

KINEMATICS 1

1. $v^2 = v_0^2 + 2ad$

$$d = \frac{v^2 - v_0^2}{2a} = \frac{(27.8)^2 - 0}{2(9.80)} = 39.4 \text{ m}$$

2. Distance fallen by end of 3rd second:

$$d_3 = \frac{1}{2}a(t_3^2)$$

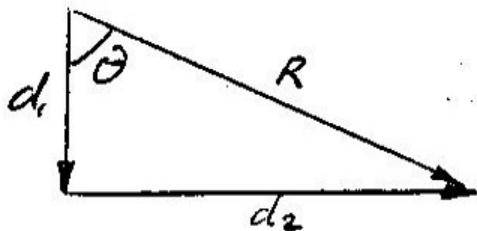
Distance fallen by end of 4th second:

$$d_4 = \frac{1}{2}a(t_4^2)$$

Distance fallen during 4th second:

$$d = d_4 - d_3 = \frac{1}{2}a(t_4^2 - t_3^2) = \frac{1}{2}(9.80)(4^2 - 3^2) = 34.3 \text{ m}$$

3.



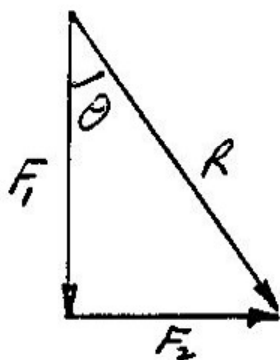
$$R^2 = d_1^2 + d_2^2 = (100)^2 + (240)^2$$

$$R = 260 \text{ m}$$

$$\tan \theta = \frac{d_2}{d_1} = \frac{240}{100} = 2.4$$

$$\theta = 67^\circ \text{ E of S}$$

4.



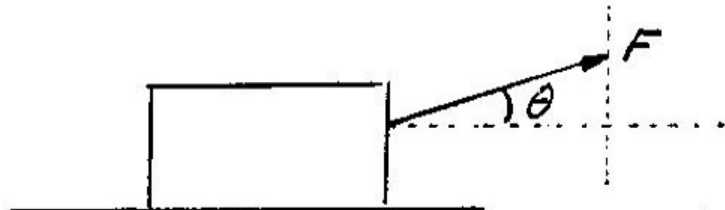
$$R^2 = F_1^2 + F_2^2 = (5)^2 + (3)^2$$

$$R = 5.8 \text{ N}$$

$$\tan \theta = \frac{F_2}{F_1} = \frac{3}{5} = 0.60$$

$$\theta = 31^\circ \text{ E of S}$$

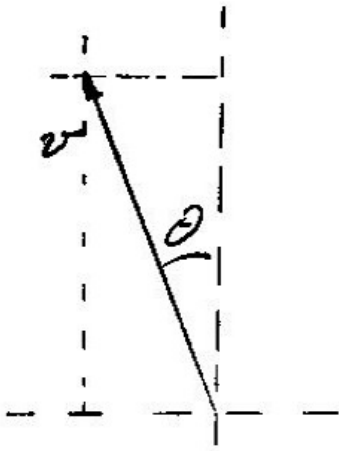
5.



(a) $F_x = F \cos \theta = 66 \cos 32^\circ = 56 \text{ N}$

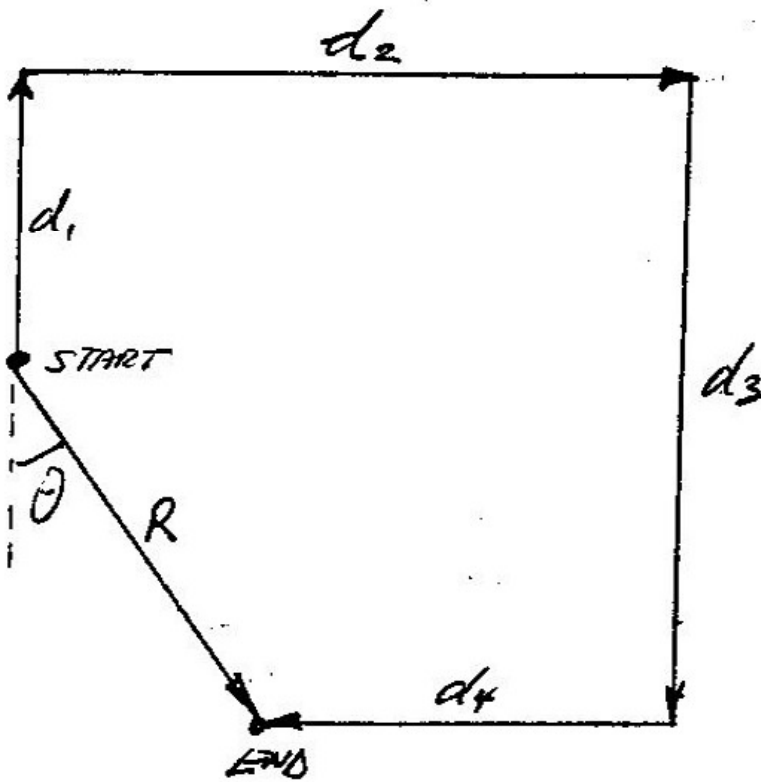
(b) $F_y = F \sin \theta = 66 \sin 32^\circ = 35 \text{ N}$

Kinematics 1



$$V_{\text{west}} = v \sin \theta = 951 \sin 35^\circ = 545 \text{ km/h}$$

$$V_{\text{north}} = v \cos \theta = 951 \cos 35^\circ = 779 \text{ km/h}$$



$$R_x = 0 + 7.0 + 0 + (-4.0) = 3.0 \text{ km}$$

$$R_y = 3.0 + 0 + (-7.0) + 0 = -4.0 \text{ km}$$

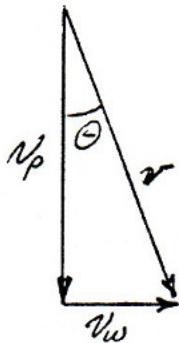
$$R = \sqrt{R_x^2 + R_y^2} = 5.0 \text{ km}$$

$$\tan \theta = \frac{R_x}{R_y} = 0.75$$

$$\theta = 37^\circ \text{ E of S}$$

KINEMATICS 2

1. $v = \sqrt{v_p^2 + v_w^2} = 852 \text{ km/h}$

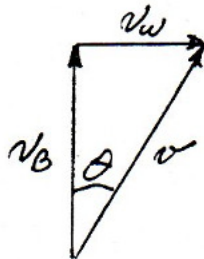


$$\tan \theta = \frac{v_w}{v_p} = 0.0423$$

$$\theta = 2.4^\circ \text{ E of S}$$

2.

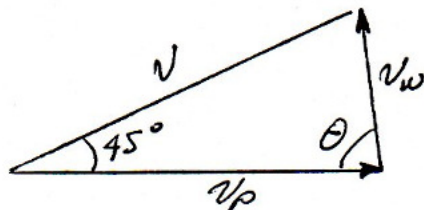
$$v = \sqrt{v_B^2 + v_w^2} = 8.0 \text{ m/s}$$



$$\tan \theta = \frac{v_w}{v_B} = 0.75$$

$$\theta = 37^\circ \text{ E of Vertical}$$

3.

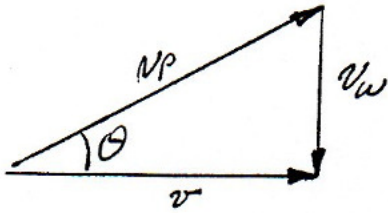


$$v_w^2 = v^2 + v_p^2 - 2(v)(v_p) \cos \theta = 99.8 \text{ km/h}$$

$$\frac{\sin \theta}{141.1} = \frac{\sin 45^\circ}{99.8}$$

$$\theta = 89^\circ \text{ N of W}$$

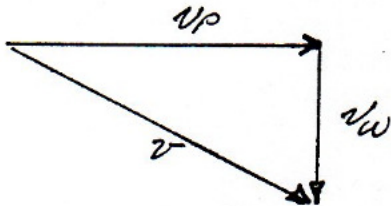
4.



$$\sin \theta = \frac{v_w}{v_p} = 0.50$$

$$\theta = 30^\circ$$

5.

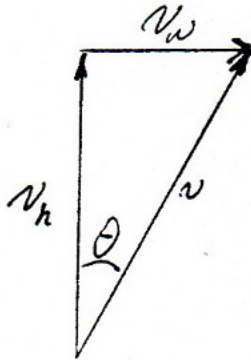


$$v_p = \frac{d}{t}$$

$$t = \frac{d}{v_p} = \frac{0.200 \text{ km}}{4.0 \text{ km/h}} = 0.050 \text{ h}$$

$$t = 3.0 \text{ minutes}$$

6.



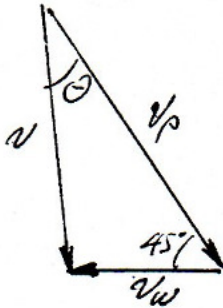
$$v^2 = v_h^2 + v_w^2$$

$$v = 50 \text{ km/h}$$

$$\sin \theta = \frac{v_w}{v_h} = 0.75$$

$$\theta = 37^\circ \text{ E of N}$$

7.



$$v^2 = v_p^2 + v_w^2 - 2(v_p)(v_w) \cos \theta$$

$$v = 447 \text{ km/h}$$

$$\frac{\sin \theta}{150} = \frac{\sin 45}{447}$$

$$\theta = 14^\circ \text{ S of SE } \underline{\text{OR}} \quad 31^\circ \text{ E of S}$$