Unit 7 Summary

Prior Learning	Grade 7, Unit 7	Grade 8
Grade 6 ● Area and surface area ● Volume of rectangular prisms Grade 7: ● Solving equations ● Properties of circles	● Angle relationships ● Building and drawing triangles with given conditions ● Volume and surface area of non-rectangular prisms	● Congruence and similarity ● Transformations ● Volume of cylinders, cones, and spheres

Angle Relationships

We can use common angle relationships to determine unknown angles in diagrams.

If two angles add to $90°$, they are *complementary angles*.

In the diagram, each marked angle must be $45°$ because $2(45) = 90$.

Complementary Angles
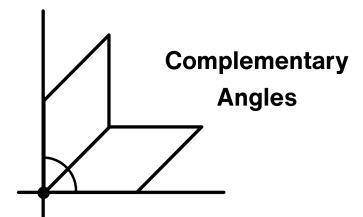
If two angles add to $180°$, they are *supplementary angles*.

If one angle of the triangle is $60°$, the larger marked angle must be $120°$ because $60 + 120 = 180$.
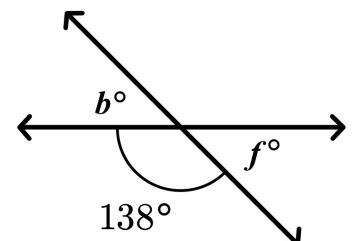
Supplementary Angles
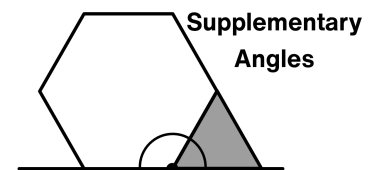
We can write equations based on angle relationships.

For example, $f + 138 = 180$ because they are supplementary angles.

It is also true that $b + 138 = 180$, so b and f are equal.

Angles b and f are called *vertical angles*, angles that are opposite each other where two lines cross.

The measures of vertical angles are always equal.

Drawing Triangles

The second part of the unit is all about drawing polygons based on descriptions. How many triangles are possible to draw based on given information?
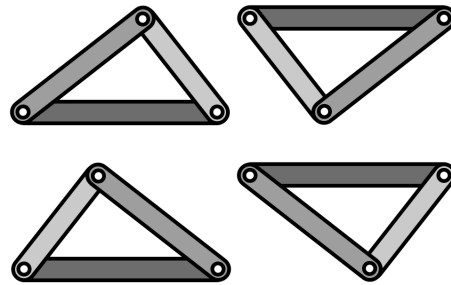
Sometimes it is not possible to draw any triangle.

The two shortest sides are not long enough to form a triangle.

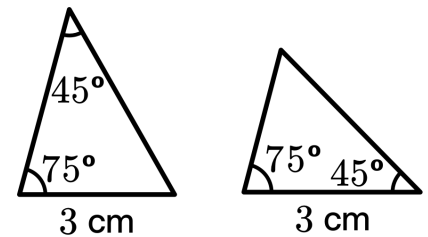They would need to be longer than the third side to connect.
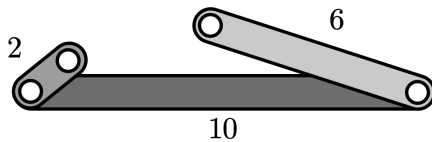
Sometimes it is only possible to draw one triangle.

All of the triangles with side lengths of 3 units, 4 units, and 5 units are *identical copies.*

Sometimes it is possible to draw more than one triangle.

One side length of 3 cm, one $75°$ angle, and one $45°$ angle could describe two triangles that are not identical copies.

Solid Geometry

There are two features we often measure in a three-dimensional object: its *volume* (how much space is inside the object) and its *surface area* (the amount of material needed to cover the object).

A *prism* is a solid that has two *bases* that are identical. In this prism, the bases are right triangles.

Volume: We can calculate the volume of any prism by multiplying the area of the base by the height.

$$\text{Volume} = \text{Area of Base} \cdot \text{Height}$$

$$\text{Volume} = \tfrac{1}{2}\,(5 \cdot 12) \cdot 14 = 30 \cdot 14 = 420 \text{ cubic inches}$$
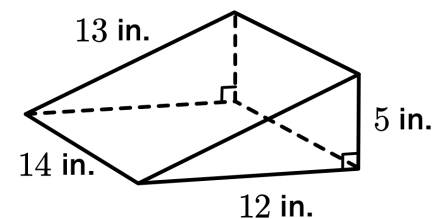
Surface area: This is the sum of the area of each face.

This prism has two triangular faces and three rectangular faces.

$$\text{Surface Area} = 30 + 30 + 70 + 168 + 182 = 480 \text{ square inches}$$

Try This at Home

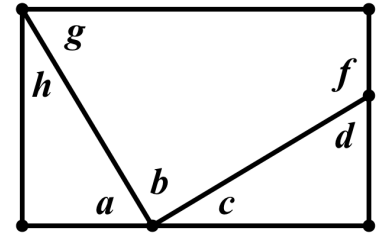## Angle Relationships

Here is a rectangle.

1.1 List two angles that are **complementary.**

1.2 List two angles that are **supplementary.**

1.3 If angle h is $31°$, determine the measure of angle g.
Label it on the diagram.

1.4 If angle f is $121°$, determine the measure of angle d.
Label it on the diagram.

1.5 If the measure of angle b is $90°$, are angles a and c complementary? Explain your thinking.
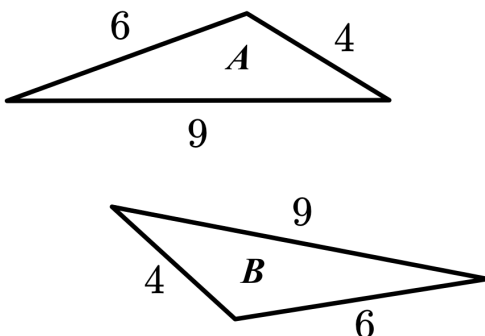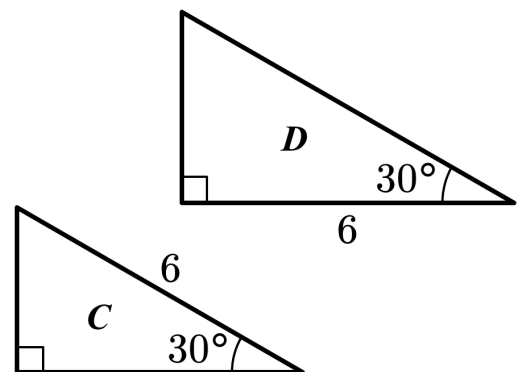
Drawing Triangles

2. How many nonidentical triangles can be made using the side lengths 5 cm, 15 cm, and 25 cm? Explain your thinking.

For each pair of triangles, explain what is similar and different about the triangles. Then determine whether or not the triangles are identical copies.
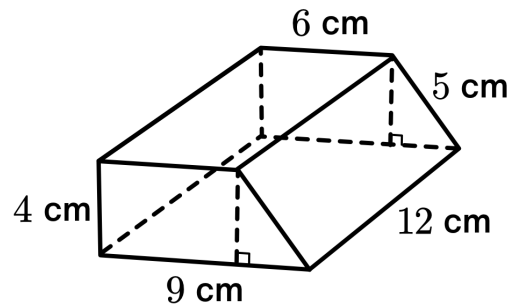
3.1

3.2

Solid Geometry

Here is a prism.

4.1   Shade one base of the prism.

4.2   Calculate the volume of this prism. Organize your calculations so that others can follow them.

6 cm

5 cm

4 cm

12 cm

9 cm

4.3   How many faces does the prism have?

4.4   Calculate the surface area of this prism. Organize your calculations so that others can follow them.

4.5   If this were a box and you wanted to know how much cardboard you would need to build it, what would be more useful information: volume or surface area? Explain your thinking.

desmos

Unit 7.7, Family Resource

Solutions:

1.1 Angles g and h

1.2 Angles d and f

1.3 $g = 59°$ $(31 + 59 = 90)$

1.4 $d = 59°$ $(121 + 59 = 180)$

1.5 Yes. *Explanations vary.* The sum of the measures of angles a, b, and c is $180°$. If the measure of angle b is $90°$, then the measures of the other two angles must add up to $90°$, which means they are complementary angles.

2. None. *Explanations vary.* In order to connect and make a triangle, the two shortest sides need to be longer than the third side. $5 + 15 < 25$, so the sides are too short to create a triangle.

3.1 These are identical triangles. They are the same shape and size, even though one triangle is turned in a different direction.

3.2 These are not identical triangles. They are the same shape, but not the same size. Both triangles are facing the same direction and both have two equal sides. The equal sides in triangle D are 6 units long. The equal sides in triangle C are less than 6 units long.

4.1 See figure.

4.2 Base Area = Area of Rectangle + Area of Triangle

$A = 4 \cdot 6 + \frac{1}{2} \cdot 4 \cdot 3 = 24 + 6 = 30$ square cm

Volume = Base Area • Height

$V = 30 \cdot 12 = 360$ cubic cm

4.3 6 faces. 2 bases and 4 other faces.

4.4 *Strategies vary.*

- Surface Area $= 30 + 30 + 108 + 60 + 72 + 48 = 348$ square units
- Surface Area $= 2(30) + 12(9 + 5 + 6 + 4) = 60 + 12(24) = 348$ square units

4.5 Surface area. *Explanations vary.* Surface area is the number of square units that covers all the faces of the object, without any gaps or overlaps. Volume is more about the amount of space that fills up an object.