



CREST Mathematics Olympiad (CMO) Worksheet *for*

Class 8



Topic

Understanding Quadrilateral



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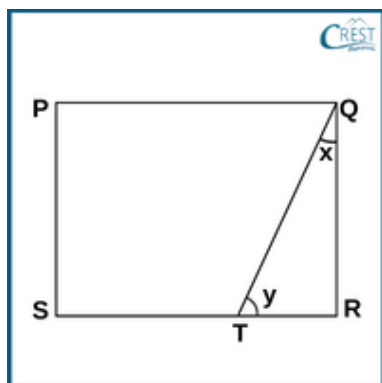
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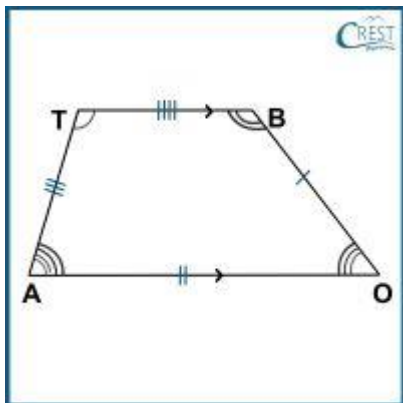
Worksheet on Understanding Quadrilateral

- Which of the regular polygons is formed if the exterior angle of a regular polygon is two-thirds of its interior angle?
 - Quadrilateral
 - Pentagon
 - Hexagon
 - Octagon
- What is the length of each side of the parallelogram PQRS if the length of QR is 11.4 cm and its perimeter is 57.5 cm?
 - PQ = 17.35 cm, QR = 11.4 cm, RS = 17.15 cm and SP = 11.4 cm
 - PQ = 17.35 cm, QR = 11.4 cm, RS = 17.25 cm and SP = 11.4 cm
 - PQ = 17.35 cm, QR = 11.4 cm, PS = 17.35 cm and SP = 11.4 cm
 - PQ = 17.35 cm, QR = 11.4 cm, RS = 17.35 cm and SP = 11.4 cm
- The following figure is a rectangle PQRS in which $x : y = 2.5 : 3.5$. What is the value of $3x - 2y$?



- $7\frac{1}{2}^\circ$
 - $15\frac{1}{2}^\circ$
 - $22\frac{1}{2}^\circ$
 - $27\frac{1}{2}^\circ$
- Which of the following options is NOT true?
 - A rectangle becomes a square if its diagonals intersect each other at a right angle.
 - The diagonals of a rectangle meet at a perpendicular angle.
 - The diagonals of a rhombus meet at a perpendicular angle.
 - The diagonals of an isosceles trapezium are equal in length.

5. If $\angle A : \angle T = \sqrt[3]{27} : \sqrt{25}$, $\angle B = (x\sqrt{225 - 13})^\circ$ and $\angle O = (x\sqrt[3]{125 + 43})^\circ$, then what are the values of all the angles of the trapezium BOAT?



- $\angle B = 89.5^\circ$, $\angle O = 80.5^\circ$, $\angle A = 57.5^\circ$ and $\angle T = 112.5^\circ$
- $\angle B = 89.55^\circ$, $\angle O = 80.5^\circ$, $\angle A = 67.5^\circ$ and $\angle T = 112.5^\circ$
- $\angle B = 99.5^\circ$, $\angle O = 80.5^\circ$, $\angle A = 57.5^\circ$ and $\angle T = 112.5^\circ$
- $\angle B = 99.5^\circ$, $\angle O = 80.5^\circ$, $\angle A = 67.5^\circ$ and $\angle T = 112.5^\circ$

Answer Key

1. b - Pentagon

Explanation: Let the measure of each interior angle be x° .

An exterior angle of a regular polygon is two-thirds of its interior angle.

According to the question,

An exterior angle of a regular polygon = $\frac{2}{3} \times$ Measure of each interior angle
 $= \frac{2}{3} x^\circ$

Interior angle + exterior angle = 180°

$$\Rightarrow x^\circ + \frac{2}{3} x^\circ = 180^\circ$$

$$\Rightarrow \frac{5}{3} \times x^\circ = 180^\circ$$

$$\Rightarrow x^\circ = 180^\circ \times \frac{3}{5}$$

$$\Rightarrow x^\circ = 108^\circ$$

Therefore, each interior angle is 108° .

$$\Rightarrow (n - 2) \times 180^\circ / n = 108^\circ$$

$$\Rightarrow (n - 2) \times 180^\circ = 108^\circ \times n$$

$$\Rightarrow 180n - 360 = 108n$$

$$\Rightarrow 180n - 108n = 360$$

$$\Rightarrow 72n = 360$$

$$\Rightarrow n = 360/72$$

$$\Rightarrow n = 5 \text{ sides}$$

The regular polygon is a pentagon.

2. d - PQ = 17.35 cm, QR = 11.4 cm, RS = 17.35 cm and SP = 11.4 cm

Explanation: Opposite sides of a parallelogram are of the same length.

$$PQ = RS \text{ and } QR = SP$$

$$QR = SP = 11.4 \text{ cm}$$

Perimeter of parallelogram PQRS = 57.5 cm

$$\Rightarrow PQ + QR + RS + SP = 57.5 \text{ cm}$$

$$\Rightarrow PQ + 11.4 + PQ + 11.4 = 57.5$$

$$\Rightarrow 2PQ + 22.8 = 57.5$$

$$\Rightarrow 2PQ = 57.5 - 22.8$$

$$\Rightarrow 2PQ = 34.7$$

$$\Rightarrow PQ = 34.7/2$$

$$\Rightarrow PQ = 17.35 \text{ cm}$$

$$PQ = RS = 17.35 \text{ cm}$$

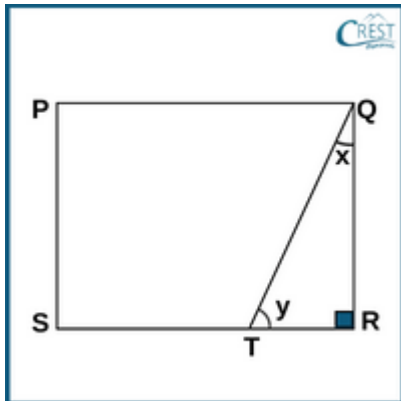
Therefore, the sides of parallelogram PQRS are:

$$PQ = 17.35 \text{ cm}, QR = 11.4 \text{ cm}, RS = 17.35 \text{ cm} \text{ and } SP = 11.4 \text{ cm}$$

3. $a - 7\frac{1}{2}^\circ$

Explanation: Let $x = 2.5a$ and $y = 3.5a$

All angles of a rectangle are 90° .



In $\triangle QRT$,

$$\angle RQT + \angle RTQ + \angle QRT = 180^\circ$$

$$\Rightarrow x + y + 90^\circ = 180^\circ$$

$$\Rightarrow 2.5a + 3.5a = 180^\circ - 90^\circ$$

$$\Rightarrow 6a = 90^\circ$$

$$\Rightarrow a = 15^\circ$$

$$x = 2.5a = 2.5 \times 15^\circ = 37.5^\circ$$

$$y = 3.5a = 3.5 \times 15^\circ = 52.5^\circ$$

$$3x - 2y = 3 \times 37.5^\circ - 2 \times 52.5^\circ$$

$$= 112.5^\circ - 105^\circ$$

$$= 7.5^\circ$$

$$= 7\frac{1}{2}^\circ$$

4. b - The diagonals of a rectangle meet at a perpendicular angle.

Explanation: The diagonals of a rectangle don't meet at a perpendicular angle.

5. d - $\angle B = 99.5^\circ$, $\angle O = 80.5^\circ$, $\angle A = 67.5^\circ$ and $\angle T = 112.5^\circ$

Explanation: $\angle A : \angle T = \sqrt[3]{27} : \sqrt{25}$

$$\text{Let } \angle A = \sqrt[3]{27} a = 3a$$

$$\angle T = \sqrt{25} a = 5a$$

In a trapezium BOAT, the sum of each pair of co-interior angles is 180° .

$$\angle A + \angle T = 180^\circ$$

$$\Rightarrow 3a + 5a = 180^\circ$$

$$\Rightarrow 8a = 180^\circ$$

$$\Rightarrow a = 22.5^\circ$$

$$\angle A = 3a = 3 \times 22.5^\circ = 67.5^\circ$$

$$\angle T = 5a = 5 \times 22.5^\circ = 112.5^\circ$$

$$\angle B = (x \sqrt{225-13})^\circ = (15x - 13)^\circ$$

$$\angle O = (x \sqrt[3]{125+43})^\circ = (5x + 43)^\circ$$

In a trapezium BOAT, the sum of each pair of co-interior angles is 180° .

$$\angle B + \angle O = 180^\circ$$

$$\Rightarrow (15x - 13)^\circ + (5x + 43)^\circ = 180^\circ$$

$$\Rightarrow 15x + 5x + 43^\circ - 13^\circ = 180^\circ$$

$$\Rightarrow 20x + 30^\circ = 180^\circ$$

$$\Rightarrow 20x = 150^\circ$$

$$\Rightarrow 20x = 150^\circ$$

$$\Rightarrow x = 7.5^\circ$$

$$\angle B = (15x - 13)^\circ$$

$$= (15 \times 7.5 - 13)^\circ$$

$$= (112.5 - 13)^\circ$$

$$= 99.5^\circ$$

$$\angle O = (5x + 43)^\circ$$

$$= (5 \times 7.5 + 43)^\circ$$

$$= (37.5 + 43)^\circ$$

$$= 80.5^\circ$$

All the angles of the trapezium BOAT are:

$$\angle B = 99.5^\circ, \angle O = 80.5^\circ, \angle A = 67.5^\circ \text{ and } \angle T = 112.5^\circ$$

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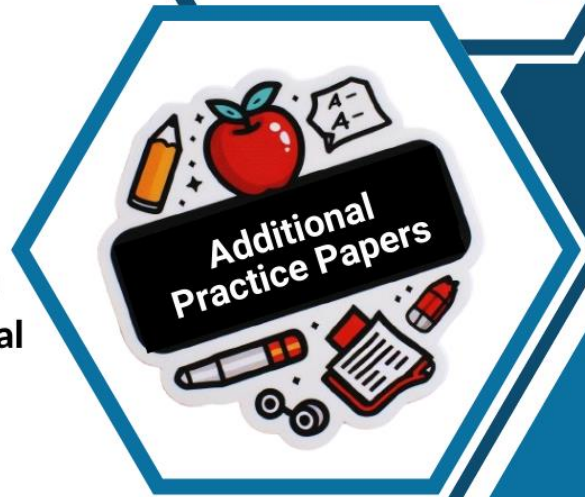
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