Seniors' Tuition And Mentorship Program (Semester 2, 2014)
Year 2

2.4: Reflection exercise (physics)

The following questions have been adapted from RI past-year MYCT papers. (Most questions have been edited so that the past-year papers can be used for practice again closer to EOYs.)

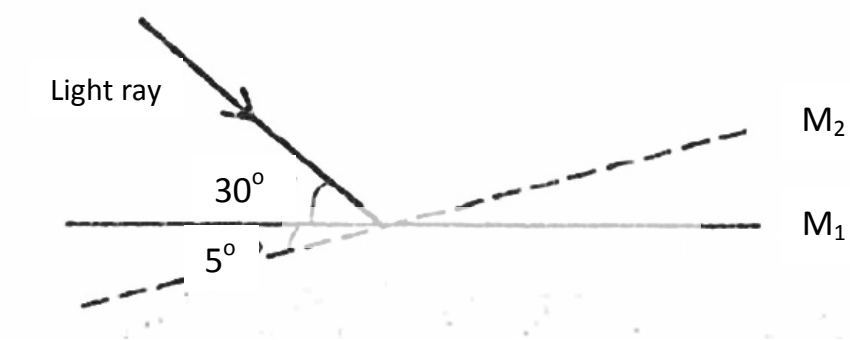
PART A: MCQ QUESTIONS

1. What are the characteristics of an image formed in a plane mirror?
   A Virtual and smaller size
   B Virtual and same size
   C Real and smaller size
   D Real and same size

2. A student stands 3.0 m in front of a plane mirror, facing it. There is a painting 2.0 m directly behind the student. He then walks 2.0 m towards the mirror.

   How far away is the student from the image of the painting formed by the mirror?
   A 3.0 m
   B 4.0 m
   C 5.0 m
   D 6.0 m

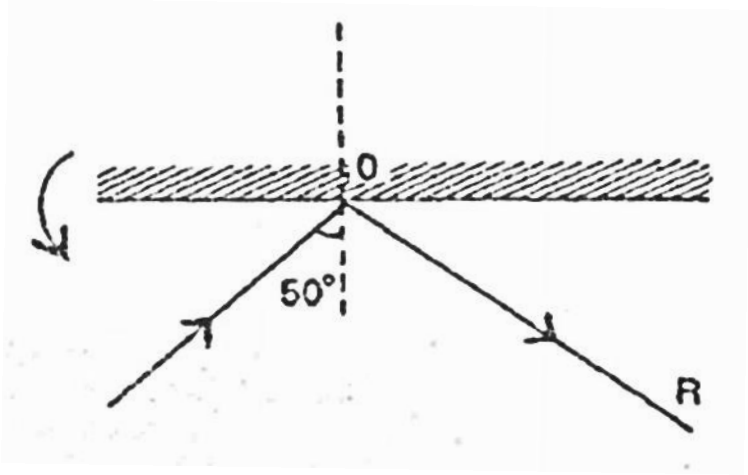
3. A light ray strikes a plane mirror M_1 at an angle of 30^o. The mirror is then rotated through an angle of 5^o to a new position M_2 without changing the position and the direction of the incident ray.



   A 5^o clockwise
   B 5^o anticlockwise
   C 10^o clockwise
   D 10^o anticlockwise

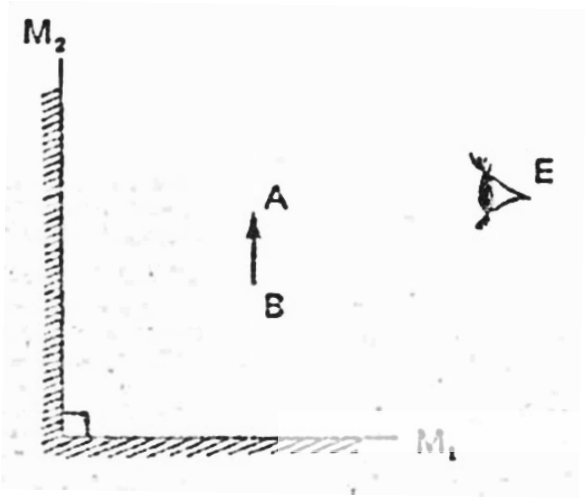
4. A ray of light is incident on a glass mirror as shown and is reflected along OR. If the mirror is rotated in the direction shown for 20^o, the ray will reflect along a new direction OS.

   What is the angle between the reflected ray in the new direction OS and the reflected ray along OR?



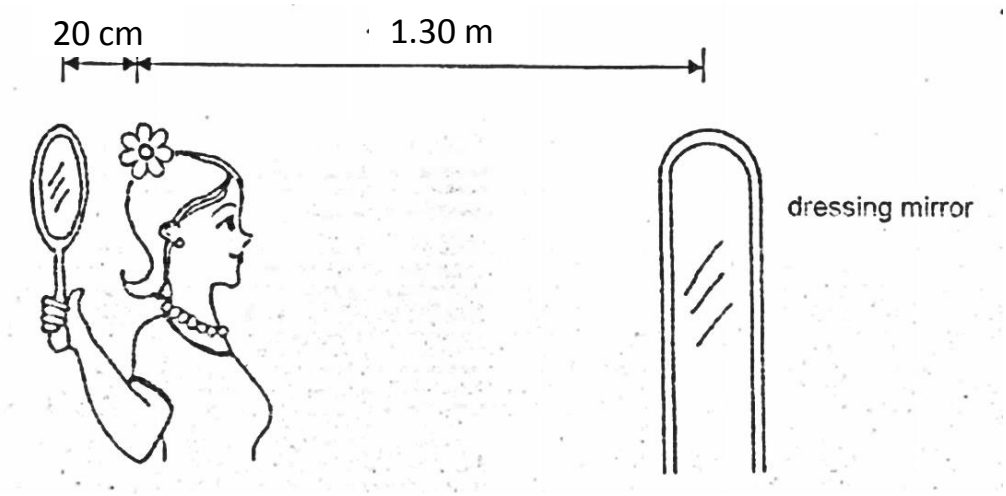
   A 10^o
   B 20^o
   C 40^o
   D 80^o

5. An object AB is placed between two inclined mirrors as shown. An observer E is looking at the image of AB formed by first reflection in M_1 and then in M_2.



   What are the properties of this image?
   A Smaller and laterally inverted
   B Same size and not laterally inverted
   C Same size and laterally inverted
   D Smaller and not laterally inverted

Refer to the following figure for questions 6 and 7.



6. Mary holds a hand plane mirror 20 cm behind her head while standing 1.30 m in front of a dressing mirror as shown. She wears a flower at the back of her head.

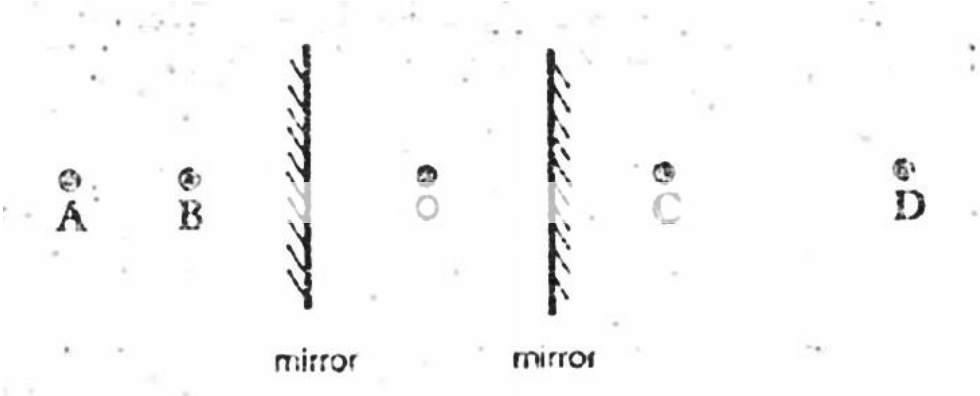
   How far behind the dressing mirror does the image of the flower appear?

   A 0.20 m
   B 1.50 m
   C 1.70 m
   D 3.00 m

7. If Mary is 1.65 m tall and her eyes are 1.6 m above the floor, how high should be bottom of the mirror be from the floor so that she is just able to see her feet?

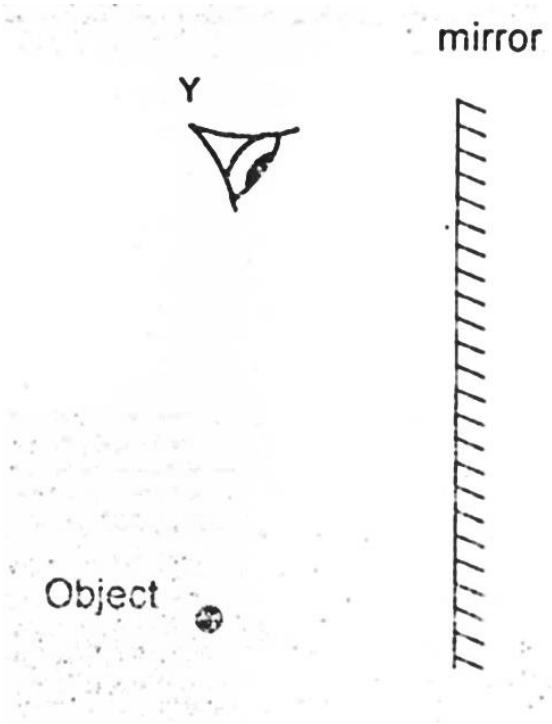
   A 0.20 m
   B 0.60 m
   C 0.80 m
   D 0.83 m

8. An object O is placed between two plane mirrors as shown. At which position A, B, C or D will an image of O not be seen by an observer standing between the two mirrors?

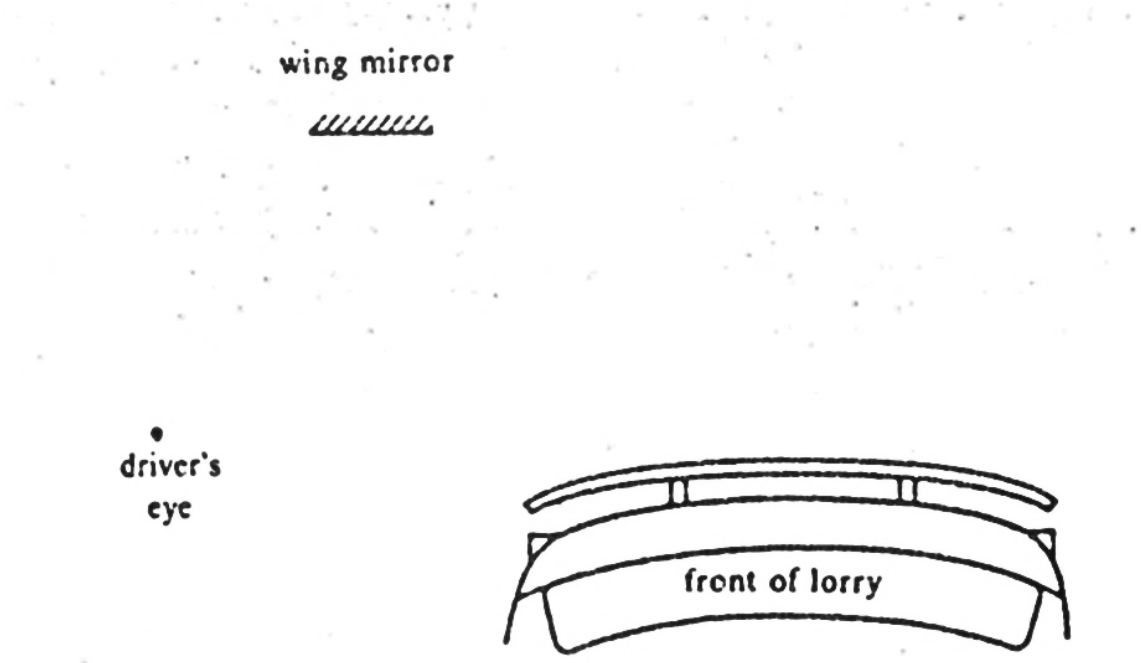


PART B: RAY DIAGRAMS

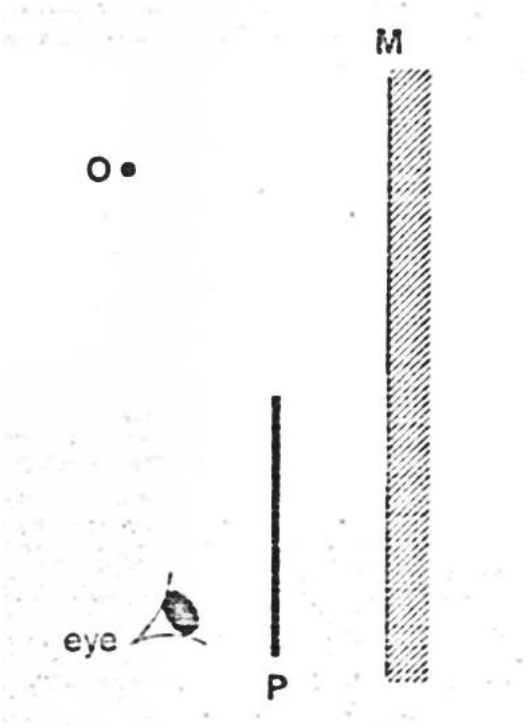
9. An object is placed at a distance away from a mirror as shown in the diagram below. An observer at position Y is able to see the image of the object. Draw accurate two light rays from the object to illustrate how the observer sees this image.



10. The diagram below shows the positions of the wing mirror of the car, the eye of the car driver, and the front of a lorry. Draw accurately two rays to show the maximum part of the lorry that can be seen by the car driver from the wing mirror.

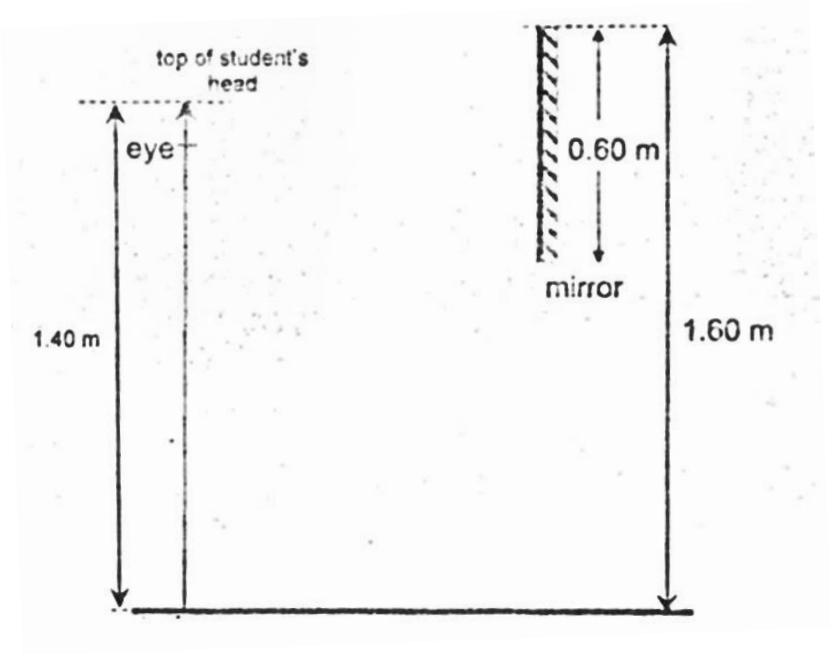


11. In the figure below, M is a mirror and P is an opaque cardboard.
Draw accurately the paths of two light rays to show why the eye cannot see the image of O inside the mirror.
Add to the diagram one more ray (labelled Z) to show where the eye should be moved to so that it can just see the object. (Moved as little as possible.)



PART C: STRUCTURED QUESTIONS/CALCULATIONS

12. A student is 1.40 m tall. He stands in front of a vertical mirror of length 0.60 m. The top of the mirror is 1.60 m above the floor, and the student's eye level is 1.30 m above the floor, as shown in the figure below.



(a) By calculations, determine how much of the student's height can be seen by himself in the mirror.

Height of student that can be seen in mirror = _____

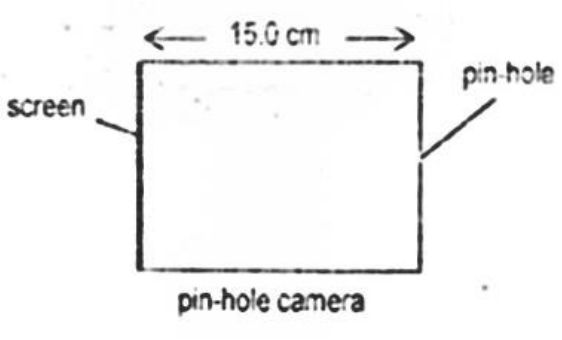
(b) What vertical length of the mirror is useful to the student?

Vertical length of mirror useful = _____

(c) If the boy were to move closer to the mirror, would he be able to see more or less of himself?

_____

13. After their examinations, some students decided to celebrate with a bonfire. A physics teacher was interested in measuring the height of the bonfire however it was too high and too hot to measure directly. Hence the teacher decided to use a pinhole camera (as shown below).



(a) The teacher stood approximately 21 m away from the fire and looked at it using the pin-hole camera. The height of the image formed on the screen of the pin-hole camera was 1.6 cm.
Calculate the actual height of the fire.

Actual height of fire = _____

(b) If the teacher wants an image 2.4 cm high to form on the screen, what distance should the pin-hole be from the fire?

Distance of pin-hole from fire = _____

(c) Describe how the image will change if the size of the pin-hole is increased.

_____

(d) Is the image vertically upright or vertically inverted? What can be inferred about the properties of light from this characteristic?

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