Task — Fix Up a Neighbourhood Park

Strand
Measurement and Trigonometry

Student Text Pages
92–93

Suggested Timing
80 min

Tools
• calculators

Related Resources
BLM 2.T.1 Task: Fix Up a Neighbourhood Park Rubric
BLM G1 Grid Paper

Specific Expectations

Solving Problems Involving Similar Triangles

In this Task, students will

MT1.02 determine the lengths of sides of similar triangles, using proportional reasoning

MT1.03 solve problems involving similar triangles in realistic situations (e.g., shadows, reflections, scale models, surveying)

Solving Problems Involving the Trigonometry of Right Triangles

MT2.02 determine the measures of the sides and angles in right triangles, using the primary trigonometric ratios and the Pythagorean theorem

MT2.03 solve problems involving the measures of sides and angles in right triangles in real-life applications (e.g., in surveying, in navigation, in determining the height of an inaccessible object around the school), using the primary trigonometric ratios and the Pythagorean theorem

Teaching Suggestions

- You may wish to start with a general discussion of parks in your area. This may generate some ideas about the sizes of parks and common features, such as play equipment, fountains, and benches.
- For question 1a), students can use the area and the length of the base of the triangle to find the height. You may need to remind students that the height of an isosceles triangle is its altitude and that this altitude bisects the base.
- For question 1c), some students may need to be reminded that, since the triangles are all in direct proportion, they increase in size at the same rate.

Prompts for Getting Started

The following list of questions will help students continue their Task. Ask students:

- For question 2, is this a similar triangle problem or a trigonometry question? How do you know? Will you need to use the Pythagorean theorem in this question?
- For question 3, which triangle represents the tree and its shadow and which one represents the object and its shadow? How do you know? Will you use trigonometry or similar triangles to answer this question?

Hints for Evaluating a Response

Student responses are being assessed for the level of understanding they represent. As you assess each response, consider the following questions.

- How much assistance did the student require to set up the proportions in the questions?
- Did the student present work that is easy to follow and understand?
- Did the student show an understanding of the relationships?
- Does the student show an understanding of the applications of similar triangle relationships as well as the trigonometric relationships and the Pythagorean theorem?

Ongoing Assessment

- Use **BLM 2.T.1 Task: Fix Up a Neighbourhood Park Rubric** to assess student achievement.

Level 3 Sample Response

1. a) The area of the smallest tier is 196 cm^2.

$A = \frac{1}{2}bh$

$196 = \frac{1}{2}(40)h$

$196 = 20h$

$h = 9.8$

Since the triangle is isosceles, the height line divides the triangle into two congruent right triangles, each with height 9.8 cm and base $\frac{40}{2}$, or 20 cm.

$c^2 = a^2 + b^2$

$x^2 = 9.8^2 + 20^2$

$x \doteq 22.27$

The height of the smallest tier is 9.8 cm and the equal sides have length 22.3 cm.

b) The area of the middle tier is 4 times the area of the smallest tier, or 784 cm^2. The equal sides have length 44.6 cm. In the smallest tier, the equal sides have length 22.3 cm. Since 44.6 is double 22.3, the side lengths of the triangle in the middle tier are double the lengths of the corresponding sides in the smallest tier. The base of the middle tier is 80 cm.

c) The area of the lowest tier is 4 times the area of the middle tier, so the side lengths of the lowest tier are double the lengths of the corresponding sides of the middle tier. The base of the lowest tier is 160 cm and the equal sides have length 89.2 cm.

2. a) $\frac{16}{x} = \tan 4.5°$ $\qquad$ $\frac{28}{y} = \tan 4.5°$

$16 = x \tan 4.5°$ $\qquad$ $28 = y \tan 4.5°$

$x = \frac{16}{\tan 4.5°}$ $\qquad$ $y = \frac{28}{\tan 4.5°}$

$x \doteq 203.3$ $\qquad$ $y \doteq 355.8$

The distances from the curbs are 203.3 cm and 355.8 cm.

b) $\frac{16}{x} = \sin 4.5°$ $\qquad$ $\frac{28}{y} = \sin 4.5°$

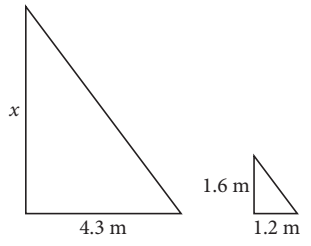
$16 = x \sin 4.5°$ $\qquad$ $28 = y \sin 4.5°$

$x = \frac{16}{\sin 4.5°}$ $\qquad$ $y = \frac{28}{\sin 4.5°}$

$x \doteq 203.9$ $\qquad$ $y \doteq 356.9$

The lengths of the ramps are 203.9 cm and 356.9 cm.

3.



$\frac{x}{1.6} = \frac{4.3}{1.2}$

$1.2x = 6.88$

$x \doteq 5.73$

The tree is about 5.7 m tall. Since it is taller than 4.9 m, it must be taken down in pieces.

Level 3 Notes

Look for the following:

- Correct use of similar triangles, trigonometry, and the Pythagorean theorem
- Evidence of planning and processing skills
- Diagrams and explanations

What Distinguishes Level 2

At this level, look for the following:

- Evidence that similar triangles, trigonometry, and the Pythagorean theorem are only partially understood
- Errors in the ratios, proportions, or solutions
- Some attempts to sketch diagrams or write explanations

What Distinguishes Level 4

At this level, look for the following:

- Clear, well-organized solution involving correct use of similar triangles, trigonometry, and the Pythagorean theorem
- Clear and convincing arguments to support solutions
- Accurate calculations