

# y6math1 Hard Answers

## Answer Key

### Question 1:

In a triangle, one angle is  $35^\circ$  and another is  $78^\circ$ . What is the size of the third angle? Is this triangle acute, right, or obtuse? Explain your reasoning.

**Answer:**  $180^\circ - 35^\circ - 78^\circ = 67^\circ$ . The triangle is acute because all angles are less than  $90^\circ$ .

### Question 2:

A straight line is divided into three angles. The first angle is  $42^\circ$ , the second is  $87^\circ$ . What is the third angle? If the line is extended to form a full revolution, what would the total of all three angles around the point be?

**Answer:** Third angle =  $180^\circ - 42^\circ - 87^\circ = 51^\circ$ . A full revolution totals  $360^\circ$ , so the total is  $360^\circ$ .

### Question 3:

Two angles are vertically opposite. One angle is measured as  $(3x + 15)^\circ$  and the other as  $96^\circ$ . Find the value of  $x$  and then determine the size of both angles.

**Answer:**  $3x + 15 = 96$ , so  $3x = 81$ ,  $x = 27$ . Both angles are  $96^\circ$  (vertically opposite angles are equal).

### Question 4:

A quadrilateral has interior angles of  $85^\circ$ ,  $92^\circ$ , and  $110^\circ$ . What is the size of the fourth interior angle? Could this shape be a parallelogram? Justify your answer.

**Answer:** Fourth angle =  $360^\circ - 85^\circ - 92^\circ - 110^\circ = 73^\circ$ . No, this cannot be a parallelogram because the angles do not add up to  $360^\circ$ .

### Question 5:

Angle A and Angle B are supplementary. Angle A is  $24^\circ$  more than twice Angle B. Find the size of both angles.

**Answer:** Let  $B = x$ , then  $A = 2x + 24$ . Supplementary:  $x + 2x + 24 = 180$ , so  $3x = 156$ ,  $x = 52^\circ$ .  $B = 52^\circ$ ,  $A = 128^\circ$ .

### Question 6:

At 4:15 on a clock face, calculate the angle between the hour hand and the minute hand. Show all working clearly.

**Answer:** At 4:15, hour hand is at  $127.5^\circ$  ( $4.25$  hours  $\times 30^\circ$ ). Minute hand is at  $90^\circ$ . Angle =  $127.5^\circ - 90^\circ = 37.5^\circ$ .

### Question 7:

A regular pentagon is drawn inside a circle. What is the size of each interior angle of the pentagon? Explain how the interior and exterior angles are related.

**Answer:** Interior angle of a regular pentagon =  $(5-2) \times 180^\circ \div 5 = 108^\circ$ . Exterior angle =  $180^\circ - 108^\circ = 72^\circ$ .

**Question 8:**

A ladder leans against a wall, making an angle of  $68^\circ$  with the ground. The ladder is 6 metres long. How far up the wall does the ladder reach? Round your answer to one decimal place and show your working.

**Answer:**  $\sin(68^\circ) = \frac{\text{height}}{6}$ , so  $\text{height} = 6 \times \sin(68^\circ) = 6 \times 0.9272 = 5.6 \text{ m}$  (1 d.p.)

**Question 9:**

A triangle has interior angles in the ratio 2 : 3 : 4. Find the size of each angle. Classify the triangle by its angles.

**Answer:**  $2x + 3x + 4x = 180$ , so  $9x = 180$ ,  $x = 20^\circ$ . Angles:  $40^\circ$ ,  $60^\circ$ ,  $80^\circ$ . The triangle is acute-angled.

**Question 10:**

Angle P and Angle Q are complementary. Angle P is four times larger than Angle Q. Find both angles. If Angle P is increased by  $15^\circ$ , are the angles still complementary? Explain.

**Answer:**  $P + Q = 90$ ,  $P = 4Q$ , so  $5Q = 90$ ,  $Q = 18^\circ$ ,  $P = 72^\circ$ . If P increased by  $15^\circ$  to  $87^\circ$ , then  $87 + 18 = 105 \neq 90$ , so they are not complementary.

**Question 11:**

A ship sails 50 km east, then 30 km north. What is the bearing from the starting point to the final position? Give your answer correct to one decimal place.

**Answer:**  $\tan^{-1}(30/50) = 30.96^\circ$ . Bearing =  $90^\circ - 30.96^\circ = 59.0^\circ$  (to 1 d.p.)

**Question 12:**

A regular octagon is placed inside a square so that four of its vertices touch the sides of the square. If the square has side length 20 cm, what is the side length of the octagon? Show your method.

**Answer:** Side length =  $20 \times (\sqrt{2} - 1) \approx 20 \times 0.414 = 8.28 \text{ cm}$ .

**Question 13:**

Two lines intersect, creating four angles. The sum of two adjacent angles is  $180^\circ$ . If one angle is  $115^\circ$ , find the other three angles. Prove that vertically opposite angles are equal using these values.

**Answer:** Adjacent angle =  $180^\circ - 115^\circ = 65^\circ$ . Angles:  $115^\circ$ ,  $65^\circ$ ,  $115^\circ$ ,  $65^\circ$ . Vertically opposite angles are equal.

**Question 14:**

A park has a triangular section with side lengths 120 m, 150 m, and 90 m. Determine whether this triangle is acute, right, or obtuse. Find the area of the triangular section using an appropriate formula.

**Answer:**  $90^2 + 120^2 = 8100 + 14400 = 22500 = 150^2$ , so it is a right triangle. Area =  $\frac{1}{2} \times 90 \times 120 = 5400 \text{ m}^2$ .

**Question 15:**

A wheel is divided into 8 equal sections. Through what angle does the wheel rotate when it turns through 3 and a half sections? Express your answer in degrees and as a fraction of a full turn.

**Answer:** One section =  $360^\circ \div 8 = 45^\circ$ . 3.5 sections =  $157.5^\circ$ . As a fraction:  $157.5/360 = 7/8$  of a full turn.