Space Shuttle Atlantis (STS-135) Launch Speed

This sequence of images shows the historic launch of the Space Shuttle Atlantis (STS-135) on July 8, 2011 at 11:29 a.m. EDT, from launch pad 39A at the NASA Cape Canaveral Space Center.

From bottom to top, the image times are 11:29:15.0, 11:29:16.0, 11:29:17.0, 11:29:18.0, and 11:29:19.0. The length of the space shuttle orbiter (not the red fuel tank) is 37 meters.

The launch sequence can be seen in the video located at:

Problem 1 - Using a millimeter ruler, what is the scale of an individual image in meters/mm?

Problem 2 - Measure the height in meters between the tip of the red shuttle fuel tank and a fixed location near the bottom of each frame.

Problem 3 - Graph the height of the fuel tank versus elapsed time beginning at T=0 in the bottom (first) image.

Problem 4 - About what was the average speed of the Shuttle in the top image in A) meters/sec? B) miles per hour?

Answer Key

**Problem 1** - Using a millimeter ruler, what is the scale of an individual image in meters/mm?

Answer: When this page is reproduced at normal scale, the length of the Orbiter is about 5 millimeters ,which corresponds to 37 meters, so the scale is 37/5 = **7.4 meters/mm.**

Problem 2 - Measure the height in meters between the tip of the red shuttle fuel tank and a fixed location near the bottom of each frame.

Answer; Students need to select a feature on the ground that is visible in each of the frames .One such feature is the top of the black rectangle 'status board' directly below the launch gantry. Measured from the top of this board to the tip of the red fuel tank, the values are as follows: 14 mm, 16mm, 18mm, 25mm, 35mm which correspond to heights of 104m ,118m, 133m, 185m and 259m.

Problem 3 - Graph the height of the fuel tank versus elapsed time beginning at T=0 in the bottom (first) image.

Answer: The elapsed times for each of the frames are 0s, 1s, 2s, 3s and 4s. The height graph is as follows:
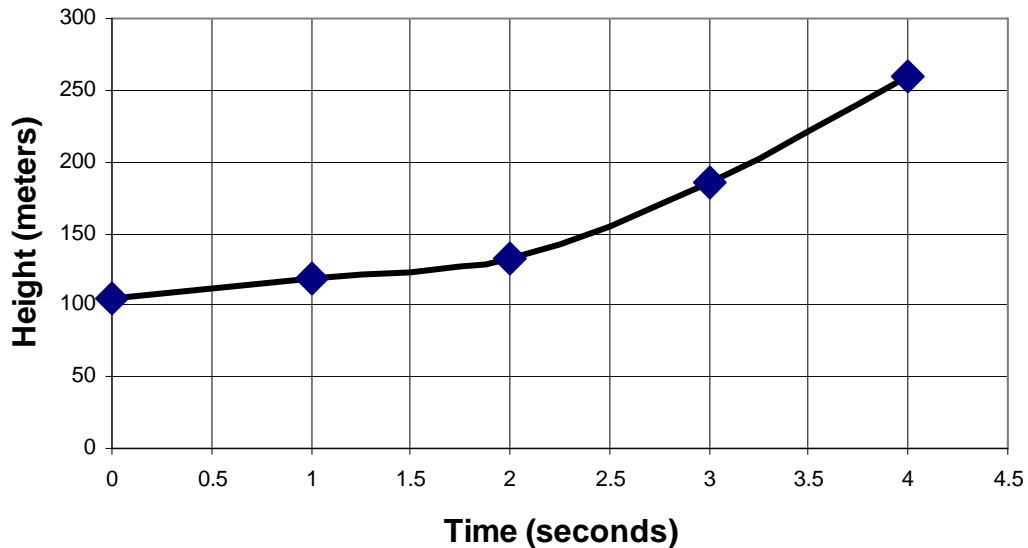
Problem 4 - About what was the average speed of the Shuttle in the top image?

Answer: A) Between 3 and 4 seconds, the height changed from 185 to 259 meters, so the speed was about   (259-185)/ (4 - 3) = **74 meters/sec**   B) about **165 mph**.