Area Review

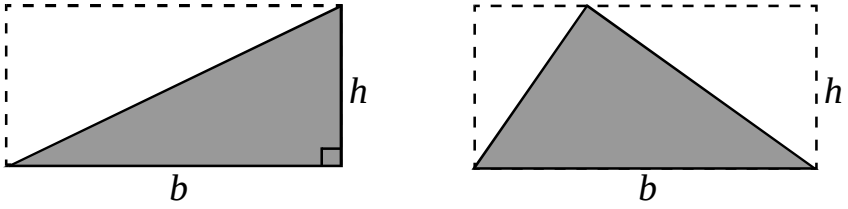
Math 8

Area of a rectangle:
The area of a rectangle can be found with the following formula:

$$A = bh$$

Area of a triangle:
The area of a triangle can be found with the following formula:

$$A = \frac{1}{2}bh$$

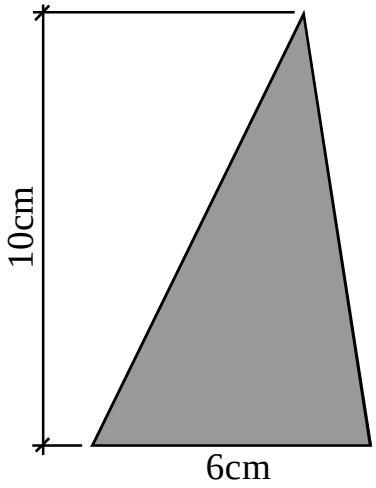


Changing Dimensions:
Changing the dimensions of an object affects its area:

1. Find the area of the triangle to the right.

2. What would be the area of a triangle that had the same base, but twice the height?

3. What would be the area of a triangle that had twice the base and height of the original triangle?



Complete the following statements:

If you double one of the dimensions of a triangle (base or height), the area of the triangle will be ____ times larger.

If you double *both* of the dimensions of a triangle (base or height), the area of the triangle will be ____ times larger.

If you double the height of a triangle and triple the length of its base, the area of the triangle will be ____ times larger.

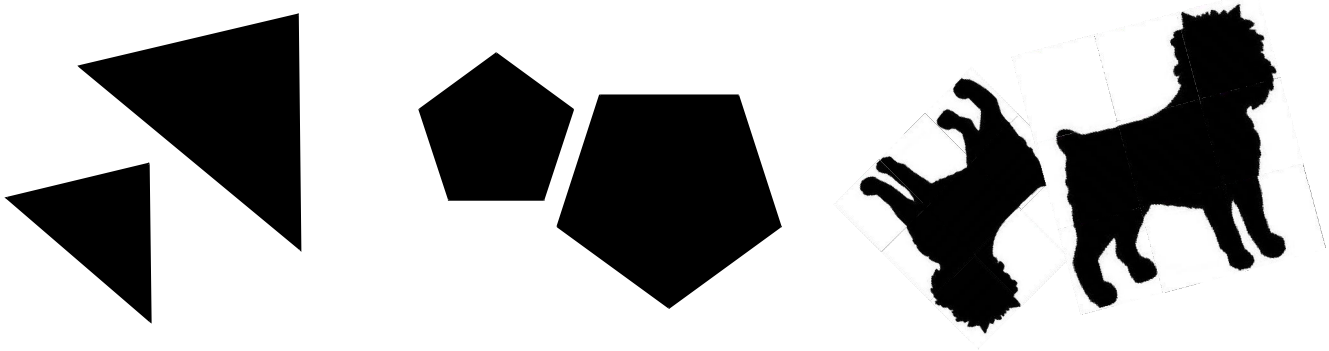
Similarity Review

Math 8

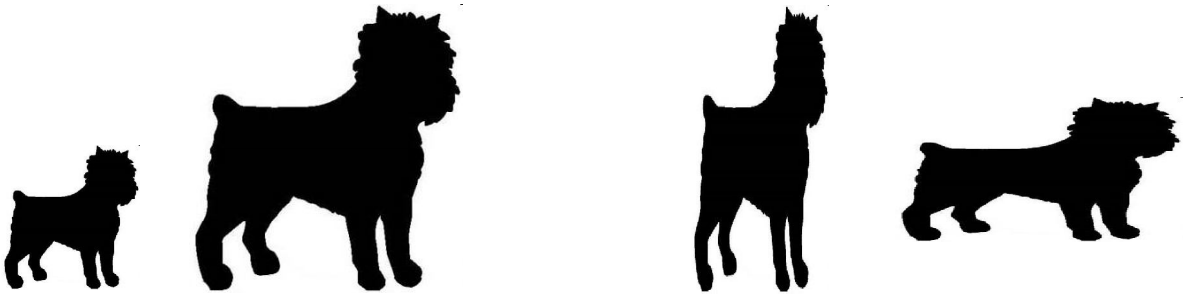
Similarity:

Two figures are similar if they are the same shape. This means that corresponding parts must be proportional.

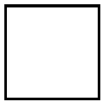
For example, the pairs of figures below are similar.



If you increase one dimension in a pair of similar figures, all of the dimensions will increase proportionally. For example, doubling the height of the dog outline below while maintaining similarity also doubles its width. If you only doubled the height or width, the figure would no longer be similar.



Practice:

The square to the right has 2-inch sides. 

1. What is its area?
2. What would be the area of a square whose sides were 5 times longer?
3. How many times greater is the area of the square in #2 than the original square?
4. If you triple the side lengths of a square, what would be the effect on the area of the square (how many times greater would the area be?)
5. The side lengths of a large square are 1.73 times greater than the side lengths of a small square. How many times greater is the area of the large square than the area of the small one?

Similarity and Area

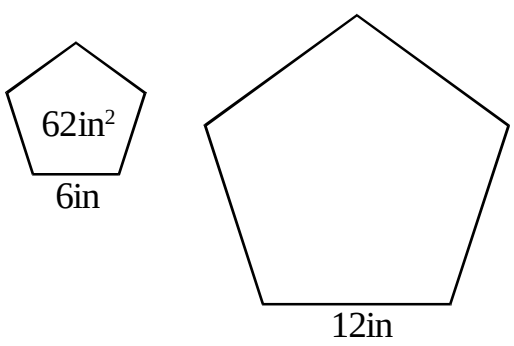
Math 8

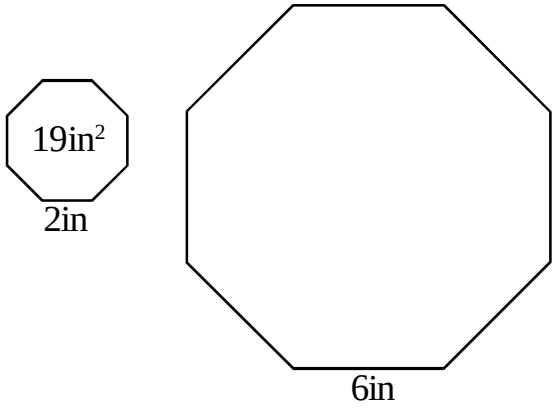
Important Concept:

Increasing (or decreasing) the dimensions of ANY FIGURE by a scale factor x will increase (or decrease) the area of the new figure by a scale factor of x^2.

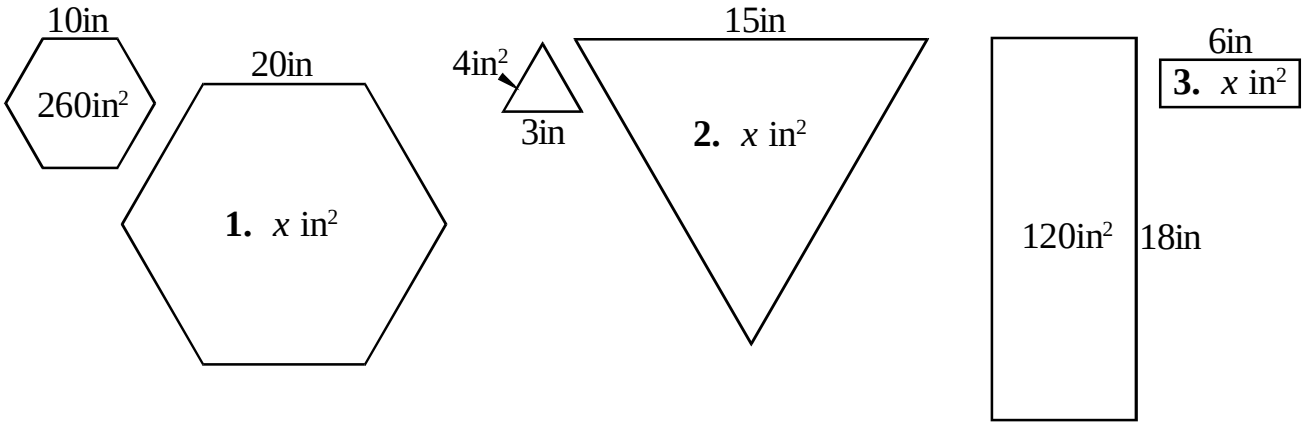
Examples:

Find the area of the larger polygons below given the area of the smaller similar polygons:





Practice: Find the missing area for each pair of similar polygons.



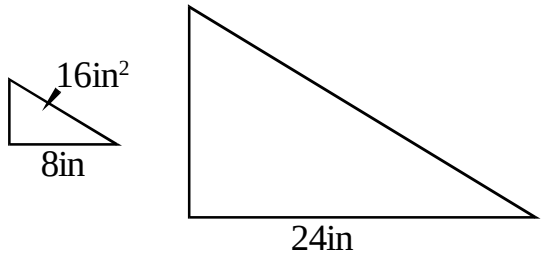
Name_____ Period _____

Similarity and Area

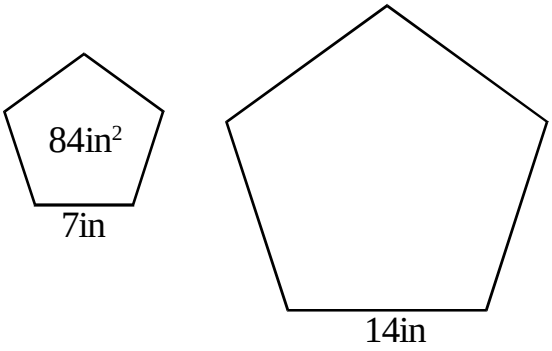
Math 8

Find the missing AREA for each pair of similar figures below. Simplify all fractional answers.

1.



2.



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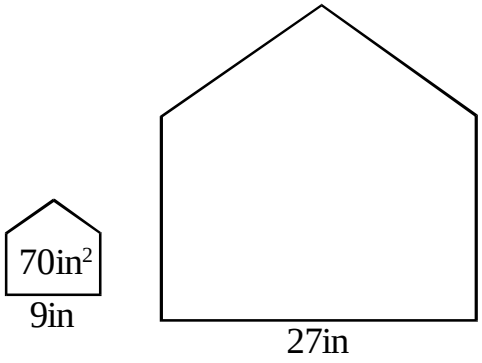

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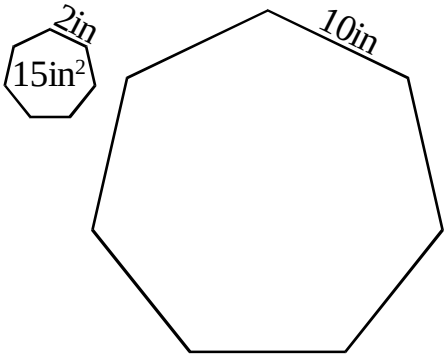

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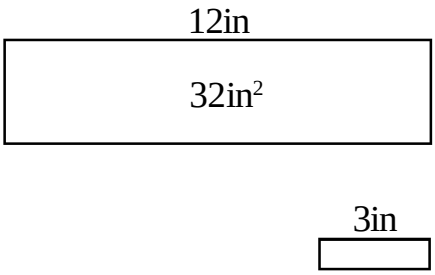

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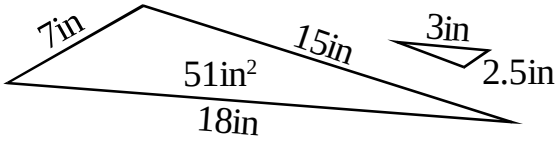

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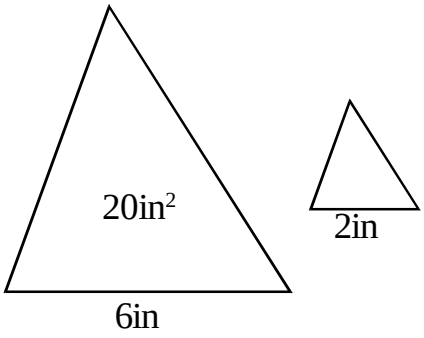

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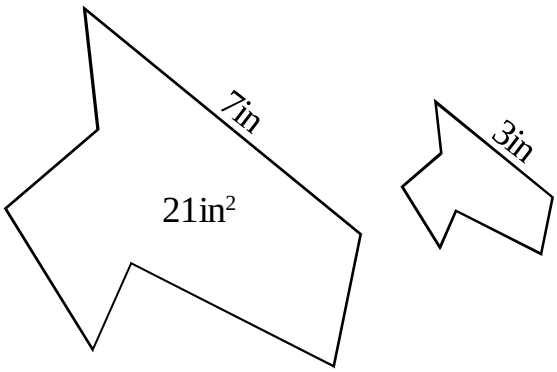


Review: Percent Change

Math 8

Important Concept:

$$\frac{new}{original} = \frac{new\%}{100}$$

Examples: Find each percent of change.

1. Originally 45 inches tall, now 65.25 inches tall.

2. Originally $14.90, now $13.41.

Notes:
A percent increase or decrease can be represented as a ratio or *scale factor*. If we say that one object is 25% taller than another, the ratio of their heights is:

$$\frac{tall}{short} = \frac{125}{100} = \frac{5}{4}.$$

Practice: Represent each percent change as a ratio in simplest form *and* a decimal:

1. A 40% increase.
2. A 20% decrease.
3. A 120% increase.
4. A 96% decrease.

Practice:
Find the side lengths of each new figure after the percent change given.

1. A hexagon has 4-inch sides. The lengths are increased by 50%.

2. A square has 15-inch sides. The side lengths are increased by 20%.

3. A pentagon has 24-inch sides. The lengths are increased by 75%.

Percent Change: Sides and Area

Math 8

Remember:

Increasing (or decreasing) the dimensions of ANY FIGURE by a scale factor x will increase (or decrease) the area of the new figure by a scale factor of x^2.

Example:

If we increase the side lengths of a figure by a scale factor of 2, then the area increases by a scale factor of 2^2.

If we increase the side lengths by a factor of $\frac{3}{2}$, then the area increases by a scale factor of $\left(\frac{3}{2}\right)^2 = \frac{9}{4}$.

This means: If the side lengths are increased by 50%, the area is increased by $\frac{9}{4} = \frac{225}{100} = 225\%$ which is a 125% increase.

Using decimals: $\left(\frac{3}{2}\right)^2 = (1.5)^2 = 2.25$ which is 225% or a 125% increase.

Examples: What is the percent increase in AREA for each percent change in side length:

1. A 20% increase in side lengths creates a _____% increase in area.

2. A 40% increase in side lengths creates a _____% increase in area.

3. A 75% increase in side lengths creates a _____% increase in area.

Practice:

Find the side lengths of each new figure after the percent change given.

1. A hexagon has 4-inch sides. The lengths are increased by 50%.

Name_____ Period _____

Percent Change: Sides and Area

Math 8

Answer the questions for each square given the percent change. Round decimal answers to the hundredth.

1. Original square: 10 inch sides.

20% increase.

New side length: _____

Old area: _____

New Area: _____

Percent change in area: _____

2. Original square: 24 inch sides.

25% increase.

New side length: _____

Old area: _____

New Area: _____

Percent change in area: _____

3. Original square: 35 inch sides.

80% increase.

New side length: _____

Old area: _____

New Area: _____

Percent change in area: _____

4. Original square: 14 inch sides.

18% increase.

New side length: _____

Old area: _____

New Area: _____

Percent change in area: _____

Name_____ Period _____

Percent Change: Sides and Area

Math 8

Answer the following:

5. What is 115% of 90?

6. If you increase the side lengths of an octagon by 15%, by what percent will the area of the octagon increase? Round your answer to the hundredth.

7. A triangle has an area of $15cm^2$. If the base and height of the triangle are each increased by 50%, what will the area of the new, larger triangle be?

8. The sides of a regular pentagon are each 5cm long. If the sides are increased to 6cm, by what percent will the pentagon's area increase?

9. The width of a rectangle is increased by 50%, and the length is increased by 40%. By what percent is the area of the rectangle increased?

10. A hexagon graphed on the coordinate plane is dilated (enlarged) with a scale factor of 5/4. If the original hexagon had an area of 24 square units, what will be the area of the new hexagon?

Dilations, Scale, and Area

Math 8

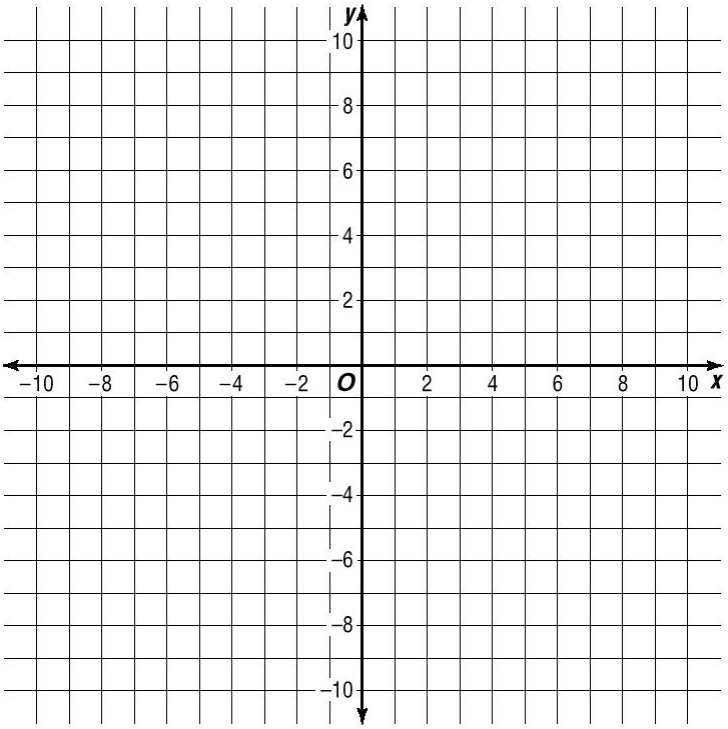
Remember how to dilate a figure.

Plot the following points and connect them to form a triangle on the plane:

(-6, 0) (6, 3) (3, -3)

1. Create a dilation with a scale factor of 4/3.

2. Create a dilation with a scale factor of 1/3.



Plot the following points and connect them to form a triangle on the plane:

(-2, -2) (-6, 4) (2, 4) (6, -2)

1. Find the area of the parallelogram (A=*bh*).

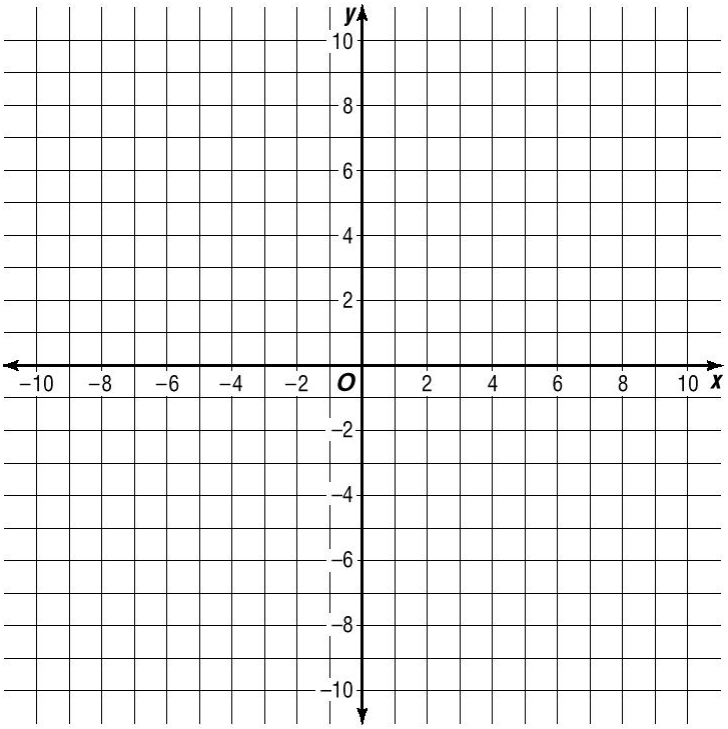
2. Create a dilation with a scale factor of 1/2.

3. Find the area of #2.

4. Create a dilation with a scale factor of 3/2.

5. Find its area.

6. Predict the area of a dilation with scale factor 7/2.



Name_____ Period _____

Practice: Dilations on the Plane

Math 8 4.4+

Plot each set of points and the dilations listed and answer the questions that follow.

1. (2, 2) (2, 4) (-4, 4) (-4, 2)

Find its area. _____

2. Graph a dilation with a scale factor of 2.

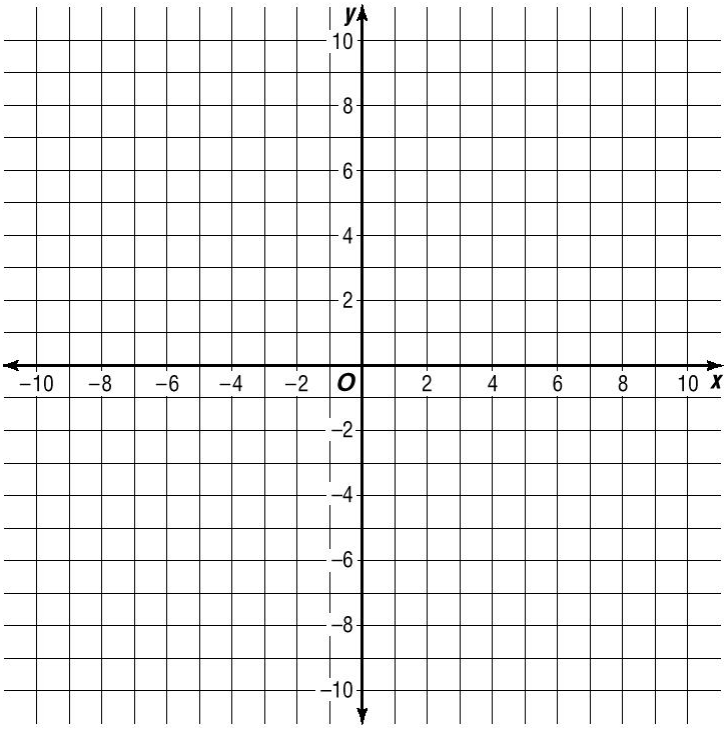
Find its area. _____

3. Graph a dilation with a scale factor of 2.5

Find its area. _____

4. Predict the area of a dilation with a scale factor of 10.

_____



5. (-3, 1) (1,1) (2,-2) (-2,-2)

Find its area. _____

6. Graph a dilation with a scale factor of 2.

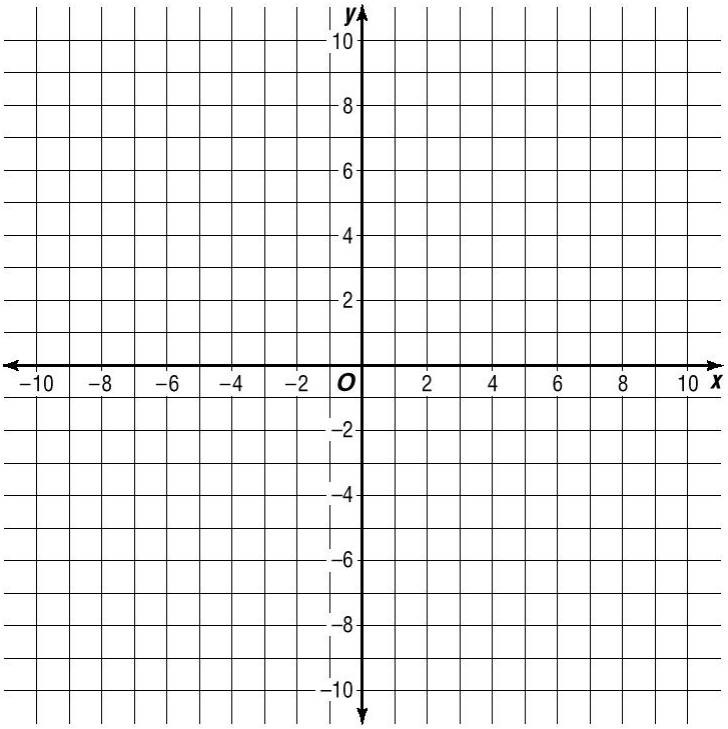
Find its area. _____

7. Graph a dilation with a scale factor of 3.

Find its area. _____

8. Predict the area of a dilation with a scale factor of 6.

_____



Name_____ Period _____

Changing Dimensions

Math 8

Practice: Solve each.

9. A rectangular prism is 2x4x7 inches. How many times greater is the volume of a 6x8x7 rectangular prism? (If you are not sure, find each volume and divide).

10. When the sides of a pentagon are 6 inches long, the area of the pentagon is about 63 square inches. What would be the area of a pentagon whose sides are 2 inches long?

11. A large circle has 36 times the area of a small circle. If the radius of the large circle is 24 inches, what is the radius of the small circle?

12. The radius and height of a cylinder are tripled. What effect does this have on the volume?

13. The radius of a cylinder is doubled, and the height is multiplied by 5. If the original cylinder had a volume of $10cm^3$, what is the volume of the new cylinder?

14. A right triangle has an area of $6in^2$. If all the dimensions are multiplied by 4, what will the area of the new triangle be?

15. The length and width of a rectangular pyramid are doubled, and the height is tripled. How many times larger is the new pyramid than the original?

16. The dimensions of a cube are increased so that they are 2.5 times longer. If the original cube had a volume of $8in^3$, what is the volume of the new cube?

Name_____ Period _____

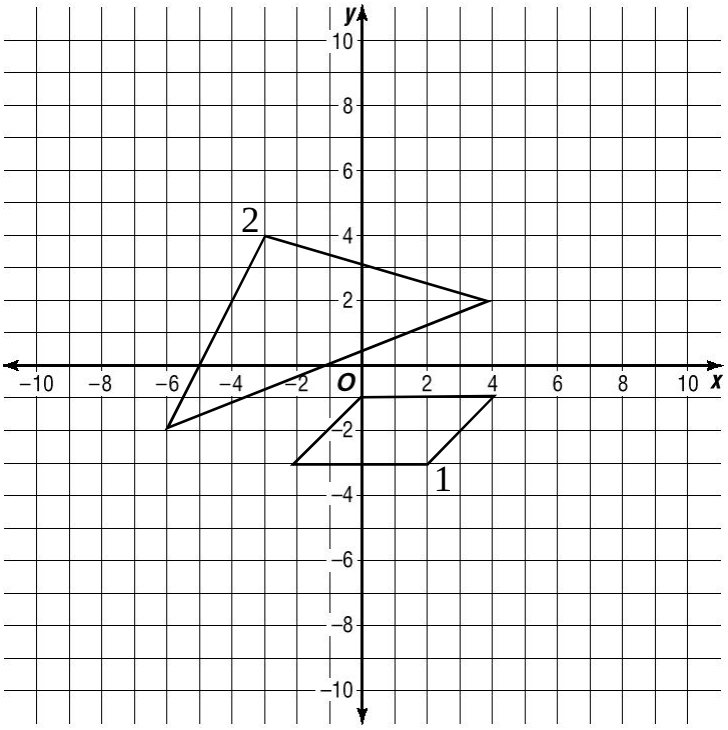
Review/Dimensions Half-Quiz

Math 8

Dilate each of the figures on the plane with the scale factor given:

1. Dilate figure 1 on the graph with a scale factor of 2.

2. Dilate figure 1 on the graph with a scale factor of 3/2.



Solve each.

3. Express 18/45 as a percent.

3._____

4. The side lengths of a hexagon are 8cm long. If all of the sides are increased in length by 45%, how long will the sides of the new hexagon be?

4._____

5. Triangle ABC has coordinates A(3,7), B(-4, 3) and C(2, -9). The triangle is dilated with a scale factor of 4.5. What are the coordinates of point A' in the dilated triangle?

5._____

6. The ratio of the side lengths of two heptagons is 2/5. What is the ratio of the areas of the two heptagons? Express your answer as a fraction.

6._____

7. In the last year Gina has grown 8 inches. She was 40 inches tall last year. By what percent has her height increased in the past year?

7._____

Name_____ Period _____

Review/Dimensions Half-Quiz

Math 8

Practice: Solve each.

8. The side lengths of a square are 5 inches long. If the lengths of the sides are doubled, what will be the area of the new square?

8. _____

9. A rectangle has an area of 54.2 square inches. If the height is doubled and the width is tripled, what will be the area of the new rectangle?

9. _____

10. A triangle has an area of $17cm^2$. If you increase all of its side lengths by 50%, what will be the area of the new triangle?

10. _____

11. The edges of a cube are all doubled. If the original cube had a volume of $3cm^3$, what is the volume of the new cube?

11. _____

12. A triangle graphed on the coordinate plane has an area of $7cm^2$. A dilation is made on the coordinate plane with a scale factor of 3/2. What is the area of the new dilated triangle?

12. _____

13. A rectangular prism has edge lengths of 5, 6, and 7 inches. Each edge is increased by 50%. by what percent is the volume of the prism increased?

13. _____

14. The edge lengths of an octagon are all tripled. How many times greater is the area of the new octagon than the area of the old octagon?

14. _____

Bonus +5: The long sides of a rectangle are increased in length by 30%, and the short sides of the same rectangle are decreased by 30%. What is the percent change in the area of the new rectangle? Indicate whether this is a percent increase or a percent decrease?

B. _____

New Approach: Dimensions.

Math 8

Review:

Fill-in the missing spaces in the table below.

Change in:	**Height**	**Length**	**Area**
	x2	x3	x6
	x4	x4	_____
	x5	x2	_____

Now try for 3-dimensions.

Change in:	**Height**	**Length**	**Width**	**Volume**
	x2	x3	x2	x12
	x1	x1	x5	_____
	x3	x3	x3	_____
	x4	____	x2	x16
	____	x3	x5	x75

More Practice/Review:

If you double one dimension of a figure, its area will _____.

If you double two dimensions of a figure, its area will be ____ times larger.

If two dimensions of a 3-dimensional object are doubled and the third dimension is tripled, what is the effect on the volume? _____

Now, try answering the questions below. Use a h/l/w table.

1. The area of a triangle is $17cm^2$. The base and height are each tripled. What is the area of the new triangle?

2. The volume of a rectangular prism is $7cm^3$. If the width and length of its base are both doubled, and the height is not changed, what will be the new volume of the enlarged pyramid?

3. The volume of a rectangular prism is $83cm^3$. All of its edge lengths are increased by 50%. What is the volume of the new prism?

Name_____ Period _____

Dimensions (Take 2)

Math 8

Practice: Solve each.

1. The dimensions of a rectangular prism are all tripled. What is the effect on the volume of the prism?

Length	Width	Height	Volume

2. A rectangle has an area of 24.2 square inches. If the height is doubled and the width is tripled, what will be the area of the new rectangle?

Height	Width	Area (times what)	New Area

3. A triangle has an area of $17cm^2$. If you increase its height and base each by 50%, what will be the area of the new triangle?

Height	Base	Area (times what)	New Area

4. The edges of a cube are all doubled. If the original cube had a volume of $3cm^3$, what is the volume of the new cube?

Length	Width	Height	Volume

5. A triangle graphed on the coordinate plane has an area of $18cm^2$. A dilation is made on the coordinate plane with a scale factor of 4/3. What is the area of the new dilated triangle?

Length	Width	Height	Volume

6. The edge lengths of an octagon are all tripled. The area of the original octagon is $2.3cm^2$. How many times greater is the area of the new octagon than the area of the old octagon?

Height	Width	Area (times what)	New Area

Name_____ Period _____

Dimensions (Take 2)

Math 8

Practice: Solve each.

7. A heptagon has an area of 11cm^2. The lengths of its sides are all multiplied by 2.5. What is the area of the new heptagon?

7. _____

8. A rectangular prism has its length and width increased by 50% and its height decreased by 50%. If its original volume was 16cm^2, what is its new volume?

8. _____

9. A hexagon has 3cm sides. Its area is 23.4cm^2. What would be the area of a hexagon with 6cm sides?

9. _____

10. A rectangular prism has a volume of 10cm^3. The height and length of its base area doubled. The width of its base is increased as well. If the volume of the new prism is 200cm^3, how many times wider is the new prism than the original? (Think! Use a chart like #1 for this one too.)

10. _____

11. A five-pointed star with 3cm sides has an area of 12cm^2. What would be the area of a star whose sides were 15cm long?

11. _____

12. A circle has an area of 4cm^2. What will be the area of a circle whose radius is 50% longer?

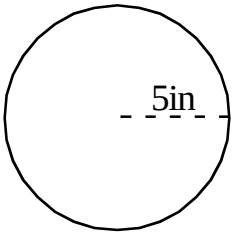
12. _____

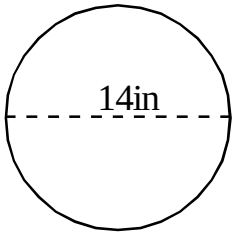
Dimensions: Circles/Cylinders

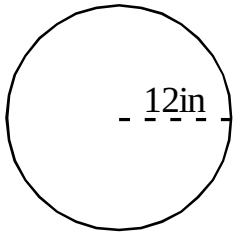
Math 8

Review:

Find the area of each circle. Leave your answers in terms of pi.

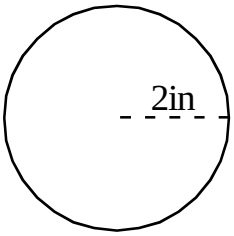




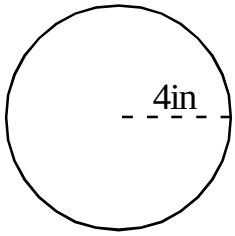


Now examine what happens when you double and triple the radius of a circle. Leave your answers in terms of pi.:

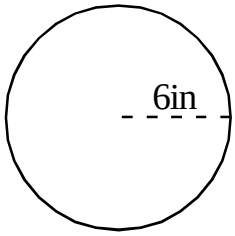
Original:



Double Radius

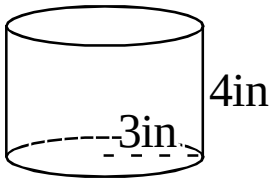


Triple Radius



Now lets go to three-dimensional objects which include circles: Cylinders.

Cylinder: $V = Bh$



1. Find the volume in terms of pi.
2. What is the volume if you double the height?
3. What is the volume if you double the height and radius?

Practice:

1. The area of a circle is $7cm^2$. What would be the area of a circle whose radius was three times the original?
2. A cylinder has a volume of $13cm^3$. The radius is tripled and the height is doubled. What is the volume of the new cylinder?
3. If the radius of a cylinder is increased by 10% but the height is not changed, by what percent will the volume of the cylinder increase?

Name_____ Period _____

Dimensions (Take 2: Circles)

Math 8

Practice: Solve each.

1. What happens to the volume of a cylinder when you:

a. Double its radius only: The volume becomes _____ times greater.

b. Double its radius and its height: The volume becomes _____ times greater.

c. Triple its radius and double its height: The volume becomes _____ times greater.

d. Double its radius and triple its height: The volume becomes _____ times greater.

e. Increase its radius by 50% but decrease its height by 50%: The volume becomes _____ times greater.

f. Increase its radius by 10% and increase its height by 10%: The volume becomes _____ times greater.

2. The original area of a circle is $16\pi cm^2$. What would be the area of the circle if you performed each of the following operations: (leave answers in terms of pi).

a. Double its radius: **a.** _____

b. Increase its radius by 50%: **b.** _____

c. Increase its radius by 25%: **c.** _____

d. Increase its radius by 125%: **d.** _____

e. Increase its radius by 2cm: (Think, this problem is different). **e.** _____

3. The ratio of the radii of two circles is 3/4.

a. What is the ratio of their areas? **a.** _____

b. The small circle has an area of 18cm2. What is the area of the larger circle?

b. _____

Name_____ Period _____

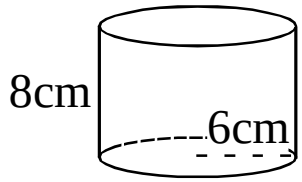
Dimensions (Take 2: Circles)

Math 8

Practice: Solve each.

PARTS A through F all refer to the original figure. Answer in terms of pi.

4. A cylinder has a radius of 6cm and height is 8cm.



a. Find its volume in terms of pi. **a.** _____

b. Increase its radius by 50% and find its new volume: **b.** _____

c. Increase its radius by 10% and find its new volume: **c.** _____

d. Increase its radius to 8cm and find its volume. **d.** _____

e. Express as a ratio the volume of part d to the original. **e.** _____

f. If you increase the radius by 50% and the height by 25% what will be the new volume?

f. _____

Pyramid/Cone Volume

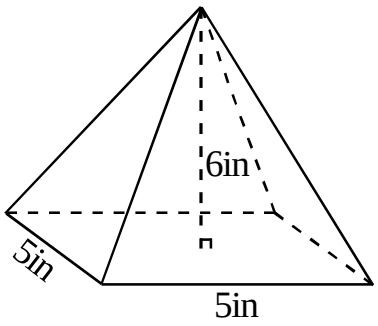
Math 8

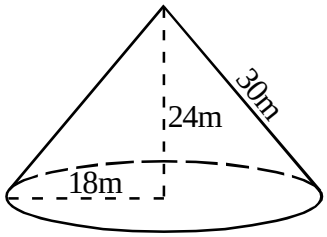
The formula used to find the volume of a pyramid or cone:

$$V = \frac{1}{3}Bh$$

Where B is the area of the base and h is the height.

Practice: Find each volume.





Pyramids and cones work just like any other three-dimensional figure. If you double two dimensions, you make the volume ____ times greater. If you double all three dimensions, you make the volume ____ times greater.

Look-out for combination questions:
Example:
A cone has a volume of 25cm³. If the radius is doubled and the height is increased by 50%, what will be the volume of the new cone?

Other questions are easiest to do using standard methods ... finding the new volume by re-calculating.

Example:

A cone with radius 3cm and height 4cm has a volume of $12\pi cm^3$. If the radius is increased to 5cm and the height is decreased to 3cm, what will be the change in volume?

a. Express your answer as an increase or decrease in cm³.

b. Express your answer as a percent change.

Name_____ Period _____

Changing Dimensions

Math 8

Practice (mixed review): Solve each.

1. The area of a circle is $30in^2$. If you triple the circle's radius, what will its new area be?

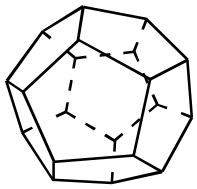
2. When a hexagon has 2-inch sides, its area is about $10.4in^2$. What will be the approximate area of a hexagon whose sides are 10 inches long?

3. A rectangular prism has a volume of $17cm^2$. If you double the length and width, but leave the height unchanged, what will be the volume of the new prism?

4. If you want to double the area of a square, by approximately what percent should you increase the length of its sides?

A. 25% B. 40% C. 75% D. 100% E. 200%

5. The volume of the regular dodecahedron below with an edge length of 4-inches is about $490\ in^3$. What would be the volume of a regular dodecahedron whose edges are a foot long?



6. The volume of a cone is $3in^3$. What would be the volume after each modification below? (each part refers to the original figure).

a. Double the radius only. _____

b. Triple the height only. _____

c. Double the height and triple the radius. _____

d. Increase the height and radius by 50%. _____

7. If you want to double the volume of a cube, by what percent should you increase the edge length?

A. 20% B. 23% C. 26% D. 30% E. 40%

Name_____ Period _____

Changing Dimensions

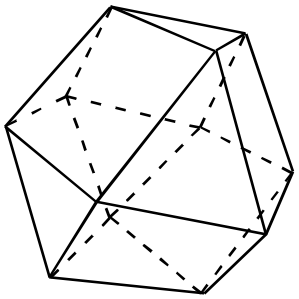
Math 8

Practice (mixed review): Solve each.

8. A pyramid has a square base with sides that are 2cm long and a height of 3cm. How many times greater is the volume of a similar pyramid that is 9cm tall?

9. A pyramid and a prism have the exact same base and the exact same volume. If the prism is 16 inches tall, how tall is the pyramid?

10. Each edge length of the polyhedron (solid figure) below is increased from 2cm to 3cm. If the volume of the original figure was 40 cubic units, what is the volume of the new solid?



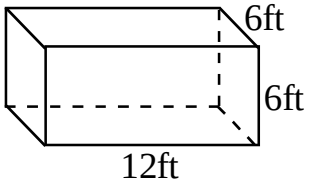
11. The ratio of the height of the smallest Egyptian pyramid at Giza to the largest pyramid at Giza is 1/10. What is the ratio of the volume of the smallest pyramid to the largest?

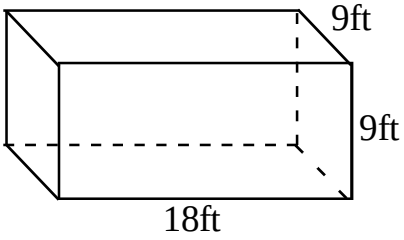
Surface Area

Math 8

The surface area is the sum of the areas of all the faces of a figure.

Dimensions and surface area:
Consider what happens when you increase the dimensions of a prism by 50%. What happens to the surface area of the figure?





The surface of a figure is 2-dimensional.
Think!
If you double the dimensions of a solid you increase the surface area of the figure by _____%. (Try an easy one like a cube.)

If you double the dimensions of a solid, you increase the volume of the figure by _____%.

If you increase the dimensions of a solid by 40%, you increase the surface area of the figure by _____%.

If you increase the dimensions of a solid by 40%, you increase the volume of the figure by _____%.

Practice:

1. A rectangular prism has side lengths of 3, 4, and 7cm.
- **a.** Find its surface area.
- **b.** Find the surface area of a rectangular prism whose dimensions are all three times the original.

2. A cube has a surface area of $24cm^2$.
- **a.** Find its surface edge length.
- **b.** If the edge length is increased by 25%, what will be the surface area of the larger cube?

3. The surface area of a cone is $60cm^2$. A similar cone is twice as tall and has twice the radius of the original. What is its surface area?

Name_____ Period _____

Dimensions Practice Quiz

Math 8

Solve each:

1. What number is 30% more than 18?

1._____

2. What is the volume of a cylinder whose radius is 4cm and whose height is 6cm? Express your answer in terms of pi.

2._____

3. Triangle ABC with coordinates A(3, 4), B(8, -9) and C(-6, -8) is dilated with a scale factor of 3/2 to create triangle A'B'C'. What are the coordinates of point C' ?

3._____

4. A square has 6-inch sides. If the sides are each increased by 2 inches to form a larger square, how many more square inches is the area of the larger square?

4._____

5. A pyramid has a rectangular base with an area of $19cm^2$. The height of the pyramid is 6cm. What is the volume of the pyramid?

5._____

6. What is the area of a circle of radius 9.7 inches? Express your answer as a decimal rounded to the hundredth.

6._____

7. Each of the edges of a rectangular prism is doubled. If the original prism had a volume of $11.5cm^3$, what is the volume of the new prism?

7._____

8. The height of a cylinder is increased by 20% but the radius is left unchanged. By what percent does the volume of the cylinder increase?

8._____

Name_____ Period _____

Dimensions Practice Quiz

Math 8

Solve each:

9. A cone with a 4cm radius and a height of 9cm has a volume of $48\pi cm^3$. If the radius is increased by 50% and the height is decreased by 25% what will be the volume of the new cone? Express your answer in terms of pi.

9._____

10. A rectangle is 6cm long and 4cm wide. The length is tripled and the width is increased by 1cm. How many more square centimeters are there in the area of the new rectangle than the area of the old rectangle?

10._____

11. A square graphed on the coordinate plane has an area of 17 square units. The square is dilated with a scale factor of 1.2. How many square units are in the area of the enlarged square? Do not round your answer.

11._____

12. Similar cones have heights of 6cm and 8cm. The volume of the smaller cone is $90cm^3$. What is the volume of the larger cone?

12._____

13. A cube has a surface area of $54cm^2$. If the dimensions of the cube area all increased by 10%, what will the new surface area of the cube be?

13._____

14. A rectangular prism has a volume of $10cm^3$. All of the dimensions of the prism are increased by x%. The resulting volume is three times the original volume. Find x.

A. 34.2 B. 44.2 C. 54.2 D. 64.2 E. 74.2

14._____