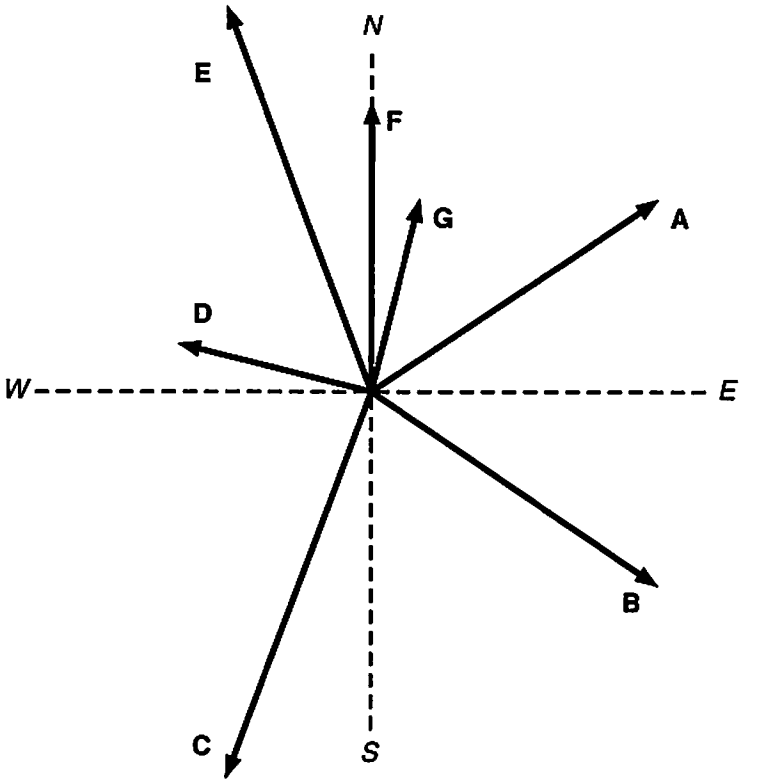
NAME: KEY

Introduction to Vectors

You will need a ruler and protractor to do these!

5. Determine the magnitude and direction of each of the vectors below:



A =	4.5 cm	34° N of E
B =	4.5 cm	34° S of E
C =	5.5 cm	20° W of S
D =	2.7 cm	14° N of W
E =	5.5 cm	69° N of W
F =	3.8 cm	N
G =	2.6 cm	76° N of E

6. Draw each of the given vectors in the space below.

A = 5 cm @ 30° N of E

B = 10 cm @ 60° N of E

C = 8 cm @ 20° N of W

D = 7 cm @ 35° W of S

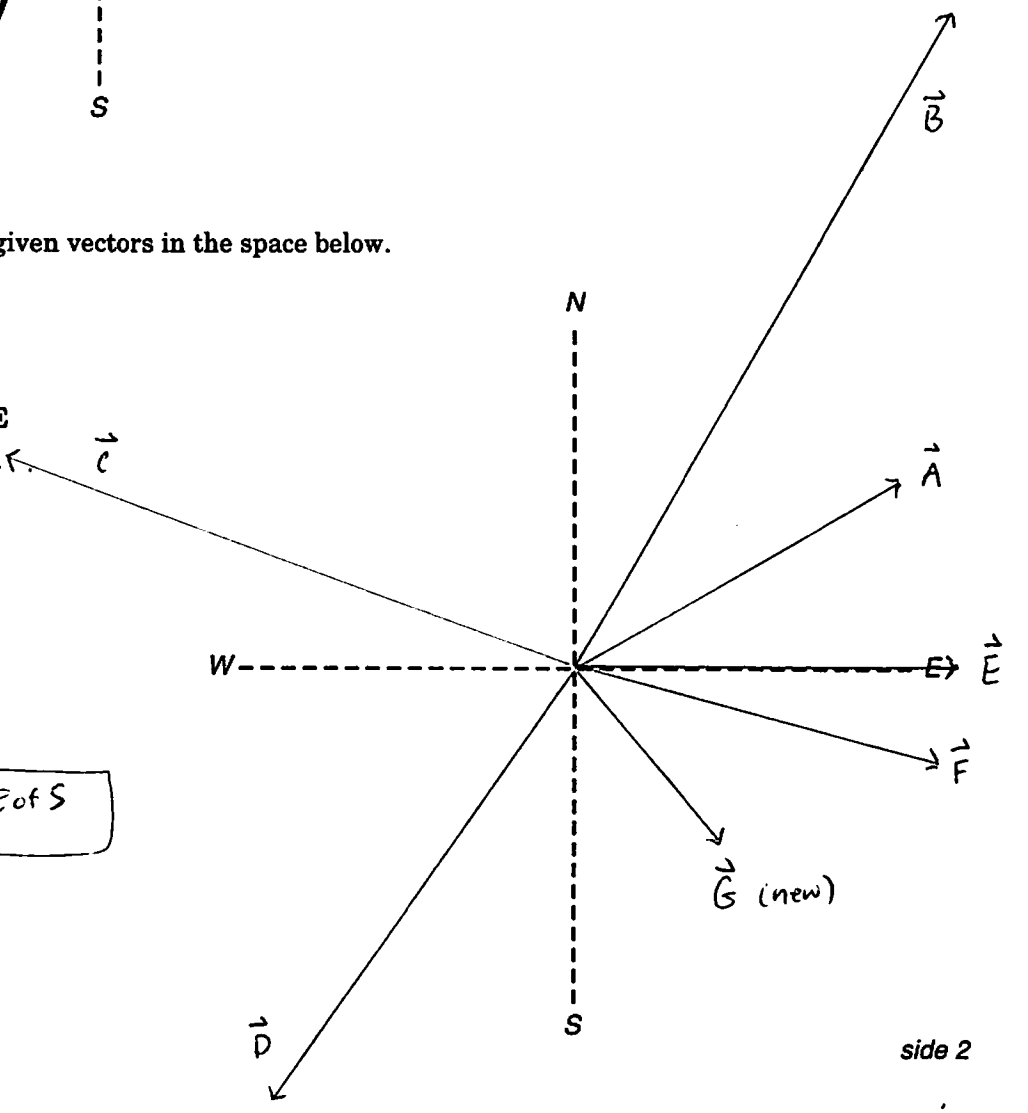
E = 5 cm E

F = 5 cm @ 15° S of E

G = 8 cm @ 30° E of S

doesn't fit!

$\vec{G}$ = 3 cm 40° E of S



NAME: _____

Introduction to Vectors

This year in physics, we will study the mathematical relationships between many things. All of these things are either a *scalar* or a *vector*.

Scalars Quantities that have only a magnitude (tells how much). Examples are distance, speed, time and mass.

Vectors Quantities that have both a magnitude and a direction. Examples are displacement, velocity, acceleration and force.

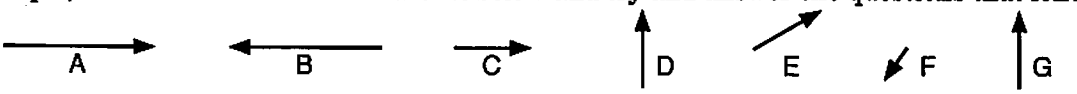
A good way to think about the difference between these is that a scalar only tells you one piece of information, while a vector gives you two pieces. The scalar *speed* tells us only how fast something is going, but the vector *velocity* tells us how fast and in what direction something is going.

Scalars are easy - you just give the number and you know everything about it. If the world was one dimensional, vectors would also be easy because you can give directions by using positive and negative numbers (like we have done so far.) To deal with vectors in two or three dimensions, however, you will have to learn a few new tools, because we need to figure out how to deal with two pieces of information for one object.

Vector Representation

Vectors are a geometrical object - so it is very easy to just think of a vector as an arrow, pointing in a certain direction and the length tells you the magnitude. Two vectors are equal only if they have the same magnitude and the same direction.

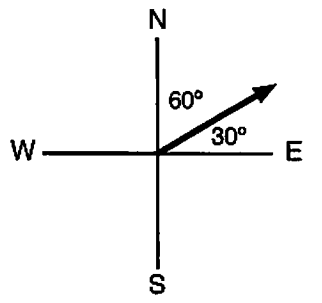
For example, look at the seven vectors shown below and try and answer the questions that follow:



1. Which two vectors have the same magnitude and same direction? D & G
2. What combinations of vectors have the same magnitude, but different directions? A & B ~~C & D~~ ~~C & G~~ A & B → C, D, E, G all same mag.
3. What combinations of vectors have the same direction, but different magnitudes? A C
4. Which vector has the smallest magnitude? F

Giving Directions

One of the main ways of giving directions is to use compass directions - north, east, south and west. To give a direction, you first need to pick a reference (N, E, S, or W). Then figure out how many degrees away from that reference direction the vector is. Finally, figure out which side of the reference direction the vector is pointed.



For example, the vector shown in the diagram is going mostly east, so let's call East the reference direction. Notice how the vector is actually pointed 30° away from East. Finally notice that the vector is pointed a little bit North of East. So we the direction is **30° North of East.**

We could also have said that the vector was going sort of North, and so used that as the reference. Then we would have measured the vector to be 60° away from North, and finally we would have said that it was going to the East side of North. That means we could also have said the direction is **60° East of North.** Notice that the angles are complements of each other and that the compass directions are flipped. Either one is fine.

Direction = *# degrees* *which side* *of* *reference direction*