1. There are 7000 residents represented in this table. Of these, 3366 support the sprint car racetrack The probability that a person selected supports the racetrack is 3366/700 = .481, correct to three decimal places.

2. $\mu = s_1p_1 + s_2p_2 + s_3p_3 + s_4p_4$

$\mu = 0(.04) + 1(.34) + 2(.47) + 3(.15)$

$\mu = 1.73$

3. Total number of license-plate codes = 26 x 26 x 26 x 10 x 10 x 10.

Total number of license-plate codes which contain no M or 5 = 25 x 25 x 25 x 9 x 9 x 9.

P (license-plate code with no M or 5) = $\frac{25\times25\times25\times9\times9\times9}{26\times26\times26\times10\times10\times10} = .648,$

correct to three decimal places.

4. It is necessary to find the z-score which is associated with 92% of the area, or .9200.

$\frac{1}{2}$ (.9200) = .4600. From the body of the z-table, the z-score closest to an area of .4600 is 1.75.

\$41,500 $\pm$ 1.75 (\$8,725)

\$41,500 − 1.75 (\$8,725) = \$26, 231.25

\$41,500 + 1.75 (\$8,725) = \$56,768.75

5. Since 75% of the incomes lie below Q_3, 25% of the incomes must lie above Q_3.

$Q_3 = \mu + .67\sigma$

Q_3 = \$41,500 + .67(\$8,725)

Q_3 = \$47,345.75

6. $\mu_{\bar{x}} = \mu = \$43,200$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{\$8,725}{\sqrt{150}}$$

Approximately 95% of all data fall within 2 standard deviations of the mean.

$$\mu \pm 2\frac{\sigma}{\sqrt{n}} = \$43,200 \pm 2 \bullet \frac{\$8,725}{\sqrt{150}} = \$43,200 \pm \$1,424.79$$

Range of annual incomes is \$41,775.21 to \$44,624.79.

7. 1.6% is one-third of 4.8%. Therefore, the sample size would have to be increased by a factor of 9: 9 x 90 = 810

The new sample size would have to be 810.

8. The width of a confidence interval estimate for a population mean will be narrower for a 95% confidence interval than for a 99% confidence interval.

9. Target value = 12 oz.

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{.19oz}{\sqrt{25}}$$

95% control limits: $12 \pm 2\frac{.19}{\sqrt{25}} \longrightarrow$ 11.924 oz. and 12.076 oz.

10. I. In control.

II. Out of control: there is a run of 9 on one side of the target value.

III. Out of control: there is one value outside the control limits.

Name:_____ Section:_____

The following questions are free response. Please show all work in order to receive credit.

11. Match the following terms with their definitions. (16 points)

C	Central Limit Theorem	A.	A family of probability models that assign probabilities to events as areas under a curve.
B	Statistic	B.	A number that describes a sample
A	Normal Distribution	C.	The average of many independent outcomes is approximately normally distributed.
E	Parameter	D.	The distribution of values taken by a statistic when many random samples are drawn under the same circumstances.
D	Sampling Distribution	E.	A number that describes a population.
G	Sample Space	F.	Any collection of possible outcomes of a random phenomenon.
F	Event	G.	A list of possible outcomes of a random phenomenon.
H	Probability	H.	A number between 0 an 1 that gives the long-run proportion of repetitions of a random phenomenon on which an event will occur.

12. The following questions are true/false. (10 points)

a. Two dice are rolled and the number rolled on each die is recorded. The outcomes in the sample space are all equally likely.

(TRUE) FALSE

b. The sum of the probabilities in a probability model may be less than 1.

TRUE (FALSE)

c. A parameter is a number that describes a population.

(TRUE) FALSE

d. A control chart monitors a process over time.

(TRUE) FALSE

e. A sample space contains three outcomes: A, B, and C. $P(A)=0.2$, $P(B)=0.3$, $P(C)=0.4$ is a legitimate assignment of probabilities to the outcome.

TRUE (FALSE)

f. Two dice are rolled. The sum of the numbers rolled is recorded. The outcomes in the sample space are all equally likely.

TRUE (FALSE)

g. If an outcome never occurs, its probability is 0.

(TRUE) FALSE

h. According to the Central Limit Theorem, when the sample size is sufficiently large, the mean of the sampling distribution is equal to the population mean.

(TRUE) FALSE

i. The value of $\sigma_{\hat{p}}$ is very sensitive to changes in the value of p.

TRUE (FALSE)

j. The expected value of a probability model is the mean of the probability model.

(TRUE) FALSE

13. Two cards are selected without replacement from a set of five cards having a picture of a star, a circle, wiggly lines, a dollar sign, and a heart. (10 points)

a. Determine the number of ways in which the two cards can be selected.

$5 \cdot 4 = 20$ ways

b. Find the probability that no star appears on either card.

No star appears in $4 \cdot 3 = 12$ ways

$P(\text{no star}) = \frac{12}{20} = .6$

c. Find the probability that a star is on one of the cards.

$P(\text{star on 1 card}) = 1 - P(\text{no star})$

$= 1 - .6$

$= .4$

14. Three-hundred patrons at a fast-food restaurant were asked, "Do you approve of our new fat-free menu?" Two-hundred-sixteen responded "Yes". (14 points)

a. Find the percentage of patrons who are in favor of the new menu.

$\frac{216}{300} = .72$ 72% are in favor of new menu.

b. Find the standard deviation of the sampling distribution of this statistic. (Correct to one decimal place).

$$s_{\hat{p}} = \sqrt{\frac{\hat{p}(100-\hat{p})}{n}}$$

$$s_{\hat{p}} = \sqrt{\frac{72(100-72)}{300}}$$

$$s_{\hat{p}} \doteq 2.6\%$$

c. Construct a 95% confidence interval for the true proportion of patrons who answered "Yes".

$72\% \pm 2(2.6\%)$

$72\% \pm 5.2\%$

$66.8\% \text{ to } 77.2\%$

d. What is the margin of error for samples of size 300?

Margin of error is 5.2%