Quiz 5

(a) $dK = mv\,dv$

$= mva\,dt$

$= Fdx$

(b) $dK = -dU$

4 points

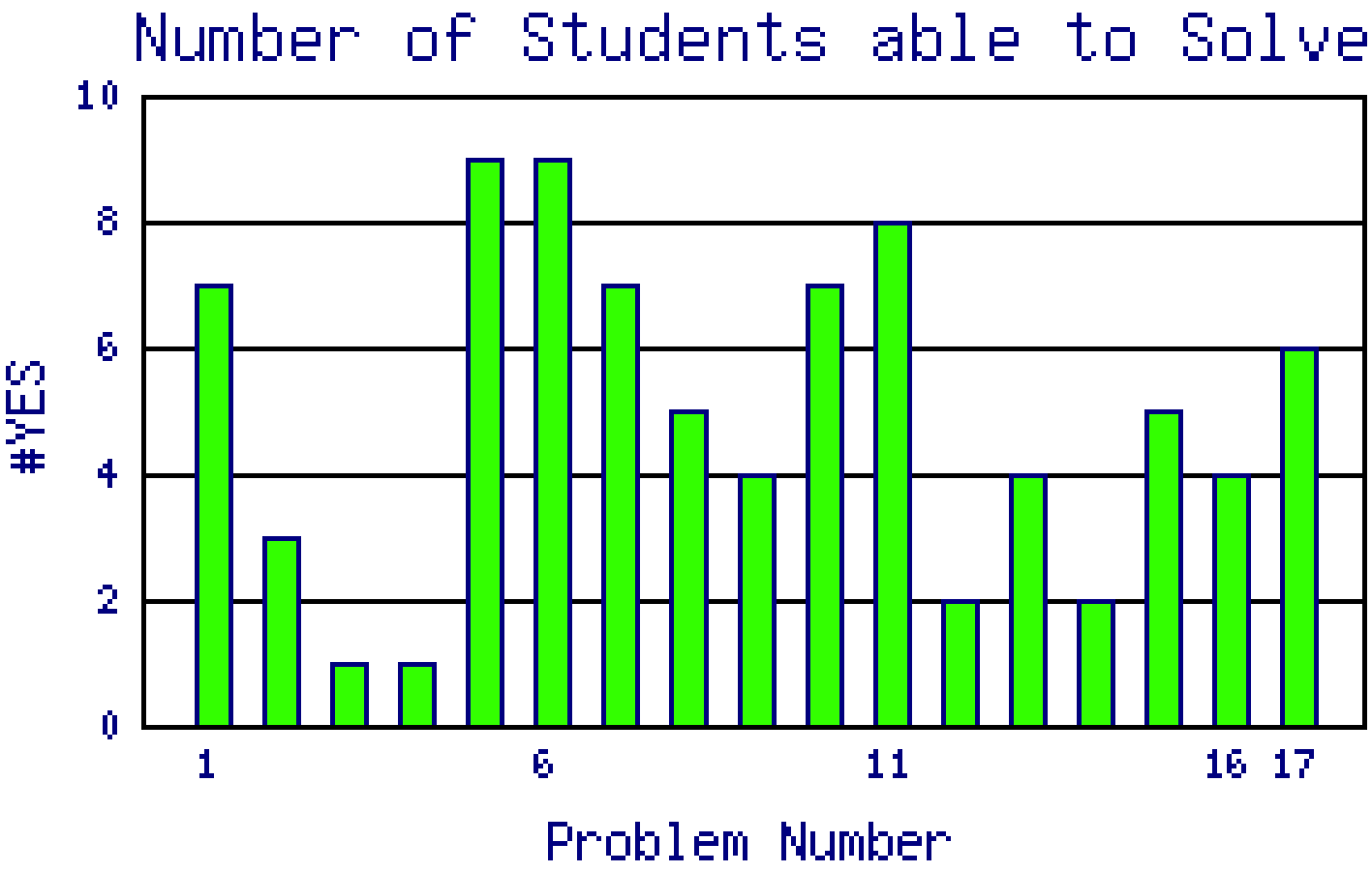
(2) $E = \frac{1}{2}mv^2 - \frac{GMm}{r}$

$E \geq 0$

$v_0 \geq \sqrt{\frac{2GM}{R}} = 11.2\ km/s$

3 points

HOMEWORK SET E



Chapter 9 = Systems of Particles

- 1 particle : $\frac{d\vec{p}}{dt} = m\frac{d\vec{v}}{dt} = \vec{F}$

- 2 particles : $\frac{d\vec{p}_1}{dt} = \vec{F}_1$ and $\frac{d\vec{p}_2}{dt} = \vec{F}_2$

Define $\vec{P} = \vec{p}_1 + \vec{p}_2$.

Then $\frac{d\vec{P}}{dt} = \vec{F}_1 + \vec{F}_2 = \vec{F}_{1,ext} + \vec{F}_{2,ext}$

By Newton's 3rd law, $\vec{F}_{12} + \vec{F}_{21} = 0$.

If the external forces are 0,
then the total momentum is constant.

- N particles : $\vec{P}_{total} = \sum_{i=1}^{N} \vec{p}_i$

$$\frac{d\vec{P}_{total}}{dt} = \sum_{i=1}^{N} \vec{F}_{i,external} = \vec{F}_{external}$$

The internal forces cancel in pairs.

Momentum conservation (if $\vec{F}_{external} = 0$)
is a consequence of Newton's 3rd law.

$$\boxed{\frac{d\vec{P}_{total}}{dt} = \vec{F}_{ext}}$$

← some problems can be analyzed from this principle alone.