

BIRZEIT UNIVERSITY

Pointers & Modular Programming

Comp230

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pointer

- Pointer or pointer variable: A memory cell that stores the address of a data item.
- The declaration:

float *p; // identifies p as a pointer variable of type "pointer to float ."

// This means that we can store the memory address of a type

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// float variable in p .

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pointer

- Pointer Type Declaration: SYNTAX: type * variable ; EXAMPLE: float *p
- > The value of the pointer variable p is a memory address

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Example (1)

int y = 5;

int *yPtr;

```
yPtr = &y; //yPtr gets address of y
```

```
yPtr "points to" y
```



Example (2)

int i = 5;

int *ptr; /* declare a pointer variable */
ptr = &i; /* store address-of i to ptr */

printf("*ptr = %d\n", *ptr); /* refer to referee of ptr */

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Example (3):

- What actually *ptr* is?
- ptr is a variable storing an address
- ptr is NOT storing the actual value of i



Example (4)

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```
#include <stdio.h>
int main()
    int x, *p;
    p = \&x;
    *p = 0;
    printf("x is %d\n", x);
    printf("*p is %d\n", *p);
    *p += 1;
    printf("x is %d\n", x);
    (*p)++;
    printf("x is %d\n", x);
    return 0;
```

Output:		
х	is	0
*p is 0		
х	is	1
х	is	2

Example (5)

Trace the execution of the following fragment int m = 10, n = 5; int *mp, *np; mp = &m; np = &m; *mp = &m; *mp = *mp + *np; *np = *mp - *np; printf("%d %d\n%d %d\n", m, *mp, n, *np);



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Examples

```
#include <stdio.h>
int sum(int,int);
int main()
```

```
int num1=4,num2=5;
int result;
result=sum(num1,num2);
printf("The result is %d",result);
```

return 0;

```
int sum(int x, int y)
```

return (x+y);

```
#include <stdio.h>
void sum(int*,int,int);
int main()
```

```
int num1=4,num2=5;
int result;
sum(&result,num1,num2);
printf("The result is %d",result);
```

return 0;

```
void sum(int*res, int x, int y)
```

*res=x+y;

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Example (6)

Write function to find the sum and the difference between two numbers.

```
#include <stdio.h>
     int sum difference (int, int, int*);
     int main()
          int num1, num2, sum, diff;
          printf("Please enter two numbers: ");
          scanf("%d%d", &num1, &num2);
          diff=sum difference (num1, num2, & sum);
          printf("Sum= %d and difference=%d", sum, diff);
          return 0;
     int sum difference (int x, int y, int* sum)
          *sum=x+y;
          return (x-y);
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```

Example (7)

- Write a function to :
- 1. Find the number of digits in a given number

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- 2. Sum of digits
- 3. Reverse a number
- Example: Please enter a number: 123 number of digits = 3 sum of digits=6 reverse=321

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```
#include <stdio.h>
     void analyzeNumber(int, int *, int *, int *);
     int main() {
     int number, numDigits, sumOfDigits, reverseNum;
     printf("Please enter a number: ");
     scanf("%d", &number);
     analyzeNumber(number, &numDigits, &sumOfDigits, &reverseNum);
     printf("Number of digits = %d\n", numDigits);
     printf("Sum of digits = %d\n", sumOfDigits);
      printf("Reverse = %d\n", reverseNum);
     return 0;}
     void analyzeNumber(int num, int *numDigits, int *sumOfDigits, int *reverseNum) {
     int tempNum = num;
     *numDigits = 0; *sumOfDigits = 0; *reverseNum = 0;
     while (tempNum != 0) {
      int digit = tempNum % 10;
     (*numDigits)++;
     *sumOfDigits += digit;
     *reverseNum = (*reverseNum) * 10 + digit;
     tempNum /= 10; }
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```

Example (8)

```
#include<stdio.h>
void interchange(int*,int*);
int main() {
```

```
int num1, num2;
printf("Enter num1 and num2: ");
scanf("%d%d", &num1, &num2);
interchange(&num1, &num2);
```

```
printf("\nNumber 1 : %d",num1);
printf("\nNumber 2 : %d",num2);
```

```
return(0);
```

```
void interchange(int *num1, int *num2)
```

```
int temp;
temp = *num1;
*num1 = *num2;
*num2 = temp;
```

```
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```

 Exchanges the values of the two integer variables



Example (9)

Identify and correct the errors in the following code fragment, given the correct output (%p is used to print a pointer):

int y = 3; int *yptr; yptr = &y;printf("The value of y is %d n", *yptr); printf("The address of y is %p\n", *yptr); Change "*yptr" in the above statement to "yptr" or "&y" Output: The value of y is 3 The address of y is 2063865468

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Example (10): Output

```
#include <stdio.h>
int main()
{
    int i = 0, j = 5;
    int *y;
    y=&j;
    for( i = 0; i <= 4; i++ )
    {
        *y = *y + i;
    }
    printf( "The final value of j is %d.\n", j );
    return 0;</pre>
```

The final value of j is 15.

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Example (11)

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```
Write C program to find square and cube of given number
#include <stdio.h>
int square cube(int, int*);
int main()
    int num, square, cube;
    printf("Please enter a number : ");
    scanf("%d", &num);
    square=square cube(num, & cube);
    printf("square=%d\ncube=%d", square, cube);
    return 0;
int square cube (int num, int*cube)
                                       Please enter a number : 2
   int square;
                                       square=4
   square=num*num;
                                       cube=8
   *cube=num*num*num;
   return square;
```

```
#include <stdio.h>
 int x=2;
                                    Example (12)
 void fun1(int, int*, int);
 void fun2(int, int*);
 int main()
     int num1=2, num2=3, res=0;
     x=num1+1;
     printf("num1=%d num2=%d res=%d x=%d\n", num1, num2, res, x);
     fun1 (num1, &res, num2);
     printf("num1=%d num2=%d res=%d x=%d\n", num1, num2, res, x);
     fun2(num2, &res);
     printf("num1=%d num2=%d res=%d x=%d\n", num1, num2, res, x);
     return 0;
 void fun1(int x, int* y, int z)
     *v=x+z;
     *v=x+2;
 void fun2(int y, int* z)
                                         Output:
                                         num1=2 num2=3 res=0 x=3
     *z=x+2;
     *z=y+3;
                                         num1=2 num2=3 res=4 x=3
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                                         num1=2 num2=3 res=6 x=4
```



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