Name: Key

Date: _____ Class: _____

1. Botterman Farms has a barn and a silo like the ones shown below. The barn is 49 feet from the ground to the top of the roof. The silo cylinder is 55 feet tall with a diameter of 16 feet and it does not touch the barn. On the top of the silo cylinder is a hemispherical roof. The hay mow begins 15 feet from the ground and continues to the roof line. Grandpa Botterman is trying to sell Botterman Farms and is looking to spruce-up the barn by putting new siding on it and putting new shingles on the roof, as well as painting the silo. He also needs to know the volumes of the silo (including the top), the volume of the hay mow and the volume of the entire barn.

75 feet

15

9

12

40 ft

Mow Line

24 ft

8
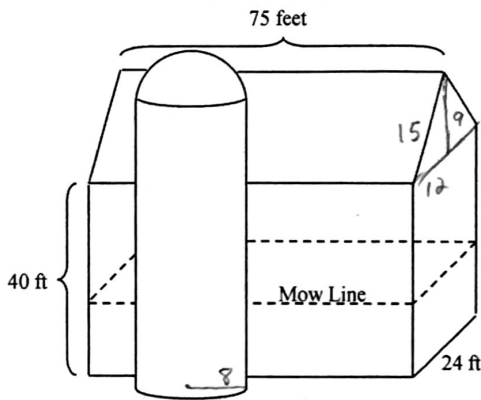
2 Rectangular Sides: $40(75)(2) = 6000 \, ft^2$

2 Pentagonal Sides: $24(40)(2) + \frac{24(9)}{2} \cdot 2 = 2136 \, ft^2$

Total Surface Area of Sides: $6000 + 2136$

2 Rectangles on Roof: $(75)(15)(2) = 2250 \, ft^2$

Lateral Area of Silo: $2\pi(8)(55) = 880\pi \, ft^2$

Volume of Silo $= \pi(8)^2(55) + \frac{2\pi(8)^3}{3} = 11584\pi$

Volume Above Mow Line $= 24(75)(25) + \frac{24(9)}{2} \cdot 75$

$= 45000 + 8100$

What is the surface area of the sides of the barn that Grandpa wants to re-side? $8136 \, ft^2$

What is the surface area of the roof that Grandpa wants to re-shingle? $2250 \, ft^2$

What is the surface area of the silo (not the top) that Grandpa wants to paint? $880\pi \, ft^2$

What is the volume of the silo (including the top hemisphere)? $3861.\overline{3}\pi \, ft^3$

What is the volume of the hay mow (barn above the mow line)? $53100 \, ft^3$

Center the correct answer.

2. You own Mail-It-Easy. You are using a rectangular box to ship a framed painting for a customer. The box is 38 inches wide, 50 inches long, and 5.5 inches deep. To the nearest tenth of a square foot, what is the surface area of the box?

$38 \times 50 \times 5.5$

[A]   16.6 in²

[B]   33.1 in²

[C]   72.6 in²
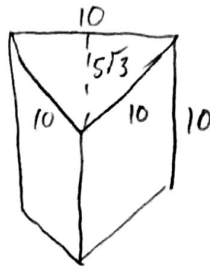
(D)   4,768.0 in²

[E]   10,450.0 in²

$P = 176$

$h = 5.5$

$B = 1900$

$SA = 176(5.5) + 2(1900) = 4768$

3. Find the total surface area of an equilateral triangular prism if each edge of the prism is 10cm long?

[A] $25\sqrt{3}+30$ cm²

[B] $25\sqrt{3}+300$ cm²

[C] $50\sqrt{3}+100$ cm²

(D) $50\sqrt{3}+300$ cm²

[E] $100\sqrt{3}+300$ cm²

$B = \dfrac{10(5\sqrt{3})}{2} = 25\sqrt{3}$

$P = 30$

$h = 10$

$SA = 30(10) + 2(25\sqrt{3})$

4. You make models of buildings for an architectural firm. The scale factor between the model of a building shaped like a rectangular prism and the actual building is 1 to 25. What is the ratio of the surface area of the model to the surface area of the actual building?

[A] 1 to 5

[B] 1 to 25

[C] 1 to 50

[D] 1 to 125

(E) 1 to 625

$1^2 : 25^2$

5.. A cylinder whose height is 5 meters has a surface *area* of 300π square meters. Find the radius of the cylinder.

[A] 5 m

(B) 10 m

[C] 15 m

[D] 20 m

[E] 25 m

$SA = 2\pi r h + 2\pi r^2$

$300\pi = 2\pi r(5) + 2\pi r^2$

$300\pi = 10\pi r + 2\pi r^2$

$300 = 10r + 2r^2$
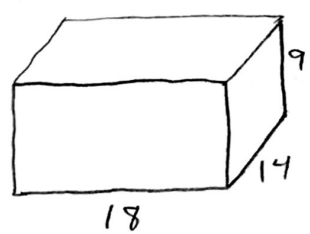
$0 = 2r^2 + 10r - 300$ ✓ Factor

$0 = r^2 + 5r - 150$ ✓

$0 = (r-10)(r+15)$

$r - 10 = 0 \qquad r + 15 = 0$

$r = 10 \qquad r = -15$

6. Kendra's dining room is a rectangular prism 14 feet wide, 18 feet long and 9 feet high. She wants to paint the dining room's walls and ceiling and each pint of paint can cover 175 ft². How many pints does she need to buy?
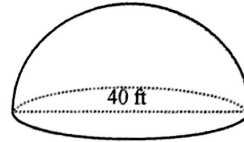
(A) 5

[B] 6

[C] 8

[D] 12

[E] 13

$2 \cdot 18 \cdot 9 + 2 \cdot 14 \cdot 9 + 14(18) = 828 \text{ ft}^2$

$\dfrac{828}{175} \approx 4.73$

7. What is the total surface area of the hemisphere to the right?

[A]   2513.3 ft²

([B])   3769.9 ft²

[C]   5026.5 ft²

[D]   10,053.5 ft²

[E]   15,079.6 ft²

40 ft

$SA = 3\pi r^2$

$= 3\pi(20)^2 \approx 3769.9$

8. The Earth has a diameter of 12,742 km. If 70.8% of the Earth's surface is covered by water, what is the area of the Earth's surface covered by land?

[A]   28,817,201.8 km²

([B])   148,938,825.8 km²

[C]   297,877,651.6 km²

[D]   361,125,646.1 km²

[E]   510,064,471.9 km²

29.2% covered by land

radius = 6371

$SA = 4\pi(6371)^2 \approx 510064471.9$

$.292(510064471.9)$

9. DCHS
~~Jacobs High School~~ is planning to build a new sports arena in the shape of a regular hexagonal pyramid. Each side of the base has a length of 100 feet and the pyramid has a height of 100 feet.

50√3

100

$P = 600$

$B = \dfrac{600(50\sqrt{3})}{2} = 15000\sqrt{3}$

$h = 100$

$SA = 600(100) + 15000\sqrt{3}$

$V = \dfrac{15000\sqrt{3} \cdot 100}{3}$

Rounded

What is the area of the base of the arena?
$\approx 25,980.8\ ft^2$

What is the total surface area of the arena?
$\approx 65,667.0\ ft^2$

What is the volume of the arena in feet³?
$\approx 866,025.4\ ft^3$

What is the volume of the arena in yards³?

$3\ ft = 1\ yd$

$27\ ft^3 = 1\ yd^3$

Exact

$15000\sqrt{3}\ ft^2$

$60000 + 15000\sqrt{3}\ ft^2$

$500000\sqrt{3}\ ft^3$

$\dfrac{500000\sqrt{3}}{27}\ ft^3$

$\approx 32,075.0\ ft^3$

10. A sphere has a great circle with an area of 201 feet². Find the surface area and volume of the sphere.

$201 = \pi r^2$

$\dfrac{201}{\pi} = r^2$

$\sqrt{\dfrac{201}{\pi}} = r$

$SA = 4\pi\left(\sqrt{\dfrac{201}{\pi}}\right)^2$

$SA = 4\pi\left(\dfrac{201}{\pi}\right)$

$SA = 804$

$V = \dfrac{4\pi\left(\sqrt{\dfrac{201}{\pi}}\right)^3}{3} \approx 2143.67$

Surface Area $804\ ft^2$

Volume $2143.67\ ft^3$

11. The surface area of a regular pyramid is 276 cm², the slant height measures 8 cm, and the area of the base is 50 cm². Find the perimeter of the base.

$$SA = \frac{Pl}{2} + B$$

$$276 = \frac{8P}{2} + 50$$

$$226 = 4P$$

$$56.5 = P$$

Perimeter __56.5cm__

12. The volume of a cone is 48π cm² and the height is 5 cm. Find the radius.

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

$$48\pi = \frac{\pi r^2 (5)}{3}$$

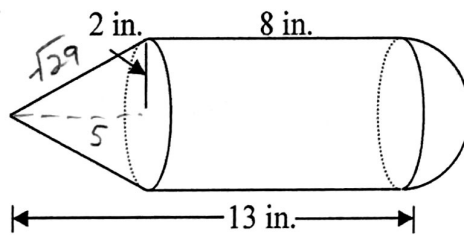$$144\pi = 5\pi r^2$$

$$28.8 = r^2$$

Radius __$\sqrt{28.8}$ cm ≈ 5.4 cm__

13. ***Surface Area & Volume "Mad-Lib"***

$LA_{cone} = \pi(2)(\sqrt{29}) = 2\pi\sqrt{29}$

$LA_{cylinder} = 2\pi(2)(8) = 32\pi$

$Area\ Hemisphere = 2\pi(2)^2 = 8\pi$

$Total\ Area = 2\pi\sqrt{29} + 32\pi + 8\pi$

$V_{cone} = \frac{\pi(2)^2(5)}{3} = \frac{20\pi}{3}$

$V_{cylinder} = \pi(2)^2(8) = 32\pi$

$V_{Hemis.} = \frac{2\pi(2)^3}{3} = \frac{16\pi}{3}$

$V_{Total} = \frac{20\pi}{3} + 32\pi + \frac{16\pi}{3}$

2 in.   8 in. $\sqrt{29}$ 5   ⊢— 13 in. —⊣

You are going to cover the "torpedo" with ___lit___ paint in order to do that you will
≈ 159.5 in²
(adjective)

need __$2\pi\sqrt{29} + 40\pi$ in²__ of it. You will then fill your torpedo with _____ in order to do
(total surface area)   (plural noun)

that you will need __44π in³__ of it.
(total volume)

≈ 138.2 in³

Convert the given units into the desired units.

14. 25 yds² = __225__ ft² $\frac{25}{x} = \frac{1}{9}$

15. 54,567 ft³ = __2021__ yd³ $\frac{54567}{x} = \frac{27}{1}$ $27x = 54567$

16. 33 ft³ = __57024__ in³ $\frac{33}{x} = \frac{1}{1728}$

17. 233,280 in³ = __5__ yd³ $\frac{233280}{x} = \frac{46656}{1}$ $46656x = 233280$

18. 9,072 in² = __7__ yd² $\frac{9072}{x} = \frac{1296}{1}$ $1296x = 9072$

19. 3 yd² = __3888__ in² $\frac{3}{x} = \frac{1}{1296}$