Answer on Question #45278 – Math – Statistics and Probability

Question. An oil-drilling company knows that it costs $25,000 to sink a test well. If oil is hit, the income for the drilling company will be $335,000. If only natural gas is hit, the income will be $130,000. If nothing is hit, there will be no income. If the probability of hitting oil is 1/40 and if the probability of hitting gas is 1/20, what is the expectation for the drilling company?

Solution. Let event A – oil hits, B – gas hits. We assume that the events A and B are independent so $P(A) = \frac{1}{40}, P(B) = \frac{1}{20}, P(A \cap B) = P(A)P(B) = \frac{1}{800}$. Let the random variable ξ is the income for the company. Find the distribution of ξ.

$P(\xi = \$335{,}000) = P(A) = \frac{1}{40}$.

$P(\xi = \$130{,}000) = P\{only\ gas\ hits\} = P(B) - P(A \cap B) = \frac{1}{20} - \frac{1}{800} = \frac{39}{800}$.

$P(\xi = 0) = P(\bar{A} \cap \bar{B}) = 1 - P(A \cup B) = 1 - P(A) - P(B) + P(A \cap B) = 1 - \frac{1}{40} - \frac{1}{20} +$

$+ \frac{1}{800} = \frac{741}{800}$.

So ξ has the next distribution:

Value of ξ	\$335,000	\$130,000	0
Probability	$\frac{1}{40}$	$\frac{39}{800}$	$\frac{741}{800}$

$E(\xi) = \$335{,}000 \cdot \frac{1}{40} + \$130{,}000 \cdot \frac{39}{800} + 0 \cdot \frac{741}{800} = \$14{,}712.5$

The expectation of income for the drilling company is equal to

$\$14{,}712.5 - \$25{,}000 = -\$10{,}287.5$

Answer. The expectation for the drilling company is equal to $-\$10{,}287.5$.