

# Filling and Wrapping Answers

## Investigation 1

1. i. a.  $10\text{ cm} \times 10\text{ cm} \times 40\text{ cm}$   
 b.  $1800\text{ cm}^2$   
 c. 4000  
 ii. a.  $5\text{ cm} \times 5\text{ cm} \times 5\text{ cm}$   
 b.  $150\text{ cm}^2$   
 c. 125  
 iii. a.  $2.5\text{ cm} \times 2.5\text{ cm} \times 2.5\text{ cm}$   
 b.  $31.25\text{ cm}^2$   
 c. 15.625  
 iv. a.  $6\text{ cm} \times 12\text{ cm} \times 30\text{ cm}$   
 b.  $1224\text{ cm}^2$   
 c. 2160
2. a.  $54\text{ ft}^2$   
 b. 3 ft; The sheet of cardboard can be divided into six  $3\text{ ft} \times 3\text{ ft}$  squares. Each square is a face of the resulting box.  
 c. 27
3. a. Four sides have area  $2\text{ ft}^2$ , and two sides have area  $1\text{ ft}^2$ .  
 b.  $1\text{ ft} \times 1\text{ ft} \times 2\text{ ft}$   
 c. 2
4. The square could be put on sides B, C, D, E, G, H, J, or K (anywhere, that is, except A or F).
5. The square could be put on sides H, J, K, or L.

## Skill: Area Review

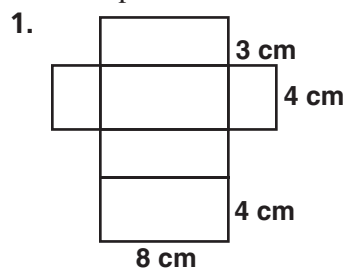
- |   |  |                        |
|---|--|------------------------|
| 1. $16\text{ m}^2$                        | 2. $115\text{ cm}^2$                   | 3. $32\text{ in.}^2$   |
| 4. $80\text{ mm}^2$                       | 5. $299\text{ cm}^2$                   | 6. $59.22\text{ mi}^2$ |
| 7. $26.8\text{ km}^2$                     | 8. $1,325\text{ yd}^2$                 | 9. $135\text{ ft}^2$   |
| 10. $199.82\text{ mm}^2$                  | 11. $240\text{ in.}^2$                 |                        |
| 12. $96.25\text{ mi}^2$                   | 13. $88\text{ m}^2$                    |                        |
| 14. $144\text{ in.}^2$                    | 15. $9.4\text{ in.}; 7.1\text{ in.}^2$ |                        |
| 16. $12.6\text{ m}; 12.6\text{ m}^2$      | 17. $22.0\text{ ft}; 38.5\text{ ft}^2$ |                        |
| 18. $37.7\text{ km}; 113.1\text{ km}^2$   |  |                        |
| 19. $25.1\text{ mi}; 50.3\text{ mi}^2$    |  |                        |
| 20. $94.2\text{ in.}; 706.9\text{ in.}^2$ |  |                        |

## Investigation 2

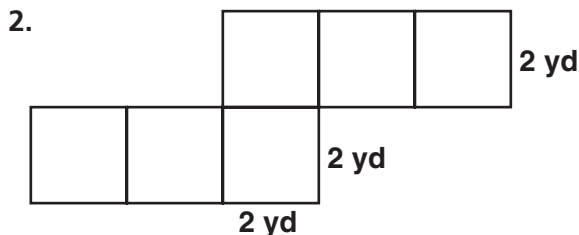
1. Answers will vary.  
 Possible answer:  $8\text{ cm} \times 5\text{ cm} \times 10\text{ cm}$ ;  
 $8\text{ cm} \times 2\text{ cm} \times 25\text{ cm}$ ;  
 $8\text{ cm} \times 4\text{ cm} \times 12.5\text{ cm}$
2. a.  $2\text{ cm} \times 4\text{ cm} \times 6\text{ cm}$   
 b.  $88\text{ cm}^2$   
 c.  $48\text{ cm}^3$   
 d. Answers will vary:  
 Possible answers:  $2\text{ cm} \times 8\text{ cm} \times 3\text{ cm}$ ;  
 $92\text{ cm}^2$ ;  $4\text{ cm} \times 4\text{ cm} \times 3\text{ cm}$ ;  $80\text{ cm}^2$ ;  
 $1\text{ cm} \times 8\text{ cm} \times 6\text{ cm}$ ;  $124\text{ cm}^2$
3. a.  $408\text{ in}^2$   
 b. It would take  $6 \times 4 = 24$  cubes to fill the bottom layer and  $24 \times 18 = 432$  to fill the box.
4. a.  $4\text{ cm} \times 6\text{ cm} \times 8\text{ cm}$   
 b.  $208\text{ cm}^2$   
 c. It would take  $6 \times 8 = 48$  cubes to make the bottom layer and  $48 \times 4 = 192$  cubes to make the prism.
5. i. a.  $92\text{ cm}^2$   
 b.  $42\text{ cm}^3$   
 ii. a.  $336\text{ cm}^2$   
 b.  $396\text{ cm}^3$   
 iii. a.  $234\text{ cm}^2$   
 b.  $202.5\text{ cm}^3$
6. a.  $1 \times 1 \times 5$  (22 sq. units)  
 b.  $1 \times 2 \times 3$  (22 sq. units)  
 c.  $1 \times 1 \times 7$  (30 sq. units)  
 d.  $2 \times 2 \times 2$  (24 sq. units)
7.  $1 \times 1 \times N$  is the only arrangement when N is a prime (or when N is 1).

## Skill: Surface Area of a Box

1–2. Sample answers



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3.  $64 \text{ in.}^2$     4.  $236 \text{ ft}^2$     5.  $104 \text{ in.}^2$   
 6.  $94 \text{ yd}^2$     7.  $594 \text{ cm}^2$     8.  $418 \text{ m}^2$   
 9.  $1,160 \text{ ft}^2$     10.  $3,150 \text{ in.}^2$     11.  $157 \text{ mm}^2$   
 12.  $430.5 \text{ in.}^2$

## Skill: Volume of a Box

1.  $1,120 \text{ in.}^3$     2.  $640 \text{ ft}^3$   
 3.  $3,136 \text{ cm}^3$     4.  $1,512 \text{ m}^3$   
 5.  $210 \text{ m}^3$     6.  $168 \text{ cm}^3$   
 7.  $125 \text{ in.}^3$     8.  $96 \text{ ft}^3$

## Investigation 3

1. The volume is the area of the triangular base times the height,  
 $\frac{1}{2}(4)(9.5)(14) = 266 \text{ cm}^3$ .
2.  $V = (\text{area of base}) \times h$ . In this case,  
 $275 = 25 \times h$ , so  $h = 11 \text{ cm}$ .
3. Answers will vary.  
 Possible answer:  $10 \text{ cm} \times 3 \text{ cm} \times 8 \text{ cm}$ ,  
 $12 \text{ cm} \times 10 \text{ cm} \times 2 \text{ cm}$ , and  $8 \text{ cm} \times$   
 $6 \text{ cm} \times 5 \text{ cm}$
4. a.  $288\pi \approx 904.8 \text{ cm}^2$   
 b.  $640\pi \approx 2,010.6 \text{ cm}^3$
5. i. a.  $840\pi \approx 2,639 \text{ cm}^2$   
 b.  $3,200\pi \approx 10,053 \text{ cm}^3$   
 ii. a.  $824.5\pi \approx 2,590.2 \text{ cm}^2$   
 b.  $2,890\pi \approx 9,079.2 \text{ cm}^3$   
 iii. a.  $312\pi \approx 980.2 \text{ cm}^2$   
 b.  $720\pi \approx 2,261.9 \text{ cm}^3$
6. a.  $8\pi \approx 25.13 \text{ m}^2$   
 b.  $3\pi \approx 9.42 \text{ m}^3$
7. a.  $275\pi \approx 863.94 \text{ cm}^2$   
 b.  $625\pi \approx 1963.5 \text{ cm}^3$

8. The volume of a triangular prism is  $(\frac{1}{2})bh$  (height); that is, the area of the triangle ( $\frac{1}{2}bh$ ) times the height of the prism. Since the height of the triangle increases, the height of the prism must decrease correspondingly.

$$(\frac{1}{2})(6)(2)(80) = (\frac{1}{2})(6)(4)(40) =$$

$(\frac{1}{2})(6)(8)(20)$ , so the heights of the prisms are 80, 40, and 20, respectively.

9.  $(\frac{1}{2})(6)(2)(80) = (\frac{1}{2})(12)(4)(20) =$

$(\frac{1}{2})(24)(8)(5)$ , so the heights of the prisms are 80, 20, and 5, respectively.

## Skill: Volume of a Prism or a Cylinder

1. cylinder    2. rectangular prism  
 3. triangular prism    4. hexagonal prism  
 5.  $628 \text{ m}^3$     6.  $1,408 \text{ cm}^3$   
 7.  $147,706 \text{ in.}^3$     8.  $726 \text{ in.}^3$   
 9.  $480 \text{ ft}^3$     10.  $25,434 \text{ cm}^3$   
 11.  $8,139 \text{ m}^3$     12.  $113 \text{ in.}^3$

## Skill: Nets and Surface Area

1. square prism    2. pentagonal prism  
 3. triangular prism    4. cylinder  
 5. cube    6.  $408 \text{ m}^2$   
 7.  $1,176 \text{ in.}^2$     8.  $660 \text{ cm}^2$   
 9.  $51,616 \text{ cm}^2$     10.  $1,539 \text{ in.}^2$   
 11.  $9,953 \text{ ft}^2$

## Investigation 4

1. a.  $\frac{256\pi}{3} \approx 268.1 \text{ cm}^3$   
 b.  $30\pi \approx 94.2 \text{ in}^3$   
 c.  $250\pi \approx 785.4 \text{ cm}^3$   
 d.  $\frac{4000\pi}{3} \approx 4188.8 \text{ cm}^3$   
 e.  $3,258\pi \approx 11,083.5 \text{ in}^3$   
 (or  $2.04\pi \approx 6.41 \text{ ft}^3$ )  
 f.  $76.67\pi \approx 240.9 \text{ cm}^3$
2. a.  $36\pi \approx 113.1 \text{ cm}^3$   
 b.  $45 \text{ cm}^3$   
 c.  $300.3\pi \approx 943.5 \text{ cm}^3$   
 d.  $665.5\pi \approx 2,090.7 \text{ cm}^3$

# Filling and Wrapping Answers

3. a.  $81\pi \approx 254.5 \text{ ft}^2$   
 b.  $270\pi \approx 848.2 \text{ ft}^3$
4. a. 14 cm  
 b.  $2,100\pi \approx 6,597.3 \text{ cm}^3$   
 c.  $262.5\pi \approx 824.7 \text{ cm}^3$   
 d. 8
5.  $\frac{32\pi}{3} \text{ m}^3$ , or about  $33.5 \text{ m}^3$
6. a. Volume =  $\pi(2)(2)(10) = 40\pi \approx 125.7 \text{ cm}^3$   
 b.  $80\pi \approx 251.3 \text{ cm}^3$  (twice as much)  
 c.  $160\pi \approx 502.6 \text{ cm}^3$  (four times as much)  
 d.  $320\pi \approx 1,005.3 \text{ cm}^3$  (eight times as much)

## Skill: Cones, Pyramids, and Spheres

1.  $3,052 \text{ ft}^3$     2.  $1,728 \text{ in.}^3$     3.  $1,272 \text{ in.}^3$   
 4.  $33 \text{ m}^3$     5.  $33 \text{ mm}^3$     6.  $5,572 \text{ cm}^3$

## Investigation 5

1. a.  $V = 32 \text{ ft}^3$ ;  $SA = 64 \text{ ft}^2$   
 b. Answers will vary.  
 Possible answer: a  $2\text{ft} \times 2\text{ft} \times 2\text{ft}$  box, which has a surface area of  $24 \text{ ft}^2$ .  
 c. Answer will depend on answer to part (b). For the answer given above, 8:3
2. a. Answers will vary.  
 Possible answer:  $4 \times 2 \times 10$   
 b. No, another box would have dimensions  $8 \times 2 \times 5$ .
3. a. height = 6 cm; radius = 2 cm

- b. Yes, the cone in part a is the only possibility because the height and radius must be scaled down by the same scale factor for cones to be similar.
4. a. The 6-cm sphere has 3.375 times more volume. The volume increases by the scale factor cubed,  $(1.5)^3 = 3.375$ .  
 b. Yes, the two spheres are similar. All spheres are similar to one another.
5. 3 cm
6. a. 14 cm; The ratio of the radius of the water to its height is 8:16. For the height of  $12 + 16 = 28 \text{ cm}$ , the radius must be in the same ratio: 14:28.  
 b.  $341.3\pi \approx 1,072.3 \text{ cm}^3$   
 c.  $5747.0 \text{ cm}^3$ ; The radius at the top is 14 cm, and the height is 28, so volume =  $\frac{1}{3}(14^2)(28)\pi = 1,829.3\pi \approx 5,747.0 \text{ cm}^3$ .
7. The volume of the cube is  $125 \text{ ml} = 125 \text{ cm}^3$ . Since  $5^3 = 125$ , each edge of the cube has a length of 5 cm.
8. a.

Closed Box	Surface Area	Volume
A: 1-2-3 box	22	6
B: 2-4-6 box	88	48
C: 3-6-9 box	198	162
D: 4-8-12 box	352	384

- b. (Figure 1)  
 c. The ratio of surface areas is the square of the ratio of dimensions. The ratio of volumes is the cube of the ratio of dimensions.

Figure 1

Boxes to Compare	Ratio of Dimensions	Ratio of Surface Areas	Ratio of Volumes
B and A	2 to 1	4 to 1	8 to 1
C and A	3 to 1	9 to 1	27 to 1
D and A	4 to 1	16 to 1	64 to 1
D and B	2 to 1	4 to 1	8 to 1
C and B	$\frac{3}{2}$ to 1 or 3 to 2	$\frac{9}{4}$ to 1 or 9 to 4	$\frac{27}{8}$ to 1 or 27 to 8
D and C	$\frac{4}{3}$ to 1 or 4 to 3	$\frac{16}{9}$ to 1 or 16 to 9	$\frac{64}{27}$ to 1 or 64 to 27