

ALGEBRA

1

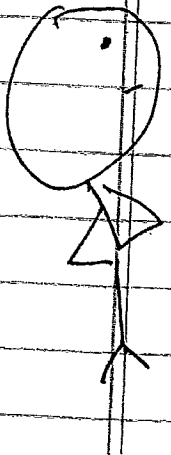
Name: Key
If you lose this you
will lose 2% on your
quarter grade.

FINAL EXAM

REVIEW

PACKET

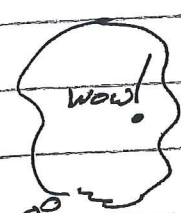
WILL
THIS
BE ON
THE
TEST?



100 questions that will prepare
you for the FINAL EXAM!

TOPICS

1. Types of Properties
2. Factoring / FOIL and the distributive property
3. Rational Equations
4. Radical Equations / simplifying radicals / estimating radicals
5. Exponents ... including negative / zero exponents
6. Inequalities / graphing / solving
7. Systems of Equations
8. Graphing $y = mx + b$ // and \perp lines
9. Quadratics "101" \rightarrow intercepts / vertex / axis of symmetry
10. Ratios / Proportions
11. FRQ / ORQ / word Related Problems (meas. related)
12. Fractions / Decimals / %'s
13. The pythagorean theorem / converse to pyth. theorem
14. Trig "101" (SINE and COSINE)
15. Rational, Irrational #'s
16. % of Change
17. Absolute value equations
18. Adding, subtracting polynomials
19. Completing the square
20. The Quadratic Formula



★ ★ ★ ★ ★ ★ ★ ★

★ This is worth $\frac{1}{7}$ th
★ of your grade for the
★ year. Make sure you
★ study! - Mr. Thittle 😊
★

1. Types of properties

WORD BANK

- commutative property
- distributive property
- associative property
- Additive inverse
- multiplicative inverse

1. $5(1) = 5$ Multiplicative Identity

2. $5+(1+2) = (5+1)+2$ Associative

3. $5 + (-5) = 0$ Additive Inverse

4. $5 + 2 = 2 + 5$ Commutative property

5. $2(3+4) = 6 + 8$ Distributive property

2. Factoring / FOIL / The Distributive property

$$6. \quad x^2 - x - 6 = 0$$

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

$$7. \quad 2x^2 + 5x - 3 = 0 \quad \begin{array}{l} -6 \\ \uparrow \\ 6-1 \end{array}$$
$$(2x^2 + 6x) - 1x - 3$$
$$2x(x+3) - 1(x+3)$$
$$(2x-1)(x+3)$$

$$8. \quad (2x-1)(-x+6)$$

$$-2x^2 + 12x + x - 6$$
$$-2x^2 + 13x - 6$$

$$9. \quad 3x(5x+7)$$

$$15x^2 + 21x$$

$$10. \quad x^2 - 49 = 0$$
$$(x+7)(x-7)$$

3. Rational Equations

11. $\frac{x+1}{3} = \frac{x-2}{4}$

$$4(x+1) = 3(x-2)$$

$$\begin{array}{r} 4x+4 \\ -3x-4 \\ \hline \end{array} = \begin{array}{r} 3x-6 \\ -3x-4 \\ \hline \end{array}$$

$$x = -7$$

Not on
F. not

12. $\frac{3}{m^2} = \frac{m-4}{3m^2} + \frac{2}{3m^2}$

$$\frac{9}{3m^2} = \frac{m-4+2}{3m^2} \rightarrow 9 = m-4+2 \quad 9 = m-2 \quad \frac{9}{3m^2} = \frac{m-2}{3m^2}$$

$$\frac{9(3m^2)}{3m^2} = \frac{(m-2)(3m^2)}{3m^2}$$

$$9 = m-2 \quad m = 11$$

Not on
F. not

13. $\frac{5}{x} = \frac{1}{5x} - \frac{x-1}{5x}$

$$\frac{5}{5x} = \frac{1-(x-1)}{5x}$$

$$5 = 1-x+1$$

$$3 = -x$$

$$x = -3$$

Not on
F. not

14. $\frac{6x+18}{x^2} + \frac{1}{x} = \frac{3}{x}$

$$\frac{6x+18+x}{x^2} = \frac{3}{x^2}$$

$$\begin{array}{r} 6x+18+x \\ -6x \\ \hline 18+x = 3x \\ -x \\ \hline 18 = 2x \end{array}$$

$$\frac{18}{2} = \frac{2x}{2} \quad x = 9$$

$$x = \frac{9}{2}$$

15. $\frac{2}{3} = \frac{x+4}{6}$

$$12 = 3(x+4)$$

$$\begin{array}{r} 12 = 3x+12 \\ -12 \\ \hline \end{array}$$

$$0 = 3x$$

$$x = 0$$

$$0 = 3x$$

$$0 = 3x$$

4. Radical Equations / Simplifying Radicals / Estimating Radicals

16. $\sqrt{x^2} = 10^2$

$x = 100$

17. $10^2 = \left(\sqrt{\frac{x}{10}}\right)^2$

$10 \cdot 100 = \frac{x}{10} \cdot 10$

$1000 = x$

18. $-8 + \sqrt{5x-5} = -3$

$(\sqrt{5x-5})^2 = 5^2$

$5x-5 = 25$

$+5 +5$

$\frac{5x}{5} = \frac{30}{5}$

$x = 6$

Not on Final

19. $\frac{1}{2x^2} = \frac{2x}{2x} \cdot \frac{1}{x} - \frac{1}{2} \cdot \frac{x^2}{x^2}$

$1 = 2x + x^2$

$x^2 - 2x + 1 = 0$

$(x-1)(x-1) = 0$

$x = 1$

Not on Final

20. $\frac{x}{x} \cdot \frac{x}{3} - \frac{1}{3x} = \frac{1}{x} \cdot \frac{3}{3}$

$x^2 - 1 = 3$
 $-3 -3$

$x^2 - 4 = 0$
 $(x+2)(x-2) = 0$

$x = 2, -2$

ALSO: ...

What is your estimate

$\sqrt{80}$

5. Exponents

21. $X^4 \cdot 2X^{-3}$
 $2x$

22. $\frac{X^2 Y^2 Z^{-1}}{X^0 Y^3 Z}$

$\frac{X^2}{Y Z^2}$

This is a 'zero'

23. $\frac{(X^2 Y)^3}{X^{-2}}$

$\frac{X^3 Y^3}{X^{-2}}$

$X^5 Y^3$

24. $\frac{2X^4}{X}$

$2x^3$

25. $(X^{-2} X^{-3})^4 = X^{-8} X^{-12} = X^{-20} = \frac{1}{X^{20}}$

6. Inequalities

$$26. \quad \begin{array}{r} -2 \\ +8 \end{array} \geq \begin{array}{r} x \\ +8 \end{array} - 8$$
$$6 \geq x$$

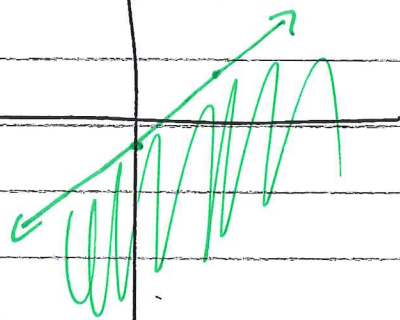
$$27. \quad \begin{array}{r} -2 \\ -1 \end{array} < \begin{array}{r} -x \\ -1 \end{array} + 1$$
$$\frac{-3 < -x}{-1 \quad -1}$$
$$3 > x$$

$$28. \quad \begin{array}{r} -4 \\ -2 \end{array} < \frac{-2x}{-2} < \frac{8}{-2}$$
$$2 > x > -4$$

$$29. \quad y \leq \frac{3}{5}x - 1$$

guide sketch

→ $0 \leq -1$
False

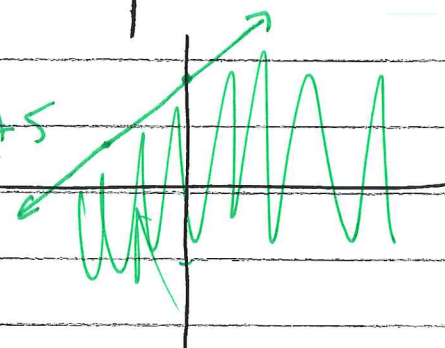


30.

$$\begin{array}{r} 5x - 3y \leq -15 \\ -5x \end{array} \quad \begin{array}{r} -3y \leq -5x - 15 \\ -3 \end{array}$$
$$y \geq \frac{5}{3}x + 5$$

→ $0 \geq 5$
False

Guide sketch



7. Systems of Equations

31. $2x + y = 20$ $2x + (4x + 8) = 20$
 $y = 4x + 8$ $2x + 4x + 8 = 20$
 $y = 4(2) + 8$ $-8 \quad -8$
 $y = 16$ $6x = 12$
 $x = 2$
(2, 16)

32. $y = 2x - 1$ $2x - 1 = 2x + 8$
 $-2x + 1 \quad -2x + 1$
 $y = 2x + 8$ $0 = 0$
~~Infinite solutions~~ No solutions

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

 $4x = 4$
 $x = 1$
 $1 + y = 2$
 $-1 \quad -1$
 $y = 1$
(1, 1)

34. $x + y = 10$ $x + -9 = 10$
 $-x + 2y = 1$ $+9 \quad +9$

 $0 \quad -y = 9$ $x = 19$
 $y = -9$
(19, -9)

35. $y = 6x - 1$ $6x - 1 = 4x + 1$
 $-4x + 1 \quad -4x + 1$ $y = 6(1) = 6$
 $y = 4x + 1$ $2x = 2$
 $x = 1$ $y = 5$
(1, 5)

8. Graphing $y = mx + b$ // and \perp lines

36. $y = 2x + 4$

write an equation //

$y = 2x + 8$

↑ Needs same slope

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

write an equation that is \perp

$y = -\frac{4}{3}x + 6$

↑ Flip? make negative

38. $y = 2x + 1$

write a \perp line that passes thru $(1, 0)$

$y = mx + b$

$0 = \frac{1}{2}(1) + b$

$b = -\frac{1}{2}$

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

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

39.

write a // line that passes thru $(0, 1)$

$y = mx + b$

$1 = \frac{3}{2}(0) + b$

$b = 1$

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

$(2, 3)$

put into $y = mx + b$

$(1, 1)$

$y = 2x - 1$

$1 = 2(1) + b$

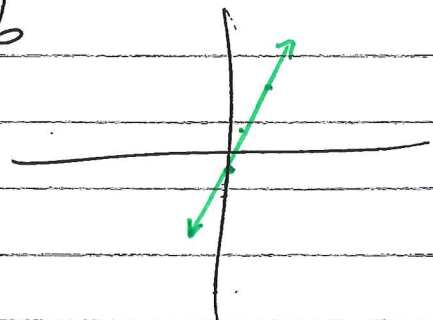
$b = -1$

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

to.

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

quick sketch



9. Quadratics "101"

41. $y = x^2 - 2x - 8$

Find the vertex

$$-\frac{b}{2a} = \frac{2}{2(1)} = 1 \quad y = (1)^2 - 2(1) - 8$$

$$(1, -9) \quad y = 1 - 2 - 8$$

$$y = -9$$

42. Find the axis of symmetry

$$x = 1$$

43. Find the x ints

$$0 = x^2 - 2x - 8$$

$$0 = (x-4)(x+2)$$

$$0 = x-4 \quad 0 = x+2$$

$$x = 4, -2$$

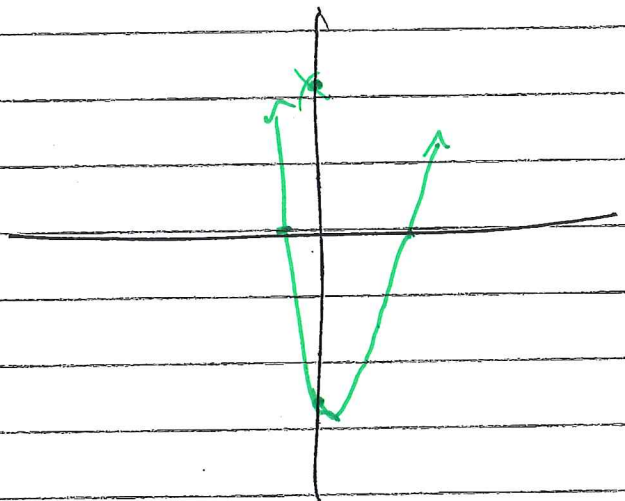
44. Find the y int

$$y = 0^2 - 2(0) - 8$$

$$y = -8$$

Graph AND label

45.



10. Ratio/Proportions

46.

$$\frac{4}{x-8} \propto \frac{8}{2}$$

$$8 = 8(x-8)$$

$$8 = 8x - 64$$
$$+64 \quad +64$$

$$\frac{72}{8} = \frac{8x}{8}$$

$$x = 9$$

47.

$$\frac{4}{9} \propto \frac{r-3}{6}$$

$$24 = 9(r-3)$$

$$24 = 9r - 27$$
$$+27 \quad +27$$

$$\frac{51}{9} = \frac{9r}{9}$$

$$r = \frac{17}{3}$$

48.

$$\frac{5}{x-9} \propto \frac{8}{x+5}$$

$$5(x+5) = 8(x-9)$$

$$5x + 25 = 8x - 72$$
$$-8x - 25 \quad -8x - 25$$

$$\frac{-3x}{-3} = \frac{-97}{-3}$$

$$x = \frac{-97}{3}$$

49.

$$\frac{x-6}{x-7} \propto \frac{9}{2}$$

$$2(x-6) = 9(x-7)$$

$$2x - 12 = 9x - 63$$
$$-2x + 63 \quad -2x + 63$$

$$\frac{7x}{7} = \frac{51}{7}$$

$$x = \frac{51}{7}$$

50.

$$\frac{x-5}{x+8} \propto \frac{2}{7}$$

$$7(x-5) = 2(x+8)$$

$$7x - 35 = 2x + 16$$
$$-2x + 35 \quad -2x + 35$$

$$5x = 51$$

$$\frac{5x}{5} = \frac{51}{5}$$

$$x = \frac{51}{5}$$

19.11

11. Word Problems

EASY

Steel Rail Half Marathon Lanesborough, MA to Adams, MA

START - 19' south of guard rail at water tower on southwest side of mall loop road. 23' north of the southern edge of traffic island across from water

FINISH - Even with pole #53 just north of entrance to Adams Visitor Center parking lot on Depot St.

ELEVATION - Start 1051', finish 790', high 1054', low 786'.

MEASURE - All measurements made assuming runners have full use of roadway except for first two miles on loop road around mall. Here runners must stay in the left (outer) lane.

COURSE - Run starts on southwest side of mall. Runners run one complete loop clockwise around mall. On second loop runners leave loop onto Ashiwillticook Rail Trail. Runners follow rail trail north all the way to end in Adams, MA. Then left on Hoosac St followed by left onto Depot St to finish.

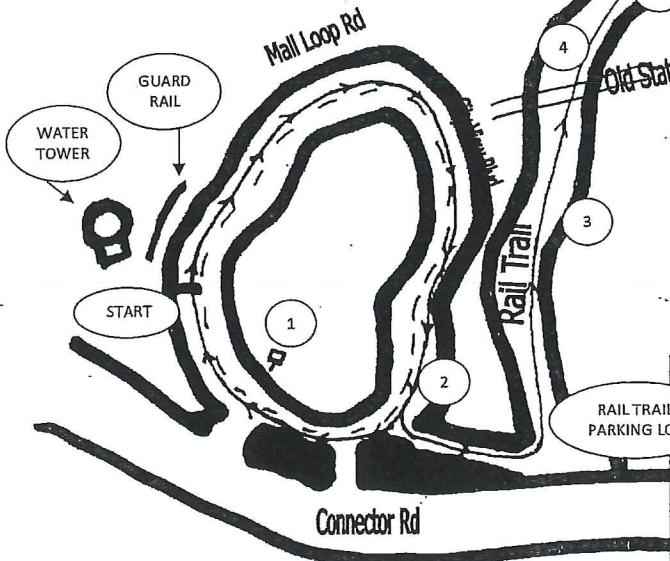


MILE 1 - 7' east of Berkshire Mall sign at southern entrance.
MILE 2 - 93' north of "Tobacco Free Zone" sign near southeast entrance. 245' north of stop sign at bike trail start.
MILE 3 - 254' south of southern end of 3 rung fence. 344' south of "Mile 10" mark on trail.
MILE 4 - 546' north of gate on north side of Old State Rd. 646' south of southern end of 3 rung fence.

MILE 5 - 553' north of wooden bridge on east side of trail. 258' south of "Mile 8" mark. 454' south of southernmost bench.
MILE 6 - 800' north of gate on north side of Farnams Rd. 220' south of "Mile 7" mark. 1293' south of gate on south side of Mallard Cove.
MILE 7 - 6' south of concrete pillar "W". 190' south of "Mile 6" mark on trail.
MILE 8 - 67' south of gate on south side of Main St. 140' south of "5 Mile" mark.

MILE 9 - 1127' north of bench. 89' south of "4 Mile" mark. 987' south of "The Wetlands" informational sign.
MILE 10 - 55' south of "3 Mile" mark.
MILE 11 - 138' north of large boulder on west side of trail. 9' south of bench near "2 Mile" mark.
MILE 12 - 792' north of northern end of fence over Hoosic River. 39' north of "1 Mile" sign. 682' south of southern side of bridge over trail.
MILE 13 - 5' west of sewer grate on Hoosac St just west of rail trail.

Measured for certification Sept. 25, 2014 by John Frey, Velocity Results. Contact JohnDFrey1@gmail.com, 413-320-1268, VelocityResults.com View detailed course map at... mapmyrun.com/routes/view/537487274



USATF Certification #MA14041JK
 Effective 10/22/2014 - 12/31/2024
 Drop 3.74 m/Km, Separation 78.57%

9.13.1 = 117.9 minutes

51. Mr. Thistle is running a half marathon. (he will likely beat Margo Smith easily..) He is running a 9:30 min mile. What will his final time be for 13.1 miles?

(Harder..)

Question 31 is an open-response question.

- BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.
- Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.
- If you do the work in your head, explain in writing how you did the work.

Write your answer to question 31 in the space provided in your Student Answer Booklet.

- 31 Katya wants to earn \$1500 this summer by doing yard work. She plans on working 125 hours over the summer.

- 52 a. Based on her plan, what is the rate, in dollars per hour, that Katya must charge customers for doing yard work to earn \$1500 over the summer? Show or explain how you got your answer.

$$\frac{1500}{125} = 12 \text{ dollars an hour}$$

Katya also wants to enroll in a summer class at a local college. As a result, she will have to work 50 hours less than the total number of hours she had originally planned.

- 53 b. What is the rate, in dollars per hour, that Katya must charge customers for doing yard work to still earn \$1500? Show or explain how you got your answer.

$$1500/75 = 20 \text{ dollars per hour}$$

- 54 c. Write an equation that represents the relationship between x , the number of hours Katya will have to work, and y , the rate she must charge customers to earn \$1500.

$$x \cdot y = 1500$$

- 55 d. Explain how a change in x , the number of hours Katya will have to work, affects y , the rate she will have to charge customers to earn \$1500, in your equation from part (c).

As the # of x increases y decreases
 3 Vice Versa.

12. Fractions / Decimals / %'s

56. $\frac{3}{8} + \frac{1}{4} \cdot \frac{2}{2} =$

$\frac{3}{8} + \frac{2}{8} = \frac{5}{8}$

ALSO

Fraction	Decimal	%
$\frac{5}{8}$.625	62.5%

57. $\frac{\frac{2}{3}}{\frac{1}{4}} =$

$\frac{2}{3} \cdot \frac{4}{1} = \left(\frac{8}{3}\right)$

58. $\frac{6}{5} \div \frac{-2}{3} =$

$\frac{6}{5} \cdot \frac{3}{-2} = \frac{18}{-10} = \left(\frac{-9}{5}\right)$

What is 18% of 50?

59.

(9)

50 is what % of 120?

60.

(41.6%)

13. The pythagorean / converse

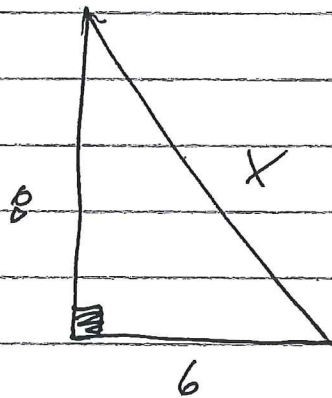
61. 3, 4, 5 ← Is it a Δ ? what kind

Right triangle

62. 2, 2, 3 ← Is It A Δ ? what kind

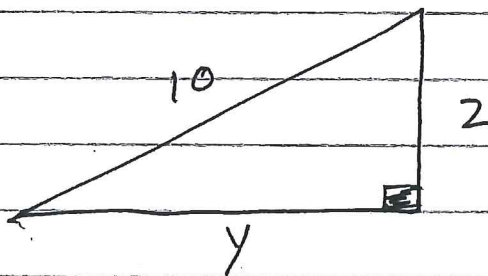
obtuse

63.



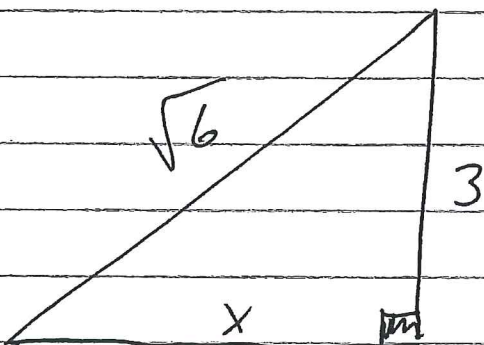
$$\begin{aligned}8^2 + 6^2 &= x^2 \\64 + 36 &= x^2 \\x &= 10\end{aligned}$$

64.



$$\begin{aligned}100 &= 2^2 + y^2 \\100 &= 4 + y^2 \\96 &= y^2 \\y &= \sqrt{96}\end{aligned}$$

65.



$$\sqrt{6} = 3^2 + x^2$$

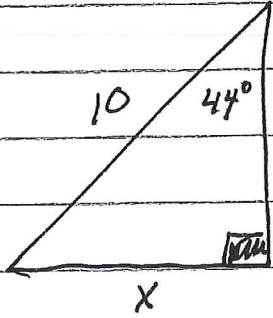
$$6 = 9 + x^2$$

Not a triangle

p.15

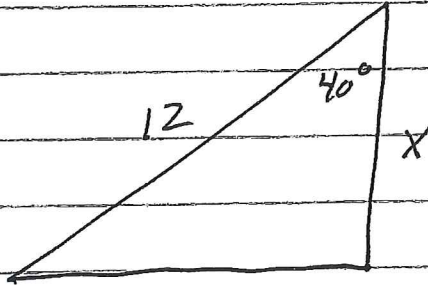
14. Trig "101"

66.

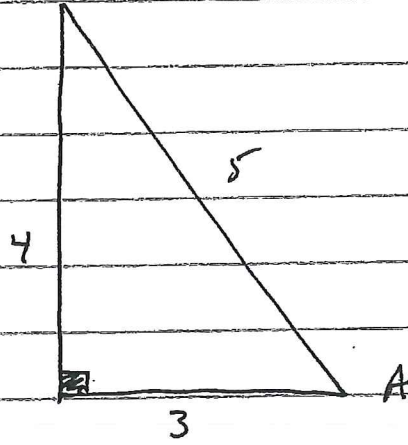


gk.p

67.

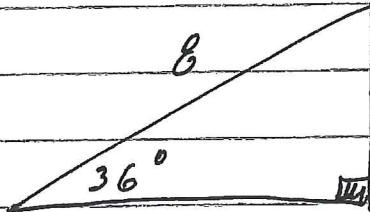


68.

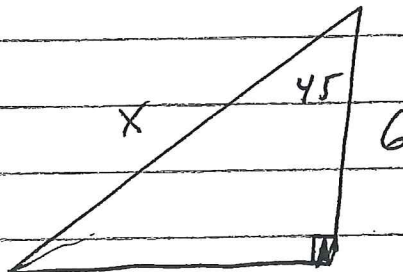


Find $\angle A$

69.



70.



15. Rational / Irrational #'s

Is it a R (rational)
or I (irrational)?

71.

$$\sqrt{50}$$

$$\begin{matrix} \uparrow \\ 5 \cdot 10 \\ \uparrow \\ 5 \cdot 2 \end{matrix}$$

$$\begin{matrix} 5\sqrt{2} \\ \neq \end{matrix}$$

72.

$$-2$$

R

73.

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

R

74.

$$5.\overline{47}$$

R

75.

$$5.47\ldots$$

I

16. % OF Change

26. You had \$24. You now have \$15.
What % of decrease?

$$\frac{24-15}{24} = 37.5\%$$

27. • It was 71°. It is now 74°.

• What is the % of increase?

$$\frac{71-74}{71} = 4.22\%$$

28. • You were 10 yrs old. You are now 15 yrs old.

• What is the % of increase?

$$\frac{10-15}{10} = 50\%$$

29. • You had 25 cookies.

• You now have 11.

• What is the % of decrease?

$$\frac{25-11}{11} = 27.27\%$$

30. • You had 100 questions to do.

• Now you have 20 more to do.

• What % of decrease?

$$\frac{100-80}{100} = 20\%$$

17. Absolute Value (Equations)

81.

$$|2x + 8| = 16$$

$$2x + 8 = 16$$

$$-8 \quad -8$$

$$\underline{2x = 8}$$

$$\underline{x = 4}$$

$$2x + 8 = -16$$

$$-8 \quad -8$$

$$\underline{2x = -24}$$

$$\underline{x = -12}$$

82.

$$|2x + 8| < 4$$

$$2x + 8 < 4$$

$$-8 \quad -8$$

$$\underline{2x < -4}$$

$$\underline{x < -2}$$

$$2x + 8 > -4$$

$$-8 \quad -8$$

$$\underline{2x > -12}$$

$$\underline{x > -6}$$

83. $|2x + 8| > 4$

$$2x + 8 > 4$$

$$-8 \quad -8$$

$$\underline{2x > -4}$$

$$\underline{x > -2}$$

$$2x + 8 < -4$$

$$-8 \quad -8$$

$$\underline{2x < -12}$$

$$\underline{x < -6}$$

84.

$$|x| = 6$$

$$\underline{x = 6, -6}$$

85.

$$|-2x + 1| = 10$$

$$-2x + 1 = 10$$

$$-1 \quad -1$$

$$\underline{2x = 9}$$

$$x = \frac{9}{2}$$

$$-2x + 1 = -10$$

$$-1 \quad -1$$

$$\underline{2x = -11}$$

$$\underline{x = \frac{9}{2}, -\frac{11}{2}}$$

18. Adding, Subtracting polynomials (+ multiplying...)

$$86. (2x^2 - x - 4) - (x^2 - 4x + 1)$$

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

$$87. (2x + x^2 - 1) + (3x^2 - x - 4)$$

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

$$88. 2x^2(x + 1)$$

$$2x^3 + 2x^2$$

$$89. 3x(2x^2 + x + 7)$$

$$6x^3 + 3x^2 + 21x$$

$$90. (3x^2 - x - 1) - (-x^2 + 8)$$

$$4x^2 - x - 9$$

19. Completing the square

91. $y = x^2 + x - 1$

$$0 = x^2 + x - 1 \quad \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

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

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

$$\pm \sqrt{\frac{5}{4}} = x + \frac{1}{4}$$

$$x = -\frac{1}{4} \pm \sqrt{\frac{5}{4}}$$

92. $y = x^2 + 2x - 4$

$$0 = x^2 + 2x - 4 \quad \left(\frac{2}{2}\right)^2 = 1$$

$$1 + 4 = x^2 + 2x + 1$$

$$5 = (x+1)(x+1)$$

$$5 = (x+1)^2$$

$$\pm \sqrt{5} = x+1$$

$$x = -1 \pm \sqrt{5}$$

93. $y = x^2 + 4x - 10$

$$0 = x^2 + 4x - 10 \quad \left(\frac{4}{2}\right)^2 = 4$$

$$4 + 10 = x^2 + 4x + 4$$

$$14 = (x+2)^2$$

$$\pm \sqrt{14} = x+2$$

$$x = -2 \pm \sqrt{14}$$

94. $y = x^2 + 2x - 20$

$$0 = x^2 + 2x - 20 \quad \left(\frac{2}{2}\right)^2 = 1$$

$$1 + 20 = x^2 + 2x + 1$$

$$21 = (x+1)^2$$

$$\pm \sqrt{21} = x+1$$

$$x = -1 \pm \sqrt{21}$$

95. $y = x^2 + x - 8$

$$0 = x^2 + x - 8 \quad \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

$$\frac{1}{4} + 8 = x^2 + x + \frac{1}{4}$$

$$\frac{33}{4} = \left(x + \frac{1}{2}\right)^2$$

$$\pm \sqrt{\frac{33}{4}} = x + \frac{1}{2}$$

$$x = -\frac{1}{2} \pm \sqrt{\frac{33}{4}}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

20. The Quadratic Formula

96.

$$y = x^2 - x - 6$$

$$a=1 \\ b=-1 \\ c=-6$$

$$x = \frac{1 \pm \sqrt{(-1)^2 - 4(1)(-6)}}{2(1)}$$

$$\frac{1 \pm \sqrt{25}}{2} \quad \frac{1 \pm 5}{2}$$

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

$$x = -2, 3$$

97.

$$y = x^2 - 2x - 8$$

$$0 = (x-4)(x+2)$$

$$0 = x-4$$

$$+4 \quad +4 \\ x = 4$$

$$0 = x+2$$

$$-2 \quad -2 \\ x = -2$$

98.

$$y = x^2 + 2x - 15$$

$$0 = (x+5)(x-3)$$

$$0 = x+5$$

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

$$0 = x-3$$

$$+3 \quad +3$$

99.

$$y = x^2 - x - 20$$

$$0 = (x-5)(x+4)$$

$$0 = x-5$$

$$+5 \quad +5 \\ x = 5, -4$$

$$0 = x+4$$

$$-4 \quad -4$$

100.

$$y = x^2 - 4x - 12$$

$$a=1 \\ b=-4 \\ c=-12$$

$$x = \frac{4 \pm \sqrt{4^2 - 4(1)(-12)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{64}}{2}$$

$$x = \frac{4 \pm 8}{2} \quad x = \frac{4+8}{2} = 6$$

$$x = \frac{4-8}{2} = -2$$

$$x = 6, -2$$

