Function (1A)

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Task: Finding Partial Sums (1)

$$S_n = \sum_{k=1}^{n} a_k$$

$$a_k = k$$

$$S_1 = \sum_{k=1}^{1} k = 1$$

```
printf("S1 = %d \n", S1);
```

$$S_2 = \sum_{k=1}^{2} k = 1 + 2$$

```
printf("S2 = %d \n", S2);
```

$$S_3 = \sum_{k=1}^{3} k = 1 + 2 + 3$$

```
printf("S3 = %d \n", S3);
```

Task: Finding Partial Sums (2)

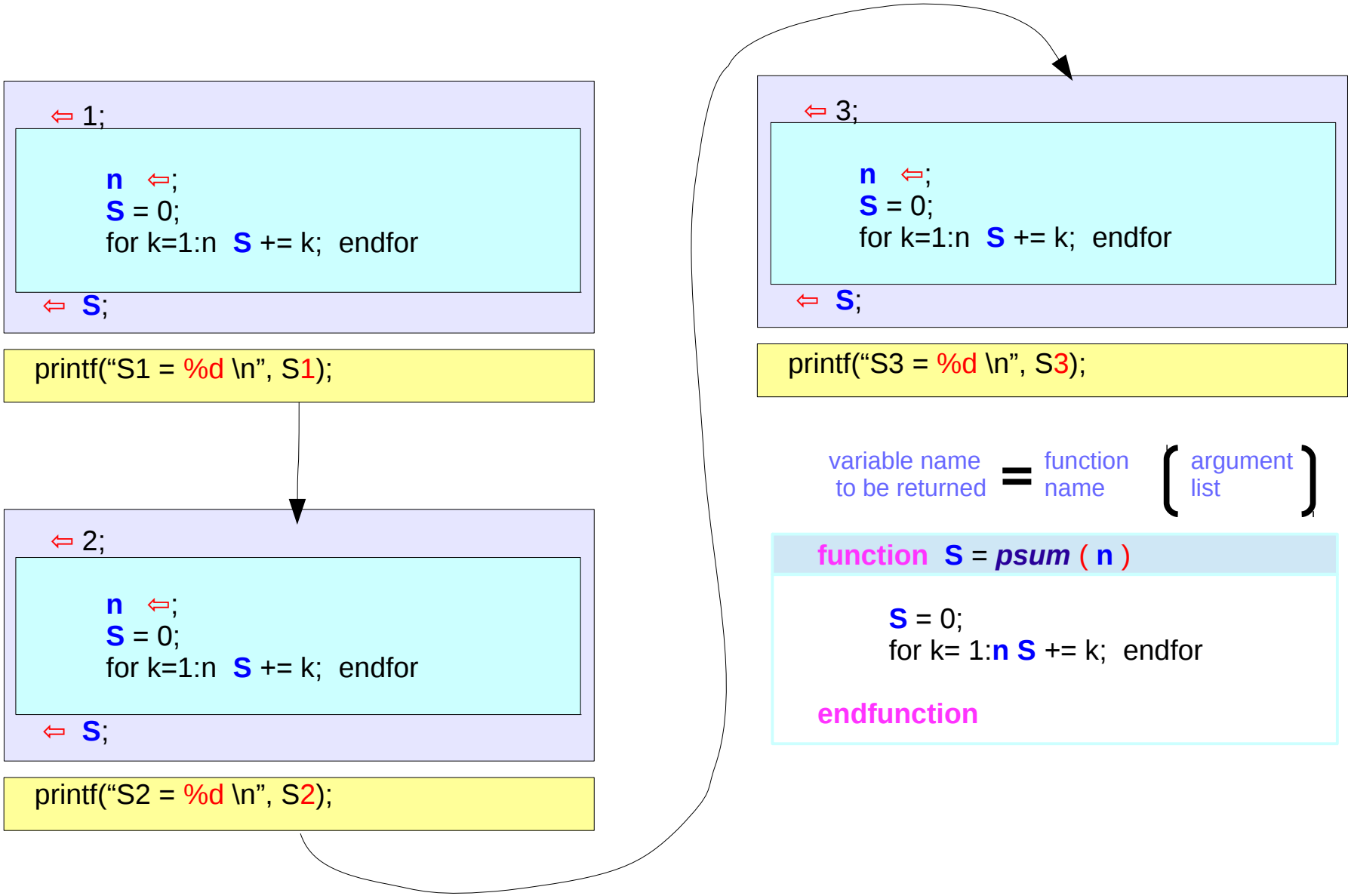
$$S_1 = \sum_{k=1}^{1} k = 1$$

$$S_2 = \sum_{k=1}^{2} k = 1 + 2$$

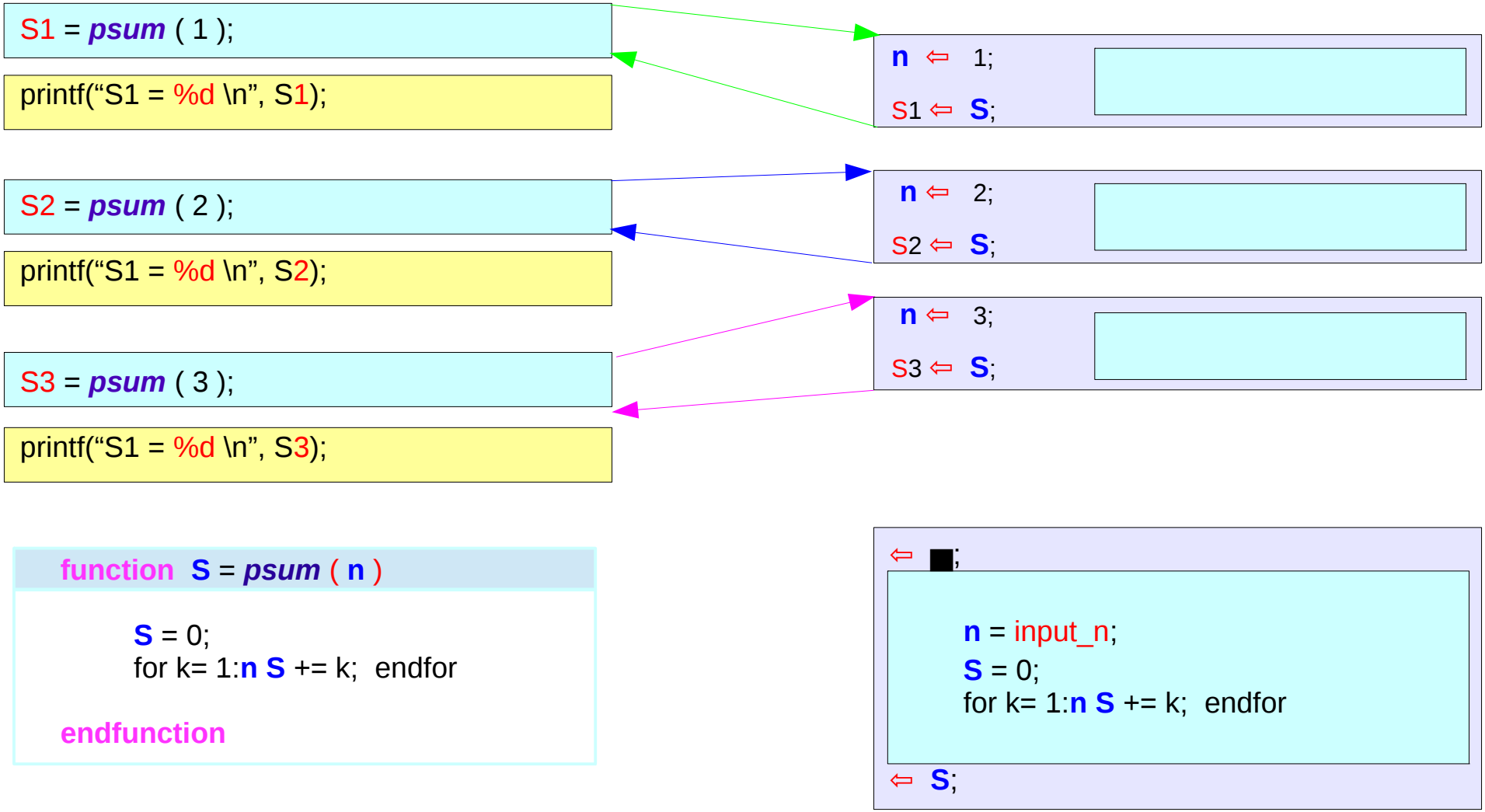
$$S_3 = \sum_{k=1}^{3} k = 1 + 2 + 3$$

```
S1 = 0;
for k=1:1      S1 += k;      endfor
printf("S1 = %d \n", S1);

S2 = 0;
for k=1:2      S2 += k;      endfor
printf("S2 = %d \n", S2);

S3 = 0;
for k=1:3      S3 += k;      endfor
printf("S3 = %d \n", S3);
```

Task: Finding Partial Sums (3)



Task: Finding Partial Sums (4)



Function Files

```
S1 = psum ( 1 );
printf("S1 = %d \n", S1);
S2 = psum ( 2 );
printf("S2 = %d \n", S2);
S3 = psum ( 3 );
printf("S3 = %d \n", S3);
```

*Since **psum** identifier is declared, **psum** can be **used** here.*

```
function  S = psum ( n )

        S = 0;
        for k= 1:n S += k;  endfor

endfunction
```

***psum.m** function file*

Subfunctions in a function file

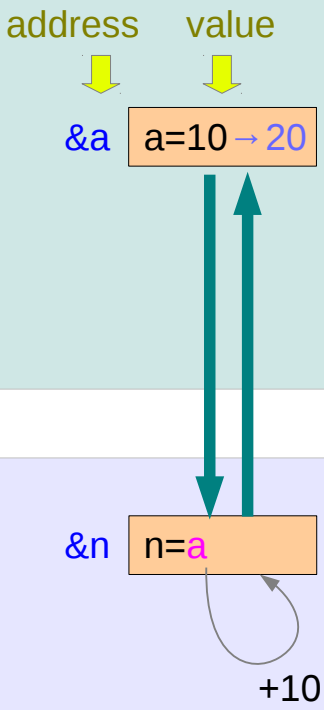
src1.c

src2.c

Call by Value

```
a = 10;

printf("a = %d \n", a);
a =  func ( a );
printf("a = %d \n", a);
```

```
function n = func ( n )

        printf("n = %d \n", n);
        n += 10;
        printf("n = %d \n", n);

endfunction
```



the **value** of **a** is passed through the parameter variable **n** and receives the return value into **a**

n is **local** to the function func and exists **while** the function is being **called**
But the return variable is declared as n

Return with many variables

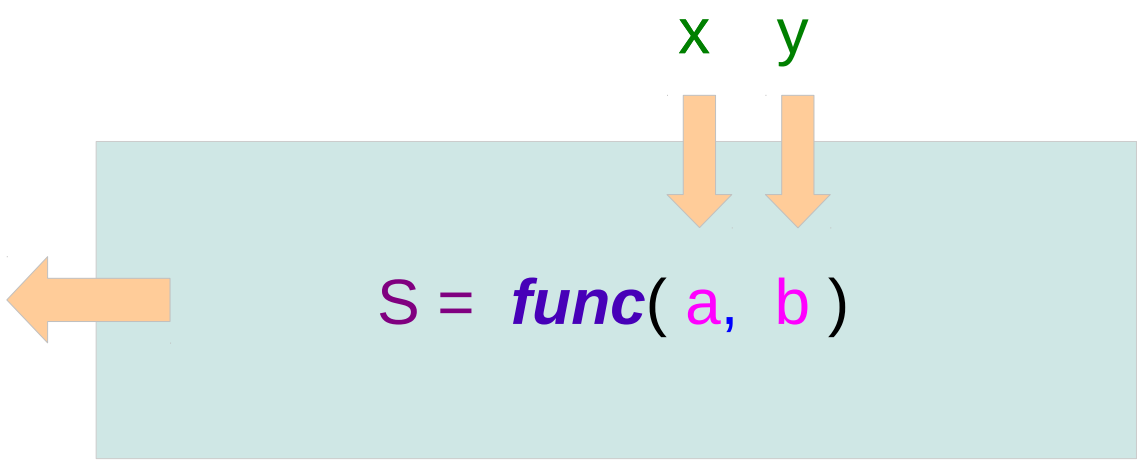
```
a = [ 1, 2, 3, 4, 5];

disp(a);
[amax, aindx] = func ( a );
printf("amax = %d \n", amax);
printf("aindx = %d \n", aindx);
```

```
function [max, idx] = func (v)
  idx = 1;
  max = v (idx);
  for i = 2:length (v)
    if (v (i) > max)
      max = v (i);
      idx = i;
    endif
  endfor
endfunction
```

[return variable list] = function name (argument list)

Function Calls in Octave (1)

```
int x, y;
```



call by value

~~call by reference~~

Function handle: A pointer to a function

```
f = @sin;       a function handle f
                that refers the function sin()
```

```
feval( f, pi/4 );
```

```
f( pi/4 );
```

Anonymous Functions

f(x) = x^2 + x + 1

Mathematical Expression

Octave Expression

```
f = @(x) x^2 + x + 1;
```

```
f = @(<arg1>, <arg2>, ...) < function expression>
```

```
f = @(x, y) x^2 + x*y + y^2;

f(1, 1);
```

References

[1] Essential C, Nick Parlante
[2] Efficient C Programming, Mark A. Weiss
[3] C A Reference Manual, Samuel P. Harbison & Guy L. Steele Jr.
[4] C Language Express, I. K. Chun