

MA 202: Exam 2 Review Problems

In general, it may be helpful to *draw pictures* to illustrate what is happening in the following problems.

1. Recall that the surface area of a right circular cone with slant height l and whose base has a radius r is given by the sum of the area of the base and the area of the lateral surface.

$$SA = \text{Area of Base} + \text{Area of Lateral Surface} = \pi r^2 + \pi r l$$

- (a) Sketch the net of the right circular cone, labeling the radius r and slant height l .
 - (b) Derive the formula for the area of the lateral surface.
2. (a) Determine the area of a regular hexagon with side length s . *Hint:* A regular hexagon has center angle measure 60 degrees.
(b) The indoor sod for the 1994 World Cup match in the Silverdome was grown in (regular) hexagonal units. Each hexagon had side length 7.5 feet. If the field is about 240 by 360 feet, how many hexagons were needed to cover the field?
 3. Ice melts at a rate proportionate to its surface area (i.e. if the surface area is higher, the ice melts faster). Joe has eight blocks of ice, each measuring 30 centimeters by 30 centimeters by 30 centimeters.
 - (a) How should he stack them if he wants them to melt as slowly as possible?
 - (b) How should he stack them if he wants them to melt as quickly as possible?
 4. (a) Consider two cubes. The smaller cube measures 4 inches on a side, and the larger cube measures 10 inches on a side. What is the ratio of the surface areas of the two cubes? What is the ratio of the volumes of the two cubes?
(b) Suppose the side measures of the two cubes are x inches and $2x$ inches, respectively. Then:
 - The surface area of the larger cube is _____ times the surface area of the smaller cube.
 - The volume of the larger cubes is _____ times the volume of the smaller cube.
 5. A farmer has a fence that encloses a square plot with an area of 36 square meters. If the farmer uses this fence to enclose a circular flower garden, what will the area of the garden be?
 6. A circular flower bed is 6 meters in diameter and has a circular sidewalk 1 meter wide around it. Find the area of the sidewalk in square meters.
 7. A cone with radius r , height h , and slant height l is contained in a cylinder of radius r and height h . Show algebraically that the cylinder has a greater surface area than the cone.
 8. (a) *True or False:* Two 8 inch diameter pizzas contain the same amount of pizza as one 16 inch diameter pizza.
(b) At a pizza joint, the diameter of a large pizza is x inches. If you want the medium pizza to be exactly one third the size of the large pizza what should the radius of the medium pizza be?

9. The area of a rectangle with base b and height h is given by $A = bh$. Using this, explain how to derive the area formulas for the following polygons:
- parallelogram
 - triangle
 - trapezoid
 - kite
10. Determine whether the following statements are *True* or *False*. If false, correct the statement to make it true. As always, justify your answer.
- Circular cylinders are examples of polyhedra.
 - The cross-section of a sphere is a circle.
 - Any face of a prism has an opposite face that is parallel to it.
 - A triangular prism has 9 edges.
 - A hexagonal prism has 6 rectangular faces.
 - A triangular pyramid has 4 triangular faces.
 - A pyramid that has an n -gon as a base has $n + 1$ faces.
 - A prism that has n -gons as bases has $n + 1$ faces.
 - Doubling the dimensions of a rectangle doubles its **perimeter**.
 - Doubling the dimensions of a rectangle doubles its **area**.
 - Doubling the dimensions of a rectangular prism doubles its surface area.
 - Doubling the dimensions of a rectangular prism doubles its volume.
11. An ice cube tray makes ice cubes whose lateral faces are slanted outward on four sides for easier removal from the tray. Are the ice cubes *prisms*, *pyramids*, or *neither*? Explain your reasoning.
12. Your shampoo bottle is about 60% full. The total capacity of the shampoo bottle is 24 fluid ounces. How many *liters* of shampoo are left in the bottle? Use the conversion: 1 gallon is approximately 3.79 liters.
13. Express the relationships between cups, quarts, fluid ounces, pints, and gallons. What do these units measure?
14. Your student tries to determine the mass of a tank of water using liters. What do you say to your student?
15. The speed of light is about 300,000 kilometers per second.
- Determine the length of one *light-year* by calculating the distance, in miles, light will travel in a year. Use the conversion 1 kilometer is approximately 0.62 miles.
 - Proxima Centauri, the closest star to Earth, is approximately 4.22 light-years away. How far, in miles, will light from Proxima Centauri travel before it reaches Earth?