Lexical Definitions

- All case sensitive
- Identifiers
    - Begin with a lower-case letter (a-z)
    - Continue with one or more letters or digits (no underscores)
        - e.g. d3, aDD8, z920, and bfa are all valid
        - but A3, a, and 382 are invalid
- Keywords
    - Again
    - If
    - Assign
    - Move
    - Show
    - Flip
    - Name
    - Home
    - Do
    - Spot
    - Place
    - Here
    - There
- Operators and delimiters group
    - &

    - +
    - /
    - %
    - .
    - {
    - }
    - <<
    - <-
- Numbers
    - Any sequence of non-negative decimal digits (0-9), no sign, and no decimal point
- Comments start with * and end with *

BNF Rules

<S> -> Name Identifier Spot Identifier <R><E>

<R> -> Place <A> <B> Home

<E> -> Show Identifier

<A> -> Name Identifier

<B> -> empty|. <C>.<B>|<D><B>

<C> -> <F>|<G>

<D> -> <H>|<J>|<K>|<L>|<E>|<F>

<F> -> { If Identifier <T><W><D> } | { Do Again <D><T><W> }

<G> -> Here Number There

<T> -> << | <-

<V> -> +|%|&

<H> -> /<Z>

<J> -> Assign Identifier <D>

<K> -> Spot Number Show Number | Move Identifier Show Identifier

<L> -> Flip Identifier

<W> -> Number <V> Number | Number.

<Z> -> Identifier | Number

Grammar Semantics

- Delimiters:
    - {}.
    - Place Home
- Operators:
    - << is the same as standard less than symbol (<)
    - <- is the same as greater than or equal to (>=)
    - / is a decrement operator. It reduces the value by one
        - Number may be immediate or stored at location indicated by identifier
    - + is the same as standard plus sign
    - % means divide the first number by the second number, truncating the remainder

        - e.g., 11 % 5 = 2
    - & means multiply the two numbers together
- Note that operators have no precedence and are applied from left to right
- ‘Name identifier’ allocates memory for given identifier and initializes its value to zero
- ‘Assign identifier <D>’ assigns the value of D to the given identifier
- ‘{If identifier <T> <W> <D>}’
    - Means to do <D> if and only if ‘identifier <T> <W>’ is true
- ‘{Do Again <D> <T> <W>}’
    - Means to repeat D until ‘<T> <W>’ is false
        - If <T> is <<, repeat <D> until <W> is zero or more
        - If <T> is <-, repeat <D> until <W> is less than zero
- ‘Spot number’ means to load the immediate number into the accumulator
- ‘Spot identifier’ means to read in an integer from the user and store the value for the given new identifier (this operation allocates memory for the identifier)
- ‘Show number’ means to write out the number to the monitor
- ‘Show identifier’ means to write out the value of the given identifier to the monitor
- ‘Move identifier’ means to load the given identifier’s value into the accumulator
- ‘Flip identifier’ means to multiply the value for the given identifier by -1 and store the value
- ‘Here number There’ means print the given number to the screen the given number of times (e.g. ‘Here 3 There’ will print the number 3 to the screen 3 times)
- In the input code, there should be at least one space between each token.