How to code control structures

Relational operators

Operator	Name
`==`	Equality
`!=`	Inequality
`>`	Greater than
`<`	Less than
`>=`	Greater than or equal
`<=`	Less than or equal

Examples that use relational operators

```
firstName == "Frank"       // equal to a string literal
txtYears.Text == ""        // equal to an empty string
message == null            // equal to a null value
discountPercent == 2.3     // equal to a numeric literal
isValid == false           // equal to the false value
code == productCode        // equal to another variable

lastName != "Jones"        // not equal to a string literal

years > 0                  // greater than a numeric literal
i < months                 // less than a variable

subtotal >= 500            // greater than or equal to a literal
value
quantity <= reorderPoint   // less than or equal to a variable
```

Logical operators

Operator	Name	Description
&&	Conditional-And	Returns a true value if both expressions are true. Only evaluates the second expression if necessary.
||	Conditional-Or	Returns a true value if either expression is true. Only evaluates the second expression if necessary.
&	And	Returns a true value if both expressions are true. Always evaluates both expressions.
|	Or	Returns a true value if either expression is true. Always evaluates both expressions.
!	Not	Reverses the value of the expression.

Examples that use logical operators

```
subtotal >= 250 && subtotal < 500
timeInService <= 4 || timeInService >= 12

isValid == true & counter++ < years
isValid == true | counter++ < years

date > startDate && date < expirationDate || isValid == true
((thisYTD > lastYTD) || empType=="Part time") &&
    startYear < currentYear

!(counter++ >= years)
```

The syntax of the if-else statement

```
if (booleanExpression) { statements }
[else if (booleanExpression) { statements }] ...
[else { statements }]
```

If statements without else if or else clauses

With a single statement

```
if (subtotal >= 100)
   discountPercent = .2m;
```

With a block of statements

```
if (subtotal >= 100)
{
   discountPercent = .2m;
   status = "Bulk rate";
}
```

An if statement with an else clause

```
if (subtotal >= 100)
   discountPercent = .2m;
else
   discountPercent = .1m;
```

An if statement with else if and else clauses

```
if (subtotal >= 100 && subtotal < 200)
   discountPercent = .2m;
else if (subtotal >= 200 && subtotal < 300)
   discountPercent = .3m;
else if (subtotal >= 300)
   discountPercent = .4m;
else
   discountPercent = .1m;
```

Nested if statements

```
if (customerType == "R")
{
   if (subtotal >= 100)               // begin nested if
      discountPercent = .2m;
   else
      discountPercent = .1m;          // end nested if
}
else    // customerType isn't "R"
   discountPercent = .4m;
```

The syntax of the switch statement

```
switch (switchExpression)
{
   case constantExpression:
      statements
      break;
   [case constantExpression:
      statements
      break;] ...
   [default:
      statements
      break;]
}
```

A switch statement with a default label

```
switch (customerType)
{
    case "R":
        discountPercent = .1m;
        break;
    case "C":
        discountPercent = .2m;
        break;
    default:
        discountPercent = .0m;
        break;
}
```

A switch statement that falls through the first case label

```
switch (customerType)
{
    case "R":
    case "C":
        discountPercent = .2m;
        break;
    case "T":
        discountPercent = .4m;
        break;
}
```

The syntax of the while statement

```
while (booleanExpression)
{
   statements
}
```

A while loop that adds the numbers 1 through 4

```
int i = 1, sum = 0;
while (i < 5)
{
    sum += i;
    i++;
}
```

A while loop that calculates a future value

```
int i = 1;
while (i <= months)
{
    futureValue = (futureValue + monthlyPayment) *
        (1 + monthlyInterestRate);
    i++;
}
```

The syntax of the do-while statement

```
do
{
   statements
}
while (booleanExpression);
```

A do-while loop that calculates a future value

```
int i = 1;
do
{
    futureValue = (futureValue + monthlyPayment) *
        (1 + monthlyInterestRate);
    i++;
}
while (i <= months);
```

The syntax of the for statement

```
for (initializationExpression; booleanExpression;
     incrementExpression)
{
   statements
}
```

A for loop that stores the numbers 0 through 4 in a string

With a single statement

```
string numbers = null;
for (int i = 0; i < 5; i++)
    numbers += i + " ";
```

With a block of statements

```
string numbers = null;
for (int i = 0; i < 5; i++)
{
    numbers += i;
    numbers += " ";
}
```

A for loop that adds the numbers 8, 6, 4, and 2

```
int sum = 0;
for (int j = 8; j > 0; j-=2)
{
   sum += j;
}
```

A for loop that calculates a future value

```
for (int i = 1; i <= months; i++)
{
    futureValue = (futureValue + monthlyPayment) *
        (1 + monthlyInterestRate);
}
```

A loop with a break statement

```
  string message = null;
  int i = 1;
  while (i <= months)
  {
      futureValue = (futureValue + monthlyPayment) *
          (1 + monthlyInterestRate);
      if (futureValue > 100000)
      {
          message = "Future value is too large.";
          break;
      }
      i++;
}
```

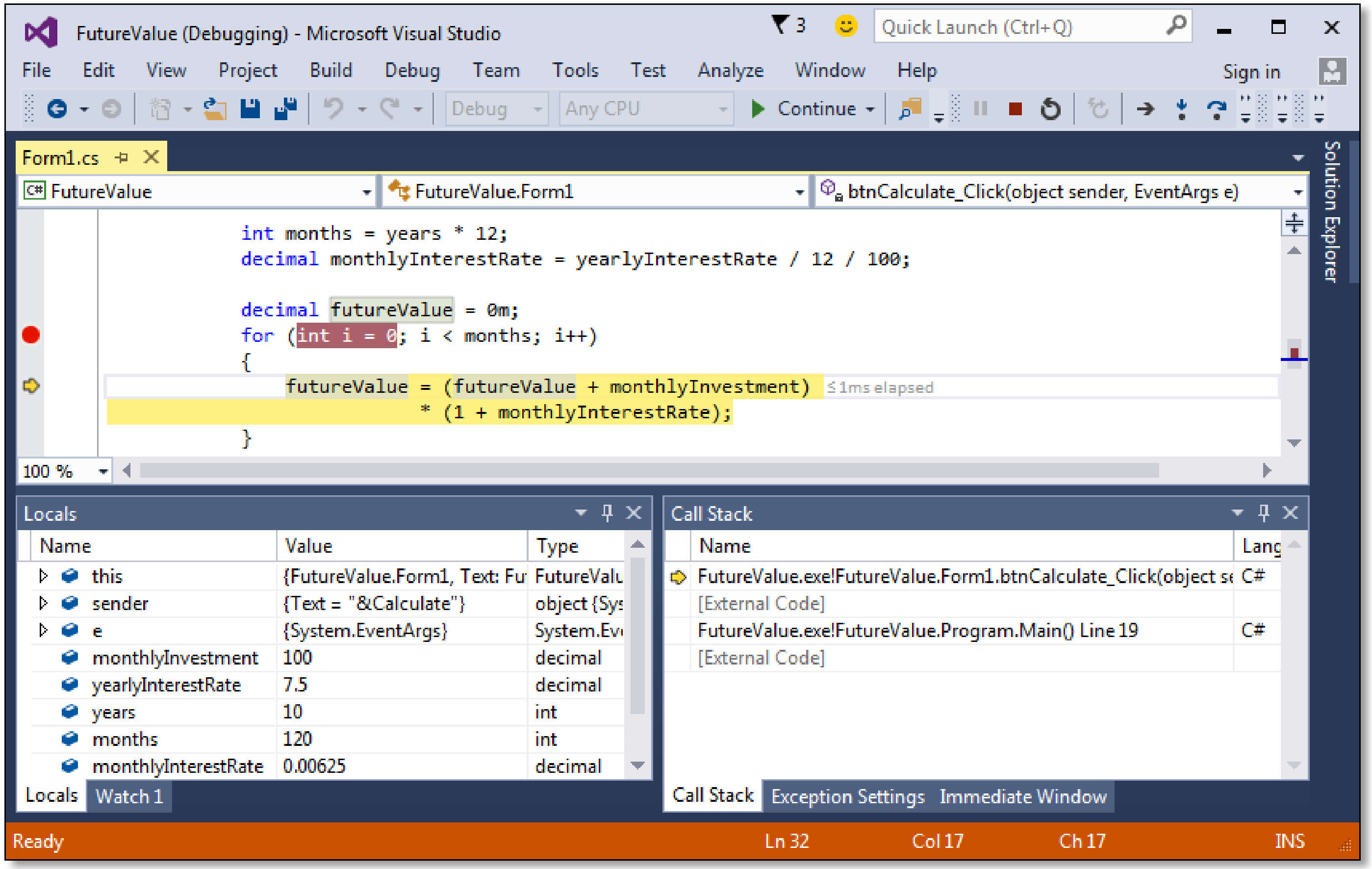
A loop with a continue statement

```
string numbers = null;
for (int i = 1; i < 6; i++)
{
    numbers += i;
    numbers += "\n";
    if (i < 4)
       continue;
    numbers += "Big\n";
}
```

The result of this loop

```
1
2
3
4
Big
5
Big
```

A for loop with a breakpoint and an execution point


FutureValue (Debugging) - Microsoft Visual Studio

Form1.cs — FutureValue — FutureValue.Form1 — btnCalculate_Click(object sender, EventArgs e)

```
int months = years * 12;
decimal monthlyInterestRate = yearlyInterestRate / 12 / 100;

decimal futureValue = 0m;
for (int i = 0; i < months; i++)
{
    futureValue = (futureValue + monthlyInvestment)  ≤1ms elapsed
                * (1 + monthlyInterestRate);
}
```

Locals

Name	Value	Type
this	{FutureValue.Form1, Text: Fu	FutureValu
sender	{Text = "&Calculate"}	object {Sys
e	{System.EventArgs}	System.Ev
monthlyInvestment	100	decimal
yearlyInterestRate	7.5	decimal
years	10	int
months	120	int
monthlyInterestRate	0.00625	decimal

Call Stack

Name	Lang
FutureValue.exe!FutureValue.Form1.btnCalculate_Click(object se	C#
[External Code]	
FutureValue.exe!FutureValue.Program.Main() Line 19	C#
[External Code]	

Ready Ln 32 Col 17 Ch 17 INS

How to set and clear breakpoints

- To set a breakpoint, click or tap in the *margin indicator bar* to the left of a statement. Or, press the F9 key to set a breakpoint at the cursor insertion point. Then, a red dot will mark the breakpoint.
- To remove a breakpoint, use any of the techniques for setting a breakpoint. To remove all breakpoints at once, use the Delete All Breakpoints command in the Debug menu.

How to work in break mode

- In break mode, a yellow arrowhead marks the current *execution point*, which points to the next statement that will be executed.
- To *step through* your code one statement at a time, press the F11 key or click the Step Into button on the Debug toolbar.
- To continue normal processing until the next breakpoint is reached, press the F5 key.