29. Which of the following is the central limit theorem?

(A) No matter how the population is distributed, as the sample size increases, the mean of the sample means becomes closer to the mean of the population.

(B) No matter how the population is distributed, as the sample size increases, the standard deviation of the sample means becomes closer to the standard deviation of the population divided by the square root of the sample size.

(C) If the population is normally distributed, then as the sample size increases, the sampling distribution of the sample mean becomes closer to a normal distribution.

(D) All of the above together make up the central limit theorem.

(E) The central limit theorem refers to something else.

30. What is a sampling distribution?

(A) A distribution of all the statistics that can be found in a given sample

(B) A histogram, or other such visual representation, showing the distribution of a sample

(C) A normal distribution of some statistic

(D) A distribution of all the values taken by a statistic from all possible samples of a given size

(E) All of the above

31. A judge chosen at random reaches a just decision roughly 80% of the time. What is the probability that in randomly chosen cases at least two out of three judges reach a just decision?

(A) $3(.8)^2(.2)$
(B) $1 - 3(.8)^2(.2)$
(C) $(.8)^3$
(D) $1 - (.8)^3$
(E) $3(.8)^2(.2) + (.8)^3$

32. Miles per gallon versus speed (miles per hour) for a new model automobile is fitted with a least squares regression line. Following is computer output of the statistical analysis of the data.

Dependent variable: Miles per gallon

Source	df	Sum of Squares	Mean Square	F-ratio
Regression	1	199.34	199.34	3.79
Residual	6	315.54	5.59	•

Variable	Coefficient	SE Coef	t-ratio	P
Constant	38.929	5.651	6.89	0.000
Speed	−0.2179	0.112	−1.95	0.099

R−Sq = 38.7%   R−Sq(adj) = 28.5%
s = 7.252 with 8 − 2 = 6 degrees of freedom

Which of the following gives a 99% confidence interval for the slope of the regression line?

(A) $-0.2179 \pm 3.707(0.112)$

(B) $-0.2179 \pm 3.143(0.112/\sqrt{8})$

(C) $-0.2179 \pm 3.707(0.112/\sqrt{8})$

(D) $38.929 \pm 3.143(3.651/\sqrt{8})$

(E) $38.929 \pm 3.707(5.651\sqrt{8})$

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33. What fault do all these sampling designs have in common?

    I. The Parent-Teacher Association (PTA), concerned about rising teenage pregnancy rates at a high school, randomly picks a sample of high school students and interviews them concerning unprotected sex they have engaged in during the past year.

    II. A radio talk show host asks people to phone in their views on whether the United States should keep troops in Bosnia indefinitely to enforce the cease-fire.

    III. The *Ladies Home Journal* plans to predict the winner of a national election based on a survey of its readers.

    (A) All the designs make improper use of stratification.
    (B) All the designs have errors that can lead to strong bias.
    (C) All the designs confuse association with cause and effect.
    (D) All the designs suffer from sampling error.
    (E) None of the designs makes use of chance in selecting a sample.

34. Hospital administrators wish to determine the average length of stay for all surgical patients. A statistician determines that for a 95% confidence level estimate of the average length of stay to within ±0.50 days, 100 surgical patients' records would have to be examined. How many records should be looked at for a 95% confidence level estimate to within ±0.25 days?

    (A) 25
    (B) 50
    (C) 200
    (D) 400
    (E) There is not enough information given to determine the necessary sample size.

35. A chess master wins 80% of her games, loses 5%, and draws the rest. If she receives 1 point for a win, $\frac{1}{2}$ point for a draw, and no points for a loss, what is true about the sampling distribution X of the points scored in two independent games?

    (A) X takes on the values 0, 1, and 2 with respective probabilities .10, .26, and .64.
    (B) X takes on the values 0, $\frac{1}{2}$, 1, $1\frac{1}{2}$, and 2 with respective probabilities .0025, .015, .1025, .24, and .64.
    (C) X takes on values according to a binomial distribution with $n = 2$ and $p = .8$.
    (D) X takes on values according to a binomial distribution with mean $1(.8) + \frac{1}{2}(.15) + 0(.05)$.
    (E) X takes on values according to a distribution with mean $(2)(.8)$ and standard deviation $\sqrt{2(.8)(.2)}$.

36. Which of the following is a true statement?

    (A) The *P*-value is a conditional probability.
    (B) The *P*-value is usually chosen before an experiment is conducted.
    (C) The *P*-value is based on a specific test statistic and thus should not be used in a two-sided test.
    (D) *P*-values are more appropriately used with *t*-distributions than with *z*-distributions.
    (E) If the *P*-value is less than the level of significance, then the null hypothesis is proved false.

An assembly line machine is supposed to turn out ball bearings with a diameter of 1.25 centimeters. Each morning the first 30 bearings produced are pulled and measured. If their mean diameter is under 1.23 centimeters or over 1.27 centimeters, the machinery is stopped and an engineer is called to make adjustments before production is resumed. The quality control procedure may be viewed as a hypothesis test with the null hypothesis $H_0: \mu = 1.25$ and the alternative hypothesis $H_a: \mu \neq 1.25$. The engineer is asked to make adjustments when the null hypothesis is rejected. In test terminology, what would a Type II error result in?

(A) A warranted halt in production to adjust the machinery
(B) An unnecessary stoppage of the production process
(C) Continued production of wrong size ball bearings
(D) Continued production of proper size ball bearings
(E) Continued production of ball bearings that randomly are the right or wrong size

38. Both over-the-counter niacin and the prescription drug Lipitor are known to lower blood cholesterol levels. In one double-blind study Lipitor outperformed niacin. The 95% confidence interval estimate of the difference in mean cholesterol level lowering was (18, 41). Which of the following is a reasonable conclusion?

(A) Niacin lowers cholesterol an average of 18 points, while Lipitor lowers cholesterol an average of 41 points.
(B) There is a .95 probability that Lipitor will outperform niacin in lowering the cholesterol level of any given individual.
(C) There is a .95 probability that Lipitor will outperform niacin by at least 23 points in lowering the cholesterol level of any given individual.
(D) We should be 95% confident that Lipitor will outperform niacin as a cholesterol-lowering drug.
(E) None of the above.

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39. The following parallel boxplots show the average daily hours of bright sunshine in Liberia, West Africa:

Average daily hours of bright sunshine
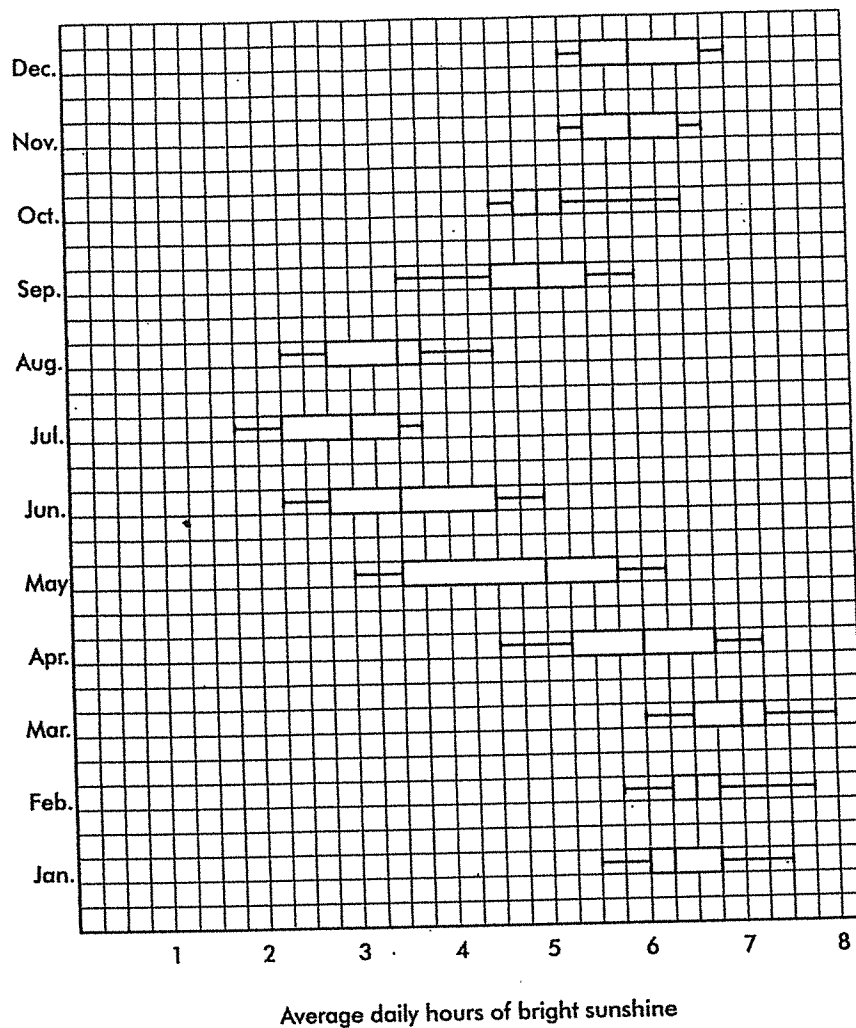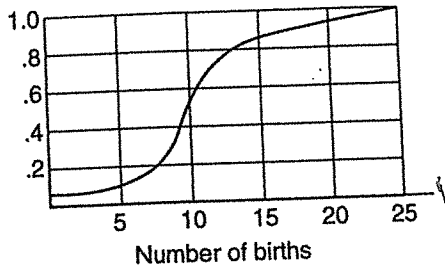
For how many months is the median below 4 hours?

(A) One
(B) Two
(C) Three
(D) Four
(E) Five

Following is a cumulative probability graph for the number of births per day in a city hospital.

Number of births

Assuming that a birthing room can be used by only one woman per day, how many rooms must the hospital have available to be able to meet the demand at least 90 percent of the days?

(A) 5
(B) 10
(C) 15
(D) 20
(E) 25

STOP

If there is still time remaining, you may review your answers.