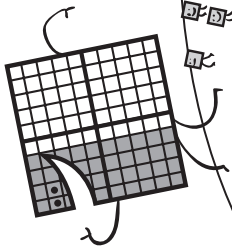
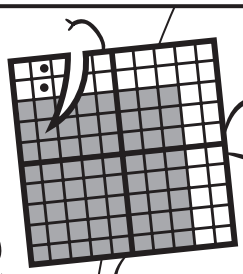
Solving Multiplication Facts

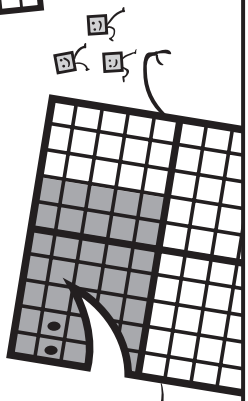
10 x 4



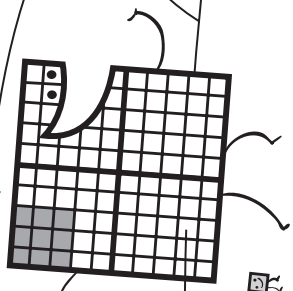
8 x 8

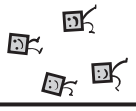


5 x 7



3 x 3

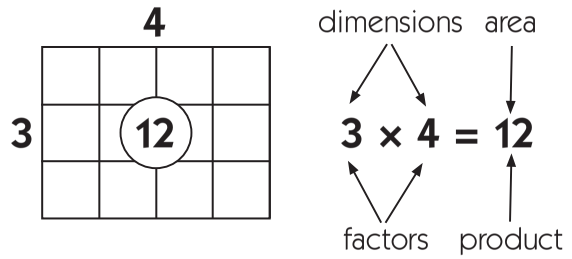




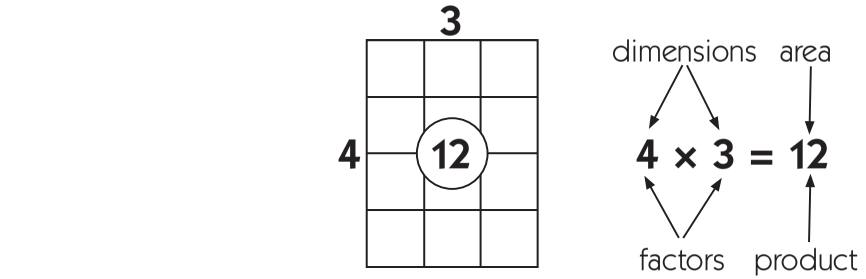
NAME _____

The Area Model of Multiplication

In third grade, we have been using the area model to think about multiplication. In the area model, the height and length (the *dimensions*) of a rectangle (also called an *array*) represent the *factors*, the two numbers being multiplied together. The *product*, which is the number you get when you multiply the two factors, is represented by the total *area* of the array.



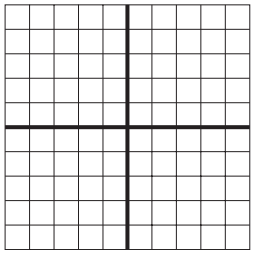
You'll notice that the orientation of the rectangle or array and the order of the factors do not change the product.



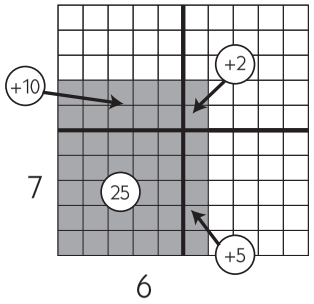
Blackline 4.21 For use in Unit Four, Session 20. Run a class set back-to-back with Blackline 4.22. Fold in half.

Using a Grid to Show Area

We use the following 10-by-10 grid to show the area models for different multiplication facts. The heavy lines break the grid into quadrants and make it easier to determine the dimensions and area of each array. What do you notice about this grid? Do you see groups of 5, 10, 25, and 50?



We can quickly see that the array below is 7 units tall and 6 units wide. We can also see that the area of this 7-by-6 array is 42, because 1 full quadrant is 25, then add 15 more, and then add the 2 in the top corner.

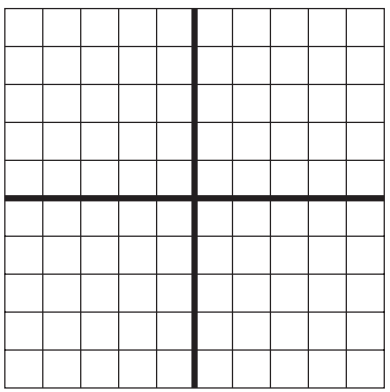


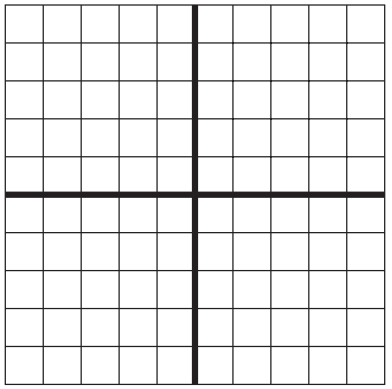
$7 \times 6 = 42$

$25 + (10 + 5) + 2 = 42$

Your Decade Minus 1 Set Facts

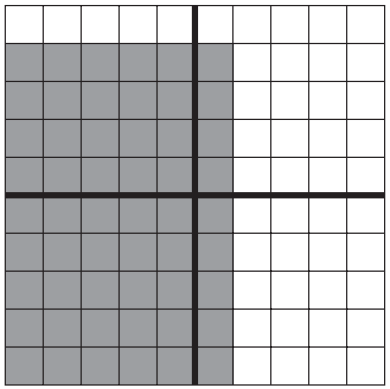
What are some other decade minus 1 set facts you know? Can you draw them or show them using number sentences? Can you write a story problem about a decade minus 1 set fact?





Decade Minus 1 Set Facts

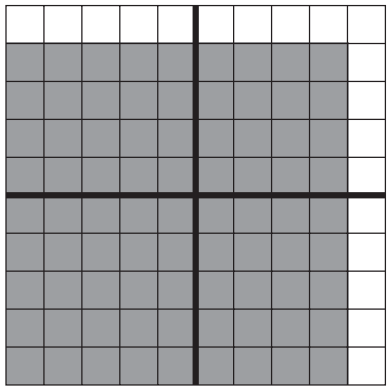
When one of the factors is 9, you can multiply by 10 and then subtract 1 set. For 9×6 think $10 \times 6 = 60$ and then subtract 6 from 60 to get 54.



9×6

$10 \times 6 = 60$

$60 - 6 = 54$



9×9

$9 \times 10 = 90$

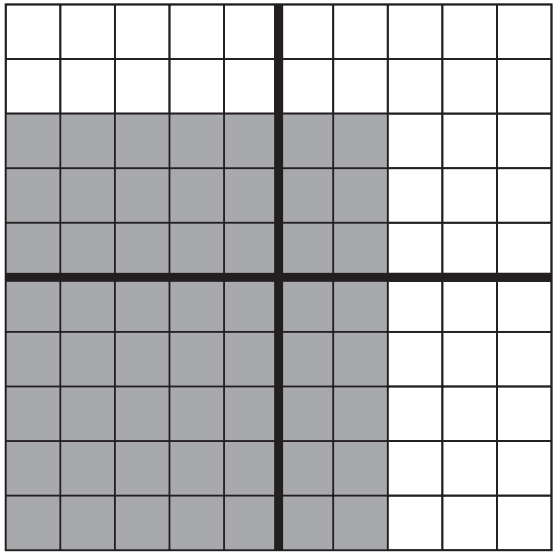
$90 - 9 = 81$

Decade Minus 1 Set Story Problems

1 There were 7 teams in the league. Each team had 9 players. How many players were in the league?

2 There are 9 tables in the classroom. 4 students sit at each table. How many students are in the class?

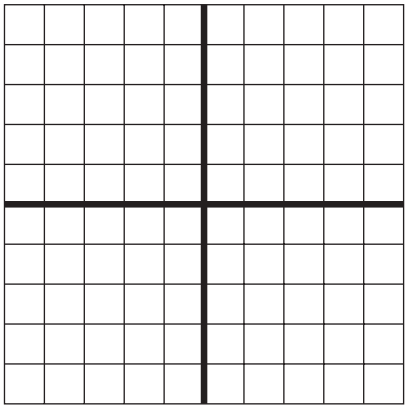
What are the dimensions and area of the array shown below? Talk to each other about how you know.



Blackline 4.23 For use in Unit Four, Session 20. Run a class set back-to-back with Blackline 4.24. Fold in half.

Zero Facts

Zero times any number is zero.



$0 \times 8 = 0$

This works with larger numbers like $345 \times 0 = 0$ and $0 \times 237 = 0$.

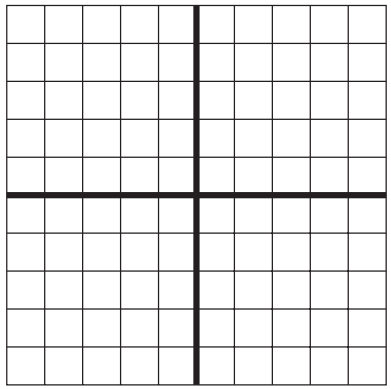
Zero Facts Story Problems

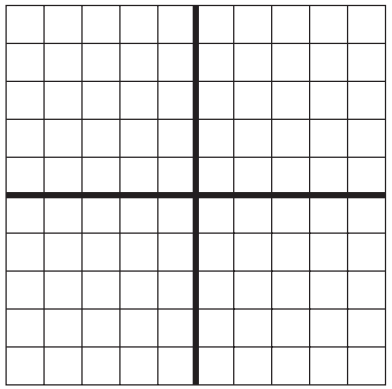
1 If I had 5 bags with no candy in any of the bags, how many pieces of candy did I have?

2 If you had no horses to shoe, how many horseshoes would you need?

Your Double-Double-Doubles Facts

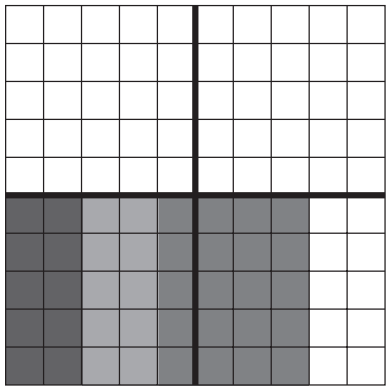
What are some other double-double-doubles facts you know? Can you draw them or show them using number sentences? Can you write a story problem about a double-double-doubles fact?



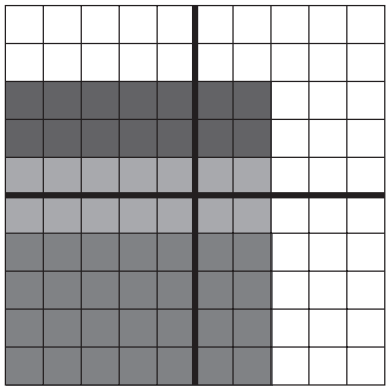


Double-Double-Doubles Facts

When one of the factors is 8, double the other factor, double the result, and then double again. When you look at the arrays below, can you see why this works? Where do you see the doubling three times?



5 × 8
5 × 2 = 10
10 × 2 = 20
20 × 2 = 40



8 × 7
2 × 7 = 14
2 × 14 = 28
2 × 28 = 56

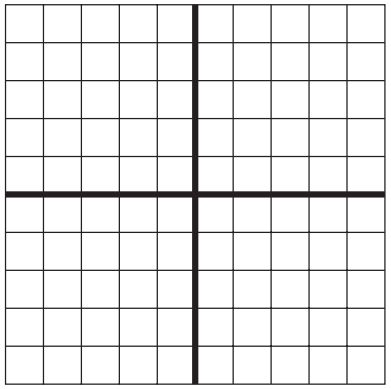
Double-Double Doubles Story Problems

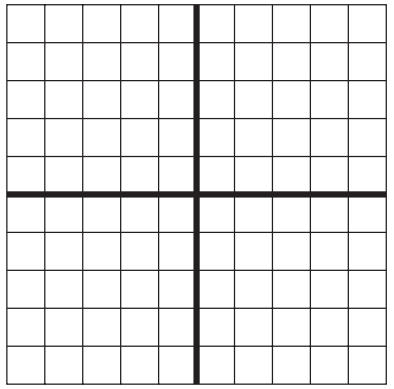
1 6 children were on each relay team. There were 8 teams. How many children altogether?

2 8 beetles were crawling up the stalk. How many legs were crawling altogether?

Your Zero Facts

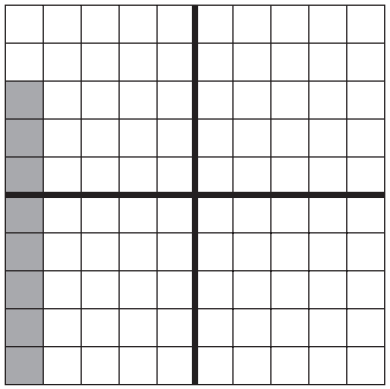
What are some other zero facts you know? Can you draw them or show them using number sentences? Can you write a story problem about a zero fact?



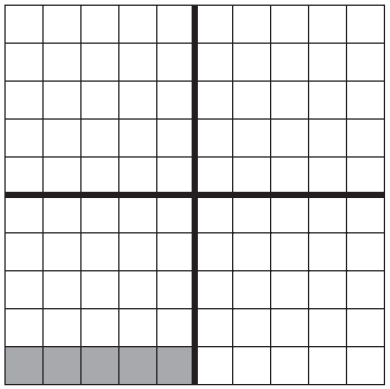


Ones Facts

When one of the factors is 1, the product is always equal to the other factor.



$8 \times 1 = 8$



$1 \times 5 = 5$

No matter how big the number, if you multiply it by 1, you'll get the same number.

$498 \times 1 = 498$ $\qquad$ $1 \times 763 = 763$

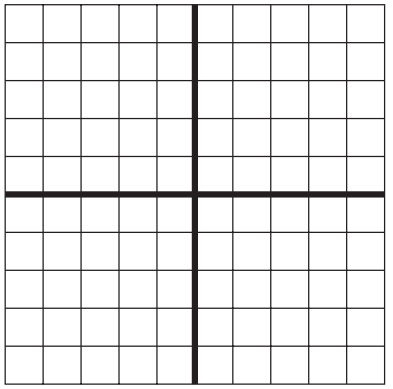
Ones Facts Story Problems

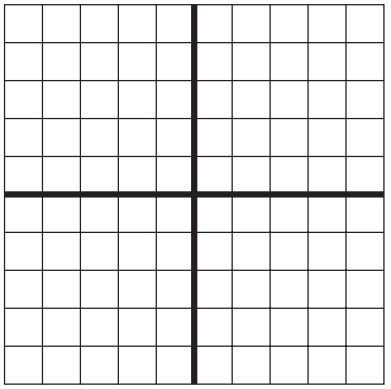
1 If I had 1 package of party invitations with 8 cards, how many invitations would I have in all?

2 If you had 1 set of 427 baseball cards, how many cards would you have altogether?

Your Clock Plus 1 Set Facts

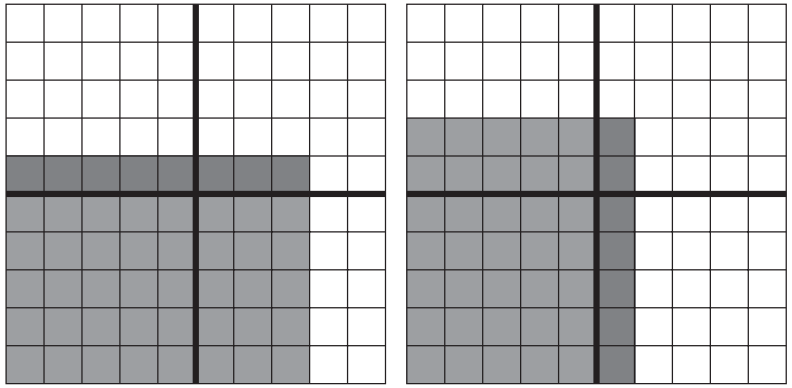
What are some other clock plus 1 set facts you know? Can you draw them or show them using number sentences? Can you write a story problem about a clock plus 1 set fact?





Clock Plus 1 Set Facts

When one of the factors is 6, recall a clock fact and then add 1 more set of the number being multiplied by 6. To solve 6 × 8, first think 5 × 8 and then add 1 more set of 8. Can you see why this works when you look at the arrays below?



6 × 8
(5 × 8) + 8
40 + 8 = 48

7 × 6
(7 × 5) + 7
35 + 7 = 42

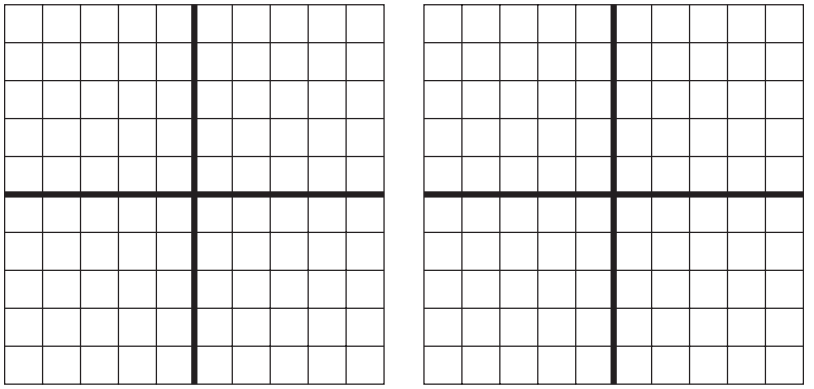
Clock Plus 1 Set Facts Story Problems

1 Six children were on each relay team. There were 7 teams. How many children were running the relay altogether?

2 Eight ants were marching down the sidewalk. How many legs were marching altogether?

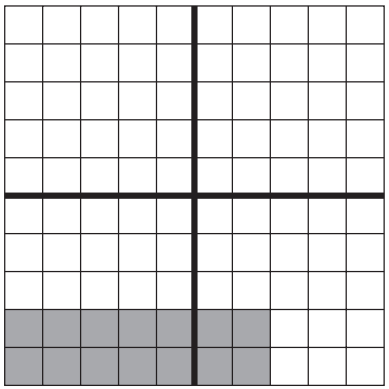
Your Ones Facts

What are some other ones facts you know? Can you draw them or show them using number sentences? Can you write a story problem about a ones fact?

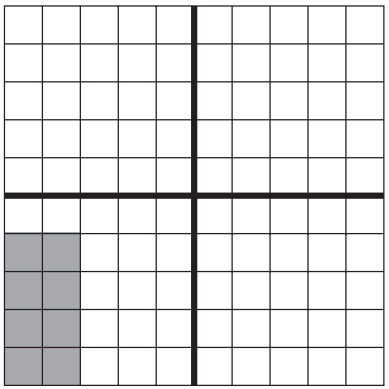


Doubles

When one of the factors is 2, just think of the addition doubles like 7 + 7. Doubles products are always even numbers. When you look at the arrays, can you see why?



$2 \times 7 = 14$
$7 + 7 = 14$



$4 \times 2 = 8$
$4 + 4 = 8$

Doubles work with larger numbers like these:

$40 \times 2 = 80$ $\quad$ $2 \times 60 = 120$

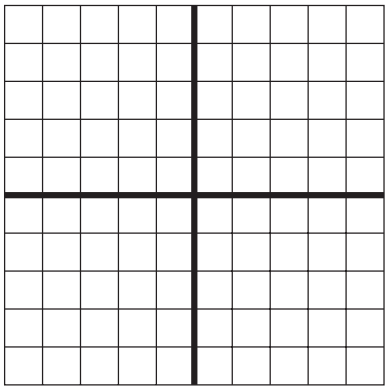
Doubles Story Problems

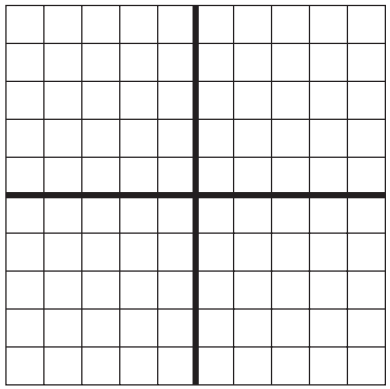
1 There were 9 players on each team. How many players were on both teams altogether?

2 If everyone in the class lined up in 2 lines and there were 10 students in each line, how many students were in the class altogether?

Your Double-Doubles Facts

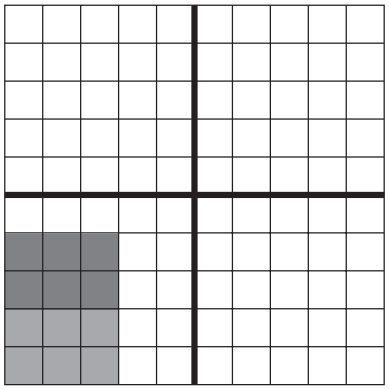
What are some other double-doubles facts you know? Can you draw them or show them using number sentences? Can you write a story problem about a double-doubles fact?



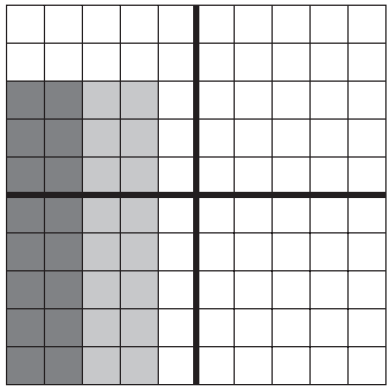


Double-Doubles Facts

When one of the factors is 4, you can double the other factor and then double again. Can you see why this works when you look at the arrays below?



$4 \times 3 = 12$
$2 \times 3 = 6$
$2 \times 6 = 12$



$8 \times 4 = 32$
$8 \times 2 = 16$
$16 \times 2 = 32$

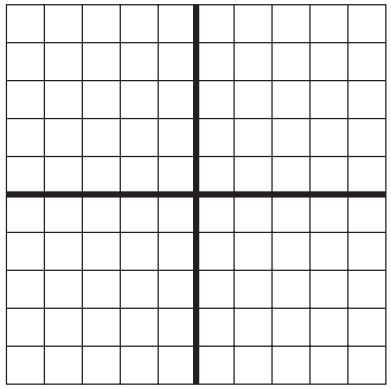
Double-Doubles Story Problems

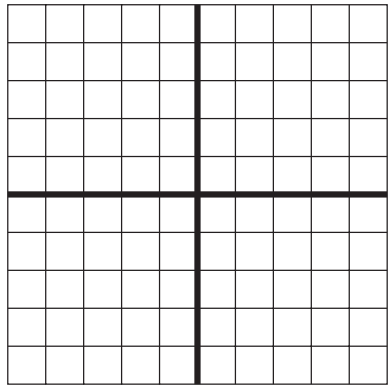
1 There are 4 candies in each package. I have 6 packages. How many candies do I have?

2 There were 7 ladybugs with 4 spots each. How many spots were on the ladybugs altogether?

Your Doubles Facts

What are some other doubles facts you know? Can you draw them or show them using number sentences? Can you write a story problem about a doubles fact?

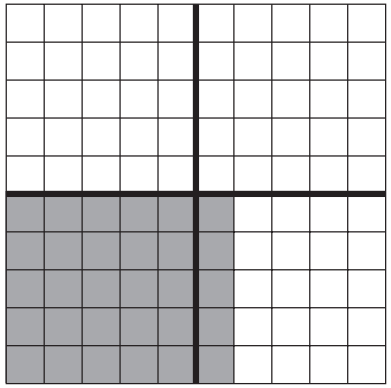




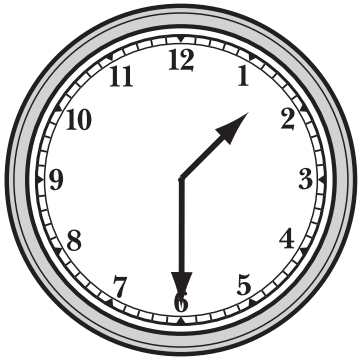
Blackline 4.29 For use in Unit Four, Session 20. Run a class set back-to-back with Blackline 4.30. Fold in half.

Clock Facts

When one of the factors is 5, you can think about the minutes on a clock face. If you can't remember a product, you can count by fives.



$5 \times 6 = 30$



When the minute hand is on the 6, it is 30 minutes past the hour.

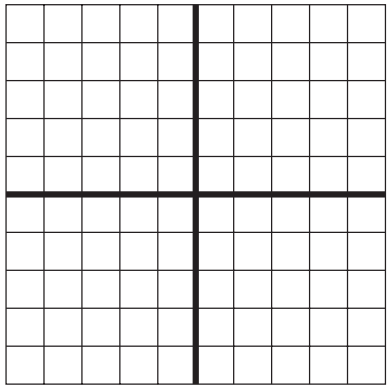
Clock Facts Story Problems

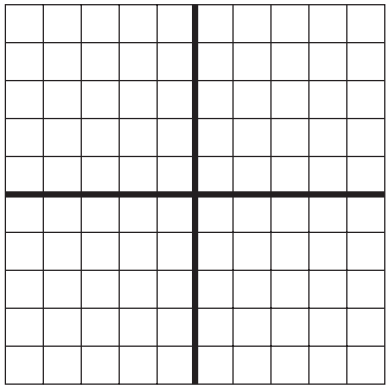
1 Joe had 7 nickels in his pocket. How much money did he have?

2 If Suzie bought 9 baskets with 5 peaches in each basket, how many peaches did she buy?

Your Doubles Plus 1 Set Facts

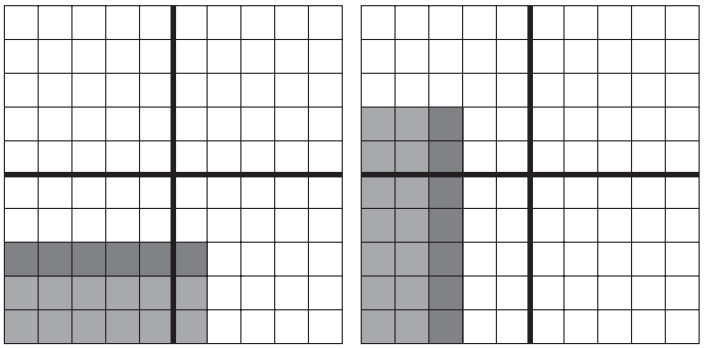
What are some other doubles plus 1 set facts you know? Can you draw them or show them using number sentences? Can you write a story problem about a doubles plus 1 set fact?





Doubles Plus 1 Set

When one of the factors is 3, you can think about the doubles fact, and then add 1 more set of the number being doubled. For example, 6 × 3 is 6 doubled (12) plus another set of 6.



3 × 6 = 18	7 × 3 = 21
(2 × 6) + 6	(7 × 2) + 7
12 + 6 = 18	14 + 7 = 21

You can use this strategy with larger numbers too.

3 × 25 = 75 150 × 3 = 450

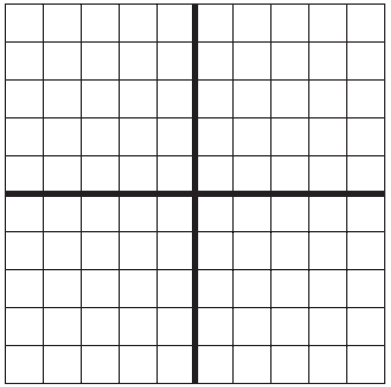
Doubles Plus 1 Set Story Problems

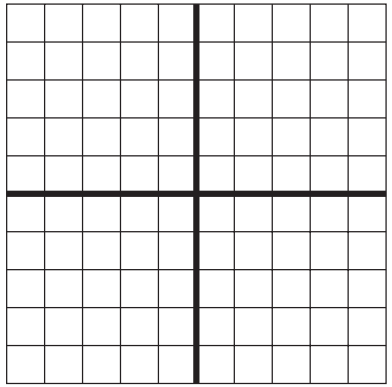
1 If you had 2 boxes of 8 crayons, and your teacher gave you another box of 8 crayons, how many crayons would you have?

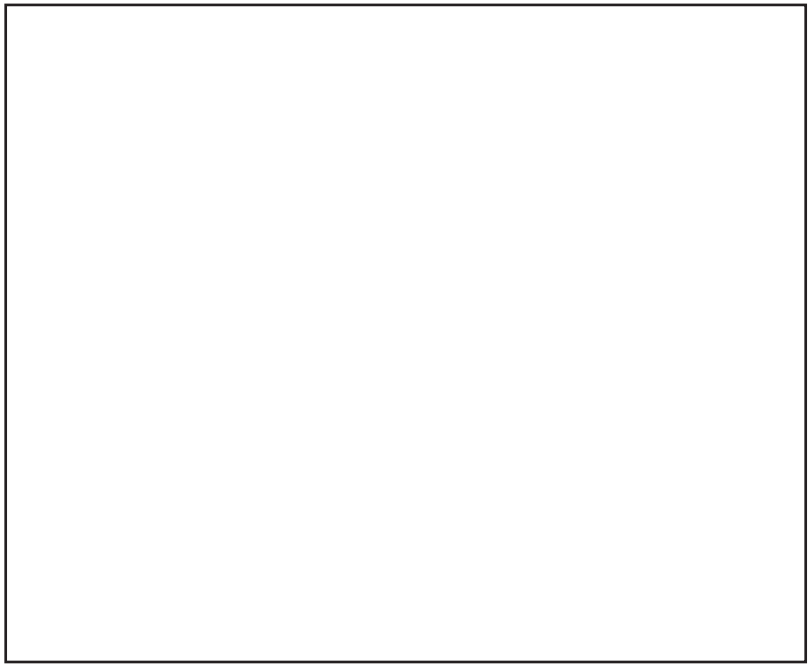
2 You bought 2 bags of 5 apples. You already had 1 bag of 5 apples at home. How many apples do you have altogether?

Your Clock Facts

What are some other clock facts you know? Can you draw them or show them using number sentences? Can you write a story problem about a clock fact?



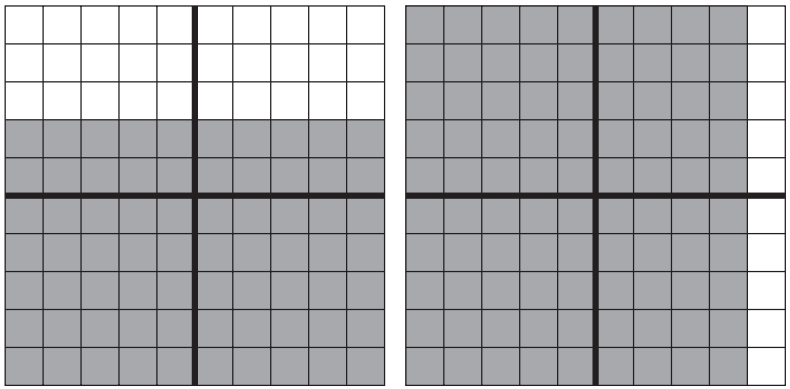




Blackline 4.31 For use in Unit Four, Session 20. Run a class set back-to-back with Blackline 4.32. Fold in half.

Decade Facts

Multiplying is easy when one of the factors is 10! We call these decade facts, because a decade is a group of 10. Where do you see the groups of 10 in the arrays below?



$7 \times 10 = 70$ $10 \times 9 = 90$

When you understand place value, multiplying larger numbers by 10 can be easy too.

$10 \times 25 = 250$ $670 \times 10 = 6700$

Decade Facts Story Problems

1 Max had 6 dimes in his pocket. How much money did he have?

2 If Jan bought 10 baskets with 5 apples in each basket, how many apples did she buy?

Your Decade Facts

What are some other decade facts you know? Can you draw them or show them using number sentences? Can you write a story problem about a decade fact?