Programming with C I

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Objectives

- To learn about functions and how to use them to write programs with separate modules.
- To understand how control flows between function main and other functions.
- To learn how to pass information to functions using input arguments.
- To learn how to return a value from a function.

Top-Down Design

top-down design

- a problem solving method
- first, break a problem up into its major subproblems
- solve the subproblems to derive the solution to the original problem

House and Stick Figure

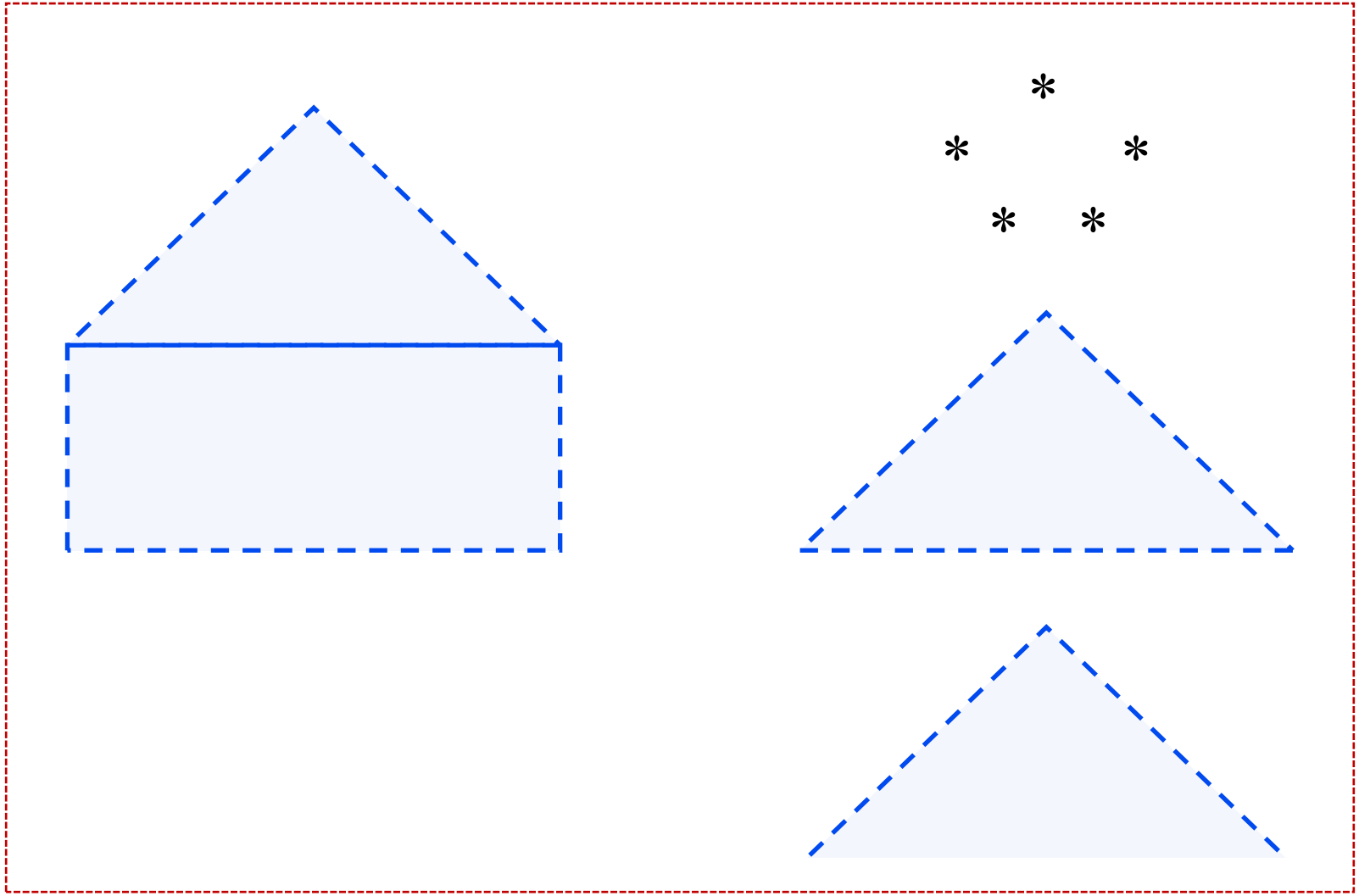
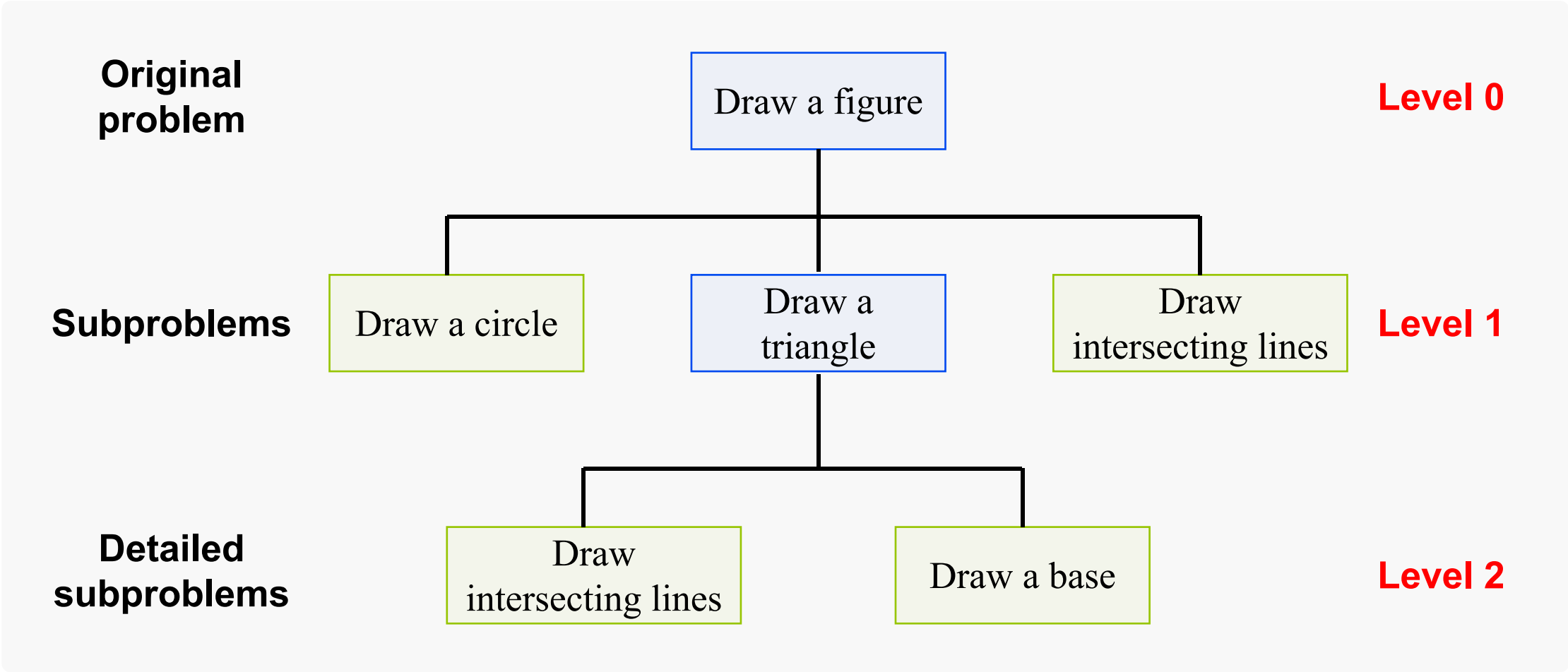


Figure Structure Chart for Drawing a Stick Figure



Functions Call Statement (Function Without Arguments)

Syntax

```
fname();
```

Example:

```
draw_circle();
```

Interpretation

- the function fname is called
- after fname has finished execution, the program statement that follows the function call will be executed

Figure Function Prototypes and Main Function for Stick Figure

```
/*
 * Draws a stick figure
 */

#include <stdio.h>                /* printf definition */

/* function prototypes */

void draw_circle(void);           /* Draws a circle                */
void draw_intersect(void);        /* Draws intersecting lines      */
void draw_base(void);             /* Draws a base line             */
void draw_triangle(void);         /* Draws a triangle              */

int
main (void)
{
        /* Draw a circle. */
        draw_circle();

        /* Draw a triangle. */
        draw_triangle();

        /* Draw intersecting line. */
        draw_intersect();

        return (0);
}
```

Function Prototype (Function Without Arguments)

Syntax

```
ftype fname(void);
```

Example:

```
void draw_circle(void)
```

Interpretation

- the identifier fname is declared to be the name of a function
- the identifier ftype specifies the data type of the function result

Figure Function draw_circle

```
/*
 * Draws a circle
 */
void draw_circle(void)
{
        printf(“      *      \n”);
        printf(“   *        *\n”);
        printf(“    *    *  \n”);
}
```

Function Definitions (Function Without Arguments)

Syntax

```
ftype fname(void)
{
        local declarations
        executable statements
}
```

Figure Function draw_triangle

```
/*
 * Draws a triangle
 */
void draw_triangle(void)
{
        draw_intersect();
        draw_base();
}
```

Advantages of Using Function Subprogram

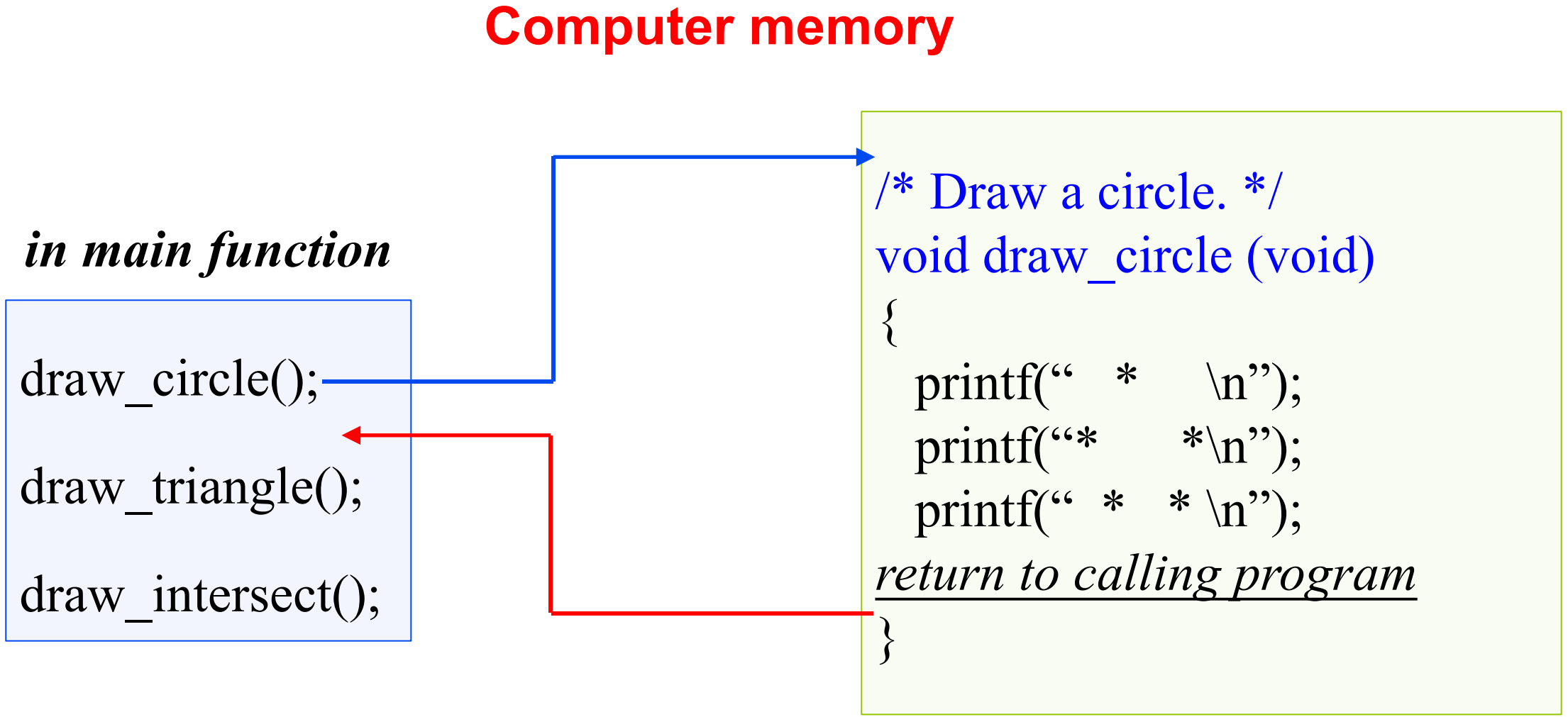
procedural abstraction

- a programming technique in which a main function consists of function calls and each function is implemented separately

reuse of functions

- functions can be executed more than once in a program

Figure Flow of Control Between the main Function and a Function Subprogram



Functions with Input Arguments

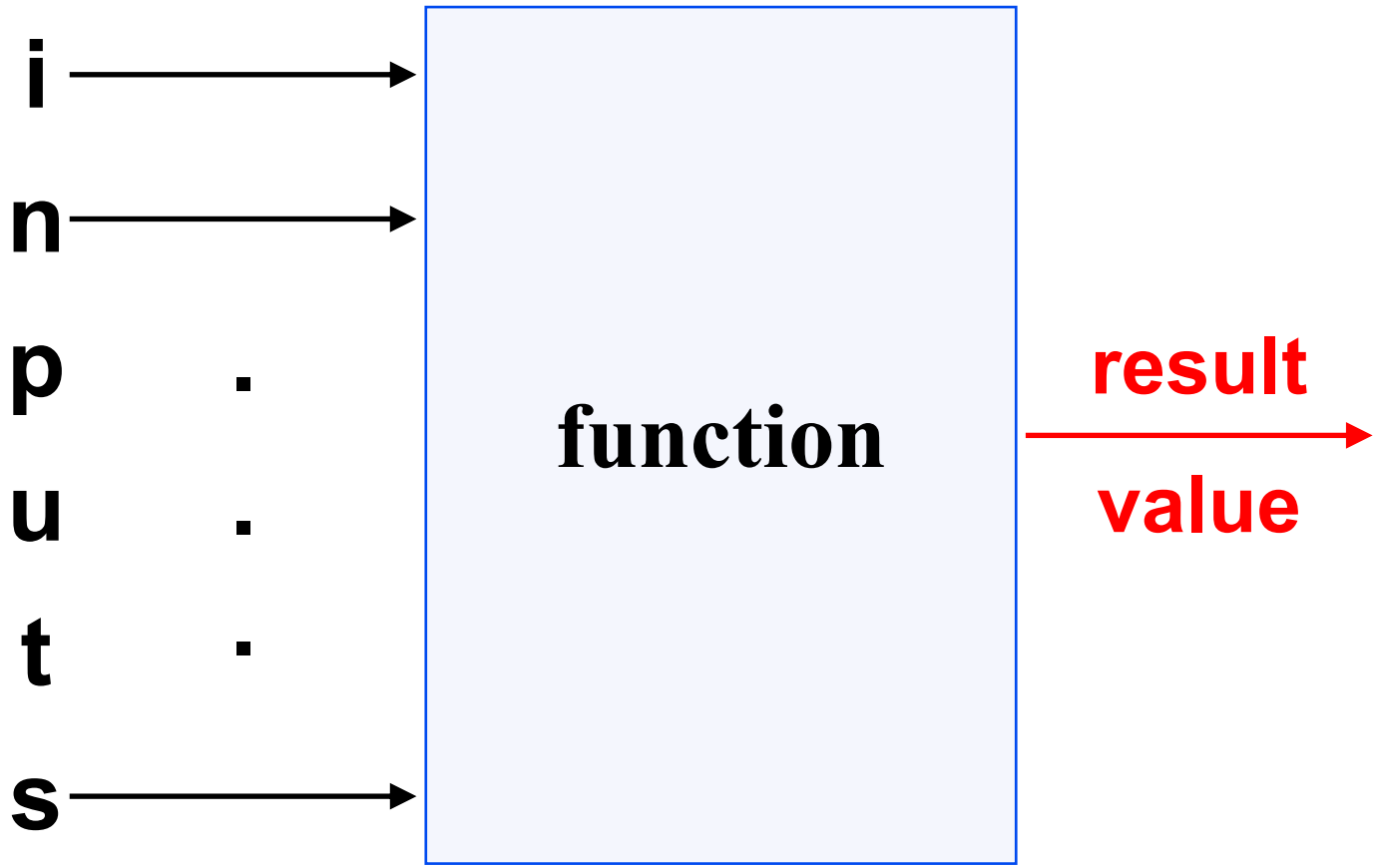
input argument

- arguments used to pass information into a function

output argument

- arguments used to return results to the calling function

Figure Function with Input Arguments and One Result



Functions with Multiple Arguments

Argument List Correspondence

- The number of actual arguments used in a call to a function must be the same as the number of formal parameters listed in the function prototype.
- Each actual argument must be of a data type that can be assigned to the corresponding format parameter with no unexpected loss of information.

Functions with Multiple Arguments

Argument List Correspondence

- The order of arguments in the lists determines correspondence.
  - The first actual argument corresponds to the first formal parameter.
  - The second actual argument corresponds to the second form parameter.
  - *etc*.

THE END

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