Animal Shapes & Sizes Final Project

Based on what you have learned about different animals, their volumes, and their surface areas, you now get the chance to create your own animal.

Design a new species of animal choosing between one of the two options below. All designs should be on computer paper or larger art pad paper. ***As you decide on a design, make sure it is one that will demonstrate your knowledge of surface area and volume.***

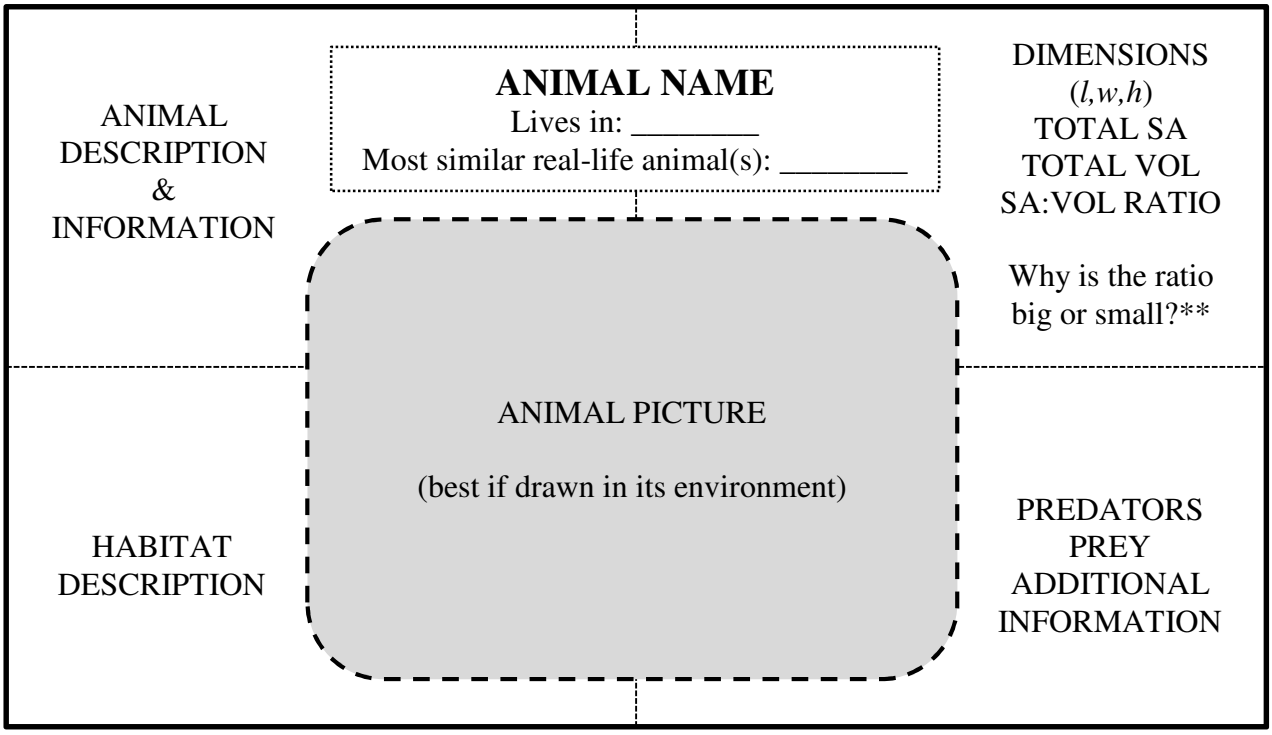
Design 1	Create a new land tetrapod that would be ideally suited to live at the Earth's equator in areas that have the highest temperatures. Make your design creative and fun while at the same time using your knowledge of surface area-to-volume ratios.
OR	
Design 2	Create a new land tetrapod that would be ideally suited to live at one of the extremes of the Earth (artic or Antarctic) in areas that have the lowest temperatures. Make your design creative and fun while at the same time using your knowledge of surface area-to-volume ratios.
Optional Extra Credit	Create a 3D scale model of your animal. You choose the scale and you choose any materials you wish to create your scale model.

Your picture:

- Should have the animal's name
- Should show the animal length-wise [You may draw additional angles of your animal if you wish.]
- Should be similar to a picture you would find in an animal encyclopedia [draw some sort of background to give the reader an idea of its habitat.]
- Should have a background helping the reader to understand its environment
- Should list its dimensions
- Should list the total surface area, total volume, and the SA-VOL ratio of your animal
- Should provide a description of the animal and its habitat.
- Should include a description include what it eats (omnivore, herbivore, carnivore) and its predators and prey.
- Can optionally be colored
- Will be graded on how well your incorporate the math you have learned into its shape, size, characteristics, and dimensions

Your project will be placed on ManghamMath when completed. Please ensure that it is neat and can easily be read. I suggest a final copy in Sharpie or marker to make it easier to see.

SUGGESTED LAYOUT



**** SA-VOL RATIO**

Big:	Greater than 1:1
Medium:	Between 0.5:1 and 1:1
Small:	Less than 0.5:1

Created by Lance Mangham, 6th grade math, Carroll ISD

Activity 16-11: **Skin and Guts** Name:

Answer the questions below regarding your new animal. Numbers 1 through 7 should be on your layout.

1.	What is the name of your new animal?			
2.	Where does your animal live?			
3.	To what real-world animal would it be closest in size?			
4.	How tall is your animal? How long is your animal? How wide is your animal? (all in inches)			
5.	What is the approximate surface area of your animal? (square inches)			
6.	What is the approximate volume of your animal? (cubic inches)			
7.	What is the surface area-to-volume ratio of your animal? (nearest hundredth)	to 1		
8.	After you decided on the volume (size) of your animal, what characteristics did you add to either increase or decrease the overall surface area of your animal?			
9.	If your animal was ten times bigger than your original design, how might you have to change some of its characteristics (in terms of the SA-VOL ratio change)?			
10.	If your animal was one-tenth of the size of your original design, how might you have to change some of its characteristics (in terms of the SA-VOL ratio change)?			

Things to remember

If an animal grows 25% in its dimensions, it will double its weight.
If an animal has twice the dimensions, the skin goes up 4x, but heat production goes up 8x.
If a bird were twice as big it would need wings 8 times as big to take off.

- Warm-blooded animals have a limited variety of shapes because large SA to VOL means large heat escape. Thus they are more spherical than other animals.
- Cold-blooded, like lizards and snakes, can be small and skinny.

- Ants can lift 10-50x their own weight.
- Rhinoceros beetles can lift 850x their own weight.

- One way for simple water creatures to become bigger is to get more skin for getting more oxygen (oxygen drifts in through skin) – make their skin "foldy" to increase its SA.
- Bigger water animals have found that it is better to have all your foldy skin for getting oxygen in one place – thus gills.
- On land gills would dry up so the land creatures developed lungs. They were simple bags at first and got more and more complicated – having bigger and bigger SA for getting more oxygen. Mammal lungs give a really huge area of thin skin for breathing.

- Commerson's dolphin is one of the smallest mammals to live its whole life in the water and it is the size of a Labrador retriever. They eat a lot and have a thick layer of fat.
- Most water mammals are much bigger so they can hold onto their heat better.
- Being too small is bad for a reptile because they can lose heat quickly and become sluggish.
- Big animals can go longer without food than small animals. Thus they can migrate more.
- Whales migrate thousands of miles, but dolphins generally stay in one place.
- Wildebeests migrate 1800 miles per year, while smaller plant eaters do not.

- Emperor penguins survive at -76 degrees and 186 miles per hour wind. They weigh 66-88 pounds. They do this by huddling to decrease their SA.
- The deserts are home to many small animals that can hide during the heat of the day and also to many big animals that are able to stand exposed to the elements and tough it out.
- The deserts do not have many medium sized animals. Exception: jackrabbits. One-third of their heat can be dumped through their ears to remain cool.

Animal	**Weight**	**Food Eaten**	**Weight:Food Eaten Ratio**
Elephant	9000 pounds	400 pounds a day	22.5:1
Male polar bear	1500 pounds	150 pounds in a feeding	10:1
Tiger	500 pounds	77 pounds of meat in a feeding	6.49:1
Female hamster	3.5 ounces	0.4 ounces per day	8.75:1
Vampire bat	1 ounce	1 ounce per day	1:1
Hummingbird	0.11 ounces	0.07 ounces	1.57:1
Queen bee	0.004 ounces	0.32 ounces per day	0.0125:1

Accelerated Mathematics Formula Chart Name:

Linear Equations

Slope-intercept form	$y = mx + b$	Direct Variation	$y = kx$ (8th grade)
Constant of proportionality	$k = \frac{y}{x}$	Slope of a line	$m = \frac{y_2 - y_1}{x_2 - x_1}$ (8th grade)

Circumference Circle $C = 2\pi r$ or $C = \pi d$

Area

Rectangle	$A = bh$	Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$
Parallelogram	$A = bh$	Circle	$A = \pi r^2$
Triangle	$A = \frac{bh}{2}$ or $A = \frac{1}{2}bh$		

Surface Area (8th grade)

	Lateral	Total
Prism	$S = Ph$	$S = Ph + 2B$
Cylinder	$S = 2\pi rh$	$S = 2\pi rh + 2\pi r^2 h$

Volume

Triangular prism	$V = Bh$	Cylinder	$V = \pi r^2 h$ or $V = Bh$ (8th grade)
Rectangular prism	$V = Bh$	Cone	$V = \frac{1}{3}Bh$ or $\frac{1}{3}\pi r^2 h$ (8th grade)
Pyramid	$V = \frac{1}{3}Bh$	Sphere	$V = \frac{4}{3}\pi r^3$ (8th grade)

Pi $\pi \approx 3.14$ or $\pi \approx \frac{22}{7}$

Distance	$d = rt$	**Compound Interest**	$A = P(1 + r)^t$
Simple Interest	$I = prt$	**Pythagorean Theorem**	$a^2 + b^2 = c^2$ (8th grade)