A recent paper investigated the relationship of osteocyte density on human bone with age among 94 healthy white women aged 20–73.

Each subject had a sample of bone removed. Several variables were measured including osteocyte density (the number of osteocytes per square mm). The researchers reported the regression line for the total osteocyte density (Y) versus age in years (X), $Y = 269 - 1.31X$. Osteocyte density ranged from 150 to 300 per square mm. The correlation coefficient between the two variables is $r = -0.61$.

(a) Are total osteocyte density and age positively or negatively associated? Explain.

(b) What units does the correlation coefficient have?

(c) Predict the total osteocyte density for a 50 year-old woman.

(d) Assume that a linear regression is an adequate explanation of the data. Interpret the slope of the regression line in the context of the problem.

(e) Briefly describe how you check whether or not a linear regression model is an adequate fit to the observed data.