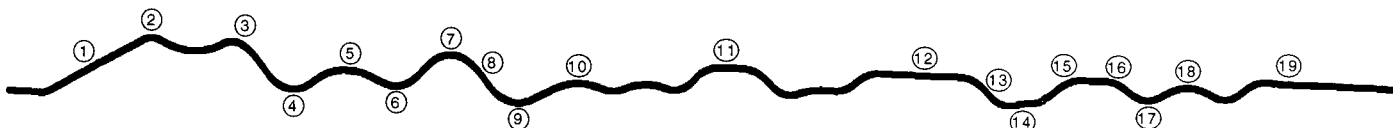


QUALITATIVE QUESTIONS

If the track were stretch out so that it were entirely in a single plane, the profile would look like the diagram below.

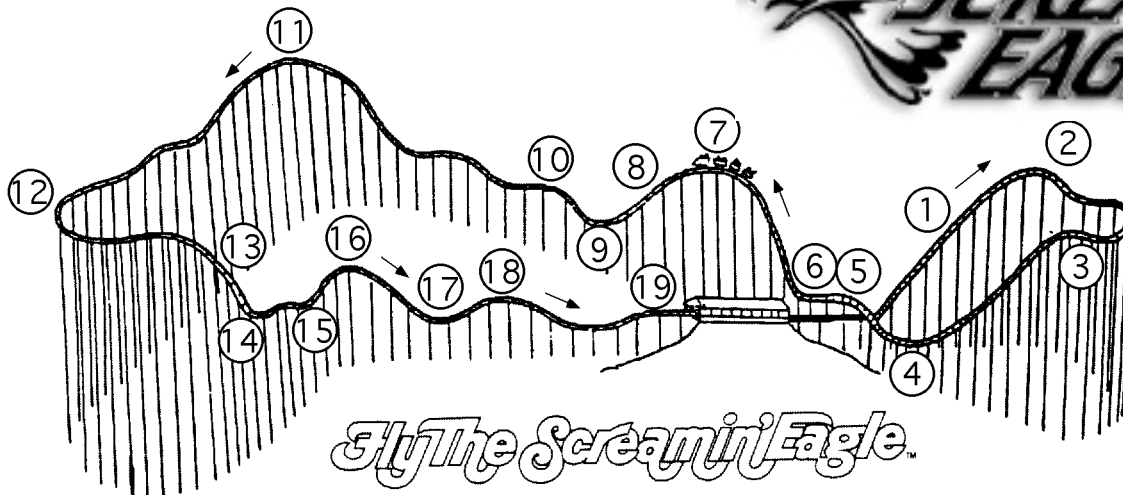


Some of the numbered sections of the track are described to the right. The times correspond to a graph found on page 58.

- List the number or numbers from the track profile that best match the phrases below:

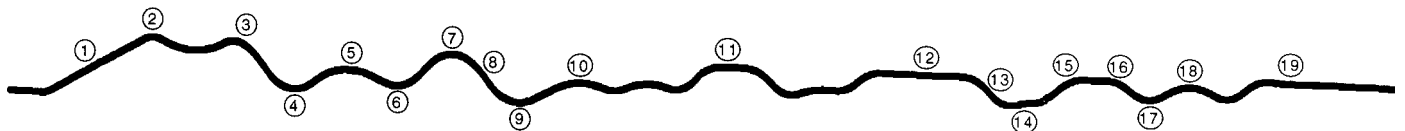
- _____ maximum velocity
- _____ maximum acceleration
- _____ maximum kinetic energy
- _____ maximum gravitational potential energy
- _____ greatest centripetal force
- _____ freefall area
- _____ weightless zone
- _____ where a machine makes the ride go instead of gravity
- _____ where the car moves with almost uniform velocity
- _____ where the coaster's velocity increases
- _____ high "g-force" zone
- _____ where friction has greatest effect
- _____ where riders slow down

Point	Description	Time (s)
1	Lift	
2	Top of lift	48
3	First hill	58
4	Bottom of first hill	63
5	First bump	65
7		70
9		73
11	Corner	83
12	180° turn	92
14		99
17	Valley	110
19	Brake shed	118



QUANTITATIVE QUESTIONS

If the track were stretch out so that it were entirely in a single plane, the profile would look like the diagram below.



Some of the numbered sections of the track are described to the right. The times are approximate but should be fairly consistent with the graphs on the next page.

About the graphs

The graphs on the following page were produced by attaching a barometric pressure sensor and an electronic "accelerometer" to a portable electronic data collection device. The device collected data at a rate of 20 samples per second. These readings were plotted against time to yield the graphs.

Pressure vs. Time Graph

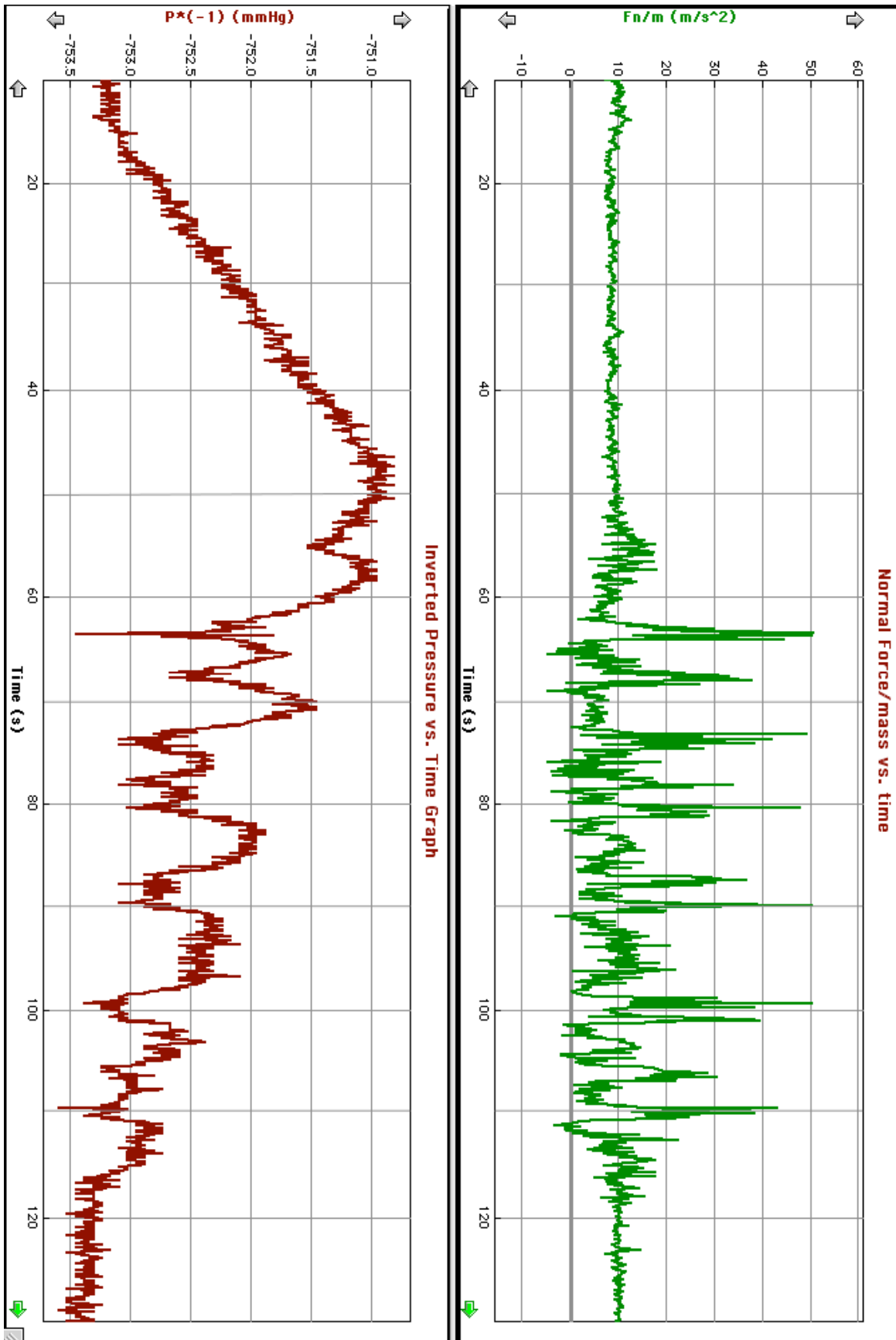
Since the pressure in a fluid in a gravitational field changes with height, the atmospheric pressure as measured by a barometer can be used to gauge vertical position. In the pressure vs. time graph on the following page, the opposite (-) value of the atmospheric pressure was plotted against time. Since atmospheric pressure gets smaller as the height increases, the inverted pressure graph resembles the profile of the ride. This can be very helpful as you attempt to interpret the normal force/mass vs. time graph.

Normal Force/mass vs. Time Graph

When oriented vertically, "accelerometers" do not actually measure acceleration. They measure the Normal Force to Mass ratio rather than the Net Force to Mass ratio. Since gravity always acts downward on the object, the Normal Force will never be the **net** force in a vertical situation. Consequently, you will have to make appropriate adjustments to the graph readings in order to determine accelerations. This discrepancy between "accelerometer" readings and actual acceleration is explained in detail in the acceleration portion of the **Suggestions for Making Measurements** manual.

Point	Description	Time (s)
1	Lift	
2	Top of lift	48
3	First hill	58
4	Bottom of first hill	63
5	First bump	65
7		70
9		73
11	Corner	83
12	180° turn	92
14		99
17	Valley	110
19	Brake shed	118

Screamin' Eagle



QUANTITATIVE QUESTIONS

1. If you stand by the restrooms near the Screamin' Eagle entrance, you can see points 3, 4, 5, 6, and 7 listed on the ride profile. Points 3 through 6 can also be seen from the ride queue line just before you enter the turnstile. Measure the time it takes the train to pass points 3, 4, 5, 6, and 7. Also measure the time it takes the train to move from point 3 to 4. .
2. If the train is 13 meters long, what is the speed of the train at points 3, 4, 5, 6, and 7?
3. Does each part of the train have the speed you calculated as it passes the point? Explain!
4. Determine the average acceleration of the train as it moves from point 3 to 4.
5. Compare your answer to question 4 to the reading on the graph between points 3 and 4. Try to explain any differences.

QUANTITATIVE QUESTIONS (continued)

11. A net force causes acceleration. Write an equation that describes the net force on you at point 5 in terms of the forces in your free body diagram from question 6.

12. Using your mass and the measured acceleration at point 5, calculate the net force on a 60.0 kg rider who is at point 5.

13. How much force does the seat exert on a 60.0 kg rider who is at point 5?

14. Using 60.0 kg for the mass of the rider and the measured acceleration at point 4, calculate the normal force the seat exerts on the rider at the bottom of the first large hill (point 4).

15. Draw and label a free body diagram for your body at the bottom of the first hill (point 4). Be sure the length of force vectors are representative of the relative sizes of the forces.

QUANTITATIVE QUESTIONS (continued)

16. Write an equation that describes the net force on a 60.0 kg rider at point 4 in terms of the forces in your force diagram from question 15.

17. Determine the net force on a 60.0 kg rider who is at point 4.