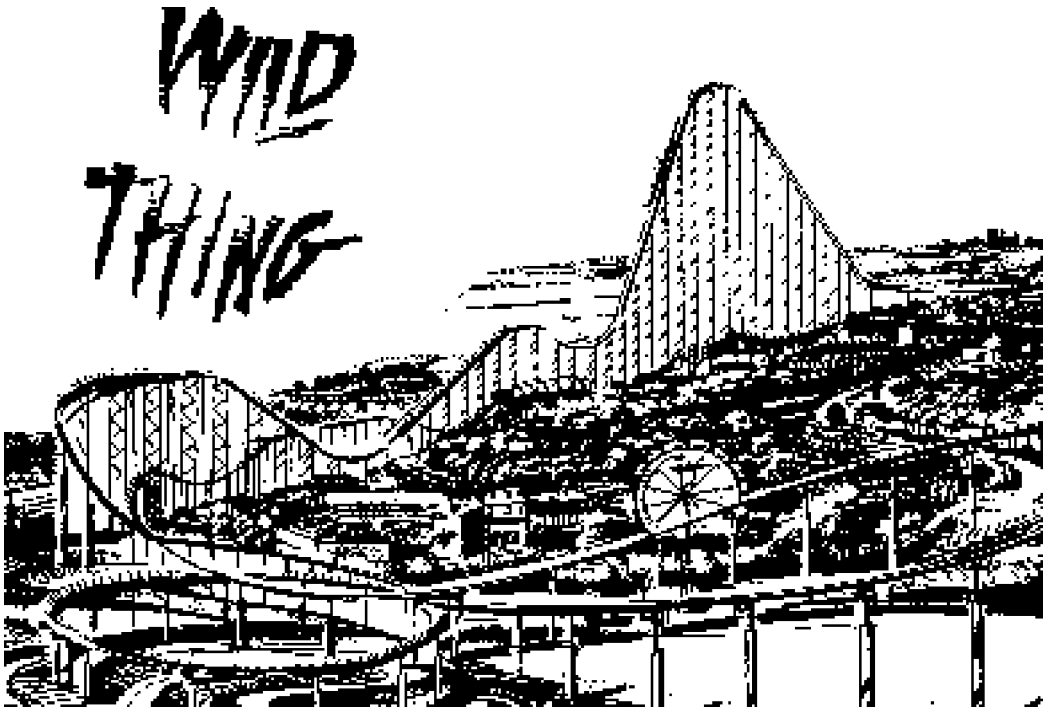

Wild Thing

Objective 1 (E1): *To calculate the average speed of the train from release at top of tow hill to station entrance.*

SUGGESTED PROCEDURE: Given the length of the track (not just the horizontal components!) and use the time required for one run to calculate the average speed.

APPARATUS: Stopwatch, angle measuring device, tape measure or calibrated pace

DATA: Time required for complete trip: _____ s
Length of track: _1664___ m

RESULTS: Average speed: _____ m/s

Objective 2 (E1): *To calculate the speeds at certain points along the track.*

SUGGESTED PROCEDURE: Determine the length of the train by at least one of the following methods (counting the number of vertical braces covered by the standing train; pacing its length when entering or leaving, etc.), and time its passing at the points indicated below.

APPARATUS: Stopwatch
Calibrated pace or tape measure

DATA:	Length of train:	_____	m
	Time for train to pass top of tow hill (point A):	_____	s
	Time for train to pass bottom of first drop (point B:)	_____	s
	Time for train to pass top of second hill (point C):	_____	s
	Time for train to pass bottom of second drop (point D):	_____	s
RESULTS:	Speed at top of tow hill (point A):	_____	m/s
	Speed at bottom of first drop (point B):	_____	m/s
	Speed at top of second hill (point C):	_____	m/s
	Speed at bottom of second hill (point D):	_____	m/s

Objective 3 (E12, E13, E14): *To predict speeds at the bottom of the first drop (point B), the top of the second hill (point C) and the bottom of the second hill (point D) using energy conservation laws.*

SUGGESTED PROCEDURE: Calculate the vertical drop of the first down-hill. Using energy conservation, calculate predicted speed at the bottom. Calculate the vertical drop from the top of the tow hill to the top of the second hill and again predict the speed using energy conservation. Finally calculate the vertical drop from the top of the tow hill to the bottom of the second hill and again predict the speed using energy conservation. Compare these calculations with the measured speeds.

DATA:	Height of tow hill (point A to point B):	_____	m
	Height of second hill (point B to point C):	_____	m
	Vertical drop from top of tow hill to bottom of second hill (point A to point D):	_____	m
RESULTS:	Predicted speed at bottom of hill (point B):	_____	m/s
	% difference with measured speed from OBJECTIVE 2:	_____	
	Predicted speed at top of second hill (point C):	_____	m/s
	% difference with measured speed from OBJECTIVE 2:	_____	
	Predicted speed at bottom of second hill (point D):	_____	m/s
	% difference with measured speed from OBJECTIVE 2	_____	

CONCLUSION:

Objective 4 (E7, E18): *To compare the acceleration in "g's" at points B, C, and D on the track by* ***measuring*** *with an accelerometer and by* ***calculation*** *using speed and radius data.*

SUGGESTED PROCEDURE: Prepare a method ahead of time for calculating the radius of curvature of an arc using chord length and height, and use this to determine the radius of curvature of the bottom of the first hill, the top of the second hill and the top of the "bump" used above. Calculate the centripetal acceleration at each of these locations using the speeds previously calculated.

APPARATUS:Vertical accelerometer

DATA:
- Chord length "L" at bottom of first hill (point B) _____ m
- Altitude "h" for this chord _____ m
- Accelerometer reading _____ m/s2

- Chord length at top of second hill (point C) _____ m
- Altitude for this chord _____ m
- Accelerometer reading _____ m/s2

- Chord length "L" at bottom of second hill (point D) _____ m
- Altitude for this chord _____ m
- Accelerometer reading _____ m/s2

RESULTS:
- Radius at bottom of first hill (point B) _____ m
- Calculated centripetal acceleration in g's _____ m/s2

- Radius at top of second hill (point C) _____ m
- Calculated centripetal acceleration in g's _____ m/s2

- Radius of bottom of second hill (point D) _____ m
- Calculated centripetal acceleration in g's _____ m/s2

CONCLUSIONS:

Objective 5 (E12, E13, E14): *To calculate energies lost due to friction, etc. during a part of the ride.*

SUGGESTED PROCEDURE: Assume the train is loaded with passengers with an average mass of 60 kg. Use data from OBJECTIVE 3 and assume the speed of the train at point A to be negligible. Calculate the potential energy of the train relative to the bottom of the first hill. Using speeds from OBJECTIVE 2 calculate the kinetic energies at the bottom of the first hill. Calculate the energy lost to friction going down the first hill.

APPARATUS: Stopwatch,

DATA:
From OBJECTIVE 3: Vertical drop of first hill (point A to point B): _____ m
Height of second hill (point B to point C): _____ m
Mass of empty car _____ X Number of cars per train
= mass of train: _____ kg
Number of people per car _____ X mass one person __60_ kg
= mass of people on train: _____ kg

RESULTS:
Mass of train and passengers: _____ kg
Predicted Kinetic Energy at bottom of first hill: _____ J
{Potential Energy of first hill (point A to point B):
Actual Kinetic Energy at bottom of first hill (point B) using speed from OBJECTIVE 2: _____ J
Energy lost to friction on first hill: _____ J

Objective 6: *To gather subjective data about the ride to compare with the direct data and calculations.*

SUGGESTED PROCEDURE: During the ride concentrate only on how forceful you are "pushed" down into the seat or "lifted" against the retaining bar. If you can, try this with your eyes closed for the duration of the ride!

APPARATUS: Clear head, relatively empty stomach, no distractions.

DATA: Rate the relative magnitude of the force at the points indicated using the rest position before the ride starts as the neutral (N) reference force. Circle the appropriate letter.

Were you pushed	INTO THE SEAT			or	AGAINST THE BAR		
	Large	medium	small	neutral	small	medium	large
Top of first hill	L	M	S	N	S	M	L
Bottom of first hill	L	M	S	N	S	M	L
Top of second hill	L	M	S	N	S	M	L
Middle of first curve	L	M	S	N	S	M	L

Objective 7: *Compare and contrast a ride on the wooden structure of High Roller with the steel structure of Wild Thing. Give possible explanations for these similarities and differences..* Must have ridden both High Roller and Wild Thing.