QUANTITATIVE METHODS
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LAB 8
Normal Distributions

Calculating Probabilities for the Normal Distribution

To find the probability $P(x \le x_0)$ with Excel, we use the function NORMDIST where for CUMULATIVE we write True.

Make the appropriate heading in cells A1:A3.
In cell A5 write "Normal distribution with mean 2.5 and standard deviation 0.7.
In cells A6:A9, write the following (with a right alignment):

$P(x<3) =$
$P(2<x<3) =$
$P(3<x<5) =$
$P(x>3.5) =$

In cells B6:B9, find the answer to these probabilities, assuming that $m = 2.5$ and $s = 0.7$. The results should be:

$P(x<3) =$ 0.7625
$P(2<x<3) =$ 0.5249
$P(3<x<5) =$ 0.2373
$P(x>3.5) =$ 0.0766

Repeat the same thing as before, below the above work, for the following two problems.

1. Find the following areas under a normal distribution curve with $m = 20$ and $s = 4$.
   a) Area between $x = 20$ and $x = 27$
   b) Area between $x = 23$ and $x = 25$
   c) Area between $x = 9.5$ and $x = 17$
   Answers: a) 0.4599 b) 0.1210 c) 0.2223
2. Determine the area of the normal distribution curve with $m = 55$ and $s = 7$.
   a) to the right of $x = 58$
   b) to the right of $x = 43$
   c) to the left of $x = 67$
   d) to the left of $x = 24$
   Answers: a) 0.3341 b) 0.9568 c) 0.9568 d) 0.000005

   Note: If you use the table to do this problem, you would obtain the following answers:
   a) 0.3336 b) 0.9564 c) 0.9564 d) 0.000

Finding the *x* value

For this, we use the command NORMINV, where the probability $P(x \le x_0)$ is entered, that is, the area to the left of x_0.

Go to Sheet 2, rename it and give the appropriate headings.

Answer the following questions in cells B6:B11

Let x be a continuous random variable that follows a normal distribution with a mean of 200 and a standard deviation of 25.

a) Find the value of x so that the area under the normal curve to the left of x is approximately 0.6330.
b) Find the value of x so that the area under the normal curve to the right of x is approximately 0.05.
c) Find the value of x so that the area under the normal curve to the right of x is approximately 0.8051.
d) Find the value of x so that the area under the normal curve to the left of x is approximately 0.015.
e) Find the value of x so that the area under the normal curve between m and x is approximately 0.4525 and the value of x is smaller than m.
f) Find the value of x so that the area under the normal curve between m and x is approximately 0.48 and the value of x is greater than m.

Answers: a) 208.50 b) 241.12 c) 178.50 d) 145.75 e) 158.26 f) 251.34