

Stat 3233 – Applied Statistics
Sample problems for least squares regression

1. Explain the least squares criterion for choosing the line that “best fits” a scatterplot of points.
2. Airfreight breakage. A substance used in biological and medical research is shipped by airfreight to users in cartons of 1000 ampules. Data was taken on 10 shipments. The data is on page 2.

X = number of times the carton was transferred from one aircraft to another over the shipment route. Y = number of ampules found to be broken upon arrival.

- (a) Find and interpret the correlation, r .
 - (b) Find the least squares regression equation that allows the prediction of the number of broken ampules for a given number of transfers. Interpret the slope and y -intercept of the regression equation in context of the problem.
 - (c) Find and interpret r^2 in context of the problem.
 - (d) Predict the number of broken ampules when there are three transfers during shipping.
3. Muscle mass. A nutritionist expects that muscle mass decreases with age. To explore this relationship in women, the nutritionist selected four women from each 10-year age group, beginning with age 40 and ending with age 79. The data is on page 2.

X = age, Y is a measure of muscle mass (the higher the measure, the more muscle mass).

- (a) Use your calculator to make a scatterplot that shows how age helps explain muscle mass. Then describe the form, direction, and strength of the relationship. Is the nutritionist’s expectation correct?
- (b) Find the least squares regression equation. Interpret slope and y -intercept in context of the problem.
- (c) Find and interpret r^2 in context of the problem.
- (d) Which regression equation do you feel more confident in using X to predict Y , the regression in #2(b) or the regression equation in #3(b)? Use your understanding of r^2 to explain your answer.
- (e) Predict the muscle mass for women aged 60 years.

Data for #2

| X (# transfers) | Y (# broken) |
|--------------------|-----------------|
| 1 | 16 |
| 0 | 9 |
| 2 | 17 |
| 0 | 12 |
| 3 | 22 |
| 1 | 13 |
| 0 | 8 |
| 1 | 15 |
| 2 | 19 |
| 0 | 11 |

Data for #3

| X (age) | Y (muscle mass) |
|------------|--------------------|
| 71 | 82 |
| 64 | 91 |
| 43 | 100 |
| 67 | 68 |
| 56 | 87 |
| 73 | 73 |
| 68 | 78 |
| 56 | 80 |
| 76 | 65 |
| 65 | 84 |
| 45 | 116 |
| 58 | 76 |
| 45 | 97 |
| 53 | 100 |
| 49 | 105 |
| 78 | 77 |