AP PHYSICS C SUMMER PREVIEW

Name: _____

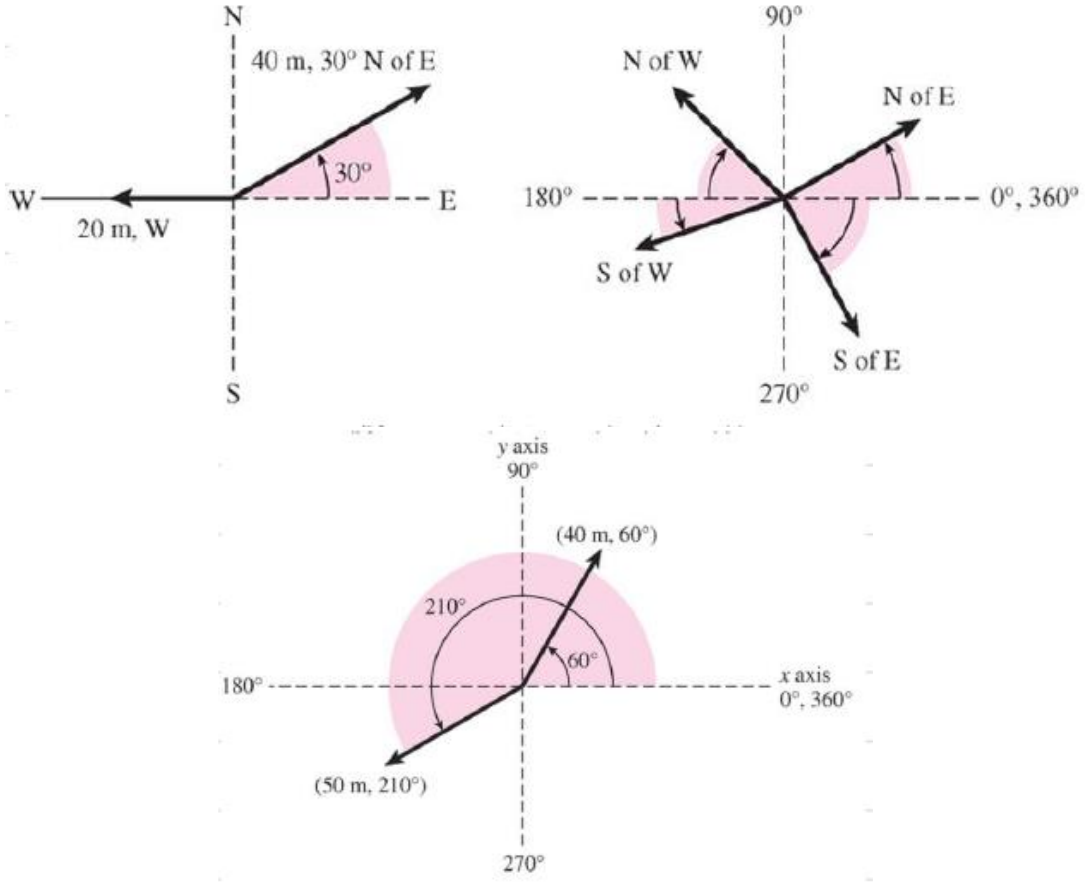
- Your summer homework assignment is to read through this summer preview, making any annotations you feel necessary, and completing TASK 3.
- It is important that you read through the notes prior to attempting to answer the questions.
- Task 3 is due the first day of class and will be counted as your first homework grade.
- You can expect a quiz during the first few days of school that is based solely upon the material contained in this summer preview.
- All of the work and calculations necessary to solve the problems in Task 3 must be shown to receive credit for this assignment.
- This is an individual assignment. As such, you may not copy any part of the solutions to this assignment from another student nor may you allow any other student to copy any of your work.

VECTORS AND SCALARS

A scalar quantity has only magnitude and is completely specified by a number and a unit. Examples are mass, volume, frequency, and time. Scalar quantities of the same kind are added by using ordinary arithmetic.

A vector quantity has both magnitude and direction. Examples are displacement, velocity, nd force. When vector quantities are added, their directions must be taken into account.

A vector is represented by an arrowed line whose length is proportional to the vector quantity and whose direction indicates the direction of the vector quantity. Examples of vectors:



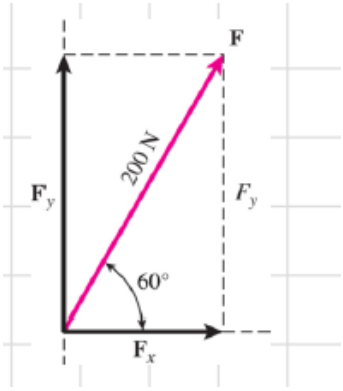
The resultant, or sum, of a number of vectors of a particular type is that a single vector would have the same effect as all the original vectors taken together.

VECTOR COMPONENTS

A vector in two dimensions may be resolved into two component vectors acting along two mutually perpendicular directions. The figure shows vector $\boldsymbol{F}$ and its x and y vector components:

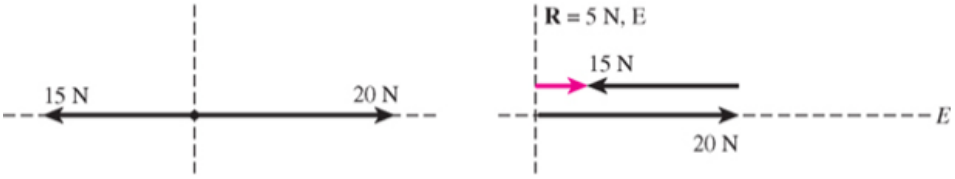
$$\boldsymbol{F}_x = \boldsymbol{F}\cos\theta \text{ and } F_y = \boldsymbol{F}\sin\theta$$

2.1 Determine the components of the force **F** shown:

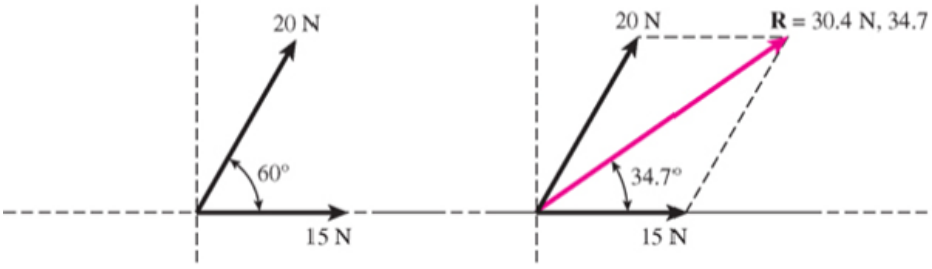


VECTOR ADDITION

(a) Forces in the same direction



(b) Forces acting in the opposite direction



(c) Forces acting at an angle of 60° with respect to each other

COMPONENT METHOD

To add two or more vectors **A, B, C**, … by the component method, follow this procedure:

1. Resolve the initial vectors into components *x* and *y*.

2. Add the components in the *x* direction to give $\sum R_x$ and add the components in the *y* direction to give $\sum R_y$. That is, the magnitudes of $\sum R_x$ and $\sum R_y$ are given by, respectively:

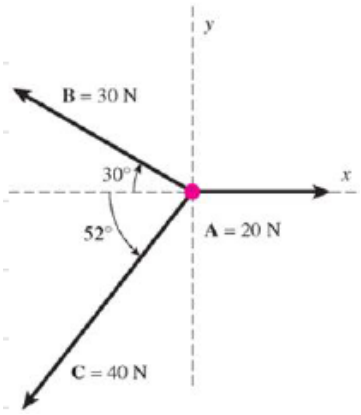
$$\sum R_x = A_x + B_x + C_x \text{ ... and } \sum R_y = A_y + B_y + C_y \text{ ...}$$

3. Calculate the magnitude and direction of the resultant vector R from its components using the Pythagorean Theorem.

$$\text{Magnitude: } R = \sqrt{(\sum R_x)^2 + \left(\sum R_y\right)^2}$$

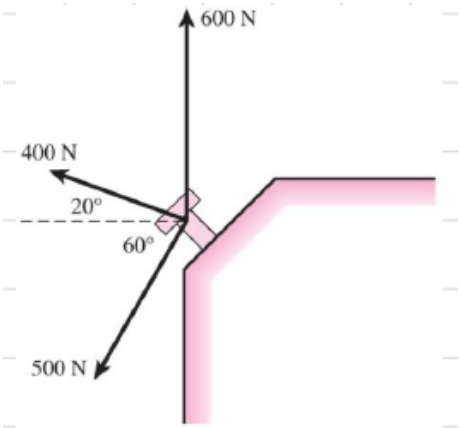
$$\text{Direction: } \theta = \tan^{-1}\frac{|\sum R_x|}{|\sum R_y|}$$

2.2 Three ropes are tied to a stake and the following forces are exerted, Find the resultant force.

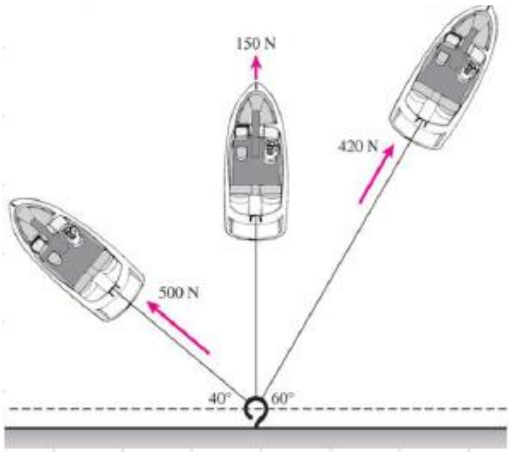


PRACTICE VECTORS

1. Determine the resultant force on the bolt in the figure. (*696 N, 154.1^0*)

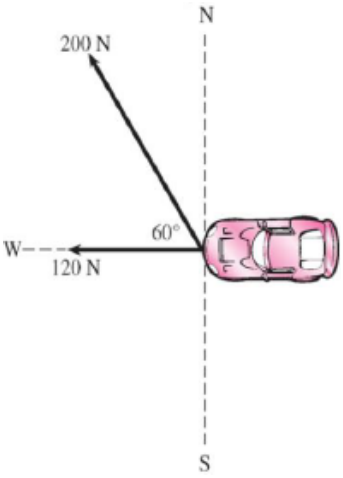


2. Three boats exert forces on a mooring hook as shown. Find the resultant force on the hook. (*853N, 101.7^0*)

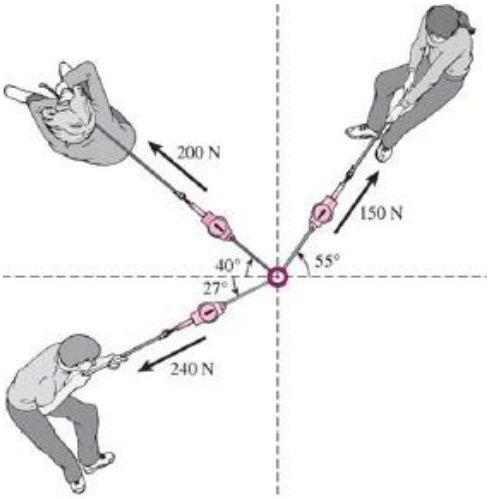


TASK 3 – Vectors are Fun Name: _____

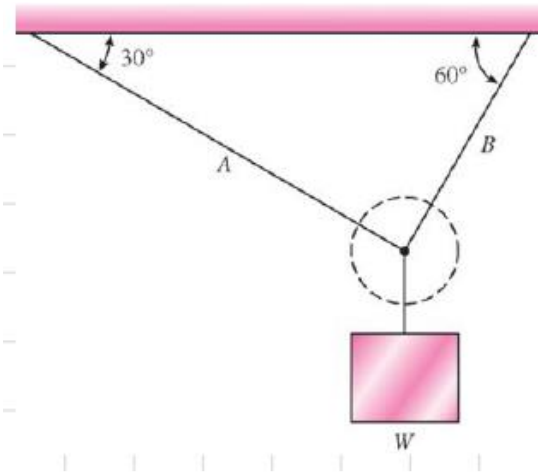
1. Find the resultant force exerted on the car shown in the figure below.



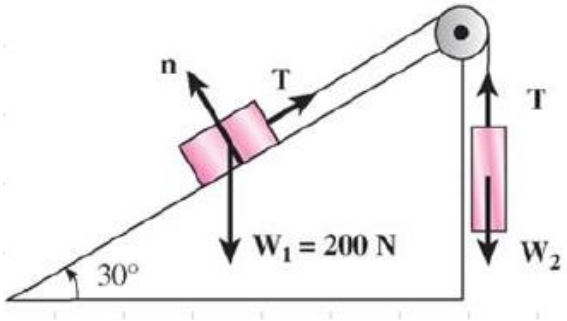
2. Find the resultant force exerted on the ring in the figure below.



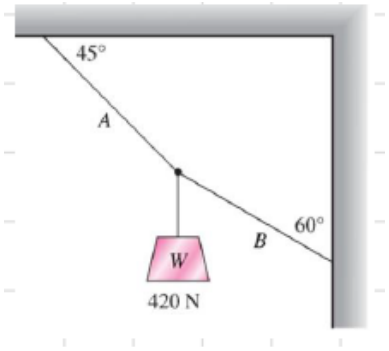
3. A block of weight 50 N hangs from a cord that is knotted to two other cords, A and B fastened to the ceiling. B makes an angle of 60^0 with the ceiling and A forms a 30^0 angle.
   (a) Draw a neat, labeled free-body diagram of the knot
   (b) Calculate the tensions A and B



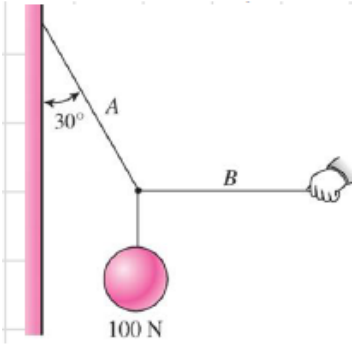
4. A 200 N block rests on a frictionless inclined plane of slope angle 30^0. A cord attached to the block passes over a frictionless pulley at the top of the plane and is attached to a second block.



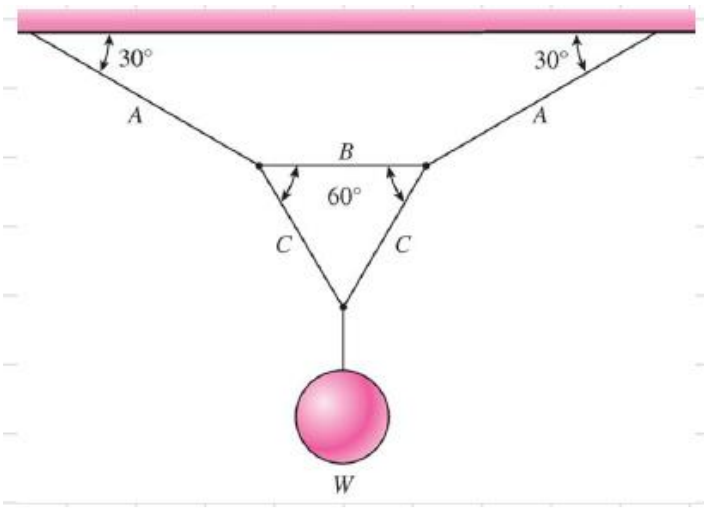
   (a) Draw a neat, labeled free-body diagram of the forces acting on each block.
   (b) Find the weight W_2 of the second block if the system is in equilibrium.



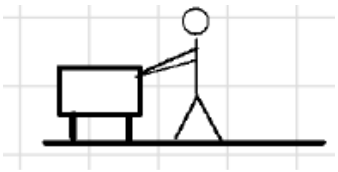
5. For the figure above
   (a) Draw a neat, labeled free-body diagram of the forces acting on the 420 N object.
   (b) Find the tension in the ropes A and B.



6. For the figure above
   (a) Draw a neat, labeled free-body diagram of the forces acting on the 420 N object.
   (b) Find the tension in the ropes A and B

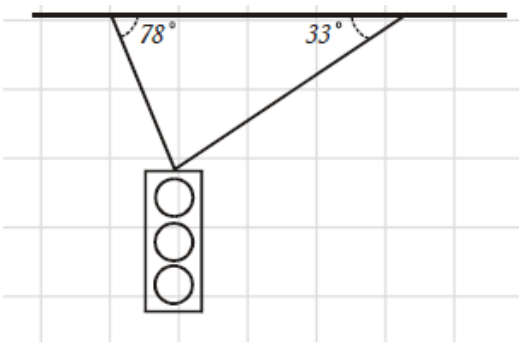


7. Find the tension in each cord of the figure above if the suspended ball is 476 N.

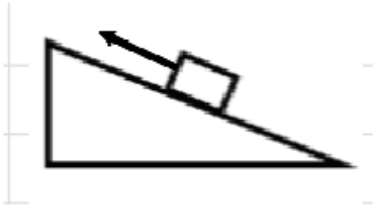


8. A teacher pulls a 50 kg desk with a 200 N force acting at a 30^0 angle above the horizontal. The desk does not budge.
   (a) Draw a neat, labeled free-body diagram for the desk
   (b) Determine the frictional force
   (c) Determine the normal force

9. Suppose in the previous problem, that the teacher is pushing down at a 30^0 angle with 200 N of force. The desk still does not move.
   (a) Draw a neat, labeled free-body diagram for the desk.
   (b) Determine the value of the frictional force.
   (c) Determine the value of the normal force.



10. A 495 N traffic light hangs from two cables at the angles shown. Calculate the tension in the two cables.



11. A 441 N crate is being pulled by a rope, up a frictionless plane, which meets the horizontal at an angle of 35^0.
    (a) Draw a neat labeled free-body diagram for the crate.
    (b) Find the magnitude of the normal force acting on the crate.
    (c) Find the magnitude of the tension force acting on the crate.