Week in Review–Additional Material sections 8.5 and 8.6

1. (a) \( \text{normalcdf}(0.3, 1.83, 0, 1) = 0.3485 \)
   (b) \( \text{normalcdf}(-1E99, 1.5, 0, 1) = 0.9332 \)
   (c) \( 0 \)

2. (a) \( A = \text{invNorm}(0.68, 0, 1) = 0.4677 \)
   (b) since 48% of the area is between \(-B\) and \(B\), this means that due to symmetry and the fact all probability adds up to one each outside piece is 26%, see the figure.

   ![Figure showing normal distribution with 48% between -B and B, and 26% outside each piece]

   \[ -B \quad B \]

   \( B = \text{invNorm}(0.48 + 0.26, 0, 1) = 0.6433 \)

3. \( z = \frac{x - \mu}{\sigma} = \frac{38 - 43}{4} = -1.25 \)

4. 1.3 standard deviations above the mean gives \( x = 83 + 1.3 \times 5 = 89.5 \)

   \( P(X < 89.5) = \text{normalcdf}(-1E99, 89.5, 83, 5) = 0.9032 \)

   Answer: 90.32%

5. (a) \( \text{normalcdf}(32, 53, 40, 8) = 0.7893 \)
   (b) \( \text{normalcdf}(45, 1E99, 40, 8) = 0.2660 \)
   (c) \( \text{invNorm}(0.75, 40, 8) = 34.6041 \)

6. (a) \( \text{normalcdf}(35000, 1E99, 40000, 2000) = 0.9938 \)
   (b) \( 800 \times 0.9938 = 795.0322 \) so approximately 795
   (c) \( \text{normalcdf}(38000, 44000, 40000, 2000) = 0.8186 \)
   (d) This is a binom problem with success being a tire having a tread life between 38,000 and 44,000 miles. \( N=4, p=0.8186 \) (from part c), and \( r=4 \).

   \( \text{binompdf}(4, 0.8186, 4) \)
   Answer: 0.4490

   (e) This is a binom problem with success being a tire having a tread life between 38,000 and 44,000 miles. \( N=4, p=0.8186 \) (from part c), and \( r=3 \).

   \( \text{binompdf}(4, 0.8186, 3) \)
   Answer: 0.3980

7. (a) \( \text{normalcdf}(-1E99, 7.2, 8, 0.5) = 0.0548 \)
   (b) \( 0.0548 \times 300 = 16.44 \) so approximately 16.

There are two different styles when approximating the Binomial Distribution. Be sure that your USE THE STYLE TAUGHT BY YOUR INSTRUCTOR.

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METHOD A: This is the method that is found in the textbook. All of these answers are computed using the 0.5 adjustment factor.

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8. Use the normal approximation to solve this problem. N=4000, p=.2 r = 0, 1, ..., 749
\[ \mu = np = 4000 \times 0.2 \quad \sigma = \sqrt{4000 \times 0.2 \times 0.8} \]
\[ \text{normalcdf}(-1E99,749.5,4000 \times 0.2, \sqrt{4000 \times 0.2 \times 0.8}) = 0.0230 \]

9. N=5000, p=0.03 so \[ \mu = np = 5000 \times 0.03 \quad \sigma = \sqrt{5000 \times 0.03 \times 0.97} \]
   (a) \[ r=115, 116, 117, ..., 180 \]
   \[ \text{normalcdf}(114.5, 180.5, 5000 \times 0.03, \sqrt{5000 \times 0.03 \times 0.97}) = 0.9926 \]
   (b) \[ r = 141, 142, ..., 5000 \]
   \[ \text{normalcdf}(140.5, 1E99, 5000 \times 0.03, \sqrt{5000 \times 0.03 \times 0.97}) = 0.7845 \]

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METHOD B: This method is NOT found in the textbook. ONLY USE IT IF YOUR INSTRUCTOR HAS TAUGHT IT IN CLASS.

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8. Use the normal approximation to solve this problem. N=4000, p=.2 r = 0, 1, ..., 749
\[ \mu = np = 4000 \times 0.2 \quad \sigma = \sqrt{4000 \times 0.2 \times 0.8} \]
\[ \text{normalcdf}(-1E99,749.5,4000 \times 0.2, \sqrt{4000 \times 0.2 \times 0.8}) = 0.0219 \]

9. N=5000, p=0.03 so \[ \mu = np = 5000 \times 0.03 \quad \sigma = \sqrt{5000 \times 0.03 \times 0.97} \]
   (a) \[ r=115, 116, 117, ...180 \]
   \[ \text{normalcdf}(115, 116, 5000 \times 0.03, \sqrt{5000 \times 0.03 \times 0.97}) = 0.9917 \]
   (b) \[ r = 141, 142, ...5000 \]
   \[ \text{normalcdf}(141, 1E99, 5000 \times 0.03, \sqrt{5000 \times 0.03 \times 0.97}) = 0.7722 \]