Vector/Project Practice MC 2014A Name Key *Hr.*_____

B 1.

30 ↔ 70

Two vectors, of magnitudes 20 and 50, are added. Which one of the following is a possible answer for the magnitude of the resultant?

A) 20 B) 40 C) 80 D) 10

D 2.

Your motorboat can move at 30 km/h in still water. How much time will it take you to move 12 km downstream, in a river flowing at 6.0 km/h?

A) 30 min B) 22 min C) 24 min (D) 20 min

$t = \frac{\text{Distance}}{\text{velocity}} = \frac{12}{(30+6)} = \frac{12}{36} = \frac{1}{3}\,hr = 20\,min$

C 3.

Three forces, each having a magnitude of 30 N, pull on an object in directions that are 120° apart from each other. Make a statement concerning the resultant force.

A) The resultant force is equal to 30 N. B) The resultant force is less than 30 N.
(C) The resultant force is zero. D) The resultant force is greater than 30 N.

30 0 30 0 0
30 150 75 -75

C 4.

If a ball is thrown with a velocity of 25 m/s at an angle of 37° above the horizontal, what is the vertical component of the velocity?

A) 25 m/s B) 12 m/s (C) 15 m/s D) 19 m/s

25 sin37

C 5.

A boat, whose speed in still water is 8.0 m/s, is directed across a river with a current of 6.0 m/s. What is the speed of the boat as it crosses the river?

A) 5.3 m/s B) 8.0 m/s (C) 10.0 m/s D) 6.0 m/s

C 6.

A stone is thrown horizontally with an initial speed of 10 m/s from the edge of a cliff. A stop watch measures the stone's trajectory time from the top of the cliff to the bottom to be 4.3 s. What is the height of the cliff?

A) 22 m B) 43 m (C) 91 m D) 77 m

	x	y
Δ		0
x_i		
v_i	10	0
v_f	10	
g	0	-9.8
t		4.3 s

$0 = x_i + v_i t - 4.9(4.3)^2$

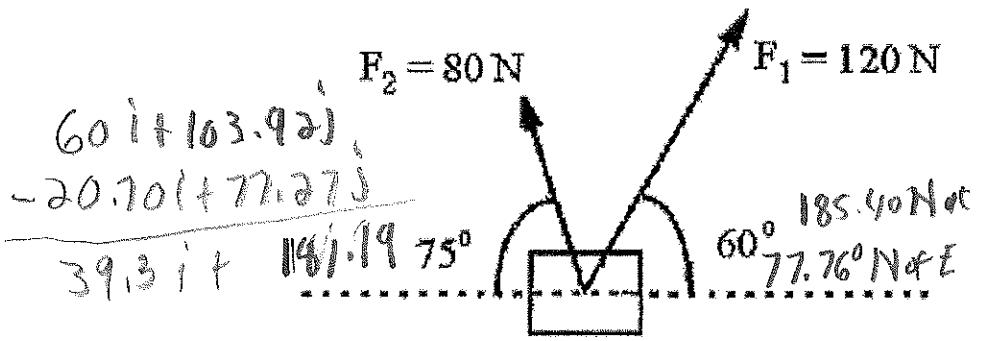
$x_i = 90.60$

A 7.

A jumper in the long-jump goes into the jump with a speed of 12 m/s at an angle of 20° above the horizontal. How far does the jumper jump?

(A) 9.4 m B) 6.2 m C) 3.4 m D) 15 m

	x	y
S	9.43m	0
x_i		0
v_i	11.28	4.10
v_f		
a		-9.8
t	.836	.836



60 i + 103.92 j

-20.70 i + 77.27 j

39.3 i + 141.19 j = 185.40 N at 74.6° N of E

FIGURE 3-1

A 8.

Two forces are acting on an object as shown in Fig. 3-1. What is the magnitude of the resultant force?

(A) 185 N B) 47.5 N C) 200 N D) 198 N

A 9.

Two forces are acting on an object as shown in Fig. 3-1. What is the direction of the resultant force?

(A) 78° above +x B) 78° above -x C) 12° above +x D) 12° above -x

A 10.

If you walk 6.0 km in a straight line in a direction north of east and you end up 2.0 km north and several kilometers east. How many degrees north of east have you walked?

(A) 19° B) 45° C) 71° D) 60°

D 11.

A rifle bullet is fired at an angle of 30° below the horizontal with an initial velocity of 800 m/s from the top of a cliff 80 m high. How far from the base of the cliff does it strike the level ground below?

A) 160 m B) 130 m C) 150 m (D) 140 m

	x	y
S	137.86m	0
x_i	0	80
v_i	200 cos -36	800 sin -30 = -400
v_f	692.80	
a		-9.8
t	.199	.199

A 12.

A swimmer heading directly across a river 200 m wide reaches the opposite bank in 6 min 40 s. She is swept downstream 480 m. What is the speed of the current?

A) 1.2 m/s B) 1.4 m/s C) 1.8 m/s D) 0.50 m/s

	i-comp	j-comp	k-comp
Vector S	5.0	-25.0	2.0
Vector T	10.0	45.0	-1.0
Vector U	-30.0	10.0	3.0

-15 i 30 j 4 k

Questions 13-15 Refer to the chart above.

D 13. What is the direction of Vector S?

A) 78.69° N of W B) 11.31° Wof N C) 11.31° S of E D) 78.69° S of E

A 14. What is the azimuth of vector U?

A) 5.4° B) 71.56° C) 18.43° D) 84.6°

$\theta = \tan^{-1}\left(\frac{K}{\sqrt{i^2+j^2}}\right) = \left(\frac{3}{\sqrt{(-30)^2+(10)^2}}\right)$ $\tan^{-1}$

$\tan^{-1}\left(\frac{3}{31.62}\right)$

B 15. What is the Magnitude of Vector S + Vector T + Vector U

A) 96.36 B) 33.78 C) 19.00 D) 49.00

	x	y
S	200	-480
x_i	0	0
V_i		-1.2 m/s
$V_f = V_i$		
a	0 m/s²	0 m/s²
t	400 sec	400 sec

$S = x_i + V_i$

$-480 = 0 + V_i 400 + \frac{1}{2}(0)t^2$

$V_i = -1.2 \frac{m}{s}$

Review Worksheet Name_____ Hr._____
Vector/Projectiles 2007

1. A treasure is located at 300m away at 210 mark -10. A) How far east/west is the treasure? B) How far North/South is the treasure? C) How far above or below the horizon is the treasure?

2. A group of kids are taking part a in a tug of war. In this tug of war each of the four teams is applying force via a rope to an attached ring. The following is a list of the forces applied to the ring by the various teams: Team 1: 500 N at 5° East of North at an azimuth of 20°; Team 2: 300 N at 10° South of West; Team 3: 275 N at 30° North of East at an azimuth of -13°; Team 4:334 N due South a) What is the resultant force acting on the ring? B) What is the equilibrant force? C) If the ring and the teams have a mass of 3000kg what is the acceleration of the system?

3. A ship leaves its port and heads at 12° N of E for 10 km. The ship then turns to 20° North of West and travels for 20 km. It then runs into trouble and sends up a flare that rises **500m** into the air at 30° to the South of East at an azimuth of 85°. A) What is the position of the flare in relation to the ship's port? B) What is the position of the flare in relation to someone who is 20 km NE of the port at an azimuth of 50° C) What is the unit vector?

4. A 500 N sign is held up by 3 ropes TWO making a 10° angle with the horizontal. The Third rope is making a 90° angle with the horizontal. What is the force acting on the ropes?

5. A boat is traveling 15° south of east across a river that is 200 meters wide and flowing north. The boat will cross the river at a speed of 5 m/s. If the river is moving at 3 m/s what will be the boat's relation to its starting point when it lands on the other side?

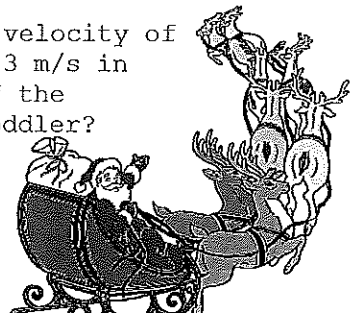
6. A ball is pushed off of a table .93 m high. a) If it lands at range of 2.0 m at what velocity did it leave the table at? b) What is the ball's final velocity?

7. A football player kicks a ball at 30 m/s at an angle of 35°. A) What is the height of the ball when it is 25 m from where it was kicked? B) What angle would give the same range?

8. A car moving at 16.8 m/s launches a soda can out the window at an angle of 25° to the horizontal at a speed of 5 m/s. A) At what range from the launch point does the can land? B) What is the maximum height of the soda can? C) What is the final velocity of the soda can? D) What is the soda can's angle of entry?

9. A projectile is launched at a speed of 50 m/s at an angle of 40°. A) What is the projectiles range? B) What is the time of flight? C) What is the maximum height of the projectile? D) What is the relationship between the projectiles launch position and its position after 1.5 sec?

10. A Santa Clause is flying at an altitude of 500 m with a velocity of 15 m/s. He is over taking a toddler on a tricycle moving at 3 m/s in the same direction as the sleigh. At what distance astern of the tricycle should Santa drop a present to deliver it to the toddler?



1. $\theta = 240$

$\theta_2 = -10$

300 m

i : mag $\cos\theta \cos\theta_2 = 300 \cos 240 \cos 10 = -147.72$ m

j : mag $\sin\theta \cos\theta_2 = 300 \sin 240 \cos 10 = -255.86$ m

j : mag $\sin\theta = 300 \sin -10 = -52.09$

147.72 m W, 255.86 m South, 52.09 m Deep

2.

Mag	θ	θ_2	i	j	F
500	85	20	40.94	468.05	171.01
300	190	0	-295.44	-52.09	0.00
275	30	-13	232.05	133.98	-61.86
334	270	0	0	-334	0.00
			-22.45	215.94	109.14

$\text{Mag} = \sqrt{(-22.45)^2 + 215.44^2 + 109.14^2} = 343.99$ N

$\theta = \tan^{-1}\left(\frac{215.94}{22.45}\right) = 84.06^\circ$ N of W

5.94° W of N

$\theta_2 = \tan^{-1}\left(\frac{109.14}{\sqrt{(-22.45)^2 + 215.94^2}}\right) = 26.64^\circ$

3.

	Mag	θ	θ2	i	j	k
A)	10	12	0	9.78	2.07	0
	20	160	0	-18.79	6.84	0
	.5	330	85	.03	-.02	.498
				-8.98	8.89	.498

$\text{Mag} = \sqrt{i^2 + j^2 + k^2} = 12.64 \text{ km}$

$\theta = \tan^{-1}\left|\frac{j}{i}\right| = \tan^{-1}\left(\frac{8.89}{8.98}\right) = 44.71^\circ \text{ N of W}$

$\theta_2 = \tan^{-1}\left(\frac{.498}{\sqrt{(-8.98)^2 + 8.89^2}}\right) = 2.25^\circ$

C) $.71i + .703j + .039k$

B

$\overrightarrow{obs}$

Mag	θ	θ2	i	j	k
20	45	50	9.09	9.09	15.32

$\overrightarrow{obj} - \overrightarrow{obs}$

$-8.98i + 8.89j + .498k$

$-(9.09i + 9.09j + 15.32k)$

$-18.07i \quad -.2j \quad -14.822k$

23.37 KM at 63° S of W at an azimuth −39.35°

4.

$M_{4g} \sin 10 + M_{4g} \sin 170 + M_{4g} \sin 90 = 500$

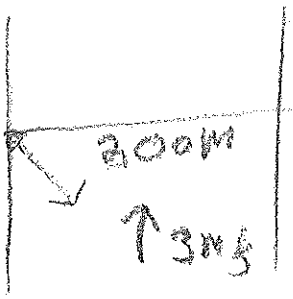
$\frac{1.35\, M_{4g}}{1.35} = \frac{500}{1.35}$

$M_{4g} = 370\ N$

5.

$5\frac{m}{s}$

$\theta = 345$



	x	y
s	200	70.62
x_i	0	0
v_i	$5\cos 345$	$5\sin 345 + 3 = 1.706$
$v_f = v_i$	4.83	1.705
a	0 m/s²	0 m/s²
t	41.40	41.40

$M_{4g} = \sqrt{()^2 + ()^2} = 212.10m$

$\theta = \tan^{-1}\frac{y}{x} = 19.44^\circ$ N of E

6.

	x	y
s	2	0
x_i	0	.93
v_i		0
v_f	4.59	-4.20
a	0	-9.8
t	.435	.435

(V_i = 4.59 m/s Mag 6.26 $\frac{m}{s}$ at 42.45° with ground)

7.

	x	y
s	25	12.79 m
x_i	0	0
v_i	24.57	17.20
v_f	24.57	
a	0	-9.8
t	1.07	1.07

B) 55°

8.

	x	y
s	9.17 m	0
x_i	0	0
v_i	21.33	2.11
v_f	21.33	-2.11
a	0	-9.8
t	.430	.430

Max height = .227 m

V_f = 21.43 $\frac{m}{s}$ at 5.65° with Ground

9. 

#9 see *

10. $0t + 15t + \frac{1}{2}0t^2 = x_i + 3t + \frac{1}{2}0t^2$

$x_i = 15t - 3t = 12t$

s	0
x_i	500
v_i	0
v_f	
a	-9.8
t	= 10.10

x_i = 121.2 M

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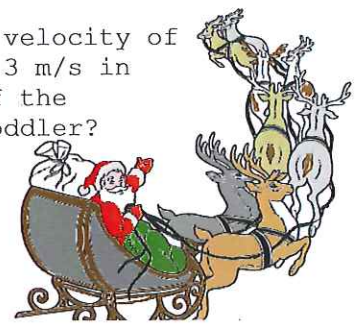

* 9.

	x	y
s	250.86 m	0
x_i	0	0
v_i	$50\cos 40 = 38.30$	32.13 m/s
v_f	$= 38.30$	-32.06 m/s
a	$= 0$	-9.8
t	6.55	6.55

Max Height: 52.67 m

	x	y
s	57.45	37.17
x_i	0	0
v_i	38.30	32.13
v_f	38.30	
a	0	-9.8
t	1.5	1.5

68.42 m at 32.90° above Horizon

Alkene Test Part B Name _____ Hr. _____

1. Prepare 1,2-propandiol from propane

2. Prepare 1-chloro 2-methyl pentane from 3-methyl 2-pentanol

3. Prepare 1,2 dichloro ethane via an alkene

4. Prepare 1-butene from ethane via an alcohol

5. Prepare 1,2 cyclohexandiol from cyclohexanol