**Lesson 2.6 – Optimizing Volume and Surface Area**

***Goal: Determine the optimal volume and surface area for 3-dimensional figures***

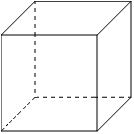
**Optimization:** The process of finding the most efficient use of available materials within given constraints.

***Key Concepts***

1. Among all rectangular prisms with a given surface area, a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ has the ***maximum*** volume
2. Among all rectangular prisms with a given volume, a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ has the ***minimum*** surface area

***FORMULAS for CUBE***

**Volume: Surface Area:**



***EXAMPLE 1***

What dimensions produce a minimum surface area of a rectangular prism with a volume of 1000 cm3?

***EXAMPLE 2***

What dimensions of a rectangular prism will produce a maximum volume if the surface area is 486 cm2?

***Optimizing with Restrictions***

There may be constraints on the prism you are optimizing.

* The dimensions may have to be whole numbers or be multiples of a given number.
* Sometimes one or more of the sides of the object are missing or bordered by some physical barrier.

In these cases, the optimal rectangular prism will not be a cube. You can use diagrams or a table and graph to find the dimensions of the optimal rectangular prism.

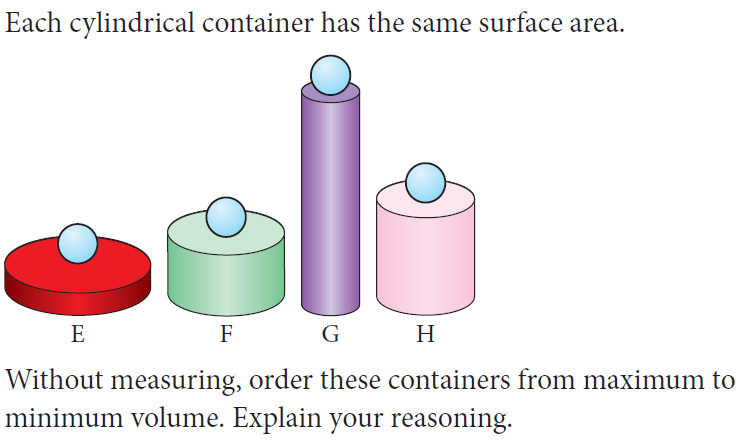
***EXAMPLE 3***

Jacob is designing a glass candle holder. It will be a square-based rectangular prism with outer surface area of 225 cm2, and no top.

Determine the maximum volume of the candle holder to the nearest cm. What are the dimensions of the candle holder?

|  |  |  |  |
| --- | --- | --- | --- |
| **Base Side Length (cm)** | **Height of Prism (cm)** | **Volume**  **(cm3)** | **Surface Area (cm2)** |
| 1 |  |  | 225 |
| 2 |  |  | 225 |
| 3 |  |  | 225 |
| 4 |  |  | 225 |
| 5 |  |  | 225 |
| 6 |  |  | 225 |
| 7 |  |  | 225 |
| 8 |  |  | 225 |
| 9 |  |  | 225 |
| 10 |  |  | 225 |

***EXAMPLE 4***



**Practice**: Page 110 #1-5, 8, 9, 12-16