

* Be sure to include all units! *

SHOW ALL WORK!

1. The pressure at sea level is 14.7 pounds per square inch. As you descend into the ocean, the pressure increases linearly at a rate of about 0.445 pounds per square foot.

- a. Write an equation that will allow you to compute the total pressure p at a depth of d feet.

$$p = 0.445d + 14.7$$

- b. What will be the pressure at a depth of 10 feet?

$$p = 0.445(10) + 14.7 = 19.15 \text{ lbs/ft}^2$$

- c. If a diver's equipment is rated to be safe up to a pressure of 40 pounds per square foot, how deep (to the nearest foot) is it safe to use this equipment?

$$40 = 0.445x + 14.7 \rightarrow \frac{40 - 14.7}{0.445} = x \rightarrow 57 \text{ ft below sea level}$$

$$56.9 = x$$

2. A computer system was purchased by a small company for \$12,000 and is assumed to depreciate at a rate of \$1250 per year.

- a. Write a linear equation that relates the value V (in dollars) to the time t (in years).

$$V = -1250x + 12,000$$

- b. What will be the expected value of the system in 5 years?

$$V = -1250(5) + 12,000 = \$5750$$

- c. When (to the nearest number of years) will the system be worthless?

$$0 = -1250x + 12000 \rightarrow \frac{-12000}{-1250} = x \rightarrow 9.6 = x$$

The system will be worthless after 10 yrs

3. Appropriate doses of medicine for both animals and humans are often based on body surface area (BSA). Since weight is much easier to determine than BSA, veterinarians use the weight of the animal to estimate BSA. The following linear equation expresses BSA for felines in terms of weight:

$$a = 28.55w + 118.7$$

Where a is BSA in square inches and w is weight in pounds.

- a. Interpret the slope of the BSA equation.

Value: 28.55

Circle one: Increasing / Decreasing

As the weight of the cat increases, the BSA increases

- b. Calculate the BSA for a cat that weighs 6.3 pounds.

$$a = 28.55(6.3) + 118.7$$

$$a = 298.565 \text{ sq. in}$$

4. Prices for round shaped diamonds taken from an online trader are given in the table below.

Weight (carats) (x)	Price (\$) (y)
0.5	1,340
0.6	1,760
0.7	2,540
0.8	3,350
0.9	4,130
1.0	4,920

- a. Find the linear regression model for the data.

$$y = 7377.14x - 2526.19$$

- b. Interpret the slope of the equation.

Value: 7377.14

Circle one: Increasing / Decreasing

As the weight of the diamond increases, the price increase

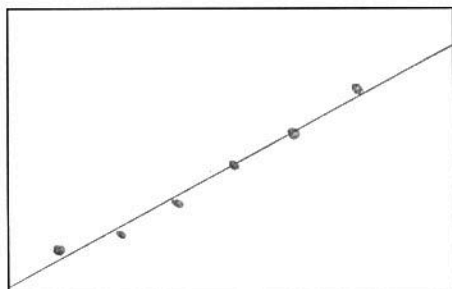
- c. What would you expect to pay for 0.75 carat diamond? Is this an example of interpolation or extrapolation?

$$y = 7377.14(0.75) - 2526.19 = \$3006.67$$

- d. How many carats could you get for \$1500?

$$1500 = 7377.14x - 2526.19 \rightarrow \frac{1500 + 2526.19}{7377.14} = x$$

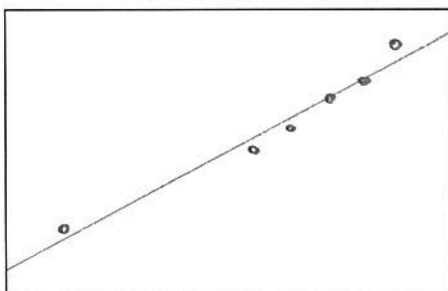
→ 0.55 carats = x



- e. Sketch the graph of the model.

5. The table below price-supply data and price-demand data for soybeans.

Price (\$/bushel) (y)	Supply (billions of bushels) (x)	Price (\$/bushel) (y)	Demand (billions of bushels) (x)
5.15	1.55	4.93	2.60
5.79	1.86	5.48	2.40
5.88	1.94	5.71	2.18
6.07	2.08	6.07	2.05
6.15	2.15	6.40	1.95
6.25	2.27	6.66	1.85



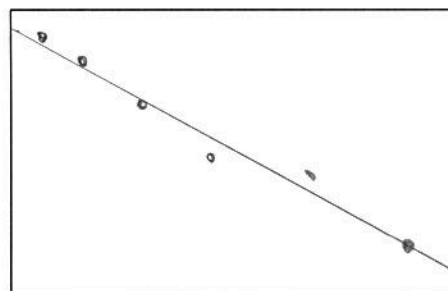
- a. Find the linear regression model for the price-supply data where x is supply (in billions of bushels) and y is price (in dollars).

$$y = 1.53x + 2.85$$

- b. Sketch the graph of the price-supply model.

- c. Find the linear regression model for the price-demand data where x is demand (in billions of bushels) and y is price (in dollars).

$$y = -2.21x + 10.66$$



- d. Sketch the graph of the price-demand model.

- e. Find the equilibrium price for soybeans

$$1.53x + 2.85 = -2.21x + 10.66$$

$$3.74x = 7.81$$

$$x = 2.09$$

$$y = 1.53(2.09) + 2.85$$

$$y = 6.05$$

Approx \$6.05 per bushel