Probability and Probability Distributions

Exercise 1:

Electro Co has determined that the assembly time for a particular electrical component is normally distributed with a mean of 20 minutes and a standard deviation of 3 minutes.

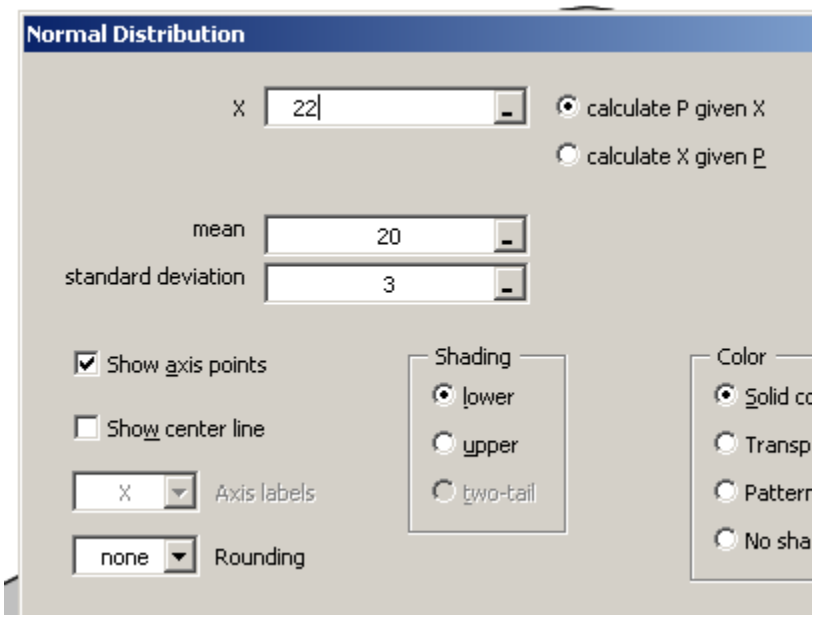
a) What is the probability that **an employee (P (X< 22))** in the assembly division takes less than 22 minutes to assemble one of these components?

$\mu = 20$

$\sigma = 3$

$P(x < 22) = 0.7475$

$$P(x > 22) = P\left(z < \frac{22-20}{3}\right) = P(z < 0.67) = 0.7475$$



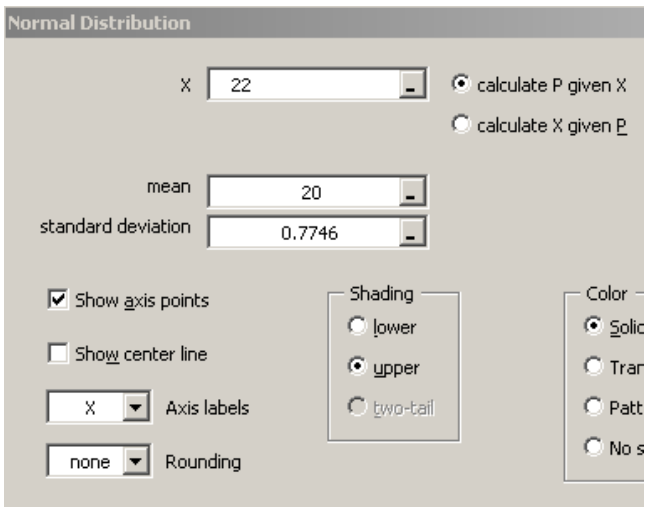
b) What is the probability that the average assembly time for 15 employees exceeds 22 minutes?

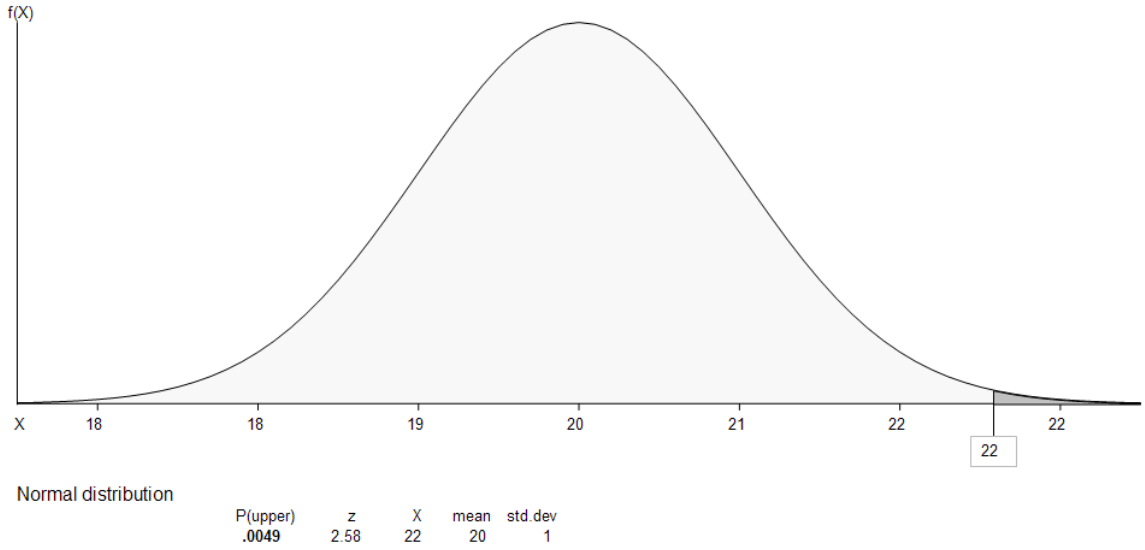
$$\mu_{\bar{x}} = \mu = 20$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{3}{\sqrt{15}} = 0.7746$$

$$P(\bar{x} > 22) = 0.0049$$

$$P(\bar{x} > 22) = P\left(z > \frac{22 - 20}{0.7746} \right) = P(z > 2.58) = 0.0049$$





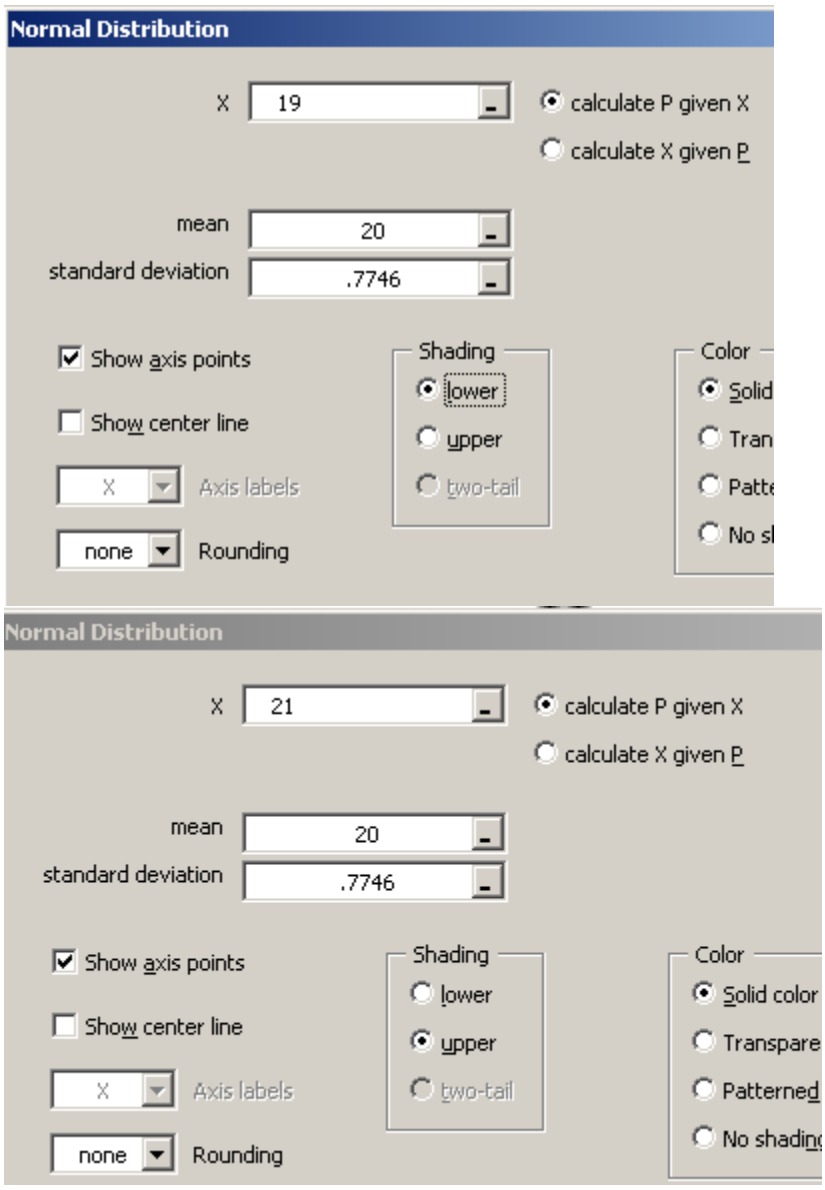
c) What is the probability that the average assembly time for 15 employees is between 19 and 21 minutes?

$$\mu_{\bar{x}} = \mu = 20$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{3}{\sqrt{15}} = 0.7746$$

$$P(19 < \bar{x} < 21) = 0.9016 - 0.0984 = 0.8032$$

$$P(19 < \bar{x} < 21) = P\left(\frac{19-20}{0.7746} < z < \frac{21-20}{0.7746}\right) = P(-1.29 < z < 1.29) = 0.9016 - 0.0984 = 0.8032$$


Normal Distribution
X
19
calculate P given X
calculate X given P
mean
20
standard deviation
.7746
Show axis points
Show center line
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Axis labels
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Rounding
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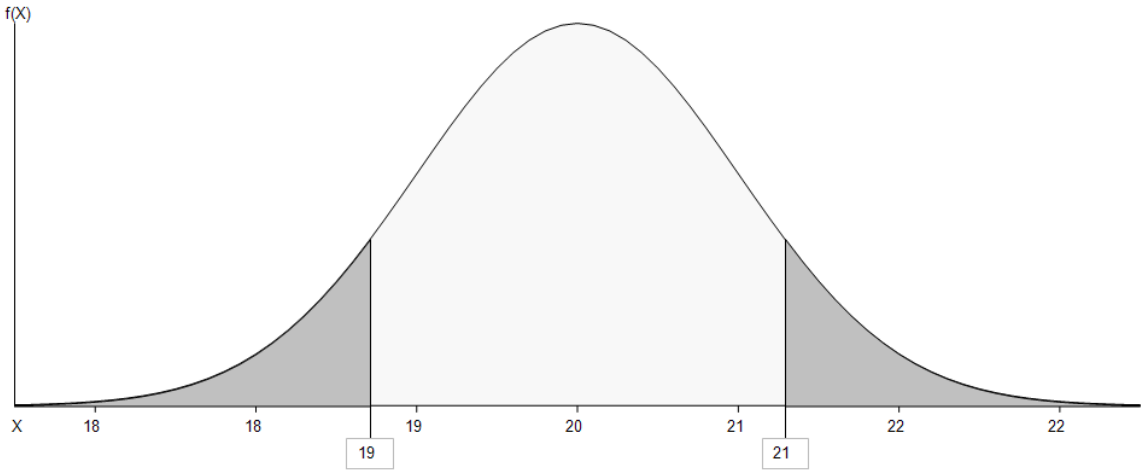


Normal distribution

P(lower)	P(upper)	z	X	mean	std.dev
.0984	.9016	-1.29	19	20	1
.9016	**.0984**	1.29	21	20	1

Exercise 2:

A population is known to have a mean of 50 and a standard deviation of 9.

If a sample of 64 is taken from the population, what is the probability that the sample mean will fall in the interval of 48 to 52?

$\mu = 50$

$\sigma = 9$

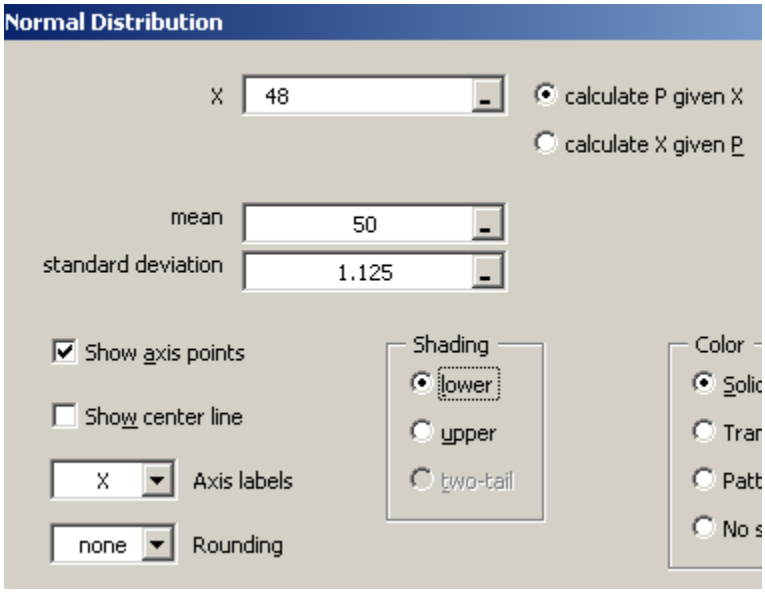
$n = 64$

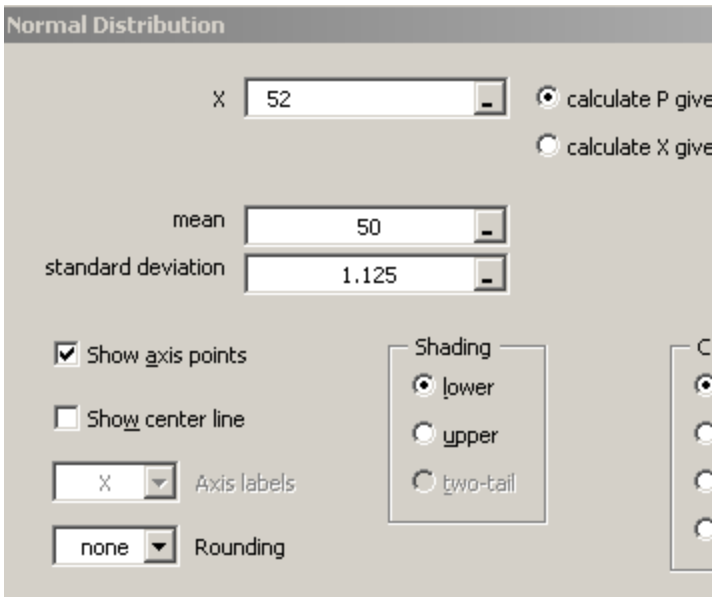
$\mu_{\bar{x}} = \mu = 50$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{9}{\sqrt{64}} = 1.125$

$P(48 < \bar{x} < 52) = 0.9623 - 0.0377 = 0.9246$

$$P(48 < \bar{x} < 52) = P\left(\frac{48-50}{1.125} < z < \frac{52-50}{1.125}\right) = P(-1.78 < z < 1.78) = 0.9623 - 0.0377 = 0.9246$$





Normal distribution

P(lower)	P(upper)	z	X	mean	std.dev
.0377	.9623	-1.78	48	50	1
.9623	**.0377**	1.78	52	50	1