39.  
   a. \( P(0 \leq Z \leq 2.17) = \Phi(2.17) - \Phi(0) = .4850 \)
   b. \( \Phi(1) - \Phi(0) = .3413 \)
   c. \( \Phi(0) - \Phi(-2.50) = .4938 \)
   d. \( \Phi(2.50) - \Phi(-2.50) = .9876 \)
   e. \( \Phi(1.37) = .9147 \)
   f. \( P(-1.75 < Z) + [1 - P(Z < -1.75)] = 1 - \Phi(-1.75) = .9599 \)
   g. \( \Phi(2) - \Phi(-1.50) = .9104 \)
   h. \( \Phi(2.50) - \Phi(1.37) = .0791 \)
   i. \( 1 - \Phi(1.50) = .0668 \)
   j. \( P(|Z| \leq 2.50) = P(-2.50 \leq Z \leq 2.50) = \Phi(2.50) - \Phi(-2.50) = .9876 \)

41.  
   a. \( \Phi(c) = .9100 \Rightarrow c \approx 1.34 \) (.9099 is the entry in the 1.3 row, .04 column)
   b. \( 9^{\text{th}} \) percentile = \( -91^{\text{th}} \) percentile = -1.34
   c. \( \Phi(c) = .7500 \Rightarrow c \approx .675 \) since .7486 and .7517 are in the .67 and .68 entries, respectively.
   d. \( 25^{\text{th}} = -75^{\text{th}} = -.675 \)
   e. \( \Phi(c) = .06 \Rightarrow c \approx -.1555 \) (.0594 and .0606 appear as the −1.56 and −1.55 entries, respectively).

45.  
   a. \( P(X > .25) = P(Z > .83) = 1 - .2033 = .7967 \)
   b. \( P(X \leq .10) = \Phi(-.33) = .0004 \)
   c. We want the value of the distribution, c, that is the 95\(^{\text{th}}\) percentile (5% of the values are higher). The 95\(^{\text{th}}\) percentile of the standard normal distribution = 1.645. So \( c = .30 + (1.645)(.06) = .3987 \). The largest 5% of all concentration values are above .3987 mg/cm\(^3\).

60.  
   \( P(X - \mu \geq \sigma) = P(X \leq \mu - \sigma \text{ or } X \geq \mu + \sigma) \)
   = 1 - \( P(\mu - \sigma \leq X \leq \mu + \sigma) = 1 - P(-1 \leq Z \leq 1) = .3174 \)
   Similarly, \( P(X - \mu \geq 2\sigma) = 1 - P(-2 \leq Z \leq 2) = .0456 \)
   And \( P(X - \mu \geq 3\sigma) = 1 - P(-3 \leq Z \leq 3) = .0026 \)
   These are considerably less than the bounds 1, .25, and .11 given by Chebyshev.
2

63. \( p = .10; n = 200; np = 20, npq = 18 \)
   a. \( P(X \leq 30) = \Phi\left(\frac{30 + .5 - 20}{\sqrt{18}}\right) = \Phi(2.47) = .9932 \)
   b. \( P(X < 30) = P(X \leq 29) = \Phi\left(\frac{29 + .5 - 20}{\sqrt{18}}\right) = \Phi(2.24) = .9875 \)
   c. \( P(15 \leq X \leq 25) = P(X \leq 25) - P(X \leq 14) = \Phi\left(\frac{25 + .5 - 20}{\sqrt{18}}\right) - \Phi\left(\frac{14 + .5 - 20}{\sqrt{18}}\right) \)
      \( \Phi(1.30) - \Phi(-1.30) = .9032 - .0968 = .8064 \)

69.
   a. \( \Gamma(6) = 5! = 120 \)
   b. \( \Gamma\left(\frac{5}{2}\right) = \frac{3}{2} \Gamma\left(\frac{1}{2}\right) = \frac{3}{2} \cdot \frac{1}{2} \cdot \Gamma\left(\frac{1}{2}\right) = \left(\frac{3}{4}\right)\sqrt{\pi} \approx 1.329 \)
   c. \( F(4:5) = .371 \) from row 4, column 5 of Table A.4
   d. \( F(5:4) = .735 \)
   e. \( F(0:4) = P(X \leq 0; \alpha = 4) = 0 \)

71.
   a. \( \mu = 20, \sigma^2 = 80 \Rightarrow \alpha\beta = 20, \alpha\beta^2 = 80 \Rightarrow \beta = \frac{80}{20}, \alpha = 5 \)
   b. \( P(X \leq 24) = F\left(\frac{24}{4}; 5\right) = F(6;5) = .715 \)
   c. \( P(20 \leq X \leq 40) = F(10;5) - F(5;5) = .411 \)

78. With \( x_p = (100p)\text{th percentile}, p = F(x_p) = 1 - e^{-\lambda x_p} \Rightarrow e^{-\lambda x_p} = 1 - p \),
   \( \Rightarrow -\lambda x_p = \ln(1 - p) \Rightarrow x_p = \frac{-\ln(1 - p)}{\lambda}. \) For \( p = .5, x_\lambda = \tilde{\mu} = \frac{.693}{\lambda}. \)