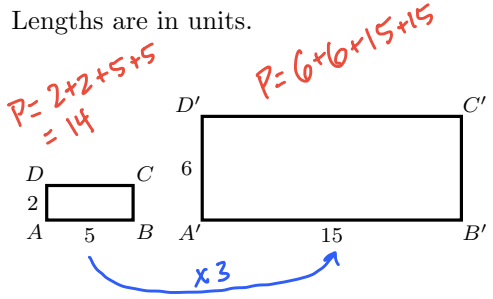
Artifact 7 – Area and Perimeter of Dilations

Driving Question: Why does area grow faster than perimeter?

Example 1

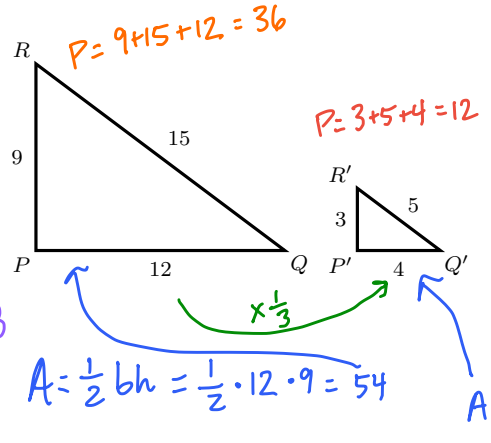
Rectangle $ABCD$ is dilated by a scale factor of 3 to create rectangle $A'B'C'D'$. Lengths are in units.



	Pre-image	Image	Image ÷ pre-image
Side	5	15	$\frac{15}{5}=3$
Perimeter	14	42	$\frac{42}{14}=3$
Area	$2\cdot5=10$	$15\cdot6=90$	$\frac{90}{10}=9$

Example 2

Triangle PQR is dilated by a scale factor of $\frac{1}{3}$ to create triangle $P'Q'R'$. Lengths are in units.



	Pre-image	Image	Image ÷ pre-image
Side	12	4	$\frac{4}{12}=\frac{1}{3}$
Perimeter	36	12	$\frac{12}{36}=\frac{1}{3}$
Area	54	6	$\frac{6}{54}=\frac{1}{9}$

Vocabulary

Perimeter
Area
Expression
Scale model

Notes to Forgetful Self

Always scaled by k

Scaled by k twice → k^2

Scale factor	Perimeter ratio	Area ratio
$k=2$	2	4
$k=3$	3	9
$k=4$	4	16
$k=\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}\cdot\frac{1}{2}=\frac{1}{4}$
$k=\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{9}$
k (any)	k	k^2

Since we multiply the side lengths already to find the area, when we scale by k, we're effectively scaling by k twice.

A figure with perimeter P and area A is dilated by k.

Perimeter of the image = $P\cdot k$

Area of the image = $A\cdot k\cdot k = A\cdot k^2$ (expression)

Try it

1. A parking lot and a scale drawing of the lot are similar rectangles. Each dimension of the parking lot is 2.4 times the corresponding dimension of the drawing. Which statement is true?

(A) The area of the parking lot is 4.8 times the area of the drawing.
(B) The area of the parking lot is 5.76 times the area of the drawing.
(C) The perimeter of the parking lot is 4.8 times the perimeter of the drawing.
(D) The perimeter of the parking lot is 5.76 times the perimeter of the drawing.

→ by k^2 → $2.4\cdot2.4=5.76$ times

↳ Perimeter would be scaled by k (by 2.4)

2. Polygon F has an area of $12m$ square feet. Polygon F is dilated by a scale factor of 4 to create polygon G. What is the area, in square feet, of polygon G?

(A) $48m$ square feet
(B) $3m$ square feet
(C) $192m$ square feet
(D) $768m$ square feet

$12m\cdot4\cdot4$

$12\cdot16\cdot m = 192m$