

Part A: Light Reflection

1. What is a luminous object? Give three examples.

2. How is it possible that we can see non-luminous objects if they're not actually producing any light of their own? Explain using text and a diagram.

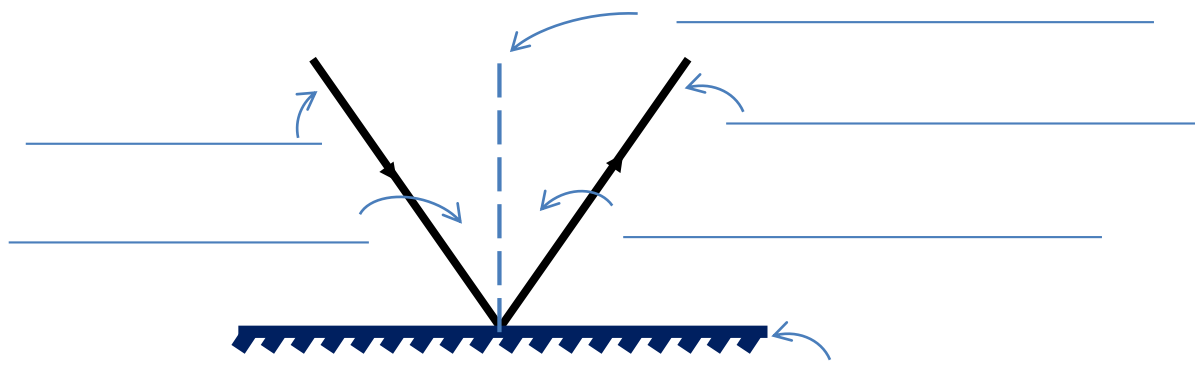
3. Write down three things that can happen to light when it strikes something.

(a) _____

(b) _____

(c) _____

4. Label the following diagram.



5. How does the angle of incidence of a light ray compare with its angle of reflection?

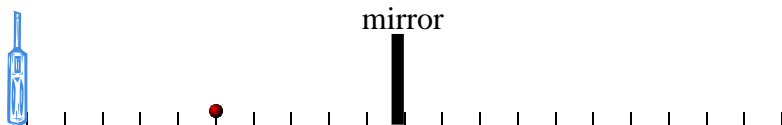
6. What is the difference between specular reflection and diffuse reflection? Give an example of where each occurs. As well as giving an explanation, draw diagrams.

Part B: Reflection in Flat Mirrors (flat mirrors are often called “plane” mirrors)

7. If your face is 20cm from a flat mirror, what is the location of your face's image?

Part C: The Virtual-3D Mirror World.

8. If a small ball is placed 50cm from a mirror and a bat is placed 1m from the mirror, where would their images appear? Draw the image of the ball and the bat in the appropriate locations.



9. What is a virtual image?

Part D: Seeing Virtual 3D in Mirrors

10. Why do we have two eyes?

11. State three **other** ways by which we judge distance.

(i) _____

(ii) _____

(iii) _____

12. How, if at all, is our ability to see in 3D affected when we look into a mirror?

13. On the moon, the astronauts (who all had excellent vision) could accurately judge how far away nearby objects were and go about their business, but they had difficulty determining how far distant objects were. Why?

Part E: Other Attributes of Images in Mirrors

14. The image of a given object in a flat mirror is:

(circle each correct attributes of an image produced in a flat mirror and cross out each incorrect attributes)

- i. virtual 2D / virtual 3D
- ii. virtual / real
- iii. the same size as the object / magnified / diminished (which means made smaller)
- iv. upside down / upright (when, as in most cases, the mirror is upright)
- v. closer to the mirror than the object / the same distance to the mirror as the object / further from the mirror than the object

15. The image in a flat mirror is laterally inverted. What does “laterally inverted” mean?

16. The image in a mirror is front-back inverted. What does front-back inverted mean?

17. How do periscopes work? Use a diagram and text.

18. Why isn't the image you see in a periscope laterally inverted or front-back inverted?

19. Why do images in mirrors sometimes appear a little blurry?

20. Describe one way scientists test an animal's ability to recognise itself in a mirror.

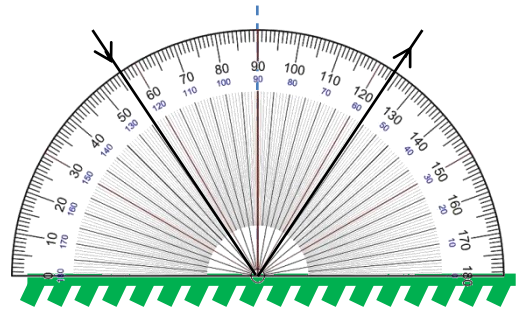
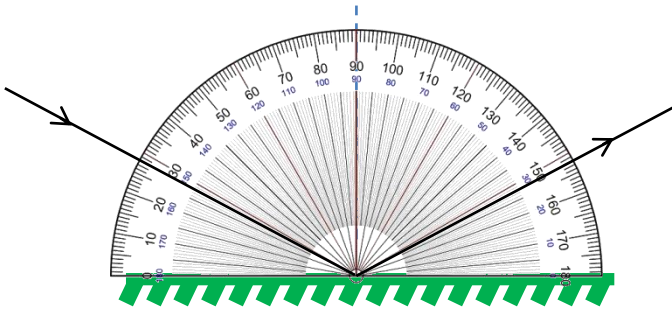
Part F: Creating Illusions with Mirrors.

21. **Explain** the set up of the illusion with the bodiless head on the table. **Create a map** showing the position of the table, the mirror, the presenter and the camera. What was the purpose of the solitary plank of wood that was in the ground in front of the table?

22. Create a map showing the camera position, mirror position and movements of the presenter as he appears with a jump and disappears with a dive.

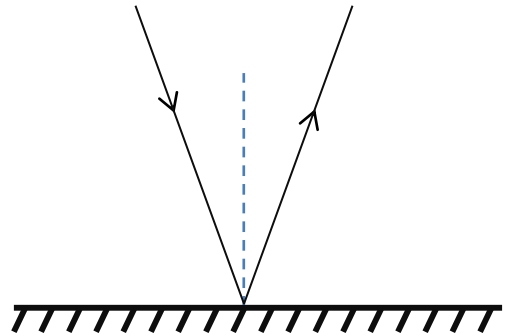
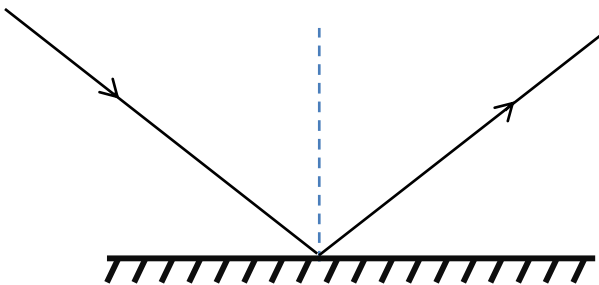
Shedding Light on Reflection: Questions For After The Program.

1. For the light rays below, measure the angles of incidence and the angles of reflection (that is, the angle between the light ray and the normal).



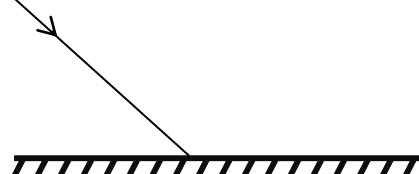
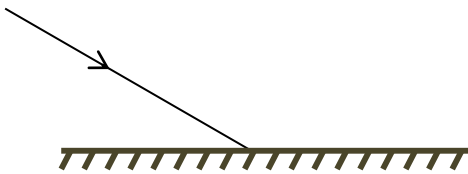
- (i) Angle of incidence = _____ (iii) Angle of incidence = _____
 (ii) Angle of reflection = _____ (iv) Angle of reflection = _____
 (28° is not the answer to any of the above questions)

2. Measure the angles of incidence and the angles of reflection (that is, the angle between the light ray and the normal).



- Angle of incidence = _____ Angle of incidence = _____
 Angle of reflection = _____ Angle of reflection = _____

3. Using a protractor and a ruler, **draw in the normal** (with a dotted line) and **the reflected rays** in the following two situations and **write** the angles of incidence and the angles of reflection.

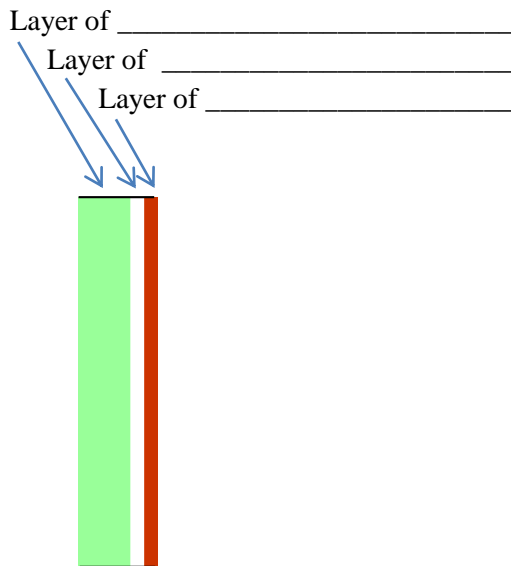


4. Write the words “AMBULANCE” and “FIRE” in mirror writing.

5. What do we mean by 3D and 2D objects (and shapes)? Give 2 examples of each.

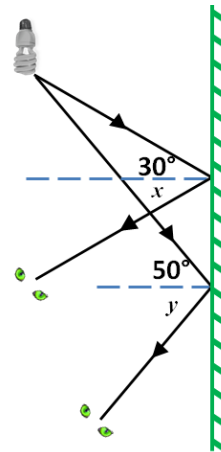
6. How would a periscope be used in a submarine? Draw a diagram of a submarine with a periscope. Show the position of the mirrors.

7. **Label** the diagram of the mirror below and **draw** some ray diagrams which clearly show how light reflects from it.

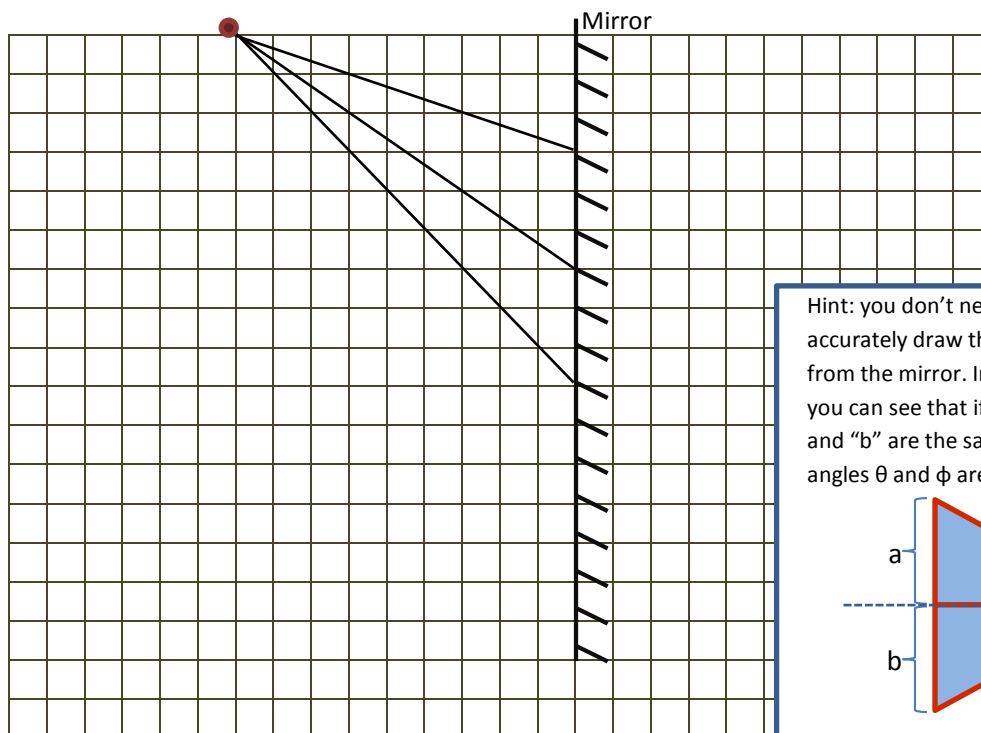


8. **Trace** the reflected light rays back (using dotted lines) to where they appear to be coming from, and then **draw** the light globe's image in its correct location. What are the angles x and y ?

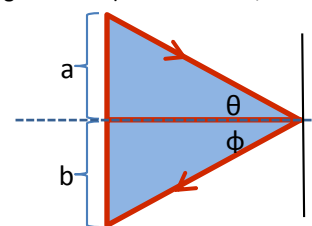
9. $x =$ _____ ; $y =$ _____



10. A small ball sits 90cm from a flat mirror. (a) **Complete** the three light rays coming from the ball which reflect from the mirror. (The grid allows you to draw accurate reflected rays without a protractor) (b) **Trace** the reflected light rays back (using dotted lines) to determine where the image of the ball is located. (c) **Draw** in the image of the ball. (d) How far behind the mirror is the ball's image located? _____

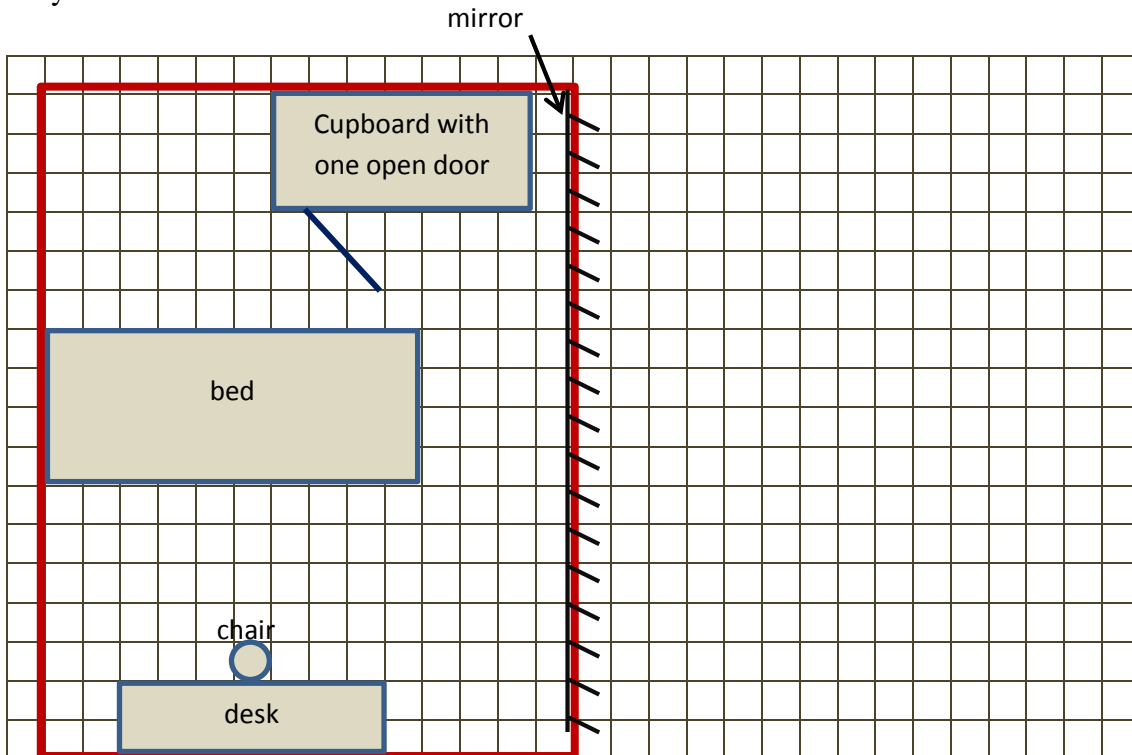


Hint: you don't need a protractor to accurately draw the ray that reflects from the mirror. In the diagram below, you can see that if the two lengths "a" and "b" are the same, then the two angles θ and ϕ are the same, too.

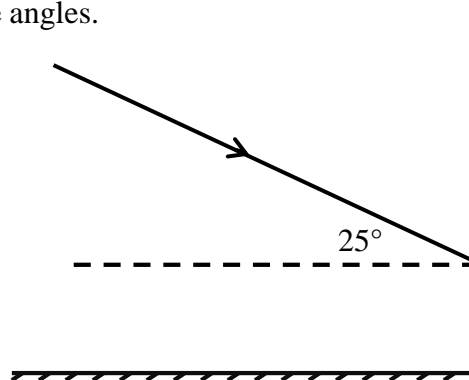


11. How do you think babies learn to recognise themselves in a mirror?

12. A large mirror takes up almost the whole wall of a room. The room is shown from above. **Draw in the furniture and the walls** of the room in the virtual-3D image of the room created by the mirror.



13. If two mirrors are placed exactly at right angles, and a single light ray shines onto the mirrors, complete the path of the light ray and determine its direction of travel after it has reflected off both mirrors. Write in the angles.



14. In Q13, what do you notice about the original incoming ray and the final reflected ray?

15. Activity: Place some dice next to a mirror. Move your position and try to see the dice in the mirror from different angles. How is the image in the mirror different to the 2D image below?

