

This practice plan was created by **Taren Long**, a math teacher and coach at Chesapeake Public Charter School. Taren created numerous free resources for MATHCOUNTS coaches in her role as the 2020-2021 DoD STEM Ambassador for MATHCOUNTS. Find more resources and information at [dodstem.us](http://dodstem.us).

# Ratios and Area



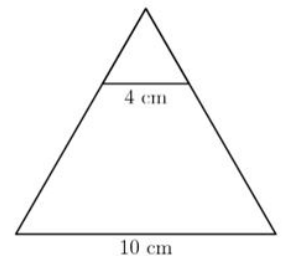
## Warm-Up!

Try these problems before watching the lesson.

- The ratio of the lengths of the corresponding sides of two similar decagons is 1:2. If the perimeter of the smaller decagon is 76 cm, what is the perimeter of the larger decagon?

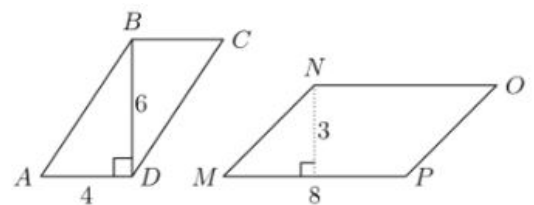
- If a rectangle is formed by doubling the length of one side of a square and halving the other side of the square, what is the ratio, expressed as a common fraction, of the perimeter of the rectangle to the perimeter of the square?

- In the diagram, the two triangles shown here have parallel bases. What is the ratio of the area of the smaller triangle to the area of the larger triangle? Express your answer as a common fraction.



- Two triangles are similar. The ratio of their areas is 1:4. If the height of the smaller triangle is 3 cm, how long is the corresponding height of the larger triangle, in centimeters?

- What is the ratio of the area of triangle ABD to the area of parallelogram MNOP, shown here? Express your answer as a common fraction.





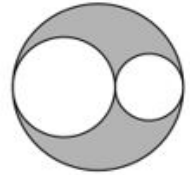
# The Problems

Take a look at the following problems and follow along as they are explained in the video.

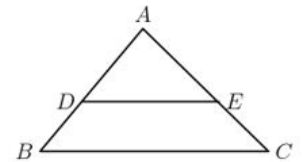
6. The length of a rectangle is increased by 25%. To keep the area of the rectangle the same, by what percent must the width be decreased?



7. Two small circles with radii 2 cm and 3 cm are externally tangent. A third circle is circumscribed about the first two as shown. What is the ratio of the area of the smallest circle to the area of the shaded region? Express your answer as a common fraction.



8. In the figure, the area of trapezoid DBCE is  $80 \text{ cm}^2$ . The ratio of the bases DE to BC is 3:5. What is the area of triangle ADE, in square centimeters?

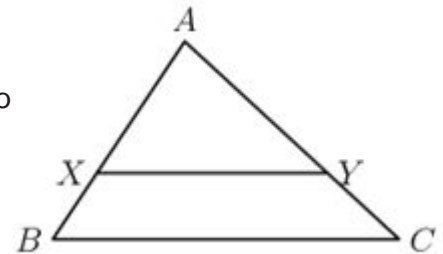


# Piece It Together

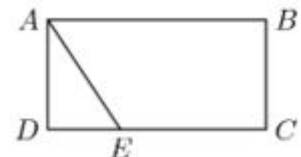
Use the skills you practiced in the warm-up and strategies from the video to solve the following problems.

9. The length of a side of a triangle with an area of 36 square inches is 4.2 inches. What is the number of square inches in the area of a similar triangle whose corresponding side measures 5.6 inches?

10. If AX and AY are  $\frac{2}{3}$  of AB and AC, respectively, what is the ratio of the area of triangle AXY to trapezoid XYCB? Express your answer as a common fraction.



11. AE divides rectangle ABCD into two parts such that the ratio of the area of triangle ADE to the area of the quadrilateral ABCE is 1:5. Find the ratio of DE to EC. Express your answer as a common fraction.



12. The length of a right, rectangular prism is doubled, its width is quadrupled and its height is unchanged. What is the ratio of the original volume to the new volume? Express your answer as a common fraction.



## Optional Extension

*To extend your understanding and have a little fun with math, try the following activities.*

### Materials

- 20 by 20 grid (can be drawn on graph paper)
- Two colored pencils/crayons
- Two dice
- Two sets of cards numbered 1 to 6

### Rules

- On your turn, roll 2 dice to generate side lengths for a rectangle.
- Then, use one of your cards, numbered 1 through 6, to multiply one of your dimensions by that number as a scale factor.
- Shade your new rectangle on the board.
- After you play a scale factor card, discard it until you have cycled through all six cards. Then, you may use them again.

### Goal

Take up the most area on the board. The game ends when each player is unable to fit a rectangle on the board in a single round.

### Modifications

Use a larger grid, such as 24 by 24, for a longer-lasting game. (What dimensions might make the game more challenging to play?)

Once you are comfortable with the main game, players can divide their rolled side lengths by the scale factor card values, as long as side lengths remain positive integers.

Come up with your own modification for the game. How can you make the game a little more challenging?