Answers must be written within the answer boxes provided. Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Solutions found from a graphic display calculator should be supported by suitable working. For example, if graphs are used to find a solution, you should sketch these as part of your answer. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

1. [Maximum mark: 5]

The front view of a doghouse is made up of a square with an isosceles triangle on top. The doghouse is $1.35\,\text{m}$ high and $0.9\,\text{m}$ wide, and sits on a square base.

diagram not to scale
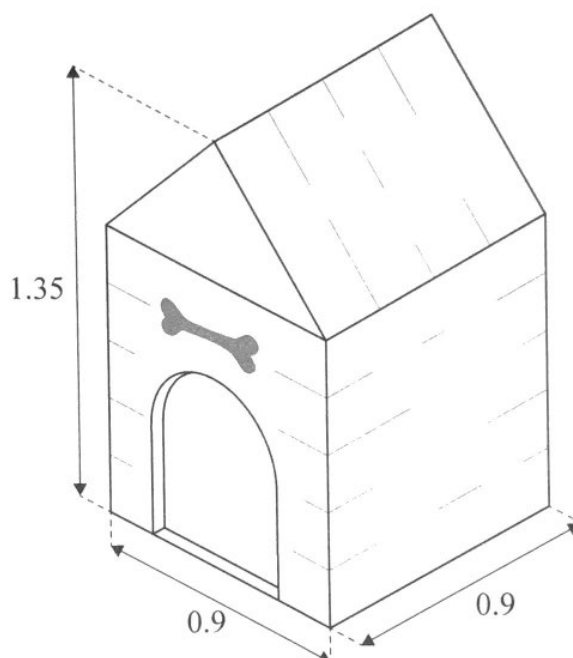
The top of the rectangular surfaces of the roof of the doghouse are to be painted.

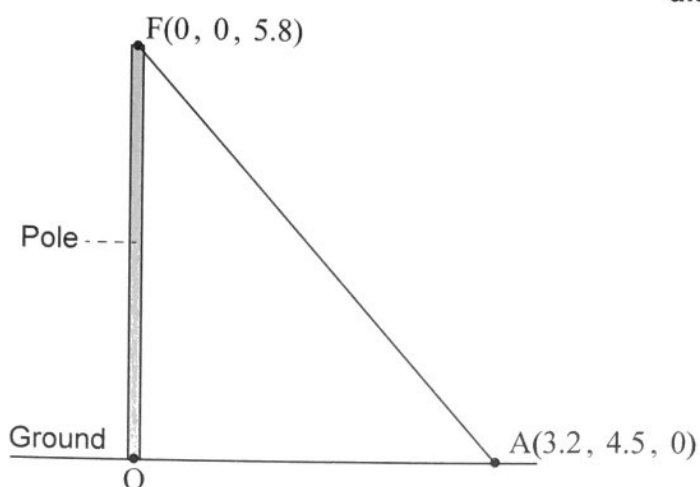Find the area to be painted.

(This question continues on the following page)

2. [Maximum mark: 4]

A vertical pole stands on horizontal ground. The bottom of the pole is taken as the origin, O, of a coordinate system in which the top, F, of the pole has coordinates $(0, 0, 5.8)$. All units are in metres.

diagram not to scale

F(0, 0, 5.8)

Pole

Ground

O

A(3.2, 4.5, 0)

The pole is held in place by ropes attached at F.

One of the ropes is attached to the ground at a point A with coordinates $(3.2, 4.5, 0)$. The rope forms a straight line from A to F.

(a) Find the length of the rope connecting A to F. [2]

(b) Find FÂO, the angle the rope makes with the ground. [2]

3. [Maximum mark: 5]

The height of a baseball after it is hit by a bat is modelled by the function

$$h(t) = -4.8t^2 + 21t + 1.2$$

where $h(t)$ is the height in metres above the ground and t is the time in seconds after the ball was hit.

(a) Write down the height of the ball above the ground at the instant it is hit by the bat. [1]

(b) Find the value of t when the ball hits the ground. [2]

(c) State an appropriate domain for t in this model. [2]

Turn over

4. [Maximum mark: 7]

Three towns, A, B and C are represented as coordinates on a map, where the x and y axes represent the distances east and north of an origin, respectively, measured in kilometres.

Town A is located at $(-6, -1)$ and town B is located at $(8, 6)$. A road runs along the perpendicular bisector of [AB]. This information is shown in the following diagram.

diagram not to scale
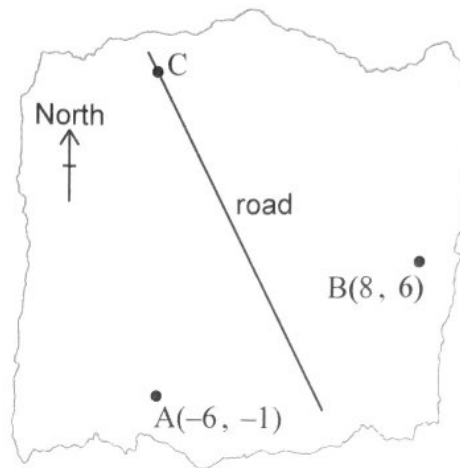
(a) Find the equation of the line that the road follows. [5]

Town C is due north of town A and the road passes through town C.

(b) Find the y-coordinate of town C. [2]