Year 9 Angles and Pythagoras – Challenge

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Answers and worked solutions · 8 questions

A. Think like a mathematician

1. No: $9^2 + 18^2 = 81 + 324 = 405$, but $21^2 = 441$.

Test Pythagoras' theorem with the longest side as the hypotenuse
$9^2 + 18^2 = 405$ and $21^2 = 441$
Not equal, so not right-angled

2. Walking round, you turn through each exterior angle once and end up facing the way you started: one full turn, 360°.

At each corner you turn through the exterior angle
After the last corner you face your starting direction
Total turn = one full turn = 360°

3. The formula is (n − 2) × 180: (7 − 2) × 180 = 900°.

Error: n × 180 instead of (n − 2) × 180
The polygon splits into 5 triangles
5 × 180 = 900°

4. For a shorter side, subtract: $\sqrt{(10^2 - 8^2)} = \sqrt{36} = 6$ cm.

Error: the squares were added, but the hypotenuse is already known
$x^2 = 100 - 64 = 36$
x = 6 cm

5. Yes. Its exterior angle is 30°, and 360 ÷ 30 = 12, so a regular dodecagon works.

Test an example
Its exterior angle is 30°, and 360 ÷ 30 = 12, so a regular dodecagon works.
Decide

6. 8 m

The ladder is the hypotenuse: $h^2 = 10^2 - 6^2 = 64$
h = √64 = 8 m

7. B = 66°, C = 114°, D = 66°

Co-interior angles between parallel sides add up to 180°
B = D = 180 − 114 = 66°
Opposite angles are equal: C = 114°

8. Construct a 60° angle (an equilateral triangle), then bisect it: 60 ÷ 2 = 30°.

Construct 60° first, using an equilateral triangle
Bisect it with equal arcs from the two arms
60 ÷ 2 = 30°