

$$3m = 21$$

$$4m = 7$$

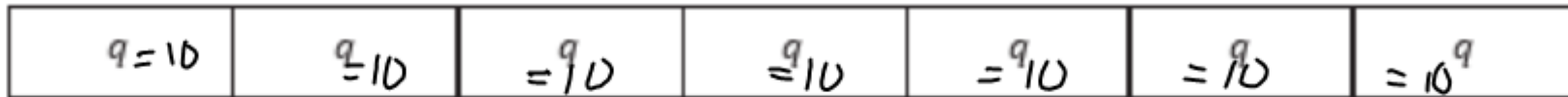
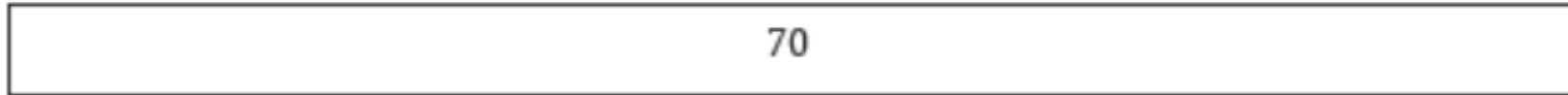
21		
m	m	m
7	7	7

$$\frac{21}{3} = \frac{21}{3}$$

$$4m = 7$$

- ① multiplied
- ② undone by division

Examine the tape diagram below, and write an equation it represents. Then, calculate the solution to the equation using the method of your



choice.

$$\frac{70}{7} = \frac{79}{7}$$

$$10 = 9$$

- ① multiplied
- ② undo by division

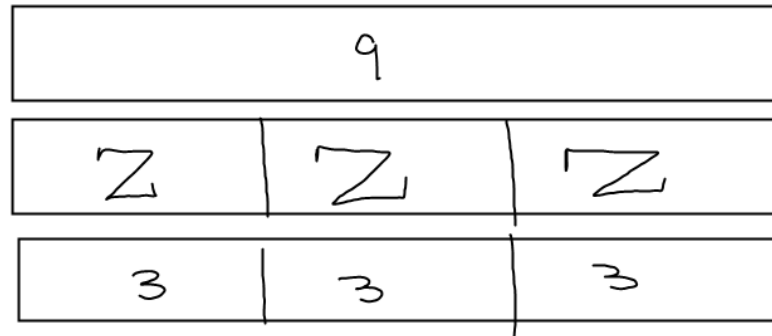
Lesson 27: One-Step Equations—Multiplication and Division

Classwork

Example 1

Solve $3z = 9$ using tape diagrams and algebraically. Then, check your answer.

First, draw two tape diagrams, one to represent each side of the equation.



$$z = 3$$

algebraically

$$\begin{array}{r} 3z = 9 \\ \hline 3 \quad 3 \end{array}$$

$$z = 3$$

① Ask yourself what is happening to the variable?. Then undo the operation

copy this chart on your paper.

Classwork

Opening Exercise

Determine what each symbol stands for and provide an example.

Symbol	What the Symbol Stands For	Example
$=$		
$>$		
$<$		
\leq		
\geq		

$$\frac{y}{4} = 2$$

$$y \div 4$$

$$2$$

$$y$$

$\frac{y}{4}$	$\frac{y}{4}$	$\frac{y}{4}$	$\frac{y}{4}$
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2	2	2	2
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$$\cancel{(4)} \frac{y}{\cancel{4}} = 2 \cancel{(4)}$$

$$y = 8$$

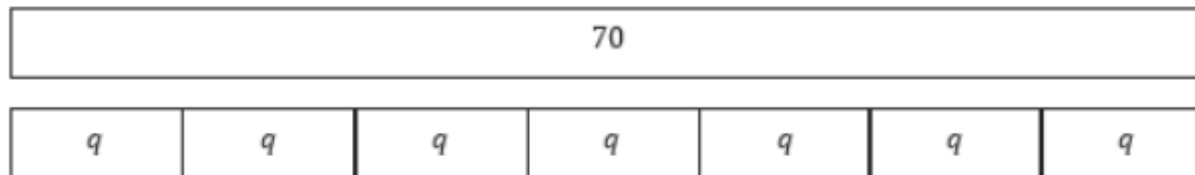
① What is happening?

The variable is being divided
we have to multiply to undo the division

② multiply both sides by 4.

Exercises

1. Use tape diagrams to solve the following problem: $3m = 21$.
2. Solve the following problem algebraically: $15 = \frac{n}{5}$.
3. Calculate the solution of the equation using the method of your choice: $4p = 36$.
4. Examine the tape diagram below, and write an equation it represents. Then, calculate the solution to the equation using the method of your



choice.

5. Write a multiplication equation that has a solution of 12 . Use tape diagrams to prove that your equation has a solution of 12 .
6. Write a division equation that has a solution of 12 . Prove that your equation has a solution of 12 using algebraic methods.

$$15 = \frac{n}{5}$$

$$5 \cdot 15 = \frac{n \cdot 5}{5}$$

$$75 = n$$

① What is happening to the variable?

Ans: being divided

How to undo division?

Ans: multiply

multiply both sides by 5.

got to keep equation balanced

Symbol	What the Symbol Stands For	Example
=	is equal to	$4\frac{7}{8} = 4.875$
>	is greater than	$5\frac{1}{4} > 4\frac{7}{8}$
<	is less than	$4\frac{1}{2} < 4\frac{7}{8}$
\leq	is less than or equal to	$4\frac{7}{8} \leq 4\frac{7}{8}$
\geq	is greater than or equal to	$5\frac{1}{4} \geq 4\frac{7}{8}$

For each equation or inequality, write the equation or inequality and then substitute 3 for every x. Determine if the equation results in a true number sentence or a false number sentence.

① $5+x = 8$	T $5+3 = 8$	}	F $5+5 = 8$
② $5x = 8$	T $5(\frac{8}{5}) = 8$		F $5(3) = 8$
③ $5+x > 8$	T $5+3.001 > 8$		F $5+3 > 8$ F
④ $5x > 8$	T $5(3) > 8$		F $5(1) > 8$
⑤ $5+x \geq 8$	T $5+3 \geq 8$		F $5+2 \geq 8$

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Calibri 18 A A Aa A

B I U abc x₂ x² A a A

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Exercises

Substitute the indicated value into the variable, and state (in a complete sentence) whether the resulting number sentence is true or false. If true, find a value that would result in a false number sentence. If false, find a value that would result in a true number sentence.

1. $4 + x = 12$. Substitute 8 for x .
2. $3g > 15$. Substitute $4\frac{1}{2}$ for g .
3. $\frac{f}{4} < 2$. Substitute 8 for f .
4. $14.2 \leq h - 10.3$. Substitute 25.8 for h .
5. $4 = \frac{8}{h}$. Substitute 6 for h .
6. $3 > k + \frac{1}{4}$. Substitute $1\frac{1}{2}$ for k .
7. $4.5 - d > 2.5$. Substitute 2.5 for d .
8. $8 \geq 32p$. Substitute $\frac{1}{2}$ for p .
9. $\frac{w}{2} < 32$. Substitute 16 for w .
10. $18 \leq 32 - b$. Substitute 14 for b .

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Substitute the indicated value into the variable, and state (in a complete sentence) whether the resulting number sentence is true or false. If true, find a value that would result in a false number sentence. If false, find a value that would result in a true number sentence.

$$\begin{array}{r} 4.5 \\ 3 \\ \hline 13.5 \end{array}$$

	True	False
1. $4 + x = 12$. Substitute <u>8</u> for x .	(1) $4 + 8 = 12$ T	F $4 + 9 = 12$
2. $3g > 15$. Substitute $4\frac{1}{2}$ for g .	(2) $(3) 5.1 > 15$	F $3(4\frac{1}{2}) > 15$
3. $\frac{f}{4} < 2$. Substitute 8 for f .	(3) $\frac{7}{4} < 2$	F $\frac{8}{4} < 2$
4. $14.2 \leq h - 10.3$. Substitute 25.8 for h .	(4) $12.2 \leq$	
5. $4 = \frac{8}{h}$. Substitute 6 for h .		
6. $3 > k + \frac{1}{4}$. Substitute $1\frac{1}{2}$ for k .		
7. $4.5 - d > 2.5$. Substitute 2.5 for d .		
8. $8 \geq 32p$. Substitute $\frac{1}{2}$ for p .		
9. $\frac{w}{2} < 32$. Substitute 16 for w .		
10. $18 \leq 32 - b$. Substitute 14 for b .		

$$\begin{array}{r} 4.5 \\ \underline{13.5} \end{array}$$

1. $4 + x = 12$. Substitute 8 for x .
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$$\textcircled{4} 14.2 \leq h - 10.3$$

$$14.2 \leq 25.8 - 10.3$$

$$14.2 \leq 15.5 \quad \text{True}$$

Any number greater than 3.9 will make this sentence true

$$\begin{array}{r} 3.12 \\ \underline{14.2} \\ +10.3 \\ \hline 3.9 \end{array}$$

① $4 + 8 = 12$ T Any # other than 8 will make it false.

$$\textcircled{2} 3(4\frac{1}{2}) > 15$$

$$13.5 > 15$$

False any number more than 5 but not 5 will make this true

③

$$\frac{f}{4} < 2$$

$$\frac{8}{4} < 2 \quad \textcircled{F}$$

2 is not less than 2

1. $4 + x = 12$. Substitute 8 for x .

(5) $4 = \frac{8}{6}$ (F)

2. $3g > 15$. Substitute $4\frac{1}{2}$ for g .

3. $\frac{f}{4} < 2$. Substitute 8 for f .

two will make sentence correct.

4. $14.2 \leq h - 10.3$. Substitute 25.8 for h .

5. $4 = \frac{8}{h}$. Substitute 6 for h .

(6) $3 > 1\frac{1}{2} + \frac{1}{4}$

6. $3 > k + \frac{1}{4}$. Substitute $1\frac{1}{2}$ for k .

$3 > 1\frac{3}{4}$ True

7. $4.5 - d > 2.5$. Substitute 2.5 for d .

(7) $4.5 - 2.5 > 2.5$
F

8. $8 \geq 32p$. Substitute $\frac{1}{2}$ for p .

9. $\frac{w}{2} < 32$. Substitute 16 for w . T

(8) $8 \geq 32(\frac{1}{2})$ F

10. $18 \leq 32 - b$. Substitute 14 for b . T

9) $\frac{w}{2} < 32$

$\frac{16}{2} < 32$ T

10) $18 \leq 32 - 14$

$18 \leq 18$

True

Copy in notebook

Lesson Summary

NUMBER SENTENCE: A *number sentence* is a statement of equality (or inequality) between two numerical expressions.

TRUTH VALUES OF A NUMBER SENTENCE: A number sentence that is an equation is said to be *true* if both numerical expressions evaluate to the same number; it is said to be *false* otherwise. True and false are called *truth values*.

Number sentences that are inequalities also have truth values. For example, $3 < 4$, $6 + 8 > 15 - 12$, and $(15 + 3)^2 < 1000 - 32$ are all true number sentences, while the sentence $9 > 3(4)$ is false.

Substitute the value for the variable and state in a complete sentence whether the resulting number sentence is true or false. If true, find a value that would result in a false number sentence. If false, find a value that would result in a true number sentence.

1. $15a \geq 75$. Substitute 5 for a .
2. $23 + b = 30$. Substitute 10 for b .
3. $20 > 86 - h$. Substitute 46 for h .
4. $32 \geq 8m$. Substitute 5 for m .

Do this on a separate sheet of paper to hand in.

Follow the directions!

15,40,42,43,49,61,63,64,67
,70,71,73,76,106,