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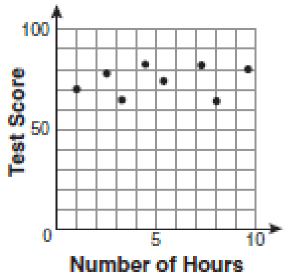
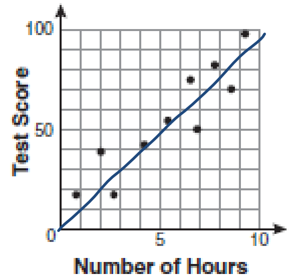
Unit 3: Linear Applications – Test Review

1. There is a negative relationship between the number of hours a student watches television and his or her social studies test score. Circle the appropriate scatterplot that represents this relationship.

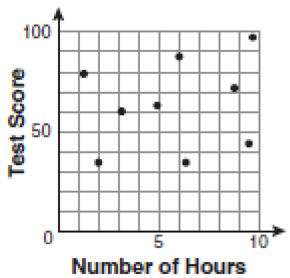
a)



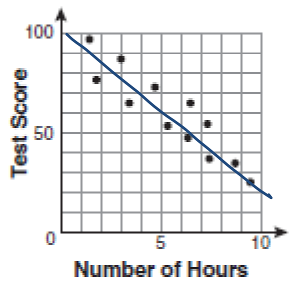
b)



c)



d)



1b. For scatterplots b) and d) above, draw a reasonable line of best fit (trend line). (Lines in Blue)

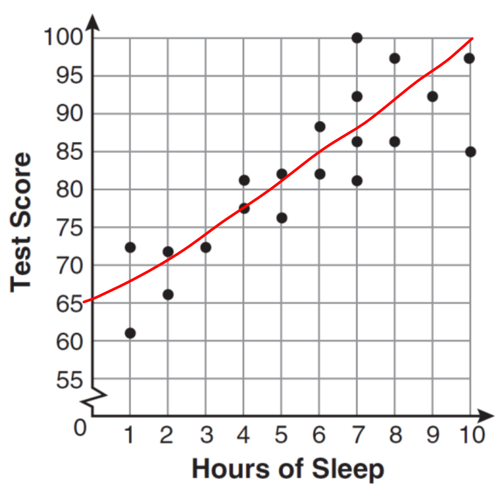
2. What is the relationship between the number of hours of sleep and the test score that was earned in the scatter plot shown below?

1) Undefined relation

2) negative relation

3) positive relation

4) no relation



2b) Draw a reasonable line of best fit (trend line) that models the data above.

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3. The table below gives the dates, heights, and number of stories (floors) for ten of the World's Tallest Buildings for their times. For example, in 1974 the Sears Tower was the World's Tallest Building.

Building	**Year Built**	**Years since 1890**	**Height (feet)**	**Stories**
New York World Building, New York	1890	0	309	20
Manhattan Life Insurance Building, New York	1894	4	348	18
Woolworth Building, New York	1913	23	792	60
Chrysler Building, New York	1930	40	1046	77
The Empire State Building, New York	1931	41	1250	102
The World Trade Center, New York	1972	82	1368	110
The Sears Tower, Chicago	1974	84	1450	110
The Petronas Towers, Kuala Lumpur, Malaysia	1998	108	1483	88
Taipei 101, Taiwan	2004	114	1670	101
Burj Khalifa, United Arab Emirates	2010	120	2716	160

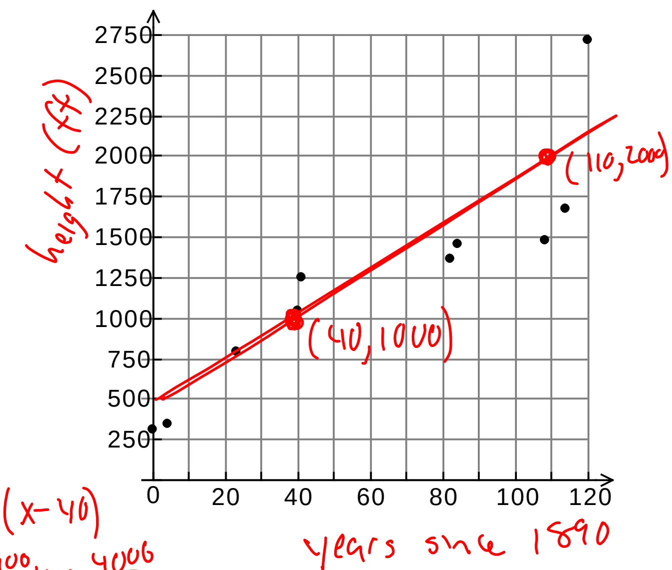
Read more: Infoplease.com http://www.infoplease.com/spot/tallest-buildings-timeline.html#ixzz1Ib9gnpC3

1. Predict the height of the world's tallest building in 2020, using the graph to find the equation of the best-fit line.

a. Identify the independent variable and dependent variable.

Independent variable: Years since 1890

Dependent variable: height of bulding



b. Label the axes.

c. Draw a trend line by hand.

d. Calculate the equation of your trend line by hand. Show all work.

ANSWERS WILL VARY

$m = \frac{2000-1000}{110-40} = \frac{1000}{70} = \frac{100}{7}$

$y - 1000 = \frac{100}{7}(x-40)$

$y - 1000 = \frac{100}{7}x - \frac{4000}{7}$

$\boxed{y = \frac{100}{7}x + \frac{3000}{7}}$

e. Use your equation to predict the height of the world's tallest building in 2020. Show all work.

set $x = 130$ $\quad y = \frac{100}{7}(130) + \frac{3000}{7}$ $\quad \boxed{y = 2285.71 \text{ ft}}$

f. Is this an example of interpolation or extrapolation? Explain.

Extrapolation → outside the observed range of data

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g. What does the slope represent in the context of this situation? (Include units!)

For every year since 1890, height of buildings increase by 14.29 ft per year on average

h. What does the y-intercept represent in the context of this situation? (Include units!)

$(0, \frac{3000}{7})$ In year 0 (1890) The height of the tallest building was approximately 428.6 ft high.

i. Are the data positively correlated, negatively, correlated or neither?

Positively correlated

j. If the data are correlated, is it a strong or weak correlation? Explain how you know.

Fairly strong – data is trending upward and the points lie fairly close to a straight line

k. Use your equation to predict when the height of the world's tallest building was 150 feet. Show all work.

$150 = \frac{100}{7}x + \frac{3000}{7}$

$-278.57 = \frac{100}{7}x$

$x = -19.5$ $1890 - 19.5$

Approximately year 1870

Extrapolation

4. Suppose you were able to use your graphing calculator to make a scatter plot of <u>height in feet</u> vs. <u>number of stories</u>.

All Answers should be the same!

a. If you press **STAT** and then click on **EDIT**. The table appears for you to enter your data.

Which variable would go under List 1? height in feet

Which variable would go under List 2? # stories

b. To find the linear regression equation, you would press **STAT** again. Then you go right to **CALC**. Then you click on **4: LINREG (ax+b)**. The screen comes up to with this information:

a = 0.0593… b = 10.874… $r^2 = 0.916…$ r = 0.9570…

Write the linear regression equation, rounding to the nearest hundredth. $y = .06x + 10.87$

c. Use your equation to predict the number of stories in a 600-foot high building.

set $x = 600$ $y = .06(600) + 10.87$

$y = 46.87$ so about 47 stories

d. What is the slope? $m = .06$ What does it represent in the context of this situation?

That on average for every 1 ft increase in building height, the number of stories increased by .06.

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e. What is the y-intercept? (0, 10.87) What does it represent in the context of the situation?

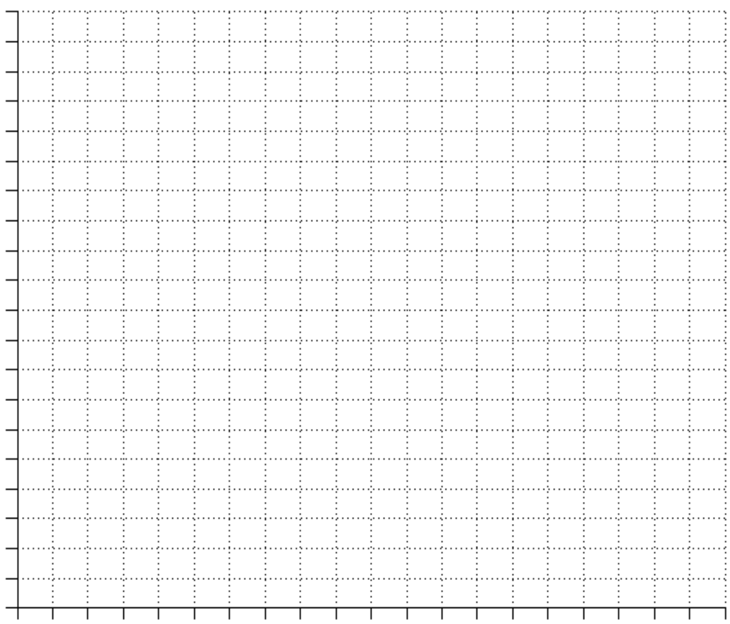
A building with no height has 10.87 stories (does not make sense... it is just a

f. What is the correlation coefficient? .957 What does it tell you about the data?

Strong positive correlation

5) Explain the relationship between the fat grams and the total calories in fast food. Use a graph and an equation to explain. Write 4 sentences about the relationship.

Sandwich	**Total Fat (g)**	**Total Calories**
Hamburger	9	260
Cheeseburger	13	320
Quarter Pounder	21	420
Quarter Pounder with Cheese	30	530
Big Mac	31	560
Arch Sandwich Special	31	550
Arch Special with Bacon	34	590
Crispy Chicken	25	500
Fish Fillet	28	560
Grilled Chicken	20	440
Grilled Chicken Light	5	300



a. Using your calculator, determine the linear regression equation (y = ax + b).

$y = 11.73x + 193.85$

b. What is the value of the correlation coefficient? Describe the nature of the relationship.\

r = .97 strong positive correlation

c. Use the equation to predict the amount of calories an item with 23 grams of fat would have.

set x = 23

$y = 11.73(23) + 193.85$

$y = 463.64$ calories

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Linear Applications

6) The price of floppy diskettes is dependent upon how many diskettes are in the package. A computer store sells 10 floppy diskettes for $15, and 30 diskettes for $40.

Let x = # of disks

(#disks, price)

Let y = price

a. Write the two ordered pairs from the problem, then determine the equation for the price of a package of floppy diskettes.

(10, 15)
(30, 40)

$m = \frac{40-15}{30-10} = \frac{25}{20} = 1.25$

$y - 15 = 1.25(x - 10)$

$y - 15 = 1.25x - 12.5$

$+15 \qquad +15$

$\boxed{y = 1.25x + 2.50}$

b. Interpret the meaning of the slope in the context of the problem.

$m = 1.25$ For every 1 disk, the price increases by $1.25

c. Interpret the meaning of the y – intercept in the context of the problem.

(0, 2.50) Cost of a package w/ 0 disks.
Really the cost of the packaging materials (box/plastic wrap)

d. Determine the price of a box containing 100 diskettes.

set x = 100

$y = 1.25(100) + 2.50$

$\boxed{y = \$127.5}$

e. Determine the number of diskettes in a box that costs $107.50.

set y = 107.50

$107.50 = 1.25x + 2.50$

$-2.50 \qquad -2.50$

$\frac{105}{1.25} = \frac{1.25x}{1.25}$

$\boxed{x = 84 \text{ disks}}$