It was only 300 meters in diameter, but on June 18, 2013 it was discovered by the Pan-STARRS-1 survey telescope in Hawaii (top image), making it the 10,000th Near Earth Object (NEO).

NASA estimates that there are 15,000 asteroids that are 140-meters or larger with orbits close to Earth. We have now discovered 30% of them according to statistical estimates based on the rate of discovery of these NEOs. Objects of this size or larger are considered severe hazards should they impact near cities. The February 2013 ‘Russian’ meteor was 17 meters in diameter, yet it injured over 3000 people, though it left no crater. A 140-meter asteroid impact would produce a 25-meter crater and the atmospheric shock wave would damage thousands of buildings.

The orbit is shown in the left. The figure to the left. The orbit is tilted nearly 45° to Earth’s orbit plane.

The distance from Earth to 2013 MZ5 is given in the table below, every 10 days, and in units of millions of kilometers.

<table>
<thead>
<tr>
<th>Date</th>
<th>Distance</th>
<th>Date</th>
<th>Distance</th>
<th>Date</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 22</td>
<td>115</td>
<td>July 1</td>
<td>71</td>
<td>August 9</td>
<td>82</td>
</tr>
<tr>
<td>June 1</td>
<td>100</td>
<td>July 10</td>
<td>69</td>
<td>August 19</td>
<td>89</td>
</tr>
<tr>
<td>June 11</td>
<td>88</td>
<td>July 20</td>
<td>71</td>
<td>August 29</td>
<td>97</td>
</tr>
<tr>
<td>June 21</td>
<td>77</td>
<td>July 30</td>
<td>76</td>
<td>September 8</td>
<td>104</td>
</tr>
</tbody>
</table>

Problem 1 – Graph the tabulated distance function and connect the points with a smooth curve.

Problem 2 – On what date is the asteroid closest to Earth?

Problem 3 – The approximate formula for the approach speed of the asteroid to Earth in km/hr is given by \( S = 1100 T - 62000 \), where \( T \) is the elapsed days from May 22. How fast was it approaching Earth on June 18, the day of its discovery?

Space Math

http://spacemath.gsfc.nasa.gov
Problem 1 – Graph the tabulated distance function and connect the points with a smooth curve. Answer: See graph below.

```
Day Number 0 20 40 60 80 100 120
Distance (million miles) 0 2 0 4 0 6 0 8 0 1 0 0 1 2
```

Problem 2 – On what date is the asteroid closest to Earth?

Answer: The table shows that on July 10 (Elapsed day 50) it reached its minimum distance of 69 million kilometers.

Problem 3 – The approximate formula for the approach speed of the asteroid to Earth in km/hr is given by \( S = 1100 \times T - 62000 \), where \( T \) is the elapsed days from May 22. How fast was it approaching Earth on June 18, the day of its discovery?

Answer: June 18 is elapsed day 27, so \( T = 27 \) and so \( S = 1100(27)-6200 = -23,500 \text{ km/hr} \). The negative sign means that the distance to Earth was decreasing.