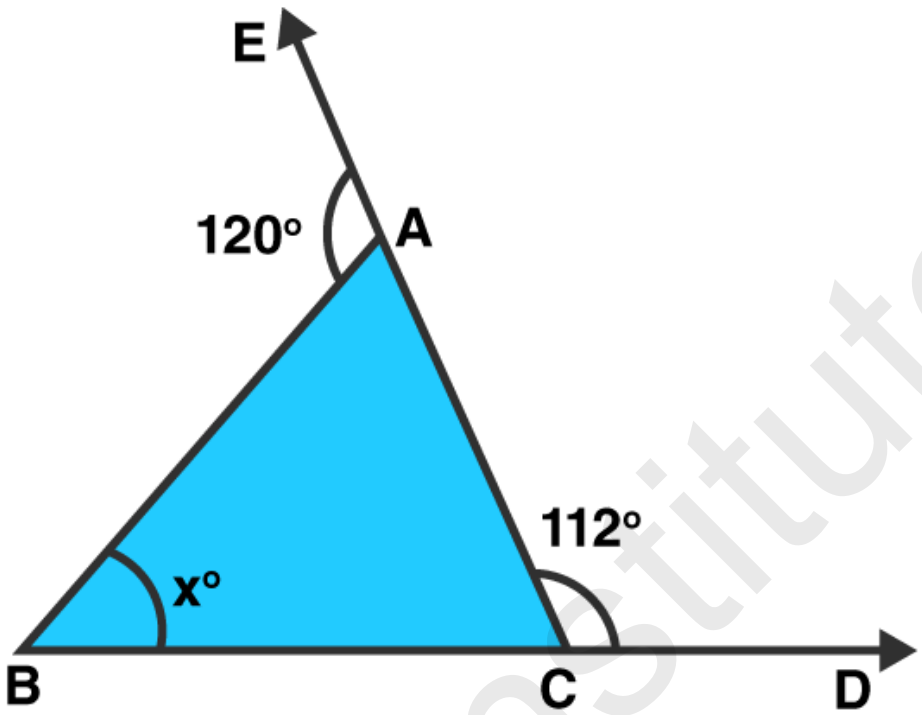
$\angle ACD = 180^0 - 105^0 = 75^0$ [Linear pair]

$\angle ABC = 105^0 - 45^0 = 60^0$ [Exterior angle property]

Question 4: Compute the value of x in each of the following figures:

(i)

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Solution:

$\angle BAC = 180^0 - 120^0 = 60^0$ [Linear pair]

$\angle ACB = 180^0 - 112^0 = 68^0$ [Linear pair]

Sum of all angles of a triangle = 180^0

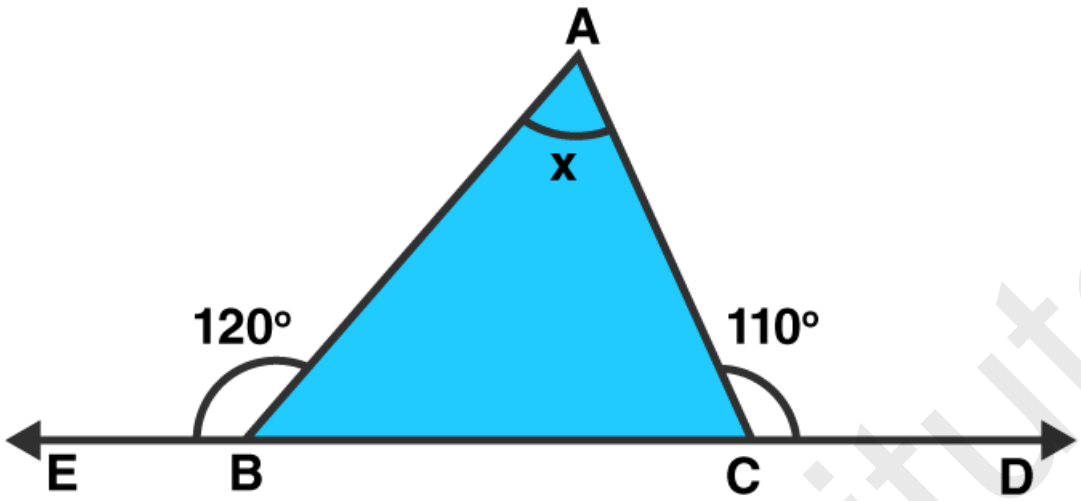
$x = 180^0 - \angle BAC - \angle ACB$

$= 180^0 - 60^0 - 68^0 = 52^0$

Answer: $x = 52^0$

(ii)

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Solution:

$\angle ABC = 180^0 - 120^0 = 60^0$ [Linear pair]

$\angle ACB = 180^0 - 110^0 = 70^0$ [Linear pair]

Sum of all angles of a triangle = 180^0

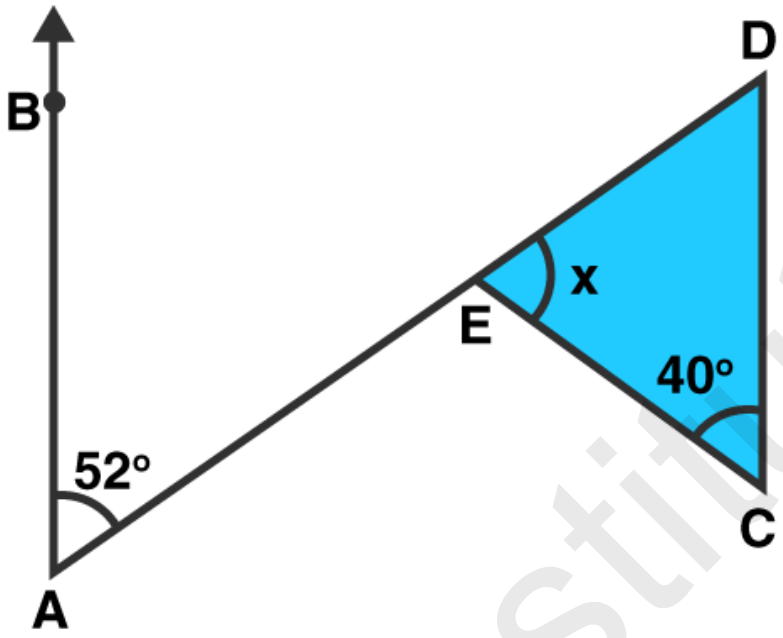
$x = \angle BAC = 180^0 - \angle ABC - \angle ACB$

$= 180^0 - 60^0 - 70^0 = 50^0$

Answer: $x = 50^0$

(iii)

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Solution:

$\angle BAE = \angle EDC = 52^0$ [Alternate angles]

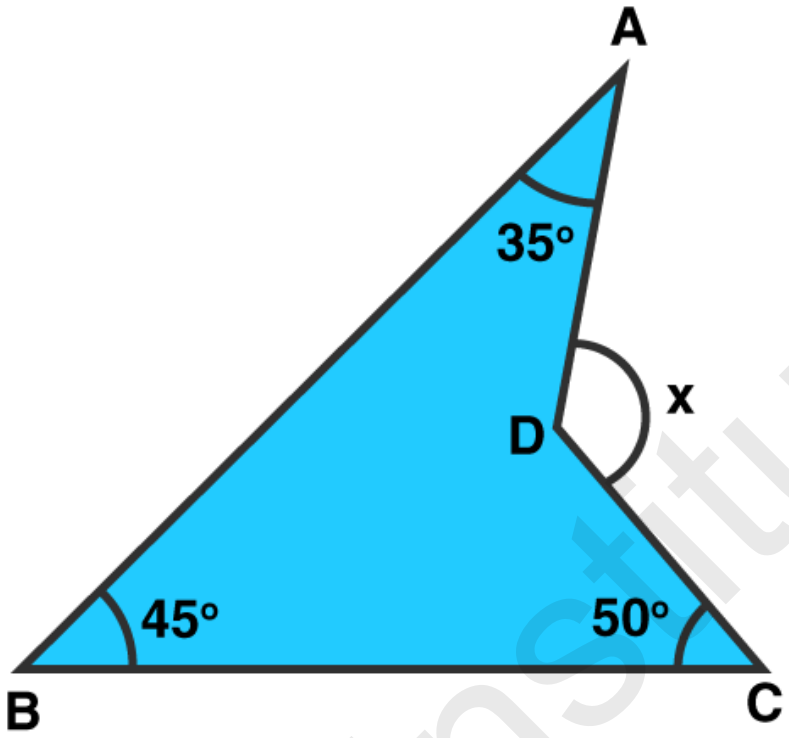
Sum of all angles of a triangle = 180^0

$x = 180^0 - 40^0 - 52^0 = 180^0 - 92^0 = 88^0$

Answer: $x = 88^0$

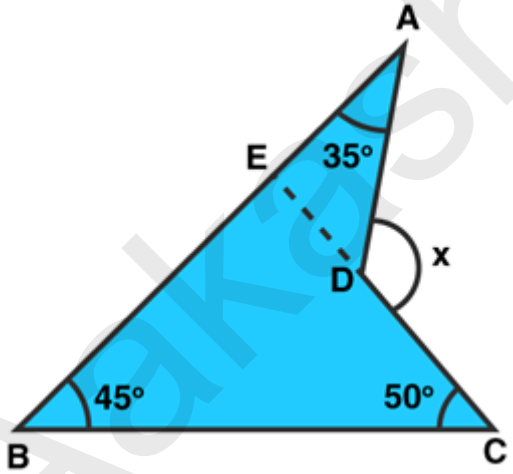
(iv)

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Solution:

CD is produced to meet AB at E.



$\angle BEC = 180^0 - 45^0 - 50^0 = 85^0$ [Sum of all angles of a triangle = 180^0]

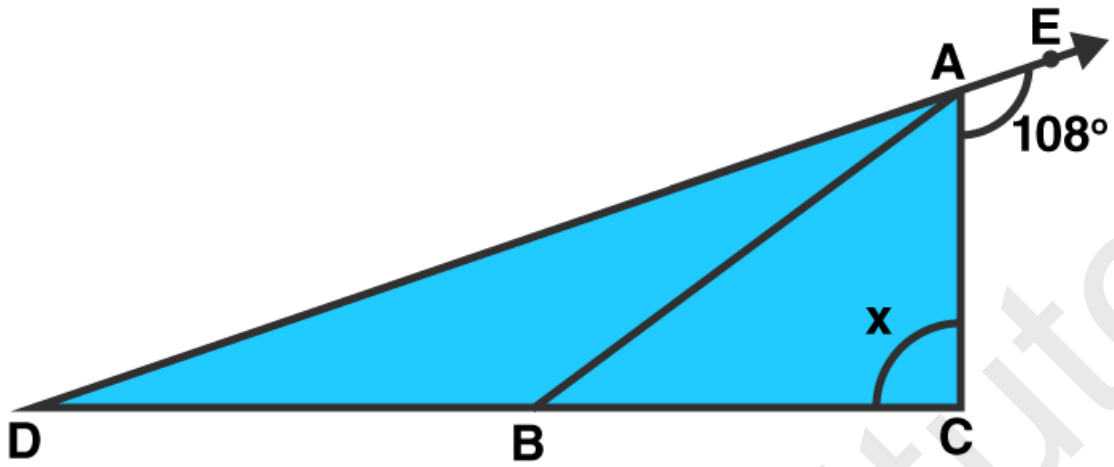
$\angle AEC = 180^0 - 85^0 = 95^0$ [Linear Pair]

Now, $x = 95^0 + 35^0 = 130^0$ [Exterior angle Property]

Answer: $x = 130^0$

Question 5: In figure, AB divides ∠DAC in the ratio 1 : 3 and AB = DB. Determine the value of x.

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Solution:

∠DAC=180°−108°=72°

∠BAC/∠DAB=1/3

∠DAB=3∠BAC
∠BAC+∠DAB=∠DAC=72°
We can write it as
∠BAC+3∠BAC=72°
4∠BAC=72°
∠BAC=72/4=18°
So we get
∠DAB=3×18°=54°
∠DAB=∠BDA=54°(AB=DB)
∠ABD=180°−(54°+54°)
=180−108°
=72°
Now,
∠DBA=72°=∠BAC+x (Exterior angle)
So we get
x=72°−18°=54°
Exercise VSAQs Page No: 9.21

Question 1: Define a triangle.

Solution: Triangle is a three-sided polygon that consists of three edges and three vertices. The most important property of a triangle is that the sum of the internal angles of a triangle is equal to 180 degrees.

Question 2: Write the sum of the angles of an obtuse triangle.

Solution: The sum of angles of obtuse triangle = 180°.

Question 3: In △ABC, if ∠B = 60°, ∠C = 80° and the bisectors of angles ∠ABC and ∠ACB meet at point O, then find the measure of ∠BOC.

Solution:

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$\angle B = 60^0$, $\angle C = 80^0$ (given)

As per question:

$\angle OBC = 60^0/2 = 30^0$ and

$\angle OCB = 80^0/2 = 40^0$

In triangle BOC,

$\angle OBC + \angle OCB + \angle BOC = 180^0$

[Sum of angles of a triangle = 180^0]
$30^0 + 40^0 + \angle BOC = 180^0$

$\angle BOC = 110^0$

Question 4: If the angles of a triangle are in the ratio 2:1:3, then find the measure of smallest angle.

Solution:

Let angles of a triangles are 2x, x and 3x, where x is the smallest angle.

To find: measure of x.

As, Sum of angles of a triangle = 180^0

$2x + x + 3x = 180^0$

$6x = 180^0$

$x = 30^0$. Answer

Question 5: If the angles A, B and C of $\triangle ABC$ satisfy the relation B – A = C – B, then find the measure of $\angle B$.

Solution:

Sum of angles of a triangle = 180^0

$A + B + C = 180^0$ …(1)

B – A = C – B …(Given)

2B = C + A …(2)

(1) => $2B + B = 180^0$

$3B = 180^0$

Or $B = 60^0$

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