

### Answer on question #51649, Math, Statistics and Probability

**Question** The masses of packages from a particular machine are normally distributed with a mean of 200g and a standard deviation of 2g. Find the probability that a randomly selected package from the machine weighs: Less than 196g Between 198.5g and 199.5g

**Solution** So we have normal distribution here. Hence, to find probabilities we have to compute numerically integrals of type

$$P(x_1 < x < x_2) = \int_{x_1}^{x_2} \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

where  $\mu$  is mean and  $\sigma$  is standard deviation. We have  $\mu = 200$  and  $\sigma = 2$ . For the first case  $x_1 = -\infty$ ,  $x_2 = 196$ . Hence

$$P = \int_{-\infty}^{196} \frac{1}{2\sqrt{2\pi}} e^{-\frac{(x-200)^2}{2 \cdot 2^2}} \approx 0.022750$$

For the second case  $x_1 = 198.5$ ,  $x_2 = 199.5$ . Hence

$$P = \int_{198.5}^{199.5} \frac{1}{2\sqrt{2\pi}} e^{-\frac{(x-200)^2}{2 \cdot 2^2}} \approx 0.174666$$

The numerical computation was done using Wolfram Mathematica 6.0. The command is

Probability[198.5 < x < 199.5, x  $\approx$  NormalDistribution[200, 2]]