PFS 26-9 Revised 2/26/13 _____

Drawings to Order

Here are instructions for geometric drawings. Please use a ruler and make the neatest drawings you can. For some you may need a protractor also. If calculations or equations go with your drawing, show them near the drawing on your neat final copy. You can also put comments near each drawing, or write a separate paragraph or two about what you did and what you learned.

How many drawings should you do? Try for the same number of drawings as your grade level—three drawings for third graders, six for sixth graders, etc. I've tried to arrange the drawing projects from simplest to hardest.

1) Draw a neat rectangle, three inches by five inches. What is its area (in square inches)? What is its perimeter (in inches)?

2) Draw a neat 8 cm by 15 cm rectangle. Draw one of its diagonals. How long is that diagonal?

3) Draw a neat right triangle with legs 3 inches and 4 inches. How long is its hypotenuse? (The legs are the two sides that form the right angle; the hypotenuse is the side opposite the right angle.) Could you have predicted the length of the hypotenuse without drawing and measuring?

4) Use a protractor to draw a circle and divide it into twelve equal parts. Draw a neat star polygon. How many different star polygons could be drawn like this with twelve points? (One way to explain what "different" means here, is that the sides of the different star polygons will meet at different angles.) Can you measure those angles?

5) Draw a neat rectangle three inches by five and a half inches. What is its perimeter? Its area?

6) Draw a neat rectangle two and a half inches by three and three quarter inches. What is its area and perimeter?

7) Draw a neat rectangle 4.4 cm by 11.7 cm. What is its area and perimeter? Draw one diagonal for this rectangle. How long is the diagonal? Could you have predicted that?

8) Use a protractor to draw a neat circle. Then draw a quadrilateral of any shape, by connecting any four points on the circle with straight line segments. How long is each side? What is the measure of each angle? What is the sum of the four angles? What do you notice about opposite angles?

9) Draw a rhombus with diagonals 12 cm and 16 cm long. (Hint: the diagonals of a rhombus meet at right angles and bisect each other.) How long is each side of the rhombus? Could you have predicted that without drawing and measuring?

10) Draw a large scalene triangle. (A triangle with sides 12 cm, 14 cm and 16 cm would work well.) Mark the midpoint of each side. Then draw a line segment from each vertex to the midpoint of the side opposite. These are called the medians of a triangle. What do you notice?

11) A rectangle has a perimeter of 32 cm. Its length is three times as long as its width. Draw the rectangle. How long are its sides? What is its area? Show your work near your drawing.

12) A rectangle has an area of 176 cm^2 and a perimeter of 54 cm. Draw the rectangle and label its sides. Show your work near your drawing.

13) Use a protractor to draw a neat circle. Then draw a regular pentagon by dividing the circle into five equal parts and connecting the five points. What is the measure of each angle in your regular pentagon? What do they add up to? Now draw one diagonal and measure it and measure one side of your pentagon. What is the ratio of their lengths, diagonal/side? Can you do some research to find an exact answer for that question?

14) Draw a scalene triangle. (For example, sides of 7 cm, 10 cm and 12 cm might work and allow your drawing to fit on one page.) Now draw an equilateral triangle (facing out) on each side. (Hint: an equilateral triangle has three 60 degree angles.) Next mark the center of each equilateral triangle. (You can use medians to find the center. See problem #10 above.) Now connect those three center points with line segments. What did you get? Can you do some research about Napoleon's Theorem? Can you find a formula for the length of each side of your final triangle, based on the sides of your original triangle?

15) Draw a large scalene triangle and trisect each angle. This job will be easier if you make each angle a multiple of three—for example, 39, 63 and 78 degrees. Mark the points where adjacent trisection lines meet. Finally connect those three points with line segments. What do you get? Can you do some research about Morley's Theorem? Can you learn a proof of Morley's Theorem?

Have fun!