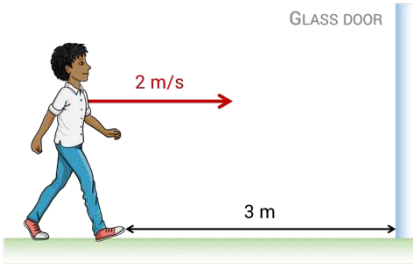
0 1 Joe is walking towards a glass door at 2 m/s. He is 3 m from the door at the moment shown in the below diagram.



0 1 . 1 Explain the meaning of the term **virtual image**.

An image which is formed by light rays which appear [1] to diverge from a point [1]. A virtual image cannot be projected onto a screen.

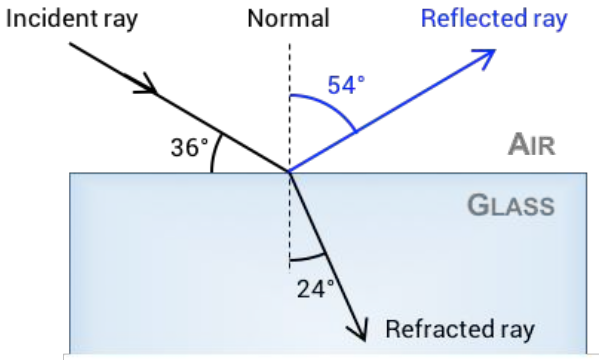
0 1 . 2 How far is Joe from his virtual image?

3 + 3 = **6 m** (his virtual image *appears* to be 3 m behind the mirror)

0 1 . 3 If he continues walking at this velocity until he reaches the door, how long will it be before he is standing directly beside his virtual image?

t = s ÷ v = 3 ÷ 2 = **1.5 seconds**

0 2 A light ray is incident from air onto a glass block, as shown below. At the boundary, the ray is **partially reflected** and **partially transmitted**.



0 2 . 1 What is a **normal**?

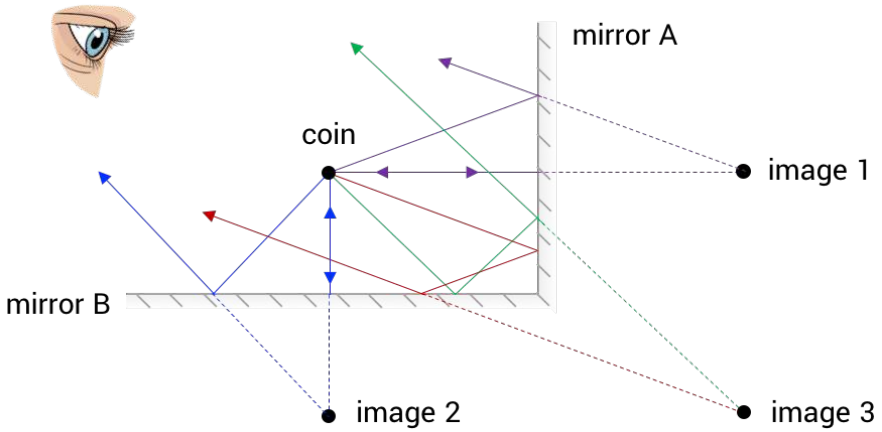
An (imaginary) line [1] which is at right angles / perpendicular / at 90° to a surface [1].

0 2 . 2 Draw the **reflected ray** onto the above diagram, then calculate the angle of reflection of this ray from the glass block.

Angle of reflection = 90 – 36 = **54°**

0 3

Jenny sets a coin in front of two mirrors which are at right angles to one another, as shown in the below diagram. She then looks towards the mirrors and sees that more than one virtual image of the coin has been produced.



0 3 . 1

How many **virtual images** of the coin will she see?

Answer = **3**

- **Image 1** is formed by the light rays reflected from mirror A
- **Image 2** is formed by the light rays reflected from mirror B
- **Image 3** is formed by the light rays which are reflected *once* by one of the mirrors, then *again* by the other one

0 3 . 2

By drawing suitable light rays onto the above diagram, mark the locations of the images of the coin which are produced in the mirrors.

This is (in my humble opinion) by far the most difficult question you could possibly be asked on this topic. The example which is shown in the video (within the 'image of an object formed in a plane mirror' section) is much more likely to come up in your exam, but this could come up in theory, which is why it's included here.

The **purple rays** show the light which is reflected from mirror A to form image 1, and the **blue** rays show the light which is reflected from mirror B to form image 2. If you got both of those, you would have picked up 4 of the 6 marks available here.

The **red** and **green** rays have been reflected from one mirror first, then from the other. The *second* reflected **red** and **green** rays are extended behind the mirrors (using the dotted 'virtual' rays) to mark the position of image 3. Understand this paragraph and the 6 marks (and quite possibly the Grade 9) are yours!