CHARACTER FUNCTIONS

- Discussion for capabilities of C++ for examining & manipulating individual characters.
- The character-handling library includes several functions
- Each function receives a character, represented as an int, or EOF as an argument.
- For using functions from the character-handling library, we should include the **<cctype>** header.

FUNCTIONS

- int isdigit(int c)
  Returns 1 if c is a digit and 0 otherwise

- int isalpha(int c)
  Returns 1 if c is a letter and 0 otherwise

- int is alnum(int c)
  Returns 1 if c is a digit or a letter and 0 otherwise

- int isxdigit(int c)
  Returns 1 if c is a hexadecimal digit and 0 otherwise

- int islower(int c)
  Returns 1 if c is a lowercase letter and 0 otherwise

- int isupper(int c)
  Returns 1 if c is a uppercase letter and 0 otherwise

- int isspace(int c)
  Returns 1 if c is a white-space character — newline(‘\n’), space(‘ ‘), etc.

- int iscntrl(int c)
  Returns 1 if c is a control character, such as newline ('\n'), form feed ('\f'), carriage return (‘\r'), etc.

- int ispunct(int c)
  Returns 1 if c is a printing character other than a space, a digit, or a letter and 0 otherwise.

- int isprint(int c)
  Returns 1 if c is a printing character including space (' ') and 0 otherwise.

- int isgraph(int c)
  Returns 1 if c is a printing character other than space (' ') and 0 otherwise.

EXAMPLE 1

```
void setup () {
    Serial.begin (9600);
    Serial.print ("According to isdigit:\r");
    Serial.print (isdigit( '8' ) ? "8 is a": "8 is not a");
    Serial.print (" digit\r" );
    Serial.print (isdigit( '8' ) ?"# is a": "# is not a") ;
    Serial.print (" digit\r");
    Serial.print ("\rAccording to isalpha:\r" );
    Serial.print (isalpha('A' ) ?"A is a": "A is not a");
    Serial.print (" letter\r");
    Serial.print (isalpha('A' ) ?"b is a": "b is not a");
    Serial.print (" letter\r");
    Serial.print (isalpha('A') ?"& is a": "& is not a");
    Serial.print (" letter\r");
    Serial.print (isalpha( 'A' ) ?"4 is a":"4 is not a");
    Serial.print (" letter\r");
    Serial.print ("\rAccording to isalnum:\r");
    Serial.print (isalnum( 'A' ) ?"A is a" : "A is not a" );

    Serial.print (" digit or a letter\r" );
    Serial.print (isalnum( '8' ) ?"8 is a" : "8 is not a" ) ;
    Serial.print (" digit or a letter\r");
    Serial.print (isalnum( '#' ) ?"# is a" : "# is not a" );
    Serial.print (" digit or a letter\r");
    Serial.print ("\rAccording to isxdigit:\r");
    Serial.print (isxdigit( 'F' ) ?"F is a" : "F is not a" );
    Serial.print (" hexadecimal digit\r" );
    Serial.print (isxdigit( 'J' ) ?"J is a" : "J is not a" ) ;
    Serial.print (" hexadecimal digit\r" );
    Serial.print (isxdigit( '7' ) ?"7 is a" : "7 is not a" ) ;

    Serial.print (" hexadecimal digit\r" );
    Serial.print (isxdigit( '$' ) ? "$ is a" : "$ is not a" );
    Serial.print (" hexadecimal digit\r" );
    Serial.print (isxdigit( 'f' ) ? “f is a" : "f is not a");

}
```

RESULT

According to isdigit:
8 is a digit
is not a digit
According to isalpha:
A is a letter
b is a letter
& is not a letter
4 is not a letter
According to isalnum:
A is a digit or a letter

8 is a digit or a letter
is not a digit or a letter
According to isxdigit:
F is a hexadecimal digit
J is not a hexadecimal digit
7 is a hexadecimal digit

$ is not a hexadecimal digit
f is a hexadecimal digit

EXAMPLE 2

```
int thisChar = 0xA0;

void setup () {
   Serial.begin (9600);
   Serial.print ("According to islower:\r") ;
   Serial.print (islower( 'p' ) ? "p is a" : "p is not a" );
   Serial.print ( " lowercase letter\r" );
   Serial.print ( islower( 'P') ? "P is a" : "P is not a") ;
   Serial.print ("lowercase letter\r");
   Serial.print (islower( '5' ) ? "5 is a" : "5 is not a" );
   Serial.print ( " lowercase letter\r" );
   Serial.print ( islower( '!' )? "! is a" : "! is not a") ;
   Serial.print ("lowercase letter\r");

   Serial.print ("\rAccording to isupper:\r") ;
   Serial.print (isupper ( 'D' ) ? "D is a" : "D is not an" );
   Serial.print ( " uppercase letter\r" );
   Serial.print ( isupper ( 'd' )? "d is a" : "d is not an") ;
   Serial.print ( " uppercase letter\r" );
   Serial.print (isupper ( '8' ) ? "8 is a" : "8 is not an" );
   Serial.print ( " uppercase letter\r" );
   Serial.print ( islower( '$' )? "$ is a" : "$ is not an") ;
   Serial.print ("uppercase letter\r ");
}
```

RESULT

According to islower:
p is a lowercase letter
P is not a lowercase letter
5 is not a lowercase letter
! is not a lowercase letter

According to isupper:
D is an uppercase letter
d is not an uppercase letter
8 is not an uppercase letter
$ is not an uppercase letter

EXAMPLE 3

```
void setup () {
   Serial.begin (9600);
   Serial.print ( " According to isspace:\rNewline ") ;
   Serial.print (isspace( '\n' )? " is a" : " is not a" );
   Serial.print ( " whitespace character\rHorizontal tab") ;
   Serial.print (isspace( '\t' )? " is a" : " is not a" );
   Serial.print ( " whitespace character\n") ;
   Serial.print (isspace('%')? " % is a" : " % is not a" );

   Serial.print ( " \rAccording to iscntrl:\rNewline") ;
   Serial.print ( iscntrl( '\n' )?"is a" : " is not a" ) ;
   Serial.print (" control character\r");
   Serial.print (iscntrl( '$' ) ? " $ is a" : " $ is not a" );
   Serial.print (" control character\r");
   Serial.print ("\rAccording to ispunct:\r");
   Serial.print (ispunct(';' ) ?"; is a" : "; is not a" ) ;
   Serial.print (" punctuation character\r");
   Serial.print (ispunct('Y' ) ?"Y is a" : "Y is not a" ) ;
   Serial.print ("punctuation character\r");
   Serial.print (ispunct('#' ) ?"# is a" : "# is not a" ) ;
   Serial.print ("punctuation character\r");

   Serial.print ( "\r According to isprint:\r");
   Serial.print (isprint('$' ) ?"$ is a" : "$ is not a" );
   Serial.print (" printing character\rAlert ");
   Serial.print (isprint('\a' ) ?" is a" : " is not a" );
   Serial.print (" printing character\rSpace ");
   Serial.print (isprint(' ' ) ?" is a" : " is not a" );
   Serial.print (" printing character\r");

   Serial.print ("\r According to isgraph:\r");
   Serial.print (isgraph ('Q' ) ?"Q is a" : "Q is not a" );
   Serial.print ("printing character other than a space\rSpace ");
   Serial.print (isgraph (' ') ?" is a" : " is not a" );
   Serial.print ("printing character other than a space ");
}
```

RESULT

According to isspace:
Newline is a whitespace character
Horizontal tab is a whitespace character
% is not a whitespace character
According to iscntrl:
Newline is a control character
$ is not a control character
According to ispunct:
; is a punctuation character
Y is not a punctuation character
is a punctuation character
According to isprint:
$ is a printing character
Alert is not a printing character
Space is a printing character
According to isgraph:
Q is a printing character other than a space
Space is not a printing character other than a space