Mathematics
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(Chapter - 3) (Understanding Quadrilaterals)
(Class - VIII)

Exercise 3.2

Question 1:
Find \(x\) in the following figures:

\[ \begin{align*}
(a) \quad 125^\circ + m &= 180^\circ \\
\Rightarrow \quad m &= 180^\circ - 125^\circ = 55^\circ \\
\text{and} \quad 125^\circ + n &= 180^\circ \\
\Rightarrow \quad n &= 180^\circ - 125^\circ = 55^\circ \\
\therefore \quad \text{Exterior angle} \quad x^\circ &= \text{Sum of opposite interior angles} \\
&= 55^\circ + 55^\circ = 110^\circ \\
(b) \quad \text{Sum of angles of a pentagon} &= (n-2) \times 180^\circ \\
&= (5-2) \times 180^\circ \\
&= 3 \times 180^\circ = 540^\circ \\
\text{By linear pairs of angles,} \\
\angle 1 + 90^\circ &= 180^\circ \quad \ldots \ldots \text{(i)} \\
\angle 2 + 60^\circ &= 180^\circ \quad \ldots \ldots \text{(ii)} \\
\angle 3 + 90^\circ &= 180^\circ \quad \ldots \ldots \text{(iii)} \\
\angle 4 + 70^\circ &= 180^\circ \quad \ldots \ldots \text{(iv)} \\
\angle 5 + x &= 180^\circ \quad \ldots \ldots \text{(v)} \\
\text{Adding eq. (i), (ii), (iii), (iv) and (v),} \\
x + (\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5) + 310^\circ &= 900^\circ \\
\Rightarrow \quad x + 540^\circ + 310^\circ &= 900^\circ \\
\Rightarrow \quad x + 850^\circ &= 900^\circ \\
\Rightarrow \quad x &= 900^\circ - 850^\circ = 50^\circ
\end{align*} \]

Question 2:
Find the measure of each exterior angle of a regular polygon of:
(a) 9 sides \hspace{1cm} (b) 15 sides

Answer 2:
(i) \quad \text{Sum of angles of a regular polygon} = (n-2) \times 180^\circ \\
= (9-2) \times 180^\circ = 7 \times 180^\circ = 1260^\circ \\
\text{Each interior angle} = \frac{\text{Sum of interior angles}}{\text{Number of sides}} = \frac{1260^\circ}{9} = 140^\circ \\
\text{Each exterior angle} = 180^\circ - 140^\circ = 40^\circ \\
(ii) \quad \text{Sum of exterior angles of a regular polygon} = 360^\circ \\
\text{Each interior angle} = \frac{\text{Sum of interior angles}}{\text{Number of sides}} = \frac{360^\circ}{15} = 24^\circ
Question 3:
How many sides does a regular polygon have, if the measure of an exterior angle is 24°?

Answer 3:
Let number of sides be \( n \).

\[
\text{Sum of exterior angles of a regular polygon} = 360°
\]
\[
\text{Number of sides} = \frac{\text{Sum of exterior angles}}{\text{Each interior angle}} = \frac{360°}{24°} = 15
\]

Hence, the regular polygon has 15 sides.

Question 4:
How many sides does a regular polygon have if each of its interior angles is 165°?

Answer 4:
Let number of sides be \( n \).

\[
\text{Exterior angle} = 180° - 165° = 15°
\]
\[
\text{Sum of exterior angles of a regular polygon} = 360°
\]
\[
\text{Number of sides} = \frac{\text{Sum of exterior angles}}{\text{Each interior angle}} = \frac{360°}{15°} = 24
\]

Hence, the regular polygon has 24 sides.

Question 5:
(a) Is it possible to have a regular polygon with each exterior angle as 22°?
(b) Can it be an interior angle of a regular polygon? Why?

Answer 5:
(a) No. (Since 22 is not a divisor of 360°)
(b) No. (Because each exterior angle is \( 180° - 22° = 158° \), which is not a divisor of 360°)

Question 6:
(a) What is the minimum interior angle possible for a regular polygon? Why?
(b) What is the maximum exterior angle possible for a regular polygon?

Answer 6:
(a) The equilateral triangle being a regular polygon of 3 sides has the least measure of an interior angle of 60°.

\[
\therefore \quad \text{Sum of all the angles of a triangle} = 180°
\]
\[
\therefore \quad x + x + x = 180°
\]
\[
\Rightarrow \quad 3x = 180°
\]
\[
\Rightarrow \quad x = 60°
\]

(b) By (a), we can observe that the greatest exterior angle is \( 180° - 60° = 120° \).