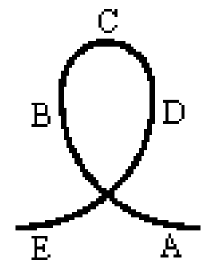
THE DEMON

DATA & OBSERVATIONS

Measurements & Observations while Standing in Line



1. Use the diagram to the right to estimate where in the first loop you think you will feel the greatest force. Explain your reasoning.

2. Loop timings. As accurately as you can, measure the time it takes the coaster to pass a point…

    ___________. (a) at start of the loop (point A)

    ___________. (b) at top of the loop (point C)

    ___________. (c) at end of the loop (point E)

3. Go to the observation area and look at the Demon's final big, banked turn (right after the corkscrew). When going around a corner in an automobile, your natural accelerometer (see "Gut Feeling at the Park") tells you that you are experiencing a left/right force because you slide towards the outside of the turn. Now look at the bank of the track. How do you think this feature will affect the forces you feel? (Circle the correct answer for these questions.)

    (d) Instead of pushing you to the left/right you will feel pushed _____.

    up/down   front/back   right/left   no effect

    (e) The coaster is going fastest _____ the curve.

    as it enters   at the midpoint of   as it leaves

    (f) The track is banked the most at the _____ of the curve.

    (start   middle   end)

4. .________ Length of one car.

5. .________ Number of cars in train.

6. .________ Length of train (length of one car times number of cars).

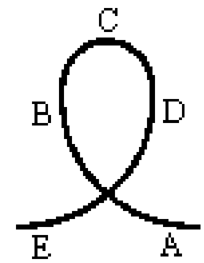
Measurements & Observations While Riding

1. Use the diagram at right and your "natural" accelerometer answer the following questions.

__________ (a) Where in the loop was the force the greatest?

__________ (b) What was the direction of the force in the loop at this point?

__________ (c) What was the direction of the force in the banked curve?



2. Use the diagram at right and your vertical accelerometer to answer the following questions.

__________ (d) What was the greatest force in the loop?

__________ (e) Where did you read this force?

__________ (f) What was the greatest force in the banked turn?

__________ (g) Where did you read this force?

CALCULATIONS & QUESTIONS

1. Calculate the speed of the train at **A**, **C** and **E** using the times you measured while standing in line.

2. The radius at the top of the first loop is approximately 4 meters. Based on your speed at point C and this radius, how much centripetal acceleration will riders experience there? ($\mathbf{a_c = v^2/R}$) Express your answer in m/s^2 and in terms of g's.

3. Calculate the centripetal force on <u>you</u> at the top of the loop.

4. Gravity acts downward which is toward the center of the curve when you are at the top of the loop. If it furnishes 1-g of your acceleration, how many g's should the seat furnish?

5. Compare the answer to the previous question with the reading you took while on the coaster. What sources of error would you expect contributed to the two answers possibly being different?

6. Using conservation of energy and the speeds you previously calculated, determine the height of the first loop.
($KE_{bottom} = PE_{top} + KE_{top}$)

7. Compare the speeds you measured at points **A** and **E**. Do you expect them to be the same? Explain your reasoning.