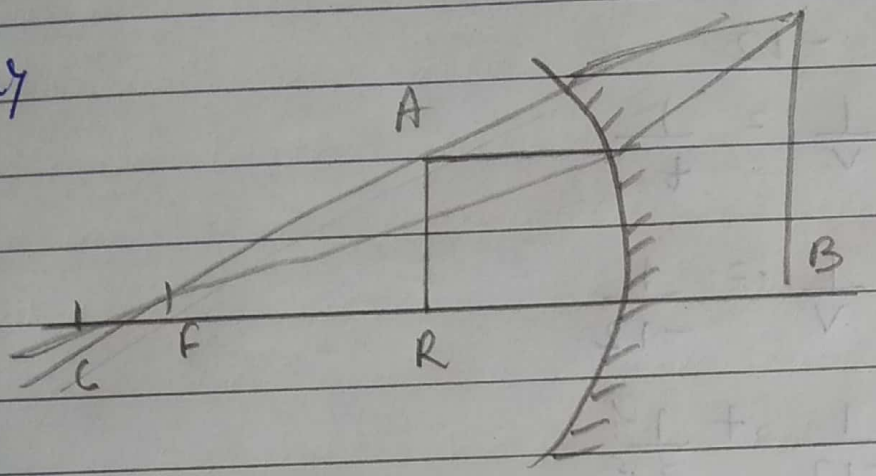
Short Answer

a)



b) $u = 10$

$f = 20$

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\frac{1}{-10} + \frac{1}{v} = \frac{1}{-20}$$

$$\frac{1}{v} = \frac{1}{-20} + \frac{1}{10}$$

$$\frac{1}{v} = \frac{-1+2}{20}$$

$$\frac{1}{v} = \frac{2}{20}$$

$$2v = 20$$

$$v = \frac{20}{2}$$

$$v = 10\text{cm}.$$

c) Virtual and erect.

12) $u = -36$

$f = -12$

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\frac{1}{-36} + \frac{1}{v} = \frac{1}{-12}$$

$$\frac{1}{v} = \frac{1}{-12} + \frac{1}{36}$$

$$\frac{1}{v} = \frac{-2}{36}$$

$$-2v = 36$$

$$v = \frac{36}{2}$$

$$= -18.$$

The image is real and inverted.

13) $f = -10$

$$m = \frac{h_2}{h_1}$$

$$m = 6/2$$

$$2m = 6$$

$$m = 3.$$

$$m = -\frac{v}{u}$$

$$3 = -\frac{v}{u}$$

14)

$3u = -v$

$v = -3u$

$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$\frac{1}{-3u} + \frac{1}{u} = \frac{1}{-10}$

$\frac{2}{3u} = \frac{1}{-10}$

$-20 = 3u$

$u = -20/3$

14) $P = \frac{1}{-2}$

$= -0.5$

An object of 5cm is held 25 cm away from a converging of 10 cm

$f = 10$

$u = -25$

$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

$\frac{1}{v} - 1 = \frac{1}{10}$

$-\frac{1}{v} = \frac{1}{10} - \frac{1}{25}$

$\frac{-1}{v} = \frac{5-2}{50}$

$\Rightarrow \frac{-1}{v} = \frac{3}{50}$

$\frac{1}{v} = \frac{3}{50}$

$3v = 50$

$v = \frac{50}{3}$

$= 16.67$ cm

$$m = \frac{-v}{u}$$

$$= \frac{16.67}{-25}$$

$$= -0.66$$

$$m = \frac{h_2}{h_1}$$

$$\therefore -0.66 = \frac{y}{5}$$

$$y_2 = -3.3 \text{ cm}$$

17) $$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\frac{1}{-27} + \frac{1}{v} = \frac{1}{-18}$$

$$\frac{1}{v} = \frac{1}{-18} + \frac{1}{27}$$

$$\frac{1}{v} = -\frac{3+2}{54}$$

$$= \frac{-1}{54}$$

$$v = 54$$

Real and inverted.

18) $f = -20$

$u = -10$

$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

$\frac{1}{-10} + \frac{1}{v} = \frac{1}{-20}$

$\frac{1}{v} = \frac{1-2}{-20}$

$\frac{1}{v} = \frac{+1}{+20}$

$v = 20$.

$m = \frac{-v}{u}$

$m = \frac{+20}{+10}$

$m = 2$.

$m = \frac{h_1}{h_2}$

$2 = \frac{h_1}{3}$

$h_1 = 6$.

Virtual and erect.

19) $f = -4$

$u = -9$

$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

$\frac{1}{-9} + \frac{1}{v} = \frac{1}{-4}$

$\frac{1}{v} = \frac{1}{-4} + \frac{1}{9}$

$= \frac{9-4}{-36}$

$= \frac{5}{-36}$

$\Rightarrow 5v = -36$

$v = -\frac{36}{5}$

$= -7.2\,cm$.

$$m = \frac{-v}{u}$$

$$= \frac{-(-7.2)}{-9}$$

$$= \frac{7.2}{9}$$

$$= 0.8$$

$$m = \frac{n_1}{n_2}$$

$$\Rightarrow 0.8 = \frac{n_2}{2}$$

$$n_2 = 1.6 \text{ cm}$$

Real and inverted.

20) $u = -20$

$$m = \frac{-v}{u}$$

$$3 = \frac{-v}{+20}$$

$$v = -60$$

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{t}$$

$$\frac{1}{-20} + \frac{1}{-60} = \frac{1}{t}$$

$$\frac{-3+1}{60} = \frac{1}{t}.$$

2) $4t = 60$

$$t = \frac{60}{4}$$

$$= 15.$$

$$\frac{4}{60} = \frac{1}{t}.$$

$$-3 = \frac{-(-v)}{u}$$

$$-3 = \frac{v}{u}$$

$$-3u = v$$

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\frac{1}{u} + \frac{1}{-3u} = \frac{1}{15}$$

$$\frac{-2}{-3u} = \frac{1}{15}$$

$$-30 = -3u$$

$$u = \frac{-30}{-3}$$

$$= 10 \text{ cm}$$

21) $R = 3$

$$f = \frac{3}{2}$$

$$5 = \frac{-v}{u}$$

$$-v = 5u$$

$$v = -5u$$

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\frac{1}{u} + \frac{1}{-5u} = \frac{1}{3}$$

$$\Rightarrow \frac{-5+1}{-5u} = \frac{2}{3}$$

$$\frac{+4}{+5u} = \frac{2}{3}$$

$$10u = 12$$

$$u = \frac{12}{10}$$

$$= 1.2 \text{ cm}$$

22) $f = \frac{R}{2}$

$= \frac{1.5}{2}$

$= \frac{-3}{4}\ m$

$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

$\frac{1}{-10} + \frac{1}{v} = \frac{1}{-\frac{3}{4}}$

$\frac{1}{v} = -\frac{4}{3} + \frac{1}{10}$

$\frac{1}{v} = \frac{-40+3}{30}$

$\frac{1}{v} = \frac{37}{30}$

$43v = 30$

$v = \frac{30}{37} = 0.81$

23) $u = -20$

$f = -15$

$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

$\frac{1}{-20} + \frac{1}{v} = \frac{1}{-15}$

$$\frac{1}{v} = \frac{1}{-15} + \frac{1}{20}$$

$$\frac{1}{v} = \frac{-4+3}{60}$$

$$= \frac{-1}{60}$$

$$-v = 60.$$

$$m = \frac{-v}{u}$$

$$m = \frac{-(-60)}{-20}$$

$$= -3.$$

$$-3 = \frac{h_1}{h_2}$$

$$= \frac{h_1}{5}$$

$$h_1 = -15$$

24) $u = -10$

$$3 = \frac{+v}{+10}$$

$$v = 30$$

$$\frac{1}{-10} + \frac{1}{30} = \frac{1}{f}$$

$$= \frac{3-1}{-30} = \frac{1}{f}$$

$\frac{-2}{30} = \frac{1}{t}$

$-t = 30$

$t = -15$

$\frac{R}{2} = \frac{-15}{1}$

$-30 = R$

$R = -30$

$t = -20$.

25) $m = \frac{-v}{u}$

$-\frac{1}{u} = \frac{-v}{u}$

$u = 4v$

$\frac{1}{4v} + \frac{1}{v} = \frac{1}{-20}$

$\frac{1+4}{4v} = \frac{1}{-20}$

$\frac{5}{4v} = \frac{1}{-20}$

$-100 = 4v$

$v = \frac{-100}{4}$

$= -25$.

$u = 4v$

$u = -100$

27) $u = -50$

$m = \frac{-v}{u}$

$-\frac{1}{2} = \frac{-v}{50}$

$-2v = 30$

$v = \frac{50}{2}$

$= -25$

$\frac{1}{-25} + \frac{1}{-50} = \frac{1}{f}$

$-\frac{3}{50} = \frac{1}{f}$

$-3f = 50$

$f = \frac{-50}{3}$

$m = -\frac{1}{5}$

$-\frac{1}{5} = -\frac{v}{u}$

$u = 5v$

$v = \frac{u}{5}$

$\frac{1}{\frac{u}{5}} + \frac{1}{u} = -\frac{3}{50}$

$\frac{5}{u} + \frac{1}{u} = -\frac{3}{50}$

$\frac{6}{u} = -\frac{3}{50}$

$-3u = 300$

$u = \frac{-300}{3}$

$= -100$