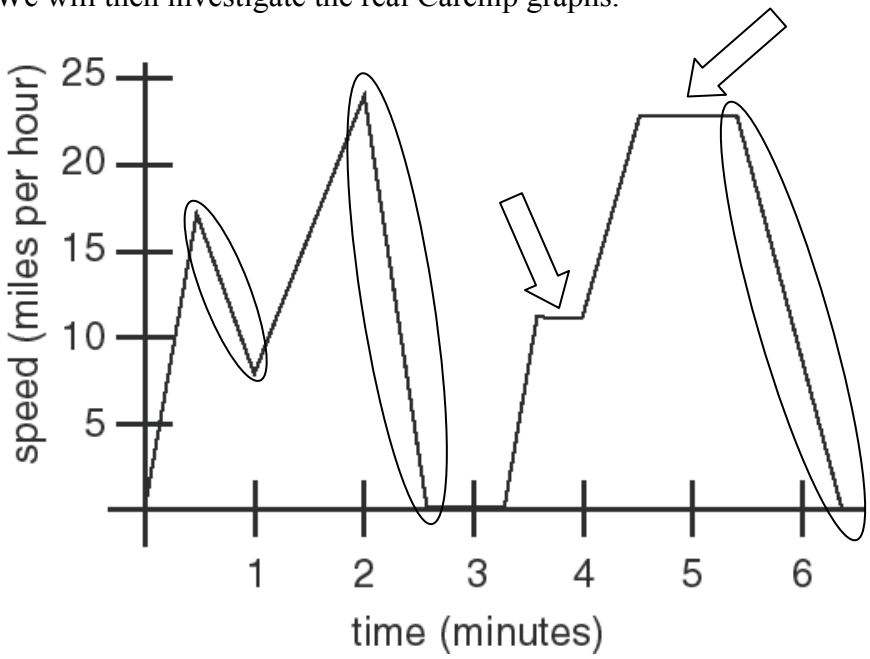
Carchip Worksheet Solutions NAME:

The following graph is a simplified version of the graph generated by the Carchip module. It shows the relationship between the speed of a car and time. Answer the questions. We will then investigate the real Carchip graphs.



1. Describe what the driver might be doing during the first two minutes. Make sure you explain all three segments that make up this part of the graph. Does the driver come to a complete stop during this time?

The driver accelerates from a complete stop to about 17 miles per hour (first segment). He then brakes to about 8 miles per hour (second segment). This puts him at the one-minute mark. Over the next minute, he accelerates to about 24 miles per hour (third segment). He does not come to a complete stop.

2. When does the car make its first complete stop? How long is the car stopped? Give a reasonable excuse for this.

The first complete stop occurs when the car has a speed of zero, or when the graph hits the x-axis. This occurs about two and a half minutes into the trip. The car is stopped for thirty or so seconds. Possibly, he encountered a stop sign.

3. Locate the two arrows near the four and five minute marks. What is happening here? In other words, why does the graph level out?

The speed levels out, meaning he is not accelerating at these points. He is moving at a constant speed.

4. How long does this car trip last?

About six and a half minutes.

5. Approximately, what is the fastest the car traveled during the trip?

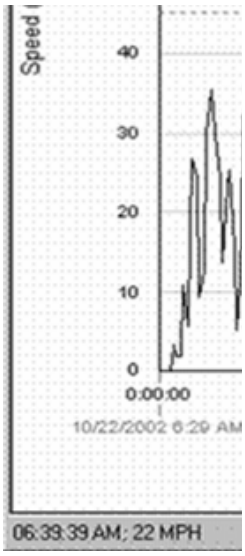
The highest y-value of the graph is the maximum speed the car traveled. It looks to be about 24 miles per hour.

6. How many times did the driver slow down or brake? How does the graph show this information?

The speed decreased every time the graph dips down (left to right). This occurred three times. These parts of the graph are circled.

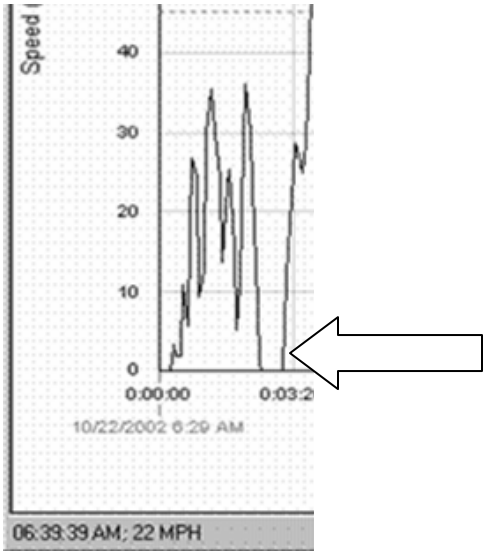
The following full-page graphs were obtained through a Carchip, designed to give mechanics diagnostic information. http://www.davisnet.com/drive/products/carchip.asp **The first full-page graph shows the speed of the vehicle for the first thirty minutes of driving. The second full-page graph shows the temperature of the car's coolant for these same thirty minutes.** Each vertical line represents 3 minutes and 20 seconds. Answer the following questions.

7. Consider the graph of the car's speed for the first 3 minutes or so, shown below. Describe, in general, what the driver is doing during this time. In other words, why does the graph look so jagged?



The driver accelerates from a complete stop. He then accelerates and brakes intermittently. Perhaps he is trying to go too fast for traffic and so accelerates, but then needs to brake.

8. Around the 3 minute mark the (speed) graph drops off completely and then resumes at a rather steep angle several seconds later. What is the driver doing here? (A picture of the appropriate portion of the graph is below. The arrow points to the area in question.)



He has stopped. He then accelerates from the stop rather quickly.

9. What is the maximum speed the car achieves (for the entire trip)?

Approximately 72 miles per hour. I drew a circle on the graph where this maximum speed occurs, around the twenty minute mark.

10. Approximately how long is the car going faster than 60 mph?

Approximately thirteen minutes. I highlighted this area of the graph with a rectangle. Estimate the time by knowing that each vertical line represents 3 minutes and 20 seconds.

11. Find the part of the graph where the car first nearly hits 60 mph (right after the 3 minute and 20 second mark). Notice it quickly dips below 40 mph directly after this point. Give a good reason the car might do this.

Perhaps he got up to speed, hopefully on the highway. But then, someone got in front of him and he had to slow down.

12. Consider the graph of the coolant temperature. Describe what is happening in this graph. Refer to the time at critical regions. (There are essentially two parts, the sloping part and the nearly horizontal part.)

For the first six minutes or so, the engine is heating up. Notice how the graph is increasing here. After that, the engine has hit its running temperature and so levels off.

13a. Approximately, what is the maximum temperature the coolant reaches?

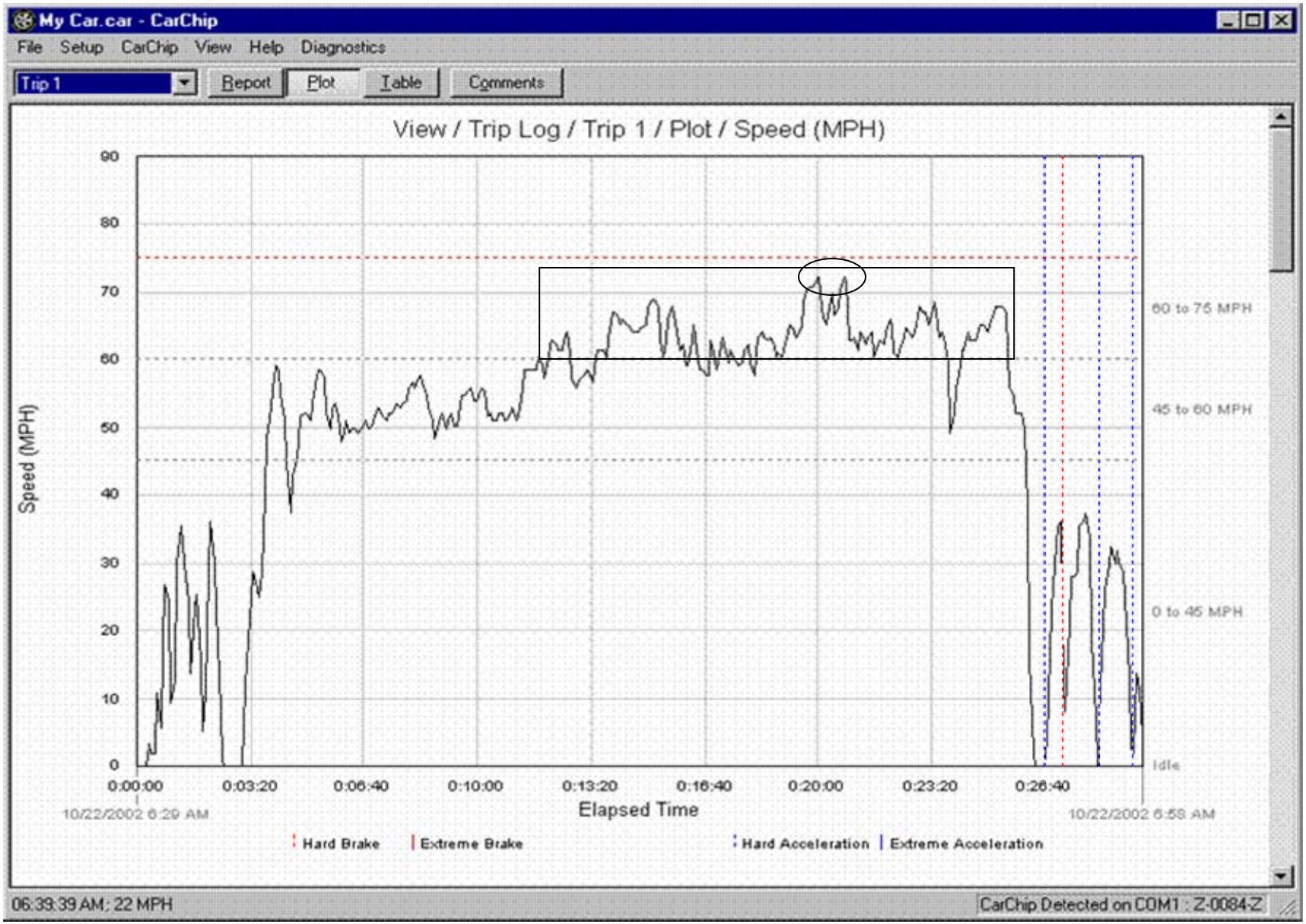
Approximately 190 degrees Fahrenheit. Notice the scale of the graph to make sure you interpret it correctly.

13b. How long does it take for the car to reach this temperature?

Approximately six minutes.

13c. Approximately, how fast is the car going when it first achieves the maximum temperature?

Here, we need to note where the coolant temperature first starts to level off at about the six minute mark. Then, look at the speed graph for the corresponding time. It looks like the car is going about 50 or 55 miles per hour.


My Car.car - CarChip
File Setup CarChip View Help Diagnostics
Trip 1
Report
Plot
Table
Comments
View / Trip Log / Trip 1 / Plot / Speed (MPH)
Speed (MPH)
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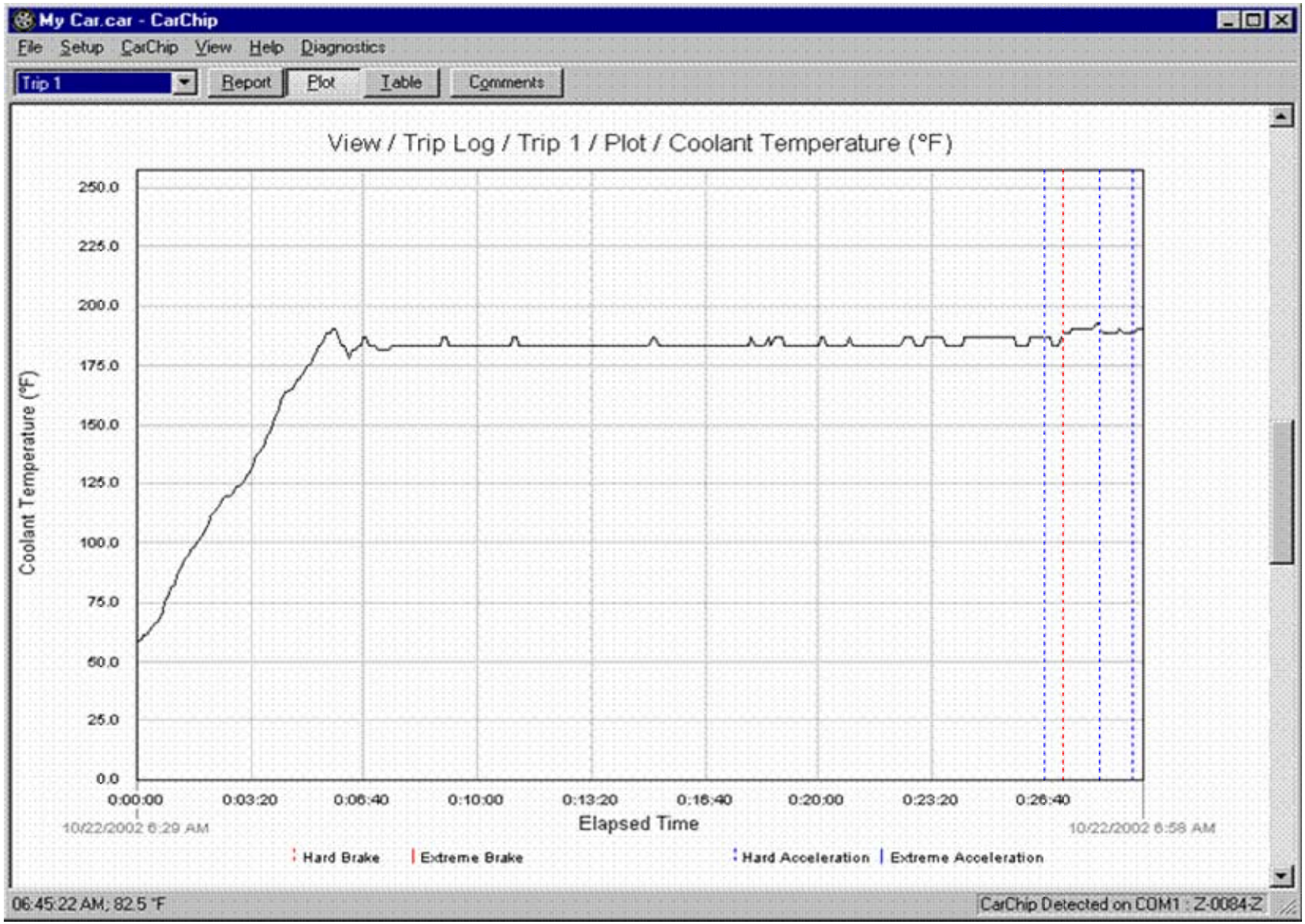
80
70
60
50
40
30
20
10
0
60 to 75 MPH
45 to 60 MPH
0 to 45 MPH
Idle
0:00:00
0:03:20
0:06:40
0:10:00
0:13:20
0:16:40
0:20:00
0:23:20
0:26:40
10/22/2002 6:29 AM
Elapsed Time
10/22/2002 6:55 AM
Hard Brake
Extreme Brake
Hard Acceleration
Extreme Acceleration
06:39:39 AM; 22 MPH
CarChip Detected on COM1 : Z-0084-Z


My Car.car - CarChip
File Setup CarChip View Help Diagnostics
Trip 1
Report
Plot
Table
Comments
View / Trip Log / Trip 1 / Plot / Coolant Temperature (°F)
Coolant Temperature (°F)
250.0
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
0:00:00
0:03:20
0:06:40
0:10:00
0:13:20
0:16:40
0:20:00
0:23:20
0:26:40
10/22/2002 6:29 AM
Elapsed Time
10/22/2002 6:58 AM
Hard Brake
Extreme Brake
Hard Acceleration
Extreme Acceleration
06:45:22 AM; 82.5 °F
CarChip Detected on COM1 : Z-0084-Z