Kyle Wolf

Homework 10

1)

addRat: Rat ⨯ Rat → Rat

addRat (a,b) (c,d) = (a times d plus b times c, b times d)

multRat: Rat ⨯ Rat → Rat

multRat (a,b) (c,d) = (a times c, b times d)

subRat: Rat ⨯ Rat → Rat

subRat (a,b) (c,d) = (a times d minus b times c, b times d)

divRat: Rat ⨯ Rat → Rat

divRat (a,b) (c,d) = (a times d, b times c)

2)

Payroll = (String, Nat, Nat)

first: String ⨯ Nat ⨯ Nat → String

first (a,b,c) = a

second: String ⨯ Nat ⨯ Nat → Nat

second (a,b,c) = b

third: String ⨯ Nat ⨯ Nat → Nat

third (a,b,c) = c

add: String ⨯ Nat → Payroll

add n r = (n, r, 0)

updatePay: Payroll ⨯ Nat → Payroll

updatePay (a,b,c) nr = (a, nr, c)

updateHours: Payroll ⨯ Nat → Payroll

updateHours (a,b,c) nh = (a, b, nh)

computePay: Payroll → Nat

computePay (a,b,c) = b times c

3)

P: Program

S: Expression-sequence

E: Expression

N: Numeral

P ::= ON S

S ::= E TOTAL S | E TOTAL OFF

E ::= E1 + E2 | E1 \* E2 | LASTANSWER (E) | IF E1, E2, E3 | ( E ) | N

Prog : Program -> Nat\*

Seq : Expression-sequence -> Nat -> Nat\*

Exp : Expression -> Nat -> Nat

Num : Numeral -> Nat

LASTANSWER: Array ⨯ Expression -> Nat

Prog [ON S] = Seq [S] zero

Seq [E TOTAL S] n = cons (Exp [E] n) (Seq [S] (Exp [E] n))

Seq [E TOTAL OFF] n = cons (Exp [E] n) ()

Exp [E1 + E2] n = (Exp [E1] n) plus (Exp [E2] n)

Exp [E1 \* E2] n = (Exp [E1] n) times (Exp [E2] n)

Exp [LASTANSWER (i)] arr i = arr[i]

Exp [IF E1, E2, E3] n = (Exp [E1] n) equals zero -> Exp [E2] n [] Exp [E3] n

Exp [(E)] n = Exp [E] n

Exp [N] n = Num [N]

Num [N] = number /\* atoi(yytext); Integer.parseInt($NUM.text); \*/