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Science Mom Lesson 70

Unit 8.4, Lesson 13: Equation Cards

A. $\begin{cases} y=7 \\ y=2x-15 \end{cases}$	E. $\begin{cases} y=-x+10 \\ y=2x+4 \end{cases}$
B. $\begin{cases} 9x+6y=15 \\ 2y=-3x+5 \end{cases}$	F. $\begin{cases} y=\frac{2}{3}x+7 \\ y=\frac{2}{3}x-4 \end{cases}$
C. $\begin{cases} y=3x+10 \\ 2y=6x+20 \end{cases}$	G. $\begin{cases} 0.5x+y=7 \\ 0.5x=-y+7 \end{cases}$
D. $\begin{cases} y=-x-4 \\ y=2x+11 \end{cases}$	H. $\begin{cases} y=x+10 \\ y=x-2 \end{cases}$

Unit 8.4, Lesson 14: Equation Cards

A. $\begin{cases} y=4 \\ x=-5y+6 \end{cases}$	E. $\begin{cases} 3x+4y=10 \\ x=2y \end{cases}$
B. $\begin{cases} y=3x+2 \\ 2x+y=47 \end{cases}$	F. $\begin{cases} y=-3x-5 \\ y=4x+30 \end{cases}$
C. $\begin{cases} y=\frac{1}{4}x+7 \\ x=-4 \end{cases}$	G. $\begin{cases} y=3 \\ x=-2y+56 \end{cases}$
D. $\begin{cases} y=-3x+10 \\ y=-2x+6 \end{cases}$	H. $\begin{cases} -4x+y=30 \\ y=-3x-5 \end{cases}$

Unit 8.4, Lesson 14: Strategic Solving Part 2 Name(s) ______________________________

Activity 1: Least and Most Difficult

Your teacher will give you a set of systems of equations. Look through the equations, and without solving, find three equations that you think would be the **least difficult** to solve and three equations that you think would be the **most difficult** to solve. Write the letter of each of the equations below.

Least Difficult Cards	**Most Difficult Cards**

Explain how you decided which equations would be the least difficult to solve.

Activity 2: Solve ‘em

Look through the equations and choose three to solve. At least one should be from your "least difficult" list and one should be from your "most difficult" list.

Activity 3: Thinking About Solutions

Martina looked at this system of equations and determined there was no solution. Do you agree? Explain your thinking.

$$\begin{cases} x+y=5 \\ x+y=7 \end{cases}$$

Lesson Synthesis

1. Write a system of equations that you would consider difficult to solve.

2. What makes your system of equations difficult to solve?

3. What are some strategies we know for solving systems of equations that have this feature?

Cool-Down

Solve this system of equations:

$$\begin{cases} x+y=10 \\ x=2y+1 \end{cases}$$

Unit 8.5, Lesson 2: Guess My Rule Name(s) ____________________

Worksheet A

Activity 1: Guess My Rule

Instructions: You and your partner will trade off being the rule holder and the rule guesser. Try to guess each other's rules by trying different inputs.

You are the RULE GUESSER.

Rule #1

Possible inputs: **Any number**

I think the rule is . . .

Input	Output

You are the RULE HOLDER.

Rule #2

Possible inputs: **Any number**

Rule: **Always output 10.**

Examples:
Input: **84** → Output: **10**
Input: **-3.5** → Output: **10**

Input	Output

You are the RULE GUESSER.

Rule #3

Possible inputs: **Single letters (e.g., "A")**

I think the rule is . . .

Input	Output

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Unit 8.5, Lesson 2: Guess My Rule Name(s) ______________________________

You are the RULE HOLDER.

Rule #4

Possible inputs: **Whole numbers 1 to 9**

Rule: **Output any two-digit number whose tens digit is the input.**

Examples:
Input: **7** → Output: **7**2 or **7**4, etc.
Input: **1** → Output: **1**9 or **1**0, etc.

Input	Output

You are the RULE GUESSER.

Rule #5

Possible inputs (ask your partner):

I think the rule is . . .

Input	Output

You are the RULE HOLDER. Make up your own rule and write it below.

Rule #6

Your made-up rule:

____

Possible inputs (based on your rule):

____

Input	Output

Worksheet B

Activity 1: Guess My Rule

Instructions: You and your partner will trade off being the rule holder and the rule guesser. Try to guess each other's rules by trying different inputs.

You are the RULE HOLDER.

Rule #1

Possible inputs: **Any number**

Rule: **Add 7 to the input.**

Examples:
Input: **5** → Output: **12**
Input: **10** → Output: **17**

Input	Output

You are the RULE GUESSER.

Rule #2

Possible inputs: **Any number**

I think the rule is . . .

Input	Output

You are the RULE HOLDER.

Rule #3

Possible inputs: **Single letters (e.g., "A")**

Rule: **Output a name beginning with that letter.**

Examples:
Input: **T** → Output: **T**errance or **T**aylor
Input: **M** → Output: **M**anuel or **M**alik

Input	Output

Unit 8.5, Lesson 2: Guess My Rule Name(s) ____________________

You are the RULE GUESSER.

Rule #4

Possible inputs: **Whole numbers 1 to 9**

I think the rule is . . .

Input	Output

You are the RULE HOLDER. Make up your own rule and write it below.

Rule #5

Your made-up rule:

____

Possible inputs (based on your rule):

____

Input	Output

You are the RULE GUESSER.

Rule #6

Possible inputs (ask your partner):

I think the rule is . . .

Input	Output

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Unit 8.5, Lesson 2: Guess My Rule Name(s) ___________________________________

Activity 2: What Is a Function?

Instructions: Make sure both partners agree on all of the rules in Activity 1. Then use those rules to figure out the meaning of a new word: *function*.

Rules #1 and #2 are called *functions*. Rules #3 and #4 are not functions.
What do you think makes a rule a function?

First-draft definition:
Revised definition after Meeting 1:
Revised definition after Meeting 2:
Class definition:

Unit 8.5, Lesson 2: Guess My Rule

Name(s) ______________________________

Lesson Synthesis

Here's one definition: A function is a rule that assigns **exactly one** output to each possible input.

This table **does not** represent a function.

Change at least one number so that it does represent a function.

Explain why you made each change.

Input	Output
1	5
2	10
3	15
2	20
1	24

Cool-Down

Every birthday has an astrological sign, like Gemini or Scorpio. Both tables show a relationship between birthday and astrological sign.

Which table(s) represent a function?

- ☐ Table A
- ☐ Table B
- ☐ Both
- ☐ Neither

Explain your thinking.

Table A

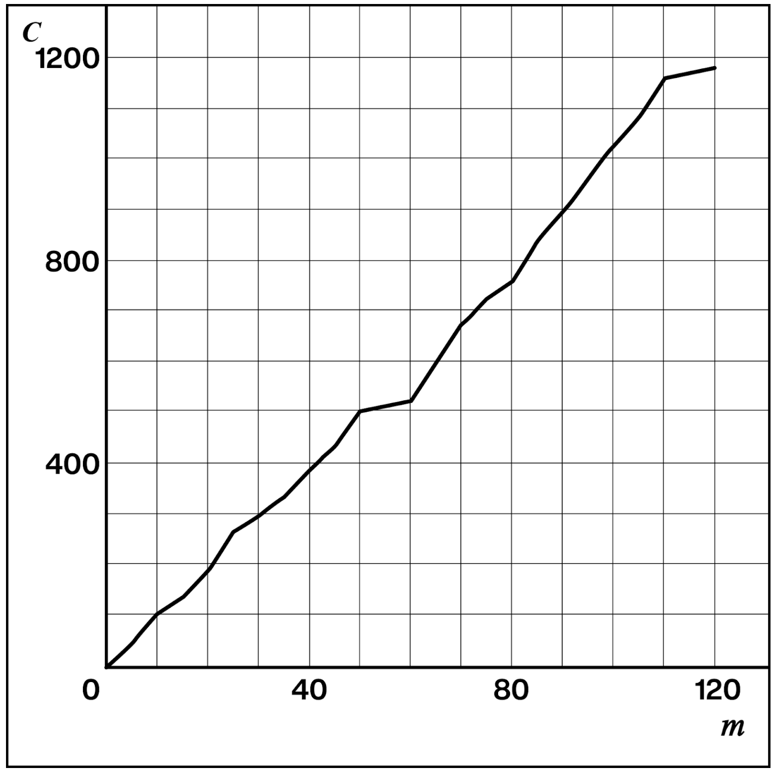
Input	Output
Taurus	May 1
Taurus	May 8
Gemini	June 5
Sagittarius	November 23
Capricorn	December 25

Table B

Input	Output
May 1	Taurus
May 8	Taurus
June 5	Gemini
November 23	Sagittarius
December 25	Capricorn

Card 1: World Cup Soccer Match

Megan competed in a World Cup soccer match that lasted a total of 120 minutes. The graph shows the relationship between the number of calories she burned, C, and time, m, in minutes.



Warm-Up: How many calories did Megan burn in the first 30 minutes of the soccer match?

Card 2: Grandmaster Chess Match

Fabiano competed in a Grandmaster chess match that lasted a total of 9 hours. This table shows the relationship between the number of calories Fabiano burned, C, and time, h, in hours.

h	1	2	3	4	5	6	7	8	9
C	127	252	377	512	641	769	900	1029	1156

Warm-Up: How many calories did Fabiano burn in the first 2 hours of the chess match?

Card 3: Olympic 5000-Meter Run

Tirunesh competed in the 5000-meter race at the olympics. She finished the race in 14.2 minutes. After the race, Tirunesh wrote the equation $C = 18.1m$ to model the relationship between the number of calories she burned, C, and the number of minutes she ran, m.

Warm-Up: How many calories did Tirunesh burn in the first 10 minutes of the 5000-meter race?

Unit 8.5, Lesson 7: Feel the Burn Name(s) ______________________________

Warm-Up: Making Sense of Representations

Select a context card and answer the question that appears on it. Then share your answer (and explain your thinking) to the members of your group.

Activity 1: Awards

Work with the members of your group to answer the following questions:

1. Who gets the award for most calories burned overall?
2. Who gets the award for most calories burned in the first 10 minutes?
3. Who gets the award for burning the most calories per minute over any period of time?

Work with the members of your group to create a poster displaying your work. Here is what your poster should include:

- The three task cards (graph, table, and equation). Do not re-create the representations. Instead, use tape or glue to affix the task cards to your poster.
- Your answers to the three “awards” questions.
- Explanations that clearly illustrate the reasoning for your answer. Include complete sentences on your poster as well as annotations on the task cards.

Lesson Synthesis

1. Look carefully at 2–3 of your classmates' posters. Describe something you would change about your display now that you have seen other groups' work.

2. Choose one of the context cards (graph, table, or equation). Describe the strengths and weaknesses of this representation compared to the others.

Cool-Down

Let's compare areas for circles and squares.

This table shows circle area for specific radius values.

Radius (inches)	0.5	1	1.5	2	2.5	3
Area (square inches)	0.25π	π	2.25π	4π	6.25π	9π

The equation $A = s^2$ gives the area, A, of a square with side length s.

Which is larger: a square with a side length of 2.5 inches or a circle with a radius of 1.5 inches?

Unit 8.6, Lesson 11: Federal Budgets Name(s) ____________________

Make a Poster

Based on the 2018 federal budgets for three countries, the table shows where some of the federal money was expected to go.

1. Choose another country and add their federal 2018 budget.

	United States	Japan	United Kingdom	
Defense	639	45.8	47.9	
Education	59	35.6	54.5	
Healthcare	1100	507	208.5	
Other	2302	271.6	781.1	
Total	4100	860	1092	

The values are in billions (10^9) of U.S. dollars.

2. Circle a question to explore.

A. Is there an association between a country and budget spending? Explain your reasoning.

B. [*I'll write my own question.*] ____________________

____

3. Create a poster. Here is what your poster should include:

- ☐ Your question.
- ☐ At least two visual representations of this data:
  - Bar graph
  - Relative frequency table
  - Segmented bar graph
  - Scatter plot
- ☐ Your answer to the question.
- ☐ Explanations that clearly show your reasoning for your answer.

 Name(s) ______________________________

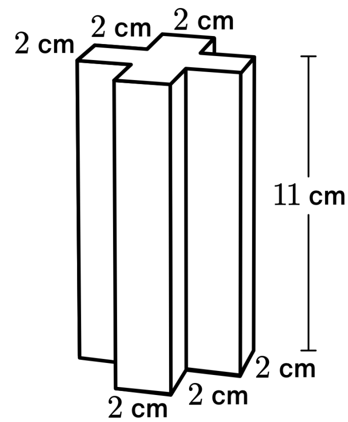
Gallery Walk

1. What representations did your classmates use in their posters?	2. What representations did your classmates not use in their posters?
3. What features of your classmates' posters helped you understand their thinking?	4. Now that you have seen other groups' posters, what would you have done differently if you had more time?

desmos Science Mom Lesson 94

Unit 7.7 Lesson 12: Surface Area Strategies Name ____________________

Warm-Up



Activity 1: Different Strategies

Three students are trying to calculate the *surface area* of this prism.

Amoli says:	**Nyanna says:**	**Miko says:**
We have to draw each of the 14 different faces, find their areas, and add those up.	There are only two different shapes: the plus sign and the rectangle. We can find the area of each shape and use a calculator to multiply by the number there are of each shape.	I see another way! Imagine unfolding the prism into a net. We can use one large rectangle instead of 12 smaller ones.

1. Who do you agree with? Explain your reasoning.

2. Sketch the "one large rectangle" Miko is talking about.
   What are the dimensions of this rectangle? Explain or show your reasoning.

3. Use any strategy to calculate the surface area of this solid. Organize your thinking and calculations so others can follow them.

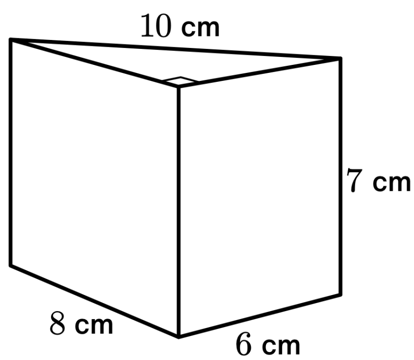
Unit 7.7 Lesson 12: Surface Area Strategies Name ______________________________

Activity 2: Calculating Surface Area

For each prism:

- Determine how many faces the prism has.
- Use any method to calculate the surface area. Show your thinking.
- Trade papers with your partner. Work together to reach an agreement about the surface area.

1.

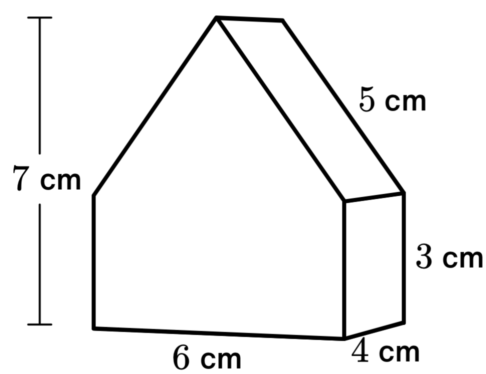


Number of faces: ______

Surface area: _____

My work:

2.

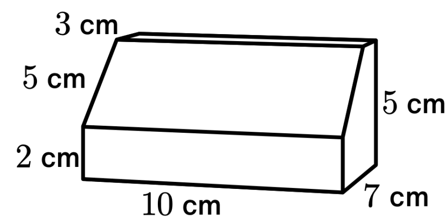


Number of faces: ______

Surface area: _____

My work:

3.



Number of faces: ______

Surface area: _____

My work:

4. Whose strategy is most similar to yours? Whose strategy is your partner's thinking most like?

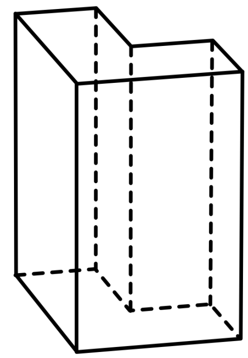
Are You Ready for More?

On a separate piece of paper, design a prism with a surface area of 200 square units.

 Name ____________________

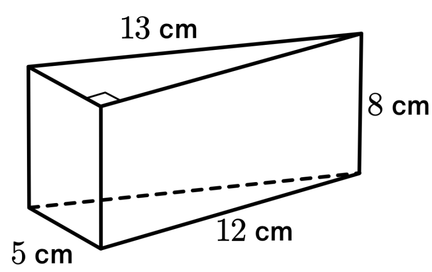
Lesson Synthesis

Describe your favorite method for calculating the surface area of a prism.
Use the prism on the right if it helps you with your explanation.



Cool-Down

Calculate the surface area of this prism. Organize your thinking and calculations so that others can follow them.



Activity 2: Volume Lab

Directions: Use the tools on Screen 6 to help you explore and answer the following questions:

1. *Responses vary.*

2. The volume of the large cone is 2 times that of the small cone.

3. The volume of the large cylinder is 9 times that of the small cylinder.

4. *Responses vary.* One such pair of objects is a sphere and cone where the cone's height and diameter are equal to the sphere's diameter. The sphere has twice the volume of the cone.

5. *Responses vary.*

Activity 2: Volume Lab

Directions: Use the tools on Screen 6 to help you explore and answer the following questions:

1. Select any two objects and adjust their dimensions. Press “Compare.” Repeat this with several pairs of objects and dimensions. Then describe something that you found interesting or surprising. Include a sketch.

2. The height of one cone is 2 times as large as the height of another cone. How are the volumes of the cones related?

3. The diameter of one cylinder is 3 times as large as the diameter of another cylinder. How are the volumes of the cylinders related?

4. Find two different objects where one has twice the volume of the other. Sketch the objects below. Label their dimensions.

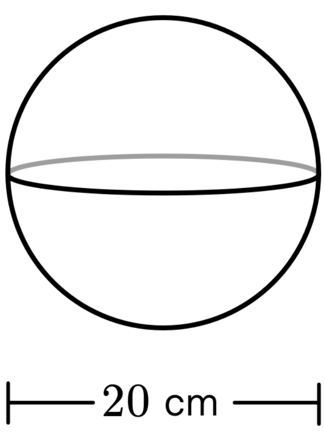
5. Find another interesting relationship between the volumes of two different objects. Describe the relationship. Include a sketch.

Activity 2: Finding Sphere Dimensions

1. A formula for the volume of a sphere is $V = \frac{4}{3}\pi r^3$. Complete the table with the missing dimensions of each sphere. Enter your answers in terms of π.

Diameter (units)	Radius (units)	Sphere Volume (cubic units)
4	2	$\frac{32}{3}\pi$
8	4	$\frac{256}{3}\pi$
6	3	36π
12	6	288π
9	4.5	121.5π

2. A sphere has a diameter of 20 centimeters. Draw the sphere. Then determine its volume.



$V = \frac{4000}{3}\pi$ cubic centimeters

Activity 2: Finding Sphere Dimensions

1. A formula for the volume of a sphere is $V = \frac{4}{3}\pi r^3$. Complete the table with the missing dimensions of each sphere. Enter your answers in terms of π.

Diameter (units)	**Radius (units)**	**Sphere Volume (cubic units)**
	2	
8		
	3	
	6	
9		

2. A sphere has a diameter of 20 centimeters. Draw the sphere. Then determine its volume.

Name(s) ____________________________

Warm-Up

Activity 1: Comparing Containers

Calculate the **amount of popcorn** each container can hold.
Organize your thinking and calculations so that others can follow them.

Container A	Container B

Calculate the **amount of paper** each container uses (including the bottom).
Organize your thinking and calculations so that others can follow them.

Container A	Container B

Name(s) ______________________________

Activity 2: Building Containers

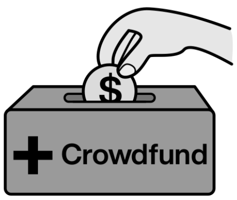
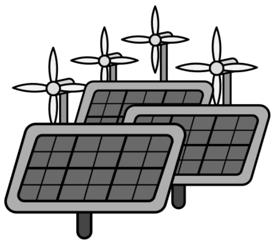
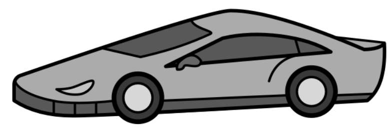
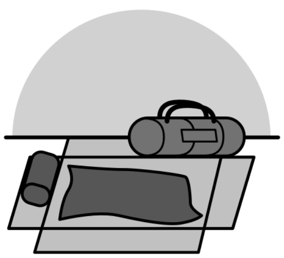
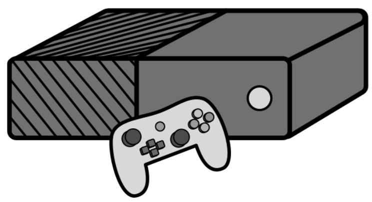
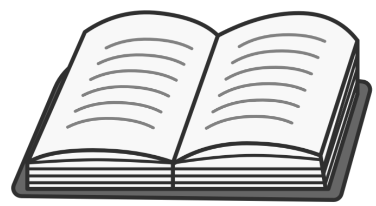
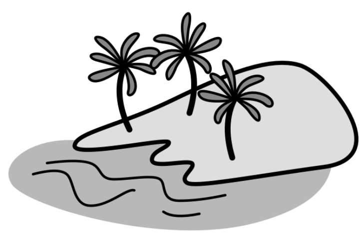
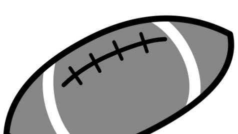
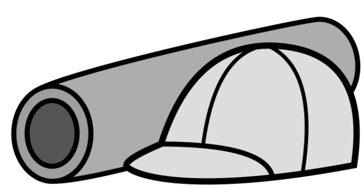
Use this space to record your thinking for the amount of popcorn and paper of the new containers. Organize your thinking and calculations so that others can follow them.

Are You Ready for More?

Name(s) ______________________________

Spend Jeff's Money

Spend as much of Jeff Bezos's money as you can (**without going over**) by purchasing any combination of these items.

 **Pay one medical crowdfunded goal** $\$5 \cdot 10^4$	 **Make green energy in the U.S.** $\$1.5 \cdot 10^{10}$	 **Lamborghini** $\$2.2 \cdot 10^5$
 **End homelessness in the U.S.** $\$2 \cdot 10^{10}$	 **Gaming console** $\$6 \cdot 10^2$	 **Book** $\$2 \cdot 10^1$
 **Pay one student's college loan debt** $\$3 \cdot 10^4$	 **Private island** $\$5 \cdot 10^6$	 **Pay for healthcare for one American for one year** $\$1 \cdot 10^4$
 **Professional football team** $\$3 \cdot 10^9$	 **Luxurious yacht** $\$1 \cdot 10^8$	 **Replace Flint's old water pipes** $\$6 \cdot 10^7$

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Unit 8.7, Lesson 13: Supplement Name(s) ______________________

Pick **at least four** different items to purchase from the options listed. Enter your selections in the table below. Then calculate how much of Jeff Bezos's money you spent.

Note: Jeff Bezos's net worth is $1.2 \cdot 10^{11}$ dollars.

Item	Price Each	Quantity	Total Cost
		Total Spent	

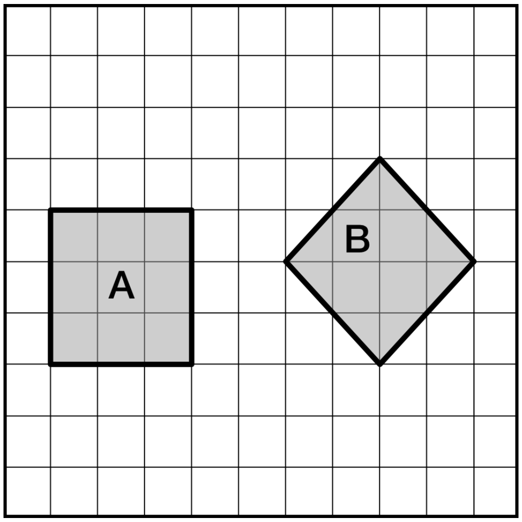
How close did you get to spending all of Jeff Bezos's money?

Explain how you figured it out.

Unit 8.8, Lesson 1: Tilted Squares Name(s) ____________________

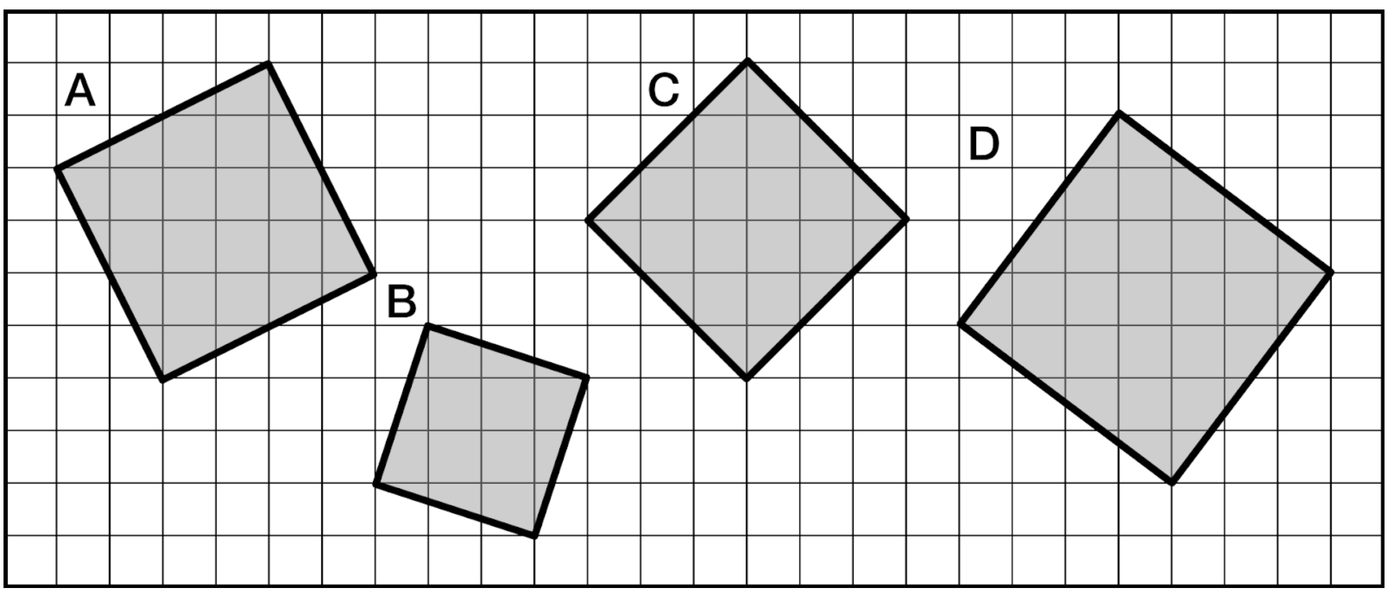
Warm-Up

Which shaded region is larger? Explain your thinking.



Activity 1: Finding the Area of Tilted Squares

1. Find the area of each shaded square (in square units).



Square	Area (square units)
A	
B	
C	
D	

Name(s) ______________________________________

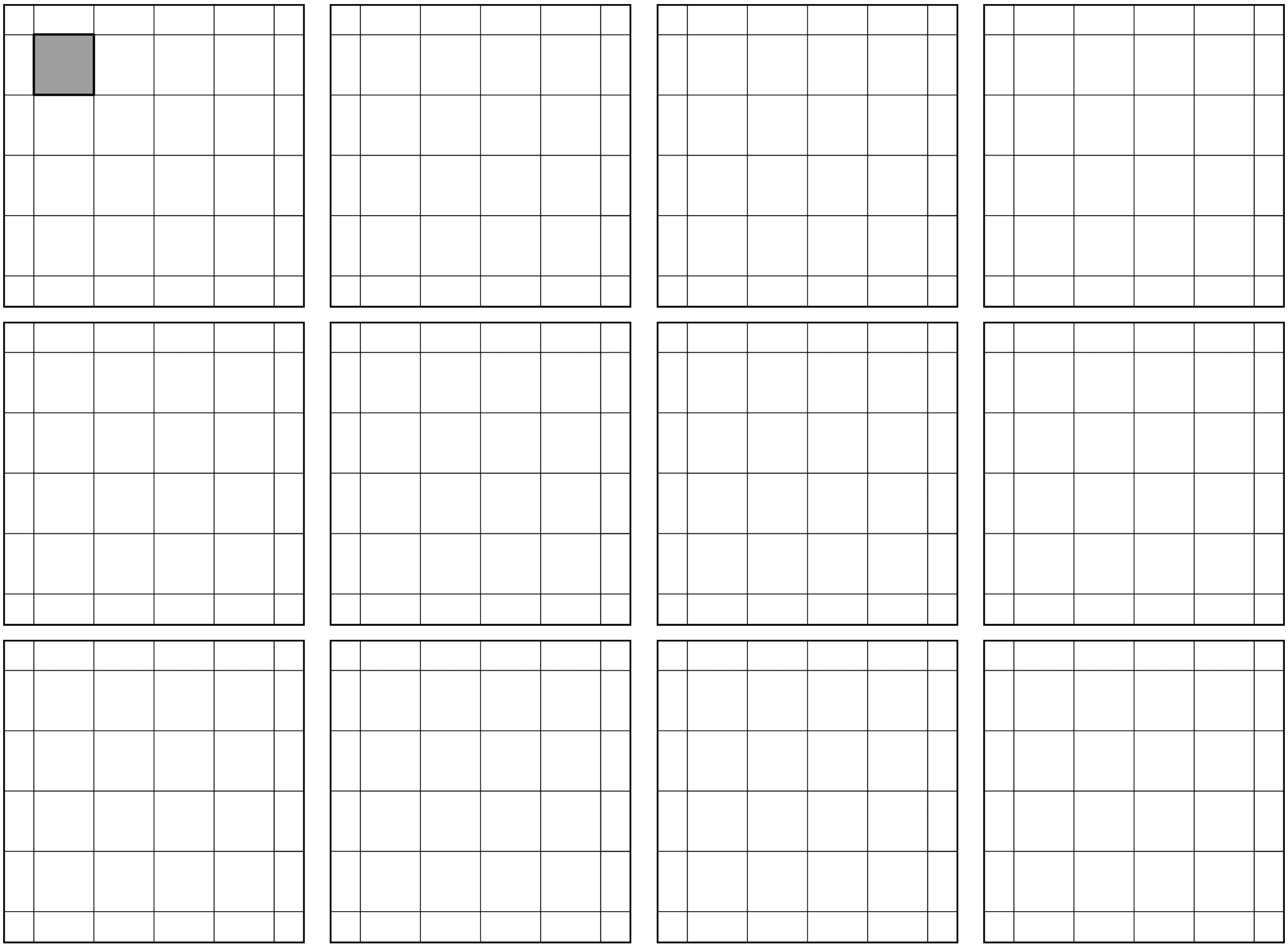
2. What strategies did you use to find the area of the tilted squares?

3. Will this strategy give you an accurate answer? Explain your thinking.

4. What is the side length of Square D? Explain your thinking.

Activity 2: Building Squares With Different Areas

The shaded square has an area of 1 square unit. What other squares can you draw with whole number areas from $1–10$ square units whose vertices are on the grid. Record your results on the grids below.



1. For which areas were you able to create a square?

2. How can you determine if it is possible to draw a square on a grid with a given area?

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Unit 8.8, Lesson 1: Tilted Squares Name(s) ________________________

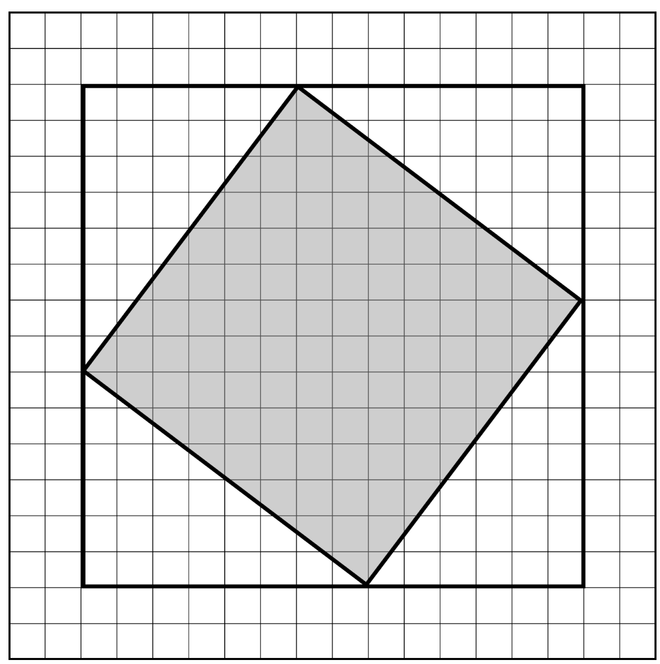
Lesson Synthesis

How can you find the area of a square if you do not know the side lengths?

Cool-Down

1. Find the area of the shaded square.

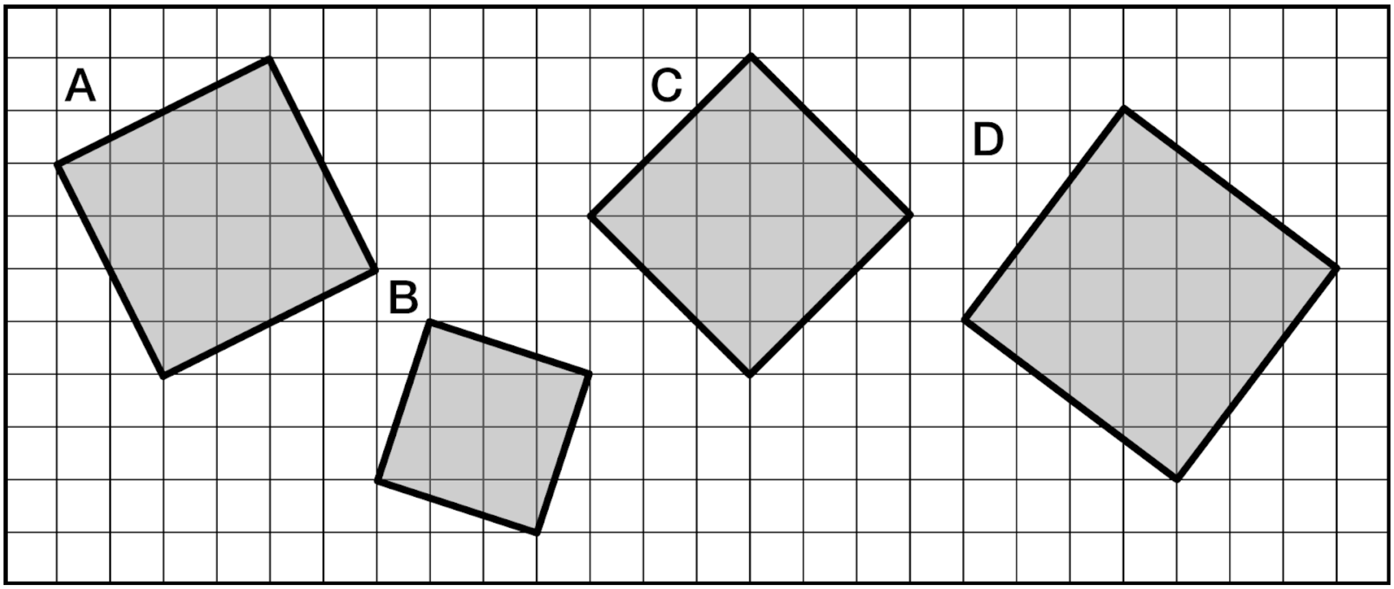
2. What is the side length of the shaded square?



Science Mom Lesson 113

Name(s) ______________________________

Activity 1: Finding the Area of Tilted Squares



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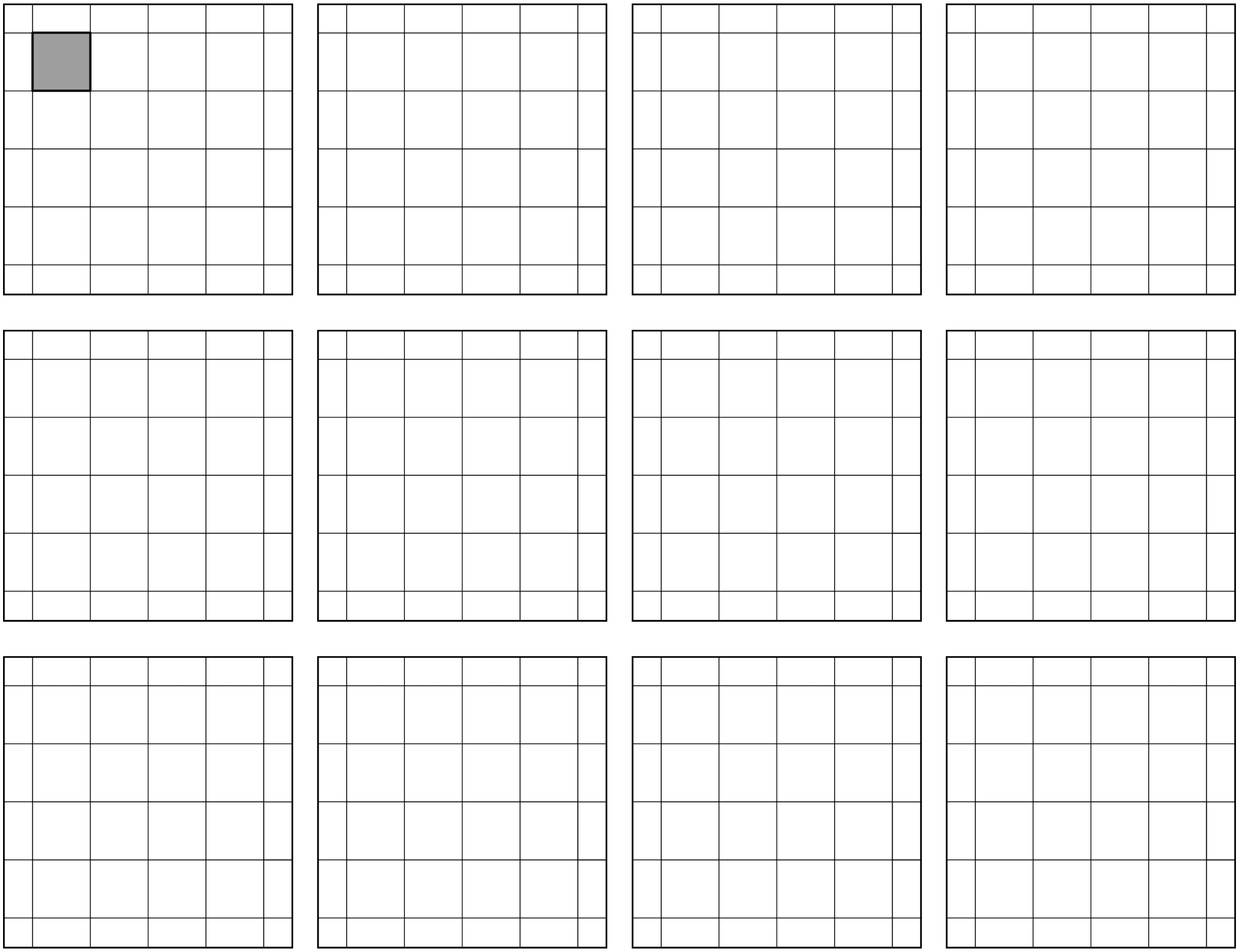
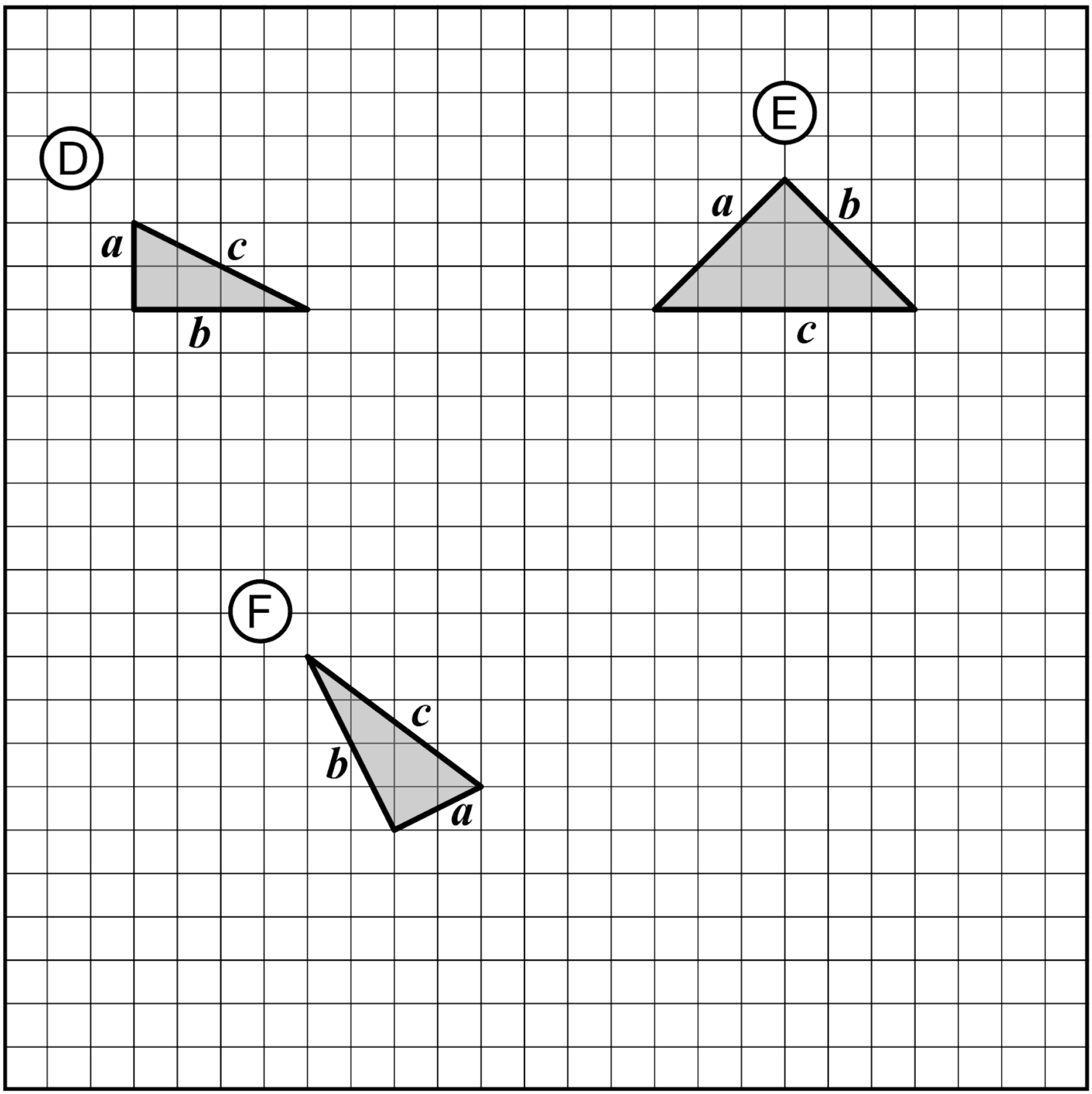
Unit 8.8, Lesson 1: Supplement Name(s) ____________________

Activity 2: Building Squares With Different Areas



Name(s) ______________________________

Using Areas to Discover the Pythagorean Theorem



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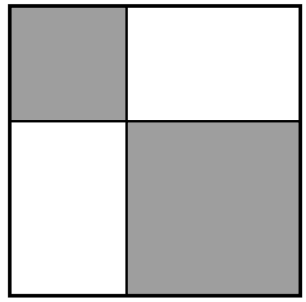
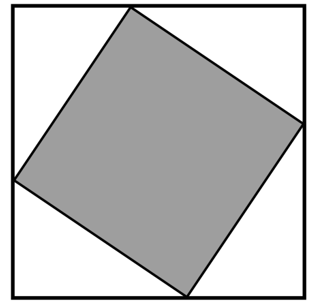
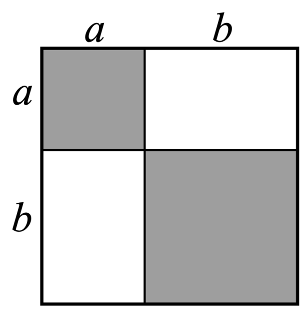
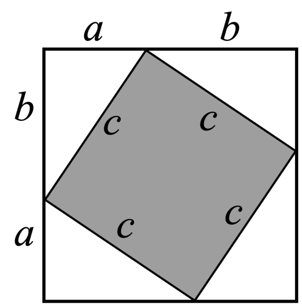
Unit 8.8, Lesson 7: Pictures to Prove It Name(s) ______________________________

For this lesson, assume that the figures that look like squares are squares.

Activity 1: Proving the Pythagorean Theorem

1. Label the side lengths for both squares. Be sure Figure C and Figure D are the same size.	 Figure C	 Figure D
1.1 What is the area of the entire figure?		
1.2 What is the total shaded area?		
1.3 What is the total unshaded area?		

2. What do you notice about the unshaded areas of the two figures?	 Figure E	 Figure F
2.1 What is the area of the entire figure?		
2.2 What is the total shaded area?		
2.3 What is the total unshaded area?		
2.4 Use the areas of the two figures to explain why $a^2 + b^2 = c^2$.		

Name(s) ______________________________________

Activity 2: Let's Put It to Work

1. Find the value of x in the shaded right triangle.

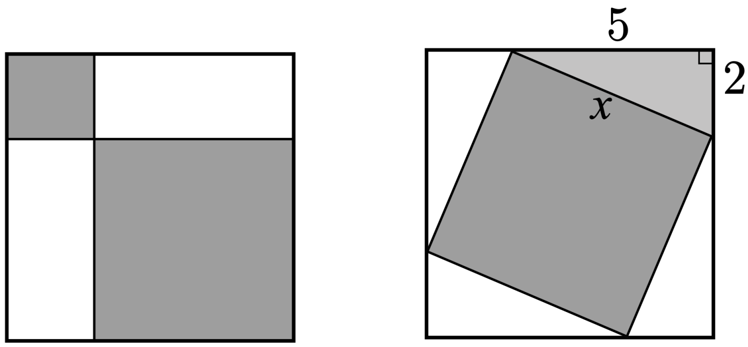


Figure G Figure H

2. Find the value of y in the shaded right triangle.

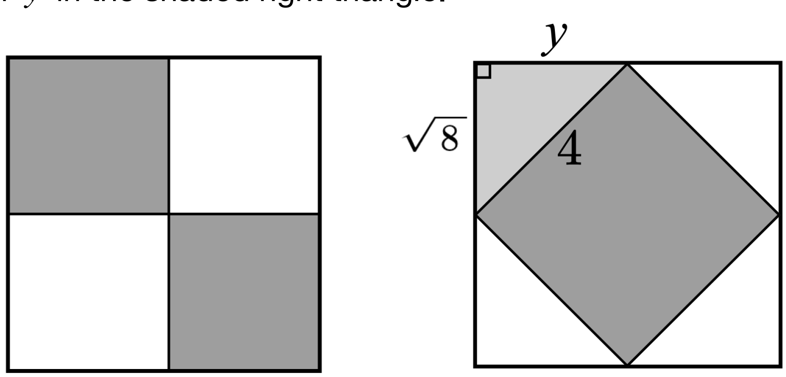


Figure I Figure J

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Unit 8.8, Lesson 7: Pictures to Prove It Name(s) ______________________

Lesson Synthesis

The Pythagorean theorem says that $a^2 + b^2 = c^2$ is true for . . .

A. . . . all triangles

B. . . . no triangles.

C. . . . all right triangles.

D. . . . some right triangles.

Explain your thinking.

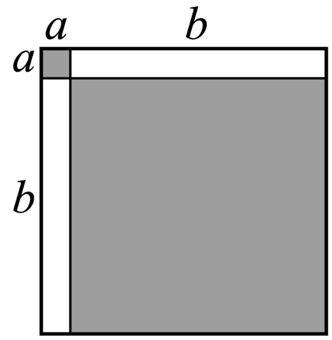


Figure K

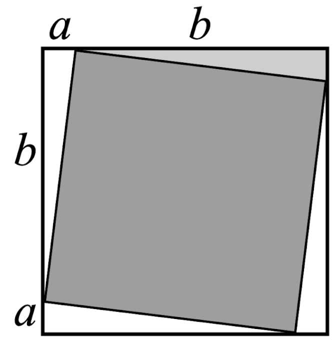
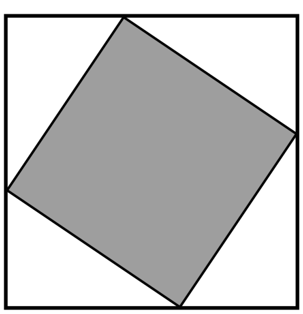
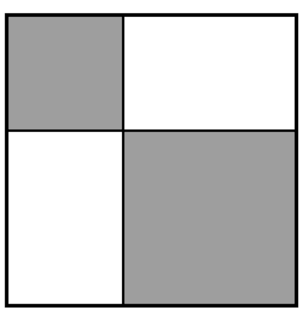


Figure L

Cool-Down

Label the two figures showing why $3^2 + 4^2 = 5^2$.

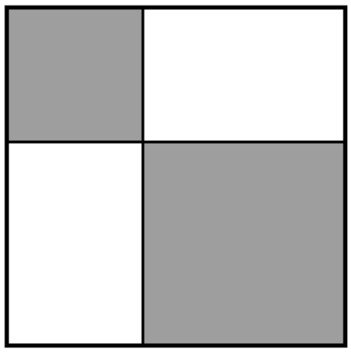


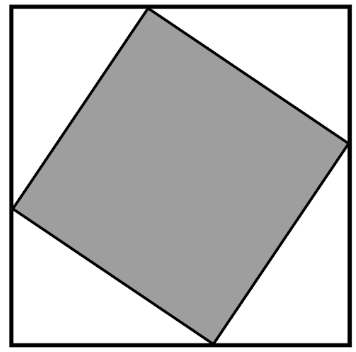


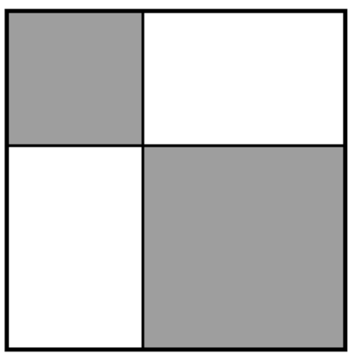
Explain how you can see this in the figures.

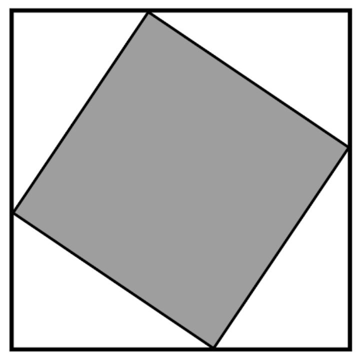
Name(s) ______________________________

Proving the Pythagorean Theorem



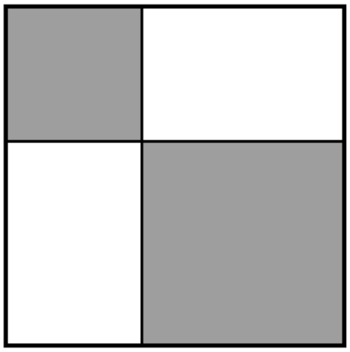


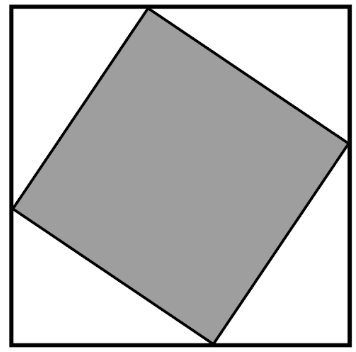


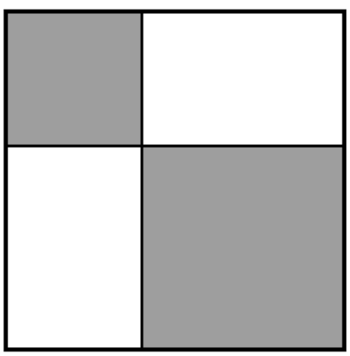


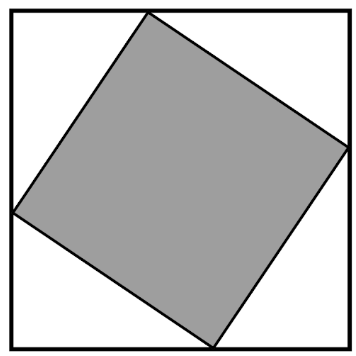
Unit 8.8, Lesson 7: Supplement

Name(s) ____________________







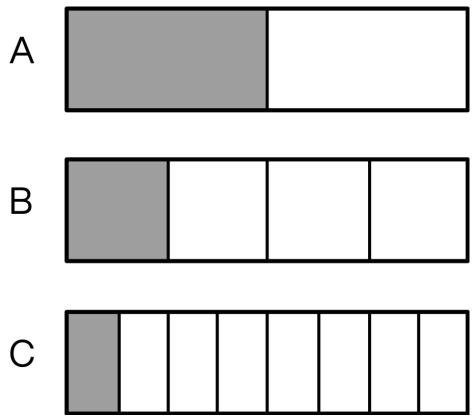


desmos Science Mom Lesson 123

Unit 8.8, Lesson 12: Fractions to Decimals Name(s) ______________________________

Warm-Up

What fraction of each rectangle is shaded? Write your answers in the table. Then write each fraction as a decimal.



Rectangle	Fraction Shaded	As a Decimal
A		
B		
C		

Activity 1: Terminating or Repeating

1. Some decimals terminate. Others repeat. The table shows three examples of each. Complete the last row of the table.

Fraction	As a Decimal	Terminating	Repeating
$\frac{1}{8}$	.125	✓	
$\frac{3}{5}$	.6	✓	
$\frac{341}{100}$	3.41	✓	
$\frac{1}{3}$	$0.333\ldots$		✓
$\frac{243}{99}$	$2.454545\ldots$		✓
$\frac{121}{15}$	$8.0666\ldots$		✓
$\frac{11}{50}$			

2. We can also use bar notation to write repeating decimals. For example, $0.333\ldots = 0.\overline{3}$ and $2.454545\ldots = 2.\overline{45}$.

   Order these numbers from least to greatest: 8.06, 8.063, $8.0\overline{6}$, $8.\overline{063}$.

3. Use long division to determine the decimal representation of each unit fraction. Then place a ✓ in the "Terminating" or "Repeating" box for each fraction.

Unit Fraction	Decimal Representation	Terminating	Repeating
$\frac{1}{2}$	0.5	✓	
$\frac{1}{3}$	$0.\overline{3}$		✓
$\frac{1}{4}$			
$\frac{1}{5}$			
$\frac{1}{6}$			
$\frac{1}{7}$			
$\frac{1}{8}$			
$\frac{1}{9}$			
$\frac{1}{10}$			
$\frac{1}{11}$			
$\frac{1}{12}$			

4. Find another unit fraction with a terminating decimal representation.

5. Find another unit fraction with a repeating decimal representation.

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Unit 8.8, Lesson 12: Fractions to Decimals Name(s) ______________________

Are You Ready for More?

1. Complete the following table.

Fraction	Decimal Representation
$\frac{1}{7}$	
$\frac{2}{7}$	
$\frac{3}{7}$	
$\frac{4}{7}$	
$\frac{5}{7}$	
$\frac{6}{7}$	

2. How are the decimal representations in the table similar to one another?

3. How are the decimal representations in the table different from one another?

4. Add the decimal representations of $\frac{3}{7}$ and $\frac{4}{7}$. What is the result? How does this compare to the result when adding the fractional representation of $\frac{3}{7}$ and $\frac{4}{7}$.

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Unit 8.8, Lesson 12: Fractions to Decimals Name(s) ______________________

Lesson Synthesis

How can you predict whether a unit fraction will terminate or repeat?

Cool-Down

Does the decimal representation of $\frac{1}{30}$ terminate or repeat?