# TASK 2 Area of Shapes

### Objectives

You will be able to

- Calculate the area of triangles and parallelograms.
- Use decomposition, negative space, and/or other strategies to calculate the area of trapezoids and other composite figures.
- Justify why the area formulas for parallelograms and triangles always work.

***How can we use mathematics to design a playground that is both fun and safe?***

### Evaluation and Feedback

To evaluate your work, you will

- Complete a check for understanding about how to find the area of composite figures.
- Check your calculations for the area of your playground floor plan with your team.

## Task 2: Area of Shapes

As a group:

- Understand how the formulas for the area of a parallelogram and a triangle are derived from the area of a rectangle.
- Develop strategies to determine the area of composite figures.
- Learn how to make a convincing argument.
- Determine the area of your playground floor plan.

### Vocabulary

- area
- composite shape
- decompose
- negative space
- parallelogram
- rectangle
- trapezoid
- triangle

### Connect to the Culminating Project

- Calculate the area of your playground floor plan.ccchhg

# LESSON 1

## PARALLELOGRAMS

## WARM-UP

### What Is the Area of My Table?

Predict the area of your table if measured in:

- Square sticky notes:
- Square inches:
- Square feet:

Describe the strategy you will use to find the area of your table.

Find the area of the table using sticky notes and the ruler. Complete the table below.

| | Length | Width | Area |
|---|---|---|---|
| **Sticky Notes** | | | _____ square sticky notes |
| **Inches** | | | _____ square inches |

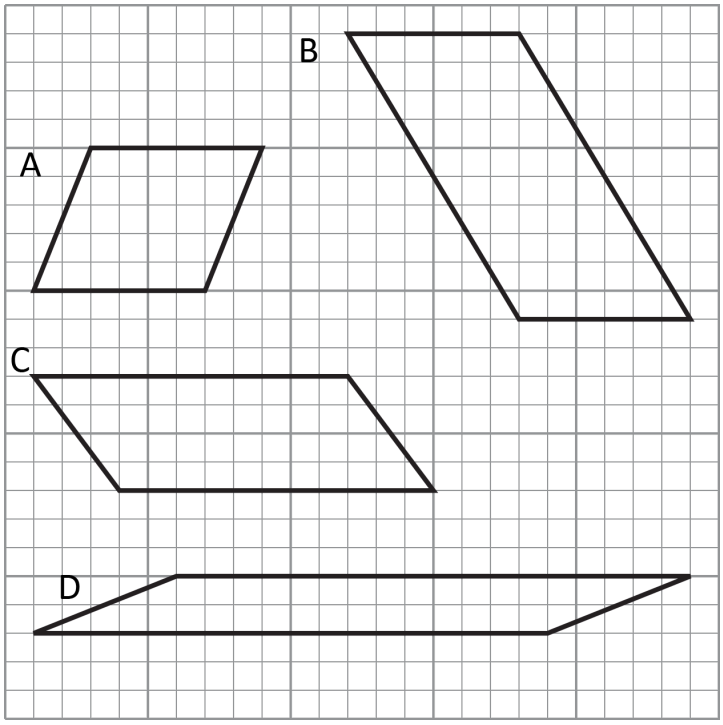
## PROJECT ACTIVITY

### Area of Parallelograms

Compare and contrast rectangles and parallelograms.

| **Rectangles** | **Parallelograms** |
|---|---|
| **Both** | |

Find the area of these parallelograms. Show your work.



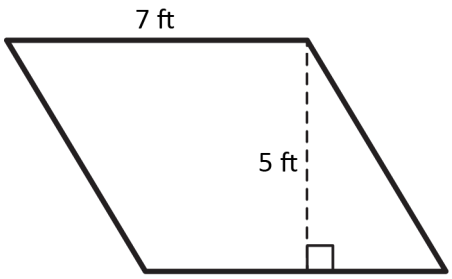

Do you notice any shortcuts or patterns?

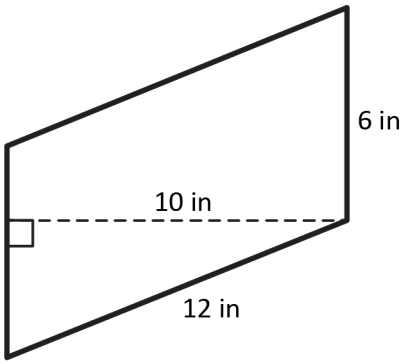
## LESSON 2
### TRIANGLES

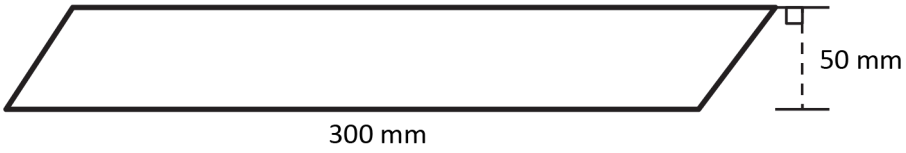
## WARM-UP

### Parallelograms

Find the area of these parallelograms. Show your work.



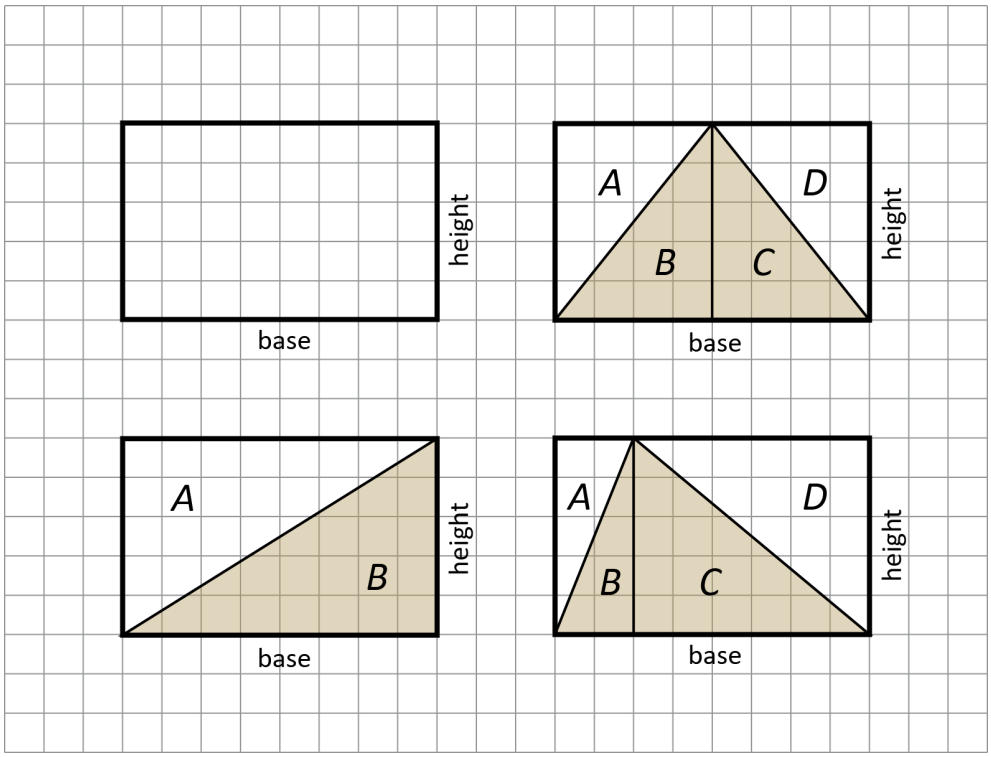



## PROJECT ACTIVITY

### Area of Triangles

Find the area of the rectangle and each of the triangles (***A***, ***B***, ***C***, ***D***, and ***B/C***). Show your work.




Do you notice any shortcuts or patterns?

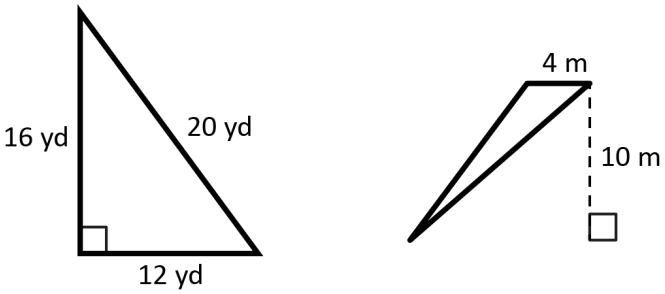
# LESSON 3

## CONVINCE A FRIEND, CONVINCE A SKEPTIC

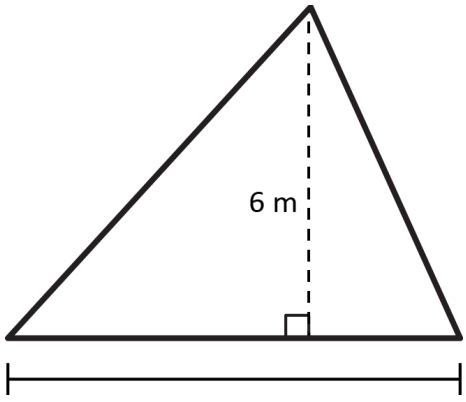
### WARM-UP

Triangles

1. Find the area of these triangles. Show your work.




2. This triangle has an area of 30 $m^2$. What is the length of the base? Show your work.



## PROJECT ACTIVITY

### Convince a Friend, Convince a Skeptic

Write a convincing argument to explain why the area formulas for triangles, parallelograms, and (extension) trapezoids work. Use words, numbers, and figures. Construct arguments for both friends and skeptics.

| For Friends | For Skeptics |
|---|---|
| ● Explain **what** you know and **how** you know it is true.<br>● Describe what you know using words, pictures, and numbers. | ● Support your claims with evidence.<br>● Justify your explanation. Explain **why** it is true.<br>● Include examples.<br>● Include examples that look like they might not work, but show that they actually do.<br>● Describe what you know using words, pictures, and numbers. |

1. The area of a parallelogram can always be found by using the formula $A = b \cdot h$ (Area = base • height).

| Convince a Friend | Convince a Skeptic |
|---|---|
| | |

2. The area of a triangle can always be found by using the formula $\boldsymbol{A} = \frac{1}{2} \cdot \boldsymbol{b} \cdot \boldsymbol{h}$ (Area = $\frac{1}{2}$ • base • height).

| **Convince a Friend** | **Convince a Skeptic** |
| --- | --- |
| | |

## Extension

3. The area of a trapezoid can always be found by using the formula $A = \frac{1}{2} \cdot h(b_1 + b_2)$ (Area = $\frac{1}{2}$ • height • base 1 + base 2).

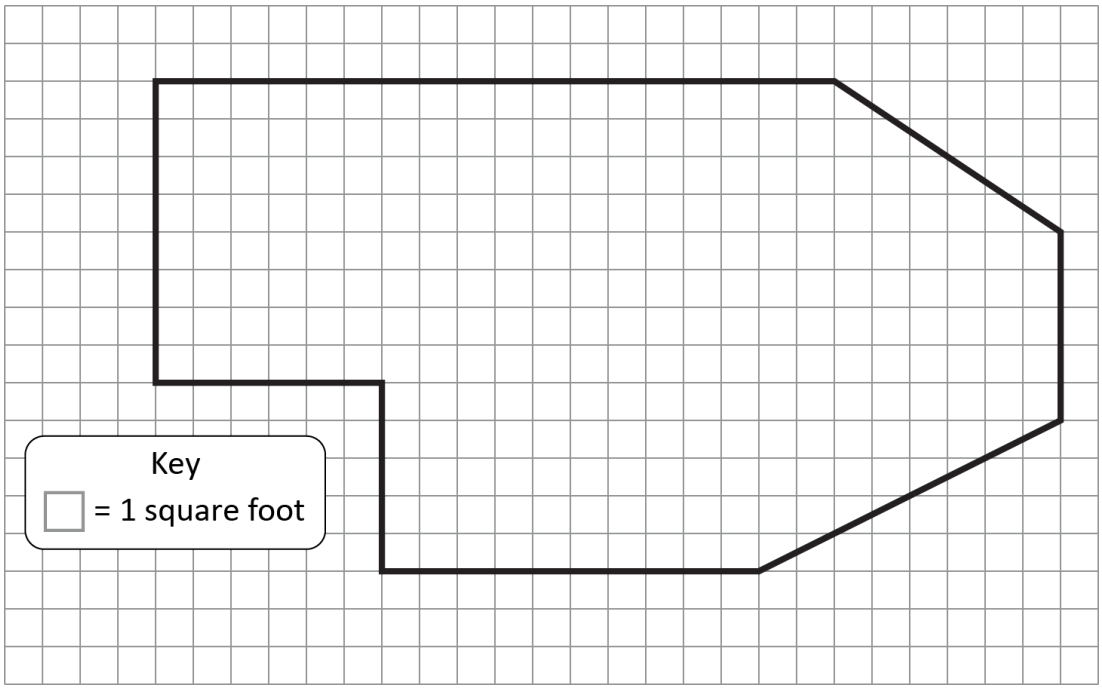
| **Convince a Friend** | **Convince a Skeptic** |
|---|---|
| | |

# LESSON 4
## COMPOSITE FIGURES

## WARM-UP

### Playground Floor Plan

What is the area of the playground floor plan below?



## PROJECT ACTIVITY

### What Is the Area of My Floor Plan?

Show how your team calculated the total area of your playground floor plan. Remember, your reflecting pool can't be moved or built on, so it does not count as part of your area.

You must include:

- A diagram of your floor plan
- Words explaining your strategy and why you chose it
- A table showing your calculations

Make sure you label all your units of measurement.

**Playground Floor Plan Name**

| |
|---|
| |

**Diagram**

| |
|---|
| (Insert picture here or attach floor plan paper that your team marked.) |

## LESSON 4 • COMPOSITE FIGURES

**Strategy**

**Table**

| Diagram Piece | Type of Figure | Dimensions of This Figure | Area of This Figure |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

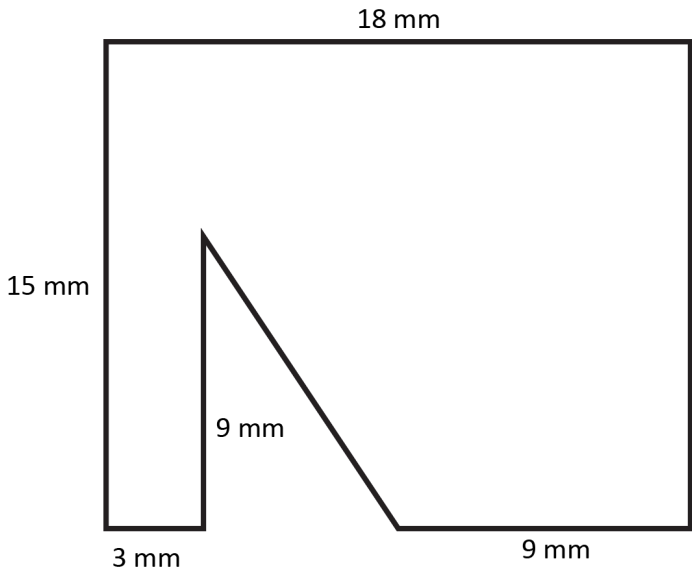
# LESSON 5

## TEAM PLANNING

## WARM-UP

### Composite Figure

A right triangle has been removed from the rectangle below. What is the area of the remaining figure?




What strategy did you use to find the area? Why did you choose that strategy?

## PROJECT ACTIVITY

### What Is the Area of My Floor Plan?

Continue to work on the "What Is the Area of My Floor Plan" pages in the previous lesson and the Playground Information Table.

**CHECK FOR UNDERSTANDING**

Test your knowledge about how to find the area of composite figures using the Check for Understanding • Areas of Polygons.