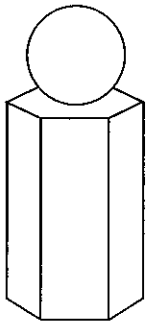
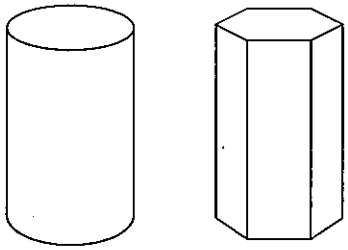
Perfume Packaging

Gina would like to package her newest fragrance, *Persuasive*, in an eye-catching yet cost-efficient box. The *Persuasive* perfume bottle is in the shape of a regular hexagonal prism 10 centimeters high. Each base edge of the prism is 3 centimeters. The cap is a sphere with a radius of 1.5 centimeters.



Gina would like to compare the cost of the proposed box designs shown below. It is important that each bottle fit tightly in the box to avoid movement during shipping, but the box must be large enough to allow people to get the bottle in and out of it. Thus, the box should only be 0.5 cm taller and 0.5 cm wider than the height and widest portion of the base of the bottle.



1. Determine the measurements needed for each dimension on the two boxes. Explain how you determined these dimensions.
2. Sketch the net for each package design, showing how you would make each box from a single sheet of cardboard. (Do not include the flaps needed to glue the box.)
3. Calculate the amount of cardboard used for each design. Which box will be more cost-efficient?

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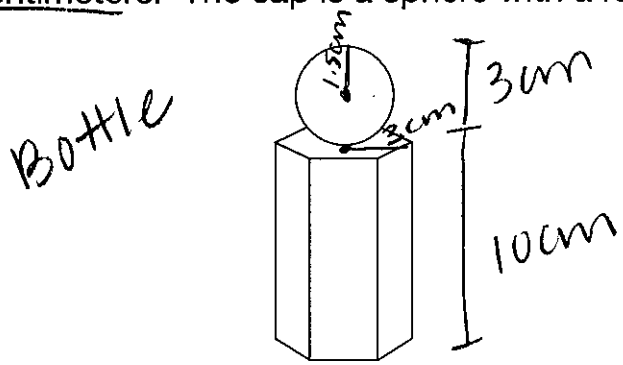

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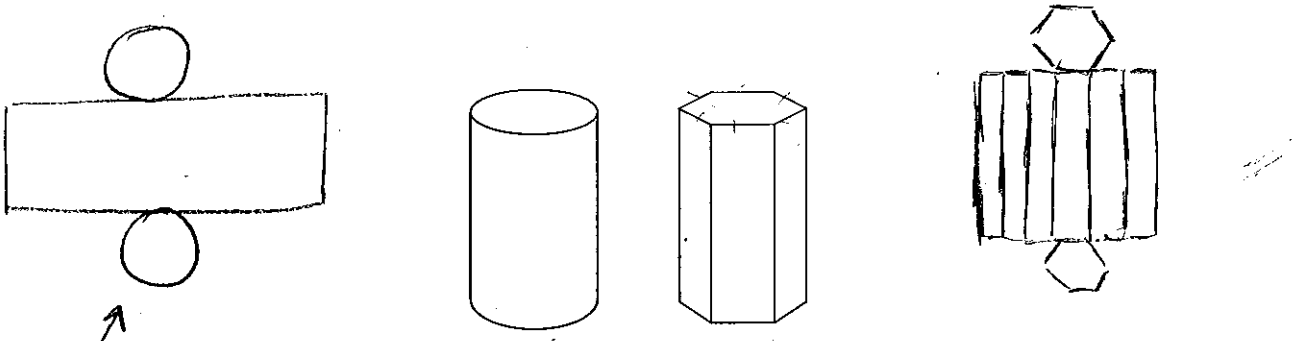


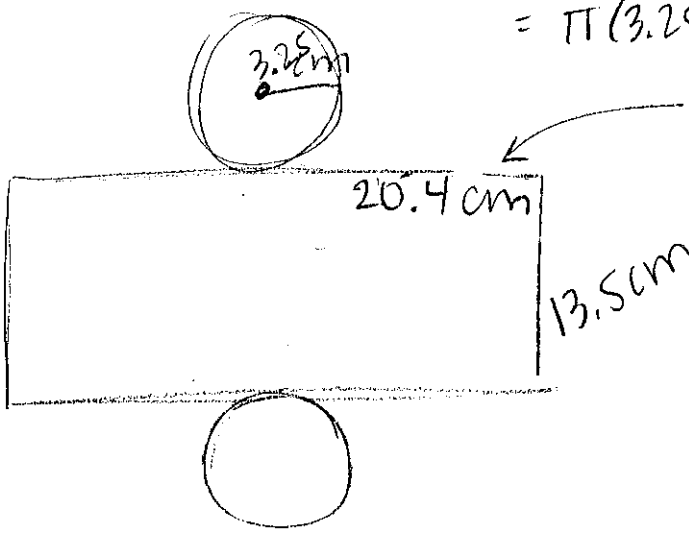
1. Determine the measurements needed for each dimension on the two boxes. Explain how you determined these dimensions. 13.5 cm x 3.25 cm
2. Sketch the net for each package design, showing how you would make each box from a single sheet of cardboard. (Do not include the flaps needed to glue the box.)
3. Calculate the amount of cardboard used for each design. Which box will be more cost-efficient? on next sheet (warning, I do surface area using common sense rather than using formulas)

*that way you don't have to memorize them!!

Area of Circle $= \pi r^2$

$= \pi(3.25)^2 \approx 33.18 cm^2$

(it wraps around the circle)



To find length, must find circumference of circle

$C = 2\pi r$

$= 2\pi(3.25) = 20.42 cm$

Area of Rectangle

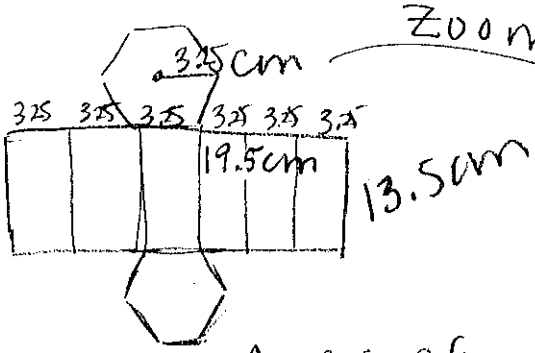
$A = l \cdot w$

$A = 20.42 \times 13.5 = 275.67 cm^2$

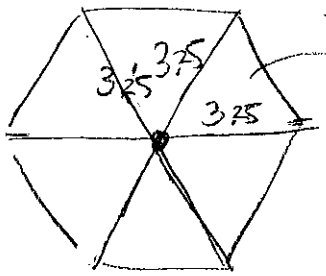
Surface Area of cylinder (there are 2 circles)

$SA = (\text{area of circle}) \times 2 + (\text{area of rectangle})$

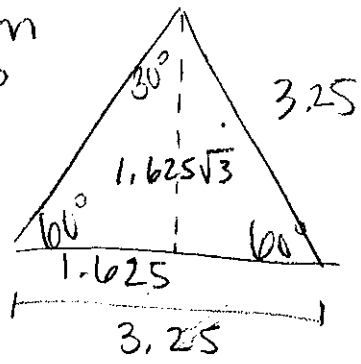
$SA = (33.18) \times 2 + (275.67) = \boxed{342.03 cm^2}$



Zoom



Zoom



Area of hexagon = find area of $\triangle$ $\times 6$

$= (4.57) \times 6$

$= 27.42 cm^2$

$1.625 \times \sqrt{3} = 2.81$

Area of $\triangle = \frac{1}{2} b h$

$A = \frac{1}{2}(3.25)(2.81)$

$= 4.57 cm^2$

Area of rectangle

$= 19.5 \times 13.5 = 263.25 cm^2$

Surface Area of Hexagon Prism

$SA = (\text{area of hexagon}) \times 2 + (\text{area of rectangle})$

$(27.42) \times 2 + 263.25 = \boxed{318.1 cm^2}$

The hexagonal prism is more cost-efficient due to the smaller surface area