Stat Unit 3 Test Review

Name: Key

Date: ____________

1. Using the standard normal distribution, find each probability:
   a. $P(0 < z < 2.16)$

      $0.98461 - 0.5 = 0.48461$

   b. $P(-1.87 < z < 0)$

      $0.5 - 0.03074 = 0.46926$

   c. $P(-1.63 < z < 2.17)$

      $0.98500 - 0.05155 = 0.93345$

   d. $P(1.72 < z < 1.98)$

      $0.97615 - 0.95728 = 0.01887$

   e. $P(z > -1.73)$

      $1 - 0.04182 = 0.95818$

   f. $P(z < 2.03)$

      0.97882

   g. $P(z > -1.02)$

      $1 - 0.15386 = 0.84614$

2. The average per capita spending on health care in the United States is \$5274. If the standard deviation is \$600 and the distribution of health care spending is normally distributed, what is the probability that a randomly selected person spends more than \$6,000?

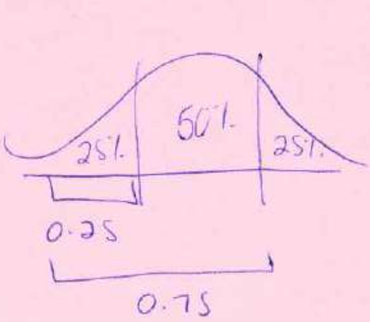
$\mu = 5274$

$\sigma = 600$

$z = \frac{5274 - 6000}{600} = \frac{+726}{600} = +1.21$

$P(z > +1.21) = 1 - \cancel{0.11314} = \cancel{0.88686}$ 0.88686 = 0.11314

Find the limits for the middle 50% of individual health care expenditures.



$z_1 = -0.67$

$z_2 = 0.67$

$-0.67 = \frac{X_1 - 5274}{600}$

$X_1 = 4872$

$0.67 = \frac{X_2 - 5274}{600}$

$X_2 = 5676$

3. The average salary for graduates entering the actuarial field is \$40,000. If the salaries are normally distributed with a standard deviation of \$5,000, find the probability that

$\mu = 40000$
$\sigma = 5000$

a. An individual graduate will have a salary over \$45,000.

$$z = \frac{45000 - 40000}{5000} = \frac{5000}{5000} = 1$$

$$P(z > 1) = 1 - 0.84134 = 0.15866$$

b. A group of nine graduates will have a group average over \$45,000.

$$z = \frac{45000 - 40000}{5000/\sqrt{9}} = 3$$

$$P(z > 3) = 1 - 0.99865 = 0.00135$$

4. The average individual monthly spending in the United States for paging and messaging services is \$10.15. If the standard deviation is \$2.45 and the amounts are normally distributed, what is the probability that a randomly selected user of these services pays

$\mu = 10.15$
$\sigma = 2.45$

a. more than \$15.00 per month?

$$z = \frac{15 - 10.15}{2.45} = 1.98 \qquad P(z > 1.98) = 1 - 0.97615 = 0.02385$$

b. between \$12.00 and \$14.00 per month?

$$z_1 = \frac{12 - 10.15}{2.45} = 0.76 \qquad P(0.76 < z < 1.57) = 0.94179 - 0.77637 = 0.16542$$

$$z_2 = \frac{14 - 10.15}{2.45} = 1.57$$

5. A recent study of life span of portable CD players found the average to be 3.7 years with a standard deviation of 0.6 year. If a random sample of 32 people who own CD players is selected, find the probability that the mean lifetime of the sample will be less than 3.4 years.

$\mu = 3.7$
$\sigma = 0.6$
$n = 32$
$P(\bar{x} < 3.4)$

$$z = \frac{3.4 - 3.7}{0.6/\sqrt{32}} = -2.83$$

$$P(z < -2.83) = 0.00233$$

6. The average electric bill in a residential area is \$72 for the month of April. The standard deviation is \$6. If the amounts of the electric bills are normally distributed, find the probability that the mean of the bills for 15 residents will be less than \$75.

$\mu = 72$
$\sigma = 6$
$n = 15$
$P(\bar{x} < 75)$

$$z = \frac{75 - 72}{6/\sqrt{15}} = 1.94$$

$$P(z < 1.94) = 0.97381$$

7. The probability of winning on a slot machine is 5%. If a person plays the machine 500 times, find the probability of winning 30 times. Use the normal approximation to the binomial distribution.

$p = 0.05$
$q = 0.95$
$n = 500$
$x = 30$

Step 1: $500(.05) = 25$ ✓ $500(.95) = 475$ ✓

Step 2: $\mu = np = 500(.05) = 25$
$\sigma = \sqrt{npq} = \sqrt{(500)(.05)(.95)} = 4.87$

Step 3: $P(X = 30)$

Step 4: $P(29.5 < x < 30.5)$

Step 5: $\frac{29.5 - 25}{4.87} = 0.92$ $\frac{30.5 - 25}{4.87} = 1.13$

Step 6: $P(0.92 < z < 1.13) = 0.87076 - 0.82121 = 0.04955$

8. Of the total population of the United States, 20% live in the Northeast. If 200 residents of the US are selected at random, find the probability that at least 50 line in the northeast.

$p = 0.2$
$q = 0.8$
$n = 200$
$x \geq 50$

Step 1: $np = 40$ ✓
$nq = 160$ ✓

Step 2: $\mu = np = 200(.2) = 40$
$\sigma = \sqrt{npq} = \sqrt{(200)(.2)(.8)} = 5.66$

Step 3: $P(x \geq 50)$

Step 4: $P(x > 49.5)$

Step 5: $z = \frac{49.5 - 40}{5.66} = 1.68$

Step 6: $P(z > 1.68) = 1 - 0.95352 = \cancel{0.4644}$ 0.04648