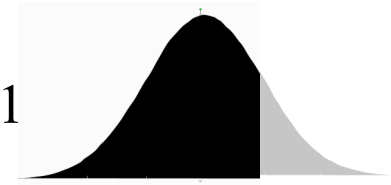
Sampling Distribution Answers

1. The scores of students on the ACT college entrance examination have a normal distribution with mean 18.6 and standard deviation of 5.9.

   a. That is the probability that a single student randomly chosen has an ACT score less 21?

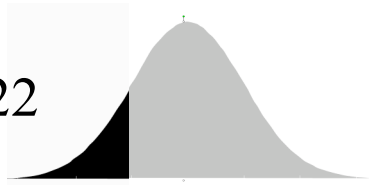
$$z = \frac{21 - 18.6}{5.9} = 0.41$$



0.657915

   b. What is the probability that 10 randomly chosen students have a mean score less than 18?

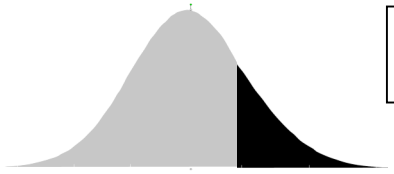
$$z = \frac{18 - 18.6}{5.9/\sqrt{10}} = -0.322$$



0.373899

   c. What is the probability that 20 randomly chosen students have a sum score greater than 380?

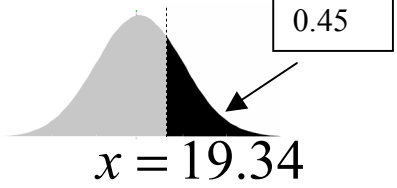
$$z = \frac{19 - 18.6}{5.9/\sqrt{20}} = 0.303$$



0.380846

   d. The probability that a single student randomly chosen has an ACT score above a certain score is 0.45. What is the score?

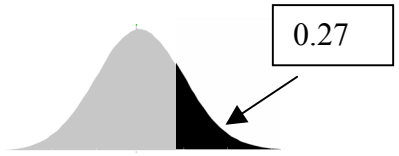
$$0.126 = \frac{x - 18.6}{5.9}$$



$$x = 19.34$$

   e. The probability that 10 randomly chosen students have an average score greater than a certain average is 0.27. What is the average score?

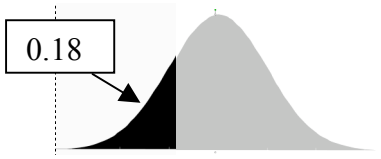
$$0.613 = \frac{\bar{x} - 18.6}{5.9/\sqrt{10}}$$



$$\bar{x} = 19.744$$

f. The probability that 10 randomly chosen students have an average score less than a certain average is 0.18. What is the average score?

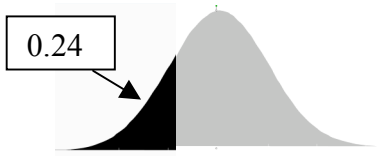
$$-0.92 = \frac{\bar{x} - 18.6}{5.9/\sqrt{10}}$$



$$\bar{x} = 16.88$$

g. The probability that 20 randomly chosen students have a total score less than a certain total 0.24. What is the total score?

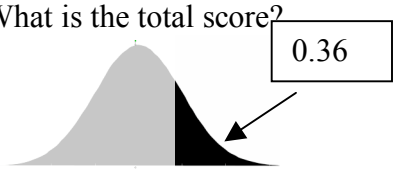
$$-0.71 = \frac{\bar{x} - 18.6}{5.9/\sqrt{20}}$$



$$\bar{x} = 17.66 \Rightarrow Sum = 353.2$$

h. The probability that 20 randomly chosen students have a total score more than a certain total 0.36. What is the total score?

$$0.358 = \frac{\bar{x} - 18.6}{5.9/\sqrt{20}}$$



$$\bar{x} = 19.07 \Rightarrow Sum = 381.4$$

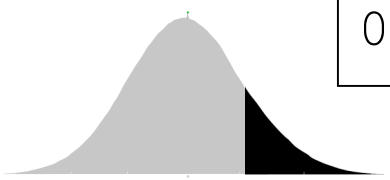
2. The average outstanding credit card balance for young couples is $650 with a standard deviation of $420.

   a. What is the probability that a couple chosen at random has a credit card balance exceeding $700?

   PROBLEM CAN NOT BE DONE

   b. What is the probability that a random sample of 100 young couples have a mean credit card balance exceeding $700?

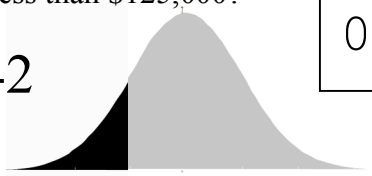
$$z = \frac{700 - 650}{420/\sqrt{100}} = 1.19$$



0.11693

   c. What is the probability that a random sample of 200 young couples have a credit card balance totaling less than $125,000?

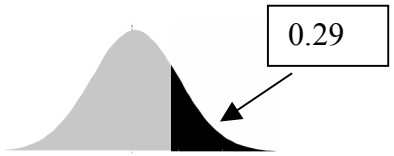
$$z = \frac{625 - 650}{420/\sqrt{200}} = -0.842$$



0.19995

   d. The probability that 50 randomly chosen young couples have an average credit card balance greater than a certain average is 0.29. What is the average amount?

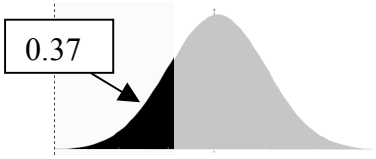
$$0.55 = \frac{\bar{x} - 650}{420/\sqrt{50}}$$



$$\bar{x} = 682.67$$

   e. The probability that 50 randomly chosen young couples have an average credit card balance less than a certain average is 0.37. What is the average amount?

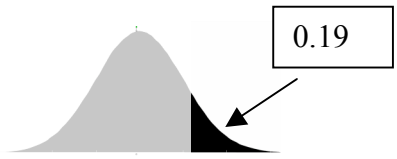
$$-0.332 = \frac{\bar{x} - 650}{420/\sqrt{50}}$$



$$\bar{x} = 630.28$$

f. The probability that 100 randomly chosen young couples have a total credit card balance greater than a certain total is 0.19. What is the total amount?

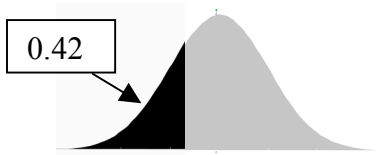
$$0.88 = \frac{\bar{x} - 650}{420/\sqrt{100}}$$



$$\bar{x} = 686.96 \quad \Rightarrow \quad Sum = 68696$$

g. The probability that 100 randomly chosen young couples have a total credit card balance less than a certain total is 0.42. What is the total amount?

$$-0.2 = \frac{\bar{x} - 650}{420/\sqrt{100}}$$



$$\bar{x} = 641.6 \quad \Rightarrow \quad Sum = 64160$$

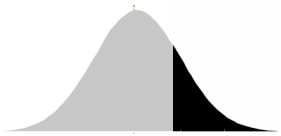
3. The average amount of time that people spend going through airport security for planes at a busy airport is 21 minutes with a standard deviation of 4.2 minutes.

   a. What is the probability that a person has to wait more than 25 minutes?

   PROBLEM CAN NOT BE DONE

   b. What is the probability that the average wait for a SRS of 40 people is more than 22 minutes?

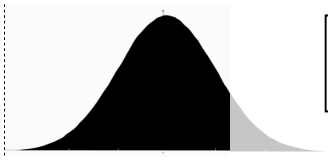
$$z = \frac{22 - 21}{4.2/\sqrt{40}} = 1.51$$



0.066031

   c. What is the probability that the total wait time for 50 people is less than 1080 minutes?

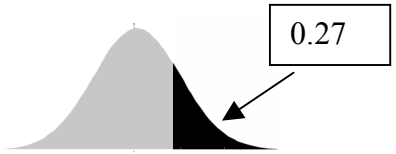
$$z = \frac{21.6 - 21}{4.2/\sqrt{50}} = 1.01$$



0.8441842

   d. The probability that 30 randomly chosen people have an average wait time longer than a certain average is 0.27. What is the average value?

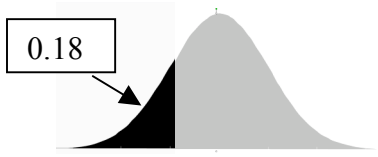
$$0.61 = \frac{\bar{x} - 21}{4.2/\sqrt{30}}$$



$$\bar{x} = 21.47$$

   e. The probability that 100 randomly chosen people have a total wait time less than a certain total is 0.18. What is the total value?

$$-0.92 = \frac{\bar{x} - 21}{4.2/\sqrt{100}}$$

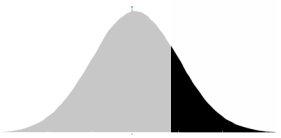


$$\bar{x} = 20.61 \Rightarrow Sum = 2061$$

4. The cost of treatment per patient for a certain medical problem was modeled by one insurance company as a normal distribution with mean \$775 and standard deviation \$150.

   a. What is the probability that the treatment cost for a randomly chosen patient is more than \$800?

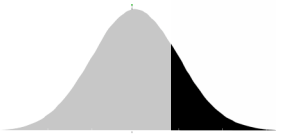
$$z = \frac{800 - 775}{150} = 0.17$$



0.433816

   b. What is the probability that the total treatment cost for 15 randomly chosen patient is more than \$12,000?

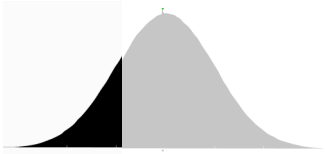
$$z = \frac{800 - 775}{150/\sqrt{15}} = 0.645$$



0.259303

   c. What is the probability that the average treatment cost for 35 randomly chosen patient is less that \$750?

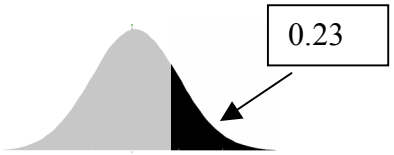
$$z = \frac{750 - 775}{150/\sqrt{35}} = -0.986$$



0.161924

   d. The probability that 20 randomly chosen people have a total treatment cost above a certain total is 0.23. What is the total value?

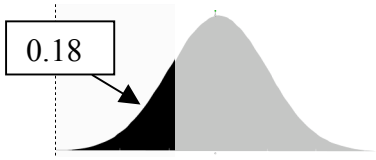
$$0.74 = \frac{\bar{x} - 775}{150/\sqrt{20}}$$



$$\bar{x} = 799.82 \Rightarrow Sum = 15996.4$$

   e. The probability that 40 randomly chosen people have an average treatment cost less than a certain average is 0.18. What is the average value?

$$-0.92 = \frac{\bar{x} - 775}{150/\sqrt{40}}$$



$$\bar{x} = 753.18$$