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#include <stdbool.h>
#include <stdio.h>
#include <string.h>
#include <stdlib.h>

// Returns 'true' if the character is a DELIMITER.
bool isDelimiter(char ch)
{
	if (ch == ' ' || ch == '+' || ch == '-' || ch == '*' ||
		ch == '/' || ch == ',' || ch == ';' || ch == '>' ||
		ch == '<' || ch == '=' || ch == '(' || ch == ')' ||
		ch == '[' || ch == ']' || ch == '{' || ch == '}')
		return (true);
	return (false);
}

// Returns 'true' if the character is an OPERATOR.
bool isOperator(char ch)
{
	if (ch == '+' || ch == '-' || ch == '*' ||
		ch == '/' || ch == '>' || ch == '<' ||
		ch == '=')
		return (true);
	return (false);
}

// Returns 'true' if the string is a VALID IDENTIFIER.
bool validIdentifier(char* str)
{
	if (str[0] == '0' || str[0] == '1' || str[0] == '2' ||
		str[0] == '3' || str[0] == '4' || str[0] == '5' ||
		str[0] == '6' || str[0] == '7' || str[0] == '8' ||
		str[0] == '9' || isDelimiter(str[0]) == true)
		return (false);
	return (true);
}

// Returns 'true' if the string is a KEYWORD.
bool isKeyword(char* str)
{
	if (!strcmp(str, "if") || !strcmp(str, "else") ||
		!strcmp(str, "while") || !strcmp(str, "do") ||
		!strcmp(str, "break") ||
		!strcmp(str, "continue") || !strcmp(str, "int")
		|| !strcmp(str, "double") || !strcmp(str, "float")
		|| !strcmp(str, "return") || !strcmp(str, "char")
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                || !strcmp(str, "case") || !strcmp(str, "char")
                || !strcmp(str, "sizeof") || !strcmp(str, "long")
                || !strcmp(str, "short") || !strcmp(str, "typedef")
                || !strcmp(str, "switch") || !strcmp(str, "unsigned")
                || !strcmp(str, "void") || !strcmp(str, "static")
                || !strcmp(str, "struct") || !strcmp(str, "goto"))
                return (true);
        return (false);
}

// Returns 'true' if the string is an INTEGER.
bool isInteger(char* str)
{
        int i, len = strlen(str);

        if (len == 0)
                return (false);
        for (i = 0; i < len; i++) {
                if (str[i] != '0' && str[i] != '1' && str[i] != '2'
                        && str[i] != '3' && str[i] != '4' && str[i] != '5'
                        && str[i] != '6' && str[i] != '7' && str[i] != '8'
                        && str[i] != '9' || (str[i] == '-' && i > 0))
                        return (false);
        }
        return (true);
}

// Returns 'true' if the string is a REAL NUMBER.
bool isRealNumber(char* str)
{
        int i, len = strlen(str);
        bool hasDecimal = false;

        if (len == 0)
                return (false);
        for (i = 0; i < len; i++) {
                if (str[i] != '0' && str[i] != '1' && str[i] != '2'
                        && str[i] != '3' && str[i] != '4' && str[i] != '5'
                        && str[i] != '6' && str[i] != '7' && str[i] != '8'
                        && str[i] != '9' && str[i] != '.' ||
                        (str[i] == '-' && i > 0))
                        return (false);
                if (str[i] == '.')
                        hasDecimal = true;
        }
        return (hasDecimal);
```

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}

// Extracts the SUBSTRING.
char* subString(char* str, int left, int right)
{
	int i;
	char* subStr = (char*)malloc(
				sizeof(char) * (right - left + 2));

	for (i = left; i <= right; i++)
		subStr[i - left] = str[i];
	subStr[right - left + 1] = '\0';
	return (subStr);
}

// Parsing the input STRING.
void parse(char* str)
{
	int left = 0, right = 0;
	int len = strlen(str);

	while (right <= len && left <= right) {
		if (isDelimiter(str[right]) == false)
			right++;

		if (isDelimiter(str[right]) == true && left == right) {
			if (isOperator(str[right]) == true)
				printf("'%c' IS AN OPERATOR\n", str[right]);

			right++;
			left = right;
		} else if (isDelimiter(str[right]) == true && left != right
				|| (right == len && left != right)) {
			char* subStr = subString(str, left, right - 1);

			if (isKeyword(subStr) == true)
				printf("'%s' IS A KEYWORD\n", subStr);

			else if (isInteger(subStr) == true)
				printf("'%s' IS AN INTEGER\n", subStr);

			else if (isRealNumber(subStr) == true)
				printf("'%s' IS A REAL NUMBER\n", subStr);

			else if (validIdentifier(subStr) == true
					&& isDelimiter(str[right - 1]) == false)
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                        printf("'%s' IS A VALID IDENTIFIER\n", subStr);

                    else if (validIdentifier(subStr) == false
                            && isDelimiter(str[right - 1]) == false)
                        printf("'%s' IS NOT A VALID IDENTIFIER\n", subStr);
                    left = right;
                }
        }
        return;
}

// DRIVER FUNCTION
int main()
{
        // maximum length of string is 100 here
        char str[100] = "int a = b + 1c; ";
        char str1[100] = "int a = b * 1c - 2";
        char str2[100] = "int a = b + d * 4e";

        parse(str); // calling the parse function
   parse(str1);
   parse(str2);
        return (0);
}
```
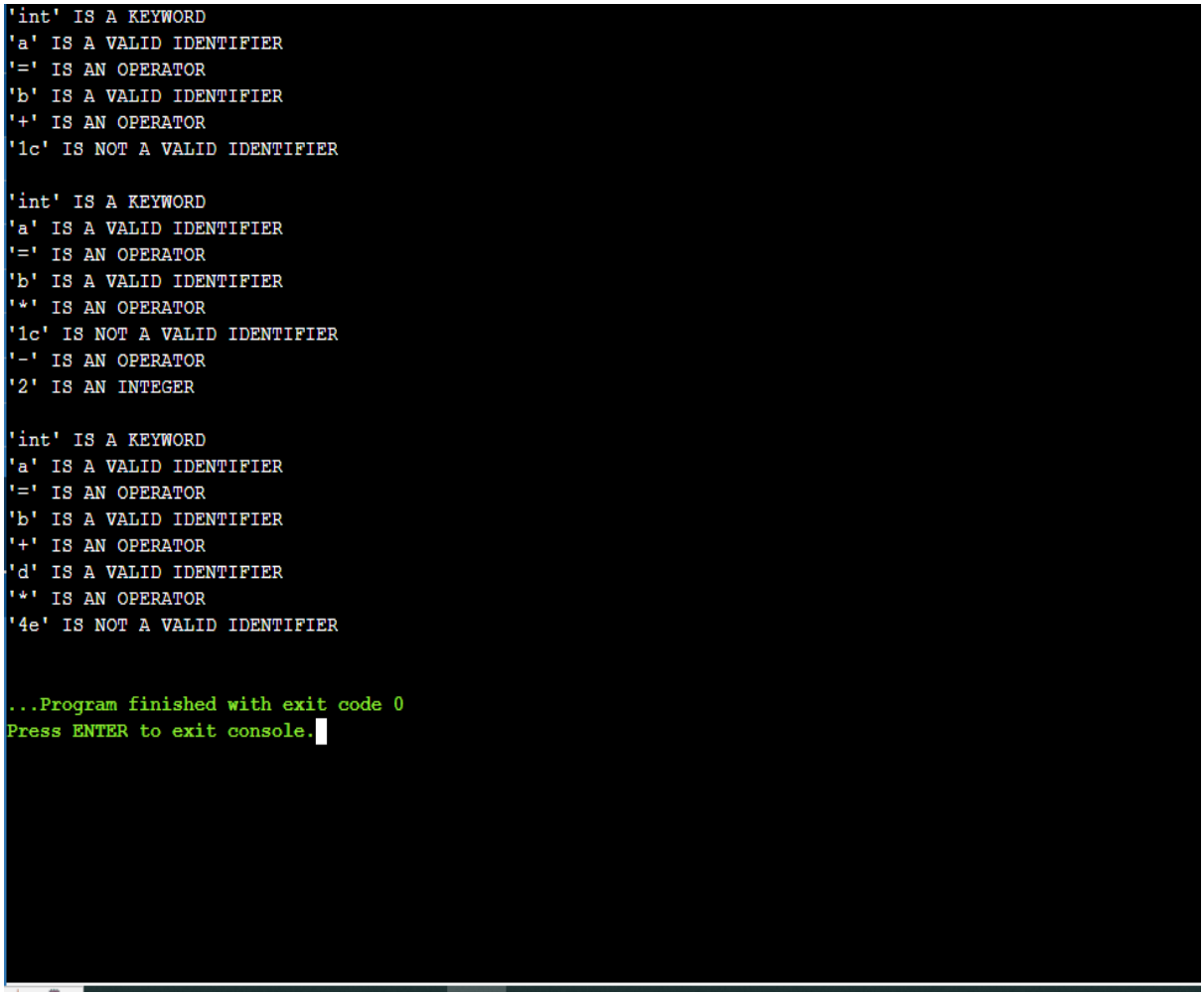

Output:


'int' IS A KEYWORD
'a' IS A VALID IDENTIFIER
'=' IS AN OPERATOR
'b' IS A VALID IDENTIFIER
'+' IS AN OPERATOR
'1c' IS NOT A VALID IDENTIFIER
'int' IS A KEYWORD
'a' IS A VALID IDENTIFIER
'=' IS AN OPERATOR
'b' IS A VALID IDENTIFIER
'*' IS AN OPERATOR
'1c' IS NOT A VALID IDENTIFIER
'-' IS AN OPERATOR
'2' IS AN INTEGER
'int' IS A KEYWORD
'a' IS A VALID IDENTIFIER
'=' IS AN OPERATOR
'b' IS A VALID IDENTIFIER
'+' IS AN OPERATOR
'd' IS A VALID IDENTIFIER
'*' IS AN OPERATOR
'4e' IS NOT A VALID IDENTIFIER
...Program finished with exit code 0
Press ENTER to exit console.