4.5

Critical Analysis

Student Text Pages
244–255

Suggested Timing
80–160 min

Tools
- short newspaper or magazine article
- scientific calculators
- computers with Internet access

Related Resources
BLM 4-9 Section 4.5 Critical Analysis

Link to Prerequisite Skills

Students should complete all the Prerequisite Skills questions before proceeding with this section.

Warm-Up

Display a short newspaper or magazine article that contains statistical information. Have students work in small groups to describe how the article's sources are described and cited.

Warm-Up Answers

Answers may vary.

Teaching Suggestions

Warm-Up

- Display the Warm-Up question. Have students complete the question independently. Then, discuss the solutions as a class.

Section Opener

- Discuss the importance of being able to find references for statistical information found in the media, as well as the importance of subjecting that statistical information to critical analysis. Explain that critical analysis should involve asking appropriate questions to determine whether the statistics are used properly, whether the data is current, whether independent researchers conducted the research, and whether any bias is present.

Investigate

- You could assign two Web sites rather than having students choose their own to save time and make assessment simpler.
- Suggest that students organize their thoughts using a chart. Refer to Chapter 3 and ask students which column headings they should use.
- Stress the importance of critically evaluating Web sites, since the Internet is becoming the most common source of information for most people.

Investigate Answers (page 244–245)

Answers may vary. For example:

2. I chose two pages on the Statistics Canada Web site.

Author: There is no single author for this Web site. Documents on the site do not cite any references. However, the methods used to gather any primary research are described.

Audience: The purpose of the Web site is to collect, analyse, and report data of importance to Canadians. The Web site has a wide audience and anyone can use the information it contains.

Bias: The Web site is not representing a point of view or selling a product.

Relevance: The Web site is current and is updated daily.

Links: The links are active, up-to-date, and do not send the viewer to any advertisements.

Examples

- Example 1 distinguishes between descriptive and inferential statistics. Caution students against using information about a small group to generalize conclusions about a large population.
- Example 2 highlights the importance of asking the right questions. Articles often provide only a summary of the statistical data, so students need to ask questions to determine the meaning of statistical claims.
- Example 3 shows the effects of poor mathematical literacy in the media. You may wish to have students bring in other examples of poor mathematical literacy in the news.
- Example 4 looks at how regression analysis can be properly or improperly used. Explain that using a sample that is too small, ignoring outliers or points that do not fit a model, using an inappropriate regression model, and incorrectly interpreting the value of r are common errors.

Key Concepts

- Review the Key Concepts as a class. Ask students to list the components of a critical analysis.

Discuss the Concepts

- **Question D2** illustrates a typical use of Education Quality and Accountability Office (EQAO) statistics in the media. Remind students that the levels are categorical labels and should not be in numerical calculations.

Discuss the Concepts Suggested Answers (page 250)

D1. "Based on a study of the use of calculators in the classroom involving 200 students, the mathematics marks of 63.5% of students increased by more than 5%."

D2. The newspaper seems to have used a weighted average using the numbers assigned to the categories of the South Shore High School results. The data appears to be reliable and new, but it is not clear that an average calculated using the categories 1, 2, 3, and 4 gives reliable results.

Practise (A)

- You may wish to have students work in pairs or small groups to complete the Practise questions.
- Encourage students to refer to the Examples before asking for assistance.
- Consider having students use a think-pair-share format for these questions.

Apply (B)

- For **question 4**, discuss that correlation does not necessarily imply a cause and effect relationship.
- For **question 5**, discuss the usual form of a newspaper article. Explain that newspaper articles typically describe, in the third person, an event that has happened, and quotes are often included. The blog component of this question should appeal to students.
- **Questions 8 and 9** are useful in assessing students' communication skills.
- **Question 10** links to the Chapter Problem. Remind students to keep the solution to this question handy as it may help them with the Chapter Problem Wrap-Up. This question is a good assessment tool that represents all four categories of knowledge and skills.

Common Errors

- Some students may have difficulty asking appropriate questions when performing a critical analysis.

R_x Have students find an article that includes statistical claims about a subject they find interesting, such as music or sports. Have them ask questions such as:
- Where did the statistics come from?
- Who compiled the statistics? Was that person an expert in the subject?
- Are the statistics relevant and informative?
- How large was the sample?
- How was the sample selected?

Have the students tailor their questions to the particular example. When they feel comfortable with the process, have them move on to other articles.

Accommodations

Perceptual—have students work in pairs for the **Investigate**. Have the students interview each other about their chosen Web site.

Gifted and Enrichment—have students present their critical analysis of **question 10** to the class as a model for the other questions in the section

Language—add definitions for *descriptive statistics* and *inferential statistics* to the Word Wall

Spatial—post the criteria and related questions used to evaluate statistics

Visual—provide a critical analysis exemplar as a handout

Memory—have students use poster paper to record a summary of what they have learned about one-variable and two-variable statistics, correlation, regression, weighted means, indices, and bias, to review the key concepts of statistical analysis

ESL—provide a partner to assist students when completing the Investigate, and to help students read and understand the Examples and Practice questions. Have students add new terms to their personal math dictionaries.

- Discuss the term *desalination* in the **Literacy Connect** for **question 11**. You may wish to ask a student to read the introduction to question 11 out loud. Then, have students discuss the situation described in the question to ensure that they understand. This question is useful in assessing students' communication skills.

Extend (C)

- Assign the Extend questions to students who are not being challenged by the Apply questions.

Literacy Connect

- Have one or two students read the section opener out loud and discuss the focus of this lesson.
- Have one or two students read the introduction paragraph above Example 1 on page 245 out loud. Discuss the distinction between descriptive and inferential statistics.
- Students could complete **question 5** as a journal entry.
- Encourage students to continue adding new terms to their personal math dictionaries.
- Allow students to work in pairs so they can assist each other in completing the questions.

Mathematical Process Expectations

Process Expectation	Questions
Problem Solving	10–12, 15
Reasoning and Proving	1–7, 9–15
Reflecting	3, 4, 10, 11
Selecting Tools and Computational Strategies	15
Connecting	2–8, 10–13, 15
Representing	n/a
Communicating	2–15

Extra Practice

- Use **BLM 4-9 Section 4.5 Critical Analysis** for remediation or extra practice.