1.4 The Method of Elimination

Student Text Pages
34–41

Suggested Timing
60–80 min

Technology Tools
- TI-89 calculator

Related Resources
- T–7 The Computer Algebra System (CAS) on the TI-89 Calculator
- BLM 1–7 Section 1.4 Practice Master
- BLM 1–8 Section 1.4 Achievement Check Rubric

TI-Navigator™

Go to **www.mcgrawhill.ca/books/principles10** and follow the links to the file for this section.

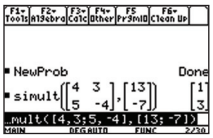
Teaching Suggestions

Investigate

- Point out that the equations for this problem can also be solved by substitution. You could solve by substitution as a check and discuss which method students prefer. Discuss the step in which students substitute into the first equation. Be sure students know that they may substitute into either original equation, so they can substitute into the "easier" equation. (15 min)

Examples

- As you discuss the **Examples**, draw attention to the thought boxes. (20 min)
- In **Examples 1** and **2**, encourage students to be careful with their form when checking answers. Have students check their work with a CAS step by step. Alternatively, students could trade their work and have another student check it. Use **T–7 The Computer Algebra System (CAS) on the TI-89 Calculator** to support CAS activities.
- **Example 3** could also be solved using a CAS, as follows:
  - Turn on your TI-89 calculator. If the CAS does not start, press the **HOME** key. From the **F6** menu, select **2:NewProb** to clear the CAS.
  - From the **MATH** menu, select **4:Matrix**. Then, select **5:simult(**. Use the syntax shown. First, enter the coefficients for the first equation. Then, enter the coefficients for the second equation. Finally, enter the constant terms. Press **ENTER**.



  The solution to the linear system is $x = 1$, $y = 3$.
- In **Example 4**, some students may observe that they could use substitution for this question, since the variables have a coefficient of 1 in the first equation. Encourage students to solve using substitution as well. Discuss which option is preferred.

Communicate Your Understanding

- Review the vocabulary term (method of elimination) before discussing the questions in this section.
- Spend time on question C3, since it gives students an opportunity to discuss and decide which method is best for a given situation. This question would be a good one for a journal entry. (10 min)
- Use **BLM 1–7 Section 1.4 Practice Master** for remediation or extra practice.

Common Errors

- Some students may substitute into only one equation when checking their solution.

R_x Have students note that a solution to a linear system must satisfy both equations.

Accommodations

Visual—Let students check their answers using a graphing calculator.

Perceptual—Encourage students to colour-code the variables when solving the systems of equations using elimination. For example:

$$\begin{aligned} 3x + y &= 4 \quad ① \\ \underline{2x - y} &= \underline{6} \quad ② \end{aligned}$$

Add equation ① and equation ②:

$$5x = 10$$

Motor—Allow students to work with a partner and use a graphing calculator or CAS to solve the questions in this section.

Memory—Encourage students to write out the "thinking" steps required to solve the linear systems to the right of the system of equations. For example:

	Thinking Steps
$6x + y = 7$ ①	$6x + 3x = 9x$
$\underline{3x - y = 2}$ ②	$y + (-y) = 0$

Add equation ① and equation ②:

$9x = 9$	$7 + 2 = 9$

Investigate Answers (page 34–35)

1. a) $p + m = 117$ **b)** $p - m = 41$

2. a) $2p = 158$ **b)** m has disappeared

c) $p = 79$ **d)** $m = 38$

e) There are 79 photos on Parnika's memory card and 38 photos on Mati's memory card.

3 a) $2m = 76$ **b)** p has disappeared

c) $m = 38$ **d)** $p = 79$

e) There are 79 photos on Parnika's memory card and 38 photos on Mati's memory card.

4. a) The two equations are either added or subtracted to make one of the variables disappear. The result is an equation in one variable, which can be solved. The answer for the one variable is substituted into one of the original equations to find the value of the other variable.

b) The solution can be verified in the wording of the situation described.

Communicate Your Understanding Responses (page 39)

C1. a) subtract **b)** add

c) Yes, because there is only one solution for the linear system.

C2. a) Multiply ① by 2, then subtract the equations. Solve for y, then substitute this value into one of the equations to solve for x.

b) Multiply ① by 3, then add the equations. Solve for x, then substitute this value into one of the equations to solve for y.

C3. Answers may vary. For example:

a) Use substitution, because one variable is already isolated.

b) Use elimination, because the coefficients of y are opposite values, so if the equations are added y is eliminated.

c) Use graphing, because the first equation is in $y = mx + b$ form, so the y-intercept and slope can be found from the equation. It is easy to find the x- and y-intercepts of the second equation.

Practise

- For **questions 1** and **2**, have students circle the variable that is to be eliminated, then actually use the method to solve the system.
- In **questions 3** and **4**, have students choose which of the variables should be eliminated before actually using the method. Again, have students think about which is the most efficient.
- For **questions 8**, **9**, and **15** through **17**, remind students to declare the meaning of the variables they are choosing before showing any of the algebraic work.
- **Question 10** will provide some interesting discussion—students have a chance to decide which method they prefer and explain why.
- Have one or two students read their answer to **question 11** aloud to the class.
- For **question 14**, remind students that they can find an equivalent system by just multiplying every term by ten to clear the decimals.
- **Question 17** refers to the Chapter Problem. Students can answer this question here as part of the ongoing assessment in class, or wait to use the series of questions at the end of the chapter as a summative assessment.
- The Achievement Check, **question 19**, allows you to assess students' understanding of the elimination method.
- **Question 20** allows for an interesting discussion of the use of "restrictions."

Student Success

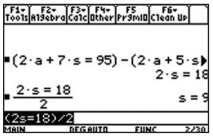
Given the steps in a solution of a linear system solved by using elimination, have students sequence the steps in the correct order.

Achievement Check Sample Solution, question 19, page 41

Provide students with **BLM 1–8 Section 1.4 Achievement Check Rubric** to help them understand what is expected.

19. a) Let a represent the price for an adult.
Let s represent the price for a student.
For Van 1: $2a + 5s = 77$ ①
For Van 2: $2a + 7s = 95$ ②
Use the method of elimination, ② – ①, to find the solution.
The entry price for an adult was \$16 and for a student \$9.

Students can verify the algebraic steps using a CAS:



Alternatively, students may substitute the prices into the second and third sentences to check that these answers work.

b) Katie has used the method of elimination correctly in adding the two equations.
Chris has made errors in the subtraction. Subtracting does not eliminate y.

Mathematical Processes Integration

The table shows questions that provide good opportunities for students to use the mathematical processes.

Process Expectations	Selected Questions
Problem Solving	19, 20–22
Reasoning and Proving	10, 13, 18, 19
Reflecting	10, 19
Selecting Tools and Computational Strategies	8, 9, 20
Connecting	8, 9, 15–17, 20–22
Representing	8, 9, 15–19
Communicating	10, 11, 13, 18, 19

Ongoing Assessment

- Use Achievement Check question 19 to monitor student success. See Achievement Check Answers and **BLM 1–8 Section 1.4 Achievement Check Rubric**.
- Chapter Problem question 17 can also be used as an assessment tool.
- Communicate Your Understanding questions can be used as quizzes to assess students' communication skills.