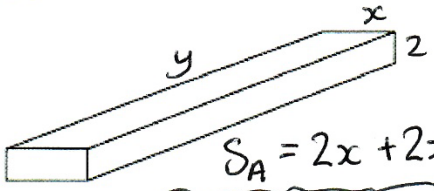
Quadratic Questions

Example and Explanation

Q3.

A solid cuboid has a volume of 40 cm^3
The cuboid has a total surface area of 100 cm^2
One edge of the cuboid has length 2 cm.



Find the length of a diagonal of the cuboid.
Give your answer correct to 3 significant figures.

Volume $= 2xy = 40$

Eliminate y $\Rightarrow \therefore \quad y = \frac{40}{2x} = \frac{20}{x}$

Surface Area, S_A

$S_A = 2x + 2x + 2y + 2y + xy + xy$

Substitute $y = \frac{20}{x}$

$S_A = 4x + 4y + 2xy = 4x + \frac{80}{x} + 2x\left(\frac{20}{x}\right) = 4x + \frac{80}{x} + 40 = 100$

$\Rightarrow 4x + \frac{80}{x} - 60 = 0$ Try to get the equation so it equals zero.

x by x

$\Rightarrow 4x^2 + 80 - 60x = 0x \quad = 4x^2 - 60x + 80 = 0$

Using the quadratic formula ... $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

This is a quadratic equation! Hooray!!

$x = \frac{-(-60) \pm \sqrt{3600 - 4(4)(80)}}{2(4)} = \frac{60 \pm \sqrt{3600 - 1280}}{8}$

$\therefore x = \frac{60 \pm \sqrt{2320}}{8} \Rightarrow x = 13.52079729$ or $x = 1.47920271$

To calculate the diagonal

$\sqrt{2^2 + 13.52079729^2 + 1.47920271^2} = 13.74772709$

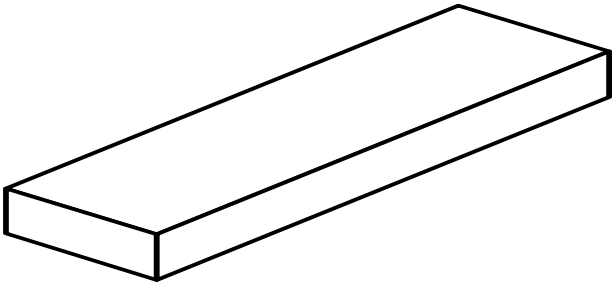
Do not round figures until the very last stage

≈ 13.7 to 3 sig. fig. ..... cm

(Total for question = 6 marks)

Q1

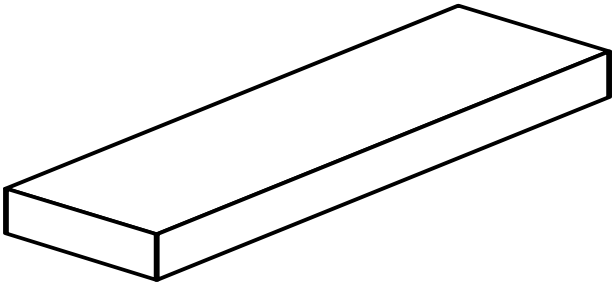
A solid cuboid has a volume of 40 m^3.
The cuboid has a total surface area of 100 m^2.
One edge of the cuboid has a length of 2 m.



Find the length of a diagonal of the cuboid.
Give your answer to 3 significant figures.

Q2

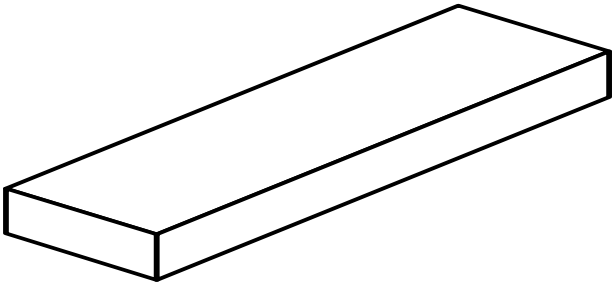
A solid cuboid has a volume of 126 mm^3.
The cuboid has a total surface area of 162 mm^2.
One edge of the cuboid has a length of 3 mm.



Find the length of a diagonal of the cuboid.
Give your answer to 3 significant figures.

Q3

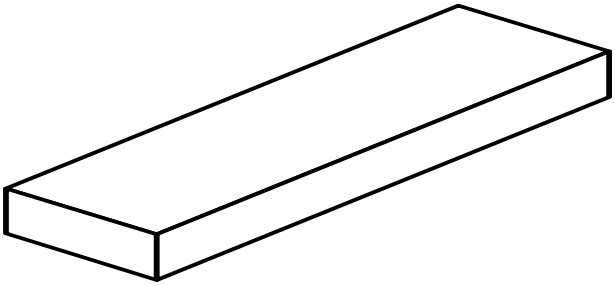
A solid cuboid has a volume of 705 cm^3.
The cuboid has a total surface area of 506 cm^2.
One edge of the cuboid has a length of 5 cm.



Find the length of a diagonal of the cuboid.
Give your answer to 3 significant figures.

Q4

A solid cuboid has a volume of 1440 cm^3.
The cuboid has a total surface area of 824 cm^2.
One edge of the cuboid has a length of 9 cm.



Find the length of a diagonal of the cuboid.
Give your answer to 3 significant figures.

Knowledge Test

Write the formula for calculating the volume of the following prisms.