

**Answer on Question #64236 – Math – Statistics and Probability  
Question**

Let  $X$  be a normal random variable with its mean equal to 65 and standard deviation equal to 12. Find the probabilities for normal distribution.

1)  $P(X > 48)$

2)  $P(35 < X < 43)$

3)  $P(X < 37)$

**Solution**

Let  $\xi$  be a standard normal random variable.

Then

1) If  $E(X) = 65$ ,  $sd(X) = 12$ , then

$$P(X > 48) = P\left(\xi > \frac{48 - 65}{12}\right) = P(\xi > -1.42) = 1 - \Phi(-1.42) = 1 - 0.0778 = 0.9222.$$

Here  $\Phi(z)$  is the standard normal cumulative distribution function of  $\xi$ . The value of  $\Phi(z)$  can be found using statistical tables

(for example, see [https://homes.cs.washington.edu/~jrl/normal\\_cdf.pdf](https://homes.cs.washington.edu/~jrl/normal_cdf.pdf)).

2)  $P(35 < X < 43) = P\left(\frac{35 - 65}{12} < \xi < \frac{43 - 65}{12}\right) = P(-2.5 < \xi < -1.83) =$   
 $= \Phi(-1.83) - \Phi(-2.5) = 0.0336 - 0.0062 = 0.0274.$

3)  $P(X < 37) = P\left(\xi < \frac{37 - 65}{12}\right) = P(\xi < -2.33) = \Phi(-2.33) = 0.0099.$

**Answer:**

1)  $P(X > 48) = 0.9222.$

2)  $P(35 < X < 43) = 0.0274.$

3)  $P(X < 37) = 0.0099.$