

## Shift, Multiplication and Division

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- Multiplication and division is often slower than shift.
- Multiplying 2 can be replaced by shifting 1 bit to the left.

**n = 10**

```
printf(“%d = %d” , n*2, n<<1);
```

```
printf(“%d = %d”, n*4, n<<2);
```

.....

- Division by 2 can be replace by shifting 1 bit to the right.

**n = 10**

```
printf(“%d = %d” , n/2, n>>1);
```

```
printf(“%d = %d”, n/4, n>>2);
```

Operator Precedence

**Operator      Precedence level**

()    1  
~, ++, --, unary -    2  
\*, /, %    3  
+, -    4  
<<, >>    5  
<, <=, >, >=    6  
==, !=    7  
&    8  
    ^    9  
    |    10  
&&    11  
||    12  
=, +=, -=, etc.    14

**An Example**

- What is the difference between the two lines of output?

```
#include <stdio.h>

int main ()
{
    int w=10,x=20,y=30,z=40;
    int temp1, temp2;
    temp1 = x * x /++y + z / y;
    printf ("temp1= %d;\nw= %d;\nx= %d;\ny= %d;\nz= %d\n",
           temp1, w,x,y,z);
    y=30;
    temp2 = x * x /y++ + z / y;
```

```
printf ("temp2= %d;\nw= %d;\nx= %d;\ny= %d;\nz= %d\n",
        temp2, w,x,y,z);
return 0;
}
```

## Conditional Operator

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- The conditional operator essentially allows you to embed an “if” statement into an expression
- Generic Form

`exp1 ? exp2 : exp3`      if exp1 is true (non-zero)  
   value is exp2  
   (exp3 is not evaluated)

   if exp1 is false (0),  
   value is exp3  
   (exp2 is not evaluated)

- Example:

```
z = (x > y) ? x : y;
```

- This is equivalent to:

```
if (x > y)
```

```
z = x;
```

```
else
```

```
z = y;
```

## Comma Operator

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- An expression can be composed of multiple subexpressions separated by commas.
  - Sub expressions are evaluated left to right.

- The entire expression evaluates to the value of the *rightmost sub expression*.
- Example:

```
x = (a++, b++);
```

- a is incremented
- b is assigned to x
- b is incremented
- Parentheses are required because the comma operator has a lower precedence than the assignment operator!
- The comma operator is often used in for loops.