# Lenses and Mirrors Equations Worksheet

Level: GCSE / A-Level / AP Physics 2 | Difficulty: Intermediate | Topic: Waves & Optics

Practice with 10 problems on the thin lens equation, mirror equation, magnification, and image formation. Full worked solutions included.

## Equations you will need

| | |
|---|---|
| **1/f = 1/u + 1/v** | Thin lens / mirror equation |
| **M = -v/u** | Magnification (linear) |
| **M = h_i / h_o** | Magnification from image and object height |
| **P = 1/f** | Lens power |

## Symbol key

| Symbol | Quantity | Unit |
|---|---|---|
| f | focal length | m |
| u | object distance | m |
| v | image distance | m |
| M | magnification | dimensionless |
| h_o | object height | m |
| h_i | image height | m |
| P | power | D (dioptres) |

## Practice problems

1. Object 30 cm from a converging lens with f = 10 cm. Find image distance.

2. Same setup: find magnification.

3. A 5 cm tall object 20 cm from a lens, f = 15 cm. Find image height.

4. Find focal length of a lens with power +2.5 D.

5. Object 12 cm from a concave mirror with f = 20 cm. Find v.

6. A converging lens (f = 8 cm) forms an image at 24 cm. Find the object distance.

7. A diverging lens with f = -10 cm: object at 15 cm. Find image position.

8. Object at f (focal point) of a converging lens. Where is image?

9. Magnifying glass: object 4 cm from f = 8 cm lens. Find magnification.

10. A camera lens with f = 50 mm photographs an object 2 m away. Find image distance.

# Answer key

Full worked solutions for each problem.

1. 1/10 = 1/30 + 1/v -> v = 15 cm
2. M = -15/30 = -0.5 (inverted, reduced)
3. 1/15 = 1/20 + 1/v -> v = 60 cm; M = -3; h_i = -15 cm (inverted)
4. f = 1/P = 0.4 m = 40 cm
5. 1/20 = 1/12 + 1/v -> v = -30 cm (virtual, behind mirror)
6. 1/8 = 1/u + 1/24 -> u = 12 cm
7. -1/10 = 1/15 + 1/v -> v = -6 cm (virtual)
8. Image at infinity (parallel rays)
9. 1/8 = 1/4 + 1/v -> v = -8 cm; M = -(-8)/4 = 2 (upright, virtual, enlarged)
10. 1/0.05 = 1/2 + 1/v -> v = 0.0513 m = 51.3 mm