## Exercise 9.1

Question 1: In a $\triangle A B C$, if $\angle A=55^{\circ}, \angle B=40^{\circ}$, find $\angle C$.

## Solution:

Given: $\angle A=55^{\circ}, \angle B=40^{\circ}$
We know, sum of all angles of a triangle is $180^{\circ}$
$\angle A+\angle B+\angle C=180^{\circ}$
$55^{\circ}+40^{\circ}+\angle \mathrm{C}=180^{\circ}$
$95^{\circ}+\angle C=180^{\circ}$
$\angle C=180^{\circ}-95^{\circ}$
$\angle C=85^{\circ}$
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 $x, 2 x, 3 x$
Sum of all angles of triangles $=180^{\circ}$
$x+2 x+3 x=180^{\circ}$
$6 x=180^{0}$
$x=180^{\circ} / 6$
$x=30^{\circ}$

Answer:
$x=30^{\circ}$
$2 x=2(30)^{0}=60^{\circ}$
$3 x=3(30)^{0}=90^{\circ}$

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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 $=180^{\circ}$
$(x-40)^{0}+(x-20)^{0}+(1 / 2 x-10)^{0}=180^{0}$
$5 / 2 x-70^{0}=1800$
$5 / 2 x=180^{\circ}+70^{0}$
$5 x=2(250)^{0}$
$x=500^{\circ} / 5$
$x=100^{\circ}$

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

## Solution:

The difference between two consecutive angles is $10^{\circ}$ (given)
Let $\mathrm{x}, \mathrm{x}+10^{\circ}, \mathrm{x}+20^{\circ}$ be the consecutive angles
$x+x+10^{0}+x+20^{0}=180^{\circ}$
$3 x+30^{\circ}=180^{\circ}$
$3 x=180^{\circ}-30^{\circ}$
$3 x=150^{0}$
or $x=50^{\circ}$

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Again,
$x+10^{\circ}=50^{\circ}+10^{\circ}=60^{\circ}$
$x+20^{\circ}=50^{\circ}+20^{\circ}=70^{\circ}$
Answer: Three angles are $50^{\circ}, 60^{\circ}$ and $70^{\circ}$.
Question 5: Two angles of a triangle are equal and the third angle is greater than each of those angles by $30^{\circ}$. 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 $30^{\circ}$. (Given)

Let $x, x, x+30^{\circ}$ be the angles of a triangle.
Sum of all angles in a triangle $=180^{\circ}$
$x+x+x+30^{\circ}=180^{\circ}$
$3 x+30^{\circ}=180^{\circ}$
$3 x=150^{0}$
or $x=50^{\circ}$
And $x+30^{\circ}=50^{\circ}+30^{\circ}=80^{\circ}$

Answer: Three angles are $50^{\circ}, 50^{\circ}$ and $80^{\circ}$.
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 $90^{\circ}$
Let $x, y$ and $z$ are three angles of a triangle, where
$z=x+y$

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Sum of all angles of a triangle $=180^{\circ}$
$x+y+z=180^{\circ}$
$z+z=180^{\circ}$ (Using equation (1))
$2 z=180^{\circ}$
$\mathrm{z}=90^{\circ}$ (Proved)

Therefore, triangle is a right angled triangle.

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## Exercise 9.2

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

## Solution:


$\angle A C D=\angle A B C+\angle B A C[$ Exterior angle property]

Find $\angle \mathrm{ABC}$ :
$\angle A B C+\angle A B E=180^{\circ}$ [Linear pair]
$\angle A B C+136^{\circ}=180^{\circ}$
$\angle A B C=44^{\circ}$
Find $\angle A C B$ :

$$
\begin{aligned}
& \angle A C B+\angle A C D=180^{\circ} \quad[\text { Linear pair }] \\
& \angle A C B+104^{\circ}=180^{\circ} \\
& \angle A C B=76^{\circ}
\end{aligned}
$$

Now,
Sum of all angles of a triangle $=180^{\circ}$

$$
\begin{aligned}
& \angle A+44^{0}+76^{\circ}=180^{\circ} \\
& \angle A=180^{\circ}-44^{0}-76^{\circ} \\
& \angle A=60^{\circ}
\end{aligned}
$$

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Answer: Angles of a triangle are $\angle A=60^{\circ}, \angle B=44^{\circ}$ and $\angle C=76^{\circ}$
Question 2: In a $\triangle A B C$, 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 $\angle B P C+\angle B Q C=180^{\circ}$.

## Solution:

In triangle $A B C$,
BP and CP are internal bisector of $\angle \mathrm{B}$ and $\angle \mathrm{C}$ respectively
$\Rightarrow$ External $\angle B=180^{\circ}-\angle B$
$B Q$ and $C Q$ are external bisector of $\angle B$ and $\angle C$ respectively.
=> External $\angle \mathrm{C}=180^{\circ}-\angle \mathrm{C}$
In triangle $B P C$,
$\angle B P C+1 / 2 \angle B+1 / 2 \angle C=180^{\circ}$
$\angle B P C=180^{\circ}-(\angle B+\angle C)$
In triangle $B Q C$,
$\angle B Q C+1 / 2\left(180^{\circ}-\angle B\right)+1 / 2\left(180^{\circ}-\angle C\right)=180^{\circ}$
$\angle B Q C+180^{\circ}-1 / 2(\angle B+\angle C)=180^{\circ}$
$\angle B P C+\angle B Q C=180^{\circ}[$ Using (1)]

Hence Proved.

Question 3: In figure, the sides $B C, C A$ and $A B$ of a $\triangle A B C$ have been produced to $D, E$ and $F$ respectively. If $\angle A C D=105^{\circ}$ and $\angle E A F=45^{\circ}$, find all the angles of the $\triangle A B C$.


## Solution:

$\angle B A C=\angle E A F=45^{\circ} \quad$ [Vertically opposite angles]
$\angle A C D=180^{\circ}-105^{\circ}=75^{\circ} \quad$ [Linear pair]
$\angle \mathrm{ABC}=105^{\circ}-45^{\circ}=60^{\circ} \quad$ [Exterior angle property]
Question 4: Compute the value of $x$ in each of the following figures:
(i)


## Solution:

$\angle B A C=180^{\circ}-120^{\circ}=60^{\circ} \quad$ [Linear pair]
$\angle A C B=180^{\circ}-112^{\circ}=68^{\circ} \quad$ [Linear pair]
Sum of all angles of a triangle $=180^{\circ}$
$x=180^{\circ}-\angle B A C-\angle A C B$
$=180^{\circ}-60^{\circ}-68^{\circ}=52^{\circ}$
Answer: $x=52^{0}$
(ii)


## Solution:

$\angle A B C=180^{\circ}-120^{\circ}=60^{\circ} \quad$ [Linear pair]
$\angle A C B=180^{\circ}-110^{\circ}=70^{\circ} \quad$ [Linear pair]
Sum of all angles of a triangle $=180^{\circ}$
$x=\angle B A C=180^{\circ}-\angle A B C-\angle A C B$
$=180^{\circ}-60^{\circ}-70^{\circ}=50^{\circ}$

Answer: $x=50^{\circ}$
(iii)


## Solution:

$\angle B A E=\angle E D C=52^{\circ} \quad$ [Alternate angles]
Sum of all angles of a triangle $=180^{\circ}$
$x=180^{\circ}-40^{\circ}-52^{\circ}=180^{\circ}-92^{\circ}=88^{\circ}$

Answer: $\mathrm{x}=88^{\circ}$
(iv)


## Solution:

$C D$ is produced to meet $A B$ at $E$.

$\angle B E C=180^{\circ}-45^{\circ}-50^{\circ}=85^{\circ} \quad$ [Sum of all angles of a triangle $=180^{\circ}$ ]
$\angle A E C=180^{\circ}-85^{\circ}=95^{\circ} \quad[$ Linear Pair]
Now, $x=95^{\circ}+35^{\circ}=130^{\circ} \quad$ [Exterior angle Property]
Answer: $x=130^{\circ}$

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Question 5: In figure, $A B$ divides $\angle D A C$ in the ratio $1: 3$ and $A B=D B$. Determine the value of $x$.


Solution:
$\angle D A C=180^{\circ}-108^{\circ}=72^{\circ}$
$\angle B A C / \angle D A B=1 / 3$
$\angle D A B=3 \angle B A C$
$\angle B A C+\angle D A B=\angle D A C=72^{\circ}$
We can write it as
$\angle B A C+3 \angle B A C=72^{\circ} \quad$ [Linear Pair]
$4 \angle B A C=72^{\circ}$
$\angle B A C=72 / 4=18^{\circ}$
So we get
$\angle D A B=3 \times 18^{\circ}=54^{\circ}$
$\angle \mathrm{DAB}=\angle \mathrm{BDA}=54^{\circ}(\mathrm{AB}=\mathrm{DB})$
$\angle A B D=180^{\circ}-\left(54^{\circ}+54^{\circ}\right)$
$=180^{\circ}-108^{\circ}$
$=72^{\circ}$
Now,
$\angle D B A=72^{\circ}=\angle B A C+x \quad$ (Exterior angle)
So we get
$x=72^{0}-18^{0}=54^{0}$

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

## Exercise VSAQs

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 $=180^{\circ}$.
Question 3: In $\triangle A B C$, if $\angle B=60^{\circ}, \angle C=80^{\circ}$ and the bisectors of angles $\angle A B C$ and $\angle A C B$ meet at point $O$, then find the measure of $\angle B O C$.

## Solution:

$\angle B=60^{\circ}, \angle C=80^{\circ}$ (given)
As per question:
$\angle O B C=60^{\circ} / 2=30^{\circ}$ and
$\angle O C B=80^{\circ} / 2=40^{\circ}$

In triangle BOC,
$\angle O B C+\angle O C B+\angle B O C=180^{\circ}$
[Sum of angles of a triangle $=180^{\circ}$ ]
$30^{\circ}+40^{\circ}+\angle B O C=180^{\circ}$
$\angle B O C=110^{\circ}$

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 $2 x, x$ and $3 x$, where $x$ is the smallest angle.
To find: measure of $x$.
As, Sum of angles of a triangle $=180^{\circ}$
$2 x+x+3 x=180^{\circ}$
$6 x=180^{\circ}$
$x=30^{\circ}$. Answer

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

Question 5: If the angles $A, B$ and $C$ of $\triangle A B C$ satisfy the relation $B-A=C-B$, then find the measure of $\angle B$.
Solution:
Sum of angles of a triangle $=180^{\circ}$
$A+B+C=180^{\circ}$
$B-A=C-B$ ...(Given)
$2 B=C+A$
(1) $\Rightarrow 2 B+B=180^{\circ}$
$3 B=180^{\circ}$
Or $B=60^{\circ}$

