Amplify Desmos Math
CALIFORNIA

Grade 6

UNIT 6 | SUB-UNIT 1

Solving Equations

About Amplify

Amplify is dedicated to collaborating with educators to create learning experiences that are rigorous and riveting for all students. Amplify creates K–12 core and supplemental curriculum, assessment, and intervention programs for today's students.

A pioneer in K–12 education since 2000, Amplify is leading the way in next-generation curriculum and assessment. All of our programs provide teachers with powerful tools that help them understand and respond to the needs of every student.

55 Washington Street, Suite 800,
Brooklyn, NY 11201
www.amplify.com

Amplify Desmos Math
CALIFORNIA

Grade 6

Unit 6: Expressions and Equations

Sub-Unit 1: Solving Equations

Math Language Development Resource

Activity Pages and Teacher Support

Explore:
Detecting Counterfeit Coins

EL **Multilingual/English Learners** Use these scaffolds and supports during the **Building Math Habits of Mind** part of the **Explore** to provide more support for your students as they:

- Interpret **(Reading and Listening)** and communicate **(Speaking)** about the mathematical habits of mind they strengthened during the Activity.
- Interact in these meaningful ways:

Collaborative	• Exchanging information / ideas • Offering / supporting opinions	**ELD.PI.6.1** **ELD.PI.6.3**
Interpretive	• Listening actively • Reading closely	**ELD.PI.6.5** **ELD.PI.6.6**
Productive	• Presenting information / ideas • Supporting / evaluating opinions	**ELD.PI.6.9** **ELD.PI.6.11**

Spanish Cognates:

English	*habit*	*mathematics*	*mind*
Español	*hábito*	*matemática*	*mente*

Materials

Students also need access to these additional materials.

In this Resource:

- *Math Habits of Mind: Hábitos Mentales Matemáticos Sheet,* one per student
- *Questions and Sentence Frames* Sheet (for display)

Explore, Building Math Habits of Mind

Distribute the *Math Habits of Mind: Hábitos Mentales Matemáticos* Sheet.

Emerging

Read aloud, or ask a student volunteer to read aloud, the first habit of mind in English and in Spanish (for your students whose primary language is in Spanish).

Invite students to collaborate with you to think about whether they used and strengthened this habit of mind during the Activity. Consider asking:

- "Did you make sense of any problems during the Activity?" Invite them to use simple words or phrases, such as **"yes"** or **"no."**
- "If you said yes, show me in which part of the Activity you made sense of a problem." Invite students to point to part of the Activity.

Repeat the above for each habit of mind.

Expanding

Invite students to work with a partner to read aloud each habit of mind and then choose at least one that they used and strengthened during the Activity. If possible, pair students together who speak the same primary language and allow them to discuss their responses in their primary language.

Then invite pairs of students to share the habits of mind they chose with another pair of students. Display the Questions and Sentence Frames Sheet and invite students to discuss the questions on this sheet and use the provided sentence frames to help them form their responses.

Bridging

Invite students to work with a partner to read aloud each habit of mind and then choose at least one that they used and strengthened during the Activity. If possible, pair students together who speak the same primary language and allow them to discuss using a mixture of their primary language(s) and English.

Then invite pairs of students to share the habits of mind they chose with another pair of students. Display the Questions and Sentence Frames Sheet and invite students to discuss the questions on this sheet. Encourage them to craft their own sentences in response to the questions, using the provided sentence frames as needed.

Name: ..... Date: ..... Period: .....

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 reducir la velocidad y primero darle sentido a un problema desafiante 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 pensamiento y hacer preguntas que me ayuden a comprender el pensamiento de los demás.

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

Puedo aplicar las matemáticas que sé para resolver problemas del mundo real, haciendo suposiciones y revisando mi pensamiento 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 mis pensamientos 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 . . .

Weight for It

Reasoning About Unknown Values

Math Language Development Resources

EL **Multilingual/English Learners** Use these scaffolds and supports during the **Activity 1, Monitor** step to provide more support for your students as they:

- Work toward the language goal in this lesson.
- Interpret **(Reading and Listening)** and communicate **(Speaking)** using the language from this activity, such as **variable**, *equation*, *tape diagram.*
- Interact in these meaningful ways:

Collaborative	• Exchanging ideas • Interacting in written English	ELD.PI.6.1 ELD.PI.6.2
Interpretive	• Listening actively	ELD.PI.6.5
Productive	• Writing to describe or explain	ELD.PI.6.10

Spanish Cognates:

English	*equation*	*diagram*	*variable*
Español	*ecuación*	*diagrama*	*variable*

Materials

Students need access to these materials.

In this Resource:

- *Equations and Tape Diagrams Sheet,* one per pair

Materials:

- coloring tools, highlighters

Activity 1, Monitor

Distribute the *Equations and Tape Diagrams* Sheet and colored pencils. Read aloud the problem from the *Equations and Tape Diagrams* screen. Invite students to color code the weight of three foxes and 18-pounds in different representations using different colors. **Sample responses shown.**

Emerging

Ask, "What does the unknown represent?"

Invite students to share their responses in their primary languages first.

Then invite them to use the sentence frames and word bank to share their responses in English using simple words or phrases, such as "3 **foxes**" or "**weight of** 3 **foxes**".

Repeat the above for these questions.

- "What do you see on the left side of both equations?" **Unknowns, 3 x's.**
- "What do you see on the right side of both equations?" **The total weight of three foxes.**
- "Where do you see these in the tape diagram?" **I see the x's in each part and the total written above the tape diagram.**

Expanding

Ask, "What does the unknown represent?"

Invite students to discuss their responses with their partner, using the sentence frames / word bank, as needed. Encourage them to use complete sentences, such as **"The variable represents the weight of each fox."**

Repeat the above for these questions.

- "What do you see on the left side of both equations?" **Variables, 3 x's are on the left side of each equation.**
- "What do you see on the right side of both equations?" **The total weight of three foxes is on the right side of each equation.**
- "Where do you see these in the tape diagram?" **The tape diagram has three parts labeled as x, and the total is written above the tape diagram.**

Bridging

Ask:

- "What does the unknown represent?"
- "What is the total weight of the foxes?"
- "Where do you see the unknown and the total in each representation?"

Invite students to discuss their responses with their partner, using the word bank, as needed. Encourage them to use complete sentences, such as **"The variable, x, represents the weight of each fox."**

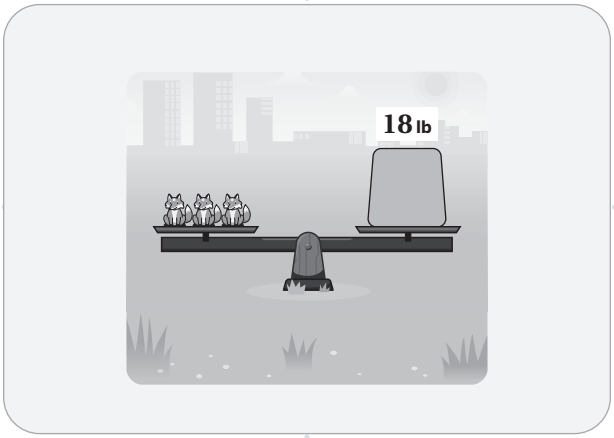
Ask, "If there were 5 foxes balanced with a 30-pound weight, how would you write the equation and design the tape diagram?"

Invite students to individually respond by sharing with their partner. Ask each partner to describe what their partner said using their own words. **I would design the tape diagram with five parts, each labeled with x, and the total would be 30 pounds. Equation: $5 \cdot x = 30$ or $x + x + x + x + x = 30$**

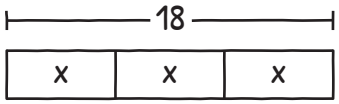
Equations and Tape Diagrams

Situation

These 3 foxes balance with an 18-pound weight. Each fox weighs the same amount.



Tape diagram



Equation 1

$3 \cdot x = 18$

Equation 2

$x + x + x = 18$

The _____, x, represents . . .

The _____ is like the left side of the equation. There are 3 x's, so . . .

The _____ in the tape diagram, 18, is like the right side of the equations.

Word bank (Banco de palabras)					
English	equation	tape diagram	total	unknown	weight
Español	ecuación	diagrama de cinta	Suma o total	Incógnita o el valor desconocido	peso

Five Equations
Tape Diagrams, Equations, Situations

EL **Multilingual/English Learners** Use these scaffolds and supports during the **Activity 2, Monitor** step to provide more support for your students as they:

- Work toward the language goal in this lesson.
- Interpret **(Reading)** and communicate **(Speaking and Writing)** using the language from this activity, such as **solution to an equation**, *represents, mowing lawns, subway.*
- Interact in these meaningful ways:

Collaborative	• Exchanging information / ideas • Interacting in written English	ELD.PI.6.1 ELD.PI.6.2
Interpretive	• Reading closely	ELD.PI.6.5
Productive	• Writing to describe or explain	ELD.PI.6.10

Spanish Cognates:

English	*represents*
Español	*representa*

Materials

In Activity 2, Launch, you distributed the Activity 2 Cards. Students also need access to these additional materials.

In this Resource:

- *Which Equation? Sheet,* one per person

Materials:

- colored pencils

Activity 2, Monitor

Distribute the *Which Equation?* Sheet. Invite a student to read aloud Card 6.
Sample responses shown.

Emerging

Invite students to work with you to complete the missing parts of the sentence in part a on the *Which Equation?* Sheet, using colored pencils to color code part a and the situation in Card 6.

Ask:

- "Do you see addition, subtraction, multiplication, or division in this situation?" **Multiplication**
- "Which equation would be the best match?" **$9x = 22$ (or points to the equation)**

Invite students to solve the equation. To support them in writing the solution's meaning, provide them with the sentence frame:

"Rebecca can buy . . ."

Ask, "Does this solution make sense?"

Repeat this process for Card 4.

Expanding

Invite students to complete the missing parts of the sentence in part a on the *Which Equation?* Sheet after they have selected an equation.

Ask, "Which equation would be the best match and how do you know?" **$9x = 22$. Each pass, x, costs $9.**

Invite them to complete parts b and c **Then invite** them to compare their answers with a partner and discuss these questions.

- "How did you know which equation matched the situation on Card 6?"
- "Did you use the story on the card or the equation to help you determine the solution to the equation?"

Repeat this process for Card 4, using the sentence frames as needed.

Bridging

Invite students to work individually or with a partner to complete the work for Cards 6 and 4, using the sentence frames in part a for each card on the *Which Equation?* Sheet. Ask, "How did you know which equation matched the situation on each card?" **Each day pass costing $9 means multiplication.**

Encourage students to create their own sentences for part b for each card. Refer them to the last part of the sentence in part a for support, e.g., **"Rebecca can buy ___ day passes."**

Listen for students who use phrases in part c for Card 6, such as **"cannot buy a fraction of a day pass."**

Which Equation?

For each card, select the equation that represents the situation. Use the sentence frame to help you determine which part of the equation relates to each part of the situation.

Card 6: Rebecca has \$22 to spend on day passes to ride the subway. Each day pass costs \$9. She can buy x day passes.		
$x - 9 = 22$	$9x = 22$	$9 + x = 22$

a. In this equation, _____ represents how much money Rebecca has to spend on day passes, _____ represents the cost of each day pass, and _____ represents how many day passes Rebecca can buy.

b. The solution to this equation is:

$x =$_____ which means . . .

c. **Discuss:** Does this solution make sense?

Card 4: Mohamed made x\$ from mowing lawns. He spent \$9 on a new video game and has \$22 left.		
$x - 9 = 22$	$9x = 22$	$9 + x = 22$

a. In this equation, _____ represents how much money Mohamed made mowing lawns, _____ represents how much he spent on a new video game, and _____ represents how much money Mohamed has left.

b. The solution to this equation is:

$x =$_____ which means . . .

c. **Discuss:** Does this solution make sense? Explain your thinking.

Hanging Around
Introduction to Balanced Hangers

EL **Multilingual/English Learners** Use these scaffolds and supports during the **Activity 2, Monitor** step to provide more support for your students as they:

- Work toward the language goal in this lesson.
- Interpret **(Reading and Listening)** and communicate **(Speaking)** using the language from this activity, such as *weight*, *lighter*, *and heavier.*
- Interact in these meaningful ways:

Collaborative	• Exchanging information / ideas	ELD.PI.6.1
Interpretive	• Justifying / evaluating arguments • Selecting language resources	ELD.PI.6.11 ELD.PI.6.12

Spanish Cognates:

English	*balance*	*adjust*	*equation*
Español	*balance*	*adjustar*	*ecuación*

Materials

Students need access to these materials.

In this Resource:

- *Make It, Solve It Sheet,* one per person

Activity 2, Monitor

Distribute the *Make It, Solve It* Sheet. To surface prior knowledge, consider asking, "What does *balanced* mean? What do *heavier* and *lighter* mean?" Encourage students to draw connections between math vocabulary and their corresponding words in their primary language. **Sample responses shown.**

Emerging

Invite students to work with you to select the equation that matches the hanger diagram on Screen 5.

Ask,

- "Which parts of the equation you selected do you see in the hanger diagram?" **I see x's and numbers.**
- "What do you see on the left side of the hanger? The left side of each equation?" **$11 \cdot 11$ and one $11 + x$.**
- "What do you see on the right side of the hanger? The right side of each equation?" **4 x's. 4, $4x$, $x + 4$, $x + x + x + x$.**
- "Do you see any equations that match the hanger? Which ones?" **Yes (points to the equations).**

Allow students time to record their reasoning using the sentence frame on the *Make It, Solve It* Sheet.

Expanding

Invite students to work with a partner to select an equation that matches the hanger diagram on Screen 5.

Ask:

- "Which parts of the equation you selected do you see in the hanger diagram?" **I see 11 on one side and 4 x's on the other side.**
- "Are there any other equations that could match this hanger diagram?" **Yes. I see another equation with 4 x's.**

Allow students time to record their reasoning using the sentence frame on the *Make It, Solve It* Sheet.

Bridging

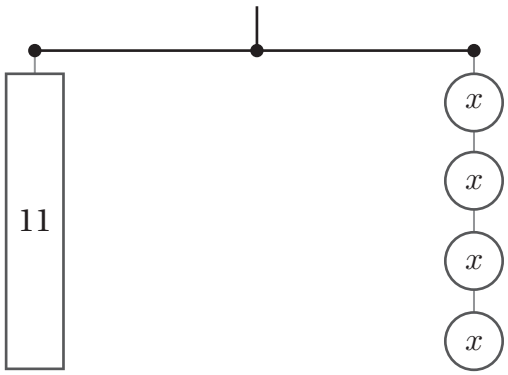
Invite students to work independently or with a partner to select an equation that matches the hanger diagram on Screen 5.

Allow students time to record their reasoning. Then give them time to compare their responses with their partner in their primary language.

Then invite them to discuss, "Which parts of the hanger do you see represented in the equation you selected?" **Each x is represented by a circle and the numbers are represented by the rectangle.**

Make it, Solve it

Select an equation that represents this hanger.



A. $11 + x = 4$

B. $11 = 4x$

C. $11 = x + 4$

D. $11 = x + x + x + x$

Equation(s) _____ represents this hanger because there is _____ on the left side of the hanger and _____ on the right side of the hanger.

Hanging It Up
Solving Equations

EL **Multilingual/English Learners** Use these scaffolds and supports during the **Activity 2, Monitor** step to provide more support for your students as they:

- Work toward the language goal in this lesson.
- Interpret **(Reading and Listening)** and communicate **(Speaking)** using the language from this activity, such as *equation*, *inverse operations*, *variable*, *solution to an equation*.
- Interact in these meaningful ways:

Collaborative	• Exchanging information / ideas • Interacting in written English	**ELD.PI.6.1** **ELD.PI.6.2**
Interpretive	• Reading closely	**ELD.PI.6.6**
Productive	• Writing to describe or explain • Selecting language resources	**ELD.PI.6.10** **ELD.PI.6.12**

Spanish Cognates:

English	*inverse*	*operations*	*solution*	*substitute*
Español	*inversas*	*operaciones*	*solución*	*sustituta*

Materials

Students need access to these materials.

In this Resource:

- *Solving and Solutions Sheet*, one per pair

Activity 2, Monitor

Distribute the *Solving and Solutions Sheet*. Read aloud the *Compare and Connect* screen. Invite students to work with a partner to compare each strategy to solve the equation. Then invite them to discuss which strategy they think is more efficient to solve more complex equations. **Sample responses shown.**

Emerging

Ask, "Why do you think Fabiana multiplied both sides of the equation by 4?"

Invite students to share their responses in their primary languages first, using gestures, or making drawings.

Then invite them to use the sentence frames and word bank to share their responses in English using simple words or phrases, such as **"undo divide by 4."**

Repeat the above for these questions.

- "What is the product of $4\frac{c}{4}$?" **c**
- "Product of $4 \cdot 1.2$?" **4.8**
- "Why do you think Alejandro substituted 4 for c ?" **To estimate the solution**

Expanding

Ask, "Why do you think Fabiana multiplied both sides of the equation by 4?"

Invite students to discuss their responses with their partner, using the sentence frames or word bank, as needed. Encourage them to use complete sentences, such as "**Fabiana multiplied both sides of the equation by 4 to determine the solution to the equation."**

Repeat the above for these questions.

- "What did Fabiana do in the next step?" **Fabiana calculated the products as $4 \cdot \frac{c}{4} = c$ and $4 \cdot 1.2 = 4.8$ and concluded $c = 4.8$.**
- "Why do you think Alejandro substituted 4 for c ?" **Alejandro substituted 4 for c to estimate the solution to the equation.**

Bridging

Ask:

- "Why do you think Fabiana multiplied both sides of the equation by 4?"
- "What did Fabiana do in the next step?"
- "Why do you think Alejandro substituted 4 for c ?"

Invite students to discuss their responses with their partner, using the word bank, as needed. Encourage them to use complete sentences, such as **"Fabiana used inverse operations by multiplying the both sides of the equation with 4 to determine the solution to the equation."**

Ask, "Which strategy do you think is more efficient to solve more complex equations?"

Invite students to individually respond by sharing with their partner. Ask each partner to describe what their partner said using their own words.
Responses vary.

Solving and Solutions

$$\frac{c}{4} = 1.2$$

Fabiana

$\frac{c}{4} = 1.2$

$\times 4 \quad \times 4$

$c = 4.8$

Fabiana multiplied _____ of the equation with 4 to leave the _____ alone on one side of the equation.

Fabiana found the value of c by using _____.

Alejandro

$\frac{c}{4} = 1.2$

$\frac{4}{4} = 1$

so . . .

$\frac{4.8}{4} = 1.2$

Alejandro _____ 4 for the variable to write $\frac{4}{4} = 1$.

Using number sense, Alejandro concluded the value of the variable must be 1.2 to make the equation _____.

Both Fabiana and Alejandro found the same _____.

Word bank (Banco de palabras)						
English	both sides	inverse operations	solution to the equation	substitute	true	variable
Español	ambos lados	operaciones inversas	solución	sustituta	verdadero	variable

Swap and Solve
Solving Equations in Context

EL **Multilingual/English Learners** Use these scaffolds and supports during the **Activity 2, Monitor** step to provide more support for your students as they:

- Work toward the language goal in this lesson.
- Interpret **(Reading and Listening)** and communicate **(Speaking)** using the language from this activity, such as *equation*, *situation*, *variable*.
- Interact in these meaningful ways:

Collaborative	• Interacting in written English	ELD.PI.6.2
Interpretive	• Listening actively • Reading closely	ELD.PI.6.5 ELD.PI.6.6
Productive	• Writing to describe or explain	ELD.PI.6.10

Spanish Cognates:

English	*equation*	*variable*
Español	*ecuación*	*variable*

Materials

Students need access to these materials.

In this Resource:

- *Trade and Solve Sheet*, one per pair

Activity 2, Monitor

Distribute the *Trade and Solve* Sheet. Read aloud Problem 6 from Activity 2 and the directions from the Sheet. Then invite students to work with a partner to write a situation and include what the variable represents in their situation for the given equations. **Sample responses shown.**

Emerging

Invite students to focus on one equation at a time.

Ask:

- "What are the values being added? x **and** $\frac{3}{4}$ **(or pointing to them in the equation)**
- "What is the sum, the total hours worked?" **6 (or pointing to 6 in the equation)**

Repeat above for the second equation using the numbers being multiplied and the product.

Invite students to first share their responses with a partner.

Model how to write situations that can be represented by the given equations to expand student students' understanding of language structures.

Expanding

Invite students to focus on one equation at a time.

Ask:

- "What are the values being added? x **and** $\frac{3}{4}$ **are added together.**
- "What is the sum, the total hours worked?" **The total is 6.**

Repeat above for the second equation using the numbers being multiplied and the product.

Invite students to work with a partner to write their situations. Allow them to use a mixture of their primary language and English.

Bridging

Invite students to focus on one equation at a time.

Ask:

- "In the first equation, what are the values being added? What is the total hours worked?" x **and** $\frac{3}{4}$ **are added together to have a total of 6.**
- "In the second equation, what are the values being multiplied? What is the total growth?" x **and 0.25 are multiplied to have a product of 20.**

Invite students to work with a partner to write their situations. Encourage them to complete the sentences with as many English words as possible.

Trade and Solve

Complete the sentence frames to describe a situation to match each equation. Then pick another equation from the equation bank to write your own situation.

	Situation	The variable represents . . .
$x + \frac{3}{4} = 6$	I worked for _____hours. Then I worked for _____ of an hour. I worked _____ hours total.	x represents . . .
$0.25x = 20$	A plant in Ada's garden grows _____inches taller each week. After _____weeks, the plant has grown _____ inches.	x represents . . .
Equation:		

Visit us online to explore digital lessons and learn more.

amplify.com/mathca

Amplify.

MA0832 - 1893635