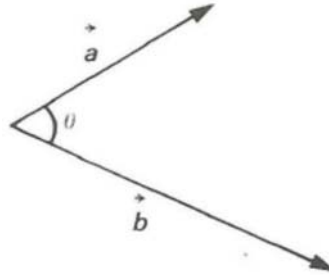


Vectors

For Problems 1 through 4, find

- $|\vec{a} + \vec{b}|$ and the angle that the resultant vectors makes with \vec{a} .
- $|\vec{a} - \vec{b}|$ and the angle that the resultant vectors makes with \vec{a} .

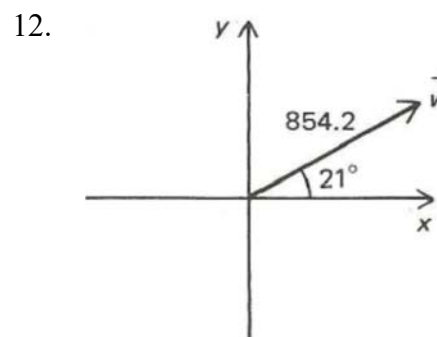
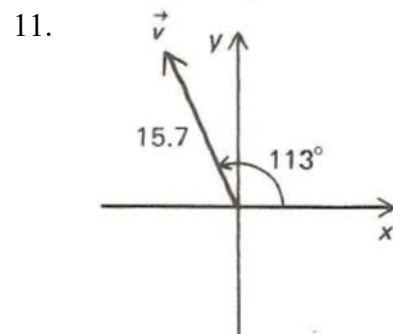
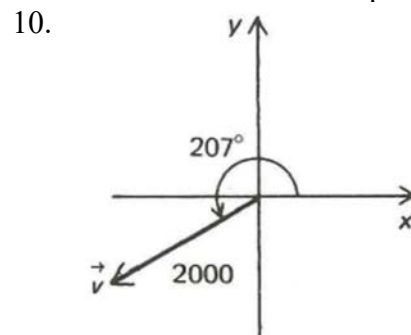
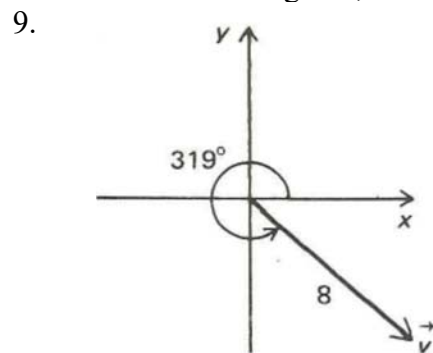
- $|\vec{a}| = 7, |\vec{b}| = 11, \theta = 73^\circ$
- $|\vec{a}| = 8, |\vec{b}| = 2, \theta = 41^\circ$
- $|\vec{a}| = 9, |\vec{b}| = 20, \theta = 163^\circ$
- $|\vec{a}| = 10, |\vec{b}| = 30, \theta = 122^\circ$



For Problems 5 through 8, do the following:

- Find the resultant of the two given displacements. Express the answer as a distance and a bearing (clockwise from north) from the starting point to the end point.
 - Tell the bearing from the end point back to the starting point.
- 11 units north (0°) followed by 5 units along a bearing of 70° .
 - 8 units east (90°) followed by 6 units along a bearing of 210° .
 - 6 units west (270°) followed by 14 units along a bearing of 110° .
 - 4 units south (180°) followed by 9 units along a bearing of 320° .

For Problems 9 through 12, resolve the vector into horizontal and vertical components.



13. If $\vec{r} = 21$ units at $\theta = 70^\circ$ and $\vec{s} = 40$ units at $\theta = 120^\circ$, and $\vec{r} + \vec{s}$
 - a. as a sum of two components,
 - b. as a magnitude and a direction.
14. If $\vec{u} = 12$ units at $\theta = 160^\circ$ and $\vec{v} = 8$ units at $\theta = 310^\circ$, find $\vec{u} + \vec{v}$
 - a. as a sum of two components,
 - b. as a magnitude and direction.
15. A ship sails 50 miles on a bearing of $\theta = 20^\circ$, then 30 miles further on a bearing of $\theta = 80^\circ$. Find the resultant displacement vector as a distance and bearing.
16. A plane flies 30 miles on a bearing of $\theta = 200^\circ$, then turns and flies 40 miles on a bearing of $\theta = 10^\circ$. Find the resultant displacement vector as a distance and bearing.
17. A plane flies 200 miles per hour (mph) along a bearing of 320° . The air is moving with a wind speed of 60 mph along a bearing of 190° . Find the plane's resultant velocity (speed and bearing) by adding these two velocity vectors.
18. A scuba diver swims 100 feet per minute along a bearing of 170° . The water is moving with a current of 30 feet per minute along a bearing of 115° . Find the diver's resultant velocity (speed and bearing) by adding these two velocity vectors.

Answers:

- | | |
|--------------------------------|---|
| 1. a) 14.66 at $45^\circ 50'$ | 9. $6.038 \vec{i} - 5.248 \vec{j}$ |
| b) 11.18 at $70^\circ 13'$ | 10. $-1782 \vec{i} - 908 \vec{j}$ |
| 2. a) 9.600 at $7^\circ 51'$ | 11. $-6.134 \vec{i} + 14.45 \vec{j}$ |
| b) 6.622 at $11^\circ 26'$ | 12. $797.5 \vec{i} + 306.1 \vec{j}$ |
| 3. a) 11.69 at $150^\circ 00'$ | 13. a) $-12.817 \vec{i} + 54.374 \vec{j}$ |
| b) 28.73 at $11^\circ 45'$ | b) 55.864 at 103.26° |
| 4. a) 26.12 at $103^\circ 03'$ | 14. a) $-6.134 \vec{i} - 2.024 \vec{j}$ |
| b) 36.30 at $44^\circ 29'$ | b) 6.459 at 198.3° |
| 5. a) 13.55 at 20.3° | 15. 70 miles at 41.8° |
| b) 200.3 | 16. 11.7 miles at 343.5° |
| 6. a) 7.211 at 136.1° | 17. 167.8 mph at 304.1° |
| b) 316.1 | 18. 119.8 ft./min at 158.2° |
| 7. a) 8.609 at 123.8° | |
| b) 303.8 | |
| 8. a) 6.468 at 296.6° | |
| b) 116.6 | |