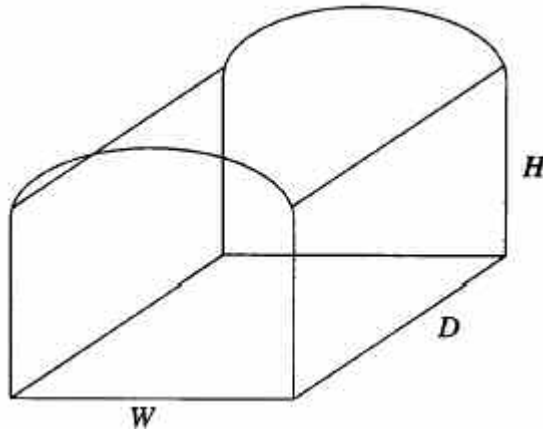


GCSE MATHEMATICS Intermediate Tier, topic sheet.  
DIMENSIONS OF FORMULAE

1. A factory uses wire to make frames for plant covers as shown in the diagram. Each frame has width  $W$ , depth  $D$  and uprights of height  $H$ .



One of these formulae may be used to estimate  $L$ , the total length of wire required for each frame.

$$L = 5W + 4D + 4H$$

$$L = 5W + 4DH$$

$$L = 5W(4D + 4H)$$

$$L = 5WDH$$

By considering the dimensions of each of the above formulae,

- a) explain why the formula  $L = 5WDH$  cannot be used to estimate the total length of wire required,
  - b) write down which of the above formulae may be used to estimate the total length of wire required, giving a reason for your choice.
2. In each of the following formulae, every letter stands for the measurement of a length. By considering the dimensions implied by the formulae, write down, for each case, whether the formulae could be for a length, an area, a volume or none of these.

The first one has been done for you.

i)  $6r^2h + 4r^3$  is a volume

ii)  $3r^2 + 5dh$

iii)  $5(r + h)d$

iv)  $4r + 6dh$

v)  $3r + 4h - d$

vi)  $3r(2h + 5d)^2$

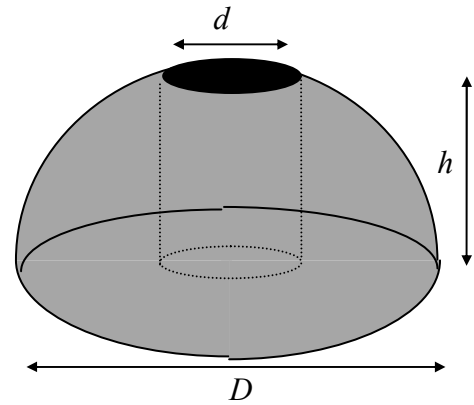
vii)  $10(r + 2h)d^2$

viii)  $30r + 16d - 5h$

ix)  $3r^2 + 5hr - 2d$

3. A pressure washer is a section from a hemisphere of diameter  $D$  cm with a cylindrical hole of diameter  $d$  cm in it. It is  $h$  cm high.

Which of these could be the formula for its curved surface area? Give a reason for your answer.



- i)  $A = \pi h(D + d)$ ,                      ii)  $A = 0.25\pi h(D^2 + d^2)$ ,  
 iii)  $A = 0.25\pi Ddh$ ,                      iv)  $A = 0.5\pi(D + d + h)$ .

4. In each of the following formulae, every letter stands for the measurement of a length. For each formula, write down its dimension.

The first one has been done for you.

- a)  $x(2x + 3y)$                                       dimension = 2  
 b)  $\pi(2x + z)^2 + 3xy$   
 c)  $3x + \pi(y - 2z)$   
 d)  $3x^2(y + z) + x^3$   
 e)  $5x^2 + 2x(3y + z)$   
 f)  $2\pi xy + 2\pi x^2$   
 g)  $\frac{4}{3}\pi x^3$   
 h)  $\frac{x^2 + y^2}{x + y}$   
 i)  $\pi x^2 - xy$   
 j)  $xz(x + 2y)$ .

ANSWERS.

1. a) Because the formula  $L = 5WDH$  measures  $\text{cm} \times \text{cm} \times \text{cm} = \text{cm}^3 = \text{volume}$ , not length.  
b)  $L = 5W + 4D + 4H$  measures  $5\text{cm} + 4\text{cm} + 4\text{cm} = 13\text{cm} = \text{cm} = \text{length}$ .
2. i) volume      ii) area      iii) area      iv) none  
v) length      vi) volume      vii) volume      viii) length  
ix) none.
- 3) i) measures  $\text{cm}^2$  and so represents an area.
- 4) a) 2      b) 2      c) 1      d) 3      e) 2      f) 2  
g) 3      h) 1      i) 2      j) 3.