FSA Geometry End-of-Course Review Packet

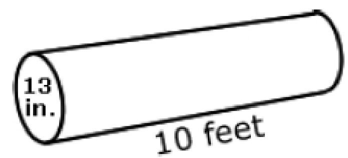
Modeling and Geometry

Contents

MAFS.912.G-MG.1.1 EOC Practice

Level 2	Level 3	Level 4	Level 5
uses measures and properties to model and describe a real-world object that can be modeled by a three- dimensional object	uses measures and properties to model and describe a real- world object that can be modeled by composite three- dimensional objects; uses given dimensions to answer questions about area, surface area, perimeter, and circumference of a real-world object that can be modeled by composite three-dimensional objects	finds a dimension for a real- world object that can be modeled by a composite three-dimensional figure when given area, volume, surface area, perimeter, and/or circumference	applies the modeling cycle to determine a measure when given a real-world object that can be modeled by a composite three-dimensional figure

1. The diameter of one side of a 10-foot log is approximately 13 inches. The diameter of the other side of the log is approximately 11 inches. Which is the best way to estimate the volume (in cubic feet) of the log?



A. $3 \cdot \frac{1}{4} \cdot 10$
B. $3 \cdot 1 \cdot 10$
C. $3 \cdot 36 \cdot 10$
D. $3 \cdot 144 \cdot 10$

2. Based on the two diagrams shown, which formula would be best to use to estimate the volume of City Park Pond?

Diagram 1: Side view of City Park Pond

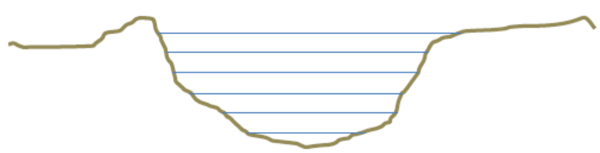
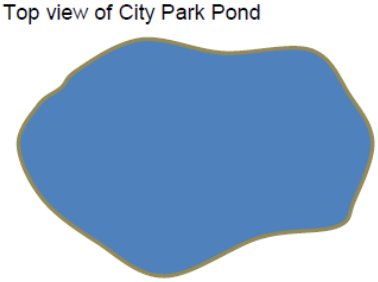
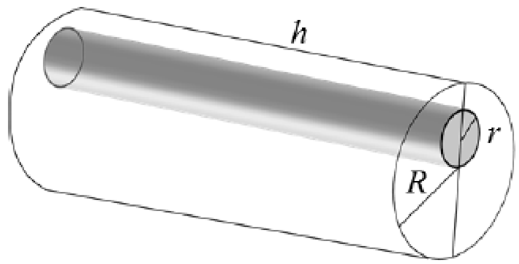


Diagram 2: Top view of City Park Pond



A. $V = \pi r^2 h$
B. $V = \frac{2}{3}\pi r^3$
C. $V = \frac{1}{3}Bh$
D. $V = \frac{1}{3}\pi r^2 h$

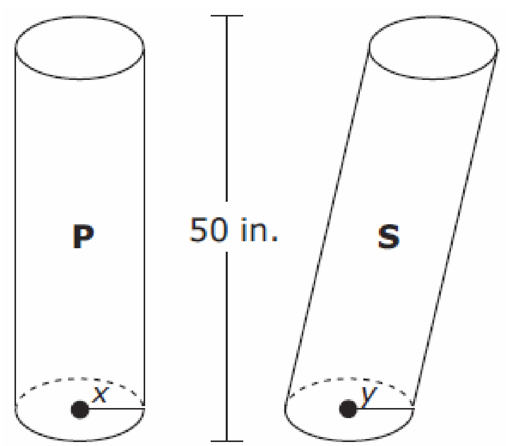
3. An object consists of a larger cylinder with a smaller cylinder drilled out of it as shown.



What is the volume of the object?

A. $\pi(R^2 - r^2)h$
B. $(\pi R^2 - r^2)h$
C. $(R^2 - \pi r^2)h$
D. $\pi(R - r)^2 h$

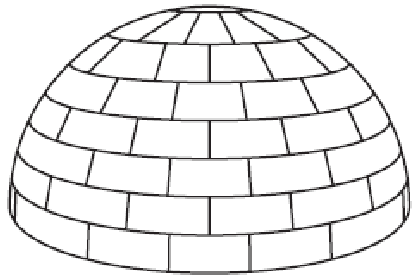
4. Two cylinders each with a height of 50 inches are shown.



Which statements about cylinders *P* and *S* are true?
Select ALL that apply.

- ☐ If $x = y$, the volume of cylinder *P* is greater than the volume of cylinder *S*, because cylinder *P* is a right cylinder.
- ☐ If $x = y$, the volume of cylinder *P* is equal to the volume of cylinder *S*, because the cylinders are the same height.
- ☐ If $x = y$, the volume of cylinder *P* is less than the volume of cylinder *S*, because cylinder *S* is slanted.
- ☐ If $x < y$, the area of a horizontal cross section of cylinder *P* is greater than the area of a horizontal cross section of cylinder *S*.
- ☐ If $x < y$, the area of a horizontal cross section of cylinder *P* is equal to the area of a horizontal cross section of cylinder *S*.
- ☐ If $x < y$, the area of a horizontal cross section of cylinder *P* is less than the area of a horizontal cross section of cylinder *S*.

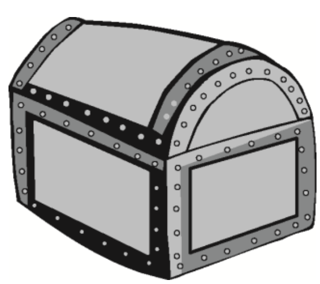
5. An igloo is a shelter constructed from blocks of ice in the shape of a hemisphere. This igloo has an entrance below ground level.



The outside diameter of the igloo is 12 feet. The thickness of each block of ice that was used to construct the igloo is 1.5 feet. Estimate in cubic feet the amount of space of the living area inside the igloo.

6. The figure below shows a 20-foot-tall evergreen tree with a 1-foot-wide trunk. The lowest branches are 3 feet above the ground, and at that level, the tree is 7 feet wide. What is an appropriate shape (or combination of shapes) that can be used to model the tree to estimate the volume of the tree. Indicate the dimensions of the shape(s).

7. The figure below represents a chest. What is an appropriate shape (or combination of shapes) that can be used to model the chest.



8. A candle maker uses a mold to make candles like the one shown below.

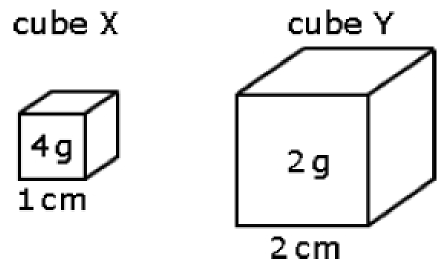
The height of the candle is 13 cm and the circumference of the candle at its widest measure is 31.416 cm. Use modeling to approximate how much wax, to the *nearest cubic centimeter,* is needed to make this candle. Justify your answer.

FSA Geometry EOC Review

MAFS.912.G-MG.1.2 EOC Practice

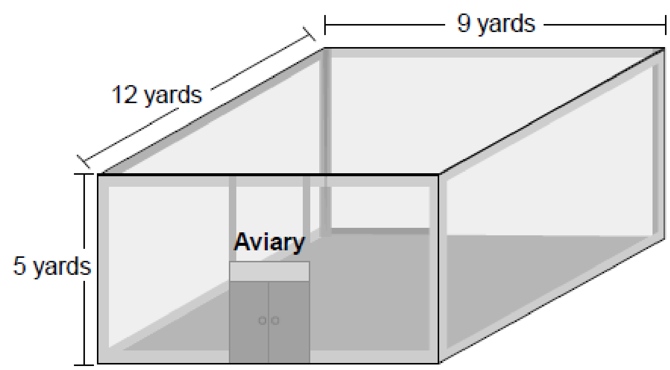
Level 2	Level 3	Level 4	Level 5
calculates density based on a given area, when division is the only step required, in a real-world context	calculates density based on area and volume and identifies appropriate unit rates	finds area or volume given density; interprets units to solve a density problem	applies the basic modeling cycle to model a situation using density

1. Given the size and mass of each of the solid cubes *X* and *Y*, how many times is the density of cube *X* greater than the density of cube *Y*?



   A. 4
   B. 6
   C. 8
   D. 16

2. An aviary is an enclosure for keeping birds. There are 134 birds in the aviary shown in the diagram.



   What is the number of birds per cubic yard for this aviary? Round your answer to the nearest hundredth.

   A. 0.19 birds per cubic yard
   B. 0.25 birds per cubic yard
   C. 1.24 birds per cubic yard
   D. 4.03 birds per cubic yard

3. County *X* has a population density of 250 people per square mile. The total population of the county is 150,000. Which geometric model could be the shape of county *X*?

   A. a parallelogram with a base of 25 miles and a height of 25 miles
   B. a rectangle that is 15 miles long and 45 miles wide
   C. a right triangle with a leg that is 30 miles long and a hypotenuse that is 50 miles long
   D. a trapezoid with base lengths of 10 miles and 30 miles and a height of 25 miles

4. Which field has a density of approximately 17,000 plants per acre?

   A. 85 acres with 1.02×10^6 plants
   B. 100 acres with 1.7×10^7 plants
   C. 110 acres with 1.9×10^6 plants
   D. 205 acres with 3.4×10^5 plants

5. A typical room air conditioner requires 2.5 BTUs of energy to cool 1 cubic foot of space effectively. For each of the following room sizes, indicate whether a 4,000 BTU air conditioner will meet the requirement to keep the room cool.

Room Length	Room Width	Ceiling Height	Will the Air Conditioner Meet the Requirement to Keep the Room Cool? (yes or no)
14 feet	14 feet	8 feet	
15 feet	12 feet	9 feet	
16 feet	10 feet	9 feet	
20 feet	11 feet	8 feet	

6. The town of Manchester (population 50,000) has the shape of a rectangle that is 5 miles wide and 7 miles long.

Part A
What is the population density, in people per square mile, in Manchester? Round your answer to the nearest whole number of people per square mile.

Part B
The town of Manchester contains a business area in the center of town that has the shape of a disk with a radius of 1 mile. If no one resides in the business area, what is the population density in Manchester, in people per square mile, outside of the business area? Round your answer to the nearest whole number of people per square mile.

7. A hemispherical tank is filled with water and has a diameter of 10 feet. If water weighs 62.4 pounds per cubic foot, what is the total weight of the water in a full tank, to the nearest pound?

A. 16,336
B. 32,673
C. 130,690
D. 261,381

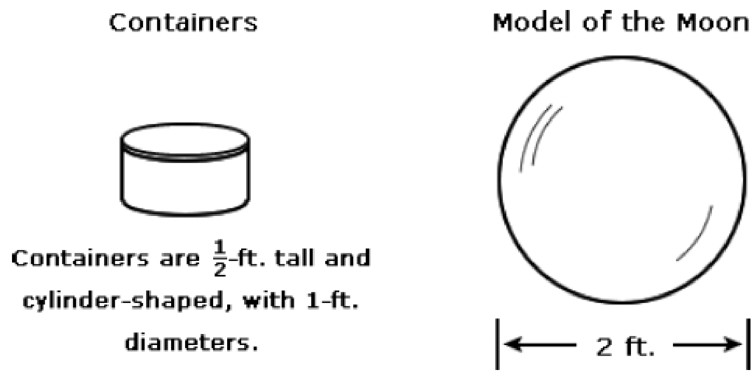
8. The density of the American white oak tree is 752 kilograms per cubic meter. If the trunk of an American white oak tree has a circumference of 4.5 meters and the height of the trunk is 8 meters, what is the approximate number of kilograms of the trunk?

A. 13
B. 9694
C. 13,536
D. 30,456

MAFS.912.G-MG.1.3 EOC Practice

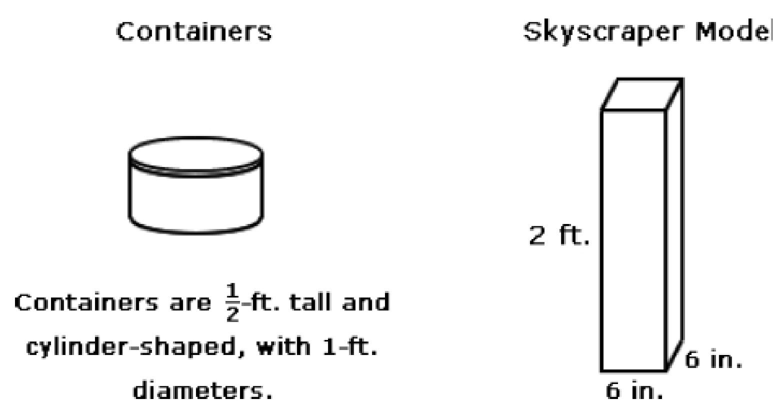
Level 2	Level 3	Level 4	Level 5
uses ratios and a grid system to determine values for dimensions in a real-world context	applies geometric methods to solve design problems where numerical physical constraints are given; writes an equation that models a design problem that involves perimeter, area, or volume of simple composite figures; uses ratios and a grid system to determine perimeter, area, or volume	constructs a geometric figure given physical constraints; chooses correct statements about a design problem; writes an equation that models a design problem that involves surface area or lateral area; uses ratios and a grid system to determine surface area or lateral area	applies the basic modeling cycle to solve a design problem that involves cost; applies the basic modeling cycle to solve a design problem that requires the student to make inferences from the context

1. Stephanie is going to form a clay model of the moon. The model will have a diameter of 2 feet, and the clay she will use comes in containers as described below. What is the least number of containers Stephanie will need in order to complete the model?



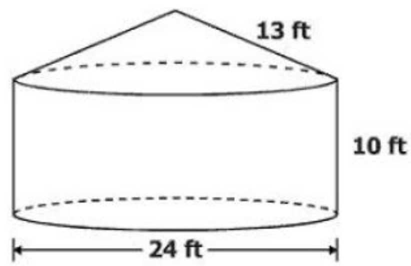
A. 3
B. 11
C. 16
D. 22

2. Lewis is going to form a clay model of a skyscraper. The model will be in the shape of a 2-foot tall prism with a 6-inch by 6-inch base. The clay he will use comes in containers as described below. What is the least number of containers Lewis will need in order to complete the model?



A. 1
B. 2
C. 4
D. 12

3. This container is composed of a right circular cylinder and a right circular cone.



Which is closest to the surface area of the container?

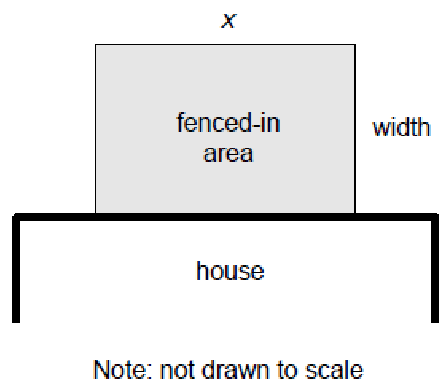
A. $490\ ft^2$
B. $754\ ft^2$
C. $1{,}243\ ft^2$
D. $1{,}696\ ft^2$

4. Beth is going to enclose a rectangular area in back of her house.

The house wall will form one of the four sides of the fenced-in area, so Beth will only need to construct three sides of fencing.

Beth has 48 feet of fencing. She wants to enclose the maximum possible area. What amount of fence should Beth use for the side labeled *x*?

A. 12 feet
B. 16 feet
C. 24 feet
D. 32 feet



5. A farmer wants to build a new grain silo. The shape of the silo is to be a cylinder with a hemisphere on top, where the radius of the hemisphere is to be the same length as the radius of the base of the cylinder. The farmer would like the height of the silo's cylinder portion to be 3 times the diameter of the base of the cylinder. What should the radius of the silo be if the silo is to hold $22{,}500\pi$ cubic feet of grain?

6. A wooden block measuring 6 inches by 8 inches by 10 inches is to be carved into the shape of a pyramid.

   Part A
   What is the largest volume of a pyramid that can be made from the block?

   Part B
   Does the length of the sides that are chosen for the base of the pyramid have an effect on your calculation in Part A? Justify your answer.

7. Hank is putting jelly candies into two containers. One container is a cylindrical jar with a height of 33.3 centimeters and a diameter of 8 centimeters. The other container is spherical. Hank determines that the candies are cylindrical in shape and that each candy has a height of 2 centimeters and a diameter of 1.5 centimeters. He also determines that air take up 20% of the volume of the containers. The rest of the space will be taken up by the candies.

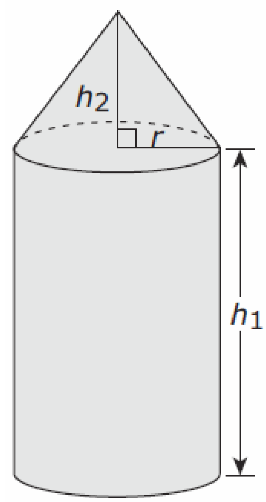
   Part A
   After Hank fills the cylindrical jar with candies, what will be the volume, in cubic centimeters, of the air in the cylindrical jar? Round your answer to the nearest whole cubic centimeter.

   Part B
   What is the maximum number of candies that will fit in the cylindrical jar?

   Part C
   The spherical container can hold a maximum of 280 candies. Approximate the length of the radius, in centimeters, of the spherical container. Round your answer to the nearest tenth.

   Part D
   Hank is filling the cylindrical container using bags of candy that have a volume of 150 cubic centimeters. Air takes up 10% of the volume of each bag, and the rest of the volume is taken up by candy. How many bags of candy are needed to fill the cylindrical container with 260 candies?

8. The Farmer Supply is building a storage building for fertilizer that has a cylindrical base and a cone-shaped top. The county laws say that the storage building must have a maximum width of 8 feet and a maximum height of 14 feet.

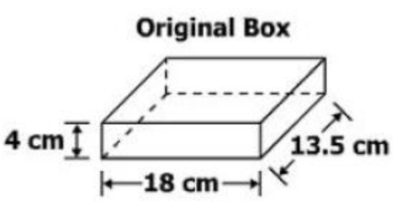


Dump trucks deliver fertilizer in loads that are 4 feet tall, 6 feet wide, and 12 feet long. Farmer Supply wants to be able to store 2 dump-truck loads of fertilizer.

Determine a height of the cylinder, h_1, and a height of the cone, h_2 , that Farmer Supply should use in the design. Show that your design will be able to store at least two dump-truck loads of fertilizer.

Enter your answer and your work in the space provided.

9. A cell phone box in the shape of a rectangular prism is shown. The height of the box is $4\ cm$.



The height of the original box will be increased by 3.5 centimeters so a new instruction manual and an extra battery can be included. Which is closest to the total surface area of the new box?

A. 479 cm^2
B. 707 cm^2
C. 738 cm^2
D. 959 cm^2

10. Mr. Fontenot planted four types of soybeans on his land in order to compare overall cost (for planting and harvesting) and crop harvest. The table shows the number of acres planted, the cost per acre, and the number of bushels of soybeans produced for the different types of soybeans.

Type of Soybean	Number of Acres Planted	Cost (per acre) to Harvest	Number of Bushels Produced
A	200	$174.70	9,000
B	150	$180.90	7,500
C	100	$192.40	5,900
D	75	$204.00	4,500

Part A
Regulations specify that Mr. Fontenot cannot devote more than 80% of a field to one particular type of soybean. He wants to design a field so that he can harvest the most soybeans for the lowest cost. What is the best design plan for Mr. Fontenot's 525 acres? Include specific details about which soybeans you chose, how many acres of each type should be planted, and why you chose those soybeans.

Part B
This table shows the profit Mr. Fontenot can earn per bushel for each type of soybean.

Type of Soybean	Profit per Bushel
A	$4.50
B	$3.88
C	$3.96
D	$4.24

Determine if the design plan created in part A is the most profitable 80/20 design.

- If part A is the most profitable plan, explain why it is the most profitable and include specific details about the profitability of the plan from part A compared to all other possible design plans.

OR

- If part A is not the most profitable plan, determine which design plan is the most profitable and include specific details about the profitability of the plan from part A compared to this design plan.

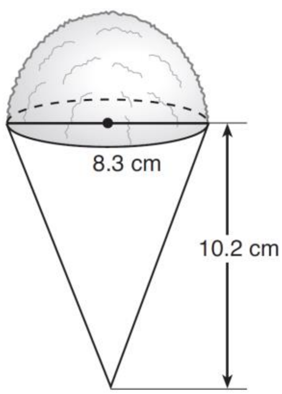
11. New streetlights will be installed along a section of the highway. The posts for the streetlights will be 7.5 m tall and made of aluminum. The city can choose to buy the posts shaped like cylinders or the posts shaped like rectangular prisms. The cylindrical posts have a hollow core, with aluminum 2.5 cm thick, and an outer diameter of 53.4 cm. The rectangular-prism posts have a hollow core, with aluminum 2.5 cm thick, and a square base that measures 40 cm on each side.

    The density of aluminum is 2.7 g/cm^3, and the cost of aluminum is \$0.38 per kilogram.

    Part A: If all posts must be the same shape, which post design will cost the town less?

    Part B: How much money will be saved per streetlight post with the less expensive design?

12. A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters.



The desired density of the shaved ice is 0.697 g/cm^3, and the cost, per kilogram, of ice is \$3.83. Determine and state the cost of the ice needed to make 50 snow cones.