Introduction (1A)

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Calculating the Mean

The mean of 3 numbers

$$m = \frac{a + b + c}{3}$$

$$\frac{40 + 50 + 60}{3} = 50$$ Integer number

$$\frac{45 + 53 + 63}{3} = \frac{161}{3} = 53.6666666\ldots$$ Real number

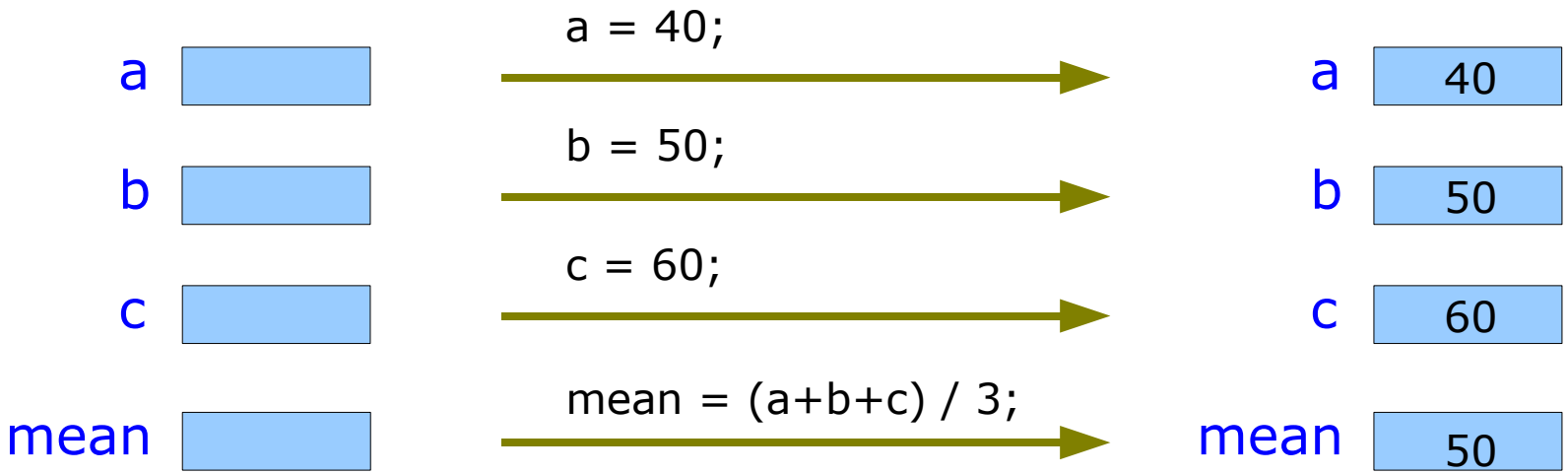
Calculating the Mean – in C

```
int     a, b, c;
int     mean;

a = 40;
b = 50;
c = 60;

mean = (a + b +c) /  3;
```

```
int     a, b, c;
float   mean;

a = 45;
b = 53;
c = 63;

mean = (a + b +c) /  3.0;
```

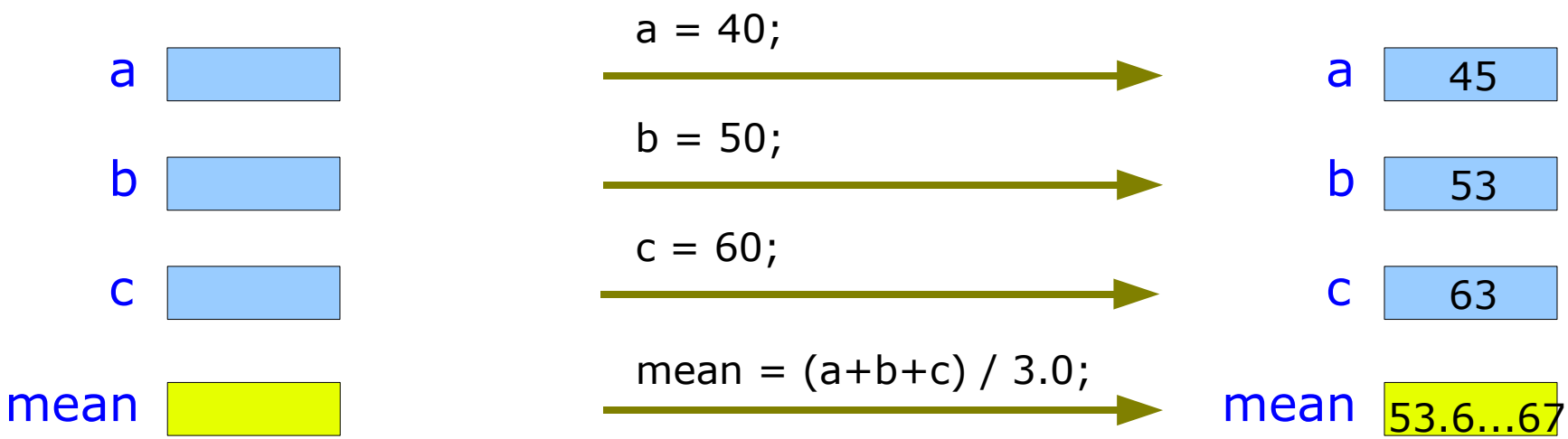
* Variable
* Type
* Assignment
* Operator

Variable – Int



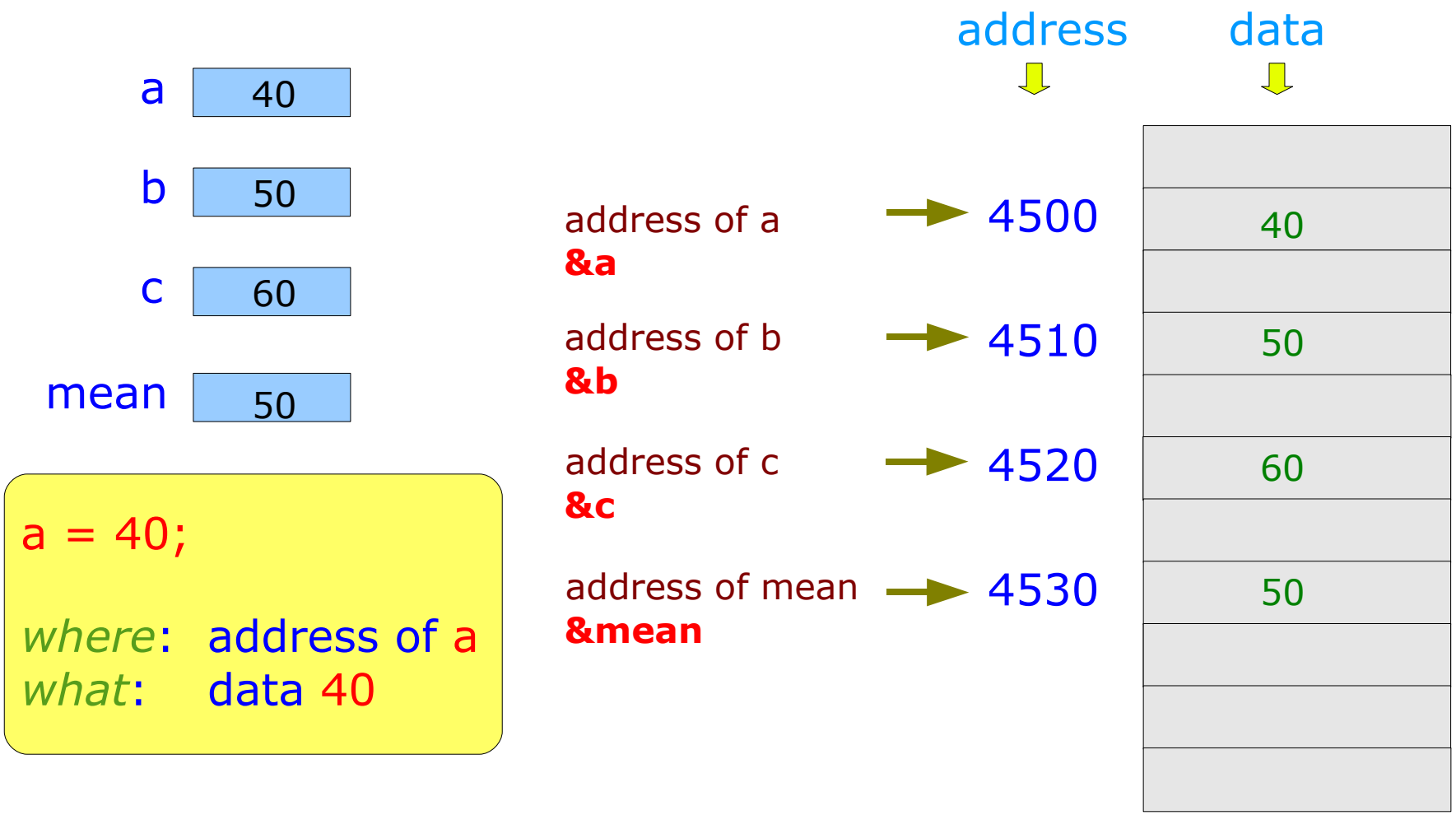
int type

Variable – Float

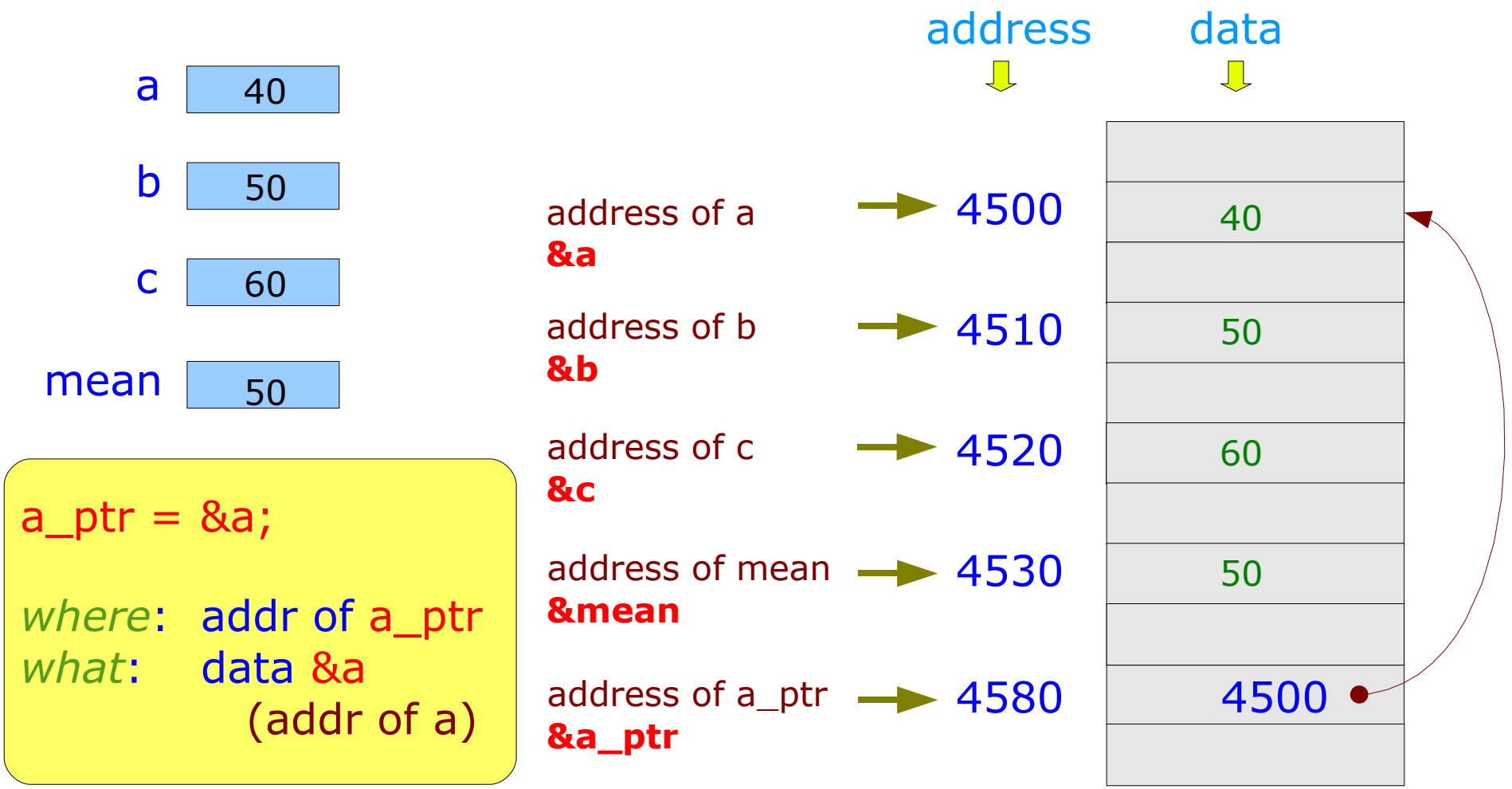


float type

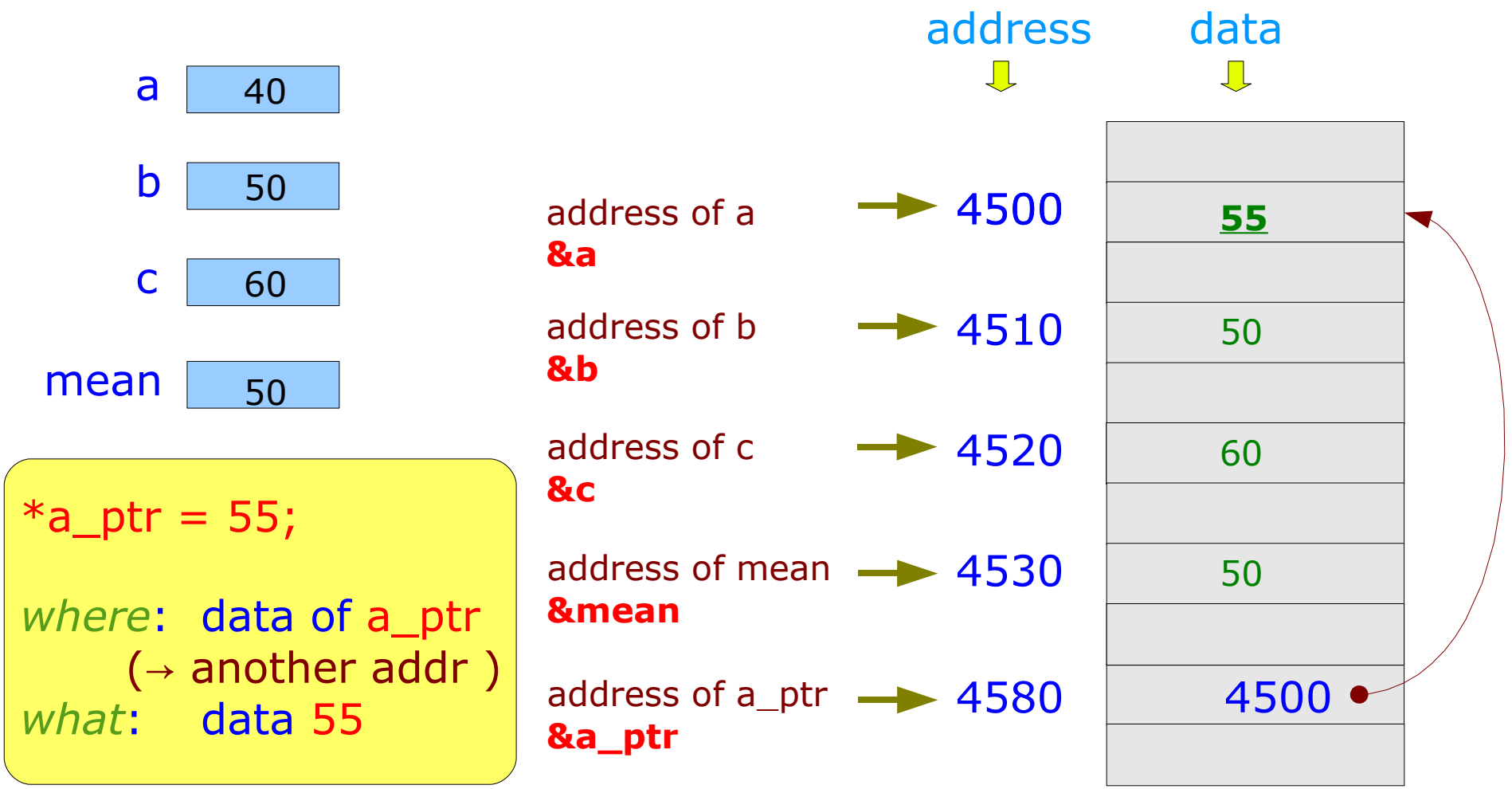
Memory and & operator



Memory and Pointer



Memory and * operator




```
*a_ptr = 55;

where:  data of a_ptr
        (→ another addr )
what:   data 55
```

Pointer Type

```
int    a;
```

a holds *data*

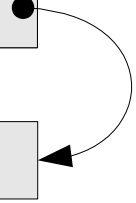
&a value of a

```
int    *a_ptr;
```

a_ptr holds *address*
*a_ptr holds *data*

&a_ptr value of a_ptr

value of a_ptr
(→ *an address*) *a_ptr



Printf Function

Expected Output

The mean of three numbers
a = 40
b = 50
c = 60
mean(40, 50, 60) => 50

```
printf("The mean of three numbers \n");
printf("a = %d \n", a);
printf("b = %d \n", b);
printf("c = %d \n", c);
printf("mean (%d, %d, %d) => %d \n", a, b, c, mean);
```

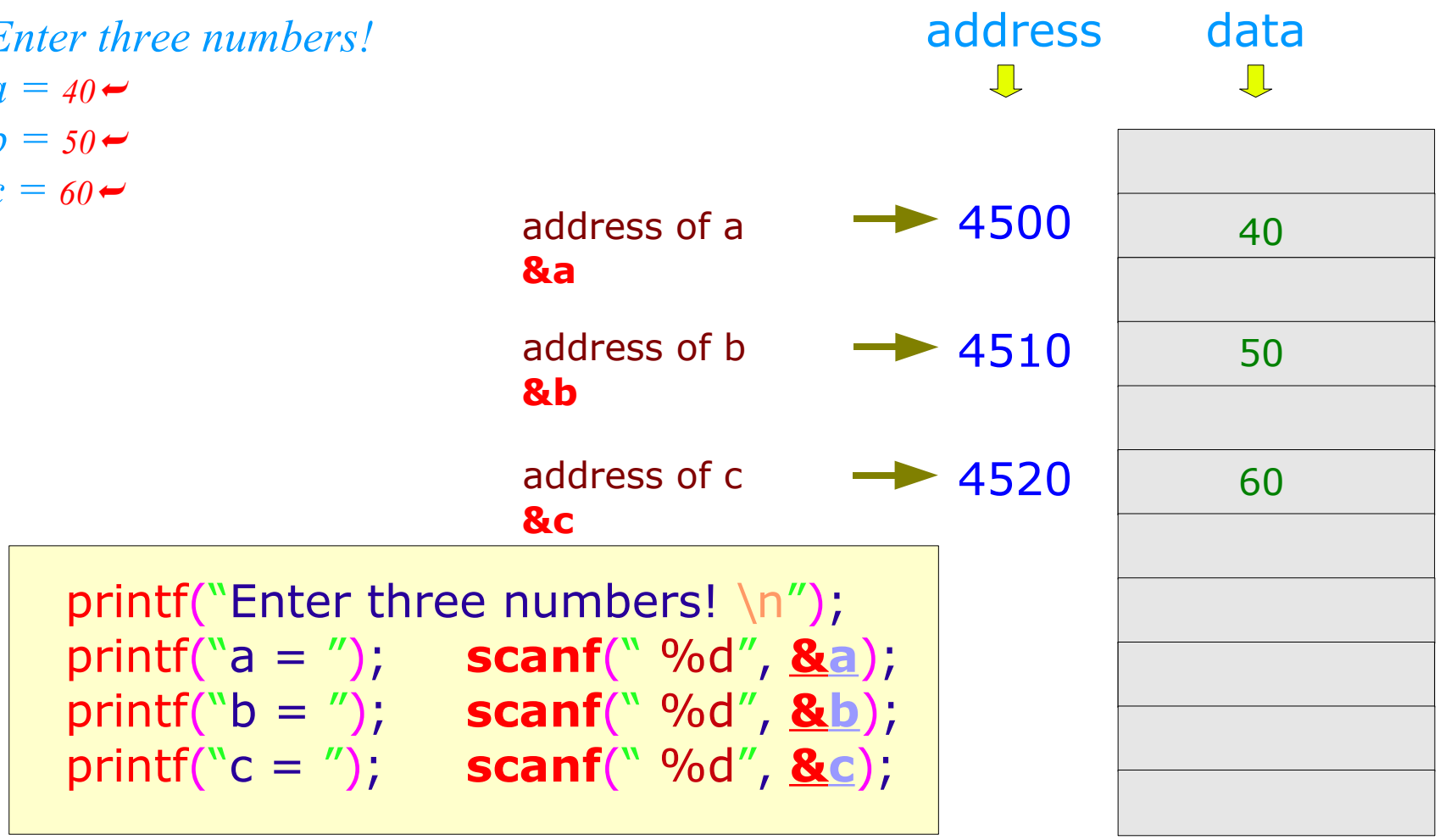
Main Function (1)

```
main (void)
{
    int     a, b, c;
    int     mean;

    a = 40;
    b = 50;
    c = 60;

    mean = (a + b + c) / 3;

    printf("The mean of three numbers \n");
    printf("a = %d \n", a);
    printf("b = %d \n", b);
    printf("c = %d \n", c);
    printf("mean (%d, %d, %d) => %d \n", a, b, c, mean);

}
```

Scanf Function

Expected Input

Enter three numbers!
a = 40↵
b = 50↵
c = 60↵




```
printf("Enter three numbers! \n");
printf("a = ");    scanf(" %d", &a);
printf("b = ");    scanf(" %d", &b);
printf("c = ");    scanf(" %d", &c);
```

Main Function (2)

```
main (void)
{
    int     a, b, c;
    int     mean;

    printf("Enter three numbers! \n");
    printf("a = ");     scanf(" %d", &a);
    printf("b = ");     scanf(" %d", &b);
    printf("c = ");     scanf(" %d", &c);

    mean = (a + b + c) / 3;

    printf("The mean of three numbers \n");
    printf("a = %d \n b = %d \n c = %d \n", a, b, c);
    printf("mean (%d, %d, %d) => %d \n",
                    a,   b,   c,      mean  );

}
```

Main Function (2)

```
main (void)
{
    int     a, b, c;
    int     mean;

    enter_numbers( ? );

    compute_mean( ? );

    print_numbers( ? );

}
```

Compute_mean Function

```
float compute_mean (int x, int y, int z)
{
    int      avg;

    avg = (x + y + z) / 3.0;

    return( avg );

}


main (void)
{
    int      mean;

    mean = compute_mean(40, 50, 60);

}
```

* Call by Value
* Return Value
* Local Variable

Enter_numbers Function

```
void enter_numbers (int *x, int *y, int *z)
{
    printf("Enter three numbers! \n");
    printf("a = ");     scanf(" %d", x);
    printf("b = ");     scanf(" %d", y);
    printf("c = ");     scanf(" %d", z);
}
```

* Call by Reference
* No Return Value

```
main (void)
{
    int      a, b, c;

    enter_numbers(&a, &b, &c);

}
```

Print_numbers Function

```
void print_numbers (int x, int y, int z, float avg)
{
    printf("The mean of three numbers \n");
    printf("a = %d \n b = %d \n c = %d \n", x, y, z);
    printf("mean (%d, %d, %d) => %d \n",
                    x,   y,   z,      avg  );
}


main (void)
{
    int     a, b, c;
    float   mean;

    print_numbers(a, b, c, mean);

}
```

* Call by Value
* Return Value

Main Function (3)

```
void enter_numbers (int *x, int *y, int *z);
float compute_mean (int x, int y, int z);
void print_numbers (int x, int y, int z, float avg);


main (void)
{
    int     a, b, c;
    int     mean;

    enter_numbers(&a, &b, &c);

    mean = compute_mean(a, b, c);

    print_numbers(a, b, c, mean);
}
```

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