Jakarta International School

7th Grade

Practice Test - Green

Area and Volume

Name: ____________________

Date: ____________________

Score: $\overline{}$ 38

Clearly show required work. Check Carefully! **(2 points per answer)**

1. **A Sandbox for Geoffrey**

Mr. and Mrs. Hesslink want to build a sandbox for their son Geoffrey. They bought 5 wooden boards to create the sandbox frame. They chose wood because they didn't know exactly what size they'd make the sandbox, so they want to be able to cut the pieces after they figure out the best size. Each board is 8 feet long. Plastic must also be purchased for the bottom of the sandbox. However, they are not sure how much to buy. First they must determine the size the sandbox is going to be.

A. What are all of the possible rectangular sandboxes that they could make using all of the wood they purchased? Only consider whole number possibilities.

The total length of the 5 boards = 8 ft × 5 = 40 ft. The 40 ft needs to be divided into 4 parts [2 length and 2 width of the rect. sand box]. The possible sizes are (19 ft, 1 ft, 1 ft, 19 ft): 19′ × 1′, 18′ × 2′, 17′ × 3′, 16′ × 4′, 15′ × 5′, 14′ × 6′, 13′ × 7′, 12′ × 8′, 11′ × 9′, 10′ × 10′.

B. Which one do you think they should build? Why?

They should build 10 ft × 10 ft or [10′ × 10′] because it is the largest area and would hold the maximum quantity of sand.

[NOTE: ANSWERS MAY VARY]

C. How much plastic do the Hesslinks need to buy to cover the bottom of the sand box?

Area of the bottom of the sand box = 10 ft × 10 ft = 100 ft²

The Hesslinks need to buy 100 ft² of plastic.

[ANSWERS WILL VARY DEPENDING ON ANSWER OF C]

2. If each side of a perfect cube is stretched to be twice as long, by how many times will the volume of the cube increase?

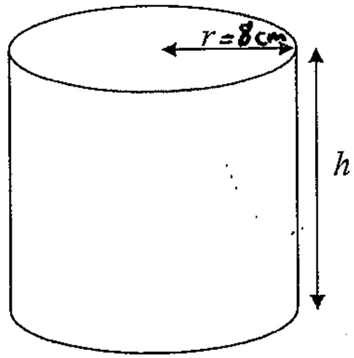
Let each side of the perfect cube = x units.

It volume will be $x \cdot x \cdot x$ units^3 = x^3 units^3

If each side is stretched to twice the length, each side of the cube will be $2x$ units. The new volume will be $= 2x \cdot 2x \cdot 2x$ units^3 = $8x^3$ units^3. The volume of the cube increases by $\frac{8x^3}{x^3} = 8$ times.

3. Calculate the volume and surface area of the following 3D shapes. Make sure you include a formula and ALL working steps.

a. The following cylinder has a **radius of 8cm** and a **height of 20 cm.**



Surface Area (show formula used)

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

$= 2\pi . 8 . 20 \text{ cm}^2 + 2\pi . 8 . 8 \text{ cm}^2$

$= 320\pi \text{ cm}^2 + 128\pi \text{ cm}^2$

$\boxed{S = 448\pi \text{ cm}^2}$

$S = 448 \times 3.14 \text{ cm}^2$

$\boxed{S = 1406.76 \text{ cm}^2}$

Volume (show formula used)

$V = \pi r^2 h$

$= \pi . 8^2 . 20 \text{ cm}^3$

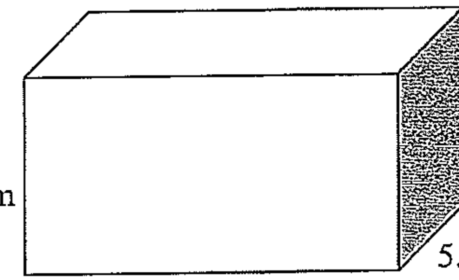
$= \pi . 64 . 20 \text{ cm}^3$

$\boxed{V = 128\pi \text{ cm}^3}$

$V = 128 \times 3.14 \text{ cm}^3$

$\boxed{V = 401.92 \text{ cm}^3}$

b. The shaded portion is the base.



Surface Area (show formula used)

$S = 2lw + 2lh + 2wh$

$= 2(9.2)(5.3) \text{ mm}^2 + 2(9.2)(7.4) \text{ mm}^2 + 2(5.3)(7.4) \text{ mm}^2$

$= 97.52 \text{ mm}^2 + 136.16 \text{ mm}^2 + 78.44 \text{ mm}^2$

$\boxed{S = 312.12 \text{ mm}^2}$

Volume (show formula used)

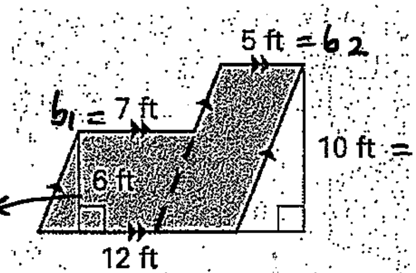
$V = lwh$

$= (9.2)(5.3)(7.4) \text{ mm}^3$

$\boxed{V = 360.824 \text{ mm}^3}$

4. Find the area of each figure below

A.



The figure is divided into 2 parallelograms.

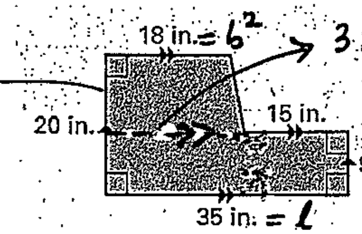
$A = b_1h_1 + b_2h_2$

$= 7 \cdot 6\ ft^2 + 5 \cdot 10\ ft^2$

$= 42\ ft^2 + 50\ ft^2$

$\boxed{A = 92\ ft^2}$

B.



$35 - 15 = 20$ in $= b_1$

$20 - 9 = 11$ in $= h$

The figure is divided into a rectangle and a trapezoid.

A = Area of rect. + Area of trapezoi

$= l \cdot w + \frac{1}{2}(b_1 + b_2)h$

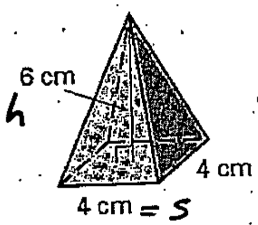
$= 35 \cdot 9\ in^2 + \frac{1}{2}(20+18) \cdot 11\ in^2$

$= 315\ in^2 + \frac{1}{2}(38) \cdot 11\ in^2$

$= 315\ in^2 + 209\ in^2$

$\boxed{A = 524\ in^2}$

5. Find the volume of the square based pyramid pictured here.



$V = \frac{1}{3} s^2 h$

$= \frac{1}{3} \cdot 4^2 \cdot 6\ cm^3$

$= \frac{1}{\cancel{3}_1} \cdot 16 \cdot \cancel{6}^{2}\ cm^3$

$\boxed{V = 32\ cm^3}$

6. A goat is tethered to a stake in the ground with a 5 meter long rope. The goat can graze to the full length of the rope a full 360° around the stake. How much area does the goat have in which to graze?

The area the goat has to graze is a circle with a radius of 5 m.

$A = \pi r^2$

$= \pi \cdot 5 \cdot 5\ m^2$

$\boxed{A = 25\pi\ m^2}$

$A = 25 \times 3.14\ m^2$

$\boxed{A = 78.5\ m^2}$

7. A bedroom is 18 ft long, 14 ft wide and 8 ft high.

a. Find the cost of painting the four walls with two coats of paint costing \$9.50 per gallon. Each gallon covers 256 ft^2 with a single coat.

The four walls to be painted have the following dimensions:
18 ft × 8 ft, 18 ft × 8 ft, 14 ft × 8 ft, 14 ft × 8 ft
The area to be painted is $A = [(18 \times 18) + (18 \times 8) + (14 \times 8) + (14 \times 8)]\,ft^2$
$A = [144 + 144 + 112 + 112]\,ft^2 = \boxed{512\,ft^2 = A}$
Since each gallon covers 256 ft^2, no. of gallons needed to cover $512\,ft^2 = \frac{512\,ft^2}{256\,ft^2} = 2$. So for a double coat, $2 \times 2 = \boxed{4 \text{ gallons}}$ are needed to paint the wall.

b. Find the cost of carpeting the floor with carpet costing \$5/ft^2.

The dimensions of the floor are 18 ft × 14 ft
$A = (18 \times 14)\,ft^2 = 252\,ft^2$
Cost of carpet
Cost of carpeting the floor $= 252 \times \$5 = \boxed{\$1260}$

c. Find the cost of covering the ceiling with acoustic tile costing \$7.50/ft^2.

Dimensions of ceiling are same as dimension of floor $= 252\,ft^2$
Cost of tile $= \$7.50/ft^2$
Cost of tiling ceiling $= 252 \times \$7.50 = \boxed{\$1890}$

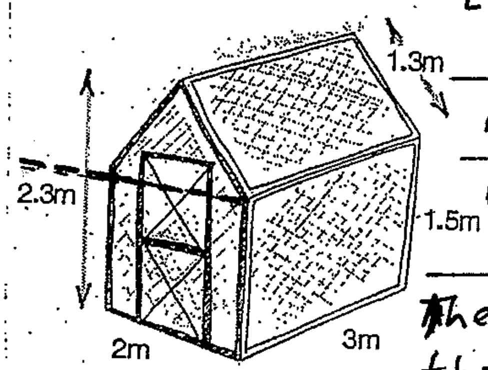
8. **Norman Windows** - A Norman window from Congress Hall in Philadelphia consists of a rectangle and a half circle, as shown. Find the area of the window to the nearest square foot.

A = Area of window = Area of rectangle + Area of semicircle

$A = l \cdot w + \frac{1}{2}\pi r^2$
$= 4 \cdot (8.25)\,ft^2 + \frac{1}{2}\pi \cdot 2 \cdot 2\,ft^2$
$= (33 + 2\pi)\,ft^2$
$= [33 + 2(3.14)]\,ft^2$
$= [33 + 6.28]\,ft^2$
$= 39.28\,ft^2$
$\boxed{A \doteq 39\,ft^2}$

Diameter of semicircle = 4 ft
So radius $= \frac{4}{2} = 2$ ft
$r = 2$ ft

9. Glenn is making an aviary (a big bird cage). The dimensions of the aviary are shown in this diagram. The total height is 2.3 m. Calculate the cost of covering the wooden frame with wire netting at \$3.95 per square meter.



A[Total wooden frame] = A[slanting roof] x 2 + A[rectangular side] x 2 + A[⌂ side] x 2

A[slanting roof] = $l \cdot w = 3m \times 1{\cdot}3m = 3{\cdot}9m^2$

A[rectangular side] = $l \cdot w = 3m \times 1{\cdot}5m$
$= 4{\cdot}5m^2$

The ⌂ side is divided into 2 parts; the triangle on top and the rectangle below.

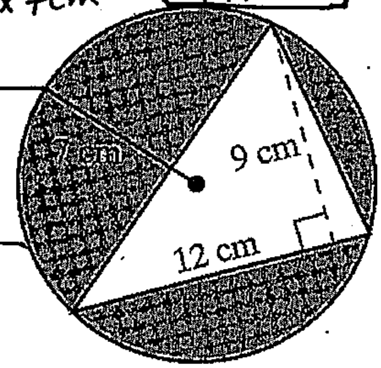
Height of the Δ = $2{\cdot}3m - 1{\cdot}5m = 0{\cdot}8m$
Base of the Δ = $2m$
Area of the Δ = $\frac{1}{2} \cdot b \cdot h = \frac{1}{\cancel{2}} \times \cancel{2}m \times 0{\cdot}8m = 0{\cdot}8m^2$

Area of the rect. = $l \cdot w = 2m \times 1{\cdot}5m = 3m^2$

A[Total wooden frame] = $(3{\cdot}9 \times 2) + (4{\cdot}5 \times 2) + (0{\cdot}8 + 3) \times 2$
$= 7{\cdot}8 + 9{\cdot}0 + 7{\cdot}6 = \boxed{24{\cdot}4m^2}$

Cost of covering wooden frame with netting = $24{\cdot}4 \times \$3.95 = \boxed{\$96{\cdot}38}$

10. Find the *circumference* of the circle and the *area* of the shaded region below. (4 points)



Circumference of the circle $= 2\pi r = 2\pi \times 7cm = \boxed{14\pi cm}$
$= 14 \times 3{\cdot}14 cm = \boxed{43{\cdot}96cm}$

Area of shaded region = Area of circle − Area of white Δ

Area of circle $= \pi r^2 = 3{\cdot}14 \times (7cm)^2$
$= 153{\cdot}86 \ cm^2$

Area of white Δ $= \frac{1}{2} \cdot b \cdot h = \frac{1}{\cancel{2}} \times \cancel{12}^{6}cm \times 9cm$
$= 54cm^2$

Area of shaded region $= 153{\cdot}86 \ cm^2 - 54 \ cm^2$
$= \boxed{99{\cdot}86cm^2}$