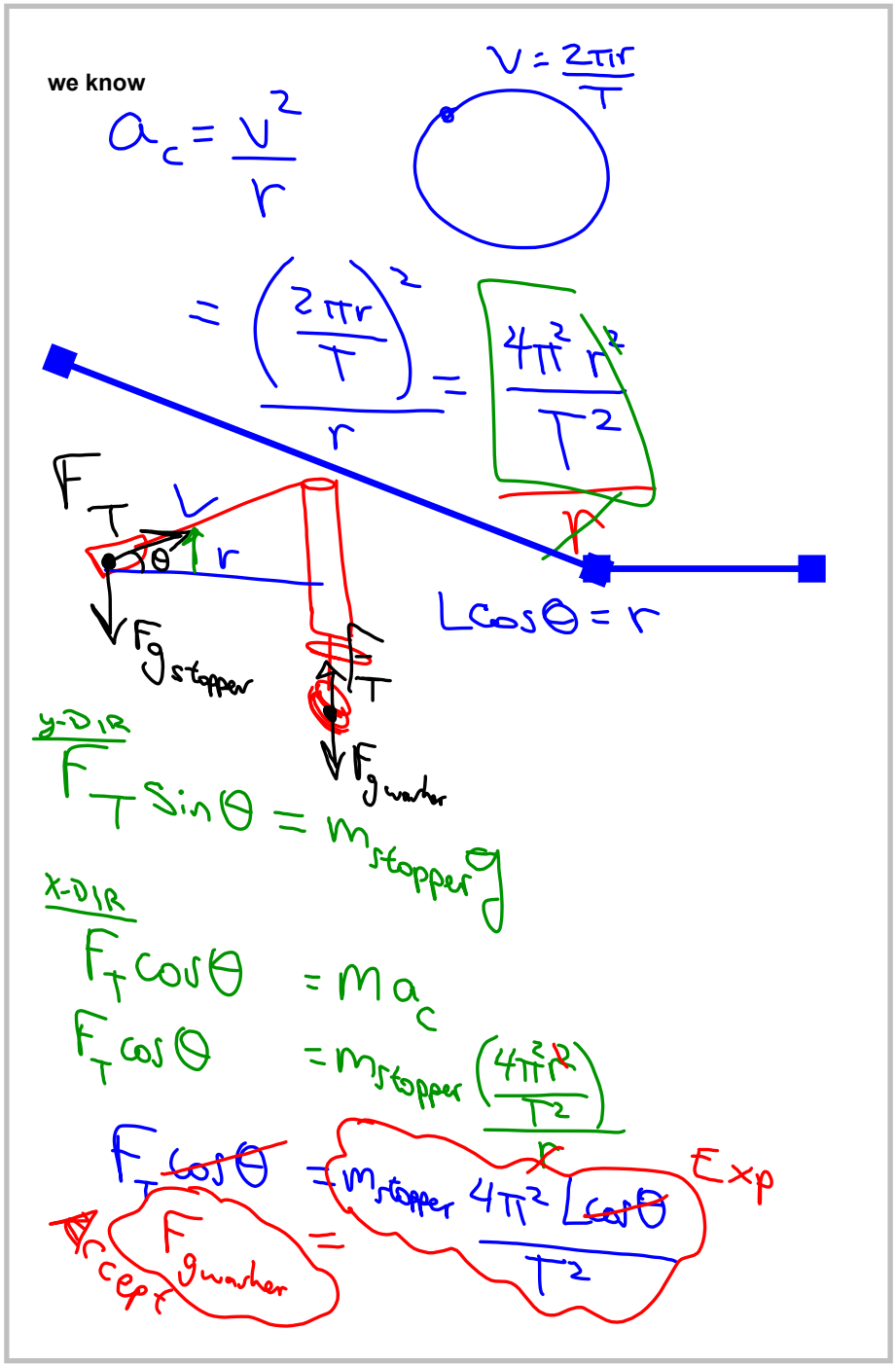

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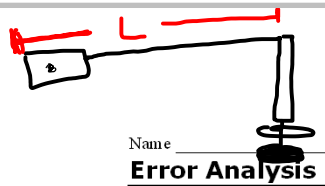

Name _____ Date _____ per _____

Error Analysis for Centripetal Lab — AP Physics

Objective: Learn about relative, absolute & percent error. Consider reasonableness of % error.

Instructions: Read and show work. *For many labs in the past you have found the percent error and wondered if this amount of error was okay, reasonable, or even permissible. In this activity you will find the true percent error and if that is value is allowable.*

L	T	a_c

short

$m_{stopper}$ = ___.___ g $m_{washers+}$ = _____

In the Centripetal Acceleration Lab you should have already shown that

$$F_{g_{washers+}} = \frac{4\pi^2 m_{stopper} L}{T^2}$$

long

The left side of the equation, weight of the washers + paper clips + string, is the accepted value, or standard. The right side of the equation is the experimental results.

1. Find the percent error for your longest length and shortest length. Show work and be sure that both the accepted and experimental are in Newtons.

Accepted value = (Wash)(9.8 m/s²) = _____ N

$m_{stopper}$ = _____ $L_{longest}$ = _____ $L_{shortest}$ = _____

period, $T_{for\ long\ length}$ = _____ $T_{for\ short\ length}$ = _____

Show Work for Experimental result for longest and shortest length

$\frac{4\pi^2 (stop)(kg)(m)}{(s)^2}$

$\left|\frac{acc - exp}{acc}\right| =$

$\frac{4\pi^2 (stopper)(kg)(m)}{(s)^2}$

$\%err_{long\ legth}$ =

$\%err_{short\ length}$

2. Now let's analyze the error from each measurement. What are the sources for error? (i.e. What did you measure?)

time, length, mass

- Sig dig
- other factors

a. Find $E_{mass} = \frac{\Delta m}{m}$

$\frac{\Delta m}{m_{stopper}} = \frac{.02g}{m_{stopper}}$

b. Find $E_{length} = \frac{\Delta L}{L}$

$\frac{\Delta L}{L_{long}} = \frac{1.5cm}{L_{long}}$ $\frac{\Delta L}{L_{short}} =$

Sig Dig $\Delta T \rightarrow .001$

c. What would the relative error for the time be?

$E_{Time} = \frac{\Delta T}{T_{Long}} = \frac{.128}{T_{Long}}$ $\frac{\Delta T}{T_{Short}} = \frac{.084}{T_{Short}}$

your Long time

your shortest

T=1.075
.947
1.059

1.075
−.947
.128

T=.509
.563
.587
.513
.503

3. Add these errors together

$E_{Long} = E_{mass} + E_{length} + E_{Time}$ E_{Short}

$=$

Now do it more properly. (Take the square root of the sum of the square of these errors)

$\sqrt{E^2 + E^2 + E^2}$

4. How does this compare with your percent error?