Chapter 5 Gifted and Enrichment Answers

1.
$$V = lwh$$
$$0.15 = 0.1 \times 0.1 \times h$$
$$0.15 = 0.01 \times h$$
$$0.15 \div 0.01 = h$$
$$15 = h$$

The height of the rectangular prism is 15 m. So, there are 4 faces measuring 15 m by 0.1 m and 2 faces measuring 0.1 m by 0.1 m.

Surface area
= area of all 6 faces
$= (4 \times 15 \times 0.1) + (2 \times 0.1 \times 0.1)$
$= 6 + 0.02$
$= 6.02$

The surface area of the rectangular prism is 6.02 m.

2. If a rectangular prism has a base that comprises 12.5% of its surface area, then both bases comprise 25% of the surface area and the four other faces comprise 75% of the surface area.

Try a simple square-based rectangular prism with base 2 cm by 2 cm.

A(base) $= 2 \times 2$, or 4
A(both bases) $= 2 \times 4$, or 8
25% of surface area is 8 cm^2.
50% would be 16 cm^2.
75% would be 24 cm^2.
If 4 identical (because base is square) faces have an area of 24 cm^2, then one would have an area of $24 \div 4$, or 6 cm^2.

A(rectangular face) $= lw$
$$6 = l \times 2$$
$$6 \div 2 = l$$
$$3 = l$$

A rectangular prism measuring 2 cm by 2 cm by 3 cm has a base comprising 12.5% of its surface area. There may be others. So, it is possible.

3. There are a total of 21 black circles on a standard die.

A(circle) $= \pi r^2$
$$\approx 3.14 \times 1.5^2$$
$$\approx 7.065$$

Area of 21 circles $= 21 \times 7.065$
$= 148.365$

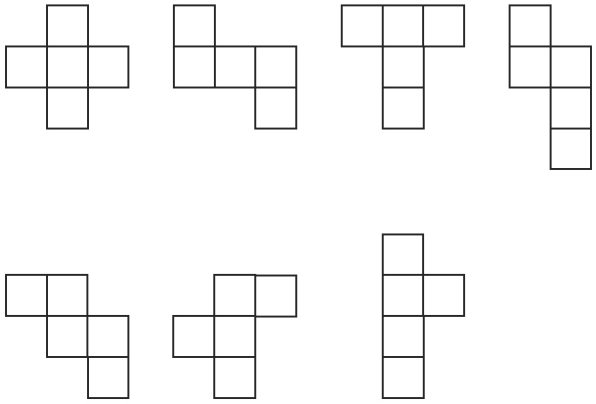
There are 6 square faces.

Surface area $= 6 \times lw$
$= 6 \times 15 \times 15$
$= 1350$

Surface area(white portion)
= surface area of all faces – area of circles
= 1350 – 148.365
= 1201.635
≈ 1201.6

The white portion of the die is approximately 1201.6 mm^2.

4. There are 7 other pentominoes.



5. Completed rows are:

1, 6, 1×1, 6

8, 6, $\frac{1}{2} \times \frac{1}{2}$, 12

27, 6, $\frac{1}{3} \times \frac{1}{3}$, 18

64, 6, $\frac{1}{4} \times \frac{1}{4}$, 24

125, 6, $\frac{1}{5} \times \frac{1}{5}$, 30

To complete the last column, I calculated:

Total surface area
= number of cubes × number of faces × A(square face)
$= 1 \times 6 \times 1 \times 1$
= 6

and $8 \times 6 \times \frac{1}{2} \times \frac{1}{2} = 12$

and $27 \times 6 \times \frac{1}{3} \times \frac{1}{3} = 18$

and $64 \times 6 \times \frac{1}{4} \times \frac{1}{4} = 24$

and $125 \times 6 \times \frac{1}{5} \times \frac{1}{5} = 30$

The total surface area increases by 6 square units.