Geo U7 SBAC Practice Name Key Date _____ Period ___

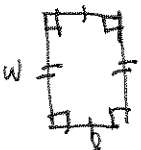
Part A: Volume [G-GMD.3]

1. Mr. Jones is inspecting rooms to determine their maximum occupancy. Building regulations require each person to have at least 20 square feet of floor space inside a room.

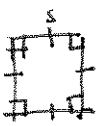
For each room, **select** the appropriate sign Mr. Jones should hang.

	Occupancy not to exceed 25 persons	Occupancy not to exceed 28 persons	Occupancy not to exceed 30 persons
A circular room with radius 14 feet.			✓
A rectangular room 17 feet wide and 30 feet long.	✓		
A square room with side lengths of 24 feet.		✓	

$r = 14\text{ ft}$
$A = \pi r^2$
$A = \pi 14^2$
$A = 615.75\text{ ft}^2$
$615.75\text{ ft}^2 \left(\frac{1\text{ person}}{20\text{ ft}^2}\right) = 30.788\text{ persons}$
rounded = 30 persons max



$A = l \cdot w$
$A = 17\text{ ft} \cdot 30\text{ ft}$
$A = 510\text{ ft}^2$
$510\text{ ft}^2 \left(\frac{1\text{ person}}{20\text{ ft}^2}\right) = 25.5\text{ persons}$
rounded = 25 persons max



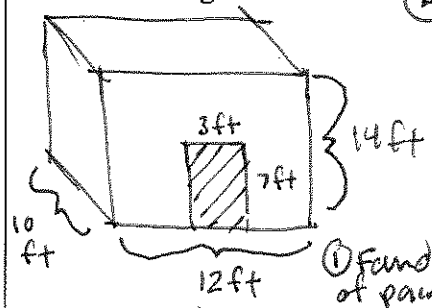
$A = s^2$
$A = (24\text{ ft})^2$
$A = 576\text{ ft}^2$
$576\text{ ft}^2 \left(\frac{1\text{ person}}{20\text{ ft}^2}\right) = 28.8\text{ persons}$
rounded = 28 persons max

Common misconceptions: In problems like 1 and 2, students lose track of units. Setting up the problem and approaching unit conversions like science can help students track the units and make sense of the relationships.

2. Veronica is painting the inside walls and ceiling of her walk-in closet. She will apply two coats of paint.

- The room is rectangular with length 10 feet, width 12 feet, and height 14 feet.
- The room has a door which will not be painted that has dimensions 3 feet by 7 feet.
- The room has no windows or other features on the walls.
- 1 gallon of paint will cover 400 square feet.
- Paint is sold in 2-gallon containers.

Determine the minimum number of containers of paint she will need to purchase. **Justify** your reasoning.



① found square feet of painted area:
Ceiling: $(10\text{ ft})(12\text{ ft}) = 120\text{ ft}^2$
left wall: $(10\text{ ft})(14\text{ ft}) = 140\text{ ft}^2$
right wall: $(10\text{ ft})(14\text{ ft}) = 140\text{ ft}^2$
front wall: $(12\text{ ft})(14\text{ ft}) = 168\text{ ft}^2$
back wall: $(12\text{ ft})(14\text{ ft}) = 168\text{ ft}^2$
door: $(3\text{ ft})(7\text{ ft}) = -21\text{ ft}^2$
surface area to paint: 715 ft^2

② doubled for two coats of paint: $2\text{ coats of paint} \cdot \left(\frac{715\text{ ft}^2}{\text{coat}}\right) = 1430\text{ ft}^2$

③ convert to gallons: $1430\text{ ft}^2 \cdot \left(\frac{1\text{ gallon}}{400\text{ ft}^2}\right) = 3.575\text{ gallons}$

④ convert to containers: $3.575\text{ gallons} \cdot \left(\frac{1\text{ container}}{2\text{-gallons}}\right) = 1.788\text{ containers}$

Veronica needs to purchase two containers of paint

common misconceptions
Like problem 1, students struggle with organizing their work and converting units. Having students justify their steps and setup unit conversions with fractions can support students in tracking quantities and relationships through a problem to solution process.

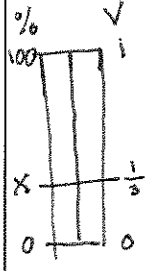
3. Suppose two containers are constructed such that container A is a rectangular pyramid and container B is a rectangular prism. Assume the two containers have congruent bases and the same height.

Container B is filled with water and then poured into container A.

Determine the percent of water from container B that it will take to completely fill container A. **Justify** your reasoning.

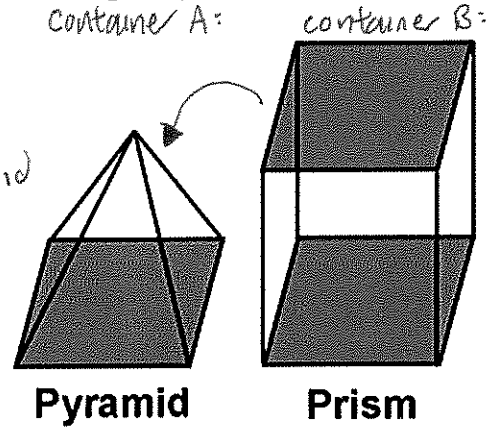
Pyramid Volume = $\frac{1}{3}bh$ Prism Volume = bh

If $bh_{pyramid} = bh_{prism}$, then the only difference is the coefficient and the pyramid is $\frac{1}{3}$ the volume of the prism.

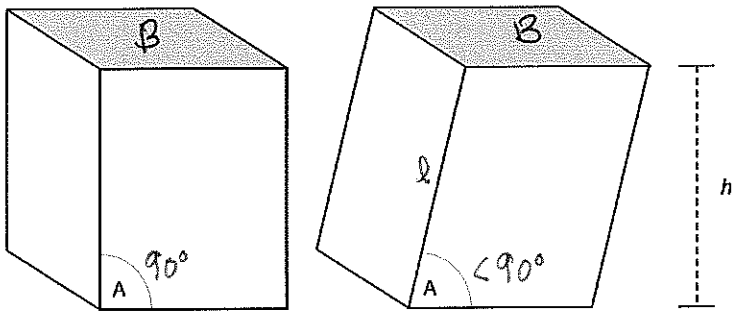


$\frac{100}{x} = \frac{1}{1/3}$ $\frac{1}{3}(100) = x$ $33.\bar{3}\% = x$

It will take $33.\bar{3}\%$ of container B to fill container A.



4. Consider the right rectangular prism shown below with $m\angle A = 90°$ and height, h.



Consider a second rectangular prism, slanted such that $m\angle A < 90°$, height is still h, and the base is congruent to the first prism's base (shaded).

Select the statement that is true and **justify** your reasoning.

A) As the measure of $\angle A$ decreases, the volume of the prism will increase.

B) As the measure of $\angle A$ decreases, the volume of the prism will remain the same.

C) As the measure of $\angle A$ decreases, the volume of the prism will decrease.

The volume for any prism is $V = bh$. Since b and h remain constant (l, slant height changes) the volume remains constant.

common misconceptions

students often confuse l, slant height, and h, height. students also confuse surface area changes with volume changes. Modeling volume with water and a variety of containers and connecting to the formulas is a recommended strategy for correcting these misconceptions.