3 The Eraser Store

Dear Student,

In this chapter, you will be working at an Eraser Store where special containers are used for packaging the erasers.

There are two rules used in the store. One rule is that packs, boxes, and crates must be full. The other rule is that there must be as few containers and as few loose erasers as possible in each shipment.

You will be developing important mathematical skills as you answer questions such as:

How many erasers are in 1 box?

How many erasers are in 1 crate?

What packages will be used to fill an order for 25 erasers?

As you go through these lessons, try to think about strategies for doing these computations in your head. You may be surprised that you can add $49 + 49 + 49 + 49$ without any paper!

We hope you enjoy your time in the store, and that you keep track of all your orders!

Mathematically yours,
The authors of *Think Math!*

7 erasers to a pack
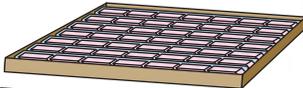
7 packs to a box
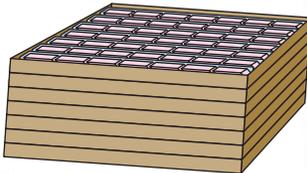
7 boxes to a crate

How Many Can You Eat?

Does the county you live in have a fair? If so, the fair may have an eating contest for adults. One popular contest is hot dog eating.

FACT·ACTIVITY 1

Use the data from the table below to answer the questions.

Results From Hot Dog Eating Contest	
Contestant	Number of Hot Dogs Eaten in 12 Minutes
A	51
B	48
C	36
D	34
E	34

1. How many hot dogs were eaten by the top two contestants altogether?

2. How many more hot dogs did the winner eat than Contestant C?

3. If Contestant E had eaten twice as many hot dogs, would Contestant E have won the contest? Explain.

4. Suppose a contestant ate 27 hot dogs in 9 minutes. On the average, how many hot dogs would the contestant have eaten per minute?

Organizers of hot dog eating contests need to purchase many hot dogs for the contestants and for the spectators. They can have hot dogs shipped to them in packages, boxes, or crates. There are 8 hot dogs in a package, 8 packages in a box, and 8 boxes in a crate.

1 Did Contestant A eat more than a box of hot dogs? Explain.

2 How many packages of hot dogs and single hot dogs did Contestant C eat?

3 How many hot dogs are in a crate?

4 If 1,000 hot dogs were eaten, write the number of crates, boxes, packages, and single hot dogs used.

CHAPTER PROJECT

Plan a party for a number of guests you would like to invite. Determine the number of packages of hot dogs, buns, and bottles of water needed for the party. Make a table to show the information.

Background information for the project:

You want enough food so every person at the party will have at least 2 hot dogs, 2 buns, and 1 bottle of water.

The food is packaged in this way:
- 8 hot dogs per package, 8 packages in a box
- 6 hot dog buns per package, 6 packages in a box
- 6 bottles of water per pack, 4 packs in a case

Determine the total number of
- boxes and packages of hot dogs. (Assume that you cannot buy individual hot dogs.)
- boxes and packages of buns. (Assume that you cannot buy individual buns.)
- packs, cases, and individual bottles of water. (Individual bottles of water can be purchased.)

ALMANAC Fact

According to the International Federation of Competitive Eating, the record for most hot dogs eaten in 12 minutes is $53\frac{3}{4}$, achieved in 2006 in Coney Island in Brooklyn, New York.

REVIEW MODEL
Introducing the Eraser Store

You can find the number of crates, boxes, and packs that are needed to package a shipment of erasers at the Eraser Store.

How many of each type are needed for a shipment of 465 erasers?

Remember: • **7 erasers to a pack** • **7 packs to a box** • **7 boxes to a crate**

Step ❶ Find the number of crates needed.

1 crate will hold $7 \times 7 \times 7 = $ **343** erasers.

2 crates will hold $2 \times 343 = $ **686** erasers

465 is between 343 and 686, so **1 crate** is needed.

$$\begin{array}{r} 465 \\ -\ 343 \\ \hline 122 \end{array}$$ erasers left over

Step ❷ Find the number of boxes needed.

1 box will hold $7 \times 7 = 49$ erasers.

2 boxes will hold $2 \times 49 = $ **98** erasers.

3 boxes will hold $3 \times 49 = $ **147** erasers.

122 is between 98 and 147, so **2 boxes** are needed.

$$\begin{array}{r} 122 \\ -\ 98 \\ \hline 24 \end{array}$$ erasers left over

Step ❸ Find the number of packs needed.

1 pack will hold 7 erasers.

3 packs will hold $3 \times 7 = $ **21** erasers.

4 packs will hold $4 \times 7 = $ **28** erasers.

24 is between 21 and 28, so **3 packs** are needed.

$$\begin{array}{r} 24 \\ -\ 21 \\ \hline 3 \end{array}$$ **erasers** left over.

So, 465 erasers can be packaged in 1 crate, 2 boxes, 3 packs, and 3 loose erasers.

✔Check for Understanding

Find the number of each type of package for each shipment of erasers.

❶ 597 erasers

❷ 357 erasers

❸ 97 erasers

❹ 228 erasers

EXPLORE
Order Form

The Eraser Store sells:

- loose erasers — packs of 7 erasers
- crates of 7 boxes □ boxes of 7 packs

Here's an order form received at the store:

Total Number of Erasers				
360	1	, 0	, 2	, 3

1 What does the **3** below the dot mean?

_____

2 What does the **2** below the line mean?

_____

3 What does the **0** below the square mean?

_____

4 What does the **1** below the cube mean?

_____

5 Why do you think the numbers are separated by commas?

EXPLORE
Changing Shipment Orders

Elizabeth ordered 2 packs and 6 loose erasers.

1 Use linkable cubes to represent this order. Make **2 rods** of **7 cubes** and **6 loose cubes.**

---

2 Elizabeth **increased** her order by **1 pack** and **5 erasers.** Use linkable cubes to represent this additional order.

---

3 How should the whole order be packaged?

Daniel ordered 4 packs and 2 loose erasers.

4 Use linkable cubes to represent this order.

---

5 Daniel **decreased** his order by **2 packs** and **5 loose erasers.** Use linkable cubes to represent the resulting shipment when these erasers are removed.

---

6 Describe the shipment Daniel received.

REVIEW MODEL
Combining and Reducing Shipments

You can find the new number of packages needed for a shipment after an order increased at the Eraser Store.

Remember: • **7 erasers to a pack**   • **7 packs to a box**   • **7 boxes to a crate**

Step ❶ Add and repackage loose erasers.

   5 loose erasers in the top order
+ 5 loose erasers in the bottom order
  10 total loose erasers

= 1 pack of 7 erasers + **3** loose erasers

	1	1	3	5
+	0	3	3	5
				3

Step ❷ Add and repackage the packs.

   3 packs in the top order
   3 packs in the bottom order
+ 1 new pack formed
   7 total packs

= 1 box with **0** packs

	1	1	3	5
+	0	3	3	5
			0	3

Step ❸ Add and repackage the boxes and crates.

   1 box
   3 boxes   1 crate
+ 1 new box   + 0 crates
   5 boxes   **1** crate

	1	1	3	5
+	0	3	3	5
	1	5	0	3

✔ Check for Understanding

Find the number of each type of package for each shipment of erasers.

❶

	1	1	3	3
+	0	6	2	4
	■	■	■	■

❷

	1	1	3	3
+	0	3	4	6
	■	■	■	■

EXPLORE
Packaging Multiple Identical Shipments

> **The Eraser Store is still shipping:**
> **10 erasers in a pack, 10 packs in a box, and 10 boxes in a crate.**

A school ordered 1 pack and 3 erasers for each of 4 classes.

1 Use base-ten blocks to represent the order for one class.

2 Use base-ten blocks to represent the school's total order.

3 How many erasers were in the total order?

A store ordered 3 packs and 5 erasers for each of its 6 locations.

4 Use base-ten blocks to represent one order.

5 Use base-ten blocks to represent the store's total order.

6 How many erasers were in the total order?

REVIEW MODEL
Multiple Shipments

You can find the new number of packages needed for a shipment when multiple identical orders are made at the Eraser Store. Remember: 10 erasers in a pack, 10 packs in a box, and 10 boxes in a crate.

Multiply: 5 × 0 crates, 1 box, 2 packs, 7 loose erasers

Step ❶ Multiply and repackage the loose erasers.

7 loose erasers × 5 orders	= 35 loose erasers	$\begin{array}{r} \overset{3}{0, 1, 2, 7} \\ \times \quad\quad 5 \\ \hline 5 \end{array}$
	= **3** packs + **5** loose erasers	

Write **5** as the new number of loose erasers.

Step ❷ Multiply and repackage the packs.

2 packs × 5 orders	= 10 packs	$\begin{array}{r} \overset{1}{}\overset{3}{} \\ 0, 1, 2, 7 \\ \times \quad\quad 5 \\ \hline 3, 5 \end{array}$
Add 3 packs from Step 1: 10 + 3	= 13 packs	
	= **1** box + **3** packs	

Write **3** as the new number of packs.

Step ❸ Multiply and repackage the boxes.

1 box × 5 orders	= 5 boxes	$\begin{array}{r} \overset{1}{}\overset{3}{} \\ 0, 1, 2, 7 \\ \times \quad\quad 5 \\ \hline 0, 6, 3, 5 \end{array}$
Add 1 box from Step 2: 5 + 1	= 6 boxes	
	= **0** crates + **6** boxes	

Write **6** as the new number of boxes. Zero crates are needed.

The total number of packages is 0, 6, 3, 5.

✔Check for Understanding

Multiply.

①
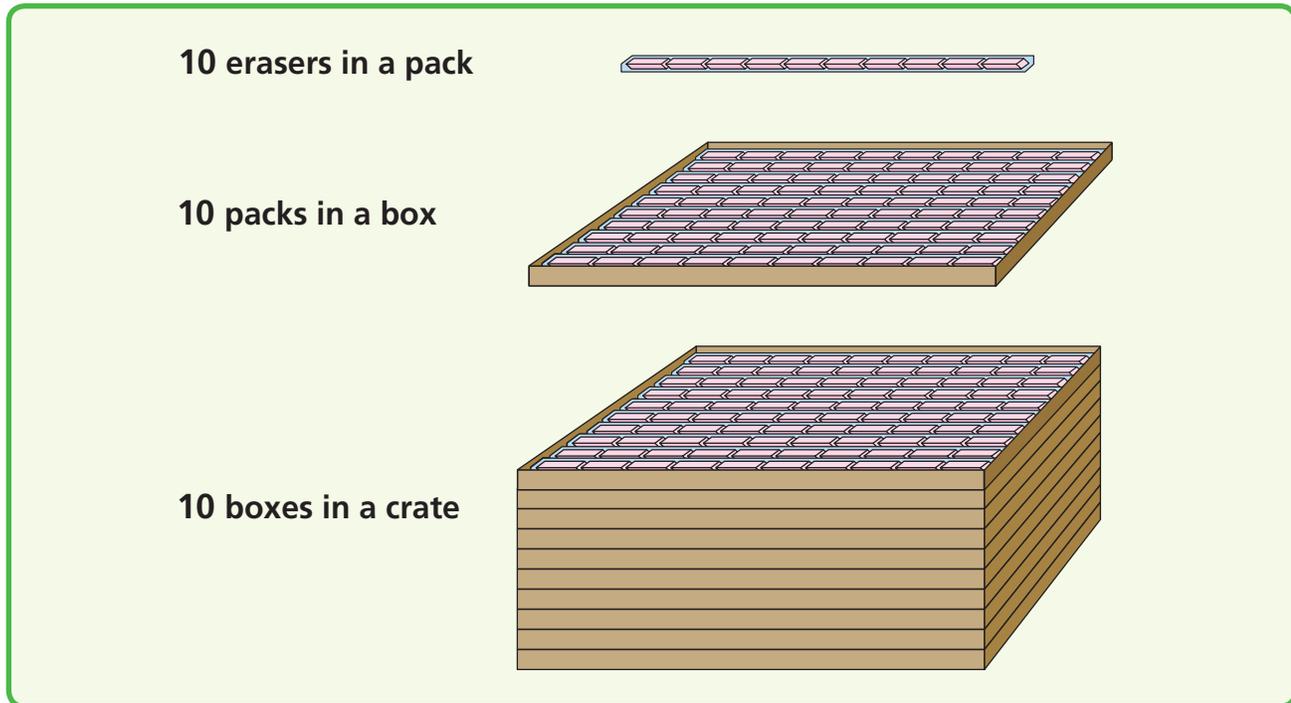$$\begin{array}{r} 1, \ 0, \ 2, \ 1 \\ \times \quad\quad 7 \\ \hline \end{array}$$

②
$$\begin{array}{r} 0, \ 2, \ 6, \ 8 \\ \times \quad\quad 5 \\ \hline \end{array}$$

③
$$\begin{array}{r} 2, \ 4, \ 5, \ 7 \\ \times \quad\quad 3 \\ \hline \end{array}$$

EXPLORE
Separating Packages of Erasers

The Eraser Store is still packaging:

10 erasers in a pack

10 packs in a box

10 boxes in a crate

Dana, Joel, and Rachel ordered a total of 3 boxes, 4 packs, and 2 loose erasers. They decided to share the erasers in the shipment equally.

1 Use base-ten blocks to represent the total order.

2 Use base-ten blocks to represent what Dana gets.

3 How many erasers does Dana get?

4 How did you divide the total order among 3 people?

REVIEW MODEL
Dividing Shipments

You can find the new number of packages needed for a shipment when orders are divided equally at the Eraser Store.

Divide: $4 \overline{) 0, 6, 5, 2}$

Step ❶ Divide the crates into equal groups. Zero crates divided into 4 groups gives 0 crates in each group.	$\begin{array}{r} 0 \\ 4 \overline{) 0,\ 6,\ 5,\ 2} \end{array}$
Step ❷ Divide and repackage the boxes, if necessary. 6 boxes divided into 4 groups gives **1** box in each group, with 2 boxes left over. Open the 2 boxes to make 20 packs. Add them to the 5 packs that are already there: 20 + 5 = **25**. Write a **2** beside the 5.	$\begin{array}{r} 0,\ 1 \\ 4 \overline{) 0,\ 6,\ ^{2}5,\ 2} \end{array}$
Step ❸ Divide and repackage the packs, if necessary. 25 packs divided into 4 groups gives **6** packs in each group, with 1 pack left over. Open the pack to make 10 loose erasers. Add them to the 2 loose erasers already there: 10 + 2 = **12**. Write a **1** beside the 2.	$\begin{array}{r} 0,\ 1,\ \textbf{6}, \\ 4 \overline{) 0,\ 6,\ ^{2}5,\ ^{1}2} \end{array}$
Step ❹ Divide the loose erasers. 12 loose erasers divided into 4 groups gives **3** erasers in each group. The total number of erasers in each order after division is 163.	$\begin{array}{r} 0,\ 1,\ \ 6,\ \textbf{3} \\ 4 \overline{) 0,\ 6,\ ^{2}5,\ ^{1}2} \end{array}$

✔Check for Understanding

Divide.

❶

$$3 \overline{) 1,\ 4,\ 6,\ 4}$$

❷

$$2 \overline{) 2,\ 4,\ 7,\ 4}$$

❸

$$6 \overline{) 1,\ 5,\ 4,\ 8}$$

EXPLORE
Shipments Without Commas

> **The Eraser Store is still packaging:**
> **10 erasers in a pack, 10 packs in a box, and 10 boxes in a crate.**

Mr. Zeh ordered erasers for his school, but some commas are gone from the order!

Order Form	Mr. Zeh: **4,183**

1 How many erasers are in a crate?

2 How many erasers are in a box?

3 How many erasers are in a pack?

4 Copy and complete this number sentence to find the total number of erasers in Mr. Zeh's order.

$4 \times \blacksquare + 1 \times \blacksquare + 8 \times \blacksquare + 3 = \blacksquare$

5 What do you notice about the order form and the number of erasers in Mr. Zeh's order?

Mrs. Ray also ordered erasers for her school.

Order Form	Mrs. Ray: **6,935**

6 How many erasers did she order?

7 Copy and complete this number sentence:

$6 \times \blacksquare + 9 \times \blacksquare + 3 \times \blacksquare + 5 = \blacksquare$

8 How many total erasers did Mr. Zeh and Mrs. Ray order?

EXPLORE
Rounding Shipments

José ordered 784 erasers and his sister, Rosa, ordered 694 erasers.

1 Did José order closer to **700** or **800** erasers?

2 Did Rosa order closer to **600** or **700** erasers?

3 Together, about how many erasers did José and Rosa order?

Kiko ordered 2,115 erasers, but her mom reduced the order by 322 erasers.

4 Round Kiko's original order to the nearest **hundred.**

5 Round **322** to the nearest **hundred.**

6 Estimate the number of erasers that Kiko will receive.

Each of Stacy's 9 friends ordered 53 erasers.

7 Round **53** to the nearest **ten.**

8 Use your rounded number to estimate **53 × 9.**

Derrick reduced his eraser order of 2,394 by 1,476 erasers.

9 Estimate Derrick's final order.

10 If Derrick and his 4 friends share his erasers, about how many erasers will each get?

REVIEW MODEL
Problem Solving Strategy
Make a Table

Gershon was preparing an order for the Eraser Store. He didn't write down how many crates or boxes were in the order or how many total erasers were ordered. His notes said that the order would include a total of 11 containers, 4 of which were packs, and there would be no loose erasers. How many different combinations of containers could there be in Gershon's order?

Strategy: Make a Table

Read to Understand

What do you know from reading the problem?

The order included 11 containers. Four of those containers were packs. There were no loose erasers.

Plan

How can you solve this problem?

Think about the strategies you might use. One way is to make a table.

Solve

How can you make a table?

Make a row or column for each type of container. List all the combinations that satisfy the requirements of the problem.

____ total of 11 containers

____ 4 packs

____ no loose erasers

There are 8 combinations that answer the question.

Crate	Box	Pack	Eraser
7	0	4	0
0	7	4	0
6	1	4	0
1	6	4	0
5	2	4	0
2	5	4	0
4	3	4	0
3	4	4	0

Check

Look back at the problem. Did you answer the questions that were asked? Does the answer make sense?

Problem Solving Practice

Use the strategy *make a table* to solve.

1 Tracy had 16¢ in her pocket. How many different combinations of coins could she have?

2 Joey tosses two number cubes, each numbered 1–6. How many different ways can the numbers have a sum of 7?

Mixed Strategy Practice

Use any strategy to solve. Explain.

3 Kate had two bags of prizes to give to each of her party guests. There were 6 more prizes in the first bag than in the second bag, and a total of 38 prizes in both bags. Find the number of prizes in each bag.

4 Jason jumped 6.2 meters on his first jump at a track meet. On his second jump, he jumped 0.45 meters farther. What was the total combined length of his two jumps?

5 The 19 members of the swim team each swam 8 laps. How many total laps did the team swim?

6 Trina spent $4\frac{1}{4}$ hours studying for her tests, $2\frac{1}{4}$ hours running errands, and $1\frac{1}{2}$ hours working out in the lawn. She also spent some time exercising. If she spent 11 hours in all, how long did she exercise?

7 How many scores are possible if you toss 2 beanbags onto the game board shown?

1	3
7	5

8 Ryan's average score on 2 tests was 89. He scored 95 on the first test. What did he score on the second test?

Vocabulary

Choose the best vocabulary term from Word List A for each sentence.

1 A table or a graph is a type of ___?___ that displays data.

2 The number 12 is a ___?___ of 3.

3 To add $4 + 4 + 4 + 4 + 4$, you can ___?___ 4 by 5.

4 Addition and subtraction are ___?___ operations.

5 The ___?___ that represents the operation "add" is $+$.

6 A(n) ___?___ is an approximation.

7 A(n) ___?___ uses vertical or horizontal bars to display data.

8 To ___?___ is to find a number near a given number that is easier to compute with.

Word List A

bar graph
chart
comma
divided by
estimate
inverse
multiple
multiplication
multiply
packing
repacking
round
symbol
unpacking

Complete each analogy using the best term from Word List B.

9 Subtraction is to addition as division is to ___?___.

10 Daisy is to flower as bar graph is to ___?___.

Word List B

chart
estimate
multiplication
symbol

💬 Talk Math

Discuss with a partner what you have learned about regrouping. Use the vocabulary terms *packing*, *repacking*, and *unpacking*.

11 An Eraser Store packs erasers by the base-7 system. How can you combine two orders of erasers?

12 An Eraser Store packs erasers by the base-10 number system. It has 1,000 erasers. How can you find the number of erasers left after an order is filled?
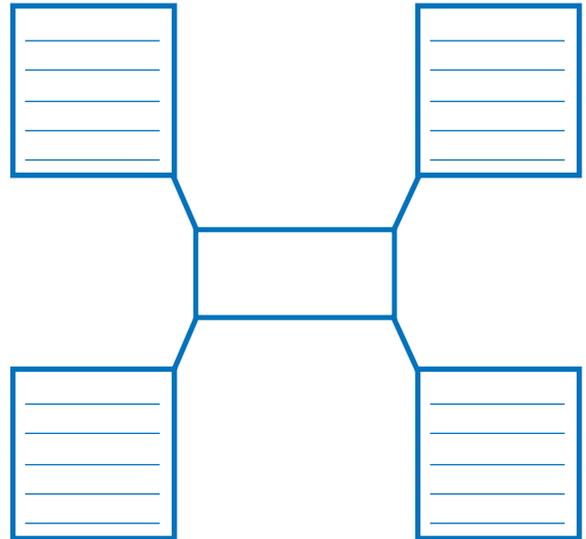
Degrees of Meaning Grid

14 Create a degrees of meaning grid that includes the terms *bar graph, chart, estimate,* and *round.*

General	Less General	Specific

Word Web

15 Create a word web using the word *multiplication.* Use what you know and what you have learned about multiplying and multiplication.

What's in a Word?

SYMBOL, CYMBAL The words *symbol* and *cymbal* sound the same even though they have different spellings. They also mean different things. A cymbal is a musical instrument. Cymbals are large plates made of bronze or brass. They can make a loud clashing sound when struck, or they can make a soft ting if tapped lightly.

A *symbol* is a sign used to stand for something else. Much of mathematics is written in *symbols* that are understood in many countries of the world. For example, almost everyone understands what $5 + 3$ means. *Symbols* help make mathematics a universal language.

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GAME

Eraser Inventory

Game Purpose
To practice combining and reducing shipments in the base-ten system

Materials
- Number cube (1–6)
- Activity Master 15: Eraser Inventory

Eraser Inventory

How To Play The Game

1 This is a game for 2 players. Each player will need one number cube and a copy of AM15: Eraser Inventory. The Eraser Store has 5 crates of erasers in stock. They accept only orders smaller than a crate.

2 Player 1 tosses the number cube three times.
- Toss 1 is the number of boxes in the order.
- Toss 2 is the number of packs in the order.
- Toss 3 is the number of loose erasers in the order.

3 Player 1 records the shipment in the spaces for Shipment #1.

4 Player 2 then figures out how many crates, boxes, packs, and loose erasers remain in stock. Player 2 records the numbers in the spaces for "New amount in stock."

5 Switch roles. Player 2 repeats Steps 2 and 3, and Player 1 repeats Step 4.

Example: Player 1 rolls 4, 6, 1. Then Player 2 rolls 2, 5, 6.

In stock	5	0	0	0
Shipment #1		4	6	1
New amount In stock	4	5	3	9
Shipment #2		2	5	6
New amount In stock	4	2	8	3

6 Keep taking turns until one player rolls an order that is too large to fill. The last player able to have his or her order filled wins!

GAME

Least to Greatest

Least to Greatest

120 ÷ 10   11 × 6   19 × 5   565 − 29

How To Play The Game

1 Play this game with a partner. Cut out the *Least to Greatest* cards from Activity Masters 17 and 18.

2 Choose one player to be the Placer and the other to be the Timer.
- The Placer holds all the *Least to Greatest* cards face down in a stack.
- The Timer gets ready to time the Placer for **60** seconds.

3 The goal is to place as many cards as possible in order from least to greatest. The Timer tells the Placer when to start. The Placer turns over one card at a time and places it where it belongs in a line of cards. Since you have only **60** seconds, a good strategy is to estimate rather than to calculate exactly.

4 When the **60** seconds are up, the Timer checks the cards.
- The Timer solves the problem on each card to see whether the cards are in the correct order.
- If the Timer finds an error, the Placer can remove cards from the row so the remaining cards are in order.
- When the order of the cards is correct, the Placer gets **1** point for each card in the line.

5 Switch roles, and play again. Keep a running tally of your points. The first player to reach **50** wins!

CHALLENGE

The Eraser Store wants to experiment with other ways of packing erasers. They will still sell loose erasers, but they will now put **8** in a pack, **8 × 8**, or **64** in a box, and **8 × 8 × 8**, or **512** in a crate.

For example, to send **925** erasers, they will use
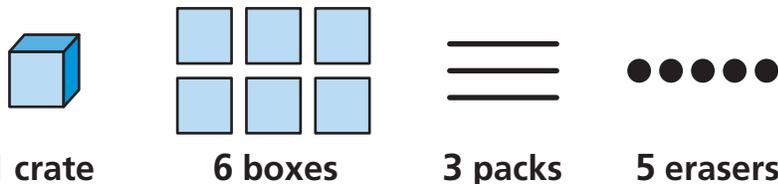
| 1 crate | 6 boxes | 3 packs | 5 erasers |

$925 - 512 = 413 \qquad 413 - (6 \times 64) = 29 \qquad 29 - (3 \times 8) = 5$

The Eraser Store has **5** orders to fill. The shipping clerk has filled the number of crates for each order. Copy and complete each order.

	Order	🧊	🔲	―	●
1	155 erasers				
2	400 erasers				
3	605 erasers	🧊			
4	1,000 erasers	🧊			
5	715 erasers	🧊			