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## 4th Grade

# Multiplication & Division Relationship

2014-09-30

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## Multiplication Review

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## Multiplication is a fast way of adding a series of repeated numbers

Using repeated addition or skip counting:

$$5 \times 3 \text{ means } 5 + 5 + 5 \\ 5 \times 3 = 15$$

$$4 \times 8 \text{ means } 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 \\ 4 \times 8 = 32$$

Or you can use a picture model:

$$5 \times 2 = 10 \text{ s}$$



Write an example of a multiplication sentence related to addition and solve it.

## Place Value and Multiplying

Remember how each place value is 10 x's larger than the next?

If we take any of the place value units, the next unit on the left is ten times as many.

1 ten = 10 x 1 one (1 ten is 10 times as much as 1 one)

1 hundred = 10 x 1 ten

1 thousand = 10 x 1 hundred

## Place Value and Multiplying

We can apply this knowledge with larger numbers whose digits are in the tens, hundreds, or even thousands!

$10 \times 3 = 30$   
 $100 \times 3 = 300$   
 $1,000 \times 3 = 3,000$

We know these are true because our place value is increasing by 10x's with each equation.

## Place Value and Multiplying

We know that if a number is increasing in place value, we need to add the additional place value to our answer.

Let's look at some examples:

$4 \times 4 = 16$	$5 \times 4 = 20$
$4 \times 40 = 160$	$50 \times 4 = 200$
$40 \times 40 = 1,600$	$50 \times 40 = 2,000$

★ Can you see how the place value is getting larger with each equation? Do you notice a pattern?

It is important to understand how place value works, but there is a TRICK when multiplying numbers that end in zeros!

## What is the Trick?

What is  $6 \times 7 = ?$

What if we multiplied  $60 \times 7 = ?$

First, we know the place value increases. You can also use the zero trick by covering up the zero, multiplying  $6 \times 7$ , which equals 42, then add the zero back onto your answer.

$6 \cancel{0} \times 7 = 42 \longrightarrow$  Add zero to end to show  $60 \times 7 = 420$

What is  $50 \times 2$  then?

What about  $70 \times 80 = ?$

Be careful, in this problem you have to cover up 2 zeros, which means you have to add 2 zeros at the end!

Teacher Notes

What if

What if

First, we know the zero trick by covering up the zero, multiplying  $6 \times 7$ , which equals 42, then add

$6 \cancel{0} \times 7 = 42 \longrightarrow$  Add zero to end to show  $60 \times 7 = 420$

What is  $50 \times 2$  then?

What about  $70 \times 80 = ?$

Be careful, in this problem you have to cover up 2 zeros, which means you have to add 2 zeros at the end!

You may want to give students continued examples and practice using white boards, partners, or other method.

It is important students understand the zero trick applies to both numbers and the zeros are added to the answer of those digits, even if the answer ends with a zero, like  $50 \times 2 = 100$

the

## Use the Trick

What is  $50 \times 2$  then?

What about  $70 \times 80 = ?$

(Be careful, in this problem you have to cover up 2 zeros, which means you have to add 2 zeros at the end!)

## Use the Trick

★ Try these:

$400 \times 3 = \underline{\quad}$	$20 \times 50 = \underline{\quad}$	$8 \times 900 = \underline{\quad}$
$10 \times 100 = \underline{\quad}$	$70 \times 40 = \underline{\quad}$	$300 \times 90 = \underline{\quad}$

Answer

### Use the Trick

★ Try these:

400 x 3 =	Answer	1,200	1,000	7,200	
10 x 100 =		1,000	2,800	27,000	

1 What would the multiplication number sentence look like for the repeated addition problem,  
 $7 + 7 + 7 + 7$ ?

- ☐ A  $7 + 4$   
☐ B  $7 \times 7$   
☐ C  $7 \times 4$   
☐ D  $4 \times 4$

Answer

1 What would the multiplication number sentence look like for the repeated addition problem,  
 $7 + 7 + 7 + 7$ ?

- ☐ A  $7 + 4$   
☐ B  $7 \times 7$   
☐ C  $7 \times 4$   
☐ D  $4 \times 4$

Answer

C

2 What would the addition sentence look like for  $3 \times 4$ ?

- ☐ A  $3 + 3 + 3$   
☐ B  $4 + 3 + 4 + 3$   
☐ C  $3 + 4$   
☐ D  $3 + 3 + 3 + 3$

Answer

2 What would the addition sentence look like for  $3 \times 4$ ?

- ☐ A  $3 + 3 + 3$   
☐ B  $4 + 3 + 4 + 3$   
☐ C  $3 + 4$   
☐ D  $3 + 3 + 3 + 3$

Answer

D

3 What is the answer to  $90 \times 80 =$  ?

- ☐ A 72  
☐ B 720  
☐ C 7,200  
☐ D 72,000

Answer

3 What is the answer to  $90 \times 80 = ?$

- ☐ A 72
- ☐ B 720
- ☐ C 7,200
- ☐ D 72,000

Answer

C

4 Select the statement that explains how the numbers 55 and 550 are different.

- ☐ A 550 is 1000 times larger than 55.
- ☐ B 550 is 100 times larger than 55.
- ☐ C 550 is 10 times larger than 55.
- ☐ D 550 is 1 times larger than 55.

Answer

4 Select the statement that explains how the numbers 55 and 550 are different.

- ☐ A 550 is 1000 times
- ☐ B 550 is 100 times
- ☐ C 550 is 10 times
- ☐ D 550 is 1 times lar

Answer

C

5 What is  $40 \times 600 = ?$

- ☐ A 2,400
- ☐ B 24,000
- ☐ C 240
- ☐ D 24

Answer

5 What is  $40 \times 600 = ?$

- ☐ A 2,400
- ☐ B 24,000
- ☐ C 240
- ☐ D 24

Answer

B

**The numbers in a multiplication sentence are represented by factors and the product.**

- Factors - numbers you multiply with together to get another number (product)
- Product - the answer when 2 or more numbers are multiplied together

Here are 2 ways to write a multiplication sentence.

$$2 \times 5 = 10$$

factor      factor      product

$$2(5) = 10$$

factor      factor      product

6 Using the multiplication sentence,  
 $6 \times 8 = 48$

Which number is the product?

Answer

6 Using the multiplication sentence,  
 $6 \times 8 = 48$

Which number is the

Answer

48

7 Using the multiplication number sentence,  
 $9 \times 5 = 45$

Which numbers are factors?

- ☐ A 9
- ☐ B 5
- ☐ C 45
- ☐ D 0

Answer

7 Using the multiplication number sentence,  
 $9 \times 5 = 45$

Which numbers are factors?

- ☐ A 9
- ☐ B 5
- ☐ C 45
- ☐ D 0

Answer

A and B

8 What is the product for  $6 \times 6$ ?

Answer

8 What is the product for

Answer

36

9 What is the product for 7(9)?

Answer

9 What is the product for 7(9)?

Answer

63

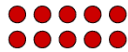
### Arrays

Multiplication sentences can also be represented using picture models called arrays.

For example:

2 X 5 means 2 + 2 + 2 + 2 + 2

2 X 5 = 10



4 X 6 means 4 + 4 + 4 + 4 + 4 + 4

4 X 6 = 24



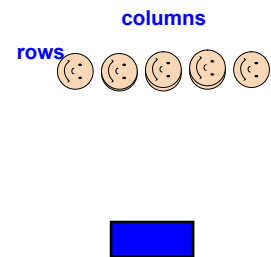
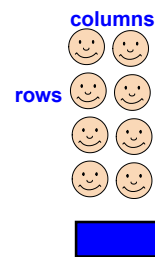
3 + 3 + 3 + 3 means 3 X 4

3 X 4 = 12



### Arrays

Array sentences are written with the number of rows first and the number of columns second.

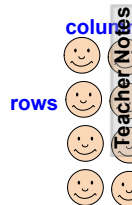


Teacher Notes

★ Create a multiplication sentence, draw a picture to represent your values.

### Arrays

Array sentences are written with the number of rows first and the number of columns second.



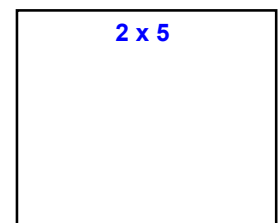
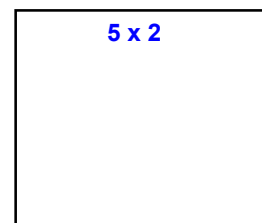
Click on the blue boxes to show multiplication sentences.

Challenge students by having them write a word problem using their multiplication sentence after they have constructed a visual model

★ Create a multiplication sentence, draw a picture to represent your values.

### Arrays

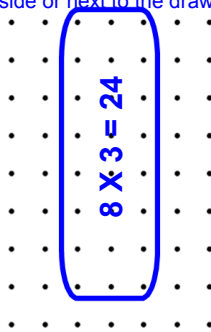
Drag arrows into each rectangle to make the arrays. How are they the same? Different?



## Arrays

- ★ 1. On a dot paper, draw several arrays
2. Trade your paper with a partner and label your partners arrays with the appropriate multiplication sentence inside or next to the drawing.

Example:



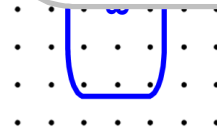
Teacher Notes

## Arrays

- ★ 1. On a dot paper
2. Trade your paper with a partner and label your partners arrays with the appropriate multiplication sentence inside or next to the drawing.

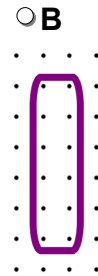
Example:

Print off the dotted paper on the next slide for each student in your class. You may want more than one paper per student. You could also use geo-boards if you have enough per student with rubber bands.



Teacher Notes

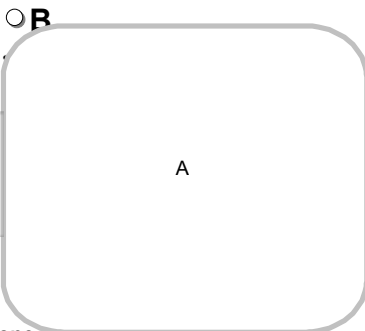
10 Which array is a model for  $3 \times 4$ ?



☐ D none of the above

Answer

10 Which array is a model for  $3 \times 4$ ?



☐ D none of the above

Answer

11 This array shows:

- ☐ A  $1 \times 3$
- ☐ B  $3 \times 1$
- ☐ C  $3 \times 0$
- ☐ D  $0 \times 3$

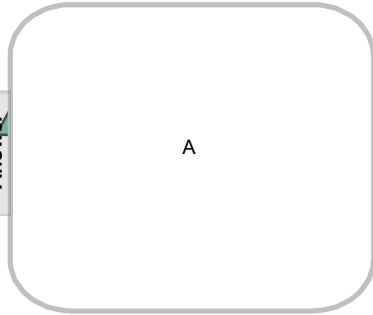


Answer

11 This array shows:

- ☐ A  $1 \times 3$   
☐ B  $3 \times 1$   
☐ C  $3 \times 0$   
☐ D  $0 \times 3$

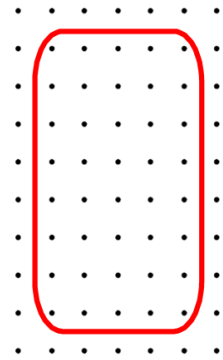
Answer



12 Which array is circled?

- ☐ A  $5 \times 8$   
☐ B  $2 \times 4 \times 5$   
☐ C  $8 \times 5$   
☐ D  $10 \times 7$

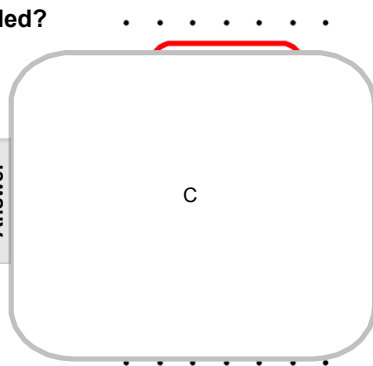
Answer



12 Which array is circled?

- ☐ A  $5 \times 8$   
☐ B  $2 \times 4 \times 5$   
☐ C  $8 \times 5$   
☐ D  $10 \times 7$

Answer



## Properties of Multiplication

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### Multiplication Properties

They make solving multiplication easier!

- |                          |   |
|--------------------------|---|
| 1. Zero Property         | $3 \times 0 = 0$                                |
| 2. Identity Property     | $4 \times 1 = 4$                                |
| 3. Commutative Property  | $5 \times 6 = 6 \times 5$                       |
| 4. Associative Property  | $2 \times (3 \times 4) = 3 \times (2 \times 4)$ |
| 5. Distributive Property | $9(20 - 3) = (9 \times 20) - (9 \times 3)$      |

💡 *These properties are directly related to the addition properties you learned previously!* 💡

### Multiplication Properties

Discuss with an elbow partner, what do all of these equations have in common?

$4 \times 0 = 0$	$0 \times 32 = 0$	$0 \times 564 = 0$
$m \times 0 = 0$	$0 \times R = 0$	$7,895 \times 0 = 0$

Based on these examples, what do you think  $5,280 \times 0 = ?$



## Zero Property

Any number multiplied by 0 is always zero

$$0 \times 3 = 0 + 0 + 0 = 0$$

$$6 \times 0 = 0$$

You can also use variables to represent any value

$$0 \times m = 0$$

★ Try this:

If Jackie has 5 hats and zero marbles in each hat. How many marbles does she have in all?

## Identity Property

Any number multiplied by ONE is always the original number

$$5 \times 1 = 5$$

$$1 \times 2,345,407 = 2,345,407$$

★ Try this:

Solve for p in the following:  $234 \times p = 234$

What tools did you use to find your answer? Tell a partner.

## Multiplication Properties

★ Solve the following equations. Write what multiplication property is represented in all 3 equations, then discuss how you determined the value of the variable in each one.

Property:

1.  $234 \times 1 = z$  \_\_\_\_\_
2.  $q \times 2,567 = 2,567$  \_\_\_\_\_
3.  $98,765 \times d = 98,765$  \_\_\_\_\_

13 Is  $7 \times 0 = 0$  an example of the Zero Property?

- ☐ Yes
- ☐ No

Answer

13 Is  $7 \times 0 = 0$  an example of the Zero Property?

- ☐ Yes
- ☐ No

Answer

Yes

14 Which equation is representing the Identity Property?

- ☐ A  $8 \times 8 = 64$
- ☐ B  $90 \times 1 = 1$
- ☐ C  $36 \times 2 = 36 \times 2$
- ☐ D  $4 \times 1 = 4$

Answer

14 Which equation is representing the Identity Property?

- ☐ A  $8 \times 8 = 64$   
☐ B  $90 \times 1 = 1$   
☐ C  $36 \times 2 = 36 \times 2$   
☐ D  $4 \times 1 = 4$

Answer

D

## Commutative Property

The commutative property of multiplication means the order of the numbers does not change the result (answer) of the problem

$3 \times 5$  is the same as  $5 \times 3$  (They both equal 15)

hint: To remember this property, think of communicating (talking) with your friends!

Here are some more examples:

$$a \times b = b \times a \quad 3 \times 8 = 8 \times 3$$

★ Try This:

How can you finish the equation using the Commutative Property?

$$7 \times 4 = ? \times ?$$

## Associative Property

$$3 \times (2 \times 4) = 2 \times (4 \times 3)$$

$$(8 \times 3) \times 9 = 8 \times (3 \times 9)$$

$$4 \times (7 \times 6) = (4 \times 7) \times 6$$



**Talk it out:** Looking at the examples to the left, how would you define the Associative Property in your own words?

Click inside the box for definition.

It does not matter the order or grouping of factors in an equation, the answer will be the same. The numbers can "associate" by moving the parentheses or numbers and answer will remain the same.

## Associative Property



Is this Associative?

$$6 \times (5 \times 2) = (2 \times 5) \times 6 \text{ Watch out!}$$

[Click here for the answer...](#)

## Commutative and Associative Properties

Move the definitions and examples below to the appropriate column.

Commutative

Associative

Keeps the same numerical order, but parenthesis move

$$3 \times 5 = 5 \times 3$$

Can reorder numbers in the expression

$$5 \times (7 \times 2) = (5 \times 7) \times 2$$

## Distributive Property

In the Distributive Property, you distribute, pass, or hand out multiplication to numbers within parenthesis using addition or subtraction.

There are 2 common ways to use this property

## Distributive Property

#1: You can use it to find math facts that can be difficult to remember...

Lets solve  $6 \times 12 = A$  by distributing 6 into parts of 12

Step 1: Break 12 into easier numbers you can multiply. We know  $10 + 2 = 12$ , right? So...

Step 2: ...if we distribute (pass out) 6 to both digits, we will have  $(6 \times 10) + (6 \times 2)$

Step 3: Solve the equation starting with multiplication.

$$6 \times 10 = 60 + 6 \times 2 = 12$$

$$60 + 12 = 72$$

★ What is another way you could distribute 12 to solve?

Look in teacher notes for answers

Teacher Notes

## Distributive Property

#1: You can use it to find math facts that can be difficult to remember...

Lets solve  $6 \times 12 = A$

Step 1: Break 12 into easier numbers you can multiply. We know  $10 + 2 = 12$ , right? So...

Step 2: ...if we distribute (pass out) 6 to both digits, we will have  $(6 \times 10) + (6 \times 2)$

Step 3: Solve the equation starting with multiplication.

$$6 \times 10 = 60 + 6 \times 2 = 12$$

$$60 + 12 = 72$$

★ What is another way you could distribute 12 to solve?

Look in teacher notes for answers

This property will be more developed in the next unit with multi-digit multiplication through the array model

**Answer:** 12 can be distributed by:  $6 \times (6 + 6)$      $6 \times (8 + 4)$

$6 \times (5 + 7)$  and so on...as long as the numbers add to 12

Teacher Notes

## Let's Practice!

How can you solve  $8 \times 13$  by using the Distributive Property?

First, let's think of an easy way to break apart the larger number...

What are possible numbers that add up to equal 13?

Does it make more sense to use  $10 + 3 = 13$  or  $8 + 5 = 13$ ? Why?

Let's use  $10 + 3$ , so applying the Distributive Property to solve would look like this...

$$\begin{aligned} 8 \times 13 &= (8 \times 10) + (8 \times 3) \\ &= 80 + 24 \\ &= 104 \end{aligned}$$

Derived from engage<sup>ny</sup>

## Let's Practice!

How can you solve  $8 \times 13$  by using the Distributive Property?

Can you solve  $8 \times 13$ , by distributing 13 using the numbers 8 and 5? What is your answer?

Derived from engage<sup>ny</sup>

## Your Turn

With your elbow partners solve the following using the distributive property. Remember to first decide what 2 numbers make the larger number easier to solve with. For example, in #1, does it make more sense to break 12 into  $6 + 6$  or  $10 + 2$ ? Show your work!

1.  $6 \times 12 =$
2.  $34 \times 8 =$
3.  $42 \times 4 =$

## Distributive Property

#2 You can solve an equation with parenthesis by distributing the number on the outside to digits on the inside.

$$6(9 + 5) = (6 \times 9) + (6 \times 5)$$

Remember a number next to parenthesis means to multiply!

$$\begin{aligned} &45 + 30 \\ &= 75 \end{aligned}$$

You use addition after you find the products because that is the function inside the parenthesis.

★ Try this using the distributive property:  $9(8 + 6) =$

## Distributive Property

You can also use it with subtraction. Instead of adding the products together, you will subtract them.

$$8(7 - 3) = (8 \times 7) - (8 \times 3)$$

Notice subtraction being carried throughout since it is function within the parenthesis

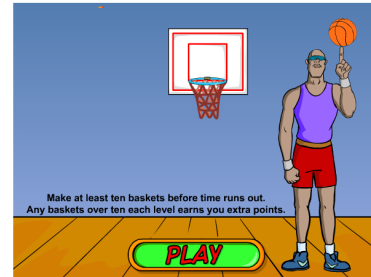
$$56 - 24 = 32$$

★ Try this using the distributive property:  
 $3(6 - 4) =$

## Let's Practice!

Click on the picture below to check your understanding of multiplication properties.

You can take turns shooting hoops and answering questions!

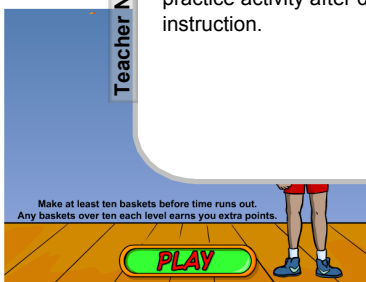


Teacher Notes

## Let's Practice!

Click on the picture below to check your understanding of multiplication properties.

You can take turns shooting hoops and answering questions!



Teacher Notes

This resource would also be a good independent or partner practice activity after direct instruction.

15 Which number sentence demonstrates the Distributive Property?

- ☐ A  $6(4 \times 2) = 6(2 \times 4)$
- ☐ B  $3 \times (2 \times 1) = (3 \times 2) \times 1$
- ☐ C  $5 \times 32 = (5 \times 30) + (5 \times 2)$
- ☐ D None of them

Answer

15 Which number sentence demonstrates the Distributive Property?

- ☐ A  $6(4 \times 2) = 6(2 \times 4)$
- ☐ B  $3 \times (2 \times 1) = (3 \times 2) \times 1$
- ☐ C  $5 \times 32 = (5 \times 30) + (5 \times 2)$
- ☐ D None of them

Answer

C

16 A candy company has orders for chocolate bars from 5 different stores. Each order contains 45 chocolate bars. Choose the equation you should use to figure out how many chocolate bars the candy company needs to make. Solve.

- ☐ A  $4 \times 50 =$  \_\_\_ chocolate bars
- ☐ B  $(45 \times 5) - (45 \times 5) =$  \_\_\_ chocolate bars
- ☐ C  $(30 \times 5) + (5 \times 5) =$  \_\_\_ chocolate bars
- ☐ D  $(5 \times 40) + (5 \times 5) =$  \_\_\_ chocolate bars

Answer

16 A candy company has orders for chocolate bars from 5 different stores. Each order contains 45 chocolate bars. Choose the equation you should use to figure out how many chocolate bars the company needs to make. Select the correct answer.

- ☐ A  $4 \times 50 =$
- ☐ B  $(45 \times 5) =$
- ☐ C  $(30 \times 5) +$
- ☐ D  $(5 \times 40) +$

$$\begin{aligned} (5 \times 40) + (5 \times 5) \\ 200 + 25 \\ = 225 \\ \text{D} \end{aligned}$$

Answer

17 Is  $8 \times (9 \times 3) = 9 \times (8 \times 3)$  an example of the Associative Property? Explain your answer.

- ☐ True
- ☐ False

Answer

17 Is  $8 \times (9 \times 3) = 9 \times (8 \times 3)$  an example of the Associative Property? Explain your answer.

- ☐ True
- ☐ False

Answer

False

18 Which set of equations show the Associative Property? \*remember the numbers are socializing!

- ☐ A  $9 \times 5 \times 4 = 5 \times 4 \times 9$
- ☐ B  $3 \times (54 \times 6) = (3 \times 54) \times 6$
- ☐ C  $2 \times 0 = 0$
- ☐ D  $2(5 - 4) = (2 \times 5) - (2 \times 4)$

Answer

19 In the Commutative Property, you can switch the numbers around and still get the same answer.

- ☐ Yes
- ☐ No

Answer

19 In the Commutative Property, you can switch the numbers around and still get the same answer.

- ☐ Yes
- ☐ No

Answer

Yes

20 Which two equations represent the statement "48 is 6 times as many as 8?" Select the two correct answers.

- ☐ 48 = 6 + 8
- ☐ 48 = 6 x 8
- ☐ 48 = 6 x 6
- ☐ 48 = 8 + 6
- ☐ 48 = 8 x 6

Answer

From PARCC sample test

20 Which two equations represent the statement "48 is 6 times as many as 8?" Select the two correct answers.

- ☐ 48 = 6 + 8
- ☐ 48 = 6 x 8
- ☐ 48 = 6 x 6
- ☐ 48 = 8 + 6
- ☐ 48 = 8 x 6

Answer

B and E

From PARCC sample test

21 Rewrite the expression  $8(4 + 3)$  using the Distributive Property of Multiplication. Then simplify your answer.

Answer

21 Rewrite the expression  $8(4 + 3)$  using the Distributive Property of Multiplication. Then simplify your answer.

Answer

$$\begin{aligned} &(8 \times 4) + (8 \times 3) \\ &32 + 24 \\ &= 56 \end{aligned}$$

22 What property is being represented by  $8 \times 3 = 24$ ;  $3 \times 8 = 24$ ?

- ☐ A Identity Property
- ☐ B Commutative Property
- ☐ C Associative Property
- ☐ D Zero Property

Answer

23 Which property is being demonstrated in  $7 \times 16 = (7 \times 10) + (7 \times 6)$ ?

- ☐ A Distributive Property
- ☐ B Associative Property
- ☐ C Identity Property
- ☐ D Commutative Property

Answer

23 Which property is being demonstrated in  
 $7 \times 16 = (7 \times 10) + (7 \times 6)$

- ☐ A Distributive Property
- ☐ B Associative Property
- ☐ C Identity Property
- ☐ D Commutative Property

A

24 Which property is shown?

$$5 \times 4 = 20$$

$$4 \times 5 = 20$$

- ☐ A Identity
- ☐ B Commutative
- ☐ C Zero
- ☐ D Same

Answer

25 Which set of number sentences show the  
 commutative property?

- ☐ A  $7 \times 3 = 21$        $7 + 7 + 7 = 21$
- ☐ B  $4 \times 1 = 4$        $0 \times 4 = 0$
- ☐ C  $8 \times 2 = 16$        $2 \times 8 = 16$
- ☐ D  $3 + 3 = 6$        $2 + 2 + 2 = 6$

Answer

25 Which set of number sentences show the  
 commutative property?

- ☐ A  $7 \times 3 = 21$
- ☐ B  $4 \times 1 = 4$
- ☐ C  $8 \times 2 = 16$
- ☐ D  $3 + 3 = 6$

Answer

C

## Factors

[Return to  
table of contents](#)

## What is a FACTOR?

What is the multiplication sentences represented by these arrays?



[click to reveal](#)



Both arrays equal the product of 8. Remember, factors are 2 numbers multiplied to get a given product. Factors,  $1 \times 8$ , and  $2 \times 4$  both multiply to equal the product 8. So we know the factors of 8 are: 1, 2, 4, 8

Derived from engage<sup>ny</sup>

Teacher Notes

## What is a FACTOR?

What is the multiplication sentence for the array?

XXXXXXXX

[click to reveal](#)

Teacher Notes

To have students actively engage in learning factors, have them draw the arrays, work with partners, and discuss how they found the factors as you work through examples. Ask them how they made sure they found all of them.

Both arrays equal the product 8. numbers multiplied to 8. 1 and 8 and 2 and 4 both multiply to equal the product 8. So we know the factors of 8 are: 1, 2, 4, 8

Derived from engage<sup>ny</sup>

## What is a FACTOR?

XXXXXXXX

$$1 \times 8 = 8$$

XXXX  
XXXX

$$2 \times 4 = 8$$

You can represent given factors by using a factor rainbow.



Derived from engage<sup>ny</sup>

## Factor Rainbows

Factor Rainbows help organize the numbers and allow you to check your work to make sure you find ALL factors.

**Lets factor 12:** Look at the following arrays. What multiplication sentence are they showing?

↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑↑

$$1 \times 12 = 12$$

↑↑↑↑↑↑  
↑↑↑↑↑↑

$$2 \times 6 = 12$$

Circle the factors. Write these factors in numerical order using the factor rainbow.



Derived from engage<sup>ny</sup>

## Factor Rainbows

★ Draw another array to represent another pair of factors for 12. Now rewrite all the factors found for 12 using a factor rainbow.

[click to reveal](#)

Derived from engage<sup>ny</sup>

## Helpful Hints

1. Always start factoring with the number and 1.
2. Even numbers always have 2 as a factor. You will need to find the number that multiplies with 2 that equals the given number to know the factor pair!
3. Numbers with 5 as a factor have a 0 or 5 in the ones place value.
4. If you make a factor rainbow, and cannot connect a number to another factor it could be....
  - You forgot to find the other factor and should do so.
  - The other factor is the same number.

## Helpful Hints

**For example:** Take the number 9.

The factors are 1, 3, 9



★ Discuss with your partner why 3 does not have a factor pair, but this factor rainbow is correct.

[click to reveal](#)



26 Is there a factor missing from this factor rainbow for the number 16?

☐ Yes

☐ No



## How do you know you've found ALL the factors?

Lets factor 18:

1. We always start with 1 and the number, in this case 18.
2. Then you continue to think of numbers and/or draw arrays that multiply to represent 18. Work up numerically, going to 2, then 3, and so on. If it doesn't multiply by another factor to equal 18, you know it's not a factor.
3. You will be able to make the factor rainbow, connecting each factor pair when you have found all of the factors!



Factor pairs of 18

1	18
2	9
3	6



Check your factor pairs, make sure you didn't forget one or more!



## Partner up and try this

Factor the following numbers using the strategies you've just learned.

30: click

24: click

45: click

Teacher Notes

How can we check our work to make sure we have all the factors?

click

Lets check our work!

## Partner

Factor the following numbers using the strategies you've just learned.

30: click

24: click

45: click

Teacher Notes

Students may need help on how to go through each number numerically, thinking if it multiplies to equal the given number or not. You may want to go through the first one together as a class to demonstrate.

How can we check our work to make sure we have all the factors?

click

Lets check our work!

## Division with Factors

Division can help to find factors of larger numbers

Lets look at the number 54. How can we determine if 3 is a factor of 54?

Use division to determine if 3 is a factor or not:  $54 \div 3 = ?$

$$\begin{array}{r} 18 \\ 3 \overline{) 54} \\ \underline{- 3} \phantom{0} \\ 24 \\ \underline{- 24} \\ 0 \end{array}$$

Because there is no remainder, you know that 3 is a factor of 54.

3 and 18 are a factor pair of 54

*Use division when unsure of numbers that could be factors!*

## Division with Factors

How can you find all the factors of 54?

Let's find out together...

1. Begin with 1 and the given number, 54
2. Because 54 is even, we know 2 is a factor

$$\begin{array}{r} 27 \\ 2 \overline{) 54} \\ \underline{- 4} \phantom{0} \\ 14 \\ \underline{- 14} \\ 0 \end{array}$$

2 and 27 are factors



Could you skip count to find the missing factor as well?

3. Previously we found 3 and 18 are factors.
4. Then 4 and so on, until you reach 12.



Is it necessary to divide to find if 5 is a factor of 54?

Teacher Notes

## Division with Factors

How can you find all the factors of 60?

Let's find out together.

1. Begin with 1 and 60.
2. Because 5 is a factor of 60, we know 5 and 12 are factors.

$$\begin{array}{r} 2 \overline{) 60} \\ \underline{-4} \phantom{0} \\ 14 \phantom{0} \\ \underline{-14} \\ 00 \end{array}$$

Tell students this hint:

Usually you have found all of the factors when you reach 12.

Always check your work and look at the numbers to make sure you have factor pairs!

Remember, not all numbers will be factors.

3. Previously we found 3 and 18 are factors.

4. Then 4 and so on, until you reach 12.



Is it necessary to divide to find if 5 is a factor of 54?

## Factors

Using the strategies we just covered, multiplication facts and division, let's find the factor pairs of 60.

### Factor 60:

1. We know 1 and 60 are the beginning factors
2. Now we think about the number 2, is 60 an even or odd number? It's even so 2 is a factor - now we need to find how many 2s
3. What about 3? Let's use division to find out.

$$\begin{array}{r} 20 \\ 3 \overline{) 60} \\ \underline{-6} \\ 00 \end{array}$$

4. Now we need to look at 4. Use division again.
5. Now keep working through the digits until you find the rest of the factors.

What are all of the factors?

Factor Pairs	
1	60
2	30
3	20
4	15

Answer

## Factors

Using the strategies we just covered, multiplication facts and division, let's find the factor pairs of 60.

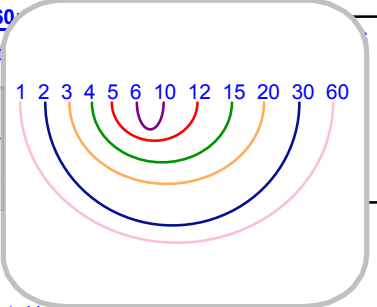
### Factor 60:

1. We know 1 and 60 are factors.
2. Now we think about the number 2, is 60 an even or odd number? It's even so 2 is a factor - now we need to find how many 2s
3. What about 3? Let's use division to find out.

$$\begin{array}{r} 20 \\ 3 \overline{) 60} \\ \underline{-6} \\ 00 \end{array}$$

4. Now we need to look at 4. Use division again.
5. Now keep working through the digits until you find the rest of the factors.

What are all of the factors?



## Analyzing the Numbers

Is 6 a factor of 54?

If we know 6 is a factor can we say that 2 and 3 are also factors of 54? Is the following multiplication sentence true?

$$54 = 6 \times 9 = (2 \times 3) \times 9$$

If we rewrite it vertically we can see how 6 relates to 2 and 3

$$\begin{array}{l} 54 = 6 \times 9 \\ = (2 \times 3) \times 9 \end{array}$$

Remember the Associative Property? Let's use it to simplify 3 with 9 to check if 2 and 3 are really factors.

$$\begin{array}{l} 54 = 2 \times (3 \times 9) \\ 54 = 2 \times 27 \\ 54 = 54 \end{array}$$

This proves 2 and 27 are a factor pair of 54

Derived from engage<sup>ny</sup>

Associative Property can help us find factors!!!

Teacher Notes

## Analyzing the Numbers

If we know 6 is a factor of 54, is the following multiplication sentence true?

If we rewrite it vertically we can see how 6 relates to 2 and 3

Remember the Associative Property? Let's use it to simplify 3 with 9 to check if 2 and 3 are really factors.

$$\begin{array}{l} 54 = 2 \times (3 \times 9) \\ 54 = 2 \times 27 \\ 54 = 54 \end{array}$$

This proves 2 and 27 are a factor pair of 54

Derived from engage<sup>ny</sup>

Associative Property can help us find factors!!!

## Let's Practice using Associative Property

Is 6 a factor of 42? How do you know...

We know 6 is a factor

Let's use the Associative Property to determine if 2 and 3 are also factors of 42.

$$\begin{array}{l} 42 = 6 \times 7 \\ 42 = (2 \times 3) \times 7 \\ 42 = 2 (3 \times 7) \\ 42 = 2 \times 21 \\ 42 = 42 \end{array}$$

Associative Property at work!

We can see that 2 is a factor of 42 because 2 and 21 are a factor pair that multiply to equal 42!

Derived from engage<sup>ny</sup>

**Factors**

★ Get with an elbow partner and answer the following.

What is  $6 \times 12$ ?

Work with your partner to prove 6 is a factor of 72, so 2 and 3 must also be factors using the associative property.

Now find all of the factors of 72. Show your work.

Answer

**Factors**

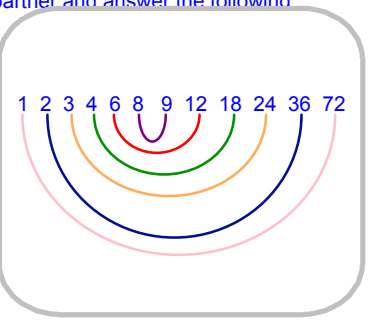
★ Get with an elbow partner and answer the following.

What

Work with your partner to prove 6 is a factor of 72, so 2 and 3 must also be factors using the associative property.

Now find all of the factors of 72. Show your work.

Answer



**27 Is 5 a factor of 75? Show how you know on paper and be prepared to explain your answer.**

☐ Yes

☐ No

Answer

**27 Is 5 a factor of 75? Show how you know on paper and be prepared to explain your answer.**

☐ Yes

☐ No

Answer

Yes, because 75 has a 5 in the one place value. I can skip count or divide to show that  $5 \times 15 = 75$ .

**28 Select all of the factors for the number 27. hint: Make sure you think through each possible factor and make a factor rainbow before choosing an answer!**

☐ A 1

☐ B 2

☐ C 3

☐ D 4

☐ E 5

☐ F 8

☐ 9

☐ 12

☐ 14

☐ 27

Answer

**28 Select all of the factors for the number 27. hint: Make sure you think through each possible factor and make a factor rainbow before choosing an answer!**

☐ A 1

☐ B 2

☐ C 3

☐ D 4

☐ E 5

☐ F 8

☐ 9

☐ 12

☐ 14

☐ 27

Answer

A, C, G, J are all factors of 27

29 If 8 is a factor of 56, can we also say that 4 and 2 are factors? Show your work and be ready to explain.

- ☐ Yes
- ☐ No

Answer

29 If 8 is a factor of 56, can we also say that 4 and 2 are factors? Show your work and be ready to explain.

- ☐ Yes
- ☐ No

Answer

Yes, by using the Associative property students should show

$$\begin{aligned} 56 &= 8 \times 7 \\ &= (4 \times 2) \times 7 \\ &= 4 \times (2 \times 7) \\ &= 4 \times 14 \\ &= 56 \end{aligned}$$

30 Select the three choices that are factor pairs for the number 28.

- ☐ 1 and 28
- ☐ 2 and 14
- ☐ 3 and 9
- ☐ 4 and 7
- ☐ 6 and 5
- ☐ 8 and 3

From PARCC sample test

Answer

30 Select the three choices that are factor pairs for the number 28.

- ☐ 1 and 28
- ☐ 2 and 14
- ☐ 3 and 9
- ☐ 4 and 7
- ☐ 6 and 5
- ☐ 8 and 3

From PARCC sample test

Answer

A, B, D

31 Which correctly lists all of the factors for 40 ?

- ☐ A 1, 40
- ☐ B 1, 2, 3, 4, 5, 8, 9, 10, 20, 40
- ☐ C 1, 2, 4, 5, 8, 10, 20, 40
- ☐ D 1, 2, 20, 40

Answer

31 Which correctly lists all of the factors for 40 ?

- ☐ A 1, 40
- ☐ B 1, 2, 3, 4, 5, 8, 9, 10, 20, 40
- ☐ C 1, 2, 4, 5, 8, 10, 20, 40
- ☐ D 1, 2, 20, 40

Answer

C

**32 Which correctly lists all of the factors for 31 ?**

- ☐ A 1, 31
- ☐ B 1, 3, 31
- ☐ C 1, 3, 9, 31
- ☐ D 1, 3, 7, 9, 31

**33 Which number is a factor of 22?**

- ☐ A 44
- ☐ B 6
- ☐ C 8
- ☐ D 2

Answer

**33 Which number is a factor of 22?**

- ☐ A 44
- ☐ B 6
- ☐ C 8
- ☐ D 2

Answer

D

**34 Which number is a factor for 63?**

- ☐ A 6
- ☐ B 10
- ☐ C 3
- ☐ D 2

Answer

**34 Which number is a factor for 63?**

- ☐ A 6
- ☐ B 10
- ☐ C 3
- ☐ D 2

Answer

C

**35 What factors can you use in the following equation to make a product that is an odd number between 30 and 60? Mark the answer with all possible solutions.**

$$\underline{\hspace{1cm}} \times 5 = \underline{\hspace{1cm}}$$

- ☐ A 6, 7 and 8
- ☐ B 7, 9 and 11
- ☐ C 7, 9, 11 and 13
- ☐ D 6, 7, 8, 9, 10 and 11

Answer

**35 What factors can you use in the following equation to make a product that is an odd number between 30 and 60? Mark the correct solutions.**

\_\_\_\_\_ X 5 = \_\_\_\_\_

- ☐ A 6, 7 and 8  
☐ B 7, 9 and 11  
☐ C 7, 9, 11 and 13  
☐ D 6, 7, 8, 9, 10 and 12

Teacher Note: Have students explain the strategies they used to find the correct solution. For students who answer incorrectly, have them explain their thinking and discuss where they made an error.

B

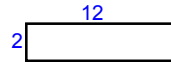
## Using Factors with Area

Imagine Suzie and her friend trying to build a sand castle. They want the castle to be 24 square feet when they are done. What are possible side lengths their castle could have?

Using our knowledge of factors and area, we can create different lengths of the sides.

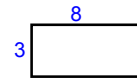
Remember the area formula is length x width →  $A = L \times W$

$$2 \times 12 = 24$$



We know 2 and 12 are a factor pair of 24 so we can make a castle area using these as dimensions.

$$3 \times 8 = 24$$



Suzie could also build her castle 3 by 8 feet.

Teacher Notes

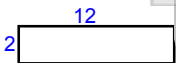
## Using Factors with Area

Imagine Suzie and her friend trying to build a sand castle. They want the castle to be 24 square feet when they are done. What are possible side lengths their castle could have?

Using our knowledge of factors and area, we can create different lengths of the sides.

Remember the area formula is length x width →  $A = L \times W$

$$2 \times 12 = 24$$



We know 2 and 12 are a factor pair of 24 so we can make a castle area using these as dimensions.

**Talk it out:**

What is another possible dimension the castle could be?

Suzie could also build her castle 3 by 8 feet.

**36 Craig's family decided that wanted to build a local neighborhood park. The city gave them 45 square yards to design their park in. What are possible dimensions that could have used to create it? (Select all that apply.)**

- ☐ 1 yard by 45 yards  
☐ 2 yards by 25 yards  
☐ 4 yards by 9 yards  
☐ 5 yards by 9 yards  
☐ 7 yards by 7 yards

## Using Factors with Area

Dillion needed to build a parking lot for the new high school. They needed it to be 100 square yards total in size. What are 3 possible dimensions Dillion could use to make his parking lot?

## Prime and Composite

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## Determining Prime/Composite Numbers



### Let's Think:

When determining if a number is Prime or Composite, you have to think about the factors.

What do you currently know about factors?

How do you solve for factors?

What do you use to check your work?

## Prime Numbers

Let's look:  $1 \times 7 = 7$

What are the factors of this equation?

*click*

How do you know?

Think about  $1 \times 5 = 5$

What are the factors of this equation?

*click*

Derived from engage<sup>ny</sup>

Teacher Notes

## Prime Numbers

Let's look:  $1 \times 7 = 7$

What are the factors

*click*

How do

Think about  $1 \times 5 = 5$

What are the factors

*click*

Derived from engage<sup>ny</sup>

Teacher Notes

Student response should be about how the numbers, 2, 3, 4, 5, and 6 cannot be factors of 7. They should reason that seven only has 1 factor pair or 2 factors

## Prime Numbers

Numbers like 5 and 7 that only have 2 factors, 1 and itself, are called prime numbers.

## Prime Numbers Practice



Try this:

Create a list of at least 2 other prime numbers with a partner. Remember, a prime number only has 1 and itself as factors.

## Composite Numbers

Numbers with multiple factors are called composite numbers.

Lets look at the number 8:

Factors	Pairs of 8
1	8
2	4

We can see 8 is a **composite number** because it has more than 1 and itself as factors. There are 4 factors of 8. The factor pair 2 and 4 make it a composite number.

## Composite Numbers

★ Try this:

Is the number 45 a prime or composite number? Work with a partner creating a visual representation of why or why not. (Remember we have used arrays, factor trees, or factor rainbows to show our work.)

Sort the numbers into the columns.

2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Prime										Composite								

In the case of 24, you can find the prime factorization by taking 24 and dividing it by all factors. 24 ÷ 2 = 12. Now divide out the smallest number that goes into 12: 12 ÷ 2 = 6. Now divide out the smallest number that goes into 6: 6 ÷ 2 = 3. Since 3 is a prime number, the prime factorization is  $2 \times 2 \times 2 \times 3$ .

Please refer to the original Notebook file.



## Exceptions

There are 2 numbers that do not qualify as prime or composite.

### 0 and 1

0 is not classified by these terms because no matter what number you multiply it by, it is always zero. Therefore, 0 is neither prime or composite.

1 is not classified by these terms because mathematicians have agreed it is easier to define the structure of our number system without it classified. Therefore, 1 is neither prime nor composite.

Derived from engage<sup>ny</sup>

Click for game.

fruit shoot  
Primes - Composites

Prime numbers are numbers that can only be divided by themselves and the number 1.\*  
Examples: 2, 3, 5

All other numbers are **composite numbers**, which means they can also be divided by other numbers.  
Examples: 4, 6, 10

\*The number 1 is not a prime number or composite number.

PLAY Numbers to 20    PLAY Numbers to 50    PLAY Numbers to 99

37 Sasha says that every number in the twenties is a composite number because 2 is even. Amanda says there are two prime numbers in the twenties. Who is correct? How do you know?

- ☐ A Sasha
- ☐ B Amanda

Answer



38 Which of the following numbers are *prime* ? (Select more than one answer.)

- ☐ A 1
- ☐ B 2
- ☐ C 3
- ☐ D 4
- ☐ E 5
- ☐ F 6

Answer

38 Which of the following numbers are *prime* ? (Select more than one answer.)

- ☐ A 1
- ☐ B 2
- ☐ C 3
- ☐ D 4
- ☐ E 5
- ☐ F 6

Answer

B, C, and E

39 Which of the following numbers are *composite* ? (Select more than one answer.)

- ☐ A 9
- ☐ B 10
- ☐ C 11
- ☐ D 12
- ☐ E 13
- ☐ F 14

Answer

39 Which of the following numbers are *composite* ? (Select more than one answer.)

- ☐ A 9
- ☐ B 10
- ☐ C 11
- ☐ D 12
- ☐ E 13
- ☐ F 14

Answer

A, B, D, and F

40 Which of the following sets of numbers has all prime numbers?

- ☐ A 1, 2, 3, 5, 7
- ☐ B 2, 3, 5, 7, 9
- ☐ C 0, 1, 2, 3, 5
- ☐ D 2, 3, 5, 7, 11

Answer

40 Which of the following sets of numbers has all prime numbers?

- ☐ A 1, 2, 3, 5, 7
- ☐ B 2, 3, 5, 7, 9
- ☐ C 0, 1, 2, 3, 5
- ☐ D 2, 3, 5, 7, 11

Answer

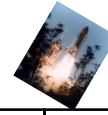
D

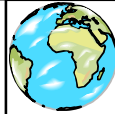
41 If you complete the following equation. Is the answer a prime or composite number?

$$8 + 7 + 2 + 7$$

- ☐ A Prime
- ☐ B Composite

Answer



111	12	59	54	62	20	78	132
98	18	23	126	81	76	9	54
42	45	41			47	5	139
108	53	109			112	72	83
20	103	14			44	97	29
126	3	36	102	98	123	41	130
138	61	121	98	123	134	127	50
82	11	17	2	97	19	37	110

Teacher Notes

Circle the prime numbers to help the space shuttle to take off from Earth

## Multiples

Teacher Notes

Return to  
table of contents

Teacher Notes

There are 3 slides at the end of this section to print off and use as activities in the classroom - individual, partner, or centers.

Return to  
table of contents

### What is a Multiple?

Turn to a partner and skip count by 4s until your teacher says to stop!  
Ready? GO!

**Talk it out:**  
What number did you land on?  
What are some things you noticed about the numbers while you were counting?

Continue to skip count with your partner, starting where you left off until your teacher tells you to stop again. See if you notice any patterns this time.

Derived from  iMagine™

**Talk it out:** What did you notice this time?

### What is a Multiple?

When you skip count by any number, the numbers you say are called **multiples**.


★ **Talk it out:**  
How is a multiple different than a factor?

**Let's keep talking:**  
(small group or partners)

How do we know that 20 is a multiple of 4?

Is 20 a multiple of 5? How do you know?

What about 6? Is 20 a multiple of 6? How do you know?

Derived from  iMagine™

Teacher Notes

## What is a Multiple?

When you skip count by any number, the numbers you say are called multiples.

**Let's keep talking**  
(small group or partners)

How do we know?

Is 20 a multiple?

What about 6?



Teacher Notes

Students should respond that factors are listed out and done, however, multiples can go on and on forever.

Tell students that it is important to remember that multiples are made by using factors. Take 20 and 4.  $4 \times 5 = 20$ , so 4 is a factor that multiplies by the factor 5 to equal 20. 20 can be called the product, and a multiple of 4 and 5 because you can skip count to 20 with both numbers.

?

Derived from iMagine™

## Multiples

What are multiples of 8?

click

Challenge question:

We know that  $2 \times 4 = 8$ , right? We can reason that 8 is a multiple of 2 and 4 because if we skip count by 2, we get to 8, or if we skip count by 4, we also get to 8.

*If 8 is a multiple of 2 and 4, are multiples of 8 also multiples of 2 and 4? Let's find out by looking at 40, a multiple of 8:*

$$40 = (5 \times 4) \times 2$$

$$40 = 20 \times 2$$

Yes, 40 is a multiple of

2. Counting 2 twenty

times, gets 40.

$$40 = 5 \times 8$$

$$40 = 5 \times (4 \times 2)$$

$$40 = (5 \times 2) \times 4$$

$$40 = 10 \times 4$$

Yes, 40 is a multiple of 4.

Counting 4 ten times, gets 40.

Derived from iMagine™

## Finding Multiples between 1 - 100



Take the number 84.  
Is 84 a multiple of the number 4?

Think about ways you could solve this problem.

When determining if a number is a multiple of another number you use skip counting, or you can also use division. This is very helpful with larger numbers.

$$\begin{array}{r} 21 \\ 4 \overline{)84} \\ \underline{-8} \phantom{0} \\ 0 \end{array}$$

$$\begin{array}{r} 21 \\ 4 \overline{)84} \\ \underline{-8} \phantom{0} \\ 0 \end{array}$$

$$\begin{array}{r} 21 \\ 4 \overline{)84} \\ \underline{-8} \phantom{0} \\ 0 \end{array}$$

84 is a multiple of 4 because when you divide it out, there are no remainders.

$$4 \times 21 = 84$$

factor      factor      multiple

Click for interactive game practice.

### Multi Multiples

Find **multi**ples of the given number to **earn** parts of the face. When you have collected all the parts, enjoy creating a face for Mrs. **P**otato **H**ead!

**START GAME**

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Sorry, this element requires Flash, which is not currently supported in PDFs.

Please refer to the original Notebook file.



42 List 3 multiples of 4.

Answer

42 List 3 multiples of 4.

Answer

Possible answers:

4, 16, 24  
8, 24, 48  
4, 32, 40,  
4, 12, 16  
etc.

43 Select all of the multiples of 6.

- ☐ A 54  
☐ B 15  
☐ C 42  
☐ D 1  
☐ E 35  
☐ F 56

Answer

44 If you are trying to find multiples of 6, are you also finding multiples of 2 and 3?

- ☐ True  
☐ False

Answer

44 If you are trying to find multiples of 6, are you also finding multiples of

- ☐ True  
☐ False

Answer

True

45 If you know that 60 is a multiple of 6 ten times, is 60 also a multiple of 2?

- ☐ Yes  
☐ No

Answer

45 If you know that 60 is a multiple of 6 ten times, is 60 also a multiple of 2?

- ☐ Yes  
☐ No

Answer

Yes

46 How many times do you count 2 in order to reach 60?

- ☐ A 15  
☐ B 20  
☐ C 25  
☐ D 30

Answer

46 How many times do you count 2 in order to reach 60?

- ☐ A 15  
☐ B 20  
☐ C 25  
☐ D 30

Answer

D

47 Select each number that is a multiple of 8.

- |                             |                             |
|-----------------------------|-----------------------------|
| <input type="checkbox"/> 1  | <input type="checkbox"/> 24 |
| <input type="checkbox"/> 2  | <input type="checkbox"/> 36 |
| <input type="checkbox"/> 4  | <input type="checkbox"/> 58 |
| <input type="checkbox"/> 8  | <input type="checkbox"/> 64 |
| <input type="checkbox"/> 20 | <input type="checkbox"/> 80 |

Answer

From PARCC sample test

47 Select each number that is a multiple of 8.

- |                             |                             |
|-----------------------------|-----------------------------|
| <input type="checkbox"/> 1  | <input type="checkbox"/> 24 |
| <input type="checkbox"/> 2  | <input type="checkbox"/> 36 |
| <input type="checkbox"/> 4  | <input type="checkbox"/> 58 |
| <input type="checkbox"/> 8  | <input type="checkbox"/> 64 |
| <input type="checkbox"/> 20 | <input type="checkbox"/> 80 |

Answer

D, F, I, J

From PARCC sample test

48 Select all of the multiples of 4.

- ☐ A 4  
☐ B 32  
☐ C 25  
☐ D 36  
☐ E 22  
☐ F 28

Answer

48 Select all of the multiples of 4.

- ☐ A 4  
☐ B 32  
☐ C 25  
☐ D 36  
☐ E 22  
☐ F 28

Answer

A, B, D, and F

49 Megan's father won first place in a bicycle race. The race was divided into equal sections, each measuring exactly 7 miles in length. Which number could be the total number of miles of the race? Use your knowledge of multiples to solve.

- ☐ A 28  
☐ B 45  
☐ C 62  
☐ D 15

Answer

49 Megan's father won first place in a bicycle race. The race was divided into equal sections, each measuring exactly 7 miles in length. Which number could be the total number of miles of the race? Use your knowledge of multiples to solve.

- ☐ A 28  
☐ B 45  
☐ C 62  
☐ D 15

Answer

A

### Hundreds Chart Activity:

By crossing out multiples of numbers, all of the prime numbers will be identified.

- Use **red** to cross out all of the even numbers (2, 4, 6, etc.)
- Use **green** to cross out all of the multiples of 3 (3, 6, 9, etc.) that remain.
- Use **purple** to cross out the multiples of 5 that remain.
- Make a list of the remaining numbers. What kind of numbers are they?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

[Click for answer](#)

## Inverse Operations

[Return to table of contents](#)

## Connecting our Learning

Get with a partner and discuss:

What are 2 math functions you have been repeatedly working with throughout this unit?

click

Think about it

$$4 \times K = 12$$

$$8 \times 2 = Q$$

$$B \times 5 = 40$$

How do those functions work together when finding factors, multiples, and solving equations?



How do you know the answer to each equation?

What math function do you use to solve them?

## Connecting our Learning

When solving a given equation or expression, you can use **inverse operations**, to find the solution. **Inverse operations** are the opposite operations that undo each other.

Now look at the examples from the previous page.

Would you change your answer on what operation you use to solve it?

$$4 \times K = 12$$

$$8 \times 2 = Q$$

$$B \times 5 = 40$$

What is different about how you solve the first example to the second one?

Multiplication and division are **inverse operations**. You can use each of them to undo the other in order to solve various equations.

Teacher Notes

## Connecting our Learning

When solving a given equation or expression, you can use **inverse operations**, to find the solution. **Inverse operations** are the opposite operations that undo each other.

Now look at the

Would you change your answer on what operation you use to solve it?

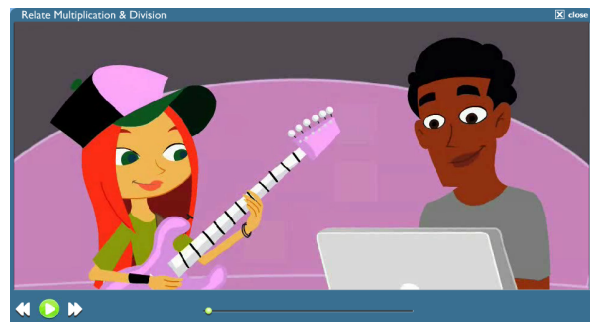
What is different about how you solve the first example to the second one?

Explain to the students: The difference is you use division to solve for the variable K, and you use multiplication to solve for the variable Q. In the first example, you UNDO multiplying, and divide to find the answer. You may also discuss with students how it seems easy because of knowing their math facts, but some numbers they may not know and will need to use the division process.

Multiplication and division are **inverse operations**. You can use each of them to undo the other in order to solve various equations.

Teacher Notes

## Click below to watch a video



## Helpful Hints with Inverse Operations

- Inverse operations are used to solve unknowns in an equation.
- An unknown can be represented using a  $\square$ ,  $?$ , or a letter to stand for the missing number.
- A letter that stands for a missing number in an equation is called a variable.
- Multiplication and division are inverse operations.
- Addition and subtraction are inverse operations.

Teacher Notes

## Helpful Hints with Inverse Operations

- Inverse operations are used to solve unknowns in an equation.
  - An unknown can be represented using a  $\square$ ,  $?$ , or a letter to stand for the missing number.
  - A letter that stands for a missing number in an equation is called a variable.
  - Multiplication and division are inverse operations.
  - Addition and subtraction are inverse operations.
- \*Note: This concept was previously taught in 3rd grade.

Teacher Notes

## Inverse Operations

Take the algebraic expression:  $2m = 14$

(Remember  $2m$  means to multiply, 2 times the amount of "m".)

Let's rewrite it so we see the multiplication sign:

$$2 \times m = 14$$

Now, we need to "move" the 2 to the right side of the equation by dividing, which is the inverse operation of multiplication.

$$\frac{2 \times m}{2} = \frac{14}{2} \longrightarrow m = 14 \div 2$$

The last step is to solve.

$$m = 7, \text{ because } 14 \text{ divided by } 2 \text{ equals } 7.$$

## Fact Families Use Inverse Operations

Fact Families are an easy way to use inverse operations. Take the numbers, 4, 7, and 28. These numbers create a fact family using multiplication and division.

$$7 \times 4 = 28$$

$$28 \div 7 = 4$$

$$4 \times 7 = 28$$

$$28 \div 4 = 7$$

is the division that undoes the multiplication of  $7 \times 4$

★ **Try this:**  $72 \div 8 = 9$

What inverse operation can you use to undo this equation?

Write the new equation. Is there more than one way to write it?

Answer

## Fact Families Use Inverse Operations

Fact Families are an easy way to use inverse operations. Take the numbers, 4, 7, and 28. These numbers create a fact family using multiplication and division.

$$7 \times 4 = 28$$

$$4 \times 7 = 28$$

$8 \times 9 = 72$  or  $9 \times 8 = 72$  is the multiplication that undoes the division of  $72 \div 8$ , you used inverse operations to solve!

★ **Try this:**  $72 \div 8 = 9$

What inverse operation can you use to undo this equation?

Write the new equation. Is there more than one way to write it?

Answer

## Inverse Operations

Move equations to match each with its inverse.

$$24 \div 6 = 4$$

$$35 \div 7 = 5$$

$$60 \div 10 = 6$$

$$6 \times 10 = 60$$

$$7 \times 5 = 35$$

$$24 \div 3 = 8$$

$$4 \times 6 = 24$$

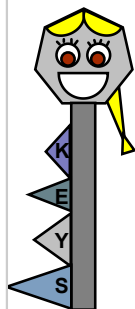
$$8 \times 3 = 24$$

## Working out Word Problems

Using inverse operations to help solve word problems is an important tool to learn.

KAYLEE the Key will help guide you through the steps of problem solving.

### The K.E.Y.S. to Problem Solving



**K:** Know the important information in the problem. Read the problem (more than once) and first find the main idea. (MAIN IDEA = What is the problem asking you to find?) Find all the important information that supports the main idea.

**E:** Equation (or equations) is created to plan your strategy and organize the important information. Use equations to develop a strategy (i.e. algorithm, diagram). Strategy must be organized and easy to follow.

**Y:** Yes, I have checked over my strategy and my answer is reasonable (makes sense). Use an estimate to check if your answer is reasonable.

**S:** Solution is written in with the correct label and explanation if needed.

## Inverse Operations Word Problems

The animal shelter has 18 kittens. The same number of kittens were born to each of 3 mother cats. How many kittens did each mother cat have?

Pull out the information you need to solve. 3, K, 18 kittens

Write the equation to solve the unknown value:  $3 \times \square = 18$

Solve  $3 \times \square = 18$

$$18 \div 3 = 6$$

Write your answer: Each mother cat had 6 kittens.



## Inverse Operations Word Problems

The cost of buying a movie is 4 times as much as renting one. It costs \$20 to buy a movie. What is the cost, in dollars, of renting a movie?

Pull out the information you need to solve. 4, R, and \$20

Write the equation to solve the unknown value:  $4 \times r = \$20$

Solve  $4 \times r = 20$

$$r = 20 \div 4$$

$$r = \$5$$

Write your answer: It costs \$5 to rent a movie.

## Inverse Operations Word Problems

★ **Try this:** With a partner read the following, write an equation, and solve using inverse operations.

A new video game you want is \$42. How much money do you need to save per week if you want to buy it in 7 weeks.

Answer

## Inverse Operations Word Problems

★ **Try this:** With a partner read the following, write an equation, and solve using inverse operations.

A new video game you want is \$42. How much money do you need to save per week if you want to buy it in 7 weeks.

Answer

$$7 \times ? = 42$$

Use the inverse operation of multiplication to solve.

$$42 \div 7 = 6$$

\$6 per week would need to be saved.

## Inverse Operations Word Problems

★ **Try this:** With a partner read the following, write an equation, and solve using inverse operations.

Stan was playing a game with this friend. His friend was trying to guess the number he was thinking of. Stan told him if he multiplied his number by 2 and added 9 the answer would be 21. Write an equation. Then use inverse operations to solve.

Answer

## Inverse Operations Word Problems

★ **Try this:** With a partner read the following, write an equation, and solve using inverse operations.

Stan was playing a game with this friend. His friend was trying to guess the number he was thinking of. Stan told him if he multiplied his number by 2 and added 9 the answer would be 21. Write an equation. Then use inverse operations to solve.

Answer

The unknown value will be represented by x

$$2x + 9 = 21$$

$$-9 \quad -9$$

$$\frac{2x}{2} = \frac{12}{2}$$

$$x = 6$$

Stan's number is 6

You can check your work by putting number back into your original equation.

$$2 \times 6 + 9 = \underline{\quad}$$

$$12 + 9 = 21$$

50 Division and multiplication are inverse operations.

☐ True

☐ False

Answer

**50** Division and multiplication are inverse operations.

- ☐ True  
☐ False

Answer

True

**51** Which equation shows the inverse operation for the equation  $63 \div 9 = 7$ ?

- ☐ A  $3 \times 7 = 63$   
☐ B  $7 \times 9 = 63$   
☐ C  $21 \div 3 = 7$   
☐ D  $63 - 9 = 54$

Answer

**52** Which equation shows the inverse operation for the equation  $5 \times 4 = 20$ ?

- ☐ A  $20 \div 4 = 5$   
☐ B  $20 \div 1 = 20$   
☐ C  $20 \div 2 = 10$   
☐ D  $10 \times 2 = 20$

Answer

**52** Which equation shows the inverse operation for the equation  $5 \times 4 = 20$ ?

- ☐ A  $20 \div 4 = 5$   
☐ B  $20 \div 1 = 20$   
☐ C  $20 \div 2 = 10$   
☐ D  $10 \times 2 = 20$

Answer

A

**53** Use inverse operations to solve for the unknown in the equation.

$$y \times 6 = 54$$

Answer

**53** Use inverse operations to solve for the unknown in the equation.

$$y \times 6 = 54$$

Answer

$$54 \div 6 = y$$

$$y = 9$$

54 Use inverse operations to solve for the unknown in the equation.

$$36 \div ? = 9$$

Answer

54 Use inverse operations to solve for the unknown in the equation.

$$36 \div ? = 9$$

Answer

$$9 \times ? = 36$$

$$? = 4$$

55 Use inverse operations to solve for the unknown in the equation.

$$\square \times 8 = 48$$

Answer

55 Use inverse operations to solve for the unknown in the equation.

$$\square \times 8 = 48$$

Answer

$$48 \div 8 = \square$$

$$\square = 6$$

56 Sammy's friend was trying to guess what number he was thinking of. Sammy told him if you multiply by 2 the answer is 24. What is Sammy's number? Write the equation showing the unknown value and solve using inverse operations.

- ☐ A 10
- ☐ B 48
- ☐ C 24
- ☐ D 12

Answer

56 Sammy's friend was trying to guess what number he was thinking of. Sammy told him if you multiply by 2 the answer is 24. What is Sammy's number? Write the equation showing the unknown value and solve using inverse operations.

- ☐ A 10
- ☐ B 48
- ☐ C 24
- ☐ D 12

Answer

$$2 \times ? = 24$$

$$\text{so, } 24 \div 2 = ?$$

$$? = 12$$

D is correct choice

57 Your teacher thinks of a number, divides it by 5 and then adds 19. The answer is 28. What number did your teacher think of?

- ☐ A 45
- ☐ B 5
- ☐ C 28
- ☐ D 43

Answer

57 Your teacher thinks of a number, divides it by 5 and then adds 19. The answer is 28. What number did your teacher think of?

- ☐ A 45
- ☐ B 5
- ☐ C 28
- ☐ D 43

Answer

$$\begin{array}{r} X \div 5 + 19 = 28 \\ -19 \quad -19 \\ \hline X \div 5 = 9 \\ \times 5 \quad \times 5 \end{array}$$

X = 45 - Correct answer is A

58 Scott is reading a book that is 50 pages long. Melanie is reading a book with 3 times as many pages. How many pages does Melanie's book have? Select the equation to represent this problem.

- ☐  $50 \div 3 =$
- ☐  $50 \times 3 = m$
- ☐  $3 \times m = 50$
- ☐  $m \div 50 = 3$

Answer