10. **(B)** Since the measurement error is approximately normal, the proportion of measurement errors of this piece of paper between −0.3 mm and 0.3 mm is equivalent to the proportion of z-scores between $\frac{-0.3 - 0}{1.2} = -0.25$ and $\frac{0.3 - 0}{1.2} = 0.25$ in a standard normal distribution. Using Table A, Standard normal probabilities, the proportion of z-scores between −0.25 and 0.25 is equal to the proportion of z-scores less than 0.25 minus the proportion of z-scores less than −0.25 = 0.5987 − 0.4013 = 0.1974. Alternatively, normalcdf(lower: -0.3, upper: 0.3, μ: 0, σ: 1.2) = 0.1974 on the TI-84. Therefore, the correct answer choice is B.

11. **(C)** The requirement of comparing 2 or more treatments is satisfied (Brand A tires and Brand B tires). There is sufficient replication since both treatments are applied to 1000 vehicles, and sample proportions of punctured tires are appropriate for comparison, so answer choices A, B, and D, are incorrect. The brand of tires is confounded with the temperature since it is generally colder in the winter months when only Brand A (winter) tires were used, so it will not be possible to know if an observed difference in puncture rates at the end of the experiment are due to the brand of tires or the temperature. The presence of confounding makes this not a good experimental design. Therefore, the correct answer choice is C.

12. **(B)** Greatly increasing the sample size will not affect the variability in the population of all people in the state (answer choice A), undercoverage bias (answer choice C), or nonresponse bias (answer choice D). Since we are not studying the relationship between variables, but rather estimating a proportion based on a single categorical variable, the concept of confounding does not apply, so answer choice E is incorrect. The standard deviation of the sampling distribution of the sample proportion $\hat{p}$, $\sqrt{\frac{\hat{p}\,(1 - \hat{p})}{n}}$, decreases as the sample size n increases since n is in the denominator. Therefore, the variability of the sampling distribution of the sample proportion will decrease if the member of the campaign of a candidate for Governor in Tennessee greatly increases the sample size, so the correct answer choice is B.

13. **(D)** "Skewed to the left" is a shape description for the distribution of a single quantitative variable, and since the mosaic plot compares two categorical variables, answer choice A is incorrect. The mosaic plot shows an association between household income and whether children have laptop computers due to the differing percentages of children with laptop computers in each of the household income categories. Because the graph displays an association between the two categorical variables, answer choice B is incorrect. It is not possible to determine the average household income from the mosaic plot. For example, some of the incomes in the $100k+ category may have a big effect on the average household income, possibly pulling it above $100k. Therefore, answer choice C is incorrect. "Bimodal" is reserved for describing the shape of the distribution of a single quantitative variable, so answer choice E is incorrect. The most narrow column in the mosaic plot is the one for the household income category of $50k to $100k. Since the width of each column is proportional to the number of observations in the corresponding income category, the household income category with the fewest respondents was $50k to $100k. Therefore, answer choice D is correct.

24. **(C)** The cumulative relative frequency histogram shows that just under 40% of the English grammar test scores are less than 80 and just under 80% of the test scores are less than 90. Therefore, the 50th percentile is between 80 and 90, which is greater than 70, so the statement in answer choice A is true. The cumulative relative frequency histogram shows no scores less than 30 (otherwise there would be a bar to the left of the one in the 30–40 interval), so the statement in answer choice B is true. The cumulative relative frequency histogram shows that about 20% of the test scores are less than 70, so about 80% of the test scores (the majority, or greater than 50%) are greater than or equal to the passing score of 70. Therefore, the statement in answer choice D is true. Since the test score distribution extends farther to the left of the median (the lowest score is between 30 and 40) than to the right (the highest score is between 90 and 100), the distribution of test scores is skewed to the left. (Note that we are not discussing the shape of the cumulative relative frequency histogram shown, but rather, the shape of the original distribution of test scores). Therefore, the mean test score is less than the median test score and answer choice E is true. Since the median is farther from the minimum of the distribution than the maximum of the distribution, there is greater variability in the lowest 15 test scores than in the highest 15 test scores, so the statement in answer choice C is false. Therefore, the correct answer choice is C.

25. **(C)** Histogram B shows the most variability in the 1000 simulated sample means, followed by Histogram A. Histogram C shows the least variability. The formula for the standard deviation of the sampling distribution of the sample mean is $\sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{n}}$, so as the sample size n increases, the denominator increases, and the standard deviation of the distribution of sample means $\sigma_{\bar{x}}$ decreases. Since Histogram C shows the least variability among the answer choices, the greatest value of n among the histograms is the sample size for the simulated sample means in Histogram C. Therefore, the correct answer choice is C.

26. **(E)** A p-value is the probability of obtaining a test statistic as extreme as or more extreme than the one we got if the null hypothesis is true and the probability model is appropriate. If the test statistic is in the direction of the one-sided alternative hypothesis, the two-sided p-value is twice the one-sided p-value, so the one-sided p-value would be $\left(\frac{1}{2}\right)(0.32) = 0.16$. The other possibility is that the test statistic is in the direction opposite to the alternative hypothesis. In this case, the p-value would be the complement of the one-sided p-value when the test statistic is in the same direction as the alternative hypothesis, so the p-value would be $1 - 0.16 = 0.84$. Therefore the two possible p-values are 0.16 and 0.84, and the correct answer choice is E.

30. **(B)** Blocking is appropriate in experimental design when there is a known source (or sources) of variation among the experimental units that is associated with the response variable. Blocking reduces variability in the response variable by separating natural variability from variability due to the blocking variable(s). Since previous studies indicate that there is a known variable associated with stopping distances, it is appropriate to block on that variable and answer choice E is incorrect. Since previous studies do not indicate that the response variable (stopping distances) is associated with type of bicycle, type of bicycle would not be an appropriate blocking variable and answer choice A is incorrect. The explanatory variable is the disc braking system type, so it is not a blocking variable and answer choice C is incorrect. Since stopping distance is the response variable, it is not a blocking variable and answer choice D is incorrect. Since previous studies indicate that the weight of the manufacturer's bicycles is associated with stopping distances, this is an important source of variation and therefore would be a good blocking variable. Therefore, the correct answer choice is B.

31. **(E)** The formula for the margin of error of a confidence interval for a population proportion is $z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$. The sample proportion of teenagers who indicated that "making a difference in the world" was either important or somewhat important, $\hat{p}$, is used in the margin of error formula since it is our "best guess" for the true population proportion. The critical value, z^*, for a 99% confidence level can be found from Table A (Standard normal probabilities), Table B (t distribution critical values), or with technology. The TI-84 calculator function invNorm(area: 0.995, μ: 0, σ: 1) gives $z^* = 2.576$. Substituting the values $z^* = 2.576$, $\hat{p} = \frac{1024}{1349} = 0.759$, and $n = 1349$ gives $2.576\sqrt{\frac{(0.759)(1-0.759)}{1349}}$, the appropriate calculation for the margin of error of a 99% confidence interval for the proportion of all U.S. teenagers who would report that "making a difference in the world" is either important or somewhat important. Therefore, the correct answer choice is E.

32. **(D)** Let W = the weight of a randomly selected apple, X = the weight of a randomly selected orange, and Y = the weight of a randomly selected pear, so $T = 4W + 3X + 2Y$. The variance of T, is $\sigma_T^2 = 4\sigma_W^2 + 3\sigma_X^2 + 2\sigma_Y^2 = 4(18^2) + 3(12^2) + 2(15^2) = 2178$ grams^2, so the standard deviation of T is calculated as follows: $\sigma_T = \sqrt{\sigma_T^2} = \sqrt{2178} = 46.7$ grams. Therefore, the correct answer choice is D.

33. **(A)** From the regression output, the standard error of the estimate is $SE_b = 0.509$. The critical value t^* for a 95% confidence level with $n - 2 = 10 - 2 = 8$ degrees of freedom is 2.306 from Table B, t distribution critical values, or invT(area: 0.975, df: 8) on the TI-84. The margin of error for the confidence interval is $t^*(SE_b) = 2.306(0.509)$. Therefore, the correct answer choice is A.

37. **(B)** The 16 equally likely possibilities from rolling two fair four-sided dice are as follows, grouped by the sum of the numbers facing downward on the two dice. For each possible sum, the value of the sample mean $\overline{X}$, and corresponding probability are given.

(1,1) –> $\overline{X} = \frac{2}{2} = 1$, $P(\overline{X} = 1) = 1/16$

(2,1), (1,2) –> $\overline{X} = \frac{3}{2} = 1.5$, $P(\overline{X} = 1.5) = 2/16 = 1/8$

(3,1), (2,2), (1,3) –> $X = \frac{4}{2} = 2$, $P(\overline{X} = 2) = 3/16$

(4,1), (3,2), (2,3), (1,4) –> $\overline{X} = \frac{5}{2} = 2.5$, $P(\overline{X} = 2.5) = 4/16 = 1/4$

(4,2), (3,3), (2,4) –> $\overline{X} = \frac{6}{2} = 3$, $P(\overline{X} = 3) = 3/16$

(4,3), (3,4) –> $\overline{X} = \frac{7}{2} = 3.5$, $P(\overline{X} = 3.5) = 2/16 = 1/8$

(4,4) –> $\overline{X} = \frac{8}{2} = 4$, $P(\overline{X} = 4) = 1/16$

Therefore, the correct answer choice is B.

38. **(A)** Since the explanatory variable x is in the base of the resulting model $\hat{y} = x^{1.5}$, the resulting model is considered a power model. In order to transform a power model to a linear model, we can take the natural logarithm of both sides of the equation and apply some logarithm rules as follows:

$\hat{y} = x^{1.5}$

$\ln \hat{y} = \ln x^{1.5}$ (taking the natural logarithm of both sides)

$\ln \hat{y} = 1.5 \cdot \ln x$ (power rule for logarithms)

$\ln \hat{y} = 0 + 1.5 \cdot \ln x$ (converting to the linear form $\hat{y} = a + bx$)

The y-intercept of the linear relationship between ln(y) and ln(x) is 0.

The slope of the linear relationship between ln(y) and ln(x) is 1.5.

With a y-intercept of 0 and a slope of 1.5, the relationship between ln(y) and ln(x) is linear. Therefore, the correct answer choice is A.