

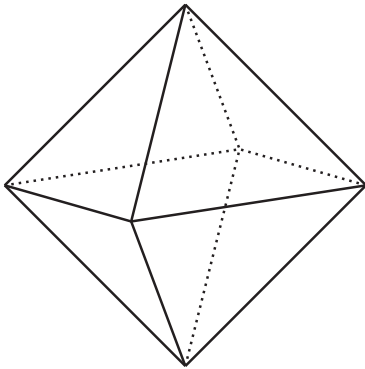
## Unit 2 Lesson 9: Which Variable to Solve for? (Part 2)

### 1 Faces, Vertices, and Edges (Warm up)

#### Student Task Statement

In an earlier lesson, you saw the equation  $V + F - 2 = E$ , which relates the number of vertices, faces, and edges in a Platonic solid.

1. Write an equation that makes it easier to find the number of vertices in each of the Platonic solids described:



- a. An octahedron (shown here), which has 8 faces.
- b. An icosahedron, which has 30 edges.

2. A Buckminsterfullerene (also called a "Buckyball") is a polyhedron with 60 vertices. It is not a Platonic solid, but the numbers of faces, edges, and vertices are related the same way as those in a Platonic solid.

Write an equation that makes it easier to find the number of faces a Buckyball has if we know how many edges it has.

## 2 Cargo Shipping

### Student Task Statement

An automobile manufacturer is preparing a shipment of cars and trucks on a cargo ship that can carry 21,600 tons.

The cars weigh 3.6 tons each and the trucks weigh 7.5 tons each.



1. Write an equation that represents the weight constraint of a shipment. Let  $c$  be the number of cars and  $t$  be the number of trucks.
2. For one shipment, trucks are loaded first and cars are loaded afterwards. (Even though trucks are bulkier than cars, a shipment can consist of all trucks as long as it is within the weight limit.)

Find the number of cars that can be shipped if the cargo already has:

- a. 480 trucks
  - b. 1,500 trucks
  - c. 2,736 trucks
  - d.  $t$  trucks
3. For a different shipment, cars are loaded first, and then trucks are loaded afterwards.
    - a. Write an equation you could enter into a calculator or a spreadsheet tool to find the number of trucks that can be shipped if the number of cars is known.
    - b. Use your equation and a calculator or a computer to find the number of trucks that can be shipped if the cargo already has 1,000 cars. What if the cargo already has 4,250 cars?

## 3 Streets and Staffing

### Student Task Statement

The Department of Streets of a city has a budget of \$1,962,800 for resurfacing roads and hiring additional workers this year.

The cost of resurfacing a mile of 2-lane road is estimated at \$84,000. The average starting salary of a worker in the department is \$36,000 a year.



1. Write an equation that represents the relationship between the miles of 2-lane roads the department could resurface,  $m$ , and the number of new workers it could hire,  $p$ , if it spends the entire budget.
2. Take the equation you wrote in the first question and:
  - a. Solve for  $p$ . Explain what the solution represents in this situation.
  - b. Solve for  $m$ . Explain what the solution represents in this situation.
3. The city is planning to hire 6 new workers and to use its entire budget.
  - a. Which equation should be used to find out how many miles of 2-lane roads it could resurface? Explain your reasoning.
  - b. Find the number of miles of 2-lane roads the city could resurface if it hires 6 new workers.