Answer on Question #47153 – Math – Statistics and Probability

Question: The annual salaries of employees in a large company are approximately normally distributed with a mean of $50000 and a standard deviation of $20000.

a. What percent of people earn less than $40000?

Solution: Let S be the random variable of a salary of employee (in $), S ~ N(50000,20000). Then the random variable $X = \frac{S-50000}{20000} \sim \mathrm{N}(0,1)$.

$$P(S < 40000) = P\left(X < \frac{40000 - 50000}{20000}\right) = P(X < -0.5) = \Phi(-0.5) = 0.3085375.$$

Here Φ(x) denotes the cumulative distribution function of a standard normal distribution.
Answer: 31%.

b. What percent of people earn between $45000 and $65000?

Solution:

$$P(45000 < S < 65000) = P\left(\frac{45000 - 50000}{20000} < X < \frac{65000 - 50000}{20000}\right) = P(-0.25 < X < 0.75)$$
$$= \Phi(0.75) - \Phi(-0.25) = 0.7733726 - 0.4012937 = 0.3720789.$$

Answer: 37%.

c. What percent of people earn more than $70000?

Solution:

$$P(S > 70000) = P\left(X > \frac{70000 - 50000}{20000}\right) = P(X > 1) = 0.8413447.$$

Answer: 84%.