



PHYSICS

BOOKS - MODERN PUBLICATION

REFLECTION OF LIGHT

Example

1. Find the focal length of convex mirror whose radius of curvature is 32 cm.



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2. Find the focal length of

a convex mirror and concave mirror each having radius of curvature of 20 cm.



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3. A concave mirror has a focal length of 20 cm and an object is placed at a distance of 16 cm from it. Find the position of the image formed by it.



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4. A concave mirror has a focal length of 10 cm and an object is placed at a distance of 16 cm from it. Find the position of the image formed by it.



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5. A convex lens of focal length 20 cm is placed at a distance of 24 cm from the screen how far from the lens should an object be placed so as

to form a real image on the screen. Also find the nature and magnification of the image produced.



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6. An object is placed at a distance of 40 cm from a concave mirror of focal length 15 cm. If the object is displaced through a distance of 20 cm towards the mirror, by how much distance is the image displaced.



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7. An object is placed at a distance of 25 cm from a spherical mirror and its image is formed behind the mirror at a distance of 5 cm. Find the focal length of the mirror. Is the mirror concave or convex in nature?



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8. An object is placed at a distance of 36 cm from a convex mirror. A plane mirror is placed in between, so that the two virtual images so

formed coincide. If the plane mirror is at a distance of 24 cm from the object, find the radius of curvature of the convex mirror.



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9. If you sit in a parked car, you glance in the rear view mirror of radius of curvature 2 m and notice a jogger approaching. If the jogger is running at a speed of 5 m s^{-1} , how fast is the image of the jogger moving, when the jogger is 39 m



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10. If you sit in a parked car, you glance in the rear view mirror of radius of curvature 2 m and notice a jogger approaching. If the jogger is running at a speed of 5ms^{-1} , how fast is the image of the jogger moving, when the jogger is 29 m



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11. If you sit in a parked car, you glance in the rear view mirror of radius of curvature 2 m and notice a jogger approaching. If the jogger is running at a speed of 5 m s^{-1} , how fast is the image of the jogger moving, when the jogger is 19 m



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12. If you sit in a parked car, you glance in the rear view mirror of radius of curvature 2 m and

notice a jogger approaching. If the jogger is running at a speed of 5ms^{-1} , how fast is the image of the jogger moving, when the jogger is 9 m away.



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13. A concave mirror of focal length 20 cm and a convex mirror of focal length 15 cm are placed 50 cm apart, such that the two mirrors face each other. An object is placed exactly midway between them. Find the nature and

position of the image formed by reflection first at the concave mirror and then at the convex mirror.



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14. An object is placed in front of a concave mirror of radius of curvature 40 cm at a distance of 10 cm. Find the position and magnification of the image.



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15. An object is placed 15 cm from a convex mirror of radius of curvature 90 cm. Calculate the image position and magnification.



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16. An object is placed in front of a convex mirror of focal length 30 cm. If the image formed is a quarter of the size of the object, find the position of the image.



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17. A square wire of side 3 cm is placed 25 cm away from a concave mirror of focal length 10 cm. What is the area enclosed by the image of the wire? (The centre of the wire is on the axis of the mirror, with its two sides normal to the axis).



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18. An object is kept in front of a concave mirror of focal length 15 cm. The image formed is three times the size of the object. Calculate

two possible distances of the object from the mirror.



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19. An object is kept in front of a concave mirror of focal length 15 cm. The image formed is three times the size of the object. Calculate two possible distances of the object from the mirror.



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20. A motor car is fitted with a convex driving mirror of focal length 20 cm. A second motor car 2 m board and 1.6 m high is 6 m away from the first car.

Calculate the position and size of the image of the second car seen in the mirror of first.



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21. A motor car is fitted with a convex driving mirror of focal length 20 cm. A second motor car 2 m board and 1.6 m high is 6 m away from

the first car.

If the second car is overtaking at a relative speed of 14ms^{-1} , how fast will the image be moving and in what direction?



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22. Out of speed, frequency and wavelength, name the parameters which remain same after reflection?



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23. A ray of light falls on a mirror normally. What are the values of the angle of incidence and the angle of reflection?



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24. A ray of light is incident at an angle 60° on a horizontal plane mirror. Through what angle should the mirror be tilted to make the reflected ray horizontal?



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25. mention any two applications of a plane mirror.



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26. A boy is running towards a plane mirror with a speed of $2ms^{-1}$. With what speed the image of the boy approach him?



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27. What should be the minimum size of a plane mirror to produce full image of a person having height h ?



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28. How can an inverted image of an object be obtained with a plane mirror?



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29. What is the focal length of a plane mirror?



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30. What is the angle of incidence ,when a ray of light falls on the spherical mirror from its centre of curvature?



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31. Define principal focus of a mirror.



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32. Define spherical mirror, centre of curvature, radius of curvature, pole, principal axis and focal length of spherical mirror.



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33. Which spherical mirror is called a divergent mirror-concave or convex?



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34. Suppose that one half of the reflecting surface of a concave mirror is covered with black soot. How will the image of an object placed in front of the mirror be affected?



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35. When does a concave mirror form a virtual image?



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36. Does size of mirror affect the nature of the image?



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37. When does a convex mirror produce a magnified image?



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38. can we obtain the image of an object formed by a convex mirror on the screen?



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39. How can the real image be photographed?



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40. What is the difference between the virtual images produced by concave, plane and

convex mirror?



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41. How is the focal length of a spherical mirror affected, when the wavelength of the light used is increased?



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42. Why is the aperture of a spherical mirror taken as small?



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43. A concave mirror is held inside water. What would be the change in the focal length of the mirror?



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44. Why is a concave mirror preferred to plane mirror for shaving?



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45. Why do we prefer a convex mirror as back view mirror in vehicles?



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46. A concave mirror is used in ophthalmoscope .Why?



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47. You read a newspaper, because of the light that it reflects. Then, why do you not see even a faint image of yourself in the newspaper?



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48. The wall of a room is covered with a perfect plane mirror and two movie films are made, one recording the movement of a man and the other of his mirror image. From viewing the films later, can an outsider tell, which is which?





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49. Does the mirror formula hold good for a plane mirror?



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50. How can you distinguish between a plane mirror , a concave mirror and convex mirror just by looking at them?



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51. is it possible to find wheather a mirror is plane.concave or convex ,from the nature of the image of an object formed by the mirrors?



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52. How will you distinguish between plane mirror,convex and concave mirror without touching ?



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53. A person standing before a concave mirror can not see his image, unless he is beyond the centre of curvature. Explain.



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54. A mobile phone lies along the principal axis of a concave mirror. Show, with the help of a suitable diagram, the formation of its image. Explain, why magnification is not uniform.



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55. Suppose the lower half of the concave mirror's reflecting surface is covered with an opaque material. What effect this will have on the image of the object? Explain.



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56. Which mirror is preferred as a driver's mirror and why?



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57. Which mirror is used as a shaving mirror and why? Explain its working with the help of a ray diagram



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58. Why are mirror is uded in search ligths parabolic and not concave spherical?



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59. A concave mirror of small aperture forms a sharper image. Why?



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60. What is the advantage of using a concave mirror (in place of convex lens) as objective in a telescope?



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61. It is difficult to see through a closed glass window from the inside of a well lighted room, when it is dark outside. However, it becomes relatively easy to see outside, when the lights in the room are switched off. Explain.



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62. What is the minimum size of the plane mirror, in which a man can see his full height? Explain.





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63. A plane mirror 1 m high hangs on a wall. A man stands at a distance 2 m away from the mirror. What is the height of the portion of the opposite wall in the room that can be seen by the man in the mirror, without changing the position of his head? The wall is 4 m from the mirror.



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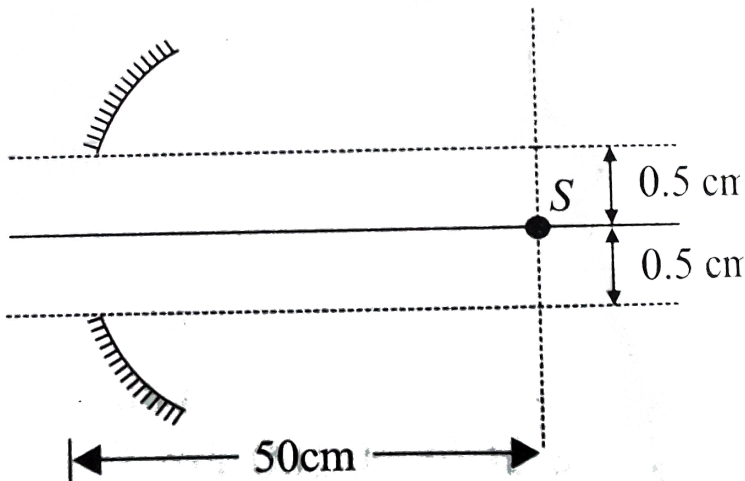
64. Prove that for spherical mirrors, the product of the distances of the object and the image from the principal focus is always equal to the square of the principal focal length.



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65. A concave mirror of focal length 25 cm forms the real image of a point object at a distance O lying on its principal axis at a distance of 50 cm from the mirror. The mirror

is cut into two halves and are drawn a distance of 1 cm apart in the direction perpendicular to the optical axis .How will the two halves of the concave mirror produce the image of the point object O?



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66. Why is there summer in December and winter in June in the southern hemisphere?



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Exercise

1. State the characteristics of image formed by a plane mirror.



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2. Image formed by a plane mirror is



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3. Define focus, focal length and aperture of a spherical mirror.



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4. Show that for a spherical concave mirror

$$f = \frac{R}{2}.$$



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5. Show that the focal length of a concave spherical mirror is half of the radius of its curvature.



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6. Show that the focal length of a spherical mirror is half the radius of its curvature.



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7. Derive mirror formula for concave mirror stating assumptions?



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8. Derive mirror formula for a convex mirror.



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9. Derive mirror formula for concave mirror stating assumptions?





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10. Derive mirror formula for a convex mirror.



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11. By stating sign conventions and assumptions made, derive mirror formula for a concave mirror.



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12. Derive mirror formula for a convex mirror.



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13. Derive mirror formula for a convex mirror.



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14. By stating the sign conventions and assumptions used, derive the relation between distance of object, distance of image and radius of curvature of convex spherical

surfaces, when refraction takes from optically rarer to optically denser medium.



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15. Define focal length and radius of curvature of a spherical mirror. Deduce the relation between them.



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16. Derive mirror formula for a convex mirror.



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17. By giving sign-conventions, derive the lens formula relating object distance, image distance and focal length for a thin convex lens. Draw a ray diagram to show the formation of image of an object placed between optical centre and focus of a convex lens.



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18. Define magnification of spherical mirror.

What is the magnification produced in a plane mirror?



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19. Draw a ray diagram to show the image formation by a concave mirror, when the object is kept between its focus and the pole.



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20. Write expression for the magnification produced by a lens system.



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21. Give the position and nature of image of an extended object for different distances from a concave mirror.



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22. Explain the sketches the formation of a real enlarged image for a concave mirror



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23. Explain the sketches the formation of a virtual image in the case of a concave mirror.



Watch Video Solution

24. Give the position and nature of image of an extended object for different distances from a concave mirror.



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25. What are the uses of concave and convex mirrors?



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26. Use the mirror equation to deduce that: an object placed between the pole and focus of a concave mirror produces a virtual and enlarged image.



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27. Derive mirror formula for concave mirror stating assumptions?



Watch Video Solution

28. Write expression for the magnification produced by a lens system.



Watch Video Solution

29. Define magnification of spherical mirror.
What is the magnification produced in a plane mirror?



Watch Video Solution

30. Give the position and nature of image of an extended object for different distances from a concave mirror.



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31. A candle is held 3 cm away from a concave mirror of radius of curvature 24 cm. Where is the image formed?



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32. How far from a lamp must a concave mirror of focal length 3 m be placed in order to throw an image on a screen 8 m from the lamp?



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33. An object is at a distance of 10 cm from a spherical mirror and the image of the object is at a distance of 30 cm from the mirror on the same side as the object. Is the mirror concave or convex? What is its focal length?



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34. A 5 cm long needle lies along the principal axis of a concave mirror of focal length 20 cm in such a way that the end closer to the pole is 40 cm from it. Find the length of the image of the needle formed by the mirror.



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35. An object is placed 15 cm from a convex mirror of radius of curvature 90 cm. Calculate

the image position and magnification.



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36. An object is at a distance of 5 m from a convex mirror of focal length 10 cm. Where is the image formed ?



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37. An object is placed in front of convex mirror 20 cm radius of curvature. Its image is

forced 8 cm behind the mirror. Find the distance of the object from the mirror.



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38. An object of 3 cm length is placed at 10 cm from the pole of a concave mirror of focal length 9 cm. Find the size and position of the image.



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39. An object placed 12 cm from the pole of a concave mirror produces a real image magnified four times. Find the radius of curvature of the mirror.



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40. An erect image of 3 times the size of the object is obtained with a concave mirror of radius of curvature 36 cm. What is the position of the object?





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41. An object 8 cm long is placed at a distance of 100 cm from a concave mirror of radius of curvature 40 cm. Find the position of the image formed by the mirror.



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42. An object 2 cm high is placed at a distance of 5 cm from a concave mirror, whose radius of

curvature is 20 cm. Find the position of the image.



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43. An object is placed in front of a concave mirror of radius of curvature 30 cm at a distance of 10 cm. Find the position, nature and magnification for the image.



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44. A concave mirror produces a real image of magnification $1/2$, when an object is placed at a distance of 60 cm from it. Where should the object be placed, so that a virtual image of double the size is formed by the mirror?



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45. Find the position of an object, which when placed in front of a concave mirror of focal

length 20 cm, produces a virtual image, which is twice the size of the object.



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46. An object is kept in front of a concave mirror of focal length 15 cm. The image formed is three times the size of the object. Calculate two possible distances of the object from the mirror.



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47. An object is kept in front of a concave mirror of focal length 15 cm. The image formed is three times the size of the object. Calculate two possible distances of the object from the mirror.



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48. An object 5.0 cm of length is placed at a distance of 20 cm in front of a convex mirror of radius of curvature 30 cm. Find the position of the image, its nature and size.



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49. An object of 3 cm height is placed at a distance of 60 cm from a convex mirror of focal length 30 cm. Find the position and size of the image formed.



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50. When an object is placed at a distance of 60 cm from a convex spherical mirror, the

magnification produced is $\frac{1}{2}$. Where should the object be placed to get a magnification of $\frac{1}{3}$?



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51. A spherical convex mirror of focal length 25 cm has an object of length 2 cm placed perpendicularly to the principal axis and at a distance of 100 cm from the mirror. Where is the image formed and what is its size and nature?



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52. An object is placed in front of a convex mirror of focal length 30 cm. If the image formed is a quarter of the size of the object, find the position of the image.



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53. An object is placed exactly midway between a convex and concave mirror each of focal length 15 cm. The two mirrors are placed 60 cm

apart and the two mirrors face each other. Find the nature and position of the image formed by reflection first at convex and then at the concave mirror.



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54. A candle is flame 1 cm high is placed at a distance of 1.5 metre from a wall. How far from the wall must a concave mirror be placed, so that it may form a 2 cm high image of the

flame on the flame on the same wall? Also find the focal length of the mirror.



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55. If a concave mirror of focal length f produces a real image n times the size of the object, then find the distance of the object from the mirror.



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56. With a concave mirror, the magnification is found to be four times as large, when the object was 25 cm from the mirror as it was with the object at 40 cm from the mirror, the image being real in both the cases. Find the focal length of the concave mirror.



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57. A short linear object of length b lies along the axis of a concave mirror of focal length f at

a distance u from the pole. What is the size of the image?



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