

1.  $u_2 = -45$ ,  $v_2 = 90 \text{ cm}$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{90} + \frac{1}{45} = \frac{1}{f} \Rightarrow f = 30 \text{ cm}$$

$$\frac{1}{v_1} = \frac{1}{f} + \frac{1}{u_1} \Rightarrow \frac{1}{30} + \frac{1}{-50} = \frac{1}{v_1} \Rightarrow v_1 = 75 \text{ cm}$$

~~40~~  
 $90 - 75 = 15 \text{ cm}$   
~~15 cm~~

2. ~~20~~  $P = P_1 + P_2$

$P_2 = 3 - 5 = -2$

$$f = \frac{1}{P} = \frac{1}{-2} \Rightarrow 50 \text{ cm}$$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{50} + \frac{1}{28} = \frac{1}{v}$$

$v = 25 \text{ cm}$

$$3. \frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

$$\frac{1}{+25} + \frac{1}{-20} = \frac{1}{f}$$

$f = 100 \text{ cm}$

$$P = P_1 + P_2 \Rightarrow \frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

$P = 10$

4.  $P = P_1 + P_2$

$100 - 50 = 50$

$\frac{100}{5} = 20 \text{ cm}$