7. Numbers Quiz B

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{{% use-mathjax %}} {{% use-goodlists %}}

1. Write in ordinary math notation:

   ```
   (+ 10 (* -7 x))
   ```

2. Write in ordinary math notation:

   ```
   (* 50
      (+ (log x)
         20)
      (- (sqrt x)))
   ```

3. Write Racket notation:

   $$-5 + \frac{\sqrt{13}}{2}$$

4. Here are two checks for the function `hpr: integer -> integer`.

   ```
   (check-expect (hpr 1234) (+ 12 34))
   (check-expect (hpr 123456) (+ 1234 56))
   ```

   - What is the actual answer supposed to be from `(hpr 1234)`?
   - Write another check-expect, very different from the ones above.
   - Write the function `hpr`.

5. Write a check for this function that shows that the distance between $(1, 4)$ and $(3, 10)$ is $\sqrt{45}$, which is about 6.708.

   ```
   (define (distance x0 y0 x1 y1)
     (sqrt (+ (sqr (- x0 x1)) (sqr (- y0 y1)))))
   ```

6. The function `abcd: Anything -> Integer` puts out a random multiple of 8 between 800 and 1200, inclusive. Write `abcd`.

7. (`rh`) A regular hexagon is made out of 6 equilateral triangles. The formula for the area of a regular hexagon of side length s is $\frac{\sqrt{3}}{2}s^2$.

   ```
   (define (hex s) (regular-polygon s 6 "outline" "blue"))
   ```

   {{% figure src="hexagon.png" caption="Side length 100 hexagon" %}}

   You will write a function `rh` that draws a regular hexagon with a random side length computed by `abcd` (above), and also displays the area (rounded to the nearest integer) on it in 50 point black text. Ignore the fact that `abcd` gives numbers that are impossibly large to use.

   1. Write `rha : number(s) -> number`, which computes the area from the given side length `s`.
   2. Write `rh`.

You may use this distance function for the rest of the test.

8. You are writing a new animation to make a circle that grows and shrinks with the mouse. Only the top half of the circle (a semicircle) will be visible, centered on the bottom of a 400x300 empty scene. The top of the circle will be at the same level as the mouse's vertical position.

```
(big-bang 50
    (to-draw rcirc)
    (on-mouse rset))
```

   1. Draw a picture of an example situation, including the coordinates of the mouse, the coordinates of the center of the circle, and the radius of the circle.
   2. Write a check-expect for the mouse handler.
   3. Write a signature and code for the draw handler.
   4. Write a signature and code for the mouse handler.