Problem Set 7
Structures: posn & color

Complete each of the exercises below. Be certain to include all components of the Design Recipe when writing each program.

1. Develop a function named **coordinate-difference** which takes in a *posn* and gives back the difference between the coordinates (which tells you, in a sense, how far the point is from the diagonal line $y = x$). The answer should never be negative, so use the built-in *abs* (absolute-value) function to ensure this.

2. Develop a function named **distance** that takes in two *posns*, and computes the straight-line distance between them. The distance formula is given below.

$$\text{distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

3. Develop a function named **midpoint** that takes in two *posns*, and returns a *posn* that is the midpoint of the line segment joining the two *posns*. The midpoint formula is given below.

$$\text{midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

4. Develop an animation that randomly generates a *posn* for a shape and plots the shape at that position on an 800x800 animation window. If the *posn* is in the upper left quadrant of the animation window, then the shape should be a blue square; if the *posn* is in the upper right quadrant of the window, then the shape should be a red circle; if the *posn* is in the lower left quadrant of the window, then the shape should be a yellow triangle; and if the *posn* is in the lower right quadrant of the window, then the shape should be a purple star. Each of the shapes should be approximately the same size. Every time the "space bar" is pressed a new *posn* and therefore, a new shape, should be generated and plotted according to all of the conditions above. Pressing the "q" key (upper or lower-case) should end the animation. All other keys should be ignored.

5. Develop an animation of a Rocket Launch. The rocket image should start at the bottom/center of the window and move up one pixel each clock tick. The rocket should move left or right in response to key presses (you can decide which keys). The rocket should stop at the right and left edges of the window. (Hint: use the min and max functions) Pressing the space bar should return the rocket to its starting location. Pressing the "q" key should quit the animation. Once the rocket completely leaves the top of the screen, a message should be displayed and the animation should end.