MiSP Force and Gravity Worksheet #3

Name _____ Date _____

Today you will view a video of a typical skydive. The skydiver had a skydiving altimeter mounted in a special box with a video camera so the skydiver's altitude can be seen on the screen during the skydive. You will collect and record time and altitude data directly from the video. The altimeter records several aberrant values at the beginning of the jump due the abrupt change from still air in the cabin of the airplane to the ~100 mph airstream. At about 14 seconds the altimeter stabilizes and you can record more accurate data.

Procedure:

1. Practice reading the altimeter using the worksheet your teacher provides.
2. View the video in its entirety to become familiar with the entire sequence.
3. View the video a second time and record the altitude at which the skydiver leaves the plane and the time when she lands in Data Table 1.

Data Table 1	Time (min.: sec.)	Altitude (feet)
Exit from the airplane	0:00	
landing		0

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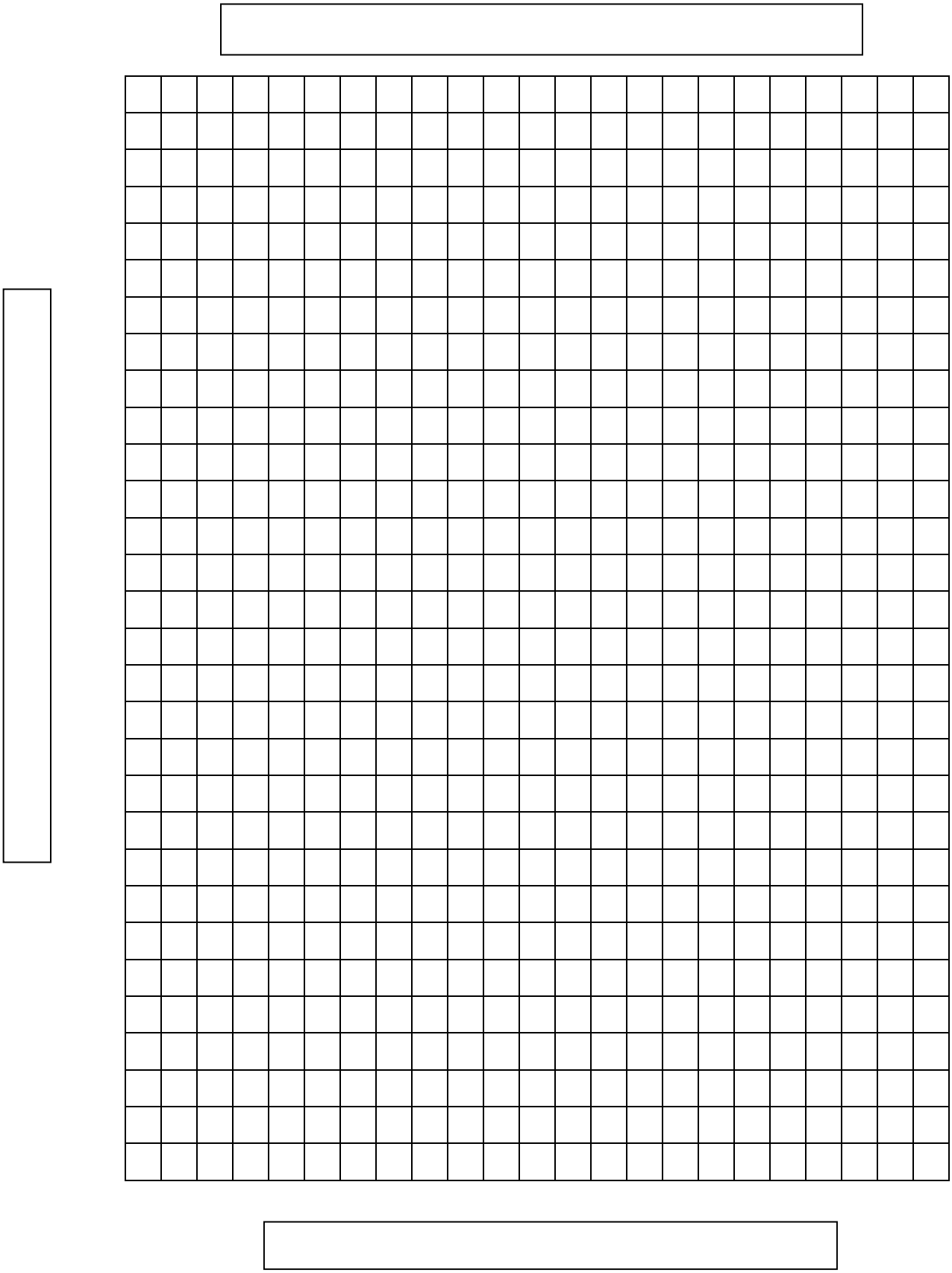
4. Plot these two data points on the graph provided.
    a. Make altitude the dependent variable and time the independent variable.
    b. Use six divisions on the x-axis for each minute so the seconds can be plotted easily.
5. Draw a line connecting the points on your graph.



6. Calculate the following values.
   a. difference between the exit altitude and landing altitude (include units)

   b. difference between exit time and landing time (include units)

   c. Divide the difference in altitude by the difference in time (include units)

7. What is term used for change in location (difference in altitude) divided by the change in time? _____
8. Did the skydiver appear to fall at the same velocity during the entire skydive? _____
9. What is inaccurate about your graph and calculations? _____
   _____
10. If the skydiver fell faster, would the line representing her average velocity be above or below the line on your graph? _____
11. If the skydiver fell slower, would the line representing her average speed be above or below the line on your graph? _____
12. View the video for a third time. This time record the time and altitude
    a. when she exits the plane
    b. at 14 seconds into the skydive
    c. when she opens her parachute
    d. when she lands.

Data Table 1	Time (min.: sec.)	Altitude (feet)
Exit from the airplane	0:00	
14 seconds into the skydive	0:14	
Opening of parachute		
landing		0

13. Add the new data points to your graph and draw three new lines:
    a. Draw a line between the point representing the exit from the airplane and the point representing 14 seconds into freefall.
    b. Draw a line between the point representing 14 seconds into freefall and the point where the parachute opens. The first two lines together represent the freefall portion of the skydive.
    c. Draw a third line between the point where the parachute opens and the point where the skydiver lands. This is the canopy portion of the skydive.

Analysis

1. Calculate the unit rate of change (slope) for each of the three new lines you drew on your graph.

	Ordered Pair used for calculation (x_1, y_1) (x_2, y_2)	Δ altitude (ft) Δy	Δ Time (seconds) Δx	**Unit Rate of Change (slope)** $\Delta y/\Delta x$
Exit from airplane to 14 seconds				
14 seconds to opening of the parachute				
Opening of the parachute to landing				

2. What does the unit rate of change above represent? (What term is used to describe a change in location divided by a change in time?) _____
3. Are the unit rates of change (slopes) positive (+) or negative (-)? _____ What does this mean? _____

   _____
4. Which of the lines on your graph (representing which part of the skydive) had the greatest slope? _____
5. During which part of the skydive was the skydiver moving at the greatest average velocity? _____
6. Which of the lines on your graph (representing which part of the skydive) had the smallest slope? _____

7. In which part of the skydive was the skydiver moving at the slowest velocity?

_____

8. Although you could not calculate it, the velocity during the first 14 seconds of freefall was changing constantly. Why? (Recall what you learned from the BASE Jump lesson.) _____

_____

9. Do you think the velocity changed <u>during</u> the second part of the freefall (14 seconds to the time when the skydiver opens the parachute)? _____ Why or why not? _____

_____

10. How could you determine this more accurately? _____

_____

11. What happens to the velocity when the parachute opens?

_____

_____

12. Why does this happen?

_____

_____

13. If the skydiver had opened her parachute 5 seconds later than she did, would her average velocity over the entire skydive have been greatest or less than it was? Explain your answer. _____

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