

Burglar Alarm Investigation

You need the following information before you start



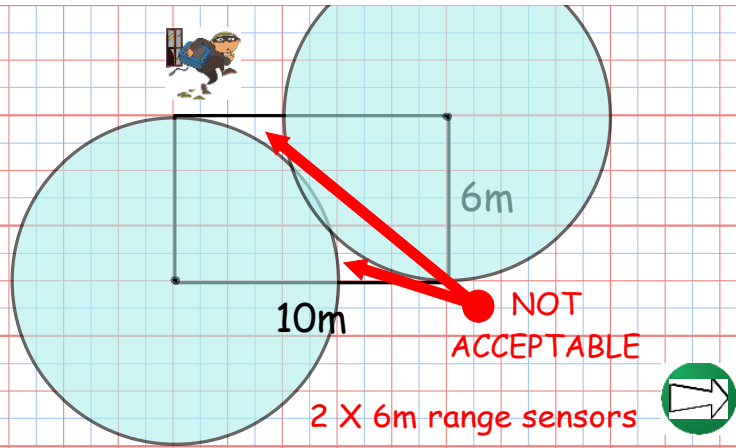
range of sensor	cost of sensor
6m	£125 each
5m	£80 each
4m	£58 each
3m	£41 each

All sensors must be fixed to a wall,
NOT to the ceiling.

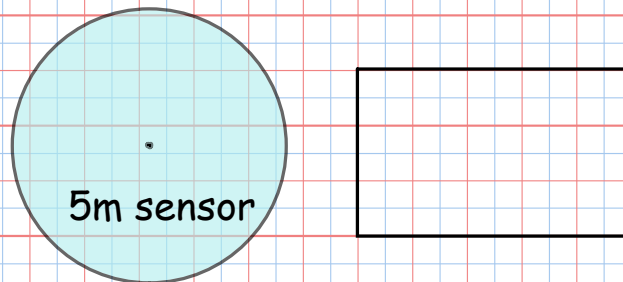


Teacher Notes

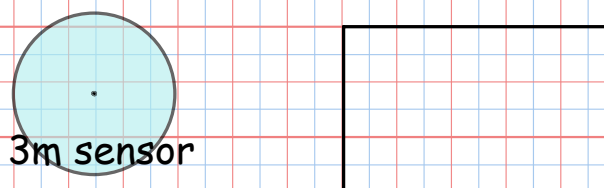
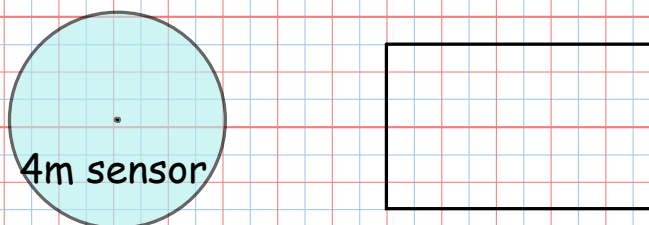


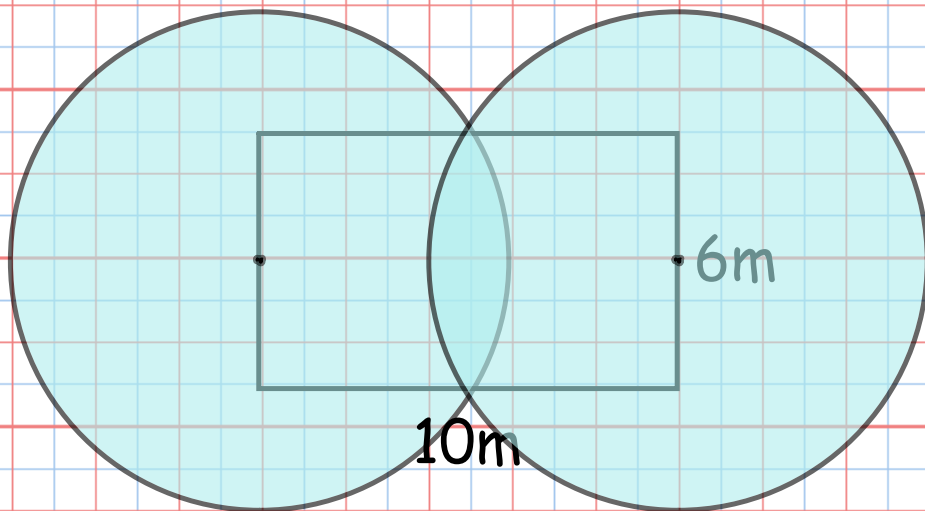


There can not be a single gap, no matter how small or where it is in the room.
(remember Mission Impossible!!!)



Do the same thing using 4m sensors then 3m sensors to find which type of sensor will cover the room for the least amount of money. At the moment you can not mix different range sensors.





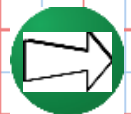
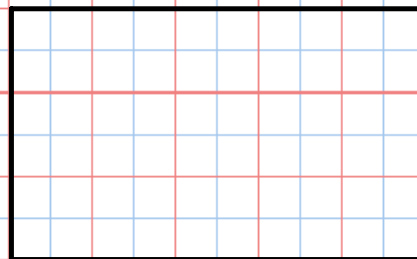
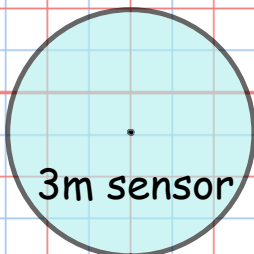
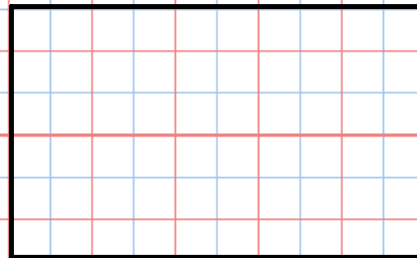
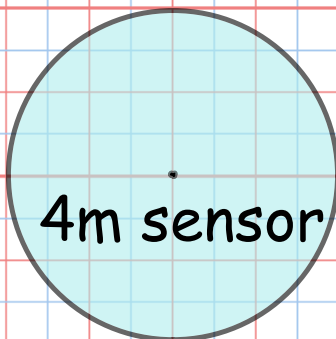
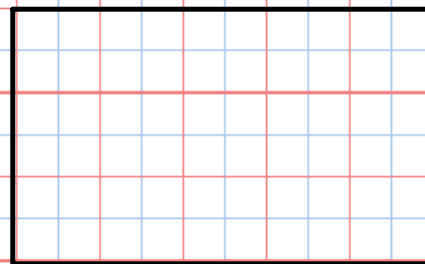
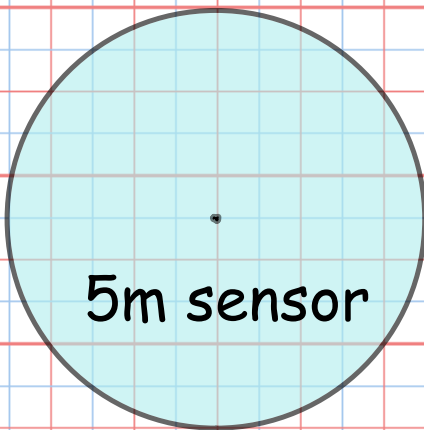
This arrangement is OK so to cover the whole of a 10m by 6m room you would need 2 X 6m range sensors.

At £125 each, the cost of covering the whole room (no gaps **anywhere**) will be

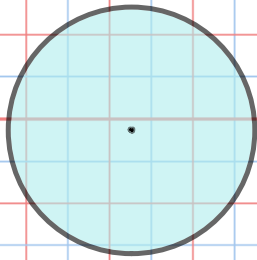
$$2 \times £125 = \text{£}250$$



Using accurate scale drawing and only one type of sensor find the least expensive way of covering the whole room.

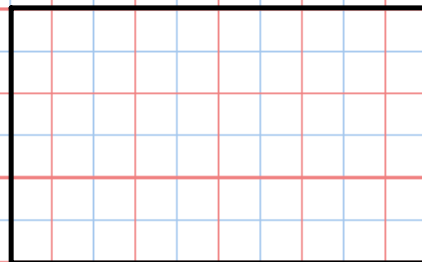


You can now use any mix of different sensors to cover the room in the cheapest way.

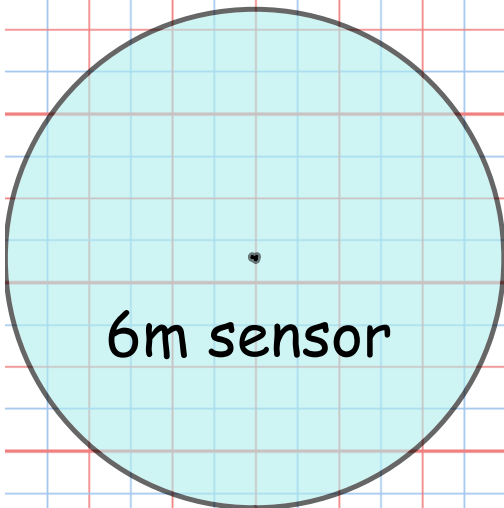


3m sensor

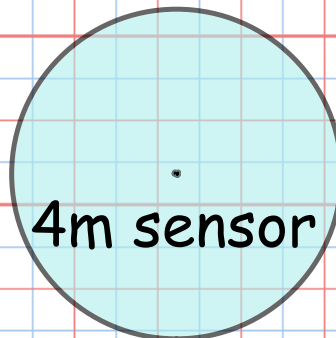
10m



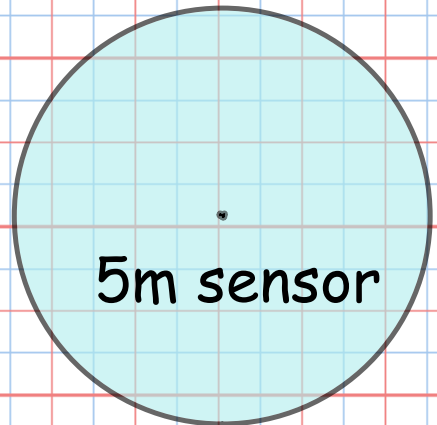
6m



6m sensor



4m sensor

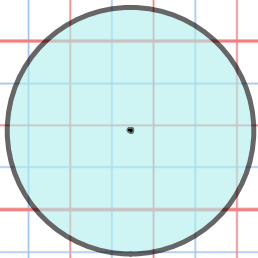


5m sensor

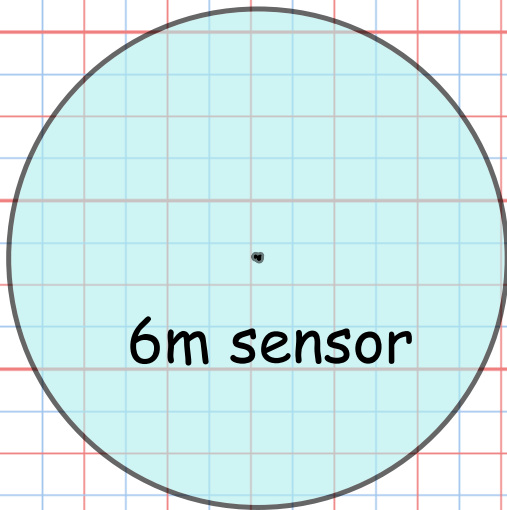
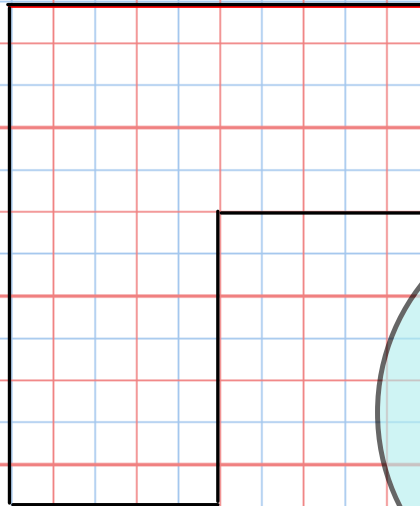


EXTENSION 1

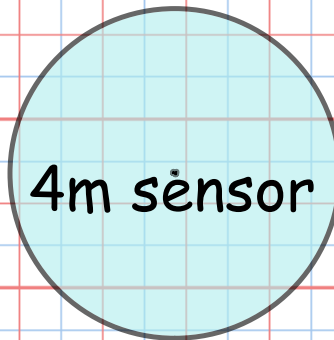
Use any mix of different sensors to cover this room in the cheapest way.



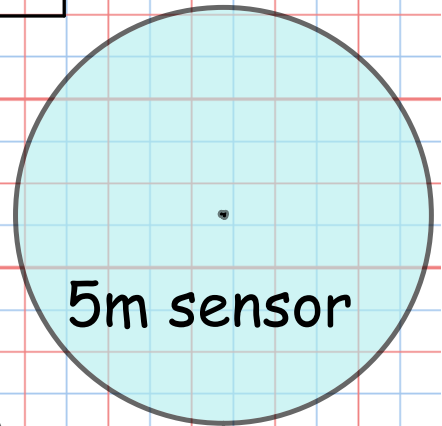
3m sensor



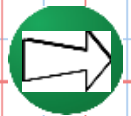
6m sensor



4m sensor



5m sensor



EXTENSIONS 2, 3 & 4

2. Tricky extension.

Find the largest square room you can cover with 4 X 3m range sensors if the sensors still have to be fixed to a wall.

3. Seriously tricky extension.

Find the largest square you can cover with 4 X 3m range sensors if the sensors can be anywhere in the square.

4. Seriously Seriously tricky extension.

Find a way to calculate the biggest square from four circles of radius r .

Teacher Notes

TOPIC - LOCI

This activity is suitable for a range of abilities.

The main part of the activity involves accurate scale drawing of circles and some simple multiplication.

The extension work starts with some similar but more challenging scale drawing but needs Pythagoras to get an accurate solution.

The final extension is for the most able students.

There are two ways of approaching this activity, dependent upon the ability of the students.

a) a simple trial and improvement technique

b) a more sophisticated method swinging out arcs from key points where the walls and the circles intersect to maximise the coverage of each sensor and identify the position of the next sensor.

Accuracy of the scale drawing is paramount, if the students change the setting of their compasses they may not discover that you need an infinite number of 3m sensors to cover the 10X6 room!!!!!!!!!!!!!!!!!!!!

Extension 3 Pythagoras holds the solution.

Extension 4 is for able students only.