

Math 099 - Summer 2011 - Test 1

Instructor: Dr. Francesco Strazzullo

Name KEY

Instructions. Only calculators are allowed on this examination. Point values of each problem are indicated. Always use the appropriate wording and units of measure in your answers (when applicable). **SHOW YOUR WORK NEATLY, PLEASE** (no work, no credit).

1. Write each sentence with an equation. Let x be the input. Let y be the output. The output is:

(a) (6pts) four more than a third of the input;

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

(b) (6pts) 5.3% of the input less than twenty;

$$5.3\% = \frac{5.3}{100} = .053 ; y = 20 - .053x$$

(c) (6pts) the reciprocal of twice the input, increased by one.

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

2. (18pts) The following is an input-output table, where the input x is the amount in pounds of Roma tomatoes bought at a wholesale and the output y is the cost charged.

x	y	model
$0 \leq x \leq 15$	1.05 dollars per pound plus a fixed cost of 1.50 dollars	$y = 1.05x + 1.50$
$15 < x \leq 50$.95 dollars per pound plus a fixed cost of 1.65 dollars	$y = .95x + 1.65$
$x > 50$.75 dollars per pound plus a fixed cost of 1.75 dollars	$y = .75x + 1.75$

Fill the third column, writing each rule with an equation in x and y , that is $y =$ "algebraic expression in x ".

3. (16pts) In the setting of Exercise 2, use the following chart

x	y
$0 \leq x \leq 15$	$1.65x + 2.10$
$15 < x \leq 50$	$1.35x + 1.80$
$x > 50$	$1.15x + 1.50$

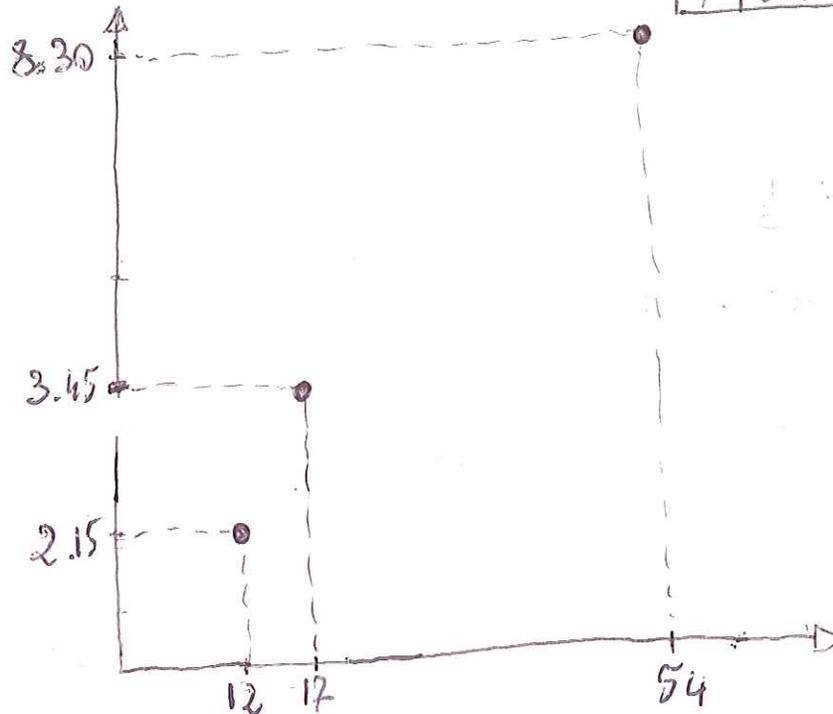
to calculate the costs for the following consumptions.

Weight	Cost
$0 \leq 15 \leq 15$ 15 lb	$1.65(15) + 2.10 = \$ 26.85$
$0 \leq 10 \leq 15$ 10 lb	$1.65(10) + 2.10 = \$ 18.60$
$60 > 50$ 60 lb	$1.15(60) + 1.50 = \$ 70.50$
$15 < 30 \leq 50$ 30 lb	$1.35(30) + 1.80 = \$ 42.30$

4. (18pts) At Groix chocolate rice cereals of your preferred brand come in three different packages as follows: 12 oz for \$2.15, 17 oz for \$3.45, and 54 oz for \$8.30. Graph the weight and cost for these packages as individual ordered pairs.

$X = \text{WEIGHT IN OZ} ; Y = \text{COST IN \$}$

X	12	17	54
Y	2.15	3.45	8.30



5. (16pts) Combine like terms in the following expressions:

(a) $6 + 2x^3 - 5y - 9x^3 - 15 + y$
 $2x^3 - 9x^3 - 5y + y + 6 - 15$
 $-7x^3 - 4y - 9$

(b) $x^2(2x - 3) - 4x^3 - 5x^2 + 3$
 $= x^2(2x) + x^2(-3) - 4x^3 - 5x^2 + 3$
 $= 2x^3 - 3x^2 - 4x^3 - 5x^2 + 3$
 $= -2x^3 - 8x^2 + 3$

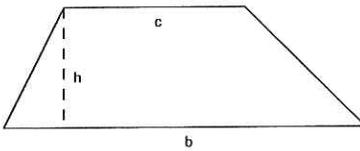
6. (14pts) Combine like terms in the expression $a + 3.14c - 4.00c - 4\frac{1}{15} + \frac{5}{12}$.

A CALC. CAN BE USED HERE

$$\begin{aligned}
 & a + (3.14 - 4.00)c - \left(4 + \frac{1}{15}\right) + \frac{5}{12} \\
 & = a - .86c - \frac{4 \cdot 15 + 1}{15} + \frac{5}{12} \\
 & = a - .86c - \frac{61}{15} + \frac{5}{12} \\
 & \text{LCD OF } 15 = 5 \cdot 3 \text{ AND } 12 = 2 \cdot 2 \cdot 3 \\
 & 18 \quad 5 \cdot 3 \cdot 2^2 = 60
 \end{aligned}$$

$$\begin{aligned}
 & = a - .86c + \frac{-61(4) + 5(5)}{60} \\
 & = a - .86c + \frac{-244 + 25}{60} \\
 & = a - .86c - \frac{219}{60} \quad \text{OR} \\
 & = a - .86c - 3.65 \quad \text{OR} \\
 & = a - .86c - 3\frac{13}{20}
 \end{aligned}$$

2. The formula for the area of a trapezoid is

$$A = \frac{1}{2}(b+c)h$$


(a) (15pts) Solve the above formula for c.

$$A = \left(\frac{1}{2}b + \frac{1}{2}c\right)h$$

$$A = \frac{1}{2}bh + \frac{1}{2}ch$$

$$-\frac{1}{2}bh \quad -\frac{1}{2}bh$$

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

$$\left(\frac{2}{h}\right) \frac{1}{2}c = \frac{2}{h} \left(A - \frac{1}{2}b\right)$$

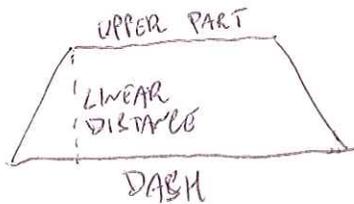
$$c = \frac{2A}{h} - b$$

(b) (10pts) You can approximate the shape of your vehicle's windshield with a trapezoid whose area is 13.5 ft^2 . Knowing that the dash of your vehicle is 7 ft and the linear distance between the dash and the roof is 5 ft , find the length of the upper part of your windshield.

WE CAN USE THE GIVEN FORMULA $A = \frac{1}{2}(b+c)h$

OR THE ONE OBTAINED AT (a).

DATA:



$$c = ? ; h = 5$$

$$b = 7 ; A = 13.5$$

PLUG:

$$13.5 = \frac{1}{2}(7+c)(5)$$

$$13.5 = \left(\frac{7}{2} + \frac{1}{2}c\right)(5)$$

$$13.5 = \frac{35}{2} + \frac{5}{2}c$$

$$-12.5 \quad -12.5$$

ALGEBRAIC CHECK

$$13.5 \stackrel{?}{=} \frac{1}{2}(7-1.6)(5)$$

$$13.5 \stackrel{?}{=} \frac{1}{2}(5.4)(5)$$

$$13.5 = (2.7)(5) \quad \checkmark$$

$$-4 = \frac{5}{2}c \rightarrow c = -\frac{8}{5} = -1.6 \text{ FT}$$

THE UPPER PART OF THE WINDSHIELD SHOULD HAVE A NEGATIVE LENGTH, WHICH IS ABSURD. THE MODEL IS WRONG

3. (15pts) The total cost of an air-compressor rental is \$45 for the first day plus \$30 for each additional day. Write two equations with inputs for each described with an inequality. Define your variables so y depends on x .

INPUT: X DAYS OF RENTAL ; OUTPUT: Y COST IN DOLLARS FOR RENTAL

$$Y = \begin{cases} 45 & , 0 < X \leq 1 \\ 45 + 30(X-1) & , X > 1 \end{cases}$$

X TOTAL DAYS, $(X-1)$ DAYS AFTER THE FIRST DAY.

4. (15pts) Solve the inequality

$$-11 \geq -5x + 2(x+1) > -20$$

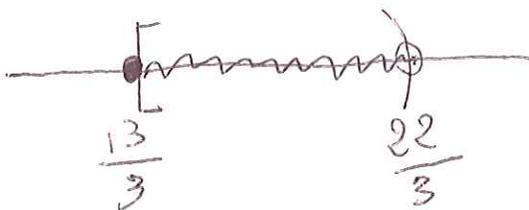
and graph its solution set, then write it in interval notation.

$$-11 \geq -5X + 2X + 2 > -20$$

$$\begin{array}{r} -11 \geq -3X + 2 > -20 \\ -2 \qquad \qquad -2 \qquad -2 \\ \hline \end{array}$$

$$\begin{array}{r} -13 \geq -3X > -22 \\ \underline{-3} \quad \quad \quad \underline{-3} \quad \quad \quad \underline{-3} \end{array}$$

$$\frac{13}{3} \leq X < \frac{22}{3}$$



CHECK: $x = 5$

$$-11 \geq -5(5) + 2(5+1) > -20$$

$$-11 \geq -25 + 2(6) > -20$$

$$-11 \geq -13 > -20 \quad \checkmark$$

SOLUTION SET:

$$\left[\frac{13}{3}, \frac{22}{3} \right)$$

or

$$[4.\bar{3}, 7.\bar{3})$$

