Student Guide

Modeling Division

Questions 1–24 (SG pp. 535–540)

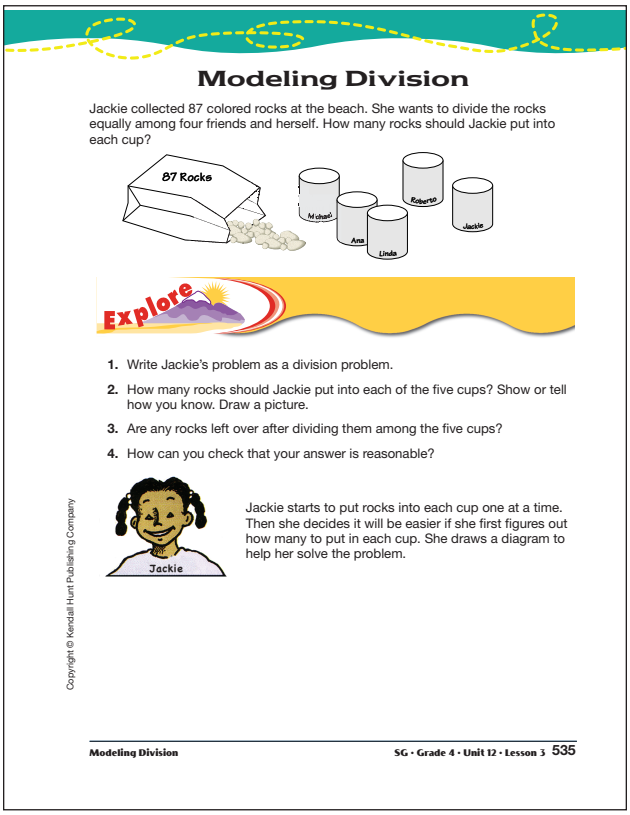
1. $87 \div 5$ or $5\overline{)87}$
2. 17 rocks; strategies and pictures will vary.
3. 2 rocks left over
4. Estimates will vary. Possible responses: Use estimation ($5 \times 20 = 100$, so the number of rocks will be less than 20) or check with multiplication ($5 \times 17 + 2 = 87$).
5. Numbers in each column are each student's share of the rocks taken from the bag; or the total number in each column is each student's share of the rocks. The total is the quotient.
6. Numbers to the right are the amounts taken from the bag and distributed into the cups.
7. Jackie subtracts the total number of rocks going into the cups from the number left in the bag from the previous try.
8. When there are not enough rocks in the bag to distribute equally into all five cups.
9. Rocks cannot be easily split into pieces. Two rocks cannot be divided evenly into 5 bags.
10. **A–B.** The numbers in each column may vary. However, the sum should be 16.

1	1	1	3
5	5	5	15
10	10	10	30
1 Brother	2 Brother	3 John	48 R2

C. Each brother gets 16 marbles.

D. John has 2 marbles left over.

E. Answers will vary.



Modeling Division

Jackie collected 87 colored rocks at the beach. She wants to divide the rocks equally among four friends and herself. How many rocks should Jackie put into each cup?

Explore

1. Write Jackie's problem as a division problem.
2. How many rocks should Jackie put into each of the five cups? Show or tell how you know. Draw a picture.
3. Are any rocks left over after dividing them among the five cups?
4. How can you check that your answer is reasonable?

Jackie starts to put rocks into each cup one at a time. Then she decides it will be easier if she first figures out how many to put in each cup. She draws a diagram to help her solve the problem.

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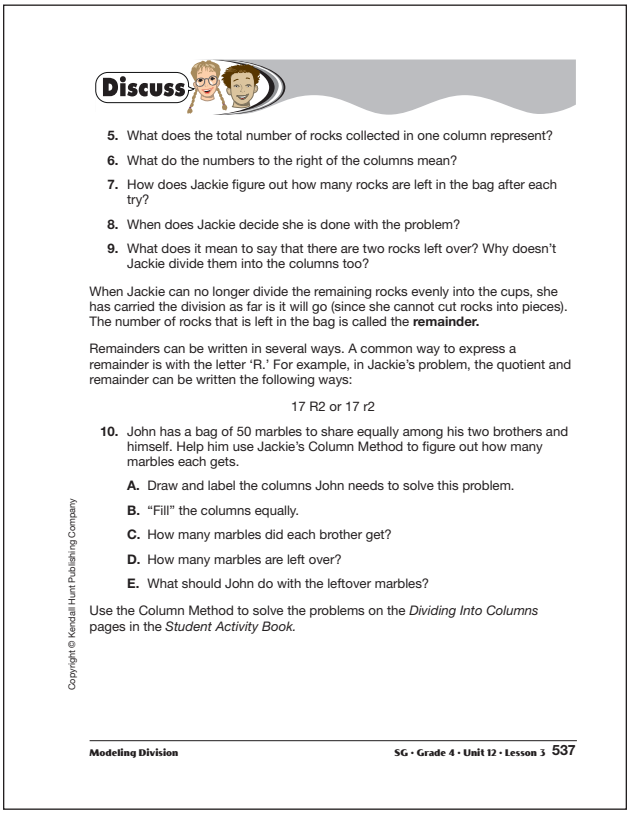

Discuss

5. What does the total number of rocks collected in one column represent?
6. What do the numbers to the right of the columns mean?
7. How does Jackie figure out how many rocks are left in the bag after each try?
8. When does Jackie decide she is done with the problem?
9. What does it mean to say that there are two rocks left over? Why doesn't Jackie divide them into the columns too?

When Jackie can no longer divide the remaining rocks evenly into the cups, she has carried the division as far is it will go (since she cannot cut rocks into pieces). The number of rocks that is left in the bag is called the **remainder.**

Remainders can be written in several ways. A common way to express a remainder is with the letter 'R.' For example, in Jackie's problem, the quotient and remainder can be written the following ways:

17 R2 or 17 r2

10. John has a bag of 50 marbles to share equally among his two brothers and himself. Help him use Jackie's Column Method to figure out how many marbles each gets.
    - **A.** Draw and label the columns John needs to solve this problem.
    - **B.** "Fill" the columns equally.
    - **C.** How many marbles did each brother get?
    - **D.** How many marbles are left over?
    - **E.** What should John do with the leftover marbles?

Use the Column Method to solve the problems on the *Dividing Into Columns* pages in the *Student Activity Book.*

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The Rectangle Model

Professor Peabody wants to paint the floor of the hallway in his laboratory. He forgot to estimate how much paint he will need and only bought one can of paint. The label says one can covers exactly 370 square feet. The hallway is 8 feet wide.

11. A. If Professor Peabody painted 5 feet down the hall, how many square feet did he paint? How do you know?

B. How many more square feet will he be able to paint with his can of paint?

12. A. If Professor Peabody painted another 10 feet down the hall, how many more square feet did he paint this time? How do you know?

B. How many more square feet will he be able to paint with his can of paint?

13. How much of the length of the hallway can Professor Peabody cover with one can of paint? Solve the problem without using a ruler. Show or tell how you found your answer.

14. Does Professor Peabody have any paint left over? How much?

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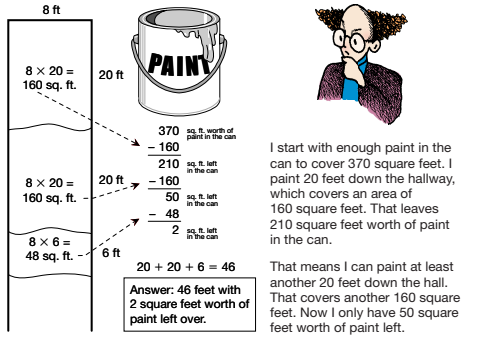
Professor Peabody solves the problem this way.



I start with enough paint in the can to cover 370 square feet. I paint 20 feet down the hallway, which covers an area of 160 square feet. That leaves 210 square feet worth of paint in the can.

That means I can paint at least another 20 feet down the hall. That covers another 160 square feet. Now I only have 50 square feet worth of paint left.

I can paint 6 more feet down the hall, since 6 × 8 = 48. That leaves just 2 square feet of paint in the can. Since there's not enough paint to cover another whole foot down the hall, I'll stop there. That means the remainder is 2 square feet worth of paint.

15. How does Professor Peabody's solution compare to yours?

16. Why did Professor Peabody subtract 370 – 160? What did he do with the answer to that subtraction?

17. When did Professor Peabody decide he was done solving the problem? Do you agree that he finished the problem?

18. Why is there a remainder? What does the remainder mean in the problem?

Use Professor Peabody's Rectangle Model to solve the problems on the *How Far Down the Hall?* pages in the *Student Activity Book*.

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11. A. 40 sq. ft.; $5 \times 8 = 40$

B. 330 sq. ft.; $370 - 40 = 330$

12. A. 80 sq. ft.; $10 \times 8 = 80$

B. 250 sq. ft.; $330 - 80 = 250$

13. 46 feet with 2 square feet worth of paint left over. Possible strategy: So far Professor Peabody has painted 10 + 5 = 15 ft. down the hall. He has 250 sq. ft. of paint left.
$31 \times 8 = 248$ so he can paint another 31 ft.
15 + 31 = 46 ft. down the hall with
250 – 248 = 2 sq. ft. left over.

14. Yes, there is enough paint to cover 2 square feet left over.

15. Answers will vary.

16. He used up 160 square feet worth of paint from the 370 square feet worth in the can.

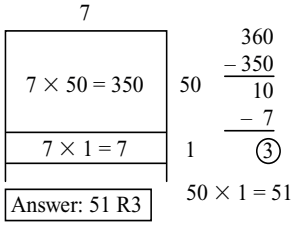
He continued to "divide" the remaining paint by painting another 20 feet down the hall.

17.* When he could not paint another full foot down the hall (i.e., when he had less than 8 square feet worth of paint left).

18.* He had enough paint left over to paint only 2 square feet, not 8 sq. ft.

***Answers and/or discussion are included in the lesson.**

19. 360 ÷ 7 = 51 R3. Possible solution using rectangle model:



20. 250 × 50 = 5. Possible solution using mental math: I think about multiplication to solve 250 ÷ 50. I know 5 × 5 = 25, so 5 × 50 = 250. 250 ÷ 50 = 5.

21. 369 ÷ 9 = 41. Possible solution using column method:

1 40	1 40	1 40	1 40	1 40	1 40	1 40	1 40	1 40
1	2	3	4	5	6	7	8	9

Into the Columns	Left to Divide
9	9 – 9 = 0
360	369 – 360 = 9

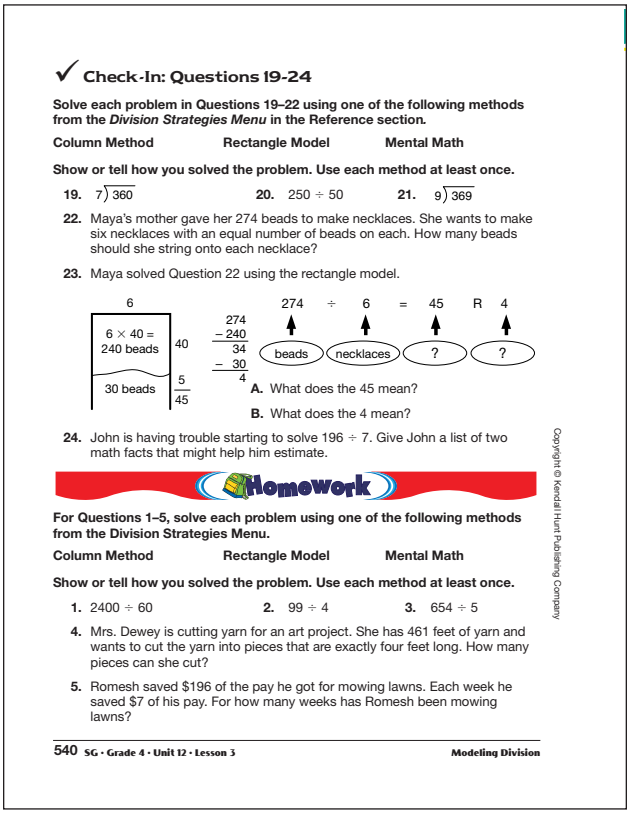
Answer: 41

22. 45 R4 beads

23. **A.** The number of beads on each necklace.

B. The number of leftover beads.

24. Answers will vary. Possible answers:
7 × 30 = 210
7 × 20 = 140
7 × 25 = 175



✓ **Check-In: Questions 19-24**

Solve each problem in Questions 19–22 using one of the following methods from the *Division Strategies Menu* in the Reference section.

Column Method **Rectangle Model** **Mental Math**

Show or tell how you solved the problem. Use each method at least once.

19. $7\overline{)360}$ **20.** 250 ÷ 50 **21.** $9\overline{)369}$

22. Maya's mother gave her 274 beads to make necklaces. She wants to make six necklaces with an equal number of beads on each. How many beads should she string onto each necklace?

23. Maya solved Question 22 using the rectangle model.

6 | 6 × 40 = 240 beads | 40 | 30 beads | 5 | 45

274 – 240 = 34; 34 – 30 = 4

274 ÷ 6 = 45 R 4

beads necklaces ? ?

A. What does the 45 mean?

B. What does the 4 mean?

24. John is having trouble starting to solve 196 ÷ 7. Give John a list of two math facts that might help him estimate.

Homework

For Questions 1–5, solve each problem using one of the following methods from the Division Strategies Menu.

Column Method **Rectangle Model** **Mental Math**

Show or tell how you solved the problem. Use each method at least once.

1. 2400 ÷ 60 **2.** 99 ÷ 4 **3.** 654 ÷ 5

4. Mrs. Dewey is cutting yarn for an art project. She has 461 feet of yarn and wants to cut the yarn into pieces that are exactly four feet long. How many pieces can she cut?

5. Romesh saved $196 of the pay he got for mowing lawns. Each week he saved $7 of his pay. For how many weeks has Romesh been mowing lawns?

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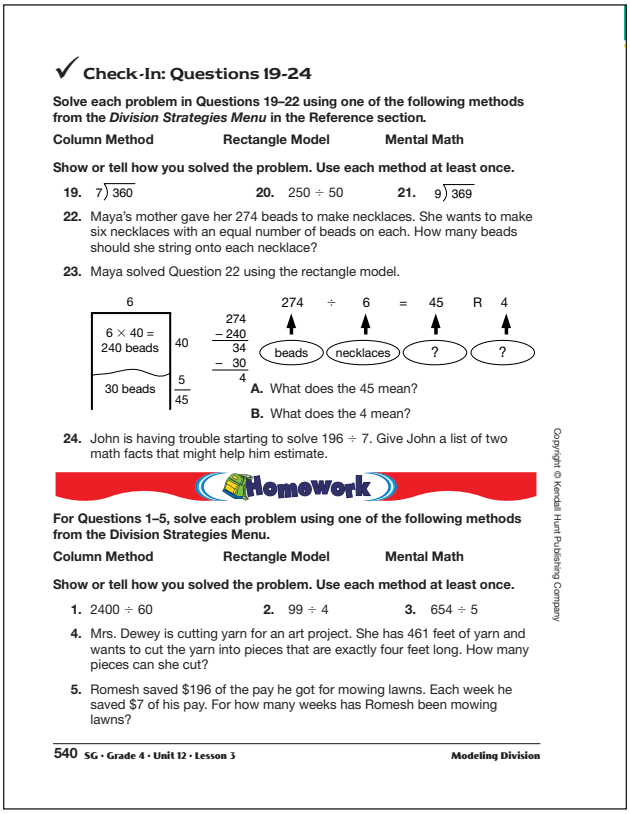

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Homework

Questions 1–5 (SG p. 540)

Methods and explanations will vary.

1. 2400 ÷ 60 = 40. Possible solution using mental math: To solve 2400 ÷ 60, I think about multiplication. I know 6 × 4 = 24, 6 × 40 = 240, and 60 × 40 = 2400. So 2400 ÷ 60 = 40.

2. 99 ÷ 4 = 24 R3. Possible solution using column method:

4	4	4	4
20	20	20	20
1	2	3	4

Into the Columns	Left to Divide
16	19 – 16 = ③
80	99 – 80 = 19

Answer: 24 R3

3. 654 ÷ 5 = 130 R4. Possible solution using rectangle model:

5

5 × 100 = 500	100	654 − 500 = 154
5 × 20 = 100	20	154 − 100 = 54
5 × 10 = 100	10	54 − 50 = ④

Answer: 130 R4 100 + 20 + 10 = 130

4. 461 ÷ 4 = 115 pieces R1 foot. Possible solution using column method:

4	4	4	4
20	20	20	20
1	2	3	4

Into the Columns	Left to Divide
20	21 – 20 = ①
40	61 – 80 = 21
400	461 – 400 = 61

Answer: 115 R1

5. 196 ÷ 7 = 28 weeks. Possible solution using mental math: To solve 196 ÷ 7, I think about money. I know 7 twenty-fives is like 7 quarters, which is 175. 196 − 175 is 21. 3 × 7 = 21.

So 25 sevens plus 3 more sevens is 28.

Student Activity Book

Dividing Into Columns

Questions 1–5 (SAB pp. 505–506)

1.* 89 ÷ 4 = 22 R1. Possible solution:

2	2	2	(2)
20	20	20	20
1	2	3	4

Into the Columns	Left to Divide
8	9 – 8 = (1)
80	89 – 80 = 9

2. 255 ÷ 8 = 31 R7. Possible solution

1	1	1	1	1	1	1	1	(1)
10	10	10	10	10	10	10	10	10
10	10	10	10	10	10	10	10	10
1	2	3	4	5	6	7	8	9

Into the Columns	Left to Divide
8	15 – 8 = (7)
80	95 – 80 = 15
80	175 – 80 = 95
80	255 – 80 = 175

3. 217 ÷ 6 = 36 R1. Possible solution:

6	6	6	6	6	(6)
10	10	10	10	10	10
20	20	20	20	20	20
1	2	3	4	5	6

Into the Columns	Left to Divide
36	37 – 36 = (1)
60	97 – 60 = 37
120	217 – 120 = 97

4. 582 ÷ 5 = 116 R2. Possible solution:

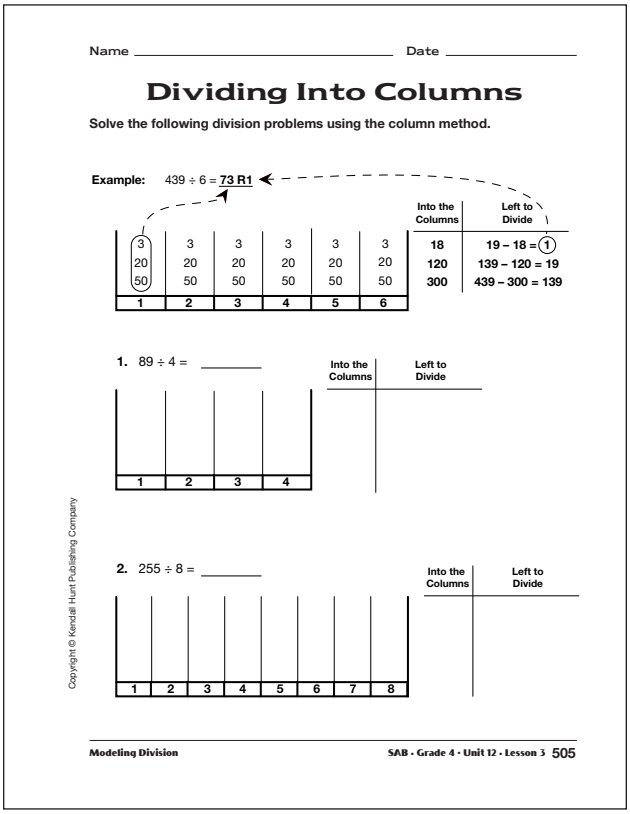
6	6	6	6	(6)
10	10	10	10	10
100	100	100	100	100
1	2	3	4	5

Into the Columns	Left to Divide
30	32 – 30 = (2)
50	82 – 50 = 32
500	582 – 500 = 82

5. 463 ÷ 3 = 154 R1. Possible solution:

4	4	(4)
50	50	50
100	100	100
1	2	3

Into the Columns	Left to Divide
12	13 – 12 = (1)
150	163 – 150 = 13
300	463 – 300 = 163



Name _____ Date _____

Dividing Into Columns

Solve the following division problems using the column method.

Example: 439 ÷ 6 = 73 R1

(3)	3	3	3	3	3
20	20	20	20	20	20
50	50	50	50	50	50
1	2	3	4	5	6

Into the Columns	Left to Divide
18	19 – 18 = (1)
120	139 – 120 = 19
300	439 – 300 = 139

1. 89 ÷ 4 = _____

1	2	3	4

Into the Columns	Left to Divide

2. 255 ÷ 8 = _____

1	2	3	4	5	6	7	8

Into the Columns	Left to Divide

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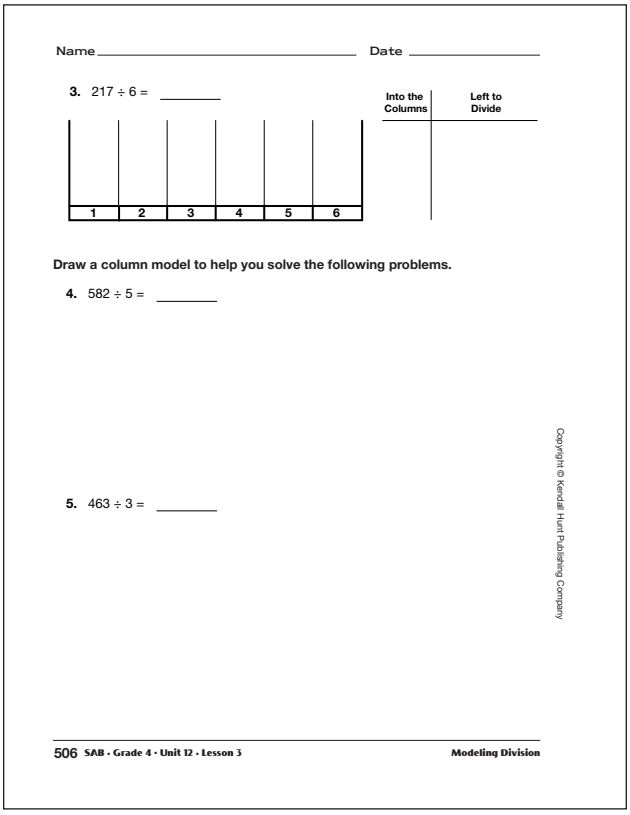

Name _____ Date _____

3. 217 ÷ 6 = _____

1	2	3	4	5	6

Into the Columns	Left to Divide

Draw a column model to help you solve the following problems.

4. 582 ÷ 5 = _____

5. 463 ÷ 3 = _____

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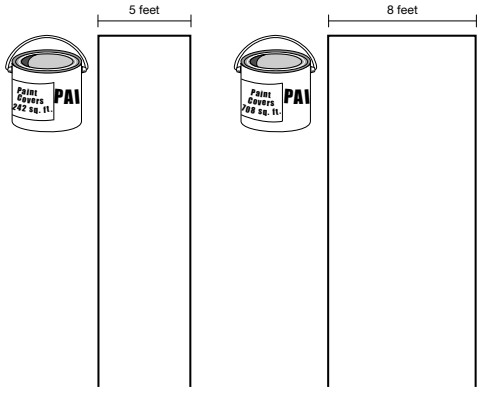
***Answers and/or discussion are included in the lesson.**

Name _____ Date _____

How Far Down the Hall?

Use the rectangle model to help Professor Peabody figure out how far down the hallway he can paint each hall. He knows the area the paint will cover and the width of each hall. Write each problem as a division problem.

1. 242 sq. ft. ÷ 5 feet = _____ 2. _____ ÷ _____ = _____



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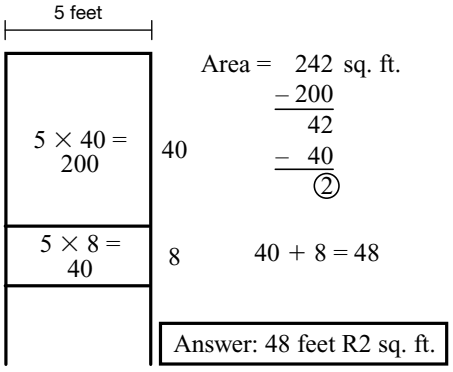
Student Activity Book

How Far Down the Hall?

Questions 1–5 (SAB pp. 507–508)

1. 242 sq. ft. ÷ 5 feet = 48 feet R2 sq. ft.
Possible solution:

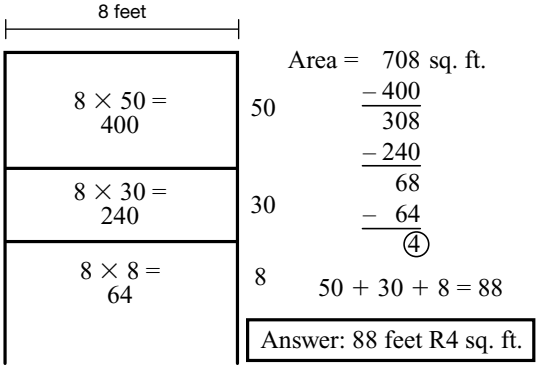


Area = 242 sq. ft.
− 200
42
− 40
②

40 + 8 = 48

Answer: 48 feet R2 sq. ft.

2. 708 ÷ 8 = 88 feet R4 sq. ft.
Possible solution:

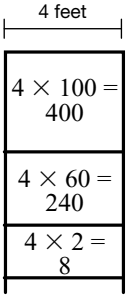


Area = 708 sq. ft.
− 400
308
− 240
68
− 64
④

50 + 30 + 8 = 88

Answer: 88 feet R4 sq. ft.

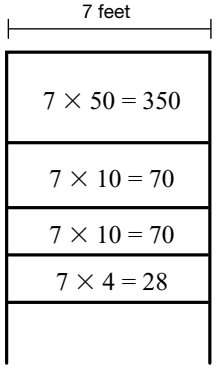
3. 650 ÷ 4 = 162 feet R2 sq. ft.
Possible solution:



Area = 650 sq. ft.
100 — 650 − 400 = 250
60 — 250 − 240 = 10
2 — 10 − 8 = ②
100 + 60 + 2 = 162

Answer: 162 feet R2 sq. ft.

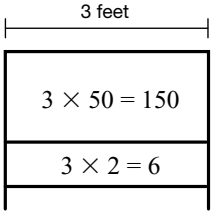
4. 522 ÷ 7 = 74 feet R4 sq. ft.
Possible solution:



Area = 522 sq. ft.
50 — 522 − 350 = 172
10 — 172 − 70 = 102
10 — 102 − 70 = 32
4 — 32 − 28 = ④
50 + 10 + 10 + 4 = 74

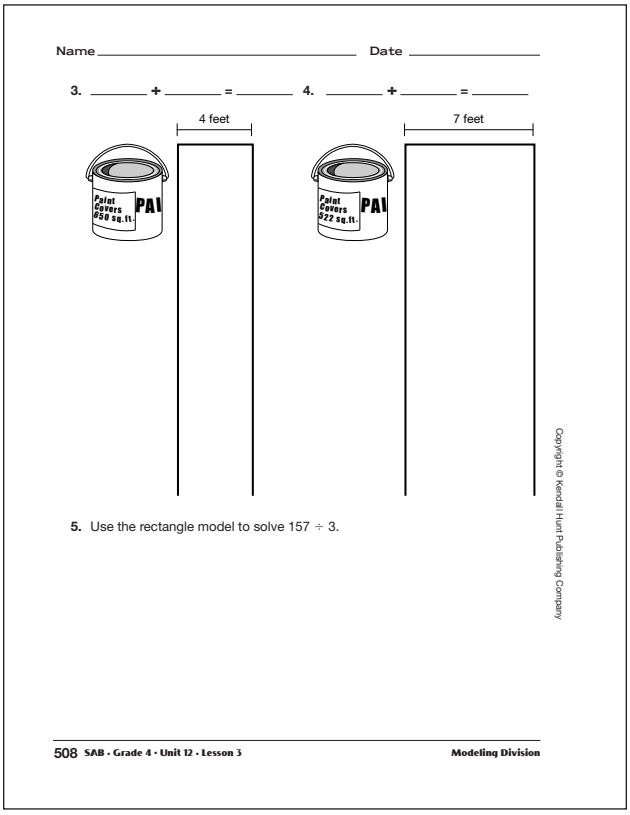
Answer: 74 feet R4 sq. ft.

5. 157 ÷ 3 = 52 feet R1 sq. ft.
Possible solution:



Area = 157 sq. ft.
50 — 157 − 150 = 7
2 — 7 − 6 = ①

Answer: 52 feet R1 sq. ft.


Name _____ Date _____

3. _____ + _____ = _____ 4. _____ + _____ = _____

5. Use the rectangle model to solve 157 ÷ 3.

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