

ACTIVITY INSTRUCTIONS

PROPEL LEARNING THROUGH TEAMWORK Discuss the teamwork tips on the poster inside. Students can complete the worksheets in pairs to practice supporting and learning from each other.

Lesson 1: Super-Hero Math

Tiered For: **Grade 3** (or additional review/support for Grades 4–5)

Materials: Student Worksheet 1

Objective: Students will learn that area is the space inside a shape, that area can be determined by tiling or multiplication, and that the proper unit of measure for area is square units.

1. Tell the class that Batman has decided to construct an engineering workshop in the Batcave in order to invent new gadgets for protecting the city. Since engineering can get messy, Robin offered to help him lay down durable protective tiles on a section of the floor. Each tile is 1 foot square, and they plan to cover an area that is 5 feet long and 6 feet wide. How many tiles will they need?
2. Draw a 5' x 6' array on the board. Show that the number of tiles can be found by counting the number of squares. Show how the number of tiles can also be found by multiplying the array's length by its width.
3. Indicate that area is the space inside a shape and can be determined either by counting the number of square units or by multiplying the side lengths.
4. Explain that the proper unit of measure for area is square units (in this case, square feet, also written as ft²), as opposed to units, which we use to measure side length, perimeter, etc.
5. Distribute Student Worksheet 1.
6. Review answers as a class.

Extension: Have students design a rectangular area for a pet and calculate the area.

Worksheet 1 Answer Key

- 1) 72 square feet; 2) 270 square feet, Yes;
 3) Answers could include:
 L = 4 feet, W = 25 feet, Perimeter = 58 feet
 L = 25 feet, W = 4 feet, Perimeter = 58 feet
 L = 10 feet, W = 10 feet, Perimeter = 40 feet
 4) Answers will vary

Lesson 2: The Joker's Lair Is Acute Place!

Tiered For: **Grade 4** (or additional review or challenge for other grades)

Materials: Student Worksheet 2

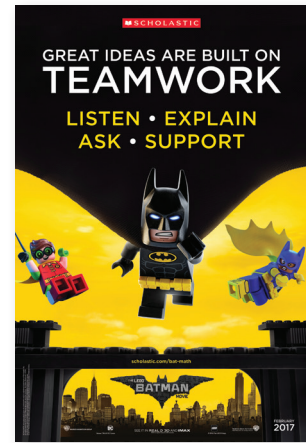
Objective: Students build on their basic knowledge of protractors to solve a real-world problem.

1. Review angle definitions:
 - **Acute:** Less than 90° • **Right:** Exactly 90°
 - **Obtuse:** Greater than 90° and less than 180°
2. Distribute Student Worksheet 2.
3. Determine the first step of Batman's plan as a class.
4. Direct the class to first look at the diagram, notice where the entrance is, and determine the type of angle formed by the path from the entrance to the Card Dispenser (acute, since Batman is looking straight ahead when he enters the lair).
5. Direct the class to place the hole of the protractor over the "X" at the entrance and line up the bottom of the protractor with the horizontal line formed by the entrance.
6. Measure the angle length of the ray formed by the path to the first stop. The ray goes through the 45/135 point on the protractor. Because this is an acute angle, 45 degrees right is the amount of the turn. Because the scale is 1"=2', the distance is 4 feet.
7. Ask the class to complete the plan individually, then review answers as a group.

Extension: Have students conduct a life-size treasure hunt out on the school blacktop using protractors, masking tape, and yardsticks. Each student (or group of students) picks a location to "bury" their treasure, then writes directions for others to follow by noting the angle measurement of turns and the length of each leg of the journey.

Worksheet 2 Answer Key

- 1) 45°, 4 feet; 2) 45°, 4 feet; 3) 90°, 6 feet;
 4) 120°, 6 feet; 5) 120°, 4 feet

**Lesson 3: Saving the City With Math!**

Tiered For: **Grade 5** (or additional challenge for Grades 3–4)

Materials: Student Worksheet 3

Objective: Students learn to identify the (x, y) coordinates of points on a coordinate grid, then use the coordinates to determine distances between points.

1. Before beginning the worksheet, project or draw a new coordinate grid on the board.
2. Draw point A and point B at (4, 2) and (4, 5), respectively. Ask students to identify the coordinates. If necessary, review the (x, y) grid system.
3. Ask students to find the distance from point A to point B. Point out that the x coordinate is the same, so the distance equals the difference between the y coordinates (5 – 2 = 3 units). It is possible to find the distance by counting the grid marks between the two points, but subtracting the y coordinates will be preferable in most calculations.
4. Distribute Student Worksheet 3.
5. Review answers as a class.

Extension: Ask students to use grid paper to make a scale drawing of a place of their choice (classroom, bedroom at home, etc.). Students should label the coordinates of important features in their drawing.

Worksheet 3 Answer Key

Part 1: Batcave (1, 1); **A** (1, 4); **B** (6, 4); **C** (6, 5); **D** (10, 5); **E** (10, 9); **The Joker's Lair** (14, 9)

Part 2: Batcave to A: .6 mile north; **A to B:** 1 mile east; **B to C:** .2 mile north; **C to D:** .8 mile east; **D to E:** .8 mile north; **E to The Joker's Lair:** .8 mile east

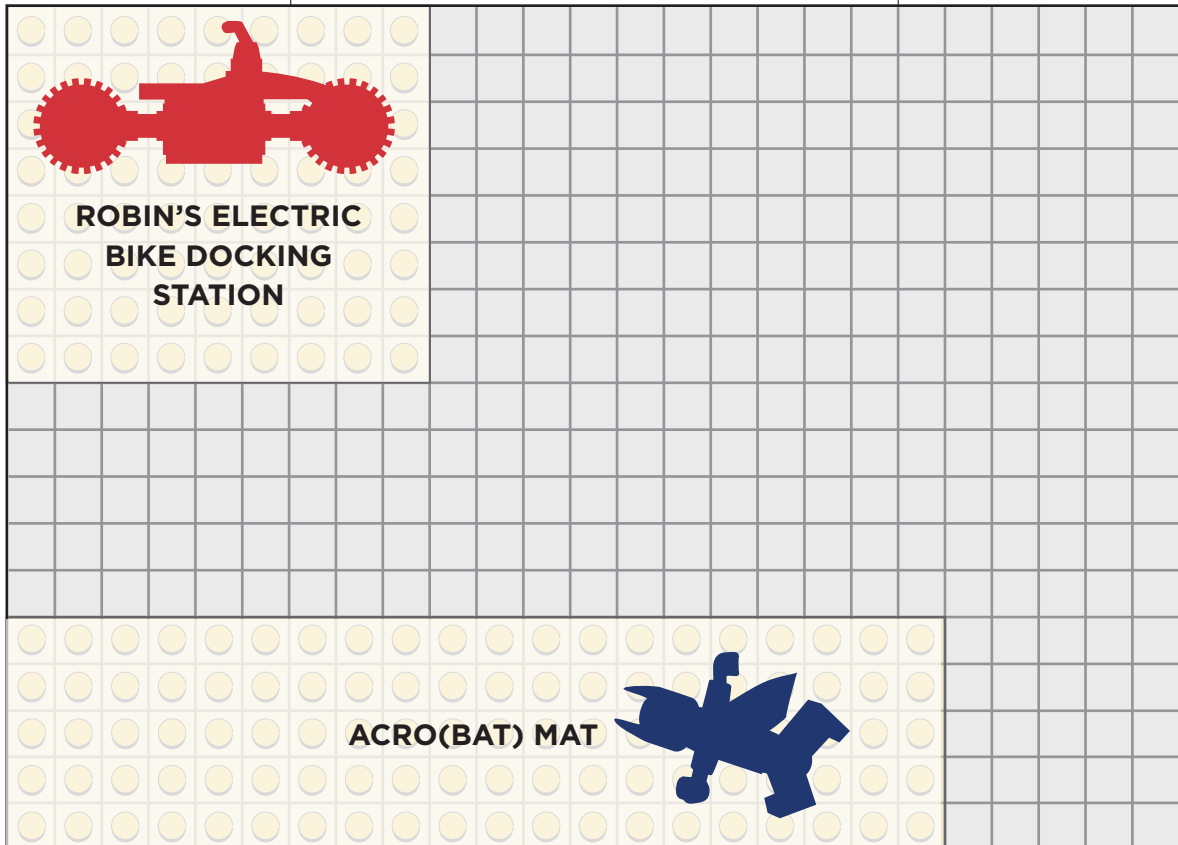
SUPER-HERO MATH

In between protecting the city from crime, Batman and Robin relax by redecorating the Batcave. They each tried several designs that didn't work out. Now they've decided to pool their ideas and work together to make the Batcave the most awesome super-hero lair anywhere!



THE NEW AND IMPROVED BATCAVE

 = 1 SQUARE FOOT



DIRECTIONS: Use the grid and your knowledge of area and perimeter to answer the following questions.

- 1** Batman and Robin have turned their old garage into a docking station for Robin's electric bike. What is the area of Robin's Electric Bike Docking Station? _____
- 2** To make room for more Batmobile vehicles, Batman and Robin plan to build a bigger garage in a section of the Batcave that is 300 square feet. They designed a garage that is 30 feet by 9 feet. What is the area of the new garage? _____
Will the new garage fit in the available space? _____
- 3** Draw in an Acro(Bat) mat with the same area but with a different length and width. What is the length, width, and perimeter of your redesigned mat?
Length: _____ Width: _____ Perimeter: _____
- 4** Batman and Robin have teamed up to engineer a new and improved Batmobile for their upcoming mission. Draw in a rectangular workshop where they can work on their invention. Then label the length and width, and calculate the area and perimeter.
Area: _____ Perimeter: _____