# 8th Grade Language Arts & Algebra I Honors Summer Assignments 2024

**Rising 8th Grade Assigned Reading:**
8th grade will select one book to read from the following list of books:

- *Because of Mr. Terupt* – Rob Buyea
- *The Seventh Most Important Thing* – Shelley Pearsall
- *Finding Mighty* – Sheela Chari.

When students have finished reading, they will need to create **2 different creative journal entries (pages)**. A creative journal entry is a notebook page with drawings and/or sketches along with the writing. Examples of creative journal entries are attached.

- Ideas include - setting, characters, plot, theme, and free-choice entries.
- Journal entries need to be completed on notebook paper and labeled.
- In order to receive full credit, each journal must include the following:
    - graphics with color
    - writing that includes text evidence
    - analysis (thought prompts).
- Entries should be detailed, thoughtful, and creative.

**Students will submit their journals for credit on the first day of school in August.** This assignment is worth **50 points**. They should also bring their book with them to school for the first week as we will be discussing the books in class.

You also need to complete **10 IXL Language Arts Recommended Skills** worth 20 points. Once you are in your IXL account under "What should I work on? > click the third tab, "Recommendations" > language arts skills are marked with a book in the top left corner > begin practicing! > You are **finished** working on the skill when you **reach a SmartScore of 80. Please stop after 80 if it is causing frustration.**

Choice Reading:
While students are only required to read one book, reading all summer long is encouraged. Choose novels that interest you and are on your reading level. It is good to challenge yourself a little! A list of suggested authors is listed below. <u>Remember, reading is the single most important factor in student success.</u>

**Rising 8th Grade Algebra I Honors:**

Summer math is assigned to help students retain math skills and enable the math classes to spend less time reviewing past material and forge ahead with new math skills. It has been designed to review topics students learned during the past school year which are crucial for success in the next grade level.

All students are expected to complete the entire Summer Skills packet to the *best of their ability*. Students should show their work so we can see the thought process used to complete the problems. Circle or box your final answer. Please keep in mind we are looking for a *good effort* at completing the problems more than a correct answer. Good effort includes attempting the problems and showing the work/thought process used to achieve an answer. A pacing suggestion would be to complete 2 - 3 pages a week. **This assignment is due Wednesday, August 14th, the first day of the new school year, and is worth 50 points.**

**Suggested Authors: (*Some books in the author's collection may contain more mature content.)**

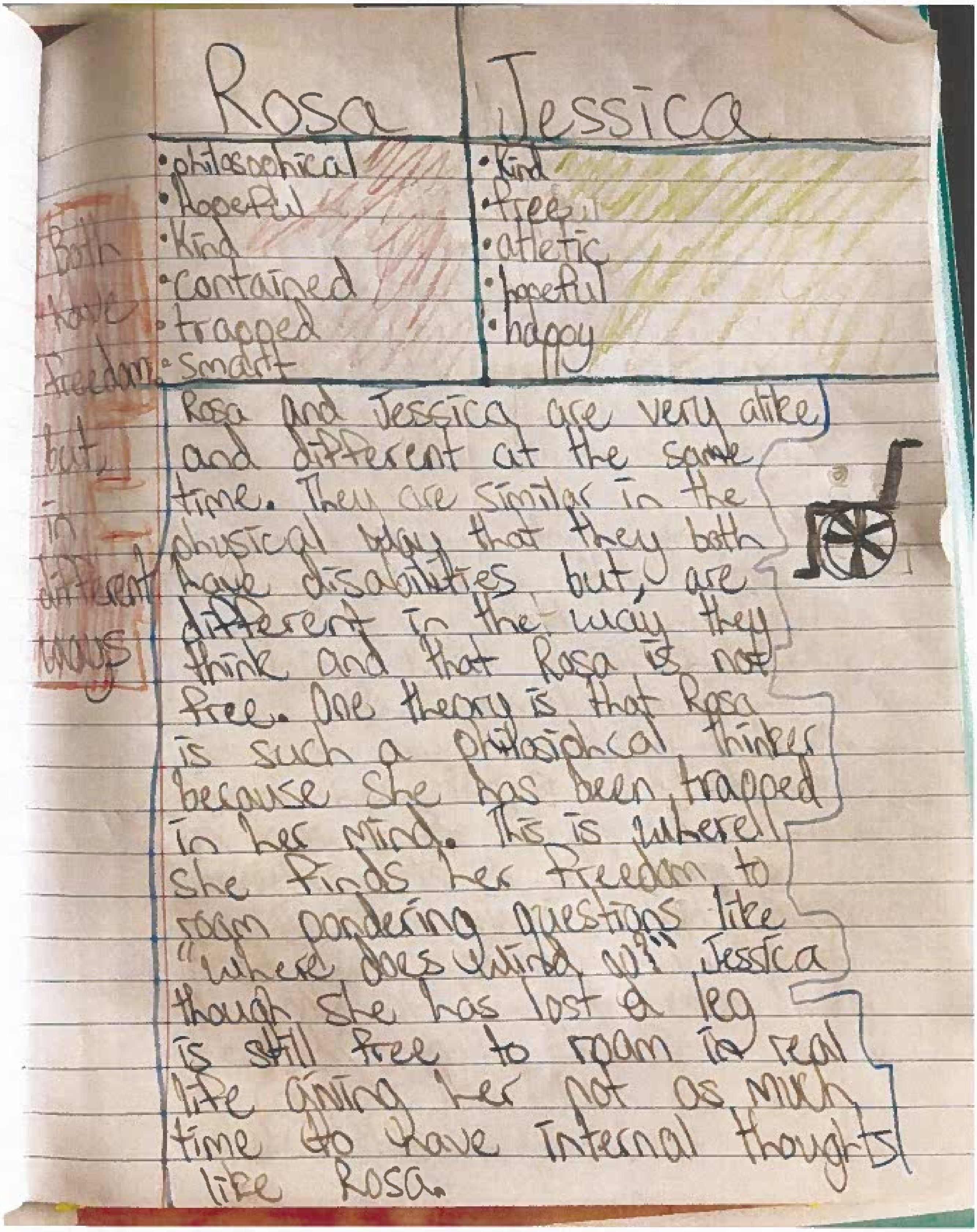
- Alexander Kwame
- Alan Gratz
- Andrew Clements
- Anthony Horowitz
- Bruce Hale
- Carl Hiassen
- Cynthia Lord
- Christopher Paolini
- Cornelia Funke
- Dave Barry and Ridley Pierson
- Debbie Viguie
- D.J. MacHale
- Eoin Colfer
- Gae Polisner
- Gail Carson Levine
- Gary Paulsen
- Gordon Korman
- Greg Mortenson*
- Jack London*
- Jacqueline Woodson
- Jane Yolen
- Jeanne DuPrau
- Jerry Spinelli
- John Green*
- John Grisham*
- Jon Sciesczka
- Julia Alvarez
- Kate Brian*
- Kate DiCamillo
- Laurie Halse Anderson*
- Lisa Graff
- Lisi Harrison*
- Louis Sachar
- Margaret Peterson Haddix
- Michael Buckley
- Michael Scott
- Mike Lupica
- Neil Gaiman*
- Patricia McCormick
- Phyllis Reynolds Naylor
- Pseudonymous Bosch
- Ray Bradbury
- Richard Peck
- Rick Riordan
- Ridley Pearson
- Roderick Gordon&Brian Williams
- Roland Smith
- Scott Westerfield*
- Sharon Creech
- Sharon Draper*
- Stephanie Meyer
- Steven Sheinkin
- Suzanne Collins
- Tim Green
- Victoria Aveyard
- Walter Dean Meyers*
- Wendy Mass

Name: ______________________________________ Date: ____________

# Summer Reading/LA Project

| | Points Earned | Points Possible |
|---|---|---|
| Journal Entry #1 | | |
| • Color | | 2 |
| • Graphics | | 3 |
| • Text Evidence | | 5 |
| • Thought Prompts/Analysis | | 5 |
| Journal Entry #2 | | |
| • Color | | 2 |
| • Graphics | | 3 |
| • Text Evidence | | 5 |
| • Thought Prompts/Analysis | | 5 |
| Creativity | | 5 |
| | | |
| **TOTAL** | | 35 |

Comparing 2 characters:

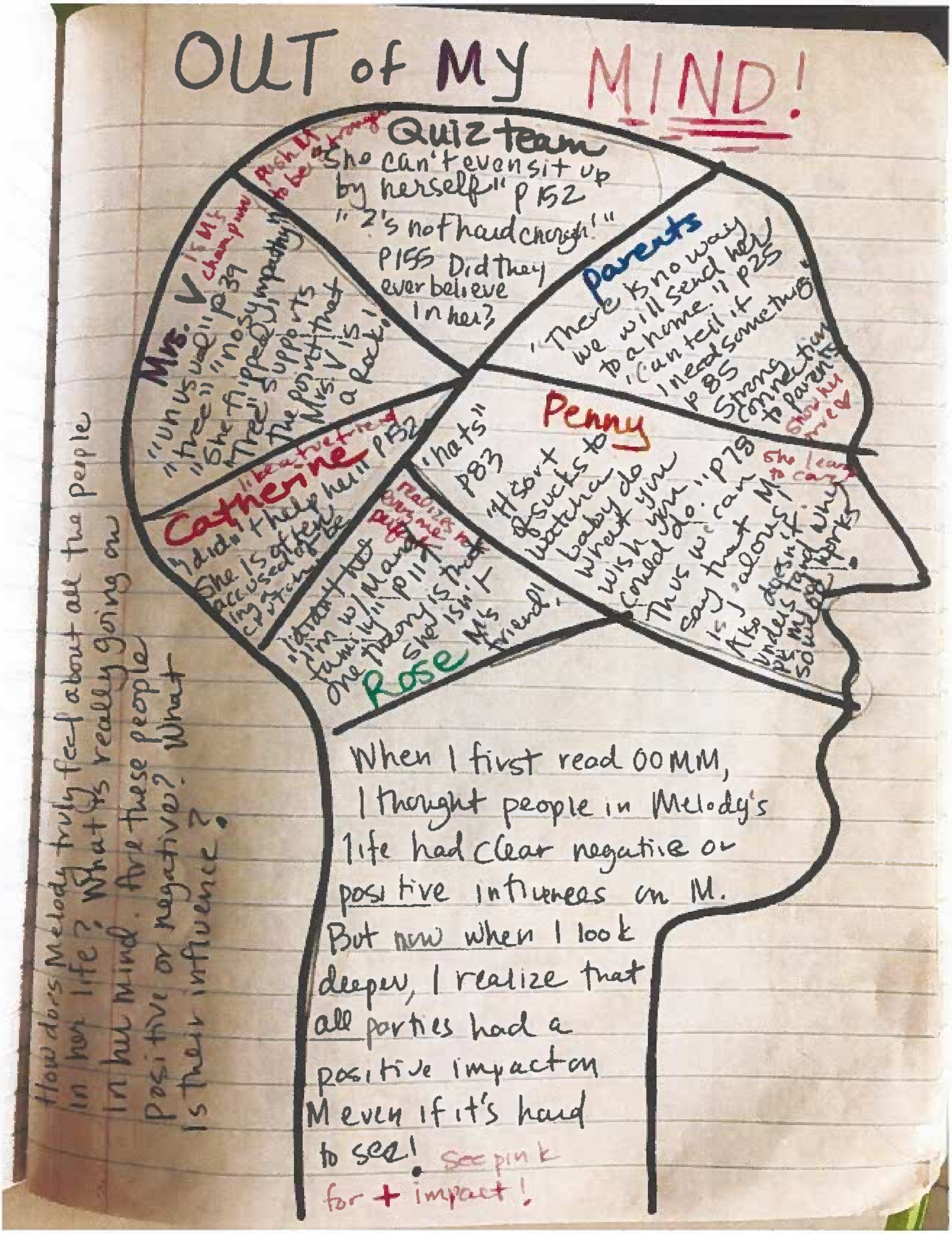


| Rosa | Jessica |
|---|---|
| • philosophical | • Kind |
| • Hopeful | • free |
| • Kind | • atletic |
| • contained | • hopeful |
| • trapped | • happy |
| • Smart | |

Both have Freedom but in different ways

Rosa and Jessica are very alike and different at the same time. They are similar in the physical way that they both have disabilities but, are different in the way they think and that Rosa is not free. One theory is that Rosa is such a philosophical thinker because she has been trapped in her mind. This is where she finds her freedom to roam pondering questions like "where does wind go?" Jessica though she has lost a leg is still free to roam in real life giving her not as much time to have Internal thoughts like Rosa.

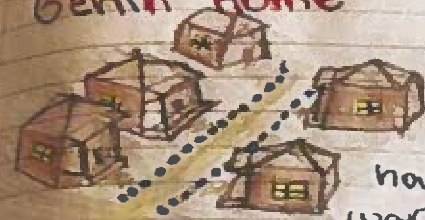
Characters Influences:



Symbolism:

Symbolism: Chapters 16-19 4/17/16

Benin Home

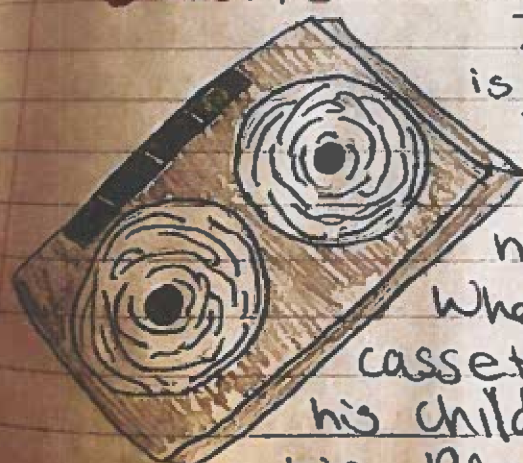


Benin Home symbolized Beah's life as a boy soldier ending. It tried to civilize the boys, however, you can take a boy out of a war, but you can't take the war out of a boy.

Esther

Esther symbolizes Beah's end to his psychological war. I believe this because every time Esther treated Beah, he would not tell her his name. However, on page 153 Beah finally opened up to Esther, by telling her his name. This shows Bean is finally learning how to trust people again, and forgive himself of what he has done.

Cassette

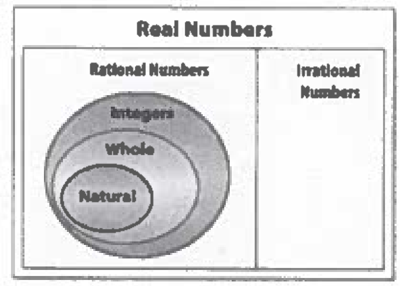


Ishmael Beah's cassete is a symbol of his childhood. For example, when Bean was little, music brought his brother and friends together. When the soldier threw Beah's cassette into the fire, it represented his childhood being destroyed and his new life as a boy soldier begi

NAME ______________________________ DATE ____________________

# 0-2 Algebra 1 Summer Skills

## *Real Numbers*




**CLASSIFY REAL NUMBERS** The set of **real numbers** consists of all whole numbers, integers, rational numbers, and irrational numbers.

- **Natural numbers:** counting numbers **1, 2, 3, …**
- **Whole numbers:** counting numbers, including 0 **0, 1, 2, 3, …**
- **Integers:** whole numbers and their negative counterparts **… ,–2, –1, 0, 1, 2, …**
- **Rational numbers:** can be written as fractions $-7.5, \frac{5}{8}, \sqrt{16}, 0.\overline{3}$
- **Irrational numbers:** decimals that do not repeat or terminate $\pi, \sqrt{3}$, 0.121221222...

**EXAMPLE: Name the set or sets of numbers to which each real number belongs.**

**a.** $\frac{5}{22}$

5 and 22 are integers and $5 \div 22 = 0.2272727\ldots$, which is a repeating decimal, so this number is a **rational number**.

**b.** $\sqrt{56}$

$\sqrt{56} = 7.48331477\ldots$, which is not a repeating or terminating decimal, so this number is **irrational**.

**c.** $\sqrt{81}$

$\sqrt{81} = 9$, this number is a **natural number**, a **whole number**, an **integer**, and a **rational number**.

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**EXERCISES**

**Name the set or sets of numbers to which each real number belongs.**

**1.** $\sqrt{64}$

**2.** $-9$

**3.** $\frac{36}{6}$

**4.** $\sqrt{28}$

**5.** $-\frac{9}{10}$

**6.** $\sqrt{121}$

NAME ______________________________ DATE ____________________

# 0-3 Algebra 1 Summer Skills *(continued)*

## *Operations with Integers*

An integer is any number from the set {… ,–2, –1, 0, 1, 2, …}. You can follow the **Rules for Integers** to add, subtract, multiply, and divide integers.

| RULES FOR INTEGERS ( SIGNED NUMBERS) | |
|---|---|
| **ADDITION** | **SUBTRACTION** |
| + and + = + | ADD THE OPPOSITE! |
| – and – = – | (Change the subtraction sign to an addition sign. |
| + and – = + | Change the sign of the second number. |
| + and – = – | Now follow the Addition rules!) |
| **MULTIPLICATION AND DIVISION** | |
| + and + = + | + and – = – |
| – and – = + | – and + = – |

### EXERCISES

**Find each sum or difference.**

**1.** –77 + (–46)

**2.** 12 – 34

**3.** 41+ (–56)

**4.** 50 – 82

**5.** – 47 – 13

**6.** – 80 + 102

**7.** A dolphin swimming 24 feet below the ocean's surface dives 18 feet straight down. How many feet below the ocean's surface is the dolphin now?

**Find each product or quotient.**

**8.** –64 ÷ (–8)

**9.** 8(–22)

**10.** 54 ÷ (–6)

**11.** 30(14)

**12.** –23(5)

**13.** –200 ÷ 2

**14.** Joey earns $13 per hour. He works 14 hours a week. His employer withholds $45 from each paycheck for taxes. If he is paid weekly, what is the amount of his weekly paycheck?

NAME ______________________ DATE ______________________

# 0-4 Algebra 1 Summer Skills

## *Adding and Subtracting Rational Numbers*

**Add and Subtract <u>Like</u> Fractions** To add or subtract fractions with the same denominators, called **like denominators,** add or subtract the numerators and write the sum or difference over the denominator.

**EXAMPLE 1: Find each sum or difference. Write in simplest form.**

**a.** $\frac{3}{5}+\frac{1}{5}$

$\frac{3}{5}+\frac{1}{5}=\frac{3+1}{5}=\frac{4}{5}$

**b.** $\frac{7}{16}-\frac{1}{16}$

$\frac{7}{16}-\frac{1}{16}=\frac{7-1}{16}=\frac{6}{16}$

**c.** $\frac{4}{9}-\frac{7}{9}$

$\frac{4}{9}-\frac{7}{9}=\frac{4-7}{9}=-\frac{3}{9}$ or $-\frac{1}{3}$

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**Add and Subtract <u>Unlike</u> Fractions** Fractions with different denominators are called **unlike fractions**. To add or subtract fractions with **unlike denominators**, rename the fractions with a **common denominator**. Then add or subtract. Simplify if possible.

**EXAMPLE 2: Find each sum or difference. Write in simplest form.**

**a.** $\frac{1}{2}+\frac{2}{3}$

$\frac{1}{2}+\frac{2}{3}=\frac{3}{6}+\frac{4}{6}=\frac{3+4}{6}=\frac{7}{6}$ or $1\frac{1}{6}$

**b.** $\frac{3}{8}-\frac{1}{3}$

$\frac{3}{8}-\frac{1}{3}=\frac{9}{24}-\frac{8}{24}=\frac{9-8}{24}=\frac{1}{24}$

**c.** $\frac{2}{5}-\frac{3}{4}$

$\frac{2}{5}-\frac{3}{4}=\frac{8}{20}-\frac{15}{20}=\frac{8-15}{20}=-\frac{7}{20}$

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**EXERCISES**

**Find each sum or difference. Write in simplest form.**

**1.** $\frac{2}{3}+\frac{1}{3}$

**2.** $\frac{6}{7}-\frac{3}{7}$

**3.** $\frac{5}{8}+\frac{7}{8}$

**4.** $\frac{4}{3}+\frac{4}{3}$

**5.** $\frac{7}{15}-\frac{2}{15}$

**6.** $\frac{3}{7}+\frac{5}{14}$

**7.** $\frac{3}{8}+\frac{1}{6}$

**8.** $\frac{13}{20}-\frac{2}{5}$

**9.** $-\frac{1}{6}-\frac{2}{3}$

**10.** $\frac{1}{2}-\frac{4}{5}$

**11.** $-\frac{4}{5}+\left(-\frac{1}{3}\right)$

**12.** $-\frac{1}{12}-\left(-\frac{3}{4}\right)$

**13.** About $\frac{7}{10}$ of the surface of the Earth is covered by water. The rest of the surface is covered by land. How much of the Earth's surface is covered by land?

NAME ________________________________ DATE ____________________

# 0-5 Algebra 1 Summer Skills *(continued)*

## *Multiplying and Dividing Rational Numbers*

**Multiply Fractions** To multiply fractions, multiply the numerators and multiply the denominators: $\frac{a}{b}\cdot\frac{c}{d} = \frac{a\cdot c}{b\cdot d}$, where $b, d \neq 0$. Fractions may be simplified either <u>before</u> or after multiplying. When multiplying negative fractions, assign the negative sign to the numerator.

**EXAMPLE 1: Find each product. Write in simplest form.**

**a.** $-\frac{8}{15}\cdot\frac{5}{7} = \frac{-8}{15}\cdot\frac{5}{7}$

$= \frac{-8}{\cancel{15}_{\,3}}\cdot\frac{\cancel{5}^{\,1}}{7}$

$= \frac{-8}{21} = -\frac{8}{21}$

**b.** $7\frac{1}{2}\cdot 2\frac{2}{3} = \frac{15}{2}\cdot\frac{8}{3}$

$= \frac{\cancel{15}^{\,5}}{\cancel{2}_{\,1}}\cdot\frac{\cancel{8}^{\,4}}{\cancel{3}_{\,1}}$

$= \frac{20}{1}$ or $20$

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**Divide Fractions** Two numbers whose product is 1 are called multiplicative inverses or reciprocals. For any fraction $\frac{a}{b}$, where $a, b \neq 0$, $\frac{b}{a}$ is the multiplicative inverse and $\frac{a}{b}\cdot\frac{b}{a} = 1$. This means that $\frac{2}{3}$ and $\frac{3}{2}$ are multiplicative inverses because $\frac{2}{3}\cdot\frac{3}{2} = 1$. To divide by a fraction, multiply by its multiplicative inverse: $\frac{a}{b}\div\frac{c}{d} = \frac{a}{b}\cdot\frac{d}{c} = \frac{ad}{bc}$, where $b, c, d \neq 0$.

**EXAMPLE 2: Find each quotient. Write in simplest form.**

**a.** $\frac{3}{4}\div\frac{5}{8} = \frac{3}{4}\cdot\frac{8}{5}$

$= \frac{3}{\cancel{4}_{\,1}}\cdot\frac{\cancel{8}^{\,2}}{5}$

$= \frac{6}{5}$ or $1\frac{1}{5}$

**b.** $-6\frac{2}{5}\div 2\frac{1}{5} = \frac{-32}{5}\div\frac{11}{5}$

$= \frac{-32}{5}\cdot\frac{5}{11}$

$= \frac{-32}{\cancel{5}_{\,1}}\cdot\frac{\cancel{5}^{\,1}}{11}$

$= \frac{-32}{11}$ or $-2\frac{10}{11}$

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**EXERCISES**

**Find each product or quotient.**

**1.** $\frac{2}{9}\cdot\frac{1}{2}$

**2.** $-\frac{9}{4}\cdot\frac{1}{18}$

**3.** $\left(-\frac{30}{11}\right)\cdot\left(-\frac{1}{3}\right)$

**4.** $\frac{16}{9}\div\frac{4}{9}$

**5.** $\frac{3}{7}\div\left(-\frac{1}{5}\right)$

**6.** $-1\frac{1}{3}\div\frac{2}{3}$

**7.** A large pizza at Pizza Shack has 12 slices. If Bob ate $\frac{1}{4}$ if the pizza, how many of the slices of pizza did he eat?

**8.** How many boards, each 2 feet 8 inches long, can be cut from a board 16 feet long if there is no waste? (Hint: 1 ft = 12 in)

NAME ______________________ DATE ______________

# 1-1 Algebra 1 Summer Skills

## *Variables and Expressions*

**Write Verbal Expressions** An **algebraic expression** consists of one or more numbers and variables along with one or more arithmetic operations. In algebra, **variables** are symbols used to represent unspecified numbers or values. Any letter may be used as a variable.

**EXAMPLE: Write a verbal expression for each algebraic expression.**

**a.** $6n^2$

the product of 6 and $n$ squared

**b.** $n^3 - 12m$

the difference of $n$ cubed and twelve times $m$

| + | − | × | ÷ |
|---|---|---|---|
| plus | minus | times | divide |
| the sum of | the difference of | the product of | the quotient of |
| Increased by | decreased by | of | divided by |
| more than | less than | | among |

**EXERCISES**

**Write a verbal expression for each algebraic expression.**

**1.** $w - 1$

**2.** $\frac{1}{3}a^3$

**3.** $81 + 2x$

**4.** $12d$

**5.** $8^4$

**6.** $6^2$

**7.** $2n^2 + 4$

**8.** $a^3 * b^3$

NAME ______________________ DATE ______________

# 1-1 Algebra 1 Summer Skills *(continued)*

## *Variables and Expressions*

**Write Algebraic Expressions** Translating verbal expressions into algebraic expressions is an important algebraic skill. In algebra, **variables** are symbols used to represent *unspecified numbers or values.* Any letter may be used as a variable.

**EXAMPLE: Write an algebraic expression for each verbal expression.**

**a. four more than a number *n***

The words *more than* imply addition.

four more than a number $n$

$4 + n$

The algebraic expression is $\mathbf{4 + n}$

**b. the difference of a number squared and 8**

The expression *difference of* implies subtraction.

the difference of a number squared and 8

$n^2 - 8$

The algebraic expression is $\mathbf{n^2 - 8}$

### EXERCISES

**Write an algebraic expression for each verbal expression.**

**1.** a number decreased by 8

**2.** a number divided by 8

**3.** a number squared

**4.** four times a number

**5.** a number divided by 6

**6.** a number multiplied by 37

**7.** the sum of 9 and a number

**8.** 3 less than 5 times a number

**9.** twice the sum of 15 and a number

**10.** one-half the square of $b$

NAME ____________________ DATE ____________

# 1-2 Algebra 1 Summer Skills
## *Order of Operations*

**Evaluate Numerical Expressions** Numerical expressions often contain more than one operation. To evaluate them, use the rules for order of operations shown below.

| | |
|---|---|
| **Order of Operations** | **Step 1:** Evaluate expressions inside grouping symbols.<br>**Step 2:** Evaluate all powers.<br>**Step 3:** Do all multiplication and/or division from left to right.<br>**Step 4:** Do all addition and/or subtraction from left to right. |

**EXAMPLE 1: Evaluate each expression.**

**a.** $3^4$

$3^4 = 3 \cdot 3 \cdot 3 \cdot 3$ Use 3 as a factor 4 times.

$= 81$ Multiply.

**b.** $6^3$

$6^3 = 6 \cdot 6 \cdot 6$ Use 6 as a factor 3 times.

$= 216$ Multiply.

**EXAMPLE 2: Evaluate the expression.**

**a.** $5 \cdot (12 \div 3)$

$5 \cdot (12 \div 3) = 5(4)$ Divide 12 by 3.

$= 20$ Multiply 5 and 4.

$= 3(18)$ Add 2 and 16.

$= 54$ Multiply 3 and 18.

**EXERCISES**

**Evaluate each expression.**

**1.** $5^2$

**2.** $3^3$

**3.** $10^4$

**4.** $12^2$

**5.** $8^3$

**6.** $2^8$

**7.** $(8 - 4) \cdot 2$

**8.** $(12 + 4) \cdot 6$

**9.** $10 + 8 \cdot 1$

NAME ______________________________ DATE ____________________

# 1-2 Study Algebra 1 Summer Skills *(continued)*

## *Order of Operations*

**Evaluate Algebraic Expressions** Algebraic expressions may contain more than one operation. Algebraic expressions can be evaluated if the values of the variables are known. First, replace the variables with their values. Then use the order of operations to calculate the value of the resulting numerical expression.

**EXAMPLE: Evaluate $x^3 + 5(y - 3)$ if $x = 2$ and $y = 12$.**

| | |
|---|---|
| $x^3 + 5(y - 3) = 2^3 + 5(12 - 3)$ | Replace $x$ with 2 and $y$ with 12. |
| $= 8 + 5(12 - 3)$ | Evaluate $2^3$. |
| $= 8 + 5(9)$ | Subtract 3 from 12. |
| $= 8 + 45$ | Multiply 5 and 9. |
| $= 53$ | Add 8 and 45. |

The solution is **53**.

### EXERCISES

**Evaluate each expression if $x = 2$, $y = 3$, $z = 4$, $a = \frac{4}{5}$, and $b = \frac{3}{5}$.**

**1.** $x + 7$

**2.** $3x - 5$

**3.** $x + y^2$

**4.** $x^3 + y + z^2$

**5.** $6a + 8b$

**6.** $23 - (a + b)$

**7.** $\frac{y^2}{z^2}$

**8.** $2xyz + 5$

**9.** $x(2y + 3z)$

**10.** $(10x)^2 + 100a$

**11.** $\frac{3xy - 4}{7x}$

**12.** $a^2 + 2b$

NAME ______________________________ DATE ____________________

# 1-3 Algebra 1 Summer Skills

## *Properties of Numbers*

**Identity and Equality Properties** The identity and equality properties in the chart below can help you solve algebraic equations and evaluate mathematical expressions.

| | |
|---|---|
| **Additive Identity** | For any number $a$, $a + 0 = a$. |
| **Additive Inverse** | For any number $a$, $a + (-a) = 0$. |
| **Multiplicative Identity** | For any number $a$, $a \cdot 1 = a$. |
| **Multiplicative Property of 0** | For any number $a$, $a \cdot 0 = 0$. |
| **Multiplicative Inverse Property** | For every number $\frac{a}{b}$, where $a, b \neq 0$, there is exactly one number $\frac{b}{a}$ (multiplicative inverse or reciprocal) such that the product $\frac{a}{b} \cdot \frac{b}{a} = 1$. |
| **Substitution Property** | If $a = b$, then $a$ may be replaced by $b$ in any expression. |

**EXAMPLE: Evaluate $24 \cdot 1 - 8 + 5(9 \div 3 - 3)$. Name the property used in each step.**

| | |
|---|---|
| $24 \cdot 1 - 8 + 5(9 \div 3 - 3) = 24 \cdot 1 - 8 + 5(3 - 3)$ | **Substitution**; $9 \div 3 = 3$ |
| $= 24 \cdot 1 - 8 + 5(0)$ | **Substitution**; $3 - 3 = 0$ |
| $= 24 - 8 + 5(0)$ | **Multiplicative Identity**; $24 \cdot 1 = 24$ |
| $= 24 - 8 + 0$ | **Multiplicative Property of Zero**; $5(0) = 0$ |
| $= 16 + 0$ | **Substitution**; $24 - 8 = 16$ |
| $= 16$ | **Additive Identity**; $16 + 0 = 16$ |

**EXERCISES**

**Evaluate each expression. Name the property used in each step.**

**1.** $2\left[\frac{1}{4} + \left(\frac{1}{2}\right)^2\right]$

**2.** $15 \cdot 1 - 9 + 2(15 \div 3 - 5)$

**3.** $2(3 \cdot 5 \cdot 1 - 14) - 4 \cdot \frac{1}{4}$

**4.** $18 \cdot 1 - 3 \cdot 2 + 2(6 \div 3 - 2)$

NAME ______________________ DATE ______________

# 1-3 Algebra 1 Summer Skills *(continued)*

## *Properties of Numbers*

**Commutative and Associative Properties** The Commutative and Associative Properties can be used to simplify expressions. The **Commutative** Properties state that the ***order*** in which you add or multiply numbers does not change their sum or product. The **Associative** Properties state that the way you ***group*** three or more numbers when adding or multiplying does not change their sum or product.

| | |
|---|---|
| **Commutative Properties** | For any numbers $a$ and $b$, $a + b = b + a$ and $a \cdot b = b \cdot a$. |
| **Associative Properties** | For any numbers $a$, $b$, and $c$, $(a + b) + c = a + (b + c)$ and $(ab)c = a(bc)$. |

**Example 1: Evaluate 6 • 2 • 3 • 5 using properties of numbers. Name the property used in each step.**

| | |
|---|---|
| $6 \cdot 2 \cdot 3 \cdot 5 = 6 \cdot 3 \cdot 2 \cdot 5$ | **Commutative Property** |
| $= (6 \cdot 3)(2 \cdot 5)$ | **Associative Property** |
| $= 18 \cdot 10$ | Multiply |
| $= 180$ | Multiply |

The product is **180**.

**Example 2: Evaluate 8.2 + 2.5 + 2.5 + 1.8 using properties of numbers. Name the property used in each step.**

$8.2 + 2.5 + 2.5 + 1.8$

| | |
|---|---|
| $= 8.2 + 1.8 + 2.5 + 2.5$ | **Commutative Property** |
| $= (8.2 + 1.8) + (2.5 + 2.5)$ | **Associative Property** |
| $= 10 + 5$ | Add |
| $= 15$ | Add |

The sum is **15**.

### Exercises

**Evaluate each expression using properties of numbers. Name the property used in each step.**

**1.** $12 + 10 + 8 + 5$

**2.** $10 \cdot 7 \cdot 2.5$

**3.** $4 \cdot 8 \cdot 5 \cdot 3$

**4.** $12 + 20 + 10 + 5$

**5.** $3\frac{1}{2} + 4 + 2\frac{1}{2} + 3$

**6.** $3.5 + 2.4 + 3.6 + 4.2$

NAME ______________________________ DATE ____________________

# 1-4 Algebra 1 Summer Skills

## *The Distributive Property*

**Evaluate Expressions** The Distributive Property can be used to help evaluate expressions.

| | |
|---|---|
| **Distributive Property** | For any numbers $a$, $b$, and $c$,<br>$a(b + c) = ab + ac$ and $(b + c)a = ba + ca$ and<br>$a(b - c) = ab - ac$ and $(b - c)a = ba - ca$. |

**Example 1:** **Use the Distributive Property to rewrite $6(8 + 10)$. Then evaluate.**

$6(8 + 10) = 6 \cdot 8 + 6 \cdot 10$ Distributive Property

$= 48 + 60$ Multiply.

$= 108$ Add.

**Example 2:** **Use the Distributive Property to rewrite $-2(3x^2 + 5x + 1)$. Then simplify.**

$-2(3x^2 + 5x + 1) = -2(3x^2) + (-2)(5x) + (-2)(1)$ Distributive Property

$= -6x^2 + (-10x) + (-2)$ Multiply.

$= -6x^2 - 10x - 2$ Simplify.

### Exercises

**Use the Distributive Property to rewrite each expression. Then evaluate or simplify.**

**1.** $3(2 + 5)$

**2.** $4(9 - 7)$

**3.** $5(4x - 9)$

**4.** $3(8 - 2x)$

**5.** $12\left(2 + \frac{1}{2}x\right)$

**6.** $\frac{1}{4}(12 - 4t)$

**7.** $3(5 + 4 + 3)$

**8.** $2(2r + 4s + 6t)$

**9.** $4(2x^2 + 9x - 3)$

NAME ______________________________ DATE ____________________

# 1-4 Algebra 1 Summer Skills *(continued)*

## *The Distributive Property*

**Simplify Expressions** A **term** is a number, a variable, or a product or quotient of numbers and variables. **Like terms** are terms that contain the same variables, with corresponding variables having the same powers. The Distributive Property and properties of equalities can be used to simplify expressions. An expression is in **simplest form** if it is replaced by an **equivalent** expression with no like terms or parentheses.

**Example: Simplify $4(a^2 + 3ab) - ab$.**

| | |
|---|---|
| $4(a^2 + 3ab) - ab = 4(a^2 + 3ab) - 1ab$ | Multiplicative Identity |
| $= 4a^2 + 12ab - 1ab$ | Distributive Property |
| $= 4a^2 + (12 - 1)ab$ | Distributive Property |
| $= 4a^2 + 11ab$ | Substitution |

### Exercises

**Simplify each expression. If not possible, write *simplified*.**

**1.** $12a - a$

**2.** $3x + 6x$

**3.** $3x - 1$

**4.** $20a + 12a - 8$

**5.** $3x^2 + 2x^2$

**6.** $-6x + 3x^2 + 10x^2$

**Write an algebraic expression for each verbal expression. Then simplify, indicating the properties used.**

**7.** six times the difference of $2a$ and $b$, increased by $4b$

**8.** two times the sum of $x$ squared and $y$ squared, increased by three times the sum of $x$ squared and $y$ squared

NAME ______________________ DATE ______________

# 1-6 Algebra 1 Summer Skills

## *Relations*

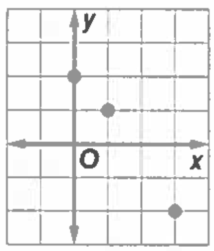
**Represent a Relation** A **relation** is a set of ordered pairs. A relation can be represented by a set of ordered pairs, a table, a graph, or a **mapping**. A mapping illustrates how each element of the domain is paired with an element in the range. The set of first numbers of the ordered pairs is the **domain** ($x$ values). The set of second numbers of the ordered pairs is the **range** ($y$ values) of the relation.

**Example:**

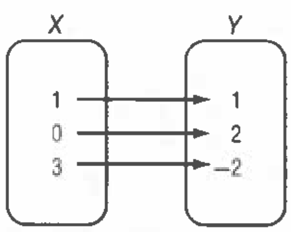
**a. Express the relation {(1, 1), (0, 2), (3, –2)} as a table, a graph, and a mapping.**

| $x$ | $y$ |
|---|---|
| 1 | 1 |
| 0 | 2 |
| 3 | –2 |

***table***




***graph***




***mapping***

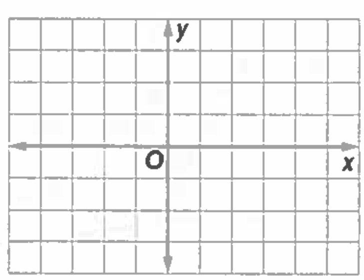
**b. Determine the domain and the range of the relation.**

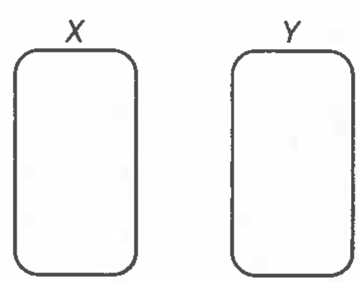
The domain for this relation is {0, 1, 3}. The range for this relation is {–2, 1, 2}.

**Exercises**

**1a.** Express the relation
{(–2, –1), (3, 3), (4, 3)}
as a table, a graph, and a mapping.

| x | y |
|---|---|
| | |
| | |
| | |




**1b.** Determine the domain and the range of the relation.

NAME ______________________________ DATE ____________________

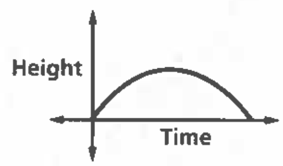
# 1–6 Algebra 1 Summer Skills *(continued)*

## *Relations*

**Graphs of a Relation** The value of the variable in a relation that is subject to choice is called the **independent variable**. The variable with a value that is dependent on the value of the independent variable is called the **dependent variable**. These relations can be graphed without a scale on either axis, and interpreted by analyzing the shape.

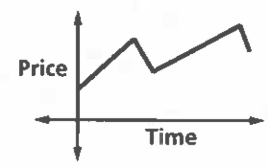
The **domain** ($x$ values) = **independent** and the **range** ($y$ values) = **dependent**.

**Example 1: The graph below represents the height of a football after it is kicked downfield. Identify the independent and the dependent variable for the relation. Then describe what happens in the graph.**




independent variable: time
dependent variable: height
The football starts on the ground when it is kicked. It gains altitude until it reaches a maximum height, then it loses altitude until it falls to the ground.

**Example 2: The graph below represents the price of stock over time. Identify the independent and dependent variable for the relation. Then describe what happens in the graph.**

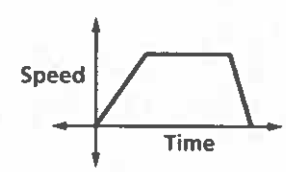



independent variable: time
dependent variable: price
The price increases steadily, then it falls, then increases, then falls again.

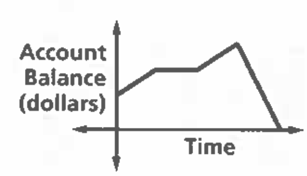
### Exercises

**Identify the independent and dependent variables for each relation. Then describe what is happening in each graph.**

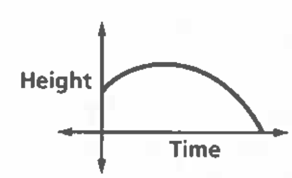
**1.** The graph represents the speed of a car as it travels to the grocery store.




**2.** The graph represents the balance of a savings account over time.




**3.** The graph represents the height of a baseball after it is hit.



NAME ________________________________ DATE ____________________

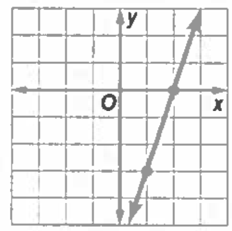
# 1-7 Algebra 1 Summer Skills
## *Functions*

**Identify Functions** Relations in which each element of the domain is paired with ***exactly one*** element of the range are called **functions**. A function is a relationship between the input (domain/$x$ values) and the output (range/$y$ values). Each input ($x$ value) has ***exactly one*** output ($y$ value).

**EXAMPLE 1:**
**Determine whether the relation $\{(6, -3), (4, 1), (7, -2), (-3, 1)\}$ is a function.**

Since each element of the domain is paired with exactly one element of the range, this relation is a function. **Yes**

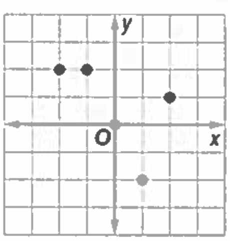
**EXAMPLE 2:**
**Determine whether the relation is a function.**

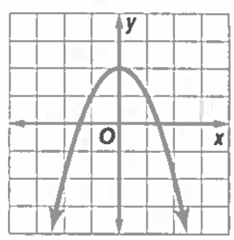


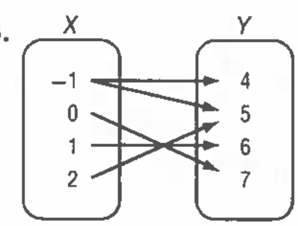

The graph is a line.

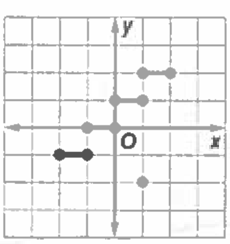
If you follow the line through each value of $x$, there is only one corresponding y value. For each value of $x$, the line passes through just one point of the graph. Thus, the line represents a function. **Yes**

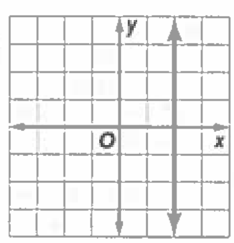
**EXERCISES**
**Determine whether each relation is a function. Answer "yes" or "no".**

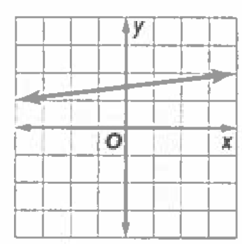
**1.**



**2.**



**3.**



**4.**



**5.**



**6.**



**7.** $\{(4, 2), (2, 3), (6, 1)\}$

**8.** $\{(-3, -3), (-3, 4), (-2, 4)\}$

**9.** $\{(-1, 0), (1, 0)\}$

NAME ______________________ DATE ______________

# 1-7 Algebra 1 Summer Skills *(continued)*
## *Functions*

**Find Function Values** Equations that are functions can be written in a form called **function notation**. For example, $y = 2x - 1$ can be written as $f(x) = 2x - 1$. In the function, $x$ represents the elements of the domain, and $f(x)$ represents the elements of the range. Suppose you want to find the value in the range that corresponds to the element 2 in the domain. This is written $f(2)$ and is read "$f$ of 2." The value of $f(2)$ is found by substituting 2 for $x$ in the equation.

**Example: If $f(x) = 3x - 4$, find each value.**

**a.** $f(3)$

$f(3) = 3(3) - 4$ Replace $x$ with 3.
$= 9 - 4$ Multiply.
$= \mathbf{5}$ Simplify.

**b.** $f(-2)$

$f(-2) = 3(-2) - 4$ Replace $x$ with $-2$.
$= -6 - 4$ Multiply.
$= \mathbf{-10}$ Simplify.

**Exercises**

**If $f(x) = 2x - 4$ and $g(x) = x^2 - 4x$, find each value.**

**1.** $f(4)$

**2.** $g(2)$

**3.** $f(-5)$

**4.** $g(-3)$

**5.** $f(0)$

**6.** $g(0)$

**7.** $f(3) - 1$

**8.** $f\left(\frac{1}{4}\right)$

**9.** $g\left(\frac{1}{4}\right)$

NAME ______________________________ DATE ____________________

# 2-1 Algebra 1 Summer Skills

## *Writing Equations*

**Write Equations** Writing equations is one strategy for solving problems. You can use a variable to represent an unspecified number or measure referred to in a problem. Then you can write a verbal expression as an algebraic expression.

**EXAMPLE 1: Translate each sentence into an equation or a formula.**

**a. Ten times a number $x$ is equal to 2.8 times the difference $y$ minus $z$.**

$10 \times x = 2.8 \times (y - z)$

The equation is $10x = 2.8(y - z)$.

**b. A number $m$ minus 8 is the same as a number $n$ divided by 2.**

$m - 8 = n \div 2$

The equation is $m - 8 = \frac{n}{2}$.

**c. The area of a rectangle equals the length times the width. Translate this sentence into a formula.**

Let $A$ = area, $\ell$ = length, and $w$ = width.

Formula: *Area equals length times width.*

$A = \ell \times w$

The formula for the area of a rectangle is $A = \ell w$.

**EXAMPLE 2: Use the Four-Step Problem-Solving Plan.**

**POPULATION The population of the United States in July 2007 was about 301,000,000, and the land area of the United States is about 3,500,000 square miles. Find the average number of people per square mile in the United States.**

**Step 1** *Read* You know that there are 301,000,000 people. You want to know the number of people per square mile.

**Step 2** *Plan* Write an equation to represent the situation. Let $p$ represent the number of people per square mile.

$3{,}500{,}000 \times p = 301{,}000{,}000$

**Step 3** *Solve* $3{,}500{,}000 \times p = 301{,}000{,}000$.

$3{,}500{,}000p = 301{,}000{,}000$ — Divide each side by 3,500,000.

$p = 86$

There are 86 people per square mile.

**Step 4** *Check* If there are 86 people per square mile and there are 3,500,000 square miles, $86 \times 3{,}500{,}000 = 301{,}000{,}000$. The answer makes sense.

### EXERCISES

**Translate each sentence into an equation or formula.**

**1.** Three times a number $t$ minus twelve equals forty.

**2.** One–half of the difference of $a$ and $b$ is 54.

**3.** Three times the sum of $d$ and 4 is 32.

**4.** The area $A$ of a circle is the product of $\pi$ and the radius $r$ squared.

**5. WEIGHT LOSS** Lou wants to lose weight to audition for a part in a play. He weighs 160 pounds now. He wants to weigh 150 pounds.

**a.** If $p$ represents the number of pounds he wants to lose, write an equation to represent this situation.

**b.** How many pounds does he need to lose to reach his goal?

NAME ______________________________ DATE ____________________

# 2-1 Algebra 1 Summer Skills *(continued)*

## *Writing Equations*

**Write Verbal Sentences** You can translate equations into verbal sentences.

**EXAMPLE: Translate each equation into a sentence.**

**a.** $4n - 8 = 12$

$4n \quad - \quad 8 \quad = \quad 12$

Four times $n$ minus eight equals twelve.

**b.** $a^2 + b^2 = c^2$

$a^2 \quad + \quad b^2 \quad = \quad c^2$

The sum of the squares of $a$ and $b$ is equal to the square of $c$.

**EXERCISES**

**Translate each equation into a sentence.**

**1.** $4a - 5 = 23$

**2.** $10 + k = 4k$

**3.** $6xy = 24$

**4.** $x^2 + y^2 = 8$

**5.** $p + 3 = 2p$

**6.** $b = \frac{1}{3}(h - 1)$

**7.** $100 - 2x = 80$

**8.** $3(g + h) = 12$

NAME ________________________ DATE ______________

# 2-2 Algebra 1 Summer Skills

## *Solving One-Step Equations*

**Solve Equations Using Addition and Subtraction** If the same number is added to each side of an equation, the resulting equation is equivalent to the original one. In general if the original equation involves subtraction, this property will help you solve the equation. Similarly, if the same number is subtracted from each side of an equation, the resulting equation is equivalent to the original one. This property will help you solve equations involving addition.

| | |
|---|---|
| **Addition Property of Equality** | For any numbers $a$, $b$, and $c$, if $a = b$, then $a + c = b + c$. |
| **Subtraction Property of Equality** | For any numbers $a$, $b$, and $c$, if $a = b$, then $a - c = b - c$. |

**EXAMPLE 1:** **Solve $m - 32 = 18$.**

| | |
|---|---|
| $m - 32 = 18$ | Original equation |
| $m - 32 + 32 = 18 + 32$ | Add 32 to each side. |
| $m = 50$ | Simplify. |

The solution is **50**.

**Example 2:** **Solve $22 + p = -12$.**

| | |
|---|---|
| $22 + p = -12$ | Original equation |
| $22 + p - 22 = -12 - 22$ | Subtract 22 from each side. |
| $p = -34$ | Simplify. |

The solution is **–34**.

**EXERCISES**

**Solve each equation. Check your solution.**

**1.** $h - 3 = -2$

**2.** $m - 8 = -12$

**3.** $p - 5 = 15$

**4.** $20 = y - 8$

**5.** $k - 0.5 = 2.3$

**6.** $w - \frac{1}{2} = \frac{5}{8}$

**7.** $x + 12 = 6$

**8.** $w + 2 = -13$

**9.** $-17 = b + 4$

**10.** $k + (-9) = 7$

**11.** $-3.2 = \ell + (-0.2)$

**12.** $-\frac{3}{8} + x = \frac{5}{8}$

NAME ______________________________ DATE ____________________

# 2-2 Algebra 1 Summer Skills *(continued)*

## *Solving One-Step Equations*

**Solve Equations Using Multiplication and Division** If each side of an equation is multiplied by the same number, the resulting equation is equivalent to the given one. You can use the property to solve equations involving multiplication and division. To solve equations with multiplication and division, you can also use the Division Property of Equality. If each side of an equation is divided by the same number, the resulting equation is true.

| | |
|---|---|
| **Multiplication Property of Equality** | For any numbers $a$, $b$, and $c$, if $a = b$, then $ac = bc$. |
| **Division Property of Equality** | For any numbers $a$, $b$, and $c$, with $c \neq 0$, if $a = b$, then $\frac{a}{b} = \frac{b}{c}$. |

**EXAMPLE 1: Solve $3\frac{1}{2}p = 1\frac{1}{2}$.**

$3\frac{1}{2}p = 1\frac{1}{2}$ Original equation

$\frac{7}{2}p = \frac{3}{2}$ Rewrite each mixed number as an improper fraction.

$\frac{2}{7}\left(\frac{7}{2}p\right) = \frac{2}{7}\left(\frac{3}{2}\right)$ Multiply each side by $\frac{2}{7}$.

$p = \frac{3}{7}$ Simplify.

The solution is $\frac{3}{7}$.

**EXAMPLE 2: Solve $-5n = 60$.**

$-5n = 60$ Original equation

$\frac{-5n}{-5} = \frac{60}{-5}$ Divide each side by $-5$.

$n = -12$ Simplify.

The solution is **$-12$**.

### EXERCISES

**Solve each equation. Check your solution.**

**1.** $\frac{h}{3} = -2$

**2.** $\frac{1}{8}m = 6$

**3.** $\frac{1}{5}p = \frac{3}{5}$

**4.** $5 = \frac{y}{12}$

**5.** $-\frac{1}{4}k = -2.5$

**6.** $-\frac{m}{8} = \frac{5}{8}$

**7.** $3h = -42$

**8.** $8m = 16$

**9.** $-3t = 51$

**10.** $-3r = -24$

**11.** $8k = -64$

**12.** $-2m = 16$