ZEARN Math

MISSION OVERVIEW

GRADE 7

M7 Angles, Triangles, and Prisms

Introduction

In this mission, students investigate whether sets of angle and side length measurements determine unique triangles or multiple triangles, or fail to determine triangles. Students also study and apply angle relationships, learning to understand and use the terms “complementary,” “supplementary,” “vertical angles,” and “unique.” The work gives them practice working with rational numbers and equations for angle relationships. Students analyze and describe cross-sections of prisms, pyramids, and polyhedra. They understand and use the formula for the volume of a right rectangular prism, and solve problems involving area, surface area, and volume.

Overview of Topics and Lesson Objectives

Each mission is broken down into topics. A topic is a group of lessons that teach the same concept. There is a balance of Independent Digital Lessons and Concept Explorations in each topic of a mission to ensure every student learns with a mix of modalities, feedback, and support while engaging in grade-level content. Throughout each mission, students work on grade-level content with embedded remediation to address unfinished learnings.

	Objective	INDEPENDENT DIGITAL LESSON	CONCEPT EXPLORATION
Topic A	**Angle Relationships**		
Lesson 1	Find unknown angle measures by reasoning about adjacent angles with known measures.	✓	✓
Lesson 2	Find unknown angle measures by reasoning about complementary or supplementary angles.	✓	✓
Lesson 3	Find unknown angle measures by reasoning about vertical angles, and nonadjacent complementary or supplementary angles.	✓	✓
Lesson 4	Solve multi-step problems involving complementary, supplementary, and vertical angles, and explain the reasoning.	✓	✓
Lesson 5	Solve an equation that represents a relationship between angle measures, and explain the reasoning.	✓	✓
Topic B	**Drawing Polygons with Given Conditions**		
Lesson 6	Recognize that four side lengths do not determine a unique quadrilateral, but that three side lengths can determine a unique triangle.	✓	✓
Lesson 7	Show that there is a minimum and maximum length the third side of a triangle could be, given the other two side lengths.	✓	✓
Lesson 8	Compare and contrast triangles that share three common measures of angles or sides, and determine whether they are identical copies or different triangles.	✓	✓
Lesson 9	Given two angle measures and one side length, draw different triangles with these measurements or show that these measurements determine one unique triangle or no triangle.	X	✓
Lesson 10	Draw triangles with two given side lengths and one angle measure or three given angle measures, and describe how many different triangles could be drawn with the given conditions.	X	✓

	Objective	INDEPENDENT DIGITAL LESSON	CONCEPT EXPLORATION
Mid-Mission Assessment: Topics A-B			
Topic C	**Solid Geometry**		
Lesson 11	Describe, compare, and contrast (orally and in writing) different cross sections that could result from slicing the same pyramid or prism.	✓	✓
Lesson 12	Find the volume of a right prism, and explain why the volume of a prism can be found by multiplying the area of the base by the height of the prism.	✓	✓
Lesson 13	Find the volume of prisms with non-rectangular bases by decomposing the base into rectangles and triangles.	✓	✓
Lesson 14	Find the surface area of a prism using different methods, including using the net of the prism to help calculate its surface area.	✓	✓
Lesson 15	Decide whether to calculate the surface area or volume of a prism to solve a problem in a real-world situation.	✓	✓
Lesson 16	Apply reasoning about surface area and volume of prisms as well as proportional relationships to calculate how much the material to build something will cost, and explain the solution method.	✓	✓
Topic D	**Let's Put It to Work**		
Lesson 17	Compare and contrast triangular prisms, including comparisons of their height, cross sections, surface area, and volume.	X	OPTIONAL
End-of-Mission Assessment: Topics C-D			

Foundational Missions

For each mission, Zearn Math highlights the foundational missions, the earlier content where concepts are introduced and developed. Teachers can access foundational missions directly from the mission page of their Teacher Account to address any unfinished learnings. Zearn recommends that teachers assign foundational missions during Flex Day or during additional non-core instruction time. It is important to use a foundational mission to support students who are struggling, rather than an unaligned mission, because the content students learn in each foundational mission supports their Core Day learning.

Foundational Missions for G7M7: G4M4 Topic C, G6M1 Topics B-F, and G6M4 Topic D

Mission Overview

In this mission, students investigate whether sets of angle and side length measurements determine unique triangles or multiple triangles, or fail to determine triangles. Students also study and apply angle relationships, learning to understand and use the terms “complementary,” “supplementary,” “vertical angles,” and “unique”. The work gives them practice working with rational numbers and equations for angle relationships. Students analyze and describe cross-sections of prisms, pyramids, and polyhedra. They understand and use the formula for the volume of a right rectangular prism, and solve problems involving area, surface area, and volume. Students should have access to their geometry toolkits so that they have an opportunity to select and use appropriate tools strategically.

Note: It is not expected that students memorize which conditions result in a unique triangle, are impossible to create a triangle, or multiple possible triangles. Understanding that, for example, SSS information results in zero or exactly one triangle will be explored in high school geometry. At this level, students should attempt to draw triangles with the given information and notice that there is only one way to do it (or that it is impossible to do).

Progression of Disciplinary Language

In this mission, teachers can anticipate students using language for mathematical purposes such as critiquing, explaining, interpreting, and justifying. Throughout the mission, students will benefit from routines designed to grow robust disciplinary language, both for their own sense-making and for building shared understanding with peers. Teachers can formatively assess how students are using language in these ways, particularly when students are using language to:

Critique

- reasoning about measuring angles (Lesson 1)
- reasoning about decomposition of prisms (Lesson 13)
- reasoning about surface area of prisms (Lesson 14)

Explain

- how to measure angles (Lesson 2)
- how to find unknown angle measurements (Lessons 4 and 5)
- how to find the volume of prisms (Lessons 12 and 13)
- how to find the surface area of prisms (Lesson 14)

Interpret

- situations involving intersecting lines in order to form a conjecture (Lesson 3)
- which information is relevant to answer questions (Lesson 4)
- equations representing angle measurements (Lesson 5)
- situations involving volume and surface area (Lesson 15 and 16)

Justify

- whether or not shapes are identical copies (Lesson 6)
- whether or not measurements determine identical copies (Lesson 9)
- whether or not measurements determine unique triangles (Lesson 10)

In addition, students are expected to use language to compare angle measurements, compare triangles in a set, compare cross sections of figures, describe characteristics of pattern blocks, describe positioning and movement of side lengths and angles, and describe cross sections of prisms and pyramids. Students also have opportunities to generalize about patterns of angle measurements, about categories for unique triangles, and about categories for cross sections.

The table shows lessons where new terminology is first introduced, including when students are expected to understand the word or phrase receptively and when students are expected to produce the word or phrase in their own speaking or writing. Terms from the glossary appear bolded. Teachers should continue to support students' use of a new term in the lessons that follow where it was first introduced.

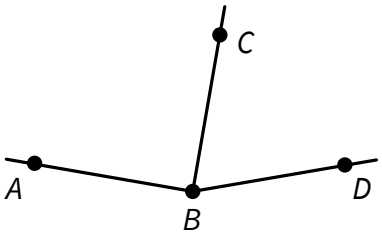
New Terminology		
Lesson	**Receptive**	**Productive**
1	**straight angle** **adjacent angles** degree	**right angle**
2	**supplementary** **complementary** angle measure protractor	degrees measurement error
3	**vertical angles** intersect vertex (of an angle)	
4		**supplementary** **vertical angles**
5	perpendicular	**complementary**
6	identical copy condition	angle measure side length quadrilateral
7	compass different triangle	intersect identical copy segment

New Terminology		
Lesson	**Receptive**	**Productive**
8		condition different triangle
9	unique triangle parallel	
10		protractor compass
11	**cross section** vertex (of a pyramid) base (of a prism or pyramid) face	perpendicular parallel prism pyramid
12		**cross section** base (of a prism or pyramid) volume
14		face perimeter
15		surface area

Terminology

Adjacent angles

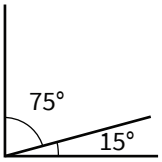
Adjacent angles share a side and a vertex. In this diagram, angle ***ABC*** *i*s adjacent to angle ***DBC.***

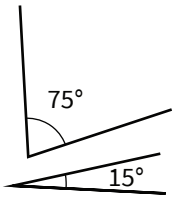


Complementary

Complementary angles have measures that add up to 90 degrees.

For example, a 15° angle and a 75° angle are complementary.

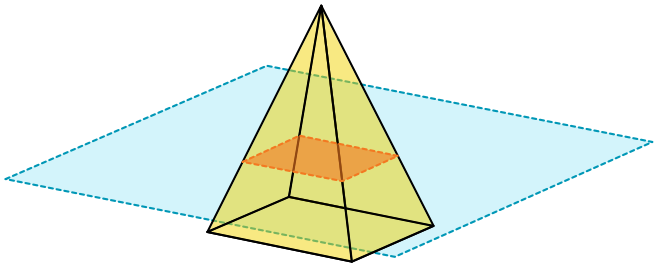




Cross section

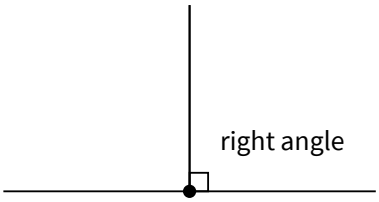
A cross section is the new face you see when you slice through a three-dimensional figure.

For example, if you slice a rectangular pyramid parallel to the base, you get a smaller rectangle as the cross section.



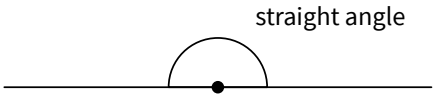
Right angle

A right angle is half of a straight angle. It measures 90 degrees.



Straight angle

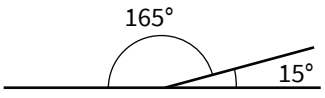
A straight angle is an angle that forms a straight line. It measures 180 degrees

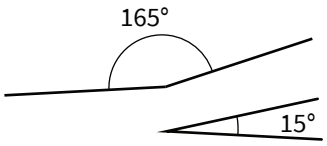


Supplementary

Supplementary angles have measures that add up to 180 degrees.

For example, a 15° angle and a 165° angle are supplementary.



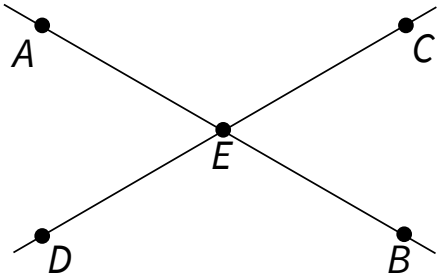


Vertical angles

Vertical angles are opposite angles that share the same vertex. They are formed by a pair of intersecting lines. Their angle measures are equal.

For example, angles ***AEC*** and ***DEB*** are vertical angles. If angle ***AEC*** measures 120°, then angle ***DEB*** must also measure 120°.

Angles ***AED*** and ***BEC*** are another pair of vertical angles.



Required Materials

Blank paper

Compasses

Fruits or vegetables

Geometry toolkits

Tracing paper, graph paper, colored pencils, scissors, centimeter ruler, protractor, and an index card to use as a straightedge or to mark right angles

Knife

Metal paper fastener

Paint

Pattern blocks

Pre-assembled polyhedra

Protractors

Rulers marked with centimeters

Scissors

Snap cubes

Straightedges

Templates

Pre-printed slips, cut from copies of the template

Lesson 4 Activity 1

Lesson 6 Activity 1

Lesson 7 Activity 2

Lesson 10 Activity 1

Lesson 11 Activity 2

Lesson 12 Activities 1 and 2

Lesson 14 Warm-Up

Lesson 15 Activty 2

Lesson 17 Activity 2