Elementary Algebra
Final Examination
SAMPLE

NAME: Answer Key

SPRING 2016

You will have 2 hours to complete this exam. You may use a calculator but must show all algebraic work in the space provided to receive full credit. Read all directions carefully, simplify all answers fully, and clearly indicate your answer. Good Luck!

Solve each equation. Show all algebraic work for full credit. *(3 points each)*

1) $14 - x = 22$

$-14 \quad -14$

$\frac{-x}{-1} = \frac{8}{-1}$

$x = -8$

1) $x = -8$

2) $\frac{2}{5}x + 6 = 30$

$-6 \quad -6$

$\frac{5}{2} \cdot \frac{2}{5}x = 24 \cdot \frac{5}{2}$

→ Isolate the variable term.

→ multiply by the reciprocal.

$x = 60$

2) $x = 60$

3) $7x + 3 = -5x + 15$

$+5x \quad +5x$

$12x + 3 = 15$

$-3 \quad -3$

$\frac{12x}{12} = \frac{12}{12}$

$x = 1$

3) $x = 1$

Solve each equation. Show all algebraic work for full credit. *(3 points each)*

4) $2(6y - 11) = 38$ Distributive Property.

4) $y = 5$

$12y - 22 = 38$
$+22 \quad +22$
$\frac{12y}{12} = \frac{60}{12}$
$y = 5$

5) $6\left(\frac{1}{2}x + \frac{1}{3} = \frac{2}{3}x\right)6$ Clear Fractions

5) $x = 2$

$\frac{6}{1} \cdot \frac{1}{2}x + \frac{6}{1} \cdot \frac{1}{3} = \frac{6}{1} \cdot \frac{2}{3}x$

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

6) $5x - (8x - 4) = -17 - 10x$

6) $x = -3$

$5x - 8x + 4 = -17 - 10x$
$-3x + 4 = -17 - 10x$
$+10x \quad +10x$
$7x + 4 = -17$
$-4 \quad -4$
$\frac{7x}{7} = \frac{-21}{7}$
$x = -3$

Solve the equation. Show all algebraic work for full credit. *(3 points)*

7) $5(y-7)-12=2(y+8)$

7) $y=21$

$5y-35-12=2y+16$

$5y-47=2y+16$

$-2y \quad -2y$

$3y-47=16$

$+47 \quad +47$

$\frac{3y}{3}=\frac{63}{3}$

$y=21$

Solve each inequality and graph the solution on the number line provided. *(3 points each)*

8) $-5x+22+3x>12$

8) $x<5$

$-2x+22>12$

$-22 \quad -22$

$\frac{-2x}{-2}>\frac{-10}{-2}$

$x<5$

9) $(0.14x+1.85\le 0.36x+2.25-0.32x)\,100$

9) $x\le 4$

$14x+185\le 36x+225-32x$

$14x+185\le 4x+225$

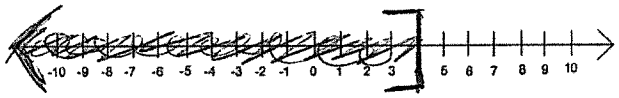
$-4x \quad -4x$

$10x+185\le 225$

$-185 \quad -185$

$\frac{10x}{10}\le\frac{40}{10}$

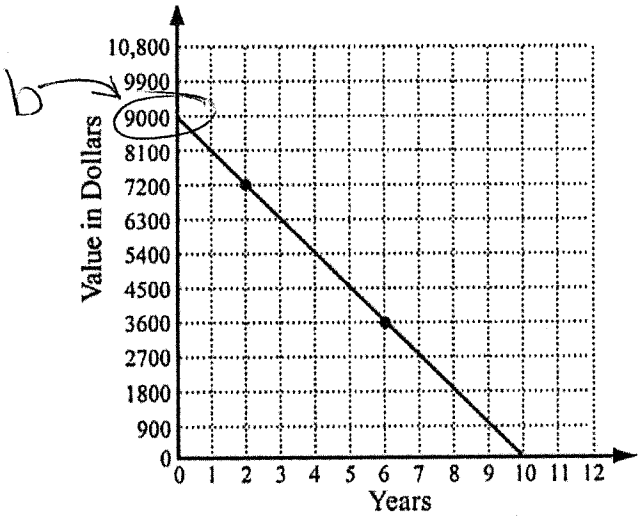
$x\le 4$



10) Write the equation of a line that has a slope of 3 and intersects the y-axis at (0, -9). *(2 points)*

$y = 3x - 9$

11) Write the equation of the line for the graph shown. *(2 points)*



$m = \frac{-3600}{4} = -900$

b = y-intercept = 9000

$y = mx + b$

$y = -900x + 9000$

12) Find the slope of each line. Then state whether the two lines are parallel, perpendicular or neither. Show your work and justify your answer for full credit. *(3 points)*

$y = -3x - 5$

Slope of first line -3

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

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

Slope of second line $\frac{1}{3}$

Answer with reason: The lines are perpendicular because the slopes are opposite reciprocals.

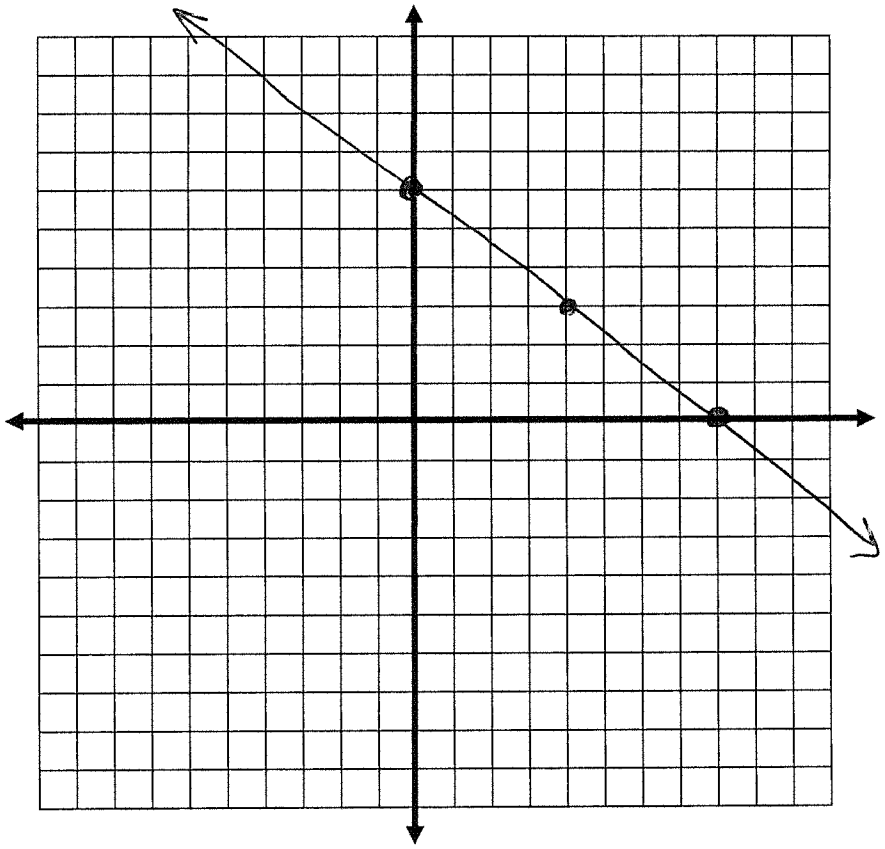
13) Given the line $3x + 4y = 24$, find the following. *(1 point each)*

x	y
0	6
8	0

OR

$\frac{4y}{4} = -\frac{3}{4}x + \frac{24}{4}$

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



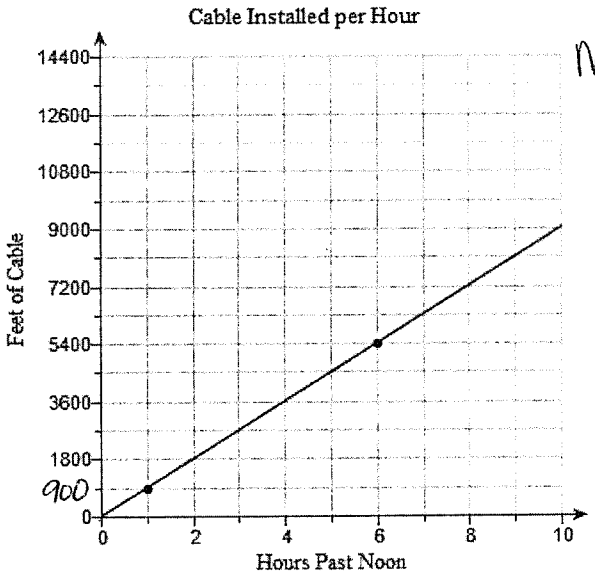
a) x-intercept: (8, 0)

b) y-intercept: (0, 6)

c) slope: $-\frac{3}{4}$

d) Graph.

14) Use the graph to find the rate of cable installation over time. Include units in your answer. *(1 point)*



$m = \frac{5400 - 900}{6 - 1} = \frac{4500}{5} = 900$

14) 900 feet per hour

15) The value v of a copy machine, in thousands of dollars, is given by:

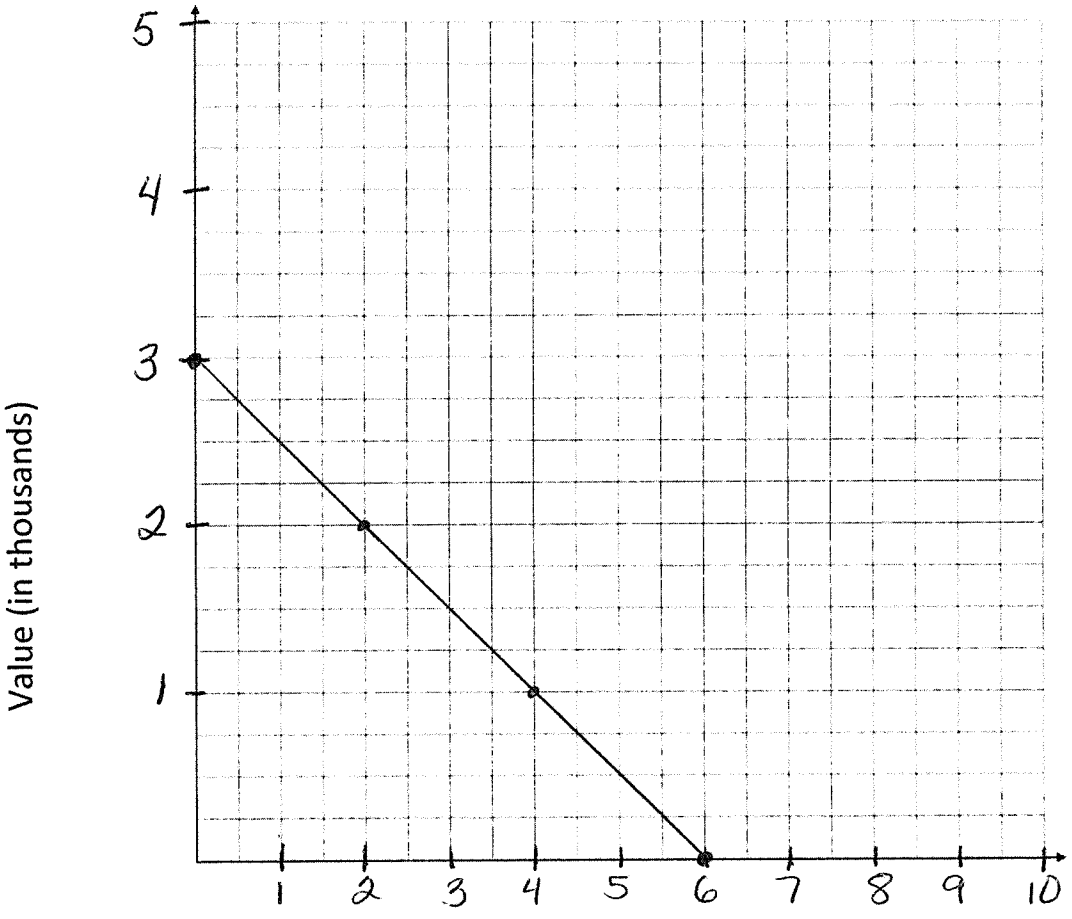
$$v = -\frac{1}{2}t + 3$$

where t is the time from the date of purchase (in years).

a) Graph the equation. *(2points)*

b) Use the graph to estimate the value of the copier after 3 years. *(1 point)* $1,500

c) Find the rate, in dollars per year, that the value of the copier was decreasing. *(1 point)* $500 per year



16) Write the equation of the line that contains the points (-2, 11) and (5, -3). *(3 points)*

$x_1\ y_1 \quad x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3-11}{5-(-2)} = \frac{-14}{7} = -2$$

$y = mx + b$

$-3 = -2(5) + b$

$-3 = -10 + b$

$+10 \quad +10$

$7 = b$

$y = -2x + 7$

17) If $f(x) = x^2 + 11$, then find $f(0)$ and $f(-3)$. *(1 point each)*

Plug these #'s in for x.

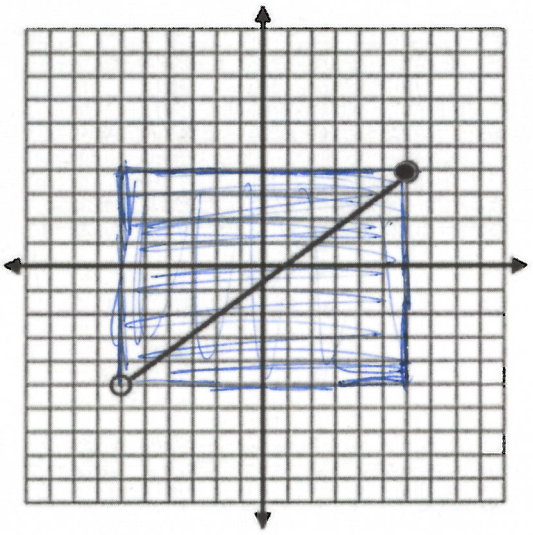
a) $f(0) =$ $(0)^2 + 11 = 11$ 17a) 11

b) $f(-3) =$ $(-3)^2 + 11$

$9 + 11$

20 17b) 20

18) What is the domain and range of the following function? Write your answer in interval notation. *(1 point each)*



Domain: $(-6, 6]$

Range: $(-5, 4]$

19) Find the point of intersection of the two lines using the substitution method. (3 points)

$x + 2y = 16$
$y = 3x + 1$ substitute

$x + 2(3x+1) = 16$

$x + 6x + 2 = 16$

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

$\frac{7x}{7} = \frac{14}{7}$

$x = 2$

$y = 3(2) + 1$

$y = 6 + 1$

$y = 7$

x, y
$(2, 7)$

20) Find the point of intersection of the two lines using the elimination (addition) method. *(3 points)*

$-4\ (x - 2y = 2)\ \cdot -4$
$4x + y = 17$

$\Rightarrow\ -4x + 8y = -8$
$+\ 4x + y = 17$

$9y = 9$

$\frac{9y}{9} = \frac{9}{9}$

$y = 1$

$x - 2(1) = 2$

$x - 2 = 2$
$+2\ \ +2$

$x = 4$

(x, y)
$(4, 1)$

21) Express 340,000,000 in scientific notation. *(1 point)*

21) 3.4×10^{8}

22) Write $3.6\ x\ 10^{-4}$ in standard form (decimal notation). *(1 point)*

22) 0.00036

.00036

23) Multiply. Write your answer in scientific notation. *(2 points)*

23) 8.1×10^{4}

$(2.7 \times 10^{12})(3 \times 10^{-8})$

Simplify each expression. Write the result using positive exponents. Please circle your final answer. *(2 point each)*

24) $x^{-10} \cdot x^5 \cdot x$

$x^{-4} = \frac{1}{x^4}$

25) $(2^5)^4$

2^{20}

26) $(-4a^{-4}b^5)^2$

$16a^{-8}b^{10} = \frac{16b^{10}}{a^8}$

27) $\frac{12x^7y^6}{20x^2y^{-2}}$

$\frac{3x^5y^8}{5}$

Perform the indicated operations. Simplify answers fully. (2 points each)

28) $15x^3 + 12x^2 - 4 + 3x^2 - 5x^3 - 1$

$10x^3 + 15x^2 - 5$

29) $(6x^2 + x - 10) - (4x^2 - 3x + 8)$

$6x^2 + x - 10 - 4x^2 + 3x - 8$

$2x^2 + 4x - 18$

30) $6x(x^2 + 3x - 5)$ $= 6x^3 + 18x^2 - 30x$

Perform the indicated operations. Simplify answers fully. (2 points each)

31) $(2x-5)^2$

$(2x-5)(2x-5)$

$4x^2-10x-10x+25$

$4x^2-20x+25$

32) $(3p+8)(3p-8)$

$9p^2-64$

33) $(4x-6y)(x-2y)$

$4x^2-8xy-6xy+12y^2$

$4x^2-14xy+12y^2$

34) $\frac{15x^3+55x^2-30x}{-5x} = \frac{15x^3}{-5x} + \frac{55x^2}{-5x} \frac{-30x}{-5x}$

$-3x^2-11x+6$

Applications. Show your algebraic work for each problem. Include the proper units. Circle your final answer.

35) A walkway rises 3 feet vertically over a horizontal distance of 51.6 feet. What is the grade of the walkway as a percent? Round to the nearest tenth of a percent. *(2 points)*

$$\text{Grade} = \text{slope} = \frac{\text{rise}}{\text{run}} = \frac{3}{51.6} = 0.0581\ldots$$

5.81%

5.8%

36) A rental car company charges a \$50 flat fee plus \$20 for each day a car is rented. Write the equation of the line that models this relationship. *(2 points)*

x = number of days
y = cost

$y = 20x + 50$

37) When all n teams in a baseball league play every other team twice, a total of G games are played, where $G = n^2 - n$. If a baseball league has 11 teams and all teams play each other twice, how many games are played? *(2 points)*

$n = 11$

$G = (11)^2 - 11$

$= 121 - 11$

$= 110$ games

38) You paid $35.40 for a meal including a 18% tip. How much was the cost before the tip? Round your answer to two decimal places. *(3 points)*

X = cost of meal before tip

$X + .18X = 35.40$

$\frac{1.18X}{1.18} = \frac{35.40}{1.18}$

$X = 30$

$30.00

No Rounding

39) The equation $C = 2d + 2.5$ can be used to determine the cost of a taxi ride C, in dollars, given the number of miles d that the taxi travels. Determine the distance a taxi drove for a ride that costs $15.50. *(3 points)*

$15.50 = 2d + 2.5$

$-2.5 \quad -2.5$

$13 = 2d$

$\frac{13}{2} = \frac{2d}{2}$

$7.5 = d$

7.5 miles

40) Karen's financial aid stipulates that her tuition not exceed $7,000. If her local community college charges a $125 registration fee plus $1,600 per course, what is the greatest number of courses for which Karen can register? *(3 points)*

X = number of courses

$125 + 1600x \leq 7000$

$-125 \quad -125$

$\frac{1600x}{1600} \leq \frac{6875}{1600}$

$x \leq 4.29$

Karen can register for at most 4 classes

41) A trip to New York City costs $50 for children and $80 for adults. A total of 42 people went on the trip and $3,000 was collected altogether. How many student tickets were sold? How many adult tickets were sold? *(3 points)*

C = number of children ($50)
a = number of adults ($80)

$-50(a + C = 42)$ → $-50a - 50C = -2100$
$80a + 50C = 3000$ → $+ 80a + 50C = 3000$

$$\frac{30a}{30} = \frac{900}{30}$$

$a = 30$

$30 + C = 42$

$C = 12$

12 children
30 adults

BONUS: ***(3 points)***

Erin's age, when divided by 2, 3, 4, or 5, gives a remainder of 1.
Find the least age that Erin could be given that she is older than 1.

Bonus: 61 years old