Cmple

A Simple Programming Language based on C

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Submitted to:

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Name: Cmple

Introduction:

Cmple (Simple) is based on C which aims to develop a programming language for beginners who are not yet experienced and used to the different technical terms in a programming environment. Since C is probably one of the first programming languages taught to a beginner, Cmple's structure is based on the C language. The members believe that building an easy but good foundation in terms of programming will make it easier for the "newbies" to process the technicalities of programming with ease.

After brainstorming, the members realized that most, if not all, languages use many difficult technical words that might scare a beginner. Terms that are not familiar were always used in many languages. The goal in mind in making this programming language is to make it easy and simple as much as possible because it is again, intended for beginners. This programming language will also help teach them the basics of coding without difficulty. The name Cmple (stylized with C and Simple in mind) is based on the word Simple, which means easily understood or done.

Syntactic Elements:

1. Character Set

These are the accepted characters of Cmple, which is composed of: Alphabets, Digits, and Symbols.

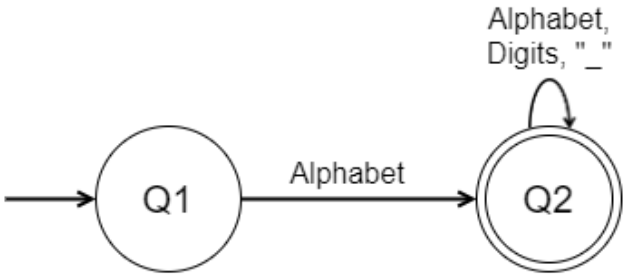
- Character_Set = {Alphabet, Digits, Symbols}
- Alphabet = {Upper, Lower}
- Upper = {A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z}
- Lower = {a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}
- Digits = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0}
- Symbols = {+, -, *, /, %, <, >, |, =, &, !, (,), {, }, [,], :, ;, “, ‘, ., _, ~}

2. Identifier

Rules for writing an identifier:

- An identifier must start with an Alphabet.
- It should not contain any Symbols except for the character "_" (underscore).
- Keywords and reserved words must not be used as an identifier.

Machine for Identifier:



Regular Expression for Identifier: Alphabet (Alphabet **+** Digits **+** "_")*

3. Operation Symbols

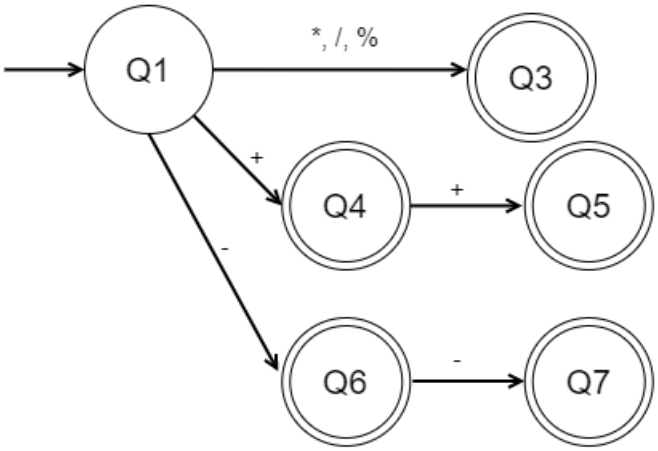
The language will accept the standard operation symbols:

- Arithmetic: +, -, *, /, %, ++, --
- Relational: <, >, <=, >=, !=, ==, =
- Logical: &&, ||, !

Arithmetic	Description	Example (A= 10, B = 20)
+	adds two operands or unary plus	A + B = 30
-	subtracts two operands or unary minus	A - B = -10
/	performs division on two operands	A / B = 0.5
*	multiplies two operands	A * B = 200
%	gives the remainder of two operands	A % B = 0

++	increases the value of the operand by 1	A++ = 11
--	decreases the value of the operand by 1	A-- = 9

Machine for Arithmetic Operators:

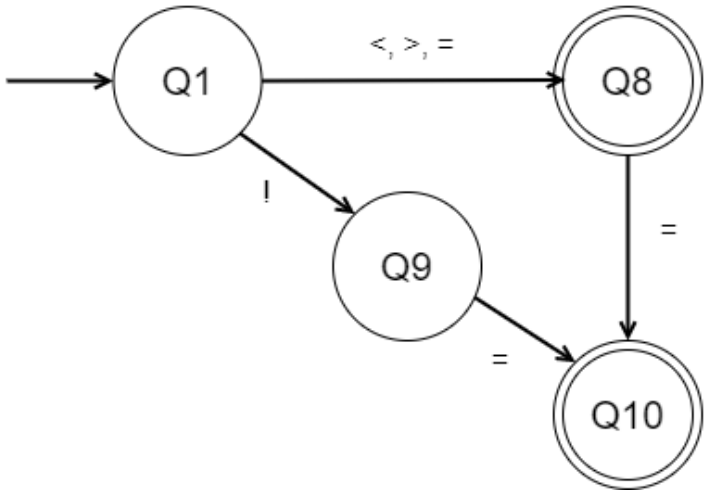


Regular Expression for Arithmetic Operators: * + / + % + + + - + (++) + (--)

Relational	Description	Example (A= 10, B = 20)
<	check operand on the left is smaller than right operand	A < B (True)
>	check if operand on the left is greater than operand on the right	A > B (False)
<=	checks if the left operand is smaller or equal than the right operand	A <= B (True)
>=	checks if the operand on the left is greater than or equal to the right operand	A >= B (False)
!=	check if two operands are not equal	A != B (True)

==	check if the two operands are equal	A == B (False)
=	assigns values from right side operands to left side operand	A = B (A = 20)

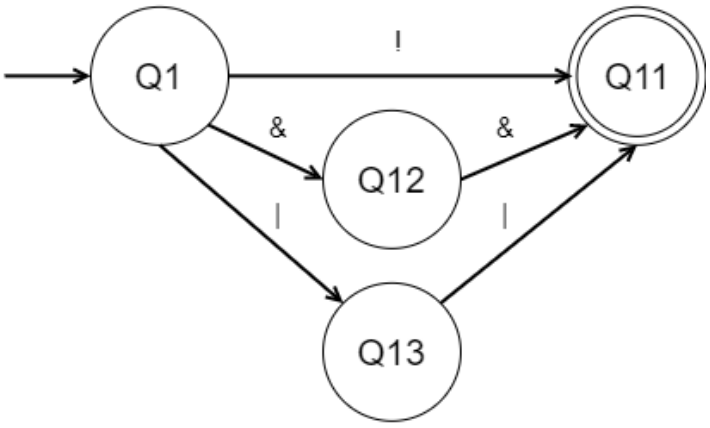
Machine for Relational Operators:



Regular Expression for Relational Operators: (< + > + =) + (< + > + = + !)=

Logical	Description	Example (A= True, B = False)
&&	a set of operands will be true if and only if all its operands are true	A && A = True A && B = False
||	a set of operands will be true if and only of one or more operands are true	A || A = True A|| B = True B || B = False
!	returns opposite logical state of its operand	!A = False !B = True

Machine for Logical Operators:



Regular Expression for Logical Operators: ! **+** (&&) **+** (||)

4. Keywords and Reserved Words

Keywords	Description
case	conditional statement
default	It is the end of switch statement; executed if no case constant-expression value is equal to the value of expression
do	It is used for iteration of specific codes if the condition for the while loop is TRUE
else	Conditional statement where another task is performed if the first condition is FALSE
for	It is used for iteration of codes until the condition it met
if	Conditional statement wherein it performs a task if it is TRUE
otherwise	conditional statement

resume	a statement that instructs a program to leave the subroutine and go back to the return address
return	a statement that instructs a program to leave the subroutine and go back to the return address
stop	the loop is immediately terminated, and the program control resumes at the next statement following the loop
switch	A conditional statement used to test on a list of values
while	It is used for iteration of specific instructions if the condition is TRUE

Reserved Words	Description
Alphabet	returns ABCDEFGHIJKLMNOPQRSTUVWXYZ
Collection	It is used for Array identifier
Comp	It is used for Structures identifier
euler	returns a constant value of 2.71828
false	returns when the logical statement is false based on the condition given
int32	returns a constant value of 2147483647
Item	It is used for Enum identifier
kelvin	returns a constant value of 273

None	null, void, nothing
Number	It is used for numeric identifier
odd	returns the first five odd numbers 1,3,5,7,9
pi	returns a constant value of 3.14
Sentence	It is used for string identifier
read	Used to read or scan an input
then	noise word after if statement
Tralse	It is used for Boolean identifier
true	returns when the logical statement is true based on the condition given
write	Used to print or display the output

Machine for Keywords and Reserved Words:

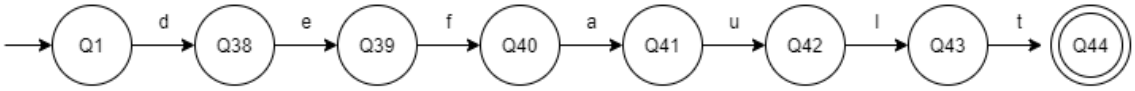
Alphabet

case

Collection

Comp

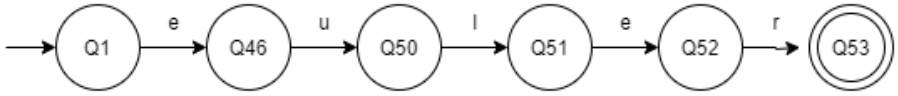
default



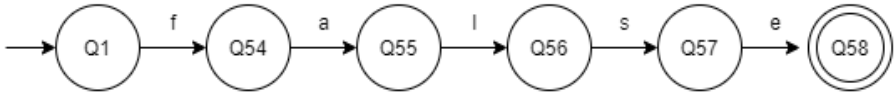
do

else

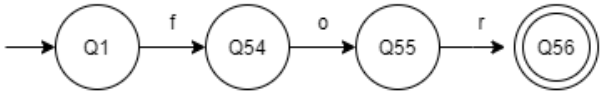
euler



false



for



if

int23

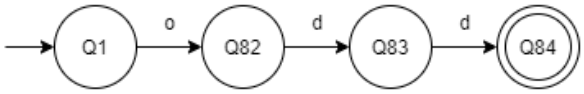
Item

kelvin

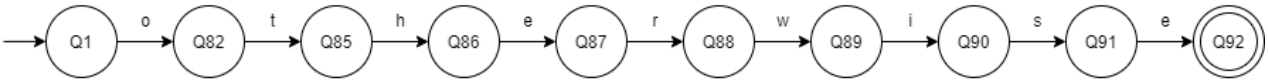
None

Number

odd



otherwise



pi

read

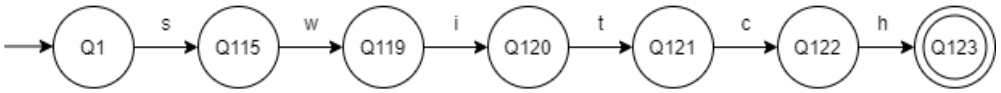
resume

return

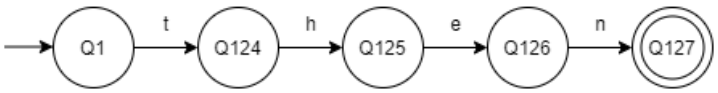
Sentence

stop

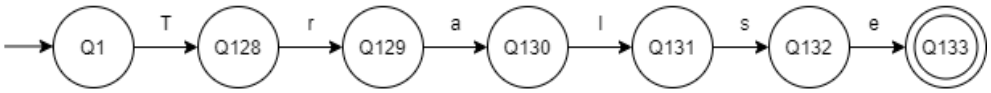
switch



then

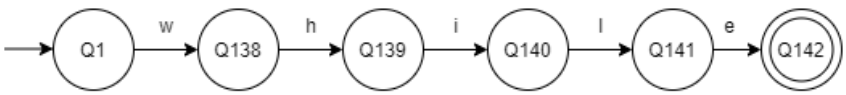


Tralse

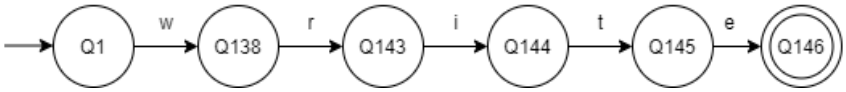


true

while



write

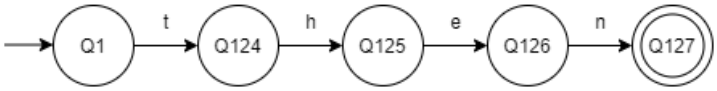


5. Noise Words

   Noise words will help the analyzer to determine a syntax error and improve code readability.

Noise Words	Syntax	Description
then	if (statement) then …	If statements contain the comparison/conditional statement and the statement itself. The noise word "then" helps distinguish the two parts of the if statement.

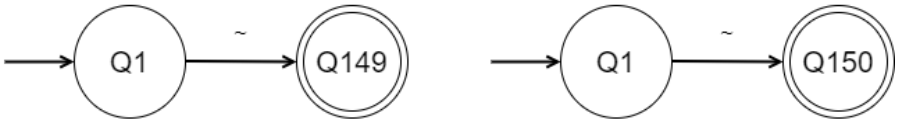
then



6. Comments

   - Single-line comment: //this is a single-line comment

   - Multi-line comment: ~ this is a multi-line comment ~

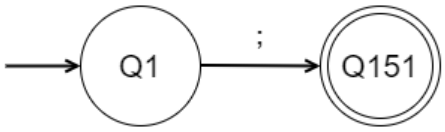


7. Blanks (spaces)

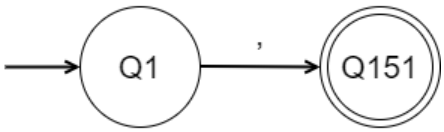
   Cmple does not read whitespaces but it is used in separating read lexemes, but it is accepted if it is used inside a Sentence literal.

8. Delimiters

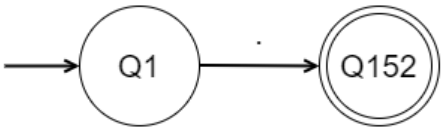
- Semicolon – used to terminate a line of code.



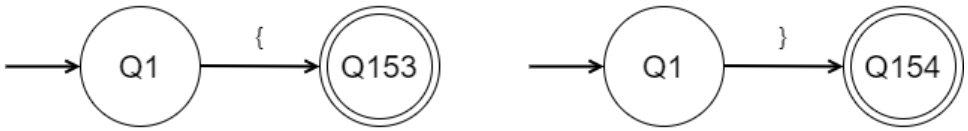
- Comma – used to separate values.



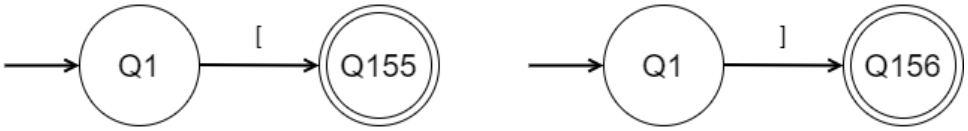
- Period – used as a decimal separator.



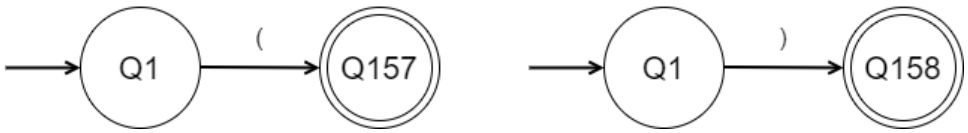
- Curly Brackets – used to enclose statements.



- Square Brackets – used to enclose data types in declaring statements.



- Parentheses – used to group expressions and statements.



9. Free-and-fixed-fields Formats

This language is a free format type of language with some statements such as a comment that needs to be in a fixed-field format for it to work.

10. Expression

Rules for evaluating expressions:

Precedence	Arithmetic	Description	Associativity
1	++, --	Postfix Increment/Decrement	Left-to-Right
2	*, /, %	Multiplication, Division, Modulus	Left-to-Right
3	+, -	Addition, Subtraction	Left-to-Right

Precedence	Relational	Description	Associativity
1	>, >=, <, <=	Greater than, Greater than or equal to, Less than, Less than or equal to	Left-to-Right
2	==, !=	Equal to, Not Equal to	Left-to-Right

Precedence	Logical	Description	Associativity
1	!	Logical NOT	Left-to-Right
2	&&	Logical AND	Left-to-Right
3	||	Logical OR	Left-to-Right

11. Statements

- Declaration Statement

  Data_Types = {Number, Sentence, Tralse, Collection, Comp, Item}

  Gen_DataTypes = {Number, Sentence, Tralse}

  Spec_DataTypes = {Comp, Item}

  Coll_DataType = {Collection}

Syntax	Variations	Output
<Gen_DataTypes> <Identifier>;	Number x; Sentence intro = “hello!”; Number value = 89.2;	x is a place holder hello! 89.2
<Spec_DataTypes> <Identifiers> {<Declaration_Statements>}	Comp ID {Sentence name; Number age;} Item size {“small”, “med”, “large”};	ID {Qwerty, 20} size.small = 0
<Coll_DataType> [<Gen_DataTypes>]<Identifier>;	Collection [Sentence] words; Collection [Number] num_id = {32, 88, 91} ;	words is a place holder for an array of strings 32, 88, 91

Source Code:

```
Sentence name;

Number age;

Number x = age + 10;

read(name);

read(age);

write(name + “ will be ” + x + “ in 10 years.”);
```

Input:

Mary

19

Output:

Mary will be 29 in 10 years.

- Input Statement

Syntax: read(<expression>);

Source Code:

write(“Insert two numbers: ”);

Number opr_1, opr_2;

read(opr_1);

read(opr_2);

Number result = opr_1 + opr_2;

write(opr_1 + “ + ” opr_2 “ = ” + result);

Input:

88

90

Output:

88 + 90 = 178

- Output Statement

Syntax	Examples	Output
write(“<Character_Set>”);	write(“X”)	X
write(<identifier>);	Number qwe = 23; write(qwe)	23

write(<identifier> + “<Character_Set>” + ….);	Number qwe = 23; write(23 + “ Hello”)	23 Hello

- Assignment Statement

  Arithmetic_Operators = {+, -, *, /, %}

Syntax	Examples	Output
<identifier> “=” literal;	Sentence Word = “hello” write(Word);	hello

<identifier> “=” <identifier>;	Tralse ans, check = false;
	ans = check;
	write(ans);
		false

<identifier> “=” <identifier> <Arithmetic_Operators> <identifier>;	Number x = 1, y = 2, z;
	z = x + y;
	write(z);
		3

<identifier> “=” value <Arithmetic_Operators> <identifier>;	Number op1 = 72, result; result = op1 – 10; write(result);	62

- Conditional Statement
  - if Statement

    Syntax:

    if(conditional statement)
    {
    //statements to be performed
    }

    Source Code:

    Number value;

```
read(value);
if(value > 10)
{
write(“Invalid Input!”);
}
```

Input:

```
98
```

Output:

```
Invalid Input!
```

- if Else Statement

Syntax:

```
if(conditional statement)
{
// statements
}
else
{
// statements
}
```

Source Code:

```
Number x = 9, y = 3;
if(x == y)
{
write(“both numbers are not equal”);
}
else
{
Number res = x – y;
write(res);
}
```

Output:

```
6
```

- If Otherwise Else Statement

Syntax:

```
if(conditional statement)
{
// statements
}
otherwise(conditional statement)
{
//statements
```

```
}
else
{
// statements
}
```

Source Code:

```
Sentence keyword;
Tralse check;
if(keyword == “pi”)
{
write(pi);
}
otherwise(keyword == “kelvin”)
{
write(kelvin);
}
else
{
write(“not a keyword”);
}
```

Input:

```
kelvin
```

Output:

```
273
```

- Switch Statement

Syntax:

```
switch(identifier) {
case literal:
//statements
stop;
case literal:
//statements
stop;
case literal:
//statements
stop;
...
}
```

Input:

```
x = 0
```

Source Code:

```
Number password;
```

```
read(password);
switch(password) {
case 0012:
write("Log in Successful!");
default:
write("Incorrect Password!");
stop;
}
```

Input:

```
0012
```

Output:

```
Log in Successful!
```

- Iteration Statement
  - For Statement

Syntax:

```
for(initialization; conditional statement; iteration)
{
// Statements
}
```

Source Code:

```
for(Number x = 0; x< 3; x++)
{
write(x+" ");
}
```

Output:

```
0 1 2
```

  - Do While Statement

Syntax:

```
do
{
//Statements
}
while(condition);
```

Source Code:

```
do
{
write(x);
x++;
}
while(x<2);
```

Output:

```
0 1
```

  - While Statement

Syntax:

```
while(condition)
{
//statements
}
```

Source Code:

```
Number x = 0;
while( x < 1)
{
x++;
write(x);
}
```

Output:

```
1
```

Sample Input:

//WEEEEEEEE

then

if (two && two)

{}[]()+++---/%*

<=>=<>

== =

while do if otherwise

stop

else

Alphabet

case

comp

Collection

default

else

euler

false

for

Item

if

int32

kelvin

None

Number

resume

odd

otherwise

pi

read

resume

return

Sentence

stop

switch

then

true

Tralse

```
while

write

two

"qweqwe"

qwe23_eqw

qweqwewq//qweqweqweqw

qwe~ewqwe

||

&&

!

!=

~Apparently this is

true LMAO ~


Number x = 23.423;


if ( x >= 23 )

{

    x = 40;

}


otherwise ( x <= 12)

{
```

```
    x = 0;
}

else
{
    x = 4;
}

for (Number i = 0; i <= 23; i++)
{
    write(i);
}
```