Name_____ Date_____
Physics A/R -- Period _____ Mr. Leacock

Laboratory 3
Measurement and determination of the value of Pi

Objectives

1. To measure the radius, circumference and area of several circles.
2. To graph radius versis circumference and radius verses area.
3. To determine the value of Pi from the slopes of these graphs.

Procedure

1. Draw three circles of different radius on a sheet of graph paper using a compass.
2. Measure the diameter of each in terms of # of boxes and halve it to find the radius. **Record this in the data chart**
3. Lay a piece of string very carefully along the circumference of each circle.
4. Remove the string, and measure its length in terms of number of boxes. **Log this information in your data table as the circumference.**
5. Graph circumference verses radius. It should be the best fitting straight line and should pass through the origin.
6. Find the slope

$$\frac{\Delta y}{\Delta x} = \frac{\Delta \text{Circumference}}{\Delta \text{radius}}$$

6. slope work

How does your slope relate to this equation?
(Circumference = $2\pi r$)

7. Go back to the circles and find the area by counting the number of boxes contained in each circle. Record it in your data chart.
8. Graph area verses r (not a straight line)
9. Graph area verses r^2 (start at origin)
10. Find slope of #7

$$\frac{\Delta y}{\Delta x} = \frac{\Delta \text{area}}{\Delta r^2}$$

7.

How does the slope relate to this equation?
(Area = πr^2)

For #4 and #9, find percentage error where
% error =((E – A)/ A)) x 100%
= 3.14

4.	9.

Data

Circle	Radius	Radius^2	Circumference	Area
#1				
#2				
#3				

Question

1. Show how your graph of circumference verses radius can be used to find the circumference of a fourth circle whose radius is between #1 and #2 (interpolate). Compare the value from the graph to the calculated value (find percentage error). **Show work in the spaces provided.**

Radius _____ Circumference _____

Calculated circumference _____

% Error _____

2. Repeat question #1, but use a circle whose radius is larger than the largest circle or smaller than the smallest circle (extrapolate).

Radius _____ Circumference _____
Calculated circumference _____
%Error _____

3. Repeat #1 & #2 for the area verses r^2

#1 -- Radius _____ Area _____
Calculated Area _____ %Error _____
#2 -- Radius _____ Area _____
Calculated Area _____ %Error _____