

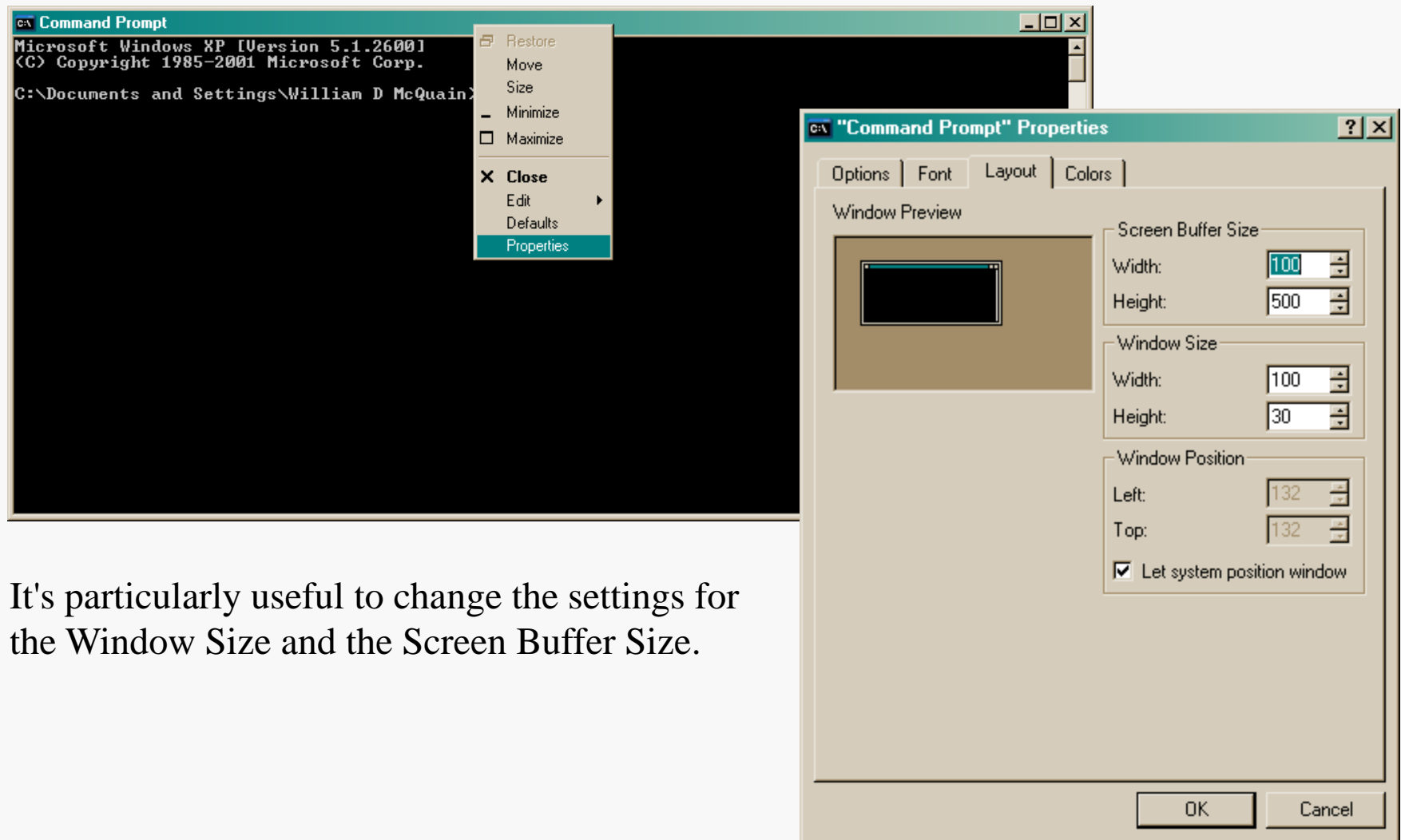
In WinXP, go to the Programs Menu, select Accessories and then Command Prompt.

In Win7, go to the All Programs, select Accessories and then Command Prompt.

Note you can drag a shortcut off the Programs Menu to your Desktop (copy, not move)... that makes it faster to just open a command shell.

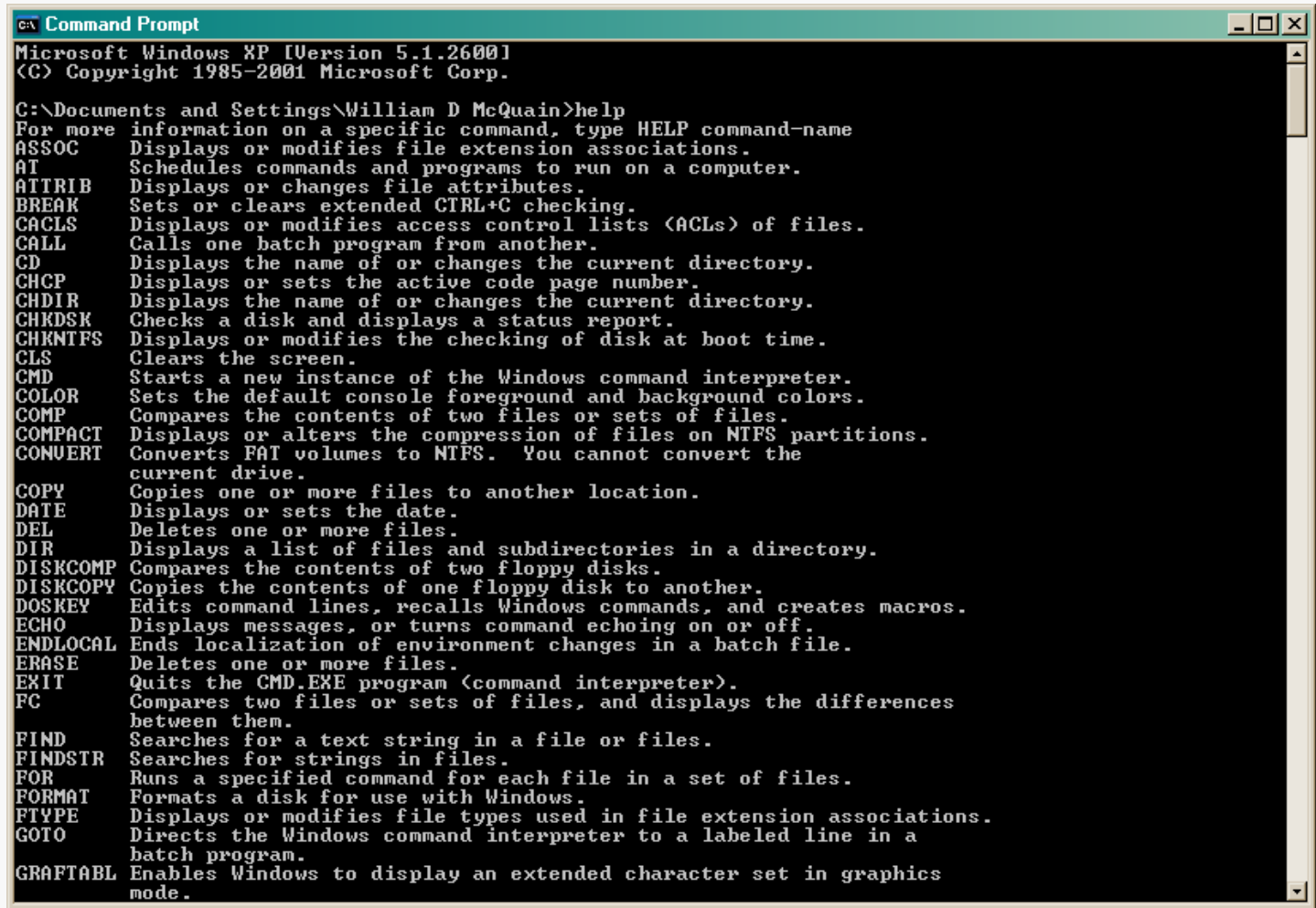
BTW, a command shell window is often referred to as a *console*.

Right-click the title bar and select Properties; you can customize many appearance and some operational properties from here...



It's particularly useful to change the settings for the Window Size and the Screen Buffer Size.

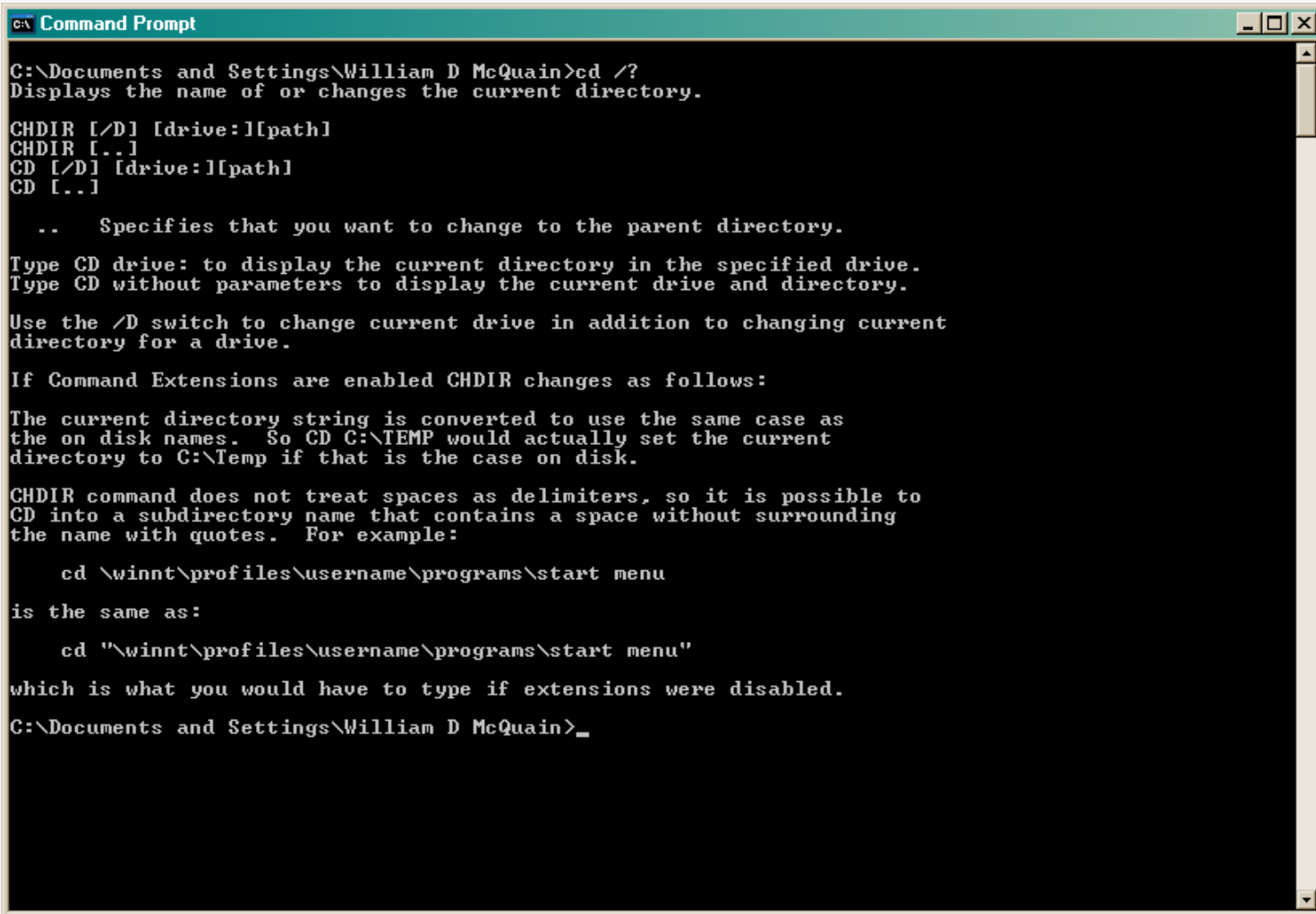
Typing "help" at the command prompt displays a list of shell commands with brief descriptions:



```
ca Command Prompt
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\William D McQuain>help
For more information on a specific command, type HELP command-name
ASSOC   Displays or modifies file extension associations.
AT      Schedules commands and programs to run on a computer.
ATTRIB  Displays or changes file attributes.
BREAK   Sets or clears extended CTRL+C checking.
CACLS   Displays or modifies access control lists (ACLs) of files.
CALL    Calls one batch program from another.
CD      Displays the name of or changes the current directory.
CHCP    Displays or sets the active code page number.
CHDIR   Displays the name of or changes the current directory.
CHKDSK  Checks a disk and displays a status report.
CHKNTFS Displays or modifies the checking of disk at boot time.
CLS     Clears the screen.
CMD     Starts a new instance of the Windows command interpreter.
COLOR   Sets the default console foreground and background colors.
COMP    Compares the contents of two files or sets of files.
COMPACT Displays or alters the compression of files on NTFS partitions.
CONVERT Converts FAT volumes to NTFS. You cannot convert the
current drive.
COPY    Copies one or more files to another location.
DATE    Displays or sets the date.
DEL     Deletes one or more files.
DIR     Displays a list of files and subdirectories in a directory.
DISKCOMP Compares the contents of two floppy disks.
DISKCOPY Copies the contents of one floppy disk to another.
DOSKEY  Edits command lines, recalls Windows commands, and creates macros.
ECHO    Displays messages, or turns command echoing on or off.
ENDLOCAL Ends localization of environment changes in a batch file.
ERASE   Deletes one or more files.
EXIT    Quits the CMD.EXE program (command interpreter).
FC      Compares two files or sets of files, and displays the differences
between them.
FIND    Searches for a text string in a file or files.
FINDSTR Searches for strings in files.
FOR     Runs a specified command for each file in a set of files.
FORMAT  Formats a disk for use with Windows.
FTYPE   Displays or modifies file types used in file extension associations.
GOTO    Directs the Windows command interpreter to a labeled line in a
batch program.
GRAFTABL Enables Windows to display an extended character set in graphics
mode.
```

Typing a command followed by "/"? displays a fuller explanation of the command:



```

C:\Documents and Settings\William D McQuain>cd /?
Displays the name of or changes the current directory.

CHDIR [/D] [drive:][path]
CHDIR [..]
CD [/D] [drive:][path]
CD [..]

.. Specifies that you want to change to the parent directory.
Type CD drive: to display the current directory in the specified drive.
Type CD without parameters to display the current drive and directory.

Use the /D switch to change current drive in addition to changing current
directory for a drive.

If Command Extensions are enabled CHDIR changes as follows:

The current directory string is converted to use the same case as
the on disk names. So CD C:\TEMP would actually set the current
directory to C:\Temp if that is the case on disk.

CHDIR command does not treat spaces as delimiters, so it is possible to
CD into a subdirectory name that contains a space without surrounding
the name with quotes. For example:

    cd \winnt\profiles\username\programs\start menu
is the same as:

    cd "\winnt\profiles\username\programs\start menu"
which is what you would have to type if extensions were disabled.
C:\Documents and Settings\William D McQuain>_

```

The most common shell commands are probably:

CD	Displays the name of or changes the current directory.
CLS	Clears the screen.
COPY	Copies one or more files to another location.
DEL	Deletes one or more files.
DIR	Displays a list of files and subdirectories in a directory.
MKDIR	Creates a directory.
MOVE	Moves one or more files from one directory to another directory.
PATH	Displays or sets a search path for executable files.
REN	Renames a file or files.
RMDIR	Removes a directory.

Use the command-line switch `\?` or `help <command>` to get more information about a command.

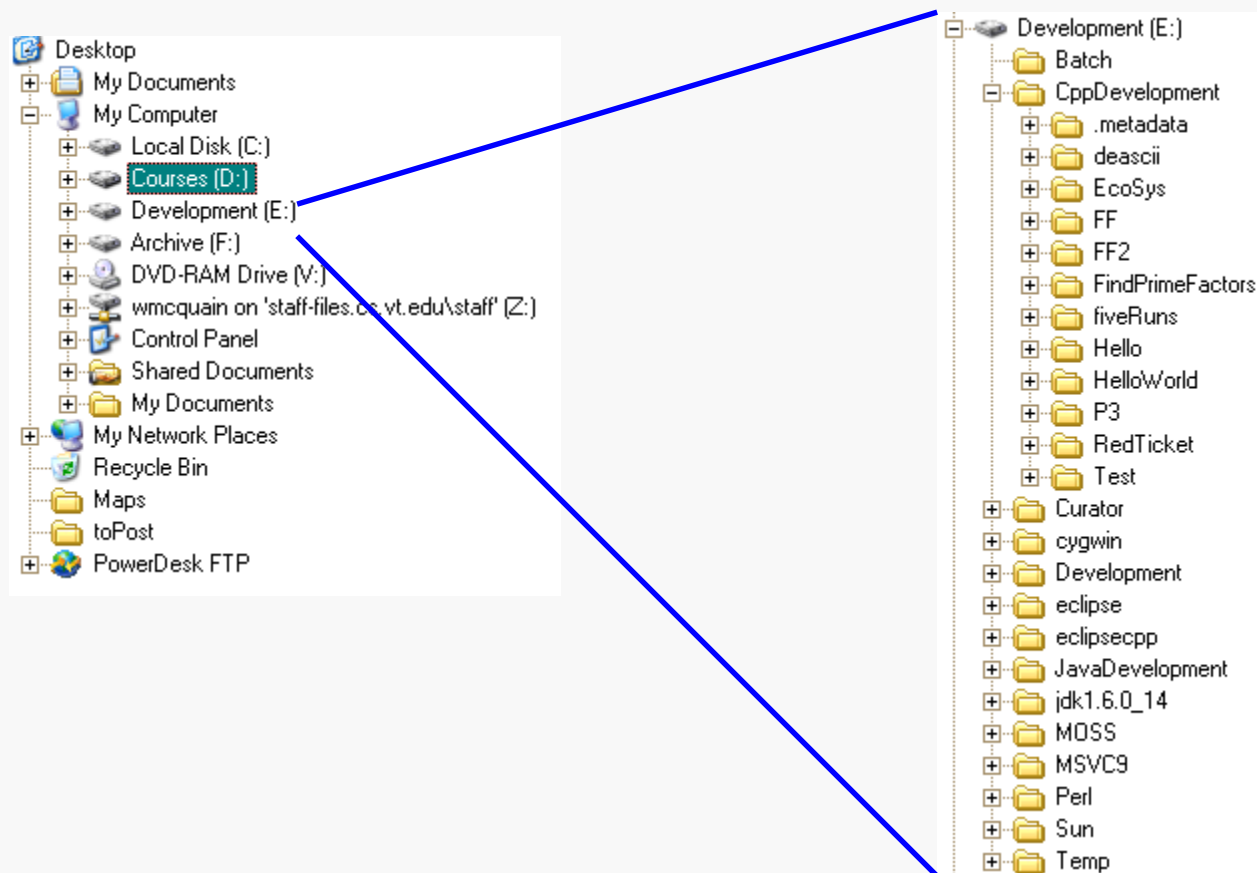
By default, a command shell opens in your home directory. Navigating from that to another directory is an exercise in forming full and regular paths and using the `cd` command. It's tedious.

Fortunately, Vista and Win7 make it easy to open a command shell in any directory.

Hold down the Shift key and right-click on the desired folder. The context menu will include the choice "Open command window here".

You should already be familiar with the basic notion of a hierarchical file system.

We may have a number of logical drives, and separate physical devices:



Each drive, like E shown on the previous slide is organized logically as a tree of nested directories (or folders).

The top-level directory is called the *root directory* and is denoted by the drive letter, a colon and a back-slash; for example E : \

There is a unique *full path* from the root directory to every other directory on the drive.

The full path is formed by concatenating directory names, separated by a back-slash:

```
E:\CppDevelopment\EcoSys\
```

We can also form a *relative path* from one directory to another. The parent of the current directory is denoted by ". .".

For example:

```
..\Redticket\
```



The shell stores the most-recently executed commands in a history list.

Use the F7 function key to display a scrollable list of those commands. You can use the up/down arrow keys to navigate the list, and press Enter to repeat the selected command.

You can also use the up/down arrow keys directly at the command prompt to scroll through the previous commands.

Note that you can use this feature to re-display a previous command and then edit that command to change file names or command-line switches.

The length of the history list can be set through the shell window Properties dialog.

The DIR command produces a listing of the files and directories in the current directory:

```
C:\Windows\system32\cmd.exe
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Fall12010\2505\Examples\Assembly

08/22/2010  09:40 PM    <DIR>      .
08/22/2010  09:40 PM    <DIR>      ..
01/14/2006  12:50 AM          1,135 Add2.s
08/22/2010  09:40 PM    <DIR>      AddMultiply
08/22/2010  09:40 PM    <DIR>      BubbleSort
08/22/2010  09:40 PM    <DIR>      CommandLine
08/22/2010  09:40 PM    <DIR>      Factorial
06/12/2004  07:55 PM          2,494 Factorial.s
08/22/2010  09:40 PM    <DIR>      Fibonacci
08/22/2010  09:40 PM    <DIR>      FileIO
08/22/2010  09:40 PM    <DIR>      FindMax
08/22/2010  09:40 PM    <DIR>      FindMedian
08/22/2010  09:40 PM    <DIR>      FormattedPrinting
08/22/2010  09:40 PM    <DIR>      HelloWorld
08/22/2010  09:40 PM    <DIR>      Histogram
08/22/2010  09:40 PM    <DIR>      Linking
08/22/2010  09:40 PM    <DIR>      List
08/22/2010  09:40 PM    <DIR>      memcpy
01/28/2008  10:49 AM          505,324 pal.exe
01/28/2008  10:49 AM           568 Palindrome.cpp
01/28/2008  11:44 AM          1,920 Palindrome.s
02/16/2006  08:48 PM          8,385 PCSpin.log
08/22/2010  09:40 PM    <DIR>      Play
02/04/2006  06:56 PM          1,075 PrintArray.s
08/22/2010  09:40 PM    <DIR>      PrintInteger
08/22/2010  09:40 PM    <DIR>      QuadraticFormula
08/22/2010  09:40 PM    <DIR>      Recursion
09/06/2006  05:31 PM          2,571 SimpleCall.s
08/22/2010  09:40 PM    <DIR>      strcpy
02/22/2006  02:39 AM           554 stuff.s
11/09/2009  04:49 PM           200 traps01.asm
          10 File(s)          524,226 bytes
          21 Dir(s)      25,038,401,536 bytes free

F:\Fall12010\2505\Examples\Assembly>
```

Entries for this directory and its parent...

Entries that are directories themselves are flagged...

If you partially type a file name and then hit the TAB key, the shell (may) complete the name for you:

```
C:\Windows\system32\cmd.exe
F:\Fall12010\2505\Examples\Assembly\HelloWorld>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Fall12010\2505\Examples\Assembly\HelloWorld
09/11/2010  10:03 PM    <DIR>          .
09/11/2010  10:03 PM    <DIR>          ..
08/28/2008  10:01 PM                404 HelloWorld.asm
               1 File(s)                404 bytes
               2 Dir(s)  25,038,356,480 bytes free

F:\Fall12010\2505\Examples\Assembly\HelloWorld>type Hell
```

```
C:\Windows\system32\cmd.exe
F:\Fall12010\2505\Examples\Assembly\HelloWorld>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Fall12010\2505\Examples\Assembly\HelloWorld
09/11/2010  10:03 PM    <DIR>          .
09/11/2010  10:03 PM    <DIR>          ..
08/28/2008  10:01 PM                404 HelloWorld.asm
               1 File(s)                404 bytes
               2 Dir(s)  25,038,356,480 bytes free

F:\Fall12010\2505\Examples\Assembly\HelloWorld>type HelloWorld.asm
```

For the following examples, we assume that your Windows path is set to contain the directory containing the gcc executable.

If you are running the Cygwin emulator package, see the following slide for relevant instructions.

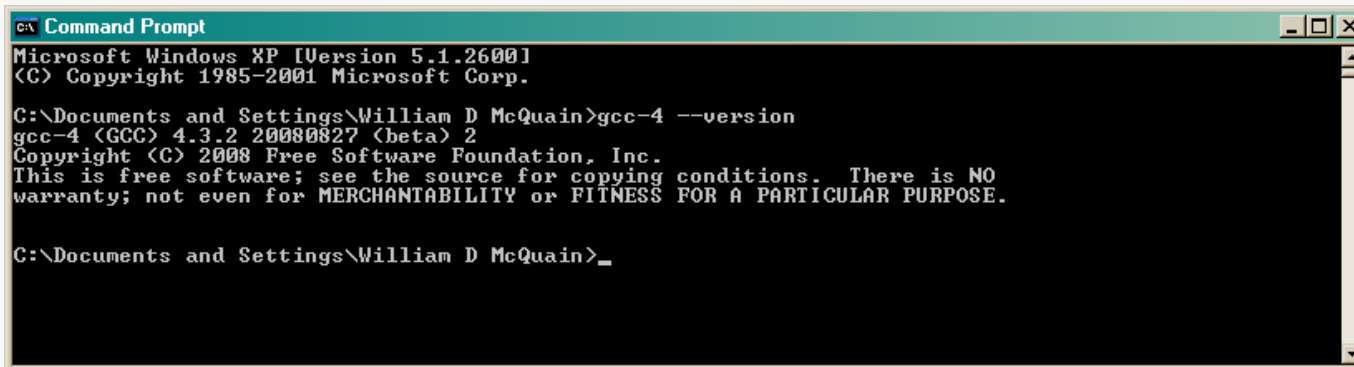
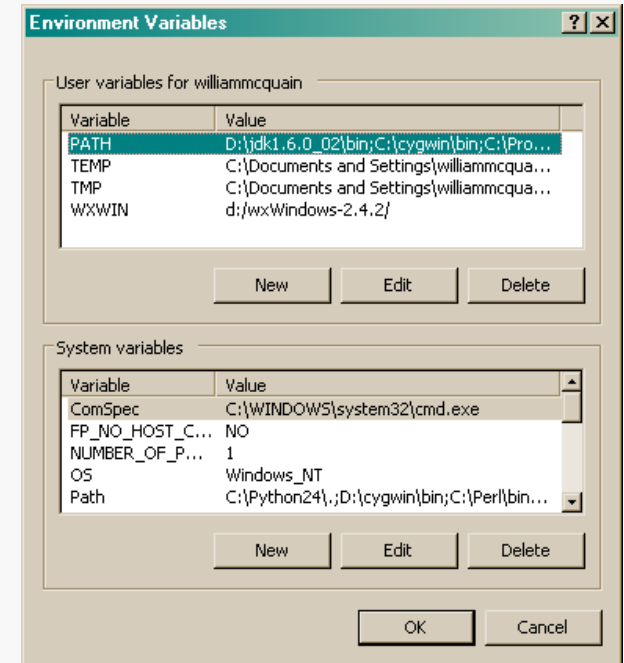
As an alternative, you could prefix the invocation of the gcc executable with the full path to it; for example:

```
C:\Cygwin\bin\gcc-4
```

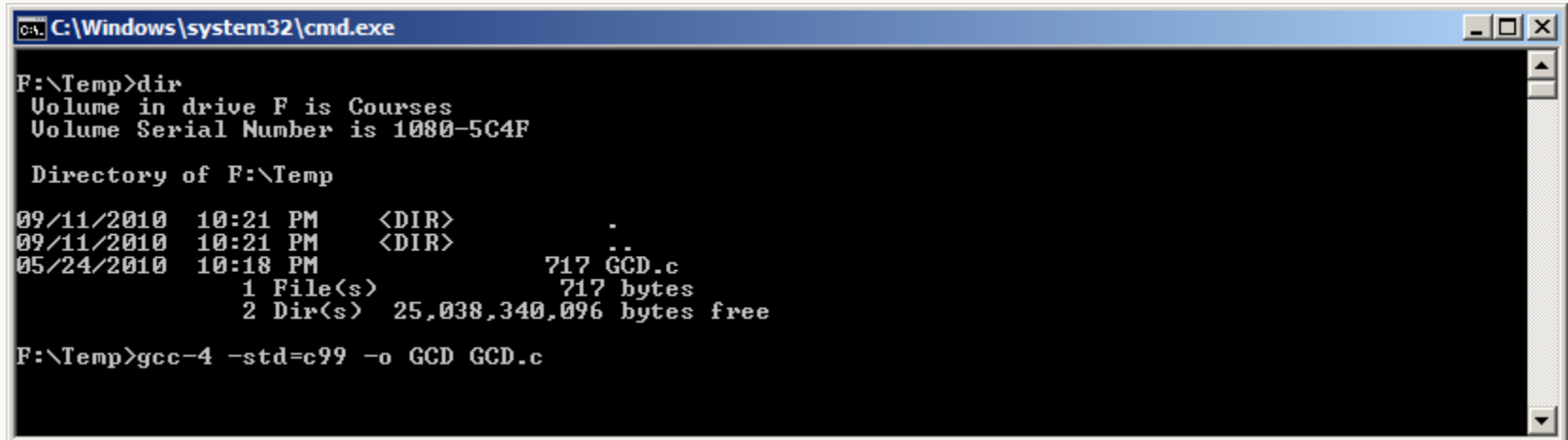
Cygwin doesn't add itself to the Windows path automatically. Go to Control Panel and run the System applet. Select the Advanced tab, and click on Environment Variables.

Select Path under System variables and add the path to the bin subdirectory of your Cygwin installation. You can see mine listed as the second entry in the Path at right. Path entries are separated by semicolons and are not case-sensitive.

To check your installation (in a very minimal way), open a Windows command shell and see if gcc is recognized:



To compile a C program from the directory containing the source file:



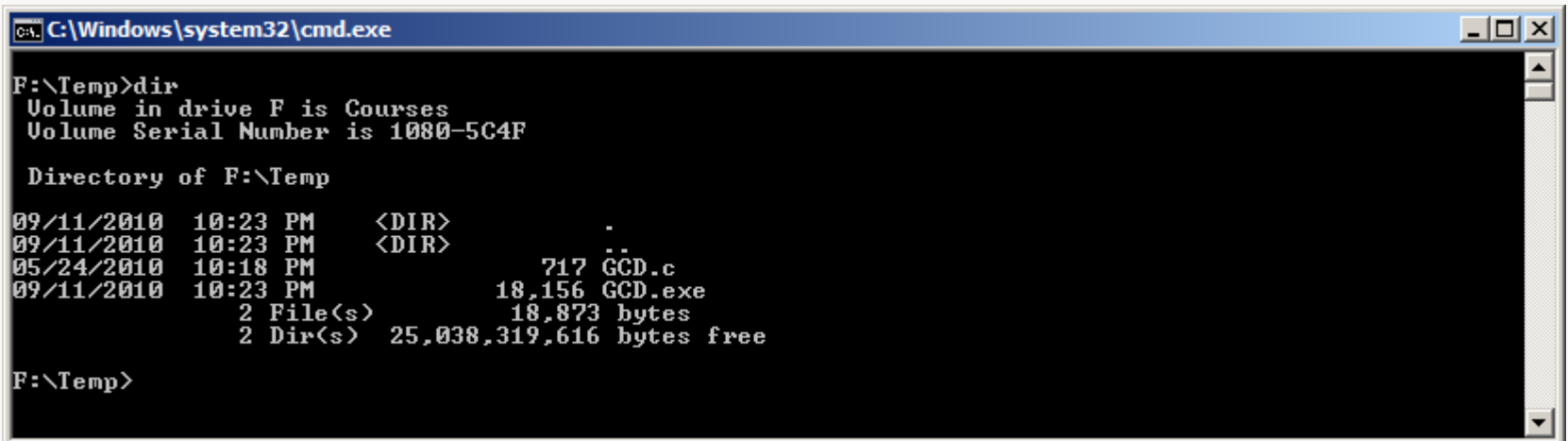
```
C:\Windows\system32\cmd.exe
F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp

09/11/2010  10:21 PM    <DIR>          .
09/11/2010  10:21 PM    <DIR>          ..
05/24/2010  10:18 PM                717 GCD.c
              1 File(s)                717 bytes
              2 Dir(s)  25,038,340,096 bytes free

F:\Temp>gcc-4 -std=c99 -o GCD GCD.c
```

Any error messages will be displayed in the shell window; otherwise an executable appears:

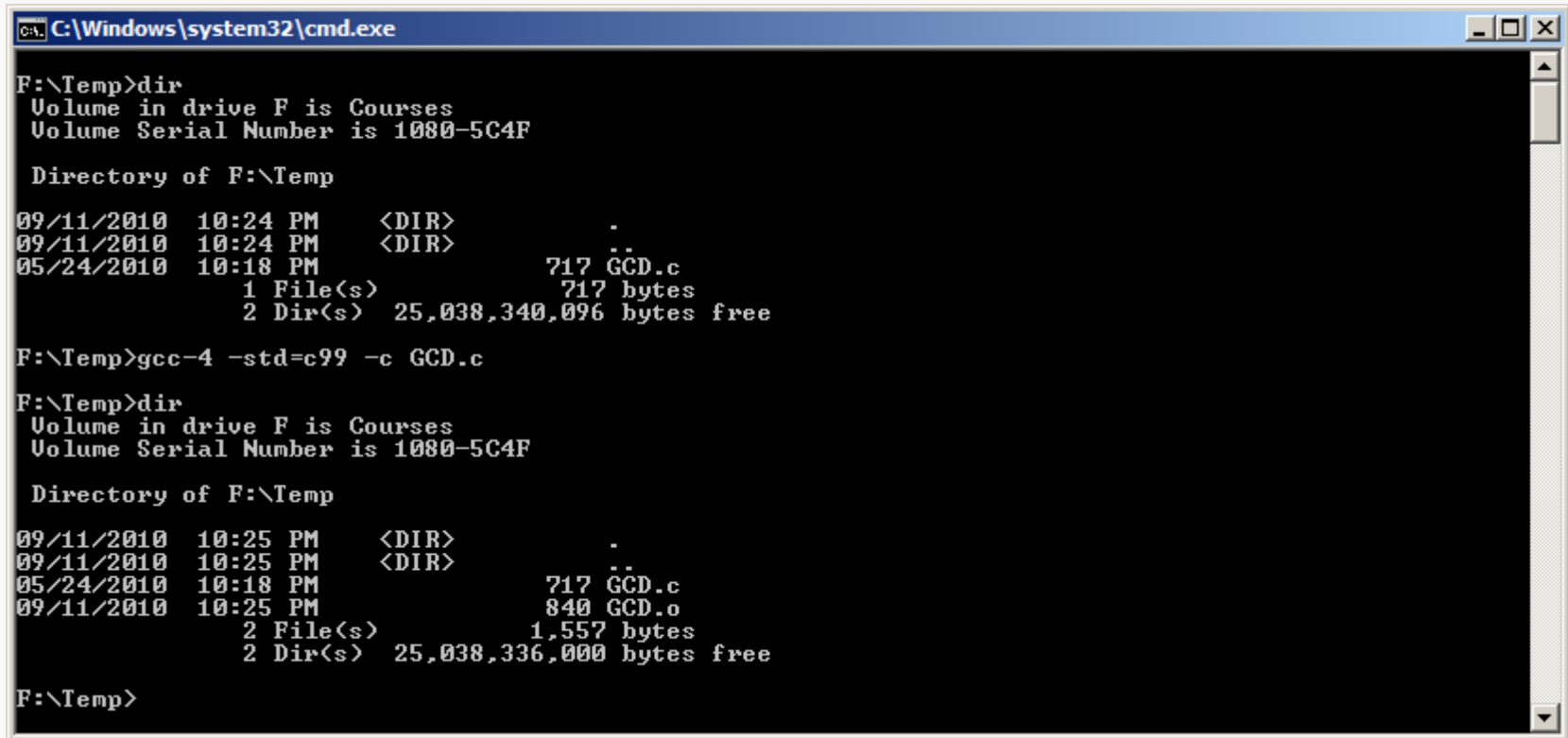


```
C:\Windows\system32\cmd.exe
F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp

09/11/2010  10:23 PM    <DIR>          .
09/11/2010  10:23 PM    <DIR>          ..
05/24/2010  10:18 PM                717 GCD.c
09/11/2010  10:23 PM            18,156 GCD.exe
              2 File(s)            18,873 bytes
              2 Dir(s)  25,038,319,616 bytes free

F:\Temp>
```



```
ca. C:\Windows\system32\cmd.exe
F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp

09/11/2010  10:24 PM    <DIR>          .
09/11/2010  10:24 PM    <DIR>          ..
05/24/2010  10:18 PM                717 GCD.c
               1 File(s)                717 bytes
               2 Dir(s)  25,038,340,096 bytes free

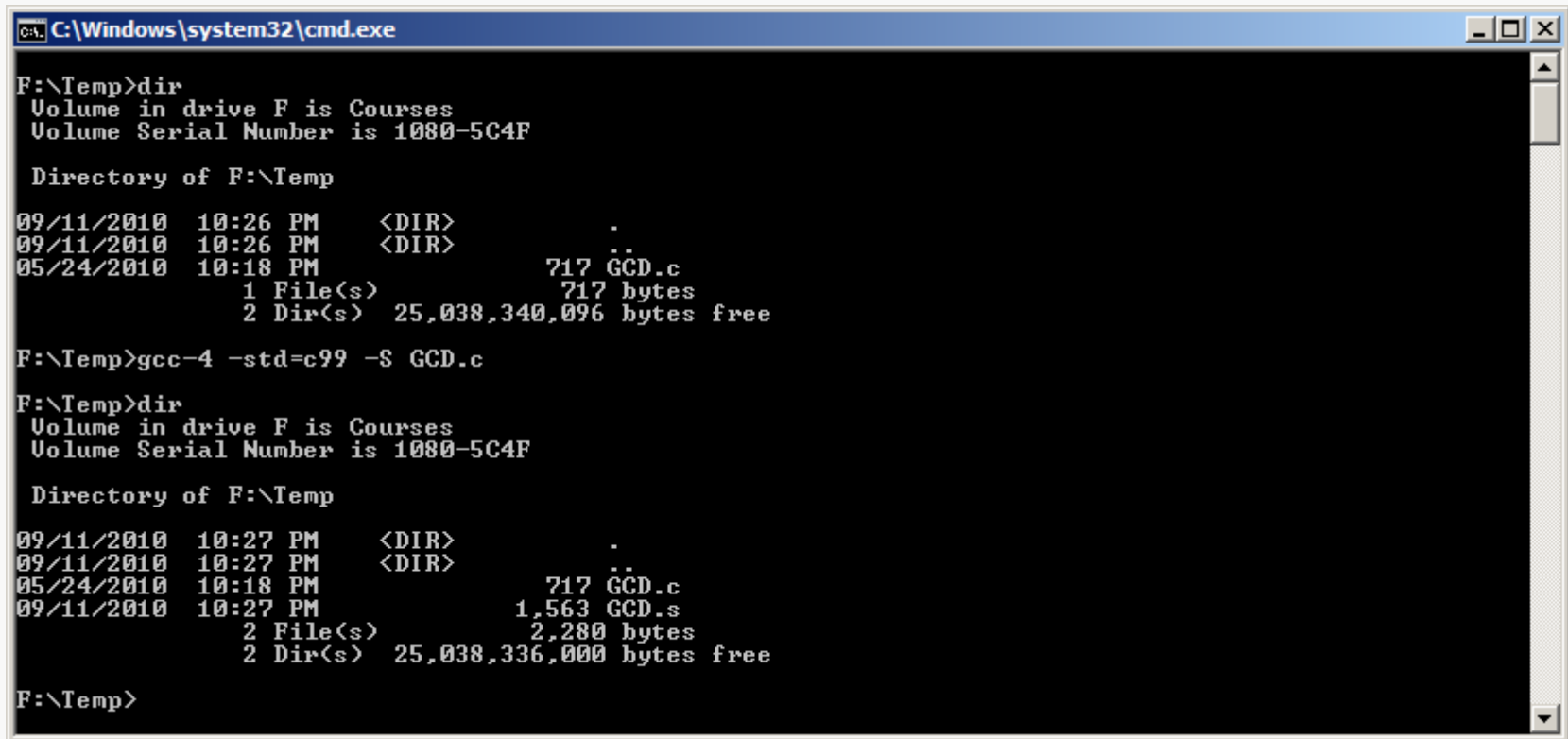
F:\Temp>gcc-4 -std=c99 -c GCD.c

F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp

09/11/2010  10:25 PM    <DIR>          .
09/11/2010  10:25 PM    <DIR>          ..
05/24/2010  10:18 PM                717 GCD.c
09/11/2010  10:25 PM                840 GCD.o
               2 File(s)                1,557 bytes
               2 Dir(s)  25,038,336,000 bytes free

F:\Temp>
```



```
C:\Windows\system32\cmd.exe

F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp

09/11/2010  10:26 PM    <DIR>          .
09/11/2010  10:26 PM    <DIR>          ..
05/24/2010  10:18 PM                717 GCD.c
               1 File(s)                717 bytes
               2 Dir(s)  25,038,340,096 bytes free

F:\Temp>gcc-4 -std=c99 -S GCD.c

F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp

09/11/2010  10:27 PM    <DIR>          .
09/11/2010  10:27 PM    <DIR>          ..
05/24/2010  10:18 PM                717 GCD.c
09/11/2010  10:27 PM            1,563 GCD.s
               2 File(s)            2,280 bytes
               2 Dir(s)  25,038,336,000 bytes free

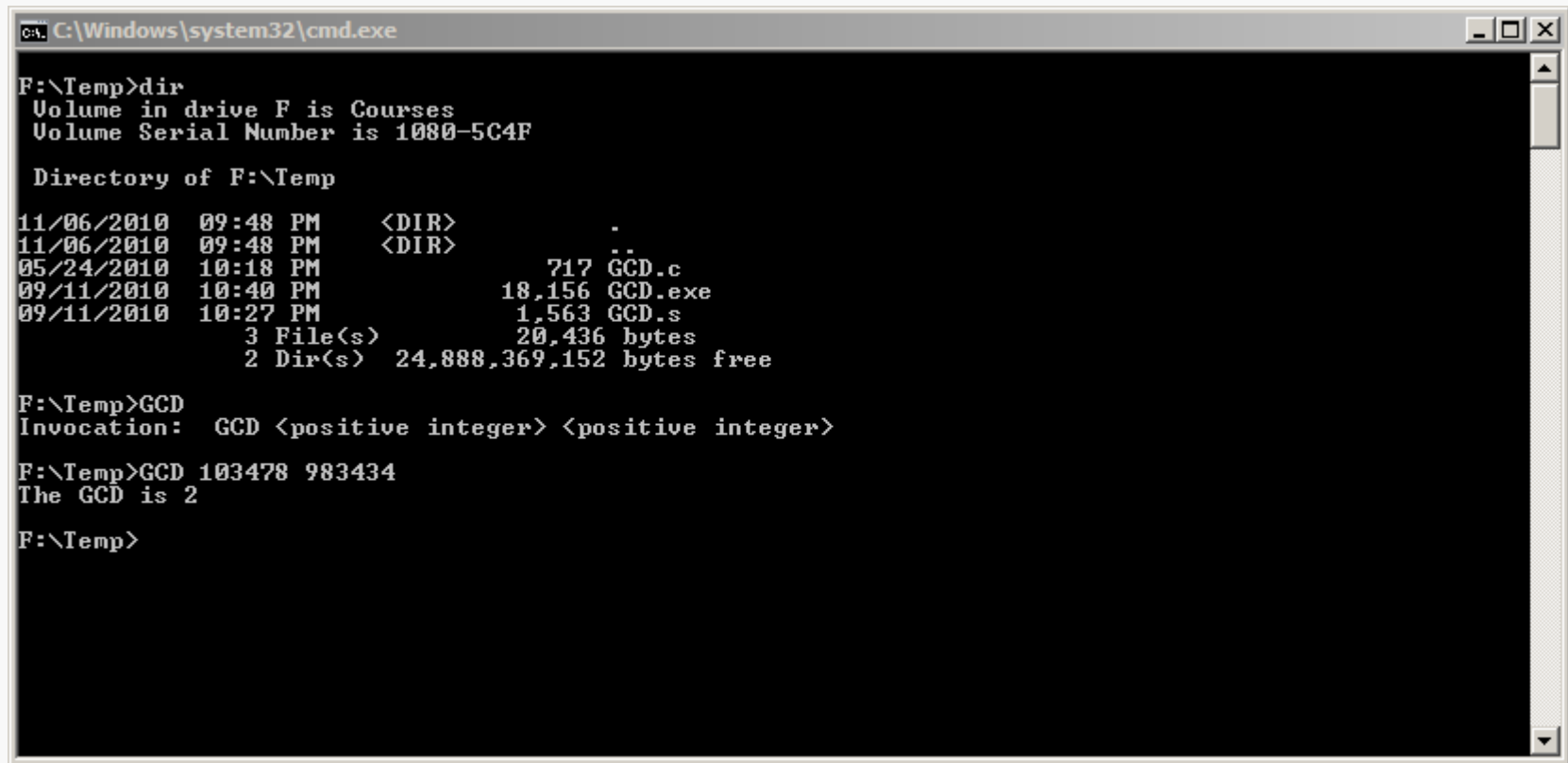
F:\Temp>
```



Some of the most common gcc options:

- c  
compile and assemble but do not link
- S  
compile but do not assemble or link; yields an assembly language listing
- o <name>  
specify name for executable file
- std=<standard>  
compile to specified standard (c89, c99 most commonly)
- W  
inhibit all warning messages
- Werror  
make all warnings be errors
- Wall  
show more warning messages
- pedantic  
require strict compliance with the specified standard

To execute a program (Windows executable file) from the command-line, just type the name of the file:



```
C:\Windows\system32\cmd.exe

F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp

11/06/2010  09:48 PM    <DIR>          .
11/06/2010  09:48 PM    <DIR>          ..
05/24/2010  10:18 PM             717 GCD.c
09/11/2010  10:40 PM          18,156 GCD.exe
09/11/2010  10:27 PM           1,563 GCD.s
           3 File(s)              20,436 bytes
           2 Dir(s)  24,888,369,152 bytes free

F:\Temp>GCD
Invocation:  GCD <positive integer> <positive integer>

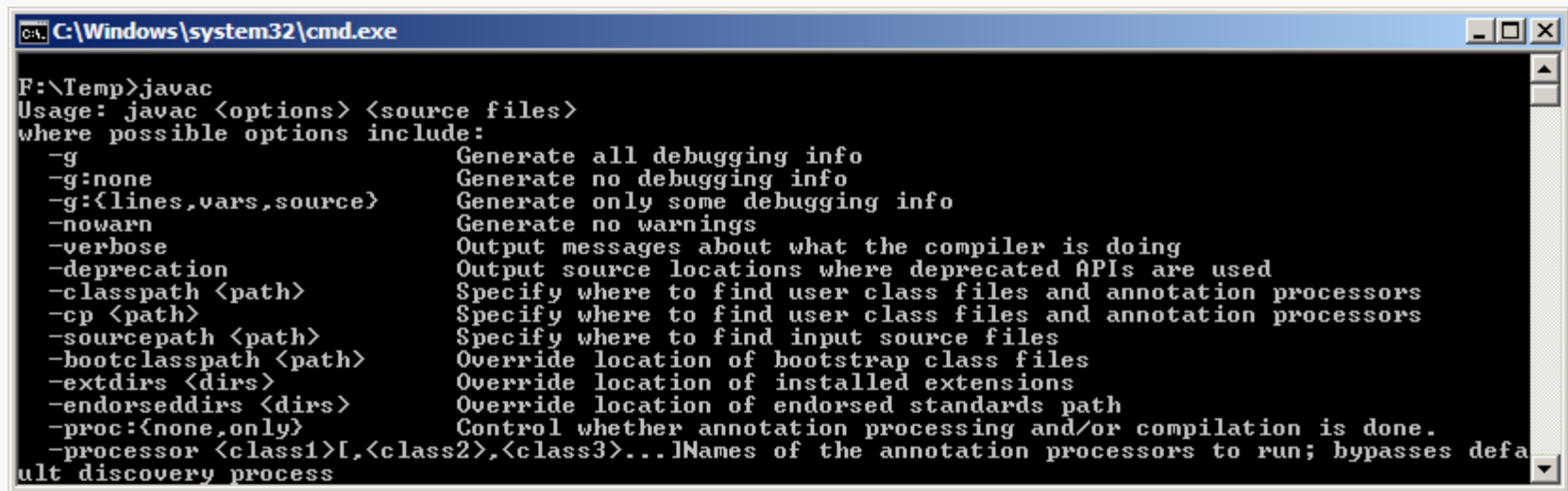
F:\Temp>GCD 103478 983434
The GCD is 2

F:\Temp>
```

Of course, in some cases the program may require you also supply parameters from the command-line, as shown above...

To compile a Java program, you must use a Java compiler; Sun provides one as part of the Java Development Kit (JDK), named `javac`.

You can test whether the compiler is in the Windows path by attempting to execute it:

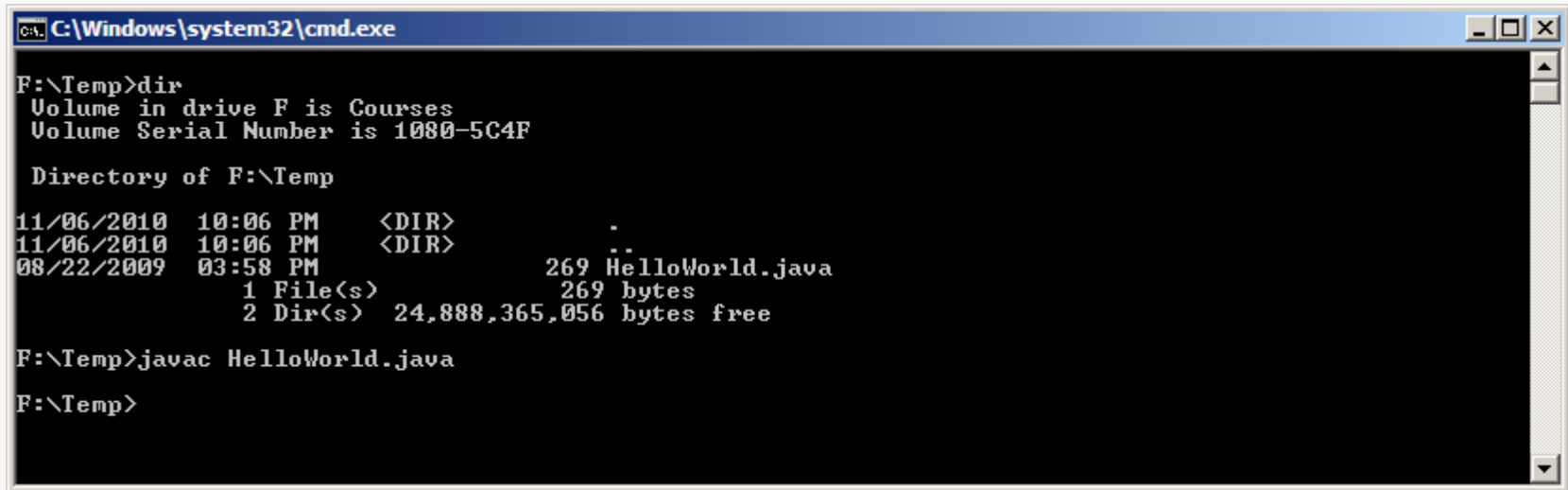


```
C:\Windows\system32\cmd.exe
F:\Temp>javac
Usage: javac <options> <source files>
where possible options include:
-g                Generate all debugging info
-g:none          Generate no debugging info
-g:<lines,vars,source> Generate only some debugging info
-nowarn          Generate no warnings
-verbose         Output messages about what the compiler is doing
-deprecation     Output source locations where deprecated APIs are used
-classpath <path> Specify where to find user class files and annotation processors
-cp <path>       Specify where to find user class files and annotation processors
-sourcepath <path> Specify where to find input source files
-bootclasspath <path> Override location of bootstrap class files
-extdirs <dirs>   Override location of installed extensions
-endorseddirs <dirs> Override location of endorsed standards path
-proc:<none,only> Control whether annotation processing and/or compilation is done.
-processor <class1>[,<class2>,<class3>...!Names of the annotation processors to run; bypasses default discovery process
```

If everything is set up correctly, you should see a display similar to the one shown above.

If not, you must add the appropriate directory to your Windows path.

To compile a single-file Java program from the directory containing the source file:



```
C:\Windows\system32\cmd.exe
F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

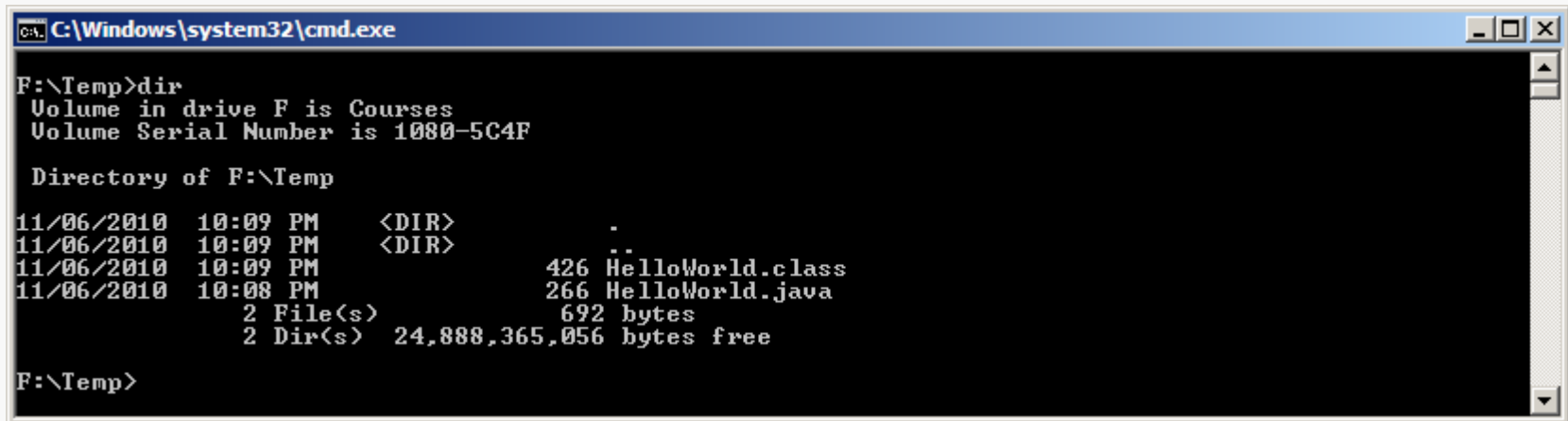
Directory of F:\Temp

11/06/2010  10:06 PM    <DIR>          .
11/06/2010  10:06 PM    <DIR>          ..
08/22/2009  03:58 PM                269 HelloWorld.java
                1 File(s)      269 bytes
                2 Dir(s)  24,888,365,056 bytes free

F:\Temp>javac HelloWorld.java

F:\Temp>
```

Any error messages will be displayed in the shell window; otherwise a Java class file appears:



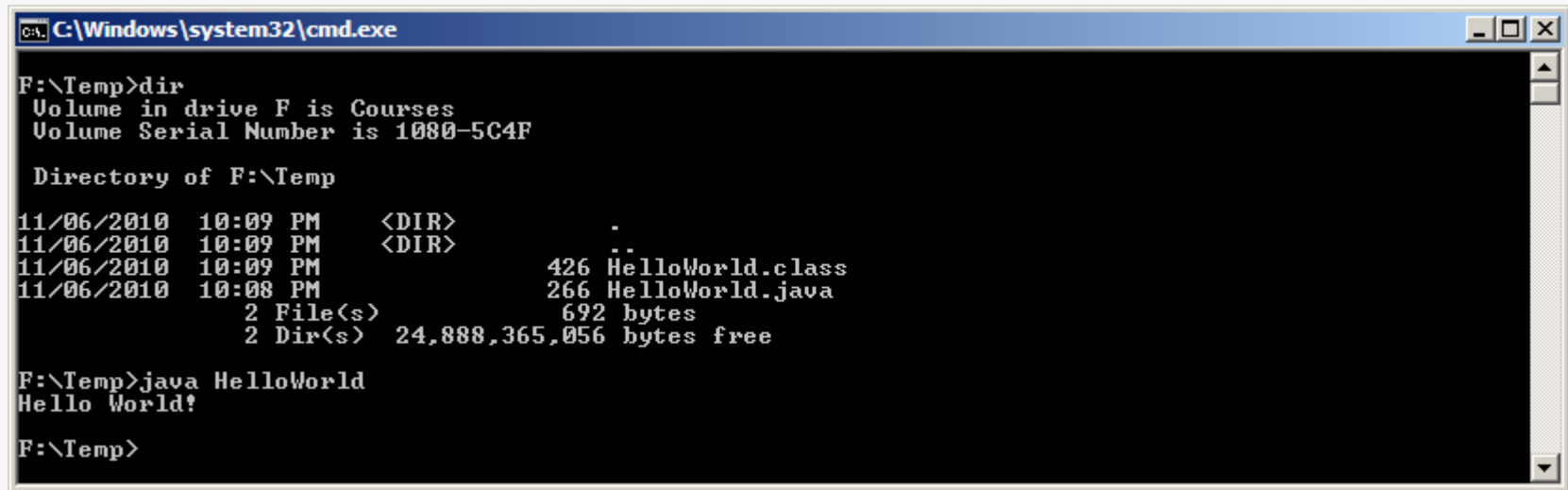
```
C:\Windows\system32\cmd.exe
F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp

11/06/2010  10:09 PM    <DIR>          .
11/06/2010  10:09 PM    <DIR>          ..
11/06/2010  10:09 PM                426 HelloWorld.class
11/06/2010  10:08 PM                266 HelloWorld.java
                2 File(s)      692 bytes
                2 Dir(s)  24,888,365,056 bytes free

F:\Temp>
```

To execute a Java program from the command-line:



```
C:\Windows\system32\cmd.exe
F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp

11/06/2010  10:09 PM    <DIR>          .
11/06/2010  10:09 PM    <DIR>          ..
11/06/2010  10:09 PM                426 HelloWorld.class
11/06/2010  10:08 PM                266 HelloWorld.java
           2 File(s)                692 bytes
           2 Dir(s)  24,888,365,056 bytes free

F:\Temp>java HelloWorld
Hello World!

F:\Temp>
```

Note that the Java interpreter is named `java`.

Any error messages or output will appear in the command shell window.

The general rule is that you invoke the Java interpreter (`java`) on the class file that contains the implementation of `static void main()`.

Suppose we have a multi-file Java program:

```
C:\Windows\system32\cmd.exe
F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp

11/09/2010  02:21 PM    <DIR>          .
11/09/2010  02:21 PM    <DIR>          ..
06/15/2010  01:55 PM             9,965 Generator.java
06/15/2010  02:00 PM             6,007 HashDriver.java
11/08/2010  09:32 PM    <DIR>          MinorP3
                2 File(s)      15,972 bytes
                3 Dir(s)  24,883,294,208 bytes free

F:\Temp>dir MinorP3\DS
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

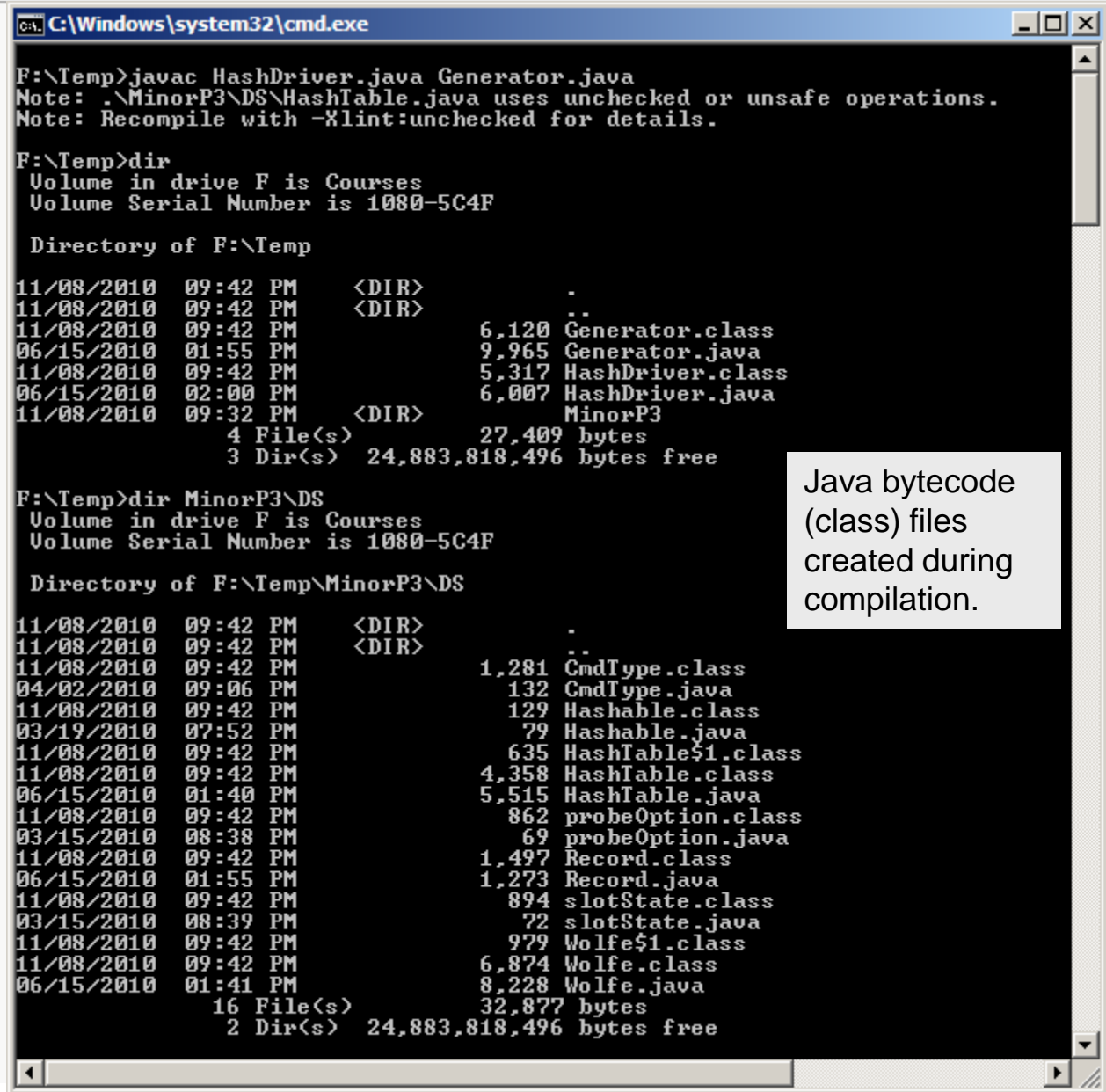
Directory of F:\Temp\MinorP3\DS

11/08/2010  09:47 PM    <DIR>          .
11/08/2010  09:47 PM    <DIR>          ..
04/02/2010  09:06 PM             132 CmdType.java
03/19/2010  07:52 PM             79 Hashable.java
06/15/2010  01:40 PM          5,515 HashTable.java
03/15/2010  08:38 PM             69 probeOption.java
06/15/2010  01:55 PM          1,273 Record.java
03/15/2010  08:39 PM             72 slotState.java
06/15/2010  01:41 PM          8,228 Wolfe.java
                7 File(s)      15,368 bytes
                2 Dir(s)  24,883,294,208 bytes free

F:\Temp>
```

- .(base directory)
- |-- HashDriver.java
- |-- Generator.java
- |-- MinorP3\
  - |-- DS\
    - |-- CmdType.java
    - |-- Hashable.java
    - |-- HashTable.java
    - |-- probeOption.java
    - |-- Record.java
    - |-- slotState.java
    - |-- Wolfe.java

To compile, it is sufficient to specify the top-level files, since they, directly or indirectly, reference all the package files:



```
C:\Windows\system32\cmd.exe
F:\Temp>javac HashDriver.java Generator.java
Note: .\MinorP3\DS\HashTable.java uses unchecked or unsafe operations.
Note: Recompile with -Xlint:unchecked for details.
F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp

11/08/2010 09:42 PM <DIR>          .
11/08/2010 09:42 PM <DIR>          ..
11/08/2010 09:42 PM                6,120 Generator.class
06/15/2010 01:55 PM                9,965 Generator.java
11/08/2010 09:42 PM                5,317 HashDriver.class
06/15/2010 02:00 PM                6,007 HashDriver.java
11/08/2010 09:32 PM <DIR>          MinorP3
                4 File(s)          27,409 bytes
                3 Dir(s)  24,883,818,496 bytes free

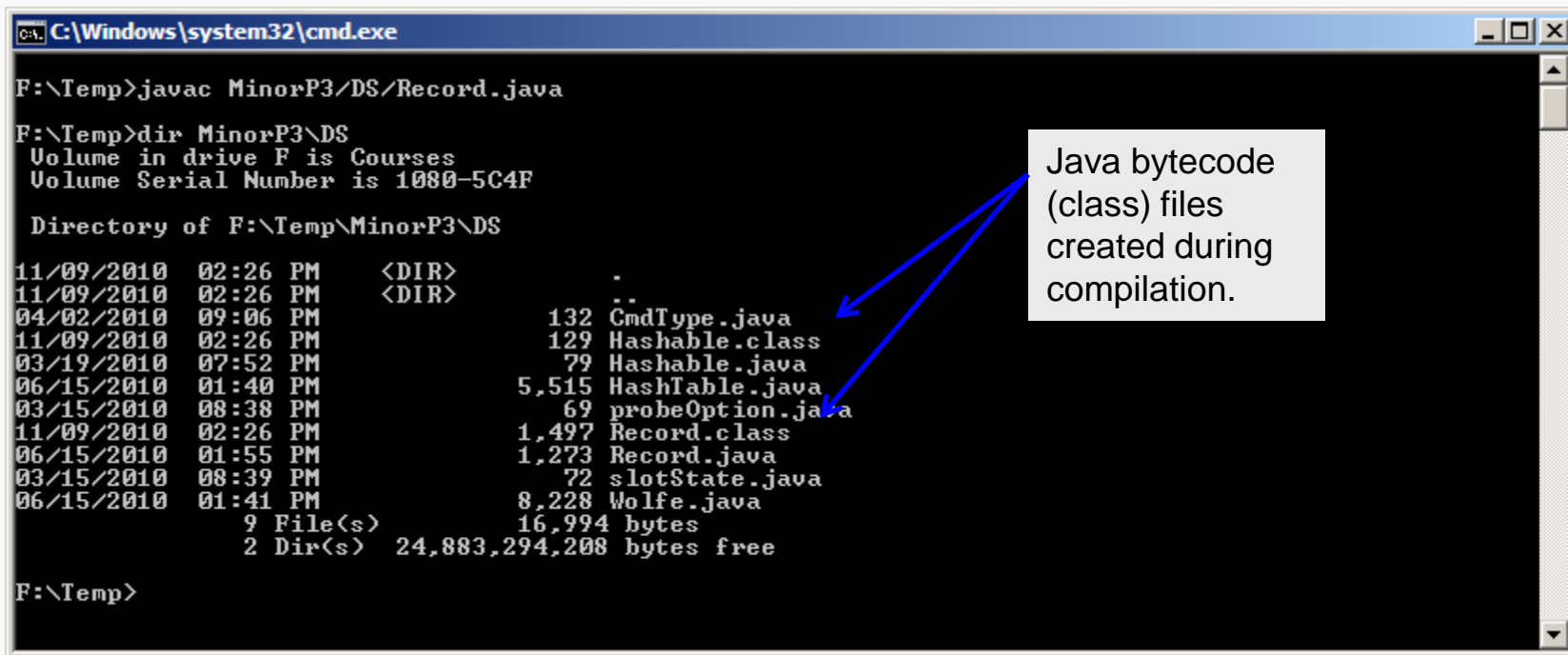
F:\Temp>dir MinorP3\DS
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp\MinorP3\DS

11/08/2010 09:42 PM <DIR>          .
11/08/2010 09:42 PM <DIR>          ..
11/08/2010 09:42 PM                1,281 CmdType.class
04/02/2010 09:06 PM                132 CmdType.java
11/08/2010 09:42 PM                129 Hashable.class
03/19/2010 07:52 PM                 79 Hashable.java
11/08/2010 09:42 PM                635 HashTable$1.class
11/08/2010 09:42 PM                4,358 HashTable.class
06/15/2010 01:40 PM                5,515 HashTable.java
11/08/2010 09:42 PM                862 probeOption.class
03/15/2010 08:38 PM                 69 probeOption.java
11/08/2010 09:42 PM                1,497 Record.class
06/15/2010 01:55 PM                1,273 Record.java
11/08/2010 09:42 PM                894 slotState.class
03/15/2010 08:39 PM                 72 slotState.java
11/08/2010 09:42 PM                979 Wolfe$1.class
11/08/2010 09:42 PM                6,874 Wolfe.class
06/15/2010 01:41 PM                8,228 Wolfe.java
                16 File(s)          32,877 bytes
                2 Dir(s)  24,883,818,496 bytes free
```

Java bytecode (class) files created during compilation.

To compile a single class in the package:



```
C:\Windows\system32\cmd.exe
F:\Temp>javac MinorP3\DS\Record.java
F:\Temp>dir MinorP3\DS
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp\MinorP3\DS

11/09/2010  02:26 PM    <DIR>          .
11/09/2010  02:26 PM    <DIR>          ..
04/02/2010  09:06 PM             132 CmdType.java
11/09/2010  02:26 PM             129 Hashable.class
03/19/2010  07:52 PM             79 Hashable.java
06/15/2010  01:40 PM          5,515 HashTable.java
03/15/2010  08:38 PM             69 probeOption.java
11/09/2010  02:26 PM          1,497 Record.class
06/15/2010  01:55 PM          1,273 Record.java
03/15/2010  08:39 PM             72 slotState.java
06/15/2010  01:41 PM          8,228 Wolfe.java
          9 File(s)          16,994 bytes
          2 Dir(s) 24,883,294,208 bytes free

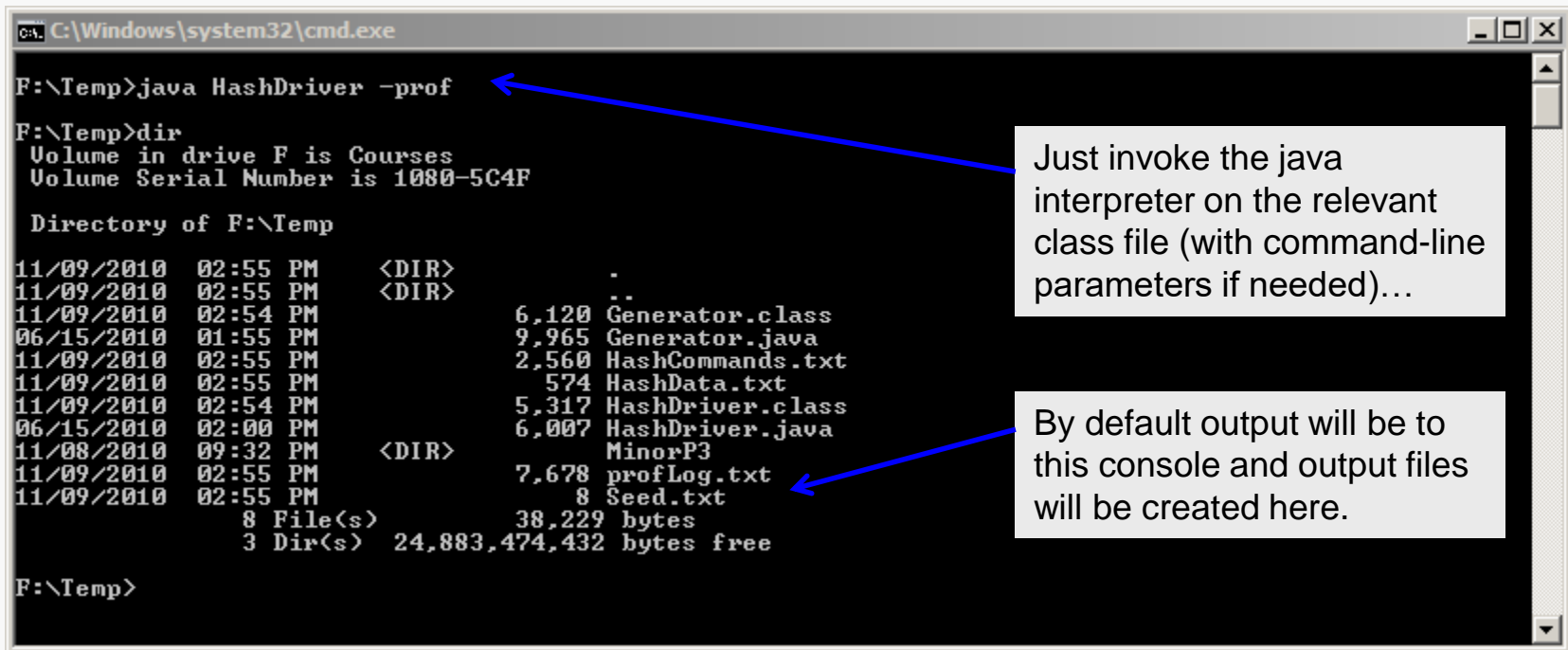
F:\Temp>
```

Java bytecode (class) files created during compilation.

Hashable.java was also compiled because it is referenced in Record.java.



If the "main" class is in the top-level directory (not in the package):



```
C:\Windows\system32\cmd.exe

F:\Temp>java HashDriver -prof
F:\Temp>dir
Volume in drive F is Courses
Volume Serial Number is 1080-5C4F

Directory of F:\Temp

11/09/2010  02:55 PM  <DIR>          .
11/09/2010  02:55 PM  <DIR>          ..
11/09/2010  02:54 PM                6,120 Generator.class
06/15/2010  01:55 PM                9,965 Generator.java
11/09/2010  02:55 PM                2,560 HashCommands.txt
11/09/2010  02:55 PM                 574 HashData.txt
11/09/2010  02:54 PM                5,317 HashDriver.class
06/15/2010  02:00 PM                6,007 HashDriver.java
11/08/2010  09:32 PM  <DIR>          MinorP3
11/09/2010  02:55 PM                7,678 profLog.txt
11/09/2010  02:55 PM                 8 Seed.txt
            8 File(s)                38,229 bytes
            3 Dir(s) 24,883,474,432 bytes free

F:\Temp>
```

Just invoke the java interpreter on the relevant class file (with command-line parameters if needed)...

By default output will be to this console and output files will be created here.

If the "main" class is in the package, invoke the interpreter from the top-level directory but specify the "path" to the main class file:

```
java MinorP3/DS/MyDriver
```