Name *Key* Hour ____________

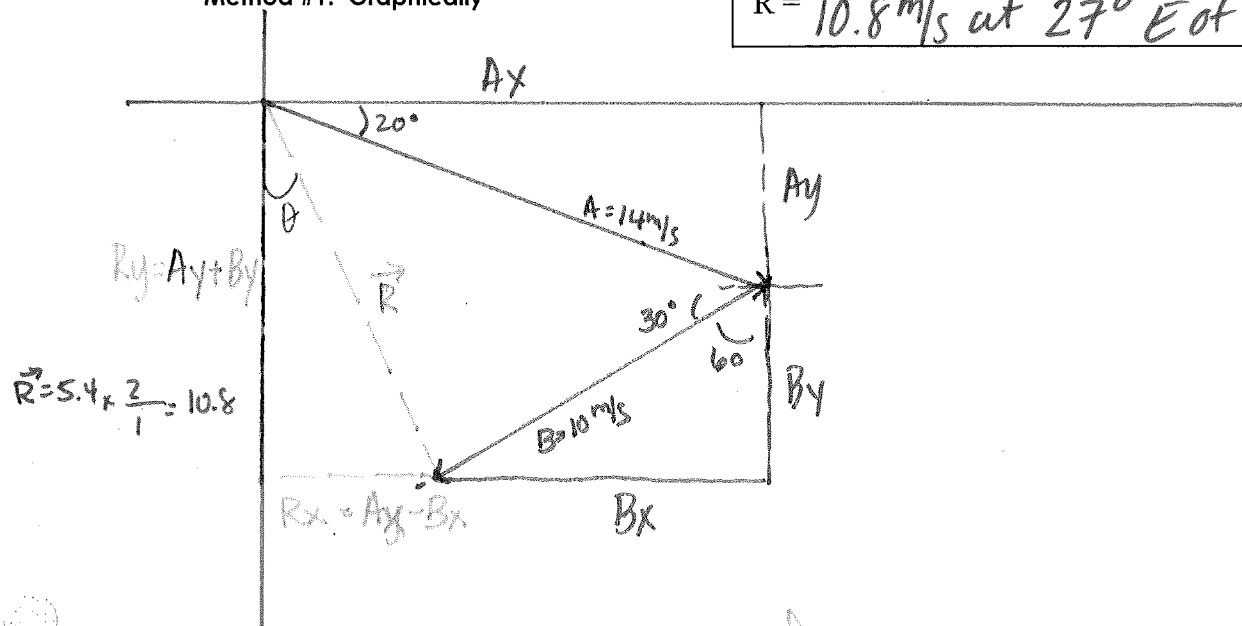
Extra Practice for Vectors and 1-D Motion:

A boat is trying to cross a river and is traveling at 14 m/s at 20° S of E. The current is moving at 10 m/s at 30° S of W. Find the velocity of the boat: ***(R= 10.8 m/s at 24.8° E of S)***

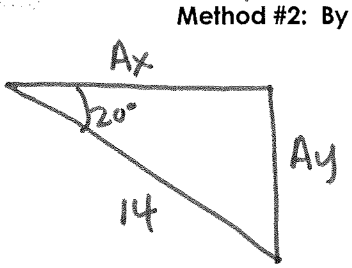
Scale: 1 cm = 2 m/s

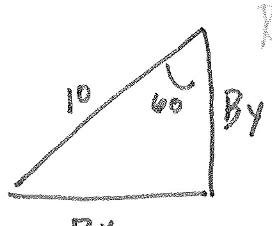
Method #1: Graphically

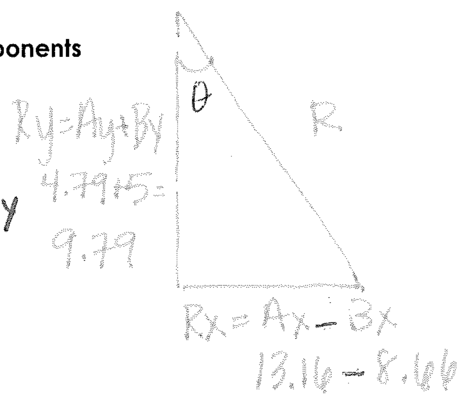
R = *10.8 m/s at 27° E of S*



Method #2: By Resolution into Components







Ay =	4.79
Ax =	13.16
By =	5
Bx =	8.66
Ry =	9.79
Rx =	4.5
R =	10.77
Angle =	24.7° E of S

$\sin 20° = \frac{Ay}{14}$

$Ay = 4.79$

$\cos 20° = \frac{Ax}{14}$

$Ax = 13.16$

$\sin 60° = \frac{Bx}{10}$

$Bx = 8.66$

$\cos 60° = \frac{By}{10}$

$By = 5$

$Rx = 4.5$

magnitude:

$R^2 = Rx^2 + Ry^2$

$R^2 = (4.5)^2 + (9.79)^2$

$R^2 = 116.1$

$R = 10.77$

direction: $\tan\theta = \frac{Rx}{Ry} = \frac{4.5}{9.79}$

$\tan\theta = .4596$

$\theta = 24.7$ E of S

R = *10.77 m/s at 24.7° E of S*

Name Key Hour ______

1-Dimensional Motion Practice with Vectors

1. You are driving in your car at 15 m/s and come to a stop in 4.55 sec. How many meters did it take you to stop?

g: $V_i = 15\,m/s$, $V_f = 0$, $\Delta t = 4.55\,sec$

u: Δx

① $a = \frac{V_f - V_i}{\Delta t}$

$a = \frac{0-15}{4.55} = -3.30\,m/s^2$

② $V_f^2 = V_i^2 + 2a\Delta x$

$0^2 = 15^2 + 2(3.3)\Delta x$

$-225 = 6.6\,\Delta x$

$\boxed{\Delta x = 34.1\,m}$

2. A rock is dropped from rest on a planet where the acceleration due to gravity is unknown. If it drops 2.2 meters during the first second, how far will it fall after 6.15 seconds? (You will need to find a!)

$V_i = 0$, $\Delta x = 2.2$, $\Delta t = 1\,sec$

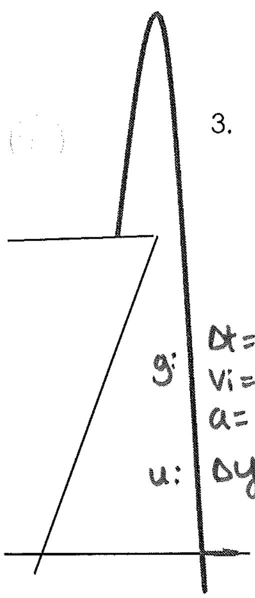
① $\Delta y = \cancel{V_i \Delta t} + \frac{1}{2}a\Delta t^2$

$2.2 = \frac{1}{2}a(1)^2$

$a = 4.4\,m/s^2$

② $\Delta y = \cancel{V_i \Delta t} + \frac{1}{2}(4.4)(6.15)^2$

$\boxed{\Delta y = 83.2\,m}$



3. You are standing on top of a 22.5 m tall cliff. If you throw a rock straight up and it takes 1.35 sec to reach its peak, how fast will it be traveling when it lands at the **bottom** of the cliff?

g: $\Delta t = 1.35\,sec$, $V_i = 0$, $a = -9.8\,m/s^2$

u: Δy, V_f

$\Delta y = \cancel{V_i \Delta t}^0 + \frac{1}{2}a\Delta t^2$

$\Delta y = \frac{1}{2}(9.8)(1.35)^2$

$-8.93\,m + -22.5 = -31.43\,m$

$V_f^2 = \cancel{V_i^2} + 2a\Delta y$

$V_f^2 = 2(-9.8)(-31.43)$

$V_f^2 = 616$

$V_f = 24.8\,m/s$

$\frac{24.8\,m}{s} \times \frac{1\,mi}{1609\,m} \times \frac{3600\,s}{1\,hr} = \boxed{55.5\,mph}$

4. You are standing on top of the same cliff and try to throw it even higher than last time. If you throw it straight up and it goes 21.5 m above the cliff, how many seconds is it in the air **TOTAL** from the time it leaves your hand until it hits the bottom of the cliff.

g: $\Delta y = 21.5\,m$, $V_i = 0$, $a = 9.8$

u: Δt

e: $\Delta y = \cancel{V_i \Delta t}^0 + \frac{1}{2}a\Delta t^2$

$-21.5 = \frac{1}{2}(9.8)\Delta t^2$

$\boxed{\Delta t = 2.09 \text{ - up}}$

$\Delta y = 44\,m$, $V_i = 0$, $a = 9.8$

down: $21.5 + 22.5\,m = 44\,m$

$\Delta y = \cancel{V_i \Delta t}^0 + \frac{1}{2}a\Delta t^2$

$-44 = \frac{1}{2}(9.8)\Delta t^2$

$\boxed{\text{down} - \Delta t = 2.997}$

total Δt : $2.09 + 2.997 = \boxed{5.09\,sec}$