5.2.

a. n = 5; p = 0.4; binomial

$$P(x) = \frac{n!}{x!(n-x)!} p^x q^{n-x}$$

$P(x \leq 1) = P(x = 1) + P(x = 0)$

$$= P(1) = \frac{5!}{1!(5-1)!} .4^1 .6^{5-1} + P(0) = \frac{5!}{0!(5-0)!} .4^0 .6^{5-0}$$

= 0.2592 + 0.0778

= 0.3370

b. n = 5; p = 0.4, binomial

$P(x \geq 4) = P(x = 4) + P(x = 5)$

Use $$P(x) = \frac{n!}{x!(n-x)!} p^x q^{n-x}$$

$P(x \geq 4) = .0768 + .0102 = .0870$

c. n = 5; p = .4; binomial

$P(x < 1) = P(x = 0) = .0778$

5.22.

n=8, p=0.37

Expected number = 8(0.37) = 2.96

Variance = 8(0.37)(0.63) = 1.8648, standard deviation = 1.3656

$P(x \leq 2) = 0.0248 + 0.1166 + 0.2397 = 0.3811$

5.25.
It is a binomial distribution with n=3, p= probability of defective module

p = .05; $P(x \geq 1) = 1 – P(x=0) = 1 – 0.8574 = 0.1426$; yes it is larger

For n = 3 the highest the p level can be such that the $P(x \geq 1) < .025$ is less than .01 (0.0084). At p = .01, $P(x \geq 1) = 1 - 0.9703 = 0.0297$ which is still slightly larger than the required .025 level. At p = 0.0084, $P(x \geq 1) = .02499$.

5.30.

a. $E[x] = \lambda t = 18(1/3) = 6.0$

$V[x] = \lambda t = 6.0$

$SD[x] = \sqrt{\lambda t} = 2.4494$

b. P(x = 0) .0025

5.35.
$\lambda = 3/400 = 0.0075$; $t = 1200$; $\lambda t = 9$

P(x=0) = 0.000123

P(x>14) = P(x≥15) = 1 – P(x≤14) = 1 – 0.9585 = 0.0415

P(x<9) = P(x≤8) = 0.4557

There is only a 4.15% chance of finding 15 or more errors if the claim is actually true. Students will probably conclude that the error rate is probably higher than 3 per 400.

5.40.

a. $\mu = 60$, $\sigma = 10$ $z = \dfrac{x-\mu}{\sigma} = \dfrac{60-60}{10} = 0.00$; therefore P(x > 60) = .50

b. $\mu = 60$, $\sigma = 10$ $z = \dfrac{x-\mu}{\sigma} = \dfrac{70-60}{10} = 1.00$; therefore P(x ≥ 70) = .50-.3413 = .1587

c. $\mu = 60$, $\sigma = 10$ $z = \dfrac{x-\mu}{\sigma} = \dfrac{70-60}{10} = 1.00$ and z = $\dfrac{50-60}{10} = -1.00$

Probability (50 ≤ x ≤ 70) = .3413 + .3413 = .6826

d. $\mu = 60$, $\sigma = 10$ $z = \dfrac{x-\mu}{\sigma} = \dfrac{40-60}{10} = -2.00$; therefore P(x ≤ 40) = .50 - .4772 = .0228

5.52.

P(x>5000) = P(z > (5000 – 4300)/750) = P(z > 0.93) = 0.5 – 0.3238 = 0.1762

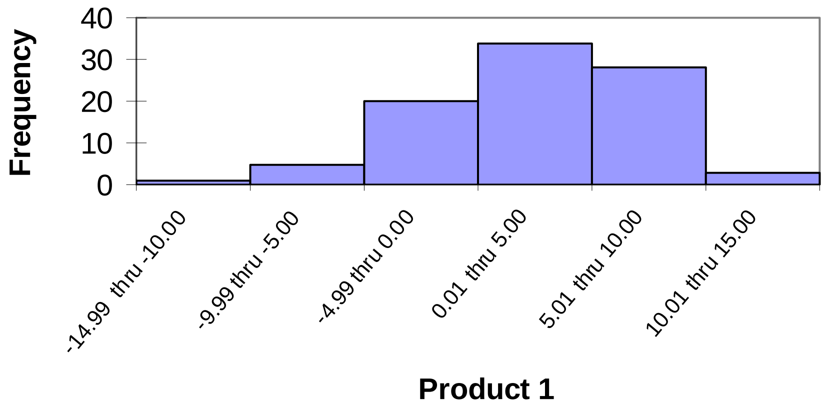
P(x<4000) = P(z < (4000 – 4300)/750) = P(z < -0.40) = 0.5 – 0.1554 = 0.3446

P(2500 < x < 4200) = P[(2500 – 4300)/750 < z < (4200 – 4300)/750] = P(-2.40 < z < -0.13) = 0.4918 – 0.0517 = 0.4401

P(x>5500) = P(z > (5500 – 4300)/750) = P(z > 1.6) = 0.5 – 0.4452 = 0.0548

5.64.

a.



It does appear that the distribution is approximately normally distributed.

b. Students can use Excel's descriptive statistics to determine the mean and standard deviation.

Product # 1	
Mean	**2.452747253**
Standard Error	0.500820671
Median	2.6
Mode	0.9
Standard Deviation	**4.777524711**
Sample Variance	22.82474237
Kurtosis	1.325755364
Skewness	-0.643107821
Range	29.2
Minimum	-15.5
Maximum	13.7
Sum	223.2
Count	91

c. Remember that positive values indicate weight gain so students need to determine the Probability that the weight loss is more than negative 12.

$P(x<-12) = P(z < (-12 – 2.4527)/4.7775) = P(z < -3.03) = 0.5 – 0.4988 = 0.0012$

d. No, this would not be an appropriate claim. The probability of losing 12 or more pounds is only 0.12%. In fact the average for this plan in a weight gain of 2.45 pounds.

5.69.

$P(x>50) = (60-50)/(60-20) = 0.25$

$P(x = 45) = 0$; you cannot find the probability of a specific value in a continuous distribution.

$P(25<x<35) = (35.25)/(60-20) = 0.25$

$P(x<34) = (34-20)/(60-20) = 0.35$

5.79.

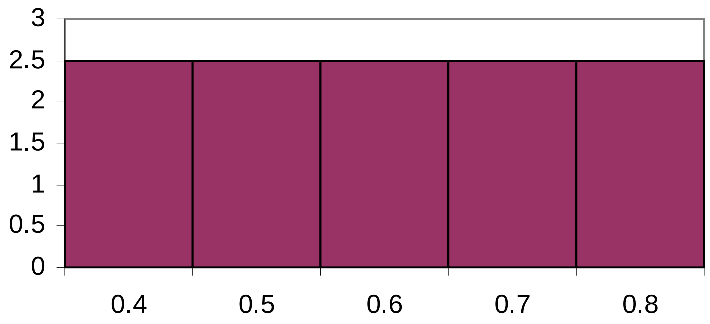
$\lambda = 12$/hour $= 0.2$ per minutes; $P(x<4) = 1 - e^{-(.2)(4)} = 1 - 0.4493 = 0.5507$

5.85.

As the sample size is increased for a given level of the probability of success, p, the probability distribution becomes more symmetric, or bell-shaped.

5.91.

$f(x) = 1/(0.80-0.40) = 2.5$



b. $P(x<0.65) = (0.65 - 0.4)/(0.8 - 0.4) = 0.625$

$P(x>0.7) = (0.8 - 0.7)/(0.8 - 0.4) = 0.25$

$P(0.6<x<0.75) = (0.75 – 0.6)/(0.8 – 0.4) = 0.375$

(0.8 – 0.4)(.9) = .36 so 0.4 + 0.36 = 0.76 which is the 90th percentile

5.116.

a. E[x] = np = 200(.20) = 40 bottles

b. E[x] = np = 100(.80) = 80 bottles

c. Assuming only dirty bottles will be scrubbed:

E[x] = np = 300(.20)(.$.03) = $1.80

d. SD[x] = $\sqrt{npq} = \sqrt{100(.20)(.80)} = \sqrt{16} = 4.0$