

$$\lambda_n = \frac{2L}{n}$$

for string with fixed ends, $f = \frac{v}{\lambda}$ $v = \text{velocity}$
 $L = \text{length}$
 $f = \text{frequency}$

Practice problems below

1) $L = 4.5 \text{ m}$ and waves 2.5
 $v = 56 \text{ m/s}$ $= 2 \cdot 6.02$

$$\lambda_1 = 2(4.5)$$

$$f_1 = \frac{56}{2(4.5)}$$

$$2 \cdot \frac{56}{2(4.5)}$$

$$f_4 = \frac{4 \cdot v}{2L}$$

$$f_4 = \frac{4 \cdot 56}{2(4.5)}$$

2) $f_1 = 1 \cdot \frac{345}{2L}$

$$L = 0.65 \text{ m}$$

$$f_1, f_2, f_3, f_4$$

$$f_1 = \frac{345}{1.3}$$

$$f_1 = 265.38$$

$$f_2 = 2 \cdot \frac{345}{1.3}$$

if $f_{\text{avg}} = 220$ and L stopped pipe

$$f_1 = n \cdot \frac{v}{2L}$$

$$220 = \frac{345}{4L}$$

$$440L = 345$$

$$\text{if } L = 2.45 \text{ m}$$

$$\lambda_{\text{fund}}$$

$$\lambda_2 = \frac{4.9}{2}$$

$$f_{\text{fund}} = \frac{345}{4.9}$$

$$f_p$$

Prob Prob water

5) if $v = 344$ in a stepped pipe

$$f_{\text{freq}} = \frac{344}{4(0.158)}$$