Mathematics in the Real World: Math 16 / Stats 90
Prof. Jack Poulson
Midterm retake (afternoon): May 4, 2015

1. Given the dataset

$$10.5, 7, 2, -5, -20, 11, 12, 27, 30,$$

   (a) (25 pts) Draw and label a box and whisker plot for the dataset.

   (b) (10 pts) Compute the best estimates of the dataset with respect to the two-norm and max-norm.

2. Consider a fair random walk:

   (a) (10 pts) Write down the expected change in squared distance from zero if the walk is currently at position k and takes one more step.

   (b) (10 pts) Write down the expected change in (absolute) distance from zero if the walk is currently at position $k \neq 0$ and takes one more random step, and compute the expected change from taking a step at $k = 0$.

   (c) (10 pts) Describe the behaviour (as precisely as possible) of the Variance and Mean Absolute Deviation of the random walk as the number of steps increases.

3. Consider a random walk where the first step is twice as likely to be backward as forward, but subsequent steps prefer to go in the **opposite** direction as the preceding step by a factor of two. For example, if the first step was forward, the odds of the next step being backward are 2/3. But, if the first step was forward and the second step was backward, then the odds of the third step being forward are 2/3. If the random walk is allowed to continue for **three steps**:

   (a) (5 pts) List the possible final locations.

   (b) (10 pts) Compute the likelihoods of each of these locations.

   (c) (5 pts) Compute the expected location.

   (d) (15 pts) Compute the variance , standard deviation, and Mean Absolute Deviation.