ADV Unit 4
One-Step Equations & Inequalities

Checking Solutions to Equations
Solving Equations
Writing Equations
Checking Solutions to Inequalities
Writing Inequalities
Graphing Inequalities on Number Lines
Independent & Dependent Variables
Direct Variation

Name: ____________________________
Math Teacher: ______________________

<table>
<thead>
<tr>
<th>Date</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/4</td>
<td>Unit 4 Pre-Test Equations and Checking for Solutions</td>
<td>No School Election Day</td>
<td>Equations</td>
<td>Quiz #1 (Equations)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW: IXL Z.1</td>
<td></td>
<td>HW: IXL Z.2</td>
<td>HW: IXL Z.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/11</td>
<td>Solving Addition and Subtraction Equations</td>
<td>Solving Multiplication and Division Equations</td>
<td>Equation Word Problems</td>
<td>Unit 4 Mid-Unit Test (Equations)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11/18</td>
<td>Inequalities</td>
<td>Wildcat Lab</td>
<td>Inequalities</td>
<td>Direct Variation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW: IXL AA.1 &amp; AA.2</td>
<td></td>
<td>HW: IXL AA.5, AA.3 &amp; AA.4</td>
<td>HW: IXL BB.1 &amp; BB.2</td>
<td></td>
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<td></td>
<td>HW: IXL BB.3 &amp; BB.4</td>
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<tr>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>12/3</td>
<td>Quiz #2 (Inequalities &amp; Direct Variation)</td>
<td>Unit 4 Review/Activity</td>
<td>Unit 4 Review/Activity</td>
<td>Unit 4 End of Unit Test</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW: IXL BB.6 &amp; BB.8</td>
<td>HW: IXL BB.9 &amp; BB.10</td>
<td>HW: UNIT 4 Study Guide</td>
<td>HW: UNIT 4 Study Guide &amp; Study</td>
<td></td>
</tr>
<tr>
<td></td>
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<td>12/25</td>
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</tbody>
</table>

IXL Skills Week of 11/4: Z.1, Z.2, Z.3
IXL Skills Week of 11/11: Z.1, Z.2, Z.3, Z.4
IXL Skills Week of 11/18: AA.1, AA.2, AA.3, AA.4, BB.1, BB.2, BB.3, BB.4
IXL Skills Week of 12/3: BB.6, BB.8, BB.9, BB.10

Thanksgiving Break

Unit 4: One-Step Equations and Inequalities
Standards, Checklist and Concept Map

Advanced Math 6 Unit 4 Calendar
Georgia Standards of Excellence (GSE):

**GSE6.EE.5:** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine if a given number in a set makes an equation or inequality true.

**GSE 6.EE.6:** Use variables to represent numbers and write expression when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set

**GSE 6.EE.7:** Solve real-world and mathematical problems by writing and solving equations of the form \(x+p=q\) and \(px=q\) for cases in which \(p,q\) and \(x\) are all nonnegative rational numbers.

**GSE 6.EE.8:** Write an inequality of the form \(x > c\) or \(x < c\) to represent a constraint or condition in real-world problem. Recognize that inequalities of the form \(x > c\) or \(x < c\) have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

**GSE 6.EE.9:** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and use the equation \(d = 65t\) to show the relationship between distance and time.

**What Will I Need to Learn??**

- Write expressions (from word problems) with a variable that represents a number
- To substitute to check the solution of an equation
- Write equations based on real-world problems
- Solve equations based on real-world problems
- To substitute to check the solution of an inequality
- Write inequalities to represent real-world problems and represent on number line
- Show relationships between two variables (independent and dependent) using an equation, a table, and a graph

**Unit 4 Circle Map:** Make a Circle Map below of important vocab and topics from the standards listed to the left.

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**Unit 4 IXL Tracking Log**

<table>
<thead>
<tr>
<th>Skill</th>
<th>Required Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Week of 1/11</strong></td>
<td><strong>Z.1</strong> (Does x Satisfy an Equation?)</td>
</tr>
<tr>
<td></td>
<td><strong>Z.2</strong> (Which x Satisfies an Equation?)</td>
</tr>
<tr>
<td></td>
<td><strong>Z.3</strong> (Write an Equation from Words)</td>
</tr>
<tr>
<td></td>
<td><strong>NEW +/- Equations</strong> (Solve One-Step Add &amp; Sub Equations with Whole #'s)</td>
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<tr>
<td></td>
<td><strong>NEW x/+ Equations</strong> (Solve One-Step Mult &amp; Div Equations with Whole #'s)</td>
</tr>
<tr>
<td></td>
<td><strong>Z.6</strong> (Solve One-Step Equations with Whole Numbers)</td>
</tr>
<tr>
<td></td>
<td><strong>Z.8</strong> (Solve One-Step Equations: Word Problems)</td>
</tr>
<tr>
<td></td>
<td><strong>Z.10</strong> (Solve Equations Involving Like Terms)</td>
</tr>
<tr>
<td></td>
<td><strong>AA.1</strong> (Solutions to Inequalities)</td>
</tr>
<tr>
<td></td>
<td><strong>AA.2</strong> (Graph Inequalities on Number Lines)</td>
</tr>
<tr>
<td></td>
<td><strong>AA.3</strong> (Write Inequalities from Number Lines)</td>
</tr>
<tr>
<td></td>
<td><strong>AA.4</strong> (Solve One-Step Inequalities)</td>
</tr>
<tr>
<td></td>
<td><strong>AA.5</strong> (Graph Solutions to One-Step Inequalities)</td>
</tr>
<tr>
<td></td>
<td><strong>BB.1</strong> (Does (x,y) Satisfy an Equation?)</td>
</tr>
<tr>
<td></td>
<td><strong>BB.2</strong> (Identify Independent &amp; Dependent Variables)</td>
</tr>
<tr>
<td></td>
<td><strong>BB.3</strong> (Find a Value Using Two-Variable Equations)</td>
</tr>
<tr>
<td></td>
<td><strong>BB.4</strong> (Find a Value Using Two-Variable Equations: Word Problems)</td>
</tr>
<tr>
<td></td>
<td><strong>BB.6</strong> (Complete a Table for a Two-Variable Relationship)</td>
</tr>
<tr>
<td></td>
<td><strong>BB.8</strong> (Identify the Graph of an Equation)</td>
</tr>
<tr>
<td></td>
<td><strong>BB.9</strong> (Graph a Two-Variable Equation)</td>
</tr>
<tr>
<td></td>
<td><strong>BB.10</strong> (Interpret a Graph: Word Problems)</td>
</tr>
<tr>
<td>Unit 4 - Vocabulary</td>
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<td>---------------------</td>
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</tr>
<tr>
<td><strong>Term</strong></td>
<td><strong>Definition</strong></td>
</tr>
<tr>
<td>Constant of proportionality</td>
<td>The constant $k$ in a direct variation equation; it is the ratio of $\frac{y}{x}$, or of $\frac{\text{dependent variable}}{\text{independent variable}}$. It is the same as unit rate.</td>
</tr>
<tr>
<td>Dependent Variable</td>
<td>The “output” or $y$ value, which “depends” on the input ($x$ value/independent variable)</td>
</tr>
<tr>
<td>Direct Proportion (Direct Variation)</td>
<td>A relationship between two variables, $x$ (independent) and $y$ (dependent) that can be written as $y-kx$, where $k \neq 0$</td>
</tr>
<tr>
<td>Equation</td>
<td>A mathematical sentence containing an equal sign, showing two equivalent values</td>
</tr>
<tr>
<td>Independent Variable</td>
<td>The “input” or $x$ value, which determines the “output” or $y$ value/dependent variable</td>
</tr>
<tr>
<td>Inequality</td>
<td>A statement showing that two values are NOT equal, using one of the following signs: $&gt;$, $&lt;$, $\geq$, $\leq$ or $\neq$</td>
</tr>
<tr>
<td>Inverse Operation</td>
<td>Opposite operations that “undo” each other</td>
</tr>
<tr>
<td>Variable</td>
<td>A symbol, usually a letter, that represents a number</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit 4 – Vocabulary – You Try</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Term</strong></td>
<td><strong>Definition</strong></td>
</tr>
<tr>
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<td></td>
</tr>
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<td></td>
</tr>
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<td>Direct Proportion (Direct Variation)</td>
<td></td>
</tr>
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<td>Equation</td>
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<tr>
<td>Variable</td>
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</table>
Math 6 – Unit 4: One-Step Equations and Inequalities Review #1

1) What are inverse operations? __________________________

2) Write 3 key words that tell you to do addition and 3 key words that tell you to do subtraction in a word problem.

_________________  ___________________  ___________________
_________________  ___________________  ___________________

3) Jack’s Candy Shop sold 8 lollipops today. He now has only 5 lollipops left to sell. How many lollipops did he have originally?

Draw a Picture:  Write your equation and SHOW ALL WORK!

What does your variable represent?

Key Words:

4) Alex has some flowers and picks two more for her bouquet. She now has 11 flowers. How many flowers did she start out with?

Draw a Picture:  Write your equation and SHOW ALL WORK!

Solution:

What does your variable represent?

Key Words:

5) Mrs. Ledesma has x dollars. Amanda has 3 times more dollars than Mrs. Ledesma. If Amanda has $90, write an equation and solve for the number of dollars Mrs. Ledesma has.

Equation: ______________  Solution: ______________

Work:
6) Daneya spends half as many hours doing homework as her older brother, Dejon. If Dejon spends 4 hours doing homework, write an equation and solve for the number of hours, x, that Daneya does homework.

Equation: \[ \frac{1}{2}x = 4 \]  
Solution: \[ x = 8 \]

Work:

Solve each equation. Show all steps. Include a “check”.

7) \[ m + 25 = 39 \]  
8) \[ 12x = 138 \]

9) \[ z - 29 = 8 \]  
10) \[ \frac{y}{7} = 21 \]

11) \[ x + \frac{1}{4} = 3 \frac{1}{2} \]  
12) \[ m - 2.8 = 5.2 \]

13) \[ 3.5x = 70 \]  
14) \[ \frac{m}{2} = 7.2 \]

15) Create your own word problem. Write an equation and show all the work to solve.

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Equations & Parts of Equations

An ________ is a mathematical sentence containing an equal sign that shows two equivalent values.

\[ x + 2 = 6 \]

The equation says: what is on the left (\( x + 2 \)) is equal to what is on the right (6)

So an equation is like a statement “this equals that”.

Here we have an equation that says \( 4x - 7 \) equals 5, and all its parts:

- A **Variable** is a symbol for a number we don’t know yet. It is usually a letter like \( x \) or \( y \).
- A **Constant** is a number on its own.
- A **Coefficient** is a number used to multiply a variable (\( 4x \) means 4 times \( x \), so 4 is a coefficient)
- An **Operator** is a symbol that shows an operation, ex: +, -, ×, ÷.

Variables on their own (without a number next to them) actually have a coefficient of 1 (\( x \) is really the same as \( 1x \))
**Solutions to Equations**

Solutions to equations are values for the variables that make the two sides equal.

Think of a correct equation as a balanced scale.

If an equation has a variable you can check to see if a number is a solution to an equation by substituting the number in for the variable. If you get the same number on both sides, you have found a solution to the equation.

**Example:**

EQUATION: \(x + 15 = 27\)

Is \(x = 12\) a solution?  
Is \(x = 10\) a solution?

- \(12 + 15 = 27\)  
- \(10 + 15 \neq 27\)

You Try:

1) Is \(x = 3\) a solution to the equation, \(x + 5 = 10\)?

2) Is \(y = 5\) a solution to the equation, \(\frac{30}{y} = 6\)?

3) Is \(z = 12\) a solution to the equation, \(8z = 95\)?

**You Try:**

Determine if the following value for the variable is a solution to the equation. Write yes or no.

1) \(9 + x = 21\), for \(x = 11\)

2) \(n - 12 = 5\), for \(n = 17\)

3) \(25r = 75\), for \(r = 3\)

4) \(72 \div q = 8\), for \(q = 9\)

5) \(28 + c = 43\), for \(c = 15\)

6) \(u \div 11 = 10\), for \(u = 111\)

7) \(\frac{k}{8} = 4\), for \(k = 24\)

8) \(16x = 48\), for \(x = 3\)

9) \(73 - f = 29\), for \(f = 54\)

10) \(67 - j = 25\), for \(j = 42\)

11) \(39 \div v = 13\), for \(v = 3\)

12) \(88 + d = 100\), for \(d = 2\)

13) \(14p = 20\), for \(p = 5\)

14) \(6w = 30\), for \(w = 5\)

15) \(7 + x = 70\), for \(x = 10\)

16) \(6n = 174\), for \(n = 29\)

Replace each \(\bigotimes\) with a number that makes the equation correct.

17) \(5 + 1 = 2 + \bigotimes\)

18) \(10 - \bigotimes = 12 - 7\)

19) \(\bigotimes \cdot 3 = 2 \cdot 9\)

20) \(28 \div 4 = 14 \div \bigotimes\)

21) \(\bigotimes + 8 = 6 + 3\)

22) \(12 \cdot 0 = \bigotimes \cdot 15\)

23) Carla had $15. After she bought lunch, she had $8 left. Write an equation using the variable, \(x\), to model this situation. What does your variable represent?

24) Seventy-two people signed up for the soccer league. After the players were evenly divided into teams, there were 6 teams in the league. Write an equation to model this situation using the variable, \(x\).
Solving Equations

There are many different ways to solve equations, but in general, the best way to solve an equation is to use inverse operations.

Inverse operations are opposite operations that “undo” each other. **Addition** is the inverse operation of ____________ and **subtraction** is the inverse operation of ______________.

**Multiplication** is the inverse operation of ______________ and **division** is the inverse operation of ________________.

When you solve equations, you should:

1. **Identify** the ______________ you need.
2. **Apply** the **inverse operation** to _____ sides of the equation.
3. **Check** your solution by putting it back into the equation.

Example

1. Solve $8 = x + 3$. Check your solution.

   **Method 1** Use models.
   Model the equation using counters for the numbers and a cup for the variable.
   - Remove 3 counters from each side.
   - There are 5 counters remaining.

   **Method 2** Use symbols.
   - Write the equation.
   - Subtract 3 from each side to “undo” the addition of 3 on the right.
   - Check
   - Write the equation.
   - Replace $x$ with 5.
   - This sentence is true.

Other Examples:

- $x - 2 = 3$  
  Add 2 to each side.
  $x = 5$  
  Simplify.
  Check
  - Write the equation.
  - Replace $x$ with 5.
  - This sentence is true.

- $2x = 10$  
  Divide each side by the coefficient 2.
  $x = 5$

- $rac{a}{3} = 7$  
  Multiply each side by 3.
  $a = 21$

- Check
  - Write the original equation.
  - Replace $a$ with 21.
  - This is a true sentence.
**Subtraction Property of Equality**

Words: If you subtract the same number from each side of an equation, the two sides remain equal.

<table>
<thead>
<tr>
<th>Examples</th>
<th>Numbers</th>
<th>Algebra</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5 - 3)</td>
<td>2</td>
<td>(2 = 2)</td>
</tr>
</tbody>
</table>

When you solve an equation by subtracting the same number from each side of the equation, you are using the **Subtraction Property of Equality**.

**You Try:**

1) \(c + 2 = 5\)  
2) \(6 = x + 5\)  
3) \(3.5 + y = 12.75\)

**Division Property of Equality**

Words: If you divide each side of an equation by the same nonzero number, the two sides remain equal.

<table>
<thead>
<tr>
<th>Examples</th>
<th>Numbers</th>
<th>Algebra</th>
</tr>
</thead>
<tbody>
<tr>
<td>(18 \div 6)</td>
<td>3</td>
<td>(3 = 3)</td>
</tr>
</tbody>
</table>

When you solve an equation by dividing both sides of the equation by the same number, you are using the **Division Property of Equality**.

**You Try:**

1) \(3x = 15\)  
2) \(8 = 4x\)  
3) \(2x = 14\)

**Addition Property of Equality**

Words: If you add the same number to each side of an equation, the two sides remain equal.

<table>
<thead>
<tr>
<th>Examples</th>
<th>Numbers</th>
<th>Algebra</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5 + 3)</td>
<td>8</td>
<td>(x = 5)</td>
</tr>
</tbody>
</table>

When you solve an equation by adding the same number to each side of the equation, you are using the **Addition Property of Equality**.

**You Try:**

1) \(x - 7 = 4\)  
2) \(y - 6 = 8\)  
3) \(9 = a - 5\)

**Multiplication Property of Equality**

Words: If you multiply each side of an equation by the same nonzero number, the two sides remain equal.

<table>
<thead>
<tr>
<th>Examples</th>
<th>Numbers</th>
<th>Algebra</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\frac{x}{2} = 7)</td>
<td></td>
<td>(x = 28)</td>
</tr>
</tbody>
</table>

When you solve an equation by multiplying each side of the equation by the same number, you are using the **Multiplication Property of Equality**.

**You Try:**

1) \(\frac{x}{8} = 9\)  
2) \(\frac{y}{4} = 8\)  
3) \(\frac{m}{5} = 9\)
### Scaffolded Equation Solving

Use the organizer below to practice solving one-step-equations.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4x = 48$</td>
<td>Substitution</td>
</tr>
<tr>
<td>$x - 8 = 11$</td>
<td>Substitution</td>
</tr>
<tr>
<td>$x + 13 = 42$</td>
<td>Substitution</td>
</tr>
<tr>
<td>$y - 3 = 4$</td>
<td>Substitution</td>
</tr>
<tr>
<td>$s + 8 = 9$</td>
<td>Substitution</td>
</tr>
<tr>
<td>$n - 6 = 3$</td>
<td>Substitution</td>
</tr>
</tbody>
</table>

### More Equation Solving (+/-)

Solve each equation. Show ALL your work.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x + 4 = 5$</td>
<td>Substitution</td>
</tr>
<tr>
<td>$x - 1 = 3$</td>
<td>Substitution</td>
</tr>
<tr>
<td>$y - 3 = 4$</td>
<td>Substitution</td>
</tr>
<tr>
<td>$y + 5 = 5$</td>
<td>Substitution</td>
</tr>
<tr>
<td>$s + 8 = 9$</td>
<td>Substitution</td>
</tr>
<tr>
<td>$s - 7 = 0$</td>
<td>Substitution</td>
</tr>
<tr>
<td>$n + 9 = 11$</td>
<td>Substitution</td>
</tr>
</tbody>
</table>
## More Equation Solving (x/÷)

Solve each equation. Show **ALL** your work.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1)</td>
<td>$5x = 25$</td>
</tr>
<tr>
<td>2)</td>
<td>$\frac{y}{4} = 7$</td>
</tr>
<tr>
<td>3)</td>
<td>$\frac{n}{2} = 19$</td>
</tr>
<tr>
<td>4)</td>
<td>$6g = 54$</td>
</tr>
<tr>
<td>5)</td>
<td>$8b = 64$</td>
</tr>
<tr>
<td>6)</td>
<td>$\frac{h}{6} = 11$</td>
</tr>
<tr>
<td>7)</td>
<td>$\frac{f}{4} = 9$</td>
</tr>
<tr>
<td>8)</td>
<td>$7s = 49$</td>
</tr>
</tbody>
</table>

## More Equation Solving (Mixed)

Solve each equation. Show **ALL** your work.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1)</td>
<td>$6x = 96$</td>
</tr>
<tr>
<td>2)</td>
<td>$\frac{y}{10} = 5$</td>
</tr>
<tr>
<td>3)</td>
<td>$y - 84 = 212$</td>
</tr>
<tr>
<td>4)</td>
<td>$y + 19 = 30$</td>
</tr>
<tr>
<td>5)</td>
<td>$4b = 48.8$</td>
</tr>
<tr>
<td>6)</td>
<td>$\frac{h}{3.2} = 10$</td>
</tr>
<tr>
<td>7)</td>
<td>$n - 5.7 = 12$</td>
</tr>
<tr>
<td>8)</td>
<td>$n + 8 = 13.4$</td>
</tr>
</tbody>
</table>
In an equation chain, you use the solution of one equation to help you find the solution of the next equation in the chain. The last equation in the chain is used to check that you have solved the entire chain correctly.

**Complete each equation chain:**

1) \(5 + a = 12\)
   \(\text{so } a = __\)

2) \(9f = 36\)
   \(\text{so } f = __\)

3) \(ab = 14\)
   \(\text{so } b = __\)

4) \(g = 13 - f\)
   \(\text{so } g = __\)

5) \(16 + b = c\)
   \(\text{so } c = __\)

6) \(g = 13 - f\)
   \(\text{so } h = __\)

7) \(14 - d = c\)
   \(\text{so } d = __\)

8) \(h + i = 18\)
   \(\text{so } i = __\)

9) \(e ÷ d = 3\)
   \(\text{so } e = __\)

10) \(j - i = 9\)
    \(\text{so } j = __\)

11) \(16 ÷ b = c\)
    \(\text{so } c = __\)

12) \(63 ÷ g = h\)
    \(\text{so } h = __\)

13) \(a + e = 25\)
    \(\text{check}\)

14) \(14 – d = c\)
    \(\text{so } d = __\)

15) \(j ÷ f = 5\)
    \(\text{Check}\)

16) \(m ÷ 4 = 8\)
    \(\text{so } m = __\)

17) \(18 = v - 12\)
    \(\text{so } v = __\)

18) \(m - n = 12\)
    \(\text{so } n = __\)

19) \(v ÷ w = 3\)
    \(\text{so } w = __\)

20) \(np = 100\)
    \(\text{so } p = __\)

21) \(80 = wx\)
    \(\text{so } x = __\)

22) \(q = 40 + p\)
    \(\text{so } q = __\)

23) \(w + x = 2y\)
    \(\text{so } y = __\)

24) \(p + q - 10 = r\)
    \(\text{so } r = __\)

25) \(xy - z = 40\)
    \(\text{so } z = __\)

26) \(r - m = 8\)
    \(\text{check}\)

27) \(z - v = 2\)
    \(\text{Check}\)

**Challenge:** Create your own equation chain using these numbers for the variables: \(a = 10, b = 6, c = 18\) and \(d = 3\)
# Equations Error Analysis

Sally is a silly little girl who makes mistakes! In Column #1, analyze her work and circle her mistake. In Column #2, explain what she did wrong. In Column #3, show how Silly Sally should work out the problem correctly. Show ALL work!

<table>
<thead>
<tr>
<th>Silly Sally’s Work (Circle her mistake):</th>
<th>What did Silly Sally do wrong?</th>
<th>Show Silly Sally how it's done! (Show ALL steps!)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x + 5 = 28$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$+ 5$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$x = 33$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\frac{12a}{12} = \frac{108}{12}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\frac{a}{12} = \frac{108}{12}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$a = 8$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$w - 42 = 18$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$+ 18$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$w = 36$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\frac{y}{15} = 3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\div 15$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$y = 5$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$x + 23.45 = 32$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$- 23.45$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$x = 9.45$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\frac{4}{2} = 162$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Solving One-Step Equations Problems

You can solve a word problem using one-step equations.

1) Figure out what you know and what you want to know. What you want to know will be represented by a variable.
2) Set up an equation to solve for the unknown (variable).
3) Use inverse operations to solve.
4) Don’t forget to label your solution and write it as statement.

### Example:

Edgar jogs for 20 minutes. He stretched then jogs some more. Altogether, he jogs for 35 minutes. How far does he jog after he stretches?

What do you know? ____________________________________________
What do you want to know? _____________________________________
What does your variable represent? ________________________________
What operation is used in the equation? __________________________
What inverse operation will you use to solve? ____________________
Write the one-step equation to solve. _____________________________
Solution: __________________
Solution as a statement: _______________________________________
**You Try:**

1) Jan used 22 gallons of water in the shower. This amount is 7 gallons less than the amount she used for washing clothes. How much water does Jan use to wash clothes?

   What do you know? ..........................................................................................................................................

   What do you want to know? ..................................................................................................................................

   What does your variable represent? ...........................................................................................................................

   What operation is used in the equation? .......................................................................................................................

   What inverse operation will you use to solve? .............................................................................................................

   Write the one-step equation to solve. ........................................................................................................................

   Solution: .............................................................................................................................................................

   Solution as a statement: ...........................................................................................................................................

2) While training for a sports event, Oliver hiked 5.3 miles each day. If he hiked for a total of 42.4 miles, how many days did Oliver hike?

   What do you know? ..........................................................................................................................................

   What do you want to know? ..................................................................................................................................

   What does your variable represent? ...........................................................................................................................

   What operation is used in the equation? .......................................................................................................................

   What inverse operation will you use to solve? .............................................................................................................

   Write the one-step equation to solve. ........................................................................................................................

   Solution: .............................................................................................................................................................

   Solution as a statement: ...........................................................................................................................................

3) At a restaurant, Erin and her three friends decided to split the bill evenly. If each person paid $11 what was the total cost of their bill?

   What do you know? ..........................................................................................................................................

   What do you want to know? ..................................................................................................................................

   What does your variable represent? ...........................................................................................................................

   What operation is used in the equation? .......................................................................................................................

   What inverse operation will you use to solve? .............................................................................................................

   Write the one-step equation to solve. ........................................................................................................................

   Solution: .............................................................................................................................................................

   Solution as a statement: ...........................................................................................................................................

4) Ronique had 3 cookies and then she bought some more and then she had a total of 19 cookies. How many cookies did she buy?

   What do you know? ..........................................................................................................................................

   What do you want to know? ..................................................................................................................................

   What does your variable represent? ...........................................................................................................................

   What operation is used in the equation? .......................................................................................................................

   What inverse operation will you use to solve? .............................................................................................................

   Write the one-step equation to solve. ........................................................................................................................

   Solution: .............................................................................................................................................................

   Solution as a statement: ...........................................................................................................................................
1) Robyn had some video games, and then bought 4 more games. If she now has a total of 10 games, how many did she start out with?

What does your variable represent in the word problem? __________
What operation will you use to solve the word problem? __________
One Step Equation: ___________________________
Solution: _______________

2) Three friends found some money on the playground. They split the money evenly, and each person got $14. How much money did they find on the playground?

What does your variable represent in the word problem? __________
What operation will you use to solve the word problem? __________
One Step Equation: ___________________________
Solution: ___________________________

3) Josh sent 574 text messages over the last 7 days. On average, how many text messages did he send each day?

What does your variable represent in the word problem? __________
What operation will you use to solve the word problem? __________
One Step Equation: ___________________________
Solution: _______________

4) In a recent presidential election, Ohio had 18 electoral votes. This is 20 votes less than Texas had, how many electoral votes did Texas have?

What does your variable represent in the word problem? __________
What operation will you use to solve the word problem? __________
One Step Equation: ___________________________
Solution: _______________

Solve each equation below:

5) $2.3 = x + 0.34$
6) $p + \frac{1}{7} = \frac{6}{7}$

7) $\frac{3}{4}d = 12$
8) $19 = \frac{x}{7}$

9) $h - 26 = 29$
10) $1.6w = 72$

11) $12.22 = y - 7.5$
12) $38.2 = 4x$
Inequalities

An __________ is a mathematical sentence that compares two quantities. We use the symbols and wording below to write inequalities.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning/Word Phrases</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;</td>
<td>is less than</td>
<td>3 &lt; 5</td>
</tr>
<tr>
<td></td>
<td>is fewer than</td>
<td></td>
</tr>
<tr>
<td></td>
<td>is below</td>
<td></td>
</tr>
<tr>
<td>&gt;</td>
<td>is greater than</td>
<td>8 &gt; 4</td>
</tr>
<tr>
<td></td>
<td>is more than</td>
<td></td>
</tr>
<tr>
<td></td>
<td>is above</td>
<td></td>
</tr>
<tr>
<td>≤</td>
<td>is less than or equal to</td>
<td>7 ≤ 10</td>
</tr>
<tr>
<td></td>
<td>at most</td>
<td>10 ≤ 10</td>
</tr>
<tr>
<td></td>
<td>no more than</td>
<td></td>
</tr>
<tr>
<td>≥</td>
<td>is greater than or equal to</td>
<td>12 ≥ 9</td>
</tr>
<tr>
<td></td>
<td>at least</td>
<td>12 ≥ 12</td>
</tr>
<tr>
<td></td>
<td>no less than</td>
<td></td>
</tr>
</tbody>
</table>

Determining if a number is a solution to an inequality requires you to substitute the value into the inequality and check to see if the value makes the inequality true.

**Example:**
The “Dollar Savers” store sells everything less than $5. Would you be able to buy the following items at the “Dollar Savers” store? Use the inequality x < 5 to substitute. Circle Yes or No.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Yes or No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socks</td>
<td>$2</td>
<td>Yes</td>
</tr>
<tr>
<td>Book</td>
<td>$5</td>
<td>Yes</td>
</tr>
<tr>
<td>Headphones</td>
<td>$4.50</td>
<td>No</td>
</tr>
<tr>
<td>Sticker</td>
<td>$5.25</td>
<td>No</td>
</tr>
</tbody>
</table>

**You Try:**

1) To ride a roller coaster, you must be at least 48” tall. Write an inequality and substitute to determine who can ride the roller coaster. Circle Yes or No.

<table>
<thead>
<tr>
<th>Name</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silly Steve</td>
<td>40”</td>
</tr>
<tr>
<td>Cool Carl</td>
<td>36”</td>
</tr>
<tr>
<td>Laughing Lou</td>
<td>48”</td>
</tr>
<tr>
<td>Toothy Tim</td>
<td>52”</td>
</tr>
</tbody>
</table>

Circle all of the values that will satisfy each of the given inequalities.

2) y > 8
3) m ≤ 525
4) c < 22
5) f ≥ 80
6) g ≥ 27
7) n < 16
8) a > 48
9) z ≤ 100
Writing Inequalities

Inequalities can be written to represent many situations.

Examples:

There are at least 25 students in the auditorium.

\[ n \geq 25 \]  
“at least” means greater than or equal to 
\( n \) represents the number of students in the auditorium

No more than 150 people can occupy the room.

\[ r \leq 150 \]  
“no more than” means less than or equal to 
\( r \) represents the possible room capacity

You Try:

Write an inequality for each given situation.

1) You cannot eat more than 2 pieces of your Halloween candy per day.

2) There are less than 15 people in the room.

3) There are at most 12 books on a shelf.

4) There are fewer than 200 people at the game.

5) You must get at least 30 minutes of exercise each day.

6) You must be at least 15 years old to get your driver’s permit.

7) A pony is less than 14.2 hands tall.

8) You must be over 12 years old to ride the go karts.

9) The pig weighs at most 220 pounds.

10) Every candy bar costs at least $2.20.

11) You must complete at least 80% of your homework to attend the Homework Stars Celebration.

12) There are no more than seven people on the boat.

13) More than 40 people attended the movie last night.

14) You must be under 54” to ride the kiddie rides at Six Flags.

15) Getting at least 8 hours of sleep at night keeps you healthy.
Graphing Inequalities

Inequalities can be graphed on a number line to illustrate all of the possible solutions.

1st draw a number line and include the number in your inequality.

2nd draw an open or closed dot on the number (depending on which inequality symbol is in the inequality. Use an open dot (○) if the inequality has the greater than (>) or less than (<) symbol. Use a solid dot (●) if the inequality has the greater than or equal to (≥) or less than or equal to (≤) symbol.

3rd draw a line and an arrow that shows all of the possible solutions.

Examples:

\( n > 9 \)

Place an open dot at 9. Then draw a line and an arrow to the right.

The values that lie on the line make the sentence true. All numbers greater than 9 make the sentence true.

\( n ≤ 10 \)

Place a closed dot at 10. Then draw a line and an arrow to the left.

All numbers 10 and less make the sentence true.

You Try:

Graph the following inequalities on a number line. Then write a word phrase to describe each inequality.

1) \( n ≤ -5 \)  
2) \( n ≤ 5 \)

3) \( n < 1 \)
4) \( r > 2 \)

5) \( n > 5 \)
6) \( n ≤ -2 \)

7) \( n ≥ -7 \)
8) \( n < 0 \)

TIP: If you keep the variable on the LEFT, the arrow at the end of your number line looks just like your inequality symbol.
Write the inequality AND graph for each problem below in 7 - 10

7) Fetty Wap has at least 3 fans in Mrs. Ledesma’s 3rd period math class.
Inequality: ______________________________
Graph: -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

8) Mr. Shaw should send Mrs. Shaw more than 6 roses per day.
Inequality: ______________________________
Graph: -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

9) Shawn snuck into a G Rated movie because he thought you had to be at most 7 years old.
Inequality: ______________________________
Graph: -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

10) When trick or treating, Daniella’s dream came true. A lady told her she could take no less than 5 pieces of candy.
Inequality: ______________________________
Graph: -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7

More Practice with Inequalities

Write an inequality for each situation, and graph on a number line.

1) Students must score at least 800 to pass the CRCT.

```
<--------------------------------------->
```

2) You must be shorter than 48” to ride the kiddie train.

```
<--------------------------------------->
```

3) You should brush your teeth at least twice a day.

```
<--------------------------------------->
```

4) A good credit score is higher than 699.

```
<--------------------------------------->
```

5) Classes can have no more than 34 students.

```
<--------------------------------------->
```

6) AJ needs to save more than $500.

```
<--------------------------------------->
```

7) A book costs less than $20

```
<--------------------------------------->
```
More Inequalities Practice

1) Which number is a solution to the inequality below? $x > 4$
   a) 1  b) 2  c) 4  d) 5

2) Which number is NOT a solution to the inequality below? $x \leq 8$
   a) 6  b) 7  c) 8  d) 9

3) Which statement describes "a number more than 22"?
   a) $x < 22$  b) $x > 22$
   c) $x < 22$  d) $x > 22$

4) Which statement describes "a number less than or equal to 43"?
   a) $x < 43$  b) $x > 43$
   c) $x < 43$  d) $x > 43$

5) Which statement describes "a number no more than 17"?
   a) $x < 17$  b) $x > 17$
   c) $x < 17$  d) $x > 17$

6) Which statement describes "at least 32"?
   a) $x < 32$  b) $x > 32$
   c) $x < 32$  d) $x > 32$

7) Which number is a solution to $x + 4 > 12$
   a) 3  b) 5  c) 7  d) 9

8) Which number is NOT a solution to $x - 3 < 10$
   a) 7  b) 8  c) 10  d) 14

9) Which number is a solution to $3x > 12$
   a) 4  b) 5  c) 2  d) 3

10) Which number is NOT a solution to $2x \leq 10$
    a) 3  b) 4  c) 5  d) 6

11) Which inequality matches the graph below?
    a) $n > 1$  b) $n \leq 1$
    c) $n \geq 1$  d) $n \geq -1$

12) Which inequality matches the graph below?
    a) $v > -3$  b) $v > 3$
    c) $v \leq -3$  d) $v < 3$

13) Which inequality matches the graph below?
    a) $x > 3$  b) $x < 3$
    c) $x \leq 3$  d) $x \geq 3$

14) Which inequality matches the graph below?
    a) $n < 0$  b) $n \leq 0$
    c) $n \geq 0$  d) $n > 0$

15) Solve $x + 11 > 19$
16) Graph the solution to the inequality from question #15.

17) Solve $x - 3 < 5$
18) Graph the solution to the inequality from question #17.

19) Solve $3x < 12$
20) Graph the solution to the inequality from question #19.

21) Solve $\frac{x}{4} \geq 2$
22) Graph the solution to the inequality from question #21.

23. Write an inequality for this statement "x is less than or equal to 7".
24. Write an inequality for this statement "x is greater than 9"
Direct Variation & Functions

A direct variation equation is used to relate two quantities using a constant of variation.

<table>
<thead>
<tr>
<th>What?</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>The situation</td>
<td>You have a problem or situation that describes a constant relationship. There is a constant, k, that will stay the same.</td>
<td>Bozo performs in 10 circus acts per day.</td>
</tr>
<tr>
<td></td>
<td>(10 is the constant, k, because it stays the same.)</td>
<td></td>
</tr>
<tr>
<td>The rule</td>
<td>Direct variation can be written as an equation, ( y = kx ), where ( k ) (           ) represents the constant.</td>
<td>y = 10x</td>
</tr>
<tr>
<td></td>
<td>x represents the number of days Bozo performs. ( y ) represents the # of total circus acts performed.</td>
<td></td>
</tr>
<tr>
<td>Table of</td>
<td>For every input, ( x ), there is one output, ( y ). Each ( (x,y) ) pair gives you an ordered pair that you can graph on a coordinate plane. FYI: The ( x ) value is the independent variable and the ( y ) value is the dependent variable. (The ( y ) value is “dependent” on whatever the ( x ) value is.)</td>
<td>Plug in input values for ( x ) and get ( y ) values. In 0 days, Bozo performs 0 acts. In 1 day, Bozo performs 10 acts. In 2 days, Bozo performs 20 acts and so on... You can write this information in a table:</td>
</tr>
<tr>
<td>Ordered Pairs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>y</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Each set is an ordered pair to be graphed. Pairs can be written as (0,0), (1,10) etc.</td>
<td></td>
</tr>
<tr>
<td>Graph</td>
<td>The ordered pairs can be graphed because ( x ) and ( y ) vary proportionally, they will always:</td>
<td>Bozo’s Performances</td>
</tr>
<tr>
<td></td>
<td>1) Start at (0,0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2) Form a straight line</td>
<td></td>
</tr>
</tbody>
</table>

You Try:

A table is useful for changing cups to ounces.

<table>
<thead>
<tr>
<th>Cups</th>
<th>Ounces</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>32</td>
</tr>
<tr>
<td>5</td>
<td>40</td>
</tr>
</tbody>
</table>

1) How many ounces are in 1 cup? _________________________

2) How many ounces are in 3 cups? _______________________

3) If “6 cups” were added to the table, how many ounces would be listed? _______________________

An equation shows the relationship between cups and ounces.

\[ \text{ounces} = 8 \cdot \text{cups} \]

\[ y = 8x \]

You can also write this information in an input/output table.

<table>
<thead>
<tr>
<th>Input →</th>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output →</td>
<td>y</td>
<td>8</td>
<td>16</td>
<td>24</td>
<td>32</td>
<td>40</td>
</tr>
</tbody>
</table>

For every value of \( x \), there is one value of \( y \). This relationship is called a function.

4) Which variable stands for the output value? ____________

5) Which variable stands for the input value? ____________

6) What is the output value for \( x = 2 \) ____________
Practice with Functions and Tables

Just the Basics -

_______ _______ represents the “constant of proportionality,” or unit rate. As x and y values change, this stays the same.

When one variable increases, the other variable _______.

If your y values are smaller than your x values, this means that k must be a _______ or a _______.

Using the given rules, find the missing x and y values.

1)  y = 9x
   
<table>
<thead>
<tr>
<th>x</th>
<th>0</th>
<th>2</th>
<th>3</th>
<th>5</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2)  y = 12x
   
   | x  | 1 | 6 | 12 |
   |----|---|----|
   | y  | 48 | 120 |

3)  y = 1.25x
   
<table>
<thead>
<tr>
<th>x</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4)  y = \frac{2}{5}x
   
   | x  | 0 | 4 | 9 | 20 |
   |----|---|----|----|
   | y  | 48 | 120 |

Using the given values, determine the equations in terms of y=kx

5) Rule: ____________________

<table>
<thead>
<tr>
<th>x</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
</tbody>
</table>

6) Rule: ____________________

   | x  | 1 | 6 | 12 |
   |----|---|----|
   | y  | 48 | 120 |

How do you know this rule works?

__________________________

__________________________

Direct Variation Problem Solving

1) Vanessa is purchasing tickets to a Bebe Rexha concert. Tickets cost $35 apiece.
   
   What is the constant of variation, k? _____________
   
   x, the input/ind. variable represents: _______________
   
   y, the output/dep. variable represents: _______________
   
   What direct variation equation represents this situation?
   
   _______________
   
   Complete the chart below using your equation.

<table>
<thead>
<tr>
<th>x</th>
<th>0</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2) TJ is saving up for a new Fortnite skin. He earns $7.50 for each chore he does.
   
   What is the constant of variation, k? _____________
   
   x, the input/ind. variable represents: _______________
   
   y, the output/dep. variable represents: _______________
   
   What direct variation equation represents this situation?
   
   _______________
   
   Complete the chart below using your equation.

<table>
<thead>
<tr>
<th>x</th>
<th>0</th>
<th>2</th>
<th>10</th>
<th>15</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3) There are 37 boys in the drama club. They want to buy new props, so they are all going to pitch in some money. They all want to pitch in the same amount.

What is the constant of variation, $k$? ________________
x, the input/ind. variable represents: ________________
y, the output/dep. variable represents: ________________

What direct variation equation represents this situation?

____________________

Complete the chart below using your equation.

<table>
<thead>
<tr>
<th>x</th>
<th>0</th>
<th>2</th>
<th>3</th>
<th>5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4) The students in math class earn one Jolly Rancher for every 3 homework assignments that they complete.

What is the constant of variation, $k$? ________________
x, the input/ind. variable represents: ________________
y, the output/dep. variable represents: ________________

What direct variation equation represents this situation?

____________________

Complete the chart below using your equation.

<table>
<thead>
<tr>
<th>x</th>
<th>0</th>
<th>3</th>
<th>9</th>
<th>18</th>
<th>27</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5) The direct variation ALWAYS uses the formula $y = kx$

Therefore, when $x = 0$, $y$ always equals ________________.
You Try:

Use the direct variation equation to complete the table and then graph the ordered pairs.

1) \( y = 3x \)

\[
\begin{array}{c|c|c|c|c}
 x & 0 & 1 & 2 & 3 \\
\hline
 y & & & & \\
\end{array}
\]

2) \( y = \frac{1}{2}x \)

\[
\begin{array}{c|c|c|c|c}
 x & 2 & 6 & 8 & \\
\hline
 y & 0 & & 5 & \\
\end{array}
\]

3) \( y = 0.8x \)

\[
\begin{array}{c|c|c}
 x & 0 & 1 & 4 \\
\hline
 y & & 4.8 & 8 \\
\end{array}
\]

4) \( y = 2x \)

\[
\begin{array}{c|c|c|c|c}
 x & 0 & 2 & 3 & 4 \\
\hline
 y & & & 10 & \\
\end{array}
\]
Direct Variation in the REAL World

An iPod Nano can hold up to 16 gigabytes (GB) of data.

1) How many gigabytes can be stored on 0 Nanos? ____________
   How many on 1 Nano? _______
   How many on 5 Nano? _______
   How many on 12 Nano? _______

2) If you have enough iPod Nanos to hold 80 GB, how many iPod Nanos do you have? ________________

3) Complete the chart:

<table>
<thead>
<tr>
<th>x (# of iPods)</th>
<th>0</th>
<th>2</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>y (total GB)</td>
<td>64</td>
<td>160</td>
<td></td>
</tr>
</tbody>
</table>

4) What is the direct variation equation (in terms of y=kx): __________

5) Based on this problem, answer the following:
   a) In words, what does the input (x) represent? ____________
   b) In words, what does the output (y) represent? ____________
   c) In words, what does the constant (k) represent? ____________

6) As the number of iPods increases, the total number of GB _______

7) Look at the values in the table above. Write each set of (x,y) values as an ordered pair

   __________ __________ __________ __________ __________

8) Graph the ordered pairs:

Math 6 – Unit 4: One-Step Equations and Inequalities Review #2

Knowledge and Understanding

1) When solving equations, why is it important to substitute your solution into the equation at the end. ____________

2) What is the difference between an open circle and a closed circle in an inequality? ________________

Proficiency of Skills

Solve each equation. Remember to show all work!

3) \( t - 1 = 11 \frac{1}{2} \)  
4) \( \frac{n}{5} = 10 \)  
5) \( r + 7 = 49 \)

Solve and graph the solution to each inequality. Show all work!

6) \( k \leq 7 \)  
7) \( a > 120 \)  
8) \( x \neq 3 \)
**Application**

9) A quarterback threw a ball total yards over 10 games. If he averaged 90 yards per game, write an equation that represents this situation and solve for \( x \), the total number of yards thrown.

Equation: _______________________

Solution: _______________________

10) Janiah had \( x \) dollars in her bank account. After spending $182 on Christmas gifts, she has $200 left in her account. Write an equation and solve for \( x \), the amount she originally had in her account.

Equation: _______________________

Solution: _______________________

11) The weight limit on a cargo plane is 55 tons. Write an inequality to represent the weight limit, \( w \), and graph it.

Inequality: _______________________

12) What inequality is graphed on the number line? _________

13) Maggie needs at least 15 lbs. of chocolate to make her chocolate fountain work. Write an inequality and graph it.

Inequality: _______________________

14) Which problem situation matches the equation \( 12x = 240 \)?

a) Jamie sold 240 newspaper subscriptions each month for 12 months. What is \( x \), the total number of newspaper subscriptions that Jamie sold in 1 year?

b) Brenna cycled a total of 240 miles this month. She cycled 12 miles less this month than last month. What is \( x \), the number of miles Brenna cycled last month?

c) Mary charges $12 per hour for labor to paint houses. What is \( x \), the number of hours Mary worked if she charged $240 for labor?

d) Sara bought 12 ride tickets and \( x \) game tickets. How many game tickets did she buy if she bought 240 tickets in all?

15) Andy makes $2.50 per chore he does on the weekends. Write a direct variation equation: _______________________

Make an \((x,y)\) table of values and graph it.

16) Draw an example of a graph of direct variation. Then draw an example of a graph that is NOT a direct variation.