

Assignment #5

Practice with Haskell

Write definitions for each of the following *Haskell* items.

Specify the *type* of each item, and include a *comment* to describe its purpose.

1. `frequencies xs`

The list of tuples of distinct items and their frequencies in list 'xs'.

```
frequencies "mississippi" ⇒ [ ('m',1), ('i',4), ('s',4), ('p',2) ]
```

2. `pytrips`

The (infinite) list of *Pythagorean Triples* — these are 3-tuples of positive integers (x, y, z) with $x^2 + y^2 = z^2$, where $x < y < z$, and where x and y have no common factor.

```
take 4 pytrips ⇒ [ (3,4,5), (5,12,13), (8,15,17), (7,24,25) ]
```

3. `as x`

Returns an infinite list $[a_1, a_2, a_3, \dots]$ of approximations which converge to the square root of 'x' ($x \geq 0$). These approximations are defined by:

$$a_1 = 1.0$$

$$a_i = (a_{i-1} + x/a_{i-1}) / 2.0, \forall i \geq 2$$

For example:

```
take 4 ( as 2.0 ) ⇒ [ 1.0, 1.5, 1.416667, 1.414216 ]
```

4. `squareroot x`

Returns the square root of 'x' ($x \geq 0$). Take this to be the first element in the list 'as x' which differs, in absolute value, from the previous element by less than 0.0001.

```
squareroot 2.0 ⇒ 1.414214
```

Program Submission:

Store the definitions in a file named 'a5.hs', and turn it in for grading by typing:

```
submit-cs4620 a5.hs
```

Due Date: Fri Dec 14, 5:00pm