

# Scaling Areas and Volumes

Winter 2018

## Scaling with Areas

1. A square has side length 5cm. What is the area of the square?
2. What is the area of a square that has side length  $L$ ?
3. It takes 3 ounces of ink to print a large picture on a poster.
  - (a) How many ounces of ink will it take to print the picture if both of its dimensions are magnified by a factor of two?
  - (b) What if the dimensions are magnified by a factor of three?
4. Kristi cuts a square with side length  $L$  into smaller squares that each have a side length of  $\frac{L}{2}$ . How many squares did she make?

5. Courtney has many square tiles. Using these tiles, she makes a larger tile whose side length is three times the original
- (a) Draw a picture of the above situation.
  
  
  
  
  
  
  
  
  
  
  - (b) How many tiles does she need to make this?
  
  
  
  
  
  
  
  
  
  
  - (c) How many times larger is the area of the larger tile than one of the original smaller tiles?
  
  
  
  
  
  
  
  
  
  
  - (d) If the side length of the smaller tile is 2cm, what is the area of the larger tile created?
6. April has a square piece of paper that has a side length of 10cm. She cuts the square into smaller squares of side length 1cm. How many squares does she now have?

7. Igor makes a picture out of square tiles of size  $1 \times 1$ . Joseph makes a picture of the same design out of tiles of size  $2 \times 2$ . Preston uses tiles of size  $3 \times 3$  to make a picture using the same design. Let  $A_1$  be the area of Igor's picture,  $A_2$  be the area of Joseph's picture, and  $A_3$  be the area of Preston's picture. (Hint: The three pictures are *similar*)

(a) Who uses the most tiles?

(b) How many times larger is the area of Joseph's square when compared to Igor's square?

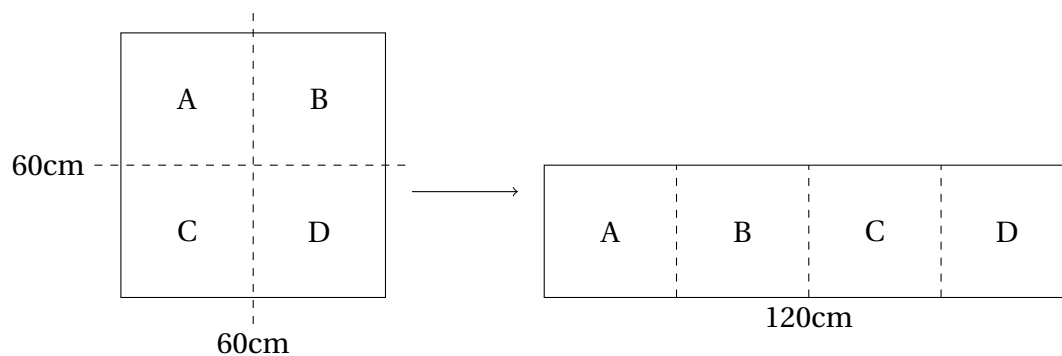
(c) Fill in the blank

$$A_2 = A_1 \times$$

(d) Express  $A_3$  in terms of  $A_1$

8. Kara cuts a square of side length 60cm into smaller squares, and then makes a long strip out of these squares. How long can she make the strip by making the squares sufficiently small?

- Let  $n$  be the number of cuts Kara makes along one side of the larger square. Let  $S$  be the side length of the small square. For example, she'll cut once along each side of the large  $60\text{cm} \times 60\text{cm}$  square (a total of two cuts). This gives us 4 total squares each with side lengths of 30cm. The picture below demonstrates this procedure:



$n$	$s$	Number of Smaller Squares	Length of New Strip
1	30	4	120
2			
3			

- (a)
- (b) Sketch a graph showing the total length of the strip as a function of  $n$ .
- (c) Can you make the length of the strip as big as you like?
- (d) Into how many small squares should Kara cut the larger square in order to form a strip of length 3600cm?