Exercise 9.1

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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

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

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

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

$5x = 2(250)^0$

$x = 500^0/5$

$x = 100^0$

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

$z = x + y$ …(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

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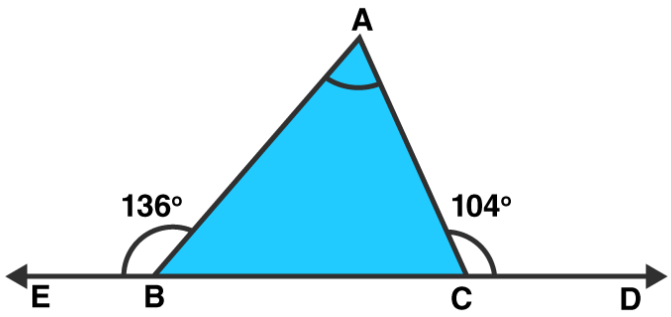
Question 1: The exterior angles, obtained on producing the base of a triangle both ways are 104^0 and 136^0. Find all the angles of the triangle.

Solution:



∠ACD = ∠ABC + ∠BAC [Exterior angle property]

Find ∠ABC:

∠ABC + ∠ABE = 180^0 [Linear pair]

∠ABC + 136^0 = 180^0

∠ABC = 44^0

Find ∠ACB:

∠ACB + ∠ACD = 180^0 [Linear pair]

∠ACB + 104^0 = 180^0

∠ACB = 76^0

Now,
Sum of all angles of a triangle = 180^0

∠A + 44^0 + 76^0 = 180^0
∠A = 180^0 – 44^0 –76^0
∠ 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 $\angle B = 180^o - \angle B$

BQ and CQ are external bisector of $\angle B$ and $\angle C$ respectively.
=> External $\angle C = 180^o - \angle C$

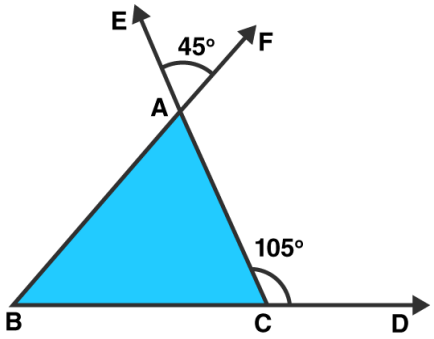
In triangle BPC,
$\angle BPC + 1/2\angle B + 1/2\angle C = 180o$

$\angle BPC = 180^o - (\angle B + \angle C)$ .... (1)

In triangle BQC,
$\angle BQC + 1/2(180^o - \angle B) + 1/2(180^o - \angle C) = 180^o$
$\angle BQC + 180^o - (\angle B + \angle C) = 180^o$
$\angle BPC + \angle BQC = 180^o$ [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 $\triangle ABC$.



Solution:

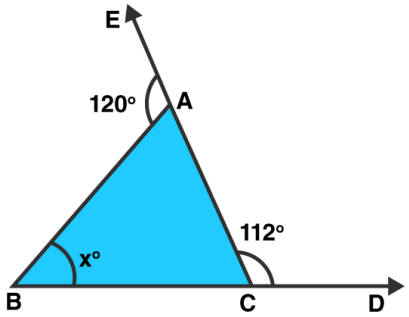
$\angle BAC = \angle EAF = 45^0$ [Vertically opposite angles]

$\angle ACD = 180^0 - 105^0 = 75^0$ [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)



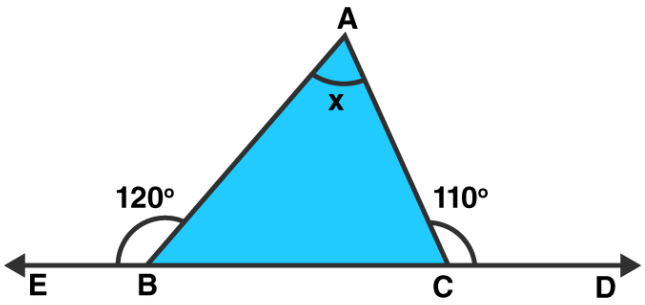
Solution:

$\angle BAC = 180^0 - 120^0 = 60^0$ [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)



Solution:

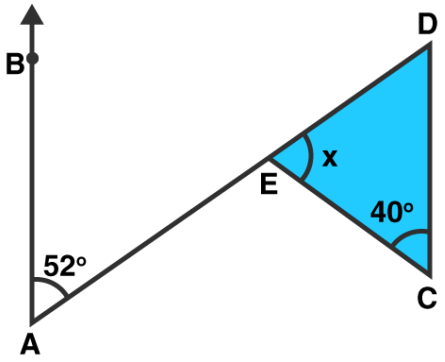
$\angle ABC = 180^0 - 120^0 = 60^0$ [Linear pair]
$\angle ACB = 180^0 - 110^0 = 70^0$ [Linear pair]

Sum of all angles of a triangle = 180^0

$x = \angle BAC = 180^0 - \angle ABC - \angle ACB$
$= 1800 - 60^0 - 70^0 = 50^0$

Answer: $x = 50^0$

(iii)



Solution:

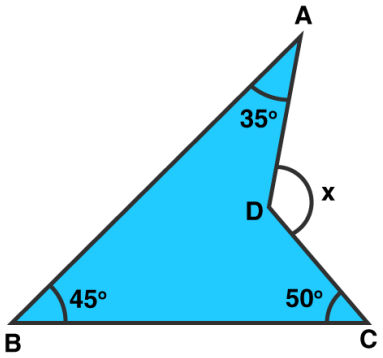
$\angle BAE = \angle EDC = 52^0$ [Alternate angles]

Sum of all angles of a triangle = 180^0

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

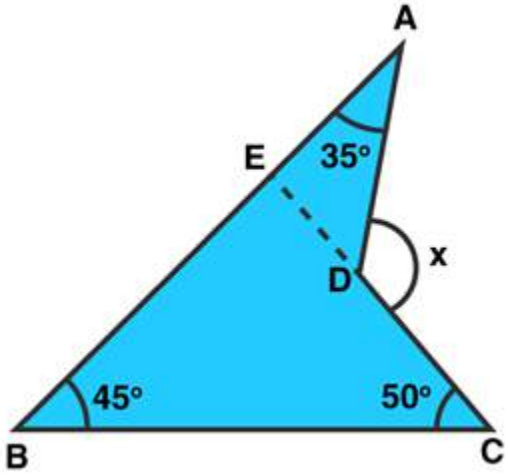
Answer: $x = 88^0$

(iv)



Solution:

CD is produced to meet AB at E.



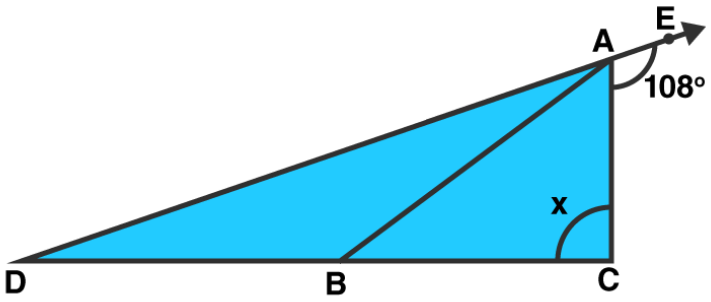
$\angle BEC = 180^0 - 45^0 - 50^0 = 85^0$ [Sum of all angles of a triangle = 180^0]

$\angle AEC = 180^0 - 85^0 = 95^0$ [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.



Solution:

Let ∠BAD = y, ∠BAC = 3y

∠BDA = ∠BAD = y (As AB=DB)

Now,
$\angle BAD + \angle BAC + 108^0 = 180^0$ [Linear Pair]

$y + 3y + 108^0 = 180^0$

$4y = 72^0$

or $y = 18^0$

Now, In ΔADC

$\angle ADC + \angle ACD = 108^0$ [Exterior Angle Property]

$x + 18^0 = 180^0$
$x = 90^0$

Answer: $x = 90^0$

Exercise VSAQs

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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 $\triangle ABC$, if $\angle B = 60^0$, $\angle C = 80^0$ and the bisectors of angles $\angle ABC$ and $\angle ACB$ meet at point O, then find the measure of $\angle BOC$.

Solution:
$\angle B = 60^0$, $\angle C = 80^0$ (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 △ABC satisfy the relation B - A = C - B, then find the measure of ∠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