Technology Assignment -- Chapter 5 "The Line of Best Fit"

Name ______________________________
Date ________________

Sections:	5.6 and 6.7
Due:	Day of Chapter 5 Test
Grade:	3 HW Grades
Assessment:	These concepts will be included on the Chapter 5 Test

Assignment Details

1) Section 5.6 "***Fit a Line to Data***" **BY HAND**
   - *Students responsible for the concepts on pages 324-326. Suggest creating notes for yourself.*
   - Δ *CW pg327 #s 3, 4, 5, 6, 9, 12, 19 (not collected; recommend taking notes)*
   - Students responsible for the concepts on pages 331-332. Suggest creating notes for yourself.
   - Δ *CW pg331 Example 1, Example 2, Practice #s 1-5 (not collected; recommend taking notes)*

   HW: Complete Section 5.6 of this handout.

2) Section 5.7 "***Predicting with Linear Models***" **USING TECHNOLOGY**
   - Students responsible for the concepts on pages 335-338. Suggest creating notes for yourself.
   - Δ *CW pg338 #s 4, (#9 with algebra & graphing), 13,15,18(not collected; recommend taking notes)*

   HW: Complete Section 5.7 of this handout.

Chapter 5 TECHNOLOGY ASSIGNMENT

CW $\boxed{5.6}$ FIT A LINE TO DATA **BY HAND**

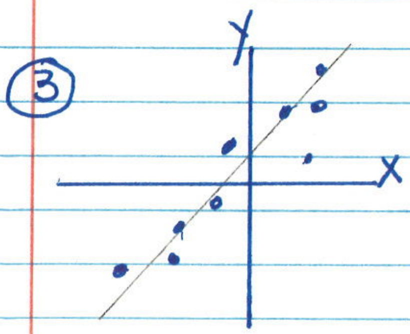
READ pgs 324-326

CW: pg 327 #'s 3-6, 9, 12, 19

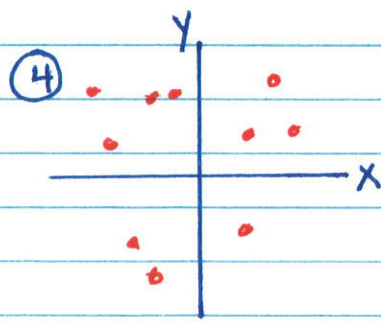
CORRELATIONS MEASURES THE STRENGTH OF THE RELATIONSHIP BETWEEN 2 NUMERIC VARIABLES.

- Look at a scatter plot to determine if there is a positive, Negative OR NO ASSOCIATION BETWEEN X and Y

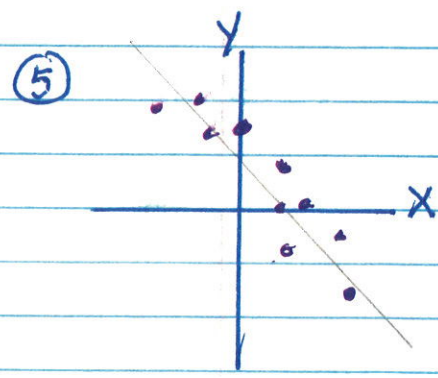
TIP: SKETCH A LINE



POSITIVE CORRELATION



NO LINEAR CORRELATION



NEGATIVE CORRELATION

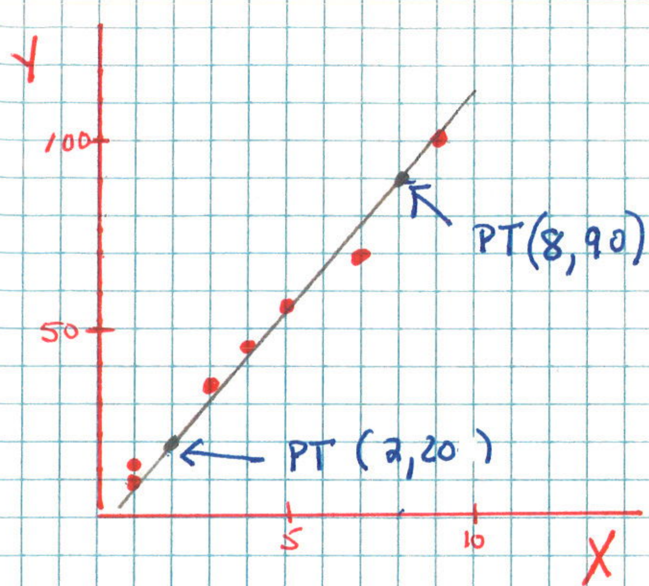
5.6 Pg 327 #6

we want to create a line of best fit (ESTIMATE IT)

X	1	1	3	4	5	6	9
Y	10	12	33	46	59	70	102

STEP 1

CREATE A SCATTER PLOT (label axis)



STEP 2 PICK A LINE WITH 2 POINTS THAT YOU THINK IS THE "BEST FIT LINE"

STEP 3 FIND SLOPE

$$m = \frac{\Delta Y}{\Delta X} = \frac{90-20}{8-2} = \frac{70}{6}$$

$$\boxed{m \approx 11.67}$$

ROUND TO 2 Decimals

STEP 4 $Y - Y_1 = m(X - X_1)$

$m = 11.67$, $pt(2,20)$

P/S $Y - 20 = 11.67(X - 2)$

$Y - 20 = 11.67X - 23.34$

$+20 \qquad +20$

S/I

STEP 5 PUT IN SLOPE-INTERCEPT

ESTIMATED

$$\boxed{y = 11.67x - 3.34}$$

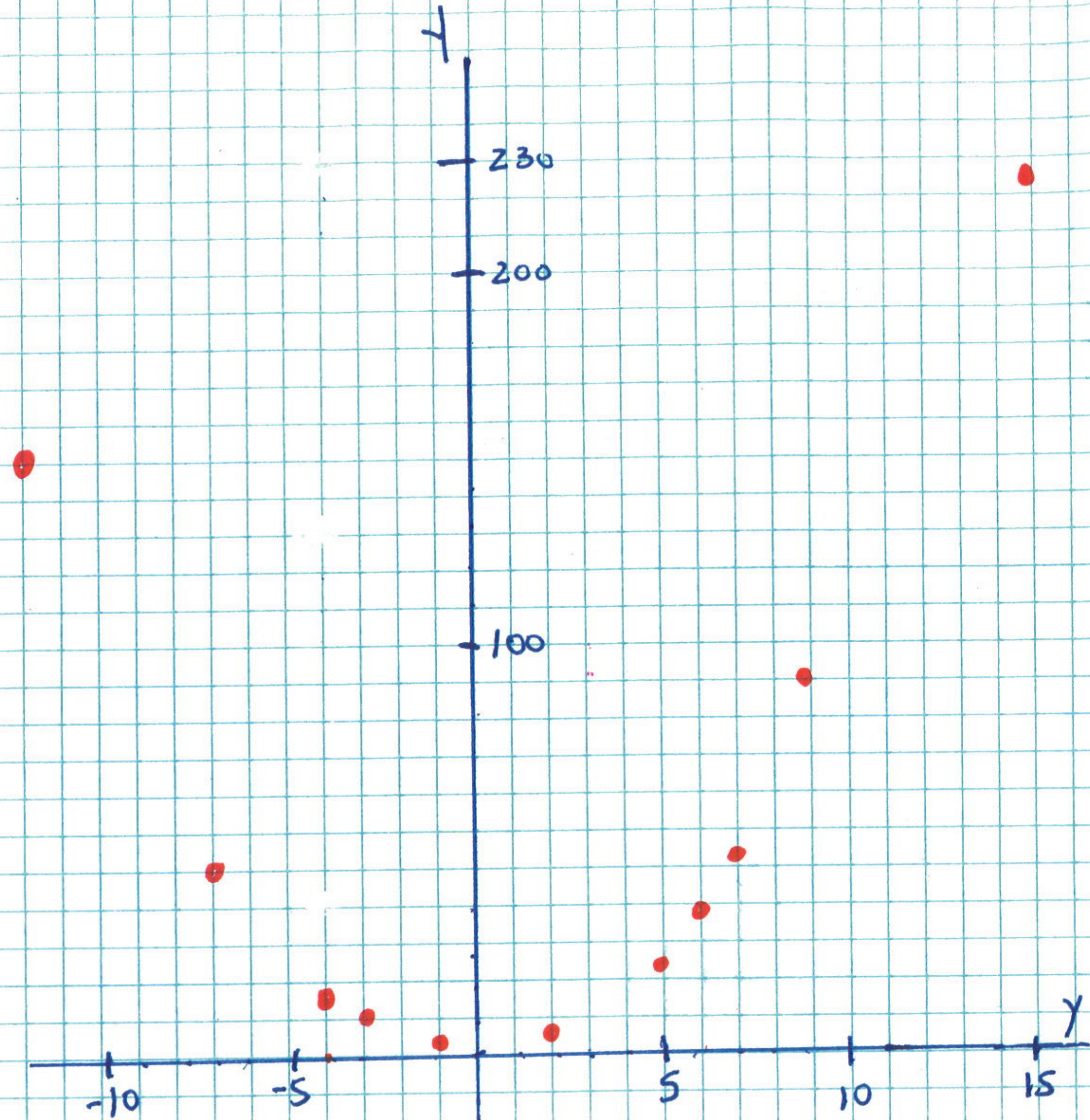
This EQUATION MODELS THE LINEAR RELATIONSHIP BETWEEN X and Y

TRUE LSRL EQ: $\hat{Y} = 11.5X - .3$

PG 328

#12

X	Y
-12	150
-7	50
-4	15
-3	10
-1	1
2	5
5	22
6	37
7	52
9	90
15	226



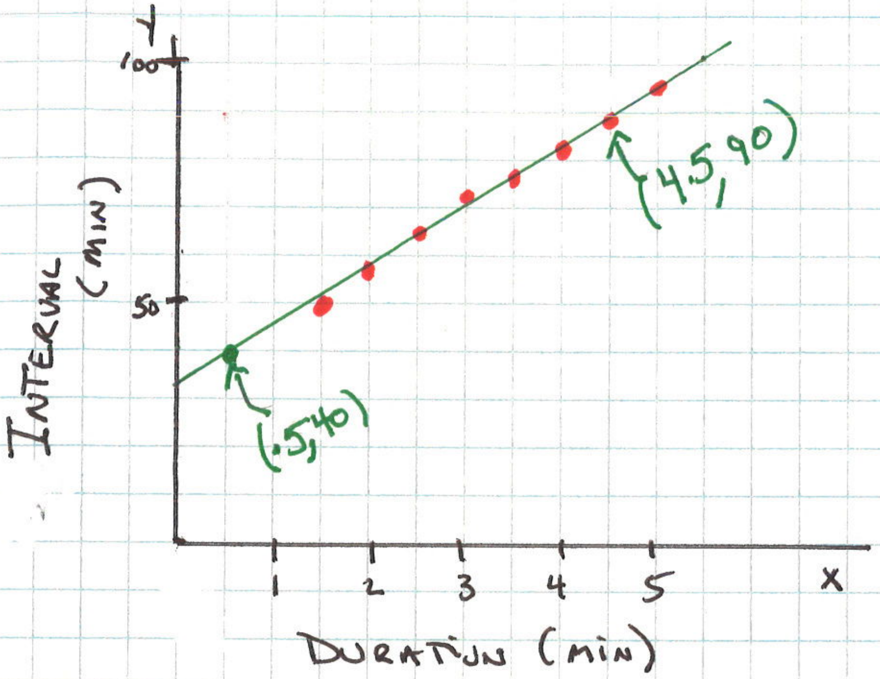
THE PATTERN OF THE POINTS IS NOT LINEAR (IT IS A U-SHAPE) AND THERE IS NO LINEAR CORRELATION, THEREFORE A LINEAR MODEL WOULD NOT BE APPROPRIATE.

5.6 TECHNOLOGY

PG 329 #19

GEOLOGY (OLD FAITHFUL)

DURATION (MIN)	1.5	2.0	2.5	3.0	3.5	4.0	4.5	[illegible]
INTERVAL (MIN)	50	57	65	71	76	82	89	9



LABEL X + Y AXIS

NOTE: POINT YOU PICK DO NOT NEED TO BE ANY OF THE GIVEN DATA POINTS

Tip Draw line so 2 points are on EXACT Grid lines

FIND EQUATION OF YOUR ESTIMATED "BEST FIT LINE"

① pts $(.5, 40)$ $(4.5, 90)$ $m = \dfrac{90-40}{4.5-.5} = \dfrac{50}{4}$ $\boxed{m = 12.5}$

② P/S $y - 40 = 12.5(x - .5)$

$$y - 40 = 12.5x - 6.25$$
$$+40 \qquad\qquad +40$$

③ S/I → $\boxed{y = 12.5x + 33.75}$ ← ESTIMATED BEST FIT LINE

$\boxed{\hat{y} = 12.64x + 32.04}$ ← ACTUAL TI CALC GENERATED BEST FIT LINE

Graphing Calculator ACTIVITY

5.6 + 5.7 Study Tip
Using TI Calc for Scatter Plots and Linear Regression

Perform Linear Regression

QUESTION How can you model data with the best-fitting line?

2ND CATALOG
Diagnostic On

The line that most closely follows a trend in data is the *best-fitting line*. The process of finding the best-fitting line to model a set of data is called *linear regression*. This process can be tedious to perform by hand, but you can use a graphing calculator to make a scatter plot and perform linear regression on a data set.

EXAMPLE 1 Create a scatter plot

The table shows the total sales from women's clothing stores in the United States from 1997 to 2002. Make a scatter plot of the data. *Describe* the correlation of the data.

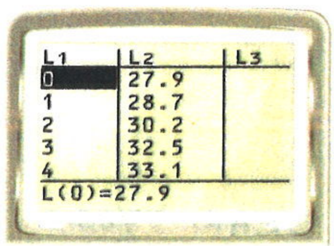
X = Years since 1997
Y = Sales $'s

	YR0	YR1	YR2	YR3	YR4	YR5
Year	1997	1998	1999	2000	2001	2002
Sales (billions of dollars)	27.9	28.7	30.2	32.5	33.1	34.3

STEP 1 *Enter data*

Press STAT and select Edit. Enter years since 1997 (0, 1, 2, 3, 4, 5) into List 1 (L_1). These will be the *x*-values. Enter sales (in billions of dollars) into List 2 (L_2). These will be the *y*-values.

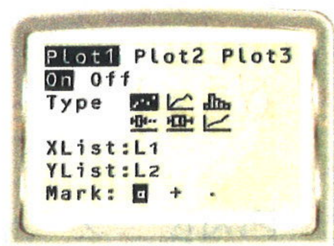
STAT
> EDIT
> L1 → Xvar
> L2 → Yvar



STEP 2 *Choose plot settings*

Press 2nd Y= and select Plot1. Turn Plot1 On. Select scatter plot as the type of display. Enter L_1 for the Xlist and L_2 for the Ylist.

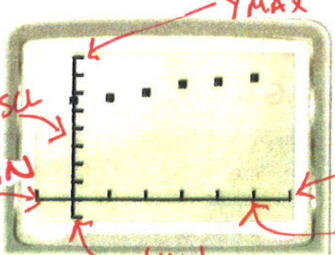
2ND STATPLOT
1: PLOT1
> ON
TYPE



STEP 3 *Make a scatter plot*

Press ZOOM 9 to display the scatter plot so that the points for all data pairs are visible.

ZOOM
9 > ZOOMSTAT



YMAX
YSCL
XMIN
XMAX
UNITS XSL
YMIN

SET THE WINDOW TO MAKE EASY TO PLOT
WINDOW X: 0, 6, 1
Y: 0, 50, 10 → GRAPH

STEP 4 *Describe the correlation*

Describe the correlation of the data in the scatter plot.

The data have a positive correlation. This means that with each passing year, the sales of women's clothing tended to increase.

MODELING DATA The *correlation coefficient r* for a set of paired data measures how well the best-fitting line fits the data. You can use a graphing calculator to find a value for r.

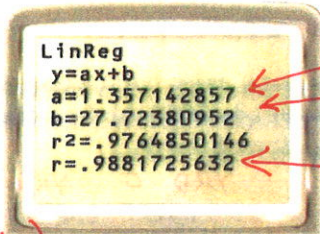
For r close to 1, the data have a strong positive correlation. For r close to -1, the data have a strong negative correlation. For r close to 0, the data have relatively no correlation.

EXAMPLE 2 Find the best-fitting line

Find an equation of the best-fitting line for the scatter plot from Example 1. Determine the correlation coefficient of the data. Graph the best-fitting line.

STEP 1 ***Perform regression*** — STAT >CALC >4 LINREG

Press STAT. From the CALC menu, choose LinReg(ax+b). The a- and b-values given are for an equation of the form $y = ax + b$. Rounding these values gives the equation $y = 1.36x + 27.7$. Because r is close to 1, the data have a strong positive correlation.



a = slope

b = Y INTERCEPT

CORRELATION COEF

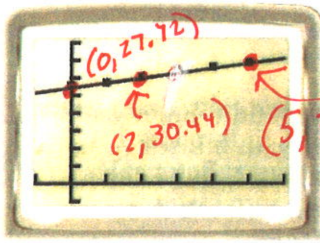
$r = .988$.

means we have a stong positive association between year and sales

(ROUND TO 2 Decimals)

STEP 2 ***Draw the best-fitting line***

Press Y= and enter $1.36x + 27.7$ for y_1.
Press GRAPH.



a = slope = 1.36

b = yint = 27.72

$\boxed{y = 1.36x + 27.72}$

put IN Y=

Your Notes

STEP 3 FIND 2 POINTS TO DRAW YOUR Best fit Line on the scatter plot

2ND TABLE

X	Y
0	27.72 ← yint
2	30.44
5	34.52

Sometimes you may need to use ASK option

→ 2ND TBLSET

INDPNT ASK

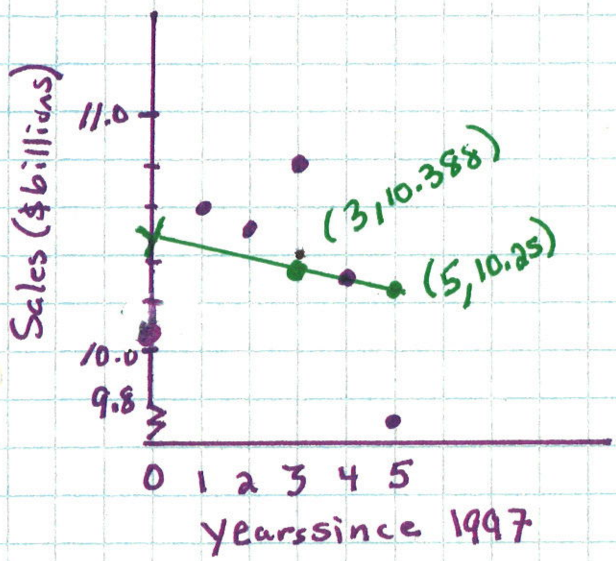
2ND TABLE

CW Page 332 PRACTICE

X	YEAR	Sales (y)
0	1997	10.1
1	1998	10.6
2	1999	10.5
3	2000	10.8
4	2001	10.3
5	2002	9.9

X = # of years since 1997
Y = Sales ($ billions)

#1 Scatterplot



CORRELATION : the graph is unclear so find the CORR COEF.

STAT > CALC > 4 $\boxed{r = -.26}$

Since the sign is Negative and "r" is close to 0, We have a weak negative association between sales and year.

#4

#2 STAT
> CALC
> 4 LINREG
a = slope
b = y intercept

BEST FIT REGRESSION LINE

$\boxed{Y = -.046X + 10.48}$

#3 DRAW THE REGRESSION LINE ON THE SCATTERPLOT
* plot the y intercept (0, 10.48) and label Y
* put the EQ in Y= to find 2 more points
USE THE TABLE FEATURE 2ND TABLE and
pick 2 points – 1 at the low or middle of X
and 1 at the high end of X

X	0	1	2	3	4	5
Y	10.48	10.43	10.40	10.34	10.30	10.25

#5 This line of best-fit should not be used to model predicting sales of men's clothes. BECAUSE THERE IS RELATIVELY NO CORRELATION BETWEEN SALES AND YEARS.

Section 5.7 "Predicting with Linear Models"

USING TECHNOLOGY

- Students responsible for the concepts on pages 335-338. Suggest creating notes for yourself.

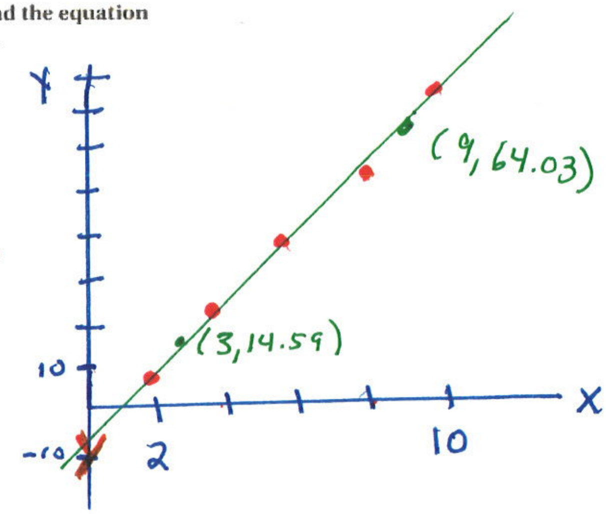
Δ *CW pg338 #s 4, ~~7~~ 9 (by graphing & with algebra), 13, 15, 18(not collected; recommend taking notes)*

LINEAR INTERPOLATION Make a scatter plot of the data. Find the equation of the best-fitting line. Approximate the value of y for $x = 5$.

4.

x	2	4	6	8	10
y	6.2	22.5	40.2	55.4	72.1

r = .999 super strong CORR. COEF.



BEST FIT LINE

$Y = 8.24X - 10.13$

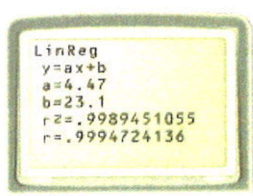
FIND Y when X=5

$Y = 8.24(5) - 10.13$

$Y = 31.07$

15. **ERROR ANALYSIS** *Describe* and correct the error in finding an equation of the best-fitting line using a graphing calculator.

Equation of the best-fitting line is
$y = 23.1x + 4.47$.



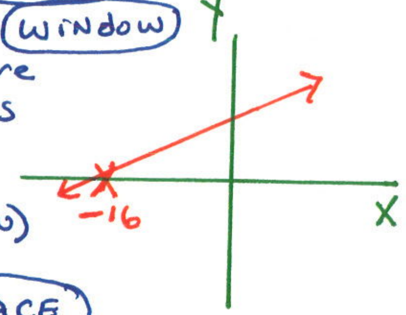
ERROR – THEY MIXED UP "a" and "b"

CORRECTION: $Y = 4.47X + 23.1$

ZERO OF A FUNCTION Find the zero of the function.

ZERO's are ordered pairs $(x, 0)$

9. $f(x) = \frac{1}{8}x + 2$

1) FINDING ZERO'S USING ALGEBRA	2) FINDING ZERO'S BY GRAPHING
Replace f(x) with Zero and solve for X $Y \Leftrightarrow f(x) = \frac{1}{8}X + 2$ $\Downarrow$ $0 = \frac{1}{8}X + 2$ $-2 \qquad -2$ $(8)\,-2 = \frac{1}{8}X\,(8)$ $X = -16$ $\boxed{\text{ZERO } (-16, 0)}$	put f(x) into TI Calc Y= enter 'y_1' $= 1/8X+2$ then graph then set window to see where line crosses x-axis (XMIN=-20)  then TRACE to $x = -15.9$ $y = .011$ Go to table 2ND Table → NOTICE The point $(-16, 0)$ This is the Zero

13. ERROR ANALYSIS *Describe* and correct the error made in finding the zero of the function $y = 2.3x - 2$.

$y = 2.3(0) - 2$
$y = -2$ ✗

ERROR: SET X TO ZERO

CORRECTION: SET Y of f(x) to Zero AND solve for X.

$0 = 2.3X - 2$
$+2 \qquad +2$
$\frac{2}{2.3} = \frac{2.3X}{2.3}$

$X \approx .87$

ZERO OF A FUNCTION Find the zero of the function.

ZERO's are $(X, 0)$

7. $f(x) = 7.5x - 20$

This zero has a decimal

1) Finding Zero's using Algebra

Put "0" in for $f(x)$ and solve for X.

$$y \Leftrightarrow f(x) = 7.5X - 20$$

$$0 = 7.5X - 20$$

Solve

$$\frac{20}{7.5} = \frac{7.5X}{7.5}$$

$$X = 2\tfrac{2}{3}$$

or

$$X \approx 2.67$$

2) Finding Zero's By Graphing

$y=$ $\quad y = 7.5x - 20$

Turn STAT PLOTS OFF

* ZOOM 6: STANDARD
* USE TRACE TO FIND THE X INT $(X, 0)$

2ND CALC

2: Zero

LB

RB

GUESS (ignore)

ENTER

$X = 2.666 \quad Y = 0$

13. **ERROR ANALYSIS** *Describe* and correct the error made in finding the zero of the function $y = 2.3x - 2$.

$$y = 2.3(0) - 2$$
$$y = -2$$

PROBLEM SOLVING

EXAMPLE 1 on p. 335 for Ex. 18

18. SAILBOATS Your school's sailing club wants to buy a sailboat. The table shows the lengths and costs of sailboats.

Length (feet)	11	12	14	14	16	22	23
Cost (dollars)	600	500	1900	1700	3500	6500	6000

a. Make a scatter plot of the data. Let x represent the length of the sailboat. Let y represent the cost of the sailboat.

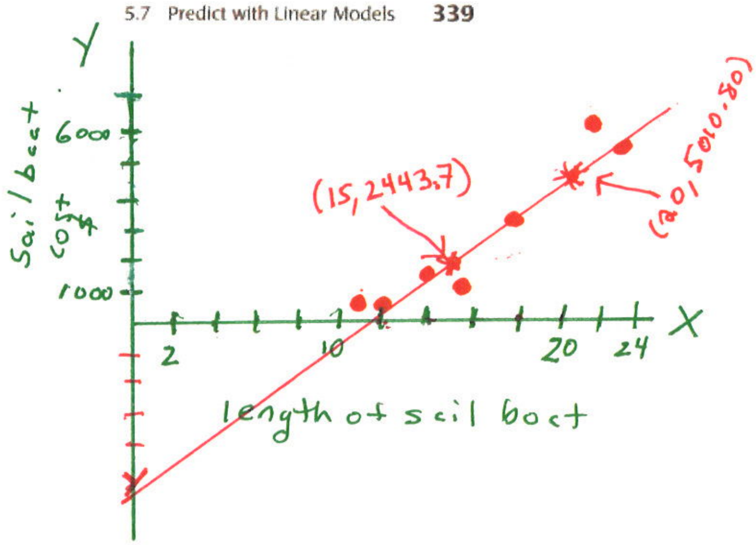
b. Find an equation that models the cost (in dollars) of a sailboat as a function of its length (in feet).

c. Approximate the cost of a sailboat that is 20 feet long.

@HomeTutor for problem solving help at classzone.com

a. SCATTERPLOT – DEFINE X & Y

- X = LENGTH OF SAILBOAT (FT)
- Y= COST OF SAILBOAT ($)



b. REGRESSION EQUATION

$\boxed{Y = 513.43X - 5{,}257.78}$

c. ESTIMATING

X = 20ft

$Y = 513.43(20) - 5257.78$

$Y = \$5010.80$ The estimated cost of a 20 ft sailboat is about $5,010.80.

d. WHAT IS THE MEANING OF THE Y-INTERCEPT IN CONTEXT OF THIS PROBLEM?

B = −$5,257.78 THE Y INTERCEPT IS TYPICALLY THE STARTING POINT (WITH X=0). IN THIS CASE THE Y-INTERCEPT IS NEGATIVE AND THERE FORE meaningless.

e. WHAT IS THE MEANING OF THE SLOPE IN CONTEXT OF THIS PROBLEM?

m = $513.43

THE SLOPE IS THE RATE OF CHANGE.

IN THIS EXAMPLE, FOR EVERY INCREASE OF 1 FOOT IN THE LENGTH OF A SAIL BOAT, THE COST OF THE SAIL BOAT INCREASE ABOUT $513.43