

1) Here  $u = -45 \text{ cm}$   
 $v = 90 \text{ cm}$

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

$$f = 30 \text{ cm}$$

When the ~~object~~ object is 5 cm away  
 $u = 45 + 5 = -50 \text{ cm}$

$$\frac{2}{150} \rightarrow v' = 75 \text{ cm}$$

Displacement of image =  $v - v'$   
 $= 90 - 75 = 15 \text{ cm}$

So, 15 cm towards the lens image will move

$$P = P_1 + P_2 + \dots$$

$$P = 3D + (-1D)$$

$$P = 3 - 1 = 2D$$

Focal length length is given by  
 $f = \left(\frac{1}{P}\right)$

$$f_1 = 0.25 \text{ m}$$

$$f_2 = 30 \text{ cm}$$

Power is 20

3) The net focal length of combination is

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

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

$$= -\frac{1}{100}$$

$$\Rightarrow f = -100 \text{ cm}$$

Power of combination =  $P = P_1 + P_2 = \frac{1}{f_1} + \frac{1}{f_2}$

$$P = \frac{1}{0.25} + \frac{1}{0.20} = \frac{100}{25} - \frac{100}{20}$$

$$\frac{400 - 500}{100} = \frac{-100}{100} = -1$$

$$\Rightarrow P = -1 \text{ D}$$

Since power is negative the combination is diverging is -1D.

4) ~~Total  $P = P_1 + P_2$   
total length  $P = \frac{1}{f} + \frac{1}{P_2}$   
 $P = 10D - 5D - 5D$~~

~~Focal length is  $= \frac{100}{5} = 20 \text{ cm}$~~

9)  $f = 20 \text{ cm}$

$P = \frac{100}{f} = +5D$

$\Rightarrow P = P_1 + P_2$  (to choose two  
 $P_1 + P_2 = 5$

$(+10, -5)$

11)  $f = 20/3 \text{ cm}$

$P = \frac{100}{20/3} = 15D$

$P = P_1 + P_2 = 15$

$(+10, +5)$