Task: Processor Fabrication

Student Text Pages
118–119

Suggested Timing
45–75 min

Related Resources
- BLM A-17 Learning Skills Checklist
- BLM 2-15 Chapter 2 Task Rubric

Ongoing Assessment
- Use **BLM 2–15 Chapter 2 Task Rubric** to assess student achievement.

Specific Expectations

1.2, 2.9, 2.10

Teaching Suggestions

- You may have students work in pairs.
- This task provides an opportunity for students to see that x could represent a change (an increase of 5°C), not just a number. When students relate the vertex of Zoe's or Tom's graph to the optimal temperature for maximizing the number of processors produced, the positive x-value represents a temperature decrease.
- When students write the factored form of a quadratic function, remind them to write the linear term before the constant term, i.e., $-(x - 10)$ instead of $10 - x$. Then, they would be able to tell that the graph of the function opens downward.
- You may also use **BLM A–17 Learning Skills Checklist** to assist you in assessing the performance of the students.

Hints for Evaluating a Response

Student responses are being assessed for the level of mathematical understanding they represent. As you assess each response, consider the following questions:
- Are all parts of the solution answered?
- Is the vertex correctly related to the optimal temperature that maximizes the number of processors produced?
- Are the calculations correct?
- Are the explanations and suggestions reasonable?
- Are all the functions written correctly in factored form?
- Is the solution provided complete and does it make sense?

Level 3 Notes

- Student gives solutions to all parts of the task.
- Student finds the expressions, quadratic functions, zeros, and vertices with no errors.
- Student relates the features of the functions to the optimal solution to the problem.
- Explanations and suggestions are reasonable and make sense.
- Student writes all the functions in factored form correctly.

Level 3 Sample Response

a) **i)** $600 - 10x$ **ii)** $10 + \frac{1}{10}x$

b) $Z(x) = (600 - 10x)\left(10 + \frac{1}{10}x\right)$

c) **i)** $x = 60$ or $x = -100$ **ii)** $(-20, 6400)$

iii) The vertex tells you the optimal number of 5°C temperature increases (-20) that will produce the maximum number of processors (6400) each day. Therefore, the temperature should be lowered by 100°C $(-20 \times 5°C)$ to maximize the number of processors produced.

d) **i)** $(600 - 2x)$ **ii)** $\left(10 + \frac{1}{50}x\right)$

e) $T(x) = (600 - 2x)\left(10 + \frac{1}{50}x\right)$

f) **i)** $x = 300$ or $x = -500$ **ii)** $(-100, 6400)$

iii) The vertex tells you the optimal number of 1°C temperature increases (-100) that will produce the maximum number of processors (6400) each day. Therefore, the temperature should be lowered by 100°C $(-100 \times 1°C)$ to maximize the number of processors produced.

g) **i)** Both Zoe and Tom have produced functions that can be used. They are the same functions but are based on the number of temperature decreases, not increases. The functions produce the same solution.

ii) Any of the functions can be used to illustrate the optimal solution. It is easier to deal with Zoe's or Tom's as the question is set up with decreases as stated in the question.

h) There are many other factors which could affect the decision: availability of raw materials, number of work force to run machines, capacity of factory, economic changes, demand for the product, etc.

i) No, do not have fractions inside the factors. The new equations would be:

Zoe: $-(x + 60)(x - 100)$; Tom: $-\frac{1}{25}(x + 300)(x - 500)$

part b): $-(x - 60)(x + 100)$; part e): $-\frac{1}{25}(x - 300)(x + 500)$.

What Distinguishes Level 2

- Student does not provide solutions to all parts of the task.
- Student finds the expressions, quadratic functions, zeros, and vertices with some errors.
- Student relates some of the features of the functions to the optimal solution to the problem.
- Some parts in the explanations and suggestions do not make sense.
- Student writes some of the functions in factored form incorrectly.

What Distinguishes Level 4

- Student gives thorough and justified solutions to all parts of the task.
- Explanations and suggestions show insight into the complexity of the solution.