Unit 16 · Solid Objects

HARDER PRACTICE QUESTIONS · ANSWER KEY

Full marks 28

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

1 From the edges

ANSWER A · 4

i. A prism with an n-sided base has $3n$ edges: $n = 5$, a **pentagon**. $F = 7$ and $V = 10$. Check: $7 + 10 = 15 + 2$. ✓

ii. A pyramid with an n-sided base has $2n$ edges: $n = 5$, a **pentagon**. $F = 6$ and $V = 6$.

iii. **No.** The number of edges of a pyramid is $2n$, always even.

MARKING SCHEME

- ✓ Pentagonal base, 7 faces and 10 vertices.
- ✓ The check with $F + V = E + 2$.
- ✓ Pentagonal base, 6 faces and 6 vertices.
- ✓ No: the edges of a pyramid are $2n$, an even number.

2 Cut off a corner

ANSWER HA · 3

The cube has $F = 6$, $V = 8$, $E = 12$. The cut adds 1 face; takes away 1 vertex and adds 3; and adds 3 edges.

$F = \mathbf{7}$, $V = \mathbf{10}$, $E = \mathbf{15}$. Check: $7 + 10 = 17 = 15 + 2$. ✓

MARKING SCHEME

- ✓ $F = 7$.
- ✓ $V = 10$ and $E = 15$.
- ✓ The check.

3 Will it fold?

ANSWER HA · 4

A folds. Name the squares: the row is left, floor, right and lid, and the other two are back and front. Each name comes up once.

B folds. It is a staircase of pairs, and each name comes up once.

C doesn't fold. Four squares round a corner (the block of four at the left) can't all stay flat: two squares would land on one face and one face would be left open.

D doesn't fold. Five squares in a row wrap all the way round: the first and the fifth land on the same face.

MARKING SCHEME

- ✓ A folds.
- ✓ B folds.
- ✓ C doesn't: its block of four squares puts two on one face.
- ✓ D doesn't: five in a row overlap.

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4 A box from one sheet

ANSWER A · 4

i. $2(5 \times 3 + 5 \times 2 + 3 \times 2) = 2 \times 31 = \mathbf{62\ cm^2}$.

ii. Strip: $5 + 3 + 5 + 3 = \mathbf{16\ cm}$ long. Height: $3 + 2 + 3 = \mathbf{8\ cm}$.

iii. Sheet: $16 \times 8 = 128\ cm^2$. Wasted: $128 - 62 = \mathbf{66\ cm^2}$, more than the box uses.

MARKING SCHEME

- ✓ $62\ cm^2$.
- ✓ 16 cm.
- ✓ 8 cm.
- ✓ $66\ cm^2$.

5 A tin's label

ANSWER A · 3

i. The rectangle wraps once round the circle, so its length is $2 \times \frac{22}{7} \times 7 = \mathbf{44\ cm}$, and its width is the height, **10 cm**.

ii. Rectangle: $440\ cm^2$. Circles: $2 \times \frac{22}{7} \times 49 = 308\ cm^2$. Total: $\mathbf{748\ cm^2}$.

MARKING SCHEME

- ✓ The length is the circumference, 44 cm, and the width 10 cm.
- ✓ $440\ cm^2$ and $308\ cm^2$.
- ✓ $748\ cm^2$.

6 From a sector to a cone

ANSWER HA · 3

i. Half of $2 \times \frac{22}{7} \times 14$: **44 cm**.

ii. The arc goes round the base: $2\pi r = 44$, so $r = \mathbf{7\ cm}$.

iii. The arc is half as long, 22 cm, so $r = \mathbf{3.5\ cm}$.

MARKING SCHEME

- ✓ 44 cm.
- ✓ 7 cm, since the arc equals the base's circumference.
- ✓ 3.5 cm.

7 Spot the error

ANSWER U · 3

$F + V = 4 + 6 = 10$, but $E + 2 = 11$, so the numbers don't fit.
A triangle has three sides, so three rectangles join the two triangles. His net **lacks a rectangle**.
With $F = 5$: $5 + 6 = 11 = 9 + 2$. ✓

MARKING SCHEME

- ✓ $10 \neq 11$.
- ✓ A rectangle is missing: a triangular prism has three.
- ✓ $F = 5$, which fits.

8 Think

ANSWER HA · 2

$3 + 0 = 3$, but $2 + 2 = 4$, so **it doesn't work**.
That is no surprise: the rule is for solids with **flat faces**, and a cylinder has a curved surface and round edges, with no vertices.

MARKING SCHEME

- ✓ $3 \neq 4$.
- ✓ The rule is only for solids with flat faces.

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9 Make your own

HA · 2

ANSWER

Opposite squares are never next to each other: the first and third squares of the row are opposite, the second and fourth are opposite, and the square above is opposite the square below.
For example, the row 1, 2, 6, 5, with 3 above and 4 below.

MARKING SCHEME

- ✓ The three pairs of opposite squares.
- ✓ Numbers placed so that each pair adds up to 7.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	0	3	11	14	**28**

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