Unit 14 · Plane Figures

HARDER PRACTICE QUESTIONS · ANSWER KEY

Full marks 31

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 From one angle to the polygon

ANSWER A · 3

i. An interior and an exterior angle make a straight line: $5e + e = 180°$, so $e = \mathbf{30}°$.

ii. $n = \dfrac{360°}{30°} = \mathbf{12}$ sides.

iii. $(12 - 2) \times 180° = \mathbf{1800}°$.

MARKING SCHEME

✓ $e = 30°$.

✓ 12 sides.

✓ 1800°.

2 Is it possible?

ANSWER HA · 3

i. **No.** Each exterior angle would be 80°, and $360 \div 80 = 4.5$ isn't a whole number of sides.

ii. **No.** The sum must be a whole number of 180°s, and $1000 \div 180$ isn't whole.

iii. **Yes.** $1260 \div 180 = 7 = n - 2$, so $n = 9$: a polygon with 9 sides.

MARKING SCHEME

✓ i. No: $360 \div 80$ isn't whole.

✓ ii. No: 1,000 isn't a multiple of 180.

✓ iii. Yes, 9 sides.

3 One isosceles inside another

ANSWER A · 3

$\angle ABC = \angle ACB = \dfrac{180° - 40°}{2} = 70°$ (base angles of an isosceles triangle).

In $\triangle BDC$, $BD = BC$, so $\angle BDC = \angle BCD = 70°$, and $\angle DBC = 180° - 140° = 40°$.

$\angle ABD = 70° - 40° = \mathbf{30}°$.

MARKING SCHEME

✓ $\angle ABC = 70°$.

✓ $\angle DBC = 40°$.

✓ $\angle ABD = 30°$.

4 A rhombus with an angle of 120°

ANSWER HA · 4

i. The diagonal BD bisects $\angle ABC$, so $\angle ABD = \mathbf{60}°$. $AB = AD$, so the base angles are 60° each and the triangle is **equilateral**, with $BD = \mathbf{6\ cm}$.

ii. $BO = 3$ cm and the diagonals cross at right angles, so $AO = \sqrt{6^2 - 3^2} = \sqrt{27} \approx 5.196$ cm, and $AC \approx \mathbf{10.4\ cm}$.

iii. $\dfrac{1}{2} \times 6 \times 10.39 \approx \mathbf{31.2\ cm^2}$.

MARKING SCHEME

✓ $\angle ABD = 60°$.

✓ Equilateral, so $BD = 6$ cm.

✓ $AC \approx 10.4$ cm.

✓ About 31.2 cm^2.

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5 Who am I?

ANSWER A · 4

i. **Square.**
ii. **Rhombus.**
iii. **Rectangle.**
iv. **Kite.**

MARKING SCHEME

✓ Square.
✓ Rhombus.
✓ Rectangle.
✓ Kite.

6 Spot the error

ANSWER U · 3

The six triangles' angles include the angles round the point inside, which make a full turn of 360°.
Those are not interior angles of the hexagon.
$1080° - 360° = \mathbf{720°}$.
Formula: $(6 - 2) \times 180° = 720°$. ✓

MARKING SCHEME

✓ The angles round the inside point are counted too.
✓ Take away 360°: 720°.
✓ The formula gives 720°.

7 Construct it

ANSWER HA · 3

Draw $AC = 8$ cm and mark its midpoint O. At O, draw a line at 60° to AC. On it, mark $OB = OD = 3$ cm, on opposite sides of O. Join A, B, C and D.
The sides measure about **3.6 cm and 6.1 cm**.

MARKING SCHEME

✓ Started from a diagonal, using its midpoint.
✓ The second diagonal at 60°, 3 cm each side of the midpoint.
✓ The parallelogram drawn, with sides of about 3.6 cm and 6.1 cm.

8 In a real setting

ANSWER A · 4

i. $BP = 16$ cm, so $AP = \sqrt{34^2 - 16^2} = \sqrt{900} = \mathbf{30\ cm}$.
ii. $PC = 42 - 30 = 12$ cm, so $BC = \sqrt{12^2 + 16^2} = \sqrt{400} = \mathbf{20\ cm}$.
iii. $2 \times 34 + 2 \times 20 = \mathbf{108\ cm}$.
iv. $\frac{1}{2} \times 42 \times 32 = \mathbf{672\ cm^2}$.

MARKING SCHEME

✓ $AP = 30$ cm.
✓ $BC = 20$ cm.
✓ 108 cm.
✓ 672 cm^2.

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9 Think

ANSWER HA · 2

Each turn is the exterior angle at that corner. By the end he has faced every direction once and is facing the first way again: one full turn, 360°.
So the exterior angles of **any** polygon add up to 360°, whatever its number of sides.

MARKING SCHEME

- ✓ Each turn is an exterior angle.
- ✓ He makes one full turn, so the exterior angles add up to 360° for any polygon.

10 Make your own

ANSWER HA · 2

For example, 100°, 105°, 110°, 112° and 113°: they add up to $540° = (5 - 2) \times 180°$.
Exterior angles: 80°, 75°, 70°, 68°, 67°, which add up to 360°.

MARKING SCHEME

- ✓ Five angles that add up to 540°.
- ✓ The exterior angles, adding up to 360°.

See it at Science Playground

Exhibits and plants at the center, Bhaktapur, that go with this unit. Book a class visit at science-playground.com/booking.

- **Patterns from Straight Lines** (exhibit): Find the regular polygons of 3 to 16 sides drawn on one shared side: the more sides, the bigger each interior angle and the rounder the shape.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	0	3	14	14	**31**

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