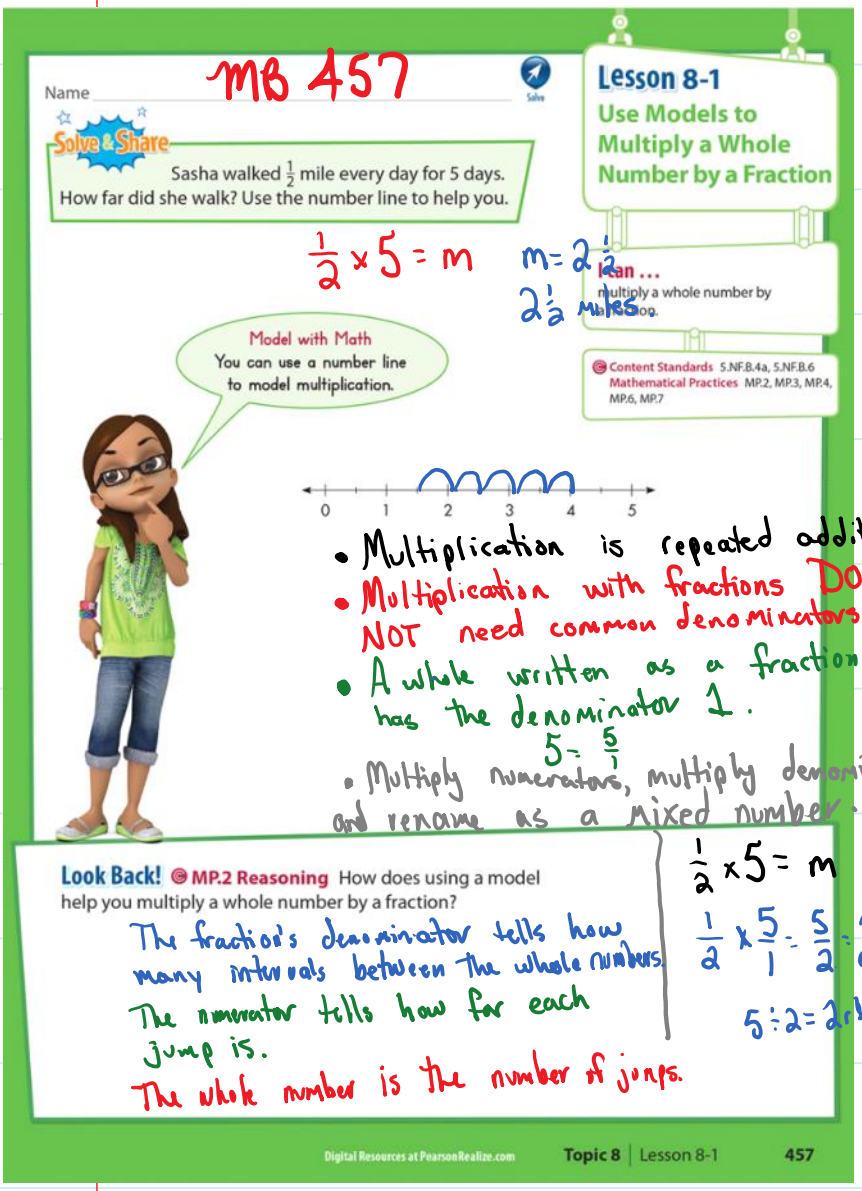
Lesson 8-1

Thursday, January 2, 2020 1:35 PM



Name MB 457

Lesson 8-1
Use Models to Multiply a Whole Number by a Fraction

Solve & Share
Sasha walked $\frac{1}{2}$ mile every day for 5 days. How far did she walk? Use the number line to help you.

$\frac{1}{2} \times 5 = m$ $m = 2\frac{1}{2}$ $2\frac{1}{2}$ miles

I can ...
multiply a whole number by a fraction.

Content Standards 5.NF.B.4a, 5.NF.B.6
Mathematical Practices MP.2, MP.3, MP.4, MP.6, MP.7

Model with Math
You can use a number line to model multiplication.

0 1 2 3 4 5

- Multiplication is repeated addition.
- Multiplication with fractions DOES NOT need common denominators.
- A whole written as a fraction has the denominator 1. $5 = \frac{5}{1}$
- Multiply numerators, multiply denominators and rename as a mixed number.

Look Back! MP.2 Reasoning How does using a model help you multiply a whole number by a fraction?

The fraction's denominator tells how many intervals between the whole numbers. The numerator tells how far each jump is. The whole number is the number of jumps.

$\frac{1}{2} \times 5 = m$

$\frac{1}{2} \times \frac{5}{1} = \frac{5}{2} = 2\frac{1}{2}$

$5 \div 2 = 2$ r 1

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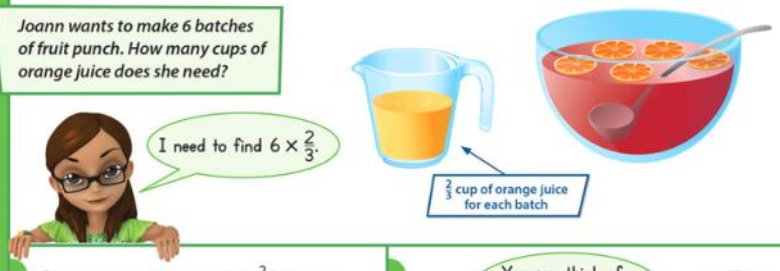
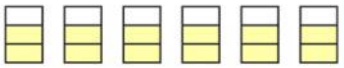
What Are Some Ways to Multiply a Whole Number by a Fraction?

A

Joann wants to make 6 batches of fruit punch. How many cups of orange juice does she need?



B One way to represent $6 \times \frac{2}{3}$ is to use repeated addition.



$$6 \times \frac{2}{3} = \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3}$$
$$= \frac{6 \times 2}{3}$$
$$= \frac{12}{3}$$

So, $6 \times \frac{2}{3} = \frac{12}{3} = 4$.

C

$$\frac{2}{3} = 2 \times \frac{1}{3}$$

So, $6 \times \frac{2}{3} = 6 \times \left(2 \times \frac{1}{3}\right)$.

Use the Associative Property.

$$6 \times \left(2 \times \frac{1}{3}\right) = (6 \times 2) \times \frac{1}{3}$$
$$= 12 \times \frac{1}{3}$$
$$= \frac{12}{3} = 4$$

Joann needs 4 cups of orange juice to make 6 batches of punch.

Convince Me! MP.7 Use Structure Find $10 \times \frac{3}{5}$. Use repeated addition to check your answer. Show all of your work.

$10 \times \frac{3}{5}$

$\frac{3}{5} + \frac{3}{5} + \frac{3}{5} + \frac{3}{5} + \frac{3}{5} + \frac{3}{5} + \frac{3}{5} + \frac{3}{5} + \frac{3}{5} + \frac{3}{5} = \frac{30}{5} = 6$

$\frac{10}{1} \times \frac{3}{5} = \frac{30}{5} = 6$

$30 \div 5 = 6$

Name _____

Guided Practice*

Do You Understand?

1. Micah wants to use Joann's recipe to make 9 batches of punch. How many cups of orange juice does he need?

$9 \times \frac{2}{3} = \frac{9}{1} \times \frac{2}{3} = \frac{18}{3} = 6$ (6 cups)

2. **MP.3 Construct Arguments** Explain why $8 \times \frac{3}{4}$ is the same as adding $\frac{3}{4}+\frac{3}{4}+\frac{3}{4}+\frac{3}{4}+\frac{3}{4}+\frac{3}{4}+\frac{3}{4}+\frac{3}{4}$.

Multiplication is repeated addition

Do You Know How?

In **3** and **4**, find each product. Shade the model to help solve.

3. $3 \times \frac{2}{3}$

$\frac{6}{3} = 2$

4. $2 \times \frac{3}{5}$

$\frac{6}{5} = 1\frac{1}{5}$

Independent Practice

Complete #9, 12, 16 and 23

Leveled Practice In **5–7**, complete each equation to find the product.

5. $6 \times \frac{3}{4} = \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} = \frac{\square \times \square}{\square} = \frac{18}{4} = \square$

6. $16 \times \frac{3}{8} = 16 \times \square \times \frac{1}{8} = \frac{\square \times 1}{8} = \frac{\square}{\square} = \square$

7. $500 \times \frac{2}{5} = \square \times 2 \times \frac{\square}{5} = \frac{\square \times 1}{5} = \frac{1{,}000}{\square} = \square$

In **8–15**, find each product. Use models to help.

8. $35 \times \frac{2}{5}$

$\frac{35}{1} \times \frac{2}{5} = \frac{70}{5} = 14$

9. $7 \times \frac{5}{12}$

$\frac{7}{1} \times \frac{5}{12} = \frac{35}{12} = 2\frac{11}{12}$

10. $9 \times \frac{2}{3}$

11. $300 \times \frac{1}{2}$

12. $64 \times \frac{3}{8}$

$\frac{64}{1} \times \frac{3}{8} = \frac{192}{8} = 24$

13. $900 \times \frac{2}{3}$

14. $84 \times \frac{1}{4}$

15. $42 \times \frac{2}{7}$

*For another example, see Set A on page 513.

Math Practices and Problem Solving*

16. **Higher Order Thinking** Explain how you would find $36 \times \frac{3}{4}$ mentally.

$36 \times \frac{1}{4} = \frac{36}{4} = 9$

$9 \times 3 = 27$

17. Lions spend about $\frac{5}{6}$ of their day sleeping. How many hours a day does a lion sleep? Write an equation to model your work.

18. **Math and Science** On Mars, your weight is about $\frac{1}{3}$ of your weight on Earth. If Helena weighs 96 pounds on Earth, about how many pounds would she weigh on Mars?

19. Bradley is making fruit salad. For each bowl of fruit salad, he needs $\frac{3}{4}$ cup of grapes. How many cups of grapes will he use if he makes 24 bowls of fruit salad?

20. **MP.3 Construct Arguments** Do you think the difference $1.4 - 0.95$ is less than 1 or greater than 1? Explain.

21. Write a multiplication expression that shows 10^6.

22. **MP.6 Be Precise** The table shows the number of miles each person ran this week. Who ran more miles by the end of the week? How many more?

DATA

	Monday	Wednesday	Saturday
Pat	2.75 mi	3 mi	2.5 mi
Toby	2 mi	2.25 mi	3.5 mi

Common Core Assessment

23. Choose Yes or No to tell if the fraction $\frac{3}{8}$ will make each equation true.

A. $96 \times \square = 36$ ○ Yes ○ No
B. $38 \times \square = 14$ ○ Yes ○ No
C. $16 \times \square = 6$ ○ Yes ○ No
D. $56 \times \square = 21$ ○ Yes ○ No

24. Choose Yes or No to tell if the number 56 will make each equation true.

$\square \times \frac{1}{2} = 28$ ○ Yes ○ No
$\square \times \frac{2}{7} = 16$ ○ Yes ○ No
$\square \times \frac{8}{9} = 49$ ○ Yes ○ No
$\square \times \frac{1}{4} = 14$ ○ Yes ○ No

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A. $\frac{96}{1} \times \frac{3}{8} = \frac{288}{8} = 36$ (yes)

$96 \times 3 = 288$

$8\overline{)288}$ → 36, -24, 48, -48, 0

B. $\frac{38}{1} \times \frac{3}{8} = \frac{84}{8} = 10\frac{4}{8} = 10\frac{1}{2}$ (No)

$38 \times 3 = 84$

C. $\frac{16}{1} \times \frac{3}{8} = \frac{48}{8} = 6$ (yes)

$16 \times 3 = 48$

$\frac{}{1} \quad \frac{}{8} \cdot \frac{}{8} = 6$ (yes)

$$\begin{array}{r} 16 \\ \times 3 \\ \hline 48 \end{array}$$

D. $\frac{56}{1} \times \frac{3}{8} = \frac{168}{8} = 21$ (yes)

$$\begin{array}{r} 1 \\ 56 \\ \times 3 \\ \hline 168 \end{array}$$

$$\begin{array}{r} 21 \\ 8\overline{)168} \\ -16\downarrow \\ \hline 08 \\ -8 \\ \hline 0 \end{array}$$