


10.5 – EFFECTS OF CHANGING DIMENSIONS DISCOVERY

 10.5.a: Describe the effect on perimeter and area when one or more dimensions of a figure are changed.

Part 1: What happens to the area of a figure if ONE dimension is changed?

Part 2: What happens to the area & perimeter of a figure if BOTH dimensions are changed proportionally?

WARM UP:

1. How do you find the area of a rectangle? $A = b \cdot h$

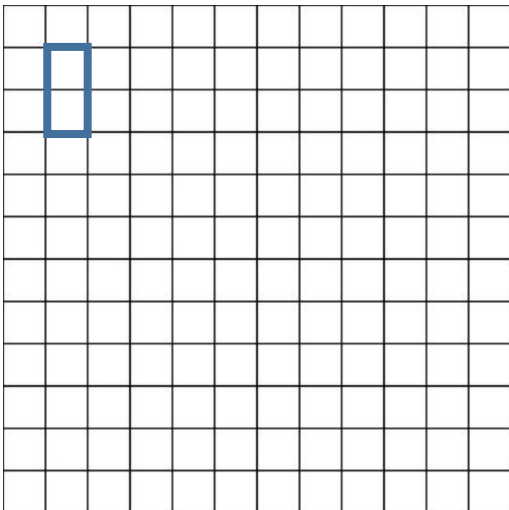
2. Make a conjecture: What do you think happens to the **AREA** of a rectangle if you...

just enlarge the base by a factor 3?

just enlarge the height by a factor of 3?

enlarge the base and the height by a factor of 3?

3. Test your conjecture:



Original Rectangle: $b = \underline{1}$ $h = \underline{2}$ $A = \underline{2}$

Rectangle #2:
MULTIPLY THE BASE BY 3: $b = \underline{3}$ $h = \underline{2}$ $A = \underline{6}$

How was the area of the rectangle changed?

$Area * 3$

Rectangle #3:
MULTIPLY THE HEIGHT BY 3: $b = \underline{1}$ $h = \underline{6}$ $A = \underline{6}$

How was the area of the rectangle changed?

$Area * 3$

Rectangle #4:
MULTIPLY THE BASE AND HEIGHT BY 3: $b = \underline{3}$ $h = \underline{6}$ $A = \underline{18}$

How was the area of the rectangle changed?

$Area * 9 \rightarrow (3^2)$

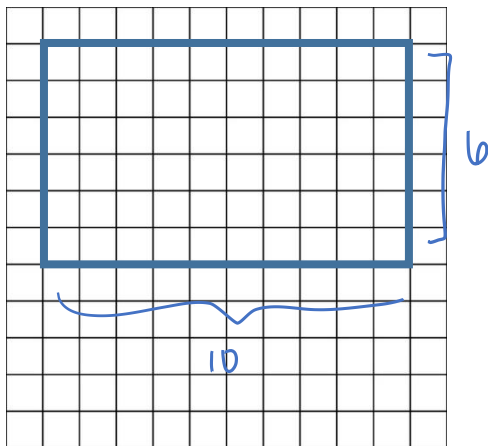
How does the perimeter of the original rectangle relate to the perimeter of rectangle #4?

$P(\text{orig}) = 2(1) + 2(2) = 6$
 $P(\text{new}) = 2(3) + 2(6) = 18$] P multiplied by 3

4. Make a conjecture: What do you think happens to the **AREA** of a rectangle if you...

- just reduce the base by a factor $\frac{1}{2}$?
- just reduce the height by a factor of $\frac{1}{2}$?
- Reduce the base and the height by a factor of $\frac{1}{2}$?

5. Test your conjecture!



Original Rectangle: $b = 10$ $h = 6$ $A = 60$

Rectangle #2:
MULTIPLY THE BASE BY $\frac{1}{2}$: $b = 5$ $h = 6$ $A = 30$
 How was the area of the rectangle changed?

Area divided by 2

Rectangle #3:
MULTIPLY THE HEIGHT BY $\frac{1}{2}$: $b = 10$ $h = 3$ $A = 30$
 How was the area of the rectangle changed?

Area divided by 2

Rectangle #4:
MULTIPLY THE BASE AND HEIGHT BY $\frac{1}{2}$: $b = 5$ $h = 3$ $A = 15$
 How was the area of the rectangle changed?

Area \div by 4 $\rightarrow (2^2)$

How does the perimeter of the original rectangle relate to the perimeter of rectangle #4?

$$\left. \begin{array}{l} P(\text{original}) = 2(10) + 2(6) = 32 \\ P(\#4) = 2(5) + 2(3) = 16 \end{array} \right\} P \div 2$$

Part 1 & 2 Checkpoint: Write one to two sentences to answer the questions below.

✓ Describe how the AREA is changed when ONE dimension of the figure is changed.

Area is changed by the same factor

✓ Describe how the AREA is changed when TWO dimensions of the figure are changed.

Area is changed by the (factor)²

✓ Describe how the PERIMETER is changed when TWO dimensions of the figure are changed.

Perimeter is changed by the factor

Part 3: What happens to the area and circumference of a circle if the radius is changed by a scale factor?

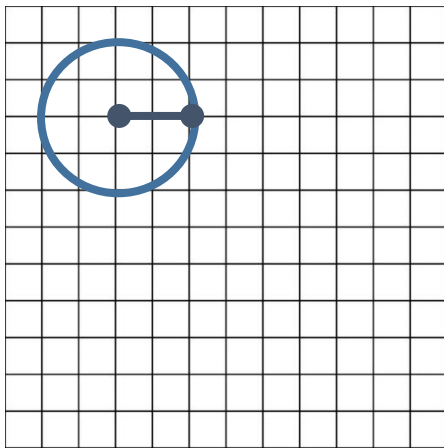
*Note: Leave all answers in terms of pi!**

6. Make a conjecture: What do you think happens to the...

area of the circle is you multiply the radius by 3?

CIRCUMFERENCE of the circle if you multiple the radius by 3?

7. Test your conjecture!



Original circle: $r = \underline{2}$ $A = \underline{4\pi}$

$d = \underline{4}$ $C = \underline{4\pi}$

Circle #2 - MULTIPLY THE RADIUS BY 3:

$r = \underline{6}$ $A = \underline{36\pi}$

$d = \underline{12}$ $C = \underline{12\pi}$

How was the area of the circle changed?

Area * 9 (3^2)

How was the CIRCUMFERENCE of the circle changed?

Circumference * 3

Part 3 Checkpoint: Write one to two sentences to answer the questions below.

✓ Describe how the AREA of a circle is changed when the radius is changed by a scale factor.

Area changes by the (scale factor)²

✓ Describe how the CIRCUMFERENCE of a circle is changed with the radius is changed by a scale factor.

Circumference changes by the scale factor

Part 4: What happens when we change the area of a figure?!?

A square has a side length of 5. If the area is tripled, what happens to the side length?

$$A = 5^2 = 25 * 3 \Rightarrow \text{new Area} = 75$$

$$\text{side length} = 5\sqrt{3}$$

$$\text{side length} * \sqrt{\text{scale factor}}$$

A circle has a radius of 5. If the area is doubled, what happens to the side length?

$$A = \pi(5)^2 = 25\pi * 2 \Rightarrow \text{new Area} = 50\pi$$

$$\pi r^2 = 50\pi$$

$$r = 5\sqrt{2} \quad \text{radius} * \sqrt{\text{scale factor}}$$

Part 4 Checkpoint: Write one to two sentences to answer the questions below.

✓ Describe how the SIDE LENGTH of a square/circle is changed when the side/radius is changed by a scale factor.

Side length changes by $\sqrt{\text{scale factor}}$