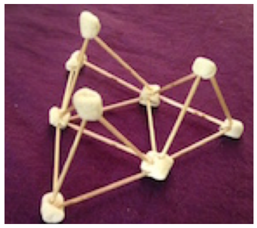




Name: ______________________________

Fractal Tetrahedrons

1. What is a fractal?

2. Describe the four types of fractal patterns.

a) b) c) d)

3. Create example of three fractal patterns that do not require a computer to create.

a) b) c)

4. Make your basic tetrahedron.

5. What type of fractal pattern is a tetrahedron?

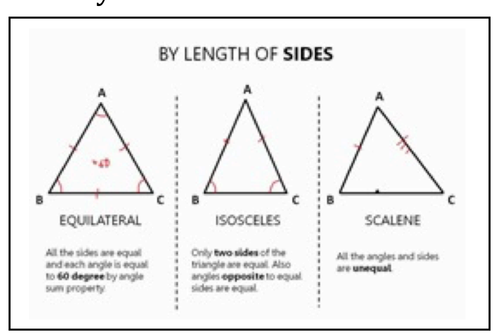
6. What does "tetra" stand for? Why is a tetrahedron named "tetrahedron"?

7. Using a protractor, measure the angles of all the different sides of your tetrahedron.

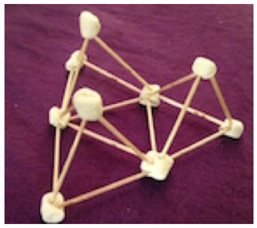
    a) What are they?

    b) Are your angles about the same or really different?

    c) What type of triangle is your tetrahedron?



Fractals are SMART: Science, Math & Art!
www.FractalFoundation.org

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Fractal Tetrahedrons

8. Now let's see what patterns we can find when we build our tetrahedrons. How big can we build one?

NOTE: As you move from first to second order, second to third order, etc, **save the marshmallows you take off –** they will help you see the patterns!

	# Toothpicks	# Marshmallows	Length (cm)
First order tetrahedron			
Second order tetrahedron			
Third order tetrahedron			
Fourth order tetrahedron			

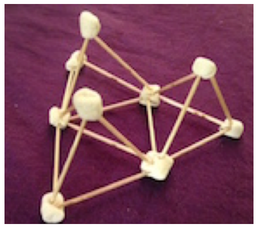
9. a. How do you get from your own tetrahedron to the next step up? What do you do to build it?

b. What is the mathematical expression for how many toothpicks you have in your own versus the next size up?

c, What is the mathematical expression for how many marshmallows you have in your own versus the next size up? Hint – you are doing two mathematical procedures

d. What is happening to the length each time you make a bigger tetrahedron?

10. Use the mathematical expressions to predict how many marshmallows and toothpicks you have in the next two sizes up and build those!

   **Name: ____________________________**

Fractal Tetrahedrons

Adaptations to different grades

- 3rd and up: measure volume and area
- 4th and up: create fractions/ratios based on proportions and discuss which ones are bigger/smaller
- 5th and up: graph each step (first, second, third order vs # marshmallows and # toothpicks) and see what kind of line data create
- 6th and up: create equations (make an equation that shows that relationship), ratios and proportions, graph numbers each iteration – type of line, area and volume, do statistics on measurements – discuss samples and spread; graph distribution and standard deviation, discuss accuracy in angles and lengths of toothpicks in making a design that is truly symmetrical and stable
- 7th and up: measure surface area and volume
- 8th and up: model relationships with quantities, model chemical compounds, molecular structure – engineering (also bridge building), modeling (Next Generation Science Standards)

Where have you seen other tetrahedron shapes or fractals around you? What ideas do you have of where tetrahedrons can be used?
Model to a bigger size with straws and clay, PVC pipe, metal, etc.