Problems of Geometric optics. Thin lenses

1) The magnitudes of the radii of curvature are 43 cm and 33 cm for the two faces of a biconvex lens. The glass has index of refraction 2.03. An object has a height of 42 mm and is placed in front of the lens at distance 194 cm. Calculate: **a)** Focal length. Is the lens converging or diverging? **b)** Image location. **c)** Image height and its description (real/virtual, upright/inverted).
Answer: **a)** 18.13 cm, converging, **b)** 20 cm, **c)** –4.33 mm, real, demagnified and inverted.

2) A converging lens has a lateral magnification of 2.3 when an object forms a virtual image at distance 134 cm of the lens. Determine: **a)** Focal length of the lens and its power. **b)** Object location.
Answer: **a)** 103.1 cm, 0.97 diopters, **b)** 58.26 cm.

3) We have a system of two lenses: A converging lens of 95 cm of focal length and a diverging lens of 175 cm of focal length. Find out the overall power of the system.
Answer: –0.481 diopters.

4) A converging lens has a power of 4.7 diopters. An object has a height of 35 mm and is placed in front of the lens at distance 174 cm. Calculate: **a)** Focal length of the lens. **b)** Image location. **c)** Image height and its description (real/virtual, upright/inverted).
Answer: **a)** 21.28 cm, **b)** 24.24 cm, **c)** –4.88 mm, real, demagnified and inverted.

5) A converging lens has a focal length of 162 cm and its lateral magnification is –0.34. Determine: **a)** Object location. **b)** Image location.
Answer: **a)** 638.5 cm, **b)** 217.1 cm.

6) A converging lens has a focal length of 24 cm. An object has a height of 20 mm and is placed in front of the lens at distance 112 cm. Find: **a)** Image location. **b)** Image height and its description (real/virtual, upright/inverted).
Answer: **a)** 30.55 cm, **b)** –5.45 mm, real, demagnified and inverted.

7) For the two faces of a biconcave lens the magnitudes of the radii of curvature are 15 cm and 18 cm. The glass has index of refraction 1.61. An object has a height of 20 mm and is placed in front of the lens at distance 52 cm. Calculate: **a)** Focal length. Is the lens converging or diverging? **b)** Image location. **c)** Image height and its description (real/virtual, upright/inverted).
Answer: **a)** –13.41 cm, diverging, **b)** –10.66 cm, **c)** 4.1 mm, virtual, demagnified and upright.

8) A diverging lens has a focal length of 68 cm. If its lateral magnification is 0.66, determine: **a)** Object location. **b)** Image location.
Answer: **a)** 35.03 cm, **b)** –23.12 cm.

Problems of Geometric optics. Thin lenses

9) A converging lens has a focal length of 290 cm. Find out the image location if the object position is 290 cm in front of the lens.
Answer: The object is at the focal point. The image is located infinitely far away from the lens.

10) An object has a height of 6 mm and is placed in front of a diverging lens at distance 168 cm. If the power of a lens is –1.9 diopters, calculate: **a)** Focal length of the lens. **b)** Image location. **c)** Image height and its description (real/virtual, upright/inverted).
Answer: **a)** –52.63 cm, **b)** –40.08 cm, **c)** 1.43 mm, virtual, demagnified and upright.

11) A converging lens has a focal length of 118 cm and a lateral magnification of 2.8. Determine: **a)** Object location. **b)** Image location.
Answer: **a)** 75.86 cm, **b)** –212.4 cm.

12) A diverging lens has a focal length of 106 cm. An object has a height of 49 mm and is placed in front of the lens at distance 194 cm. Find out: **a)** Image location. **b)** Image height and its description (real/virtual, upright/inverted).
Answer: **a)** –68.55 cm, **b)** 17.3 mm, virtual, demagnified and upright.