FOMP 10 Chapter 2 Review Pack v1
Answer Section

SHORT ANSWER

1. ANS:

a) $V = \frac{1}{3}lwh$

$V = \frac{1}{3}(4)(4)(9)$

$V = 48$

The volume of the right pyramid is 48 mm^3.

b) $V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}\pi (25)^3$

$V = 20\,833.333\pi$

$V = 65\,449.8469\ldots$

The volume of the sphere is approximately 65 449.8 cm^3.

c) $V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\pi (7.5)^2 (20)$

$V = 375\pi$

$V = 1178.097\ldots$

The volume of the right cone is approximately 1178.1 $in.^3$.

PTS: 1 DIF: 1-2 OBJ: Section 2.3 NAT: M3 | AN3
TOP: Volume KEY: calculate volume | imperial | right cone | right pyramid | SI | sphere

2. ANS:

2.7 ft^2

$$area = 85\ cm * 30\ cm \frac{(1\ in)^2}{(2.54\ cm)^2}\frac{(1\ ft)^2}{(12\ in)^2} = 2.7\ ft^2$$

PTS: 1 DIF: 1-2 OBJ: Section 2.1 NAT: M1
TOP: Units of Area and Volume KEY: conversion factors | convert SI to imperial

3. ANS:
0.151 m^2

$$area = 29\ cm * 52\ cm \frac{(1\ m)^2}{(100\ cm)^2} = 0.151\ m^2$$

PTS: 1 DIF: 1-2 OBJ: Section 2.1 NAT: M1
TOP: Units of Area and Volume KEY: convert within the SI system

4. ANS:
$V = \pi r^2 h$

PTS: 1 DIF: 1-2 OBJ: Section 2.3 NAT: M3
TOP: Volume KEY: formula | right cylinder | volume

5. ANS:
$SA = 2\pi r^2 + 2\pi rh$

PTS: 1 DIF: 1-2 OBJ: Section 2.2 NAT: M3
TOP: Surface Area KEY: formula | right cylinder | surface area

6. ANS:
22 cm^2

$$SA = 2(1\ cm * 2\ cm + 1\ cm * 3\ cm + 2\ cm * 3\ cm) = 22\ cm^2$$

PTS: 1 DIF: 1-2 OBJ: Section 2.2 NAT: M3
TOP: Surface Area KEY: calculate surface area | right prism | SI

7. ANS:
33.1 ft

$$volume = 725\ ft^3 = \left(21.9\ ft^2\right)h$$

$$h = \frac{\left(725\ ft^3\right)}{21.9\ ft^2} = 33.1\ ft$$

PTS: 1 DIF: 3-4 OBJ: Section 2.3 NAT: M3
TOP: Volume KEY: determine height from volume and base | imperial | right prism

8. ANS:
360 m^3

$$volume_{right\ pyramid} = \frac{volume_{right\ prism}}{3}$$

$$volume_{right\ prism} = 3 * volume_{right\ pyramid} = 3 * 120\ m^3 = 360\ m^3$$

PTS: 1 DIF: 3-4 OBJ: Section 2.3 NAT: M3
TOP: Volume KEY: calculate volume | problem solving | right prism | right pyramid | SI

9. ANS:
280 ft^3

$$volume_{right\ pyramid} = \frac{volume_{right\ prism}}{3} = \frac{840\ ft^3}{3} = 280\ ft^3$$

PTS: 1 DIF: 3-4 OBJ: Section 2.3 NAT: M3
TOP: Volume KEY: calculate volume | imperial | problem solving | right prism | right pyramid

10. ANS:
14000 mm^3

$$volume_{right\ prism} = area_{base} * height = 140\ mm^2 * 10\ cm\frac{10\ mm}{1\ cm} = 14000\ mm^3$$

PTS: 1 DIF: 3-4 OBJ: Section 2.1 | Section 2.3
NAT: M1 | M3 TOP: Units of Area and Volume | Volume
KEY: calculate volume | convert within the SI system | right prism

11. ANS:
190.2 yd^3

$$volume_{right\ pyramid} = \frac{area_{base} * height}{3} = \frac{44.8\ yd^2 * 38.2\ ft}{3}\ \frac{1\ yd}{3\ ft} = 190.2\ yd^3$$

PTS: 1 DIF: 3-4 OBJ: Section 2.1 | Section 2.3
NAT: M1 | M3 TOP: Units of Area and Volume | Volume
KEY: calculate volume | convert within the imperial system | right pyramid

12. ANS:
5 mm

$$SA = 946\ mm^2 = 2(22\ mm * 11\ mm + 22 * h + 11 * h)$$

$$473\ mm^2 = 22\ mm * 11\ mm + 22 * h + 11 * h$$

$$231\ mm^2 = (22\ mm + 11\ mm) * h$$

$$h = 7\ mm$$

PTS: 1 DIF: 3-4 OBJ: Section 2.2 NAT: M3
TOP: Surface Area
KEY: determine height from surface area, length, and width | right prism | SI

13. ANS:
641 cm^2

$$area_{bases} = 2\pi\left(\frac{10.8\ cm}{2}\right)^2 = 183.22\ cm^2$$

$$area_{lateral} = \pi * 10.8\ cm * 13.5\ cm = 458.04\ cm^2$$

$$SA = 183.22\ cm^2 + 458.04\ cm^2 = 641\ cm^2$$

PTS: 1 DIF: 3-4 OBJ: Section 2.2 NAT: M3 | AN3
TOP: Surface Area KEY: right cylinder | calculate surface area | SI

14. ANS:
217 cm^2

$$radius = \frac{6\ cm}{2} = 3\ cm$$

$$base = \pi(3\ cm)^2 = 28.3\ cm^2$$

$$lateral = \pi * (3\ cm)(20\ cm) = 188.5\ cm^2$$

$$SA = 28.3\ cm^2 + 188.5\ cm^2 = 217\ cm^2$$

PTS: 1 DIF: 3-4 OBJ: Section 2.2 NAT: M3 | AN3
TOP: Surface Area KEY: calculate surface area | right cone | SI | slant height

15. ANS:
295 mm^2

$$slant = \sqrt{(4.5\ mm)^2 + (11\ mm)^2} = 11.885\ mm$$

$$SA = area_{base} + 4 * area_{triangle} = 9\ mm * 9\ mm + 2 * 11.885\ mm * 9\ mm = 295\ mm^2$$

PTS: 1 DIF: 3-4 OBJ: Section 2.2 NAT: M3
TOP: Surface Area
KEY: calculate surface area | right pyramid | SI | slant height | square root

16. ANS:
7.7 in.

$$area_{base} = \frac{2645\ in^3}{14.2\ in} = 186.27\ in^2$$

$$radius^2 = \frac{186.27\ in^2}{\pi} = 59.29\ in^2$$

$$radius = \sqrt{59.29\ in^2} = 7.7\ in$$

PTS: 1 DIF: 3-4 OBJ: Section 2.3 NAT: M3 | AN3
TOP: Volume KEY: determine radius from volume and height | imperial | right cylinder | square root

17. ANS:
5.6 m

$$area_{bases} = 2\pi(8.6\ m)^2 = 464.7\ m^2$$

$$area_{lateral} = SA - area_{bases} = 767\ m^2 - 464.7\ m^2 = 302.6\ m^2$$

$$302.6\ m^2 = 2\pi rh$$

$$h = \frac{302.6\ m^2}{2\pi r} = \frac{302.6\ m^2}{2\pi * 8.6\ m} = 5.6\ m$$

PTS: 1 DIF: 3-4 OBJ: Section 2.2 NAT: M3 | AN3
TOP: Surface Area
KEY: determine height from surface area and radius | right cylinder | SI

18. ANS:
7238 cm^3

$$volume = \frac{4\pi\left(\frac{24\ cm}{2}\right)^3}{3} = 7238\ cm^3$$

PTS: 1 DIF: 3-4 OBJ: Section 2.3 NAT: M3 | AN3
TOP: Volume KEY: calculate volume | SI | sphere

19. ANS:
24 $in.^3$

$$area_{base} = \pi\left(\frac{3\ in}{2}\right)^2 = 7.07\ in^2$$

$$volume = \frac{7.07\ in^2 * 10.3\ in}{3} = 24\ in^3$$

PTS: 1 DIF: 3-4 OBJ: Section 2.3 NAT: M3 | AN3
TOP: Volume KEY: calculate volume | imperial | right cone

20. ANS:
3.6 mm

$$area_{base} = \pi(2.7\ mm)^2 = 22.9\ mm^2$$

$$volume = 27.5\ mm^3 = \frac{22.9\ mm^2 * h}{3}$$

$$h = \frac{3 * 27.5\ mm^3}{22.9\ mm^2} = 3.6\ mm$$

PTS: 1 DIF: 3-4 OBJ: Section 2.3 NAT: M3 | AN3
TOP: Volume KEY: determine height from volume and radius | right cone | SI

21. ANS:
113.6 $in.^3$

$$volume_9 = \frac{4\pi * \left(\frac{9\ in}{2}\right)^3}{3} = 381.7\ in^3$$

$$volume_8 = \frac{4\pi * \left(\frac{8\ in}{2}\right)^3}{3} = 268.1\ in^3$$

$$air\ needed = 381.7\ in^3 - 268.1\ in^3 = 113.6\ in^3$$

PTS: 1 DIF: 3-4 OBJ: Section 2.3 NAT: M3 | AN3
TOP: Volume KEY: calculate volume | imperial | problem solving | sphere

22. ANS:
38 cm^3

$$radius = \frac{2\ cm}{2} = 1\ cm$$

$$area_{base} = \pi(1\ cm)^2 = 3.1\ cm^2$$

$$volume = 3.1\ cm^2 * 16\ cm = 50\ cm^3$$

$$water = \frac{3}{4} 50\ cm = 38\ cm^3$$

PTS: 1 DIF: 3-4 OBJ: Section 2.3 NAT: M3 | AN3
TOP: Volume KEY: problem solving | right cylinder | SI | volume

23. ANS:
a) $SA = 2\pi r^2 + 2\pi rh$
$SA = 2\pi(1)^2 + 2\pi(1)(3.4)$
$SA = 2\pi + 6.8\pi$
$SA = 8.8\pi$
$SA = 27.646...$
The surface area of the cylinder is approximately 27.6 m^2.
$V = \pi r^2 h$
$V = \pi(1)^2(3.4)$
$V = 10.681...$
The volume of the cylinder is approximately 10.7 m^3.

b) $SA = 2\pi r^2 + 2\pi rh$
$SA = 2\pi(7.8)^2 + 2\pi(7.8)(2)$
$SA = 121.68\pi + 31.2\pi$
$SA = 152.88\pi$
$SA = 480.286...$
The surface area of the cylinder is approximately 480.3 yd^2.
$V = \pi r^2 h$
$V = \pi(7.8)^2(2)$
$V = 121.68\pi$
$V = 382.268...$
The volume of the cylinder is approximately 382.3 yd^3.

PTS: 1 DIF: 3-4 OBJ: Section 2.2 | Section 2.3
NAT: M3 | AN3 TOP: Surface Area | Volume
KEY: calculate surface area | calculate volume | imperial | right cylinder | SI

24. ANS:
53.4 ft^2

$$slant_1 = \sqrt{\left(\frac{2\,ft}{2}\right)^2 + \left(2\,yd\frac{3\,ft}{1\,yd}\right)^2} = 6.083\,ft$$

$$slant_2 = \sqrt{\left(\frac{5\,ft}{2}\right)^2 + \left(2\,yd\frac{3\,ft}{1\,yd}\right)^2} = 6.5\,ft$$

$$area = 2\,ft * 5\,ft + 2\,ft * 6.5\,ft + 5\,ft * 6.083\,ft = 53.4\,ft^2$$

PTS: 1 DIF: 5-6 OBJ: Section 2.1 | Section 2.2
NAT: M1 | M3 | AN3 TOP: Units of Area and Volume | Surface Area
KEY: calculate surface area | convert within the imperial system | right pyramid

25. ANS:
93 ft^2

$$area_{bases} = 2\pi(2\,ft)^2 = 25.1\,ft^2$$

$$area_{lateral} = 2\pi * 2\,ft * 1.8\,yd\frac{3\,ft}{1\,yd} = 67.9\,ft^2$$

$$SA = 25.1\,ft^2 + 67.9\,ft^2 = 93\,ft^2$$

PTS: 1 DIF: 5-6 OBJ: Section 2.1 | Section 2.2
NAT: M1 | M3 | AN3 TOP: Units of Area and Volume | Surface Area
KEY: calculate surface area | convert within the imperial system | right cylinder

26. ANS:
Let r_c be the radius of the cone and r_s be the radius of the sphere.
Volume of sphere = volume of cone

$$\frac{4}{3}\pi r_s^3 = \frac{1}{3}\pi r_c^2 h$$

$$4\pi r_s^3 = \pi r_c^2 h$$

$$4r_s^3 = r_c^2 h$$

$$4r_s^3 = (8)^2(12)$$

$$4r_s^3 = 768$$

$$r_s^3 = 192$$

$$r_s = \sqrt[3]{192}$$

$$r_s = 5.768\ldots$$

The radius of the sphere is approximately 5.8 cm.

PTS: 1 DIF: 5-6 OBJ: Section 2.3 NAT: M3 | AN3
TOP: Volume KEY: cube root | problem solving | right cone | SI | sphere | volume

27. ANS:
a) $SA = 2lw + 2lh + 2wh$
$SA = 2(2)(2) + 2(2)(4) + 2(2)(4)$
$SA = 40$
The surface area of the right prism is 40 m^2.

b) $SA = 6(\text{area of base})$
$SA = 6(4)(4)$
$SA = 96$
The surface area of the cube is 96 m^2.

c) $SA = lw + 4\left[\frac{1}{2}(l)(s)\right]$

$SA = (3)(3) + 4\left[\frac{1}{2}(3)(5)\right]$

$SA = 9 + 30$

$SA = 39$
The surface area of the pyramid is 39 m^2.

d) Determine the height of the triangular base using the Pythagorean relationship.
$h = \sqrt{(2)^2 - (1)^2}$
$h = \sqrt{3}$
$h = 1.732\ldots$
The height of each triangle is approximately 1.73 m.
SA = 2(area of triangular base) + 3(area of rectangular face)
$SA \approx 2\left[\frac{1}{2}(2)(1.732)\right] + 3(2)(6)$
$SA \approx 3.464 + 36$
$SA \approx 39.464$
The surface area of the equilateral triangular prism is approximately 39.5 m^2.
The cube has the greatest surface area.

PTS: 1 DIF: 5-6 OBJ: Section 2.2 NAT: M3 | AN3
TOP: Surface Area
KEY: calculate surface area | cube | problem solving | right prism | right pyramid | SI | square root

28. ANS:
Convert the dimensions to feet. Use 1 m $\approx$ 3.281 ft.
13.5 m $\approx$ 13.5(3.281)
$\approx$ 44.2935 ft
22 m $\approx$ 22(3.281)
$\approx$ 72.182 ft
The known dimensions are approximately 44.2935 ft and 72.182 ft.
Determine the length of base *b* of the right triangle using the Pythagorean relationship.

$$b^2 + 44.2935^2 \approx 72.182^2$$
$$b^2 + 1961.9141 \approx 5210.2411$$
$$b^2 \approx 3248.327$$
$$b \approx \sqrt{3248.327}$$
$$b \approx 56.994...$$

The length of the base is approximately 57.0 ft, to the nearest tenth of a foot.
Use the formula for the area of a triangle.

$$A = \frac{1}{2}bh$$
$$A \approx \frac{1}{2}(57)(44.3)$$
$$A \approx 1262.55$$

The area of Natasha's garden is approximately 1263 ft^2.

PTS: 1 DIF: 5-6 OBJ: Section 2.1 NAT: M1 | AN3
TOP: Units of Area and Volume KEY: area | conversion factors | convert SI to imperial

29. ANS:
Volume of one earring:

$$V = \frac{1}{2}(\text{volume of melted gold})$$
$$V = \frac{1}{2}(226)$$
$$V = 113$$

The volume of gold in one earring is 113 mm^3.
Substitute into the formula for the volume of a sphere.

$$V = \frac{4}{3}\pi r^3$$
$$113 = \frac{4}{3}\pi r^3$$
$$3(113) = 4\pi r^3$$
$$\frac{339}{4\pi} = r^3$$
$$\sqrt[3]{\frac{339}{4\pi}} = r$$
$$3.00 \approx r$$

The radius of each earring is approximately 3 mm.

PTS: 1 DIF: 5-6 OBJ: Section 2.3 NAT: M3 | AN3
TOP: Volume KEY: cube root | determine radius from volume | SI | sphere

30. ANS:
a) Surface area of mailbox = surface area of half a right cylinder + surface area of right prism minus its top

$$SA = \frac{1}{2}\left(2\pi r^2 + 2\pi rh\right) + \left(lw + 2lh + 2wh\right)$$

$$SA = \frac{1}{2}\left[2\pi(4)^2 + 2\pi(4)(11)\right] + \left[11(8) + 2(11)(6) + 2(8)(6)\right]$$

$$SA = 60\pi + 316$$

$$SA = 188.495\ldots + 316$$

$$SA = 504.495\ldots$$

The surface area of the outside of the mailbox is approximately 504.5 in.^{2}.

b) Volume of mailbox = volume of half a cylinder + volume of right prism

$$V = \frac{1}{2}\left(\pi r^2 h\right) + (lwh)$$

$$V = \frac{1}{2}\left[\pi(4)^2(11)\right] + (11)(8)(6)$$

$$V = 88\pi + 528$$

$$V = 276.460\ldots + 528$$

$$V = 804.460$$

The volume of mail that can fit inside the mailbox is approximately 804.5 in.^{3}.

PTS: 1 DIF: 5-6 OBJ: Section 2.2 | Section 2.3
NAT: M3 | AN3 TOP: Surface Area | Volume
KEY: calculate surface area | calculate volume | imperial | right cylinder | right prism

31. ANS:
a) The slant height is 10 cm. The slant height is the same as the radius of the circle from which the 90° sector was removed.

b) The base of the cone is a circle formed by joining the ends of the 270° sector of the original circle with radius 10 cm. The circumference of the cone is $\frac{3}{4}$ of the circumference of the circle. Let *R* represent the radius of the circle.

$$\begin{aligned}\text{Circumference of cone} &= \frac{3}{4}(2\pi r)\\ &= \frac{3}{4}(2\pi)(10)\\ &= 15\pi\end{aligned}$$

Let *r* represent the radius of the cone.

$$\begin{aligned}\text{Circumference of cone} &= 2\pi r\\ 15\pi &= 2\pi r\\ 7.5 &= r\end{aligned}$$

The radius of the cone is 7.5 cm.

c) Determine the height of the cone using the Pythagorean relationship.
Let *h* represent the height and *s* represent the slant height.

$$\begin{aligned}h^2 + r^2 &= s^2\\ h^2 + 7.5^2 &= 10^2\\ h^2 + 56.25 &= 100\\ h^2 &= 43.75\\ h &= \sqrt{43.75}\end{aligned}$$

Leave the height in square root form to calculate the volume.
Volume of the cone:

$$V = \frac{1}{3}\pi r^2 h$$

$$V \approx \frac{1}{3}\pi(7.5)^2\sqrt{43.75}$$

$$V \approx 389.6190328$$

The volume of the cone is approximately 390 cm^3.

PTS: 1 DIF: 7-8 OBJ: Section 2.2 | Section 2.3
NAT: M3 | AN3 TOP: Surface Area | Volume
KEY: calculate volume | problem solving | right cone | SI | slant height

32. ANS:
a) $V = lwh$
$V = (38)(51)(26)$
$V = 50\ 388$
The volume of the bin is 50 388 cm^3.

b) The radius of the softball is half the diameter, so $r = 6.3$ cm.

$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3}\pi(6.3)^3$$

$$V = 1047.394\ldots$$

The volume of each softball is approximately 1047 cm^3.

c) Brian said the bin could hold 48 balls. He likely arrived at this conclusion by dividing the volume of the bin by the volume of one softball. However, he is incorrect because softballs are spherical and the bin is a right rectangular prism. This means there will be spaces left between the balls. Shao-Mei is correct. By aligning the balls side by side, the balls fit in the bin so that there are 4 balls across the length, 3 balls across the width, and 2 balls along the height. This gives a total of 24 balls.

PTS: 1 DIF: 7-8 OBJ: Section 2.3 NAT: M3 | AN3
TOP: Volume KEY: calculate volume | problem solving | right prism | SI | sphere