

5.

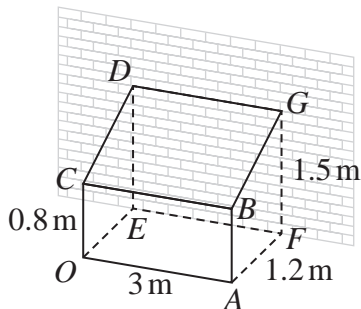


Figure 2

Figure 2 shows a sketch of a shelter against a wall. The shelter consists of two rectangular wooden boards, $OABC$ and $BCDG$, which can be modelled as parts of planes. Board $OABC$ is vertical and parallel to the wall and the ground may be assumed to be horizontal.

The points E and F are at the foot of the wall directly below D and G respectively.

The length OC is 0.8 m, the length OA is 3 m and the board $OABC$ is 1.2 m away from the wall. The points D and G are 1.5 m above the ground.

To model the shelter, take O as the origin, the vector \mathbf{i} to be 1 m in the direction of \vec{OA} , the vector \mathbf{j} to be 1 m in the direction of \vec{OE} and the vector \mathbf{k} to be 1 m in the direction of \vec{OC} .

(a) Find an equation of the plane $BCDG$, giving your answer in the form $\mathbf{r} \cdot \mathbf{n} = d$ (5)

In order to support the roof of the shelter, one end of a pole is attached to the ground at the centre of the rectangle $OAFE$ and the other end to a point on the roof. Modelling the pole as a rod,

(b) find, to the nearest mm, the shortest possible length for the pole. (3)

(c) State a limitation of the assumption that the boards can be modelled as planes. (1)