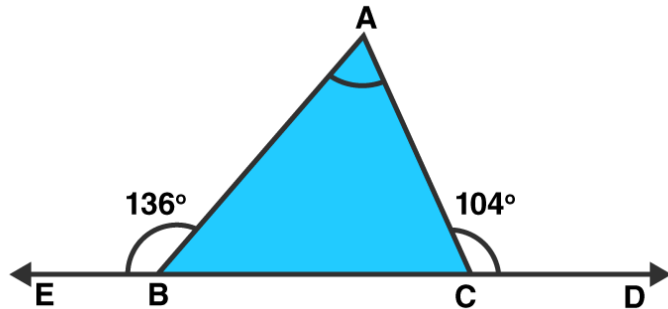


Exercise 9.2

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

Solution:



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

Find $\angle ABC$:

$$\angle ABC + \angle ABE = 180^\circ \text{ [Linear pair]}$$

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

$$\angle ABC = 44^\circ$$

Find $\angle ACB$:

$$\angle ACB + \angle ACD = 180^\circ \text{ [Linear pair]}$$

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

$$\angle ACB = 76^\circ$$

Now,

Sum of all angles of a triangle = 180°

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

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

$$\angle A = 60^\circ$$

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

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 $\angle BPC + \angle BQC = 180^\circ$.

Solution:

In triangle ABC,

BP and CP are internal bisector of $\angle B$ and $\angle C$ respectively
 \Rightarrow External $\angle B = 180^\circ - \angle B$

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

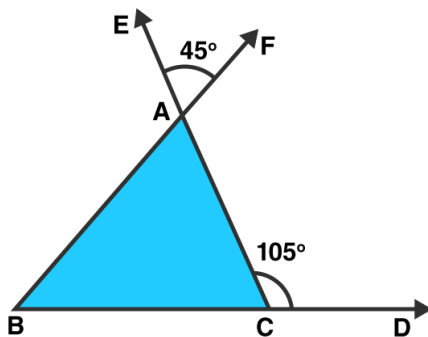
In triangle BPC,
 $\angle BPC + 1/2\angle B + 1/2\angle C = 180^\circ$

$$\angle BPC = 180^\circ - (\angle B + \angle C) \dots (1)$$

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 $\angle ACD = 105^\circ$ and $\angle EAF = 45^\circ$, find all the angles of the $\triangle ABC$.



Solution:

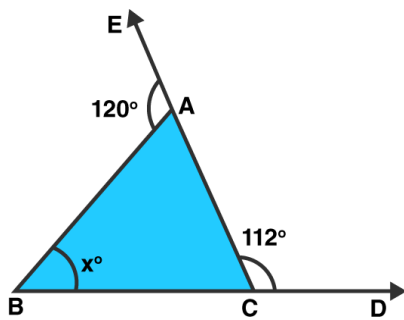
$$\angle BAC = \angle EAF = 45^\circ \quad [\text{Vertically opposite angles}]$$

$$\angle ACD = 180^\circ - 105^\circ = 75^\circ \quad [\text{Linear pair}]$$

$$\angle ABC = 105^\circ - 45^\circ = 60^\circ \quad [\text{Exterior angle property}]$$

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

(i)



Solution:

$$\angle BAC = 180^\circ - 120^\circ = 60^\circ \quad [\text{Linear pair}]$$

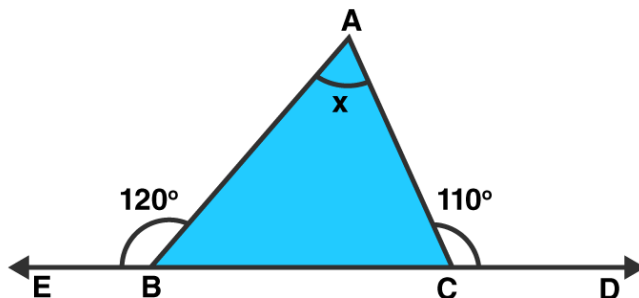
$$\angle ACB = 180^\circ - 112^\circ = 68^\circ \quad [\text{Linear pair}]$$

Sum of all angles of a triangle = 180°

$$\begin{aligned} x &= 180^\circ - \angle BAC - \angle ACB \\ &= 180^\circ - 60^\circ - 68^\circ = 52^\circ \end{aligned}$$

Answer: $x = 52^\circ$

(ii)



Solution:

$$\angle ABC = 180^\circ - 120^\circ = 60^\circ \quad [\text{Linear pair}]$$

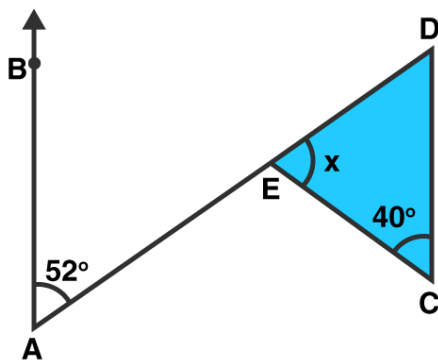
$$\angle ACB = 180^\circ - 110^\circ = 70^\circ \quad [\text{Linear pair}]$$

Sum of all angles of a triangle = 180°

$$\begin{aligned} x = \angle BAC &= 180^\circ - \angle ABC - \angle ACB \\ &= 180^\circ - 60^\circ - 70^\circ = 50^\circ \end{aligned}$$

Answer: $x = 50^\circ$

(iii)



Solution:

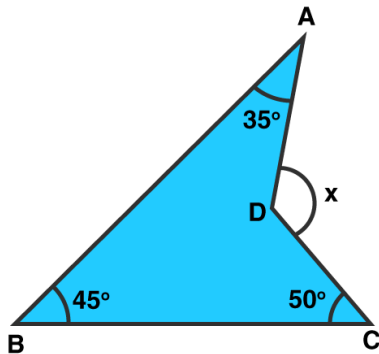
$$\angle BAE = \angle EDC = 52^\circ \quad [\text{Alternate angles}]$$

Sum of all angles of a triangle = 180°

$$x = 180^\circ - 40^\circ - 52^\circ = 180^\circ - 92^\circ = 88^\circ$$

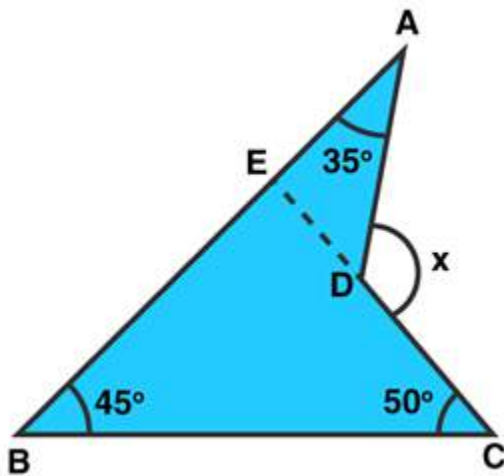
Answer: $x = 88^\circ$

(iv)



Solution:

CD is produced to meet AB at E.



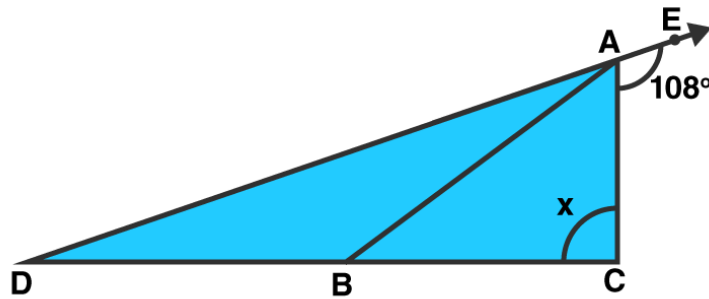
$$\angle BEC = 180^\circ - 45^\circ - 50^\circ = 85^\circ \quad [\text{Sum of all angles of a triangle} = 180^\circ]$$

$$\angle AEC = 180^\circ - 85^\circ = 95^\circ \quad [\text{Linear Pair}]$$

$$\text{Now, } x = 95^\circ + 35^\circ = 130^\circ \quad [\text{Exterior angle Property}]$$

Answer: $x = 130^\circ$

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



Solution:

$$\angle DAC = 180^\circ - 108^\circ = 72^\circ$$

$$\angle BAC / \angle DAB = 1/3$$

$$\angle DAB = 3\angle BAC$$

$$\angle BAC + \angle DAB = \angle DAC = 72^\circ$$

We can write it as

$$\angle BAC + 3\angle BAC = 72^\circ$$

[Linear Pair]

$$4\angle BAC = 72^\circ$$

$$\angle BAC = 72/4 = 18^\circ$$

So we get

$$\angle DAB = 3 \times 18^\circ = 54^\circ$$

$$\angle DAB = \angle BDA = 54^\circ \text{ (AB = DB)}$$

$$\angle ABD = 180^\circ - (54^\circ + 54^\circ)$$

$$= 180^\circ - 108^\circ$$

$$= 72^\circ$$

Now,

$$\angle DBA = 72^\circ = \angle BAC + x \text{ (Exterior angle)}$$

So we get

$$x = 72^\circ - 18^\circ = 54^\circ$$