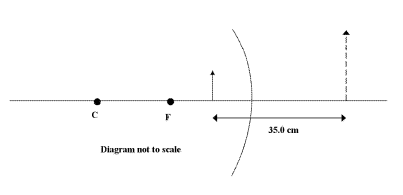


Part I. Mirrors and Reflection Problems.

15. A converging mirror has a focal length of 15.0 cm. a) Where is the image if the object is 58.0 cm from the vertex? b) What is the height of the image if the original object was 75.0 cm high?
16. A 2.5 m tall person stands 1.5 m in front of a large diverging mirror. a) What is the focal length of the mirror if the mirror has a magnification of $M = +0.65$? b) What is the height of the image?
17. An image of a person's face is located a distance of $d_i = -25.0$ cm from the vertex of a converging mirror. The person is 11.0 cm from the vertex. a) What is the focal length of the mirror? b) What is the magnification of the mirror? c) What is the height of the image if the face is 26.0 cm high?
18. How far from the vertex is an image in a diverging mirror if it has a focal length of $f = -49.0$ cm and the object is 33.0 cm from the vertex?
19. Determine the image distance for a converging mirror with a focal length of $f = 44$ cm if the object is placed 62 cm from the screen. What are the four characteristics of the image?
20. A 15 cm pencil is placed 35 cm from a diverging mirror. If the focal length is $f = -25$ cm, find the image distance and height. What are the four characteristics of the image?
21. Determine the image distance in a converging mirror that has a focal length of 15.0 cm when the object is placed a) 40.0 cm from the mirror; and b) 10.0 cm from the mirror.
22. Determine the image distance in a diverging mirror that has a focal length of -20.0 cm when the object is placed a) 10.0 cm from the mirror; and b) 30.0 cm from the mirror.
23. A candle 3.0 cm high is placed 30.0 cm from a converging mirror with a focal length of 20.0 cm. Find the location and height of the image. What are the images characteristics?
24. A woman looks at herself in a magnifying converging mirror whose focal length is 20.0 cm. If her face is 10.0 cm from the mirror, at what distance from the mirror is her image? what is the magnification of her face?
25. A 2.0 cm high candle is placed 15 cm in front of a converging mirror with a focal length of 30.0 cm. How far behind the mirror does the candle appear, and how large is it?
26. A dentist holds a converging mirror with a focal length of 20.0 mm a distance of 15 mm from a tooth. What is the magnification of a filling in the tooth?
27. A trucker sees the image of a car passing her truck in her diverging rear-view mirror whose focal length is -60.0 cm. If the car is 1.5 m high and 6.0 m away, what is the size and location of the image?
28. Where is an image formed with a converging mirror of focal length 25 cm if the object is placed a) 45 cm from the vertex? b) 15 cm from the vertex?
29. A converging mirror has a focal length of 42 cm. Where should an object be placed to produce a *real* image one third the size of the object?
30. A converging mirror has a focal length of 42 cm. Where should an object be placed to produce a *virtual* image three times the size of the object?
31. Where is the centre of curvature of a diverging mirror that produces an image three quarters as high as the original object? The original object is 24.0 cm from the vertex of the mirror.
32. A converging mirror has a focal length of 30.0 cm. Where must an object be placed to produce a real image five times the size of the object?

33. A child looks at his reflection in a spherical Christmas tree ornament 8.0 cm in diameter, and sees that the image of his face is reduced by a factor of half. How far is his face from the ornament?
35. A converging mirror has a focal length of 24 cm. Where would you place an object: a) to produce a real image one-third the size of the object? b) to produce a real image 3.00 times the size of the object? c) to produce a virtual image 3.00 times the size of the object?
37. A converging mirror has a focal length of $f = 12.0$ cm. The distance between the object and its real, reduced image is 55.0 cm. Determine the magnification.
38. A virtual image is produced in a converging mirror with a focal length of $f = 15.0$ cm. The object and image are separated by a distance of 35 cm (refer to diagram and remember that $d_i < 0$). Determine the magnification.



Answer List

- | | | |
|---|---|---|
| <p>15. a) $d_i = 20.2 \text{ cm}$
b) $h_i = -26.1 \text{ cm}$</p> | <p>16. a) $f = -2.8 \text{ m}$
b) $h_i = 1.6 \text{ m}$</p> | <p>17. a) $f = 19.6 \text{ cm}$
b) $M = 2.27$
c) $h_i = 59.1 \text{ cm}$</p> |
| <p>18. $d_i = -19.7 \text{ cm}$</p> | <p>19. $d_i = 1.5 \times 10^2 \text{ cm}$. Image is real, inverted, beyond C, and larger than the object.</p> | <p>20. $d_i = -15 \text{ cm}$; $h_i = 6.3 \text{ cm}$. Image is virtual, between V and F, smaller than the object, and erect.</p> |
| <p>21. a) $d_i = 24.0 \text{ cm}$
b) $d_i = -30.0 \text{ cm}$</p> | <p>22. a) $d_i = -6.70 \text{ cm}$
b) $d_i = -12.0 \text{ cm}$</p> | <p>23. $d_i = 60.0 \text{ cm}$; $h_i = -6.0 \text{ cm}$. The image is real, inverted, beyond C, and larger than the object.</p> |
| <p>24. $d_i = -20.0 \text{ cm}$; $M = +2.0$</p> | <p>25. $d_i = -30.0 \text{ cm}$; $h_i = 4.0 \text{ cm}$</p> | <p>26. $M = +4.0$</p> |
| <p>27. $h_i = 14 \text{ cm}$; $d_i = -0.55 \text{ m}$</p> | <p>28. a) $d_i = 56 \text{ cm}$
b) $d_i = -38 \text{ cm}$</p> | <p>29. $d_o = 1.7 \times 10^2 \text{ cm}$</p> |
| <p>30. $d_o = 28 \text{ cm}$</p> | <p>31. $C = -144$</p> | <p>32. $d_o = 36 \text{ cm}$</p> |
| <p>33. $d_o = 2.0 \text{ cm}$</p> | <p>34. $d_o = 7.5 \text{ cm}$</p> | <p>35. a) $d_o = 96 \text{ cm}$
b) $d_o = 32 \text{ cm}$
c) $d_o = 16 \text{ cm}$</p> |
| <p>36. $d_o = 20.0 \text{ cm}$, $d_i = 60.0 \text{ cm}$,
$M = -3.00$</p> | <p>37. $d_o = 69.5 \text{ cm}$, $d_i = 14.5 \text{ cm}$,
$M = -0.209$</p> | <p>38. $d_o = 9.5 \text{ cm}$, $d_i = -25.5 \text{ cm}$,
$M = +2.68$</p> |

Catalog List

- | | | | |
|---------------|---------------|---------------|---------------|
| 15. 20P CB 1 | 16. 20P CB 2 | 17. 20P CB 3 | 18. 20P CB 4 |
| 19. 20P CB 5 | 20. 20P CB 6 | 21. 20P CB 8 | 22. 20P CB 9 |
| 23. 20P CB 11 | 24. 20P CB 12 | 25. 20P CB 13 | 26. 20P CB 14 |
| 27. 20P CB 15 | 28. 20P CB 17 | 29. 20P CB 19 | 30. 20P CB 20 |
| 31. 20P CB 21 | 32. 20P CB 24 | 33. 20P CB 26 | 34. 20P CB 27 |
| 35. 20P CB 28 | 36. 20P CB 31 | 37. 20P CB 32 | 38. 20P CB 35 |