Grade 9 Mathematics Worksheet

Space, shape and measurement

Questions:

1. Use the activity and figure 1 and 2 to explore attributes of geometric figures to create a definition for similar polygons.

- Cut out each of the rectangles from figures 1 and 2.
- Sort the rectangles into groups of similar figures.
- Within each group, sort the rectangles from smallest to largest and lay them on top of each other with the largest rectangle on the bottom. Match the bottoms and lower left corner when the pieces of each group are stacked.
- Place the bottom left corner of the nested figures at the origin (0,0) on the graph paper and draw a diagonal line from the origin through the rectangles. Repeat this process for each group of rectangles.
- Make notes about the observation of the "nested" rectangles in each group and the diagonal of the rectangles.
- Measure the rectangles in each group and record in a chart.

| Rectangle	Width	Length	Ratio$\left(\dfrac{w}{l}\right)$
A			
B			

Answer the following questions on your paper:

1. If you were given another rectangle how could you determine into which group it would fit?

2. What are the ratios for each group? (Record in the chart)

3. What is the area and perimeter of the rectangles in each group?

4. What if only the length measurement were given, how would you determine into which group to place the rectangle?

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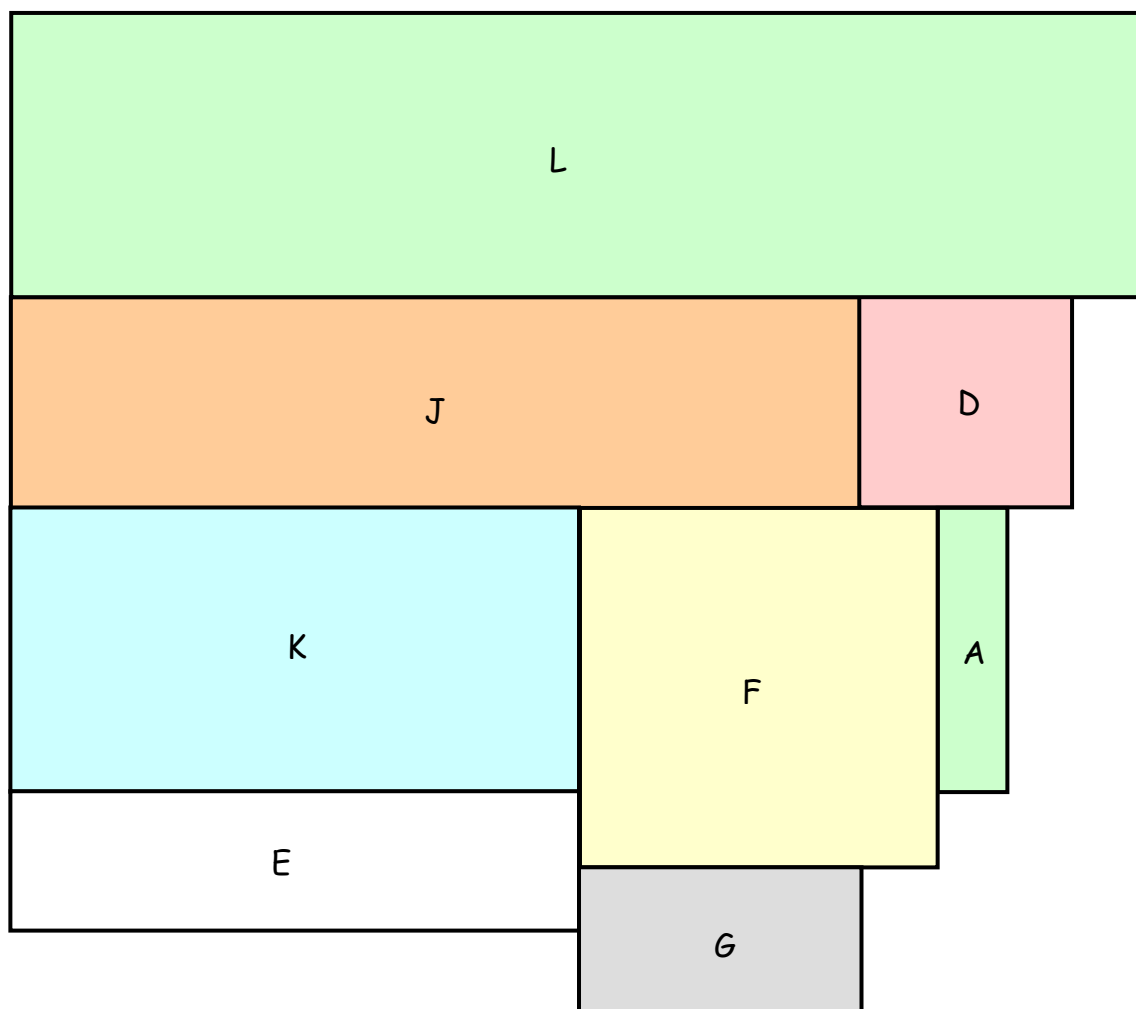**Figure 1**
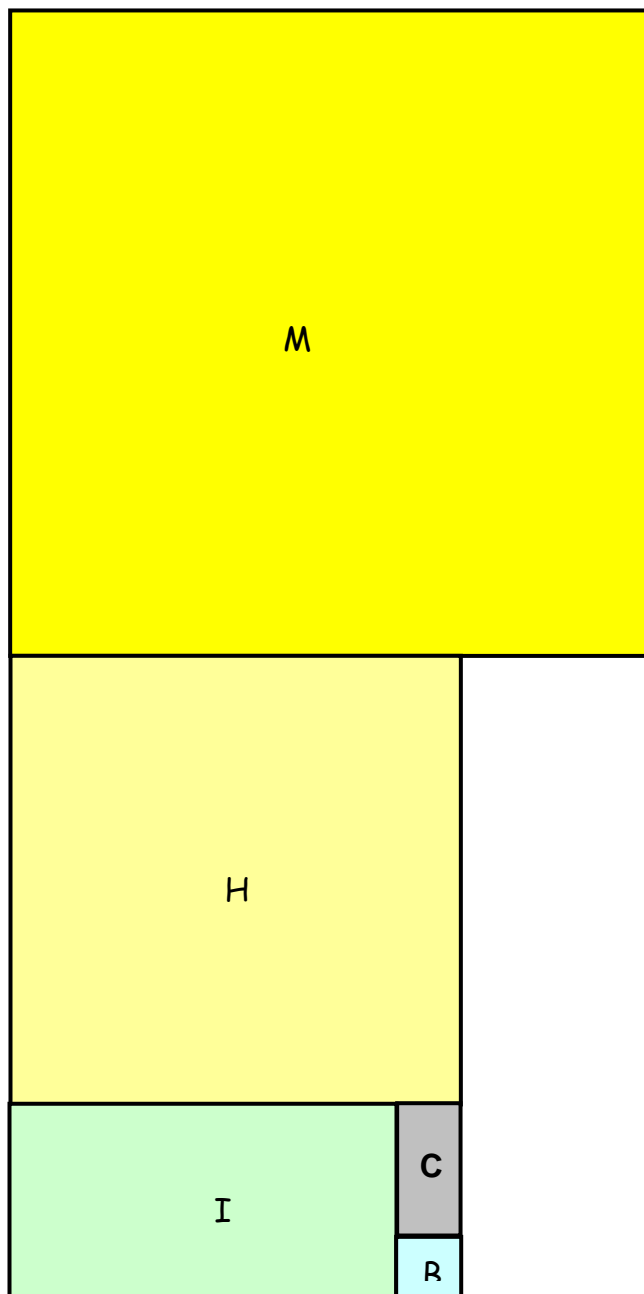
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Figure 2

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Solution

1. Cut out each of the rectangles.
   - Sort the rectangles into groups of similar figures.
     As learners are placing the rectangles into groups, walk around the room and ask questions such as:
   a) How do you know these figures belong together?
      (The top right vertices move in the same direction.)
   b) How many groups are there?
   c) Why is rectangle C not part of BDFHM? (It is not a square.)
   d) Why is rectangle C not part of AEJL? (It is not in line with the top right vertices.)
   - Within each group, sort the rectangles from smallest to largest and lay them on top of each other with the largest rectangle on the bottom. Match the bottoms and lower left corner when the pieces of each group are stacked. Ask learners what they notice about the shapes.
   - Place the bottom left corner of the nested figures at the origin (0,0) on the graph paper and draw a diagonal line from the origin through the rectangles. Repeat this process for each group of rectangles. The groups are: (A,E,J,L) (C,G,I,K,N) and (B,D,F,H,M).
   - Make notes about the observation of the "nested" rectangles in each group and the diagonal of the rectangles. Notations will differ with each learner.
   - Measure the rectangles in each group and record in a chart.

Rect.	W	L	Rect.	W	L	Rect.	W	L
A	1	4	C	1	2	B	1	1
E	2	8	G	2	4	D	3	3
J	3	12	I	3	6	F	5	5
L	4	16	K	4	8	H	7	7
			N	5	10	M	10	10

<u>**Ask the following follow up questions**</u>

How would you determine where to fit another rectangle into one of the groups of rectangles? Measure the rectangles and find the ratio of width to height. Analyse the graph to find a point the diagonal goes through for corner edge of the rectangles.

1. What are the ratios for each group?
   Width to length:(A,E,J,L, ratio = 1:4 or $\frac{1}{4}$),

(C,G,I,K,N, ratio = 1:2 or $\frac{1}{2}$), (B,D,F,H,M, ratio = 1:1 or $\frac{1}{1}$).

2. What is the area and perimeter of the rectangles in each group?

    A: Area = 4, Perimeter = 10
    E: Area = 16 (4 x 4^2), Perimeter = 20
    J: Area = 36 (4 x 3^2), Perimeter = 30
    L: Area = 64 (4 x 4^2), Perimeter = 40

3. What if only the length were given on a rectangle? How would you determine which group to place it into? Learners should draw on prior knowledge from previous activities about scaling. They could divide the measurement by the width or multiply by the ratio.

Learners need two sheets of graph paper. The concepts of ratio are assessed in terms of extended investigations in the context of shapes.