

Begin your response to **QUESTION 5** on this page.

5. Baseball cards are trading cards that feature data on a player's performance in baseball games. Michelle is at a national baseball card collector's convention with approximately 20,000 attendees. She notices that some collectors have both regular cards, which are easily obtained, and rare cards, which are harder to obtain. Michelle believes that there is a relationship between the number of months a collector has been collecting baseball cards and whether the majority of the cards (cards appearing more often) in their collection are regular or rare. She obtains information from a random sample of 500 baseball card collectors at the convention and records how many full months they have been collecting baseball cards and whether the majority of the cards in their card collection are regular or rare. Her results are displayed in a two-way table.

**Majority Type of Baseball Cards and Months of Collecting Baseball Cards**

	Fewer Than 6 Months	6 - 10 Months	11 - 15 Months	16 - 20 Months	21 or More Months	<b>Total</b>
Has a Majority of Regular Baseball Cards	80	84	71	76	112	423
Has a Majority of Rare Baseball Cards	11	16	9	6	35	77
<b>Total</b>	91	100	80	82	147	500

- (a) If one collector from the sample is selected at random, what is the probability that the collector has been collecting baseball cards for 11 or more months and has a majority of regular baseball cards? Show your work.
- (b) Given that a randomly selected collector from the sample has been collecting baseball cards for fewer than 6 months, what is the probability the collector has a majority of regular baseball cards? Show your work.

**GO ON TO THE NEXT PAGE.**

Continue your response to **QUESTION 5** on this page.

- (c) Michelle believes there is a relationship between the number of months spent collecting baseball cards and which type of card is the majority in the collection (regular or rare).
- (i) Name the hypothesis test Michelle should use to investigate her belief. Do not perform the hypothesis test.
- (ii) State the appropriate null and alternative hypotheses for the hypothesis test you identified in (c-i). Do not perform the hypothesis test.
- (d) After completing the hypothesis test described in part (c), Michelle obtains a *p*-value of 0.0075. Assuming the conditions for inference are met, what conclusion should Michelle make about her belief? Justify your response.

**GO ON TO THE NEXT PAGE.**

Begin your response to **QUESTION 6** on this page.

**SECTION II, Part B**

**Suggested Time—25 minutes**

**1 Question**

**Directions:** Show all your work. Indicate clearly the methods you use, because you will be scored on the correctness of your methods as well as on the accuracy and completeness of your results and explanations.

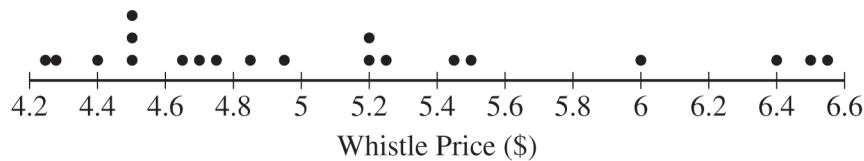
6. A company sells a certain type of whistle. The price of the whistle varies from store to store. Julio, a statistician at the company, wants to estimate the mean price, in dollars (\$), of this type of whistle at all stores that sell the whistle.

(a) (i) Identify the appropriate inference procedure for Julio to use.

(ii) Describe the parameter for the inference procedure you identified in part (a-i) in context.

Julio called the managers of 20 randomly selected stores that sell the whistle and recorded the price of the whistle at each store. Following is a dotplot of Julio's data.

**Price of the Whistle at 20 Stores**



**GO ON TO THE NEXT PAGE.**

**Question 5: Multi-Focus****4 points****General Scoring Notes**

- Each part of the question (indicated by a letter) is initially scored by determining if it meets the criteria for essentially correct (E), partially correct (P), or incorrect (I). The response is then categorized based on the scores assigned to each letter part and awarded an integer score between 0 and 4 (see the table at the end of the question).
- The model solution represents an ideal response to each section of the question, and the scoring criteria identify the specific components of the model solution that are used to determine the score.

Model Solution	Scoring
(a) $\begin{aligned} P(11+ \text{ months} \cap \text{majority regular cards}) \\ = \frac{71 + 76 + 112}{500} \\ = \frac{259}{500} \\ = 0.518 \end{aligned}$	<b>Essentially correct (E)</b> if the response satisfies the following two components: 1. Provides the correct probability 2. Shows work for the correct probability
	<b>Partially correct (P)</b> if the response satisfies only one of the two components required for E.
	<b>Incorrect (I)</b> if the response does not meet the criteria for E or P.

**Additional Notes:**

- An arithmetic or transcription error in a response can be ignored if correct work is shown.
- A correct fraction, decimal, or percentage may satisfy component 1.
- To satisfy component 2 work must demonstrate how the numerator of 259 was computed. This may be accomplished by showing the addition or clearly indicating the appropriate summands on the table.
- A response that satisfies components 1 and 2 for the probability that the collector has been collecting baseball cards for 11 or more months and has a majority of *rare* baseball cards may be scored P.
- A specific probability statement is not required, but if correctly given should be considered a positive in holistic scoring.

Model Solution	Scoring
<p>(b) <math>P(\text{majority regular cards} \mid \text{fewer than 6 months})</math></p> $= \frac{P(\text{majority regular cards} \cap \text{fewer than 6 months})}{P(\text{fewer than 6 months})}$ $= \frac{\frac{80}{500}}{\frac{91}{500}}$ $= \frac{80}{91}$ $= 0.879$	<p><b>Essentially correct (E)</b> if the response satisfies the following two components:</p> <ol style="list-style-type: none"> <li>Provides the correct probability</li> <li>Shows work for the correct probability</li> </ol> <p><b>Partially correct (P)</b> if the response satisfies only one of the two components required for E.</p> <p><b>Incorrect (I)</b> if the response does not meet the criteria for E or P.</p>

**Additional Notes:**

- An arithmetic or transcription error in a response can be ignored if correct work is shown.
- A response of  $\frac{80}{91}$  satisfies both components 1 and 2.
- A response that satisfies components 1 and 2 for the probability that given a randomly selected collector has been collecting baseball cards for fewer than six months, they have a majority of *rare* baseball cards may be scored P.
- A specific probability statement is not required, but if correctly given should be considered a positive in holistic scoring.