# STAT 210
# TEST 4 SOLUTIONS – Version A

1. 0 (zero) – The probability that a normal variable is exactly equal to any value is zero.

2. B, C, and D – The Z distribution and all t-distributions all have a bell shape, a mean of zero, and no unusual features. The only difference between the Z and all t-distributions is that they have different standard deviations.

3. A – A sampling distribution is the distribution of all values taken by a statistic in a large number of simple random samples of the same size from the same population.

4. 0 (zero) – The mean of the standard normal (Z) distribution is zero.

5. Top 1.32% implies find $x$ such that $P(X > x) = 0.0132$.
   $1 – 0.0132 = 0.9868$, look up $p = .9868$ in the body of the table, find $z = 2.22$
   So $x$ = □ + $z$□ = 52.8 + 2.22(10.3) = 52.8 + 22.866 = 75.666 years old

   On the calculator: invNorm(0.9868, 52.8, 10.3) = 75.669 years old

6. $P(X < 24) = P\left(Z < \frac{24-52.8}{10.3}\right) = P(Z < -2.80) = 0.0026$

   On the calculator: normalcdf(–1E99, 24, 52.8, 10.3) = 0.0026

7. $P(X > 46) = P\left(Z > \frac{46-52.8}{10.3}\right) = P(Z > -0.66) = 1 - P(Z < -0.66) = 1 - 0.2546 = 0.7454$

   On the calculator: normalcdf(46, 1E99, 52.8, 10.3) = 0.7454

8. $P(28 < X < 37) = P\left(\frac{28-52.8}{10.3} < Z < \frac{37-52.8}{10.3}\right) = P(-2.41 < Z < -1.53) =$
   $P(Z < -1.53) - P(Z < -2.41) = 0.0630 - 0.0080 = 0.0550$

   On the calculator: normalcdf(28, 37, 52.8, 10.3) = 0.0545

9. Bottom 11.12% implies find $x$ such that $P(X < x) = 0.1112$
   Look up $p = .1112$ in the body of the table, find $z = -1.22$
   So $x$ = □ + $z$□ = 52.8 + (–1.22)(10.3) = 52.8 – 12.566 = 40.234 years old

   On the calculator: invNorm(0.1112, 52.8, 10.3) = 40.232 years old

# STAT 210
# TEST 4 SOLUTIONS – Version B

1. A, C, and D – The Z distribution and all t-distributions all have a bell shape, a mean of zero, and no unusual features. The only difference between the Z and all t-distributions is that they have different standard deviations.

2. C – A sampling distribution is the distribution of all values taken by a statistic in a large number of simple random samples of the same size from the same population.

3. 1 (one) – The standard deviation of the standard normal (Z) distribution is one.

4. 0 (zero) – The probability that a normal variable is exactly equal to any value is zero.

5. $P(40 < X < 57) = P\left(\frac{40-49.3}{11.8} < Z < \frac{57-49.3}{11.8}\right) = P(-0.79 < Z < 0.65) =$
   $P(Z < 0.65) - P(Z < -0.79) = 0.7422 - 0.2148 = 0.5274$

   On the calculator: normalcdf(40, 57, 49.3, 11.8) = 0.5277

6. Top 1.46% implies find $x$ such that $P(X > x) = 0.0146$.
   $1 - 0.0146 = 0.9854$, look up $p = .9854$ in the body of the table, find $z = 2.18$
   So $x = □ + z□ = 49.3 + 2.18(11.8) = 49.3 + 25.724 = 75.024$ years old

   On the calculator: invNorm(0.9854, 49.3, 11.8) = 75.033 years old

7. Bottom 18.14% implies find $x$ such that $P(X < x) = 0.1814$
   Look up $p = .1814$ in the body of the table, find $z = -0.91$
   So $x = □ + z□ = 49.3 + (-0.91)(11.8) = 49.3 - 10.738 = 38.562$ years old

   On the calculator: invNorm(0.1814, 49.3, 11.8) = 38.561 years old

8. $P(X < 31) = P\left(Z < \frac{31-49.3}{11.8}\right) = P(Z < -1.55) = 0.0606$

   On the calculator: normalcdf(–1E99, 31, 49.3, 11.8) = 0.0605

9. $P(X > 62) = P\left(Z > \frac{62-49.3}{11.8}\right) = P(Z > 1.08) = 1 - P(Z < 1.08) = 1 - 0.8599 = 0.1401$

   On the calculator: normalcdf(62, 1E99, 49.3, 11.8) = 0.1409

# STAT 210
# TEST 4 SOLUTIONS – Version C

1. C – A sampling distribution is the distribution of all values taken by a statistic in a large number of simple random samples of the same size from the same population.

2. 0 (zero) – The mean of the standard normal (Z) distribution is zero.

3. 0 (zero) – The probability that a normal variable is exactly equal to any value is zero.

4. A, B, and D – The Z distribution and all t-distributions all have a bell shape, a mean of zero, and no unusual features. The only difference between the Z and all t-distributions is that they have different standard deviations.

5. $P(X > 27) = P\left(Z > \frac{27 - 47.8}{12.6}\right) = P(Z > -1.65) = 1 - P(Z < -1.65) = 1 - 0.0495 = 0.9505$

   On the calculator: normalcdf(27, 1E99, 47.8, 12.6) = 0.9506

6. $P(52 < X < 64) = P\left(\frac{52 - 47.8}{12.6} < Z < \frac{64 - 47.8}{12.6}\right) = P(0.33 < Z < 1.29) =$
   $P(Z < 1.29) - P(Z < 0.33) = 0.9015 - 0.6293 = 0.2722$

   On the calculator: normalcdf(52, 64, 47.8, 12.6) = 0.2702

7. Top 2.62% implies find $x$ such that $P(X > x) = 0.0262$.
   $1 - 0.0262 = 0.9738$, look up $p = .9738$ in the body of the table, find $z = 1.94$
   So $x = □ + z□ = 47.8 + 1.94(12.6) = 47.8 + 24.444 = 72.244$ years old

   On the calculator: invNorm(0.9738, 47.8, 12.6) = 72.242 years old

8. Bottom 13.35% implies find $x$ such that $P(X < x) = 0.1335$
   Look up $p = .1335$ in the body of the table, find $z = -1.11$
   So $x = □ + z□ = 47.8 + (-1.11)(12.6) = 47.8 - 13.986 = 33.814$ years old

   On the calculator: invNorm(0.1335, 47.8, 12.6) = 33.814 years old

9. $P(X < 74) = P\left(Z < \frac{74 - 47.8}{12.6}\right) = P(Z < 2.08) = 0.9812$