RECITATION 2

1) The radius r of a circle inscribed in any triangle whose sides are a, b, and c is given by $r=\left[(s-a)(s-b)(s-c)/s\right]^{1/2}$, where s is an abbreviation for $(a+b+c)/2$. Check this formula for dimensional consistency.

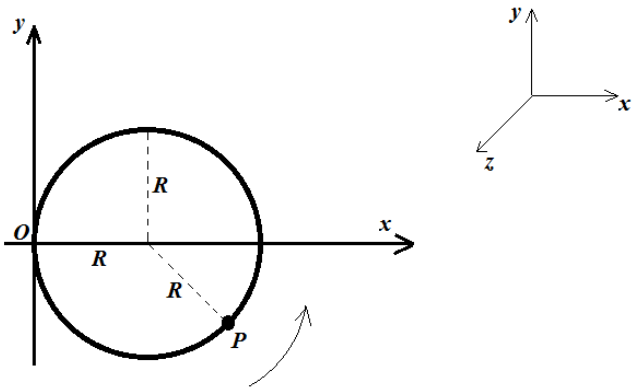
2) Check which of the following equations are dimensionally correct:

a) $\frac{m\upsilon^2}{2}=Ft$ (where m is the mass, υ is the velocity, F is the force and t is the time)

b) $\frac{m\upsilon^2}{2}=Fd$ (where m is the mass, υ is the velocity, F is the force and d is the displacement)

3) A force F acting on a body of mass m a distance r from some origin has magnitude $F=\frac{Ame^{-\alpha r}}{r^3}$, where A and α are both constants. The constant $e=2,718...$. What are the dimensions of the constants A and α ? And determine the units of the constants A and α in SI system.

4)



A particle *P* travels with constant speed υ on a circle of radius *R*. The particle passes through *O* at time $t = 0$ in counterclockwise direction and has a period *T*.

a) With respect to *O*, find the particle's position vector at time $t = \frac{3T}{4}$. Give your result in terms of unit vectors.

b) Calculate the scalar product $\vec{\upsilon} \bullet \vec{r}$ where $\vec{\upsilon}$ and $\vec{r}$ are, respectively, the velocity and position vectors of the particle at time $t = \frac{3T}{4}$.

c) Calculate the vector product $\vec{a} \times \vec{r}$ where $\vec{a}$ and $\vec{r}$ are, respectively, the acceleration and position vectors of the particle at time $t = \frac{3T}{4}$. Give your result in terms of unit vectors.

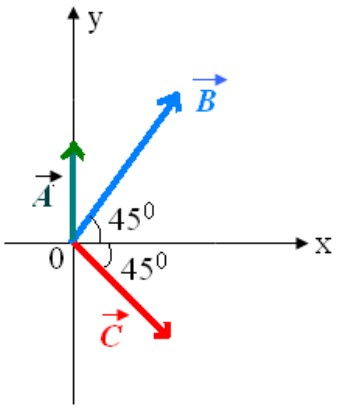
d) Where is the particle if $\vec{r} \bullet \vec{\upsilon} = 0$?

e) Where is the particle if $\vec{a} \times \vec{r} = 0$?

5) Three vectors are oriented as shown in figure, where $|\vec{A}| = 20\,\text{m}$, $|\vec{B}| = 40\,\text{m}$ and $|\vec{C}| = 30\,\text{m}$. Find;

a) The *x* and *y* components of the resultant vector,

b) The magnitude and direction of the resultant vector.



6) A car travels 20 *km* east, then 10 *km* north, and then 40 *km* northeast (30^o east of north). Draw a vector diagram and write the displacement vector from the starting point. Find the magnitude and direction of the displacement vector.