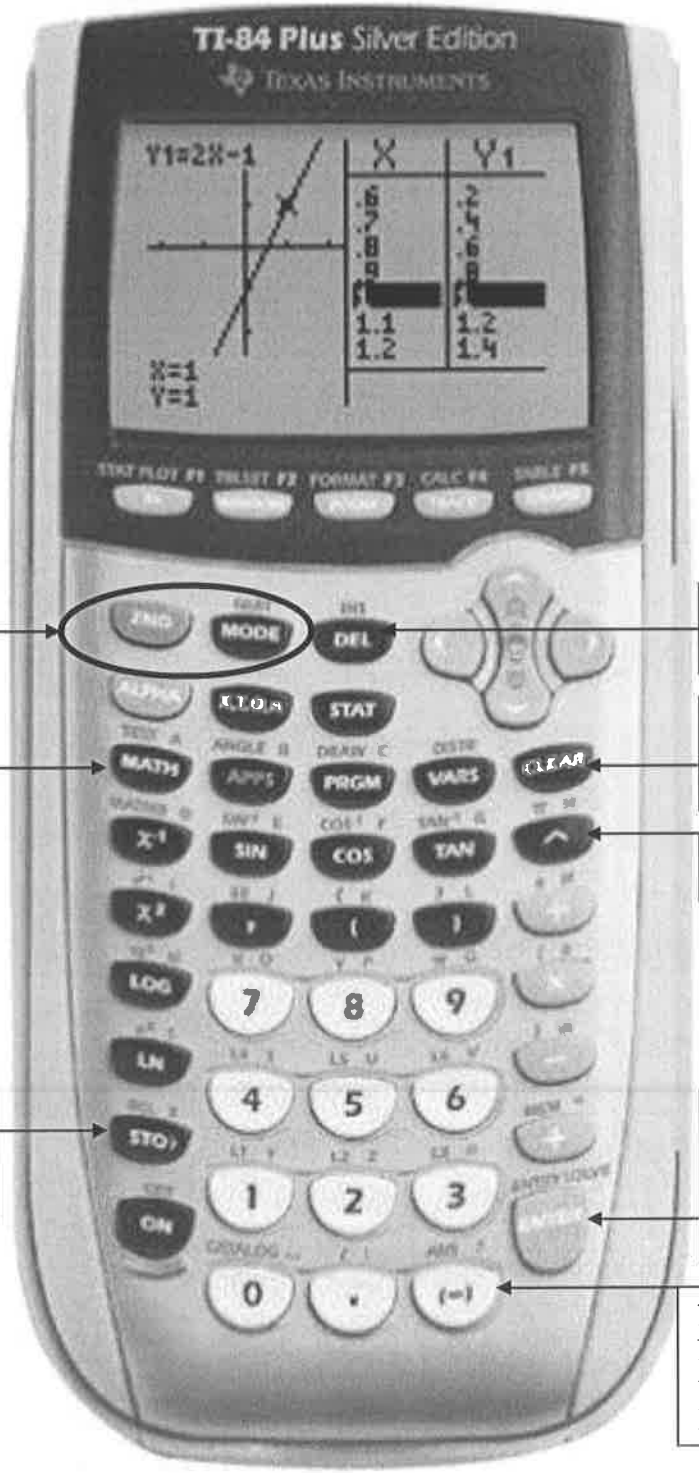
Calculator Reference Page

Use this as a guide as you work through problems on which you may use a calculator.



To get back to the home screen (where calculations are performed), press 2nd MODE.

MATH key allows us to access features such as absolute value and converting decimal answers to fractions

STORE key allows us to evaluate variable expressions for a specified value

DELetes one character

CLEARs an entire line of text

Exponent key

ENTER at the end of a sentence. Works as the = key does on a regular calculator

Negative key—NOT the same as the subtraction key!

Prerequisite Algebra skills for Algebra II

Directions:

- All work must be done NEATLY, on separate paper. You are expected to recopy and number each problem, show work clearly, and circle your final answer. Papers will not be accepted unless all of these conditions are met.
- All graphs must be done on graph paper. (print some from my website if necessary)
- Questions with the icon indicate that a calculator may **not** be used.
- Explanations, if required, must be written in complete sentences.

I. Operations with integers. SHOW ALL WORK.

1. (-5)-(-4)
2. 8-(-8)
3. 1+(-4)
4. -5+(-7)
5. $(-21) \div (-3)$
6. $(-8) \cdot (6)$
7. $(-10) \cdot (-11)$
8. $(42) \div (-7)$

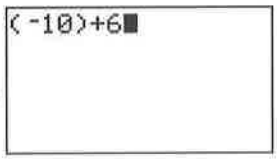
To check your answers using your graphing calculator, review and apply the keystrokes below.

Example: Let's evaluate (-10)+6

a. Be sure to type negative numbers in parentheses. Use the (−) found below the 3.

b. Finish typing the expression. Press ENTER.

Answer: -4



II. Operations with fractions. Write each as a single fraction in simplest form. *SHOW ALL WORK.*

9. $\frac{3}{10}+\frac{2}{5}$
10. $\frac{4}{9}-\frac{3}{2}$
11. $\frac{3}{4} \bullet 8$
12. $\frac{4}{7} \bullet \frac{21}{16}$
13. $\frac{7}{3} \div \frac{14}{3}$
14. $8\frac{5}{6}+1\frac{2}{3}$
15. $\frac{1}{3}$ of 93
16. 5% of 40
17. 0.45
18. 0.125

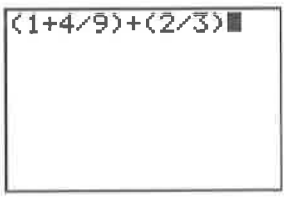
Provide the *reciprocal* of each as a fraction in simplest form. No decimal answers are allowed here.

19. $\frac{2}{3}$
20. -4

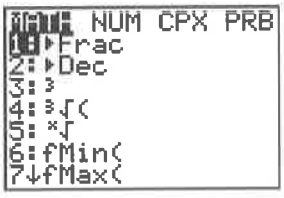
To check your answers using your graphing calculator, review and apply the keystrokes below.

Example 1: Let's evaluate $1\frac{4}{9}+\frac{2}{3}$

a. Type the expression in the "homescreen". Use parentheses to group each fraction.

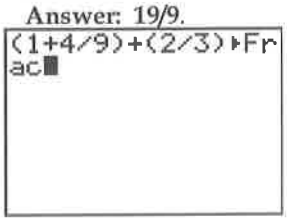


b. Press MATH (the key below the green ALPHA key, followed by 1



c. Press ENTER. This will express the computation in fractional form.

Answer: 19/9.



Example 2: Let's find the reciprocal of $2\frac{3}{4}$.

a. Remember: Always place parentheses around a fraction.

b. Type MATH 1 ENTER

```
1/(2+3/4)
```

```
1/(2+3/4)▸Frac
          4/11
```

Answer:

the reciprocal of $2\frac{3}{4}$ is $\frac{4}{11}$.

Now, use your graphing calculator to check #1-12. If your answers do not match, check your work, and check how you typed the expression into the calculator. Can you find your mistake(s)?

III. Use of zero and one, Exponents. Evaluate, if possible. If not possible, write "undefined".

21. $\frac{0}{5}$ 22. $\frac{5}{0}$ 23. $0-5$ 24. $555 \bullet 55 \bullet 5 \bullet 0 \bullet 5555$ 25. 5^1

26. 0^4 27. 1^4 28. 2^4 29. $(-1)^2$ 30. -1^2

To check your answers using your graphing calculator, review and apply the keystrokes below.

Example: Let's evaluate $3 \bullet 2^3$.

Process: Type 3 × 2 ^ 3 ENTER.

```
3*2^3
                24
```

Answer: 24

Now, use your graphing calculator to check #13-22. If your answers do not match, check your work, and check how you typed the expression into the calculator. Can you find your mistake(s)? ***Do you think that the calculator is wrong on any of them?***

IV. Order of Operations. Evaluate:

31. $4 \bullet 3^2$ 32. $4-2 \bullet 2$ 33. $5-2(3-4)$ 34. $5+2 \bullet 8-9 \div 3$

Now, use your graphing calculator to check #23-26. If your answers do not match, check your work, and check how you typed the expression into the calculator. Can you find your mistake(s)?

V. Algebraic Expressions
Simplify each:

35. $5x-4x$ 36. $5x-(-4x)$ 37. $-5x-4x$ 38. $(-5x)(-4x)$ 39. $x+x+x$

40. $x-x-x$ 41. $x \bullet x \bullet x$ 42. $x^2 \bullet x^3$ 43. $3(5x-7)$ 44. $5xy \bullet 3xy$

45. Evaluate $3+5x^2-8x$ a. for $x = 0$ b. for $x = 1$ c. for x = -1 d. for x = 2 e. for x = -2
SHOW ALL WORK.

46. Given the expression $3x-4(5x-9)$,
   a. evaluate it for $x = 7$
   b. simplify it without substituting a value for x. SHOW ALL WORK.
   c. evaluate your expression in part (b) for $x = 7$ and show that you get the same answer as in part (a). (Of course, if you don't get the same answer as in part (a), then you should check over your work.)

VI. Absolute Value - Evaluating Expressions, Equations, and Inequalities

47. $|-5|$ 48. $-|-5|$ 49. $|3+5(-2)|$

50. $|-4-8|$ 51. $|300-157|$ 52. $|157-300|$

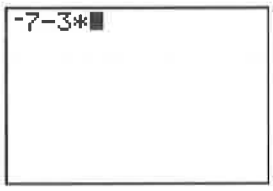
53. Find two values of x—one positive and one negative—that satisfy each statement below.
   a. $|x|=12$ b. $|x-3|=12$ c. $|x|-3=12$ d. $|x+3|=12$

   e. $|x|+3=12$ f. $|x|>12$ g. $|x-3|<12$ h. $|x+3|\geq 12$

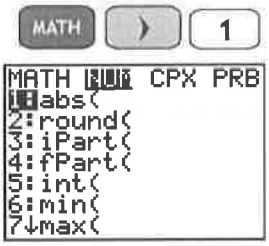
To check your answers using your graphing calculator, review and apply the keystrokes below.

Example: Let's evaluate $-7+3\bullet|4-9|$.

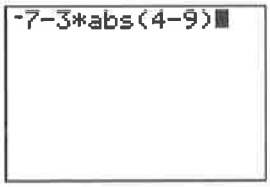
a. Type the first part of the expression we wish to evaluate.



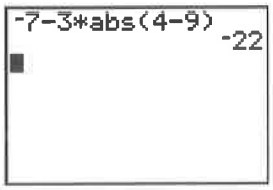
b. Locate absolute value in the NUM menu. Press



c. Finish typing the expression. Be sure to end the parentheses.



d. Press ENTER.
Answer: -22.



Now, use your graphing calculator to check #39-45. If your answers do not match, check your work, and check how you typed the expression into the calculator. Can you find your mistake(s)?

VII. One-Variable Linear Equations. Solve each equation for *x:* Provide answers as fractions in simplest form. If an equation has no solution, explain why. *SHOW ALL WORK.*

54. $\frac{x}{28} = 7$

55. $4x = -4x$

56. $8x = 0$

57. $0x = 8$

58. $4x - 2 = 1 + 2x$

59. $\frac{7}{3}x = \frac{1}{3}x + 1$

60. $4(x+2) - 2(6-x) = 0$

61. $2(x+2) + 3(x+3) = 4(x+4)$

62. $\frac{1}{2}(6x-12) + \frac{1}{3}(3x+18) = 1 - 2x$

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63. For each of the problems in #54-62, prove to me that your answers are correct by substituting each into the original equation and verifying that it makes a true statement. I have worked #60 out for you to model the skill and to show you what I expect.

Check answer x = 2/3: $4\left(\frac{2}{3}+2\right) - 2\left(6 - \frac{2}{3}\right) = 4\left(\frac{8}{3}\right) - 2\left(\frac{16}{3}\right) = \frac{32}{3} - \frac{32}{3} = 0 \ \surd$

VIII. One-Variable Linear Inequalities. Solve each inequality for *x:* Provide answers as fractions in simplest form. Graph all solutions on a number line. *SHOW ALL WORK.*

Example: $-3x + 4 > 5$

$-3x + 4 > 5$

Subtract 4 from both sides:

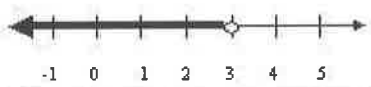
$-3x > 9$

Divide by -3. When dividing by a negative number, switch the inequality sign

$x < -3$

Graph solution on number; the endpoint is open since 3 is not included, shade left since <

Note: Endpoint is closed if ≤ or ≥; shade right if >



64. $-2x - 13 \geq 7$

65. $5x - 4x > 2$

66. $4x + 6 \leq 22$

67. $x - 7 < 5x - 17$

IX. Number Types. Carefully review the following definitions:

Summary **Subsets of Real Numbers**

Natural numbers $1, 2, 3, 4, \ldots$

- Natural numbers are the numbers used for counting.

Whole numbers $0, 1, 2, 3, 4, \ldots$

- Whole numbers are the natural numbers and 0.

Integers $\ldots -3, -2, -1, 0, 1, 2, 3, 4, \ldots$

- The integers are the natural numbers (positive integers), zero, and the negative integers.
- Each negative integer is the opposite, or additive inverse, of a positive integer.

Rational numbers Examples: $\frac{7}{5}, \frac{-3}{2}, -\frac{4}{5}, 0, 0.3, -1.2, 9$

- Rational numbers are all the numbers that can be written as quotients of integers. Each quotient must have a nonzero denominator.
- Some rational numbers can be written as terminating decimals. For example, $\frac{1}{8} = 0.125$.
- All other rational numbers can be written as repeating decimals. For example, $\frac{1}{3} = 0.\overline{3}$.

Irrational numbers Examples: $\sqrt{2}, \sqrt{7}, \sqrt{\frac{2}{3}}, \pi, 1.011011101111011111\ldots$

- Irrational numbers are numbers that cannot be written as quotients of integers.
- Their decimal representations neither terminate nor repeat.
- If a positive rational number is not a perfect square such as 25 or $\frac{4}{9}$, then its square root is irrational.

Number Sets: Real, Rational, Irrational, Integers, Whole Numbers, Natural Numbers

Example: To which number set(s) does -17 belong?

Answer: -17 is an integer, and it is a rational number (since it can be written as $-\frac{17}{1}$, a ratio of two integers).
-17 is also real.

#68-. State the number set(s) to which each number belongs.

68. $2\frac{3}{4}$ 69. $\sqrt{16}$ 70. $-0.\overline{3}$ 71. 0 72. -22 73. π 74. $\frac{1}{2}$ 75. 2

X. Linear Functions.

For #76-, solve for y in terms of x. In other words, write each in y = mx + b form by isolating the variable y.
SHOW ALL WORK.

76. $3x+2y=6$ 77. $y-3=-2(x+1)$ 78. $x-y=4$

79. Write an equation of the line whose slope is 5 and y-intercept is −3.

80. Write an equation of the line whose x-intercept is 5 and y-intercept is −10.

81. Write the equation of a line parallel to y = 2x + 1.

82. Write the equation of line perpendicular to y = 2x + 1

83. a. Find the slope of the line through the points (6, -3) and (4, 3)

b. Write the equation of the line through the point (6, -3) and (4, 3), using the slope you found in part a

84. On graph paper, graph each line in problems #79-83 on the xy-plane. Label two points on each line.

XI. Operations with Quadratic Expressions (a.k.a.,"FOIL" and Factoring)

Example 1: Multiply $(x+10)(x-9)$.

Answer:

F (first two terms) $= x \bullet x =$ x^2
O (outer two terms) $= x \bullet (-9) =$ $-9x$
I (inner two terms) $= 10 \bullet x =$ $10x$
L (last two terms) $= 10 \bullet (-9) =$ -90

Add them up to get your answer: x^2+x-90

Multiply. SHOW ALL WORK.

85. $(x+3)(x+3)$ 86. $(x-2)(x-3)$ 87. $(x-3)(x+2)$ 88. $(x-3)^2$

Example 2: Factor $x^2+7x-18$.

Answer: $(x+9)(x-2)$

Check by using FOIL: $x^2-2x+9x-18$
$= x^2+7x-18$ √

Factor.

89. $x^2+10x+24$ 90. $x^2+10x-24$ 91. x^2-5x-6 92. $x^2-13x+30$ 93. $x^2-13x-30$

XII. Solving Linear Systems Algebraically

For #94-99, solve the system of equations by any method. I have provided examples of each method—substitution and elimination—to refresh your memory on this skill.

Sample 1: Solve:
$$x = 1 - 3y$$
$$2x + 9y = -4$$

I'll use substitution. Replace *x* with 1 – 3*y* in the second equation:

$$2(1 - 3y) + 9y = -4$$
$$2 - 6y + 9y = -4$$
$$2 + 3y = -4$$
$$-2 \qquad -2$$
$$3y = -6$$
$$y = -2$$

Then, replacing *y* with -2 in the top equation, we get

$$x = 1 - 3(-2)$$
$$x = 1 + 6$$
$$x = 7$$

Sample 2: Solve:
$$5x - 4y = 30$$
$$x + 2y = 6$$

I'll use elimination. Multiply the bottom equation by 2 so that the y's will cancel when the equations are added together. (Note: you could have multiplied the bottom equation through by -5 to eliminate *x* instead.)

$$5x - 4y = 30$$
$$2(x + 2y = 6)$$

$$5x - 4y = 30$$
$$+ 2x + 4y = 12$$
$$7x \qquad = 42$$
$$x = 6$$

Then, replacing *x* with 6 in the top equation (either works), we get

$$5(6) - 4y = 30$$
$$30 - 4y = 30$$
$$-30 \qquad -30$$
$$-4y = 0$$
$$y = 0$$

Solve each system using either method: substitution or elimination. SHOW ALL WORK.

94. $2x - 3y = 6$, $y = -2$

95. $y = x + 11$, $11x - 2y = 5$

96. $x + y = 168$, $-x + y = 18$

97. $8x - 7y = 5$, $x = y + 1$

98. $15x - 9y = -24$, $-5x - y = 4$

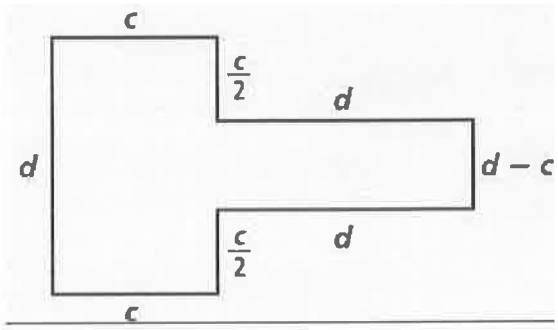
99. $2x + 3y = 5$, $3x - 5y = -21$

100. For each of the problems in #94-99 prove to me that your answers are correct by substituting each into the original equations and verifying that both equations are satisfied.

XIII. Number Sense, Open Response, Applications.

101. A sweater that originally costs $50 is marked 10% off. In addition, you have a coupon that entitles you to take 10% off of the sales price. Assuming that clothing purchases are tax exempt,
   a. determine the sale price of the sweater;
   b. determine the price that you will wind up paying with your coupon;
   c. what fraction of the original price do you wind up paying?
   d. write a formula for new price p based on original price x.

102.



   a. Provide a simplified expression, in terms of c and d, that represents the perimeter of the figure.
   b. Using c = 10 and d = 18, determine the area of the figure. Assume that all angles are right angles.
   c. If the values of c and d are both doubled, determine the effect that would have on the
      i. perimeter
      ii. area

XIV. Exploratory Challenge

103. Go to the following website: https://youtu.be/M3D1ppKWotY , watch the video clip and think about how you can describe the motion of the man.

A. What are some different ways that you can describe the man's motion?

B. What would be some variable relationships we might want to examine in more detail?

Mathematics follows the **"Rule of Four"** whenever investigating a mathematical relationship. We want to discuss the relationship **1) VERBALLY** by communicating and describing the relationship in words; examine the relationship **2) NUMERICALLY** by looking at data points either in a table or as a set of ordered pairs; visualize the relationship **3) GRAPHICALLY** by determining independent and dependent variables and sketching; and analyze the relationship **4) ALGEBRAICALLY** by developing a formula we can use to solve real world questions.

C. Now suppose we decide to examine the relationship between the heights of the man's waist with respect to time. Write a few short paragraphs describing verbally how the height of the man's waist changes with respect to time. Some points to consider.... How high do you think he was at the top of the stairs? How did you estimate that elevation? Were there intervals of time when his elevation wasn't changing? Was he still moving? Did his elevation ever increase? When? What units did you use for the height of his waist and for the time? Were there intervals where the rate his height was changing with respect was constant? Can you estimate that rate during those intervals?

D. Examine the relationship numerically and create a table of values. Decide which variable should be the independent variable and which should be the dependent variable.

E. Represent the situation visually by sketching a graph. Some points to consider...How should we label the vertical axis? What unit of measurement should we choose (feet or meters)? How should we label the horizontal axis? What unit of measurement should we choose? What should the title of the graph be?

F. Using your graph from E, answer the following questions:

i. How fast is the height changing with respect to time at 3 seconds?

ii. What kind of function formula could be used to model the height between 1 and 5 seconds and why would you choose this type of function?

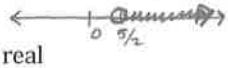
iii. Write a formula for the height between 1 and 5 seconds. How is your answer to part i related to this formula?

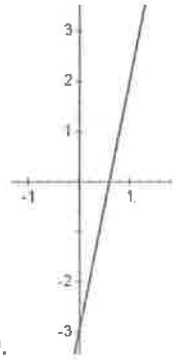
iv. How fast is the height changing with respect to time at 7 seconds? At 10 seconds?

v. At what time(s) was the height decreasing? Increasing? Not changing?

vi. Write a formula for the height between 8 and 12 seconds. Why does the answer to iv. at 10 seconds make sense for this formula?

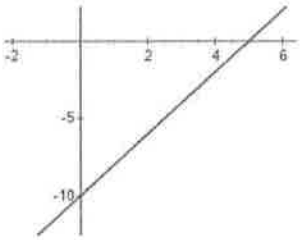
SOLUTIONS

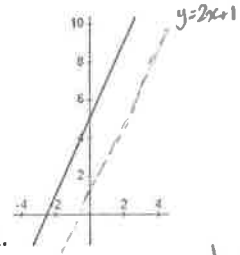
1. -1
2. 16
3. -3
4. -12
5. 7
6. -48
7. 110
8. -6
9. $\frac{7}{10}$
10. $-\frac{19}{18}$
11. 6
12. $\frac{3}{4}$
13. $\frac{1}{2}$
14. $\frac{21}{2}$
15. 31
16. 2
17. $\frac{9}{20}$
18. $\frac{1}{8}$
19. $\frac{3}{2}$
20. $-\frac{1}{4}$
21. 0
22. Undefined
23. -5
24. 0
25. 5
26. 0
27. 1
28. 16
29. 1
30. -1
31. 36
32. 0
33. 7
34. 18
35. X
36. 9x
37. -9x
38. $20x^2$
39. $3x$
40. $-x$
41. x^3
42. x^5
43. $15x - 21$
44. $15x^2y^2$
45. a. 3
    b. 0
    c. 16
    d. 7
    e. 39
46. a. -83
    b. -17x+36
    c. -83
47. 5
48. -5
49. 7
50. 12
51. 143
52. 143
53. a. x=12, -12
    b. x=15, -9
    c. x = 15, -15
    d. x = 9, -15
    e. x= 9, -9
    f. answers will vary $x<-12$ or $x>12$
    g. answers will vary $-9<x<15$
    h. 10, -16 (answers will vary) $x\le -15$ or $x\ge 9$
54. x = 196
55. x = 0
56. x = 0
57. no solution
58. $x = \frac{3}{2}$
59. $x = \frac{1}{2}$
60. $x = \frac{2}{3}$
61. $x = 3$
62. $x = \frac{1}{6}$
63. Check solutions
    – show work
64. $x \le -10$
65. $x > 2$
66. $x \le 4$
67. $x > \frac{5}{2}$ 
68. Rational, real
69. Real, rational, integer, whole, natural
70. Rational, real
71. Real, rational, integer, whole
72. Integer, rational, real
73. Irrational, real
74. Rational, real
75. Real, rational, integers, whole, natural
76. $y = -\frac{3}{2}x + 3$
77. $y = -2x + 1$
78. $y = x - 4$
79. $y = 5x - 3$
80. $y = 2x - 10$
81. $y = 2x + 5$ (y int may vary)
82. $y = -\frac{1}{2}x - 3$ (y int may vary)
83. a. -3
    b. $y = -3x + 15$



84. 79.

80.

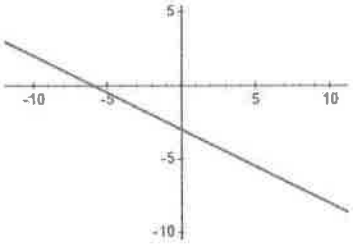


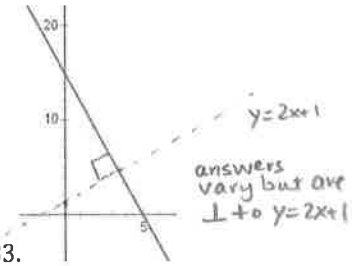


81.

answers may vary but will be parallel to y= 2x+1

82.





83.

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

86. $x^2 - 5x + 6$

87. $x^2 - x - 6$

88. $x^2 - 6x + 9$

89. (x+4)(x+6)

90. (x+12)(x-2)

91. (x-6)(x+1)

92. (x-10)(x-3)

93. (x-15)(x+2)

94. x=0, y = -2

95. x = 3, y = 14

96. x = 75, y = 93

97. x = -2, y = -3

98. x = -1, y = 1

99. x = -2, y = 3

100. Check answers

101. a. $45

b.$40.50

c. $\frac{81}{100}$

d. $P = \frac{81}{100}x$

102. a. 2c+4d

b. 92

c. perimeter is doubled, area is times 4

103. Will be discussed first day of class.