16. $\angle FGE \cong \angle BGC$: vertical angles
    $m\angle BGC + m\angle AGB = 90°$:
    complementary angles
    $m\angle AGB = 90° - 43° = 47°$
17. $m\angle EGD = 90° - 43° = 47°$:
    complementary angles
    $m\angle EGC = 90° + 47° = 137°$
18. $m\angle BGC = m\angle FGC - m\angle FGB =$
    $180° - 135° = 45°$
19. $m\angle AGB = m\angle FGB - 90° =$
    $135° - 90° = 45°$
    $m\angle EGD = m\angle AGB = 45°$:
    vertical angles
20. semicircle:
    $C = \frac{1}{2}(2\pi r) \approx$
    $\frac{1}{2}(2)(3.14)(3.3) = 10.36$ ft
    sides of triangle:
    $6.2 + 6.2 = 12.4$ ft
    total :
    $10.36 + 12.4 = 22.76$ ft

Systematic Review 13E

1. diameter
2. $A = \pi r^2$
3. $\frac{22}{7}$
4. 3.14
5. latitude
6. longitude
7. $A = \frac{1}{2}(9) \times \frac{1}{2}(3) \times \pi \approx$
   $(4.5)(1.5)(3.14) = 21.2 \text{ in}^2$
8. 60
9. sphere
10. diameter
11. $A = \pi r^2 \approx (3.14)(3.5)^2 = 38.47 \text{ m}^2$
12. $C = \pi d \approx (3.14)(1.25) = 3.925$ or 3.93 cm
13. $360° \div 40° = 9$
14. infinite
15. exterior
16. alternate exterior
17. MLK, CEH
18. GHE
19.
$$\begin{array}{rr} & 3Y + 2X = 12 \\ (2)(4Y - X = 5) \Rightarrow & \underline{8Y - 2X = 10} \\ & 11Y \quad = 22 \\ & Y = 2 \end{array}$$
$$\begin{array}{rr} 3Y + 2X = 12 \Rightarrow & 3(2) + 2X = 12 \\ & 6 + 2X = 12 \\ & 2X = 6 \\ & X = 3 \end{array}$$
    solution $= (3, 2)$
20.
$$\begin{array}{rr} & Y - \ X = -3 \\ Y - 2X = -4 \Rightarrow & \underline{-Y + 2X = \ \ 4} \\ & X = \ \ 1 \end{array}$$
$$\begin{array}{rr} Y - X = 3 \Rightarrow & Y - (1) = -3 \\ & Y = -2 \end{array}$$
    solution $= (1, -2)$

Lesson Practice 14A

1. base, height
2. faces
3. squares
4. edges
5. circle
6. cubic
7. vertices
8. $V = (4)(4)(4) = 64 \text{ in}^3$
9. $V = (5)(4)(3) = 60 \text{ ft}^3$
10. $V = Bh = \pi r^2 h \approx$
    $(3.14)(10^2)(5) = 1{,}570 \text{ ft}^3$
11. $V = (5)(7)(4) = 140 \text{ ft}^3$
12. $V = Bh = \pi r^2 h \approx$
    $(3.14)(10^2)(25) = 7{,}850 \text{ ft}^3$

Lesson Practice 14B

1. g
2. a
3. c
4. b
5. d
6. h
7. f
8. e
9. $V = (20)(30)(10) = 6{,}000 \text{ ft}^3$
10. $V = Bh = \pi r^2 h \approx$
$(3.14)(15^2)(60) = 42{,}390 \text{ ft}^3$
11. $V = (10)(10)(10) = 1{,}000 \text{ ft}^3$
12. $V = Bh = \pi r^2 h \approx$
$(3.14)(10^2)(15) = 4{,}710 \text{ ft}^3$

Systematic Review 14C

1. $V = (3)(5)(4) = 60 \text{ m}^3$
2. $V = Bh = \pi r^2 h \approx$
$(3.14)(4^2)(4) = 200.96 \text{ ft}^3$
3. $V = Bh = \pi r^2 h \approx$
$(3.14)(6^2)(10) = 1{,}130.4 \text{ ft}^3$
4. $A = (8)(8) = 64 \text{ cm}^2$
5. $A = \pi r^2 \approx (3.14)(6^2) = 113.04 \text{ cm}^2$
6. $A = (3)(5)(\pi) \approx (3)(5)(3.14) =$
47.1 cm^2
7. $(N-2)180° \Rightarrow ((8)-2)180° =$
$(6)(180°) = 1{,}080°$ total
$1{,}080° \div 8 = 135°$ per angle
8. $180° - 135° = 45°$ or $360° \div 8 = 45°$;
$45°(8) = 360°$
9. $360° \div 10° = 36$ sides
10. sphere
11. $C = 2\pi r \approx (2)(3.14)(6) = 37.68$ in
12. 0°
13. point
14. $A = \frac{5+7}{2}(13) = 78 \text{ in}^2$
15. $180° - (65° + 15°) = 180° - 80° = 100°$
16. obtuse
17. $m\angle CLM = m\angle EHL = 115°$:
corresponding angles
$m\angle MLK = 180° - m\angle EHL =$
$180° - 115° = 65°$
supplementary angles
18. $m\angle ACL = m\angle MLK = 65°$:
corresponding angles
19. $\angle CED = m\angle EHL = 115°$:
corresponding angles
20. $m\angle EHG = 180° - m\angle EHL =$
$180° - 115° = 65°$:
supplementary angles

Systematic Review 14D

1. $V = (7)(10)(8) = 560 \text{ m}^3$
2. $V = Bh = \pi r^2 h \approx$
$(3.14)(3.5^2)(3) = 115.40 \text{ ft}^3$
3. $V = Bh = \pi r^2 h \approx$
$(3.14)(4^2)(7) = 351.68 \text{ in}^3$
4. $A = (5.4)(4.1) = 22.14 \text{ cm}^2$
5. $A = \pi r^2 \approx (3.14)(11^2) = 379.94 \text{ cm}^2$
6. $V = (10)(4)(\pi) \approx$
$(10)(4)(3.14) = 125.6 \text{ cm}^2$
7. $(N-2)180° \Rightarrow ((10)-2)180° =$
$(8)(180°) = 1{,}440°$
$1{,}440° \div 10 = 144°$
8. $180° - 144° = 36°$
or $360° \div 10 = 36°$;
$36° \times 10 = 360°$
9. $360° \div 45° = 8$
10. diameter
11. 23°
12. 0°
13. plane
14. yes, because $3 + 4 > 5$

15. $m\angle 10 = m\angle BCA = 62°$
definition of bisector

16. $m\angle 10 + m\angle 11 = 62° + 62° = 124°$

17. $m\angle 9 = 180° - (m\angle 10 + m\angle 11) =$
$180° - (124°) = 56°$
supplementary angles

18. $m\angle 9 = 56°$ (from problem 17)
$m\angle 1 = 56°$: corresponding angles

19. $62°$: $m\angle 7 = m\angle BCA$ because they are alternate interior angles.

20. $m\angle 11 = m\angle 12$: vertical angles
$m\angle 7 = m\angle 11 = 58°$:
alternate interior
or:
$m\angle 7 = m\angle 12 = 58°$: corresponding

Systematic Review 14E

1. $V = (20)(30)(10) = 6{,}000\ m^3$

2. $V = Bh = \pi r^2 h \approx$
$(3.14)(10^2)(15) = 4{,}710\ ft^3$

3. $V = Bh = \pi r^2 h \approx$
$(3.14)(5^2)(7) = 549.5\ in^3$

4. $A = \frac{1}{2}bh = \frac{1}{2}(8)(6) = 24\ in^2$

5. $A = \pi r^2 \approx (3.14)(4^2) = 50.24\ cm^2$

6. $A = \frac{1}{2}(20) \times \frac{1}{2}(15) \times \pi \approx$
$(10)(7.5)(3.14) = 235.5\ units^2$

7. $(N-2)180°\quad ((6)-2)180° =$
$(4)180° = 720°$
$720° \div 6 = 120°$

8. $180° - 120° = 60°$ or $360° \div 6 = 60°$
360° is always the total of exterior degrees.

9. $360° \div 60° = 6$ sides

10. tangent

11. $C = 2\pi r \approx (2)(3.14)(15) = 94.2\ in$

12. 60'

13. line (or line segment or ray)

14. $P = 25 + 25 + 25 + 25 = 100\ ft$

15. $180° - (23° + 35°) =$
$180° - 58° = 122°$

16. minor arc $= 23°$;
major arc $= 360° - 23° = 337°$

17. $\sqrt{16} = 4$

18. $\sqrt{100} = 10$

19. $\sqrt{25} = 5$

20. $\sqrt{144} = 12$

Lesson Practice 15A

1. slant height

2. altitude

3. vertex

4. $\frac{1}{3}$

5. circle

6. congruent, parallel

7. parallelograms

8. $\frac{4}{3}\pi r^3$

9. $V = \frac{1}{3}Bh = \frac{1}{3}(5)(5)(6) = 50\ in^3$

10. $V = \frac{1}{3}Bh \approx$
$\frac{1}{3}(3.14)(3^2)(11) = 103.62\ in^3$

11. $V = Bh = \frac{1}{2}(8)(9)(15) = 540\ ft^3$

12. $V = \frac{4}{3}\pi r^3 \approx$
$\frac{4}{3}(3.14)(2^3) = 33.49\ ft^3$ In this and in other problems of this type, you may ignore small answer variations caused by differences in rounding technique.

13. $V = \frac{1}{3}Bh = \frac{1}{3}(10)(10)(40)$
$\approx 1{,}333.33\ in^3$

14. $V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2 h \approx$
$\frac{1}{3}(3.14)(2^2)(6) = 25.12\ in^3$

Lesson Practice 15B

1. prism
2. volume; sphere
3. base; height
4. $\frac{1}{3}$
5. square
6. altitude
7. $\frac{1}{3}$
8. face
9. $V = \frac{1}{3}Bh = \frac{1}{3}(3.6)(3.6)(4)$

   $= 17.28 \text{ ft}^3$
10. $V = \frac{1}{3}Bh \approx$

    $\frac{1}{3}(3.14)\left(4.2^2\right)(9.7) = 179.09 \text{ ft}^3$
11. $V = Bh = \frac{1}{2}(4.8)(3.2)(7.8)$

    $= 59.9 \text{ cm}^3$
12. $V = \frac{4}{3}\pi r^3 \approx \frac{4}{3}(3.14)\left(1^3\right) = 4.19 \text{ ft}^3$
13. pyramid:

    $V = \frac{1}{3}Bh = \frac{1}{3}(6)(6)(3.6) = 43.2 \text{ ft}^3$

    rectangular solid:

    $V = (6)(6)(2.7) = 97.2 \text{ ft}^3$

    total:

    $V = 43.2 + 97.2 = 140.4 \text{ ft}^3$
14. cone: $V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2 h \approx$

    $\frac{1}{3}(3.14)(6)^2(14) = 527.52 \text{ in}^3$

    cylinder: $V = Bh =$

    $\pi r^2 h \approx (3.14)\left(6^2\right)(11) = 1{,}243.44 \text{ in}^3$

    total: $V = 527.52 + 1{,}243.44$

    $= 1{,}770.96 \text{ in}^3$

Systematic Review 15C

1. $V = \frac{1}{3}Bh = x\frac{1}{3}\ x\frac{5}{2}x\frac{5}{2}x\frac{9}{2} =$

   $\frac{225}{24} = 9\frac{3}{8} \text{ m}^3$ or

   $V = \frac{1}{3}Bh = \frac{1}{3}(2.5)(2.5)(4.5) = 9.375 \text{ m}^3$
2. $V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2 \approx$

   $\frac{1}{3}(3.14)\left(4.5^2\right)(8.25) = 174.86 \text{ in}^3$
3. prism:

   $V = Bh = \frac{1}{2}(4)(5)(6) = 60 \text{ ft}^3$

   rectangular solid:

   $V = (5)(6)(2) = 60 \text{ ft}^3$

   total:

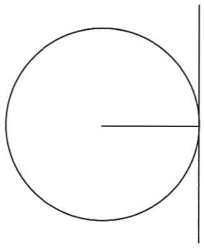
   $V = 60 + 60 = 120 \text{ ft}^3$
4. $V = \frac{4}{3}\pi r^3 \approx \frac{4}{3}(3.14)\left(4^3\right)$

   $= 267.95 \text{ in}^3$
5. altitude
6. They are parallel. (or congruent)
7. $V = (20)(20)(20) = 8{,}000 \text{ in}^3$
8. $A = \pi r^2 \approx (3.14)\left(5^2\right) = 78.5 \text{ ft}^2$
9. $A = \frac{1}{2}(2) \times \frac{1}{2}(10) \times \pi \approx (1)(5)(3.14)$

   $= 15.7 \text{ ft}^2$
10. circumference
11. $(N-2)180^\circ \quad ((10)-2)180^\circ =$

    $(8)180^\circ = 1{,}440^\circ$

    $1{,}440^\circ \div 10 = 144^\circ$
12. If interior angle is 120°,
    then exterior angles are
    $180^\circ - 120^\circ$ or 60°.
    Exterior angles always add up
    to 360°. $360^\circ \div 60^\circ = 6$ sides
13. use protractor to check
14. use protractor to check: New angles should each measure 62.5°.
15. A radius and tangent that touch a circle at the same point are always perpendicular to each other.



16. $m\angle 6 = m\angle 14 = 50°$:
corresponding angles
$m\angle 5 = 180° - m\angle 6 =$
$180° - 50° = 130°$:
supplementary angles
There are other valid ways of arriving at this answer.

17. $m\angle BCD = 180° - m\angle 14 =$
$180° - 50° = 130°$:
supplementary angles
$m\angle 10 = \frac{1}{2} m\angle BCD = \frac{1}{2}(130°) = 65°$:
line AC bisects $\angle BCD$

18. $m\angle 11 = 65°$ from last problem
$m\angle 4 = m\angle 11 = 65°$:
corresponding angles
$m\angle 8 = 180° - m\angle 4 =$
$180° - 65° = 115°$:
supplementary angles

19. $m\angle 11 = 65°$ from problem 17
$m\angle 12 = m\angle 11 = 65°$:
vertical angles

20. complementary; If two angles are complementary, they add up to 90°.

Systematic Review 15D

1. $V = \frac{1}{3}Bh =$
$\frac{1}{3} \times \frac{13}{2} \times \frac{13}{2} \times \frac{7}{2} = \frac{1{,}183}{24} = 49\frac{7}{24}\ m^3$
or
$\frac{1}{3}(6.5)(6.5)(3.5) \approx 49.29\ m^3$

2. $V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2 h \approx$
$\frac{1}{3}(3.14)(3.4^2)(7.6) = 91.96\ in^3$

3. cone:
$V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2 h \approx$
$\frac{1}{3}(3.14)(4^2)(12) = 200.96\ in^3$
cylinder:
$V = Bh = \pi r^2 h \approx (3.14)(4^2)(10) = 502.4\ in^3$
total:
$V = 200.96 + 502.4 = 703.36\ in^3$

4. $V = \frac{4}{3}\pi r^3 \approx \frac{4}{3}(3.14)(2^3) = 33.49\ in^3$

5. parallelogram

6. chord

7. $A = bh = (20)(15) = 300\ in^2$

8. $P = 20 + 20 + 20 + 20 = 80\ in$

9. $A = \frac{1}{2}(3) \times \frac{1}{2}(6) \times \pi \approx$
$(1.5)(3)(3.14) = 14.13\ ft^2$

10. scalene

11. $(N-2)180° \Rightarrow ((8)-2)180° =$
$(6)180° = 1{,}080°$
$1080° \div 8 = 135°$

12. exterior angles $= 180° - 150° = 30°$
$360° \div 30° = 12$ sides

13. check with ruler

14. check with ruler:
each half should be $2\frac{3}{8}$ in

15. check with protractor

16. midpoint

17. $AF = \frac{1}{2}AD = \frac{1}{2} \times 2\frac{7}{8} = 1\frac{7}{16}$

18. $m\angle BFD = m\angle AFE = 88.5°$:
vertical angles
$m\angle BFC = \frac{1}{2} m\angle BFD = \frac{1}{2}(88.5°) = 44.25°$:
bisector

19. $m\angle EFD = 180° - m\angle AFE =$
$180° - 88.5° = 91.5°$:
supplementary angles

20. supplementary; If two angles add up to 180°, they are supplementary.

Systematic Review 15E

1. $V = Bh = \frac{1}{2}(4.5)(4.2)(11)$
   $= 103.95 \text{ mm}^3$
2. $V = \frac{4}{3}\pi r^3 \approx \frac{4}{3}(3.14)\left(1.5^3\right)$
   $= 14.13 \text{ cm}^3$
3. pyramid:
   $V = \frac{1}{3}Bh = \frac{1}{3}(8)(8)(6) = 128 \text{ ft}^3$
   rectangular solid:
   $V = (8)(8)(3) = 192 \text{ ft}^3$
   total:
   $V = 128 + 192 = 320 \text{ ft}^3$
4. altitude
5. prism
6. $\frac{1}{3}$
7. $A = bh = (8)(3.5) = 28 \text{ in}^2$
8. $P = 8 + 4 + 8 + 4 = 24 \text{ in}$
9. $A = \frac{1}{2}(8) \times \frac{1}{2}(10) \times \pi \approx (4)(5)(3.14)$
   $= 62.8 \text{ ft}^2$
10. equilateral
11. $(N-2)180° \Rightarrow ((5)-2)180° =$
    $(3)180° = 540°$
    $540° \div 5 = 108°$
12. 8
13. exterior angles =
    $180° - 135° = 45°$;
    $360° \div 45° = 8$ sides
14. check with ruler
15. check with protractor:
    angles should measure 55°
16. check with protractor
17. $8^3 \cdot 8^4 = 8^{3+4} = 8^7$
18. $2^8 \div 2^3 = 2^{8-3} = 2^5$
19. $X^2X^3Y^5Y^{-1} = X^{2+3}Y^{5+(-1)} = X^5Y^4$
20. $\frac{1}{10^3} = \frac{10^{-3}}{1} = 10^{-3}$

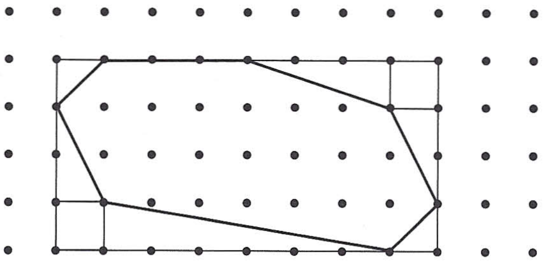
Lesson Practice 16A

1. 6
2. 5
3. 4
4. circles; rectangle
5. square
6. height; circumference
7. $SA = 2(3)(5) + 2(3)(4) + 2(4)(5) =$
   $30 + 24 + 40 = 94 \text{ ft}^2$
8. $SA = 2\pi r^2 + 2\pi rh \approx$
   $(2)(3.14)\left(10^2\right) + (2)(3.14)(10)(5) =$
   $628 + 314 = 942 \text{ ft}^2$
9. $SA = (5)(5) + (4)\ \frac{1}{2}\ (5)(6) =$
   $25 + 60 = 85 \text{ in}^2$
10. base:
    $SA = \frac{1}{2}(6)(5) = 15 \text{ ft}^2$
    sides:
    $SA = (3)\frac{1}{2}(6)(8) = 72 \text{ ft}^2$
    total:
    $SA = 15 + 72 = 87 \text{ ft}^2$
11. $SA = 2(5)(4) + 2(5)(7) + 2(4)(7) =$
    $40 + 70 + 56 = 166 \text{ ft}^2$
12. "roof":
    $SA = 2(4.5)(6) = 54 \text{ ft}^2$
    sides:
    $SA = 2(4)(5) + 2(4)(6)$
    $= 40 + 48 = 88 \text{ ft}^2$
    triangles:
    $SA = 2\ \frac{1}{2}\ (4)(5) = 20 \text{ ft}^2$
    bottom:
    $SA = (5)(6) = 30 \text{ ft}^2$
    total:
    $SA = 54 + 88 + 20 + 30 = 192 \text{ ft}^2$

Lesson Practice 16B

1. square
2. pyramid
3. cube

6. See illustration



7. $4 \text{x} 8 = 32$ units^2

8. $1 \text{x} 2 = 2$ units^2

$\frac{1}{2}(1 \text{x} 3) = 1.5$ units^2

$\frac{1}{2}(2 \text{x} 3) = 3$ units^2

$\frac{1}{2}(2 \text{x} 2) = 2$ units^2

$\frac{1}{2}(1 \text{x} 7) = 3.5$ units^2

$\frac{1}{2}(1 \text{x} 2) = 1$ unit^2

9. $2+1.5+3+2+3.5+1=13$ units^2

$32 - 13 = 19$ units^2

10. $10 \text{ x } 5 = 50$ units^2

$\frac{1}{2}(5 \text{x} 2) = 5$ units^2

$1 \text{ x } 5 = 5$ units^2

$\frac{1}{2}(1 \text{x} 5) = 2.5$ units^2

$\frac{1}{2}(4 \text{x} 1) = 2$ units^2

$1 \text{ x } 1 = 1$ unit^2

$\frac{1}{2}(6 \text{x} 1) = 3$ units^2

$\frac{1}{2}(3 \text{x} 4) = 6$ units^2

$5+5+2.5+2+1+3+6 = 24.5$ units^2

$50 - 24.5 = 25.5$ units^2

11. $4 \text{ x } 8 = 32$ units^2

$\frac{1}{2}(1 \text{x} 1) = .5$ units^2

$\frac{1}{2}(3 \text{x} 1) = 1.5$ units^2

$1 \text{x} 1 = 1$ unit^2

$\frac{1}{2}(1 \text{x} 2) = 1$ unit^2

$\frac{1}{2}(1 \text{x} 2) = 1$ unit^2

$1 \text{ x } 1 = 1$ unit^2

$\frac{1}{2}(5 \text{x} 1) = 2.5$ units^2

$\frac{1}{2}(2 \text{x} 1) = 1$ unit^2

$.5 + 1.5 + 1 + 1 + 1 + 1 + 2.5 + 1$

$= 9.5$ units^2

$32 - 9.5 = 22.5$ units^2

Honors Lesson 14

1. $\frac{1}{2}(3 \text{x} 4) = \frac{1}{2}(12) = 6$ units^2

2. $A = \sqrt{s(s-a)(s-b)(s-c)}$

$A = \sqrt{6(6-3)(6-4)(6-5)}$

$A = \sqrt{6(3)(2)(1)}$

$A = \sqrt{36}$

$A = 6$ units^2

yes

3. $A=\sqrt{16(16-7)(16-10)(16-15)}$

$A=\sqrt{16(9)(6)(1)}$

$A=\sqrt{864}$

$A = 29.39 \text{ units}^2$

4. $A=\sqrt{52(52-36)(52-28)(52-40)}$

$A=\sqrt{52(16)(24)(12)}$

$A=\sqrt{239{,}616}$

$A = 489.51 \text{ units}^2$

5. $V=\pi r^2h$

$V=3.14(2)^2(10)$

$V=3.14(4)(10)$

$V=125.6 \text{ in}^3$

6. $V=\pi r^2h$

$V=3.14(1)^2(10)$

$V=3.14(1)(10)$

$V=31.4 \text{ in}^3$

It is $\frac{1}{4}$ the first one

7. $V=\pi r^2h$

$V=3.14(2)^2(5)$

$V=3.14(4)(5)$

$V=62.8 \text{ in}^3$

It is half the first one.

8. $V=\pi r^2h$

$V=3.14(4)^2(10)$

$V=3.14(16)(10)$

$V=502.4 \text{ in}^3$

It is four times the first one.

9. $V=\pi r^2h$

$V=3.14(2)^2(20)$

$V=3.14(4)(20)$

$V=251.2 \text{ cu in}^3$

It is two times the first one

10. When the height is doubled, the volume is doubled. When the height is halved, the volume is halved. When the radius is doubl the volume increases by a factor When the radius is halved, the vo decreases by a factor of 4. The student may use his own wor to express this.

11. Answers will vary.

12. Take the formula, and multiply bo sides by 2:

$V=\pi r^2h$

$2V=2\pi r^2=h$

Now rearrange the factors:

$V=\pi r^2h$

$2V=\pi r^2 2h$

Take the formula, and multiply both sides by 4:

$V=\pi r^2h$

$4V=4\pi r^2h$

Rewrite the 4 on the right side as 2

$4V=2^2\pi r^2h$

Rearrange the factors:

$4V=\pi 2^2 r^2 h$

$4V=\pi(2r)^2h$

There is more than one way to set this up. As long as you show the same results as by experimentation the answer is correct.

Honors Lesson 15

1. $3 \times 3 \times 3 = 27$ ft
2. $12 \times 12 \times 12 = 1{,}728$ in^3
3. $8 \times 4 \times 2 = 64$ in^3
   $64 \times .3 = 19.2$ lbs
4. $64\ \text{in}^3 \div 1{,}728 = .037\ \text{ft}^3$
   $.037 \times 1200 = 44.4$ lbs
   You could probably lift it,
   but it would be much heavier
   than expected.
5. First find what the volume would
   be if it were solid:
   $V = \pi r^2 h$
   $V = 3.14(.5)^2(12)$
   $V = 9.42\ \text{in}^3$
   Now find the volume inside
   the pipe:
   $V = \pi r^2 h$
   $V = 3.14(.25)^2(12)$
   $V = 2.355\ \text{in}^3$
   Then find the difference:
   $9.42 - 2.355 = 7.065\ \text{in}^3$
6. $7.065 \text{x} .26 = 1.8369$ lbs
7. $V = \frac{4}{3}\pi r^3$
   $V = \frac{4}{3}(3.14)(.25)^3$
   $V = .07\ \text{in}^3$ (rounded)
   $.07 \times .3 \approx .002$ pounds for
   one bearing
   $25 \div .02 = 12{,}500$ bearings
   Because we rounded some
   numbers, the actual number
   of bearings in the box may be
   slightly different. Keep in mind
   that the starting weight was
   rounded to a whole number.
   Our answer is close enough to
   be helpful in a real life situation,
   where someone wants to know
   approximately how many bearings
   are available without counting.
8. The side view is a trapezoid,
   and the volume of the water
   is the area of the trapezoid
   times the width of the pool:
   $A = \frac{3+10}{2}(40)$
   $A = 6.5(40)$
   $A = 260\ \text{ft}^2$
   $V = 260(20)$
   $V = 5{,}200\ \text{ft}^2$
9. Volume of the sphere:
   $V = \frac{4}{3}(3.14)(1)^3\ \text{units}^3$
   $V = 4.19$
   Volume of the cube:
   $V = 2 \times 2 \times 2 = 8\ \text{units}^3$
   $8 - 4.19 = 3.81\ \text{units}^3$

10. Volume of the cylinder:

$V=3.14\ (1)^2(2)$

$V = 6.28\text{ units}^3$

Volume of the sphere from #9:

4.19 units^3

$6.28 - 4.19 = 2.09\text{ units}^3$

Note: You may use the fractional value of π if it seems more convenient.

Honors Lesson 16

1. $(r)\pi r = \pi r^2$
2. $A = LW + LW + LH + LH + WH + WH$
   $= 2LW + 2LH + 2WH$
   $= 2(LW + LH + WH)$
3. $2(s^2 + s^2 + s^2) = 2(3s^2) = 6s^2$
4. $V = 3(11)(3) = 99\text{ ft}^3$
   $SA = 2(3\text{x}11) + 2(3\text{x}3) + 2(11\text{x}3)$
   $= 2(33) + 2(9) + 2(33)$
   $= 66 + 18 + 66$
   $= 150\text{ ft}^2$
5. $150\text{ ft}^2 \div 6$ faces $= 25\text{ ft}^2$ per face
   $\sqrt{25} = 5$ ft
   The new bin is 5 x 5 x 5.
6. The cube-shaped one holds more.
   $125 - 99 = 26\text{ ft}^3$ difference.

Honors Lesson 17

1. $V = \pi r^2 h$
   $V = 3.14(2)^2(4)$
   $V = 50.24\text{ ft}^3$
2. $V = \frac{4}{3}\pi r^3$
   $V = \frac{4}{3}(3.14)(2)^3$
   $V = 33.49\text{ ft}^3$ (rounded)
3. $V = 3.14(3)^2(6)$
   $V = 169.56\text{ units}^3$
4. $V = \frac{4}{3}(3.14)(3)^3$
   $V = 113.04\text{ units}^3$ (rounded)
5. $V = 3.14(1)^2(2)$
   $V = 6.28\text{ units}^3$
6. $V = \frac{4}{3}(3.14)(1)^3$
   $V = 4.19\text{ units}^3$ (rounded)
7. $\frac{33.49}{50.24} \approx .67 \qquad \frac{113.04}{169.56} \approx .67$
   $\frac{4.19}{6.28} \approx .67$
8. $\frac{2}{3}$
9. $A = 2\pi r^2 + 2\pi rh$
   $A = 2(3.14)(3)^2 + 2(3.14)(3)(6)$
   $A = 56.52 + 113.04 = 169.56\text{ units}^2$
10. $A = 4(3.14)(3)^2$
    $A = 113.04\text{ units}^2$
11. $\frac{113.04}{169.56} \approx \frac{2}{3}$
12. The surface area and volume of a sphere appear to be $\frac{2}{3}$ of the surface area and volume of a cylinder with the same dimensions. (Archimedes proved that this is the case.)

Honors Lesson 18

1. 4,003 mi
2. 90°; a tangent to a circle is perpendicular to the diameter