3. Geometry Review: Circle Folding—Solutions

First & Last Name: _____ **Class:** _____

1. Cut out circle using template (see below) or draw your own circle using something round (like a paper plate).

2. Write down four properties of your cut-out circle. Prepare to share out.

   Answers vary: diameter, radius, circumference, 2-dimensional, area, chord, tangent, secant, sector, segment, symmetrical, ..

3. Fold circle in half. What do you notice? Write the name of the math concept below.

   Reflective symmetry across the fold line.

4. The formal math name for a "half a circle" is:

   Semi-circle.

5. Name at least one thing you've seen that looks like a "half a circle":

   Answers vary: half moon, pie, protractor, setting sun on horizon, ...

6. Fold circle in fourths. Unfold and mark center. Draw a line from edge to edge through center. The name of this line is called:

   Diameter.

7. Draw a line from edge to the center. The name of this line is called:

   Radius.

8. What is the formula for the circumference of a circle?

   If r is the radius, the circumference is $C = 2\pi r$
   If d is the diameter, the circumference is $C = \pi d$

9. What is the formula for the area of a circle?

   If r is the radius, the area is $A = \pi r^2$

10. Fold the edge of the circle down so it meets the center. Draw a line on the resulting fold. This line is called a:

    Chord.

11. Fold down another edge to create an "ice cream cone" shape. [**Challenge:** How would you find the area of this shape?] Then fold down the final edge. What is the shape and what are some of its properties?

    [Challenge] The shape is a portion of a full circle, so we could use proportions, if we knew what fraction of a full circle the "ice cream cone" (sector) is.

    Triangle. All sides lengths are congruent. All angles are congruent. Symmetrical.

12. Explain how you can prove your shape is equilateral.

    Answers vary: can fold to show congruency, for example.

13. What is the formula for the area of you shape?

    If b is the length of the base and h is the height of the triangle, the area is $A = \frac{1}{2} b h$

14. Fold one vertex down so it touches the center of the opposite side. What is the resulting shape?

    Trapezoid.

15. **[Challenge]** What is the formula for the area of you shape?

    $A = \frac{1}{2}(a + b) h$ where a and b are the lengths of the parallel sides and h is the distance between the parallel sides.

16. Fold one of the *acute* vertices so it meets an *obtuse* vertex. What is the shape and what are some of its properties?

    Rhombus.

17. What is the relationship between the set of all rhombuses, the set of all parallelograms, and the set of all quadrilaterals?

All rhombuses are parallelograms and all parallelograms are quadrilaterals.

18. Fold one acute vertex so it touches the other acute vertex. In your group, have one person unfold back to the original triangle.

Similarity.

19. If you have a small triangle still, unfold back to original triangle. Fold each vertex so it touches the center point. The name of the "resulting shape" is:

A polygon; specifically, a hexagon.

20. How can you prove your "resulting shape" is *regular*?

Answers vary: can fold to show congruency, for example.

21. **[Challenge]** How could you find the area of this shape?

Take it apart into 6 congruent triangles and use the area formula for a triangle.

22. Unfold back to the original triangle and then refold to make a pyramid. Describe the shape and name the related math concepts:

Answers vary: triangular pyramid, 3-dimensional, all faces are congruent, volume, ...

23. **[Challenge]** What is the formula for the volume of a pyramid?

$V = \frac{1}{3} A_{\text{base}}\, h$ where A_{base} is the area of the base and h is the height of the pyramid.

24. Fold the top halves of the triangles down across each other to make a *truncated triangular pyramid*. Describe the bottom base, top base and sides:

Bottom base: equilateral triangle;
Top base: (smaller) equilateral triangle;
Sides: 3 congruent trapezoids

25. **[Challenge]** How could you find the volume of your truncated pyramid?

Find the volume of the original pyramid and subtract the volume of the truncated pyramid.