Physics 12: 2D vectors

1 a. $\vec{F}_x = 1.0 \times 10^2\,N$ East
$\vec{F}_y = 64\,N$ South

b. $\vec{d}_x = 10.5\,m\,\hat{x}$
$\vec{d}_y = 3.61\,m\,\hat{y}$

c. $\vec{v}_x = 12\,m/s$ W
$\vec{v}_y = 64\,m/s$ N

d. $\vec{d}_x = 570\,km\,\hat{x}$
$\vec{d}_y = -1100\,km\,\hat{y}$

e. $\vec{a}_x = -0.66\,m/s^2\,\hat{x}$
$\vec{a}_y = 0.16\,m/s^2\,\hat{y}$

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2 a. $\vec{d} = 25\,m$ [27° above −x]

b. $\vec{v} = 7.6\,m/s$ [56° above +x]

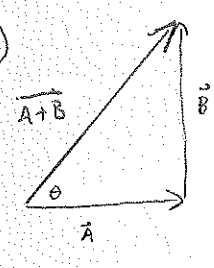
c. $\vec{F} = 262\,N$ [32.1° below +x]

d. $\vec{a} = 1.5\,m/s^2$ [59° above −x]

e. $\vec{d} = 170\,m$ [57° below +x]

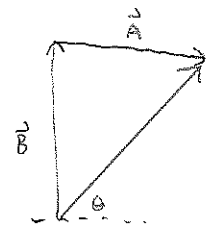
f. $1.0 \times 10^2\,N$ [25° below +x]

3



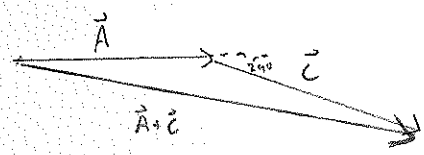
$\vec{A}+\vec{B} = 55\,m$ [49° above +x]

b.



$\vec{B}+\vec{A} = 55\,m$ [49° above +x]

c.

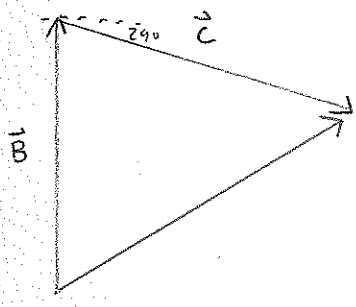


$\hat{x}$: $\vec{A}_x = 36\,m$
$\vec{C}_x = 39\cos 29°$
$\vec{A}_x + \vec{C}_x = 70.11016858\,m$

$\vec{A}_y = 0$
$\vec{C}_y = -39\sin 29°$
$\vec{A}_y + \vec{C}_y = -18.90757519$

$\vec{A}+\vec{C} = 73\,m$ [15° below +x]

d.



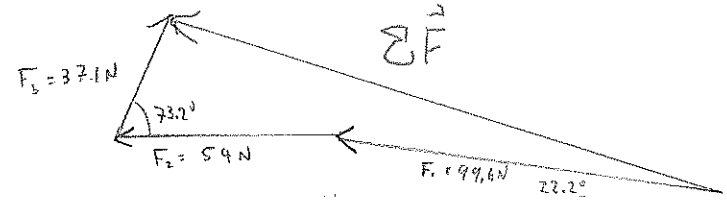
$\hat{x}$: $\vec{B}_x = 0$
$\vec{C}_x = 39\cos 29°$
$\vec{B}_x + \vec{C}_x = 34.11016858\,m$

$\hat{y}$: $\vec{B}_y = 42\,m$
$\vec{C}_y = -39\sin 29°$
$\vec{B}_y + \vec{C}_y = 23.09242481\,m$

$\vec{B}+\vec{C} = 41\,m$ [34° above +x]

(4)

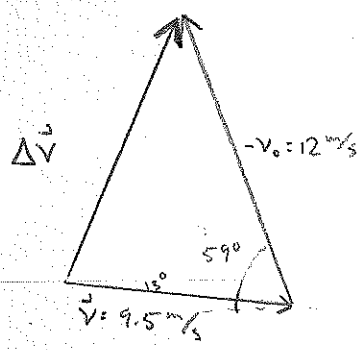
	$\hat{x}$	$\hat{y}$
$\vec{F}_1$	$-99.6\cos 22.2$	$+99.6\sin 22.2$
$\vec{F}_2$	-54	0
$\vec{F}_3$	$+37.1\cos 73.2$	$+37.1\sin 73.2$
$\sum\vec{F}$	$-135.4936306N$	73.14949573



$\sum\vec{F} = 154N$ [28.4° above $-x$]

(5) $\Delta\vec{v} = \vec{v} - \vec{v}_0 = \vec{v} + (-\vec{v}_0)$

$-\vec{v}_0 = 12\,m/s$ [59° above $-x$]



$\hat{x}$: $\vec{v}_x = +9.5\cos 13°$

$-\vec{v}_{0x} = -12\cos 59°$

$\Delta\vec{v}_x = 3.076058717\,m/s$

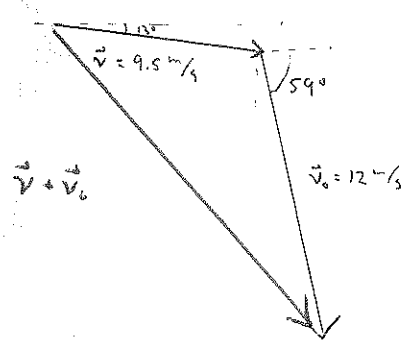
$\hat{y}$ $\vec{v}_y = +9.5\sin 13°$

$-\vec{v}_{0y} = +12\sin 59°$

$\Delta\vec{v}_y = 8.148972592\,m/s$

$\Delta\vec{v} = 8.7\,m/s$ [69° above $+x$]

$\bar{v} = \frac{\vec{v} + \vec{v}_0}{2} = \frac{1}{2}(\vec{v} + \vec{v}_0)$; First I will find $\vec{v} + \vec{v}_0$; then I will multiply by $\frac{1}{2}$.



$\hat{x}$: $\vec{v}_x = +9.5\cos 13°$

$\vec{v}_{0x} = +12\cos 59°$

$(\vec{v} + \vec{v}_0)_x = 15.43697251$

$\vec{v}_y = +9.5\sin 13°$

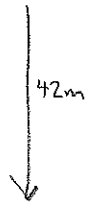
$\vec{v}_{0y} = -12\sin 59°$

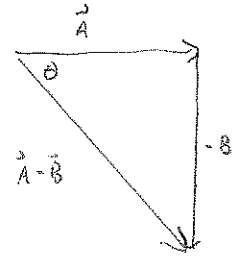
$(v + v_0)_y = -12.42304262$

$\vec{v} + \vec{v}_0 = 19.81494659\,m/s$ [39° below $+x$]

$\bar{v} = \frac{1}{2}(\vec{v} + \vec{v}_0) = 9.9\,m/s$ [39° below $+x$]

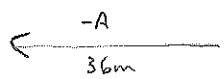
e. $\vec{A}-\vec{B} = \vec{A}+(-\vec{B})$ $\Rightarrow$ $-\vec{B}$

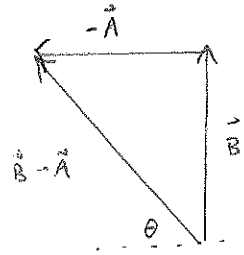




$\vec{A}-\vec{B} = 55m$ [49° below +x]

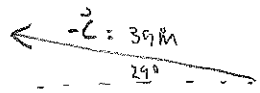
f. $\vec{B}-\vec{A} = \vec{B}+(-\vec{A})$ $\Rightarrow$

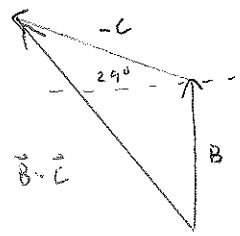




$\vec{B}-\vec{A} = 55m$ [49° above -x]

g. $\vec{B}-\vec{C} = \vec{B}+(-\vec{C})$ $\Rightarrow$



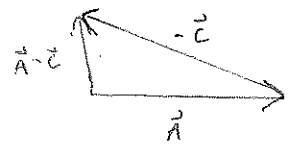


	$\hat{x}$	$\hat{y}$
$\vec{B}$	0	42m
$-\vec{C}$	-39cos29	39sin29
$\vec{B}+(-\vec{C})$	-34.11016858m	60.907575 9m

$\vec{B}-\vec{C} = 7.0\times10m$ [61° above -x]

h. $\vec{A}-\vec{C} = \vec{A}+(-\vec{C})$

	$\hat{x}$	$\hat{y}$
$\vec{A}$	36	0
$-\vec{C}$	-39cos29	39sin29
	1.889831422	18.90757519

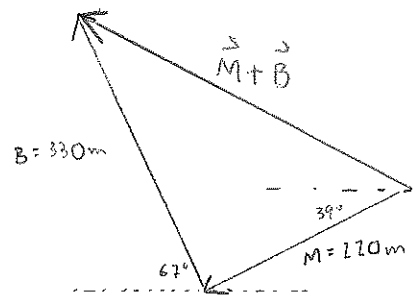


$\vec{A}-\vec{C} = 19m$ [84° above +x]

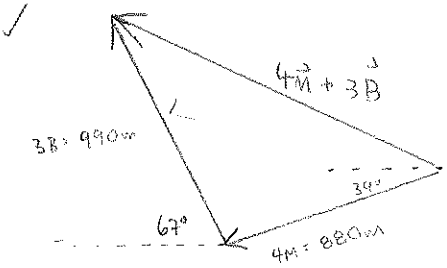
c. $\vec{d} = \bar{v}t = 7.3\,m$ [39° below + x]

6.

	$\hat{x}$	$\hat{y}$
$\vec{M}$	$-220\cos 39°$	$-220\sin 39°$
$\vec{B}$	$-330\cos 67$	$+330\sin 67°$
$\vec{M}+\vec{B}$	-299.9133889	$+165.3161156$



$\vec{M}+\vec{B} = 340\,m$ [29° above − x]



b.

$4\vec{M}+3\vec{B}$	$\hat{x}$	$\hat{y}$
$4\vec{M}$	$-880\cos 39°$	$-880\sin 39°$
$3\vec{B}$	$-990\cos 67°$	$+990\sin 67°$
$4\vec{M}+3\vec{B}$	$1070.712263\,m$	357.4978608

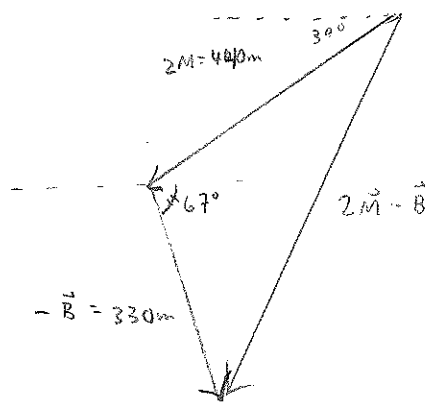
$4\vec{M}+3\vec{B} = 1100\,m$ [18° above − x]

c. $2\vec{M}-\vec{B} = 2M+(-\vec{B})$

$-\vec{B} = 330\,m$ [67° below + x]

$\hat{x}$: $2M_x = -440\cos 39°$
$-\vec{B}_x = 330\cos 67°$
$(2\vec{M}+-\vec{B})_x = -213.0029506$

$\hat{y}$: $2M_y = -440\sin 39°$
$-\vec{B}_y = -330\sin 67°$
-580.6675737



$2\vec{M}-\vec{B} = 620\,m$ [(7.0×10)° below − x

d. $\vec{T}+\vec{M}$

$\boxed{\text{CANNOT BE ADDED}}$