Part (c)

Game plan: Find the cuboid's internal diagonal. It is a diameter of the sphere, so halve it to get the radius.

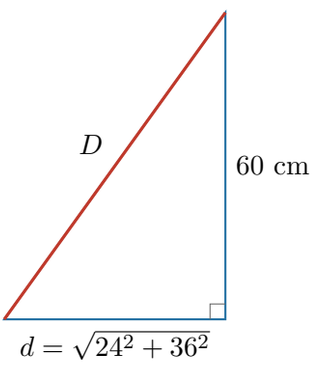
Step 1: Find the diagonal across the base

Let d be the diagonal of the 24 cm by 36 cm base.

$$d^2 = 24^2 + 36^2 = 1872.$$

Step 2: Include the third dimension

The internal diagonal D forms a right-angled triangle with d and the 60 cm edge.



A diagonal cross-section through the cuboid

$$\begin{aligned} D^2 &= d^2 + 60^2 = 1872 + 3600 = 5472, \\ D &= \sqrt{144 \times 38} = 12\sqrt{38}, \\ r &= \frac{D}{2} = 6\sqrt{38}. \end{aligned}$$

The centre of the cuboid is equally far from all eight vertices, so it is also the sphere's centre. Opposite vertices therefore lie at opposite ends of a diameter.

Step 3: Find the sphere's volume

Sphere volume — Logbook p. 10

$$V = \frac{4}{3}\pi r^3.$$

$$\begin{aligned} V &= \frac{4}{3}\pi(6\sqrt{38})^3 \\ &= \frac{4}{3}\pi\,(216)(38)\sqrt{38} \\ &= 10\,944\sqrt{38}\,\pi. \end{aligned}$$

Final Answer

$\mathbf{10\,944\sqrt{38}\,\pi\ cm^3}$.