Problem of the Week
Problem B and Solution
No Business Like Snow Business

Problem

The snow is deep and it's perfect snow fort weather. You've decided to build a wall 1.5 m high, 9 m long and 30 cm deep. You find that, by packing snow into your trusty plastic bin, you can make cubic 'snow bricks' which have dimensions 30 cm × 30 cm × 30 cm.

a) How many bricks will you need to build the wall?

b) Suppose you had a rectangular prism bin 60 cm long by 30 cm wide by 15 cm high. How many rectangular prism bricks would you need to build a wall with the same dimensions?

c) In the end, you decide to use a 2:1 ratio of rectangular bricks to cubic bricks. How many cubic bricks will you need?

Solution

a) Since each brick is a 30 cm cube, it has height and length equal to 0.3 m. Thus a wall 1.5 m high and 9 m long will need to be $1.5 \div 0.3 = 5$ bricks high, and $9 \div 0.3 = 30$ bricks long. So the total number of bricks required will be $5 \times 30 = 150$ bricks.

b) The number of blocks needed is 150. This can be done in many ways. Here is one solution. Since the wall is 30 cm deep (or thick), you must use that dimension of the rectangular prism bricks as the depth. Using the 15 cm (or 0.15 m) dimension for the height, a 1.5 m high wall would need to be $1.5 \div 0.15 = 10$ bricks high. Using the 60 cm (or 0.6 m) dimension for the length, the 9 m length would require $9 \div 0.6 = 15$ bricks. Thus the total number of rectangular prism bricks required would be $10 \times 15 = 150$ bricks.

c) For a 2:1 ratio of rectangular bricks to cubic bricks, you want half as many cubic bricks as rectangular (i.e., $\frac{2}{3}$ rectangular and $\frac{1}{3}$ cubic). We see from a) and b) that 150 of either type of snow brick is needed to completely build the wall. So we can use 100 rectangular bricks (10 high and 10 wide) to cover 6 m of the length, and 50 cubic bricks (5 high by 10 wide) to cover the remaining 3 m of length.