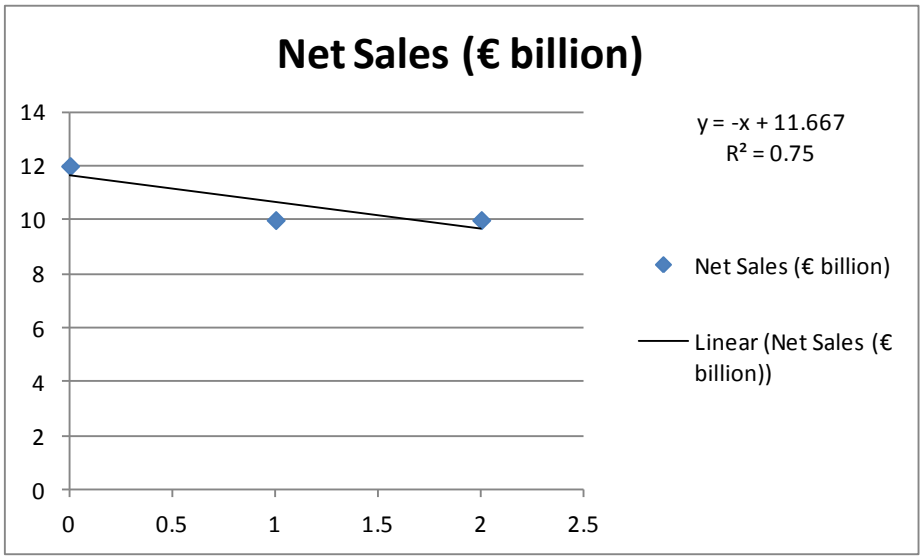
18. ***Net Sales*** The following table show the reported net sales by Nokia in the third quarters of 2008, 2009, and 2010 ($t = 0$ represents the third quarter of 2008):[63]

Year t	0	1	2
Net Sales (€ billion) y	12	10	10

Find the regression line (round coefficients to one decimal place) and use it to "predict" Nokia's net income in the third quarter of 2011. (The actual figure was approximately €9.0 billion.)

Here is the graph of the data points and the regression line:



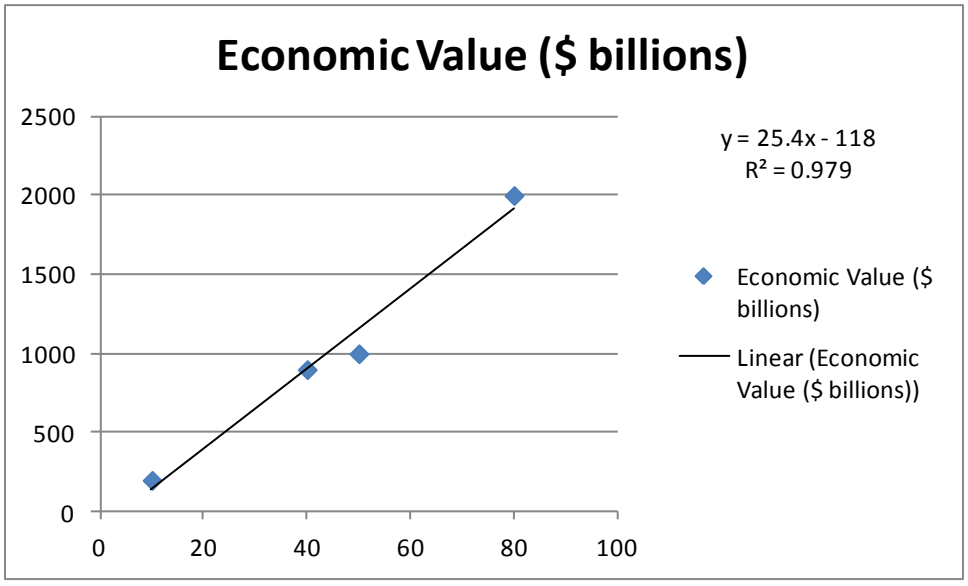
The regression equation is $y = -t + 11.7$. In the third quarter of 2011, the model predicts that Nokia's net income will be about €8.7 billion (8.7 billion euros).

20. ***Oil Recovery*** (Refer to Exercise 19.) The following table gives the approximate economic value associated with various levels of oil recovery in Texas.[65]

Percent Recovery (%)	10	40	50	80
Economic Value ($ billions)	200	900	1,000	2,000

Find the regression line and use it to estimate the economic value associated with a recovery level of 70%.

Here is a graph of the data points and the regression line:



The regression equation is $y = 25.4x - 118$. According to the equation, the economic value associated with a recovery level of 70% is $y = 25.4(70) - 118 = 1660$, or about $1,660 billion dollars.

22. ***Operating Expenses: Amazon.com*** The following table shows Amazon.com's approximate net sales (revenue) and operating expenses in 2006–2009:[67]

Net Sales ($ billions)	10	15	20	25
Operating Expenses ($ billions)	2	2.5	3	4.5

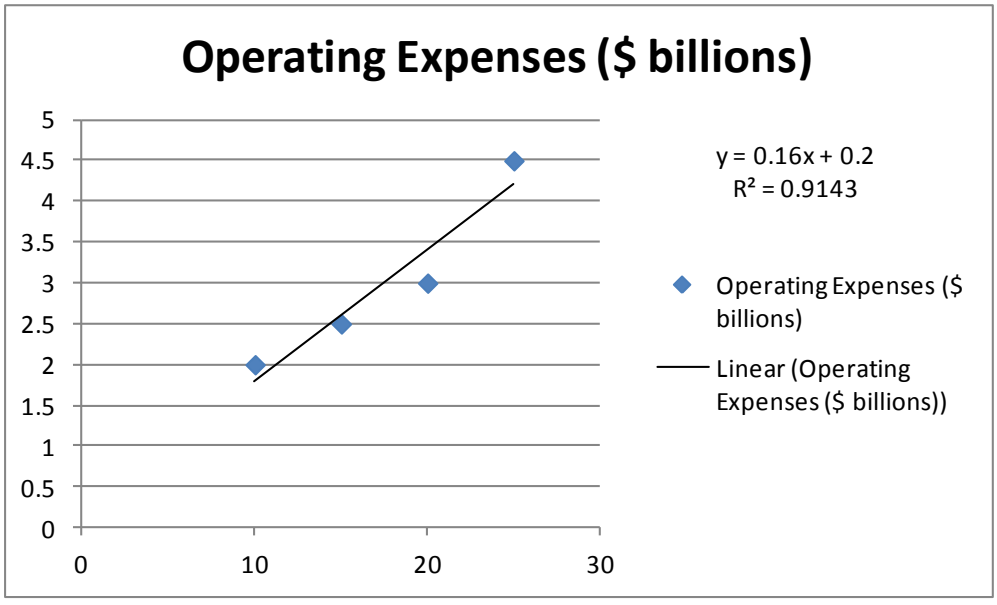
a. Use this information to find a linear regression model for Amazon's operating expenses E (in billions of dollars) as a function of net sales S (in billions of dollars).

b. Give the units of measurement and interpretation of the slope.

c. What, according to the model, would Amazon.com need to earn in net sales in order for its operating expenses to be $5 billion? (Round answer to the nearest $ billion.)

d. Plot the data and regression line. Based on the graph, would you say that the linear model is reasonable? Why?

Here is the graph with the data points, regression line, and regression equation:



a. The regression model is $E = 0.16S + 0.2$.

b. The slope is $m = \frac{\Delta E}{\Delta S} = 0.16$, which can be written as $\frac{0.16}{1}$. This can be read as the change in operating expenses over the change in net sales. We can interpret it to mean that if net sales increase by \$1 billion, then operating expenses can be expected to increase by \$0.16 billion dollars (\$160 million).

c. This question is asking us to find out what S would have to be if $E = 5$. Thus, we set $E = 5$ in the regression model, and solve for S:

$$5 = 0.16S + 0.2 \rightarrow 0.16S = 4.8 \rightarrow S = 30.$$

So, Amazon would need to have net sales of about \$30 billion in order to have operating expenses of \$5 billion.

d. The correlation coefficient is $R^2 = 0.9143$, which is pretty close to 1, so this indicates that the data are closely correlated. Therefore, a linear model is reasonable.