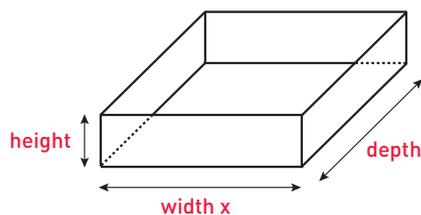


**YOU & MATHS** **The volume of a box** A box with a square base and no top is to be constructed so that it has a volume of 1000 cubic centimeters. Let  $x$  denote the width of the box, in centimeters as shown below.



- Express the height  $h$  in centimeters as a function of the width  $x$ .
- Solve  $h(x) \geq x$  and interpret.

- The volume equals the product of the dimensions, so  $1000 = h \cdot x \cdot x = hx^2$ . Therefore  $h = \frac{1000}{x^2}$ .
- If  $h(x) \geq x$ , then  $\frac{1000}{x^2} \geq x$ , and so  $\frac{1000 - x^3}{x^2} \geq 0$ . This is verified only if the numerator is greater or equal to zero. Since its sign changes only for  $1000 - x^3 = 0$ , that is  $x = 10$ , and we know that  $x \geq 0$ , and if  $0 \leq x < 10$  the expression  $1000 - x^3$  is positive, then it must be  $x \leq 10$ . This means that the side of the box has to be less or equal than 10 cm.