SUMMER REVIEW for Students entering ALGEBRA 2 in September

Name _____

ANSWER Key

Believe it or not, all of these problems are ones taught in our eighth grade Algebra 1 course, but since it has been at least a year since you studied the material you may be a bit rusty. The purpose of spending 2-3 hours during summer break on these problems is to review or in some cases relearn the math needed to hit the ground running and help insure a successful year in Algebra 2. Ideally, break this into 4-6 sessions lasting 20-35 minutes. The more you remember, the easier and quicker this will be. Put forth your best effort!

We make no mention of how to score this review packet because obtaining a score is not the purpose. Work hard and use the ANSWER KEY to help fill in any gaps. The ANSWER KEY is provided to help you navigate through those problems that you struggle with. Don't get discouraged when you get confused, just try your best AND work closely with the key AFTER you give your best effort. If there is a section of the test that you do not recall learning (this could be the case if you did not study Algebra 1 at St. Sebastian's,) you should be sure to learn that material during the summer.

DO NOT JUST USE THE KEY JUST TO WRITE IN CORRECT ANSWERS.

USE THE KEY TO CORRECT YOUR WORK OR TO HELP GUIDE YOU THROUGH THE BEGINNING OF A PROBLEM.

Be thorough and show work !

******Please bring this on the first day of classes******

DO NOT LEAVE PROBLEMS BLANK JUST BECAUSE YOU DO NOT RECALL THE MATERIAL.

USE THE ANSWER KEY TO HELP YOU RELEARN THE MATERIAL, IF NECESSARY.

SIMPLIFY

1. $-12-|7-13|-[3-(-9)]$

2. $2(8x^2y-7xy+3xy^2)-(3x^2y-2xy-9xy^2)$

$16x^2y-14xy+6xy^2-3x^2y+2xy+9xy^2$

$13x^2y+15xy^2-12xy$

3. $(3cd^2)^2(-2c^3d)^3$

4. $h^{m-n}(h^{m+n}+h^m)$

$h^{2M}+h^{2M-N}$

*RecALL: $A^M \cdot A^N = A^{M+N}$

5. $(5xy^4)^3$

$125x^3y^{12}$

6. $(2xy^2)(2xy)(5x^4)(x)$

7. 3^{-2}

$\frac{1}{3^2}=\frac{1}{9}$

8. 5^0

9. -4^3

10. $(-2)^{-4}$

$\frac{1}{(-2)^4}=\frac{1}{16}$

EVALUATE:

11. $3y^3+2y^2-y+7$, if $y=-4$

12. $\frac{n+3}{n-2}$ if $n=-8$

$\frac{-8+3}{-8-2}=\frac{-5}{-10}=\frac{1}{2}$

MULTIPLY:

13. $\left(\frac{-1}{5}\right)(15n^3 - 10n^2 + 20)$

14. $(x + 2)(x - 2)$

$x^2 - 2x + 2x - 4$

$x^2 - 4$

15. $(2x + 3)(3x - 2)$

$6x^2 - 4x + 9x - 6$

$6x^2 + 5x - 6$

16. $(x + 3)(x + 3)$

17. $(5x + 7y)(2x - 3y)$

18. $(x^2 + 2x - 3)(2x + 1)$

$2x^3 + 1x^2 + 4x^2 + 2x - 6x - 3$

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

TRUE OR FALSE? If FALSE, give an example to show why:

19. a) If $a < b$, then $a^3 < b^3$

b) If $a > b$ and $c > d$, then $c - a < d - b$

$a = 5$ $c = 3$

$b = 0$ $d = -7$

FALSE

$3 - 5$ $-7 - 0$

$-2 > -7$ NOT <

c) If $a > b$, then $a^2 > b^2$

SOLVE and CHECK each of the following. Identify any problem that has NO SOLUTION or is an IDENTITY (Infinite number of solutions.)

20. $3n + 2 = -16$

21. $n + 5 = 2n - 3$

$-2N \quad -2N$

$-1N + 5 = -3$

$-5 \quad -5$

$-N = -8$

$N = 8$

22. $3(y - 2) = y + 6 + 2y$

$3y - 6 = 3y + 6$

$-3y \quad -3y$

$-6 = 6$

NO SOLUTION

23. $5(3x - 7) = 4(2x + 7)$

24. $2x - 5 + x = 3(x - 1) - 2$

25. $4n - 3(n - 4) + 1.5n = 6n - 2$

$4N - 3N + 12 + 1.5N = 6N - 2$

$2.5N + 12 = 6N - 2$

$12 = 3.5N - 2$

$+2 \quad +2$

$14 = 3.5N$

$\frac{14}{3.5} = \frac{3.5N}{3.5}$

$4 = N$

SOLVE FOR the given variable.

26. $s = -\frac{1}{2}gt^2 + vt$ *for* g

$-2s = gt^2 - 2vt$

$+2vt \quad +2vt$

$2vt - 2s = gt^2$

$\frac{2vt - 2s}{t^2} = \frac{gt^2}{t^2}$

27. $A = \frac{1}{2}h(b_1 + b_2)$ *for* b_1

SOLVE/ANSWER EACH PROBLEM:

28. A car traveled for 1/2 hour at r miles per hour, then increased its speed by 10 miles per hour for the next 1 and 1/2 hours. Write an expression for the total distance traveled.

SPEED • TIME = DISTANCE

R = RATE

R	$\frac{1}{2}$	$\frac{1}{2}R$
$R+10$	$\frac{3}{2}$	$\frac{3}{2}(R+10)$

TOTAL DISTANCE

$\frac{1}{2}R + \frac{3}{2}R + 15$

$2R + 15$

29. The measure of an angle is 8 degrees less than three times the measure of the angle's supplement. (Supplementary angles are a pair of angles which have a sum of 180 degrees.) Find the measure of the two angles.

Let x = MEASURE OF AN Angle

$180 - x$ = MEASURE OF ITS SUPPLEMENT

$x = 3(180 - x) - 8$

$x = 540 - 3x - 8$

$+3x \quad +3x$

$4x = 532$

$x = 133$

Angle = 133°

Supplement = 47°

30. Two cars leave City A at the same time and both travel to City B. One car travels at an average speed of 72 km/hr and the other at 78 km/hr. If the slower car arrives 20 minutes after the faster car, what is the distance between City A and City B?

SOLVE EACH PROBLEM:

31. How many mL of a 40% salt solution should be added to 240 mL of a 15% solution in order to produce a 25% salt solution?

# mL	x	% salt	=	Amount of salt
x		.40		$.4x$
240		.15		36
$x+240$		.25		$.25(x+240)$

$.4x+36 = .25(x+240)$

$.4x+36 = .25x+60$

$-.25x \quad -.25x$

$.15x+36 = 60$

$-36 \quad -36$

$.15x = 24$

$x = 160$

32. Mary Kay has an equal number of dimes, nickels, and quarters. If their total value is less than $9.00, what is the maximum number of each coin she could have?

33. Larry has twice as many nickels as quarters. If the total value of his nickels and quarters is $4.90, how many nickels and how many quarters does Larry have?

Let Q = # of quarters

Then $2Q$ = # of Nickles

# coins	×	value per	=	Total value
$2Q$	×	.05	=	$.10Q$ } $.35Q$
Q	×	.25	=	$.25Q$ }

$.35Q = 4.90$

$Q = 14$

Quarters = 14

Nickels = 28

SOLVE. FOR THE INEQUALITIES, ALSO GRAPH THE SOLUTION SET ON A NUMBER LINE.

34. $|x+7| = 6$

$x+7=6 \quad x+7=-6$

$x=-1 \quad \text{OR} \quad x=-13$

35. $|2n-3| = 9$

36. $|2n-5| \geq 13$

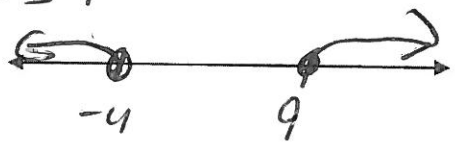
$2N-5 \geq 13 \quad \text{OR} \quad 2N-5 \leq -13$

$+5 \quad +5 \qquad +5 \quad +5$

$2N \geq 18 \qquad 2N \leq -8$

$\frac{2N}{2} \geq \frac{18}{2} \qquad \frac{2N}{2} \leq \frac{-8}{2}$

$N \geq 9 \qquad N \leq -4$



37. $|y+5| - 3 \leq 1$



SOLVE AND GRAPH THE SOLUTION SET.

38. $5x - 4(6 + 2x) < 2(1 - x)$

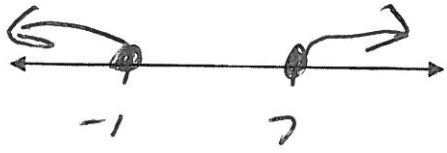


39. $5y + 3 \leq -2 \text{ or } y - 7 \geq 0$

$-3 \quad -3 \qquad +7 \quad +7$

$5y \leq -5 \qquad y \geq 7$

$y \leq -1$



40. $x - 9 \leq 3x - 4 \leq x + 8$



LINEAR EQUATIONS, INEQUALITIES, and GRAPHING

41. Find the slope of the line that passes through each pair of points.

a. (2, 5) and (4, – 5) b. (3, – 2) and (3, 5) c. (2, 6) and (– 2, 6) d. (3, 1) and (–1, – 1)

$M = \text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$

$\frac{-5-5}{4-2} = \frac{-10}{2} = -5$

$\frac{5-(-2)}{3-3}$

$\frac{7}{0} \rightarrow$ UNDEFINED SLOPE

$\frac{-1-1}{-1-3} = \frac{-2}{-4} = \frac{1}{2}$

$M = \frac{1}{2}$

42. Find the equation of the line that passes through (2, – 2) and (4, 4). Write the equation in both Slope-Intercept Form and in Standard Form.

FIRST FIND THE SLOPE: $y = mx + b$ (slope → m, int → b)

$\frac{4-(-2)}{4-2} = \frac{6}{2} = 3$

$y = 3x + b$

USE (2, 2) → $x\ y$

$-2 = 3(2) + b$

$-2 = 6 + b$

$-8 = b$

$y = mx + b$

$y = 3x - 8$

NOW CONVERT TO STANDARD

$-3x + y = -8$

Slope-Intercept form $y = 3x - 8$

Standard Form $-3x + y = -8$ OR $3x - y = 8$

43. Find the equation of the line which is perpendicular to $y = x + 5$ and which contains $(0, -8)$.

Perpendicular Lines have slopes which multiply to be -1 (unless one of the lines happens to be vertical)

$y = x + 5$ has slope $= 1$

So the perpendicular lines slope must be $= -1$

New line: slope $= -1$

$y = -1(x) + b$

$-8 = -1(0) + b$

$-8 = b$

$y = -1x - 8$

44. Find the slope of each line:

a. $4x - 5y = 10$

$\frac{-5y}{-5} = \frac{-4x}{-5} + \frac{10}{-5}$

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

$m = \frac{4}{5}$

b. $x = 4$

This is a vertical line

Slope is undefined

c. $y - 4 = -3(x + 6)$

$m = 3$

d. $y = 3x - 1$

45. Find the equation of the line with slope $= -1/2$ and which passes through $(8, -2)$.

x y

46. Determine the constant **k** so that $(-2, 3)$ will satisfy the equation $kx - 4y = -k$.

$k(-2) - 4(3) = -k$

$-2k - 12 = -k$

$-12 = k$

47. Find the equation of the line that is parallel to $2x + 3y = 7$ and which passes through (9, 5).

$3y = -2x + 7$

$y = -\frac{2}{3}x + \frac{7}{3}$

ORIGINAL LINE HAS SLOPE $= -\frac{2}{3}$

PARALLEL LINES HAVE SAME SLOPE

$y = mx + b$

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

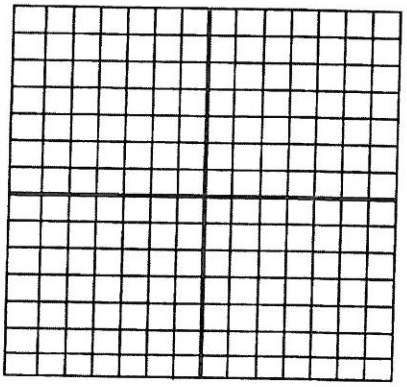
$5 = -\frac{2}{3}(9) + b$

$5 = -6 + b$

$11 = b$

$y = -\frac{2}{3}x + 11$

48. Graph the lines $2x - y = 6$ and $x + 3y = 3$ on the same coordinate plane. What is the point of intersection?



GRAPH EACH LINE ON THE COORDINATE PLANE GIVEN.

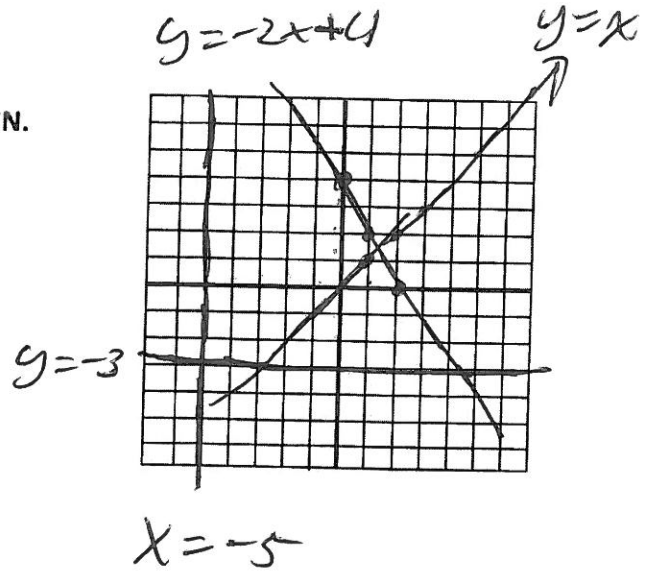
49.

$y = -2x + 4$

$y = x$

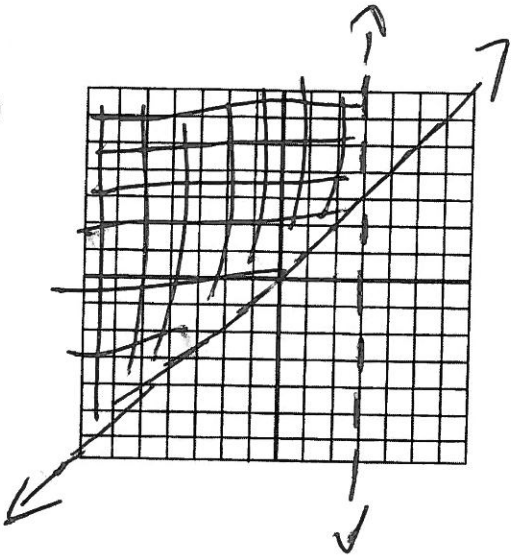
$x = -5$

$y = -3$



50. Graph the system of inequalities (shade the solution.)

$y \geq x$ *and* $x < 3$



FUNCTIONS

51. If f is a linear function, and
$f(0) = 10$ while $f(10) = 14$, then $f(5) =$ 12 and $f(-5) =$ 8

(0, 10) (10, 14)

LINEAR MEANS $y = mx + b$

$m = \frac{14-10}{10-0} = \frac{4}{10} = \frac{2}{5}$ $y = \frac{2}{5}x + b$ $10 = b$ → $y = \frac{2}{5}x + 10$

$y = \frac{2}{5}\cdot 5 + 10 = 12$

$y = \frac{2}{5}(-5) + 10$

$y = 8$

52. *Given* $f(x) = 1 - 3x$ *and* $g(x) = \frac{1}{x^2+1}$, find each of the following:

a. $f(2)$ b. $g(1)$ c. $f(g(0))$ d. $f(3) + g(0)$

$f(2) = 1 - 3\cdot 2$
$= 1 - 6 = -5$

$g(0) = \frac{1}{0+1} = 1$

$f(1) = 1 - 3(1) = -2$

53. Find the GCF and the LCM for $56x^2y^3z$, $42x^2y^2z^2$, *and* $70x^3y^2$

$2^3 \cdot 7 \cdot x^2 \cdot y^3 \cdot z$ $2 \cdot 3 \cdot 7 \cdot x^2 \cdot y^2 \cdot z^2$ $2 \cdot 5 \cdot 7 \cdot x^3 \cdot y^2$

GCF = $2 \cdot 7 \cdot x^2 \cdot y^2$ / $14x^2y^2$

LCM = $2^3 \cdot 3 \cdot 5 \cdot 7\, x^3 y^3 z^2$ / $840x^3y^3z^2$

SOLVE each system of equations (if possible,) by using the ELIMINATION or SUBSTITUTION method.

54. $3x + 2y = 11$
$x - 2 = -4y$

55. $c = 3d - 4$
$c + d = 16$

56. $5y - 2x = 3$
$6x = 15y - 1$

$x = -4y + 2$

$3(-4y+2) + 2y = 11$

$-12y + 6 + 2y = 11$

$-10y = 5$

$y = \frac{5}{-10} = \left(\frac{-1}{2}\right)$ $x = -4y + 2$
$= -4(-\frac{1}{2}) + 2$
$= 2 + 2 = 4$

SIMPLIFY each radical completely.

57. $\sqrt{32x^4}$

$\sqrt{16}\sqrt{2}\sqrt{x^4}$

$4x^2\sqrt{2}$

$\sqrt{2x^3} \cdot \sqrt{8x^7}$

$3\sqrt{8} + 2\sqrt{50}$

$3\sqrt{4}\sqrt{2} + 2\sqrt{25}\sqrt{2}$

$6\sqrt{2} + 10\sqrt{2}$

$16\sqrt{2}$

$\sqrt[3]{\frac{64}{125y^3}}$

$\frac{2}{\sqrt{7}+5} \cdot \frac{\sqrt{7}-5}{\sqrt{7}-5}$

$\frac{2\sqrt{7}-10}{7-25} = \frac{2\sqrt{7}-10}{-18}$

$= \frac{\sqrt{7}-5}{-9}$

$\sqrt{3a^2} \cdot \sqrt{12ab^2}$

$\frac{4}{\sqrt{20}} \cdot \frac{\sqrt{20}}{\sqrt{20}}$

$\frac{4\sqrt{20}}{20} = \frac{\sqrt{20}}{5}$

$= \frac{\sqrt{4}\sqrt{5}}{5} = \frac{2\sqrt{5}}{5}$

FACTOR EACH POLYNOMIAL COMPLETELY. If it not possible to factor, write "Not Factorable" or "Prime."

58. $2x^4 - x^3$

$x^3(2x-1)$

59. $x^2 + 6x + 9$

60. $x^2 - 14x + 13$

$(x-13)(x-1)$

61. $y^2 - 25$

62. $2n^3 - 4n^2 + 2n$

$2N(N^2-2N+1)$

$2N(N-1)(N-1)$

63. $n^2 - 7n + 12$

64. $10n^3 + 4n^2 - 6n$

$2N(5N^2+2N-3)$

$2N(5N-3)(N+1)$

65. $x^2 + 36$

PRIME

66. $2n^2 - n - 6$

67. $6n^2 + 5n - 4$

68. $9x^2 - 30xy + 25y^2$

$(3x-5y)(3x-5y)$

OR

$(3x-5y)^2$

69. $6(2x-3) + n(2x-3)$

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

70. $m^2 + 12m + 36 - 49y^2$

$(M+6)^2 - 49y^2$

$(M+6-7y)(M+6+7y)$

71. $8(n-6) + 3x(6-n)$

SOLVE EACH EQUATION. Identify all double or multiple roots.

72. $(2x+3)(x-5) = 0$

$2x+3=0 \quad | \quad x-5=0$

$x=-\frac{3}{2} \quad | \quad x=5$

73. $3x(x^2-9) = 0$

74. $x^4 - 25x^2 = 0$

$x^2(x^2-25)=0$

$x^2(x-5)(x+5)=0$

$x=0 \quad | \quad x=5 \quad | \quad x=-5$

75. $8y^2 + 1 = 6y$

$8y^2-6y+1=0$

$(4y-1)(2y-1)=0$

$4y-1=0 \qquad 2y-1=0$

$y=\frac{1}{4} \qquad y=\frac{1}{2}$

76. $B^4 = 9B^2$

77. $(x-3)^3 - (x-3)^2 = 0$

$(x-3)^2[(x-3)-1]=0$

$(x-3)^2[x-4]=0$

$x-3=0 \quad | \quad x-4=0$

$x=3$ (d.R.) $\qquad x=4$

Recall the Quadratic Formula, $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, which can be used to solve any quadratic equation in the form $ax^2 + bx + c = 0$. Use the formula to solve the following.

78. $x^2 - 3x - 6 = 0$

79. $2x^2 - 5x = 1$

$2x^2-5x-1=0 \qquad a=2, \; b=-5, \; c=-1$

$\dfrac{5 \pm \sqrt{25-4(2)(-1)}}{2(2)}$

$\dfrac{5 \pm \sqrt{33}}{4}$

SIMPLIFY each expression.

80. $\dfrac{b^2 - 7b - 18}{b^2 - 4}$

$\dfrac{(b-9)(b+2)}{(b+2)(b-2)} = \dfrac{b-9}{b-2}$

81. $\dfrac{3n-5}{n} + \dfrac{n^2+8n+5}{n} = \dfrac{N^2+11N}{N}$

$= \dfrac{N(N+11)}{N} = N+11$

SIMPLIFY.

82. $\dfrac{(a^2 + b^2)(a^2 - b^2)}{(a + b)^2(2a^2 - 3ab + b^2)}$

$\dfrac{(a^2+b^2)(a-b)(a+b)}{(a+b)(a+b)(2a-b)(a-b)} = \dfrac{a^2+b^2}{(a+b)(2a-b)}$

83. Now evaluate the expression in number 82 above if $a = 4$ *and* $b = 3$.

84. Find two consecutive odd integers whose product is 195. Show work or explain how you find the answer.

x = FIRST ODD INTEGER

$x+2$ = NEXT ODD INTEGER

$x(x+2) = 195$

$x^2 + 2x = 195$

$x^2 + 2x - 195 = 0$

$(x+15)(x-13) = 0$

$x = -15 \quad x = 13$

IF $x = -15$ THEN $-13, -15$

OR

IF $x = 13$ THEN $13, 15$

85. The length of a rectangle is 1 cm less than twice its width. A new rectangle is formed by adding 3 cm to the length and 5 cm to the width of the original rectangle. If the perimeter of the new rectangle is 56 cm, what are the dimensions of the ORIGINAL rectangle?

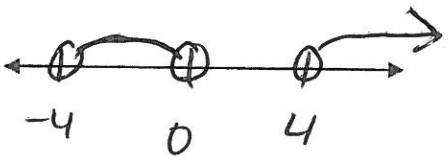
SOLVE, then GRAPH the solution set on a number line.

86. $x^3 - 16x > 0$

$x(x^2-16) > 0$

$x(x-4)(x+4) > 0$

CRITICAL PTS $x = 0, -4, 4$



87. $x^2 - 5x \leq -6$



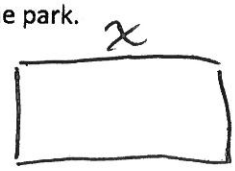
SOLVE.

88. A projectile is fired from the ground with an initial velocity of 245 m/s. After how many seconds will the projectile return to the ground?

Use the formula $h = vt - 4.9t^2$ where $h = height,\ t = time,\ and\ v = initial\ velocity\ (speed.)$

89. The width of a rectangular park is 5m shorter than its length. If the area of the park is 300m^2, find the length and width of the park.

length $= x$
width $= x - 5$



$x(x-5) = 300$
$x^2 - 5x = 300$
$x^2 - 5x - 300 = 0$
$(x-20)(x+15) = 0$
$x = 20 \quad | \quad x = -15$
can't have negative length

Length $= 20$
width $= 15$

90. Three loaves of bread and two jars of peanut butter cost $5.49 while four loaves of bread and three jars of peanut butter cost $7.75. What is the price of one loaf of bread? What is the price of one jar of peanut butter?