

Exercise walk-through

Images Formed by Mirrors ■ 13.2

eXercise

You must be able to

- use ray diagrams to locate images from **plane** and **curved mirrors** 曲面镜
- apply the **mirror equation** 镜面公式 $\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}$
- describe an image as real or virtual, upright or inverted, and find its **magnification** 放大率

Method — The mirror equation

$\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}$, where s_o is the object distance, s_i the image distance, and f the focal length.

Method — Magnification

$$m = -\frac{s_i}{s_o} \text{ — a negative } m \text{ means inverted.}$$

Method — Real or virtual

A positive s_i is a **real** image (in front, inverted); a negative s_i is a **virtual** image (behind, upright), as with a plane mirror.

Practice 2.1 ■ 2 marks

An object is 20 cm from a concave mirror of focal length 10 cm. Find the image distance.

Solution 2.1

Method: The mirror equation

Worked steps

$$\frac{1}{s_i} = \frac{1}{10} - \frac{1}{20} = \frac{1}{20} \Rightarrow s_i = 20 \text{ cm} \quad \text{M1} \quad \text{A1}.$$

Practice 2.2 ■ 1 mark

State whether a plane mirror forms a real or a virtual image.

Solution 2.2

Method: Real or virtual

Worked steps

virtual **B1**.

Practice 2.3 ■ 2 marks

Find the magnification when $s_i = 15$ cm and $s_o = 30$ cm.

Solution 2.3

Worked steps

$$m = -\frac{s_i}{s_o} = -\frac{15}{30} = -0.5 \quad \text{M1 A1}.$$

Exam-style 3.1 ■ 1 mark

The mirror equation is

A $\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}$

B $s_o + s_i = f$

C $s_o s_i = f^2$

D $s_i - s_o = f$

Solution 3.1

Method: The mirror equation

A $\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}$



B $s_o + s_i = f$

C $s_o s_i = f^2$

D $s_i - s_o = f$

Worked steps

A.

Exam-style 3.2 ■ 1 mark

A virtual image formed by a mirror is

- A** in front of the mirror and inverted
- B** behind the mirror and upright
- C** always at the focus
- D** always larger than the object

Solution 3.2

Method: Real or virtual

A in front of the mirror and inverted

B behind the mirror and upright



C always at the focus

D always larger than the object

Worked steps

B.

Exam-style 3.3 ■ 3 marks

An object is placed 24 cm from a concave mirror of focal length 8.0 cm.

- (a) Find the image distance.
- (b) State whether the image is real or virtual.

Solution 3.3

Method: The mirror equation

Worked steps

$$(a) \frac{1}{s_i} = \frac{1}{8.0} - \frac{1}{24} = \frac{3-1}{24} = \frac{1}{12} \Rightarrow s_i = 12 \text{ cm} \quad \text{M1} \quad \text{M1} \quad \text{A1}. \quad (b) \text{ real } (s_i > 0) \quad \text{B1}.$$