

**SUMMER PACKET FOR STUDENTS ENTERING  
ALGEBRA II, ALGEBRA II ESSENTIALS, AND ALGEBRA II +**

Dear Students,

This summer packet is intended for you to brush up on some of the topics of Algebra I. Completion of this packet is required. The packet will be collected on the first day of school.

All problems are designed to be completed without a calculator. Answers are provided at the end of the packet.

Please feel free to work with a friend, an adult, or to use any on-line resources for help with concepts.

We look forward to seeing you in August!

Sincerely,

BHA Math Department

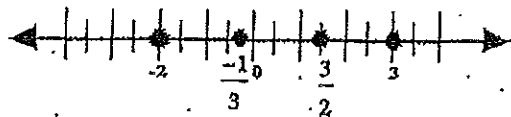
### Section 1: Ordering Numbers

Example: Graph the numbers on a number line, then write the numbers in increasing order.

Given:  $3, \frac{3}{2}, -2, -\frac{1}{3}$

Step 1: Rewrite #'s as decimals 3, 1.5, -2, -.33

Step 2: Plot on number line



Step 3: Write the #'s from least to greatest.

$$-2, -\frac{1}{3}, \frac{3}{2}, 3$$

Try these:

1.  $4, \frac{-5}{2}, 0, \frac{3}{4}$

2.  $1, \frac{-2}{3}, \frac{7}{2}, -4$

### Section 2: Vocabulary

Circle the sign of the operation that corresponds to the term.

3. Product + -  $\cdot$   $\div$

4. Sum + -  $\cdot$  +

5. Difference + -  $\cdot$  +

6. Quotient + -  $\cdot$   $\div$

### Section 3: Order of Operation (no calculator)

When given an expression to evaluate use the following steps:

1. Parentheses
2. Exponents
3. Multiplication & Division (left to right)
4. Addition & Subtraction (left to right)

Example:

$$(3 - 1)^2 + 10 \div 5$$

$$(2)^2 + 10 \div 5$$

$$4 + 10 \div 5$$

$$4 + 2$$

$$6$$

Try These:  
Evaluate the following expressions without a calculator.

7.  $4 + 4 \div 2 - 1$

8.  $20 + (7 - 5)^2 + 2$

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**Section 4: Combining Like Terms**

Example:

$$5x^2 + 3x - 2 - 4x^2 + 5x - 4 =$$

$$\underline{5x^2} + \underline{3x} - \underline{2} - \underline{4x^2} + \underline{5x} - \underline{4} =$$

$$x^2 + 8x - 6$$

Try these:

9.  $5x^2 + 3x - 2x + 4x^2$

10.  $2(x - 2) + 4(x + 3)$

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**Section 5: Fractions (Without Calculator)**

Simplifying or Reducing Fractions

Example:

a.  $\frac{3}{6} = \frac{1}{2}$

b.  $\frac{4 \pm 6\sqrt{2}}{2} = \frac{4}{2} \pm \frac{6\sqrt{2}}{2} = 2 \pm 3\sqrt{2}$

Try These:

11.  $\frac{4}{16}$

12.  $\frac{4 \pm 2\sqrt{3}}{6}$

13.  $\frac{15 \pm 10\sqrt{5}}{25}$

Adding and Subtracting (Find the Least Common Denominator)

Example:

To add:  $\frac{1}{4} + \frac{5}{6}$

$\boxed{\text{LCD} = 12}$

To subtract:  $\frac{2}{3x} - \frac{1}{6}$

$\boxed{\text{LCD} = 6x}$

$$\frac{3}{12} + \frac{10}{12} = \frac{13}{12}$$

$$\frac{4}{6x} - \frac{x}{6x} = \frac{4-x}{6x}$$

Try These: Add or Subtract

14.  $\frac{1}{3} + \frac{4}{5}$

15.  $\frac{7}{12} - \frac{1}{4x}$

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

## Multiplying Fractions

### Example:

- Step 1: Multiply the numerators
- Step 2: Multiply denominators
- Step 3: Simplify or reduce if necessary

$$\text{Ex. } \frac{3}{4} \cdot \frac{3}{5} = \frac{9}{20}$$

Try these:

$$17. \frac{3}{4} \cdot \frac{8}{9} =$$

$$18. \frac{2}{3} \cdot \frac{4}{5} =$$

$$19. \frac{15}{4} \cdot \frac{6}{5} \cdot \frac{8}{9} =$$

## Dividing Fractions

### Example:

- Step 1: Find reciprocal of second fraction
- Step 2: Multiply the 2 fractions
- Step 3: Reduce if necessary

$$\text{Ex. } \frac{3}{10} \div \frac{1}{5} = \frac{3}{10} \cdot \frac{5}{1} = \frac{15}{10} = \frac{3}{2}$$

Try These:

$$20. \frac{1}{3} \div \frac{8}{5} =$$

$$21. \frac{4}{7} \div \frac{4}{5} =$$

$$22. \frac{8}{9} \left( \frac{-24}{15} \right) =$$

## Section 6: Solving Equations

### Example:

- Step 1: Clear fraction by multiplying by LCD (Lowest Common Denominator) if necessary
- Step 2: Move all variables to one side
- Step 3: Move constants to other side

$$\begin{aligned} \text{Given: } & \frac{3}{2}x + 6 = 5 + x \\ & \left[ \frac{3}{2}x + 6 = 5 + x \right] \cdot 2 \\ & 3x + 12 = 10 + 2x \\ & x + 12 = 10 \\ & x = -2 \end{aligned}$$

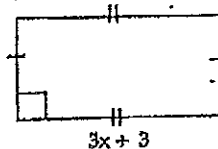
Try These: Find the value of x.

$$23. 3x - 9 = 2(x - 5)$$

$$24. \frac{3}{4}x + 1 = 4$$

$$25. \frac{x}{5} = \frac{8}{2}$$

$$26. \text{Perimeter} = 20$$



## Section 7: Inequalities

**Example:** Solve and Graph

$$2x + 1 \leq 6x - 1$$

> Move variable to one side

$$-4x + 1 \leq -1$$

> Bring constant to other side

$$-4x \leq -2$$

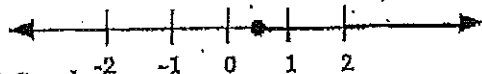
> Divide by -2

$$x \geq \frac{1}{2}$$

**NOTE:** When multiplying or dividing by a negative, flip the inequality sign.

If sign  $<$  or  $>$ , then dot on graph is open  $\circ$

If sign  $\leq$  or  $\geq$ , then dot on graph is solid  $\bullet$



**Try These: Solve and Graph**

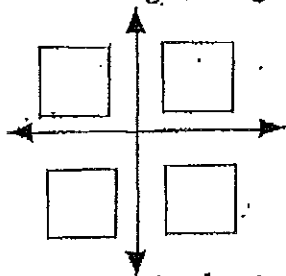
27.  $3x + 2 < 5$

28.  $3 - 2x \leq 5$

## Section 8: Graphing

29. Complete the following.

- Label the quadrants I, II, III, IV
- Clearly label the x & y axis
- Clearly label the origin, using a point and the ordered pair

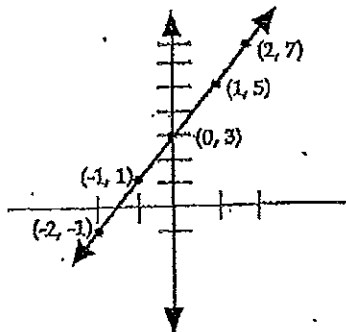


**Example:**

Complete the table of values for the given function. Then graph the function.

$$y = 2x + 3$$

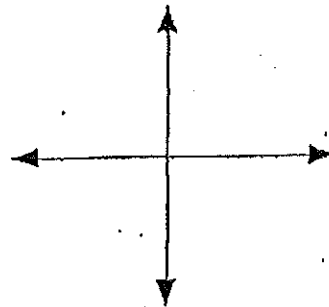
x	y = 2x + 3	y
-2	2(-2) + 3	-1
-1	2(-1) + 3	1
0	2(0) + 3	3
1	2(1) + 3	5
2	2(2) + 3	7



Try This: Complete the table of values for the given function. Then graph the function.

30.  $y = -\frac{1}{2}x + 4$

x	y

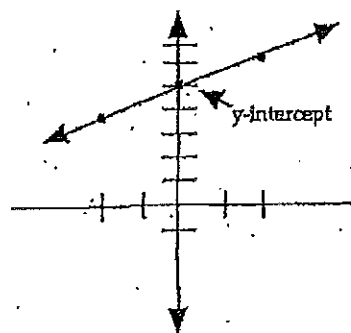


Example:

Graph  $y = \frac{1}{2}x + 5$  using the slope and the y-intercept.

$$\text{slope} = \frac{1}{2} = \frac{\text{rise}}{\text{run}}$$

$$\text{y-int} = (0, 5)$$

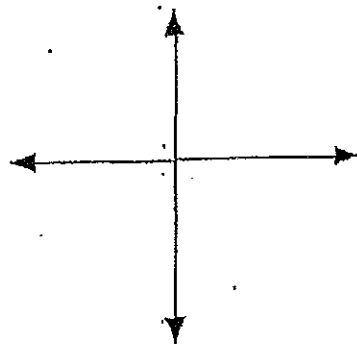


Try This: State the slope and y-intercept. Sketch the graph.

31.  $y = -3x - 5$

slope \_\_\_\_\_

y-intercept \_\_\_\_\_



Example:

Sketch the graph by finding the x & y intercepts.

$$2x + 3y = 18$$

x-intercept:  $2x + 3y = 18$

$$2x + 3(0) = 18$$

$$2x = 18$$

$$x = 9$$

$$(9, 0)$$

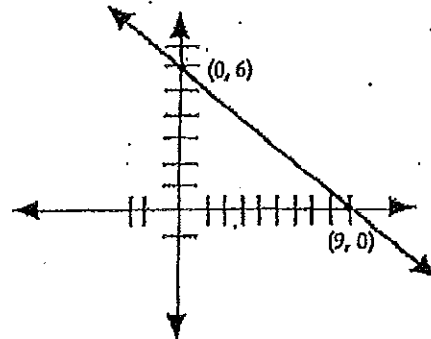
y-intercept:  $2x + 3y = 18$

$$2(0) + 3y = 18$$

$$3y = 18$$

$$y = 6$$

$$(0, 6)$$

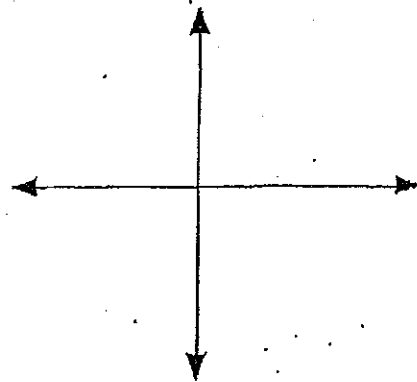


Try This: Find the x and y intercepts. Sketch and graph.

32.  $5x - 2y = 20$

x-intercept = \_\_\_\_\_

y-intercept = \_\_\_\_\_



Section 9: Write the Equation of a Line

Example:

Given the following two points, find the slope.

$$(-10, -12), (2, -6)$$

$x_1 \quad y_1 \quad x_2 \quad y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1} \longrightarrow$$

$$m = \frac{-6 - (-12)}{2 - (-10)}$$

$$m = \frac{-6 + 12}{2 + 10}$$

$$m = \frac{6}{12} = \frac{1}{2}$$

Try this: Find the slope given the two points.

33.  $(1, -4), (2, 6)$

Example:

W.E.L. if  $m = -3$  and  $b = -4$

$$y = mx + b$$

$$y = (-3)x - 4$$

$$\boxed{y = -3x - 4}$$

Try This: Write the equation of the line

34.  $m = \frac{3}{5}, b = 6$

Example:

W.E.L. given the point  $(-3, -7)$  and the slope  $= 2$ .

$$y = mx + b$$

$$-7 = (-3)(2) + b$$

$$-7 = -6 + b$$

$$-1 = b$$

$$\boxed{y = 2x - 1}$$

Try This: W.E.L.

35. point  $(1, 2)$ ,  $m = -2$

Example:

W.E.L. given the two points  $(1, 1)$  and  $(5, 9)$

1st:  $m = \frac{9-1}{5-1} = \frac{8}{4} = 2$

2nd:  $y = mx + b$  (choose either point)

$$1 = 2(1) + b$$

$$1 = 2 + b$$

$$-1 = b$$

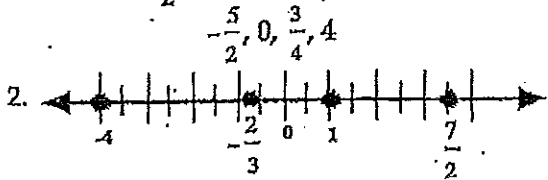
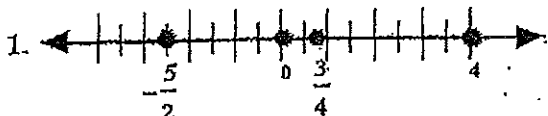
$$\boxed{y = 2x - 1}$$

Try This: W.E.L.

36.  $(2, 1)$  and  $(3, -7)$



Answers:



3. \*    4. +    5. -    6. ÷

7. 5                      8. 22

9.  $9x^2 + x$

10.  $6x + 8$

11.  $\frac{1}{4}$

12.  $\frac{2 \pm \sqrt{3}}{3}$

13.  $\frac{3}{5} \pm \frac{2\sqrt{5}}{5}$

14.  $\frac{17}{15}$

15.  $\frac{7x-3}{12x}$

16.  $\frac{73}{60}$

17.  $\frac{2}{3}$

18.  $\frac{8}{15}$

19. 4

20.  $\frac{5}{24}$

21.  $\frac{5}{7}$

22.  $\frac{-5}{9}$

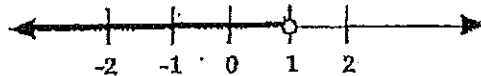
23.  $x = -1$

24.  $x = 4$

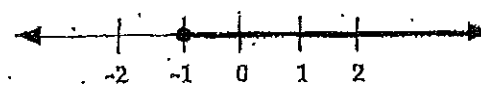
25.  $x = 20$

26.  $x = \frac{7}{4}$

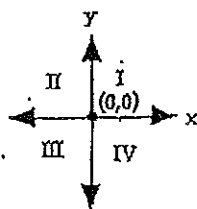
27.  $x < 1$



28.  $x \geq -1$

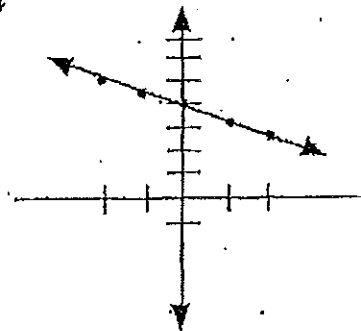


29.



30.  $y = -\frac{1}{2}x + 4$

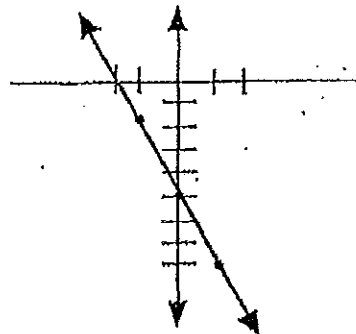
x	y
-2	5
-1	4.5
0	4
1	3.5
2	3



31.  $y = -3x - 5$

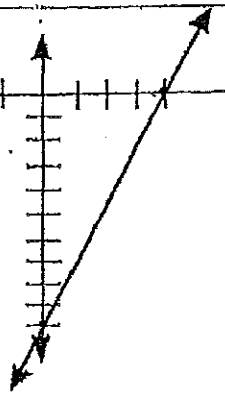
slope: -3

y-int: -5



32. x-int. (4, 0)

y-int. (0, -10)



33.  $m = 10$

34.  $y = \frac{3}{5}x + 6$

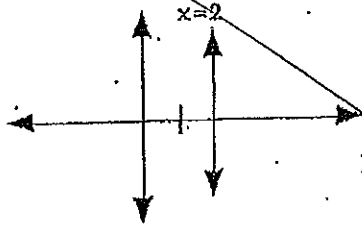
35.  $y = -2x + 4$

36.  $y = -8x + 17$

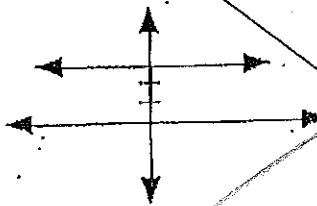
37.  $y = -2x + 7$

38.  $y = -2x + 3$

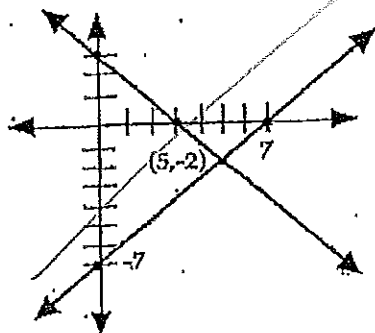
39. Vertical  $x = 2$



Horizontal  $y = -3$



40.



41. (7, -5)

42. (2, -4)

43.  $3x^2 - x - 2$

44.  $9x^2 - 30x + 25$

45.  $2a^2 b^2 (a^2 - 2a + 5)$

46.  $5x^2 y (2xy + 3x^2 - 4y^2)$

47.  $(x + 7)(x - 4)$

48.  $(x - 5)(x + 8)$

49.  $(3x - 1)(x + 4)$

50.  $(5x + 3)(x - 2)$

51.  $(4x + 3)(4x - 3)$

52.  $(5x - y)(5x + y)$

53.  $\frac{-5 \pm \sqrt{29}}{2}$

54.

