PROBLEM SET 2

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Instructions: Here is our second set of practice problems. The TAs will go over some of these in discussion, but please feel free to ask about anything that's difficult or unclear in office hours or on Piazza.

Practice problems

(1) Suppose that a quality control sample of crackers from a production line has mean length 2.3cm, and standard deviation 0.6cm. If an individual cracker has length 2cm, what is its standardized value?

answer: -0.5

(2) The market capitalizations, in millions of US dollars, of a sample of companies are recorded. Which of the following is the unit of measurement of their standardized values?

   (a) Millions of US dollars

   (b) US dollars

   (c) Mongolian Tugrug

   (d) Standard deviations above the mean

answer: (d)

(3) Suppose that a quality control sample of crackers from a production line has mean length 2.3cm, and standard deviation 0.6cm. If an individual cracker has length 2 standard deviations above the mean, what is its length in cm?

answer: 3.5cm

(4) Suppose that a quality control sample of crackers from a production line has mean length 3.5cm, and standard deviation 0.3cm. If an individual cracker has standardized value -1.2, what is its length in cm?

answer: 3.14cm

(5) Suppose that a quality control sample of crackers from a production line has mean length 2.1cm, and standard deviation 0.7cm. If an individual cracker has standardized value 0.4, what is its length in cm?

answer: 2.38cm

(6) The times to market (in days) of a sample of products are recorded. The mean is 36 days. If a product that has time to market of 42 days also has standardized value 2, what is the standard deviation of the times to market?

answer: 3

(7) Suppose that the distribution of standardized velocities of some cargo ships is standard Normal (in this case the velocities themselves are said to be Normally distributed). The mean of the velocities themselves is 4.3 m/s, and their standard deviation is 2.5 m/s. What is the mean of the standardized velocities?

answer: 0

(8) Suppose that the distribution of velocities of some cargo ships is Normally distributed. The mean of the velocities themselves is 4.3 m/s, and their standard deviation is 2.5 m/s. What is the 20th percentile of the standardized velocities?

answer: -0.842

(9) Suppose that the distribution of velocities of some cargo ships is Normally distributed. The mean of the velocities themselves is 4.3 m/s, and their standard deviation is 2.5 m/s. What is the 20th percentile of the velocities (in m/s)?

answer: 2.195

(10) Suppose that the distribution of the valuations (in million dollars) of some companies are Normally distributed. The mean valuation is 12.7, and the standard deviation is 4.3 m/s. What is the 20th percentile of the velocities (in million dollars)?

answer: 9.081

(11) Suppose that some data have a standard Normal distribution. What is their standard deviation?

answer: 1

(12) Suppose that some data have a standard Normal distribution. What is their 75th percentile? Their 25th percentile?

answer: 0.674, -0.674

(13) Suppose that some data have a standard Normal distribution. What is their IQR?

answer: 1.349

(14) You are working with a dataset that has first quartile 25.2, median 48.9, and third quartile 52.4. If you take an "extreme value" to be defined as a value that is 1.5 IQR's or more away from the box in the boxplot of the data, would you say that the value 65 would be unusual?

answer: no!

(15) Consider a probability model for rolling a single, six-sided die. Which of the following is an outcome?

    (a) The result is even

    (b) A royal flush

    (c) In-person instruction in the Fall

    (d) None of the other answers

answer: (d)

(16) A small trial studying risk preferences enrolled 20 participants. 12 of the participants have health insurance, and 8 do not. When offered a particular risky payoff, 4 of the participants would accept it, while 16 would not.

You will randomly select one of the 20 patients to interview. Which of the following is an outcome for the probability model of this situation?

    (a) The selected participant has health insurance

    (b) The selected participant identifies as female

    (c) The selected participant eats a vegetarian diet

    (d) The participant named Wilhelmina

    (e) None of the other answers

answer: (d)

(17) Consider a probability model for rolling a single, six-sided die. Which of the following is an event?

    (a) $\{\boxdot, \boxdot\}$

    (b) The cat swats the dice away before you can read it

    (c) Atlanta, Georgia

    (d) None of the other answers

answer: (a)

(18) Consider a Laplace probability model for rolling a single, six-sided die. What is the probability that the result of the roll is two or smaller?

answer: $1/3$

(19) Consider a probability model for rolling a single, six-sided die with

$$P(A) = \begin{cases} 1 & \text{if } \boxtimes \text{ is in } A \\ 0 & \text{if } \boxtimes \text{ is not in } A. \end{cases}$$

What is the probability that the result of the roll is two or smaller?

answer: 0

(20) Suppose that events A and B in a probability model have

$$P(A) = 0.3,$$
$$P(B) = 0.4,$$

and
$$P(A \text{ and } B) = 0.15 .$$

What is $P(A \text{ or } B)$?

answer: 0.55

(21) Suppose that events A and B in a probability model have

$$P(A) = 0.1,$$
$$P(B) = 0.8,$$

and
$$P(A \text{ and } B) = 0.1 .$$

Are A and B mutually exclusive?

answer: no!

(22) Suppose that $P(A) = 0.9$ and $P(B) = 0.8$. Do you have enough information to compute $P(A \text{ and } B)$? If so, do this; if not, determine its smallest possible value. Is there enough information to determine whether A and B are mutually exclusive?

answer: No; 0.7. Yes: they are not!

(23) Roll two six-sided dice. Let A be the event that the total number of dots (sum of the two results) is even, and B be the event that the total is odd. Are A and B mutually exclusive?

answer: yes!

(24) Roll two six-sided dice. Let A be the event that the total number of dots is twelve, and B be the event that the first roll is six. What is $P(A \text{ and } B)$?

answer: ¹/₃₆

(25) Suppose that A and B are mutually exclusive events with $P(A) = 0.3$ and $P(B) = 0.4$. What is $P(A \text{ or } B)$?

answer: 0.7