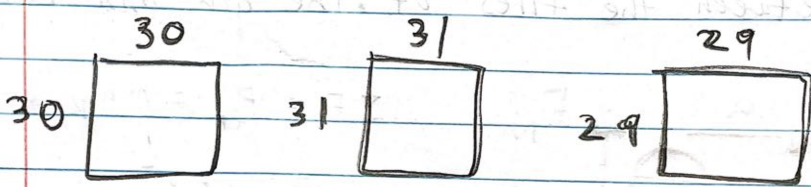
Jason Vu
Dr. Gill Pre-
Physics 31 Lab 6

1) Review rules for propagation of uncertainties.

- The length of the side of a square, a, is measured to be 30 mm, with an uncertainty Δa of $\pm$ 1 mm. Calculate the area A of the square and its associated uncertainty ΔA. Clearly show your work. You may report final result in mm^2



$A = (30)(30)$ $= 900\ mm^2$

$A = (31)(31)$ $= 961\ mm^2$

$A = (29)(29)$ $= 841\ mm^2$

$$\begin{array}{lr} [31] & 961\ mm^2 \\ [30] & -\ 900\ mm^2 \\ \hline & 61\ mm^2 \end{array} \qquad \begin{array}{lr} [30] & 900\ mm^2 \\ [29] & -\ 841\ mm^2 \\ \hline & 59\ mm^2 \end{array}$$

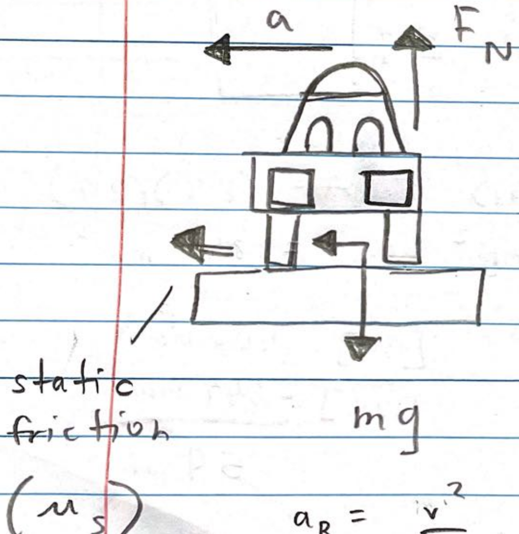
Power: $\Delta z = |n| x^{n-1} \Delta x$

$$|2|(30)^{(2-1)} \times 1 = 60\ mm^2$$

2) Draw a free body diagram for a car moving on a flat circular path of radius r. Clearly indicate your choice of coordinate axes. Then use Newton's 2nd law to show that maximum speed v_{max} at which the car can safely remain on the banked road is:

$$v_{max} = \sqrt{r g \mu_s}$$

where μ_s is the static friction coefficient between the tires of the car and road.



$$\Sigma F_x : F_{fr} = m a_R$$

$$\mu_s F_n = m \cdot \frac{v^2}{r}$$

$$r \cdot \mu_s \cancel{m} g = \frac{\cancel{m} v^2}{r} \cdot r$$

$$\sqrt{v^2} = \sqrt{r g \mu_s}$$

$$\boxed{v = \sqrt{r g \mu_s}}$$

$$a_R = \frac{v^2}{R}$$

$$F_{fr} = \mu_s F_n = \mu_s m g$$

$$F_n = m g$$