Red Bank Catholic High School Name:______________________________

Summer Math Assignment for students entering ACP Geometry

Radicals

What does $\sqrt{\ }$ mean?

$\sqrt{25} = 5$

You should be familiar with the perfect squares up to 20.

$\sqrt{1} = 1$	$\sqrt{64} = 8$	$\sqrt{225} = 15$
$\sqrt{4} = 2$	$\sqrt{81} = 9$	$\sqrt{256} = 16$
$\sqrt{9} = 3$	$\sqrt{100} = 10$	$\sqrt{289} = 17$
$\sqrt{16} = 4$	$\sqrt{121} = 11$	$\sqrt{324} = 18$
$\sqrt{25} = 5$	$\sqrt{144} = 12$	$\sqrt{361} = 19$
$\sqrt{36} = 6$	$\sqrt{169} = 13$	$\sqrt{400} = 20$
$\sqrt{49} = 7$	$\sqrt{196} = 14$	

What do you do when the number under the radical is not a perfect square?

Most Basic Way

Step 1 – Find the prime factorization of the number.

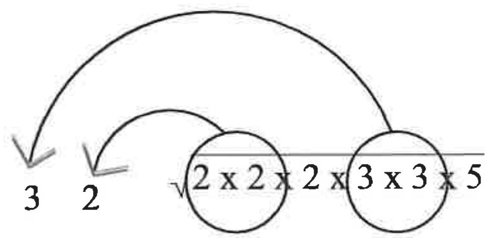
example: $\sqrt{360}$

$2 \times 2 \times 2 \times 3 \times 3 \times 5$

Step 2 – Put the numbers in order under the radical.

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

Step 3 – Circle any pairs of numbers – they come out as ONE of that number.



Step 4 – Multiply outside numbers together and left over inside numbers together.

$6\sqrt{10}$

More Advanced Way

Step 1 – Think of a perfect square factor of the number under the radical.

example: $\sqrt{360}$

$\sqrt{36 \times 10} = \sqrt{36} \times \sqrt{10}$

Step 2 – Take the square root of the number from Step 1 - Bring it out. Leave the rest under the radical.

$6\sqrt{10}$

Exercises – Simplify

1. $\sqrt{24}$ 2. $\sqrt{12}$ 3. $\sqrt{32}$ 4. $\sqrt{48}$

5. $\sqrt{250}$ 6. $\sqrt{98}$ 7. $6\sqrt{20}$ 8. $\sqrt{44}$

<u>Multiplying Radicals</u> – think of them as variables – multiply radicands by radicands and coefficients by coefficients.

Example- $3\sqrt{2}\ x\ 4\sqrt{5} = (3\ x\ 4)\sqrt{(2\ x\ 5)} = 12\sqrt{10}$

Exercises – Multiply

9. $4\sqrt{2} \times 8\sqrt{3} =$ 10. $\sqrt{99} \times \sqrt{3} =$ 11. $5\sqrt{2} \times 3\sqrt{6} =$

12. $\sqrt{18} \times \sqrt{2} =$ 13. $\sqrt{12} \times \sqrt{6} =$ 14. $\sqrt{8} \times \sqrt{6} =$

<u>Dividing Radicals</u> – Sometimes it is easier to reduce the fraction first – sometimes it is easier to take the square root first.

Example - $\frac{\sqrt{24}}{\sqrt{2}} = \sqrt{\frac{24}{2}} = \sqrt{12} = 2\sqrt{3}$ Example - $\sqrt{\frac{5}{25}} = \frac{\sqrt{5}}{\sqrt{25}} = \frac{\sqrt{5}}{5}$

Exercises – Divide

15. $\frac{\sqrt{18}}{\sqrt{6}}$

16. $\frac{\sqrt{72}}{\sqrt{36}}$

17. $\frac{\sqrt{75}}{\sqrt{3}}$

18. $\frac{\sqrt{3}}{\sqrt{4}}$

Rationalize the denominator- You may never have a radical in the denominator of a fraction or a fraction under a radical. The process to eliminate this is called "Rationalizing the Denominator."

Step 1 – Find the smallest number that you would have to multiply the radicand in the denominator by to get a perfect square.

$$\frac{3}{\sqrt{2}}$$

2

Step 2 – Multiply the numerator and the denominator by one in the form of $\frac{\sqrt{x}}{\sqrt{x}}$, where x is the number found in Step 1.

$$\frac{3}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{2}}{\sqrt{4}}$$

Step 3 – Simplify – this will eliminate the radical in the denominator.

$$\frac{3\sqrt{2}}{2}$$

Exercises – Rationalize the denominator

19. $\frac{\sqrt{5}}{\sqrt{3}}$

21. $\frac{\sqrt{3}}{\sqrt{8}}$

20. $\frac{\sqrt{12}}{\sqrt{5}}$

22. $\sqrt{\frac{5}{12}}$

Adding and Subtracting Radical Expressions – Again, think of variables, the radicands must be the same in order to add or subtract.

Example- $2\sqrt{3} + 8\sqrt{3} = (2+8)\sqrt{3} = 10\sqrt{3}$

$15\sqrt{10} - 2\sqrt{10} = (15-2)\sqrt{10} = 13\sqrt{10}$

$4\sqrt{2} + 6\sqrt{7} - 11\sqrt{7} = 4\sqrt{2} + (6\sqrt{7} - 11\sqrt{7}) = 4\sqrt{2} - 5\sqrt{7}$

(only the $\sqrt{7}$'s can be combined)

Sometimes you have to simplify first to add or subtract.

Example- $3\sqrt{8} + 5\sqrt{2} = 6\sqrt{2} + 5\sqrt{2} = 11\sqrt{2}$

Exercises – Add or subtract.

23. $6\sqrt{2} + 8\sqrt{2} - \sqrt{2} =$

25. $4\sqrt{20} + 6\sqrt{45} - 3\sqrt{5} =$

24. $5\sqrt{3} - 2\sqrt{12} =$

26. $-3\sqrt{7} + 5\sqrt{28} =$

Multi-Step Equations. Solve each equation.

27. $-20 = -4x - 6x$

28. $8x - 2 = -9 + 7x$

29. $-8 = -(x + 4)$

30. $-18 - 6x = 6(1 + 3x)$

31. $2(4x - 3) - 8 = 4 + 2x$

32. $-(1 + 7x) - 6(-7 - x) = 36$

33. $-3(4x + 3) + 4(6x + 1) = 43$

34. $-5(1 - 5x) + 5(-8x - 2) = -4x - 8x$

Find the slope of the line that passes through the following points.

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

35. $(-3, 5), (8, -2)$

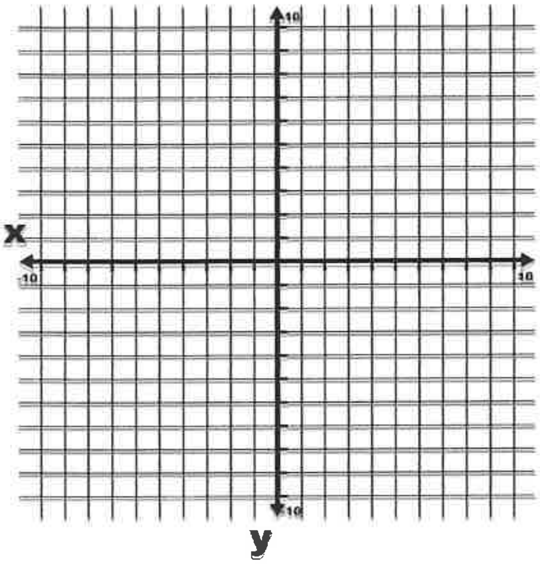
36. $(0, 4), (-8, 1)$

37. $(2, -7), (6, -7)$

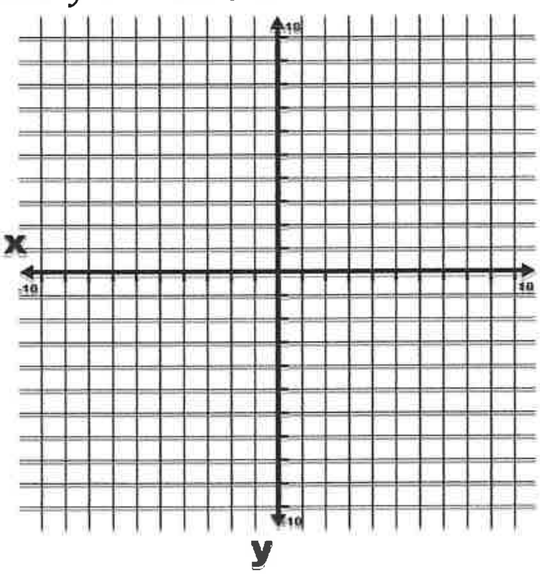
38. $(9, 4), (9, -2)$

Graph each of the following lines.

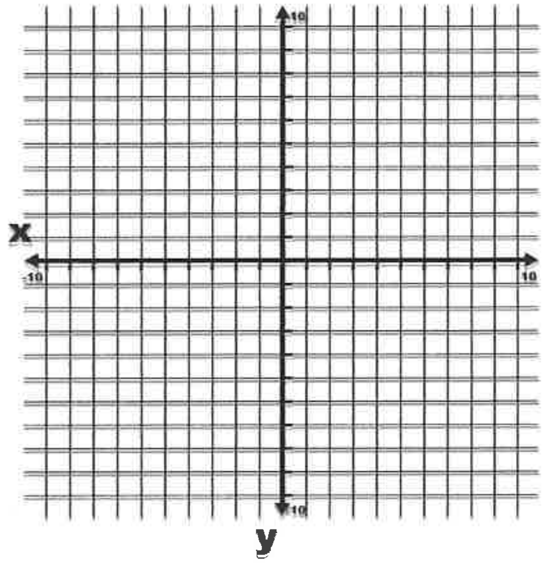
39. $y = \frac{4}{3}x - 2$



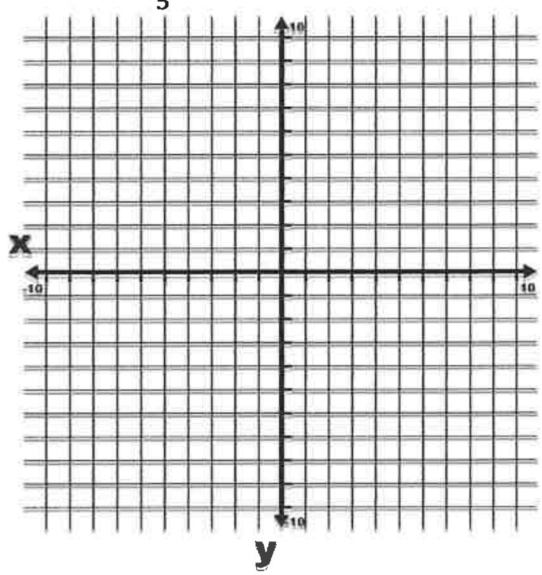
40. $y = -6x + 3$



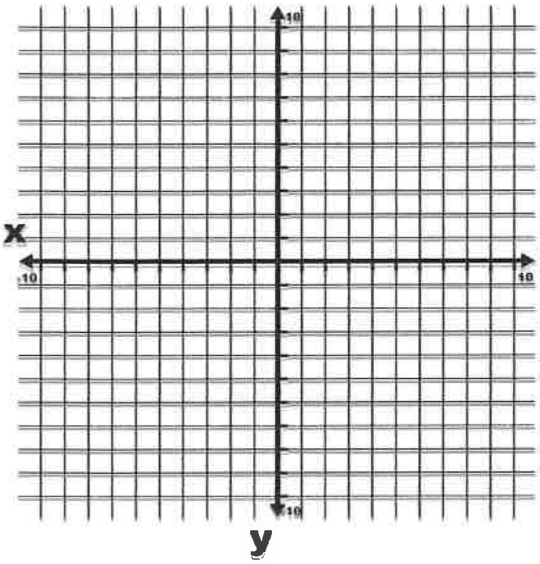
41. $y = -5$



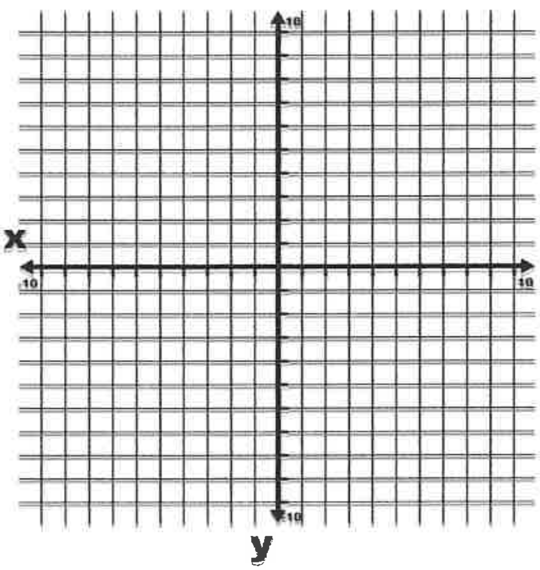
42. $y = \frac{-3}{5}x + 6$



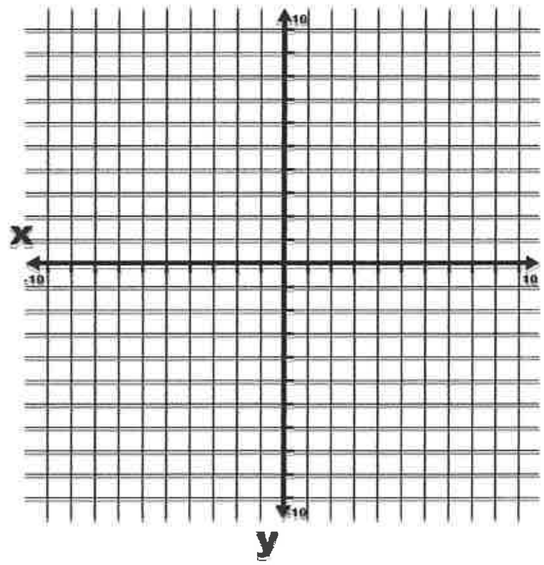
43. $y = \frac{1}{4}x + 2$



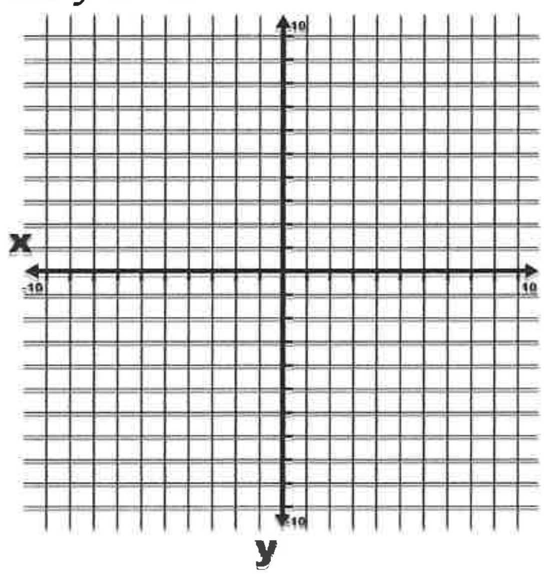
44. $x = 4$



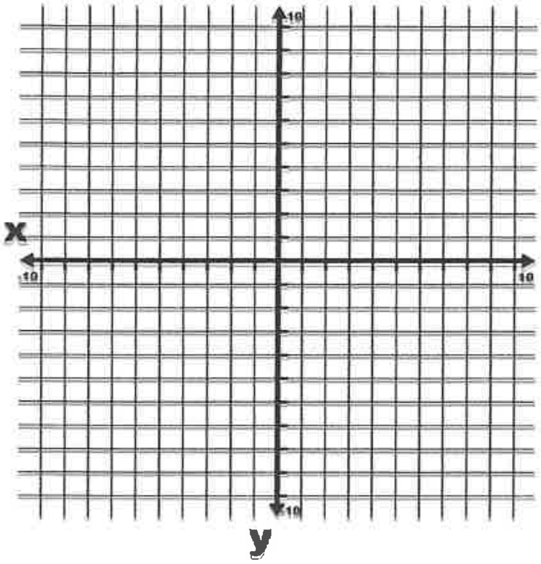
45. $y = x$



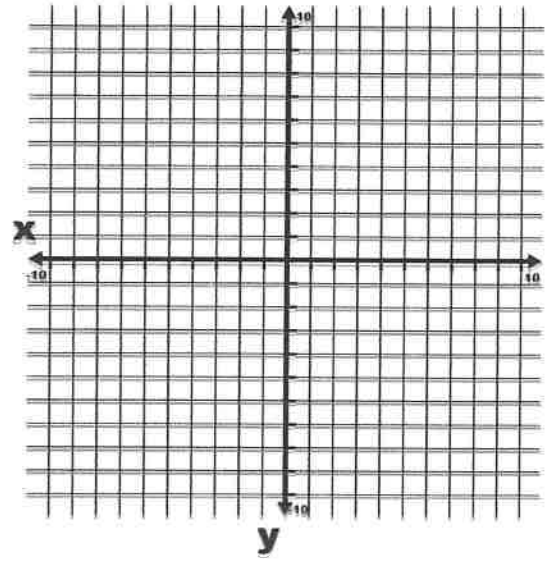
46. $y = -x$



47. $y = \frac{5}{3}x$



48. $y = -\frac{1}{3}x + 3$



Write the slope-intercept form of the equation of each line.

49. $3x - 2y = -16$

50. $13x - 11y = -12$

51. $9x - 7y = -7$

52. $x - 3y = 6$

53. $11x - 4y = 32$

54. $11x - 8y = -48$

Write the slope-intercept form of the equation of the line described.

55. through: $(1, 2)$, slope =7

56. through: $(3, -1)$, slope =-1

57. through: $(-2, 5)$, slope =-4

58. through: $(3, 5)$, slope =$\frac{7}{3}$

59. through: $(2, 5)$, slope = undefined

60. through: $(-1, 2)$, slope =0

61. through: $(4,2)$, parallel to $y = -\frac{3}{4}x - 5$

62. through: $(-3,-3)$, parallel to $y = \frac{7}{3}x + 3$

63. through: $(2,0)$, parallel to $y = \frac{1}{3}x + 3$

64. through: $(-2,4)$, parallel to $y = -\frac{5}{2}x + 5$