Laws of Reflection

To hit a hidden target with a laser and a mirror you need 2 rules: i = r (both measured from the normal) and all three rays in one plane.

Name: Date: Score: ____ / 19

A. Fill in the blanks

1. First law: angle of incidence = angle of ____.

2. Angles are measured from the ____, not from the surface.

3. The incident ray, normal and reflected ray lie in the same ____.

4. A ray along the normal returns along ____.

B. True or False

5. i = r for every reflection at a mirror. True / False

6. The angle of incidence is measured from the mirror surface. True / False

7. A ray hitting a mirror at 90° to the surface reflects back on itself. True / False

8. The reflected ray can leave the plane of incidence. True / False

C. Assertion and reason

9. Assertion (A): A ray falling along the normal retraces its path.
Reason (R): For i = 0°, r = 0°.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

10. Assertion (A): Angle of incidence is measured from the mirror surface.
Reason (R): The normal is perpendicular to the mirror.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

D. Choose the correct option

11. A ray makes 30° with the mirror surface. Angle of reflection:

(a) 30°
(b) 60°
(c) 90°
(d) 0°

Answer: _____

12. If i = 45°, the angle between incident and reflected rays is:

(a) 45°
(b) 90°
(c) 180°
(d) 0°

Answer: _____

13. The normal is:

(a) along the mirror

(b) perpendicular to the mirror at the point of incidence

(c) the reflected ray

(d) a light ray

Answer: _____

14. Which law says the three rays lie in one plane?

(a) first

(b) second

(c) third

(d) none

Answer: _____

E. Numerical problems

15. A ray strikes a plane mirror at 35° to the surface. Find the angle of incidence, angle of reflection and the angle between incident and reflected rays.

16. The angle between the incident and reflected rays is 70°. Find the angle of incidence and the angle the ray makes with the mirror.

F. Short answer questions

17. State the two laws of reflection.

18. A ray strikes a mirror at 25° to the surface. Find i and r.

G. Match the columns

19. Match each item in Column A with the correct item in Column B.

Column A	Column B	Your answer
1. i = r	(a) First law	1 → ____
2. Same plane	(b) Second law	2 → ____
3. Perpendicular at point of incidence	(c) Ray returns on itself	3 → ____
4. i = 0	(d) Normal	4 → ____

Detailed solutions

1. reflection

2. normal

3. plane

4. itself

5. True. First law of reflection.

6. False. It is measured from the normal.

7. True. Then i = 0.

8. False. Second law: all three lie in one plane.

9. (a) The first law gives r = i = 0.

10. (d) A is false (measured from the normal); R is true.

11. (b) 60°. i = 90° − 30° = 60° = r.

12. (b) 90°. i + r = 90°.

13. (b) perpendicular to the mirror at the point of incidence. Definition.

14. (b) second. The second law.

15. Angle of incidence i = 90° − 35° = 55°; Angle of reflection r = i = 55°; Angle between the rays = i + r = 110°. **Answer: 55°, 55°, 110°**

16. i + r = 70° and i = r, so i = 35°; Angle with mirror = 90° − 35° = 55°. **Answer: i = 35°; 55° with the mirror**

17. 1. The angle of incidence equals the angle of reflection. 2. The incident ray, the normal at the point of incidence and the reflected ray lie in the same plane.

18. i = 90° − 25° = 65°; r = 65°.

19. 1 → (a), 2 → (b), 3 → (d), 4 → (c). Always measure from the normal.