While Loop

Example 33 (contd)

```
#include <stdio.h>
#include <math.h>
int main() {
    int n;
    int i = 3, prime = 1;

    printf("Enter a positive number: ");
    scanf("%d", &n);
    if (n!=2 && (n % 2) == 0) {
        printf("%d is not a prime\n", n);
        return 0;
    }

     /* Check if any odd n is divisible by a number less than
        or equal to square root of n and set the prime flag */
}
```

While Loop

Example 33 (contd)

```
while (i <= sqrt(n)) {
    if ((n % i) != 0) {
        i += 2;    // Next odd number could be a divisor
        continue; // Jump back to check next divisor
    }
    prime = !prime; // i divides n, so n is composite
    break;          // Exit while
}
if (prime)
    printf("%d is a prime\n", n);
else
    printf("%d is not a prime\n", n);
```

For Loop

Syntax

for(expr1; expr2; expr3) { body }

- Best choice for counter controlled loops.
- Normal forms are:

```
for(i = 0; i < 10; i++) {...}
for(i = n-1; i >= 0; i--) {...}
```

- When **expr1** is omitted: loop index should be initialized before entry into loop.
- When **expr3** is omitted, loop index should be incremented inside the loop.
- When **expr2** is omitted, loop becomes infinite loop unless `break` occurs inside the loop.

For Loop

Different Variations

```
int i = 9;

for ( ; i >= 0; i-- )
   printf("%d    ", i);

printf("\n");
```

```
int i = 9;

for ( ; i >= 0; )
   printf("%d    ", i--);

printf("\n");
```

For Loop

Different Variations

```
int i;

for ( i = 0; i < 10; )
    printf("%d    ", i++);

printf("\n");
```

```
int i = 0;

for ( ;; ) {
    printf("%d    ", i++);
    if (i == 10)
        break;
}
printf("\n");
```

For Loop

Different Variations

```
int main() {
  int i, n, sum = 0;

  for (i = 0; i < 10; i++) {
      scanf("%d", &n);

      if (n == 0)
          continue;
      else
          sum = sum + n;
  }
}
```

For Loop

Different Variations

```
int main() {
  int i, n, sum = 0;

  for (i = 0; i < 10; i++) {
      scanf("%d", &n);

      if (n != 0)
         sum = sum + n;
  }
}
```

For Loop

Using Continue Inside For Loop

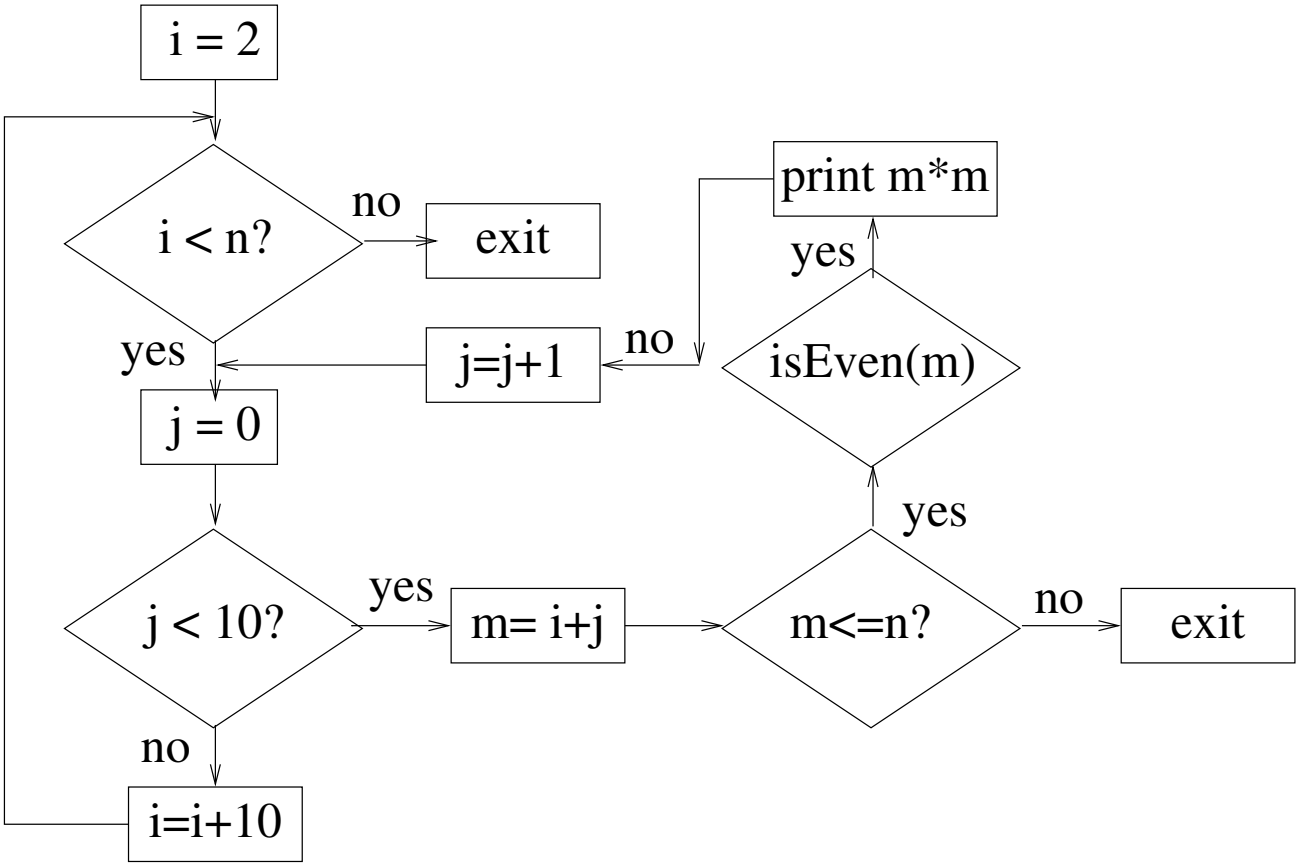
```
for (;;) {
    if (data fails first test)
        continue;

    if (data fails second test)
        continue;
            ....

    if (data fails last test)
        continue;

    process data
}
```

For Loop


i = 2
i < n?
no
exit
yes
j = 0
j < 10?
yes
m= i+j
m<=n?
no
exit
yes
isEven(m)
yes
print m*m
no
j=j+1
no
i=i+10

For Loop

Example 34

```
#include <stdio.h>
int main() {
    int n, m, i, j;

    printf("Enter number: ");
    scanf("%d", &n);
    for (i=2; i<=n; i=i+10) {
        for (j = 0; j < 10; j++) { // 5 even squares in a row
            m = i+j;
            if (m <= n)
                if (m % 2 == 0)
                    printf("%6d",m*m); // Square of even
                else continue;          // Skip on odd
            else break;                 // If m > n exit
        }
        printf("\n");                   // Print end of line
    }
}
```

More Example Using Loops

Example 35