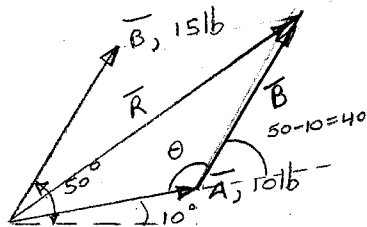


Use the parallelogram rule to determine the Resultant vector, **R**, resulting from the addition of vectors **A** and **B**.

1A.



law of cosines

$$R^2 = A^2 + B^2 - 2AB \cos \theta$$

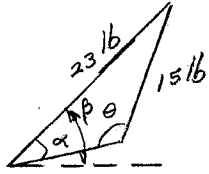
$$= (10)^2 + (15)^2 - 2(10)(15) \cos \theta$$

but $\theta = 180^\circ - (50^\circ - 10^\circ) = 140^\circ$

$$R^2 = 100 + 225 - 2(10)(15) \cos 140^\circ$$

$$R^2 = 554 \text{ lb}^2$$

$$R = 23 \text{ lb}$$



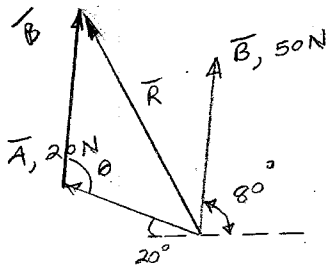
law of sines

$$\frac{23}{\sin \theta} = \frac{15}{\sin \alpha} \Rightarrow \sin \alpha = \frac{15 \sin \theta}{23}$$

$$\sin \alpha = .419 \Rightarrow \alpha = 24.8^\circ$$

$$\beta = \alpha + 10^\circ = 34.8^\circ$$

1B.



$$R^2 = A^2 + B^2 - 2AB \cos \theta$$

$$R^2 = (20)^2 + (50)^2 - 2(20)(50) \cos \theta$$

$$\theta = 80^\circ + 20^\circ = 100^\circ$$

$$R^2 = 400 + 2500 - 2(20)(50) \cos 100^\circ$$

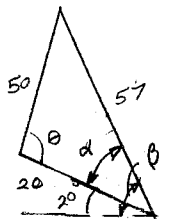
$$R^2 = 3247 \text{ N}^2 \Rightarrow R = 57 \text{ N}$$

$$\frac{57}{\sin \theta} = \frac{50}{\sin \alpha} \Rightarrow \sin \alpha = \frac{50 \sin \theta}{57}$$

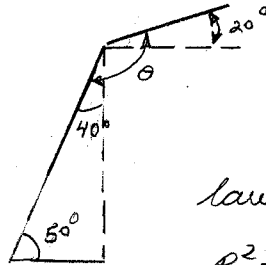
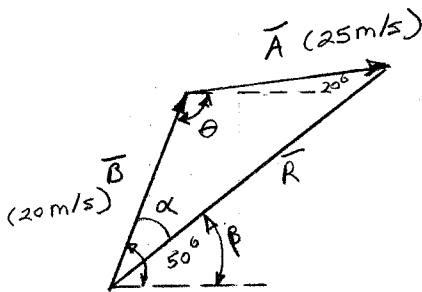
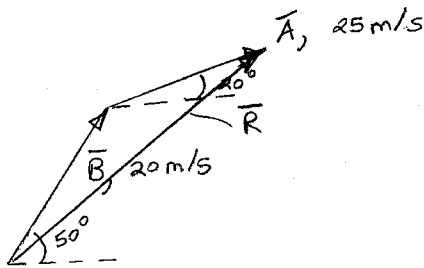
$$\sin \alpha = .863$$

$$\alpha = 59.7^\circ$$

$$\beta = \alpha + 20^\circ = 79.7^\circ$$



1C.



$$\theta = 40^\circ + 90^\circ + 20^\circ = 150^\circ$$

law of cosines

$$R^2 = A^2 + B^2 - 2AB \cos \theta$$

$$= (25)^2 + (20)^2 - 2(20)(25) \cos 150^\circ$$

$$R^2 = 1891 \text{ m}^2/\text{s}^2$$

$$R = 43.5 \text{ m/s}$$

law of sines

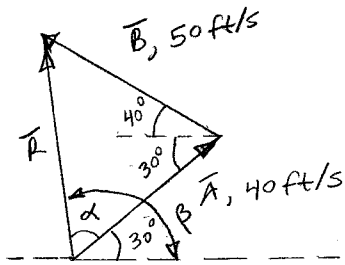
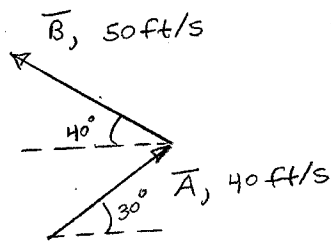
$$\frac{R}{\sin \theta} = \frac{A}{\sin \alpha} \Rightarrow \sin \alpha = \frac{A \sin \theta}{R}$$

$$\sin \alpha = \frac{25 \sin 150^\circ}{43.5} = .287$$

$$\alpha = 16.7^\circ$$

$$\beta = 50^\circ - \alpha = 33.3^\circ$$

10.



law of cosines

$$R^2 = A^2 + B^2 - 2AB \cos \theta$$

$$= (40)^2 + (50)^2 - 2AB \cos (40+30)$$

$$R^2 = 2731$$

$$R = 52.2 \text{ ft/s}$$

law of sines

$$\frac{52.2}{\sin 70^\circ} = \frac{50}{\sin \alpha} \Rightarrow \sin \alpha = \frac{50 \sin 70^\circ}{52.2}$$

$$\sin \alpha = .900$$

$$\alpha = 64.1^\circ$$

$$\beta = 30^\circ + \alpha = 94.1^\circ$$