| galois |

Solution to the exercises

Exercise 1:

In file `solutions.cry`:

```
type Circle = { radius : Rational, left : [64], top : [64] }
a : Circle
a = { radius=(ratio 5 2), left=20, top=16}
```

Running in Cryptol:

```
Cryptol> :l solutions.cry
Loading module Cryptol
Loading module Main
Main> :s base=10
Main> aCircle
{radius = (ratio 5 2), left = 20, top = 16}
```

Exercise 2:

Add this to `solutions.cry`:

```
areaCircle : Circle -> Rational
areaCircle b = (b.radius * b.radius * (ratio 355 113))
aCircleArea = areaCircle aCircle
```

Running in Cryptol:

```
Main> :l solutions.cry
Loading module Cryptol
Loading module Main
Main> aCircleArea
(ratio 8875 452)
```

Exercise 3:

Add the following to solutions.cry:

```
type Displacement = { left : [64], top : [64] }
disp : Displacement
disp = { left= 12, top=2 }

nudgeCircle : Circle -> Displacement -> Circle
nudgeCircle circle d =
   { radius = circle.radius, left = circle.left+d.left, top = circle.top+d.top }

movedaCircle = nudgeCircle aCircle disp

newDisp : Displacement
newDisp = { left= -32, top=2 }

secondTry = nudgeCircle aCircle newDisp
```

Running in Cryptol:

```
Main> :l solutions.cry
Loading module Cryptol
Loading module Main
Main> movedaCircle
{radius = (ratio 5 2), left = 32, top = 18}
Main> secondTry
{radius = (ratio 5 2), left = 18446744073709551604, top = 18}
```

Exercise 4:

Add the following to `solutions.cry` (recall `import Float` is at the top of the file):

```
type BMI = { weight : Float16, height : Float16 }
type BMIimp = { weight : Float16, feet : Float16, inches : Float16 }

calcBMI : BMI -> Float16
calcBMI bmi = bmi.weight /. bmi.height /. bmi.height * 10000

calcBMIimp : BMIimp -> Float16
calcBMIimp bmi = bmi.weight /. (bmi.feet*12+bmi.inches) /.
                 (bmi.feet*12+bmi.inches) * 703

t1 = { weight=80, height=174 }                  // for testing
t2 = { weight=180.0, feet=5.0, inches=8.5 }     // for testing
```

Running in Cryptol:

```
Main> :l solutions.cry
Loading module Cryptol
Loading module Float
Loading module Main
Main> calcBMI t1
0x1a.6c
Main> calcBMIimp t2
0x1a.f8
```