# AP® STATISTICS
# 2008 SCORING GUIDELINES

## Question 1

**Intent of Question**

The primary goals of this question were to assess a student's ability to (1) compare two distributions; (2) reevaluate shape, center, and spread for comparing the two distributions after one of the distributions is transformed by multiplying each of the data points by a constant; and (3) make a prediction about the means of the two distributions based on information derived about the behavior of the distributions from the boxplots.

**Solution**

**Part (a):**

The cereals that list a serving size of one cup have a median sugar amount larger than the median for the cereals that list a serving size of three-quarters of a cup. There is more variability (larger range and larger IQR) for the one-cup cereals. The shapes of the two distributions differ. The distribution of sugar content for three-quarter-cup cereals is reasonably symmetric: notice that the median is in the middle of the box. The distribution of sugar content for one-cup cereals is clearly skewed to the left (skewed toward the lower values): notice that the median is pulled to the right side of the central box closer to the third quartile.

**Part (b):**

The distribution of sugar content in the cereals that list one-cup serving sizes remains the same as in part (a) because no transformations were applied to this distribution. There is a noticeable shift toward higher sugar content for the cereals that list three-quarter-cup servings after the transformation was applied to this distribution. The two types of cereals (one-cup and three-quarter-cup) now have similar medians, and the two distributions now show similar maximum values. In addition, the variability in the sugar content for cereals with a three-quarter-cup serving size increased by a factor of $\frac{4}{3}$ after the transformation was applied to the data in this distribution.

**Part (c):**

Judging from the boxplots in part (b), we would expect the mean amounts of sugar per serving to be different. By the symmetry of the boxplot for the three-quarter-cup cereals, we would expect the mean and median to be similar. Because the boxplot for the one-cup cereals is skewed to the left, we would expect the mean to be lower than the median. Thus, because both types of cereal have similar medians, we would expect the mean amount of sugar per cup for cereals with a one-cup serving size to be lower than the mean amount of sugar per cup for cereals with a three-quarter-cup serving size.

**Scoring**

Parts (a), (b), and (c) are each scored as essentially correct (E), partially correct (P), or incorrect (I).

**Part (a)** is scored as follows:

Essentially correct (E) if the student correctly compares center, shape, and spread of the two distributions. Specific numerical values are not required.

# AP® STATISTICS
# 2008 SCORING GUIDELINES

## Question 1 (continued)

Partially correct (P) if the student correctly compares any two of the three characteristics (center, shape, and spread) of the two distributions.

Incorrect (I) if the student compares no more than one of the three characteristics.

*Note:* If the student uses "normal," "mound-shaped," or "uniform" for "symmetric," then no credit is given for shape. If the student uses "mean" for "median," then no credit is given for center.

**Part (b)** is scored as follows:

Essentially correct (E) if the student correctly indicates that the three-quarter-cup cereals shift to higher values *AND* that the three-quarter-cup distribution becomes more variable.

Partially correct (P) if the student recognizes one of the two changes (shift to higher values or increase in variability) for the distribution of the three-quarter-cup cereals.

Incorrect (I) if the student identifies neither the shift to higher values nor the increased variability for the three-quarter-cup distribution.

**Part (c)** is scored as follows:

Essentially correct (E) if the student predicts that the mean for cereals with a one-cup serving size would be lower than the mean for cereals with a three-quarter-cup serving size *AND* provides a reasonable justification based on the left skewness of the distribution for the one-cup serving size.

Partially correct (P) if the student predicts that the mean will be lower for the one-cup serving size but provides a weak justification *OR* if the student correctly compares mean and median for each serving size with a justification based on the shapes of the distributions but fails to compare the means of the two serving sizes.

Incorrect (I) if the student predicts that the means will be different with no justification *OR* predicts that the means will be similar *OR* makes no prediction.

**4** **Complete Response**

All three parts essentially correct

**3** **Substantial Response**

Two parts essentially correct and one part partially correct

**2** **Developing Response**

Two parts essentially correct and no parts partially correct

*OR*

One part essentially correct and one or two parts partially correct

*OR*

Three parts partially correct

## Question 1 (continued)

**1** **Minimal Response**

One part essentially correct and no parts partially correct

*OR*

No parts essentially correct and two parts partially correct