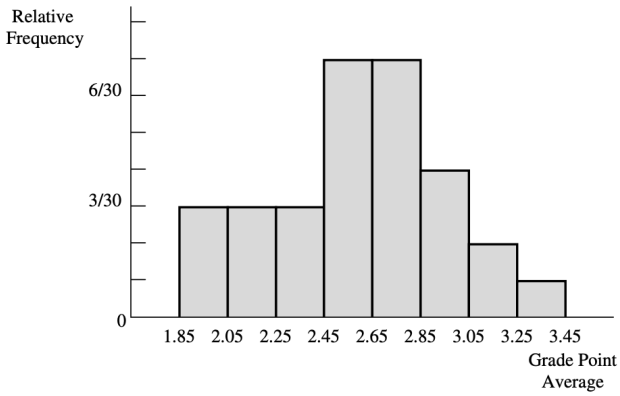
1. Given below is a relative frequency histogram associated with grade point averages (GPAs) of a sample of 30 students:



   (a) Which of the GPA categories identified on the horizontal axis are associated with the largest proportion of students?

   (b) What proportion of students had GPAs in each of the categories that you identified in the previous part.

   (c) What proportion of the students had GPAs less than 2.65?

2. A professor gave a test to 140 students and determines the median score. After grading the test, she realizes that the 5 students with the highest scores did exceptionally well. She decides to award there 5 students a bonus of 10 more points. The median of the new score distribution will be _____ that of the original score distribution (circle the choice that best describes the situation):

   A. smaller than
   B. equal to
   C. larger than
   D. depending on skewness, larger or smaller than
   E. depending on modality, larger or smaller than

   Provide justification for your answer below:

3. Researchers studying the effect of antibiotic treatment for acute sinusitus compared to symptomatic treatments randomly assigned 166 adults diagnosed with acute sinusitis to one of two groups: treatment or control. Study participants received either a 10-day course of amoxicillin (an antibiotic) or a placebo similar in appearance and taste. The placebo consisted of symptomatic treatments such as acetaminophen, nasal decongestants, etc. At the end of the 10-day period, patients were asked if they experienced an improvement in symptoms. The distribution of responses is shown below:

	Yes	No	Total
Treatment	66	19	85
Control	65	16	81
Total	131	35	166

Let the following events be denoted:

$$T = \text{treatment group}$$

$$C = \text{control group}$$

$$I = \text{improvement in symptoms}$$

$$I^c = \text{no improvement in symptoms}$$

(a) What proportion of participants in the treatment group experienced improvement in symptoms?

(b) A participant is randomly selected. Using probability notation, describe the probability that they are in the group described in part (a).

(c) What is the probability that a randomly selected individual is in the treatment group or experienced improvement in symptoms?

4. The game of roulette involves spinning a wheel with 38 slots: 18 red, 18 black, and 2 green. A ball is spun onto the wheel and eventually lands in one of the 38 slots each with equal probability.

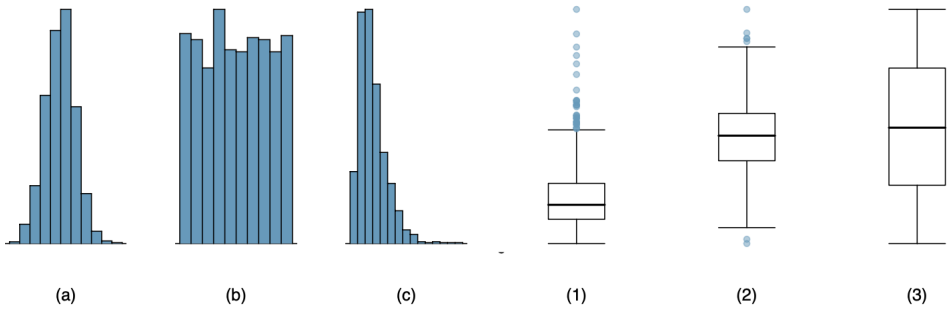
   (a) You watch a roulette wheel spin 3 times and the ball lands on red each time. What is the probability that the ball will land on red on the next spin? Show work to justify your answer. (You do not need to simplify your expression; eg. $\frac{1}{3}^7 \cdot \frac{5}{6} + 0.1$ is an acceptable answer)

   (b) What is the probability that the ball will land on red twice in a row? Show work to justify your answer. (You do not need to simplify your expression)

   (c) What is the probability that the ball lands in a red slot or a green slot? Show work to justify your answer. (You do not need to simplify your expression)

5. A recent article in a college newspaper stated that college students get an average of 5.5 hrs of sleep each night. A student who was skeptical about this value decided to conduct a survey by randomly sampling 25 students. On average, the sampled students slept 6.25 hours per night. Identify which value represents the sample mean and which value represents the claimed population mean.

6. Three data sets are represent below with both a histogram and a boxplot. Match each histogram with the box plot that represents the same data set.



7. Sally wears sunscreen 50% of days during the summer. She goes swimming 15% of the days during the summer. The probability that she wears sunscreen given that she went swimming is 90% . On a random day in the summer find the probability that Sally:

   (a.) went swimming and wore sunscreen.

   (b) went swimming or wore sunscreen.

8. Suppose we are measuring characteristics of Davidson students. Provide examples of the following types of data you can collect:

   qualitative nominal:

   qualitative ordinal:

   quantitative discrete:

   quantitative continuous:

9. Given the following information about a data set:

Min	Q_1	Q_2	Q_3	Max
5	12	28	52	99

   Can you conclude that there are any outliers in the data set?

10. Sophia who took the Graduate Record Examination (GRE) scored 158 on the Verbal Reasoning section and 157 on the Quantitative Reasoning section. The mean score for Verbal Reasoning section for all test takers was 151 with a standard deviation of 7, and the mean score for the Quantitative Reasoning was 153 with a standard deviation of 7.67. Suppose that both distributions are symmetric and bell shaped.

    (a) What is Sophia's Z-score on the Verbal Reasoning section?

    (b) What is Sophia's Z-score on the Quantitative Reasoning section?

    (c) Which did she perform better on relative to other people?

    (d) Approximately what percentage of people performed better than her on the Verbal Reasoning section?

11. You are looking to purchase a new iPhone for $\$1,199$ and are debating about buying apple care for \$199 (apple care is insurance that will replace your phone if it breaks for any reason). You think there is a 10% chance you will need to replace your screen for \$400, a 2% chance you will need to replace the battery for \$200, and a 1% chance your phone will be damaged so badly that you need to buy a new phone. If you get apple care though, you would not need to pay for any of these repairs. Calculate the expected cost of phone repairs without apple care. Based on the expected cost, does apple care seem worth it?

Formula Sheet

Throughout, X is a random variable and x_i is a particular value of X.

$$\mu = \frac{\sum x_i}{N}$$

$$\overline{X} = \frac{\sum x_i}{n}$$

$$\sigma = \sqrt{\frac{\sum(\mu - x_i)^2}{N}}$$

$$s = \sqrt{\frac{\sum(\overline{X} - x_i)^2}{n-1}}$$

$$IQR = Q_3 - Q_1$$

$$\text{whiskers} = \begin{cases} Q_1 - 1.5 \cdot IQR \\ Q_3 + 1.5 \cdot IQR \end{cases}$$

$$z\text{-score} = \frac{\text{observation} - \text{expected}}{\text{standard deviation}}$$

$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$E(X) = \sum x_i P(X = x_1)$$

$$\sigma(E(X)) = \sqrt{\sum (x_i - E(X))^2 P(X = x_1)}$$