Chapter 6 Problem Wrap-Up

Student Text Pages
317

Suggested Timing
30 min

Tools
- grid paper

Technology Tools
- graphing calculator

Related Resources
- G–1 Grid Paper
- G–3 Coordinate Grids
- BLM 6–12 Chapter 6 Problem Wrap-Up Rubric

Using the Chapter Problem

- Introduce the problem by having the students read it over and clarifying any difficulties with the vocabulary or diagram.
- Students who skateboard may agree to provide background knowledge of how the half-pipe is used in skateboarding, the terminology of the sport, and the types of skills involved. This could be done in small groups or in a class discussion.
- The Chapter Problem Wrap-Up is very dependent on the Chapter Problem development throughout Chapter 6 (Section 6.1, question 18, and Section 6.4, question 12). Discuss the solutions to these questions. On the other hand, you may wish to assign the questions in Sections 6.1 and 6.4 as part of the Wrap-Up, since their solutions are needed for the Wrap-Up.
- Consider reviewing the following topics with the class or in small group discussions:
  - key features of the graph of a parabola (axis of symmetry, coordinates of the vertex, maximum/minimum value)
  - expressing $y = ax^2 + bx + c$ in the form $y = a(x - h)^2 + k$ using various methods
  - equation of a circle centred at (0, 0)
- Provide the students with a rubric so they know how they will be evaluated. Have students answer the Wrap-Up questions on their own and then compare solutions and responses. This could be done in pairs, in small groups, or in a class discussion.

Summative Assessment

- Use **BLM 6–12 Chapter 6 Problem Wrap-Up Rubric** to assess student achievement.

Level 3 Sample Response

a) Answers will vary. The parabolic skateboard half-pipe ramp with equation $y = 0.2x^2 - 1.6x + 4.2$ has its vertex sitting 1 m above the ground. It is 8 m wide, and the sides reach a height of 3.2 m above the vertex. The semicircular half-pipe ramp with equation $x^2 + y^2 = 16$ has a radius of 4 m. Therefore, the half-pipe has a width of 8 m and a height of 4 m. The two half-pipes are the same width, but the semicircular one will have slightly steeper sides (0.8 m greater in height). So, the parabolic half-pipe may be more suitable for beginners.

b) Answers will vary. The radius of the standard semicircular half-pipe is 4 m. So, the radius of the inverted quarter circles in the deluxe model is $4 \div 2$, or 2 m. The vertical height of the deluxe model is $4 + 2$, or 6 m. The width will be $2 + 4 + 4 + 2$, or 12 m. This design will be advantageous for the more talented and experienced skateboarders, since the higher sides will allow more speed in tricks, higher jumps, and more advanced moves. If the deluxe model is used by less experienced skateboarders, it could be more dangerous.

Note: Students who are experienced skateboarders may add specific details of moves that are possible and what they feel constitutes the best in half-pipe design. However, the mathematics of the designs should be evident in their responses.

Level 3 Notes

Look for the following:
- Clear understanding of the properties of quadratic relations
- Ability to substitute values in a quadratic relation to find coordinates
- Ability to complete the square in a quadratic relation

- Application of the equation of the circle $x^2 + y^2 = r^2$ to the context of the problem
- Planning and thinking in analysing the problem(s)
- Ability to find the vertex of a parabola with the equation in the forms $y = ax^2 + bx + c$ and $y = a(x - h)^2 + k$
- Mostly accurate calculations
- Well-constructed mathematical arguments
- Use of good form and correct mathematical notation

What Distinguishes Level 2

At this level, look for the following:

- Some understanding of the properties of quadratic relations
- Some ability to substitute values in a quadratic relation to find coordinates
- Some ability to complete the square in a quadratic relation
- Limited application of the equation of the circle $x^2 + y^2 = r^2$ to the context of the problem
- Some planning and thinking in analysing the problem(s)
- Some ability to find the vertex of a parabola with the equation in the forms $y = ax^2 + bx + c$ and $y = a(x - h)^2 + k$
- Somewhat accurate calculations
- Some well-constructed mathematical arguments
- Some use of good form and correct mathematical notation

What Distinguishes Level 4

At this level, look for the following:

- Very clear understanding of the properties of quadratic relations
- Detailed ability to substitute values in a quadratic relation to find coordinates
- Detailed ability to complete the square in a quadratic relation
- Detailed application of the equation of the circle $x^2 + y^2 = r^2$ to the context of the problem
- Detailed planning and thinking in analysing the problem(s)
- Detailed ability to find the vertex of a parabola with the equation in the forms $y = ax^2 + bx + c$ and $y = a(x - h)^2 + k$
- Accurate calculations
- Detailed evidence of well-constructed mathematical arguments
- Use of very good form and correct mathematical notation