Vector Applications

Heading and Bearing

An airplane heads $N60^{0}E$ at a speed of 600 mph relative to the air. A wind blows in the direction of $N45^{0}W$ at 50 mph.



- 1. Find the velocity of the airplane as a vector.
- 2. Find the velocity of the wind as a vector.
- 3. Find the true velocity vector (resultant vector) of the airplane.
- 4. What is the true speed of the airplane and it's heading and bearing.

Heading and Bearing

An airplane heads *N*60⁰*E* at a speed of 600 mph relative to the air. A wind blows due North at 50 mph.



- 5. Find the velocity of the airplane as a vector.
- 6. Find the velocity of the wind as a vector.
- 7. Find the true velocity vector (resultant vector) of the airplane.
- 8. What is the true speed of the airplane and it's heading and bearing.

Heading and Bearing

An airplane heads due **East** at a speed of **500 mph** relative to the air. A wind blows $S30^{0}E$ at **60 mph**.



- 9. Find the velocity of the airplane as a vector.
- 10. Find the velocity of the wind as a vector.
- 11. Find the true velocity vector (resultant vector) of the airplane.
- 12. What is the true speed of the airplane and it's heading and bearing.

Tugboats and a Barge

Two tugboats are pulling a barge. Tugboat 1 is pulling with a force of **20,000 pounds** in the direction of $N40^{0}E$ and tugboat 2 is pulling with a force of **34,000 pounds** in the direction $S75^{0}E$.



- 13. What is the resultant force vector on the barge?
- 14. What is the magnitude and direction of the resultant force on the barge?

Two Forces \overline{F}_1 and \overline{F}_2 are Acting on an Object at a point P A **100-pound** force is acting on an object at point P and a **270-pound** force is acting on the same object at point P. See the figure below.



- 15. What is the force vector \overline{F}_1 ?
- 16. What is the force vector \overline{F}_2 ?
- 17. What is the **resultant force vector** acting on the object at point P?
- 18. What is the magnitude and standard angle direction $0 \le \theta \le 2\pi$ of the resultant force vector?

Three Forces \overline{F}_1 , \overline{F}_2 , \overline{F}_3 are Acting on an Object at a point P A **100-pound** force is acting on an object at point P, a **270-pound** force is acting on the object at point P, a **240-pound** force is acting on the object at point P. See the figure below.



- 19. What is the force vector \overline{F}_3 ?
- 20. What is the resultant force vector acting on the object at point P?
- 21. What is the magnitude and standard angle direction $0 \le \theta \le 2\pi$ of the resultant force vector?

Equilibrium of Tensions

A 100-pound weight hangs from a string as shown.



22. Determine the tension for the tension vectors \overline{T}_1 and \overline{T}_2 for each string as described below.

