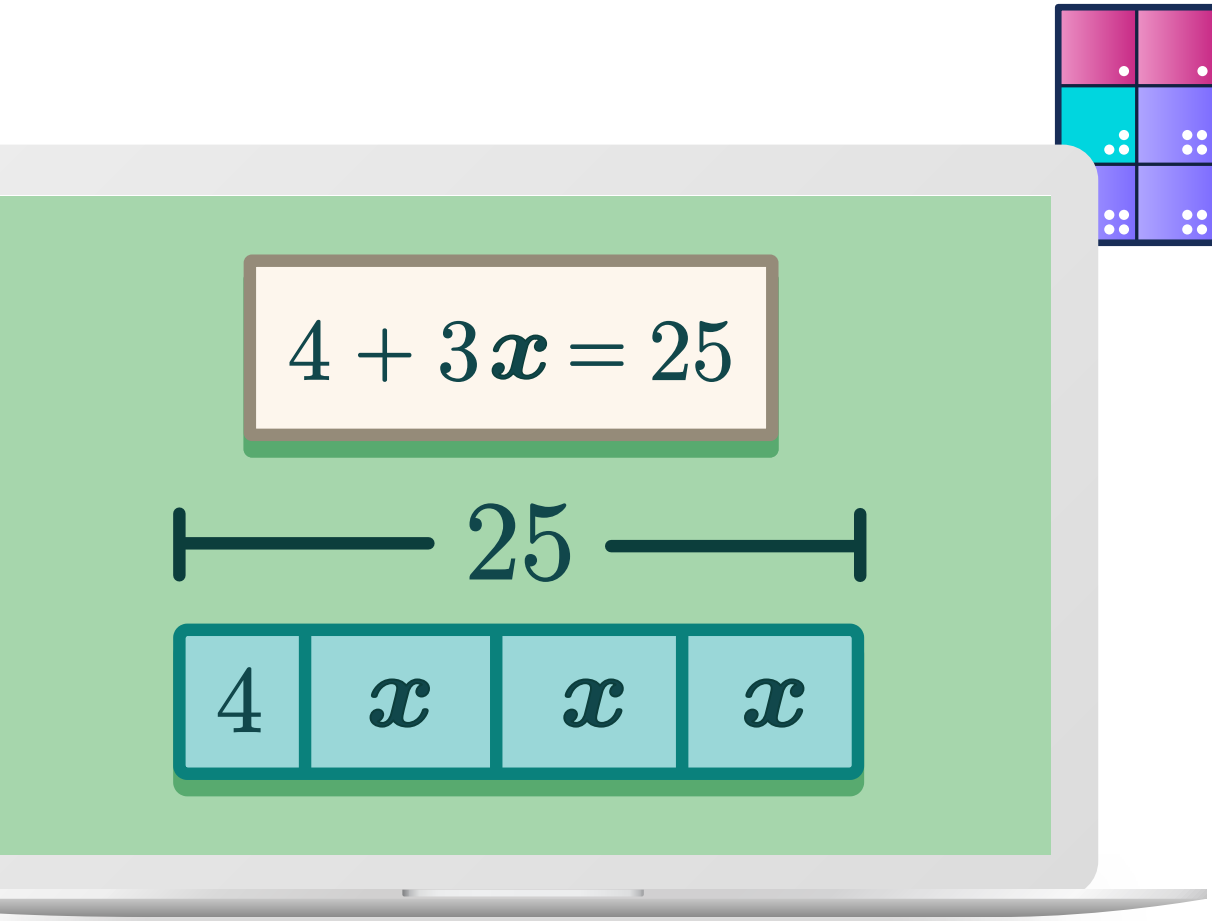
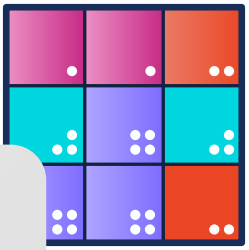
Amplify Desmos Math
CALIFORNIA

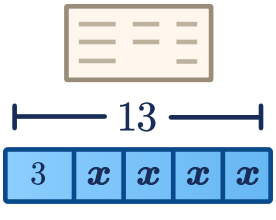
Grade 7

UNIT 6 | SUB-UNIT 1

# Equations and Tape Diagrams





# 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.



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Amplify Desmos Math
CALIFORNIA

# Grade 7

## Unit 6: Expressions, Equations, and Inequalities

## Sub-Unit 1: Equations and Tape Diagrams

**Math Language Development Resource**

# Activity Pages and Teacher Support

# Explore:
## Keeping the Balance



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<br>• Offering / supporting opinions | **ELD.PI.7.1**<br>**ELD.PI.7.3** |
| **Interpretive** | • Listening actively<br>• Reading closely | **ELD.PI.7.5**<br>**ELD.PI.7.6** |
| **Productive** | • Presenting information / ideas<br>• Supporting / evaluating opinions | **ELD.PI.7.9**<br>**ELD.PI.7.11** |

**Spanish Cognates:**

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

## Materials

Students also need access to these 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.

# 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 mediante ecuaciones y desigualdades e interpretar sus soluciones dentro de su contexto

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

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

I can apply the math that I know to solve real-world problems, making assumptions and revising 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 elegir la herramienta adecuada que me ayude a resolver problemas.

I can communicate my thinking and solutions clearly to others.

Puedo comunicar mis ideas 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 . . .

# Toothpicks and Tiles
## Determining Unknowns in Patterns



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 Writing)** and communicate **(Speaking)** using the language from this activity, such as *multiple, pattern, stage, tiles*.
- Interact in these meaningful ways

| | | |
|---|---|---|
| **Interpretive** | • Reading closely | **ELD.PI.7.6** |
| **Productive** | • Writing to describe or explain<br>• Justifying / evaluating arguments | **ELD.PI.7.10**<br>**ELD.PI.7.11** |

**Spanish Cognates:**

| | | |
|---|---|---|
| **English** | *multiple* | *pattern* |
| **Español** | *múltiple* | *patrón* |

## Materials

Students need access to these materials.

**In this Resource:**

- *Patterns and Predictions* Sheet, one per student

## Activity 1, Monitor

**Distribute** the *Patterns and Predictions* Sheet. Encourage students to use their responses from Screen 2 to annotate each stage shown in the diagrams on the sheet.
**Sample responses shown.**

### Emerging

**Read aloud** the prompt on Screen 3. Invite students to share how they determined the number of border toothpicks in Stages 2 and 3. Then invite them to write the number of border toothpicks for Stages 1–3 on the Sheet.

**Ask,**

- "What do you notice about the number of border toothpicks at each stage?" **Add 8 each time.**
- "How does this help you know if there will be a stage with 100 toothpicks?" **8 times a number cannot be 100.**

**Invite students** to use the sentence frames to explain their thinking.

**Repeat** the above for Screen 4, considering the number of border tiles.

**Consider asking,** "How can you use the pattern to know when there are 100 border tiles?" **Keep adding 8.**

### Expanding

**Ask,** "What do you notice about the number of border toothpicks at each stage?" **Each stage has 8 more toothpicks.**

**Invite students** to use a mixture of their primary language and English. If students disagree with their partner on the answer to a question, encourage them to work together to reach a consensus.

**Invite students** to use the sentence frames to explain their thinking.

**Repeat** the above for Screen 4, considering the number of border tiles.

**Consider asking,** "How can you use the pattern to know when there are 100 border tiles?" **I can start at 12 and keep adding 8 to see if it gets to 100.**

### Bridging

**Ask,** "What do you notice about the number of border toothpicks at each stage?" **They are all multiples of 8.**

**Invite students** to discuss their thinking with a partner. If students disagree on the answer to a question, encourage them to work together to reach a consensus.

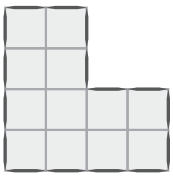
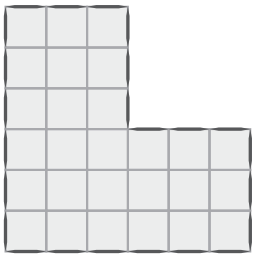
**Invite students** to use the sentence frames to explain their thinking.

**Repeat** the above for Screen 4, considering the number of border tiles.

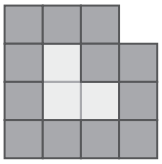
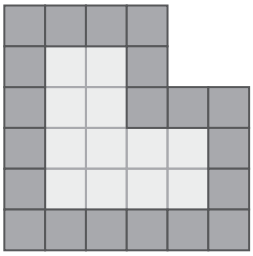
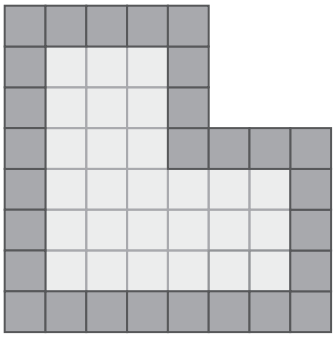
**Consider asking,** "How can you use the pattern to know when there are 100 border tiles?" **Because the tiles go up by 8, I can start at 12 and keep adding 8 until it reaches 100.**

Name: Date: Period:

# Patterns and Predictions

| Stage 1 | Stage 2 | Stage 3 |
|---|---|---|
|  |  |  |
| Number of border toothpicks: | Number of border toothpicks: | Number of border toothpicks: |

I noticed that the number of border toothpicks is always _____ so . . .

| Stage 1 | Stage 2 | Stage 3 |
|---|---|---|
|  |  |  |
| Number of border tiles: | Number of border tiles: | Number of border tiles: |

I know that the number of border tiles goes up by _____ with each stage so . . .

# Smudged Receipts

## Connecting Contexts and Tape Diagrams



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 and Writing)** using the language from this activity, such as *distributive property, tape diagram*.
- Interact in these meaningful ways

| | | |
|---|---|---|
| **Collaborative** | • Exchanging information / ideas<br>• Interacting in written English | **ELD.PI.7.1**<br>**ELD.PI.7.2** |
| **Interpretive** | • Listening actively<br>• Reading closely | **ELD.PI.7.5**<br>**ELD.PI.7.6** |
| **Productive** | • Selecting language resources | **ELD.PI.7.12** |

**Spanish Cognates:**

| | | | |
|---|---|---|---|
| **English** | *section* | *total* | *variable* |
| **Español** | *sección* | *total* | *variable* |

## Materials

Students need access to these materials.

**In this Resource:**

- *Ordering Food* Sheet, one per student

**Materials:**

- coloring tools

## Activity 2, Monitor

**Distribute** the *Ordering Food* Sheet and coloring tools. Display the tape diagrams from the Sheet. Read aloud, or ask a student to read aloud, the problem from Screen 8.

### Emerging

**Invite students** to highlight the key information in the problem on the Sheet. Then invite them to collaborate with you to complete the first row of the table describing what each part of the tape diagram represents.

**Ask:**

- "How many parts of $y$ are there? 3? $y + 3$?"
- How can these sections be put together to describe how the tape diagrams represent the situation?" **Cost for each meal + service fee for each meal = total**

**Invite students** to collaborate with you to write an explanation in the final row of the table using the word bank.

**Encourage students** to read aloud their completed explanation to you or a partner.

### Expanding

**Invite students** to highlight the key information in the problem on the Sheet. Then invite them to collaborate with a partner to complete the first row of the table describing what each part of the tape diagram represents.

**Ask:**

- "How many parts of $y$ are there? 3? $y + 3$?"
- "How can these sections be put together to describe how the diagrams represent the situation?" **The cost for each meal + the service fee for each meal = total they can spend**

**Invite** students to work with a partner to write an explanation using short sentences in the second row of the table using the word bank.

**Encourage students** to read aloud their final completed explanation to their partner.

### Bridging

**Invite students** to highlight the key information in the problem on the Sheet. Then invite them to work individually or with a partner to complete the first row of the table describing what each part of the tape diagram represents. Invite them to use that information to write an explanation in the second row of the table, using complete sentences and the word bank as needed.

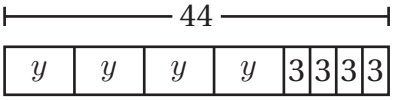
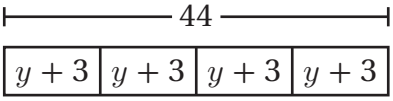
**Then invite** students to share their explanations with a partner and make any revisions, based on peer feedback.

**Ask,** "What revisions did you make based on the feedback from your partner?"

# Ordering Food

**Raven and her three siblings are also considering using their $44 to order from Salads-R-Us. This restaurant charges a $3 service fee for each meal.**

**Here are two diagrams that represent the situation.**

| |  |  |
|---|---|---|
| **What does each part of the tape diagram represent in the situation?** | **44:**<br><br>**$y$:**<br><br>**3:** | **44:**<br><br>**$y+3$:** |
| **How does the diagram represent the situation?** | | |

| **Word bank** (Banco de palabras) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **English** | meal | section | service fee | sibling | spend | takeout | total | variable |
| **Español** | comida | sección | tarifa de servicio | hermana/ hermano | gastar | sacar | total | variable |

# Equations
## Representing Contexts With Tape Diagrams and 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 communicate **(Speaking and Writing)** using the language from this activity, such as *tape diagram, equation*.
- Interact in these meaningful ways:

| | | |
|---|---|---|
| **Collaborative** | • Interacting in written English | **ELD.PI.7.2** |
| **Interpretive** | • Reading closely<br>• Evaluating language choices | **ELD.PI.7.6**<br>**ELD.PI.7.7** |
| **Productive** | • Writing to describe or explain | **ELD.PI.7.10** |

**Spanish Cognates:**

| | | |
|---|---|---|
| **English** | *diagram* | *equation* |
| **Español** | *diagrama* | *ecuación* |

## Materials

Students need access to these materials.

**In this Resource:**

- *Missing Representations* Sheet, one per pair

## Activity 2, Monitor

**Distribute** the *Missing Representations* Sheet.

### Emerging

**Ask:**

- "How many parts are shown in the tape diagram?"
- "What is the value of each part?"

**Repeat** the above questions for the equation. Invite students to use the sentence frames to record their thinking.

**Ask:**

- "How many parts are represented in the situation and the tape diagram?"
- "What is the value of each part?"
- "What is the total?"
- "How can you write this as an equation?"

**Invite** students to use the sentence frames to explain their thinking and share their equations with the class.

**Ask:**

- "What could $x$ represent?"
- "What could $2$ represent?"
- "What could $28$ represent?"
- "How can you use these values to write a story?"

### Expanding

**Ask:**

- "How many parts are shown in the tape diagram?"
- "What is the value of each part?"

**Repeat** the above questions for the equation. Invite students to use the sentence frames to record their thinking.

**Ask:**

- "What do you know about the situation and the tape diagram?"
- "How can you use this information to write this as an equation?"

**Invite** students to use the sentence frames to explain their thinking and share their equations with the class.

**Ask:**

- "What could $x$ represent?"
- "What could $2$ represent?"
- "What could $28$ represent?"
- "How can you use these values to write a story?"

### Bridging

**Ask:**

- "What does the tape diagram show?"
- "What does the equation show?"

**Invite** students to use the sentence frames to record their thinking.

**Ask:**

- "What do the situation and tape diagram show?"
- "How can you use this information to write an equation that matches?"

**Invite** students to use the sentence frames to explain their thinking and share their equations with the class.

**Invite** students to think of a context they would like to represent. Then, invite them to identify what $x$, $2$, and $28$ represent. Encourage students to use these values to write a story.

**Encourage** students to share their stories with a partner and compare and contrast their stories.

# Missing Representations

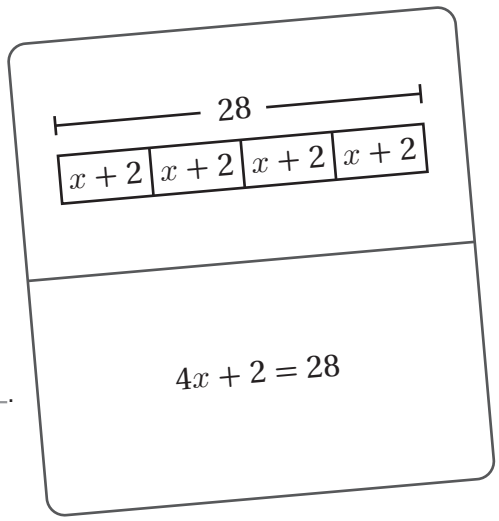
**Irene incorrectly matched these two cards.**

**What would you tell Irene to convince her that these cards don't match?**

The cards do not match because . . .

The tape diagram shows _____ parts of _____.

The equation shows _____ parts of _____ plus _____.

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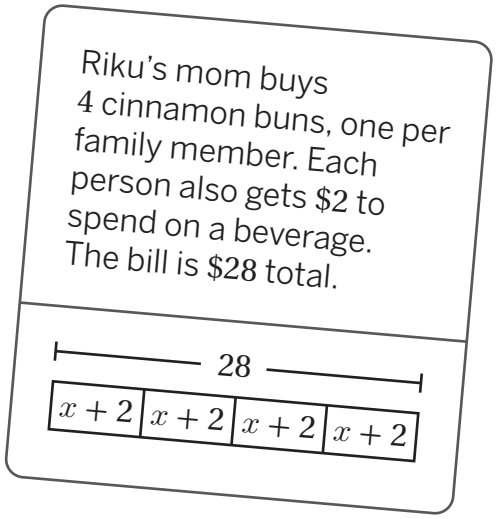
**One group from the card sort did not have a matching equation.**

**Write an equation that matches.**

There are _____ parts of _____. The total is _____.

Equation:

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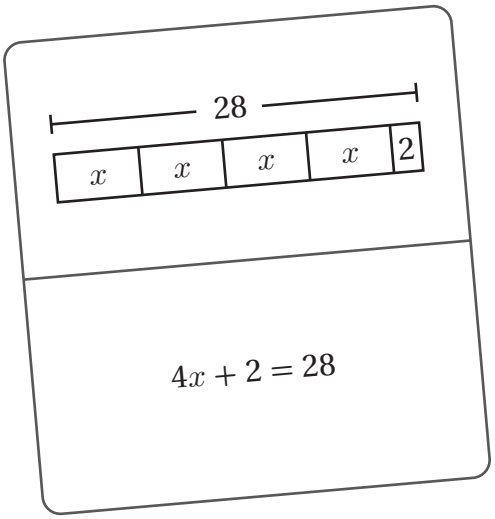
**One group from the card sort did not have a matching story.**

**Write a story that matches.**

$x$ represents: 2 represents: 28 represents:

Story:



# Seeing Structure
## Connecting Contexts and Tape Diagrams



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* and *equation*.
- Interact in these meaningful ways

| | | |
|---|---|---|
| **Collaborative** | • Exchanging information / ideas<br>• Interacting in written English | **ELD.PI.7.1**<br>**ELD.PI.7.2** |
| **Interpretive** | • Listening actively<br>• Reading closely | **ELD.PI.7.5**<br>**ELD.PI.7.6** |
| **Productive** | • Presenting information/ideas | **ELD.PI.7.9** |

**Spanish Cognates:**

| | | |
|---|---|---|
| **English** | *equation* | *variable* |
| **Spanish** | *ecuación* | *variable* |

## Materials

Students need access to these materials.

**In this Resource:**

- *Which Diagram?* Sheet, one per student

**Materials:**

- coloring tools

## Activity 1, Monitor

**Distribute** the *Which Diagram*? Sheet and coloring tools. Display the situations from the Sheet. Read aloud, or ask a volunteer to read aloud, Problem 3.
**Sample responses shown.**

### Emerging

**Discuss** the meaning of any unfamiliar terms such as postal worker, cardboard package, or plastic box. Invite students to color code key information as you color code it on the Sheet.

**Invite** students to collaborate with you to complete a drawing to identify which information is unknown.

**Ask,** "How does the weight of the plastic box help us to determine the weight of the other packages?" **Subtract**

**Repeat** this process for the other situations.

### Expanding

**Invite** students to color code key information as you color code it on the Sheet.

**Then invite** students to collaborate with a partner to complete a drawing to identify which information is unknown.

**Ask,** "How does the weight of the plastic box help us to determine the weight of the other packages?" **It can be subtracted from the weight.**

**Invite** students to discuss their responses with their partner.

**Repeat** this process for the other situations.

### Bridging

**Invite** students to color code key information.

**Then invite** students to work independently or with a partner to complete a drawing to identify which information is unknown.

**Ask,** "How does the weight of the plastic box help us to determine the weight of the other packages?" **It can be subtracted from the total weight of all the packages.**

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

**Repeat** this process for the other situations.

# Which Diagram?

| Highlight the key information. | Draw a picture. | What information is *unknown?* |
|---|---|---|
| **3.** A postal worker weighs 5 identical cardboard packages and a 3-pound plastic box. Everything weighs a total of 45 pounds. | | |
| **4.** Tyani is making 5 gift bags. Each bag contains $x$ pencils. Tyani adds 3 more pencils to each bag. Altogether, the gift bags contain 45 pencils. | | |
| **5.** A national park charges \$3 for each car that enters and also a fee for each person that enters. A family of 5 enters the park in 1 car and pays a total of \$45. | | |
| **6.** A souvenir store sells hats for the same price. Ava buys 5 hats and pays a total of \$45. | | |

# Notes

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