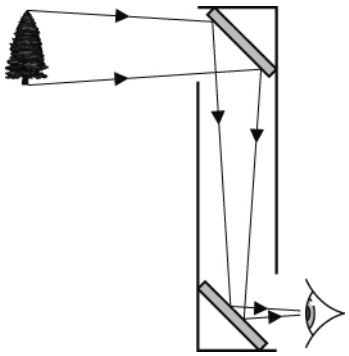
The diagram shows the path of two rays of light from a tree. The tree is being viewed through a periscope.



1 Explain why the image of the tree that the person sees is upright (the right way up).

2 The diagram is a model to help us to think about what is happening when we look through a periscope. The diagram shows only two rays of light coming from the tree.

Explain why only two rays are drawn.

3 You look at two trees of the same height (without a periscope). One is twice as far away from you as the other.

Draw a ray diagram to show why the more distant tree looks smaller. (*Hint*: the size an object appears to be depends on the angle at which rays of light meet at your eye.)

The image in a mirror is the same distance behind the mirror as the object is in front.

4 Sketch a copy of the periscope diagram.

a Mark on your diagram where the image of the tree would be if you looked directly into the top mirror.

b The image you see in the bottom mirror is a reflection of the image in the top mirror. Mark on your diagram where this image is.

5 Use the diagram you drew for question 4 to help you to explain these statements:

a The image of the tree you see through the periscope is further away than the tree itself.

b If you make a periscope with a longer tube, the image you see through it will be smaller.

Periscopes can be used at sporting events to help people to see over the heads of other spectators. They are also used in tanks and submarines.

6 Suggest why periscopes are useful in tanks and in submarines.

7 Suggest why the periscopes in submarines need to include lenses to help to magnify the image.

I can…

- use ray diagrams to explain some of the features of images in periscopes.