UNIT

3

Unit 3 Project

***Mathematics 10*, pages 402–405**

Suggested Timing

80–100 min

Materials

- ruler

Blackline Masters

Master 1 Project Rubric
BLM 6–4 Chapter 6 Unit 3 Project
BLM 7–4 Chapter 7 Unit 3 Project
BLM U3–3 Unit 3 Project Final Report

Mathematical Processes

- ✓ Communication (C)
- ✓ Connections (CN)
- ✓ Mental Math and Estimation (ME)
- ✓ Problem Solving (PS)
- ✓ Reasoning (R)
- ✓ Technology (T)
- ✓ Visualization (V)

General Outcome

Develop algebraic and graphical reasoning through the study of relations.

Specific Outcomes

RF1 Interpret and explain the relationships among data, graphs and situations.

RF3 Demonstrate an understanding of slope with respect to:

- rise and run
- line segments and lines
- rate of change
- parallel lines
- perpendicular lines.

RF5 Determine the characteristics of the graphs of linear relations, including the:

- intercepts
- slope
- domain
- range.

RF6 Relate linear relations expressed in:

- slope-intercept form ($y = mx + b$)
- general form ($Ax + By + C = 0$)
- slope-point form ($y - y_1 = m(x - x_1)$) to their graphs.

RF7 Determine the equation of a linear relation, given:

- a graph • a point and the slope • two points
- a point and the equation of a parallel or perpendicular line

to solve problems.

Planning Notes

Discuss what type of evidence a forensic archaeologist might look for and how the evidence can give information related to time or distance travelled. Discuss how such bones are treated after study. For example, modern archaeologists return bones like these to the families or descendants for proper burial.

Emphasize to students that they need a system for putting all of the information together once they complete the questions in Part B.

Unit project questions occur throughout Chapters 6 and 7. These questions are optional, but some of them do provide additional information that students may need to complete the unit project. For example, students may need to know what carbon-14 dating is or how the length of a particular bone can enable one to predict the height of the person. Information about these processes is included in the relevant unit project questions. You may wish to have students record their finalized answers for the Unit 3 project in a student booklet that you create from **BLM 6–4 Chapter 6 Unit 3 Project** and **BLM 7–4 Chapter 7 Unit 3 Project**.

As you read through the project, highlight the information in Part A. Students can begin to hypothesize about want happened to the trio. In Part B, students will use slope to verify that the points are collinear. When determining the time it would take to travel from point A to point B, students will need a multi-step approach. Remind them to pay attention to the map scale. Encourage students to be creative. Their explanation, however, must be consistent with the answers to Part B.

Give students time to review the contents of their project portfolio and ensure that they have completed all required components for their final report or presentation. Students should have completed all of the questions related to Part B on pages 404 and 405 in the student resource, and they should include a description of a new clue as part of their explanation of what happened to the three gold seekers.

Meeting Student Needs

- The Unit 3 project is a great way to showcase student learning. Post Part A outside the classroom when it is assigned. Create excitement by posting leading questions or hints, either just one a day, or possibly three or four one day to encourage students to come back to your classroom to gain assistance to finish the project. You may wish to offer a "Pot of Gold" for the best presentation that was finished quickly. (The "Pot of Gold" could be chocolate or gum coins wrapped in gold foil.)
- Students may need to recall how to read a contour map. Tell them that each line represents the same elevation above sea level. You may wish to discuss the meaning of the contour interval given in the legend.
- To find the distance to the top of Mount Tempest, students will need to approximate. Encourage them to try a variety of methods, such as the distance formula and Pythagorean relationship.
- Some students may benefit from redrawing the path that the gold seekers took using grid paper. Encourage students to determine where the origin on their coordinate grid should be located.
- You may need to remind students of the directions: north, south, east, and west.

ELL

- Students may not be familiar with the term *terrain*. Explain the meaning of this word and emphasize to students that in the context of #4b), students are asked to describe the slope of the mountain.
- The term *blueprints* may be new to students. You may wish to bring in some blueprints to show what they are and discuss how they are used.

Enrichment

- Have students determine the length of time it would take to travel from point B to the top of Mount Tempest and down to point C.

Answers

Part B

1. 6.5 h **2.** Yes; $m_{AB} = m_{BC} = -\frac{1}{8}$

3. Yes; no contour lines are crossed.

4. a) 3000 m

b) Example: The contour lines around Mount Tempest are much closer than around other rock formations, indicating a faster altitude change and steeper slope. In addition, the slope of the ascent is steeper than that of the descent.

5. a) 6.7 h **b)** 1.3 h

6. 4 °C at the base of Mount Tempest and –15.2 °C at the top
Example: This low temperature would cause the travellers to expend extra energy in keeping themselves warm and require the use of heating elements since water would freeze.

7. Example: Taller male: 2.0 m, Shorter male: 1.6 m, Female: 1.5 m

8. a) 120.66 years

b) The first femur belongs to the woman, since $H(40.9) \approx 155$. The second femur belongs to the taller male, since $M(56.1) \approx 195$.

9. a) $y = -\frac{1}{8}x + \frac{83}{8}$ **b)** $8x - y - 274 = 0$ **c)** $n = 38$

Part C

Example: The three explorers started their journey by canoe. The canoe capsized due to rapids and most of the supplies were lost. Sam, the leader of the group and the tallest, suggested that they continue their trip for gold and ration their supplies more strictly. The ascent up Mount Tempest was harsh due to snow (which required the party to wear snowshoes) and cold weather. After this climb, the snowshoes were left behind to both serve as a checkpoint and to lighten the load of the traveller's cargo. Upon arrival at Honey Lake, tension had arisen between Sam and Kittie, both of whom wanted to take all of the gold for themselves. The argument only increased in frequency and in intensity after the gold was retrieved. Halfway through the ascent back up Mount Tempest they both collapsed due to exhaustion. This was probably caused by the extra energy used in their arguing as well as the limited quantity of food and supplies. This left Billy with more than enough food, supplies, and treasure to return to civilization. After finding his snowshoes, he began the final descent down Mount Tempest. Once he reached the closest village, which happened to be located near the banks of Moon River, he purchased a car with a small portion of the gold he retrieved. The seller of the car told authorities that he thought it strange to be paid in gold coins. This final clue helped the investigator explain what happened to Sam, Kittie, Billie, and their treasure.

Assessment	Supporting Learning
Assessment *of* Learning	
Unit 3 Project This unit project gives students an opportunity to demonstrate the concepts, skills, and processes learned in Unit 3. **Master 1 Project Rubric** provides a holistic descriptor that will assist you in assessing student work on the Unit 3 project.	• You may wish to have students use **BLM U3–3 Unit 3 Project Final Report**, which provides a checklist for students to identify where in their project they demonstrate the skills, concepts, and processes explored in Unit 3. • Reviewing **Master 1 Project Rubric** with students will help clarify the expectations and the scoring. It is recommended to review the scoring rubric at the beginning of the unit, as well as intermittently throughout the unit to remind students about the project assessment.

The Specific Level Notes below provide suggestions for using **Master 1 Project Rubric** to assess student work on the Unit 3 project.

Score/Level	Specific Level Notes
5 (Standard of Excellence)	• provides a complete and correct response with clear and concise communication; may include a minor error that does not affect the understanding of the overall project; may include weak communication in no more than one calculation
4 (Above Acceptable)	Provides *one* of the following: • a complete response to all parts of the project, with possibly weak or missing justification in no more than two calculations; includes good communication that addresses the relationships among slope, intercepts, and linear equations and how they can be used to make predictions • a complete response with one error that is carried through correctly (i.e., uses an incorrect point in determining an equation but then graphs and interprets the results correctly based on an incorrect equation); includes good communication that addresses how the concepts relate to solving the puzzle of the gold seekers • a response which addresses all parts of the project but is difficult to follow and lacks organization; does not provide obvious support and connection for each explanation of the disappearance of the gold seekers; includes good communication
3 (Meets Acceptable)	Demonstrates *one* of the following: • makes initial correct start to all sections of the project • correctly substitutes a given length into a linear equation to determine height and to solve problems; determines the span of values correctly; tests calculations against additional data with some errors present; is able to identify a function and a non-function; is able to sketch a straight line from a given equation with accuracy; can determine the slope and y-intercept and explain their representations with some consistency; models a basic understanding of slope and equations and their applications; communication contains some connections to the overall project • provides answers to all parts without supporting work or justification
2 (Below Acceptable)	• makes initial start to various sections of the project; provides some correct links • determines an appropriatee range for two functions but is unable to explain why it is appropriate • sketches a straight-line graph of given data with and without technology, with some success • classifies a relation as a function or non-function and makes some connections to the problem • determines the slope of a line and explain what it represents with some success • uses the graph of a linear function to solve problems with limited success • identifies the y-intercept but can not explain what it represents • attempts to determine the equation of a line with limited success • uses a given equation to solve problems • includes some communication
1 (Beginning)	• makes initial start to various sections of the project but is unable to carry through or link concepts together • substitutes a given value into a linear equation to determine height • sketches a straight-line graph of given data using technology only • classifies a relation as a function or non-function but makes no connection to the problem • determines the slope of a line but is unable to explain what it represents • attempts to predict the altitude of a given temperature from a straight-line graph with limited success • attempts to determine the equation of a line with little or no success • includes little or no communication