

Exploring Multiplication

Goal Solve multiplication problems using models.

1. Circle the letter of the problem that can be solved using multiplication.

A. Rey read 22 pages on Monday, 29 pages on Tuesday, and 27 pages on Thursday. How many pages did he read altogether?

B. Natalie read on Monday, Tuesday, and Thursday. She read 31 pages each day. How many pages did she read altogether?

C. Paulette read 96 pages in total on Monday, Tuesday, and Thursday. How many pages did she read each day?

D. Chantal read 37 pages on Monday. Vinh read 29 pages on Monday. How many more pages did Chantal read than Vinh?

At-Home Help

Multiplication involves groups of the same size.

4×28 is 4 groups of 28 objects. 28 groups of 4 has the same product.

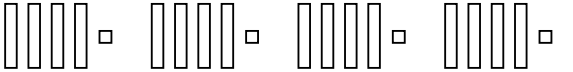
Explain how you know this problem can be solved using multiplication.

Answers will vary. For example, Natalie read 31 pages 3 times. This means that there are 3 equal groups of 31. I can add $31 + 31 + 31$, or 31 three times, which is multiplication: 3×31 .

2. Solve the problem in Question 1 using multiplication.

$$31 \times 3 = 93$$

3. Circle the letter that shows base ten blocks being used to model multiplication.

A. 

B. 

Explain how you know that the base ten blocks are being used to model multiplication.

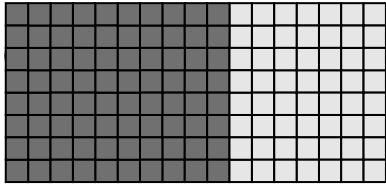
$41 + 41 + 41 + 41$ is the same as 4 groups of 41, or 4×41 .

Multiplying with Arrays

Goal

Use easier numbers to simplify multiplication.

1. A kitchen floor has 8 rows and 17 columns of tiles. These arrays show 8×17 by showing $8 \times 10 + 8 \times 7$.



$$8 \times 17 = \underline{\quad 8 \times 10 \quad} + \underline{\quad 8 \times 7 \quad}$$

$$8 \times 17 = \underline{80} + \underline{56}$$

$$8 \times 17 = \underline{136}$$

2. Complete.

a) $2 \times 56 = 2 \times 50 + 2 \times 6$

$$2 \times 56 = \underline{100} + \underline{12}$$

$$2 \times 56 = \underline{112}$$

b) $5 \times 14 = 5 \times 7 + 5 \times \underline{7}$

$$5 \times 14 = \underline{35} + \underline{35}$$

$$5 \times 14 = \underline{70}$$

c) $4 \times 29 = 4 \times \underline{25} + 4 \times \underline{4}$

$$4 \times 29 = \underline{100} + \underline{16}$$

$$4 \times 29 = \underline{116} \quad \text{Answers will vary.}$$

d) $6 \times 22 = \underline{6} \times \underline{20} + \underline{6} \times \underline{2}$

$$6 \times 22 = \underline{120} + \underline{12}$$

$$6 \times 22 = \underline{132}$$

3. Find each product.

a) 9×18

$$162$$

c) 4×19

$$76$$

b) 7×12

$$84$$

d) 8×33

$$264$$

At-Home Help

Using easier numbers to multiply is useful when one factor is greater than 10.

$$3 \times 18 = 3 \times 10 + 3 \times 8$$

$$3 \times 18 = 30 + 24$$

$$3 \times 18 = 54$$

Or using other easier facts:

$$3 \times 18 = 3 \times 9 + 3 \times 9$$

$$3 \times 18 = 27 + 27$$

$$3 \times 18 = 54$$

Multiplying in Expanded Form

Goal

Multiply 1-digit numbers by 2-digit numbers using expanded form.

1. Complete.

a) 46×9

$$\begin{array}{r} 4 \text{ tens} + 6 \text{ ones} \\ \underline{\hspace{1.5cm}} \\ \times 9 \\ \hline 36 \text{ tens} + 54 \text{ ones} \\ 41 \text{ tens} + 4 \text{ ones} \\ \hline 14 \end{array}$$

c) 78×9

$$\begin{array}{r} 70 + 8 \\ \underline{\hspace{1.5cm}} \\ \times 9 \\ \hline 630 \\ + 72 \\ \hline 02 \end{array}$$

b) 89×5

$$\begin{array}{r} 8 \text{ tens} + 9 \text{ ones} \\ \underline{\hspace{1.5cm}} \\ \times 5 \\ \hline 40 \text{ tens} + 45 \text{ ones} \\ \hline 44 \text{ tens} + 5 \text{ ones} \\ \hline 45 \end{array}$$

d) 36×8

$$\begin{array}{r} 30 + 6 \\ \underline{\hspace{1.5cm}} \\ \times 8 \\ \hline 240 \\ + 48 \\ \hline 88 \end{array}$$

At-Home Help

The **expanded form** of 28 is
2 tens + 8 ones
or 20 + 8.

2. Stanley can display 37 models on 1 shelf. How many models can he display on 4 shelves?

148

3. Circle the letter that is a reasonable estimate for 96×5 .

A. more than 450

B. less than 450

C. less than 45

D. less than 30

Explain how you know.

$$5 \times 90 = 450$$

$$96 - 90 = 6$$

Since 90 is 6 less than 96, the answer will be more than 450.

Communicate About Solving Problems

Goal

Explain your thinking when solving a problem.

1. Name the steps that Chantal used to solve this problem.

Chantal's baby brother is 17 weeks old.
How many days old is he?

Step 1 understanding the problem

My brother is 17 weeks old.
I know there are 7 days in 1 week.

Step 2 making a plan to solve the problem

I will multiply 17 and 7.

Step 3 carrying out the plan

$$\begin{array}{r} 10 + 7 \\ \times 7 \\ \hline 70 \\ + 49 \\ \hline 119 \end{array}$$

My brother is 119 days old.

Step 4 looking back to check

If my brother were 20 weeks old,
he would be 140 days old.
So 119 days is reasonable
for 17 weeks old.

At-Home Help

Problem solving involves

- understanding the problem
- making a plan to solve the problem
- carrying out the plan
- looking back to check

2. Show the steps as you solve each problem. Answers will vary. For example:

- a) At a party there are 36 tables. Each table will have 5 balloons.

How many balloons will there be in all?

Understanding the problem: 1 table has 5 balloons, 2 tables have 10 balloons, 3 tables have 15 balloons. I find the number of balloons by skip counting by 5s, which is like multiplying.

Making a plan to solve the problem: I will multiply the number of balloons by the number of tables. I estimate that there will be about $5 \times 30 = 150$ balloons. Since 36 is 6 more than 30, I estimate that there will be more than 150, but less than $5 \times 40 = 200$.

Carrying out the plan: $5 \times 36 = 180$

Looking back to check: 180 is reasonable because it is more than 150, but less than 200.

- b) It rained for 3 days. How many hours did it rain?

Understanding the problem: It rained for 3 days, and I know that each day has 24 hours. I find the number of hours that it rained by multiplying 3 and 24.

Making a plan to solve the problem: I will multiply the number of days by the number of hours in a day. I estimate that there will be about $3 \times 25 = 75$ hours. Since 24 is 1 less than 25, I estimate that the answer will be slightly less than 75.

Carrying out the plan: $3 \times 24 = 72$

Looking back to check: 72 is reasonable because it is just less than 75.

Multiplying with an Algorithm

Goal Multiply using a procedure.

Estimates will vary. For example:

1. Estimate each product.

a) 139×9

1400

b) 358×8

2400

c) 729×2

1400

d) 298×5

1500

e) 498×6

3000

2. You should have 3 estimates that are 1500 or less.
Calculate their products.

a) 1251

c) 1458

d) 1490

3. Estimate and then calculate.

a) 396

$$\begin{array}{r} \times 7 \\ \hline \end{array}$$

estimate: 2800

calculate: 2772

b) 629

$$\begin{array}{r} \times 5 \\ \hline \end{array}$$

estimate: 3000

calculate: 3145

At-Home Help

One multiplication **algorithm**, or **procedure** to multiply, is this:

$$\begin{array}{r} 32 \\ 174 \\ \times 5 \\ \hline 870 \end{array}$$

Because

4 ones $\times 5 = 20$,

or 2 tens **0 ones**.

7 tens $\times 5 + 2$ tens more =
 $350 + 20 = 370$, or

3 hundreds **7 tens**.

1 hundred $\times 5 + 3$ hundreds
more = $500 + 300 = 800$,
or **8 hundreds**.

Choosing a Method to Multiply

Goal Choose and justify a multiplication method.

Use these facts in the questions below.

- The average Canadian consumes 25 kg of fresh fruit in juices in 1 year.
- The average Canadian child watches 884 hours of TV in 1 year.
- A small roast beef submarine sandwich has 954 kilojoules of energy.

Answers will vary. For example:

1. You want to find out how many kilograms of fresh fruit in juices a family of 6 consumes in 1 year. Would you use pencil and paper or mental math? Explain your choice. Solve the problem.

Mental math because it is easy to multiply 25s mentally.

I can skip count 25, 50, 75, 100, 125, 150, so the answer is 150 kg.

2. You want to find out about how many hours of TV a child would watch in 9 years. Would you estimate or do an exact calculation? Explain your choice. Solve the problem.

Estimation because I want to find out about how many hours of television the average child watches.

$9 \times 900 = 8100$, so the answer is 8100 hours.

3. You want to find out how many kilojoules of energy a person would get from eating 1 small roast beef submarine sandwich each day for a week. Would you use pencil and paper or mental math? Why? Solve the problem.

Paper and pencil because 7×954 does not have numbers that are easy to multiply mentally.

$7 \times 954 = 6678$

At-Home Help

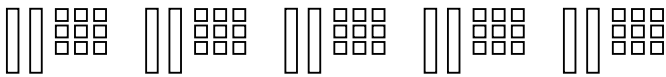
Look at the question to decide if an estimate will do.

Look at the numbers in a problem to decide if you can solve it mentally or if you need to use pencil and paper.

Test Yourself

Circle the correct answer.

1. What are these base ten blocks modelling?



- A. $140 \div 5$ **B. 5×29** C. 29×4 D. $30 + 30 + 30 + 30 + 30$

2. Which multiplication equation is modelled by this array?



- E. $4 \times 22 = 4 \times 20 + 4 \times 2$** G. $4 \times 20 = 4 \times 10 + 4 \times 10$
 F. $23 \times 4 = 20 \times 4 + 3 \times 4$ H. $4 \times 20 = 2 \times 20 + 2 \times 20$

3. The array in Question 2 could be broken into other arrays. Which of these is possible?

- A. $4 \times 9 + 4 \times 14$ C. $2 \times 23 + 2 \times 23$
B. $4 \times 11 + 4 \times 11$ D. $25 \times 4 + 3 \times 4$

4. Miki used expanded form. What problem was she solving?

- E. How many eggs are in 129 dozen?
 F. How many weeks are in 129 days?
 G. How many hours are in 7 days?

- H. How many days are in 129 weeks?**

| |
|----------------|
| $100 + 20 + 9$ |
| $\times 7$ |
| <hr/> |
| 700 |
| 140 |
| $+ 63$ |
| <hr/> |
| 903 |

5. Which estimate is the most reasonable for the product of 389×4 ?

- A. 1200 **B. 1600** C. 2000 D. 700

6. What is the product of 638×6 ?

- E. 3828** F. 3688 G. 3728 H. 3888

7. The average Canadian eats 183 kg of vegetables in 1 year. How much does a family of 4 eat in 2 years?

- A. 366 kg B. 732 kg **C. 1464 kg** D. 1098 kg