Amplify Desmos Math CALIFORNIA

Grade 8

Math Language Development Resources

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Words With Multiple Meanings

Draw a picture or write in words to show one or more math meanings and another meaning of the term.

Math meaning(s)

image

Another meaning

Math Habits of Mind:
Hábitos mentales matemáticos

I can slow down and first make sense of a challenging problem before trying to solve it.

Puedo ir más despacio y primero comprender un problema difícil antes de intentar resolverlo.

I can represent real-world problems using equations and inequalities and interpret their solutions within the context of the problem.

Puedo representar problemas del mundo real usando ecuaciones y desigualdades e interpretar sus soluciones dentro del contexto del problema.

I can justify my thinking and ask questions to help me understand the thinking of others.

Puedo justificar mi razonamiento y hacer preguntas que me ayuden a comprender el razonamiento de los demás.

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Puedo comunicar mi razonamiento y soluciones claramente a los demás.

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Puedo buscar estructuras o patrones que me ayuden a resolver problemas.

I can look for repeated calculations and other repeated steps to make generalizations.

Puedo buscar cálculos y otros pasos repetidos para hacer generalizaciones.

Questions and Sentence Frames

Why did you choose this habit of mind?

Did you choose any others? Why or why not?

What part of the Activity reminded you of this habit of mind?

Can you tell me more?

I chose this habit of mind because . . .

I also chose _____ because . . .

In the Activity, I . . .

Transformers

	Transformer #1	Transformer #2	Transformer #3
Different size			
Turned left/right			
Moved location			

What happened to your figure?

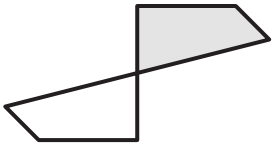
My figure . . .

Word bank						
English	bigger	change	down	left	right	same
Español	más grande	cambiar	abajo	izquierda	derecha	mismo
English	smaller	side length	size	spin	turn	up
Español	más pequeño	largo de lado	tamaño	girar	doblar	arriba

Rotations, Reflections, Translations

Reflection *reflexión*	Rotation *rotación*
mirror flip	spin turn

To map the shaded figure onto the unshaded one . . .

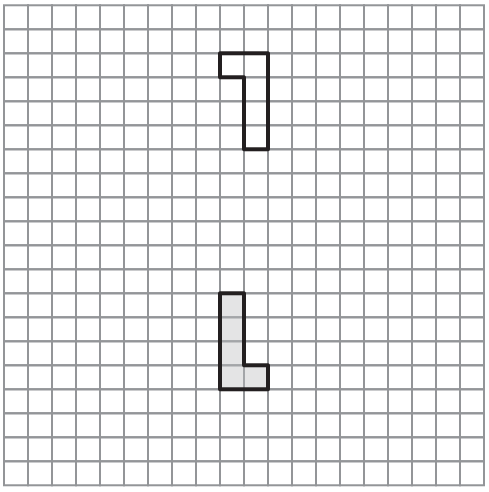


- Matias says you can use one *reflection*.
- Dyani says you can use one *rotation*.

Matias is _____. *(correct / incorrect)*	• Reflecting the shaded figure once _____ match the unshaded figure. *(does / does not)* • The shaded figure maps onto the unshaded figure if . . .
Dyani is _____. *(correct / incorrect)*	• Rotating the figure once _____ match the unshaded figure. *(does / does not)* • The shaded figure maps onto the unshaded figure if . . .

Sequences of Transformations

The sequence of transformations that maps the shaded figure onto the unshaded figure is . . .



Use the words shown if they help you describe your sequence of transformations.

Reflect	Rotate	Translate
line of reflection horizontal vertical	clockwise counterclockwise degrees center of rotation	down left right up

Transformation Information

Here are important details to help you describe transformations:

Translation	Reflection	Rotation
• Distance: _____ units • Direction: left/right/up/down	• Line of reflection	• Direction of rotation: clockwise/counterclockwise • Angle • Center of rotation

- Translate triangle ABC _____ units _____.
  (up / down / left / right)

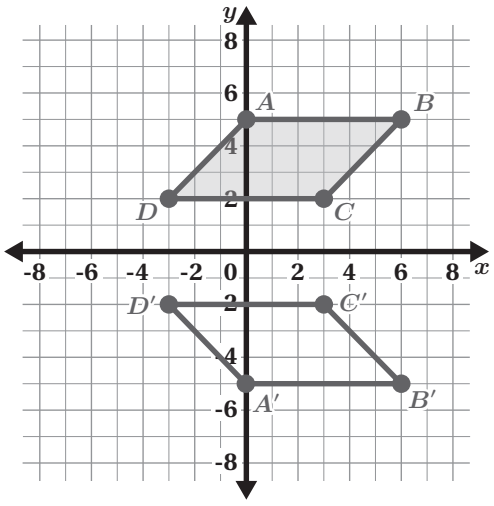
- Reflect triangle ABC over the line _____.

- Rotate triangle ABC _____ by _____ degrees around _____.
  (clockwise / counterclockwise)

Reflection and Translation Patterns

- The patterns that I notice are . . .
- The x-coordinate of the pre-image and image . . .
- The y-coordinate of the pre-image and image . . .
- The x-coordinate increased / decreased by _____.
- The y-coordinate increased / decreased by _____.

Coordinate Patterns

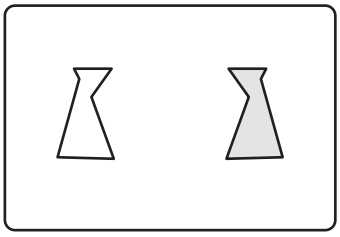


I agree with _____ *(Binta / Chloe)* because . . .	If figure $ABCD$ is rotated $180°$ counterclockwise around center $(0,0)$, then . . . If figure $ABCD$ is reflected over the x-axis, then . . .

Word bank						
English	coordinates	correspond	image	maps onto	pre-image	quadrant
Español	coordenadas	corresponder	imagen	proyectarse	preimagen	cuadrante

Rigid Transformations

This is a _____ transformation because . . .
(rigid / non-rigid)



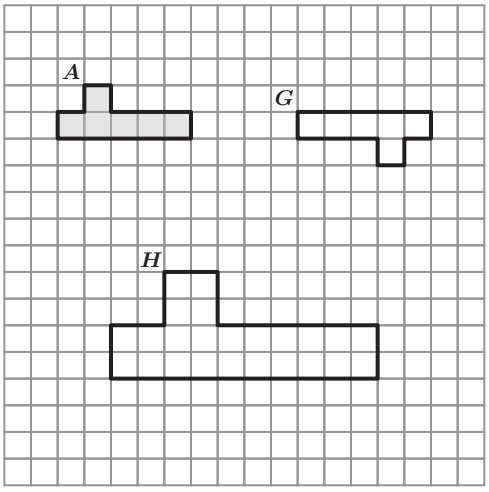
A transformation that would map the pre-image (shaded) onto the image (unshaded) is . . .

Word bank					
English	translation	corresponding side lengths	corresponding angle measurements	rotation	reflection
Español	traslación	longitudes de lado correspondientes	medidas de ángulos correspondientes	rotación	reflexión
English	unshaded	pre-image	image	shaded	vertical line
Español	sin sombra	preimagen	imagen	sombreado	linea vertical

Defining Congruence

- Kweku says figures A and G are congruent.
- Lan says figures A and H are congruent.

Whose claim is correct?



Decide *(decidir)*	Defend *(defender)*
Kweku is _____. *(correct / incorrect)*	
Lan is _____. *(correct / incorrect)*	

Word bank					
English	mapped	rotated	directly	figures	congruent
Español	proyectado	rotado	directamente	cifras	congruente

Congruent or Not?

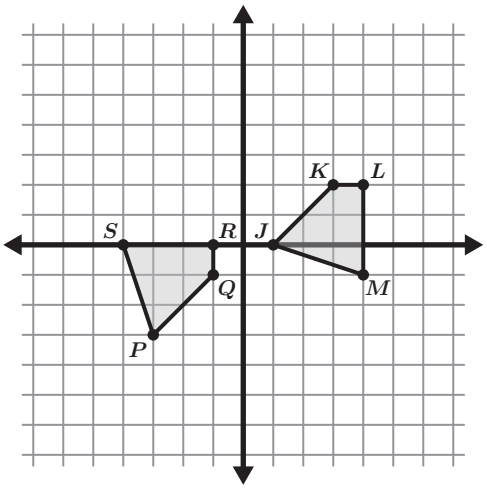
Discuss: Which of their arguments do you think is most convincing?

A. Both figures have 4 sides and an area of 5.5 square units.

B. I can map the figures right on top of each other by translating figure $JKLM$ down 3 units and left 4 units, and then reflecting over side QP.

C. When I measure the side lengths of figures $JKLM$ and $PQRS$, I get the same measurements.

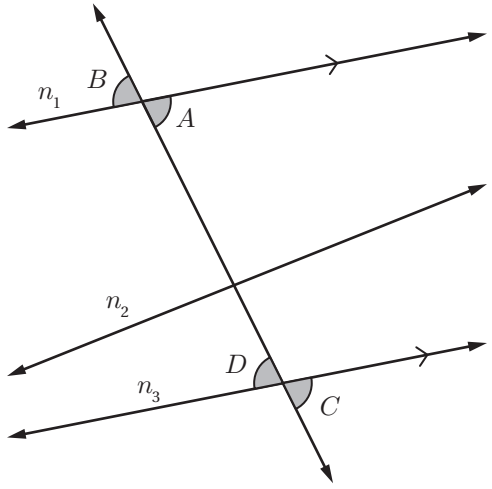
Pair C



I think Student _____'s argument is most convincing because . . .

Word bank							
English	map	sequence of transformations	argument	convincing	translation	reflection	congruent
Español	proyectar	secuencia de transformaciones	argumento	convincente	traslación	reflexión	congruente

Congruent Angles?



Determine which transformation can be used to show that angles B, C, and D are congruent to angle A then choose the correct relationship for each set of angles.

- Angle B is congruent to angle A using a _____. This is true because angles A and B are _____ angles.
  (vertical / corresponding)

- Angle C is congruent to angle A using a _____. This is true because angles A and C are _____ angles.
  (vertical / corresponding)

- Angle D is congruent to angle A using a _____. This is true because angles A and D are _____ angles.
  (vertical / corresponding)

Word bank							
English	angle	corresponding	reflection	rotation	translation	transversal	vertical
Español	ángulo	correspondiente	reflexión	rotación	traslación	transversal	vertical

Tear It Up

Place the torn angles from each partners' triangles in the spaces below. Arrange the angles so that the three vertices meet with no overlap.

Partner A	Pair C

Compare: How are these angles different? *Comparar: ¿En qué se diferencian estos ángulos?*	Connect: How are these angles alike? *Conectar: ¿En qué se parecen estos ángulos?*

Discuss:

- What do you notice that each set of angles have in common?

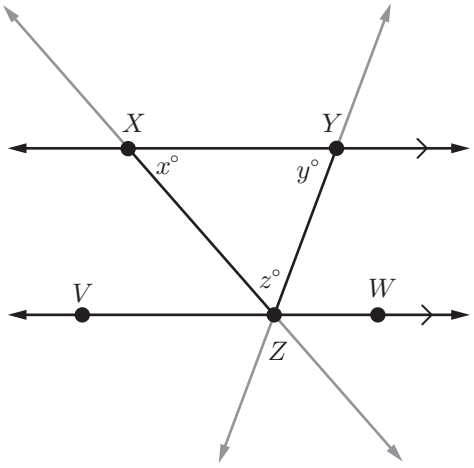
- What does this mean about the sum of the angles in a triangle?

Word bank						
English	angles	arrange	corners	interior	triangle	vertices
Español	ángulos	organizar	esquinas	interior	triángulo	vértices

Triangles and Parallel Lines

Fabiana claims that if you tell her the value of x and y, she can use transformations to determine the value of z.

Fill in the blanks to justify whether her claim is true.



To show angle x is congruent to angle VZX, I can . . .

To show angle y is congruent to angle WZY, I can . . .

Angles _____ (*VZX / YXZ*), _____ (*x / y / z*), and _____ (*XYZ / WZY*) form line VW.

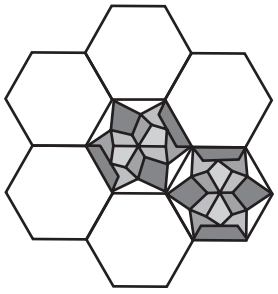
The sum of the measures of the three _____ (*interior / exterior*) angles of a triangle is _____ (*180° / 360°*).

Discuss: How can you determine the value of z if you know the values of x and y?

I believe Fabiana's claim is _____ (*true / false*).

Word bank							
English	angles	claim	exterior	false	interior	sum	true
Español	ángulos	afirmación	exterior	falso	interior	suma	verdadero

Hexagon Tessellations



	Reflection	Rotation	Translation
Could this single transformation be used to map the center hexagon onto the outer hexagon?			
Why or why not?			

Word bank					
English	center	corner	hexagon	orientation	pattern
Español	centro	esquina	hexágono	orientación	patrón
English	reflection	rotation	single	tessellation	transformation
Español	reflexión	rotación	única	teselación	transformación

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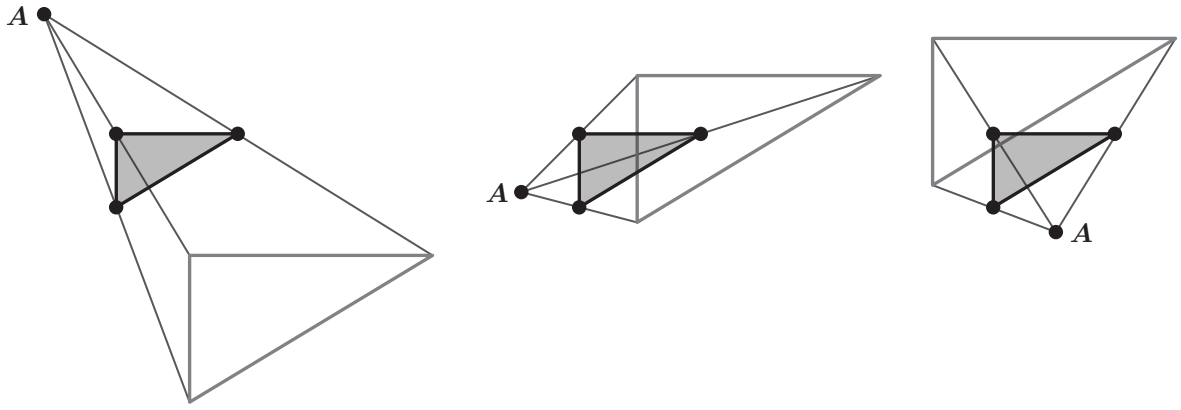
Dilations and Scaled Copies



When point A is moved, the size of the image is the _____ and the location of the image is _____. The distance from point A to each point on the image is about _____ the distance between point A and the corresponding points on the pre-image, but in a different _____.

Word bank				
English	different	location	same	twice
Español	diferente	ubicación	mismo	dos veces

Dilating a Triangle

Some ways that the scale factor of 2 is represented in this diagram is . . .

- The side lengths on the image are _____ the _____ side lengths of the pre-image. For example . . .

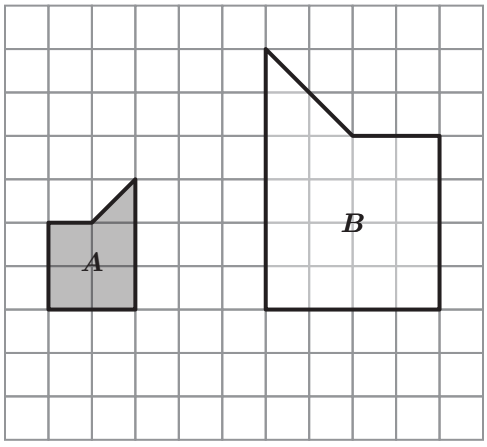
- The distance from the center of dilation to a point on the image is _____ the distance as the center of dilation to the corresponding point on the _____. For example . . .

Word bank						
English	center of dilation	corresponding	image	pre-image	scale factor	twice
Español	centro de dilatación	corresponder	imagen	preimagen	factor de escala	dos veces

Warm-Up

Here are important details to help you describe transformations:

Translation	Reflection	Rotation	Dilation
• Direction: left/right/up/down • Distance: _____ units	• Line of reflection	• Center of rotation • Angle • Direction of rotation: clockwise/counterclockwise	• Dilate by a scale factor • Center of dilation



- Translate the polygon _____ units _____.
  (up / down / left / right)
- Reflect the polygon over _____.
- Rotate the polygon _____ _____ degrees around _____.
  (clockwise / counterclockwise)
- Dilate the polygon by a scale factor of _____ using the point _____ as the center of dilation.

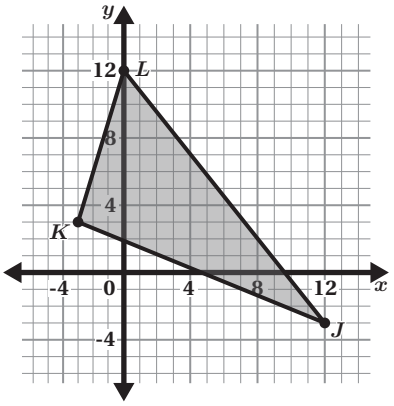
Dilation Challenges

When the scale factor is . . .	The size of the image . . .	The location of the image . . .
Greater than 1		
Equal to 1		
Between 0 and 1		

Word bank						
English	between	center of dilation	farther	image	increases	larger
Español	entre	centro de dilatación	más lejos	imagen	aumenta	más grande
English	opposite	pre-image	scale factor	same	smaller	
Español	opuesto	preimagen	factor de escala	mismo	mas pequeño	

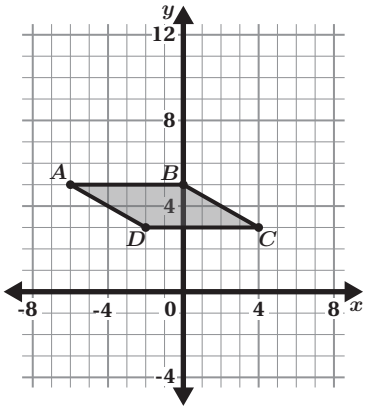
Dilate It!

Dilation With Center of Dilation (0, 0)



Scale factor: $\frac{1}{3}$

Dilation With Center of Dilation (-6, 5)



Scale factor: $\frac{1}{2}$

Discuss:

a Can the rule $(x, y) \rightarrow (kx, ky)$ always be used to determine the image coordinates for dilations?

- When the center of dilation is $(0, 0)$, the rule _____ map the image onto the pre-image. I know this because . . .
  (does / does)

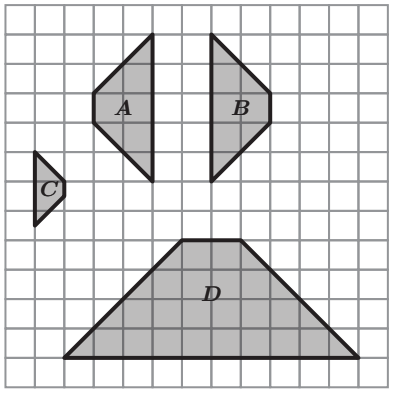
- When the center of dilation is not $(0, 0)$, the rule _____ map the image onto the pre-image. I know this because . . .
  (does / does not)

b What sequence of transformations can be used to dilate a figure when the center of dilation is *not* at the origin?

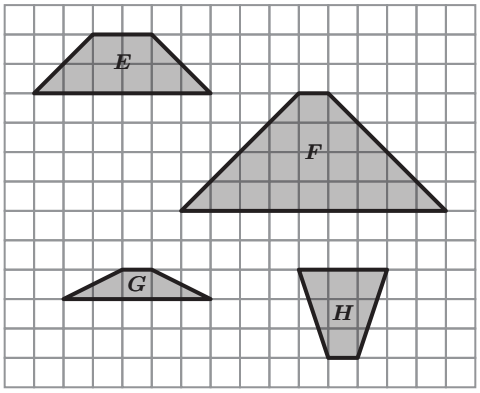
Word bank						
English	center	coordinates	dilation	distances	figure	horizontal
Español	centro	coordenadas	dilatación	distancias	figura	horizontal
English	image	origin	pre-image	scale factor	vertex	vertical
Español	imagen	origen	preimagen	factor de escala	vértice	vertical

What Are Similar Figures?

Similar



Not Similar



How can transformations be used to show that trapezoids B, C, and D are similar to the pre-image A?

- A can be mapped onto B by . . .

- A can be mapped onto C by . . .

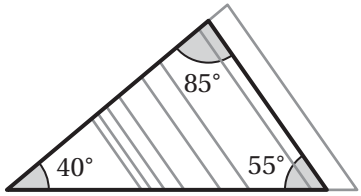
- A can be mapped onto D by . . .

Discuss: Can transformations be used to map the pre-image, E, onto trapezoids F, G, and H? Explain your thinking.

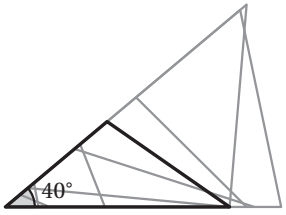
Word bank						
English	dilation	reflection	rotation	scale factor	sequence	translation
Español	dilatación	reflexión	rotación	factor de escala	secuencia	traslación

Are Angles Enough?

Group A:
Triangles with 40°, 85°, and 55° angles



Group B:
Triangles with one 40° angle



Discuss: Are these triangles within each group similar? Explain your thinking.

- The triangles within Group A _____ similar because . . .

- The triangles within Group B _____ similar because . . .

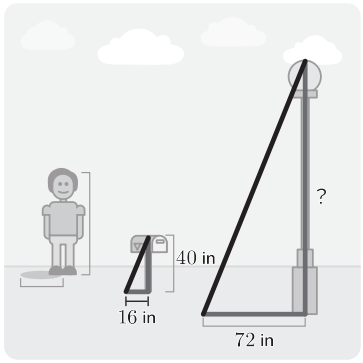
- How does having two different sets of angle measures affect the similarity between two triangles?

- If all of your classmates created triangles with one congruent corresponding angle measure, would all the triangles be similar? Explain your thinking.

Word bank						
English	angles	congruent	corresponding	sides	similar	triangle
Español	ángulos	congruente	correspondiente	lados	similar	triángulo

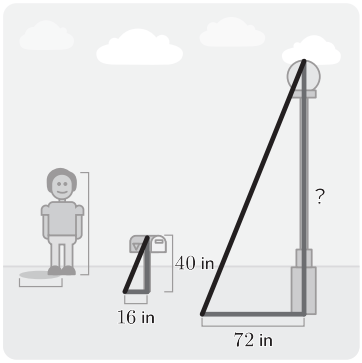
Similar Triangles in Shadows

Ama



$\frac{40}{?} = \frac{16}{72}$

Neena



$\frac{40}{16} = \frac{?}{72}$

Compare: How are these strategies different? *Comparar: ¿En qué se diferencian estas estrategias?*	Connect: How are these strategies alike? *Conectar: ¿En qué se parecen estas estrategias?*

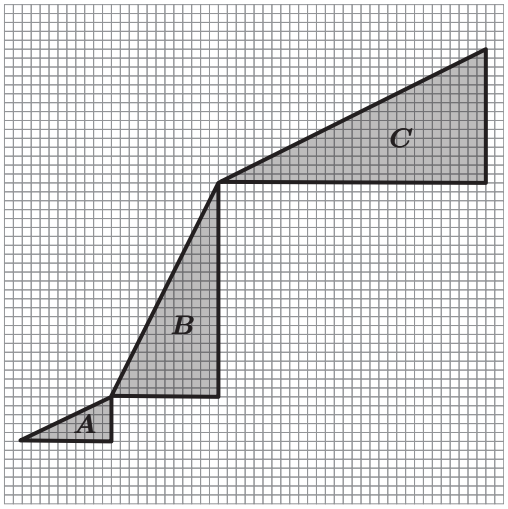
Word bank

English	height	hypotenuse	leg	length	proportion
Español	altura	hipotenusa	cateto	longitud	proporción
English	ratio	sides	similar	strategies	triangles
Español	razón	lados	similar	estrategias	triángulos

Introducing Slope

Habib wants to create a line with a slope of $\frac{1}{2}$.

Triangle	Base (units)	Height (units)
A	10	5
B	12	24
C	30	15



He used triangles to create this line but made a mistake.

- Identify any correct thinking.
- Identify the mistake Habib made.

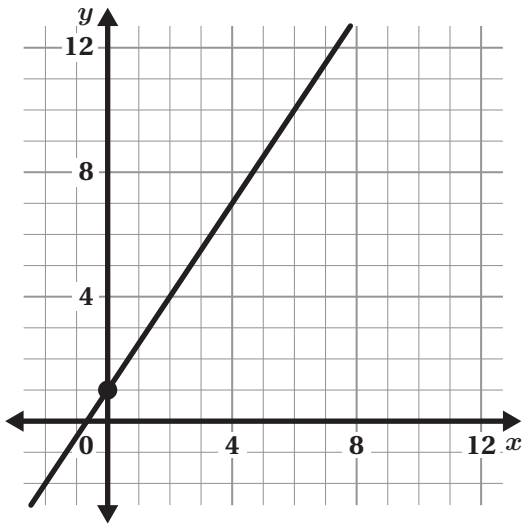
Correct thinking	Mistake
Habib correctly . . .	Habib made a mistake when he . . . I know because . . .

Word bank							
English	base	height	measurement	ratio	similar	slope	triangles
Español	base	la altura	la medida	razón	semejante	la pendiente	el triángulo

Determining Slope

Kweku says the slope of the line in the previous problem is $\frac{6}{4}$.

Liam says the slope is $\frac{2}{3}$.



Whose claim is correct?

Decide (*decidir*)	Defend (*defender*)
Kweku is _____ because . . . *(correct / incorrect)*	
Liam is _____ because . . . *(correct / incorrect)*	

Word bank					
English	base	height	slope	slope triangle	steep
Español	base	la altura	la pendiente	triangulo de inclinacion	empinado

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I also chose _____ because . . .

In the Activity, I . . .

Turtle Race

Vocabulary	
English	**proportional relationship** Two variables are in a proportional relationship if you can multiply the values for one variable by the same number to get the values for the other variable. The graph of a proportional relationship is a straight line passing through the origin, $(0,0)$.
Español	***relación proporcional*** *Dos variables están en una relación proporcional si puede multiplicar los valores de una variable por el mismo número para obtener los valores de la otra variable.* *La gráfica de una relación proporcional es una línea recta que pasa por el origen,* $(0,0)$.

Does the line pass through the origin?	Yes	No
Turtle 1		
Turtle 2		
Turtle 3		

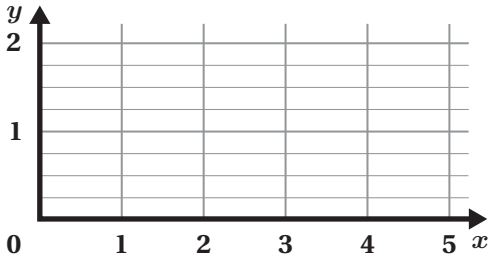
Evan is _____.
(correct / incorrect)

- The relationship between the distance and time _____ proportional for Turtle 1 because the line _____ through the origin.
  (is / is not) *(passes / does not pass)*
- The relationship between the distance and time _____ proportional for Turtle 2 because the line _____ through the origin.
  (is / is not) *(passes / does not pass)*
- The relationship between the distance and time _____ proportional for Turtle 3 because the line _____ through the origin.
  (is / is not) *(passes / does not pass)*

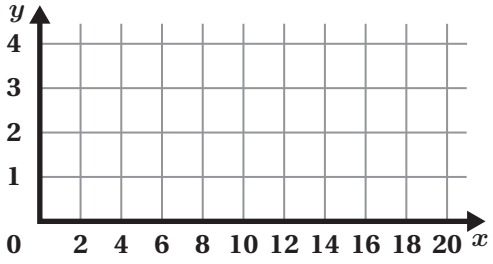
Pairing Graphs and Equations

Explain how you decided where to draw the lines.

For the first graph I . . .



For the second graph, I . . .



Word bank						
English	distance	equation	fraction	graph	horizontal	line
Español	distancia	ecuación	fracción	gráfica	horizontal	línea
English	point	scale	slope	slope triangle	table	vertical
Español	punto	escala	pendiente	triángulo de pendiente	tabla	vertical

Comparing Two Different Representations

Different Representations of Proportional Relationships

Verbal Description

To determine the unit rate, look for keywords, such as:

- earnings per hour
- amount of mix per cup
- ____ per ____
- every
- each

or determine the ratio of a y value to its corresponding x value.

Equation

$y =$ _____ x

unit rate

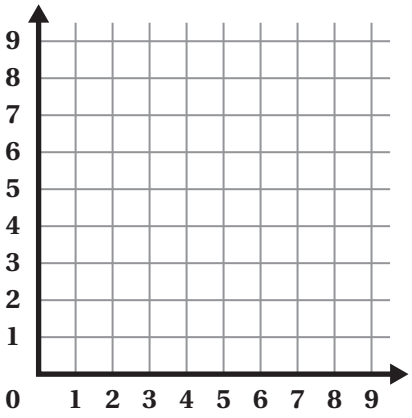
Table

The amount that y changes when x increases by 1 is the unit rate or rate of change.

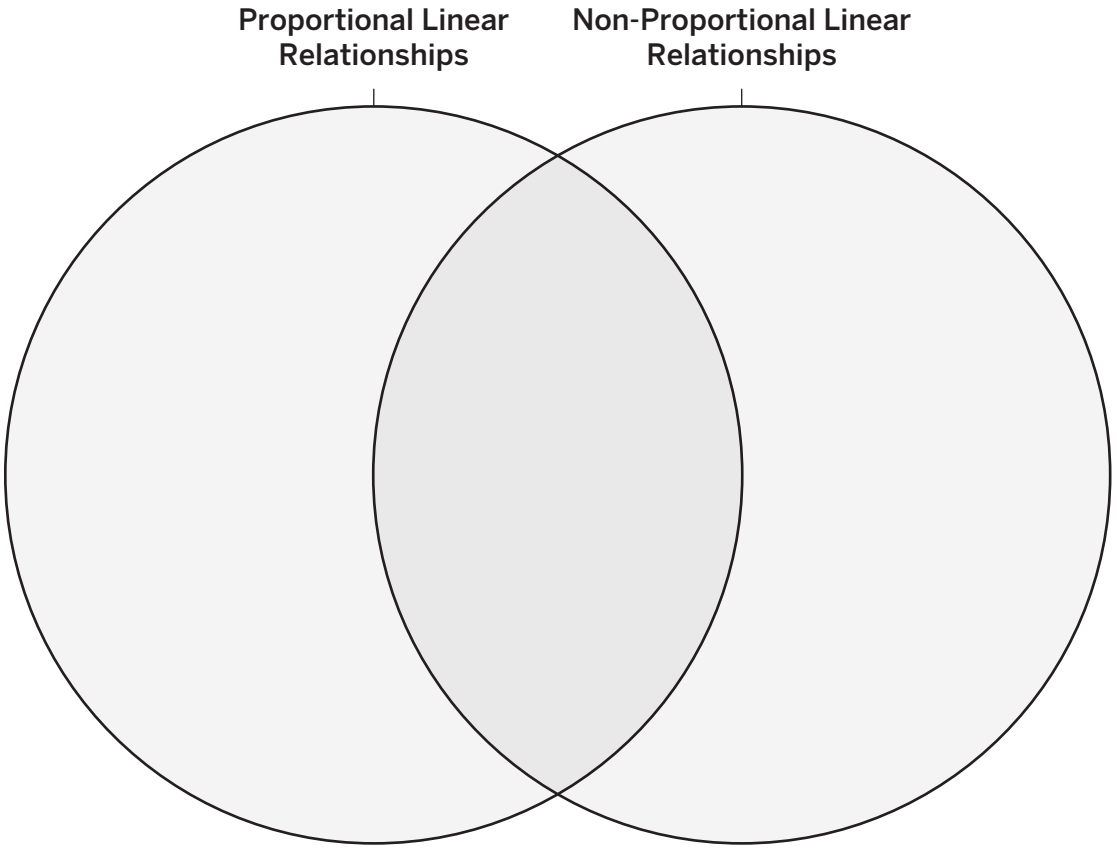
x	y
0	
1	
2	
4	
5	
10	

Graph

The slope of a line also represents the unit rate for the situation.



Exploring Linear Relationships



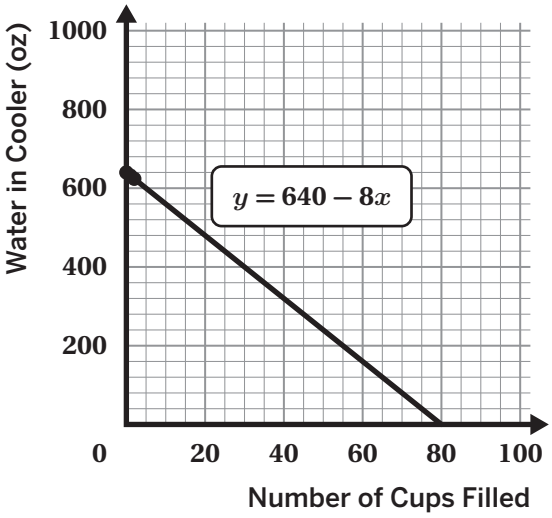
Word bank						
English	down	equation	horizontal	line	negative	origin
Español	*bajar*	*ecuación*	*horizontal*	*línea*	*negativo*	*origen*
English	slope	start	straight	term	up	
Español	*pendiente*	*comenzar*	*recto*	*término*	*subir*	

Cooler Cups

Vocabulary	
English	**vertical intercept** The point where the graph of a line crosses the vertical axis or when $x = 0$. The vertical intercept is sometimes called the y-intercept.
Español	***intersección vertical*** *El punto donde la gráfica de una recta se cruza con el eje vertical o cuando $x = 0$. La intersección vertical a veces se denomina intersección con el eje y.*

a The vertical intercept is the point (_____, _____). This means there were _____ ounces of water in the cooler when _____ cups were filled.

b The slope of the line is _____. This means . . .



Word bank					
English	constant rate	cup	decrease	increase	water
Español	tasa constante	taza	disminuir	aumentar	agua

Two Transportation Cards

The slope for the equation written for Student 1 is _____.
(positive / negative)

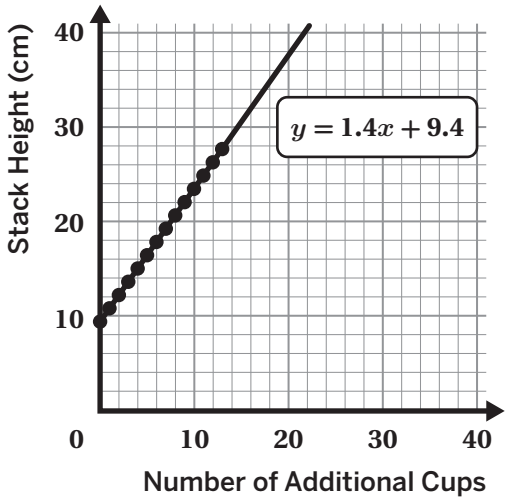
This means . . .

The slope for the equation written for Student 2 is _____.
(positive / negative)

This means . . .

Word bank						
English	amount	card	decrease	increase	money	remaining
Español	cantidad	tarjeta	disminuir	aumentar	dinero	restante

Modeling the Relationship



Discuss:

- What is the slope of the line?
- What does the slope represent in this situation?

  The _____ increases by _____ every time the _____
  (choose a variable) *(choose a variable)*
  increases by _____.

- What is the y-intercept?
- What does the y-intercept represent in this situation?

  The _____ value of the _____ is _____ centimeters.

Word bank						
English	decrease	increase	initial	point	slope	y-intercept
Español	disminuir	aumentar	inicial	punto	pendiente	intersección con el eje y

Translating Lines

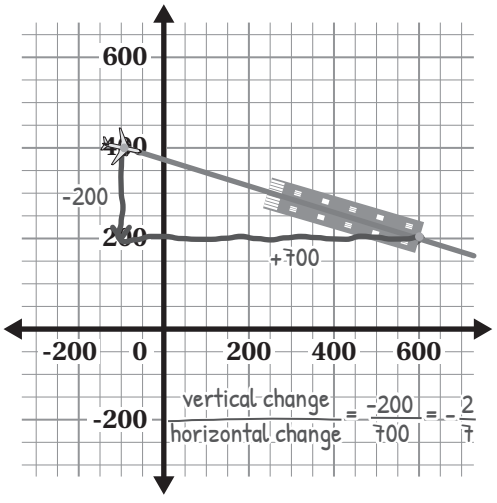
What do you notice about the relationship between the y-intercept (vertical intercept) of the translated line and its equation?

In the equation, the number being added to the x-term represents . . .

Word bank							
English	distance	equation	graph	horizontal	line	units	vertical
Español	distancia	ecuación	gráfica	horizontal	línea	unidades	vertical

Strategies for Calculating Slope

Kwame's work



Wey Wey's Work

X	Y
-100	400
600	200

+700 (X) -200 (Y)

$$\frac{\text{change in Y}}{\text{change in x}} = \frac{-200}{700} = -\frac{2}{7}$$

Compare: How are these strategies different? *Comparar: ¿En qué se diferencian estas estrategias?*	Connect: How are these strategies alike? *Conectar: ¿En qué se parecen estas estrategias?*

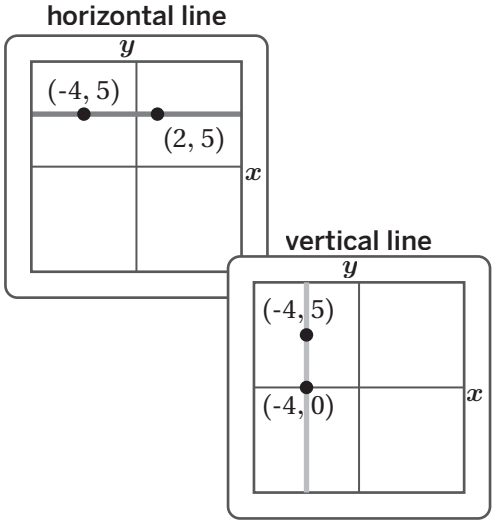
Word bank					
English	equivalent	horizontal change	slope	slope triangle	vertical change
Español	equivalente	cambio horizontal	pendiente	triángulo de pendiente	cambio vertical

Capture the Coins

Juana says that vertical lines have a slope of zero.

Nekeisha says that horizontal lines have a slope of zero.

Whose claim is correct?



Decide (*decidir*)	Defend (*defender*)
Juana is correct / incorrect because . . .	
Nekeisha is correct / incorrect because . . .	

Word bank						
English	horizontal	ratio	slope	undefined	vertical	y-coordinate
Español	horizontal	relación	pendiente	indefinido	vertical	coordenada y

Determining the Equation

Tariq

x	y
3	9
4	7

(+1 on x, −2 on y)

x	y
0	15
1	13
2	11
3	9
4	7

(−1 on x, +2 on y)

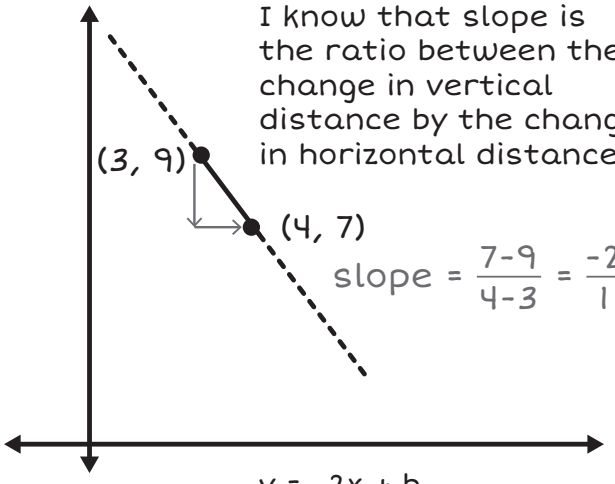
slope: $\frac{-2}{1}$ y-intercept = (0,15)

I can place the values in a table and work backwards to find the initial value.

y = mx + b, where m is the slope and b is the y-intercept.

The equation is y = -2x + 15.

Nia



I know that slope is the ratio between the change in vertical distance by the change in horizontal distance.

slope = $\frac{7-9}{4-3} = \frac{-2}{1}$

y = -2x + b

I'll substitute (3, 9) in for x and y.

9 = -2(3) + b

9 = -6 + b

9 + 6 = b

15 = b

The equation is y = -2x + 15.

Compare: How are these strategies different? *Comparar: ¿En qué se diferencian estas estrategias?*	Connect: How are these strategies alike? *Conectar: ¿En qué se parecen estas estrategias?*

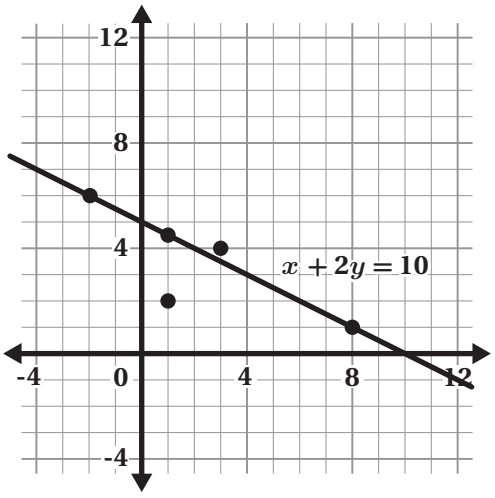
Word bank

English	equation	ordered pairs	slope	substituted	y-intercept
Español	ecuación	pares ordenados	pendiente	sustituido	intersección con el eje y

Solution to Linear Equations

This graph shows the line $x + 2y = 10$, as well as some points that are **solutions** to the equation and some that are not.

Show or explain how you can tell from the graph if a point is not a solution to the equation.



The point (_____, _____) is a solution because . . .

The point (_____, _____) is not a solution because . . .

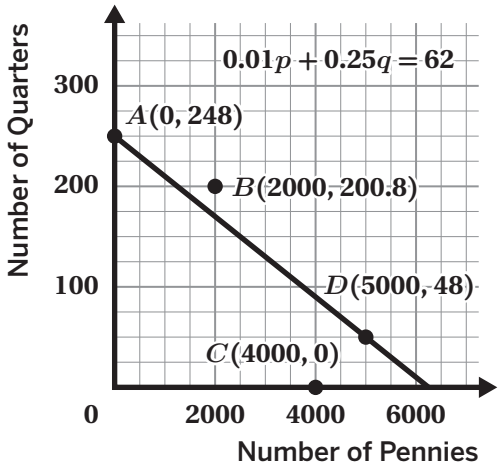
Word bank				
English	equation	line	point	solution
Español	ecuación	línea	punto	solución

Pennies and Quarters

Ava wrote the equation $0.01p + 0.25q = 62$ to represent all the combinations of pennies, p, and quarters, q, that are worth $\$62.00$.

Select *all* the points that are solutions to the equation.

- ☐ Point A
- ☐ Point B
- ☐ Point C
- ☐ Point D



Discuss: How did you determine which points were solutions to the equation?.

The solutions to the equation are _____ that make the equation _____.
I can _____ the coordinate values of Points A and D into the equation to make it true.
These points lie on the _____.

Word bank					
English	false	line	ordered pair	solutions	true
Español	falsa	línea	par ordenado	soluciones	verdadera

Words With Multiple Meanings

Draw a picture or write in words to show one or more math meanings and another meaning of the term.

Math meaning(s)

system

Another meaning

Math Habits of Mind: Hábitos mentales matemáticos

I can slow down and first make sense of a challenging problem before trying to solve it.

Puedo ir más despacio y primero comprender un problema difícil antes de intentar resolverlo.

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Puedo representar problemas del mundo real usando ecuaciones y desigualdades e interpretar sus soluciones dentro del contexto del problema.

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Puedo justificar mi razonamiento y hacer preguntas que me ayuden a comprender el razonamiento de los demás.

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Puedo poner en práctica mis conocimientos matemáticos para resolver problemas del mundo real, formulando hipótesis y modificando mi razonamiento según sea necesario.

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Puedo seleccionar una herramienta adecuada que me ayude a resolver problemas.

I can communicate my thinking and solutions clearly to others.

Puedo comunicar mi razonamiento y soluciones claramente a los demás.

I can look for structure or patterns to help me solve problems.

Puedo buscar estructuras o patrones que me ayuden a resolver problemas.

I can look for repeated calculations and other repeated steps to make generalizations.

Puedo buscar cálculos y otros pasos repetidos para hacer generalizaciones.

Questions and Sentence Frames

Why did you choose this habit of mind?

Did you choose any others? Why or why not?

What part of the Activity reminded you of this habit of mind?

Can you tell me more?

I chose this habit of mind because . . .

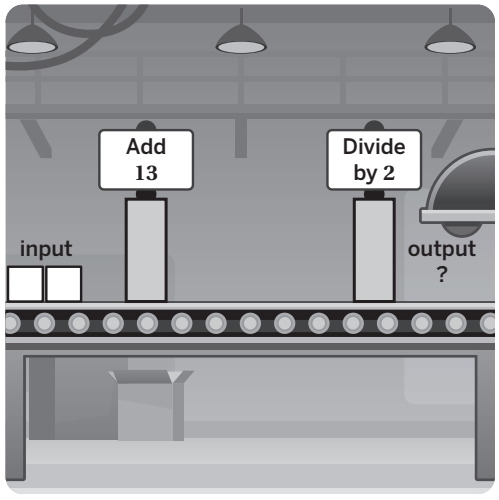
I also chose _____ because . . .

In the Activity, I . . .

Number Machines

Felipe said, "If you take the output, then subtract 13 and multiply by 2, you will get the input."

Is his claim correct?

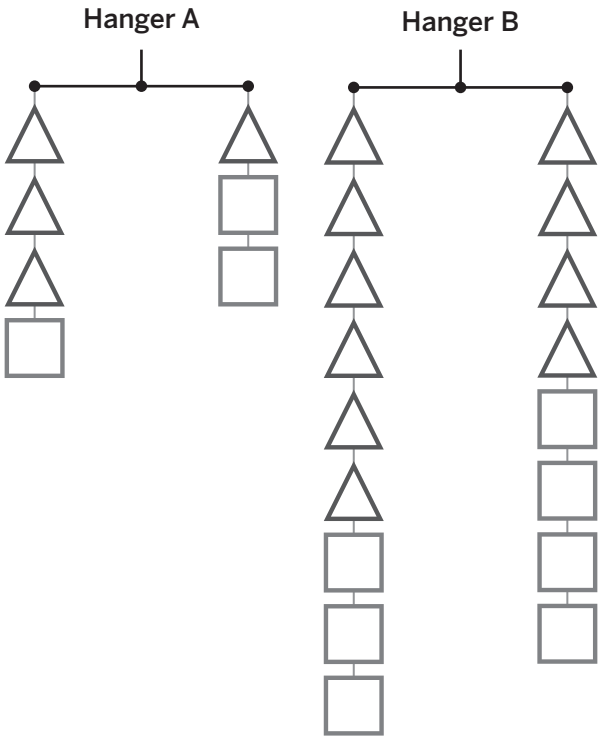


If I input 15 into the number machine, then the output is _____

Felipe is _____ because . . .

Word bank				
English	add	divide	input	inverse operations
Español	sumar	dividir	entrada	operaciones inversas
English	multiply	output	reverse	subtract
Español	multiplicar	salida	Inverso	sustraer

Hanger Equations



Hanger A balances. Will Hanger B also balance? Circle one.

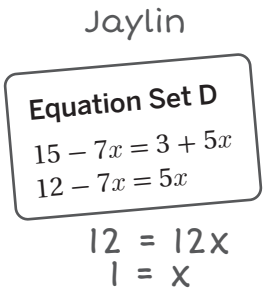
Yes No

Explain your thinking.

If I add _____ triangles and _____ squares to each side of Hanger A, I will get Hanger B.

That means Hanger B is _____ because . . .
(balanced / unbalanced)

Solving Equations



Is Jaylin's solution correct? _____
(yes / no)

Explain your thinking.

If I substitute $x = 1$ into the original equation, then . . .

Jaylin's moves are _____ for each of his steps because . . .
(balance / unbalanced)

Step by Step by Step by Step

Sadia	Amir
$12x + 3 = 3(5x + 9)$	$12x + 3 = 3(5x + 9)$
$4x + 1 = 5x + 9$	$12x + 3 = 15x + 27$

How are the steps alike?	How are the steps different?

Word bank

English	balance	distributive property	divide	equivalent equations	multiply	parenthesis
Español	balancear	propiedad distributiva	dividir	ecuaciones equivalentes	multiplicar	paréntesis

Find and Fix

Equation 1:

Jordan's work	What did Jordan do?	Does Jordan's work create a balanced equation? If not, explain why.
$\frac{3}{4}x + \frac{1}{2} = \frac{1}{4}x - 3$		
$\frac{3}{4}x + \frac{1}{2} = \frac{1}{4}x + (-3)$		
$3x + 2 = 1x + (-3)$		
$2x + 2 = -3$		
$2x = -5$		
$x = -\frac{5}{2}$		

Equation _____:

Jordan's work	What did Jordan do?	Does Jordan's work create a balanced equation? If not, explain why.

Number of Solutions

No Solution (True for No Values)
$\frac{1}{2} + x = \frac{1}{3} + x$

Kiandra might have noticed that . . .

This means that . . .

For example . . .

Word bank						
English	constant	equal	number	same	solution	variable
Español	constante	igual	número	mismo	solución	variable

What Happened?

Deven

$13x + 42 = 13x + -42$

$42 = -42$

$0 = -84$

Because 0 is never equal to −84, there is no solution.

Deven started balancing the equation by . . .

Next, Deven . . .

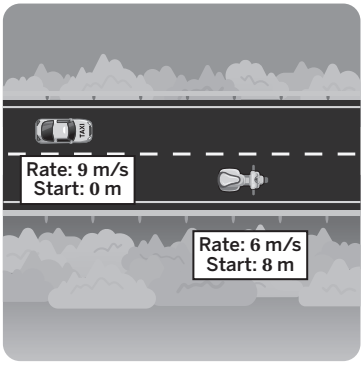
Deven determined there is no solution because . . .

Did Deven make a mistake? Explain your thinking.

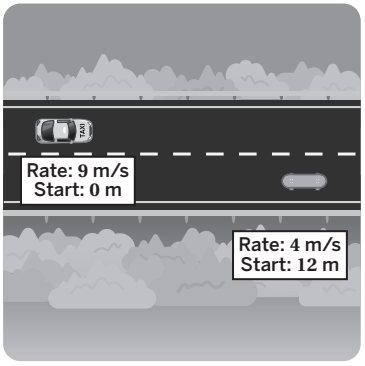
Word bank						
English	add	equation	equivalent	mistake	solution	subtract
Español	sumar	ecuación	equivalente	error	solución	sustraer

Choose Your Vehicle

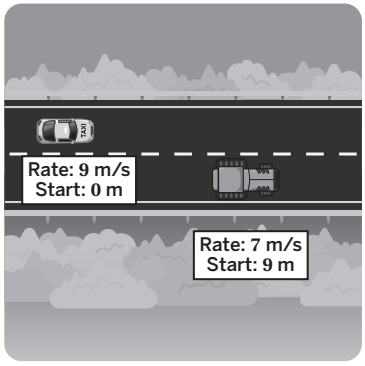
Scooter



Skateboard



Tractor



The rate of the taxi is _____ meters per second so the taxi's position can be represented with the expression _____.

The _____'s position can be represented by the expression _____.
(scooter / skateboard / tractor)

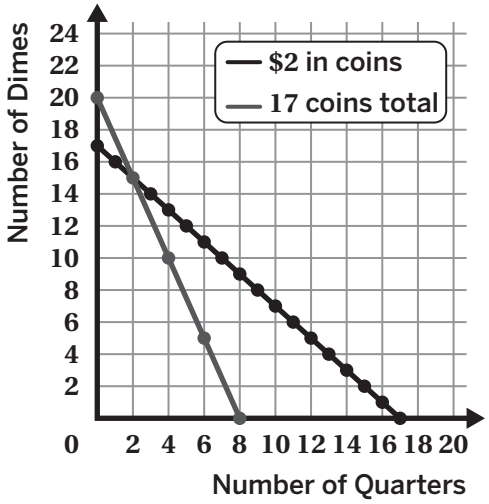
The equation I selected is _____. This tells me . . .

Two Dollars

Here are the graphs of these conditions on the same coordinate plane.

I have $2 in my pocket: I only have quarters and dimes, and I have a total of 17 coins.

How many quarters and dimes must I have?



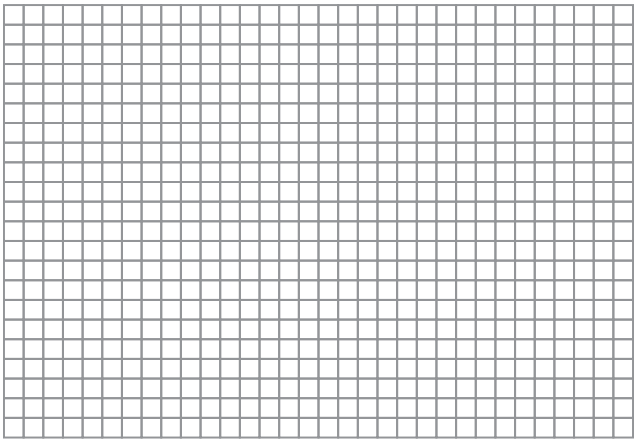
Number of Quarters	Number of Dimes

Explain your thinking.

I have _____ quarters and _____ dimes. The point (_____, _____) is the point of intersection. It is the only solution that is on _____.
(both lines / one line)

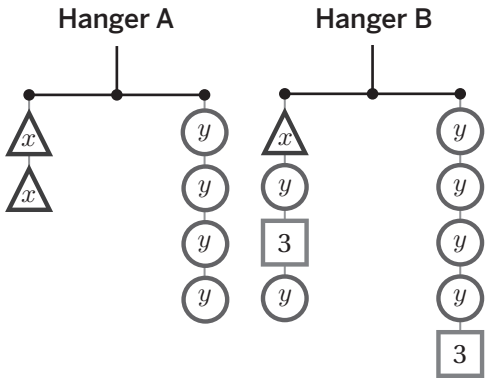
On Both Lines

A summary of the situation	Equations
• What do you know about each company? • Some key words are . . . • What are some questions that you have?	• What equations represent each company? • What does each part of the equation represent?

Your Graph	Your conclusions
	• The point of intersection is (_____, _____). This tells me . . . • _____ represents . . . • Company _____ has a better deal when _____ because . . .

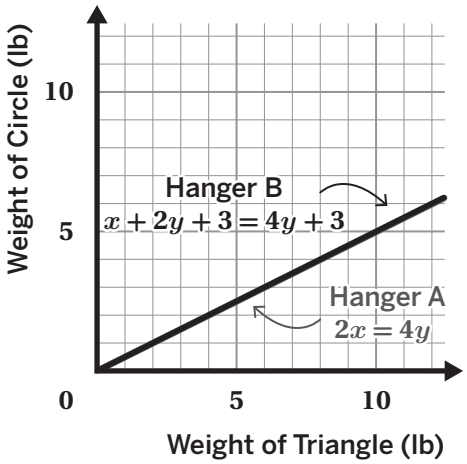
Hanger Solutions

Here is another set of equations.



$2x = 4y$ $x + 2y + 3 = 4y + 3$

x 0 lb y 0 lb 3 3 lb



Discuss: How many solutions do you think this system has? How do you know?

$$\begin{cases} 2x = 4y \\ x + 2y + 3 = 4y + 3 \end{cases}$$

I think this system has _____ solution(s).
(one / no / infinitely many)

I know because any ordered pair . . .

For example . . .

Word bank						
English	balance	double	false	line	ordered pair	true
Español	balancear	doble	falso	línea	par ordenado	verdadero

Line Zapper

a Select all the lines that would be captured if the point $(2, 4)$ were zapped.

Equations	Zapped	Not Zapped
Line A: $y = \frac{1}{2}x$		
Line B: $y = 2x$		
Line C: $y = -x + 6$		

b Explain how you decided which lines to select.

I know the point $(2, 4)$ is on Line _____ and Line _____ because if I substitute 2 for x then . . .

Connecting Graphs and Equations

One Solution	No Solution	Infinitely Many Solutions
$\begin{cases} y = -4x + 8 \\ y = -2x + 5 \end{cases}$	$\begin{cases} y = \frac{2}{3}x + 4 \\ y = \frac{2}{3}x - 5 \end{cases}$	$\begin{cases} y = \frac{1}{2}(3x + 4) \\ y = \frac{3}{2}(x + 2) \end{cases}$
The equations have _____ slopes.	The equations have _____ slopes and _____ y-intercepts. *(the same / different)*	The equations have _____ slopes and _____ y-intercepts. *(the same / different)*

Thinking About Solutions

Martina says that $(2, -4)$ is a solution to the system. Sai says there are infinitely many solutions.

$$\begin{cases} y = 4(x - 3) \\ y = 4x - 12 \end{cases}$$

Whose claim is correct?

	Yes	No
Is $(2, -4)$ a solution to $y = 4(x - 3)$?		
Is $(2, -4)$ a solution to $y = 4x - 12$?		
Are $y = 4(x - 3)$ and $y = 4x - 12$ equivalent equations?		

_____ correct because . . .

Word bank	
English	**Español**
equation	ecuación
equivalent	equivalente
infinitely many solutions	infinitas soluciones
no solution	ninguna solución
one solution	una solución
point	punto
solution	solución
system of equations	sistemas de ecuaciones

Name: Date: Period:

Words With Multiple Meanings

Draw a picture or write in words to show one or more math meanings and another meaning of the term.

Math meaning(s)

function

Another meaning

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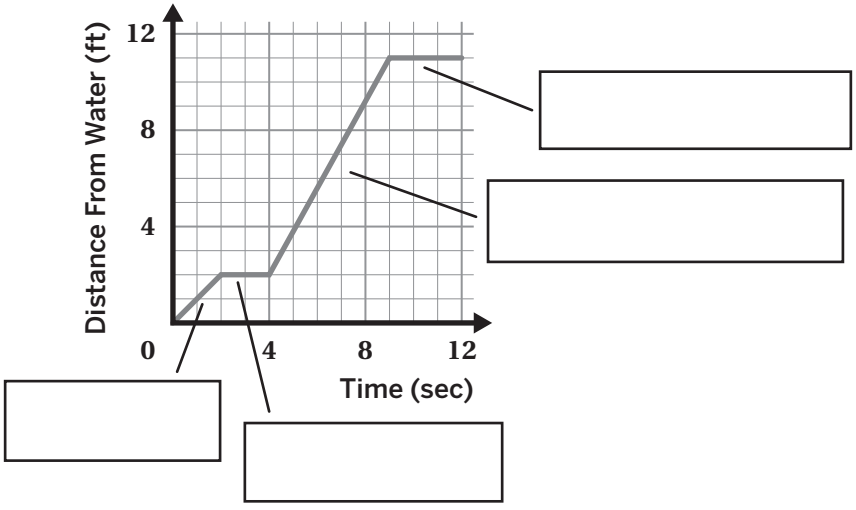
I also chose _____ because . . .

In the Activity, I . . .

Turtle Graphs

What does the graph tell you about the turtle's journey?



Use these statements if it helps with your thinking.

The turtle walks for 2 seconds.	The turtle stops for 1 second.	The turtle walks at a speed of 2 feet per second.	The turtle stops 11 feet away from the water.

What Is a Function?

Function

Rule #1: Function

Input	Output
35	25
723	713
-4	-14
53	43
723	713

Rule #2: Function

Input	Output
15	7
18	7
262	7
-3	7
82.3	7

Rule #3: Function

Input	Output
hi	J
my	Z
name	F
is	T
Arturo	P

Not a Function

Rule #4: Not a Function

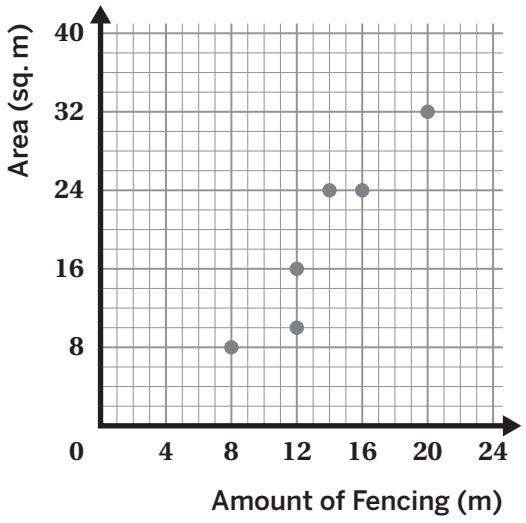
Input	Output
H	Hailey
J	Jada
M	Mai
H	Hamza
M	Madison

First draft	A rule is a function if . . .
Second draft	A rule is a function if . . .

Word bank						
English	different	each	exactly	input	output	same
Español	diferente	cada	exactamente	entrada	salida	mismo

Rectangular Pen

Vocabulary	
function	A relationship that assigns exactly one output to each possible input.
función	*Una relación que asigna exactamente una salida a cada entrada posible.*



Area is not a function of the amount of fencing because for each input value. . .

For example, when the amount of fencing is 12 meters . . .

Independent and Dependent Variables

Vocabulary	
dependent variable (output)	A variable whose value is based on the value of another variable or set of variables. In a function, the dependent variable is sometimes called the output.
fuvariable dependiente (salida)	*Una variable cuyo valor se basa en el valor de otra variable o un conjunto de variables. En una función, la variable dependiente a veces se denomina la salida.*
independent variable (input)	A variable whose value is not based on the value of any other variable. In a function, the independent variable is sometimes called the input.
variable independiente (entrada)	*Una variable cuyo valor no depende del valor de ninguna otra variable. En una función, la variable independiente a veces se denomina la entrada.*

Situation B: The Events Committee has raised money for their next event and wants to know how many attendees they can host with their budget for food costs.

In this situation, what do you think they should use as the independent and dependent variable? Circle one.

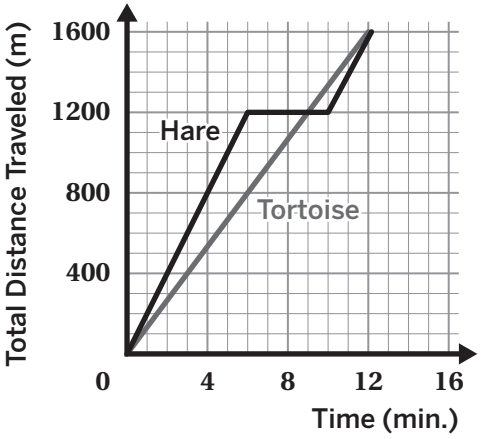
Independent variable: Food cost, f Number of attendees, a

Dependent variable: Food cost, f Number of attendees, a

Explain your thinking.

The _____ depends on the _____.
(food cost / number of attendees) *(food cost / number of attendees)*

Warm-Up



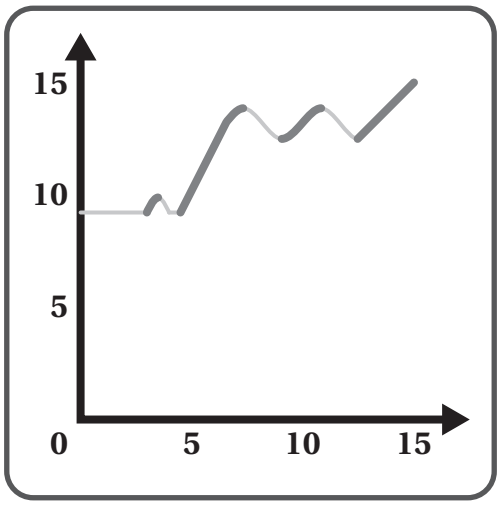
The straight line represents the _____ because . . .
(hare / tortoise)

The graph with the horizontal section from 6 to 10 minutes represents the _____
(hare / tortoise)
because . . .

Word bank							
English	constant rate	distance	hare	minutes	stop	time	tortoise
Español	tasa constante	distancia	liebre	minutos	detener	hora	tortuga

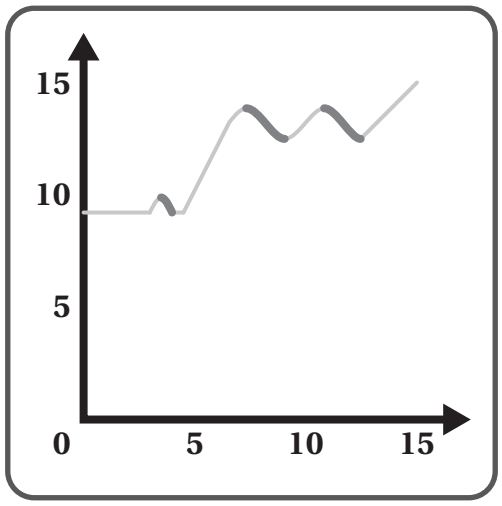
Describing Graphs

Increasing



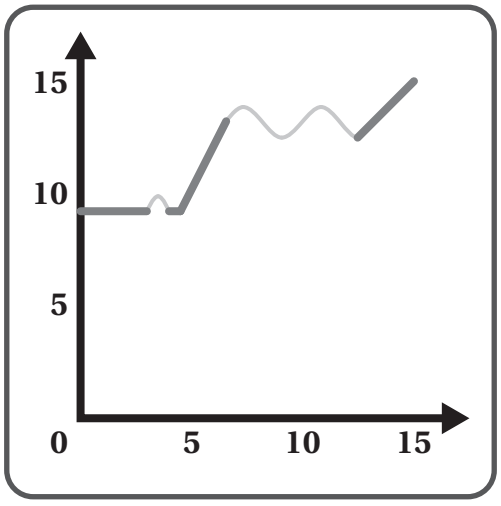
A function, or part of a function, is increasing if the y-values go _____ when the x-values go up.
(up / down)

Decreasing



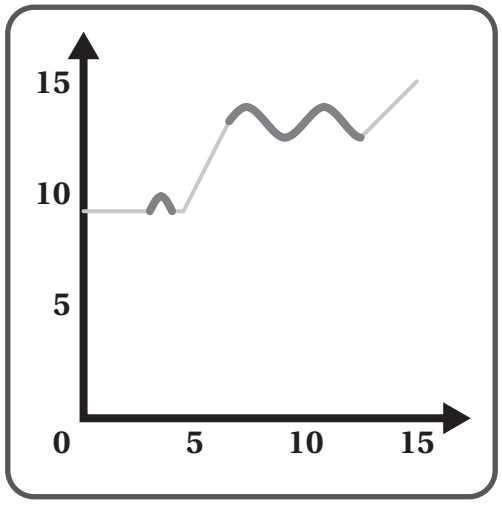
A function, or part of a function, is decreasing if the y-values go _____ when the x-values go up.
(up / down)

Linear



A function, or part of a function, is linear when its graph _____ form a straight line.
(does / does not)

Non-Linear



A function is non-linear when its graph _____form a straight line.
(does / does not)

Which Is Growing Faster?

Different Representations of Linear Relationships

Written Description

Initial value: starting value

Slope: rate of change

Equation

$y =$ _____ $x +$ _____

slope y-intercept

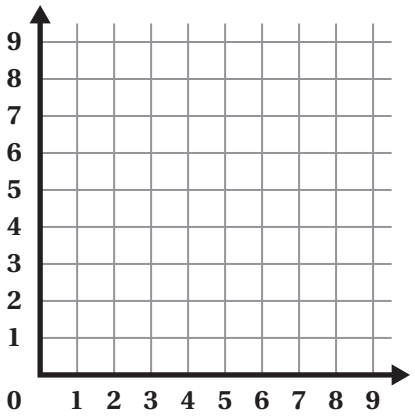
Table

x	y
0	
1	
2	
4	
5	
10	

Initial value: The y-value when the x-value is 0

Rate of change: $\frac{\text{change in } y}{\text{change in } x}$

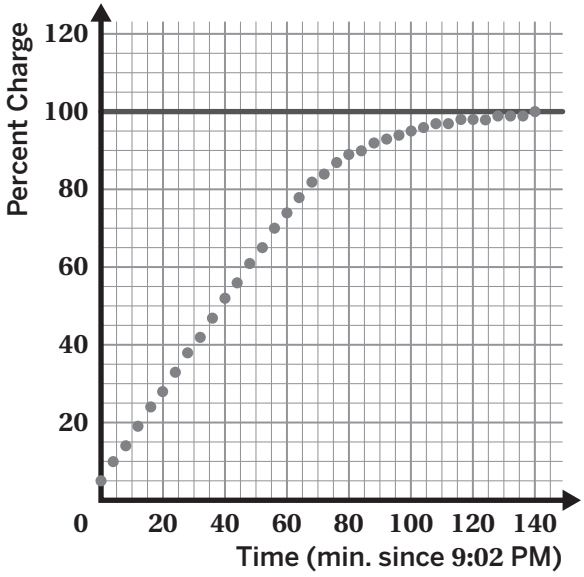
Graph



y-intercept: $(0,$ _____$)$.

Slope: $\frac{\text{vertical change}}{\text{horizontal change}}$ between any two points on the line.

Is It Linear?



When might it be appropriate to use a linear function to model the data that describes the percent charge and the time?

- A linear function can be used when . . .

- The relationship can be modeled with a linear function until the phone reaches a charge of about _____.

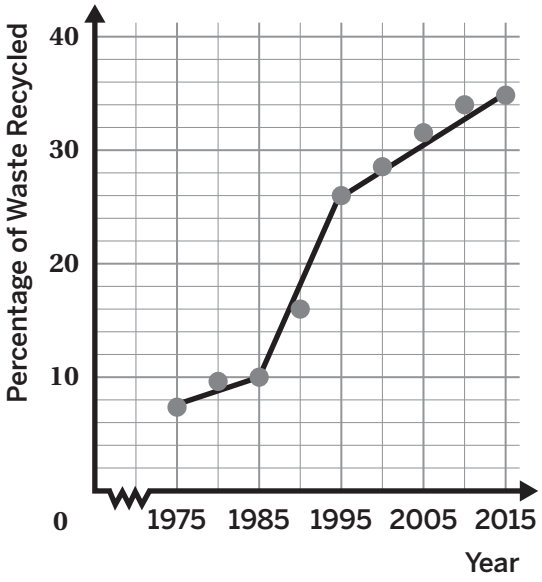
When might it not be appropriate to use a linear function to model this data?

- After the phone has charged for a while, a linear function cannot be used because . . .

- A linear function is not appropriate if . . .

Word bank								
English	curve	decrease	function	increase	interval	line	relationship	segment
Español	curva	decrecer	función	crecer	intervalo	línea	relación	segmento

Recycling



A student sketched the third line segment to complete the function.

Is the slope of this line segment increasing or decreasing?

The slope of their line segment is about _____ percent per year.

The slope means that between the years _____ and _____,
the _____ grew by approximately _____ percent per _____.

How did the student's sketch compare to your sketch?

Word bank								
English	decrease	increase	line	percentage	recycling	segment	slope	waste
Español	decrecer	crecer	línea	porcentaje	reciclaje	segmento	pendiente	residuos

Volume Lab

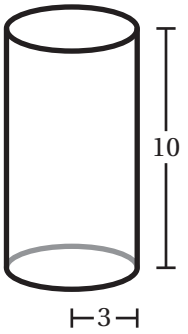
Here are some scenarios. How are the volumes related?

	Explanation
Two cones have equal diameters. The height of one cone is 2 times as large as the height of the other cone.	The volume of the _____ cone is _____ times the volume of the _____ cone. *(large / small)* *(large / small)*
Two cylinders have the same height. The diameter of one cylinder is 3 times as large as the diameter of the other cylinder.	The volume of the _____ cylinder is _____ times the volume of the _____ cylinder. *(large / small)* *(large / small)*
Two spheres where the diameter of one is twice the other.	The volume of the _____ sphere is _____ times that of the _____ sphere. *(large / small)* *(large / small)*

Cylinder Volumes

This cylinder has a height of 10 units and a radius of 3 units.

Calculate the volume of the cylinder. Explain your thinking.

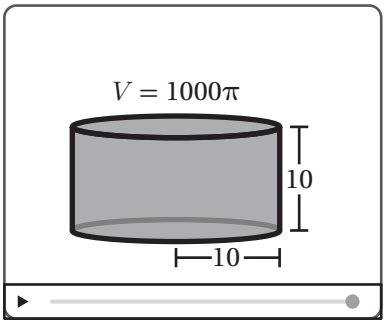


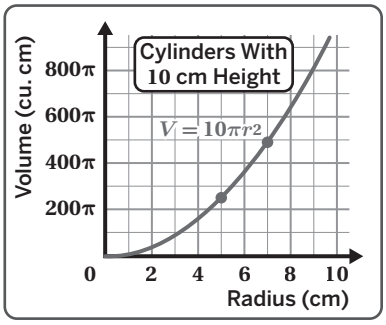
First, I can determine the area of the _____. I know the shape of the base is a _____ so I can use the equation _____. The area of the base of this cylinder is _____.

Then I can _____ the area of the base by the _____ of the cylinder. The volume of the cylinder is _____ cubic units.

Word bank						
English	area	base	circle	height	multiply	volume
Español	área	área	círculo	altura	multiplicar	volumen

Changing the Radius





	Yes	No
Is there exactly one output for each input?		
Is the relationship a function?		
Is there a constant rate of change?		
Is the graph a straight line?		
Is the relationship linear?		

The relationship _____ a function because . . .
(is / is not)

The relationship _____ linear because . . .
(is / is not)

Estimating the Volume of a Cone

$V = 24\pi$ $V = 8.49\pi$ $V = ?$

Cylinders: 25

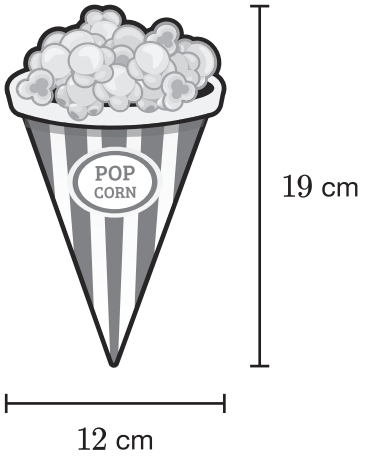
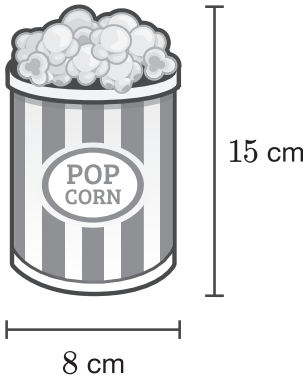
I think the exact volume of the cone would be _____ cubic units because . . .

When the number of stacked _____ increases, they begin to form a _____.
(cones / cylinders) *(cone / cylinder)*

Discuss: What do you notice about the relationship be tween the volumes of cylinders and cones with the same base and height?

Word bank							
English	base	cone	cubic	cylinder	height	radius	volume
Español	base	cono	cúbico	cilindro	altura	radio	volumen

Which Is the Better Deal?

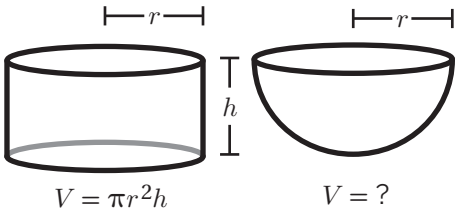
	$6.25 	$6.50 
The shape of the container is a . . .		
To determine the volume of the container, I can . . .	The volume is approximately _____ cubic centimeters.	The volume is approximately _____ cubic centimeters.
The amount of popcorn per dollar for the container is about _____ cubic centimeters because . . .		

The _____ is a better deal because . . .

Hemispheres

One way of writing a formula for the volume of a cylinder is $V = \pi r^2 h$, where r is the radius and h is the height.

Select one formula or write your own formula that represents the volume of a hemisphere. Explain your thinking.



	Explanation
$V = \frac{2}{3}\pi r^2 h$	A hemisphere fills up _____ of the _____, so I can multiply the volume of a cylinder by _____ to determine the volume of a hemisphere.
$V = \pi r^2 h - \frac{1}{3}\pi r^2 h$	I can subtract the volume of a _____ from the volume of a _____ to get the volume of a hemisphere.
$V = \frac{2}{3}\pi r^3$	

Word bank						
English	cone	cylinder	height	hemisphere	radius	volume
Español	cono	cilindro	altura	hemisferio	radio	volumen

Math Habits of Mind: Hábitos mentales matemáticos

I can slow down and first make sense of a challenging problem before trying to solve it.

Puedo ir más despacio y primero comprender un problema difícil antes de intentar resolverlo.

I can represent real-world problems and interpret their solutions within the context of the problem.

Puedo representar problemas del mundo real e interpretar sus soluciones dentro del contexto del problema.

I can justify my thinking and ask questions to help me understand the thinking of others.

Puedo justificar mi razonamiento y hacer preguntas para comprender el razonamiento de los demás.

I can apply the math that I know to solve real-world problems, make assumptions and revise my thinking as needed.

Puedo poner en práctica mis conocimientos matemáticos para resolver problemas del mundo real, formulando hipótesis y modificando mi razonamiento según sea necesario.

I can select an appropriate tool to help me solve problems.

Puedo seleccionar una herramienta adecuada que me ayude a resolver problemas.

I can communicate my thinking and solutions clearly to others.

Puedo comunicar mi razonamiento y soluciones claramente a los demás.

I can look for structure or patterns to help me solve problems.

Puedo buscar estructuras o patrones que me ayuden a resolver problemas.

I can look for repeated calculations and other repeated steps to make generalizations.

Puedo buscar cálculos y otros pasos repetidos para hacer generalizaciones.

Questions and Sentence Frames

Why did you choose this habit of mind?

Did you choose any others? Why or why not?

What part of the Activity reminded you of this habit of mind?

Can you tell me more?

I chose this habit of mind because . . .

I also chose _____ because . . .

In the Activity, I . . .

Organizing Data

Directions: Make copies and pre-cut. Give each student the appropriate support. **Note:** The top portion offers emerging language supports, the middle portion offers expanding language supports, and the bottom portion offers bridging language supports.

- The *Time* column in the table matches with the _____ on the graph and the *Number of Clicks* column matches with the _____ on the graph.
- Each row in the table appears as a _____ on the graph.
- As the time increases, the number of clicks _____.

Word bank					
English	decreases	increases	point	x-axis	y-axis
Español	disminuye	incrementa	punto	eje-x	eje-y

- The *Time* column in the table matches with the _____ on the graph and the *Number of Clicks* column matches with the _____ on the graph.
- Each row in the table appears as a _____ on the graph.
- As the time increases, the number of clicks _____.

One connection between the graph and table is . . .

Another connection between the graph and table is . . .

Word bank				
data	increases	point	x-axis	y-axis

Visualizing Data

Question	Can it be answered from the dot plots? (Screen 4)	Can it be answered from the scatter plot? (Screen 6)
How many people are 62 inches tall?		
What is the wingspan of a person who is 60 inches tall?		
How many people are taller than 65 inches?		
Is there a relationship between height and wingspan?		
Who is the tallest person?		

Challenge Creator (Tell a Story)

My Challenge:

What context did you choose?

 Fuel efficiency

 Book page count

 Animal lifespan

 Energy use

 Quarterback wins

 Foot width

 Flight time

 Oil imports

The x-axis represents . . .

The y-axis represents . . .

The large blue point on my graph . . .

Word bank	
English	**Español**
animal	animal
book	libro
distance	distancia
energy	energía
flight	vuelo
foot	pie
fuel	combustible
heart rate	ritmo cardiaco
length	longitud
lifespan	esperanza de vida
oil	aceite
page	página
quarterback	mariscal de campo
temperature	temperatura
time	tiempo
vehicle	vehículo
weight	peso
width	ancho
word	palabra

Dapper Cats

The point I plotted is (_____, _____).

The x-value is _____. This represents the cat's . . .

The y-value is _____. This represents the cat's . . .

The cat is _____ because . . .
(dapper / not dapper)

Warm-Up

Vocabulary	
English	**outlier** A data value that is far from the other values in the data set.
Español	**valor atípico** Un valor que está lejos de los demás valores del conjunto de datos.

- The point $(40, 40)$ represents . . .

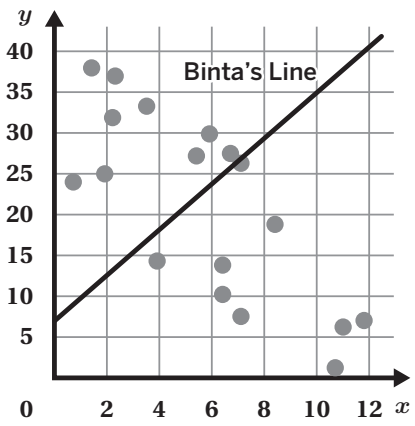
- The point $(40, 40)$ is _____ far from the rest of the data.
  (is / is not)

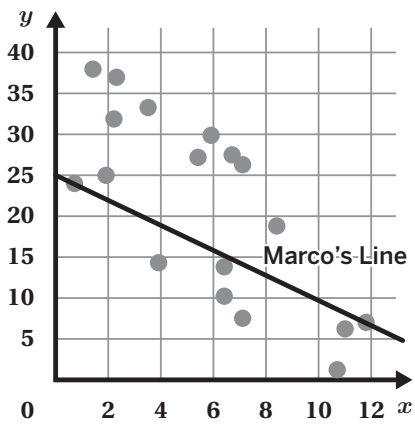
- This point $(40, 40)$ _____ follow the trend of the data.
  (does / does not)

- _____ is correct.
  (Sora / Saavani)

Find the Fit

	Binta's Line	Marco's Line
The line is close to as many points as possible.		
The line has a good balance of points above and below it.		
The slope of the line follows the trend of the data.		

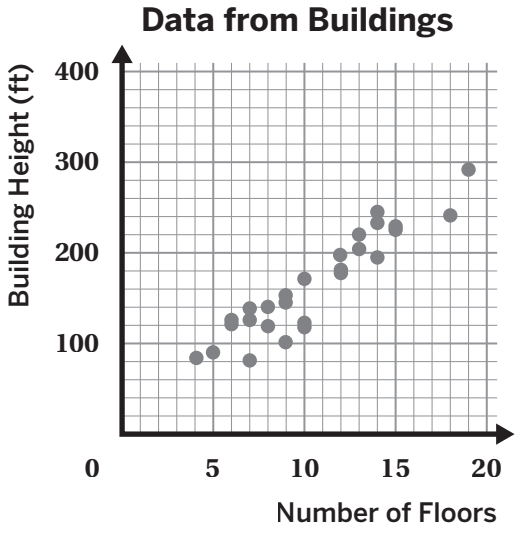




Discuss: Whose line is a good line of fit for the data: Binta, Marco, both, or neither? Explain your thinking. Use the word bank if it helps with your thinking.

Word bank				
English	balance	data	line of fit	linear model
Español	balance	datos	línea de mejor ajuste	modelo lineal
English	point	scatter plot	slope	trend
Español	punto	diagrama de dispersión	pendiente	tendencia

Associations



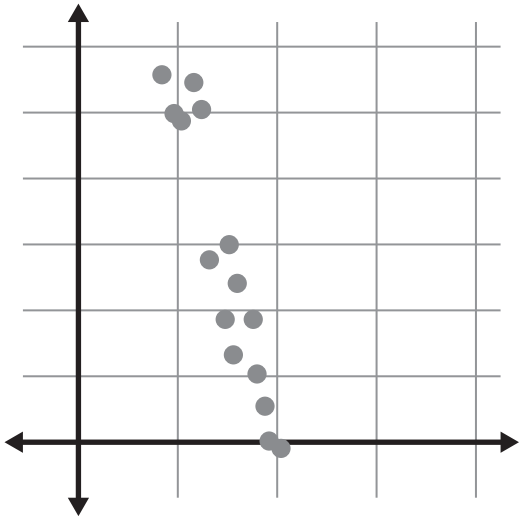
Draw a line of fit for the linear model then fill in the blanks. Use the word bank if it helps with your thinking.

- The linear model shows a _____ association between the number of floors and the building height.
- The slope of the line of fit is _____.
- The _____ represents the number of floors in the building.
- The _____ represents the building height in feet.
- For each _____, the height of the building _____ by _____ feet.

Word bank						
English	decreases	increases	negative	positive	x-variable	y-variable
Español	disminuye	aumenta	negativo	positivo	variable x	variable y

Putting It All Together

Choose the word that best fits each statement.



a. The scatter plot has a _____ association.
(positive / negative)

b. The scatter plot has a _____ association.
(linear / non-linear)

c. The scatter plot _____ clusters of data.
(has / does not have)

Describe the scatter plot using vocabulary from this unit. Use the word bank if it helps with your thinking.

- The _____ has a _____ association with _____ .

Word bank						
English	cluster	linear	negative	non-linear	positive	scatter plot
Español	agrupamiento	lineal	negativo	no lineal	positivo	diagrama de dispersión

Line of Fit

Equation of the line: $y =$ _____ $x +$ _____

a What is the slope?

What is the y-intercept?

b **Discuss:**

- What does each number mean in this situation?
  - The slope of _____ means that for every 1 kilogram _____ in _____ weight, *(increase / decrease)*
    the _____ weight _____ by _____ grams.
    (increases / decreases)
  - The y-intercept of _____ means when the body weight is _____ kilograms, the brain weight is _____ grams.
- Do these values make sense in this situation?
  - The slope _____ make sense because . . .
    (does / does not)
  - The y-intercept _____ make sense because . . .
    (does / does not)

Word bank						
English	body	brain	decreases	increases	weigh	weight
Español	cuerpo	cerebro	disminuye	aumenta	pesar	peso

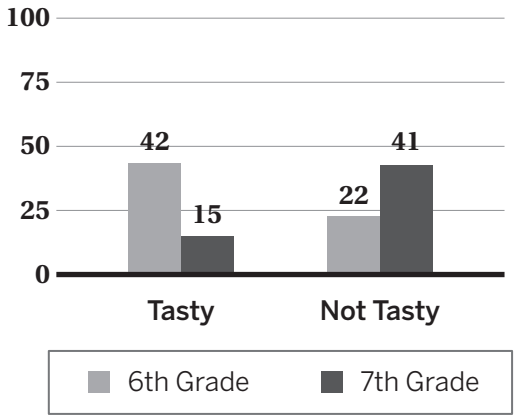
Analyzing Categorical Data

The bar graph and two-way table show the results from Abena's survey.

Two-Way Table

	6th Grade	7th Grade	Total
Tasty	42	15	57
Not Tasty	22	41	63
Total	64	56	120

Bar Graph



Discuss: How can you use the representations to determine how 6th and 7th grade students feel about grapes?

Based on the data, do 6th and 7th graders feel the same about grapes?

- More 6th graders think that grapes are _____ because . . .

- More 7th grades think that grapes are _____ because . . .

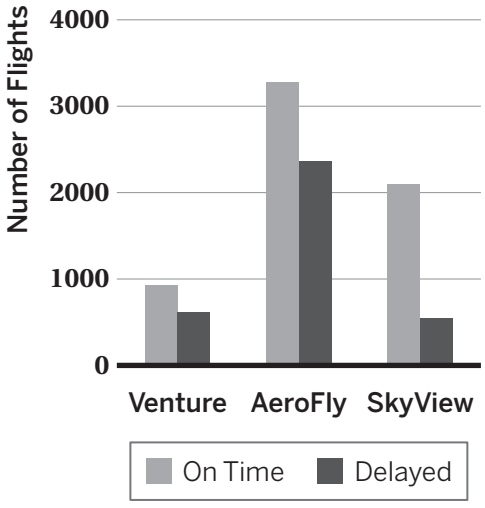
Word bank					
English	bar graph	categorical data	frequency	representation	two-way table
Español	diagrama de barras	datos categóricos	frecuencia	representación	tabla de doble entrada

Analyzing Data Representations

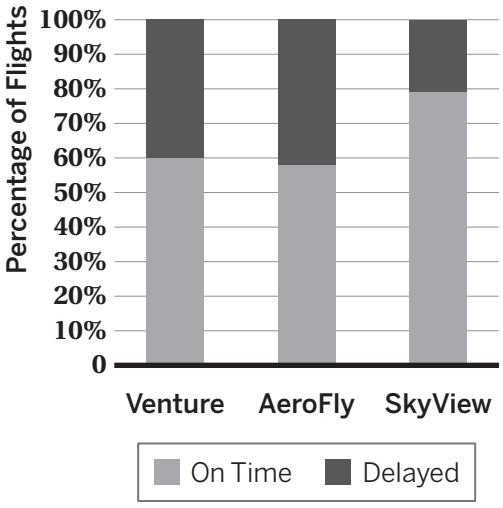
Consider this claim:

AeroFly Airlines has the highest rate of on-time flights because it has more on-time flights than Venture and SkyView combined.

Bar Graph



Segmented Bar Graph



The bar graph shows that AeroFly has a _____ _____ of on-time flights than Venture and Skyview combined.
(higher / lower) *(number / percentage)*

The segmented bar graph shows that AeroFly has a _____ _____ of on-time flights than either Venture or Skyview.
(higher / lower) *(number / percentage)*

Discuss: Is the claim correct?

- Yes, this claim is correct because . . .

- No, this claim is not correct because . . .

Math Habits of Mind:
Hábitos mentales matemáticos

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Puedo ir más despacio y primero comprender un problema difícil antes de intentar resolverlo.

I can represent real-world problems using equations and inequalities and interpret their solutions within the context of the problem.

Puedo representar problemas del mundo real usando ecuaciones y desigualdades e interpretar sus soluciones dentro del contexto del problema.

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Puedo comunicar mi razonamiento y soluciones claramente a los demás.

I can look for structure or patterns to help me solve problems.

Puedo buscar estructuras o patrones que me ayuden a resolver problemas.

I can look for repeated calculations and other repeated steps to make generalizations.

Puedo buscar cálculos repetidos y otros pasos repetidos para hacer generalizaciones.

Questions and Sentence Frames

Why did you choose this habit of mind?

Did you choose any others? Why or why not?

What part of the Activity reminded you of this habit of mind?

Can you tell me more?

I chose this habit of mind because . . .

I also chose _____ because . . .

In the Activity, I . . .

Lots of Circles

After seeing the animation, Adah and Jamal both calculated the number of circles in Stage 12.

- Consider each student's work.
- Determine if their work is correct.
- Identify any correct thinking.
- Describe the meaning of their expressions.

	Adah	Jamal
Work	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$	2^{12}
Is their work correct?		
Identify any correct thinking		
Describe the meaning of their expressions	Adah uses a pattern of repeated _____ of the number ___ a total of ___ times to represent how the 2 circles in Stage 1 grow to become the number of circles in Stage 12.	Jamal's expression uses a _____ of 2 and an _____ of 12 to represent a repeating _____ where 2 is multiplied by itself 12 times to determine the number of circles in Stage 12.

Word bank				
English	base	exponent	multiplication	pattern
Español	base	exponente	multiplicación	patrón

Combining Exponents

Abdullah's and Madison's expressions are both equivalent to $(8^3)^2$. Fill in the information below about each of the expressions. Use the word bank if it helps with your thinking.

Abdullah's Expression

Abdullah

$8^3 \cdot 8^3$

Madison's Expression

Madison

$(8 \cdot 8 \cdot 8) \cdot (8 \cdot 8 \cdot 8)$

1. Explain how Abdullah got his expression from $(8^3)^2$.

- First, he wrote 8^3, which has a _____ of 8 and an _____ of 3.
- Next, he _____ 8^3 to itself because the _____ outside the parentheses is ___.

2. Explain how Madison got her expression from $(8^3)^2$.

- First, Madison rewrote 8^3 in _____ form, $(8 \cdot 8 \cdot 8)$.
- Next, she _____ the group to itself because there is an exponent of ___ after the parentheses.

Compare: How are these expressions different? *Comparar: ¿En qué se diferencian estas expresiones?*	Connect: How are these expressions alike? *Conectar: ¿En qué se parecen estas expresiones?*

Word bank

English	base	expanded	exponent	expression	group	multiplied
Español	base	expandido	exponente	expresión	grupo	multiplicado

Power Pairs

Decide whether the expressions are equivalent and explain your thinking. Use the word bank if it helps with your thinking.

$(3^4)^2$ $3^5 \cdot 3^3$

Complete the sentence frames about the expressions.

- The first expression can be rewritten as ___ groups of ___.
- The second expression can be rewritten as _____ • _____.

The expressions _____ equivalent because . . .
(are / are not)

Word bank						
English	add	base	exponent	expression	group	multiply
Español	sumar	base	exponente	expresión	grupo	multiplicar

Single Powers

Fill in the blanks to describe how to rewrite an expression as a single power. Jayla's work is shown for reference. Use the word bank if it helps with your thinking.

Jayla

$$\frac{7^5 \cdot 7^2}{7^3} = \frac{(7 \cdot 7 \cdot 7 \cdot 7 \cdot 7) \cdot (7 \cdot 7)}{7 \cdot 7 \cdot 7}$$

$$= \frac{7}{7} \cdot \frac{7}{7} \cdot \frac{7}{7} \cdot 7 \cdot 7 \cdot 7 \cdot 7$$

$$= 1 \cdot 1 \cdot 1 \cdot 1 \cdot 7 \cdot 7 \cdot 7 \cdot 7$$

$$= 7^4$$

7^4 ← single power of 7

Discuss: How could you rewrite $\frac{4^9}{4^2 \cdot 4^4}$ as a single power?

To rewrite the fraction, I could . . .

- _____ the _____ to be $(4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4)$.
- _____ the _____ to be $(4 \cdot 4) \cdot (4 \cdot 4 \cdot 4 \cdot 4)$.
- _____ the nine 4s from the _____ by the six 4s from the _____ to get . . .

The expression could then be rewritten as a single power, 4^3, because . . .

Word bank						
English	denominator	divide	expand	multiply	numerator	power
Español	denominador	dividir	expandir	multiplicar	numerador	potencia

Negative and Zero Exponents

What patterns do you see in the table? Describe as many as you can. Use the sentence frames and the word bank if it helps with your thinking.

Exponent Form	Expanded Form	Value
10^4	$10 \cdot 10 \cdot 10 \cdot 10$	10,000
10^3	$10 \cdot 10 \cdot 10$	1,000
10^2	$10 \cdot 10$	100
10^1	10	10
10^0	1	1
10^{-1}	$\frac{1}{10}$	$\frac{1}{10}$
10^{-2}	$\frac{1}{10} \cdot \frac{1}{10}$	$\frac{1}{100}$

- I notice that as I move down the Exponent Form column, the exponents . . .
- I notice that as I move down the Expanded Form column, . . .
- I notice that as I move down the Value column, . . .
- Positive exponents represent . . .
- Negative exponents represent . . .
- Zero exponents represent . . .

Word bank

English	exponent	expand	expression	decrease	divide	factor
Español	exponente	expandir	expresión	disminuir	dividir	factor
English	increase	multiply	negative	patterns	value	zero
Español	aumentar	multiplicar	negativo	patrones	valor	cero

Write Your Own Rules

Word bank	
English	**Español**
add	sumar
base	base
exponent	exponente
divide	dividir
multiply	multiplicar
negative	negativo
positive	positivo
power	potencia
reciprocal	recíproco
subtract	restar
term	término

Ships and Shuttles

1. Decide who you think is correct.
2. Show or describe your thinking in writing. Use pictures, diagrams, words, and/or numbers to support your thinking.
3. Be prepared to defend your thinking.

Rishi	Parv
$2.03 \cdot 10^6$ kilograms	$20 \cdot 10^5 + 3 \cdot 10^4$ kilograms

Rishi is _____ *(correct / incorrect)* because . . .	• his expression _____ *(is / is not)* equivalent to $2{,}030{,}000$ kilograms. • For example:
Parv is _____ *(correct / incorrect)* because . . .	• his expression _____ *(is / is not)* equivalent to $2{,}030{,}000$ kilograms. • For example:

Light Weights

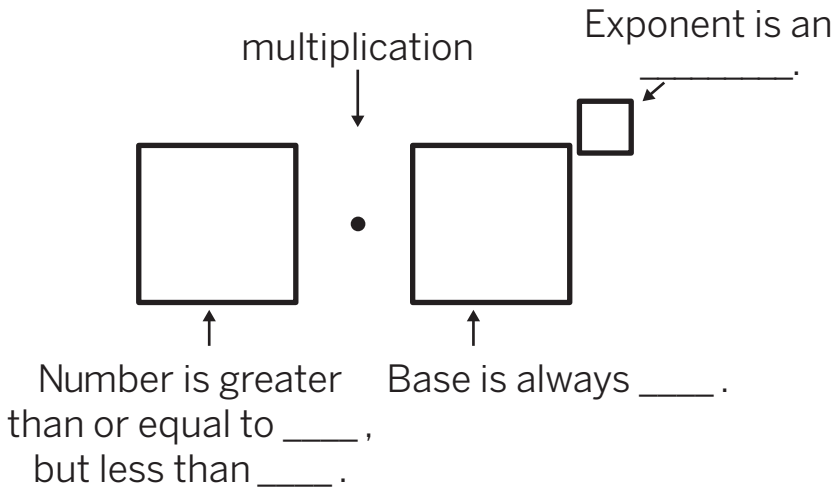
Consider each student's work.

- Identify any correct thinking.
- Identify any incorrect or unclear thinking.
- Create a correct and clear solutio

	0.0031	
	Arturo $3.1 \cdot 10^{-2}$	**Kimaya** $3 \cdot 10^{-4} + 1 \cdot 10^{-3}$
Correct thinking		
Incorrect / Unclear thinking		
Create correct and clear solution	I would tell Arturo . . .	I would tell Kimaya . . .

Word bank						
English	decimal	exponent	negative	place value	positive	power of 10
Español	decimal	exponente	negativo	valor del espacio	positivo	potencia de 10

Scientific Notation



- All of the numbers written in scientific notation . . .
- The first part of the number . . .
- The second part of the number . . .

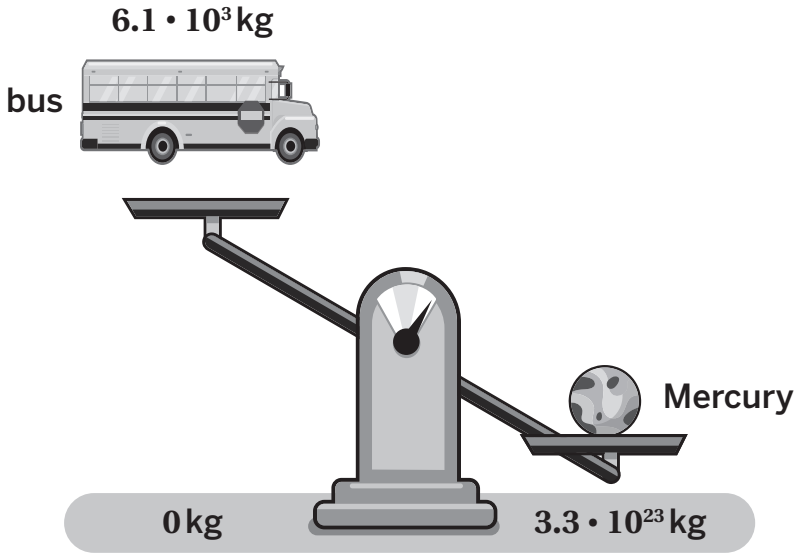
Word bank					
English	exponent	factor	integer	power of 10	product
Español	exponente	factor	entero	potencia de 10	producto

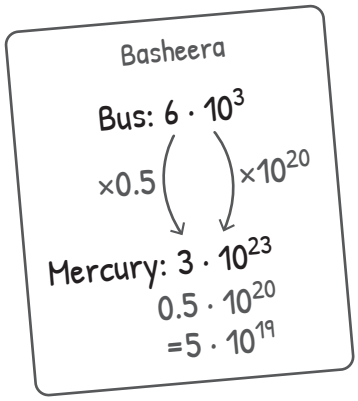
Multiplication and Division Strategies

- Both strategies are alike because . . .
- One thing that the strategies have in common is . . .
- I notice that . . .
- Anya and Ruda's strategies are different because . . .
- In Anya's strategy . . . , but in Ruda's strategy . . .
- One thing that is different is . . .

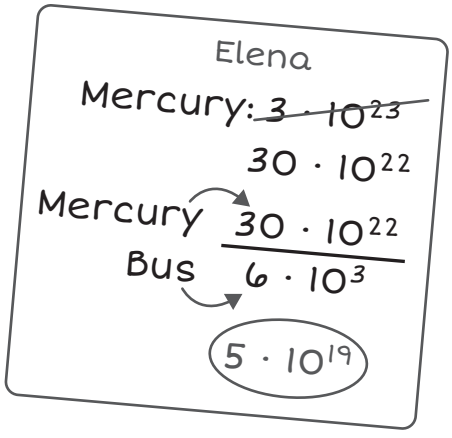
Word bank					
English	divide	expands	exponent	multiply	scientific notation
Español	dividir	expande	exponente	multiplicar	notación científica

Balance the Scale, Part 2





- First, Basheera rounded the weight of the bus and Mercury.
- Then to get from 6 to 3, Basheera . . .
- To get from 10^3 to 10^{23}, Basheera . . .
- Last, Basheera wrote $0.5 \cdot 10^{20}$ in . . .



- First, Elena rounded Mercury's weight from $3.3 \cdot 10^{23}$ to $3 \cdot 10^{23}$.
- Then, Elena rewrote $3 \cdot 10^{23}$ as $30 \cdot 10^{22}$ by . . .
- Next, Elena . . .
- Last, Elena arrived at the answer . . .

Make a Poster

A summary of the situation	All of the measurements you will use to answer each question (with units)
• What is the situation about? • Some key words are . . . • What are some questions that you have?	• What can be counted or measured in this situation? • It looks like _____ represents . . .
Your calculations	**Your answers (with units)**
	• What does your answer tell you? • _____ represents . . . • The answer is surprising / not surprising because . . .

City Lights, Part 2

Review Ariel's and Tameeka's strategies. Use these questions and the word bank if it helps with your thinking.

Ariel

$1.5 \cdot 10^9 + 8.3 \cdot 10^7$

$1.5 \cdot 10^9 + 0.083 \cdot 10^9$

- What did Ariel do?
- What is the same in the new expression?
- How might Ariel finish the problem?

Tameeka

$1.5 \cdot 10^9 + 8.3 \cdot 10^7$

$150 \cdot 10^7$

$+ \ 8.3 \cdot 10^7$

- What did Tameeka do?
- What is the same in the new expression?
- How might Tameeka finish the problem?

How would you add $3.2 \cdot 10^6 + 2.5 \cdot 10^5$? Would you use Ariel's, Tameeka's, or another strategy?

Word bank						
English	add	change	keep	number	power	strategy
Español	sumar	cambiar	mantener	número	potencia	estrategia

What Would You Buy?

Days 365 days in 1 year	Years	Centuries 100 years	Millennia 1,000 years

2,500,000 years (or $2.5 \cdot 10^6$ years) is equivalent to approximately . . .

_____ days

_____ centuries

_____ millenia

I think _____ is the most appropriate unit because . . .

Words With Multiple Meanings

Draw a picture or write in words to show one or more math meanings and another meaning of the term.

Math meaning(s)

legs

Another meaning

Math Habits of Mind: Hábitos mentales matemáticos

I can slow down and first make sense of a challenging problem before trying to solve it.

Puedo ir más despacio y primero comprender un problema difícil antes de intentar resolverlo.

I can represent real-world problems using equations and inequalities and interpret their solutions within the context of the problem.

Puedo representar problemas del mundo real usando ecuaciones y desigualdades e interpretar sus soluciones dentro del contexto del problema.

I can justify my thinking and ask questions to help me understand the thinking of others.

Puedo justificar mi razonamiento y hacer preguntas que me ayuden a comprender el razonamiento de los demás.

I can apply the math that I know to solve real-world problems, make assumptions and revise my thinking as needed.

Puedo poner en práctica mis conocimientos matemáticos para resolver problemas del mundo real, formulando hipótesis y modificando mi razonamiento según sea necesario.

I can select an appropriate tool to help me solve problems.

Puedo seleccionar una herramienta adecuada que me ayude a resolver problemas.

I can communicate my thinking and solutions clearly to others.

Puedo comunicar mi razonamiento y soluciones claramente a los demás.

I can look for structure or patterns to help me solve problems.

Puedo buscar estructuras o patrones que me ayuden a resolver problemas.

I can look for repeated calculations and other repeated steps to make generalizations.

Puedo buscar cálculos y otros pasos repetidos para hacer generalizaciones.

Questions and Sentence Frames

Why did you choose this habit of mind?

Did you choose any others? Why or why not?

What part of the Activity reminded you of this habit of mind?

Can you tell me more?

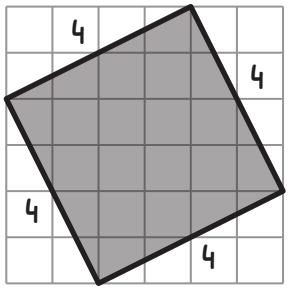
I chose this habit of mind because . . .

I also chose _____ because . . .

In the Activity, I . . .

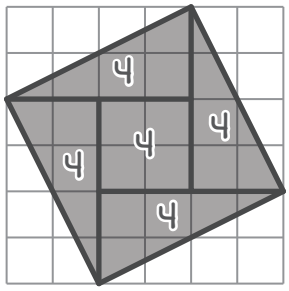
Different Strategies

Trevon



$6 \cdot 6 - 4 \cdot 4 = 20$ square units

Zahra



$4 \cdot 4 + 4 = 20$ square units

Compare: How are these strategies different? *Comparar: ¿En qué se diferencian estas estrategias?*	Connect: How are these strategies alike? *Conectar: ¿En qué se parecen estas estrategias?*

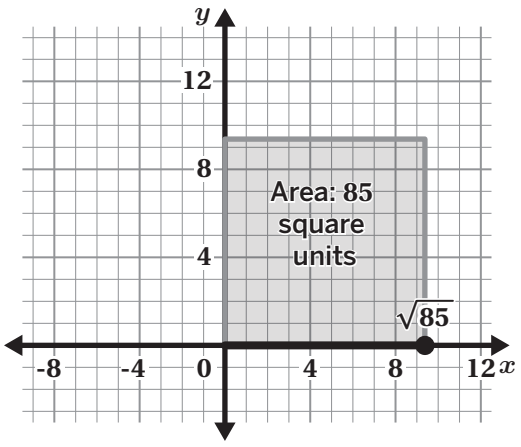
Word bank

English	area	congruent	decompose	square	surround	tilted	triangle
Español	área	congruente	descomponer	cuadrado	rodear	inclinado	triángulo

Square Roots

Fill in the blanks using the image. Use the word bank if it helps with your thinking.

- 85 square units represents the square's _____.
- The area of a square is found by multiplying the lengths of two _____.
- The _____ of 85 is written as $\sqrt{85}$.
- $\sqrt{85}$ represents the _____ length of the side of the square.

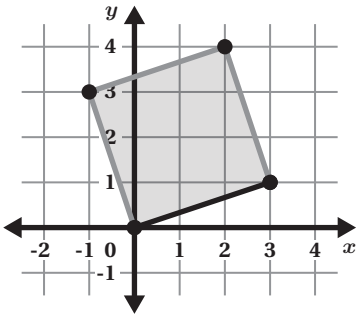


Discuss: In your own words, what is a square root?

Word bank					
English	area	exact	root	side	square
Español	área	exacto	raíz	lado	cuadrada

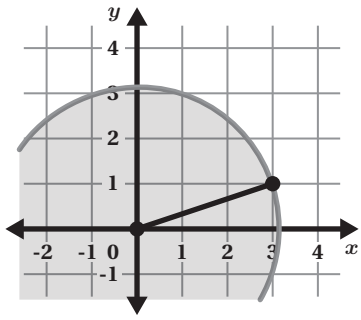
Squaring Lines

Ava



Ava says that the segment length is $\sqrt{10}$ units because the area of the square is 10 square units.

Rebecca



Rebecca says that the segment length is about 3.2 units because that's the approximate length of the circle's radius.

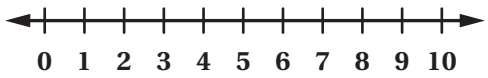
Compare: How are these strategies different? *Comparar: ¿En qué se diferencian estas estrategias?*	Connect: How are these strategies alike? *Conectar: ¿En qué se parecen estas estrategias?*

Discuss: What is helpful about each strategy?

Word bank						
English	approximate	between	decimal	radius	segment	square root
Español	aproximado	entre	decimal	radio	segmento	raíz cuadrada

Between Whole Numbers

The numbers x and y are positive. $x^2 = 3$ and $y^2 = 35$. Plot x and y on the number line then describe how you decided where to plot each point.



For point x . . .

- I plotted the point between ____ and ____.
- I decided to plot the point here because . . .

For point y . . .

- I plotted the point between ____ and ____.
- I decided to plot the point here because . . .

Word bank			
English	**Español**	**English**	**Español**
between	entre	perfect square	cuadrado perfecto
greater	mayor	plot	marcar
less	menos	point	punto
number line	línea numérica	square root	raíz cuadrada

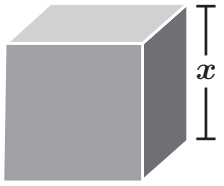
Filling Cubes

Definition (in your own words)

Connections to a Cube

- x represents the _____ of the cube.
- $x \cdot x \cdot x = x^3$, which represents the _____ of the cube.
- The _____ of a cube is equal to the cube root of its _____.

Volume: 100 cu. in.



cube root

Examples

If . . .

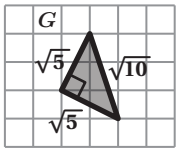
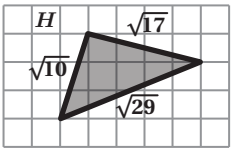
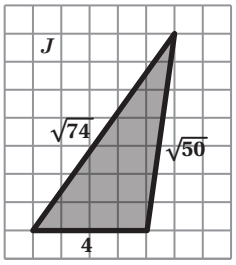
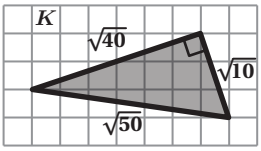
- $3^3 = 27$, then $\sqrt[3]{27} =$ _____.
- $4^3 = 64$, then $\sqrt[3]{64} =$ _____.
-

Non-examples

-
-
-

Word bank					
English	cube root	length	radical symbol	side	volume
Español	raíz cúbica	longitud	símbolo radical	lado	volumen

True for Every Triangle?

	Triangle G	Triangle H	Triangle J	Triangle K
				
What are the lengths of the shorter sides a and b? What is the length of the longest side, c?	• a is _____ • b is _____ • c is _____	• a is _____ • b is _____ • c is _____	• a is _____ • b is _____ • c is _____	• a is _____ • b is _____ • c is _____
Is the triangle a right triangle? How do you know?				
Is $a^2 + b^2 = c^2$ true for this triangle? How do you know?				

Word bank						
English	angle	right	side	square	triangle	true
Español	ángulo	recto	lado	cuadrado	triángulo	verdad

Thinking More Generally

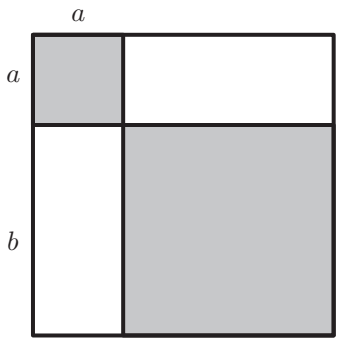


Figure G

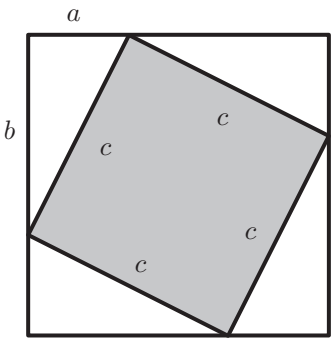


Figure H

	Figure G	Figure H
Total Area (sq. units)		
Total Unshaded Area (sq. units)		
Total Shaded Area (sq. units)		

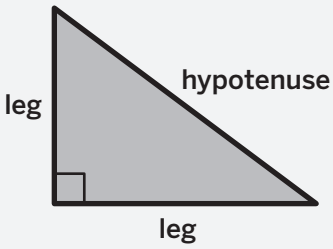
- Figure H shows a _____ where a and b are the _____ and c is the _____.
- The areas of the Figures G and H are _____ because they both have a total area of $(a + b)^2$.
- The unshaded area of the two squares are _____ because they both have a total area of $2ab$.
- This means that the shaded areas in Figure G _____ and Figure H _____ must be _____.
- Therefore, the _____ can be expressed as $a^2 + b^2 = c^2$.

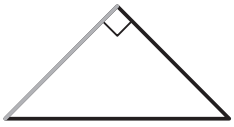
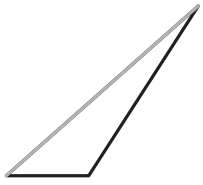
Word bank					
English	equal	hypotenuse	leg (of a right triangle)	Pythagorean theorem	right triangle
Español	igual	hipotenusa	cateto (de un triángulo recto)	teorema de Pitágoras	triángulo recto

Hypotenuse

The **hypotenuse** is the side of a right triangle that is opposite (across from) the right angle.

The **legs** of a right triangle are the sides that make the right angle.



	A.	B.	C.	D.
				
Is it a right triangle?				
Is the highlighted side across from the right angle?				

Melissa did well when she . . .

Melissa made a mistake when she . . .

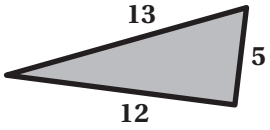
Word bank			
English	hypotenuse	leg (of a right triangle)	right triangle
Español	hipotenusa	cateto (de un triángulo recto)	triángulo recto

Make It Right

If this was a right triangle then:

_____ and _____ would represent the legs of the triangle.

_____ would represent the hypotenuse.



If I use the Pythagorean theorem, then it would be true.

_____ + _____ = _____

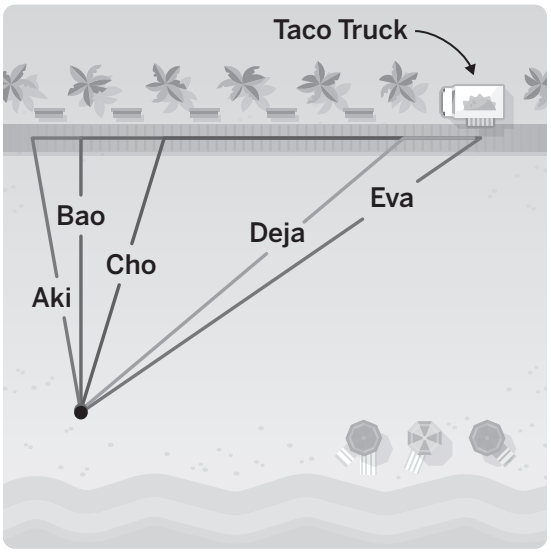
Is it a right triangle? Explain your thinking.

I think the triangle is _____ because . . .

Word bank						
English	equal	hypotenuse	legs of a right triangle	right triangle	square	sum
Español	igual	la hipotenusa	catetos de un triángulo recto	triángulo recto	el cuadrado	la suma

Three More Paths

Discuss: What path did each person take?



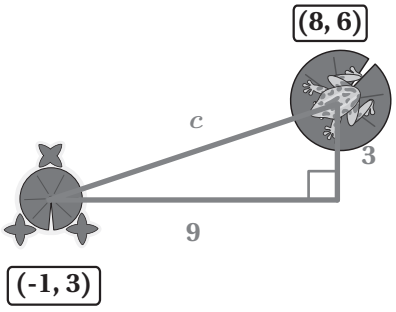
- Aki
- Bao
- Cho
- Deja
- Eva

Who do you think will reach the taco truck first and last? Explain your thinking.

I think _____ will reach the taco truck first because . . .

I think _____ will reach the taco truck last because . . .

Pond Hopper



All measurements in feet

The distance between the frog and the lily pad can be determined by creating a _____.

The distance between the frog and the lily pad represents the _____ of the right triangle.

The horizontal distance and vertical distance between the frog and lily pad represent the _____ of the right triangle.

The horizontal distance is _____ units because . . .

The vertical distance is _____ units because . . .

If I use the _____ to determine the distance between the frog and the lily pad, then . . .

Word bank				
English	hypotenuse	legs	Pythagorean theorem	right triangle
Español	hipotenusa	catetos	teorema de Pitágoras	triángulo recto

Converting Unit Fractions

First draft	A unit fraction will terminate if . . . A unit fraction will repeat if . . .
Second draft	A unit fraction will terminate if . . . A unit fraction will repeat if . . .

Word bank							
English	decimal notation	denominator	divide	equivalent	factor	repeating decimal	terminating decimal
Español	notación decimal	denominador	dividir	equivalente	factor	decimal periódico	decimal exacto

Repeating Decimals to Fractions

Mai's Work	What did Mai do?
$x = 1.8\overline{3}$	
$10x = 18.\overline{3}$	
$100x = 183.\overline{3}$	
$100x = 183.\overline{3}$ $-(10x = 18.\overline{3})$ $90x = 165$ $x = ?$	

Use these statements if it helps with your thinking.

Created an equivalent equation by multiplying each side of the equation $x = 1.8\overline{3}$ by 100	Subtracted the equations that she created	Created an equivalent equation by multiplying each side of the equation $x = 1.8\overline{3}$ by 10	Wrote the equation x equals $1.8\overline{3}$

Discuss: Why do you think she chose these steps?

- Mai multiplied by 10 and 100 because . . .
- I think Mai subtracted because . . .

Irrational Numbers

Examples of square roots or cube roots	Rational or Irrational?
2	
$\sqrt[3]{2}$	
$\sqrt[3]{2}$	
$\sqrt{\frac{1}{2}}$	
$\sqrt{10}$	

Jada is _____ because . . .
(correct / incorrect)

For example . . .

Word bank						
English	cube root	fraction	integer	irrational number	rational number	square root
Español	raíz cúbica	fracción	entero	número irracional	número racional	raíz cuadrada