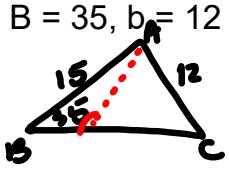
Warm up

1. Solve the triangle.

B = 35, b = 12 , c = 15



$h = 15\sin 35 = 8.6$

2 Δs

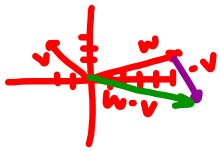
A = 99.2/16.8 a = 18.44/3.92

C = 45.8/134.2

2. Use the given vectors for the following: $v = \langle -2, 3 \rangle$ $w = \langle 5, 1 \rangle$

a. sketch w - v

$w + (-v)$



QI

b. find the unit vector for vector v

$U = \left\langle \frac{v_1}{\|v\|}, \frac{v_2}{\|v\|} \right\rangle$ $\|v\| = \sqrt{13}$ $u = \left\langle \frac{-2}{\sqrt{13}}, \frac{3}{\sqrt{13}} \right\rangle$

c. find the trig component form of vector w (calc ok)

1. $\|w\| = \sqrt{26}$

2. $\theta \Rightarrow \tan\theta = \frac{1}{5}$

$\tan^{-1}\left(\frac{1}{5}\right) = \theta$

$11.31 = \theta$

$\langle \sqrt{26}\cos 11.31, \sqrt{26}\sin 11.31 \rangle$

Apr 15-6:00 AM

GO COUGARS!

Homework Questions

p 434

In Exercises 45–50, find the vector v with the given magnitude and the same direction as u.

	Magnitude	Direction
45.	$\|v\| = 8$	$u = \langle 5, 6 \rangle$

	Magnitude	Direction
47.	$\|v\| = 7$	$u = 3i + 4j$
48.	$\|v\| = 10$	$u = 2i - 3j$
49.	$\|v\| = 8$	$u = -2i$
50.	$\|v\| = 4$	$u = 5j$

In Exercises 51–54, the initial and terminal points of a vector are given. Write the vector as a linear combination of the standard unit vectors i and j.

	Initial Point	Terminal Point
51.	$(-3, 1)$	$(4, 5)$
52.	$(0, -2)$	$(3, 6)$
53.	$(-1, -5)$	$(2, 3)$

$4+3, 5-1$

$7i + 4j$

In Exercises 55–60, find the component form of v and sketch the specified vector operations geometrically, where $u = 2i - j$ and $w = i + 2j$.

55. $v = \frac{1}{2}u$
56. $v = \frac{1}{2}w$
57. $v = u + 2w$
58. $v = -u + w$
59. $v = \frac{1}{2}(3u + w)$
60. $v = 2u - 2w$

In Exercises 61–66, find the magnitude and direction angle of the vector v.

61. $v = 8(\cos 30°i + \sin 30°j)$ (mag, direction angle)
62. $v = 8(\cos 135°i + \sin 135°j)$
63. $v = 6i - 6j$ Q4
64. $v = -4i - 7j$
65. $v = -2i + 5j$
66. $v = 12i + 15j$

$\|v\| = \sqrt{6^2 + (-6)^2} = \sqrt{72} = 6\sqrt{2}$

$\tan\theta = \frac{-6}{6} = -1$

$RA\ \theta = \frac{\pi}{4}$

$\theta = \frac{7\pi}{4}$

$6\sqrt{2}\cos\frac{7\pi}{4} + 6\sqrt{2}j \sin\frac{7\pi}{4}$

In Exercises 67–72, find the component form of v given its magnitude and the angle it makes with the positive x-axis. Sketch v.

	Magnitude	Angle
67.	$\|v\| = 3$	$\theta = 0°$
68.	$\|v\| = 1$	$\theta = 45°$
69.	$\|v\| = 3\sqrt{2}$	$\theta = 150°$
70.	$\|v\| = 4\sqrt{3}$	$\theta = 90°$
71.	$\|v\| = 2$	v in the direction $i + 3j$
72.	$\|v\| = 3$	v in the direction $3i + 4j$

In Exercises 73–76, find the component form of the sum of u and v with direction angles θ_u and θ_v.

	Magnitude	Angle
73.	$\|u\| = 5$	$\theta_u = 60°$
	$\|v\| = 5$	$\theta_v = 90°$
75.	$\|u\| = 20$	$\theta_u = 45°$
	$\|v\| = 50$	$\theta_v = 150°$

$\langle 5\cos 60, 5\sin 60 \rangle$

$+ \langle 5\cos 90, 5\sin 90 \rangle$

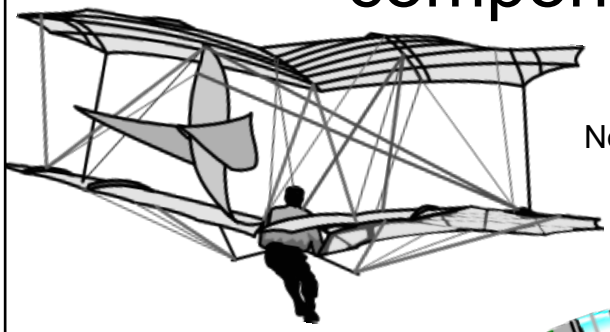
$\frac{5}{2}, \frac{5\sqrt{3}}{2}$

$0 \quad 5$

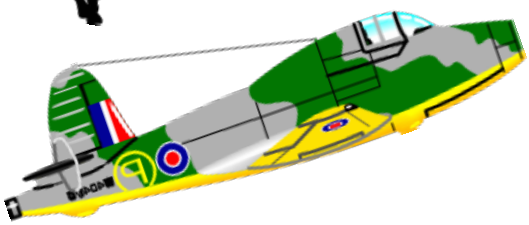
$\left\langle \frac{5}{2}, \frac{5\sqrt{3}}{2} + 5 \right\rangle$

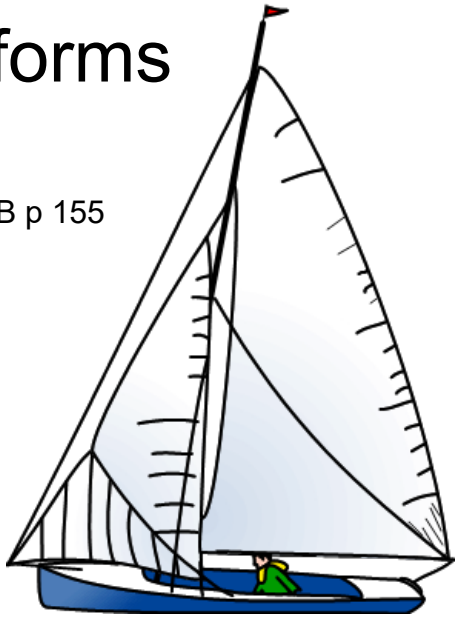
Feb 2-9:51 PM

Applications of vectors and component forms



Notes in WB p 155





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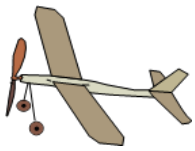
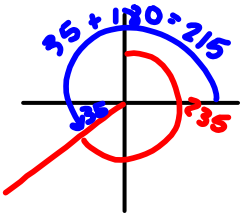


Find the component form of a plane flying 200 mph at a bearing of 235 degrees.



1. Sketch the bearing on the axis.

2. Change the angle from bearing to trig angle.

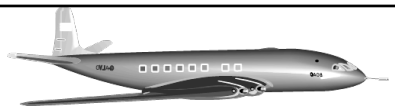
$\langle 200\cos 215, 200\sin 215 \rangle$

3. speed = magnitude

4. Write in component form.

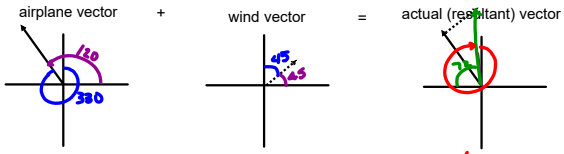
$\langle -163.83, -114.72 \rangle$

Apr 17-4:55 PM



An airplane is traveling 300 mph at a bearing of 330 degrees. If it is being pushed by a wind blowing 70 mph at a bearing of 45 degrees, what is the resultant speed and direction of the plane?

airplane vector + wind vector = actual (resultant) vector



$\langle 300\cos 120, 300\sin 120\rangle + \langle 70\cos 45, 70\sin 45\rangle = \langle -100.5, 309.31\rangle$

$\text{Speed} = \sqrt{(-100.5)^2 + (309.31)^2}$
$= 325.23 \text{ mph}$

$\tan\theta = \frac{309.31}{-100.5}$

$RA\theta = 72$

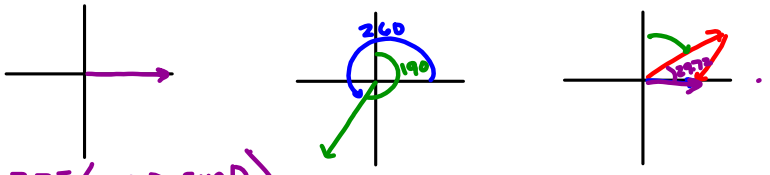
$\text{Bearing} = 270 + 72 = 342^\circ$

speed 325.23 mph
bearing 342 degrees

Apr 17-4:40 PM

A sailboat motoring under auxiliary power is traveling due east at a speed of 7.75 mph in still water. A wind begins to blow 5 mph at a bearing of 190 degrees. What speed and bearing must the captain maintain to stay on course?

actual (resultant) vector - wind vector = boat vector



$7.75\langle \cos\theta, \sin\theta\rangle$

$\langle 7.75\cos\theta, 7.75\sin\theta\rangle - \langle 5\cos 260, \sin 260\rangle = \langle 8.62, 4.92\rangle$

$\text{speed} = \sqrt{8.62^2 + 4.92^2}$
$= 9.93 \text{ mph}$

$\tan\theta = \frac{8.62}{4.92}$

$RA\theta = 29.72$

$\text{bearing} = 90 - 29.72$

speed 9.93 mph
bearing 60.28 degrees

Apr 17-5:14 PM

HOMEWORK

WB p 156 1-7 all

Feb 2-9:51 PM

Vector Application Worksheet Answers

1. $\langle -223.99, 480.34 \rangle$
2. $\langle 250, -433.01 \rangle$
3. speed = 362.85 mph, bearing = 337.84
4. speed = 530.79, bearing = 174.32
5. speed = 18.91 mph, bearing = 251.63
6. speed = 433.48, bearing = 272.72
7. speed = 758.91, bearing = 1.05

Apr 17-3:25 PM