










R1-12  $AC^2 = 4^2 + 5^2 - 2 \times 4 \times 5 \cos 143.1$   
 $AC = 8.54$   
 $h = 5 \sin 36.9 = 3$   
  
 $\cos \theta = \frac{3}{4} \Rightarrow \theta = 60^\circ$   
 $(AC')^2 = 4^2 + 5^2 - 2 \times 4 \times 5 \cos 60$   
 $AC' = 4.58$   
 $\Delta AC = 3.96 \text{ m}$


2-1  $R = 42.7 \text{ lb}$  


2-2  $60.2 \text{ lb}$    $126 \text{ lb}$    $1060 \text{ lb}$  


2-3  $R = 80.8 \text{ lb}$    $R = 539 \text{ lb}$    
 $R = 7210 \text{ lb}$  


2-4  $R = 15.2 \text{ kN}$    
 $R = 16.2 \text{ MN}$    
 $R = 25 \text{ N}$  


2-5  $R = 632 \text{ N}$  


2-6  $R = 17 \text{ lb}$  


2-7  $\tan \theta = \frac{250}{1500} \Rightarrow \theta = 9.5^\circ$   
 $\therefore R = 1.5 \text{ N kN}$  


2-8  $R = \sqrt{(1.5)^2 + 4^2} = 4.27$   
 $\tan \theta = \frac{4}{1.5} \Rightarrow \theta = 69.4^\circ$   
 $69.4 + 12 = 81.4^\circ$   
 $R = 4.27 \text{ kN}$  


2-9  $R = \sqrt{30^2 + 20^2} = 36.1 \text{ lb}$    
 $\tan^{-1} \frac{30}{20} = 56.3^\circ$   
 $56.3 + 20 = 76.3^\circ$

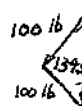
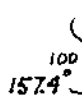

2-10  $R^2 = 120^2 + 250^2 - 2(120)(250) \cos 122$   
 $R = 300 \text{ N}$    
 $\frac{330}{\sin 122} = \frac{250}{\sin \theta} \Rightarrow \theta = 40^\circ$   
 $40 + 40 = 80^\circ$

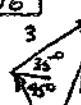

2-11  $R^2 = 30^2 + 40^2 - 2(30)(40) \cos 130$   
 $R = 63.6 \text{ kN}$    
 $\frac{\sin \phi}{40} = \frac{\sin 50}{63.5} \Rightarrow \phi = 28.8^\circ$

2-12  $R^2 = 20^2 + 15^2 - 2(20)(15) \cos 100$   
 $R = 27 \text{ lb}$    
 $\frac{27}{\sin 100} = \frac{20}{\sin \theta} \Rightarrow \theta = 46.8^\circ$   
 $46.8 + 15 = 61.8^\circ$

2-13  $R^2 = (6.5)^2 + (8)^2 - 2(6.5)(8) \cos 151.6^\circ$   
 $R^2 = 197.7$   
 $R = 14.1 \text{ kN}$    
 $\frac{6.5}{\sin \theta} = \frac{14.1}{\sin 151.6} \Rightarrow \theta = 12.7^\circ$   
 $21.8 + 12.7 = 34.5^\circ$

2-14  $R^2 = 400^2 + 150^2 - 2(400)(150) \cos 40$   
 $R = 301 \text{ lb}$    
 $\frac{301}{\sin 40} = \frac{150}{\sin \theta} \Rightarrow \theta = 18.7^\circ$   
 $30 + 18.7 = 48.7^\circ$

2-15  $\sin \theta = \frac{2.5}{6.5} \Rightarrow \theta = 22.6^\circ$   
  
 $\frac{R}{\sin 134.8} = \frac{100}{\sin 22.6}$   
 $R = 185 \text{ lb}$   
  
 $\frac{R}{\sin 157.4} = \frac{100}{\sin 11.3}$   
 $R = 196 \text{ lb}$  

2-16  $\tan \theta = \frac{3}{4} \Rightarrow \theta = 36.9^\circ$   
  
 $180 - 55 - 36.9 = 88.1^\circ$   
 $R = 5 \text{ kips}$  

2-17  $P_x = 25 \sin 20 = 8.55 \text{ lb} \leftarrow$   
 $P_y = 25 \cos 20 = 23.5 \text{ lb} \downarrow$   
 $P_x = 2 \cos 50 = 1.29 \text{ kips} \rightarrow$   
 $P_y = 2 \sin 50 = 1.53 \text{ kips} \uparrow$   
 $P_x = 20 \cos 30 = 17.3 \text{ lb} \leftarrow$   
 $P_y = 20 \sin 30 = 10 \text{ lb} \uparrow$

2-18  $F_x = \frac{9}{17} \times 85 = 40 \text{ N} \rightarrow$   
 $F_y = \frac{15}{17} \times 85 = 75 \text{ N} \uparrow$   
 $F_x = .707 \times 40 = 28.3 \text{ kN} \leftarrow$   
 $F_y = .707 \times 40 = 28.3 \text{ kN} \downarrow$   
 $F_x = \frac{4}{5} \times 120 = 96 \text{ N} \rightarrow$   
 $F_y = \frac{3}{5} \times 120 = 72 \text{ N} \uparrow$   
 $F_x = \frac{12}{13} \times 52 = 48 \text{ kN} \leftarrow$   
 $F_y = \frac{5}{13} \times 52 = 20 \text{ kN} \downarrow$

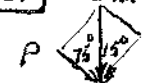
2-19  $F_y = 30 \text{ lb} \uparrow$   $F_x = 52 \text{ lb} \rightarrow$   
 $F_y = 75.2 \text{ kips} \downarrow$   $F_x = 27.4 \text{ kips} \leftarrow$   
 $v_y = 400 \text{ ft/sec} \uparrow$   $v_x = 300 \text{ ft/sec} \leftarrow$   
 $v_y = 16 \text{ mph} \downarrow$   $v_x = 30 \text{ mph} \leftarrow$

2-20  $F_x = 200 \cos 38 = 158 \text{ lb} \leftarrow$   
 $F_y = 200 \sin 38 = 123 \text{ lb} \uparrow$   
 $F_x = 28 \sin 25 = 11.8 \text{ ft/sec} \leftarrow$   
 $F_y = 28 \cos 25 = 25.4 \text{ ft/sec} \downarrow$   
 $F_x = 190 \sin 63 = 169 \text{ lb} \rightarrow$   
 $F_y = 190 \cos 63 = 86.3 \text{ lb} \uparrow$   
 $F_x = 860 \cos 20.5 = 806 \text{ lb} \rightarrow$   
 $F_y = 860 \sin 20.5 = 301 \text{ lb} \downarrow$

2-21  $F_x = 1.8 \cos 80 = 0.313 \text{ kN} \rightarrow$   
 $F_y = 1.8 \sin 80 = 1.77 \text{ kN} \downarrow$

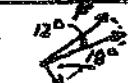
2-22  $A_x = 637.6 \cos 45 = 451 \text{ N} \rightarrow$   
 $A_y = 451 \text{ N} \downarrow$

2-23  $P_y = 100 \sin 40 = 64.3 \text{ N} \nearrow 70^\circ$   
 $P_x = 100 \cos 40 = 76.6 \text{ N} \nearrow 20^\circ$   
 $Q_y = 12 \cos 10 = 11.8 \text{ kN} \nearrow 70^\circ$   
 $Q_x = 12 \sin 10 = 2.1 \text{ kN} \nearrow 20^\circ$   
 $R_y = 40 \sin 16.8 = 11.6 \text{ N} \nearrow 70^\circ$   
 $R_x = 40 \cos 16.8 = 38.3 \text{ N} \nearrow 20^\circ$

2-24  $5 \text{ kN}$   
  
 $\cos 75 = \frac{P}{5}$   
 $P = 1.29 \text{ kN}$

2-25  $F_x = 20 \sin 30 = 10 \text{ lb} \nearrow 15^\circ$

2-26  $P_y = 80 \sin 32 = 42.4 \text{ N} \searrow 70^\circ$   
 $P_x = 80 \cos 32 = 67.8 \text{ N} \nearrow 20^\circ$

2-27  $\cos 12^\circ = \frac{F}{25}$   
  
 $F = 24.5 \text{ lb} \nearrow 30^\circ$

2-28  $P_x = 400 \cos 10^\circ = 394 \text{ N} \nearrow 70^\circ$   
 $P_y = 400 \sin 10^\circ = 69.5 \text{ N} \nearrow 70^\circ$

2-29  $R_y = \frac{4}{5} \times 50 + \frac{5}{13} \times 52 = 60 \text{ N} \uparrow$   
 $R_x = \frac{12}{13} \times 52 - \frac{3}{5} \times 50 = 19 \text{ N} \rightarrow$   
 $R = 62.6 \text{ N} \nearrow 10^\circ$

2-30  $R_y = \frac{3}{5} \times 50 + \frac{1}{4.12} \times 100 = 54.3 \text{ lb} \uparrow$   
 $R_x = \frac{4}{5} \times 50 + 65 - 25 - \frac{4}{4.12} \times 100 = 17 \text{ lb} \rightarrow$   
 $R = 56.9 \text{ lb} \nearrow 20^\circ$

2-31  $R_x = \frac{15}{17}(204) - 160 \sin 15 + 70 \cos 65 = 168.2$   
 $R_y = \frac{8}{17}(204) - 160 \cos 15 - 70 \sin 65 = -73.9$   
 $R = 184 \text{ N} \searrow 23.7^\circ$

2-32  $R_x = 90 \sin 75 - 70 \cos 10 - \frac{5}{13} \times 104 = -22$   
 $R_y = +80 + 90 \cos 75 + 70 \sin 10 + \frac{12}{13} \times 104 = +211.5$   
 $R = 213 \text{ lb} \nearrow 84.1^\circ$

2-33  $R_x = 4 \sin 20 + 2 - 3 \cos 30 - 5 \sin 15 = -0.524$   
 $R_y = 4 \cos 20 - 3 \sin 30 + 5 \cos 15 = +7.09$   
 $R = 7.11 \text{ kN} \nearrow 85.2^\circ$

2-34  $R_x = -1200 \cos 20 - 700 \sin 35 = -1530$   
 $R_y = 1200 \sin 20 - 700 \cos 35 - 800 = -963.4$   
 $R = 1810 \text{ lb} \searrow 52.6^\circ$

2-35  $R_x = \frac{12}{13} \times 52 - 20 - \frac{3}{5}(30) - 40 \cos 80 = +3.054$   
 $R_y = \frac{5}{13}(52) + \frac{4}{5}(30) - 40 \sin 80 = 4.608$   
 $R = 5.53 \text{ kN} \nearrow 56.5^\circ$

2-36  $R_x = 70 \cos 25 + 150 \sin 30 + 200 \cos 70 = 206.8$   
 $R_y = 70 \sin 25 + 150 \cos 30 + 200 \sin 70 = 87.6$   
 $R = 225 \text{ lb} \nearrow 23^\circ$

2-37  $R_x = -40 \sin 20 - 20 \cos 40 + \frac{12}{13}(39) = +6.99$   
 $R_y = 40 \cos 20 - 20 \sin 40 - \frac{5}{13} \times 39 = 9.73$   
 $R = 12 \text{ lb} \nearrow 54.3^\circ$

R2-1  $R = 65 \text{ N} \nearrow 12^\circ$   
 $R = 8.54 \text{ kN} \nearrow 8^\circ$   $R = 102 \text{ N} \nearrow 15^\circ$

R2-2  $\tan \theta = \frac{6}{3}$   $\theta = 63.4^\circ$   
 $180 - 30 - 63.4 = 86.6^\circ$   
 $R = 6.7 \text{ kN} \nearrow 86.6^\circ$

R2-3  $R_x = -180 \cos 45 - 300 \cos 10 = -422.7$   
 $R_y = 180 \sin 45 + 300 \sin 10 = +179.4$   
 $R = 459 \text{ N} \nearrow 23^\circ$

R2-4  $F_x = 80 \sin 15 = 20.7 \text{ lb} \rightarrow$   
 $F_y = 80 \cos 15 = 77.3 \text{ lb} \downarrow$   
 $v_x = 19 \cos 37 = 15.2 \text{ ft/sec} \leftarrow$   
 $v_y = 19 \sin 37 = 11.4 \text{ ft/sec} \uparrow$   
 $F_x = 2 \cos 48 = 1.34 \text{ lb} \rightarrow$   
 $F_y = 2 \sin 48 = 1.49 \text{ lb} \downarrow$   
 $F_x = 920 \cos 21.8 = 390 \text{ lb} \rightarrow$   
 $F_y = 920 \sin 21.8 = 156 \text{ lb} \downarrow$

R2-5  $v_x = 6 \cos 55 = 3.44 \text{ m/s} \leftarrow$   
 $v_y = 6 \sin 55 = 4.91 \text{ m/s} \downarrow$   
 $s_x = 18 \sin 10 = 3.13 \text{ m} \rightarrow$   
 $s_y = 18 \cos 10 = 17.7 \text{ m} \uparrow$   
 $a_x = \frac{15}{17}(68) = 60 \text{ m/s}^2 \leftarrow$   
 $a_y = \frac{8}{17}(68) = 32 \text{ m/s}^2 \uparrow$   
 $P_x = \frac{2}{3.605}(65) = 36.1 \text{ N} \rightarrow$   
 $P_y = \frac{3}{3.605}(65) = 54.1 \text{ N} \uparrow$

R2-6 initial  $F_x = 3 \cos 6 = 2.98 \text{ kN} \nearrow 40^\circ$   
 Final  $F_x = 3 \cos 15 = 2.9 \text{ kN} \nearrow 40^\circ$