Technology Integrated Mathematics
Class Notes
Solid Figures: Prisms (Section 9.1)

How much concrete do we need for a certain slab? We need its volume.
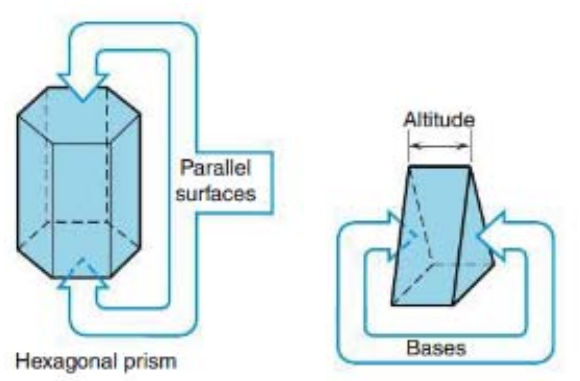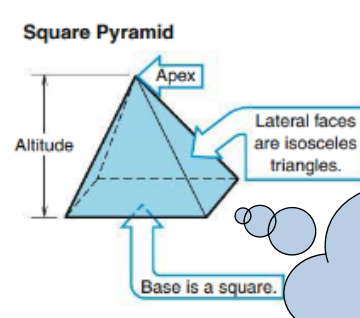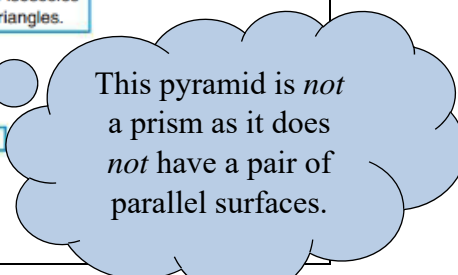
We are talking about solid, three-dimensional figures. We'll start off with some definitions.

Definition: Prism: A **prism** is a solid figure made of polygons that has *at least one* pair of parallel surfaces that create a uniform cross section. Cutting a prism anywhere that is parallel to these surfaces would produce the same cross section. Can you imagine the cross sections for the shapes below?

Examples:

Parallel surfaces

Altitude

Bases

Hexagonal prism

Counterexample:

Square Pyramid

Apex

Altitude

Lateral faces are isosceles triangles.

Base is a square.

This pyramid is *not* a prism as it does *not* have a pair of parallel surfaces.

Definitions: All of the polygons that form the prism are **faces**. The (parallel) faces that form the uniform cross section are also called **bases**. We will name the prism after these bases. The other faces are **lateral faces**.

The sides of the polygons are the edges of the **prism**. The corners are **vertices**. The perpendicular distance between the bases is the **altitude**.
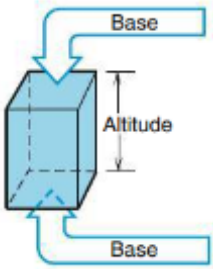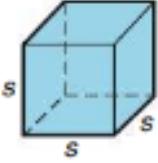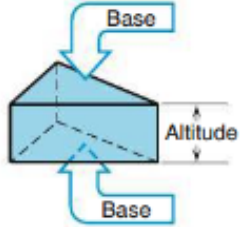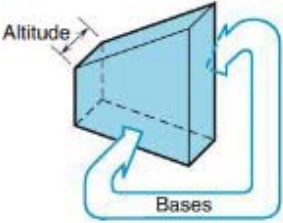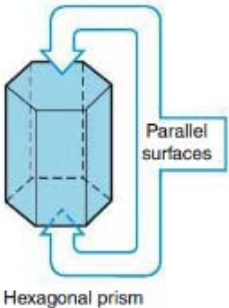
We will focus here on **right prisms**. Considering what a right angle is, what do you think that means? Which of these shapes would you call right prisms and which are *not*?
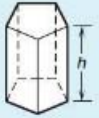
We will find the volume and surface area of these shapes. First, let's have a quick look at the various shapes.

Various Prisms:

Rectangular Prism: All opposite faces are parallel. Choose any pair as bases.	**Cube:** All faces are the same size square.	**Triangular Prism:** Bases are identical triangles.
Trapezoidal Prism: Bases are identical trapezoids.	**Polygonal Prism:** Bases are identical polygons.	**Joke:** Where do rainbows go when they are bad? **Answer: Prism. It's a light sentence.**

Do you remember the difference between lateral faces and bases? Let's get into some formulas for these shapes.

Right Prisms

Lateral surface area	$L = ph$	h = altitude
Total surface area	$T = L + 2A$	p = perimeter of the base
Volume	$V = Ah$	A = area of the base

Lots of variables so be sure you know what they represent.

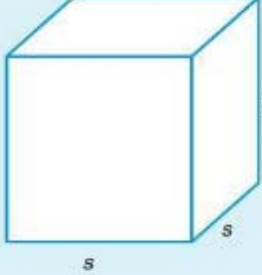The **lateral surface area** L is the area of all surfaces *excluding* the two bases.

The **total surface area** T is the lateral surface area *plus* the area of the two bases.

We can simplify these formulas a bit for cubes.

Cubes

Lateral surface area	$L = 4s^2$
Total surface area	$T = 6s^2$
Volume	$V = s^3$
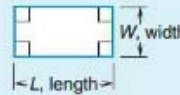
Recall: Areas of Certain Polygons:

Area of a Rectangle

Area = length × width

$A = LW$

Area of a Square
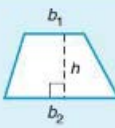
$A = s^2$

Perimeter of a Square

$P = 4s$

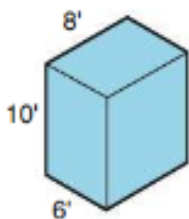**Area of a Parallelogram**

$A = bh$

Area of a Trapezoid

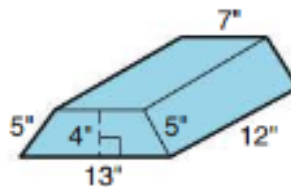$A = \left(\dfrac{b_1 + b_2}{2}\right)h$ or $A = \dfrac{h}{2}(b_1 + b_2)$

expl 1: Find the volumes of these right prisms. Round to the nearest tenth if needed. Include units.
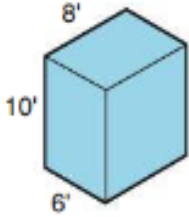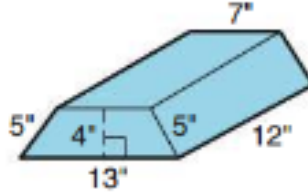
a.)

8'
10'
6'

b.)

7"
5" 4" 5" 12"
13"

expl 2: Find the *lateral* surface areas of these right prisms. Round to the nearest tenth if needed. Include units.

a.)

8'

10'

6'

b.)

7"

5"   4"   5"   12"

13"

For part a, take the bases to be the top and bottom.
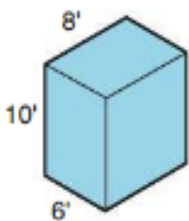
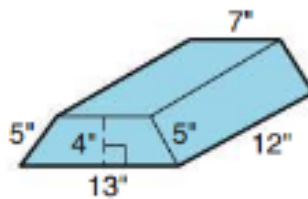expl 3: Find the *total* surface areas of these right prisms. Round to the nearest tenth if needed. Include units.

a.)

8'

10'

6'

b.)

7"

5"   4"   5"   12"

13"

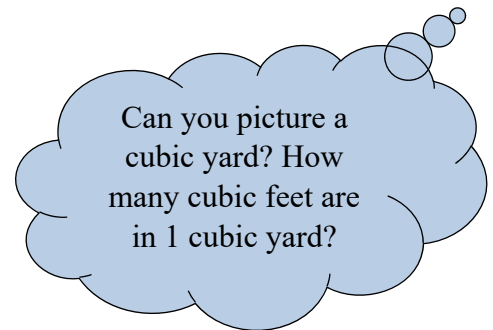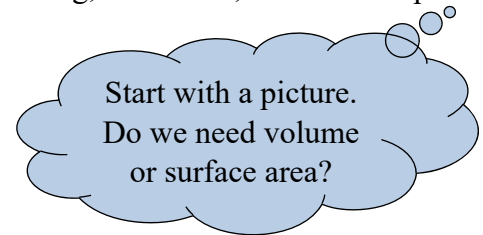*How do the total surface area and lateral surface area differ?*

We will need **unit conversion** to answer certain questions.

expl 4: A homeowner needs to pour a concrete slab that is 26 ft long, 12 ft wide, and 6 in. deep. How many cubic *yards* of concrete is needed?

Start with a picture. Do we need volume or surface area?

Can you picture a cubic yard? How many cubic feet are in 1 cubic yard?

Worksheet: Volume and Surface Area of Prisms:
This worksheet will practice volume, lateral surface area, and total surface area of a hexagonal prism. We also look at an application.