Name: Key Student ID: _____

Algebra II CP – Summer Packet

Algebra II CP is a very rigorous and fast-paced course. In order to prepare for the rigor of Algebra II CP, you will need to be familiar with the topics in this packet prior to starting the school year. Teachers will not spend a large amount of time reviewing these topics.

This packet is **due** on the first day of school, **Thursday, August 27, 2015.** This packet will NOT be graded. However, on **Friday, September 4, 2015**, you will have a **test** on the material from the packet. If you are unsure of how to answer some of the questions in the packet, please see your Algebra II CP teacher for extra help during the first week of school.

Prerequisite Skills for Algebra II CP

1) Simplify and evaluate expressions
2) Solve basic equations (linear and quadratic)
3) Solve absolute value equations
4) Determine if relations are functions or not
5) Function notation
6) Domain and range of a function
7) Calculate/Interpret the equation of a line
8) Graph linear functions
9) Solve systems of 2 equations
10) Solve and graph inequalities
11) Simplify and factor polynomial expressions
12) Simplify radical expressions
13) Solve and write explanations for word problems

Skill #1: Simplify and Evaluate Algebraic Expressions

Simplify the expressions by combining like terms.

1. $5a - a$

$4a$

2. $-(3x - 4y) + 2(2y - 6x)$

$-3x + 4y + 4y - 12x$

$-15x + 8y$

3. $7b - (3a - 8b)$

$7b - 3a + 8b$

$-3a + 15b$

4. $-a^2 + b^2 - \frac{a^2}{2}$

like terms!

$\frac{-2a^2}{2} + b^2 - \frac{a^2}{2}$

$\frac{-3a^2}{2} + b^2$

5. $0.5x - 1.5x$

$-x$

6. $\left(\frac{r}{2}\right)^2 + 3r^2 + r$

$\frac{r^2}{4} + 3r^2 + r$

* use a common denominator

$\frac{r^2}{4} + \frac{12r^2}{4} + r$

$\frac{13r^2}{4} + r$

Evaluate the expressions for the given value of the variable.

7. $x + 2x - x - 1; x = 2$

$2 + 2(2) - 2 - 1$

$2 + 4 - 2 - 1$

3

8. $5c^3 - 6c^2; c = -5$

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

$5(-125) - 6(25)$

$-625 - 150$

-775

9. $y^2 + 4; y = \sqrt{7}$

$(\sqrt{7})^2 + 4$

$7 + 4$

11

10. $4a + 7b - 3 + 6b;$ $a = 2, b = -5$

$4(2) + 7(-5) - 3 + 6(-5)$

$8 - 35 - 3 - 30$

-60

11. $12(1.1)^t;$ $t = 8$

$12(1.1)^8$

$12(2.143588)$

25.723

12. $\frac{3k+2(k-4)}{k+8}; k = -3$

$\frac{3(-3) + 2(-3-4)}{-3+8}$

$\frac{-9 + 2(-7)}{5}$

$\frac{-9 - 14}{5}$

$\frac{-23}{5}$

12. Write an expression to model the situation:

You have a summer job at a car wash. You earn $8.50 per hour and are expected to pay a one-time fee of $15 for the uniform. If you work x hours in your first week, how much money will you make in that week?

$8.5x - 15$

Skill #2: Solve Basic Equations

Solve each equation.

13. $5c - 9 = 8 - 2c$

$+2c \quad +9 \quad +9 \quad +2c$

$\frac{7c}{7} = \frac{17}{7}$

$c = 17/7$

14. $5(2 - g) = 0$

$\frac{5}{5}$

$2 - g = 0$

$+g \quad +g$

$2 = g$

15. $6(n - 4) = 3n$

$6n - 24 = 3n$

$-6n \quad -6n$

$\frac{-24}{3} = \frac{-3n}{3}$

$n = 8$

16. $\sqrt{x^2} = \sqrt{16}$

$x = \pm 4$

17. $3x^2 - 5 = 22$

$+5 \quad +5$

$\frac{3x^2}{3} = \frac{27}{3}$

$x^2 = 9$

$x = \pm 3$

18. $\sqrt{x} + 3 = 8$

$-3 \quad -3$

$\sqrt{x} = 5$

$x = 25$

19. The first stage of a rocket burns for 28 seconds longer than the second stage. If the rocket's total burning time is 158 seconds, for how long does each stage burn?

Stage 2 = x

Stage 1 = $x + 28$

$x + x + 28 = 158$

$2x + 28 = 158$

$2x = 130$

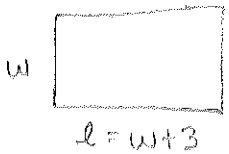
$x = 65$

Stage 1 = $65 + 28$

$= 93$ sec

Stage 2 = 65 sec

20. The length of a rectangle is 3 cm greater than the width. The perimeter is 24 cm. What are the dimensions of the rectangle?



$P = 2l + 2w$

$24 = 2(w + 3) + 2w$

$24 = 2w + 6 + 2w$

$-6 \quad -6$

$18 = 4w$

$w = 18/4 = 4.5$ cm

Dimensions:

$w = 4.5$ cm

$l = 7.5$ cm

Solve each formula for the indicated variable.

21. $v = s^2 + \frac{1}{2}sh$; for h

$-s^2$

$2(v - s^2) = \left(\frac{1}{2}sh\right)2$

$\frac{2v - 2s^2}{s} = \frac{sh}{s}$

$h = \frac{2v - 2s^2}{s}$

22. $C = \frac{5}{9}(F - 32)$; for F.

$\frac{9}{5}(C) = \left(\frac{5}{9}(F - 32)\right)\frac{9}{5}$

$\frac{9}{5}C = F - 32$

$+32 \quad +32$

$F = \frac{9}{5}C + 32$

Skill #3: Solve Absolute Value Equations

Solve each equation. Check for extraneous solutions.

23. $|2x + 8| - 4 = 12$

$+4 \quad +4$

$|2x+8| = 16$

or

$2x+8 = 16$ or $2x+8 = -16$

$2x = 8$ $\quad 2x = -24$

$x = 4$ or $x = -12$

24. $|3x - 2| = 7$

or

$3x-2 = 7$ $\quad 3x-2 = -7$

$3x = 9$ $\quad 3x = -5$

$x = 3$ or $x = -5/3$

25. $|x - 1| = 5x + 10$

or

$x-1 = 5x+10$ $\quad x-1 = -(5x+10)$

$-x \quad -10 \quad -x \quad -10$ $\quad x-1 = -5x-10$

$-11 = 4x$ $\quad +5x \quad +1 \quad +5x \quad +1$

$x = -11/4$ ← Extraneous $\quad 6x = -9$

$x = -3/2$

Check!

$|-11/4 - 1| = 5(-11/4) + 10$ $\quad |-3/2 - 1| = 5(-3/2) + 10$

$|-3\frac{3}{4}| = -13\frac{3}{4} + 10$ $\quad |-2\frac{1}{2}| = -7\frac{1}{2} + 10$

$3\frac{3}{4} \neq -3\frac{3}{4}$ ✗ $\quad 2\frac{1}{2} = 2\frac{1}{2}$ ✓

26. $|2x + 5| = 3x + 4$

$2x+5 = 3x+4$ or $2x+5 = -(3x+4)$

$-2x \quad -4 \quad -2x \quad -4$ $\quad 2x+5 = -3x-4$

$1 = x$ or $5x = -9$

$x = -9/5$

Check:

$|2(1)+5| = 3(1)+4$ $\quad |2(-9/5)+5| = 3(-9/5)+4$

$|7| = 7$ $\quad |7/5| = -7/5$ ✗

$1 = 1$ ✓

↑ Extraneous

Skill #4: Relations and Functions

Determine if each relation is a function.

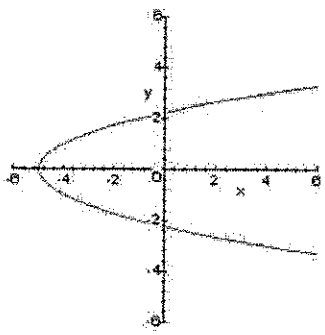
27. $\{(2, 4), (3, 5), (2, 7), (1, 8)\}$

No (2 elements of domain repeat)

28. $\{(1, 3), (2, 3), (3, 3)\}$

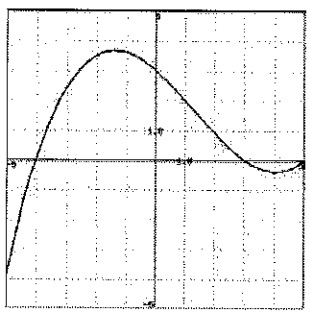
Yes

29.



No (Fails Vertical Line Test)

30.



Yes

Skill #5: Function Notation

Find *f*(-4) for each function.

31. $f(x) = 2x^2 + 3x - 7$

$f(-4) = 2(-4)^2 + 3(-4) - 7$

$= 2(16) - 12 - 7$

$= 32 - 12 - 7$

$f(-4) = 13$

32. $f(x) = \frac{2}{x}$

$f(-4) = \frac{2}{-4}$

$f(-4) = -\frac{1}{2}$

33. $f(t) = t^3 - \frac{t}{2}$

$f(-4) = (-4)^3 - \frac{-4}{2}$

$= -64 + 2$

$f(-4) = -62$

Solve for the missing variable.

34. What value of x makes $f(x) = 8$ if $f(x) = 3x + 12$?

$8 = 3x + 12$

$-12 \quad -12$

$-4 = 3x$

$x = -4/3$

35. What value(s) of t make $f(t) = 2$, if $f(t) = t^2 - 7$.

$2 = t^2 - 7$

$+7 \quad +7$

$9 = t^2$

$t = \pm 3$

Evaluate the function.

36. If $f(x) = 2x + 3$, what is the function for $f(x + 2)$?

$f(x+2) = 2(x+2) + 3$

$= 2x + 4 + 3$

$f(x+2) = 2x + 7$

37. If $f(x) = 2x + 3$, what is the function for $f(2x)$?

$f(2x) = 2(2x) + 3$

$f(2x) = 4x + 3$

Skill #6: Domain and Range

Identify the domain and range of each relation.

38. $\{(2,4),(3,5),(2,7),(1,8)\}$

Domain: $\{x: 1, 2, 3\}$

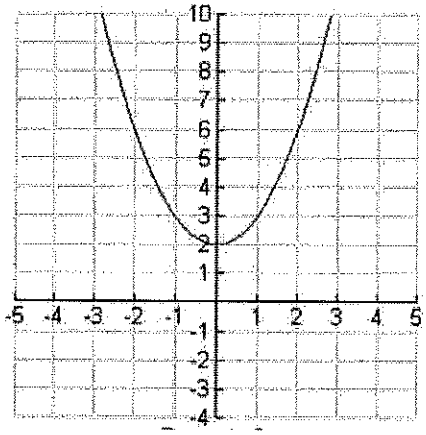
Range: $\{y: 4, 5, 7, 8\}$

39. $\{(1,3),(2,3),(3,3)\}$

Domain: $\{x: 1, 2, 3\}$

Range: $\{y: 3\}$

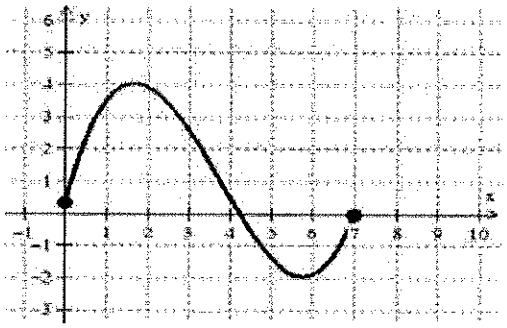
40.



Domain: $\mathbb{R}$

Range: $\{y: y \geq 2\}$

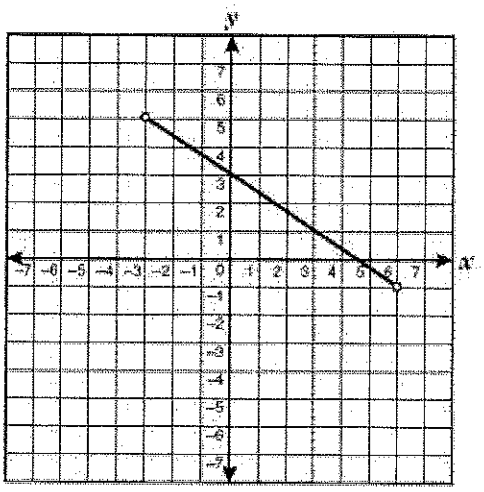
41.



Domain: $\{x: 0 < x < 7\}$

Range: $\{y: -2 < y < 4\}$

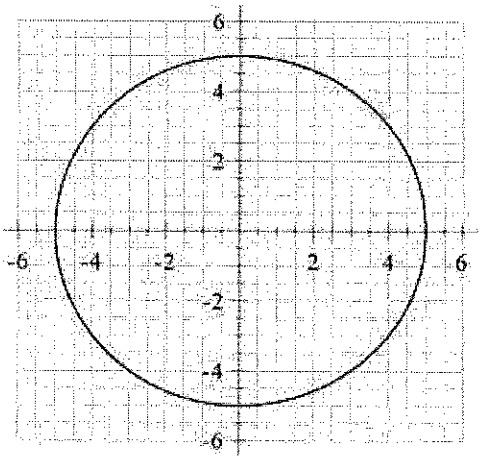
42.



Domain: $\{x: -3 < x < 6\}$

Range: $\{y: -1 < y < 5\}$

43.



Domain: $\{x: -5 \leq x \leq 5\}$

Range: $\{y: -5 \leq y \leq 5\}$

* Open circles → use $>$ or $<$, not $\leq$, $\geq$

Skill #7: Linear Equations

44. Identify the slope (m) and the y-intercept (b) of the following linear equations.

a. $y = \frac{1}{3}x + 9$

$m = \frac{1}{3}$, $b = 9$

b. $y = -2x$

$m = -2$, $b = 0$

c. $2x - 4y = 12$

$-2x \quad -2x$

$\frac{-4y}{-4} = \frac{-2x + 12}{-4}$

$y = \frac{1}{2}x - 3$

$m = \frac{1}{2}$, $b = -3$

d. $3x + 4y = 18$

$-3x \quad -3x$

$4y = -3x + 18$

$y = -\frac{3}{4}x + \frac{9}{2}$

$m = -3/4$, $b = 9/2$

45. Find the equation in slope-intercept form of a line with a slope of -2 and a y-intercept of -9.

$y = mx + b$

$y = -2x - 9$

46. Find the equation of a line in slope-intercept form that has a slope of 4 and passes through (3, 8).

Start in point-slope: $y - y_1 = m(x - x_1)$

$y - 8 = 4(x - 3)$

Then convert: $y - 8 = 4x - 12$

$+8 \quad +8$

$y = 4x - 4$

$y = 4x - 4$

47. Find the equation of a line in slope-intercept form that passes through (2, 5) and (-2, 3).

Find slope: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 5}{-2 - 2} = \frac{-2}{-4} = \frac{1}{2}$

Then repeat #46: $y - 5 = \frac{1}{2}(x - 2)$

$y - 5 = \frac{1}{2}x - 1$

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

48. Convert the equation into standard form: $y = \frac{1}{3}x + 7$

$Ax + By = C$

$y = \frac{1}{3}x + 7$

$-\frac{1}{3}x \quad -\frac{1}{3}x$

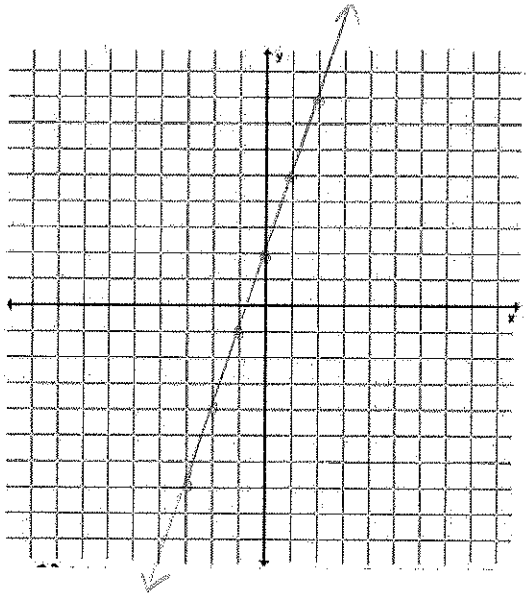
$-3\left(-\frac{1}{3}x + y = 7\right)$

$x - 3y = -21$

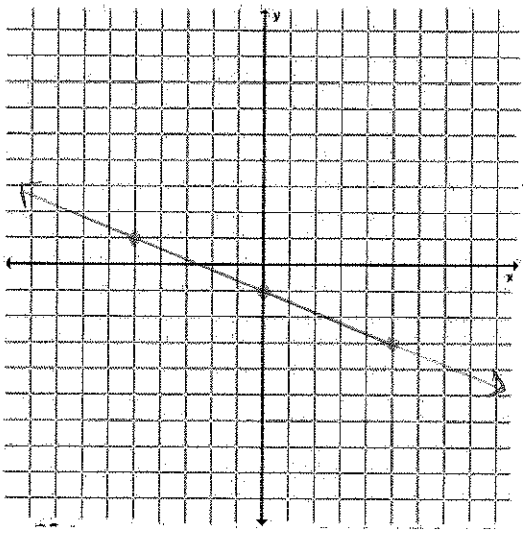
Skill #8: Graphing Linear Functions

Graph the following linear functions on the coordinate plane.

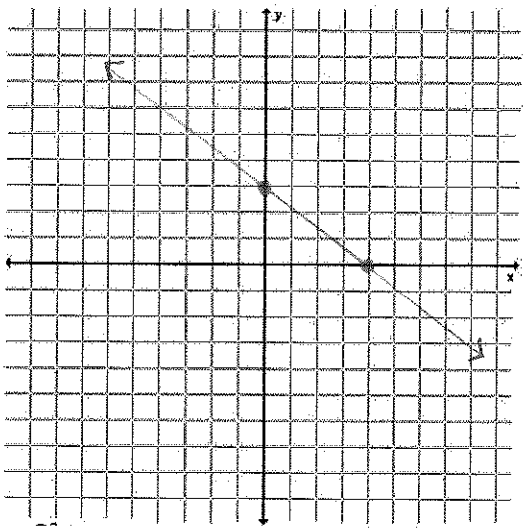
49. $f(x) = 3x + 2$



50. $f(x) = -\frac{2}{5}x - 1$



51. $3x + 4y = 12$



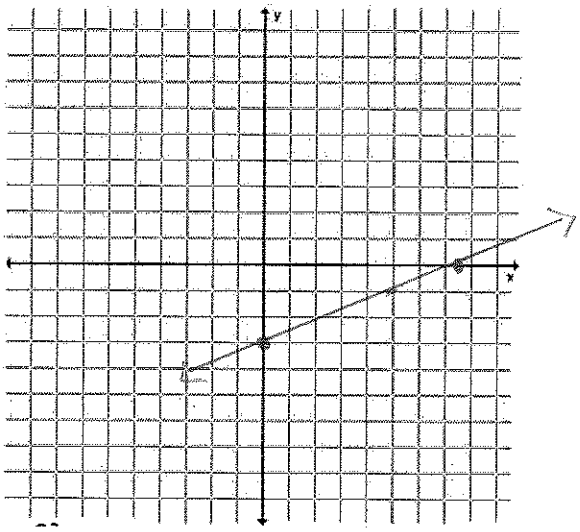
x-int: $3x = 12$

$x = 4$

y-int: $4y = 12$

$y = 3$

52. $2x - 5y = 15$



x-int: $2x = 15$

$x = 15/2$

y-int: $-5y = 15$

$y = -3$

Skill #9: Solving Systems of 2 Equations

Solve the systems by substitution. Write your answer as a coordinate pair(s), if it exists.

53. $\begin{cases} y = 6x - 11 \\ -2x - 3y = -7 \end{cases}$

$-2x-3(6x-11)=-7$
$-2x-18x+33=-7$
$-20x+33=-7$
$-20x=-40$
$x=2$
$y=6(2)-11$
$=12-11$
$=1$

$\{(2,1)\}$

54. $\begin{cases} y = 4x - 9 \\ y = x - 3 \end{cases}$

$4x-9=x-3$
$+9 \quad +9$
$3x=6$
$x=2$
$y=4(2)-9$
$=8-9$
$y=-1$

$\{(2,-1)\}$

55. $\begin{cases} y = -2x + 6 \\ 2x + y = -7 \end{cases}$

$2x+-2x+6=-7$
$6=-7$

No Solution

Solve the systems by elimination. Write your answer as a coordinate pair, if it exists.

56. $\begin{cases} 6x - 12y = 24 \\ -x - 6y = 4 \end{cases}$ $\cdot -2$

$2x+12y=-8$
$8x=16$
$x=2$
$6(2)-12y=24$
$12-12y=24$
$-12y=12$
$y=-1$

$\{(2,-1)\}$

57. $2\begin{cases} 3x - 4y = 2 \\ -6x + 8y = -4 \end{cases}$

$6x-8y=4$
$0+0=0$

Infinitely Many Solutions

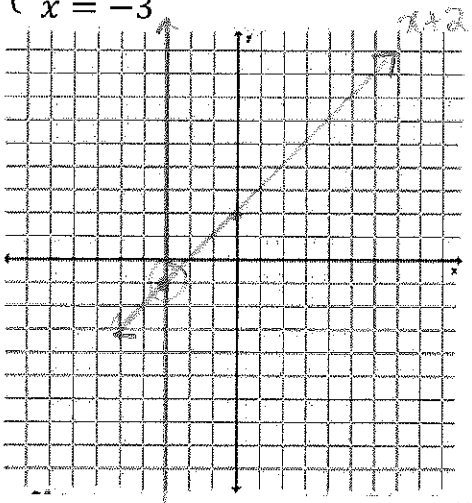
58. $5\begin{cases} -11x - 4y = 36 \\ -10x - 10y = 20 \end{cases}$ $\cdot -2$

$-55x-20y=180$
$20x+20y=-40$
$-35x=140$
$x=-4$
$-10(-4)-10y=20$
$40-10y=20$
$-10y=-20$
$y=2$

$\{(-4,2)\}$

Solve the systems by graphing. Write your answer as a coordinate pair, if it exists.

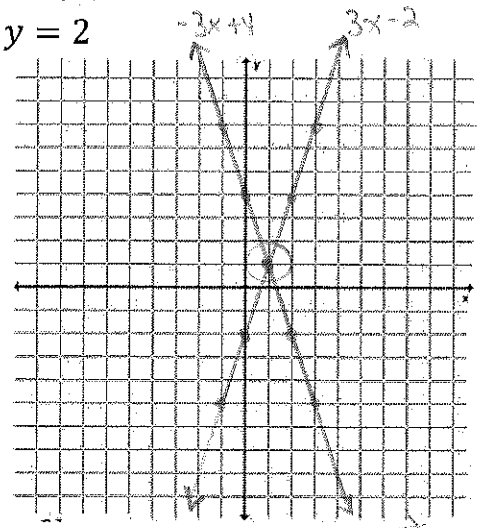
59. $\begin{cases} y = x + 2 \\ x = -3 \end{cases}$



$\{(-3,-1)\}$

60. $\begin{cases} y = -3x + 4 \\ 3x - y = 2 \end{cases}$

$-y=-3x+2$
$y=3x-2$



$\{(1,1)\}$

Skill #10: Solve and Graph Inequalities

Solve each inequality. Then, graph it on the number line. Label the number line for each problem.

61. $7x + 4 > 18$

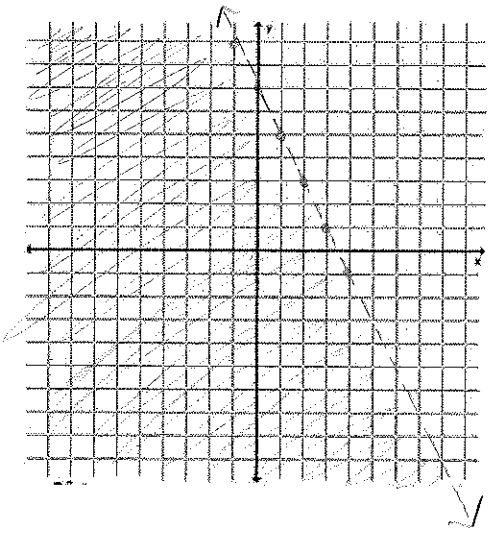
$7x + 4 > 18$
$-4 \quad -4$
$7x > 14$
$x > 2$

62. $-2(x + 5) \geq -16$

$-2x - 10 \geq -16$
$-2x \geq -6$
$x \leq 3$

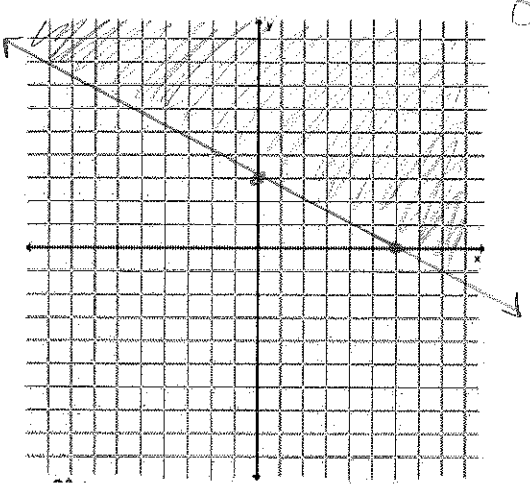
63. $y < -2x + 7$

Test (0,0)
$0 < -2(0) + 7$
$0 < 7$
True



64. $2x + 6y \geq 18$

Test (0,0)
$2(0) + 6(0) \geq 18$
$0 \geq 18$
FALSE



Skill #11: Simplify and Factor Polynomial Expressions

Simplify the expressions by multiplying and combining like terms.

65. $(2x + 7)(3x - 5)$ FOIL

$6x^2 - 10x + 21x - 35$

$6x^2 + 11x - 35$

66. $2x^2(x^3 + 5x^2 - 6)$

$2x^5 + 10x^4 - 12x^2$

67. $(3x - 1)(x^2 + 4x - 2)$

$3x^3 + 12x^2 - 6x - x^2 - 4x + 2$

$3x^3 + 11x^2 - 10x + 2$

68. $(x^2 - 3x + 4)(x^2 + x - 5)$

$x^4 + x^3 - 5x^2 - 3x^3 - 3x^2 + 15x + 4x^2 + 4x - 20$

$x^4 - 2x^3 - 4x^2 + 19x - 20$

Factor the given expressions using the method described.

69. Factor out the greatest common factor:

a. $10x^2y^2 + 15xy^3 - 5xy^2$

$5xy^2(2x + 3y - 1)$

b. $-6rs - 12r^2s + 9rt$

$-3r(2s + 4rs - 3t)$

70. Factor by difference of squares. If the expression is not factorable, write "N.F."

a. $x^2 - 81$ $(x+9)(x-9)$

b. $4t^2 - 25$ $(2t+5)(2t-5)$

c. $z^2 + 36$ N.F.

d. $x^4 - 49$ $(x^2+7)(x^2-7)$

71. Factor the trinomial into two binomials. If the expression is not factorable, write "N.F."

a. $x^2 + x - 12$ $(x-3)(x+4)$

b. $x^2 + 13x + 40$ $(x+8)(x+5)$

c. $x^2 - 17x + 72$ $(x-9)(x-8)$

d. $2x^2 - 6x - 8$

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

$2(x-4)(x+1)$

e. $2x^2 - 9x - 18$

$a \cdot c = -36$

$-12 \cdot +3$

$2x^2 - 12x + 3x - 18$

$2x(x-6) + 3(x-6)$

$(x-6)(2x+3)$

f. $12x^2 + 11x - 5$

$a \cdot c = -60$

$15 \cdot -4$

$12x^2 + 15x - 4x - 5$

$3x(4x+5) - 1(4x+5)$

$(4x+5)(3x-1)$

Skill #12: Simplifying Radical Expressions

Simplify:

72. $2\sqrt{3} + 5\sqrt{3}$

$7\sqrt{3}$

73. $2\sqrt{5} \times 3\sqrt{5}$

$6 \cdot 5$

30

74. $3\sqrt{3} \times 4\sqrt{5}$

$12\sqrt{15}$

Simplify the radicals:

75. $\sqrt{25}$

5

76. $\sqrt{200}$

$\sqrt{100}\ \sqrt{2}$

$10\sqrt{2}$

77. $\sqrt{96}$

$\sqrt{16}\ \sqrt{6}$

$4\sqrt{6}$

78. $\sqrt{216}$

$\sqrt{36}\ \sqrt{6}$

$6\sqrt{6}$

79. $\sqrt{80x^2}$

$\sqrt{16}\ \sqrt{5}$

$4x\sqrt{5}$

80. $\sqrt{125x^3}$

$\sqrt{25}\ \sqrt{5}$

$5x\sqrt{5x}$

Name: _____ **Teacher:** _____

Skill #13: Word Problems

81. Phil and Matt made cookies for a fundraiser at their school. Phil made 25% more cookies than Matt. The cookies sold for $0.25 each. After the sale, 20% of the combined total cookies remained.

a. Create an equation to represent the total amount of money Matt and Phil will earn at the fundraiser based on the number of cookies Matt baked. Explain how you determined your equation.

x = # of cookies Matt baked y = $ made

$1.25x$ = # of cookies Phil made

$.8\,(.25(x+1.25x)) = y$

$.2\,(2.25x) = y$

$\boxed{y = 0.45x}$

I multiplied $0.25 by the number of cookies made ($2.25x$). Then, I multiplied that by 0.8 because they should sell 80% of the cookies.

b. Phil and Matt made a total of $72.00 at the fundraiser. How many cookies did Phil make, and how many did Matt make? Show your work.

$72 = 0.45x$

$x = 160$

∴ Phil made $1.25(160) = 200$ cookies

Matt made 160 cookies

c. Next month, Matt and Phil plan to bake the same number of cookies again, but want to sell them for $0.50 each. They estimate they will only sell 70% of the cookies because of the price increase. Based on their prediction, should they increase the price? Justify your answer.

New equation:

$0.7(0.5(x + 1.25x)) = y$

$y = 0.7875x$

If Matt again bakes 160 cookies, then

$y = 0.7875(160)$

$y = \$126$ profit

Old equation:

$y = 0.45x$

$y = 0.45(160)$

$y = \$72$ profit

Yes they will make more money selling cookies for $0.50, so they should raise the price.

Name: _____ **Teacher:** _____

82. Let $|x| + |y| = c$, where c is a real number.

Determine the number of solutions for x and y for each of the following scenarios. Justify your answer for each case.

Case 1: $c < 0$

Case 2: $c = 0$

Case 3: $c > 0$

Case 1: If $c < 0$, x and y have no solution. This is because x and y are in absolute value signs, making a positive number + a pos. number. This can never result in $c < 0$.

Case 2: If $c = 0$, x and y each have only 1 solution: $x = 0$ and $y = 0$. The only way for 2 absolute valued numbers to add to 0 is if they are both also 0.

Case 3: If $c > 0$, then x and y each have infinitely many solutions. They can be any real number, because when in the absolute value signs, they will create positive values. 2 positive values will always add to a c-value greater than 0.