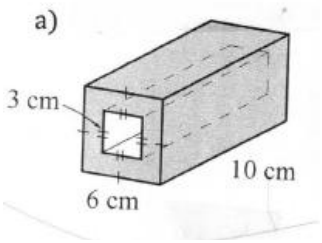
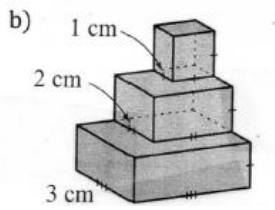
Math 8Challenge: Solving Surface Area and Volume Problems.

1. Calculate the volume and surface area of the following shapes.



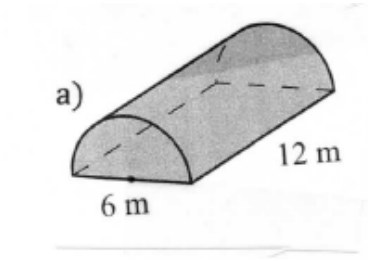


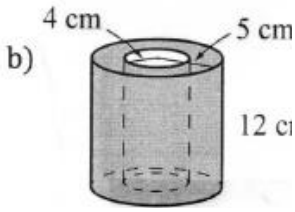
2. If the edges of a box are doubled in length, what happens to the surface area? Tripled? In general what effect will increasing the dimensions of a prism by a factor of n have on the SA?

3. The length of a rectangular solid is four times the width and the height is three times the width. If the volume is 768 cm^3, what are the dimensions of the solid?

4. The base of an isosceles right triangular prism has legs equal to its height. If the volume of the prism is 108 cm^3, what is the height of the prism?

5. Calculate the volume and surface area of the following shapes.





6. What area of pavement is covered by 5 revolutions of a roller 3.6 m wide, with a radius of 1.2 m?

7. Two pipes of the same length have an inside radius of 3 m and 4 m respectively. What would be the radius of a single pipe that will allow the same capacity of water to run through it as the two pipes together?

8. A solid metal cylinder with radius 6 cm and a height of 18 cm is melted down to form a solid cube. Find the length of the sides of the cube to two decimal places.

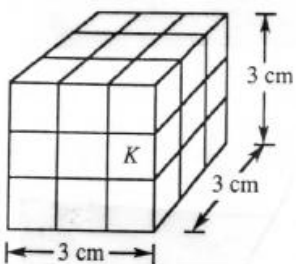
9. A cylinder and rectangular prism have the same volume. The rectangular prism has a length of 4π, and a height the same as the cylinder. If the cylinder has a radius of 6 cm, what is the width of the prism?

10. The volume of a cylinder is 108π. If the diameter is half the height, find the radius of the cylinder.

11. The area of the labels on two similar shaped soup cans are 81π and 144π. How much bigger in volume is the larger can compared to the smaller can?

12. The figure shown is made up of 27 identical cubes. The cube marked k is removed. The effect that this has on the total surface area of the figure is to.

    a) increase it by 2 cm^2
    b) increase it by 1 cm^2
    c) leave it unchanged
    d) decrease it by 1 cm^2
    e) decrease it by 2 cm^2



13. A rectangular tank with base a square of side 4 feet contains water to a height of 3 feet. A solid cube of edge 2 feet is placed on the bottom of the tank. What is the new height of the water?

14. The volume of a sphere is given by the formula $V = \frac{4}{3}\pi r^3$, where r is the radius of the sphere. What is the volume of the largest sphere which can fit entirely in a box having dimensions 6 by 6 by 6?

Bonus: Each of the numbers 1,2,3,4,5, and 6 is painted, one to a face, on the faces of a cube. The cube is placed on a table so that from each of the three positions a person can see the top and two of the other faces. The sums of the numbers showing on the visible faces from the three positions are 9, 14 and 15. What number is on the bottom face?

Answers:

1. a) SA= 414 cm^2 V= 270 cm^3 b) SA = 42 cm^2 V= 14 cm^3

2) SA is four times as large; 9 times; n^2 times 3) 16cm x 4cm x 12cm 4) 6cm

5. a) SA =45π+72 m^2 V= 54π m^3 b) SA =234π cm^2 V= 108π cm^3

6) 43.2π m^2 7) 5 m 8) 12.67 cm 9) 9 cm 10) 3 11) $^4/_3$ 12) A 13) 3.5 feet 14) 36π