Explore Dividing Three-Digit Numbers

You have learned about division as equal sharing and about the relationship between multiplication and division. Use what you know to try to solve the problem below.

↓ **What is 78 ÷ 3?**

TRY IT

Learning Target
- Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

SMP 1, 2, 3, 4, 5, 6, 7, 8

Math Toolkit
- base-ten blocks
- counters
- bowls
- paper plates
- grid paper
- multiplication models

DISCUSS IT

Ask your partner: How did you get started?

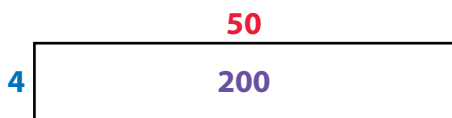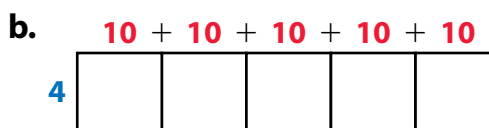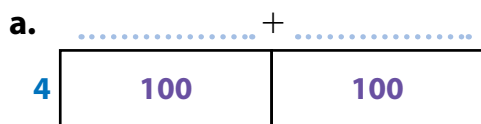**Tell your partner:** At first, I thought . . .

CONNECT IT

1 LOOK BACK

Explain how you found the quotient of 78 ÷ 3.

2 LOOK AHEAD

You can solve division problems in many ways. You can use place value, rectangular arrays, area models, equations, and the relationship between multiplication and division. The area model below shows 200 ÷ 4.

```
                        50
              ┌──────────────────────┐
           4  │         200          │
              └──────────────────────┘
```

An area model shows both multiplication (**4** × **50** = **200**) and division (**200** ÷ **4** = **50**). You can also use area models to break apart a problem into smaller parts. Fill in the missing labels on two other area models for 200 ÷ 4.

a. .... + ...
```
              ┌───────────┬───────────┐
           4  │    100    │    100    │
              └───────────┴───────────┘
```

b. **10 + 10 + 10 + 10 + 10**
```
              ┌────┬────┬────┬────┬────┐
           4  │    │    │    │    │    │
              └────┴────┴────┴────┴────┘
```

3
a. Sometimes there is a remainder left over when you divide. Fill in the remainder for 21 ÷ 4 in the box at the right.

$$\begin{array}{r} 5\,\text{R}\,\boxed{} \\ 4\overline{)21} \end{array}$$

b. The **dividend** is ...., the number you are dividing.

c. The **divisor** is ...., the number you are dividing by.

d. The quotient is ...., the result of the division problem.

4 REFLECT

Explain how an area model shows both multiplication and division.

....

....

....

Prepare for Dividing Three-Digit Numbers

1 Think about what you know about division. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

Word	In My Own Words	Example
division		
dividend		
divisor		
quotient		
remainder		

2 Use the term *equal groups* to describe the division problem shown below.

$123 \div 5 = 24 \text{ R } 3$

3 Solve the problem. Show your work.

What is 68 ÷ 4?

Solution ....

4 Check your answer. Show your work.

Develop Dividing with Arrays and Area Models

Read and try to solve the problem below.

▼ **What is 136 ÷ 4?**

TRY IT

🧰 **Math Toolkit**
- base-ten blocks 🔍
- counters
- bowls
- paper plates
- grid paper
- multiplication models 🔍

💬 **DISCUSS IT**

Ask your partner: Why did you choose that strategy?

Tell your partner: I do not understand how . . .

Explore different ways to understand dividing three-digit numbers by one-digit numbers.
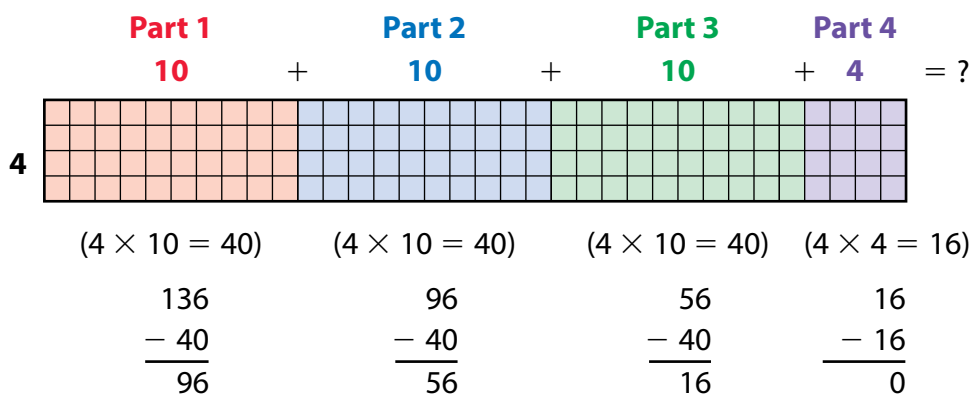
What is 136 ÷ 4?

MODEL IT

You can use a rectangular array to help you break apart the problem into smaller parts.

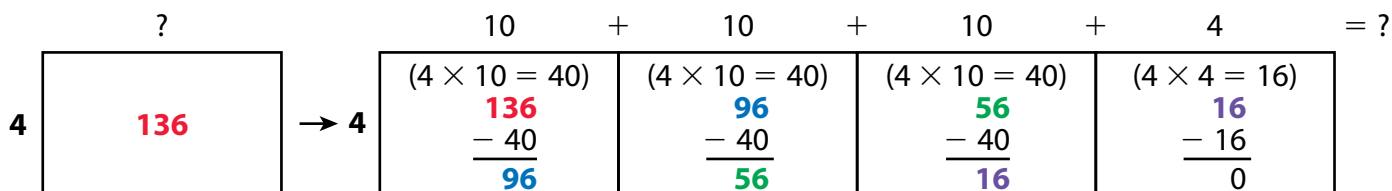The array shows a rectangle divided into 136 squares in 4 rows.

You can use what you know about multiplication and subtraction to break apart 136 and divide the lesser numbers by 4.

Part 1		Part 2		Part 3		Part 4	
10	+	10	+	10	+	4	= ?

$(4 \times 10 = 40)$ $(4 \times 10 = 40)$ $(4 \times 10 = 40)$ $(4 \times 4 = 16)$

$$136 \\ -\ 40 \\ \overline{96}$$ $$96 \\ -\ 40 \\ \overline{56}$$ $$56 \\ -\ 40 \\ \overline{16}$$ $$16 \\ -\ 16 \\ \overline{0}$$

MODEL IT

You can use an area model to help you break apart the problem into smaller parts.

This area model uses multiplication and repeated subtraction. You can break apart 136 and divide the lesser numbers by 4.

	?		10	+	10	+	10	+	4	= ?

4	136	→ 4	$(4 \times 10 = 40)$ 136 − 40 96	$(4 \times 10 = 40)$ 96 − 40 56	$(4 \times 10 = 40)$ 56 − 40 16	$(4 \times 4 = 16)$ 16 − 16 0

CONNECT IT

Now you will use the problem from the previous page to help you understand how to use a rectangular array and an area model to divide a three-digit number by a one-digit number.

1 Look at the first **Model It**. Why do you think Parts 1, 2, and 3 of the array show multiplying the divisor, 4, by 10?

2 Why is the area model in the second **Model It** broken into four parts?

3 What is 136 ÷ 4? .... How do both **Model Its** show how to find the quotient of 136 ÷ 4 in a similar way?

4 Explain how using an array and an area model can help you divide.

5 How can you use multiplication to check that your answer is correct?

6 REFLECT

Look back at your **Try It**, strategies by classmates, and **Model Its**. Which models or strategies do you like best for dividing a three-digit number by a one-digit number? Explain.

....

....

....

APPLY IT

Use what you just learned to solve these problems.

7 Complete the area model below to find 132 ÷ 3.

$$20 \quad + \quad \boxed{} \quad + \quad \boxed{} \quad = \quad \boxed{}$$

	132	72	12
3	− 60	− ☐	− ☐
	☐	☐	☐

Solution ....

8 Complete the array to find 198 ÷ 6. Use multiplication to check your answer. Show your work.

10

6

Solution ....

9 What is 224 divided by 7?

Ⓐ 30   Ⓑ 31

Ⓒ 32   Ⓓ 42

Practice Dividing with Arrays and Area Models

Study the Example showing one way to divide a three-digit number by a one-digit number. Then solve problems 1–5.

EXAMPLE   What is 260 divided by 4?

Use an area model.

	50 +	**10** +	**5** = **65**
4	$(4 \times 50 = 200)$ 260 $- 200$ 60	$(4 \times 10 = 40)$ 60 $- 40$ 20	$(4 \times 5 = 20)$ 20 $- 20$ 0

Use multiplication to check:

$4 \times 65 = (4 \times 60) + (4 \times 5)$

$\qquad\quad = 240 + 20$

$\qquad\quad = 260$

$260 \div 4 = 65$

1 Complete this area model to find $135 \div 5$.

☐ + ☐ + ☐ = ☐

5	135 − ☐ ☐	85 − ☐ ☐	35 − ☐ ☐

Solution ....

2 Identify the dividend, divisor, and quotient.

a. $900 \div 3 = 300$

dividend: _____ divisor: _____ quotient: _____

b. $120 = 600 \div 5$

dividend: _____ divisor: _____ quotient: _____

3 Complete the array to find 208 ÷ 8. Show your work.
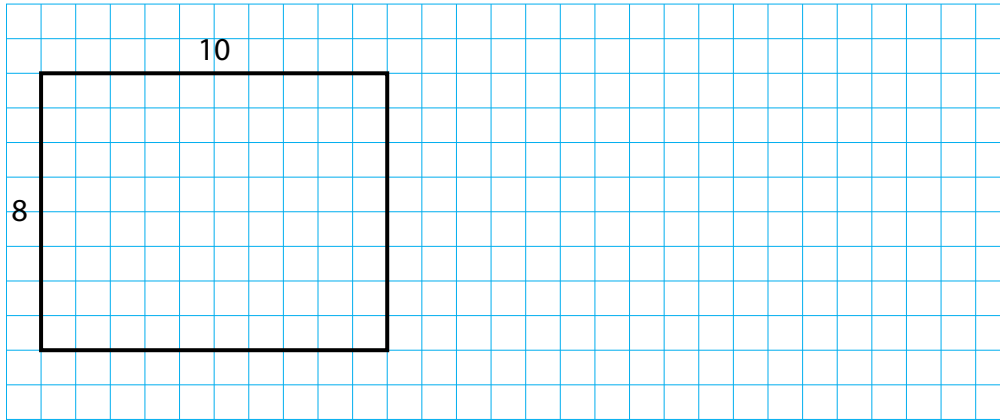
Solution ....

4 What is 476 ÷ 7? Use an area model to solve the problem. Show your work.

Solution ....

5 Explain how to use multiplication to check your answer in problem 4.

Develop Dividing with Estimation and Area Models

Read and try to solve the problem below.

> There are 232 people waiting in line for an amusement park ride. Each car on the ride will be filled with 5 people. How many cars are needed to hold all the people waiting in line?

TRY IT

Math Toolkit
- base-ten blocks
- grid paper
- multiplication models

DISCUSS IT

Ask your partner: Do you agree with me? Why or why not?

Tell your partner: I disagree with this part because . . .

Explore how to estimate a quotient and how to use the estimate to divide with an area model.

> There are 232 people waiting in line for an amusement park ride. Each car on the ride will be filled with 5 people. How many cars are needed to hold all the people waiting in line?

MODEL IT

You can use the relationship between multiplication and division to estimate the quotient in a division problem with a one-digit divisor.

$232 \div 5 = ?$ and $5 \times ? = 232$

Find the products of 5 and multiples of 10. Make a table.

Number of Cars	10	20	30	**40**	**50**
Number of People	50	100	150	**200**	**250**

The dividend 232 is between **200** and **250**, so the quotient is between **40** and **50**.

MODEL IT

You can use an area model to solve a division problem with a one-digit divisor.

The estimate shows the quotient is between 40 and 50.
Begin the area model by multiplying 40 by 5.

```
        ?                            40        +        6        = ?
  ┌──────────────┐            ┌────────────────┬────────────────┐
  │              │            │ (5 × 40 = 200) │ (5 × 6 = 30)   │
  │              │            │      232       │      32        │
5 │     232      │    ──→   5 │    − 200       │    − 30        │
  │              │            │   ─────────    │   ─────────    │
  │              │            │       32       │       2        │
  └──────────────┘            └────────────────┴────────────────┘
                                                        remainder
```
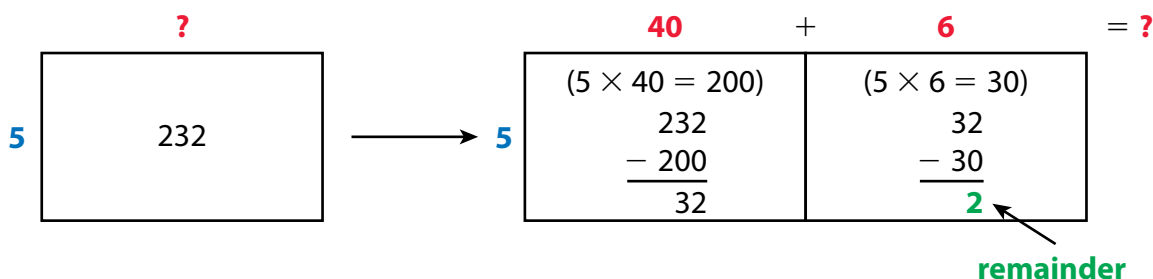
Use multiplication to check:
$5 \times 46 = (5 \times 40) + (5 \times 6)$
$\qquad = 200 + 30$
$\qquad = 230 \qquad\qquad\qquad 230 + 2 = 232$

CONNECT IT

Now you will use the problem from the previous page to help you understand how to estimate a quotient and use the estimate to divide with an area model.

1 In the first **Model It**, why do you multiply 5 by multiples of 10?

2 Look at the second **Model It**. How can you find the number of cars that are each filled with 5 people?

3 What does the remainder mean in this problem?

4 How many cars are needed to hold all the people waiting in line? Explain.

5 How can you break apart a division problem with an area model in order to solve the problem?

6 REFLECT

Look back at your **Try It**, strategies by classmates, and **Model Its**. Which models or strategies do you like best for estimating a quotient and for dividing a three-digit number by a one-digit number? Explain.

....

....

....

....

APPLY IT

Use what you just learned to solve these problems.

7 A store orders 315 hats. The hats are shipped in boxes of 8. How many boxes are needed to ship all the hats? First, find which two multiples of 10 the quotient is between. Then find the quotient using an area model. Show your work.

Number of Boxes				
Number of Hats				

Solution ....

8 What is 174 divided by 3? Use multiplication to check your answer. Show your work.

Solution ....

9 Find 456 ÷ 6. Show your work.

Solution ....

Practice Dividing with Estimation and Area Models

Study the Example showing one way to divide a three-digit number by a one-digit number. Then solve problems 1–6.

EXAMPLE

There are 650 flowers to arrange in vases. Each vase holds 6 flowers. How many vases can each be filled with 6 flowers? Are there any flowers left over?

Find $650 \div 6$.
Use an area model.

```
        100        +      8       = 108
     ┌──────────────┬──────────────┐
     │(6 × 100 = 600)│ (6 × 8 = 48) │
     │     650       │        50    │
  6  │   − 600       │      − 48    │
     │    ─────      │       ────   │
     │      50       │         2    │
     └──────────────┴──────────────┘
```

$650 \div 6 = 108$ R **2**

108 vases can each be filled with 6 flowers. There are 2 flowers left over.

---

1 The table lists the products of 7 and multiples of 10. Use the table to help estimate the quotient of $253 \div 7$.

10	20	30	40	50
70	140	210	280	350

The quotient is between .... and ....

2 Use the estimate in problem 1 to find the quotient of $253 \div 7$.
Complete the area model to solve the problem.

```
        30          +        6        = ☐
     ┌──────────────┬──────────────┐
     │ (7 × 30 = ☐ ) │ (7 × 6 = ☐ )  │
     │     253       │       43     │
  7  │   − ☐         │     − ☐       │
     │    ─────      │      ────     │
     │     ☐         │       ☐       │
     └──────────────┴──────────────┘
```

Solution ....

3 Explain how to check whether the answer to the division problem below is correct.

$$134 \div 5 = 26 \, R \, 4$$

4 Mike has 876 toy building pieces to share among himself and 2 friends. He wants each person to have an equal number of pieces. How many pieces does each person get? Show your work.

Solution ....

5 Look at how you solved problem 4. Explain how you could use estimation before you divide in order to know whether your answer is reasonable.

6 Explain how to use multiplication to check your answer in problem 4.
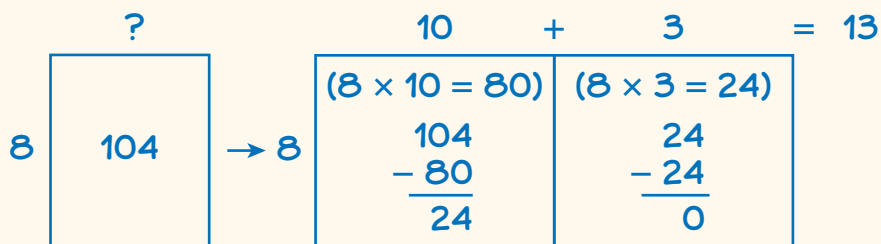
Refine Dividing Three-Digit Numbers

Complete the Example below. Then solve problems 1–9.

EXAMPLE

In art class, 8 students share 104 pieces of felt. Each student gets the same number of pieces. How many pieces of felt does each student get?

Look at how you could show your work using an area model.

```
        ?                    10        +        3       =   13
   ┌──────────┐        ┌──────────────┬──────────────┐
   │          │        │(8 × 10 = 80) │ (8 × 3 = 24)  │
 8 │   104    │  → 8   │    104       │     24        │
   │          │        │  − 80        │   − 24        │
   └──────────┘        │    24        │      0        │
                       └──────────────┴──────────────┘
```

Solution ....

> The student first multiplied 8 × 10. After subtracting 80 from 104, there were still 24 left.

APPLY IT

1 Find 641 ÷ 3. Use multiplication to check your answer. Show your work.

> How can you estimate to find how many digits the quotient will have?

Solution ....

2   What is 738 divided by 9? Show your work.

> How could you use an area model to help solve this problem?

Solution ....

> **PAIR/SHARE**
> How could you use multiplication to check your answer?

3   The Prize Place has 252 toys to divide equally among 6 piñatas. How many toys go into each piñata?

Ⓐ   32

Ⓑ   41 R 4

Ⓒ   42

Ⓓ   420

Erin chose Ⓓ as the correct answer. How did she get that answer?

> Will there be any toys left over?

> **PAIR/SHARE**
> How can you tell that Erin's answer does not make sense?

4 Select all the true division equations.

Ⓐ $255 \div 8 = 31$

Ⓑ $493 \div 7 = 73$

Ⓒ $320 \div 4 = 8$

Ⓓ $675 \div 5 = 135$

Ⓔ $318 \div 6 = 53$

5 Select all the expressions that have a value of 25.

Ⓐ $225 \div 8$

Ⓑ $180 \div 7$

Ⓒ $150 \div 6$

Ⓓ $130 \div 5$

Ⓔ $100 \div 4$

6 Together, Aiden and his two sisters save 720 quarters. They divide the quarters equally. Aiden puts his quarters into 3 equal piles. How many quarters does Aiden put in each pile?

7 James, Micah, and Rebecca work at a restaurant. There is $115 in the tip jar. They decide to divide the tips equally among them and leave any extra money in the jar. How much money do they leave in the jar?

Ⓐ $1

Ⓑ $2

Ⓒ $38

Ⓓ $39

8 Mrs. Long makes 7 snack bags. She uses 175 almonds and shares them evenly among the bags. How many almonds are in each bag? How many almonds are left over? Show your work.

There are .... almonds in each bag.

There are .... almonds left over.

9 MATH JOURNAL

Look at the expression 228 ÷ 6. What two multiples of 10 is the quotient between? Explain how you know.

✓ SELF CHECK Go back to the Unit 3 Opener and see what you can check off.
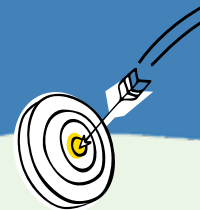
Explore Dividing Four-Digit Numbers

Previously, you learned about dividing three-digit numbers by one-digit numbers. Use what you know to try to solve the problem below.

What is 1,400 ÷ 4?

TRY IT

Math Toolkit
- base-ten blocks
- grid paper
- multiplication models

DISCUSS IT

Ask your partner: Can you explain that again?

Tell your partner: I started by . . .
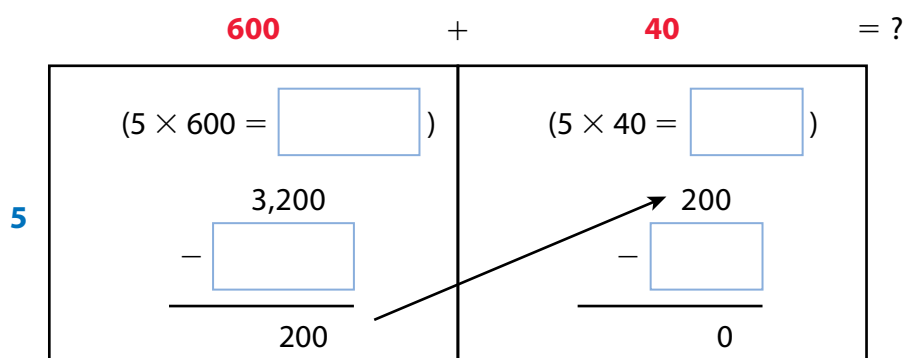
CONNECT IT

① LOOK BACK

Explain how you found the quotient of 1,400 ÷ 4.

② LOOK AHEAD

You can divide four-digit numbers in many ways.

a. Complete the area model to show 3,200 ÷ 5.

$$600 \qquad + \qquad 40 \qquad = ?$$

5

$(5 \times 600 = \boxed{})$ $(5 \times 40 = \boxed{})$

3,200   200

$-\boxed{}$ $-\boxed{}$

200   0

The quotient of 3,200 ÷ 5 is ....

b. Another way to find 3,200 ÷ 5 is by using **partial quotients**. Complete the division that shows using partial quotients.

```
    40
   600
 5)3,200    ← How many groups of 5 in 3,000? ..................
 −┌──┐
  └──┘        Subtract 600 groups of 5.
  − 200     ← How many groups of 5 in 200? ................
 ┌──┐
 └──┘         Subtract 40 groups of 5.
     0      ← The remainder is ................ .
```

Add the partial quotients shown above the problem to find the quotient:

.... + ... = ...

③ REFLECT

How are the strategies of using an area model and partial quotients alike?

....

....

Prepare for Dividing Four-Digit Numbers

1 Think about what you know about division. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

What Is It?	What I Know About It

partial quotients

Examples	Examples	Examples

2 Complete the area model to show $2{,}200 \div 8$. Add the partial quotients to solve the division problem.

$$200 \quad + \quad 70 \quad + \quad 5 \quad = \; ?$$

$(8 \times 200 = \boxed{})$ $(8 \times 70 = \boxed{})$ $(8 \times 5 = \boxed{})$

$$8\overline{\smash{\big)}\begin{array}{r} 2{,}200 \\ -\boxed{} \\ \hline 600 \end{array}} \qquad \begin{array}{r} 600 \\ -\boxed{} \\ \hline 40 \end{array} \qquad \begin{array}{r} 40 \\ -\boxed{} \\ \hline 0 \end{array}$$

3 Solve the problem. Show your work.

What is 1,500 ÷ 6?

Solution ....

4 Check your answer. Show your work.

Develop Dividing Four-Digit Numbers

Read and try to solve the problem below.

> A factory has 2,125 tablets to ship to stores.
> It can ship 4 tablets in each box.
> How many full boxes can the factory ship?

TRY IT

Math Toolkit
- base-ten blocks
- grid paper
- multiplication models

DISCUSS IT

Ask your partner: Do you agree with me? Why or why not?

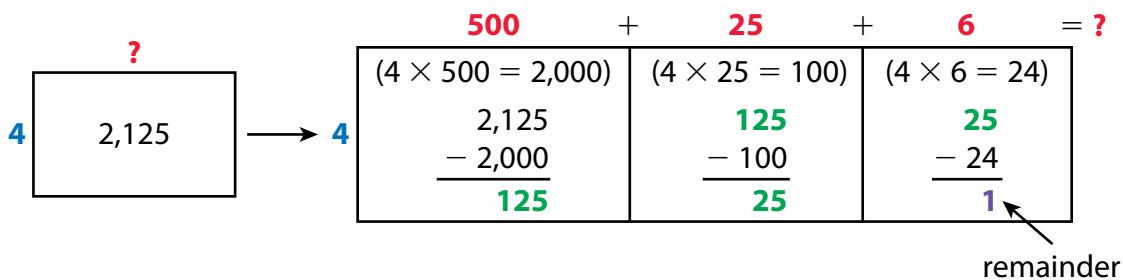**Tell your partner:** I agree with you about . . . because . . .

Explore different ways to understand dividing a four-digit number by a one-digit number.

> **A factory has 2,125 tablets to ship to stores. It can ship 4 tablets in each box. How many full boxes can the factory ship?**

MODEL IT

You can use an area model to break apart the problem into smaller parts.

The area model shows how to use multiplication and repeated subtraction to divide 2,125 by 4.

$$500 \quad + \quad 25 \quad + \quad 6 \quad = ?$$

$(4 \times 500 = 2{,}000)$	$(4 \times 25 = 100)$	$(4 \times 6 = 24)$
2,125	125	25
− 2,000	− 100	− 24
125	**25**	**1**

4) 2,125 → 4

remainder

MODEL IT

You can also find partial quotients to divide.

Divide each place value of 2,125 by 4.

```
        6
       25
      500
   4)2,125  ←—  How many groups of 4 in 2,000? 500
   − 2,000      Subtract 500 groups of 4.
       125  ←—  How many groups of 4 in 100? 25
     − 100      Subtract 25 groups of 4.
        25  ←—  How many groups of 4 in 25? 6
      − 24      Subtract 6 groups of 4.
         1
```

The partial quotients are **500**, **25**, and **6**.

The quotient includes both the sum of the partial quotients and the remainder, the amount left over.

CONNECT IT

Now you will use the problem from the previous page to help you understand how to use an area model and partial quotients to divide a four-digit number by a one-digit number.

1 Look at the first **Model It**. How can you find the number of full boxes the factory can ship?

2 What does the remainder mean in this problem?

3 Look at the second **Model It**. How does using the partial quotients strategy help you find the quotient of 2,125 ÷ 4?

4 Explain how using an area model and partial quotients can help you divide a four-digit number by a one-digit number.

5 How can you check that your answer is correct?

6 REFLECT

Look back at your **Try It**, strategies by classmates, and **Model Its**. Which models or strategies do you like best for dividing a four-digit number by a one-digit number? Explain.

APPLY IT

Use what you just learned to solve these problems.

7 Find 1,010 ÷ 9. Show your work.

Solution ....

8 Find 1,458 ÷ 3. Use multiplication to check your answer. Show your work.

Solution ....

....

9 What is 5,783 divided by 6?

Ⓐ 963

Ⓑ 963 R 5

Ⓒ 964 R 5

Ⓓ 968

Practice Dividing Four-Digit Numbers

Study the Example showing how to divide a four-digit number by a one-digit number. Then solve problems 1–5.

EXAMPLE

A group of hikers plan to take 3 hours to hike a trail 5,380 meters long. They want to hike the same distance each hour. How many meters do they plan to hike each hour?

$$5,380 \div 3 = \textbf{1,793 R 1}$$

The hikers plan to hike 1,793 meters each hour. Then they will need to hike 1 more meter to reach the end of the trail.

```
        3
       90
      700
    1,000
  3)5,380  ←— There are 1,000 groups of 3 in 5,000.
  − 3,000       Subtract 1,000 groups of 3.
    2,380  ←— There are 700 groups of 3 in 2,380.
  − 2,100       Subtract 700 groups of 3.
      280  ←— There are 90 groups of 3 in 280.
    − 270       Subtract 90 groups of 3.
       10  ←— There are 3 groups of 3 in 10.
      − 9       Subtract 3 groups of 3.
        1
```

1 Complete the division problem using partial quotients.

$8,235 \div 5 =$ ....

```
5)8,  2  3  5
```

2 Complete the division problem using partial quotients.

$4,507 \div 4 =$ ....

```
4)4,  5  0  7
```

3 One week has 7 days. How many weeks do 1,230 days make? What does the remainder mean? Show your work.

Solution ....

4 Mugs can be packed with up to 6 mugs in each box. How many boxes are needed to pack 1,528 mugs? Show your work.

Solution ....

5 Use estimation to select all the true division equations.

Ⓐ $4,960 \div 2 = 9,920$

Ⓑ $7,095 \div 5 = 1,419$

Ⓒ $9,621 \div 3 = 230 \text{ R } 7$

Ⓓ $3,875 \div 6 = 645 \text{ R } 5$

Ⓔ $5,004 \div 4 = 251$

Vocabulary

remainder the amount left over when one number does not divide another number a whole number of times.

$5,380 \div 8 = 672 \text{ R } 4$

↑ remainder

Refine Dividing Four-Digit Numbers

Complete the Example below. Then solve problems 1–9.

EXAMPLE

What is 7,824 divided by 3?

Look at how you could show your work using partial quotients.

```
        8 ⎫
      600 ⎬ partial quotients
    2,000 ⎭
  3)7,824  ←— 7,824 is between 3 × 2,000 and 3 × 3,000,
  − 6,000      so subtract 3 × 2,000.
    1,824  ←— 1,824 is between 3 × 600 and 3 × 700,
  − 1,800      so subtract 3 × 600.
       24  ←— 24 is equal to 3 × 8,
  −    24      so subtract 3 × 8.
        0  ←— There is no remainder.
```

$7,824 ÷ 3 = 2,000 + 600 + 8$

Solution ....

The student added the partial quotients to find $7,824 ÷ 3$.

PAIR/SHARE
How else could you solve this problem?

APPLY IT

1 Find $1,359 ÷ 4$. Use multiplication to check your answer. Show your work.

Solution ....

How many digits will the quotient have?

PAIR/SHARE
How do you know if there is a remainder in this problem?

2 Rogelio has 2,490 stamps in his collection. He divides his stamps equally among his 6 children. How many stamps does each child get? Show your work.

How could you use partial quotients to solve this problem?

Solution ....

3 There are 1,275 people waiting to try out for a show. The people wait in 5 rooms. Each room has the same number of people. How many people are in each room?

Ⓐ 111

Ⓑ 251

Ⓒ 255

Ⓓ 1,270

Awan chose Ⓓ as the correct answer. How did he get that answer?

Can you use multiplication to help solve the problem?

4 Mariah finds 4,048 ÷ 8 using partial quotients as shown at the right. What partial quotient goes in the box?

Ⓐ 6

Ⓑ 7

Ⓒ 60

Ⓓ 70

$$\begin{array}{r} \square \\ 500 \\ 8\overline{)4{,}048} \\ -\ 4{,}000 \\ \hline 48 \\ -\ 48 \\ \hline 0 \end{array}$$

5 A tailor has 1,495 yards of fabric to make costumes. He needs 7 yards of fabric for each costume. How many costumes can the tailor make? Is there any fabric left over? Show your work.

Solution ....

6 Jack uses partial quotients to solve 6,035 ÷ 5 as shown by the area model.

	1,000	+ 200 + 35	
5	5,000	1,000	35

Jack says the quotient is 1,235 because 1,000 + 200 + 35 = 1,235. What did Jack do wrong?

Ⓐ Jack broke apart 6,035 incorrectly.

Ⓑ Jack wrote the incorrect partial quotient above 1,000.

Ⓒ Jack should have subtracted 35 from 1,000 + 200.

Ⓓ Jack wrote the incorrect partial quotient above 35.

Lesson 15 Divide Four-Digit Numbers   **325**

7 Find 2,259 ÷ 3.

8 Trina has a box of 1,132 beads to make necklaces. She wants to use as many of the beads as possible to make 9 necklaces. She uses the same number of beads for each necklace. How many beads are on each necklace? How many beads are left over? Show your work.

There are .... beads on each necklace.

There are .... beads left over.

9 MATH JOURNAL

Explain how to divide 3,625 by 4 using partial quotients.

☑ SELF CHECK Go back to the Unit 3 Opener and see what you can check off.