

# White Station Middle School



## 2022 Summer Rising 8<sup>th</sup> Grade


















**Student Name** \_\_\_\_\_  
(Please be sure to write your initials on the line at the bottom of each page.)




This packet contains math concepts that may or may not have been taught in your previous classes but are important for 8<sup>th</sup> Grade Pre-Algebra. Students enrolled in Pre-Algebra for the 2022-2023 school year are expected to submit a completed packet during the first week of school (August 8-12). Exact due dates/procedures will be discussed on August 8th.

## 8<sup>th</sup> Grade Pre-Algebra Summer Math Packet Instructions

Student Name \_\_\_\_\_

1. This packet has 6 sections and it is recommended that students work on one section each week during the summer. It is NOT recommended to complete this packet immediately following school dismissal nor the night before the packet is due. Student learning is most effective if the packet is worked on throughout the summer at a steady pace.
2. You should complete the problems without a calculator, and you should **SHOW ALL YOUR WORK**. Use additional paper is needed. No credit will be provided if your work is not shown.
3. After completing a section, rate your understanding of each week's topic by circling the image in the chart below.
  - **Smiley face** – You understand ALL the concepts for that week and would be able to teach it to another student.
  - **Neutral face** – You understand the concepts for the most part
  - **Confused face** – You do not understand these concepts and need help reviewing.

WEEK	MATH TOPIC	MY RATING		
1	Integer Operations			
2	Order of Operations			
3	Laws of Exponents			
4	Pythagorean Theorem			
5	Simplifying Radicals			

6	Graphing Linear Equations			
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### What do I do if I don't understand something?

- Use your resources (online help sites, iReady, Study Island, videos, parents, siblings, etc.)
- You may use the reference links in this packet to help you.
- Make a note of the topic/question on the rating chart and ask your teacher to review it during the first week of school.

### What happens next?

- Concepts will be reviewed and discussed during the first week of school.
- Students will receive both a participation grade and a project grade, based on the packet completion.

We are excited about working with all of the students entering 8<sup>th</sup> Grade Pre-Algebra in 2022-2023. We want all students to feel prepared, confident, and successful for all of the important new concepts they will learn next year.



## Rising Pre-Algebra RESOURCES

WEEK	MATH TOPIC	VIDEO & TUTORIAL LINKS
1	Integer Operations	<ul style="list-style-type: none"> <li><a href="https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-negative-numbers-add-and-subtract/cc-7th-sub-neg-intro/v/adding-and-subtracting-negative-number-examples">https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-negative-numbers-add-and-subtract/cc-7th-sub-neg-intro/v/adding-and-subtracting-negative-number-examples</a></li> <li><a href="https://www.youtube.com/watch?v=0hEQL3F5mc8">https://www.youtube.com/watch?v=0hEQL3F5mc8</a></li> </ul>
2	Order of Operations	<ul style="list-style-type: none"> <li><a href="https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-arithmetic-operations/cc-6th-order-of-operations/v/order-of-operations-1">https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-arithmetic-operations/cc-6th-order-of-operations/v/order-of-operations-1</a></li> <li><a href="https://www.youtube.com/watch?v=dXvvGc9TldY">https://www.youtube.com/watch?v=dXvvGc9TldY</a></li> </ul>
3	Laws of Exponents	<ul style="list-style-type: none"> <li><a href="https://www.mathwarehouse.com/algebra/exponents/laws-of-exponents.php">https://www.mathwarehouse.com/algebra/exponents/laws-of-exponents.php</a></li> <li><a href="https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-pos-neg-exponents/v/negative-exponents">https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-pos-neg-exponents/v/negative-exponents</a></li> <li><a href="https://mathantics.com/lesson/laws-of-exponents">https://mathantics.com/lesson/laws-of-exponents</a></li> </ul>
4	Pythagorean Theorem	<ul style="list-style-type: none"> <li><a href="https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-geometry/cc-8th-pythagorean-theorem/v/the-pythagorean-theorem">https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-geometry/cc-8th-pythagorean-theorem/v/the-pythagorean-theorem</a></li> <li><a href="https://www.youtube.com/watch?v=-jeYE99qwBY">https://www.youtube.com/watch?v=-jeYE99qwBY</a></li> </ul>
5	Simplifying Radicals	<ul style="list-style-type: none"> <li><a href="https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:rational-exponents-radicals/x2f8bb11595b61c86:simplifying-square-roots/v/simplifying-square-roots-1">https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:rational-exponents-radicals/x2f8bb11595b61c86:simplifying-square-roots/v/simplifying-square-roots-1</a></li> <li><a href="https://www.youtube.com/watch?v=oB7r_kfMC6o">https://www.youtube.com/watch?v=oB7r_kfMC6o</a></li> </ul>
6	Graphing Linear Equations (slope – intercept form)	<ul style="list-style-type: none"> <li><a href="https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:forms-of-linear-equations/x2f8bb11595b61c86:graphing-slope-intercept-equations/v/graphing-a-line-in-slope-intercept-form">https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:forms-of-linear-equations/x2f8bb11595b61c86:graphing-slope-intercept-equations/v/graphing-a-line-in-slope-intercept-form</a></li> <li><a href="https://www.youtube.com/watch?v=mDwREDma3ro">https://www.youtube.com/watch?v=mDwREDma3ro</a></li> </ul>

## Week 1: Integer Operations

### Addition

When addends have the same sign, add. Use that sign when you write the sum:

$$5 + 8 = 13$$
$$-2 + -5 = -7$$

When addends have different signs, subtract. Use the sign of the greater addend:

$$-6 + 4 = -2$$
$$45 + -10 = 35$$

### Subtraction

To subtract an integer, add its opposite:

\*The opposite of 12 is -12

$$4 - 12 = 4 + -12 = -8$$
$$9 - -12 = 9 + 12 = 21$$

\*The opposite of 15 is -15

$$1 - -15 = 1 + 15 = 16$$
$$-20 - -15 = -20 + 15 = -5$$

### Multiplication

When factors have the same sign, the product is positive:

$$5 \cdot 6 = 30$$
$$-13 \cdot -3 = 39$$

When the factors have different signs, the product is negative:

$$-6 \cdot 8 = -48$$
$$9 \cdot -11 = -99$$

### Division

When the dividend and the divisor have the same sign, the quotient is positive:

$$45 \div 5 = 9$$
$$-120 \div -6 = 20$$

When the dividend and the divisor have different signs, the quotient is negative:

$$35 \div -5 = -7$$
$$-250 \div 10 = -25$$

Solve:

1.  $-2 + (+3) =$

2.  $-3(-4) =$

3.  $45 - (-27) =$

4.  $-5 + (+4) =$

5.  $24 \div (-6) =$

6.  $19(-4) =$

7.  $5 - (-3) =$

8.  $5(-18) =$

8.  $-42 \div (-6) =$

9.  $-7 - (-3) =$

10.  $-8 \div (-4) =$

11.  $-21 + -19 =$

12.  $-14 - 6 =$

13.  $17(-4) =$

14.  $32 \div (-4) =$

15.  $6 + (-8) =$

16.  $81 \div (-9) =$

17.  $14 - (-7) + (-2) =$

18.  $93 - -21 =$

19.  $-7 + 2 =$

20.  $-21 \div (-7) =$

21.  $-3 * -6$

22.  $15 * -3$

23.  $-4 * 9$

24.  $-3 * -5 * -6$

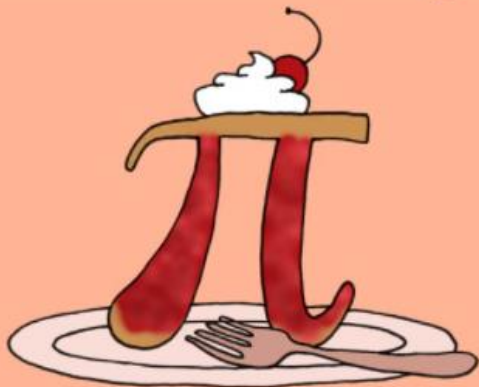
25.  $-24 \div -3$

26.  $40 \div -8$

27.  $10 * -9$

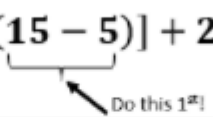




28.  $-98 \div 7$

**Why shouldn't you let advanced  
math intimidate you?**



It's really as easy as *pi*!

## Week 2: Order of Operations

Order of Operations			
1 <sup>st</sup>	Grouping Symbols	$\frac{4+2}{8 \cdot 7} = \frac{(4+2)}{(8 \cdot 7)}$ $\sqrt{50 - 1}$ $50 - [3 \cdot (15 - 5)] + 23$ 	<b>Grouping Symbols include:</b> $()$ , $\{ \}$ , $[ ]$ , $   $ ← absolute value bars.  In addition, complete all operations <b>grouped</b> by the <u>numerator</u> or <u>denominator</u> in a fraction & operations located underneath a radical symbol.
2 <sup>nd</sup>	Radicals & Exponents	$3^2$ $3^{\frac{1}{2}}$ $\sqrt{3}$ $\sqrt[4]{81}$	Rational Exponents & Roots are included
3 <sup>rd</sup>	Division & Multiplication	$30 \div 2 \cdot 5 = 75$ versus $30 \cdot 2 \div 5 = 12$ 	Calculate Left to Right 
4 <sup>th</sup>	Subtraction & Addition	$-2 + 6 - 8 = -4$ 	Calculate Left to Right 

Use the order of operations to solve the following problems.

1.  $18 - (-12 - 3) =$

2.  $-19 + (7 + 4)3 =$

3.  $18 + (-7) \cdot (32 - 6) =$

4.  $-19 - (-3) + -2(8 + -4) =$

5.  $20 + -4(32 - 6) =$

6.  $-3 + 2(-6 \div 3)2$

7.  $3 \cdot (-4) + (52 + -4 \cdot 2) - (-9.82) =$

8.  $23 + (-16) \div 42 \cdot 5 - (-3) =$

9.  $-6(12 - 15) + 23 =$

10.  $-50 \div (-10) + (5 - 3)^4 =$

11.  $-4.5 \cdot (-0.53) + (-1)$

12.  $5 - 2 + 8$

13.  $85 / 5 + (8+9) \times 2 =$

## Week 3: Laws of Exponents

1. **PRODUCT RULE:** To multiply when two bases are the same, write the base and ADD the exponents.

$$x^m \cdot x^n = x^{m+n}$$

Examples:

A.  $x^3 \cdot x^8 = x^{11}$

B.  $2^4 \cdot 2^2 = 2^6$

C.  $(x^2y)(x^3y^4) = x^5y^5$

2. **QUOTIENT RULE:** To divide when two bases are the same, write the base and SUBTRACT the exponents.

$$\frac{x^m}{x^n} = x^{m-n}$$

Examples:

A.  $\frac{x^5}{x^2} = x^3$

B.  $\frac{3^5}{3^3} = 3^2$

C.  $\frac{x^2y^5}{xy^3} = xy^2$

3. **ZERO EXPONENT RULE:** Any base (except 0) raised to the zero power is equal to one.

$$x^0 = 1$$

Examples:

A.  $y^0 = 1$

B.  $6^0 = 1$

C.  $(7a^3b^{-1})^0 = 1$

4. **POWER RULE:** To raise a power to another power, write the base and MULTIPLY the exponents.

$$(x^m)^n = x^{m \cdot n}$$

Examples:

A.  $(x^3)^2 = x^6$

B.  $(3^2)^4 = 3^8$

C.  $(z^5)^2 = z^{10}$

5. **EXPANDED POWER RULE:**

$$(xy)^m = x^m y^m \quad \left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$$

Examples:

A.  $(2a)^3 = 2^3 a^3 = 8a^3$

C.  $\left(\frac{x^2}{y}\right)^4 = \frac{(x^2)^4}{y^4} = \frac{x^8}{y^4}$

B.  $(6x^3)^2 = 6^2 (x^3)^2 = 36x^6$

D.  $\left(\frac{2x}{3y^2}\right)^3 = \frac{(2x)^3}{(3y^2)^3} = \frac{2^3 x^3}{3^3 (y^2)^3} = \frac{8x^3}{27y^6}$

6. **NEGATIVE EXPONENTS:** If a factor in the numerator or denominator is moved across the fraction bar, the sign of the exponent is changed.

$$x^{-m} = \frac{1}{x^m} \quad \frac{1}{x^{-m}} = x^m \quad \left(\frac{x}{y}\right)^{-n} = \left(\frac{y}{x}\right)^n$$

Examples:

A.  $x^{-3} = \frac{1}{x^3}$

B.  $4^{-2} = \frac{1}{4^2} = \frac{1}{16}$

C.  $-4x^5y^{-2} = \frac{-4x^5}{y^2}$

D.  $\left(\frac{x^2}{y}\right)^{-3} = \left(\frac{y}{x^2}\right)^3 = \frac{y^3}{x^6}$

E.  $(3x^{-2}y)(-2xy^{-3}) = -6x^{-1}y^{-2} = \frac{-6}{xy^2}$

F.  $\frac{a^{-2}b^3}{c^{-4}d^{-1}} = \frac{b^3c^4d}{a^2}$

G.  $(-2x^2y^{-4})^{-2} = \left(\frac{-2x^2}{y^4}\right)^{-2} = \left(\frac{y^4}{-2x^2}\right)^2 = \frac{y^8}{4x^4}$

**CAUTION:**  $-x \neq \frac{1}{x}$  For example:  $-3 \neq \frac{1}{3}$

**REMEMBER:** An exponent applies to only the factor it is directly next to *unless* parentheses enclose other factors.

Examples:

A.  $(-3)^2 = (-3)(-3) = 9$

B.  $-3^2 = -9$

Simplify each of the following.

1.  $3 \cdot 4^3$

2.  $4x^3 \cdot 2x^3$

3.  $x^5 \cdot x^3$

4.  $2x^3 \cdot 2x^2$

5.  $\frac{6^5}{6^3}$

6.  $\frac{x^4}{x^7}$

7.  $8^0$

8.  $-(9x)^0$

9.  $(y^4)^3$

10.  $(x^2y)^4$

11.  $\frac{6x^7}{2x^4}$

12.  $\frac{8x^5}{4x^2}$

13.  $(2cd^4)^2(cd)^5$

14.  $(2fg^4)^4(fg)^6$

15.  $\frac{x^5y^6}{xy^2}$

16.  $\frac{x^2y^5}{xy^4}$

17.  $\left(\frac{4x^5y}{16xy^4}\right)^3$

18.  $\left(\frac{5x^3y}{20xy^5}\right)^4$

19.  $y^{-7}$

20.  $7^{-2}$

21.  $\frac{1}{x^{-5}}$

22.  $\frac{1}{2^{-4}}$

23.  $x^5 \cdot x^{-1}$

24.  $x^{-6}$

25.  $x^9 \cdot x^{-7}$

26.  $(j^{-13})(j^4)(j^6)$

27.  $\frac{x^{-1}}{x^{-8}}$

28.  $\frac{52x^6}{13x^{-7}}$

29.  $f^{-3}(f^2)(f^{-3})$

30.  $\frac{x^{-4}}{x^{-9}}$

31.  $\frac{24x^6}{12x^{-8}}$

32.  $\frac{3x^2y^{-3}}{12x^6y^3}$

33.  $(2x^3y^{-3})^{-2}$

34.  $\frac{2x^4y^{-4}}{8x^7y^3}$

35.  $(4x^4y^{-4})^3$

36.  $5x^2y(2x^4y^{-3})$

37.  $\left(\frac{-7a^2b^3c^0}{3a^3b^4c^3}\right)^{-4}$

38.  $\left(\frac{-2a^3b^2c^0}{3a^2b^3c^7}\right)^{-2}$

39)  $a \cdot a^2 \cdot a^3$

40)  $(2a^2b)(4ab^2)$

41)  $(6x^2)(-3x^5)$

42)  $b^3 \cdot b^4 \cdot b^7 \cdot b$

43)  $(3x^3)(3x^4)(-3x^2)$

44)  $(2x^2y^3)^2$

45)  $(5x^2y^4)^3$

46)  $(6x^4y^6)^3$

47)  $(4x^3y^3)^3$

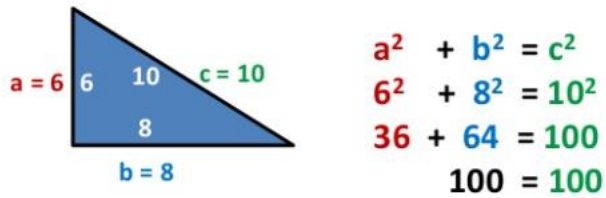
48)  $(7xy)^2$

49)  $\frac{x^3}{x}$

50)  $\frac{18c^3}{-3c^2}$

## Week 4: Pythagorean Theorem

### Pythagoras Theorem



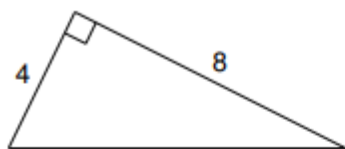
Pythagoras rule works on all Right Angled Triangles

Find the missing side lengths.

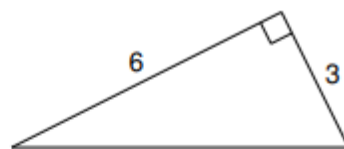
1. 	2. 
3. 	4. 
5. 	6. 

Find the missing length to the nearest tenth.

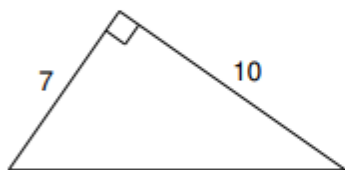
7)



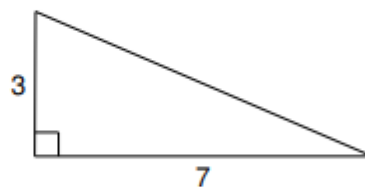
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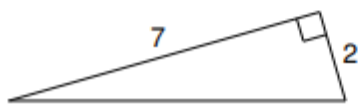
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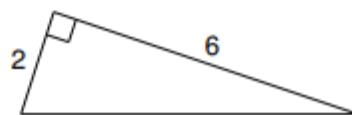
10)



11)



12)



What is the missing side length? Show your work.

13)  $a = 7$ ,  $b = 24$ ,  $c = ?$

14)  $a = ?$ ,  $b = 34$ ,  $c = 37$

15)  $a = 11$ ,  $b = ?$ ,  $c = 61$

16)  $a = 5$ ,  $b = 12$ ,  $c = ?$

## Week 5: Simplifying Radicals

### Simplify Square Roots

#### Find Perfect Square

$$\begin{aligned}\sqrt{48} &= \sqrt{16} \times \sqrt{3} \\ &= 4 \times \sqrt{3} \\ &= 4\sqrt{3}\end{aligned}$$

#### Find Prime Factors

$$\begin{aligned}\sqrt{48} &= \sqrt{2 \times 2 \times 2 \times 2 \times 3} \\ &= \sqrt{2 \times 2} \times \sqrt{2 \times 2} \times \sqrt{3} \\ &= 2 \times 2 \times \sqrt{3} \\ &= 4 \times \sqrt{3} \\ &= 4\sqrt{3}\end{aligned}$$

Simplify completely.

1.  $\sqrt{9} =$

2.  $\sqrt{32}$

3.  $\sqrt{50}$

4.  $\sqrt{80}$

5.  $\sqrt{72}$

6.  $\sqrt{120}$

7.  $\sqrt{68}$

8.  $\sqrt{200}$

9.  $\sqrt{180}$

10.  $\sqrt{33}$

11.  $3\sqrt{12}$

12.  $5\sqrt{48}$

13.  $2\sqrt{76}$

14.  $-3\sqrt{32}$

15.  $5\sqrt{80}$

16)  $\sqrt{28}$

17)  $\sqrt{45}$

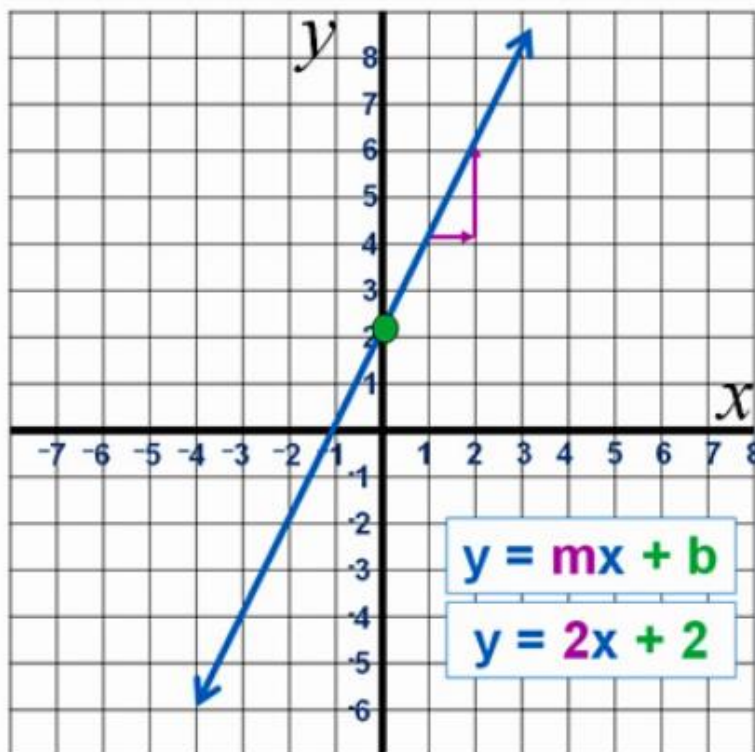
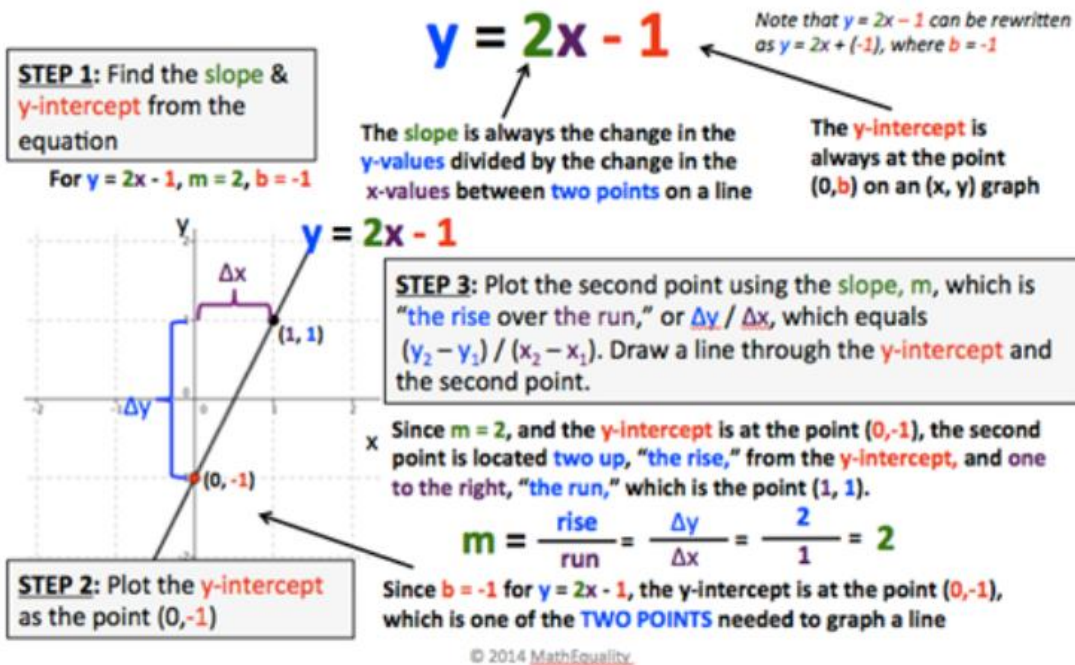
18)  $\sqrt{72}$

19)  $\sqrt{20}$

20)  $\sqrt{150}$

## Week 6: Graphing Linear Equations (Slope – Intercept Form)

### Step-by-Step Method to Graph a Line when in Slope-Intercept Form



The value of  $b$  or  $c$  is the point at which the line crosses the **y-axis**

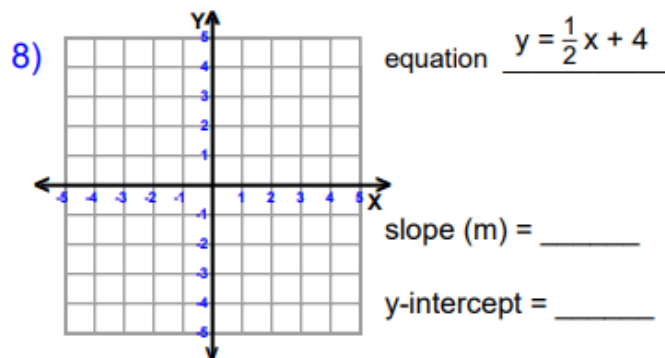
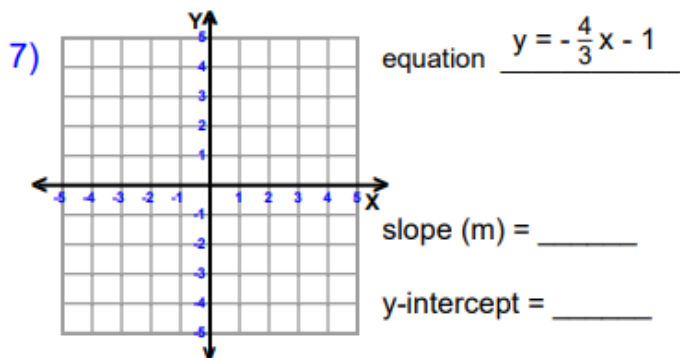
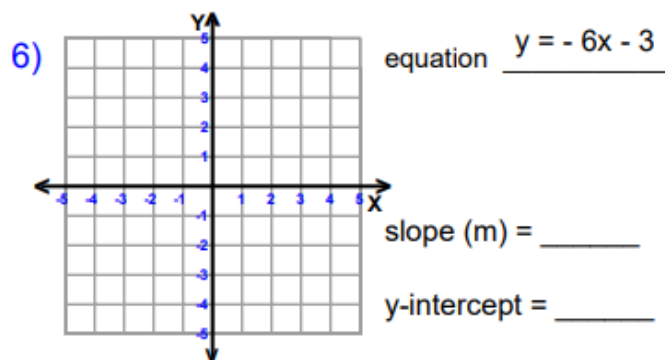
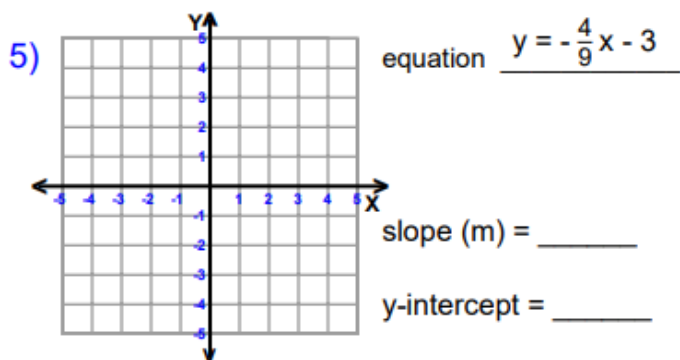
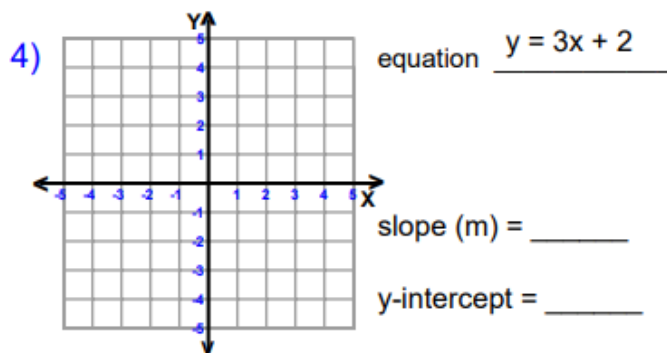
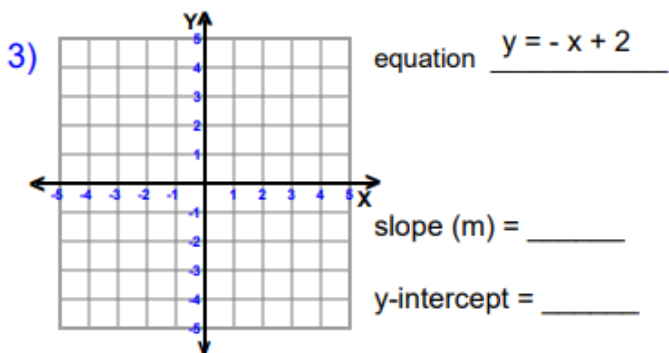
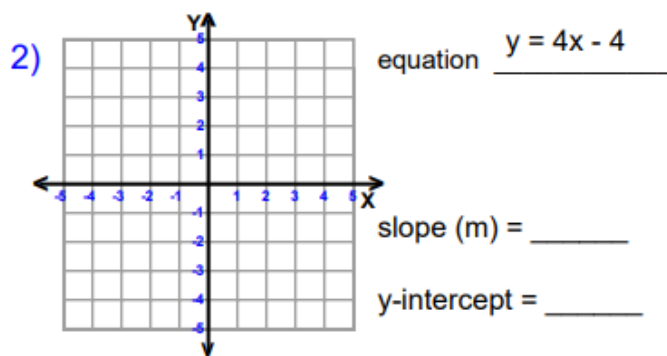
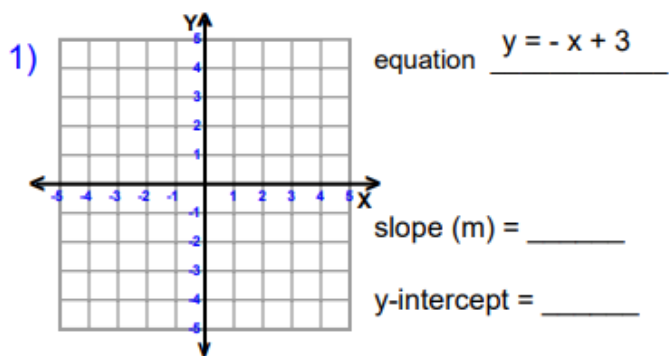
$$b = 2$$

$m$  is the **gradient** slope which is the **Rise Up / Run Across**

Each time the line moves 1 place to the right, it goes **UP** by 2 places.

$$m = 2/1 = 2$$

Graph each line with a straight edge or ruler. Then tell the slope and y-intercept.



Graph each line with a straight edge or ruler.

