# 5.2 Best Fit Lines

NOTES

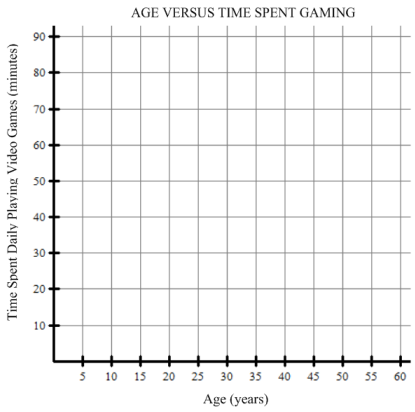
ALGEBRA

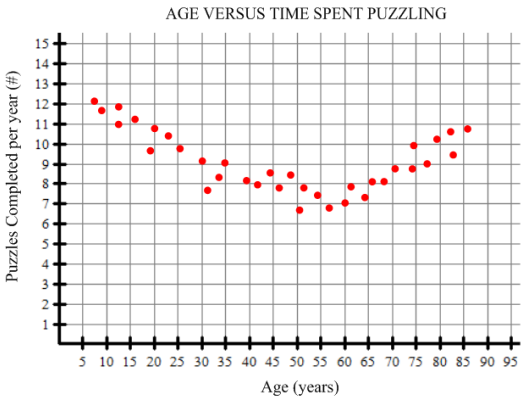
Write your questions here!

## SCATTERPLOTS

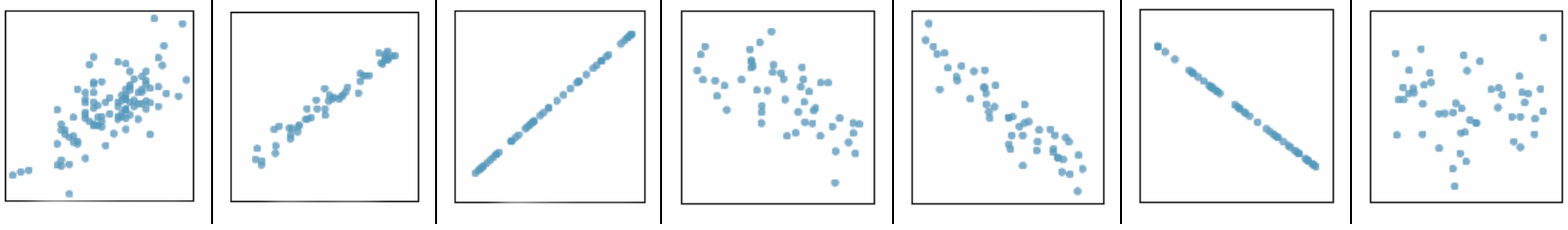
The table shows the time spent playing video games daily for selected ages.

| Age (years) | Time (minute) |
|---|---|
| 10 | 85 |
| 15 | 75 |
| 20 | 80 |
| 22 | 78 |
| 26 | 65 |
| 30 | 60 |
| 35 | 48 |
| 40 | 38 |
| 44 | 30 |




## CORRELATION



**Construct a Scatterplot on graphing calculator**

| 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 |

The equation of the best fit line is $y = 12x + 193$

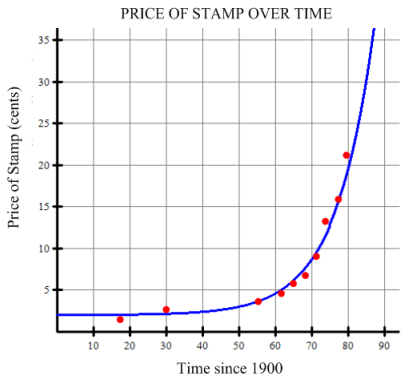
Predict the calories of a sandwich that has 18 grams of fat.

Predict the fat grams of 400 calorie sandwich.

## Extrapolation

Predict the calories of the Grilled Cheese Burger that has 79 grams of fat. Extrapolation!

The scatterplot shows the price of stamps over time. Time is in years since 1900.
So, $x = 20$ means 20 years since 1900 or 1920




The equation of the best fit curve is $y = 1.1^{x-50} + 2$

Use the equation to predict the price of stamp in 1940.

The actual price of a stamp in 1972 was 13 cents. How far off is the model's prediction?

## SUMMARY:

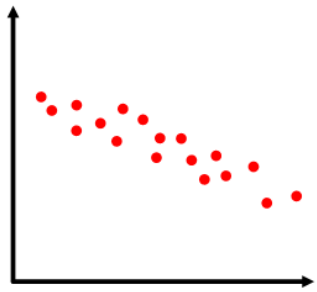
Now, summarize your notes here!

## 5.2 Best Fit Lines

PRACTICE

**Determine if the data is linear or non-linear. Draw in the best fit model to represent the data.**

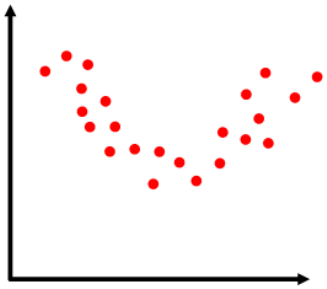
1.



The data is…

Linear Non-Linear

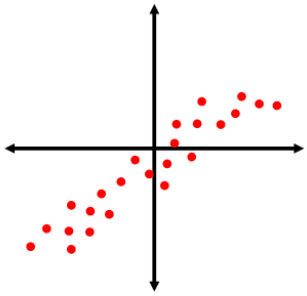
2.



The data is…

Linear Non-Linear

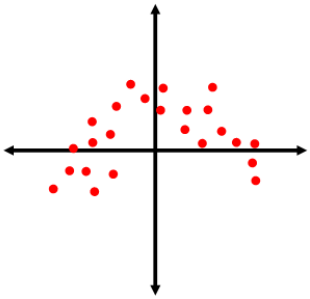
3.



The data is…

Linear Non-Linear

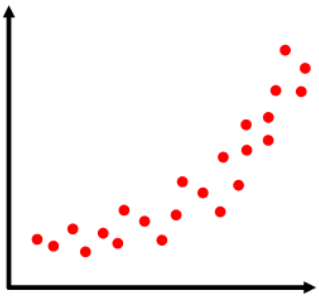
4.



The data is…

Linear Non-Linear

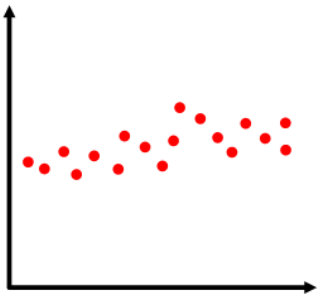
5.



The data is…

Linear Non-Linear

6.

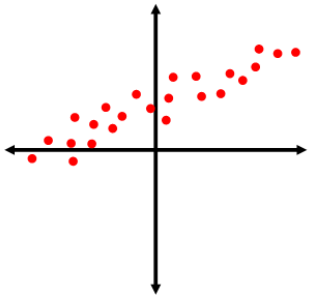


The data is…

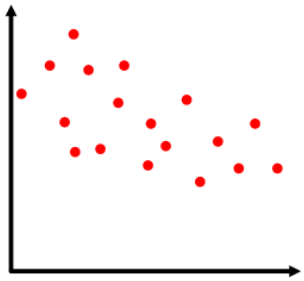
Linear Non-Linear

**Determine if the data has a linear correlation. If so, describe as positive/negative and strong/moderate.**

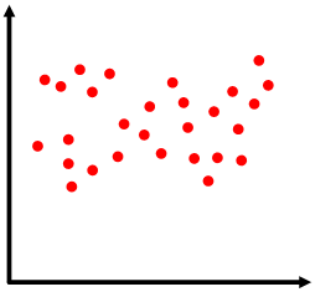
7.



8.

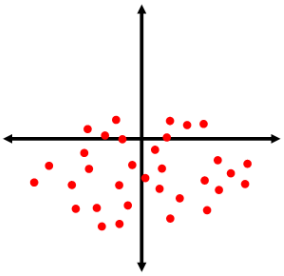


9.

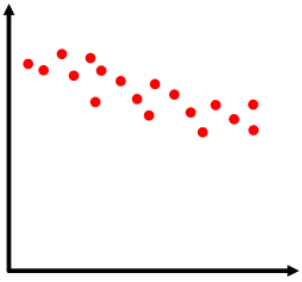


10.

11.



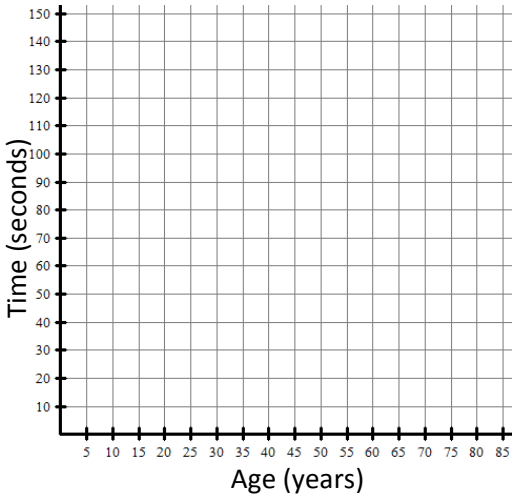
12.



**Construct a scatterplot and answer the questions.**

13. People of various ages are timed solving a puzzle.

| **Age (years)** | 14 | 18 | 24 | 30 | 34 | 47 | 54 | 68 | 72 |
|---|---|---|---|---|---|---|---|---|---|
| **Time (seconds)** | 120 | 104 | 75 | 60 | 55 | 75 | 110 | 130 | 145 |




a. The data is…

Linear Non-Linear

b. Draw in a best fit line/curve.

c. Estimate the time it would take for 40 year old to solve the puzzle.

d. How old would you expect a person to be that took 90 seconds to solve the puzzle?

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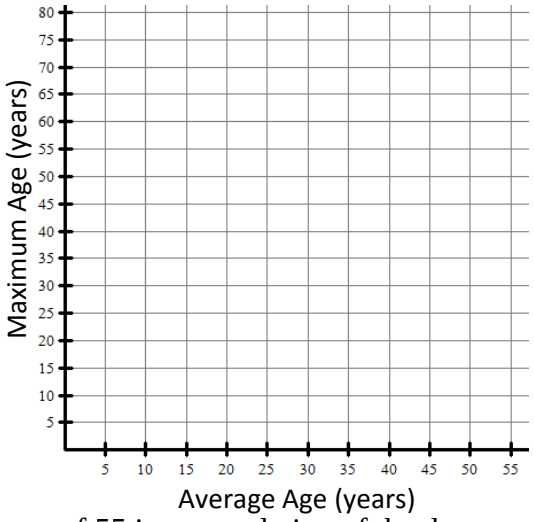
14. The table shows the average age and maximum age of various animals at a zoo.

| **Average (years)** | 12 | 25 | 15 | 8 | 35 | 40 | 41 | 20 |
|---|---|---|---|---|---|---|---|---|
| **Maximum (years)** | 47 | 50 | 40 | 35 | 70 | 77 | 61 | 54 |




a. The data is…

Linear Non-Linear

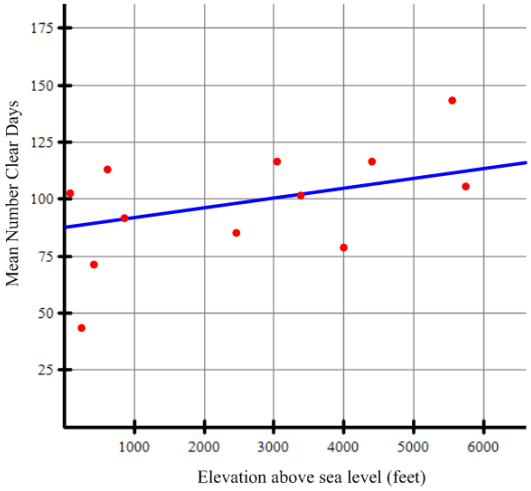
b. Draw in a best fit line/curve.

c. Estimate the maximum age of an animal with average age of 33 years old.

d. Explain why predicting the maximum age of an animal with average age of 55 is extrapolation of the data.

**Use the scatterplot and equation for the best fit line/curve to answer the following.**

15. The scatterplot shows the elevation above sea level in feet of selected cities and their mean number of clear days per year. The equation of the best fit line is $y = 83 + 0.008x$ and is shown graphed below.




a. Use the equation of best fit to predict the mean number of clear days for Denver "The Mile High City" 5280 feet above sea level.

b. Use the equation of best fit to predict the height above sea level for a city with a mean of 90 clear days per year.

c. Describe the relationship between the elevation of a city and the mean number of clear day per year.

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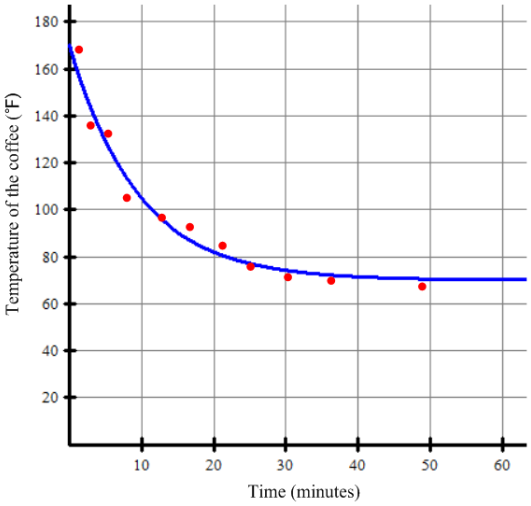
16. The scatterplot shows the temperature of a cup of coffee in Fahrenheit left on the counter measured over various times in minutes. The equation of the best fit curve is $y = 100(0.9)^x + 70$ and is graphed below.




a. Use the equation of best fit to predict the temperature of the coffee after 12 minutes.

b. The actual temperature of the coffee at 20 minutes was 86°F. How far off is the model's prediction at this time? (round to hundredths)

c. Describe the relationship between the time and the temperature of the coffee.

**Construct a scatterplot on a graphing calculator of the data below. State the window that you used to view the graph. Make a rough sketch and answer the questions.**

17.

| **wind speed (mph)** | 0 | 6 | 9 | 12 | 17 | 20 | 22 |
|---|---|---|---|---|---|---|---|
| **temperature** (°F) | 32 | 28 | 22 | 18 | 16 | 10 | 3 |


SKETCH:

a. The equation of the best fit line is $y = -1.2x + 33$. Graph in calculator.

b. Use the best fit line from above to predict temperature when the wind speed is 10 mph.

c. Use the best fit line from above to predict the wind speed when the temperature is 14°F ?

**Construct a scatterplot on a graphing calculator of the data below. State the window that you used to view the graph. Make a rough sketch and answer the questions.**

18. A ball is thrown into the air.

| **time (sec)** | 0 | 1 | 1.5 | 3 | 4 | 4.5 | 5 |
|---|---|---|---|---|---|---|---|
| **height (ft)** | 6 | 71 | 89 | 100 | 68 | 43 | 7 |


SKETCH:

a. The equation of the best fit curve is $y = -16x^2 + 80x + 6$. Graph in calculator.

b. Use the best fit curve from above to predict the height of the ball at 2 seconds.

c. How far off is the model's prediction of the height of the ball at 3 seconds?

d. Use the best fit curve from above to predict the height of the ball at 8 seconds. What is wrong with this prediction?

**Solve the following.**

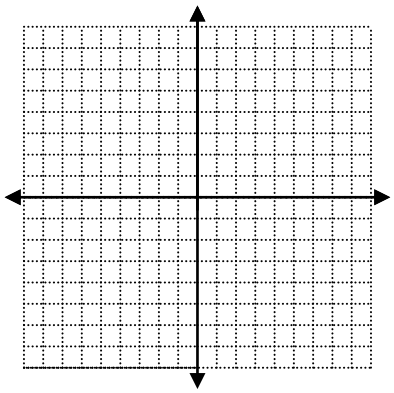
19. $2(y + 1) - 7 = 9$

20. $\frac{7}{3x} + 3 = 7$

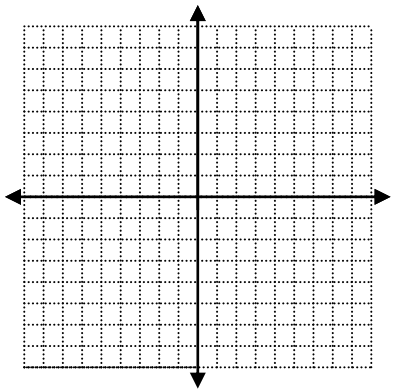
21. $2x - 3y = 15$
$y = 2x - 1$

**Graph the following.**

22. $y < -\frac{1}{3}x - 3$



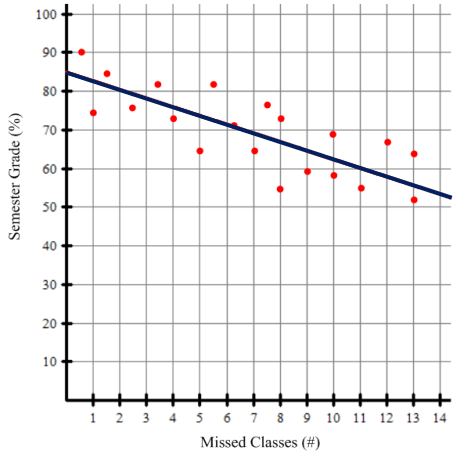
23. $2x + 3y = 12$
$y = 2$



# 5.2 Best Fit Lines

**WRAP UP**

1. The scatterplot shows the number of missed classes for a college class and the corresponding semester grade.. The equation of the best fit line is $y = -2.25x + 85$ and is graphed below.




a. Use the equation of best fit to predict the semester grade of a college student that missed 11 classes.

b. Use the equation of best fit to predict the number of missed classes for a college student that earned an 80%. Round to nearest hundredth.

**MULTIPLE CHOICE**

2. Which equation best represents the line of best fit for the data shown in the graph below?

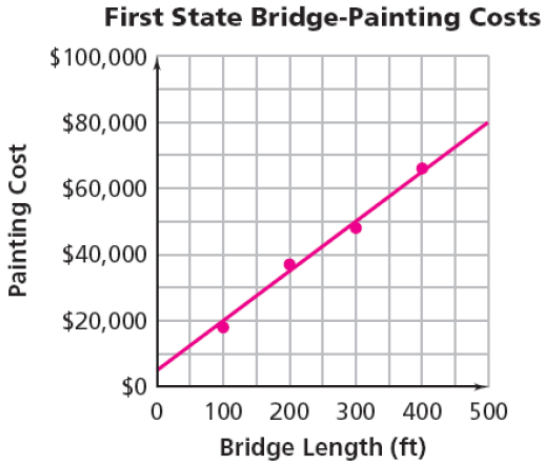
(A) $y = 200x + 5000$

(B) $y = 50x + 15000$

(C) $y = 150x + 5000$

(D) $y = 50x + 20000$

(E) $y = 150x + 15000$




**EXIT TICKET**

**Mr. Kelly says the data below is linear and modeled by the equation $s = 6.5t + 2$**

**Mr. Sullivan says the data below is non-linear and modeled by the equation $s = 0.9t^2 - 3t + 4.5$**

**Time is in years since 1988. So $t = 3$ means 3 years since 1988 or 1991**

| Time | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subscribers (in millions) | 1.6 | 2.7 | 4.4 | 6.4 | 8.9 | 13.1 | 19.3 | 28.2 | 38.2 | 48.7 | 60.8 | 76.3 | 97 | 118.4 |

**Who do you agree with? Construct a viable argument to support.**

**SMP #4**