Amplify Desmos Math CALIFORNIA

Algebra 1

Math Language Development Resources

Contents

Unit 1: Patterns and Sequences

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Words With Multiple Meanings

Draw a picture or write in words to show the meaning of the term *arithmetic* that is used in this unit and another meaning of the term.

Math meaning(s)

Description

Example

arithmetic

Description

Example

Another meaning

Words With Multiple Meanings

Draw a picture or write in words to show the meaning of the term *geometric* that is used in this unit and another meaning of the term.

Math meaning(s)

Description

Example

geometric

Description

Example

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 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 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.

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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.

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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 . . .

Pattern C

Pattern A

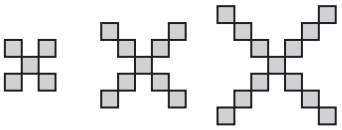


Figure 1 Figure 2 Figure 3

Figure	Number of Tiles
1	5
2	9
3	13
4	17

Pattern B

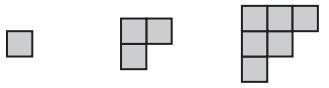


Figure 1 Figure 2 Figure 3

Figure	Number of Tiles
1	1
2	3
3	6
4	10

Here are the two visual patterns we've seen.

How are these patterns alike? How are they different?

Discuss:

Where do you see _____?

Can you show me how _____?

What makes you think _____?

How does that compare to _____?

What I am hearing you say is _____.
Is that right?

I want to add that . . .

In this case, . . .

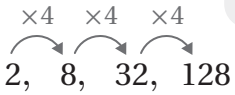
Write:

Alike	Different
In both patterns, . . .	The patterns are different because they . . .
When you move from one figure to the next, . . .	Pattern A . . .
Both tables . . .	Pattern B . . .
	Pattern A/B _____, but . . .

Seeing Sequences

Definition

Characteristics



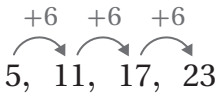
constant ratio

Examples/Models

Non-Examples

Definition

Characteristics



constant difference

Examples/Models

Non-Examples

Recursive Challenges

Troy created this recursive definition by . . . Then he . . .

I think Troy . . . to . . .

First, Troy . . . Then he . . .

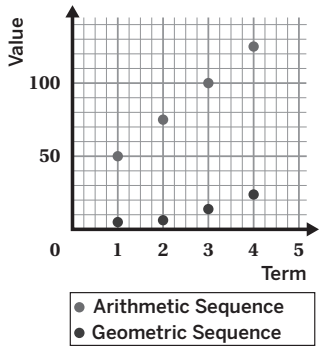
Troy can improve his work by . . .

Troy should . . . because . . .

Word bank	
English	**Español**
add	sumar
subtract	restar
divide	dividir
term	término
sequence	secuencia
constant difference	diferencia constante
constant ratio	razón constante

Sequence Types

a. What are the advantages and disadvantages of each representation?

Representation	Advantages	Disadvantages
First term: 50 Rule: Constant difference of 25 50, 75, 100, 125, ___ First term: 3 Rule: Constant ratio of 2 3, 6, 12, 24, ___	A recursive definition is useful because it shows how a sequence starts and how it changes.	A recursive definition is not as useful when you want to determine what the later terms of the sequence are.
Term / Arithmetic Sequence / Geometric Sequence 1 / 50 / 3 2 / 75 / 6 3 / 100 / 12 4 / 125 / 24	A table is useful because . . .	A table is not as useful . . .
	A graph is useful because . . .	A graph is not as useful . . .

b. Choose one representation. Explain how you can use it to help you determine which sequence has the greater 10th term.

The representation I would use to compare the 10th terms would be the recursive definition / table / graph because . . .

Explicit Expressions

How are the explicit expressions for the two patterns alike? How are they different?

Pattern 1 Explicit Expression	Pattern 2 Explicit Expression
$80\left(\frac{1}{2}\right)^n$	$80 - 8n$

Discuss:

Where do you see . . .?

Can you show me how . . .?

What makes you think . . .?

How does that compare to . . .?

What I am hearing you say is . . . Is that right?

I want to add that . . .

In this case . . .

Write:

Alike	Different
Both expressions have ____ representing _____. I see ____ and ____ in both expressions. Both expressions have _____.	The expression in Pattern 1 has _____. The expression in Pattern 2 has _____. The _____ in the expression for Pattern 1 corresponds to _____ _____. The _____ in the expression for Pattern 2 corresponds to _____ _____.

Word bank					
English	explicit expression	constant difference	constant ratio	multiply	subtract
Español	expresión explícita	diferencia constante	razón constante	multiplicar	restar

How Many Tiles?

Zoe correctly . . .

Zoe incorrectly . . . because . . .

Zoe was correct/incorrect when she . . .

Zoe's mistake was . . .

How does this figure suggest . . . ?

Word bank	
English	**Español**
constant	constante
difference	diferencia
ratio	razón
sequence	secuencia
figure	figura
expression	expresión

Models in Real Life

For each situation, describe how you might revise Garcia's proposal to better meet the community needs.

Landscapers

Landscapers report they need more time. The timeline was extended to 12 years. They need to plant the same number of trees.

Because the landscapers get 2 more years, . . .

Tree Specialist

A tree specialist says that a percentage of trees die each year.

Because a percentage of trees die each year, the landscapers . . .

Homeowners

Some homeowners cannot maintain trees and do not want trees planted on their land.

The Metropolis Council could . . .

Accountant

An accountant reports that after the third year, the cost of planting trees will increase.

The landscapers could . . .

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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 . . .

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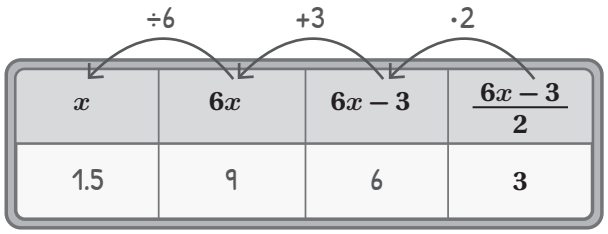
In the Activity, I . . .

Number Machines

Let's look at Jin's and Nasir's strategies for determining what number has to go into the machine for 3 to come out.

Jin



Nasir

$2 \cdot \frac{6x-3}{2} = 3 \cdot 2$

$6x - 3 = 6$

$+3 \quad +3$

$\frac{6x}{6} = \frac{9}{6}$

$x = 1.5$

Discuss: How are their strategies alike and how are they different?

The strategies are alike in . . .

The strategies are different in . . .

Where do you see . . .?

Can you show me how . . .?

What makes you think . . .?

How does that compare to . . .?

What I am hearing you say is . . . Is that right?

I want to add that . . .

In this case . . .

Write:

Alike	Different
First they _____. Next they _____. Finally they, _____. One thing that is the same is ... Both Jin's and Nasir's strategies are alike because...	Jin's strategy... Nasir's strategy.... One thing that is different is... Jin's and Nasir's strategies are different because...

Step It Up

Sadia solved the equation by _____.

Amir solved the equation by _____.

I notice that Sadia _____.

I notice that Amir _____.

I wonder why Sadia _____.

I wonder why Amir _____.

First they _____.

Next they _____.

Why do you think . . .?

What happens if . . .?

Word bank	
English	**Español**
add	sumar
subtract	sustraer
multiply	multiplicar
divide	dividir
distribute	distribuir
inverse operation	operación inversa
equivalent equation	ecuación equivalente
balanced equation	ecuación equilibrada

Once, Never, Always

Here are Ava's and Nikhil's strategies for solving a challenge from the previous activity.

Ava

$$12t = 20t$$
$$-12t \quad -12t$$
$$0 = 8t$$
$$0 = t$$

they will meet when $0 = t$

Nikhil

$$\frac{12t}{t} = \frac{20t}{t}$$
$$12 = 20$$

they will never meet

Discuss: How are Ava and Nikhil's strategies alike? How are they different?

Alike	Different
Both Ava and Nikhil's strategies are alike because . . .	Both Ava and Nikhil's strategies are different because . . .

Discuss: Is each strategy correct?

- _____ strategy is correct/incorrect because . . .
- In _____ strategy first, they _____. Next, they _____.

  Finally, _____.
- _____ strategy was to _____.
- I see _____ in both strategies.

Crowded Subways

Here is Tiam's strategy for determining the number of standing passengers that can fit when you know the number of seats.

- t is the seating capacity.
- d is the standing capacity.

Tiam

$$6t + 2d = 600$$
$$-6t \quad -6t$$
$$\frac{2d}{2} = \frac{600 - 6t}{2}$$
$$d = 300 - 3t$$

What do 300 and -3 mean in this situation?

300:

-3:

Word bank			
English	**Español**	**English**	**Español**
constraint	restricción	fewer	menos
capacity	capacidad	more	más
seating	asientos	equivalent equations	ecuaciones equivalentes
standing	de pie	subway car	vagón de metro
feet	pies	people	gente

Equations and Formulas

11. **Discuss:** How is solving the equations on the left side like solving the equations on the right?

Where do you see . . .?

Can you show me how . . .?

What makes you think . . .?

How does that compare to . . .?

What I am hearing you say is . . . Is that right?

I want to add that . . .

In this case . . .

Write: How are solving the equations alike? How are solving the equations different?

Alike	Different
• I see _____ in solving both equations. • Solving the equations on the left is like solving the equations the right because . . . • Solving both equations are alike because . . .	• The difference between solving both equations is that . . . • I _____ when I solved for the equations on the left. • I _____ _____ when I solved for the equations on the right.

Mind the Gap

In the diagram, $4x$ is represented by . . .

In the diagram, $2y$ is represented by . . .

In the diagram, 28 is represented by . . .

On the graph, 14 is shown . . .

On the graph, $2x$ is shown . . .

It looks like _____ represents _____.

_____ corresponds to _____.

The equations are equivalent because . . .

Word bank						
English	blocks	diagram	equation	equivalent	x-intercept	y-intercept
Español	bloques	diagrama	ecuación	equivalente	intersección en x	intersección en y

Make It

Complete all the representations for this situation.

Equation in Standard Form

Equation in Slope-Intercept Form

Description:

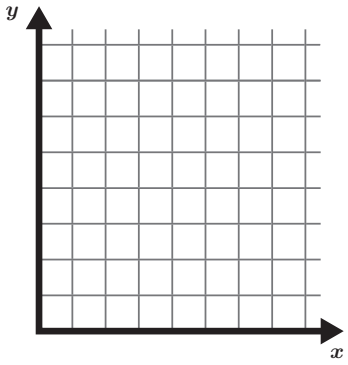
- Each bus ride costs $\$2$.
- Each train ride cost $\$2.50$
- Kiana spent $\$40$ riding the bus and the train last month.

Variables:

- x represents the number of bus rides Kiana took last month.
- y represents the number of train rides Kiana took last month.

Number of Bus Rides, x	Number of Train Rides, y
0	
	12
10	
	4
20	0

Table



Graph

Discuss: Use these sentence frames as you talk with your group about connecting the descriptions, variables, and multiple representations.

- We are trying to . . .
- We already know . . .
- What does this part of _____ mean?
- It looks like _____ represents . . .
- _____ represents _____.
- _____ stands for _____.
- _____ corresponds to _____.
- How else could we show this?

Trampoline World

8. Jamir is planning to host a party at Trampoline World.

Discuss: What constraints might Jamir think about when planning this party?

I think a possible constraint is _____.

How many _____.

How long _____.

How much _____.

9. Hosting a party at Trampoline World costs a flat fee of $80, plus $30 per hour for the small room or $50 per hour for the large room.

Match each constraint to an inequality, where x represents the number of hours for the party. One inequality will have no match.

$30 + 80x > 140$ $\quad$ $80 + 30x < 140$ $\quad$ $80 + 50x > 140$ $\quad$ $80 + 80x < 140$

Mariana's party in the small room costs at most $140.	The owner wants to earn at least $140 for a party in the large room.	Amoli can spend up to $140 for a party that uses both the big and small rooms.

I think this inequality matches with _____ because . . .

I think this situation matches with _____ because . . .

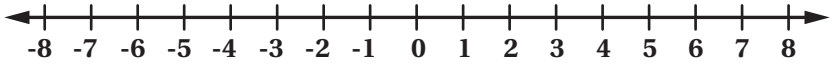
Word bank

English	Español	English	Español	English	Español
at most	costo máximo	cost	costo	flat fee	tarifa fija
at least	al menos	people	personas	small room	sala pequeña
constraint	restricción	party	fiesta	large room	sala grande

Show a Solution

3. **a** Plot a solution to this inequality.

$$2x - 8 > 0$$



Share your response with your classmates.

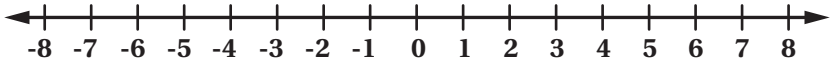
b **Discuss:** Are any of the points incorrect? How do you know?

No, because . . .

Yes, because . . .

4. **a** Plot a solution to this inequality.

$$6x \leq 3x$$



b Explain how you know that your point is a solution (or why there is no solution).
I know _____ is a solution because . . .

5. **a** Lan explains that $6x \leq 3x$ does not have a solution: 6 *of something is always more than* 3 *of the same thing.*

Is Lan's statement correct? Circle one.

Yes No I'm not sure

Show or explain your thinking.

Lan's statement is *correct/incorrect* because . . .

Feed the Sheep

a  **Discuss:** What do you notice and wonder about Kayleen's strategy?

I notice . . .

I wonder . . .

b Describe how Kayleen's work can help her decide which way to shade the solution set on the number line.

Kayleen's work helps her because . . .

Because she tested a value on either side of the boundary point, she can . . .

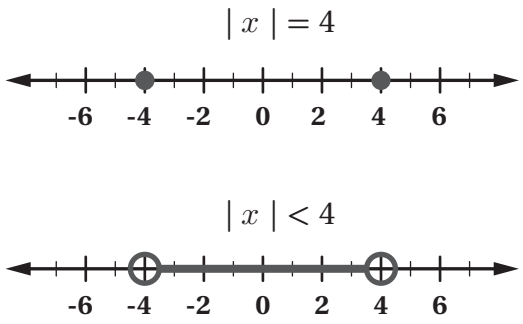
Kayleen knows which way to shade the solution set because . . .

Word bank					
English	inequality	equation	points	shade	boundary point
Español	desigualdad	ecuación	puntos	sombra	punto límite
English	solutions	true	test	left	right
Español	soluciones	verdadero	prueba	izquierda	derecha

Showing Solutions

Complete this Sheet in place of Activity 1, Screen 5 in Digital or in your Student Edition.

Here are all the solutions to $|x| = 4$ and $|x| < 4$.



Discuss: Use these sentence frames as you talk with your partner about how the solutions to $|x| = 4$ and $|x| < 4$ are *alike* and *different*.

- Where do you see . . .?
- Can you show me how . . .?
- What makes you think . . .?
- How does that compare to . . .?
- What I am hearing you say is . . . Is that right?
- I want to add that . . .
- In this case . . .

How are these solutions alike? How are they different?

Alike	Different
The two solutions . . .	The solutions are different because . . .
For both the equation and the inequality, their solutions . . .	The solutions to the equation are . . . The solutions to the inequality are . . . The solutions to the equation . . . , but for the inequality . . .

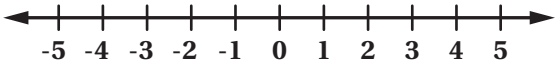
Describing Solutions

Words

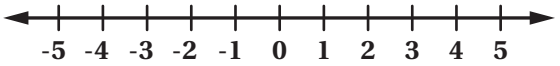
"and" versus "or"

Compound Inequality

$x \geq -1$ **and** $x \leq 4$

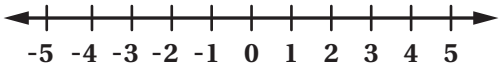


$x \geq -1$ **or** $x \leq 4$



Examples

$|6x + 3| \leq 15$



Connection to Absolute Value Inequalities

Modeling with Inequalities

The _____ statement describes all the bracelets Binta can buy because . . .

The sign in the statement should be $\leq$ /$\geq$ /= because . . .

This statement makes sense because . . .

I agree because . . .

I disagree because . . .

How do you know . . .

Why do you think . . .

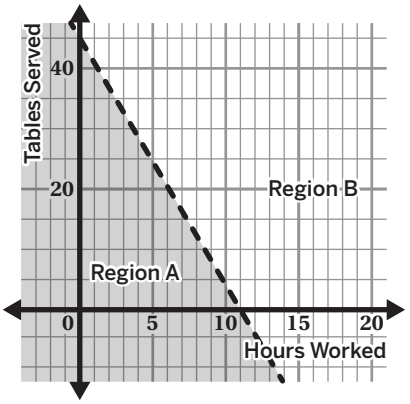
Which Region?

Use this handout to assist you with understanding which region to shade to represent an inequality.

7. Circle the region you chose.

Explain your thinking.

I chose this region because . . .

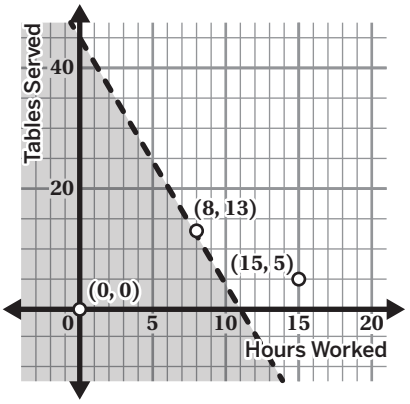


8. Rebecca chose the points $(0, 0)$, $(8, 13)$, and $(15, 5)$.

Discuss:

a. What do you notice about the location of these points?

b. Which of these points are solutions to $16x + 4y \geq 180$?



9. Nathan is graphing the solutions to $x + 2y < 4$.

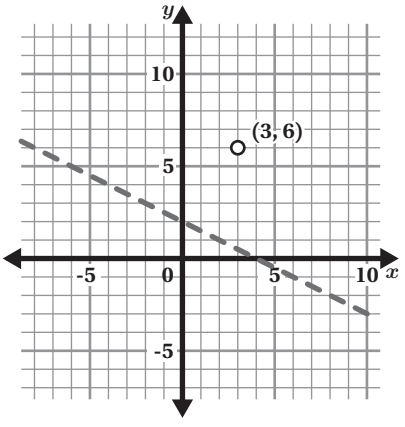
a. **Discuss:** Why is his line dashed?

The line is dashed to show . . .

b. Nathan determined that $(3, 6)$ is *not* a solution. Does he have enough information to graph all the solutions?

Yes or No

Explain your thinking: When the point (3, 6) is substituted into the expression x + 2y, the result is 15. This means. . . the point is not part of the solution



Word bank						
English	region	boundary line	solution(s)	half-plane	greater than	less than
Español	región	línea límite	solución(es)	semiplano	mayor que	menor que

SoundZone Concerts

Use this Sheet as a support when working on Activity 1, Problems 8–10 in your Student Edition.

8. Shade the region on the graph that represents all the solutions to the inequality you wrote. What does the solution mean in this situation?

The solution means . . .

The shaded region represents . . .

9. Are all the solutions to the inequality realistic in this context? Explain your thinking.

All the solutions are/are not realistic because . . .

The only solutions that are realistic are _____ because . . .

Only _____ solutions are realistic because . . .

10. Write a question that the Funk-tions could answer using the graph.

If . . . , how . . . ?

How many concerts do we need to hold if . . . ?

How many tickets do we need to sell if . . . ?

Perspectives

City A wants to build a dam that will make electricity for both cities and store up to 150 billion gallons of water for droughts.

Here are two people that live in City A and City B.

Dalia — City A	Ricardo — City B
Dalia is a farmer in City A. She grows crops on a farm. Her crops are sold to restaurants and stores in City B.	Ricardo lives in an apartment in City B. His water bill has been increasing each year. If City B receives more water, the cost of water will go down.

11. If the dam is going to help both cities, how do you think Dalia and Ricardo may feel about your group's decision from Activity 2? Explain your thinking.

Dalia may feel _____ because she *will / will not* . . .

Ricardo may feel _____ because the dam will . . .

12. How do you think the environment and animals could be affected by the dam?

I think the dam could *cause / create / provide* . . .

13. Should City A build the dam? Why or why not?

Yes / No. City A *should / should not* build the dam because . . .

Word bank						
crops	decrease	drought	electricity	energy	habitat	improve
increase	migration	plants	pollution	reproduction	store	unsure

Words With Multiple Meanings

Draw a picture or write in words to show the meaning of the term *association* that is used in this unit and another meaning of the term.

Math meaning(s)

Description

Example

association

Description

Example

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 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 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, formular hipótesis y modificar 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 . . .

Types of Data

1. Listen to your classmate's statement about the type of data that the question "Do you live within 2 miles of a grocery store?" would produce. Think about it! Does their response make sense mathematically?
2. Choose your position and decide whether you agree with their statement, disagree with their statement, or have questions about their statement.
3. Show or describe your thinking in writing. Use pictures, diagrams, words, and/or numbers to support your thinking.
4. Be prepared to defend your position.

I agree with my classmate's statement.	**The statement makes sense mathematically because . . .**
I disagree with my classmate's statement.	**The statement does not make sense mathematically because . . .**
I am not sure. I have questions about my classmate's statement.	**My question is . . .**

Hearing Loss and Age

6. Adhira says: Out of all the people who are over the age of 18 in Metropolis, about 19% of them already have hearing loss, so the trains aren't going to make a big difference.
Do you agree or disagree with Adhira? Explain your thinking.

I *agree / disagree* with Adhira because . . .

7. Based on this data, do you think there is an association between the city that people live in and hearing loss? Circle one.

Yes or No

Explain your thinking.

There *is / is not* an association between city and hearing loss because . . .

8. Should this data cause the people of Metropolis to act?

I think this data _____ cause people to act because . . .
(will / will not)

9. Hearing loss is one impact that trains might have on the population of Metropolis.
What are some other impacts that trains might have on the population of Metropolis?

The trains could impact . . .

Another impact the trains could have is . . .

Word bank			
English	**Español**	**English**	**Español**
city	ciudad	property value	valor de la propiedad
community	comunidad	residents	residentes
hearing loss	pérdida de audición	train	tren
impact	impacto	variables	variables
people	gente	wildlife	vida silvestre

Closing Arguments

One middle schooler and one high schooler decided to talk to the principal about what the school should choose.

Kayleen (a middle schooler) said: *The school should build a basketball court because it's the most popular across the whole school.*

Mariam (a high schooler) said: *High school students have been here the longest, and we think a picnic area would benefit the entire school the most.*

Write: Use these sentence frames to create a first draft written response.

13. Imagine you want to convince the principal which choice the school should make. Write an argument using data, reasoning, and your personal preference about what choice the school should make.

I would choose _____ because _____.

Based on _____, this would be a great choice.

Plus, I think _____

14. What is a decision that your school is trying to make? How might a two-way frequency table help you make this decision?

My school is trying to decide _____.

A two-way frequency table might be helpful because _____.

Discuss: Use these sentence frames as you talk with your partner to create a stronger and clearer second draft.

Your explanation tells me . . .

Can you say more about why . . .

A detail (or word) you could add is _____, because . . .

Is it always true that . . .?

That could be true because . . .

That could not be true because . . .

Histograms

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

8. What is true about Kwame's claim? What is misleading?

It is true that a bin width _____ all ratings.

It is misleading that people _____ the dentist equally.

8. What is true about Kwame's claim? What is misleading?

It is true that a bin width _____ all ratings. The ratings are _____ into equal _____.

It is misleading that people _____ the dentist equally because if you change the bin width _____.

Word bank							
English	bin width	data	split	halves	ratings	fifths	tenths
Español	ancho del contenedor	datos	dividirse	mitades	calificaciones	quintos	decenas

8. What is true about Kwame's claim? What is misleading?

It is true that _____.

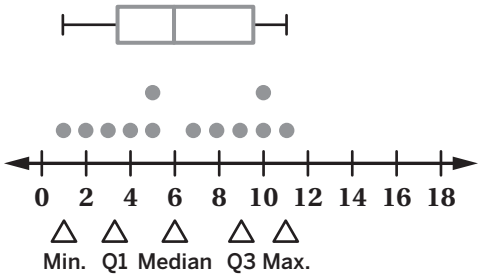
It is misleading that _____.

Comparing

5. Here is a dot plot and a box plot for the number of rainy days for each month in Charleston in 2021.

Bao says: *In half of the months of the year, Charleston had at least 6 rainy days*.

Number of Rainy Days Each Month (Charleston 2021)



a. **Discuss:** How can the box plot help you know that Bao's statement is true?

Bao's statement is true because . . .

b. Write *two* more true statements that can be determined from the dot plot or box plot.

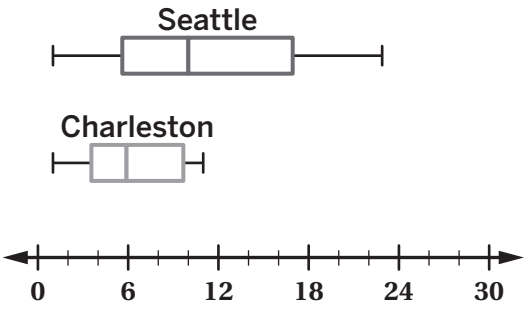
The box plot tells us . . .

Based on the dot plot, the rainiest month . . .

6. Here are two box plots showing the number of rainy days for each month in Seattle and Charleston in 2021.

Use the box plots to help Bao convince Mia that Seattle is the rainier city.

Number of Rainy Days Each Month (2021)



Seattle is the rainier city because . . .

In Seattle . . .

In Charleston . . .

Word bank			
English	**Español**	**English**	**Español**
minimum	mínimo	less than	menor que
maximum	máximo	more	más
median	mediana	less	menos
mean	medio	rainy	lluvioso
greater than	mayor que	days	días

Polygraph

Is it _____?

Does it have _____?

Are there more on the _____?

Is the graph _____?

Are the ends _____?

Is there a _____?

Is the _____?

Does it look like _____?

Word bank			
English	**Español**	**English**	**Español**
bell-shaped	en forma de campana	minimum	mínimo
bimodal	bimodal	shape	forma
maximum	máximo	skewed	asimétrico
mean	medio	symmetric	simétrico
median	mediana	uniform	uniforme

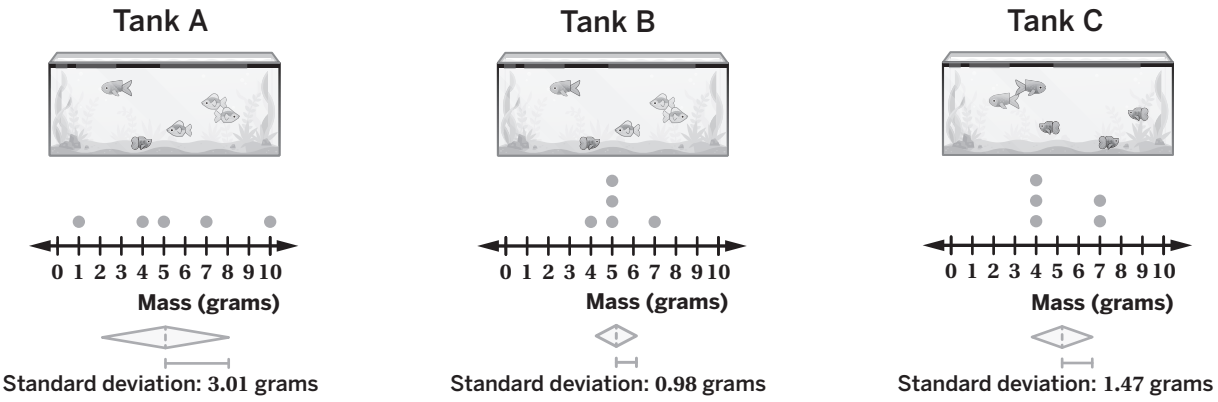
Measures of Center

1. Listen to your classmate's statement about the measure of center. Think about it! Does their response make sense mathematically?
2. Choose your position and decide whether you agree with their statement, disagree with their statement, or have questions about their statement.
3. Show or describe your thinking in writing. Use pictures, diagrams, words, and/or numbers to support your thinking.
4. Be prepared to defend your position.

I agree with my classmate's statement.	**The statement makes sense mathematically because . . .**
I disagree with my classmate's statement.	**The statement does not make sense mathematically because . . .**
I am not sure. I have questions about my classmate's statement.	**My question is . . .**

Introduction to Standard Deviation

4. One way to determine the consistency of data is to calculate the **standard deviation**, which is a **measure of spread**. Here are three different fish tanks.



Explain what you think standard deviation measures.

In Tank A, the standard deviation is _____. The dot plot shows . . .

In Tank B, the standard deviation is _____. The dot plot shows . . .

In Tank C, the standard deviation is _____. The dot plot shows . . .

When the standard deviation is small, the dot plot values . . .

When the standard deviation is large, the dot plot values . . .

I think the standard deviation measures _____ because . . .

Word bank			
English	**Español**	**English**	**Español**
apart	separado	small	pequeño
close	cerca	spread	dispersión
data	datos	standard deviation	desviación estándar
dot plot	diagrama de puntos	values	valores
large	grande	weight	peso

Portland vs. Phoenix

I think _____ is hotter because the _____ tells me _____.

In my opinion, _____.

I noticed _____, so I think _____ is hotter.

It looks like . . .

I know because . . .

The _____ suggests that the temperature in _____ is _____.

Word bank			
English	**Español**	**English**	**Español**
maximum	máximo	standard deviation	desviación estándar
mean	media	statistic	estadística
median	mediano	temperature	temperatura
minimum	mínimo		

Which Statistic?

1. Listen to your classmate's statement about who they would give the Best Overall Car award to. Think about it! Does it make sense mathematically?
2. Choose your position and decide whether you agree with the statement, disagree with the statement, or have questions about the statement.
3. Show or describe your thinking in writing. Use pictures, diagrams, words, and/or numbers to support your thinking.
4. Be prepared to defend your position.

I agree with my classmate's statement.	**The statement makes sense mathematically because . . .**
I disagree with my classmate's statement.	**The statement does not make sense mathematically because . . .**
I am not sure. I have questions about my classmate's statement.	**My question is . . .**

Outliers and Their Effects

1. Listen to your classmate's statement about whether you should use the mean for the typical score. Think about it! Does it make sense mathematically?
2. Choose your position and decide whether you agree with the statement, disagree with the statement, or have questions about the statement.
3. Show or describe your thinking in writing. Use pictures, diagrams, words, and/or numbers to support your thinking.
4. Be prepared to defend your position.

I agree with my classmate's statement.	**The statement makes sense mathematically because . . .**
I disagree with my classmate's statement.	**The statement does not make sense mathematically because . . .**
I am not sure. I have questions about my classmate's statement.	**My question is . . .**

Minimum Wages

Use this Sheet as a support when working on Activity 1, Problems 6 and 7 in your Student Edition.

6. Help Omari answer: *How has the minimum wage in the United States changed over time?* Use statistics about center and spread to support your ideas.

The minimum wage in the United States has _____ from 2010 to 2024 because . . .

The minimum wages in 2024 are _____ spread out because . . .

Since 2010, the median minimum wage . . .

Since 2010, the IQR of the minimum wage . . .

Since 2010, the mean minimum wage . . .

Since 2010, the standard deviation of the minimum wage . . .

7. **Discuss:** Did the minimum wage change in the ways you expected or were you surprised?

A statistic that changed was _____, which means _____.

I was surprised that . . .

Word bank			
English	**Español**	**English**	**Español**
increased	aumentado	spread	dispersión
decreased	disminuido	minimum	mínimo
smaller	mas pequeño	maximum	máximo
larger	más grande		

The r-value

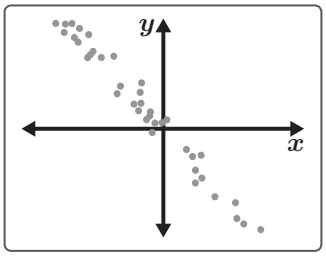
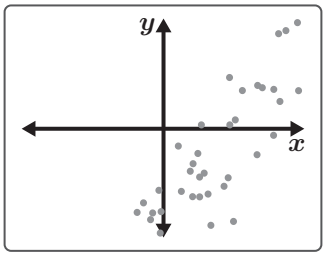
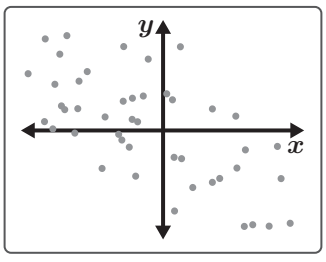
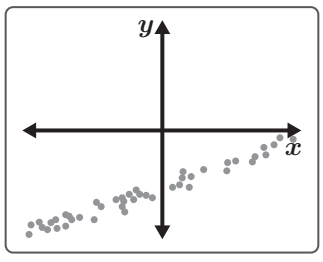
5. The ***r*-value** is a number that measures the strength and direction of a linear association.

What do you notice and wonder about the r-value?

I notice . . .

I wonder . . .

6. Match each scatter plot to its r-value. Then use the words from the word bank to describe the strength and direction of each scatter plot.

-0.99	-0.65	0.86	0.99
			
			

Word bank				
English	negative	positive	strong	weak
Español	negativo	positivo	fuerte	débil

Including Income

Use this Sheet to support you as you complete Screens 7 and 8 in Activity 2.

7. Laila wonders: *Is there an association between income and tree cover?*

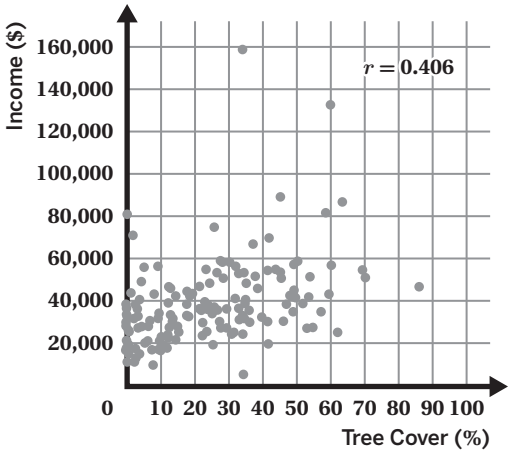
a Make a prediction: What kind of association do you expect between these variables? (e.g., weak positive or strong negative.)

I think there will be a _____ association because . . .

b Let's look at the data. **Discuss:** Was your prediction correct?

My prediction was _____ because . . .
(correct / incorrect)

8. This graph shows the average income and the percentage of tree cover for 150 blocks in Philadelphia.



What does the r-value say about the association between income and tree cover?

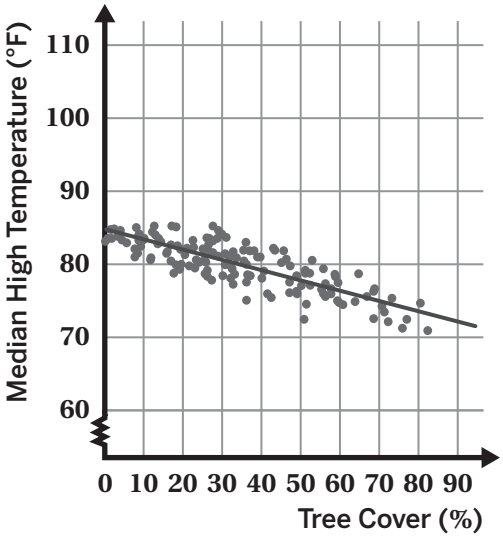
It looks like there is a _____ association between income and tree cover.

Word bank				
English	weak	strong	negative	positive
Español	débil	fuerte	negativo	positivo

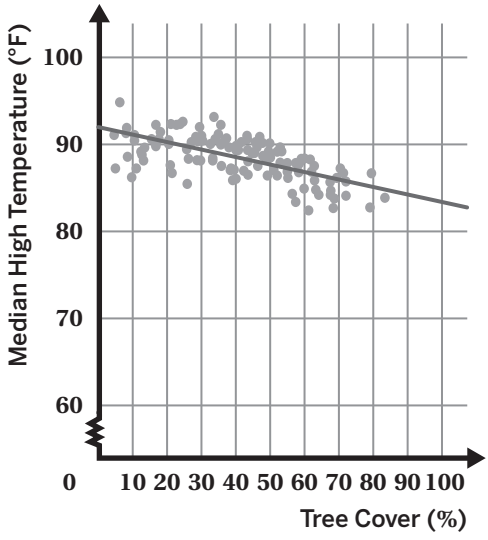
Interpreting in Context

What do the slope and y-intercept mean about the relationship between temperature and tree cover for each city?

Detroit: $y = -0.14x + 84.58$



Austin: $y = -0.08x + 92.07$



-0.14 means that . . .

As the tree cover _____ , the median temperature _____.

84.58 would be the . . .

If there was _____ tree cover then _____.

Word bank	
English	**Español**
decrease	disminuir
increase	aumentar
less	menos
median high temperature	temperatura media alta
more	más
tree cover	cubierta arbórea

Residual Plots

When the line fits the data well, the points on the residual plot are . . .

When the line doesn't fit the data well, the points on the residual plot are...

Word bank	
English	**Español**
above	arriba
below	debajo
close	cerca
far	lejos
line	línea
point	punto

I agree/disagree because . . .

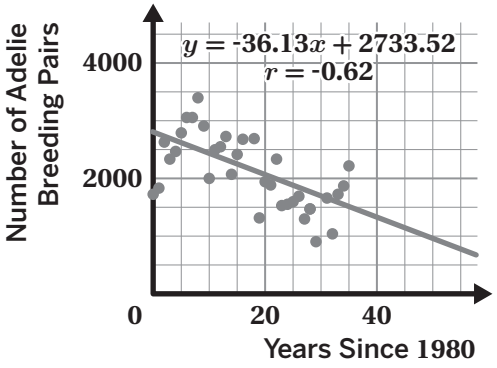
Why do you think . . . ?

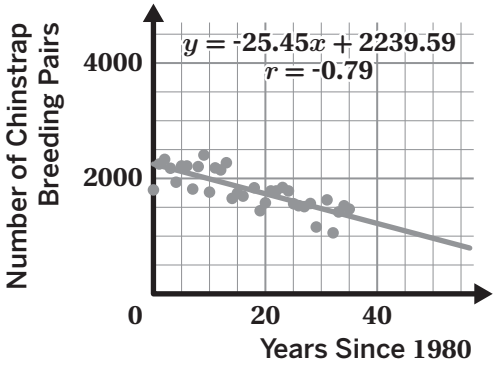
How do you know . . .?

I see your point, but . . .

Generating a Line of Best Fit

Compare the data of these two penguin populations.





Write: How are they alike? How are they different? *Consider adding more to each category than what is provided in each category.*

Alike	Different
Both populations are . . .	The data are different because . . .
They both started with . . .	The relationship between population and time is different because . . .
Both of the r-values and slopes are . . .	According to the line of best fit, . . .

Discuss:

- Where do you see . . .?
- Can you show me how . . .?
- What makes you think . . .?
- How does that compare to . . .?
- What I am hearing you say is . . . Is that right?
- I want to add that . . .
- In this case . . .

Correlation, Yes. But Causation?

1. Read aloud the two headlines for the given data and think about which headline you believe is more accurate. Which one makes more sense?
2. Choose which headline you think is more accurate, or if you have questions about the headlines.
3. Show or describe your thinking in writing. Use pictures, diagrams, words, and/or numbers to support your thinking.
4. Be prepared to defend your position.

I think headline A is more accurate.	**Headline A is more accurate because . . .**
I think headline B is more accurate.	**Headline B is more accurate because . . .**
I am not sure. I have questions about the two headlines.	**My question is . . .**

Interview a Classmate

Step 1: Select and Ask Your Question

A. What variables did you choose? What about those variables is interesting?

B. What relationship did you see? What statistics support that?

C. Were the results what you expected or were you surprised?

D. Do you think one of your variables causes the other? Are there other variables that might be affecting this relationship?

E. How might your city or town use the information about the relationship you studied?

F. What other questions do you have about the data?

Step 2: Listen and Take Notes

Interview Process

A. I chose the variable _____.
This variable was interesting because _____.

B. The relationship I saw was _____.
The statistic that supports this is _____.

C. I expected _____.
I was surprised that _____.

D. I think _____.

E. I think my city _____.

F. What does _____?
How does _____?

How do you know . . .?

Why do you think . . .?

What happened between _____ and _____?

Is it always true that . . .?

How did you get . . .?

Step 3: Share your response

Step 4: Ask other questions or comments to continue conversation.

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 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 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 . . .

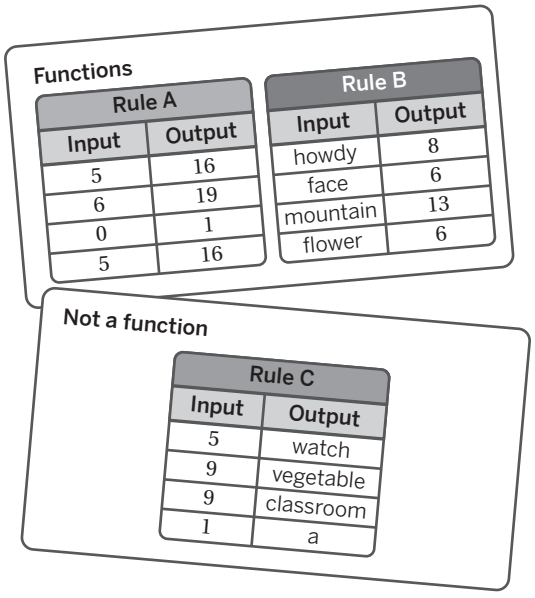
What Is a Function?

Rules A and B are examples of a *function*.

Rule C is *not* a function.

What do you think makes Rule C not a function?

I think Rule C is not a function because. . .



Rule C is not a function because. . .

For example. . .

Word bank				
English	input	output	rule	function
Español	entrada	salida	regla	función

Prizing Pizzas

Critique: Use these sentence frames as you discuss what is correct in Luca's work.	
• Luca is correct in . . . • It looks like Luca thought that _____ represents . . .	• Luca's method works because . . .
Correct: Use these sentence frames as you discuss what is incorrect or unclear in Luca's work.	
• Luca is incorrect in . . . • Another strategy would be _____ because . . .	• Luca's method doesn't work because . . .
Clarify: Use these sentence frames as you create a question for how Luca's work can be improved or create a revised response.	
• Is there another way to say/do . . .? • How can Luca use . . .?	• Luca should . . .

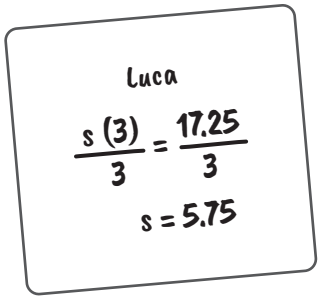
On the previous problem, Luca said:

s times 3 is 17.25, so a small pizza with 3 toppings will cost $5.75.

What would you say to help him understand his mistake?

Luca thinks that . . .

When reading the statement . . .



Writing Equations of Functions

I think Kimaya is correct because . . .

I think Kimaya is incorrect because . . .

Kimaya's function shows . . .

Tariq's function shows . . .

Kimaya's statement is true because . . .

Kimaya's statement is not true because . . .

Word bank					
English	exponent	base	width	equation	bow tie
Español	exponente	base	ancho	ecuación	corbata de moño

Cannon Person

I notice that the graph _____.

I notice that _____ is connected to _____ in the graph.

_____ corresponds to _____.

To be more precise, the graph _____.

Another way to show _____ is _____.

How else could we show this?

Word bank	
English	**Español**
rate of change	tasa de cambio
up	arriba
down	abajo
height	altura
increasing	creciente
decreasing	decreciente
maximum	máximo
parabola	parábola
linear	lineal
slope	pendiente

Build It

This graph could be Latifa's because . . .

This graph cannot be Latifa's because . . .

I notice this graph _____ so it could/cannot be Latifa's because . . .

These graphs are always positive because . . .

I know these graphs have a maximum at $(2, 4)$ because . . .

Word bank								
English	above	below	highest	lowest	maximum	negative	point	positive
Español	arriba	abajo	el más alto	el más bajo	máximo	negativo	punto	positivo

Arjun's Automobile Trip

At first, Arjun was _____.

Then he _____ to _____.

He stayed there for _____ and then _____.

Arjun finished the trip by _____.

What did you mean when you said _____?

Where on the graph do you see _____ part of your story?

Can you point to the part of the graph where Arjun was _____?

What parts of each of our stories are alike? What parts are different?

Comparing Graphs by Key Features

Discuss: Use these sentence frames as you talk with your partner about how your strategy to calculate the average rate of change for Polina and Nekeisha compared to their strategy.

Where do you see . . .?

Can you show me how . . .?

What makes you think . . .?

How does that compare to . . .?

What I am hearing you say is . . . Is that right?

I want to add that . . .

In this case . . .

Write: How are these strategies alike? How are they different?

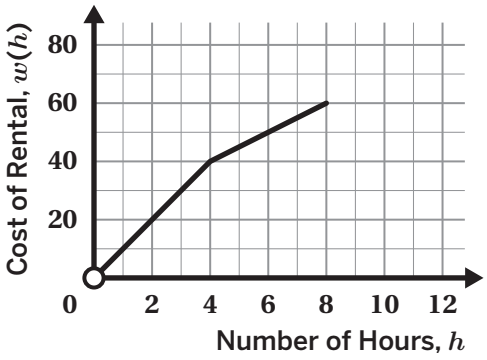
Alike	Different
• One thing that is the same is . . .	• One thing that is different is . . .
• Both of our strategies are alike because . . .	• My partner used _____ method to determine . . .

Word bank					
English	**Español**	**English**	**Español**	**English**	**Español**
average rate of change	tasa de cambio promedio	slope triangle	triángulo de pendiente	faster	más rapido
ordered pairs	pares ordenados	graph	gráfica	slower	más lento
slope	pendiente	time	tiempo	intuition	intuición

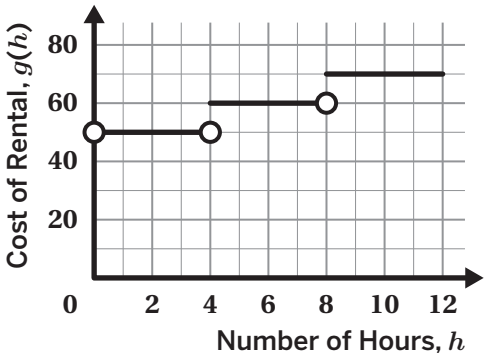
What About the Outputs?

Two bike rental companies decided to graph the cost of a bike as a function of time. The functions $w(h)$ and $g(h)$ represent the cost of a bike rental for h hours.

Wheels-R-Us



Gears-2-Go



9. The set of all possible outputs of a function is called the **range**. How would you describe the range of each function?

	$w(h)$	$g(h)$
What are some values in the range for this function?		
How would you make sense of this in context?		
Describe the range for this function.		

Distinguishing Domain and Range

1. Listen to your classmate's statement about whether Ali or Shanice is correct. Think about it! Does their response make sense mathematically?
2. Choose your position and decide whether you agree with their statement, disagree with their statement, or have questions about their statement.
3. Show or describe your thinking in writing. Use pictures, diagrams, words, and/or numbers to support your thinking.
4. Be prepared to defend your position.

I agree with my classmate's statement.	**The statement makes sense mathematically because . . .**
I disagree with my classmate's statement.	**The statement does not make sense mathematically because . . .**
I am not sure. I have questions about my classmate's statement.	**My question is . . .**

Restrict the Domain and Range

I chose _____ because _____.

I know _____ is correct because _____.

_____ makes sense because _____.

Why do you think _____?

I see your point, but _____.

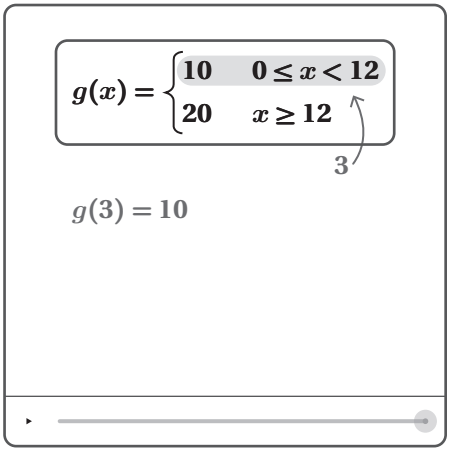
When you say _____, it makes me think about _____.

I agree/disagree with you because _____.

Evaluating Piecewise-Defined Functions

Let's watch what Abdel did to determine $g(3)$.

Abdel



a **Discuss:** How would you describe Abdel's strategy?

It looks like . . .

I notice that . . .

I wonder if . . .

Let's try . . .

A quantity that varies is . . .

What do you notice?

What other details are important?

Where do you see . . .?

Can you show me how . . .?

What makes you think . . .?

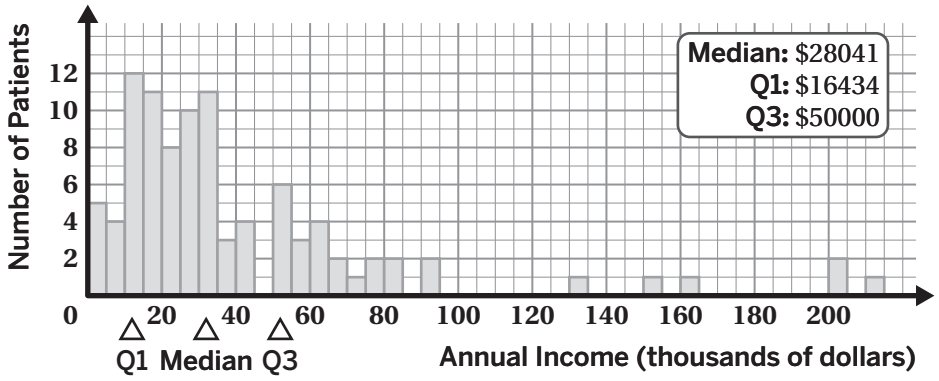
b **Write:** Describe how to use Abdel's strategy to determine $g(35)$.

To determine ....., using Abdel's strategy I would need to . . .

Word bank					
English	input	output	x-value	equation	interval
Español	entrada	salida	valor x	ecuación	intervalo

Dr. Remy

10. This histogram shows the annual incomes of Dr. Remy's patients.



- Analyze the histogram.
- Describe how switching from a $50 flat fee to the plan you chose could impact patients of different incomes.
- Describe how switching could impact Dr. Remy's office.

Stronger and Clearer Each Time: Use Steps 1–3 as you write a response.

Step 1: Write a first draft.

Plan _____ offers _____.

Switching from a $50 flat fee would impact _____.

Dr. Remy's office will be affected because _____.

Step 2: Meet with a partner to discuss your first draft.

How do you know that _____?

What do you mean when you say _____?

How could you support your response?

Step 3: Write a second draft that is stronger and clearer.

Word bank	
English	**Español**
cheaper	más barato
different	diferente
expensive	caro
equal	igual
income	ingreso
less than	menor que
money	dinero
more than	mayor que
payment	pago

Sequences as Functions

A sequence's *recursive definition* is made up of its first term and rule.

Here are some recursive definitions.

$5, 7, 9, 11, 13$	$10, 6, 2, -2, -6$	$80, 40, 20, 10, 5$
First Term: 5 Rule: Constant difference of 2	First Term: 10 Rule: Constant difference of -4	First Term: 80 Rule: Constant ratio of 0.5

Here is how we write these rules using function notation

$f(n) = \begin{cases} 5 & n = 1 \\ f(n-1) + 2 & n \geq 2 \end{cases}$	$f(n) = \begin{cases} 10 & n = 1 \\ f(n-1) + (-4) & n \geq 2 \end{cases}$	$f(n) = \begin{cases} 80 & n = 1 \\ f(n-1) \cdot 0.5 & n \geq 2 \end{cases}$

What do you notice? What do you wonder?

I notice...

I wonder...

Discuss: What does $f(n-1)$ mean?

$f(n-1)$ means _____.

Discuss: What does $f(n-1)+2$ mean?

$f(n-1)+2$ means you take the value of the term before it and _____.

Discuss: What does $f(n-1)+(-4)$ mean?

$f(n-1)+(-4)$ means you take the value of the term before it and _____.

Discuss: What does $f(n-1) \cdot 0.5$ mean?

$f(n-1) \cdot 0.5$ means you take the value of the term before it and _____.

Recursive and Explicit

To write the recursive definition, I . . .

To write the explicit definition, I . . .

First, I _____. Then, I _____.

An error someone might make when writing definitions of sequences is . . .

Word bank	
English	**Español**
arithmetic	aritmética
constant difference	diferencia constante
constant ratio	razón constante
first term	primer término
function	función
geometric	geométrico
pattern	patrones
previous term	término anterior
sequence	secuencia
term	término

Absolute Value Functions

This function gives the score because . . .

I chose _____ because . . .

_____ makes sense because . . .

I (agree / disagree) because . . .

Why do you think _____?

How do you know _____?

I see your point, but . . .

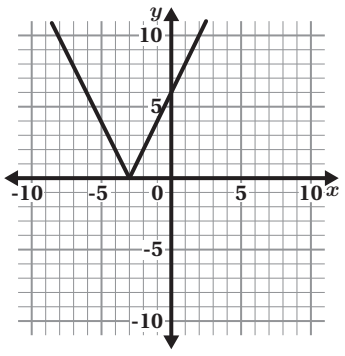
When you say _____, it makes me think . . .

More Graphs of Absolute Value Functions

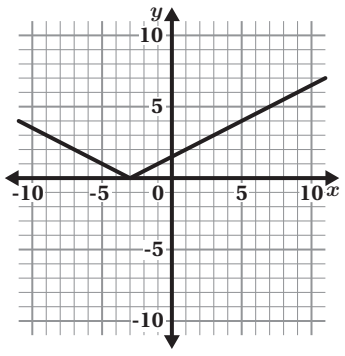
Complete this Sheet in place of Activity 3, Screen 11 in the digital activity or in your Student Edition.

Laila and Bao graphed two different absolute value functions.

Laila graphed $h(x) = 2|x + 3|$.



Bao graphed $k(x) = \frac{1}{2}|x + 3|$.



Discuss: How are the two absolute value functions and their graphs alike? How are they different? Use the word bank to help with your comparison.

Word bank			
English	**Español**	**English**	**Español**
minimum	mínimo	narrow	estrecho
maximum	máximo	wide	ancho
domain	dominio	x-value	valor x
range	rango	y-value	valor y

How do Laila's and Bao's functions and graphs compare to the function and graph for $m(x)$ on Screen 10?

All of the functions . . .

All of the graphs . . .

Compared to the graph of $m(x)$ on Screen 10, Laila's graph . . .

Compared to the graph of $m(x)$ on Screen 10, Bao's graph . . .

How does the coefficient in front of the absolute value affect the graph of the function?

When the coefficient is greater than ____, the graph is _____ than the original function.

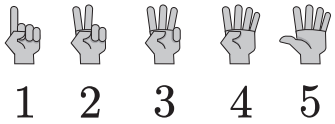
When the coefficient is between ____ and ____, the graph is _____ than the original function.

Storytime

Complete this Sheet in place of Activity 1, Problems 6 and 7 in your Student Edition.

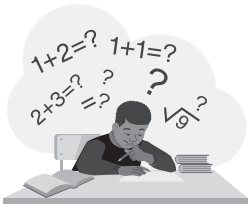
Faaria is another student in Adrian's class. She shared these moments from her math story:

- My earliest math experience was when I was at daycare. We counted with our fingers.

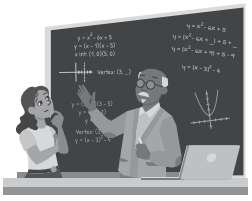


- In 2nd grade, I loved playdough. I liked to make smaller shapes and put them together to make complicated pieces.

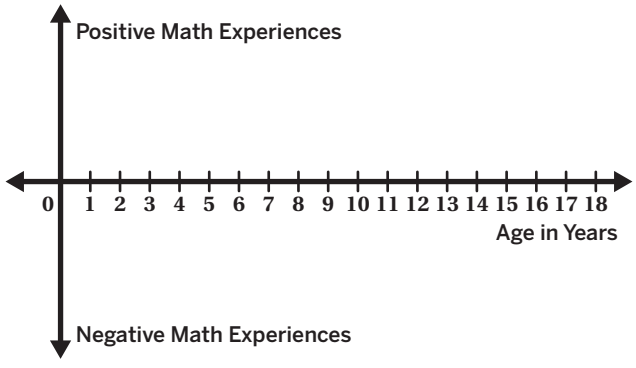
- In middle school, my experiences changed when my classes got harder. I had no idea what was going on. Sometimes, it was hard to show up and take notes.



- In high school, math was difficult for me, but my experiences were generally positive.



6. Sketch a graph that could represent Faaria's story.



Storytime (continued)

7. Use the vocabulary you've learned in this unit to compare your graph with a classmate's.

Word bank			
English	**Español**	**English**	**Español**
maximum	máximo	domain	dominio
minimum	mínimo	range	rango
positive	positivo	interval	intervalo
negative	negativo	increasing	creciente
slope	pendiente	decreasing	decreciente

Discuss: How are your graphs the same? How are they different?

Inverse Challenges, Challenging Inverses

Jin is (correct / incorrect) because . . .

I (agree / disagree) with Jin because . . .

Word bank	
English	Español
inverse	inverso
x-intercept	intersección con el eje x
y-intercept	intersección con el eje y
function	función
line	línea
point	punto

I (agree / disagree) because . . .

Why do you think . . . ?

How do you know . . .

I see your point, but . . .

When you say . . . , it makes me think . . .

Inverse Machines

Latifa is correct because . . .

Irene is correct because . . .

Both are correct because . . .

Neither is correct because . . .

Word bank	
English	**Español**
inverse	inverso
add	sumar
subtract	sustraer
function	función
multiply	multiplicar
divide	dividir
input	entrada
output	salida

I (agree / disagree) because . . .

Why do you think . . . ?

How do you know . . .

I see your point, but . . .

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 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 . . .

Shape Puzzle Strategies

Using Jayden's first step, I can determine _____.

Once I know _____, I can determine _____.

Jayden's first step is helpful in solving the puzzle because . . .

Word bank	
English	**Español**
column	columna
equal	igual
flower	flor
heart	corazón
row	fila
solution	solución
sum	suma
substitute	sustituir
star	estrella
value	valor

Elimination

1. Listen to your classmate's statement about whose strategy is correct. Think about it! Does it make sense mathematically?
2. Choose your position and decide whether you agree with the statement, disagree with the statement, or have questions about the statement.
3. Show or describe your thinking in writing. Use pictures, diagrams, words, and/or numbers to support your thinking.
4. Be prepared to defend your position.

I agree with my classmate's statement.	**The statement makes sense mathematically because . . .**
I disagree with my classmate's statement.	**The statement does not make sense mathematically because . . .**
I am not sure. I have questions about my classmate's statement.	**My question is . . .**

First Steps of Elimination

Diego's first step was . . .

Diego

$x + 2y = 11$
$4x + y = 2$

$\rightarrow$

$x + 2y = 11$
$8x + 2y = 4$

Next, Diego . . .

$x + 2y = 11$
$-(8x + 2y = 4)$
$-7x = 7$
$x = -1$

Finally, Diego . . .

Next, I think Diego should . . .

Word bank					
English	**Español**	**English**	**Español**	**English**	**Español**
add	agregar	multiply	multiplicar	solve	resolver
equation	ecuación	substitute	sustituir		
equivalent	equivalente	subtract	sustraer		

Original System

$x + 2y = 11$
$4x + y = 2$

New system

$x = -1$
$x + 2y = 11$

Ariel created the first equation . . .

Both systems will have the same solution . . .

Practicing Substitution

My first step for solving System A / B / C would be...

I would use substitution / elimination to solve System A / B / C because...

Substitution / Elimination works best for this system because...

To use substitution / elimination I would have to...

The first / second equation in the system should be...

Word bank	
English	**Español**
add	sumar
eliminate	eliminar
elimination	eliminación
equation	ecuación
first	primero
isolate	aislar
multiply	multiplicar
second	segundo
substitute	sustituir
substitution	sustitución
solve	resolver
step	paso
subtract	sustraer
system	sistema
variable	variable

Graphing Systems

1. Read Jaleel's and Irene's claims. Decide whose claim is correct.
2. Justify your thinking. Use pictures, diagrams, words, and/or numbers to support your thinking.
3. Be prepared to defend your position.

I think Jaleel's claim is *correct / incorrect*.	**Jaleel's claim *makes sense / does not make sense* because...**
I think Irene's claim is *correct / incorrect*.	**Irene's claim *makes sense / does not make sense* because...**
I am not sure. I have questions about Jaleel's and Irene's claims.	**My question is...**

Comparing Proposals

An advantage of building apartments / houses is . . .

A disadvantage of building apartments / houses is . . .

Apartments / Houses allow . . .

Apartments / Houses could _____ because . . .

The city should consider _____ because . . .

Word bank					
English	**Español**	**English**	**Español**	**English**	**Español**
advantage	ventaja	environment	ambiente	more	más
animals	animales	families	familias	people	gente
apartment	apartamento	green space	espacio verde	plants	plantas
cause	causa	habitat	hábitat	plot of land	parcela de tierra
community	comunidad	house	casa	pollution	polución
cost	costo	improve	mejorar	proposal	propuesta
decrease	disminuir	increase	aumentar	same	igual
disadvantage	desventaja	less	menos	space	espacio

Making Recommendations

7. Which configuration would you recommend for Bus Line 1? Circle one.

Configuration A Configuration B Configuration C Configuration D

Explain your thinking.

This configuration makes sense for Bus Line 1 because . . .

8. Which configuration would you recommend for Bus Line 2? Circle one.

Configuration A Configuration B Configuration C Configuration D

Explain your thinking.

This configuration makes sense for Bus Line 2 because . . .

9. **Discuss:** What else should the MTA consider when choosing a configuration for a bus line?

- I've noticed that . . .
- I wonder about . . .
- More information could be found by . . .

Word bank

English	Español	English	Español	English	Español
children	niños	persons with disabilities	personas con discapacidad	shopping	compras
crowded	concurrido	longer time	más tiempo	sitting	sentado
elderly	anciano	luggage	equipaje	standing	de pie
empty	vacío	shorter time	menos tiempo	travel	viaje

Repeated Challenges

Use this sheet to help you explain what Adah's work says about the system of equations.

Adah tried to light up these lines with one zap:

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

Adah

$y = 3x + 4$ $\qquad$ $y = 3x - 2$

$3x + 4 = 3x - 2$

$3x + 6 = 3x$

$6 = 0$

The equations have the same _____ but different _____.

The equations tell me that the graphs of the lines are:

A. different lines that meet at one point.

B. the same line that overlaps everywhere.

C. parallel lines that never intersect.

When Adah solves correctly but runs into a false statement, it means there are/is :

A. infinitely many solutions.

B. no solution.

C. one solution.

What does her work say about this system of equations?

This means that . . .

Sai's Quilt

The white region

A point in this region means the quilt . . .

The blue region

A point in this region means the quilt . . .

What does it mean when the point is in this region?

The red region

A point in this region means the quilt . . .

The red and blue region

A point in this region means the quilt . . .

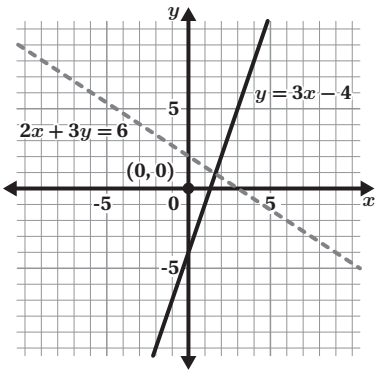
Word bank					
English	**Español**	**English**	**Español**	**English**	**Español**
constraint	restricción	large	grande	small	pequeño
cost	costo	quilt	colcha		
expensive	caro	size	tamaño		

Where Is the Solution Region?

7 Terrance is trying to graph the solutions to this system of inequalities. First, he tests the point $(0, 0)$.

$2x + 3y > 6$
$y \geq 3x - 4$

Dashed Line	Solid Line
$2(0) + 3(0) > 6$	$0 \geq 3(0) - 4$
$0 + 0 > 6$	$0 \geq 0 - 4$
$0 > 6$	$0 \geq -4$
False!	True!



Discuss: What can Terrence do next to determine the solution region?

I think Terrance could . . .

Since . . .

Then he could . . .

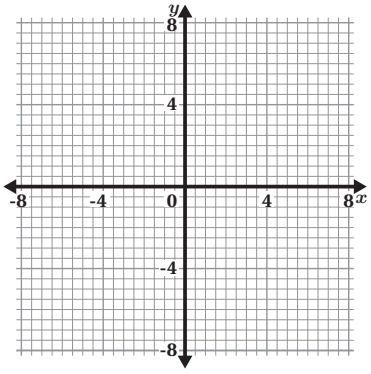
Critique: Use these sentence frames as you discuss what is correct in Terrance's work.	
• Terrance is correct in _____. • It looks like Terrance thought that _____ represents _____.	• Terrance's first step works because _____.
Correct: Use these sentence frames as you discuss what is incorrect or unclear in Terrance's work.	
• Terrance is incorrect in_____. • Another strategy would be _____ because _____.	• Terrance's method doesn't work because _____.
Clarify: Use these sentence frames as you create a question for how Terrance's work can be improved or create a revised response.	
• How can Terrance use _____?	• Terrance should _____.

Rounds of Systems

Round 1

My inequality: _____

My partner's inequality: _____



What is one solution to the system? _____

Show or explain your thinking.

The strategy I used was . . .

First, I . . .

Next, I . . .

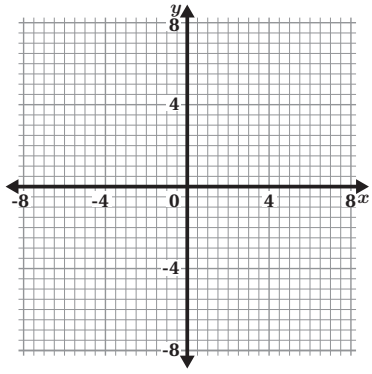
I noticed . . .

I determined that the solution was _____ because . . .

Round 2

My inequality: _____

My partner's inequality: _____



What is one solution to the system? _____

Show or explain your thinking.

The strategy I used was . . .

First, I . . .

Next, I . . .

I noticed . . .

I determined that the solution was _____ because . . .

Word bank								
English	inequalities	intersect	point	solution region	substitute	test	true	false
Español	desigualdades	intersecarse	punto	región solución	sustituir	prueba	verdadero	falso

Meal Prep

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

Decide if you think Liam is correct or incorrect. Then complete the sentences to help explain your thinking.

I think Liam is _____ because the amount of _____ meals
(correct / incorrect) *(vegetarian / non-vegetarian / both)*
_____ located in the _____ region of the graph.
(are / are not) *(overlapping / non-overlapping)*

Decide if you think Liam is correct or incorrect. Then complete the sentences to help explain your thinking.

I think Liam is *(correct / incorrect)* because the _____ created by the number of vegetarian and non-vegetarian meals *(is / is not)* located within the _____. This means that to meet the _____, the number of *(vegetarian / non-vegetarian / both)* meals needs to be located *(inside / outside)* of the _____ region of the _____ graph.

Word bank					
constraints	meals	solution region	ordered pair	overlapping	system of inequalities

Decide if you think Liam is correct or incorrect. Then complete the sentences to help explain your thinking.

I think Liam is _____ because . . .

Word bank						
correct	incorrect	meals	non-vegetarian	ordered pair	system of inequalities	vegetarian

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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 . . .

Doubles Every Hour

$m = 25 \cdot 2^t$

Time (hours)	Mass (grams)
0	25
1	50
2	100
3	200
4	400
5	800

In the table, 2 is _____.

In the equation, 2 is _____.

In the table, 25 is _____.

In the equation, 25 is _____.

The t in the equation represents . . .

The m in the equation represents . . .

Word bank						
English	base	fish	grams	initial value	mass	time
Español	base	pescado	gramos	valor inicial	masa	tiempo

Comparing Growth

1. Read Fabiana's and Lukas's claims. Decide whose claim is correct.
2. Justify your thinking. Use pictures, diagrams, words, and/or numbers to support your thinking.
3. Be prepared to defend your position.

I think Fabiana's claim is correct / incorrect.	**Fabiana's claim *makes sense / does not make sense* because . . .**
I think Lukas's claim is correct / incorrect.	**Lukas's claim *makes sense / does not make sense* because . . .**
I am not sure. I have questions about Fabiana's and Lukas's claims.	**My question is . . .**

Three Memes

The graphs are alike . . .

The graphs are different . . .

I notice . . .

Word bank						
English	rate of change	exponential	growth factor	initial value	linear	steep
Español	tasa de cambio	exponencial	factor de crecimiento	valor inicial	lenta	inclinado

The graph that represents the cat meme is _____ because . . .

The graph that represents the dog meme is _____ because . . .

The graph that represents the duck meme is _____ because . . .

Return of the Globs

Green Globs

Situation: At first, there are 4 globs. 6 more globs are added each day.

Starting Value

In the table, I can see . . .

On the graph, I can see . . .

In the equation, I can see . . .

Constant Rate of Change

In the table, I can see . . .

On the graph, I can see . . .

In the equation, I can see . . .

Orange Globs

Equation: $y = 5 \cdot 2^x$

Numbers 5 and 2

In the table, I can see . . .

On the graph, I can see . . .

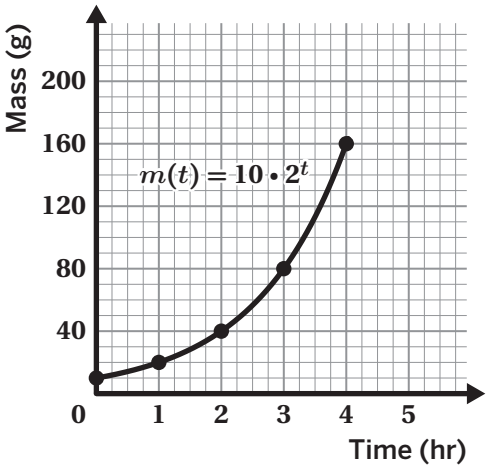
From the situation, I can see . . .

Carlos's Fish

Use the space provided to evaluate the equation of the function when $m = 5$ and when $m = -1$. Use the sentence frames and the word bank to help you discuss with your partner.

Making Sense

Carlos made this graph to represent the function $m(t) = 10 \cdot 2^t$.



a What is the value of $m(5)$?

b What is the value of $m(-1)$?

c **Discuss:**

- What does each value say about the fish's mass?

  $m(5)$ tells me that the fish . . .

  $m(-1)$ tells me that the fish . . .

  Do both of those values make sense?

- How would you describe the domain of $m(t)$?

  The domain of this function is . . .

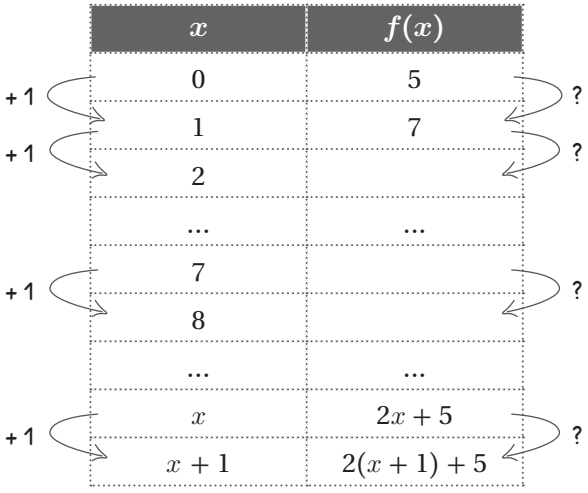
Word bank						
English	domain	double	growth factor	mass	multiply	weight
Español	dominio	doble	factor de crecimiento	masa	multiplicar	peso

Linear Functions

Use this sheet to help you think through and explain Problems 4–8.

4. As the input values grow by 1, what happens to the output values?

As x increases by 1, $f(x)$. . .



5. Is Precious correct? Circle one.

Yes or No

Explain how you know.

For any two consecutive values of x, $f(x)$. . .

6. $f(x+1) - f(x) =$

7. Rewrite $(2(x+1)+5) - (2x+5)$

8. Precious's expression has the same value as my answer to Problem 4 because . . .

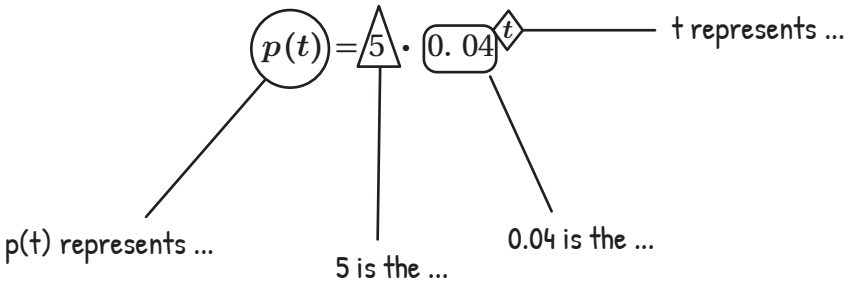
Any linear function . . .

Word bank					
English	consecutive	difference	expression	grows	increases
Español	consecutivo	diferencia	expresión	crece	crece

Growing with Percents

As you discuss and work to answer Problems 10–12, use this sheet and the word bank to help you.

10.



Word bank			
English	**Español**	**English**	**Español**
amount	cantidad	multiply	multiplicar
decay	decaer	percent	porciento
decrease	disminuir	original	original
exponent	exponente	starting	inicial
growth	crecimiento	value	valor
increase	crece		

11. Tyler's mistake was with (circle one):

$p(t)$ 5 0.04 t

Explain:

12. The 1 represents:

It is there because. . .

Des-Phone

3. **Discuss:**

- How are the functions alike?
- How are the functions different?

Alike	Different
• I see _____ in both functions.	• The difference between both functions is . . .
• Both functions have . . .	• Taylor's function shows . . .
• Both functions are alike because . . .	• Aaliya's function shows . . .

Word bank	
English	**Español**
base	base
decrease	decrecer
exponent	exponente
exponential	exponencial
initial value	valor inicial
percent	porciento

Comparing Algae Treatments

9. **Discuss:** What do the graphs tell you about each treatment method?

The graphs tell us that each treatment method . . .

Treatment A . . .

Treatment B . . .

Treatment A's graph shows that . . .

Treatment B's graph shows that . . .

This means . . .

10. Let's take a closer look at Treatment B's function $g(x) = 340 \cdot (0.82)^x + 10$.

a. Write: What do the numbers 0.82 and 10 mean for the situation?

- I think the 0.82 represents _____ because the size of the algae bloom _____. This tells us that . . .
- I think the 10 represents _____. This means that . . .

b. Write: Why is the y-intercept for $g(x)$ not at $(0,340)$?

The y-intercept is at _____ because . . .

Word bank			
English	**Español**	**English**	**Español**
algae bloom	floración de algas	initial value	valor inicial
decay	decrecer	slower	más lento
faster	más rapido	size	tamaño
growth	crecimiento	square meters	metros cuadrados
growth factor	factor de crecimiento		

Challenges

	Translation Description	Effect on the Graph
$g(x) = 6 \cdot 3^{(x+4)} - 2$		
$g(x) = 6 \cdot 3^{(x+4)} - 2$		
Explanation	I think Kiri's function will / will not capture all the stars because . . . To capture the stars, the graph needs to move . . .	

Word bank						
English	horizontal translation	vertical translation	left	right	up	down
Español	traslación horizontal	traslación vertical	izquierda	derecha	arriba	abajo

Equivalent Expressions

1. Listen to your classmate's statement to the question "Whose strategy you could use to rewrite $10^{\frac{1}{2}} \cdot 10^{\frac{1}{2}} = 10$ without using rational exponents?". Think about it! Does their response make sense mathematically?
2. Choose your position and decide whether you agree with their statement, disagree with their statement, or have questions about their statement.
3. Show or describe your thinking in writing. Use pictures, diagrams, words, and/or numbers to support your thinking.
4. Be prepared to defend your position.

I agree with my classmate's statement.	**The statement makes sense mathematically because . . .**
I disagree with my classmate's statement.	**The statement does not make sense mathematically because . . .**
I am not sure. I have questions about my classmate's statement.	**My question is . . .**

Equivalent Expressions

9. With a partner, compare all the expressions you created.

Discuss:

- Which of your expressions are the same? Which are different?

Expression Type 1	Expression Type
$(x^5)^{\frac{1}{4}}$	$\sqrt[4]{x^5}$
$(x^{\frac{1}{4}})^5$	$\sqrt[4]{x^5} \cdot \sqrt[4]{x^5} \cdot \sqrt[4]{x^5} \cdot \sqrt[4]{x^5} \cdot \sqrt[4]{x^5}$

The expressions are the same because . . .

The expressions are different because . . .

- How can you tell if all of the expressions are equivalent?

  The expressions are equivalent because . . .

Word bank					
English	equivalent	exponent	expression	radical	rational
Español	equivalente	exponente	expresión	radical	racional

Earning Interest

Discuss: Use these sentence frames as you talk with your partner about how the functions are alike and different.

Where do you see . . .?

Can you show me how . . .?

What makes you think . . .?

How does that compare to . . .?

What I am hearing you say is _____. Is that right?

I want to add that . . .

In this case . . .

Write: How are these strategies alike? How are they different?

Alike	Different
• The functions are alike because . . .	• The functions are different because . . .
• Both of the functions are _____.	• One function is _____ while the other is _____.
	• One function is modeling _____ while the other is modeling _____.

Word bank

English	compound interest	decreasing	exponential	initial value	increasing	linear	simple interest
Español	interés compuesto	decreciente	exponencial	valor inicial	creciente	lineal	interés simple

Payday Loan

Marc wonders how much money he would owe if he doesn't pay back the loan after 3 years.

He wrote two expressions to represent this situation.

Expression A

$100 \cdot 1.15^{36}$

Expression B

$100 \cdot (1.15^{12})^3$

Discuss:

- How are the expressions alike? How are they different?
- How much money would he owe after 3 years?

The expressions are alike because _____.

The expressions are different because _____.

Expression A / B represents _____.

Marc would owe _____ after 3 years.

Where do you see _____?

Can you show me how _____?

What makes you think _____?

What I am hearing you say is _____. Is that right?

Marc wrote a third equivalent expression to represent this situation.

Expression C

$100 \cdot (5.35)^3$

What interest rate does the 5.35 represent?

435% per year 535% per year Neither

Write: Explain your thinking using one or more of the sentence frames.

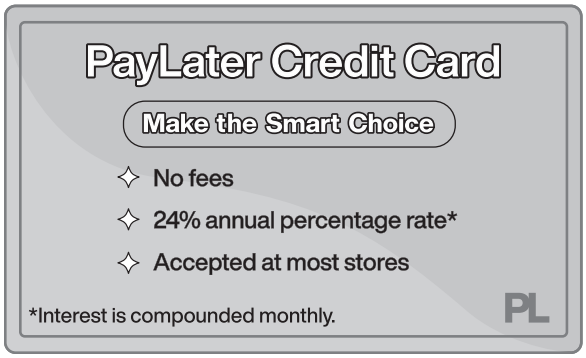
The interest rate is _____ because . . .

The amount Marc owes is _____, so . . .

When I _____, I . . .

Because _____ represents _____and the initial value represents _____, I know . . .

PayLater



$1000\ (1 + 0.24)^5$

2. Alejandro is considering charging $\$1{,}000$ to this credit card.

He wrote $1000(1 + 0.24)^5$ to determine the balance after 5 years with no payments or additional charges.

Explain what each part of the expression means.

1000:

$1 + 0.24$:

5:

Word bank			
English	**Español**	**English**	**Español**
amount	cantidad	interest	interés
charge	cobro	number	número
credit card	tarjeta de crédito	payment	pago
growth factor	factor de crecimiento	rate	tasa
initial	inicial	year	año

3. The fine print says interest is *compounded* monthly.

This means the interest is $\frac{24}{12} = 2$, or 2% per month.

Compared to compounding annually, how do you think compounding monthly will affect the total Alejandro owes after 5 years? Circle one.

A. He will owe more **B.** He will owe less **C.** He will owe the same

Explain your thinking by completing one of the statements below.

- Compounding monthly will make the total amount _____ compounding annually because you will be multiplying the rate . . .

- The amount owed will be the same because . . .

Predicting the Future

This number *is / is not* realistic because . . .

The prediction *is / is not* realistic because . . .

I'm not sure if the prediction is realistic because . . .

For the year 2020, the model predicts . . .

The model *provides / does not provide* realistic numbers because . . .

The model *is / is not* accurate *from / until / when* . . .

Word bank					
English	**Español**	**English**	**Español**	**English**	**Español**
accurate	preciso	greater than	más que	people	gente
calculations	cálculos	less than	menos que	population	población
data	datos	million	millón	prediction	predicción
function	función	model	modelo	realistic	realista
future	futuro	number	número	years	años

Analyzing Data

The linear model *should / should not* be used because . . .

The exponential model *should / should not* be used because . . .

Both / Neither model(s) should be used because . . .

The *linear / exponential* model shows that in 2075 _____, so it *should / should* not be used.

I think _____ because . . .

Word bank					
English	**Español**	**English**	**Español**	**English**	**Español**
curve	curva	future	futuro	negative	negativo
decrease	decrecer	graph	gráfico	people	gente
events	eventos	increase	crecer	points	puntos
exponential	exponencial	linear	lineal	population	población
function	función	model	modelo	predict	predecir

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 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 . . .

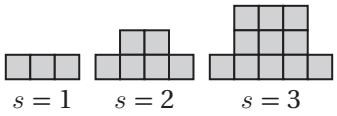
I also chose _____ because . . .

In the Activity, I . . .

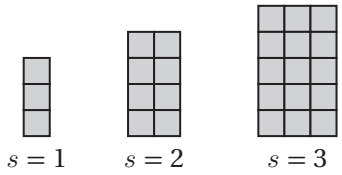
Comparing Patterns

Use this sheet to support you while you work through Problems 6–7.

Pattern A



Pattern B



The patterns are alike because. . .

The patterns are different because. . .

Word bank						
English	column	rectangle	row	square	tall	wide
Español	columna	rectángulo	fila	cuadrado	alto	ancho

Focus on Pattern B

Abdullah said: *I see a square plus two rows.*

Discuss:

To draw the image when $s = 4$, Abdullah might say:

First I would draw. . .

Then I would add. . .

Deja said: *I see a rectangle where the length is two more than the width.*

Discuss:

To draw the image when $s = 4$, Deja might say:

I would draw. . .

Quadratic Relationships

Use this sheet to support you while you work through Problems 6–7.

Quadratic $2n^2 + 1$ $2n^2 + n + 1$ $n^2 + 2n$	I notice that each quadratic expression has. . .
Linear $2n + 1$	I notice the linear expression. . .

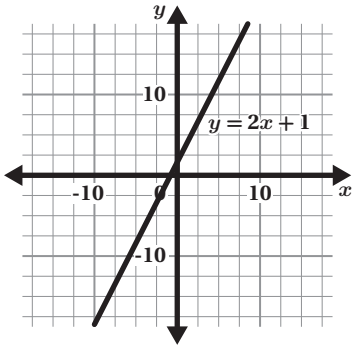
This makes me think that a quadratic expression is . . .

Word bank				
English	expression	linear	quadratic	square
Español	expresión	lineal	cuadrático	cuadrado

Sort'em

Use this organizer to help you determine what type of relationship is represented by each card.

Linear/Lineal



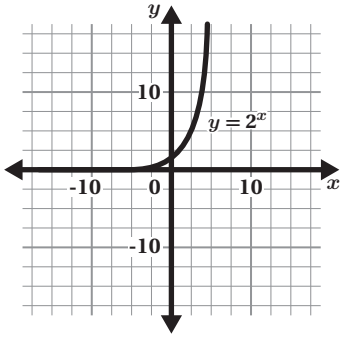
x_1	y_1	
-1	-1	
0	1	2
1	3	2
2	5	2

constant difference/diferencia constante

Exponential/Exponencial

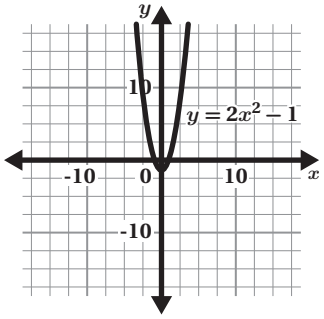
x_1	y_1	
-1	$\frac{1}{2}$	$\frac{1}{\frac{1}{2}} = 2$
0	1	$\frac{2}{1} = 2$
1	2	$\frac{4}{2} = 2$
2	4	

constant ratio/relación constante



Types of Patterns

Quadratic/Cuadrática



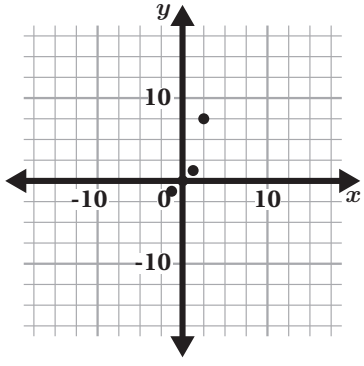
x_1	y_1		
-1	1		
0	-1	-2	
1	1	2	4
2	7	6	4

second difference/segunda diferencia

something else/otra cosa

x_1	y_1
-1	1
0	0
1	1
2	8

something else/otra cosa



By the Stream

How are these relationships alike? How are they different?

Alike	Different
• Both . . . • They both start at _____ feet and go until _____ feet. • They both have . . .	• The difference between both functions is . . . • One graph . . . • The stream graph has . . . • The Pasture graph has . . .

Word bank	
English	**Español**
high point	punto alto
line of symmetry	eje de simetria
low point	punto bajo
maximum	máximo
ordered pairs	pares ordenados
parabola	parábola

Predicting With Tables and Graphs

Discuss: What is the same and what is different about each rocket launch?

Same	Different
• Each graph . . . • The _____ for all graphs is at ____. • All of the graphs . . .	• The difference between the graphs are . . . • The graphs have different . . . • Some of the graphs _____ while the other graphs _____.

Word bank	
English	**Español**
axis of symmetry	eje de simetría
domain	dominio
range	rango
height	altura
initial value	valor inicial
landing time	hora de aterrizaje
maximum	máximo
minimum	mínimo
origin	origen
parabola	parábola
x-axis	eje x
y-axis	eje y

Polygraph

Is it _____?

Does it have _____?

Are there more on the _____?

Is the graph _____?

Are the ends _____?

Is there a _____?

Is the _____?

Does it look like _____?

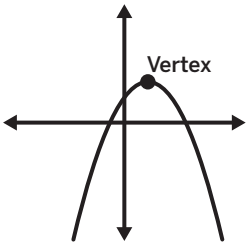
Word bank			
English	**Español**	**English**	**Español**
axis of symmetry	eje de simetría	x-intercept	intersección con el eje x
concavity	concavidad	y-intercept	intersección con el eje y
maximum	máximo	symmetric	simétrico
minimum	mínimo		

Ball Launch

Use this organizer to help you determine the key features of a Quadratic function

Key Features of Quadratic Functions

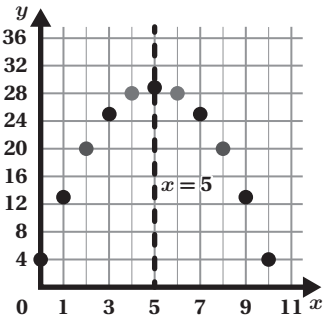
Vertex / Vértice



The vertex is the *maximum* or *minimum* point on a parabola (where a parabola changes from increasing to decreasing, or vice versa).

In this case the parabola shows a maximum.

Line of Symmetry / Línea de simetría

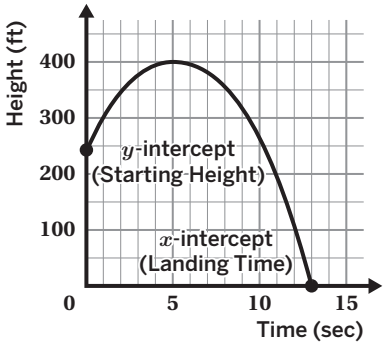


x	y
2	20
4	28
5	29
6	28
8	20

You can see the points are symmetrical across a *line of symmetry*.

In this case the line of symmetry is at $x = 5$.

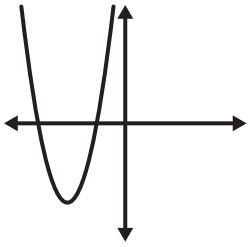
Intercepts / Intersecciones



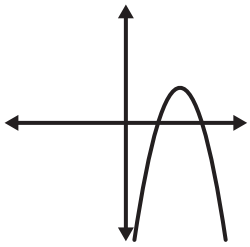
The y-intercept of a parabola is found when the graph crosses the y-axis. The y-intercept may represent a starting height.

The x-intercept of a parabola is found when the graph crosses the x-axis. The x-intercepts may represent a landing time.

Concavity / Concavidad



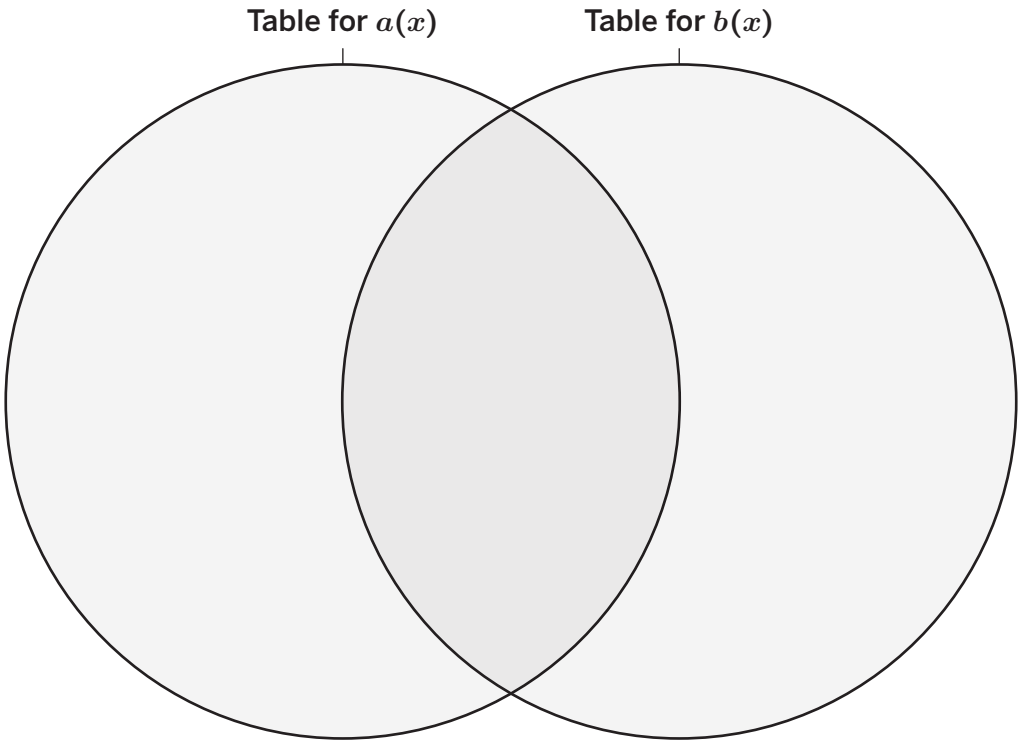
A parabola that opens upward is concave up.



A parabola that opens downward is concave down.

Coordinate Co-Op

Create a Venn diagram to compare and contrast how Ethan's tables work.



Compare your observations with a partner and update your venn diagram to be stronger and clearer.

Card Sort

3. **Discuss:** How did you sort the cards?

I sorted the cards into . . .

I noticed _____ on cards _____.

I thought these cards would be grouped together because . . .

4. **Discuss:** With your partner, decide whether each card is written in factored form, standard form or neither.

I think this card is in factored form because . . .

I think this card is in standard form because . . .

I think this card is in neither _____ or _____ because . . .

5. Match the remaining cards with the graphs. Two cards will have no match.

I think _____ matches with the first graph because . . .

I think _____ matches with the second graph because . . .

I think _____ matches with the third graph because . . .

I think _____ doesn't match with any of the graphs because . . .

Word bank						
English	factored form	exponent	standard form	x-intercept	y-intercept	ordered pair
Español	forma factorizada	exponente	forma estándar	intersección con el eje x	Intersección con el eje y	par ordenado

Determine the Intercepts

Critique: Use these sentence frames as you discuss what is correct in Raven's work.	
• Raven is correct in . . . • It looks like Raven thought . . .	
Correct: Use these sentence frames as you discuss what is incorrect or unclear in Raven's work.	
• Raven is incorrect in . . . • I can tell _____ because . . .	
Clarify: Use these sentence frames as you create a question for how Raven's work can be improved or create a revised response.	
• How can Raven use _____ _____? • What needs to happen for . . .?	• Raven should . . .

Here is Raven's work from the previous challenge.

She found an x-intercept at 5.

She says there will be another x-intercept at 6.

x	$(2x-6)$	$(x-5)$	$(2x-6)(x-5)$
5	4	0	0
6	$2(6)-6$	$6-5$	$(2(6)-6)(6-5)$

Explain why Raven is incorrect.

Raven is incorrect because . . .

The x-value must be _____ because . . .

Graphing by Zapping

Discuss:

Pilar

$g(x) = (x - 1)(x - 5)$

x	x - 1	x - 5	g(x)
1	0	-4	0
5	4	0	0
3			

In the first row of Pilar's table, she . . .

In the second row of Pilar's table, she . . .

Something that makes sense in Pilar's work is . . .

Something that doesn't make sense in Pilar's work is . . .

Word bank					
English	median	middle	x-coordinate	vertex	y-coordinate
Español	mediana	medio	coordenada x	vértice	coordenada y

The 3 represents _____. I know this because _____.

Pilar could find the y-coordinate of the vertex by . . .

First Pilar should _____. Then she should _____.

Building Quadratic Functions

Something that will be the same is . . .

Something that will be different is . . .

The _____ would not change because . . .

The _____ would change because . . .

Word bank	
English	**Español**
closer	más cerca
factor	factor
farther	más lejos
multiplier	multiplicador
narrower	más estrecho
x-intercept	intersección con el eje x
x-axis	eje x
vertex	vértice
wider	más ancho
y-intercept	intersección con el eje y

Price Points

Stronger and Clearer Each Time

1. Write a first draft.

- Selling shoes for $\$0$ means . . .
- If the shoes cost _____, then . . .
- In the table/graph this is seen . . .
- The most revenue you can make happens when . . .
- In the table/graph this is seen . . .

2. Meet with a partner to discuss your first draft.

- How do you know that _____?
- What do you mean when you say _____?
- Could you use a different word for _____?

3. Write a second draft that is stronger and clearer.

Word bank					
English	**Español**	**English**	**Español**	**English**	**Español**
cost	costar	parabola	parábola	table	mesa
graph	gráfica	revenue	ingresos	vertex	vértice
maximum	máximo	shoes	zapatos	x-intercept	intersección con el eje x
model	modelo	sell	vender		

Name: Date: Period:

Translating Parabolas

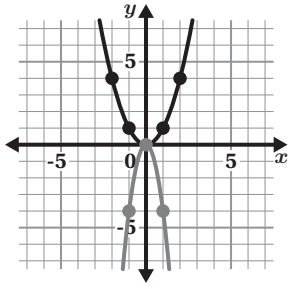
Invite students to use the graphic organizer before writing an explanation for Screen 4.

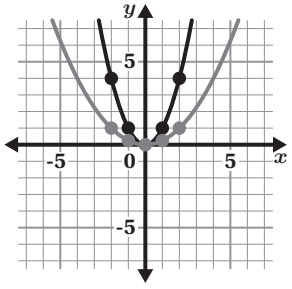
	Effect on the Graph	Where do you see the translation in the equation?
$y = (x - 3)^2$	This moves the graph of $y = x^2$ . . .	
$y = (x + 4)^2$	This moves the graph of $y = x^2$ . . .	
Explanation	The number _____ tells you . . .	

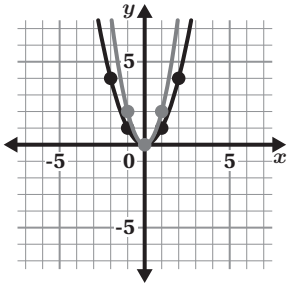
Word bank	
English	Español
down	hacia abajo
horizontal translation	traslación horizontal
left	izquierda
parabola	parábola
parentheses	paréntesis
right	derecha
units	unidades
up	hacia arriba
vertical translation	traslación n vertical

Vertical Stretches and Compressions

Use the graphic organizer and word bank to help you describe and match the functions on Screen 4.







$a(x) = -4x^2$	$b(x) = -2x^2$
$c(x) = \frac{1}{4}x^2$	$d(x) = 2x^2$

Word bank

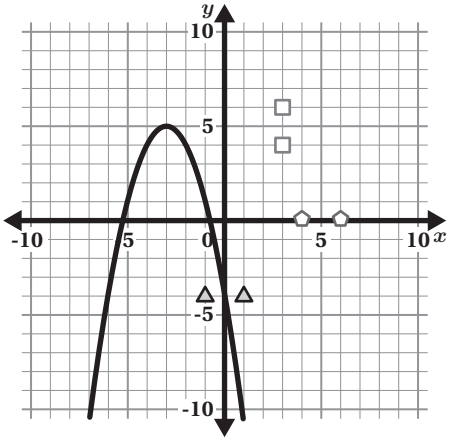
English	compression	concave	down	equation	graph	narrower	negative
Español	compresión	cóncavo	abajo	ecuación	gráfica	más estrecho	negativo
English	output	parabola	point	positive	stretch	up	wider
Español	salida	parábola	punto	positivo	estiramiento	arriba	más ancho

Going Through Gates

Critique: Use these sentence frames as you discuss what Haru did well.	
• Haru correctly . . . • It looks like Haru thought . . .	
Correct: Use these sentence frames as you discuss what should be changed in Haru's equation.	
• Haru is incorrect in thinking . . . • I can tell that Haru's equation is not correct because . . .	
Clarify: Use these sentence frames as you create a question for how Haru's work can be improved or create a revised equation.	
• What needs to happen _____? • How can Haru _____?	• Haru should . . .

Here is the equation Haru entered for this challenge:

$y = -(x + 3)^2 + 5$



a What did Haru do well?

Haru correctly . . .

b How would you change Haru's equation so that it goes through all of the gates?

I would change Haru's equation so the _____ of the parabola is correctly at _____ instead of _____. An equation that could work is _____.

Rent vs. Revenue

Directions: Make 1 copy per pair of students. Then pre-cut the cards and give each pair a set. Instruct the students to use the priorities they establish in Problem 8 to help them decide upon a fair rent in Problem 9.

Card 1

Making the most revenue.

Obtener el máximo ingreso.

Card 2

Making housing affordable for most people.

Hacer que la vivienda sea asequible para la mayoría de las personas.

Card 3

Making enough money to equal the cost of development.

Ganar suficiente dinero para igualar el costo del desarrollo.

Card 4

Building enough housing to meet the demand.

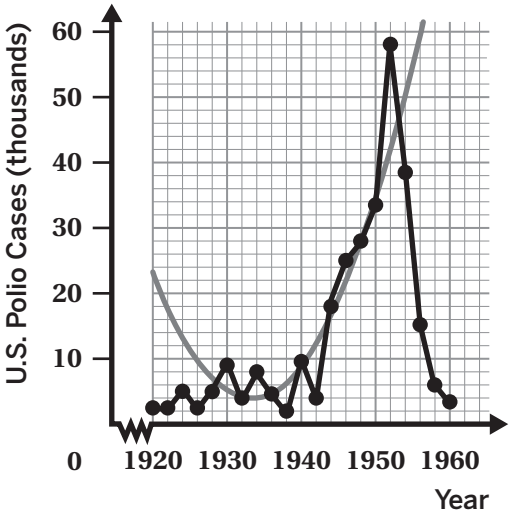
Construir suficientes viviendas para satisfacer la demanda.

Word bank					
English	affordable	debt	extra money	fair price	revenue
Español	asequible	deuda	dinero extra	precio justo	ingresos

Making Predictions

Ava Says

Ava says she can use the model to accurately estimate the number of polio cases in 1953.



I agree with Ava because. . .

I disagree with Ava because. . .

I'm not sure because. . .

Restricted Domain

The domain I chose goes from _____ to _____.

Ava would not want to use her model to predict 1925 or 1957 because. . .

Ava might be most confident about predicting the missing data for 1949 because. . .

Discuss: Wrong, but Useful

The models are wrong because. . .

The model is useful when. . .

Word bank						
English	between	data	decreasing	good fit	increasing	intersect
Español	entre	datos	decreciente	buen ajuste	creciente	intersecarse
English	interval	model	prediction	quadratic	substitute	trend
Español	intervalo	modelo	predicción	cuadrático	sustituir	tendencia

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 . . .

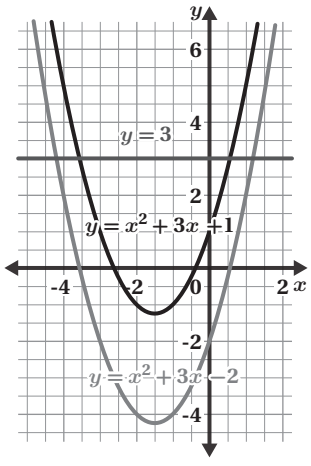
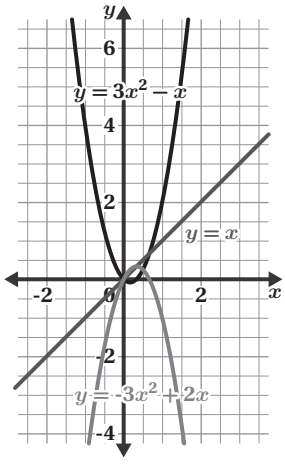
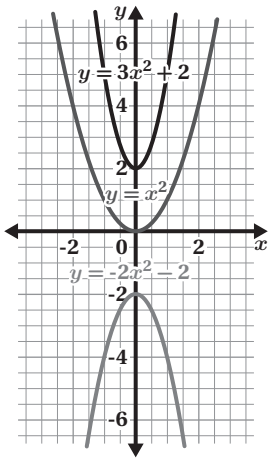
Sum Functions

I know _____ because . . .

I tried _____ and what happened was . . .

I noticed _____ so I . . .

If _____ then _____ because . . .

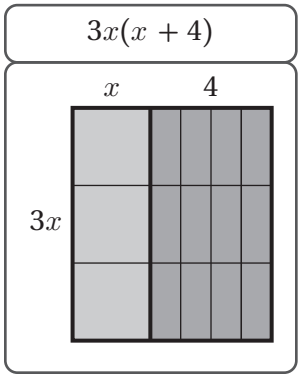
Constant	Linear	Quadratic
 $y = 3$	 $y = x$	 $y = x^2$
Characteristics: The equation needs to have only a constant. **Example:** $x^2 + 3x + 1 - (x^2 + 3x - 2) = 3$	**Characteristics:** The equation needs to have a leading term of ax. **Example:** $3x^2 - x + (-3x^2 + 2x) = x$	**Characteristics:** The equation needs to have a leading term of ax^2. **Example:** $3x^2 + 2 + (-2x^2 - 2) = x^2$

Multiplying With Area Models

Use this organizer to help you describe the connections between area models and different forms of a quadratic equation.

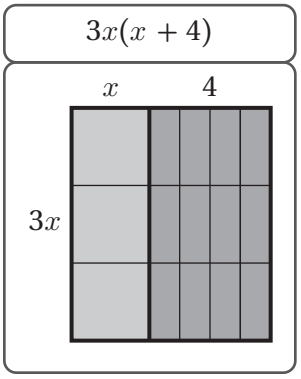
Factored Form/ Forma Factorizada

$3x(x + 4)$

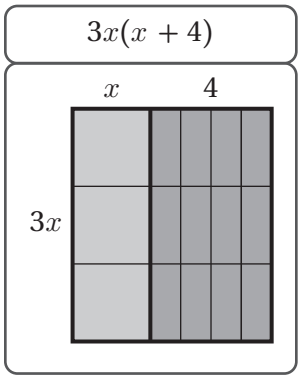


Standard Form/ Forma Estándar

$3x^2 + 12x$



Connections Between Area Models and Different Quadratic Forms



I see . . .

Each green tile represents . . .

Each purple tile represents . . .

Area Model / Intersecciones

Connections / Conexiones

Now I Know My ABC's

To have a positive b-value the factored form needs to . . .

To have a negative c-value the factored form needs to . . .

I notice that the factored form . . .

I notice that the _____ is connected to . . .

Word bank	
English	**Español**
standard form	forma estándar
factored form	forma factorizada
constant	constante
coefficient	coeficiente
opposite signs	signos opuestos
positive	positivo
negative	negativo
value	valor
equation	ecuación

Next Steps

Nicolas is trying to factor $2x^2 + 9x + 7$.

	2x	1
x	$2x^2$	x
7	14x	7

10. **Discuss:**

- What did Nicolas do well?
- Explain what you think is incorrect about Nicolas's work?
- What could he try next?

Critique: Use these sentence frames as you discuss what is correct in Nicolas's work.	
• Nicolas was correct in . . . • Nicolas also correctly . . .	
Correct: Use these sentence frames as you discuss what is incorrect or unclear in Nicolas's work.	
• Nicolas is incorrect in . . . • I can tell this is incorrect because . . .	
Clarify: Use these sentence frames as you create a next step Nicolas could try.	
• Next, he could try . . .	• Nicolas should . . .

Spotting Similarities

Use the graphic organizer and the sentence frames as you discuss and write responses.

Group 1	Group 2	Group 3

Deiondre factored the expression $7x^2 + 28x + 21$.

Deiondre

$7x^2 + 28x + 21$

$7(x^2 + 4x + 3)$

$7(x + 3)(x + 1)$

5. **Discuss:**

- Are $7x^2 + 28x + 21$ and $7(x^2 + 4x + 3)$ equivalent? How do you know?
  Yes / No
  They are equivalent because . . .

  They are not equivalent because . . .

- Why might Deiondre have written $7(x^2 + 4x + 3)$ as a first step?
  Dieondre may have written $7(x^2 + 4x + 3)$ because . . .

6. Does Deiondre's expression belong in Group 1, 2, or 3? Explain your thinking.

It belongs in Group _____ because . . .

Yasmine factored the expression $9x^2 - 49$.

Yasmine

$9x^2 - 49$

$9x^2 + 0x - 49$

$(3x - 7)(3x + 7)$

7. **Discuss:** Does Yasmine's expression belong in Group 1, 2, or 3? Explain your thinking.

I think it belongs in Group _____ because . . .

Standard Space Mail

Use the graphic organizer and the sentence frames as you discuss Screen 6.

Aba	Darius	Rishi
$a(x) = 4(x + 3)(x + 2)$ • In Aba's function I see . . .	$a(x) = (4x + 8)(x + 3)$ • In Darius's function I see . . .	$a(x) = (2x + 6)(2x + 4)$ • In Rishi's function I see . . .
All equations . . . This means . . .		

Word bank	
English	**Español**
factor	factor
solve	resolver
x-intercepts	intersecciones x
opposite signs	signos opuestos
substitute	sustituir
negative	negativo
positive	positivo
quadratic	cuadrático

Zeroing In

Inola might think that . . .

Inola's equation is not . . .

Inola's equation is . . .

To rewrite the equation you could . . .

Word bank	
English	**Español**
standard form	forma estándar
factored form	forma factorizada
factor	factor
equation	ecuación
zero	cero

How Many and More

Use the sentence frames as you discuss Screen 10.

For each equation, put a check for whether it has one, two, or no solutions.

	No Solutions	One Solution	Two Solutions
$x(x-6)=0$			
$2x^2=50$			
$x^2=-9$			
$x^2+4=0$			
$(x+2)(x+2)=0$			

Discuss: With your partner, decide whether each equation has no solutions, one solution, or two solutions.

I think this equation has no solutions because . . .

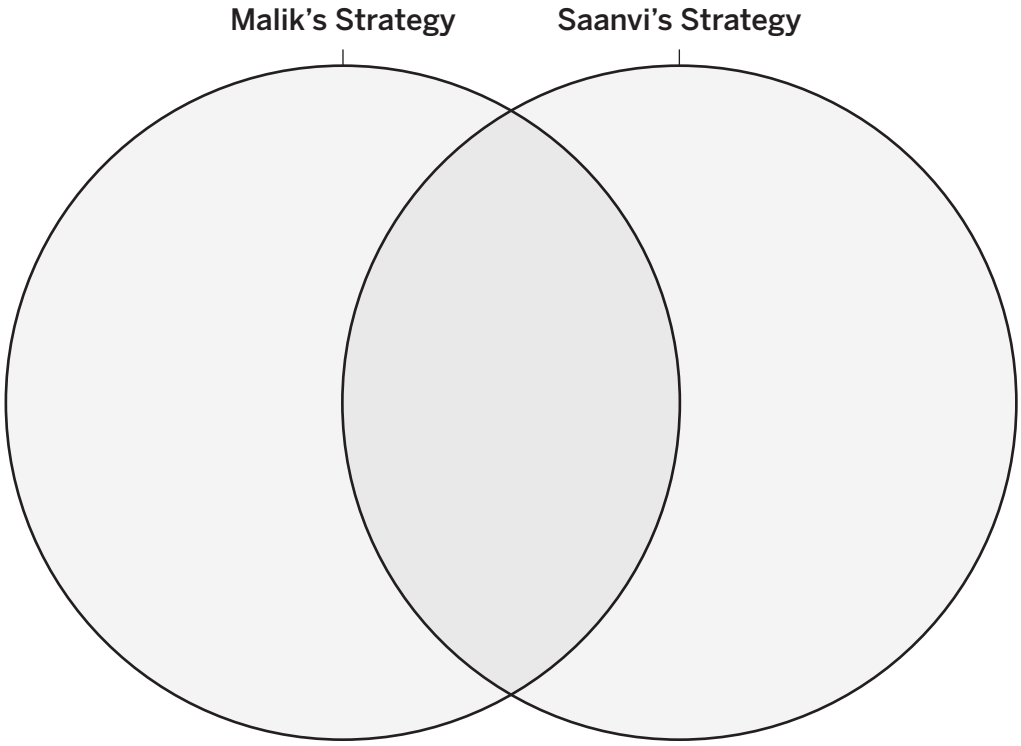
I think this equation has one solution because . . .

I think this equation has two solutions because . . .

Word bank						
English	factored form	factor	zero	x-intercept	value	zero-product property
Español	forma factorizada	factor	cero	intersección con el eje x	valor	propiedad del producto cero

None, One, or Some

Create a Venn diagram to compare and contrast Malik's and Saanvi's strategies.



Compare your observations with a partner and update your Venn diagram to be stronger and clearer.

Two Strategies

2. **Discuss:** Where do you see two solutions in each student's strategy?

In Binta's graph, . . .

In Charlie's strategy, . . .

I see the solutions . . .

5. **Discuss:** What are some advantages to each strategy? What are some disadvantages?

An advantage of Binta's strategy is . . .

An advantage of Charlie's strategy is . . .

A disadvantage of Binta's strategy is . . .

A disadvantage of Charlie's strategy is . . .

In the first equation, . . .

In the second equation, . . .

Word bank								
English	equation	integer	intersection	minus	plus	points	sign	solutions
Español	ecuación	entero	intersección	menos	más	puntos	signo	soluciones

Perfect Squares

I notice . . .

I wonder . . .

Word bank	
English	**Español**
constant	constante
expression	expresión
factors	factores
factored form	forma factorizada
half	mitad
perfect square	cuadrado perfecto
squared	cuadrado
standard form	forma estándar
twice	dos veces

To be a perfect square . . .

If the b-value is 12, that would mean . . .

With a b-value of 12, the factors would be _____. This means . . .

If the c-value is 144, that would mean . . .

With a c-value of 144, the factors would be _____. This means . . .

To make the expression a perfect square, I would need to. . .

Completing the Square

Discuss:

Roberto's first step was . . .

Roberto's second step was . . .

Something that makes sense in Roberto's work is . . .

Something that doesn't make sense in Roberto's work is . . .

Roberto

$$x^2 - 12x + 6 = 14$$
$$x^2 - 12x + 36 = 14 + 36$$
$$(x - 6)^2 = 50$$
$$x - 6 = \pm\sqrt{50}$$
$$x = 6 \pm \sqrt{50}$$

Word bank								
English	add	balanced	completing the square	constant	equation	perfect square	subtract	value
Español	sumar	equilibrado	completando el cuadrado	constante	ecuación	cuadrado perfecto	restar	valor

Roberto did a good job . . .

Roberto knew to . . .

To fix his work, Roberto should . . .

Roberto needed to _____ in order to _____.

First, Roberto should _____. Then, he should _____.

Form to Form

Discuss:

Omar's first step was . . .

Omar's second step was . . .

This is like Ebony's work because . . .

This is different from Ebony's work because . . .

$2x^2 + 20x + 47$

$2(x^2 + 10x) + 47$

$2(x^2 + 10x + 25) - 50 + 47$

$2(x + 5)2 - 3$

Word bank								
English	add	coefficient	completing the square	constant	multiply	perfect square	subtract	value
Español	sumar	coeficiente	completando el cuadrado	constante	multiplicar	cuadrado perfecto	restar	valor

Omar subtracted 50 because . . .

This makes sense because . . .

This does not make sense because . . .

If the leading coefficient is not equal to 1, this means . . .

Formula-izing

For any quadratic equation: $ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

	What does each part represent?
a	a represents . . .
b	b represents . . .
c	c represents . . .
$\pm$	The $\pm$ symbol is in the formula because . . .
How does this formula help you?	The quadratic formula helps to . . .

Word bank								
English	coefficient	constant	negative	positive	square root	standard form	term	value
Español	coeficiente	constante	negativo	positivo	raíz cuadrada	forma estándar	término	valor

Form Over Function

Discuss: Do you think that the quadratic formula is the best strategy for solving each of these equations? Explain your thinking.

The quadratic formula is the best strategy for:	The quadratic formula is not the best strategy for:

The quadratic formula is the best strategy for solving . . .

The quadratic formula is not the best strategy for solving . . .

This is true because . . .

In general, the quadratic formula is the best strategy when . . .

The quadratic formula . . .

Word bank	
English	**Español**
equation	ecuación
factoring	factorización
solutions	soluciones
standard form	forma estándar

Rocket Time

Makayla substituted 0 for $h(t)$ because . . .

In this function, $h(t)$ represents _____, and to determine _____.

Makayla correctly _____.

Makayla incorrectly _____.

Word bank	
English	**Español**
equal	igual
function	función
formula	fórmula
ground	tierra
height	altura
negative	negativo
positive	positivo
quadratic	cuadrático
substitute	sustituir
rocket	cohete
time	tiempo

Sums and Products of Rational Numbers

Use these sentence frames and word bank as you discuss Tyani's statements and your opinions.

Tyani says: *I know that* $\frac{11}{43}+\frac{273}{101}$ *is rational without even calculating it*.
I agree/disagree with this statement because. . .

The sum of two rational numbers is _____ because. . .

Tyani says: *I know that* $\frac{11}{43}\cdot\frac{273}{101}$ *is rational without even calculating it.*
I agree/disagree with this statement because. . .

The product of two rational numbers is _____ because. . .

Word bank					
English	**Español**	**English**	**Español**	**English**	**Español**
add	sumar	fraction	fracción	numerator	numerador
agree	estar de acuerdo	integer	entero	product	producto
always	siempre	irrational	irracional	rational	racional
denominator	denominador	multiply	multiplicar	sometimes	a veces
disagree	estar en desacuerdo	never	nunca	sum	suma

Shooting Stars

Demetrius's first step was . . .

First Demetrius _____ because . .

Word bank	
English	**Español**
eliminate	eliminar
elimination	eliminación
equal	igual
equation	ecuación
factor	factor
first	primero
inverse	inverso
operations	operaciones
second	segundo
solve	resolver
substitute	sustituir
substitution	sustitución

Next, he could _____ , then _____.

He could also finish solving this system by . . .