subprogram or a function is a collection of statements, and when it is activated, or executed, it accomplishes something. Some functions, called predefined or standard functions, are already written and are provided as part of the system

In ASCII, lowercase computes to 32 more than uppercase
Semantic
Syntax
logical

0	?	1	?	2	?	3	?	4	?	5	?	6	?	7	?
8	?	9	?	10	?	11	?	12	?	13	?	14	?	15	?
16	?	17	?	18	?	19	?	20	?	21	?	22	?	23	?
24	?	25	?	26	?	27	?	28	?	29	?	30	?	31	?
32		33	!	34	"	35	#	36	$	37	%	38	&	39	'
40	(	41	)	42	*	43	+	44	,	45	-	46	.	47	/
48	0	49	1	50	2	51	3	52	4	53	5	54	6	55	7
56	8	57	9	58	:	59	;	60	<	61	=	62	>	63	?
64	@	65	A	66	B	67	C	68	D	69	E	70	F	71	G
72	H	73	I	74	J	75	K	76	L	77	M	78	N	79	O
80	P	81	Q	82	R	83	S	84	T	85	U	86	V	87	W
88	X	89	Y	90	Z	91	[	92	\	93	]	94	^	95	_
96	`	97	a	98	b	99	c	100	d	101	e	102	f	103	g
104	h	105	i	106	j	107	k	108	l	109	m	110	n	111	o
112	p	113	q	114	r	115	s	116	t	117	u	118	v	119	w
120	x	121	y	122	z	123	{	124	|	125	}	126	~		

(ASCII table)

White space is 32, all letters are greater, all numbers are lesser
Identifier: A C++ identifier consists of letters, digits, and the underscore character (_) and must begin with a letter or underscore
Simple data types: integral, floating point, enumeration

Integral data types are further classified into the following nine categories: `char`, `short`, `int`, `long`, `bool`, `unsigned char`, `unsigned short`, `unsigned int`, and `unsigned long`.

e char data type is used to represent integers between –128 and 127. The int data type is used to represent integers between –2147483648 and 2147483647, and the data type short is used to represent integers between –32768 and 32767

Data Type	Values	Storage (in bytes)
`int`	**-2147483648** to **2147483647**	4
`bool`	`true` and `false`	1
`char`	**-128** to **127**	1

(integral)

long long is 64 bytes and ranges from -2^{63} to $2^{63} - 1$

`float`: The data type `float` is used in C++ to represent any decimal number between $-3.4 * 10^{38}$ and $3.4 * 10^{38}$. The memory allocated for a value of the `float` data type is four bytes.

`double`: The data type `double` is used in C++ to represent any decimal number between $-1.7 * 10^{308}$ and $1.7 * 10^{308}$. The memory allocated for a value of the `double` data type is eight bytes.

Precedence: *, /, % are all equal higher precedence than +, -

- **Integral expressions**—all operands in the expression are integers. An integral expression yields an integral result.
- **Floating-point (decimal) expressions**—all operands in the expression are floating-points (decimal numbers). A floating-point expression yields a floating-point result.
- **Mixed expressions**—the expression contains both integers and decimal numbers.

```
static_cast<double>(15/2)
```
or double(15/2)

```
const dataType identifier = value;
```
Named constant: A memory location whose content is not allowed to change during program execution
use string.length()

	Escape Sequence	Description
\n	Newline	Cursor moves to the beginning of the next line
\t	Tab	Cursor moves to the next tab stop
\b	Backspace	Cursor moves one space to the left
\r	Return	Cursor moves to the beginning of the current line (not the next line)
\\	Backslash	Backslash is printed
\'	Single quotation	Single quotation mark is printed
\"	Double quotation	Double quotation mark is printed

Preprocessor directives are commands supplied to the preprocessor that cause the preprocessor to modify the text of a C++ program before it is compiled (Ex. include)
std::cin format
Declaration statements are used to declare things, such as variables.
Executable statements perform calculations, manipulate data, create output, accept input, and so on.
Quick Review:

1. A C++ program is a collection of functions.
2. Every C++ program has a function called **main**.
3. A single-line comment starts with the pair of symbols **//**anywhere in the line.
4. Multiline comments are enclosed between **/*** and ***/**.
5. The compiler skips comments.
6. Reserved words cannot be used as identifiers in a program.
7. All reserved words in C++ consist of lowercase letters (see Appendix A).
8. In C++, identifiers are names of things.
9. A C++ identifier consists of letters, digits, and underscores and must begin with a letter or underscore.
10. Whitespaces include blanks, tabs, and newline characters.
11. A data type is a set of values together with a set of operations.
12. C++ data types fall into the following three categories: simple, structured, and pointers.
13. There are three categories of simple data: integral, floating-point, and enumeration.
14. Integral data types are classified into nine categories: `char`, `short`, `int`, `long`, `bool`, `unsigned char`, `unsigned short`, `unsigned int`, and `unsigned long`.
15. The values belonging to `int` data type are -2147483648 $(= -2^{31})$ to 2147483647 $(= 2^{31} - 1)$.
16. The data type `bool` has only two values: `true` and `false`.
17. The most common character sets are ASCII, which has 128 values, and EBCDIC, which has 256 values.
18. The collating sequence of a character is its preset number in the character data set.
19. C++ provides three data types to manipulate decimal numbers: `float`, `double`, and `long double`.
20. The data type `float` is used in C++ to represent any real number between $-3.4 * 10^{38}$ and $3.4 * 10^{38}$. The memory allocated for a value of the `float` data type is four bytes.
21. The data type `double` is used in C++ to represent any real number between $-1.7 * 10^{308}$ and $1.7 * 10^{308}$. The memory allocated for a value of the `double` data type is eight bytes.
22. The arithmetic operators in C++ are addition (+), subtraction (-), multiplication (*), division (/), and modulus (%).

INT_MAX
Memorize byte bit values
Char takes up 2 byte
Bool t
Unsigned signed

1. maximum type of significant digits for double are 15 maximum type of significant digits for bool is one maximum type of significant digits for float is 6 to 7 maximum type of significant digits for int is 2^31 - 1

23. The modulus operator, `%`, takes only integer operands.
24. Arithmetic expressions are evaluated using the precedence rules and the associativity of the arithmetic operators.
25. All operands in an integral expression, or integer expression, are integers, and all operands in a floating-point expression are decimal numbers.
26. A mixed expression is an expression that consists of both integers and decimal numbers.
27. When evaluating an operator in an expression, an integer is converted to a floating-point number, with a decimal part of `0`, only if the operator has mixed operands.
28. You can use the cast operator to explicitly convert values from one data type to another.
29. A string is a sequence of zero or more characters.
30. Strings in C++ are enclosed in double quotation marks.
31. A string containing no characters is called a null or empty string.
32. Every character in a string has a relative position in the string. The position of the first character is 0, the position of the second character is 1, and so on.
33. The length of a string is the number of characters in it.
34. During program execution, the contents of a named constant cannot be changed.
35. A named constant is declared by using the reserved word `const`.
36. A named constant is initialized when it is declared.
37. All variables must be declared before they can be used.
38. C++ does not automatically initialize variables.
39. Every variable has a name, a value, a data type, and a size.
40. When a new value is assigned to a variable, the old value is lost.
41. Only an assignment statement or an input (read) statement can change the value of a variable.
42. In C++, `>>` is called the stream extraction operator.
43. Input from the standard input device is accomplished by using `cin` and the stream extraction operator `>>`.
44. When data is input in a program, the data items, such as numbers, are usually separated by blanks, lines, or tabs.
45. In C++, `<<` is called the stream insertion operator.
46. Output of the program to the standard output device is accomplished by using `cout` and the stream insertion operator `<<`.
47. The manipulator `endl` positions the insertion point at the beginning of the next line on an output device.

```
BYTE SIZE OF VARIOUS DATA TYPES

character size is = 1 bytes
integer size is = 4 bytes
short size is = 2 bytes
long size is = 4 bytes
short integer size is = 2 bytes
long integer size is = 4 bytes
float size is = 4 bytes
double size is = 8 bytes
long double size is = 8 bytes
Press any key to continue . . .
```

1382-end
selector- expression in switch statement
Cin.ignore
Before
cin.getline