

Number Puzzles

NCTM Standards 1, 2, 6, 7, 8, 9, 10

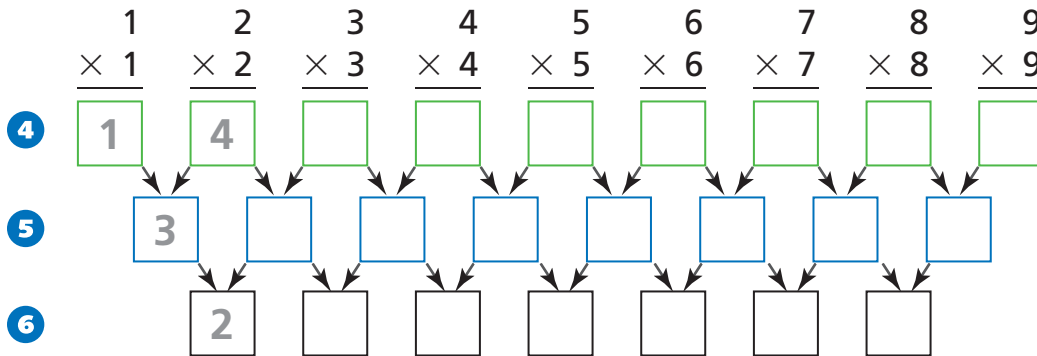
1 Complete the chart.

	Think of a whole number between 0 and 10.	Multiply by 9.	Add the digits in your product.
A			
B			
C			
D			
E			
F			
G			
H			
I			

2 What do you notice?

3 Can you think of any numbers that don't follow this pattern?

As you complete this puzzle, look for patterns. The number in each blue box is the difference between the numbers in the green boxes above it. The number in each black box is the difference between the numbers in the blue boxes above it.



7 Describe the pattern in row 4.

8 Describe the pattern in row 5.






9 **Challenge** Two fourth-grade classes have the same number of students. Each student in these classes made a card for his or her first-grade buddy. One of the teachers also made a card. In the end, there were 49 cards. How many students are in each of the fourth-grade classes? Explain your answer. _____ students

Introducing Variables





NCTM Standards 1, 2, 6, 7, 8, 9, 10

Fill in the missing numbers.




1

		A	B	C	D	E
Think of a number. Put that many counters in the bag.		4	11			
Add 6. You now have the bag and 6 extra counters.		10		21		
Double it. You now have two bags and 12 extra counters. How many counters all together?		20			46	12

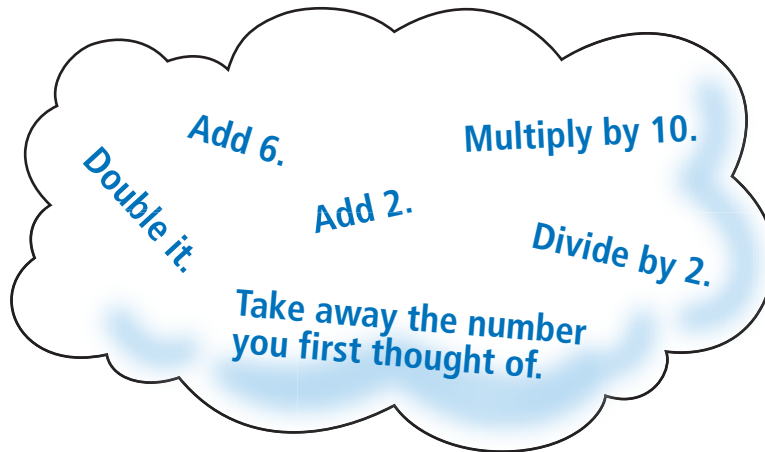
2

		F	G	H	I	J
Think of a number.			4			
Double it.				0		
Add 6.	 :::					
Divide by 2. How many counters do you have all together?	 ...	15			20	4

3

		K	L	M	N	O
Think of a number.		7				
Add 7.	 :::					
Add the number you thought of first.	 :::					
Subtract 5. How many do you have all together?	 ..		22	52	2	4

- 4 Choose steps to put in your puzzle.
Then complete the puzzle.



Think of a number.	6	20		12	



- 5 **Challenge** Fill in steps that give the correct final number from the given starting number.






Think of a number.	1	15	7	91	
	16	30	22	106	39

Introducing a Shorthand Notation







NCTM Standards 1, 2, 6, 7, 8, 9, 10

Complete the puzzles.

1

Words	Pictures	A	B	C	D	E
Think of a number.		7				
Multiply it by 10.	10 		10			
Add 130.	10  + 130			160		
Divide by 5.	2  + 26				50	
Divide by 2.	 + 13					35
Subtract the number you thought of first.						

2

Words	Pictures	Shorthand	F	G	H
Think of a number.		x	3	5	
Add 47.	 + 47	$x + 47$	50		
Double it.	2  + 94	$2x + 94$			
Subtract 75.	2  + 19	$2x + 19$			
Subtract the number you thought of first.	 + 19	$x + 19$			
Subtract 18.	 + 1	$x + 1$			54
Subtract the number you thought of first.					

3

Pictures	Shorthand	I	J
⌘	x	8	
⌘...	$x + 4$		
⌘⌘:::			
⌘⌘::			10
⌘⌘⌘:::			
⌘:			
:			

4

Pictures	Shorthand	K	L
⌘		19	
⌘ + 50			
2 ⌘ + 100			
2 ⌘ + 148			
⌘ + 74			154
74			



5 Challenge Describe each step in the puzzle with words.

Words	Shorthand
Think of a number.	x
	$2x$
	$2x + 5$
	$4x + 10$

Using Shorthand Notation to Complete Number Puzzles

NCTM Standards 1, 2, 6, 7, 8, 9, 10

Find the missing numbers in these puzzles.

		A	B
Think of a number.	\otimes		0
	$\otimes \otimes \dots$	52	2

		C	D
Think of a number.	\otimes		6
	$2 \otimes + 26$	40	

		E	F
Think of a number.	x		
	$3x + 6$	18	33

		G	H
Think of a number.	x		
	$4x + 7$	11	35

If x is:	then $30x + 75$ is:
10	375
20	
25	
35	

If:	then x is:
$2x + 10 = 50$	20
$x + 17 = 92$	
$10 + 13x = 23$	
$8x - 2 = 22$	

7 Choose the correct answer.

Johanna has 6 boxes of erasers and 3 loose erasers. She counted all of her erasers and found she had exactly enough to give 1 eraser to each of the 81 fourth graders in her school. Which equation can be used to figure out the number of erasers in a box?

A. $81 \div 3 = 6x$

C. $6x + 3 = 81$

B. $81 \times 3 = 6x$

D. $3x + 6 = 81$

- 8 Use the clues in the table to find the missing parts of the puzzle. You do not need to fill in the **Words** column.

Words	Shorthand	A	B	C	D	E
Think of a number.	x		0			
		12	0	30		75
	$3x + 6$	18	6	36		
			6	26	16	56
Divide by 2						
Subtract the number you thought of first.	3					

- 9 Describe how you found the shorthand notation for the second row of the above puzzle.

10 Challenge Rosie brought 2 boxes of tissues and 1 pocket pack of tissues for her class to use. There are 12 tissues in the pocket pack. Rosie announced that she had brought 212 tissues. Which of the following describe this situation?

A. $212 - 2x = 200$

C. $x + 212 = 412$

B. $2x + 12 = 212$

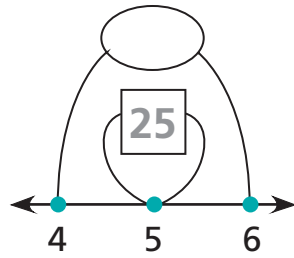
D. $2x - 12 = 212$

Using Square Numbers to Remember Other Multiplication Facts

NCTM Standards 1, 2, 6, 7, 8, 9, 10

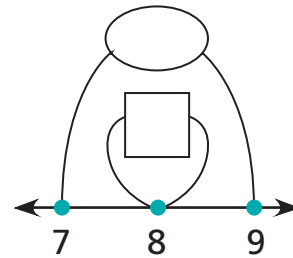
Complete the diagrams and number sentences.

1



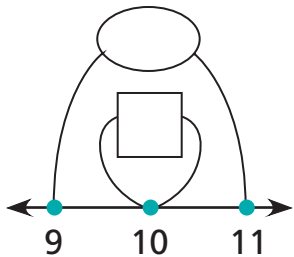
$$\begin{array}{r} 5 \times 5 = \square \\ 4 \times 6 = \bigcirc \end{array}$$

2



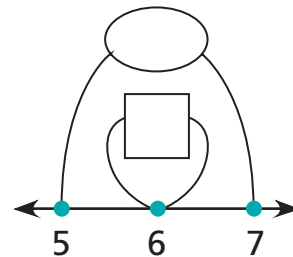
$$\begin{array}{r} 8 \times 8 = \square \\ 7 \times 9 = \bigcirc \end{array}$$

3



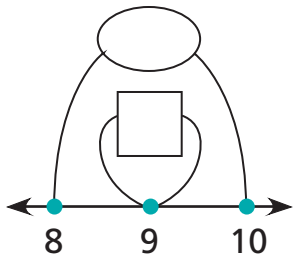
$$\begin{array}{r} 10 \times 10 = \square \\ 9 \times 11 = \bigcirc \end{array}$$

4



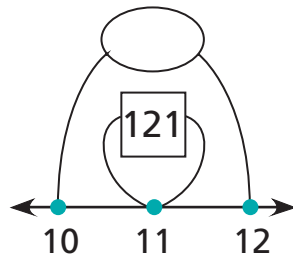
$$\begin{array}{r} 6 \times 6 = \square \\ 5 \times 7 = \bigcirc \end{array}$$

5



$$\begin{array}{r} 9 \times 9 = \square \\ \bigcirc \times \bigcirc = \bigcirc \end{array}$$

6



$$\begin{array}{r} \square \times \square = \square \\ 10 \times 12 = \bigcirc \end{array}$$

Complete the related number sentences.

7

$12 \times 12 = \square$

$11 \times 13 = \bigcirc$

8

$20 \times 20 = \square$

$19 \times 21 = \bigcirc$

9

$15 \times 15 = \square$

$\bigcirc \times \bigcirc = 224$

10

$25 \times 25 = 625$

$24 \times 26 = \bigcirc$

11

$\square \times \square = 324$

$17 \times 19 = \bigcirc$

12

$\square \times \square = \square$

$\bigcirc \times \bigcirc = 899$

13 Challenge Write two examples that show that:

$$A \times A - 1 = (A + 1) \times (A - 1)$$

Generalizing a Multiplication Pattern

NCTM Standards 1, 2, 6, 7, 8, 9, 10

1 Complete the chart.

Try some examples of your own.

Words	Shorthand	Ben	Al	Mary	Jane	A	B	C
Think of a number.	n	3	5	11	4			
Multiply your number by itself.	$n \cdot n$	9						
Subtract 1 from the product.	$(n \cdot n) - 1$	8						
Add 1 to the number you thought of.	$n + 1$	4						
Subtract 1 from the number you thought of.	$n - 1$	2						
Multiply your results together.	$(n + 1) \cdot (n - 1)$	8						

2 Draw a picture to show that $(5 \cdot 5) - 1 = (5 + 1) \cdot (5 - 1)$.

Use square numbers to help you find the products below.

3 $31 \cdot 29 = \square$

Hint: What's $30 \cdot 30$?

4 $51 \cdot 49 = \square$

5 $13 \cdot 11 = \square$

6 $101 \cdot 99 = \square$

7 $41 \cdot 39 = \square$

8 $71 \cdot 69 = \square$

Use nearby products to find square numbers.

9 $(31 \cdot 31) - 1 = \square$

Hint: What's $30 \cdot 32$?

10 $(51 \cdot 51) - 1 = \square$

11 $(41 \cdot 41) - 1 = \square$

12 $(101 \cdot 101) - 1 = \square$



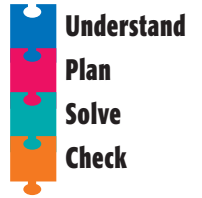
13 Challenge Jeneba is tiling a 14-foot by 14-foot square room. She bought exactly enough tiles to do this. But then she changed her mind and decided to tile a room that is 13 feet by 15 feet. Does she have enough tiles to do this?

Draw a picture and write a number sentence to explain how you found the answer.

Problem Solving Strategy

Work Backward

NCTM Standards 1, 2, 6, 7, 8, 9, 10



- 1 On Monday, Lorenzo bought x marbles. On Tuesday, he bought the same number he bought on Monday. On Wednesday, he gave 3 marbles to his brother. On Thursday, he bought 5 more marbles, giving him a total of 14 marbles. The equation $2x - 3 + 5 = 14$ represents the number of marbles Lorenzo had on Thursday.

Fill in the table to find how many marbles Lorenzo bought on Monday.

	Shorthand	Number of Marbles
Monday	x	
Tuesday	$2x$	
Wednesday	$2x - 3$	
Thursday	$2x - 3 + 5$	14

Lorenzo bought _____ marbles on Monday.

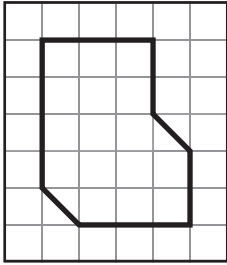
- 2 Jean ended up with 8 when she completed this number puzzle. What number was Jean thinking of? Fill in the table to find out.

Think of a number.	
Double it.	
Add 2.	
Divide by 2.	
Subtract 1.	8

Problem Solving Test Prep

Choose the correct answer.

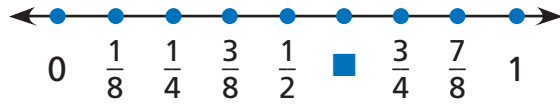
- 1 What is the area of the figure?



- A. $16\frac{1}{2}$ square units
 - B. 17 square units
 - C. $17\frac{1}{2}$ square units
 - D. 18 square units
- 2 Which expression has the same product as 80×427 ?

- A. 800×42
- B. 400×827
- C. 80×42.7
- D. $8 \times 4,270$

- 3 Which fraction should go in the box on the number line?



- A. $\frac{2}{3}$
 - B. $\frac{5}{6}$
 - C. $\frac{5}{8}$
 - D. $\frac{6}{8}$
- 4 Athena has two $\frac{1}{2}$ -gallon containers and one 1-quart container of orange juice. How many 1-cup servings can she make in all?

- A. 5
- B. 10
- C. 20
- D. 24

Show What You Know

Solve each problem. Explain your answer.

- 5 Carmen has \$1.43 when she gets home from school. She paid \$0.35 each way on the city bus, bought lunch for \$1.45, and had a snack for \$0.79. How much money did she leave home with?

- 6 Curtis cut his birthday cake into equal pieces. Six pieces were eaten at the party, and half of the leftover pieces were eaten the next day. The last 3 pieces were eaten two days later. Into how many slices was the cake cut?

Chapter 14

Name _____ Date _____

Review/Assessment

NCTM Standards 1, 2, 6, 7, 8, 9, 10

1 Complete the puzzle. [Lessons 1, 2, 3, and 4](#)

Words	Pictures	Shorthand	A	B	C	D
Think of a number.	⌘	x	5			
Multiply by 2.	⌘⌘					
Multiply by 2 again.	⌘⌘⌘⌘	$4x$			24	
Add 6.	⌘⌘⌘⌘⋮					
Subtract the number you thought of first.	⌘⌘⌘⋮					33
Divide by 3.	⌘:	$x + 2$				
Add 8.	⌘⋮⋮⋮			20		
Subtract the number you thought of first.	⋮⋮⋮					

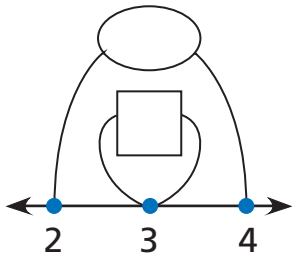
2 What was each person's original number? [Lessons 1, 2, and 7](#)

Words		Jason	Sami	Joel	Rachel
Think of a number.	⌘				
	⌘⌘⋮⋮	12	24	30	38

3 Computer Mart sold 147 printers for \$147 each.
Printers Plus sold 146 printers for \$148 each.
Which store made the most money in printer sales?
Explain how you know. [Lesson 5](#)

Complete the diagrams and number sentences. **Lesson 5**

4



$$3 \times 3 = \square$$

$$2 \times 4 = \bigcirc$$

5

$$9 \times 9 = \square$$

$$8 \times 10 = \bigcirc$$

6

$$\square \times \square = 2,401$$

$$48 \times 50 = \bigcirc$$

7 Draw a picture to show that $(4 \cdot 4) - 1 = (4 + 1) \cdot (4 - 1)$ **Lesson 6**

8 Finish this puzzle so that no matter what number someone chooses, the final number will always be 2. **Lessons 4 and 7**

Think of a number.	x			
Double it.	$2x$			
Add 20.	$2x + 20$			
Subtract the number you thought of first.	$x + 20$			
		2	2	2