

Preparing for MTA Certification

MICROSOFT TECHNOLOGY ASSOCIATE (MTA)
STUDENT STUDY GUIDE FOR DEVELOPERS

- 98-361 Software Development Fundamentals**
- 98-362 Windows Development Fundamentals**
- 98-363 Web Development Fundamentals**
- 98-364 Database Administration Fundamentals**
- 98-372 Microsoft .NET Fundamentals**

Authors

Michael Teske (Windows Operating System). Michael has been teaching in the Network Specialist Program for 10 years at Northeast Wisconsin Technical College and has been involved as an engineer for 15 years. He has a passion for both teaching and technology and loves helping people find happiness in a career. Mike believes that learning technology should be fun, but he also recognizes that the networking field continually changes and can challenge even the brightest students. Mike also works as an independent consultant for several small businesses in northeast Wisconsin and enjoys bringing that real-world experience in to the classroom on a daily basis. Mike has become known as "the Microsoft Guy" on campus. His goal is to continue to teach network technology with the same enthusiasm and passion for many years to come and to help his students find the same joy and passion that he has found in an amazing industry.

Jeffrey Sonnleitner (Windows Operating System). Jeff is a lead Instructor in the Information Technologies department at Moraine Park Technical College (MPTC) in Fond du Lac, Wisconsin. Jeff teaches the Network Specialist degree program and the Advanced Technical Certificate in Information Security. Jeff is also certified to teach classes in international business. He is beginning his 10th year at MPTC, and enjoys teaching courses in networking, Microsoft servers, and information security. Jeff's goal is to help students succeed and enjoy their college experience in a future-focused learning environment. He was instrumental in developing MPTC's student exchange with technical colleges in Darmstadt, Germany, and he has led the college's student exchange programs for over six years. As an advisor to MPTC's student IT Club, he initiated annual tours to Silicon Valley. Prior to joining the faculty at MPTC, Jeff spent 14 years as an independent consultant, specializing in medical and dental office computer systems and software.

Tim McMichael (.NET Development). Tim has been a high school computer science teacher for the past 11 years. He currently teaches Advanced Placement computer science, .NET programming, and computer game programming at Raymond S. Kellis High School in Glendale, Arizona. Prior to teaching, Tim worked for several years as a database application developer. Tim is the author of the Software and Windows Development Exam Review Kits in the Developer Exam Review Kit series.

Tom Indelicato (.NET Development). Tom teaches computer science at Bishop Guertin High School in Nashua, New Hampshire for 11 years, including courses on Microsoft Office applications, Microsoft Visual Basic programming, AP computer science, and, most recently, autonomous robotics programming. Outside the classroom, he runs the school's FIRST Robotics team. Prior to teaching, Tom was a software engineer for 17 years.

Patricia Phillips (Authoring Manager). Patricia taught computer science for 20 years in Janesville, Wisconsin. She served on the Microsoft National K-12 Faculty Advisory Board and edited the Microsoft MainFunction website for technology teachers for two years. For the past five years, she has worked with Microsoft in a variety of roles related to K-12 curriculum development and pilot programs, such as the MTA Exam Review Kits and Student Study Guides, Expression Studio web design, and XNA game development. In her role as an author and editor, Patricia has written several articles and a student workbook on topics including computer science, web design, and computational thinking. She is currently the editor of the Computer Science Teachers Association newsletter, the *Voice*.

This content is only for use by or provision to students for their personal use.

Some examples depicted herein are provided for illustration only and are fictitious. No real association or connection is intended or should be inferred.

Microsoft and other trademarks listed at <http://www.microsoft.com/about/legal/en/us/IntellectualProperty/Trademarks/EN-US.aspx> are trademarks of the Microsoft group of companies. All other marks are property of their respective owners.

© 2010 Microsoft Corporation. All Rights Reserved. This content is provided "as-is" and Microsoft makes no warranties, express or implied.

Contents



Introduction	ix
Career Planning	x
Exploring Job Roles	xii
Value of Certification.....	xiv

98-361 SOFTWARE DEVELOPMENT FUNDAMENTALS

CHAPTER 1

Understanding Core Programming	3
1.1 Understand computer storage and data types.....	5
1.2 Understand computer decision structures.....	7
1.3 Identify the appropriate method for handling repetition.....	9
1.4 Understand error handling.....	11

CHAPTER 2

Understanding Object Oriented Programming	13
2.1 Understand the fundamentals of classes	15
2.2 Understand inheritance	17
2.3 Understand polymorphism.....	19
2.4 Understand encapsulation	21

CHAPTER 3 **Understanding General Software Development 23**

- 3.1 Understand application life-cycle management..... 25
- 3.2 Interpret application specifications..... 27
- 3.3 Understand algorithms and data structures 29

CHAPTER 4 **Understanding Web Applications 31**

- 4.1 Understand Web page development 33
- 4.2 Understand Microsoft ASP.NET Web application development.... 35
- 4.3 Understand Web hosting 37
- 4.4 Understand Web services 39

CHAPTER 5 **Understanding Desktop Applications 41**

- 5.1/5.2 Understand Windows Forms applications; Understand console-based applications 43
- 5.3 Understand Windows services 45

CHAPTER 6 **Understanding Databases 47**

- 6.1 Understand relational database management systems..... 49
- 6.2 Understand database query methods 51
- 6.3 Understand database connection methods 53

98-362 WINDOWS DEVELOPMENT FUNDAMENTALS**CHAPTER 1** **Understanding Windows Programming Basics 57**

- 1.1 Identify Windows application types 59

1.2	Implement user interface design.....	61
1.3	Create Windows-based applications by using Visual Studio.....	63

CHAPTER 2

	Creating Windows Forms Applications.....	65
2.1A	Create and handle events.....	67
2.1B	Create and handle events.....	69
2.2	Understand Windows Forms inheritance.....	71
2.3A	Understand how to create new controls and extend existing controls.....	73
2.3B	Understand how to create new controls and extend existing controls.....	75
2.4A	Validate and implement user input	77
2.4B	Validate and implement user input	79
2.5A	Debug a Windows-based application	81
2.5B	Debug a Windows-based application	83

CHAPTER 3

	Creating Windows Services Applications	85
3.1	Create a Windows Services application	87
3.2	Install a Windows Services application.....	89

CHAPTER 4

	Accessing Data in a Windows Forms Application	91
4.1	Understand data access methods for a Windows Application....	93
4.2A	Understand databound controls (Databinding)	95
4.2B	Understand databound controls (Validating databound items) ...	97

CHAPTER 5**Deploying a Windows Application 99**

- 5.1A Understand Windows application deployment methods 101
- 5.1B Understand Windows application deployment methods 103
- 5.2 Create Windows setup and deployment projects 105

98-363 WEB DEVELOPMENT FUNDAMENTALS**CHAPTER 1****Programming Web Applications 109**

- 1.1 Customize the layout and appearance of a Web page 111
- 1.2 Understand ASP.NET intrinsic objects 113
- 1.3 Understand state information in Web applications 115
- 1.4 Understand events and control page flow 117
- 1.5 Understand controls 119
- 1.6 Understand configuration files 121

CHAPTER 2**Working with Data and Services 123**

- 2.1 Read and write XML data 125
- 2.2 Distinguish between DataSet objects and DataReader objects 127
- 2.3 Call a service from a Web page 129
- 2.4 Understand DataSource controls 131
- 2.5 Bind controls to data by using data-binding syntax 133
- 2.6 Manage data connections and databases 135

CHAPTER 3**Troubleshooting and Debugging Web Applications 137**

- 3.1 Debug a Web application 139
- 3.2 Handle Web application errors 141

CHAPTER 4 **Working with Client-Side Scripting 143**

- 4.1 Understand client-side scripting 145
- 4.2 Understand AJAX concepts 147

CHAPTER 5 **Configuring and Deploying Web Applications 149**

- 5.1 Configure authentication and authorization 151
- 5.2 Configure projects and solutions and reference assemblies 153
- 5.3 Publish Web applications 155
- 5.4 Understand application pools 157

98-364 DATABASE ADMINISTRATION FUNDAMENTALS**CHAPTER 1** **Understanding Core Database Concepts 161**

- 1.1 Understand how data is stored in tables 163
- 1.2 Understand relational database concepts 165
- 1.3 Understand data manipulation language (DML) 167
- 1.4 Understand data definition language (DDL) 169

CHAPTER 2 **Creating Database Objects 171**

- 2.1 Choose data types 173
- 2.2 Understand tables and how to create them 175
- 2.3A Create views using T-SQL 177
- 2.3B Create views using a graphical designer 179
- 2.4 Create stored procedures and functions 181

CHAPTER 3	Manipulating Data.....	183
3.1A	Select data utilizing SELECT with simple queries	185
3.1B	Select data utilizing SELECT with complex queries.....	187
3.2	Insert data.....	189
3.3	Update data	191
3.4	Delete data	193
CHAPTER 4	Understanding Data Storage	195
4.1	Understand normalization	197
4.2	Understand primary, foreign, and composite keys	199
4.3	Understand indexes.....	201
CHAPTER 5	Administering a Database	203
5.1	Understand database security concepts	205
5.2	Understand database backup and restore	207
CHAPTER 6	Database Concepts Review.....	209
	Database administration fundamentals review.....	211

98-372 MICROSOFT .NET FUNDAMENTALS

CHAPTER 1	Understanding .NET Framework Concepts.....	215
1.1	Understand basic application settings	217
1.2	Understand events and event handling in the .NET Framework ..	219
1.3	Understand structured exception handling in the .NET Framework.....	221

CHAPTER 2**Understanding Namespaces and Classes in the .NET Framework .223**

2.1 Understand .NET class hierarchies.....	225
2.2 Understand Object Oriented Concepts in the .NET Framework. .	227
2.3 Understand .NET namespaces.....	229
2.4 Understand and create class libraries.....	231
2.5 Understand and use different data types in the .NET Framework.....	233
2.6 Understand generics	235

CHAPTER 3**Understanding .NET Code Compilation237**

3.1 Understand the fundamentals of Microsoft Intermediate Language and Common Language Infrastructure	239
3.2 Understand the use of strong naming	241
3.3/3.4 Understand version control; Understand assemblies and metadata.	243

CHAPTER 4**Understanding I/O Classes in the .NET Framework245**

4.1 Understand .NET file classes.....	247
4.2 Understand console I/O	249
4.3 Understand XML classes in the .NET Framework	251

CHAPTER 5**Understanding Security253**

5.1/5.2 Understand the System.Security namespace; Understand authentication and authorization.....	255
--	-----

CHAPTER 6 **Understanding .NET Languages.....257**

- 6.1 Understand language interoperability 259
- 6.2 Understand type safety..... 261

CHAPTER 7 **Understanding Memory Management****263**

- 7.1 Understand resource allocation..... 265
- 7.2 Understand the difference between managed
and unmanaged applications..... 267

Introduction



MTA validates building-block technology concepts and helps students explore, discover and pursue successful careers in Information Technology (IT) in an exciting and rewarding way! As the first step in the Microsoft Technology Certification Series, this new, entry-level certification provides students with confidence, credibility, and differentiation.

Explore IT career options without committing a lot of time and resources MTA exams validate the core technology knowledge that is in demand today by businesses around the world. Whether you want to explore becoming a network administrator, software engineer, web developer, or database analyst, MTA gets you started on the right path.

Prepare to compete A little investment in IT can go a long way in today's job market. Becoming MTA certified helps you build a solid foundation to prepare for intermediate technology studies and for Microsoft Certified Technology Specialist (MCTS) certifications. It can also help you compete on college admissions and jumpstart your IT career planning!

Empower yourself As the first step toward becoming an MCTS, MTA shows your commitment to technology while connecting you with a community of more than five million Microsoft Certified Professionals. Learn from them and show them what you know by becoming MTA certified!

This MTA Student Study Guide serves as a study tool to help students prepare for their MTA certification exam. Students are challenged with real-life situations for each of the major topics covered in the exam. Although successful completion of the study guide exercises does not guarantee that you will pass your MTA exam, it is an excellent way to gauge your readiness to take the exam and build confidence that you know your stuff on exam day.

I wish you all the best as you prepare for a successful career in technology!

Victoria Pohto

Victoria Pohto
MTA Product Marketing Manager

Career Planning



Most IT solutions or infrastructure built on Microsoft technologies require proficiency with one or all of the following products, often referred to as "The Microsoft Stack."

- Microsoft Windows® Server® as the data center or development platform
- Microsoft SQL Server® as the data and business intelligence (BI) platform
- Microsoft Visual Studio® as the suite of application life-cycle management tools

MTA is the starting point of Microsoft technology certifications, providing aspiring technologists with the fundamental knowledge essential to succeed with continued studies and a successful career with technology.

Preparing for and becoming MTA certified helps you explore a variety of career paths in technology without investing a lot of time and money in a specialized career path. When you find a path that is right for you, Microsoft learning products and certification can help you prepare and guide your longer-term career planning.

If you already know that you want to start building a career in technology, MTA preparation and certification is the recommended entry point. Becoming MTA certified shows that you have a firm working

knowledge of the fundamental IT concepts critical for success with intermediate learning and certifications such as Microsoft Certified Technology Specialist (MCTS). Moreover, Microsoft certifications demonstrate an individual's commitment of self-investment and confidence to take his or her knowledge and skills to the next level with an industry-recognized credential.

MTA is not a "career certification," meaning that employers recognize you as "job ready," but it is the first step toward that career goal and can help differentiate you for an internship or to college admissions committees. As you prepare for your first job focusing on technology, be sure that you are equipped with an MCTS credential—the intermediate level certification that validates Microsoft product and technology skills.

The MTA Certification path on the next page shows you the MTA exams that are recommended prior to taking on some of Microsoft's intermediate technology certification, MCTS.

Microsoft Technology Associate Certification Paths

MTA is the first step in the Microsoft® Technology Certification Series. MTA is a recommended but not required pre-requisite to MCTS exams. One certification is earned for each exam passed. Free Student Study Guides are available for download at www.certiport.com/mta.

IT PRO

DEVELOPER

DATABASE

CAREERS

SPECIALIST

ASSOCIATE

Entry Level Jobs in:
Network Administration
Server Administration

Entry Level Jobs in:
Security Administration
Identity and Access Management

Entry Level Jobs in:
Desktop Deployment
Desktop Support

MCTS
Windows Server 2008, Network Infrastructure
EXAM 72-642

MCTS
Windows Server 2008, Active Directory
EXAM 72-640

MCTS
Windows 7, Configuring
EXAM 72-680

MTA
Windows Server Administration Fundamentals
EXAM 98-365

MTA
Windows OS Fundamentals
EXAM 98-349

MTA
Security Fundamentals
EXAM 98-367

MTA
Networking Fundamentals
EXAM 98-366

Entry Level Jobs in:
Windows Development
Software Engineering

Entry Level Jobs in:
Web Development Software Engineering

MCTS
.NET Framework 4, Windows Applications
EXAM 72-511

MCTS
.NET Framework 4, Web Applications
EXAM 72-515

MTA
Windows Dev Fundamentals
EXAM 98-362

MTA
Web Development Fundamentals
EXAM 98-363

MTA
.NET Fundamentals
EXAM 98-372

MTA
Software Development Fundamentals
EXAM 98-361

Entry Level Jobs in:
Database Administration
Database Engineering

Entry Level Jobs in:
Database Development
Business Intelligence Development

MCTS
SQL Server 2008, Implementation and Maintenance
EXAM 72-432

MCTS
SQL Server 2008, Database Development
EXAM 72-433

MTA
Database Administration Fundamentals
EXAM 98-364

For full Microsoft Certification roadmaps, visit <http://www.microsoft.com/learning/certification>

©2011 Microsoft Corporation. All rights reserved.

Exploring Job Roles



Choosing a career path is a big decision and it's not always easy, but you're not alone! Microsoft created a career site to help students understand the options and possibilities of pursuing a career in IT. The site also connects you with learning resources, student techie communities, and much more to help you prepare for a career in technology.

To chart your career with Microsoft technology, visit www.microsoft.com/learning/career/en/us/career-org-charts.aspx.

Database Administrator



As a database administrator, you are in charge of important databases that span multiple platforms and environments. You are a strong team player who thrives in a fast-paced environment. You build complex, highly scalable databases that meet business needs and security requirements. You are an expert in optimizing, maintaining, and troubleshooting databases, but also in designing archival, data distribution, and high-availability solutions.

Server Administrator



As a server administrator, you are in charge of implementing and managing some of the most important technology in your organization—the servers. You use extensive monitoring and profiling tools to manage the network and tune systems so they perform at optimal levels. You are an expert in Active Directory®, and you have an in-depth understanding of network protocols, and file and directory security.

Computer Support Technician



Consider starting your IT career by becoming a consumer support technician. You don't need any formal work experience, but a company might require that you know how to install, administer, and troubleshoot operating systems in a home network environment that has desktop computers, laptops, and printers. As a consumer support technician, you'll also handle network, virus, malicious software, and hardware support issues. You'll typically find this position in small to medium-sized organizations.

Exploring Job Roles



Web Developer

 As a web developer, you are an expert in using the dynamic programming tools and languages that fuel the web. You might work independently or be part of a team that builds and integrates interactive web sites, applications, and services for both internal and public sites. Your role is to make it work, which means developing web applications and testing them on various browsers, enhancing and modifying them as necessary to ensure the best experience for the user. As a web developer, you might also architect websites, design data-driven applications, and find efficient client-server solutions. You must have an in-depth understanding of the software development life cycle and be able to communicate project status, issues, and resolutions.

Windows Developer

 As a Windows client developer, knowing how to optimize Windows code and track bugs is a given. But you also know how to use Microsoft Visual Studio® and the Microsoft .NET framework to design, develop, test, and deploy Windows-based applications that run on both corporate servers and desktop computers. Your key talents include understanding multiple Windows application models

and n-tier applications, and knowing how to work with object-oriented programming, algorithms, data structures, and multithreading. Windows developers have an in-depth understanding of software engineering principles, software life cycles, and security principles.

Additional Online Resources for New Developers:

<http://msdn.microsoft.com/beginner>

<http://msdn.microsoft.com/rampup>

Imagine Cup



The Imagine Cup is the world's premier student technology competition where students from

around the world can learn new skills, make new friends, and change the world. Competitions include Software Design, Embedded Development, Game Design, Digital Media and Windows Phone 7. The brightest young minds harness the power of technology to take on the world's toughest problems.

www.imaginecup.com

Value of Certification



Technology plays a role in virtually everything we do. In the 20-plus years since Microsoft has been certifying people on its products and technologies, millions of people have gained the knowledge, expertise, and credentials to enhance their careers, optimize business solutions, and create innovation within just about every business and social sector imaginable. Today's Information Technology (IT) hiring managers are more often using professional credentials, such as Microsoft certification, to identify properly skilled IT candidates. Certification becomes a way to easily differentiate qualified candidates in a sea of resumes.

The job outlook for IT professionals, as reported in a study prepared by the U.S. Department of Labor's Bureau of Labor Statistics (BLS), is positive! The BLS indicates an increase that will be "faster than the average for all occupations through 2014" for Computer Support Specialists, Systems Engineers, Database Administrators, and Computer Software Engineers. One significant message resulting from this study is that information and communications

technology (ICT) skills are the entry ticket to the job market, regardless of the country, industry, or job function. Information Technology is clearly an area worth investing time, resources, and education in – and technology certification is a key part of the education process, validating product and technology expertise as a result of their learning experiences.

Microsoft IT Certifications provide objective validation of the ability to perform critical IT functions successfully for worldwide IT professionals, developers, and information workers. Microsoft certifications represent a rich and varied spectrum of knowledge, job roles, and responsibilities. Further, earning a specific certification provides objective validation of the candidate's ability to perform critical IT functions successfully. Embraced by industry professionals worldwide, Microsoft certification remains one of the most effective ways to help reach long-term career goals.



MTA 98-361

SOFTWARE DEVELOPMENT FUNDAMENTALS

1



Understanding Core Programming

IN THIS CHAPTER

- 1.1 Understand computer storage and data types
- 1.2 Understand computer decision structures
- 1.3 Identify the appropriate method for handling repetition
- 1.4 Understand error handling





OBJECTIVE

UNDERSTANDING CORE PROGRAMMING 1.1

Understand computer storage and data types

SCENARIO: Ken is a soccer coach who has a difficult time keeping track of all of his players: At the beginning of the season, each of his players filled out a paper with personal data, but it always takes him a long time to find the information he needs.

Cassie is one of his brightest players, and Ken knows that she's a computer programmer. Tired of shuffling through the huge stack of papers, he asks her to create a program to keep track of his records. The program will need to store each player's full name, jersey number, age, gender, height and weight, as well as goals scored and number of games played.

Cassie agrees to develop the software for him, but she has some decisions to make . . .

- 1. Which of the following data types would be the best choice for keeping track of players' ages and jersey numbers using the least amount of memory?**
 - a. short
 - b. byte
 - c. int
- 2. As with any program, some data will be stored on the *heap*, while other data is placed on the *stack*. Which of the following will be stored on the heap?**
 - a. player's name
 - b. height
 - c. age
- 3. It would make sense to store one of these variables as a *char*. Which one?**
 - a. player's name
 - b. weight
 - c. gender

hint

Remember: String is a reference data type.

Answers

1. A good choice for keeping track of jersey numbers and ages is:
 - b. **byte.** It uses the least amount of memory, but still holds numbers up to 255—more than enough for ages or jersey numbers!
2. Player data that will be stored on the heap includes:
 - a. **player's name.** This will be stored as a String.
3. The variable that could be stored as a `char` is:
 - c. **gender.** 'M' for males, 'F' for females!

Essential details

- Integral data types, such as byte, integer, short, and long store whole numbers—such as the number of goals a player has scored.
- Floating point data types, like float, single, and double can represent numbers that include fractional data, such as a player's height.
- Value data types go on the stack; reference data types go on the heap. Look at the first vowel in each to help you remember: `Value` = `stack`. `Reference` = `heap`.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/ff715351.aspx>
- <http://msdn.microsoft.com/en-us/library/ms173104.aspx>
- <http://msdn.microsoft.com/en-us/library/asz1fz8b.aspx>

track
your score

_____ /3



OBJECTIVE

UNDERSTANDING CORE PROGRAMMING 1.2

Understand computer decision structures

SCENARIO: Reina has created a simple DVR application to record her favorite television programs, but her code has some bugs. She's a big sports fan and always wants to record the broadcasts of sporting events, even if they conflict with another of her favorite programs.

For non-sport favorites, she does not want to record reruns; however, if the scheduled time of a favorite program conflicts with another favorite and will be broadcast again later, she wants to wait and record it in the future.

Unfortunately, her program is not working correctly. Many television programs that she doesn't want are being recorded; the programs she DOES want are only being recorded if they are broadcast later.

The C# code (with line numbers added) of Reina's DVR program looks like this:

```
1: if (isSportsEvent) {  
2:     RecordShowNow();  
3: }  
4: else {  
5:     if (!isConflict || !isRerun) {  
6:         RecordShowNow();  
7:     }  
8:     if (isConflict && isOnLater); {  
9:         RecordShowLater();  
10:    }  
11: }
```

- 1. Which line is causing shows to be recorded now even if there is a conflict?**
 - a. line 4
 - b. line 5
 - c. line 8

2. How should line 8 be rewritten?

- a. if (isOnLater); {
- b. if (isConflict || isOnLater); {
- c. if (isConflict && isOnLater) {

3. Reina has placed two control structures (lines 5–7 and lines 8–10) inside her first control structure. This technique is known as:

- a. parenting
- b. encapsulating
- c. nesting

hint

Indentation used in the code is good programming style, but it has no effect on the execution of the statement.

Answers

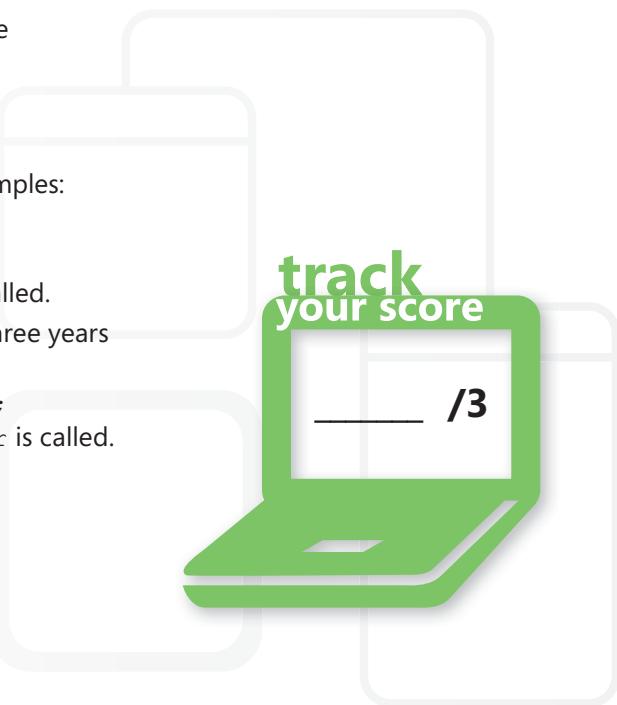
1. Shows are being recorded now even if there is a conflict because:
 - b. **Line 5.** The conditional-OR (||) returns true if the show isn't a rerun, even if `isConflict` is true.
2. Line 8 should read:
 - c. `if (isConflict && isOnLater) {`The semicolon at the end of the line terminates the conditional—`RecordShowLater()` will always be called.
3. Placing control structures inside other control structures is called:
 - c. **nesting**

Essential details

- The code in the parentheses of an if-statement must be a complete Boolean ("conditional") expression. Example:
 - "If a person is at least 18 years old, that person will vote"
`if (age > 18) vote();`
- Logical operators allow programmers to join two expressions. Examples:
 - "I will stay home if it's raining OR if it's snowing." (logical-OR)
`if (isRaining | isSnowing) stayHome();`
If EITHER is true, the entire expression is true; `stayHome` is called.
 - We will buy a new computer if the current one is more than three years old AND computers are on sale. (logical-AND)
`if (computerAge > 3 & isOnSale) buyComputer();`
If BOTH are true, the entire expression is true; `buyComputer` is called.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308749.aspx>
- <http://msdn.microsoft.com/en-us/library/8y82wx12.aspx>



track
your score



OBJECTIVE

UNDERSTANDING CORE PROGRAMMING 1.3

Identify the appropriate method for handling repetition

SCENARIO: Adriana is creating a point-of-sale (cash register) application for Fourth Coffee. Her responsibility is to create a password-protected login system to ensure security of the system. She has finished the login window and password check, but she is having trouble implementing it correctly.

Adriana's project manager wants the system to give the user three attempts to login correctly before locking the system. In Adriana's most recent version, the system prompts the user for a name and password three times—even if the user correctly logs in on the first try. After the third attempt, the system always locks—even if the input is correct.

- 1. Adriana is using a `for` loop, which works best when:**
 - a. the number of iterations is known and is unlikely to change during execution
 - b. the number of iterations is known but is likely to change during execution
 - c. the number of iterations is unknown
- 2. What control structure would be best for Adriana's login system?**
 - a. `for` loop
 - b. `while` loop
 - c. a recursive method
- 3. How many times does a `do...while` loop execute?**
 - a. at least zero times
 - b. at least one time
 - c. at least two times

hint

An “iteration,” in this context, is one trip through the loop.

Answers

1. for loops work best when:
 - a. **the number of iterations is known and is unlikely to change**
2. The best control structure for this situation is:
 - b. **while loop.** The number of times the loop will need to be executed is uncertain: It depends on the data entered by the user. In this case, a while loop (or do..while) is usually the best choice.
3. How many times does a do..while loop execute?
 - b. **at least one time.** Unlike a do..while loop, a while loop may not execute at all!

Essential details

- The for loop executes a statement, or a block of statements, based on the value of a control variable (also called a counter). Example:

```
for (int i = 0; i < 10; i++)
    Console.WriteLine(i);
```

Note: `i` (the control variable) is initialized to zero. The loop will continue as long as `i` is less than 10. After each iteration, `i` is incremented.

- The while loop executes a statement or block of statements repetitively based on a Boolean expression. You can think of it as a repeating if statement. Example:

```
int i = 0;
while (i < 10)
{ Console.WriteLine(i);
    i++;}
```

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/32dbftby.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308747.aspx>

Note: This loop is essentially identical to the for loop example. The Boolean expression is checked before the loop executes, so it may never run at all. For instance, if `i` was initialized to 20, the expression would evaluate to false and the loop would not execute.

- The do..while loop is similar to a while loop, but the Boolean expression is not checked until after the code executes. Example:

```
int i = 0;
do { Console.WriteLine(i);
    i++;} while (i < 10);
```

Note: Even if `i` is initialized to 20 (instead of 0), the loop will execute one time before the Boolean expression is evaluated.

track
your score

/3



OBJECTIVE

UNDERSTANDING CORE PROGRAMMING 1.4

Understand error handling

SCENARIO: Lionel is a student at the School of Fine Art. To help pay his tuition, he took a job in the school's student records department. He developed a program that calculates each student's grade point average (GPA). He thought it would be simple, because he knows that the formula is:

total grade points divided by total credit hours attempted

However, Lionel's program crashes with new students who have not attempted any credit hours, instead of just giving them a GPA of 0.0. Here is his code in C# (line numbers added):

```
1: double GPA;  
2: GPA = totalGP / creditHoursAttempted;  
3: Console.WriteLine(GPA);
```

- 1. Given what we know about the problem, what is the most likely exception this code will throw?**
 - a. DivideByZeroException
 - b. NullReferenceException
 - c. StackOverflowException
- 2. What structure should Lionel use to handle the exception?**
 - a. do-catch
 - b. catch-exception
 - c. try-catch
- 3. Which of the following should Lionel's catch-block probably include?**
 - a. creditHoursAttempted = 1.0;
 - b. totalGP = 4.0;
 - c. GPA = 0.0;

hint

An exception is an error that cannot be detected by the compiler but occurs when the program is executed. It is referred to as a "run-time error."

Answers

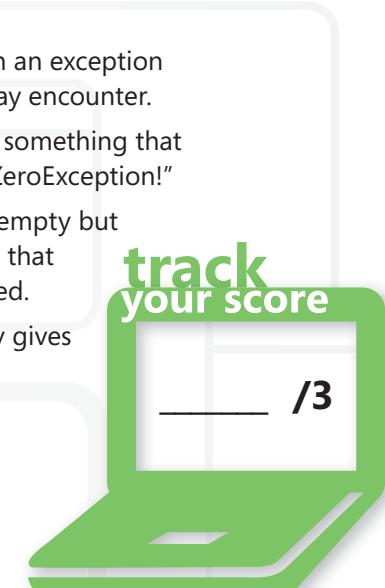
1. The exception most likely creating the problem is:
 - a. **DivideByZeroException.** If a student's creditHoursAttempted is zero, an exception will occur.
2. The structure that will handle the exception is:
 - c. **try-catch**
3. Lionel's catch-block should probably include:
 - c. **GPA = 0.0;** Because the division has already been attempted, there's no reason to change the values used in the calculation.

Essential details

- An **exception** is an object that contains information about an error.
- Developers use the terms *throw* and *catch* when talking about exceptions. When an exception occurs it is *thrown*. Therefore, you should *catch* any exceptions your program may encounter.
- Think of a `try` statement as a warning to the computer that you're about to try something that may not work. "I'm going to do some division, and it might result in a DivideByZeroException!"
- The `catch` block executes if the exception does occur. You can leave this block empty but generally it's good to put your "backup plan" in the catch block. In Lionel's case, that means setting the GPA to 0.0. If no exception is thrown, the catch block is skipped.
- A try-catch structure doesn't prevent the exception from being thrown, it simply gives the developer a chance to keep the program from crashing.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms173160.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308817.aspx>



track
your score

— /3

2



Understanding Object Oriented Programming

IN THIS CHAPTER

- 2.1 Understand the fundamentals of classes
- 2.2 Understand inheritance
- 2.3 Understand polymorphism
- 2.4 Understand encapsulation





OBJECTIVE

UNDERSTANDING OBJECT ORIENTED PROGRAMMING 2.1

Understand the fundamentals of classes

SCENARIO: Tailspin Toys is developing a simple, robotic dog for small children. The dog will connect to a computer via a USB cable, and kids will be able to use a simple application to personalize the toy to their liking. Although the hardware is nearly complete, Tailspin has not yet created the software that owners will use to customize their toy dog. Viktor has been hired to begin work on the software.

Initially, Viktor will need to design a class to represent the dogs. Naturally, the class will be named `Dog`. The toy—and therefore the `Dog` class—will need to keep track of the dog's name, age, and gender, and it will be able to bark, walk, wag its tail, and sit.

So far, he has written the following C# code

```
public class Dog {  
    public Dog() {  
        name = "Hugo";  
        age = 1;  
        gender = 'M';  
    }  
}
```

- 1. Which of the following would be a property in the `Dog` class?**
 - a. bark
 - b. name
 - c. `Dog()`
- 2. To create a `Dog` with a different name, age, or gender, Viktor should add:**
 - a. another constructor
 - b. more properties
 - c. a creation event

- 3. Which line of code correctly creates a new `Dog` in C#?**
 - a. `Dog hugo = Dog.new();`
 - b. `Dog hugo = new Dog();`
 - c. `new Dog hugo = Dog();`

hint

Many classes have more than one constructor.

Answers

1. Which member is a property?
b. **name**
2. To create a different Dog, Viktor should add:
a. **another constructor**
3. Which C# code creates a Dog?
b. **Dog hugo = new Dog();**

Essential details

- An object often represents something from the real world; in this case, the Dog class represents the robotic toy (or, it simply represents a dog).
- In object-oriented design, verbs (such as barking, walking, tail-wagging, and sitting) are typically **methods**; attributes (such as name, age, and gender) are **properties** or **fields**.
- A **field** is a variable declared within a class; a **property** provides a simple way to access the data stored in a field.
- A **class** is like a blueprint. It defines the properties and methods that all objects of that class will have in the same way a blueprint defines the attributes of a house.
- Multiple objects can be created from a class, or **instantiated**. Similarly, many houses can be built from one blueprint.
- Objects are instantiated (created) with the `new` keyword.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms173109.aspx>
- <http://msdn.microsoft.com/en-us/library/x9afc042.aspx>
- <http://msdn.microsoft.com/en-us/library/x9fsa0sw.aspx>

track
your score

_____ /3



OBJECTIVE

UNDERSTANDING OBJECT ORIENTED PROGRAMMING 2.2

Understand inheritance

SCENARIO: As Tailspin Toys continues to develop its robotic dog toy, early marketing tests reveal that customers would like to choose from different breeds of robotic dogs. As a result, Tailspin has decided to create three variations: a poodle, a bulldog, and a golden retriever. The company has indicated that they will consider adding additional breeds in the future. The breeds will have a set of common attributes and behaviors, but each breed may have some unique capabilities.

This presents some challenges for Viktor as he designs the software children will use to customize the dogs.

He doesn't want to write all of his code three times—once for each breed. He also doesn't want future programmers to create new breeds that are not compatible with his original design. Since Viktor realizes that a poodle "is a" dog, and the same is true for the other breeds, Viktor decides to use inheritance.

- 1. In Viktor's new design, Poodle, Bulldog, and GoldenRetriever are all:**

- a. abstract classes
- b. base classes
- c. derived classes

- 2. To allow breeds to reuse code, and to help ensure that future breeds are compatible, Dog could be declared as:**

- a. abstract
- b. derived
- c. sealed

- 3. Which of the following are NOT going to be inherited by the three derived classes?**

- a. constructors
- b. properties
- c. methods

hint

Base classes are referred to as "parent" classes or "superclasses;" derived classes are referred to as "child" classes or "subclasses."

Answers

1. In this design, the three breeds are:
c. **derived classes**
2. To take advantage of code reuse, the `Dog` should be declared as:
a. **abstract**. Abstract classes cannot be instantiated, but implemented methods will be shared by all derived classes.
3. Which of these will NOT be inherited by the derived classes?
a. **constructors**

Essential details

- **Inheritance** allows you to create new classes that reuse, extend, and modify the behavior that is defined in other classes.
- **Derived** classes inherit all the members of the base class, except for constructors and destructors.
- Use the “is a” test to see if inheritance is appropriate. In Viktor’s case, a `Poodle` *is a* `Dog`, a `Bulldog` *is a* `Dog`, and a `GoldenRetriever` *is a* `Dog`; therefore, his use of inheritance is correct. However, a `Tarantula` is *not a* `Dog`, so if Tailspin decides to make robotic spiders, they’ll need a new base class. Otherwise, the spider would bark and wag its tail!
- An **abstract** class cannot be instantiated. In other words, Tailspin can no longer make a robotic dog—each toy will have to be a poodle, bulldog, or golden retriever.
- **Interfaces** are similar to abstract classes, but it does not have to adhere to the “is a” guideline. If Tailspin *did* decide to make robotic spiders, Viktor could create an interface that both dogs and spiders could implement. Perhaps it would be called `IRobotic`.
- In C#, a colon is used to indicate inheritance, as in this example:

```
public class Poodle : Dog
```

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms173149.aspx>
- <http://msdn.microsoft.com/en-us/library/ms173150.aspx>

track
your score

_____ /3

Understand polymorphism

SCENARIO: Viktor's work with Tailspin Toys' robotic dogs is progressing well. He knows that his software for personalizing the dogs will be popular with customers. Viktor feels that his basic class design ideas are good and he's ready to think about the details, as long as the engineers and marketers stop making changes!

Viktor knows that while all dogs share some common behaviors, such as barking, that bark may be very different from one breed to the next. The Bark method he creates for a Poodle will need to be different from the Bark method he implements for a GoldenRetriever.

In his Dog class, he's created a few methods. Here are the headers, written in C#:

```
public void Bark() { ... }  
public void WagTail() { ... }  
public void Walk() { ... }
```

- 1. To be able to override these methods in the derived classes, what modifier should Viktor add to all three headers?**
 - a. new
 - b. static
 - c. virtual
- 2. How can Viktor invoke the Bark method in the Dog class from within a derived class?**
 - a. Bark()
 - b. Dog.Bark()
 - c. base.Bark()
- 3. What should Viktor do if he wants the Bulldog class to just use the Walk method from Dog?**
 - a. Implement Walk in Bulldog, copying and pasting the code from Dog
 - b. Implement Walk in Bulldog and simply call Dog's Walk method
 - c. Do not implement Walk in Bulldog

hint

Overriding a method allows a derived class to have its own implementation, different from other derived classes.

Answers

1. What modifier should Viktor add to the three methods?
c. **virtual**
2. How can Viktor invoke the Dog's Bark() method?
c. **base.Bark()**. The `base` keyword is used to access members of the base class.
3. How should Viktor retain the base class's `Walk` method in a derived class?
c. **Do not implement Walk in Bulldog**. No need to call `base.Walk()`—if a derived class does not override an inherited method, the base class's method will automatically be used.

Essential details

- Important keywords:
 - `base`: Used to access members of the base class from within a derived class.
 - `virtual`: Allows a method's implementation to be overridden in a derived class.
 - `sealed`: When applied to a class, prevents other class from inheriting from it; when applied to a member, prevents that member from being overridden by other classes.
 - `new`: When used as a modifier, this hides a base class member; the new member replaces the implementation in the base class. *Note: This is different than the `new` operator used to instantiate an object!*
 - `override`: Required to replace an inherited member.
- The following C# code shows how Viktor can replace Dog's methods in his derived classes (assuming he corrects Dog as indicated by question 1):

```
public override void Bark() { ... }  
public override void WagTail() { ... }  
public override void Walk() { ... }
```

track
your score

_____ /3

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms173152.aspx>
- <http://msdn.microsoft.com/en-us/library/ms173153.aspx>

Understand encapsulation

SCENARIO: Viktor has done a great job designing software to customize Tailspin Toys' robotic dogs. So great, in fact, that his boss wants to give him a promotion. Unfortunately, that means Viktor won't be able to finish writing the software himself; instead, a new developer will take over the project. On the new developer's first day, however, she accidentally sets the robot's age to -237 and crashes the program.

To ensure that the new developer doesn't damage code that already works, Viktor decides to "black box" the code he's already implemented. This means that the new developer won't need to see Viktor's code, but will be able to use it as she continues the project. Viktor can also ensure that values are checked before any changes are made so that a dog doesn't end up with a negative age.

- 1. Viktor has implemented several methods in the Dog class that he uses for Bark, such as OpenMouth and CloseMouth. He doesn't want those methods to be called by any derived classes. Which access modifier should he use for those "black-boxed" methods?**
 - a. public
 - b. protected
 - c. private
- 2. Viktor's primary methods, Bark, Sit, Walk, and WagTail should be accessible from anywhere in the project. Which access modifier should he use for those methods?**
 - a. public
 - b. protected
 - c. private
- 3. Which of the following provides a means for reading and/or modifying private attributes?**
 - a. an interface
 - b. a constructor
 - c. a property

hint

In C# and Visual Basic, properties provide "getter" and "setter" (also called "accessor" and "mutator") functionality for instance variables.

Answers

1. Which accessibility should Viktor's "black boxed" methods use?
c. **private**
2. Which accessibility level should Viktor use for his primary methods?
a. **public**
3. Reading and/or modifying `private` attributes is provided by:
c. **a property**

Essential details

- This type of "black boxing" is often referred to as **encapsulation**.
- In keeping with the principle of encapsulation, instance variables (attributes or fields) should be given the most restrictive accessibility level possible. That means making instance variables `private` whenever possible.
- Instance variables of base classes are often defined as `protected`; this allows derived classes (such as the `Poodle` class) access to the data, while still hiding the data from other parts of the program.
- One important reason for restricting access to data is to ensure validity when data is changed. Remember when the new developer tried to set the `age` attribute to a negative number? Likewise, the `gender` attribute should not accept a value of "green."

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms173121.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308891.aspx>

track
your score

_____ /3

3



Understanding General Software Development

IN THIS CHAPTER

- 3.1 Understand application life-cycle management
- 3.2 Interpret application specifications
- 3.3 Understand algorithms and data structures





OBJECTIVE

UNDERSTANDING GENERAL SOFTWARE DEVELOPMENT 3.1

Understand application life-cycle management

SCENARIO: Nupur has been named Project Manager of a new reservation system for Blue Yonder Airlines. She will lead a team of developers tasked with all phases of the application life cycle.

Napur and her team met with managers from each branch of the company and discussed the company's needs and the basic features that everyone requires. The application will be web-based, and will allow Blue Yonder's customers to search flights, book reservations, and check in online.

After the meeting, Napur and her developers began outlining the program from their perspective. Although they haven't begun coding, the developers are beginning to sketch out the classes and objects of the project using UML. Their outline is not complete, but a plan for accomplishing the required tasks is coming together. Napur wants to divide the job in such a way that team members can work on different parts of the program at the same time.

- 1. Napur's meeting with the company's managers is part of which stage of the application life cycle?**
 - a. Design
 - b. Development
 - c. Planning

- 2. The use of UML in this scenario:**
 - a. is a waste of time because they haven't started writing code.
 - b. helps ensure that different components will work together when finished.
 - c. helps ensure that the clients understand how the team will create the software.

- 3. As the team writes code, Napur will ask each team to test their classes independently. What is this strategy called?**
 - a. Load testing
 - b. Unit testing
 - c. Integration testing

hint

Developers may use different names for the stages or phases of managing the application life cycle, but the basic process is the same!

Answers

1. Napur's meeting was the:
 - c. **Planning** stage of the application life cycle. Planning (also called *envisioning*) includes gathering the client's needs and requirements; in this case, the rest of the company is Napur's client.
2. Napur's use of UML:
 - b. **helps ensure that different components will work together when finished.** The clients probably don't need to know how to organize the actual development!
3. Testing individual components separately is called:
 - b. **Unit testing**

Essential details

- The phases of application life cycle management (ALM) are: planning, designing, developing, testing, and maintenance.
- The ALM process is iterative, meaning that it repeats. When the application is deployed, new issues or feature requests are likely to come up, so the process starts again.
- Notice that actually writing code (developing) is only a small part of the overall process.
- UML stands for Unified Modeling Language. It provides a way to create visual models of the different components of an application.
- Many programmers are familiar with "class diagrams" in object-oriented programming—these are generally drawn as UML diagrams.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/fda2bad5%28VS.100%29.aspx>
- <http://msdn.microsoft.com/en-us/library/dd409393%28VS.100%29.aspx>

track
your score

_____ /3

Interpret application specifications

SCENARIO: Ari has just completed an internship with Contoso Pharmaceuticals, working with their developers on software used by the company's employees. His supervisor is very impressed, and has offered Ari a job on the development team for Contoso's next-generation application. The company has decided to start from scratch, allowing the new team to develop the application while employees continue to use the old system.

The company currently produces more than 1,000 products and plans to expand. The new application will track all of the company's inventory as well as some basic shipping and receiving details. Employees should be able to search through the company's product catalog and view product details such as product description, a product image, in-stock quantity, and cost.

- 1. What type of application will be a good fit for these requirements?**
 - a. console application
 - b. database application
 - c. Windows service application
- 2. Many of the company's computers are old, with limited RAM and hard drive space, but are all connected to the company's intranet. How can Ari ensure the new version will work on all of the systems?**
 - a. Write the program in an older programming language, such as C.
 - b. Develop the program in an older operating system, such as Windows 98.
 - c. Make the program a web application so that it can be accessed by a browser.
- 3. Ari's supervisor has asked him to prepare a non-functioning demonstration of what the new application will look like so that department managers understand what is being developed and how they will interface with the application. This is called:**
 - a. a mock-up
 - b. alpha testing
 - c. diagramming

hint

Application specifications help developers understand the needs of the client or user.

Answers

1. The most appropriate type of application is:
 - b. **database application.** The program will need to store, view, and update a large number of inventory records.
2. Ari can make sure the software will run on old systems by:
 - c. **making the program a web application.** Any computer with a reasonably current web browser should be able to access the web application without a problem.
3. A non-functioning demonstration is referred to as:
 - a. **a mock-up.** A mock-up may not do anything, but it shows the client what the user interface will look like.

Essential details

- The application specification describes the problem that needs to be solved and communicates the requirements to the developer.
- Developers take this set of requirements, which are usually created from the perspective of a client or user, and translate them into a program design.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/5b13a7k4.aspx>
- <http://msdn.microsoft.com/en-us/library/aa984771%28VS.71%29.aspx>



track
your score

_____ /3

Understand algorithms and data structures

SCENARIO: Some time ago, Cassie agreed to help her soccer coach, Ken, keep track of the team by creating a software program especially for the task. The roster application will make it much easier for the coach to keep track of his players' personal information and some simple statistics.

Now that Cassie has completed some initial planning, she needs to decide how to organize all of the data in her program. The application will need to keep track of many players, allowing the user to search through and pull up any individual's data. And of course the coach will need to print a few reports, such as a complete roster sorted by jersey numbers, a phone list arranged alphabetically by the players' last names, and the team's leaders in goals.

- 1. Which of the following data structures would be a good choice for organizing the players?**
 - a. stack
 - b. array
 - c. linked List

- 2. Which of the following would help Cassie arrange the players in alphabetical order?**
 - a. a binary search
 - b. a queue
 - c. a bubble sort

- 3. Which data structure could Cassie use if she only wanted to retrieve players using a "last in, first out" model?**
 - a. stack
 - b. queue
 - c. linked List

hint

Data structures are classes used to organize data and perform various operations upon that data.

Answers

1. The data structure Cassie should use is:
 - b. **array.** Arrays are well-suited for programs that need to access the data in any order, as when the user performs a search.
2. Cassie will easily be able to put the collection into a specified order with:
 - c. **a bubble sort**
3. The data structure that uses a “LIFO” pattern for adding and retrieving records is:
 - a. **stack**

Essential details

- Common data structures:
 - **array:** A list of data values or objects, all of the same type, any element of which can be referenced by an expression consisting of the array name followed by an indexing expression.
 - **linked list:** A list of nodes or elements of a data structure connected by pointers. Linked lists are great for collections that require many insertions in the middle of the list because such insertions simply require updating a couple of pointers.
 - **queue:** A structure from which elements can be removed only in the same order in which they were inserted; that is, it follows a “first-in, first-out” (FIFO) logic.
 - **stack:** A structure from which elements can be removed only in the reverse order in which they were inserted; this is referred to as “last-in, first-out” (LIFO).
- A sort algorithm puts a collection of data elements into a sequenced order, sometimes based on one or more key values in each element. Common sort algorithms include bubble sort, selection sort, and insertion sort.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/vcsharp/aa336800.aspx>
- <http://msdn.microsoft.com/en-us/library/ms379570.aspx>
- <http://msdn.microsoft.com/en-us/library/aa288453.aspx>

track
your score

_____ /3

4



Understanding Web Applications

IN THIS CHAPTER

- 4.1 Understand Web page development
- 4.2 Understand Microsoft ASP.NET Web application development
- 4.3 Understand Web hosting
- 4.4 Understand Web services





OBJECTIVE

UNDERSTANDING WEB APPLICATIONS 4.1

Understand Web page development

SCENARIO: Tanja owns a small dance studio and is looking for ways to bring in new customers and improve communications with her existing customers. She is not particularly knowledgeable about web design, but several years ago one of her dance students offered to create a website for the studio. That student has moved on to the university, so Tanja has relied on a few different volunteers to maintain the site. As a result, the site is disorganized and lacks consistency—the volunteers all used different colors and fonts that resulted in a very non-professional website.

Knowing that she can't fix the site herself, she has asked her nephew, Maxim, to help. Before Maxim creates a page, he wants Tanja to have at least a basic understanding of the technology involved.

- 1. Which technology uses “tags” to indicate how information should be displayed in a web browser?**
 - a. HTML
 - b. XML
 - c. JavaScript

- 2. Which of the following is a key advantage of using CSS?**
 - a. It allows a web page to be interactive.
 - b. It allows a site to incorporate multimedia clips, such as videos and music.
 - c. It simplifies the formatting of multiple pages within a site.

- 3. What is JavaScript?**
 - a. a markup tag that manages various font settings
 - b. a server-side technology for running Java applications
 - c. a client-side technology for making web pages interactive

hint

CSS stands for Cascading Style Sheet.

Answers

1. What uses tags to specify how data should be displayed on a web page?
 - a. **HTML**
2. An advantage of CSS is:
 - c. **It simplifies the formatting of multiple pages within a site.**
3. JavaScript is:
 - c. **a client-side technology for making web pages interactive**

Essential details

- HTML stands for **HyperText Markup Language** and uses markup tags to specify how information should be displayed on a web page.
 - HTML **tags** are surrounded by angle brackets. The `<p>` tag indicates a paragraph.
 - Most HTML tags work in pairs—an opening tag and a closing tag.
- **CSS** works in conjunction with HTML to indicate how data should be presented, including colors and fonts.
 - Although styles can be defined for an individual page, they can also be defined in a separate document and shared by each web page in a site. That means a developer can make a change to the CSS document and the look of the entire site will change! This makes it easy to ensure that each page in a site looks consistent.
- **JavaScript** is a scripting language that allows developers to write code that goes beyond the markup limitations of HTML.
 - JavaScript is frequently used to make web pages more interactive.
 - Although JavaScript itself is a client-side technology, it is often used in conjunction with server-side technologies such as ASP.NET.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308786.aspx>
- <http://msdn.microsoft.com/en-us/library/bb330932.aspx>
- <http://msdn.microsoft.com/en-us/library/bb330916.aspx>





OBJECTIVE

UNDERSTANDING WEB APPLICATIONS 4.2

Understand Microsoft ASP.NET Web application development

SCENARIO: Maxim has spent quite a bit of time talking with his aunt, Tanja, about a new website for her dance studio and he is beginning to get ideas on how to update and improve the site. Tanja's old site is pretty basic, and Maxim believes he can add a lot of exciting features that will appeal to younger, web-savvy customers.

One of his first priorities is to make the site a little more interactive with buttons that respond to mouse rollovers and a slideshow to display images of the studio. He also wants to implement online shopping for dance apparel. That update would include a "wish list" feature for users to "save" items they're interested in purchasing at a later time.

- 1. Maxim's mouse rollover effect can be accomplished with a client-side script. Which of the following is a client-side technology?**
 - a. PHP
 - b. ASP.NET
 - c. JavaScript

- 2. In a standard HTML site, page information is lost each time the user refreshes a page or moves to a different page. Which of the following allows page information to be retained?**
 - a. state management
 - b. page life cycle
 - c. CSS

- 3. Maxim wants to use cookies to keep track of users' wish lists. What is a cookie?**
 - a. text data stored by the users' web browser
 - b. a back-end database for storing user information
 - c. a server-side scripting tool for saving session data

hint

Client-side scripts are run by the user's web browser.

Answers

1. A client-side technology is:
c. **JavaScript**
2. The process that allows page information to be retained is:
a. **state management**
3. A cookie is:
a. **text data stored by the users' web browser**

Essential details

- In a web application, a program or script can be either **client-side** or **server-side**.
 - A client-side script is downloaded by the user's web browser and executed on that user's computer (the "client") when the page is loaded.
 - A server-side script is executed by the web server *before* the web page is sent to the user's computer.
- The **event model** in a web application is similar to that of a client application. One significant difference is that an event is *raised* on the client side (for example, when the user clicks a button), but the event is *handled* on the server side.
- When an ASP.NET page runs, the page performs a series of processing steps in what is called the **page life cycle**. These steps include initialization, instantiating controls, restoring and maintaining state, running event handler code, and rendering.
- **State management** refers to the process by which a developer maintains page information over multiple requests for the same or different pages.



track
your score

_____ /3

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308770.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308809.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308818.aspx>



OBJECTIVE

UNDERSTANDING WEB APPLICATIONS 4.3

Understand Web hosting

SCENARIO: With plans for Tanja's dance studio website beginning to take shape, it's time for Maxim to think about how he will put the site on the Internet. Maxim doesn't have a lot of experience creating web applications—most of his experience is with traditional Windows applications. He knows that a website is hosted on a server, but he's never worked with a server before. Plus, his aunt doesn't have a lot of money for this project, so he has to keep costs to a minimum until the site brings in some business.

1. Why is an ISP probably a good choice for Maxim?

- a. ISPs are always free.
- b. An ISP subscription includes a copy of Windows Server.
- c. The ISP will provide technical support and maintenance.

2. An employee at a reputable ISP tells Maxim that they use Windows Server and that he needs to understand the basics of Internet Information Services (IIS). Which of the following is NOT a role of IIS?

- a. to deliver HTML documents to web browsers
- b. to enable server-side scripting, such as ASP.NET
- c. to enable client-side scripting, such as JavaScript

3. The ISP tells Maxim they support Virtual Directories. What is a Virtual Directory?

- a. a folder on Maxim's computer that maps to the ISP, so he can easily publish the site
- b. a directory name that maps to the physical location on the server
- c. a listing service that ensures that users can find the site with a search engine

hint

Web hosting allows a developer to publish a website so that it is accessible via the World Wide Web.

Answers

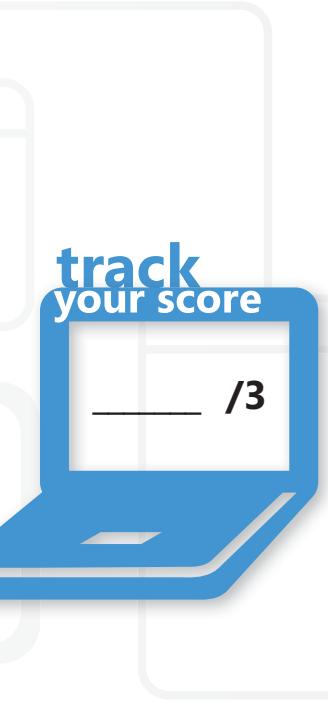
1. Maxim should use an ISP because:
 - c. **The ISP provides technical support and maintenance.** With an ISP, a developer can focus on developing the site without worrying about setting up or maintaining a server.
2. The following is NOT a role of IIS:
 - b. **to enable server-side scripting, such as ASP.NET**
3. A Virtual Directory is:
 - b. **a directory name that maps to the physical location on the server**

Essential details

- An **ISP** (Internet Service Provider) is a business that supplies Internet connectivity services, often including web hosting.
- An ISP will generally provide:
 - space on a server
 - maintenance and support
 - email service
 - security and stability
- **IIS** (Internet Information Services) is a part of Windows Server that delivers content such as web pages by using HTTP over the World Wide Web.
 - IIS provides functionality essential for deploying ASP.NET web applications.
 - IIS also supports other server-side scripting, such as PHP.
- **Virtual Directories** can be configured in IIS and allow access to folders and files outside of the site's home folder.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308861.aspx>
- www.iis.net



track
your score



Understand Web services

SCENARIO: Maxim has worked hard to publish an exciting, professional site for Tanja's dance studio. It's been available for more than a month now and customers have given Tanja great feedback. They love all of the interactive media and the simple consistency of the overall design.

Best of all, the new site has increased Tanja's income by attracting new students and by allowing customers to purchase items from home. With the extra money, she wants to pay Maxim to put a little more into the site—no major changes, just some catchy additions. She'd like her home page to display the current weather and traffic conditions, and she thinks a Bing search box would help users find information quickly.

Although Maxim has never programmed this type of functionality before, he knows he can use web services to help.

- 1. In this context, what is a web service?**
 - a. a process for running a script and serving the resulting HTML to a client
 - b. a program that enables secure web-based interactions
 - c. a system that allows multiple programs to interact via the Internet
- 2. When using the Bing API to add search capabilities to a site, what is the web service role of Bing?**
 - a. requester
 - b. provider
 - c. processor
- 3. Which of the following is a framework commonly used to access a web service?**
 - a. Java
 - b. SOAP
 - c. ASP.NET

hint

An API (Application Programming Interface) provides a framework for accessing a program. The Bing API allows developers to add Bing to their sites.

Answers

1. A web service is:
 - c. a system that allows multiple programs to interact via the Internet
2. The role of Bing in this implementation is as the:
 - b. provider. The dance studio website is the requester.
3. The framework used to access a web service is:
 - b. SOAP

Essential details

- **Web services** are frameworks that allow programs (or sites) to communicate with each other via the web.
- **SOAP** (Simple Object Access Protocol) is an XML-based protocol for exchanging structured and typed information via the web.
 - Numerous SOAP services are available, including searches (such as Bing), current weather, stock quotes, traffic conditions, and more.
- **WSDL** (Web Services Description Language) is an XML format that allows for better interoperability among web services and development tools.
 - WSDL uses SOAP to pass messages to the provider and interpret the results.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/aa480728.aspx>
- <http://msdn.microsoft.com/en-us/library/ms950421.aspx>

track
your score

_____ /3

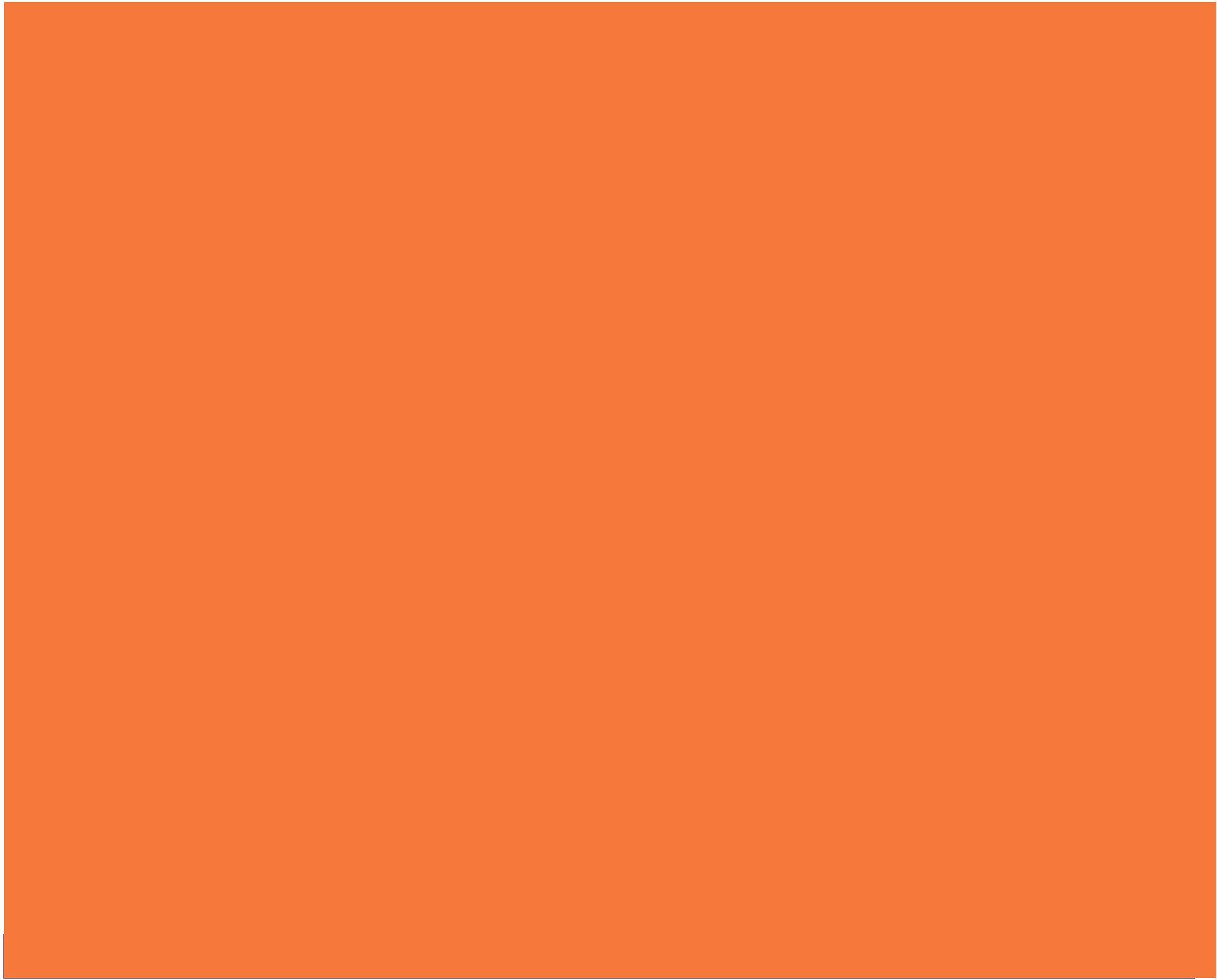
5



Understanding Desktop Applications

IN THIS CHAPTER

- 5.1/5.2 Understand Windows Forms applications; Understand console-based applications
- 5.3 Understand Windows services





OBJECTIVE

UNDERSTANDING DESKTOP APPLICATIONS 5.1/5.2

Understand Windows Forms applications; Understand console-based applications

SCENARIO: Julia doesn't have a lot of free time while she's studying computer science at her university, but in the evenings she enjoys playing online role-playing games (RPGs). She plays several games on a regular basis, and she enjoys "leveling-up" her characters and completing quests for special items.

However, because her playing time is both limited and fragmented, she has difficulty keeping track of the status of each of her characters. So she decides to create an application to keep track of the progress of her different characters, including levels and quests. She envisions a simple application that will allow her to select a character and then view and edit relevant information (a picture of the character, its current level, XP needed to advance, current quest item, and so on).

- 1. What type of application would best fit Julia's needs?**
 - a. console application
 - b. Windows Forms application implementing SDI
 - c. Windows Forms application implementing MDI

- 2. For which one of the following situations would visual inheritance be useful?**
 - a. several different forms displaying the same data in different ways
 - b. several different forms displaying data from tables in the same database
 - c. several different forms using the same basic layout and UI features

- 3. Which of the following describes how the event model might function in Julia's program?**
 - a. A Button click event is handled by code that creates a new character.
 - b. A new character event is handled by code that asks for user input.
 - c. A loop event cycles through the various characters, displaying each on the form.

hint

*SDI is Single Document Interface.
MDI is Multiple Document Interface.*

Answers

1. Julia should make a:
 - b. **Windows Forms application with SDI.** Although any application could work, SDI is ideal because the user only needs one window at a time. Note that a console application could not display images of Julia's characters.
2. Visual inheritance would be useful when:
 - c. **Several different forms use same the same basic layout and UI features.**
3. The event model could function in Julia's program when:
 - a. **A Button click event is handled by code that creates a new character.**

Essential details

- **Windows Forms** is a rich Windows client library for building Windows client applications.
- A **console application** uses a text-only interface and usually requires only a keyboard for input.
- The **user interface** is the portion of a program with which a user interacts. Different types of UIs include graphical user interfaces (GUIs), such as the Windows user interface, as well as command-line interfaces used by console applications.
- The two basic styles of Windows interfaces are SDI and MDI.
 - **Single Document Interface (SDI)** is an interface in which each document frame window is separate from others and contains its own menu and toolbar.
 - **Multiple Document Interface (MDI)** is an interface in which multiple document frame windows may be open in the same instance of an application; the application features a parent window in which multiple child windows can reside.
 - More recent applications tend to favor the SDI approach.
- An **event** is an action or occurrence, often generated by the user, to which a program might respond. Examples include key presses, button clicks, and mouse movements.
 - Code that is executed in response to an event is called an **event handler**.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308740.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308743.aspx>

track
your score

_____ /3

Understand Windows Services

SCENARIO: Employees at Contoso, Ltd., engage in extensive word processing sessions while preparing manuscripts for publication. Managers are worried that employees who type for extended periods of time may have problems with repetitive motion injuries and eye strain, as well as general fatigue. They have asked the IT department to come up with a way to help reduce the chance of such injuries.

Anna is developing an application that will monitor keystrokes. When a user has typed 2,000 words in fewer than 30 minutes, the application will display a notification reminding the user to take a brief break and stand up for a stretch. Anna has decided to write the application as a Windows Service.

- 1. What type of user interface (UI) do most Windows Services—including Anna's reminder application—employ?**
 - a. little or no UI
 - b. a console UI
 - c. a standard Windows GUI
- 2. Which of the following is NOT a characteristic of many Windows Services?**
 - a. intended to run continuously while the computer is on
 - b. can be configured to start when the operating system is booted
 - c. generally designed to require user intervention at timed intervals
- 3. A Windows Service generally has three different states after being started: running, stopped, and:**
 - a. interrupted
 - b. completed
 - c. paused

hint

You've probably used many Windows Services applications—a common example is antivirus software!

Answers

1. Typically Windows Services use:
 - a. **little or no UI**
2. All are true of Windows Services except that they are not:
 - c. **generally designed to require user intervention at timed intervals**
3. The three possible states of a Windows Service after being started include running, stopped, and:
 - d. **paused**

Essential details

- A Windows Service application is a long-running program that generally does not show a user interface.
 - Many users think of Windows Services as running “in the background” and taking care of tasks necessary to keep the system running smoothly.
 - Common examples include antivirus applications, applications to help use printers and other hardware, and applications that aid in network communications.
- Services are managed by the Windows Services Control Manager. To run, they must be installed via this manager and then started.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/d56de412.aspx>
- <http://msdn.microsoft.com/en-us/library/zt39148a.aspx>

track
your score

_____ /3

6



Understanding Databases

IN THIS CHAPTER

- 6.1 Understand relational database management systems
- 6.2 Understand database query methods
- 6.3 Understand database connection methods





OBJECTIVE

UNDERSTANDING DATABASES 6.1

Understand relational database management systems

SCENARIO: Jesper pays for school by working part-time in a vintage record shop that sells music albums on vinyl. The store has thousands of albums by thousands of different artists, but the owner does not have an inventory system—he simply organizes the albums by artist on the store shelves. That means when a customer asks if a particular album is in stock, Jesper must go out to the shelves and look for the album.

Jesper wants to put together a simple inventory system so that he can look up which albums are in stock from a computer behind the counter. He'll set up a relational database to store the information. He'll start by giving each artist a random and unique *Artist ID* number. Likewise, each album will get an *Album ID* number.

- 1. What function do Artist ID and Album ID fulfill in Jesper's relational database, as described above?**
 - a. relationships
 - b. constraints
 - c. primary keys
- 2. Jesper will link albums to artists by adding an Artist ID field to his Albums table. In this Albums table, what is the Artist ID?**
 - a. primary key
 - b. foreign key
 - c. link key
- 3. Which of the following will result from the use of a relational database for this project?**
 - a. minimize or eliminate redundant (repetitive) data
 - b. increase processing time resulting from inefficient storage of data
 - c. require the use of a web server

hint

There will be two tables in the database: Artists will store artist information; Albums will hold data related to individual albums.

Answers

1. Artist ID and Album ID are:
c. **primary keys**
2. The Artist ID field in the Albums table is a:
b. **foreign key.** A foreign key from one table (Albums) refers to a primary key in another table (Artists).
This establishes a relationship between the two tables.
3. The use of a relational database in this project will:
a. **minimize or eliminate redundant (repetitive) data**

Essential details

- A **relational database** is a system for storing potentially large amounts of data. Relational databases consist of one or more *tables* that can be visualized as columns and rows.
- One of the primary advantages of a relational database is the reduction of data redundancy—data in multiple tables can be linked instead of stored twice.
- In a table, a **primary key** defines a column that uniquely identifies each row.
- A relationship can be established by setting up a **foreign key constraint**. Each album in the store includes the corresponding Artist ID. That foreign key establishes a link between the album and the artist who recorded it.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308825.aspx>
- <http://www.asp.net/sql-server/videos/designing-relational-database-tables>

track
your score

_____ /3



OBJECTIVE

UNDERSTANDING DATABASES 6.2

Understand database query methods

SCENARIO: Now that Jesper has designed and implemented a relational database to keep track of the inventory at the record shop, he needs to be able to read and modify the data itself. He'll use SQL queries for his database operations.

The application must enable Jesper to add to the database when the store gets a new album, and to modify data such as the quantity in stock and the price. Additionally, he will need to pull data from the database: find artists or albums, list the current inventory, and list albums that are currently out of stock. Reviewing SQL concepts will help Jesper quickly complete the project.

1. Which SQL command should Jesper use to add a new album to his database?

- a. ADD
- b. INSERT
- c. UPDATE

2. Jesper can save frequently used queries as:

- a. UPDATE files
- b. database methods
- c. stored procedures

3. Which query could retrieve the artist "U2" from the table of artists?

- a. SELECT "U2" FROM Artists
- b. SELECT * FROM Artists WHERE ArtistName = "U2"
- c. SELECT * FROM Artists WHERE "U2" IN ArtistName

hint

SQL stands for Structured Query Language and is used to execute most common actions on a relational database.

Answers

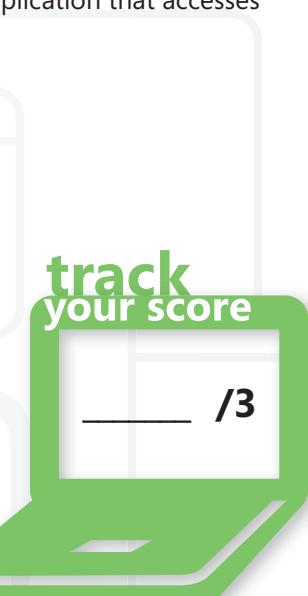
1. A new row can be added to the database with:
 - b. **INSERT**
2. Queries can be saved to the database as:
 - c. **stored procedures**
3. "U2" can be retrieved from the table of artists with:
 - b. **SELECT * FROM Artists WHERE ArtistName = "U2"**

Essential details

- **Structured Query Language (SQL)** is used to manage data in a relational database.
- SQL queries can be used interactively with the database itself or implemented in an application that accesses the database. Basic statements in SQL queries include:
 - SELECT to retrieve data
 - INSERT to add rows to the database
 - UPDATE to modify existing rows
 - DELETE to remove an existing row
- Other clauses can be added to indicate the desired table (FROM), to filter data based on comparisons (WHERE), and to sort (ORDER BY), among others.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308825.aspx>
- <http://www.w3schools.com/sql/default.asp>



track
your score



OBJECTIVE

UNDERSTANDING DATABASES 6.3

Understand database connection methods

SCENARIO: With a solid database design in place and a few stored procedures to help manage his SQL queries, Jesper turned his attention to a user interface for his application. Using Windows Forms, he now has the essential elements in place to connect his application to the database.

Jesper decides to use a “disconnected” approach, meaning that he will copy what he needs from the database to memory, then disconnect from the database. When the user changes data, the application can connect again and update the database.

1. What is the advantage of Jesper’s use of a disconnected data access model?

- a. It minimizes the impact on the database server.
- b. It does not require an Internet connection.
- c. It prevents unauthorized access to the database.

2. What is the term used to describe an in-memory cache of the database?

- a. dataset
- b. XML
- c. OLE DB

3. What object contains the information ADO needs to connect to a database?

- a. SQL Query
- b. file path
- c. connection string

hint

ActiveX Data Objects (ADO) is an interface that allows developers to access databases without worrying about details of database connections.

Answers

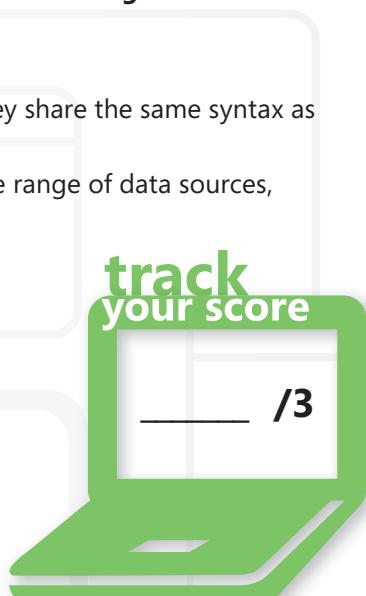
1. An advantage of using a disconnected data access is:
 - a. **It minimizes the impact on the database server.**
2. The name of the in-memory database object is:
 - a. **dataset**
3. The information needed to connect to a database is stored in the:
 - c. **connection string**

Essential details

- To bring data into your application (and send changes back to the data source), a two-way communication path needs to be established. This connection is usually configured with a **connection string** that stores information necessary to find and access the data source.
- Data sources don't have to be relational databases.
 - **Extensible Markup Language (XML)** files are common on the Internet. They share the same syntax as HTML, so many users are comfortable working with them.
 - **Language Integrated Query (LINQ)** allows developers to connect to a wide range of data sources, including arrays and other data structures.
 - Flat files are conventional computer files that store database information.
- Many developers use a disconnected data access model. By connecting to a data source only as long as it takes to retrieve or update data, the developer gains several advantages:
 - Reduced load on the database server.
 - Scalability, or the ability to continue to function as the work load increases.
 - Multiple users can access the same database without "locking" file access.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308825.aspx>
- <http://www.w3schools.com/ado/default.asp>



track
your score

_____ /3

MTA 98-362

WINDOWS DEVELOPMENT FUNDAMENTALS



1



Understanding Windows Programming Basics

IN THIS CHAPTER

- 1.1 Identify Windows application types
- 1.2 Implement user interface design
- 1.3 Create Windows-based applications by using Visual Studio®





OBJECTIVE

UNDERSTANDING WINDOWS PROGRAMMING BASICS 1.1

Identify Windows application types

SCENARIO: Matthias and his classmates enjoy making videos with their pocket-size camcorders and sharing them with each other. One of the students has made a simple website for posting the files, and Matthias likes to watch their creations on his laptop. The problem is that Matthias is often away from home and unable to find a Wi-Fi connection—which means he can't watch his friends' videos.

He has an idea for a set of applications that would automate the process of checking the website for new videos and downloading the most recent additions to his laptop so he can watch them whenever he wants. He envisions two separate programs. The first is an application that will monitor his network connectivity. When he has an active Wi-Fi connection, it will download new content to his laptop. The second is a multimedia player that will let him browse and play all of the downloaded videos.

- 1. The program to monitor connectivity and download new content should load automatically and run without user interaction. Which application type would be a good choice?**
 - a. Windows Forms application
 - b. WPF application
 - c. Windows Services application
- 2. Matthias wants to develop a media player with a rich, animated UI capable of playing a variety of media files; which application type would work well for this application?**
 - a. Windows Forms application
 - b. WPF application
 - c. Windows Services application
- 3. If Matthias chooses to develop his media player in C++, which library can him implement standard Windows GUI elements, such as menus and buttons?**
 - a. Swing
 - b. Win32
 - c. XNA Framework

hint

Windows Presentation Foundation (WPF) is a framework for creating Windows applications with media-intensive user interfaces.

Answers

1. The application type well-suited to the needs of the content download application is:
c. **Windows Services application**
2. A good choice for the media player application is:
b. **WPF application.** Although a Windows Forms application could work, WPF is intended to make multi-media applications easier to develop.
3. The library that helps C/C++ developers create applications with standard Windows GUI elements is:
b. **Win32.** Also known as the Windows API, this library is often used by developers who aren't using the .NET Framework.

Essential details

- **Windows Forms** applications use Forms as the foundation of a user interface.
- **Windows Presentation Foundation** (WPF) simplifies the creation of "rich" user interfaces with such features as audio/video and 3D elements.
- WPF uses Extensible Application Markup Language (XAML) to implement a user interface.
- **Windows Services** applications, such as antivirus applications, run "in the background" with little or no user interaction.
- Win32 is a library often used by developers of C/C++ programs who are not utilizing the .NET Framework.
- Win32 applications generally use *native code*, which is faster than the *managed code* used by .NET applications. For most applications, the difference in speed is negligible; however, graphics-intensive games and other high-performance applications may benefit from this speed.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/5b13a7k4.aspx>
- <http://msdn.microsoft.com/en-us/library/bb514232.aspx>

track
your score

_____ /3



OBJECTIVE

UNDERSTANDING WINDOWS PROGRAMMING BASICS 1.2

Implement user interface design

SCENARIO: As part of her internship at Litware, Inc., Pilar needs to update one of the company's oldest applications. It is a "time sheet" application that allows users to track their hours at work and transfers that data to the company's payroll department. The application functionality does not need to be changed.

However, it was originally created as a "console application," relying on text information and keyboard input to communicate with users. The company would like Pilar to give the application a user-friendly graphical user interface (GUI); they have directed her to keep the interface simple, but consistent with the Windows environment. They want Pilar to take advantage of menus and buttons, and they also want a comprehensive Help system to assist employees.

- 1. Pilar decides to use a toolbar of buttons at the top of the screen. What functions should be accessible via the toolbar?**
 - a. every function available in the application
 - b. only file-management functions (*new, open, save, and so on*) and printing functions
 - c. only functions that are used frequently
- 2. Components that make up the GUI, such as buttons, text boxes, check boxes, and radio buttons, are often referred to as:**
 - a. event handlers
 - b. icons
 - c. controls
- 3. Litware wants the application to have context-sensitive help. Which of following is a common feature of a good context-sensitive help system?**
 - a. extensive and consistent use of tooltips
 - b. pressing F1 to bring up a table of contents for the complete help system
 - c. a Bing search available in the top-right corner of the window

hint

Toolips provide information when the user hovers over an element on the screen, usually in a small "pop-up."

Answers

1. The functions or features on a toolbar should include:
 - c. **only functions that are frequently used.** A toolbar should be simple and clean—don't try to include every feature the program has to offer!
2. GUI elements are also called:
 - c. **controls**
3. Context-sensitive help features:
 - a. **extensive and consistent use of tooltips.** Many good help systems allow the user to access a table of contents for help, but a table of contents is not context-sensitive.

Essential details

- The **user interface** (UI) is how a user communicates with an application.
- A **graphical user interface** (GUI) is a UI in which a user communicates with the application through graphical elements such as images, icons, and buttons, rather than just typing.
 - The components that make up a GUI are generally referred to as **controls**.
- A GUI in a Windows application is generally expected to follow some common conventions:
 - Any menu should be placed at the top of the screen and should conform to established standards; controls should be labeled with text or recognizable icons; visual elements should be consistent.
- A **context-sensitive** help system tailors help content to the user's current state or point in the application.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308740.aspx>
- <http://msdn.microsoft.com/en-us/library/aa733613>
- <http://msdn.microsoft.com/en-us/library/aa468595.aspx>





OBJECTIVE

UNDERSTANDING WINDOWS PROGRAMMING BASICS 1.3

Create Windows-based applications by using Visual Studio

SCENARIO: Tom, a recent technical school graduate, is excited for his first job; he has just been hired to work with the development team at Fabrikam, Inc. Although Tom learned how to develop programs in school, he is now working in a new environment. Fabrikam develops applications with Visual Studio, which Tom has not worked with very often. To help familiarize Tom with the integrated development environment or IDE, his manager asks him to reorganize a few of the company's Visual Studio® projects. This will give Tom a chance to learn more about the company's work as well as become reacquainted with Visual Studio.

- 1. If Tom has an existing application and he wants to add a related application that will use many of the same classes, what should he do?**
 - a. add a new solution to same project
 - b. add a new project to same solution
 - c. create a new solution
- 2. Tom learns that Visual Studio creates two different files to maintain data about a solution. What extensions do they have?**
 - a. .sln and .suo
 - b. .prj and .sln
 - c. .prj and .suo
- 3. What tool can Tom use to manage the various settings and properties for a project?**
 - a. Project Designer
 - b. Start Page
 - c. Toolbox

hint

Visual Studio is an IDE that provides an editor for entering code as well a variety of tools for debugging applications.

Answers

1. To add a second, related application, Tom should:
 - b. **add a new project to the same solution.** A solution is like a container that can hold multiple projects.
2. The two file extensions used by Visual Studio for files that maintain solution information are:
 - a. **.sln and .suo**
3. The tool that Visual Studio provides for managing project settings and properties is:
 - a. **Project Designer**

Essential details

- Visual Studio uses two different “containers” to manage applications:
 - A **solution** includes one or more related projects and their settings.
 - A **project** represents one particular part of a solution; it includes source files and metadata related to that project.
- In general, each project represents one application. If one application is closely related to another, they should both go in the same solution.
- The **Project Designer** is a window in Visual Studio that allows a developer to manage properties, settings, and resources for a project.
- The **Solution Explorer** is a window in Visual Studio that provides an organized view of a solution and all of its projects and files.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308731.aspx>
- <http://msdn.microsoft.com/en-us/library/b142f8e7.aspx>
- <http://msdn.microsoft.com/en-us/library/zfzh36t7.aspx>

track
your score

_____ /3

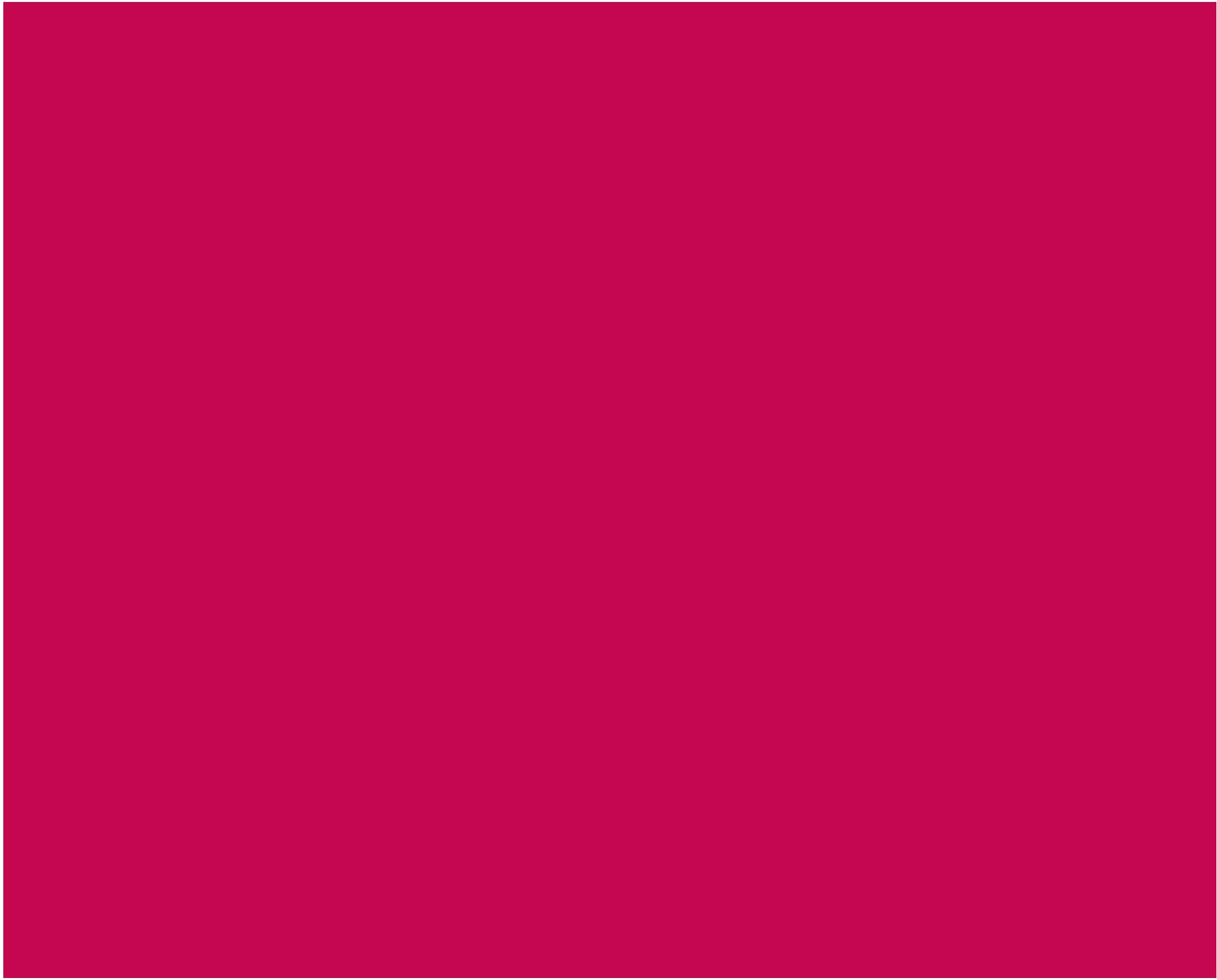
2



Creating Windows Forms Applications

IN THIS CHAPTER

- 2.1A Create and handle events
- 2.1B Create and handle events
- 2.2 Understand Windows Forms inheritance
- 2.3A Understand how to create new controls and extend existing controls
- 2.3B Understand how to create new controls and extend existing controls
- 2.4A Validate and implement user input
- 2.4B Validate and implement user input
- 2.5A Debug a Windows-based application
- 2.5B Debug a Windows-based application





OBJECTIVE

CREATING WINDOWS FORMS APPLICATIONS 2.1A

Create and handle events

SCENARIO: Pilar has been hard at work adding a friendly GUI to the old time-sheet application at Litware, Inc. She's designed a nice, user-friendly form that will be the main part of the interface. For the functionality of the application itself (allowing employees to clock in and out, transferring that data to the payroll department, and so on), she's able to use pre-existing code. So most of what is left is "wiring up" the application to her new interface, which consists of a menu, a toolbar for commonly used functions, and some input controls for users to enter their employee ID numbers.

- 1. Which of the following best describes what happens when a user clicks a button to "clock in?"**
 - a. The Button event is raised and the code to save the correct data is executed
 - b. A Click event is raised and the code to save the correct data is executed
 - c. A ClockIn event is raised and the code to save the correct data is executed
- 2. Pilar will be using pre-existing code to save the data when a user clocks in. Where will she put this code?**
 - a. In the button's constructor
 - b. In a property
 - c. In an event handler
- 3. When an event is raised, what two parameters are sent to the method that is triggered?**
 - a. e and control
 - b. e and sender
 - c. control and sender

hint

Events are often user actions such as clicking a button. Events can be responded to within the code.

Answers

1. When a user clicks a button to "clock in:"
 - b. **A Click event is raised and an event handler is executed.**
2. Pilar will put the code to save the clock-in data:
 - c. **In an event handler**
3. The following parameters are sent to the event handler:
 - b. **e and sender.** `sender` is a reference to the object (often a control) that raised the event; `e` is an object specific to the event, such as the location of the mouse pointer when a `MouseDown` event is raised.

Essential details

- An **event** is an action that you can respond to in your code.
 - Sometimes the event is triggered by the user's interaction, such as clicking a button or selecting an item from the menu.
 - Other times, the event is generated by the system. For example, a `Timer` object raises a `Tick` event.
- An **event handler** is a block of code (a method or procedure) that executes when an event is raised.
- Each control type has an event handler that is created when the developer double-clicks the control in the Form Designer; this is called the **default event handler**.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308743.aspx> (Visual Basic)
- <http://msdn.microsoft.com/en-us/beginner/bb308738.aspx> (C#)
- <http://msdn.microsoft.com/en-us/library/1h12f09z.aspx>

track
your score

_____ /3



OBJECTIVE

CREATING WINDOWS FORMS APPLICATIONS 2.1B

Create and handle events

SCENARIO: The Coho Winery uses an application to prepare and track shipments to retail stores around the world. The application lists the available inventory and allows an employee to click a button to create a shipping label and packing manifest. François would like to modify the application so that employees cannot accidentally print documentation to ship products that are not currently in stock. He's already modified the application to examine the inventory, and it only creates buttons next to products with a quantity greater than zero. However, he can't create event handlers using the Form Designer like he's used to doing.

1. Why can't François create event handlers for the different products in the Form Designer?

- a. Event handlers can only be added in a Form's constructor.
- b. The Form has no connection to the database server.
- c. The buttons do not exist yet—they are created when the application runs.

2. What is the correct C# syntax for adding an event handler at run time?

- a. newButton.add(button _ Click);
- b. newButton.Click += new EventHandler(button _ Click);
- c. EventHandler Click = new EventHandler(button _ Click);

3. What is the correct Visual Basic syntax for adding an event handler at run time?

- a. AddHandler newButton.Click, AddressOf button _ Click
- b. AddHandler newButton.Click(buttonClick)
- c. newButton.Click = New Click AddressOf button _ Click

hint

An event handler added at run time is called a dynamically added handler.

Answers

1. Event handlers could not be added at design time in this example because:
 - c. **the buttons did not exist yet—they are created when the application runs.**
2. The syntax for adding an event handler with C# is:
 - a. `newButton.Click += new EventHandler(button_Click);`
3. The syntax for adding an event handler with Visual Basic is:
 - b. `AddHandler newButton.Click, AddressOf button_Click`

Essential details

- In some cases, controls may be added while the application is running (at *run time*), so they do not appear in the Form Designer.
 - If a control doesn't exist at *design time* (when you are working in the Form Designer), you cannot add an event handler for any events related to that control.
- In that case, the developer must write the code for the event handler and connect it to the event while the application is running, using code.
 - This also allows the developer to control when the event handler is connected to the event.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/dfty2w4e.aspx>
- [http://support.microsoft.com/kb/319266 \(C#\)](http://support.microsoft.com/kb/319266)
- [http://support.microsoft.com/kb/308433 \(Visual Basic\)](http://support.microsoft.com/kb/308433)

track
your score

_____ /3

Understand Windows Forms inheritance

SCENARIO: Woodgrove Bank needs a new application that will allow tellers to retrieve account information for customers. Cassie is working on the user interface for the application while the rest of the development team creates the code to access the bank's records.

The project manager has requested three forms: one with general account information, one with transaction details, and one with customer contact information. All three should have a consistent appearance and should have the same set of information displayed at the top, including the account number, the customer's name, and the current balance. She will use *forms inheritance* to create the forms.

- 1. Cassie has created one form that will have the basic UI controls and the account number, customer name, and current balance; the rest of the form is empty. What is the role of this form?**
 - a. base form
 - b. derived form
 - c. template form
- 2. Each of the three forms that inherit from Cassie's first form is called a:**
 - a. base form
 - b. derived form
 - c. template form
- 3. Which of the following is an advantage of using forms inheritance?**
 - a. If a change to the layout is required, it only needs to be done on one form
 - b. Forms only need to be compiled once, regardless of the number of changes
 - c. The load on the database server is decreased when the application is running

hint

Forms inheritance allows forms to share common elements/functionality. It is analogous to object inheritance in OOP.

Answers

1. The role of Cassie's first form is:
 - a. **base form.** This is also referred to as a *parent form*.
2. Forms that inherit from that form are called:
 - b. **derived forms.** They are also called *child forms*.
3. An advantage of forms inheritance is:
 - a. **if a change to the layout is required, it only needs to be done on one form.** If a base form is changed, derived forms automatically inherit the changes.

Essential details

- **Forms inheritance** (or **visual inheritance**) is a feature that allows forms to share common elements and functionality. Advantages of using forms inheritance include:
 - Consistency: Like a template, the base form ensures that all derived forms will have the same basic layout.
 - Maintainability: If you change the design of the base form, the derived forms inherit the changes, which means that you don't have to go into each individual form to make the same changes over and over.
 - Decreased design time: Design work can be done once and then shared with other forms, rather than designing each form individually.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/aa983613>
- <http://msdn.microsoft.com/en-us/library/aa984465>

track
your score

_____ /3

Understand how to create new controls and extend existing controls

SCENARIO: Jenny has just started an internship at A. Datum Corporation. Although she programmed with Visual Basic and Visual C# in school, Jenny's manager at A. Datum wants to see some of her work before she joins the development team. Jenny's first project will be creating some new GUI controls for the application the developers are planning. They need the following controls:

- A Text Box that converts inputted text to an integer
- A "clock" control that displays the current time
- A Button shaped like an octagon

- 1. Jenny realizes the clock can be made by simply combining a Label with a Timer control. What is the name of this type of combined control?**
 - a. combo control
 - b. inherited control
 - c. user control
- 2. If Jenny wishes to make a new control by modifying an existing control—she will likely modify a Button to create an octagonal button—what type of control should she create?**
 - a. combo control
 - b. inherited control
 - c. user control
- 3. Which of the following would be an ideal situation for creating a user control?**
 - a. you only want to change the GUI of an existing control
 - b. the desired functionality is similar to an existing control
 - c. you wish to combine the functionality of two or more existing controls

hint

The term "custom control" is used to refer to both inherited controls and user controls.

Answers

1. The name of a control made by combining existing controls is:
 - c. **user control**. Also referred to as a *composite control*.
2. The type of control Jenny should make if she wishes to modify an existing control is an:
 - b. **inherited control**. Also referred to as a *derived control*.
3. An ideal situation for creating a user control is when:
 - c. **you wish to combine the functionality of two or more existing controls**

Essential details

- There are several different approaches to creating a new control:
 - A **user control** or **composite control** simply combines existing controls into one new control.
 - An **inherited control** or **derived control** extends or modifies an existing control, adding new functionality or changing the GUI.
- Usually, one of these approaches is ideal for the desired result:
 - To combine functionality without changing the GUI or adding any new features, create a user control.
 - To create a control similar to an existing control with slightly different GUI or functionality, create an inherited control.
 - To create a control with completely new functionality, such as a control to display a rotating 3D model, you'll probably need to inherit from the Control class.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms171725.aspx>
- <http://msdn.microsoft.com/en-us/library/yah0tcw1.aspx>

track
your score

_____ /3



OBJECTIVE

CREATING WINDOWS FORMS APPLICATIONS 2.3B

Understand how to create new controls and extend existing controls

SCENARIO: Now that Jenny understands how to create the three controls her manager at A. Datum Corporation wants, she's ready to begin. First she creates a user control that she calls ClockLabel. It combines a Timer and a Label, and the Timer's Tick event triggers code to update the Text property of the Label. Jenny is satisfied with the way it works, but she feels that she can't utilize user controls for the other two: an OctagonButton and an IntegerTextBox. Instead, she'll need to create inherited controls.

1. What class should Jenny's IntegerTextBox extend?

- a. Integer
- b. TextBox
- c. Control

2. What template should Jenny select when creating her project to create this IntegerTextBox?

- a. Empty Project
- b. Windows Forms Application
- c. Windows Forms Control Library

3. After her controls are complete, how can Jenny add them to a new project for testing?

- a. by copying and pasting her controls
- b. by adding a reference to her controls
- c. by importing her controls to the Toolbox

hint

Inherited controls are also called derived controls, because they originate from a control that already exists.

Answers

1. The class that the IntegerTextBox should extend is:
 - b. **TextBox.** The functionality of the new control is very similar to that of a TextBox.
2. The template Jenny should use to create an IntegerTextBox is:
 - c. **Windows Forms Control Library**
3. Jenny add controls to a new project for testing by:
 - b. **adding a reference to her controls**

Essential details

- To create a control that you can use in other projects, use the Windows Forms Control Library template in Visual Studio.
- Because a Control Library does not create an executable application, it cannot be tested independently. Create a new project and add a reference to the Control Library you have created.
 - Be sure to “Build” the library before creating the new project!

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/5h0k2e6x.aspx \(C#\)](http://msdn.microsoft.com/en-us/library/5h0k2e6x.aspx)
- [http://msdn.microsoft.com/en-us/library/w2a8y03d.aspx \(Visual Basic\)](http://msdn.microsoft.com/en-us/library/w2a8y03d.aspx)

track
your score

_____ /3



OBJECTIVE

CREATING WINDOWS FORMS APPLICATIONS 2.4A

Validate and implement user input

SCENARIO: Jenny's manager at A. Datum Corporation is very pleased with Jenny's work on the custom controls, and the development team plans to use them on their current application. As a reward, Jenny has the opportunity to do a little work on the application that the team is currently developing. Before giving her a more advanced assignment, the manager has assigned Jenny to go through the team's progress so far and to add input validation to some of the forms.

First, Jenny needs to understand the process by which Forms applications handle user input.

1. What event is raised one time when the user first presses a key on the keyboard?

- a. KeyDown
- b. KeyEvent
- c. KeyPress

2. Which event is NOT raised when the user clicks a button?

- a. Click
- b. MouseDown
- c. MousePress

3. What mechanism is used in Windows to notify an application that user input has occurred?

- a. Windows Alarms
- b. Windows Messages
- c. Windows Notifications

hint

Input validation means checking data entered to make sure it is valid. Example: there should be no letters in a Text Box requesting a number.

Answers

1. When the user presses a key, the event that is raised one time is:
 - a. **KeyDown.** KeyPress is raised continuously as long as the key is held.
2. The event not raised in a Button click is:
 - c. **MouseClick**
3. An application is notified of a user input action through:
 - b. **Windows Messages**

Essential details

- Windows Messages are sent to an application in response to user input.
- Windows Forms processes these signals and raises events.
 - Applications then use event handlers to process the user's input.
- Three events are typically associated with keyboard input (in this order):
 1. *KeyDown* is raised once when a key is pressed.
 2. *KeyPress* is raised continuously as the key is held down.
 3. *KeyUp* is raised once when a key is released.
- The event handler receives an object with information about which keys were pressed
- In a standard mouse click, the following events are triggered (in this order): *MouseDown; Click; MouseClick; MouseUp*.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms171532.aspx>
- <http://msdn.microsoft.com/en-us/library/ms171536.aspx>
- <http://msdn.microsoft.com/en-us/library/ms171540.aspx>



Validate and implement user input

SCENARIO: Jenny is proving herself to be a valuable member of the development team at A. Datum! Her manager has given her the specifics for the input validation she needs to add to the forms in A. Datum's new application. The two most important involve checking to make sure that customer contact information is entered correctly.

- Telephone numbers: Each telephone number should be entered in a standard U.S. number format—exactly ten digits, with a hyphen after the first three digits and another after the second three. For example: 800-555-1212.
- Email addresses: An email address should have a user name, the at character (@), and a valid domain. Although Jenny's validation does not need to verify the exact address, it will need to use the World Wide Web to verify that the domain exists.

1. Jenny can use a MaskedTextBox for telephone numbers. Which of the following is a valid mask for a U.S. telephone number?

- a. #####-###-####
- b. 000-000-0000
- c. 999-999-9999

2. Jenny will use the Validating event to check email addresses. When is this event raised?

- a. when the control loses focus
- b. when the user presses Enter or Tab
- c. each time a character is added to the control

3. What property should Jenny's code set to true if the email address is not valid?

- a. e.Invalid
- b. e.Cancel
- c. e.Error

hint

A mask is a string that specifies what characters the user can input at any given position in a MaskedTextBox.

Answers

1. A valid mask for a U.S. telephone number is:
 - b. **000-000-0000**
2. The **Validating** event is raised:
 - a. **when the control loses focus.**
3. The property that gets set to *true* if the input validation fails is:
 - b. **e.Cancel**

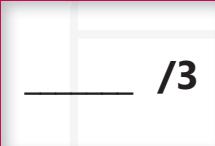
Essential details

- A **MaskedTextBox** provides an easy way to perform input validation; it is also the most common way to enforce input restrictions.
- The **Mask** property accepts a string that indicates the requirements of user input.
- If your input requires more comprehensive validation, such as Jenny's email address validation, you can handle the **Validating** event, which is raised whenever a control loses focus. In an event handler, write code to perform all necessary validation.
 - If the input is valid, the handler can simply finish execution and the user can continue.
 - If the input is invalid, set the `e.Cancel` property to *true*. The user will not receive any notification, but he or she will not be able to move on to any other control.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms229603.aspx>
- <http://msdn.microsoft.com/en-us/library/system.windows.forms.maskedtextbox.aspx>
- <http://msdn.microsoft.com/en-us/library/system.windows.forms.control.validating.aspx>

track
your score



Debug a Windows-based application

SCENARIO: Lisa is an intern at Woodgrove Bank, helping with small projects related to a new application the company is developing. However, a software engineer, Miklós, had to leave town unexpectedly for a family emergency, and the project manager has asked Lisa to debug the code Miklós was testing. Lisa opens the project and sees that there are no build errors, but when she runs it she finds that several calculations are incorrect, and she sometimes gets a `StackOverflowException`. Because she is not very familiar with the code, Lisa is not sure what is causing the problems. The project manager suggests using the Visual Studio Debugger to track down the errors.

- 1. What feature will allow Lisa to suspend execution of the application at specified points so that she can examine what is happening?**
 - a. breakpoint
 - b. stop point
 - c. watch point
- 2. After suspending execution, Lisa would like to monitor data as the application executes code one line at a time. Which feature will also go through any functions or methods that are invoked?**
 - a. Step Into
 - b. Step Over
 - c. Step Out
- 3. Lisa wants a simple way to output some data while the application executes, but she doesn't want any output to execute in the version of the program. Which method should she use?**
 - a. `Console.WriteLine`
 - b. `Debug.WriteLine`
 - c. `System.Out.Println`

hint

"Build" errors are problems that keep the program from compiling; "logic" errors are problems that show up when the application executes.

Answers

1. The feature that suspends ("pauses") execution at specified points is a:
 - a. **breakpoint**
2. The feature that will step through any functions or methods is called:
 - a. **Step Into**
3. The method that will output text only when the application executes in Debug mode is:
 - b. **Debug.WriteLine**. `Console.WriteLine` will also output text to the console, but the output will still execute if the application is run in Release mode (rather than Debug mode).

Essential details

- The **Visual Studio Debugger** is a tool that helps find logic errors (or **run-time errors**) by letting the developer observe how the application behaves as it is executing.
- A **breakpoint** is a marker that tells the debugger to suspend execution of a program temporarily at a designated point; this allows the developer to examine a variety of data related to the program. There are three ways to step through the execution of the code:
 - Step Into, Step Over, and Step Out
- The **Debug** class provides methods/properties to help debug code. One commonly used method is `Debug.WriteLine`, which outputs to the console like `Console.WriteLine`. However, if the application is run in Release mode, `Debug.WriteLine` will not execute.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/awtaffxb.aspx>
- <http://msdn.microsoft.com/en-us/library/kya29xtx.aspx>

track
your score

_____ /3



OBJECTIVE

CREATING WINDOWS FORMS APPLICATIONS 2.5B

Debug a Windows-based application

SCENARIO: Nupur is an intern at Litware, Inc. The company computers each use a custom antivirus application created by the company's development team. Since a recent software upgrade, the application has been crashing. The development team is busy on a different project and cannot take the time to fix this annoying but non-critical problem. Nupur wants to see if she can identify the issue using the Visual Studio Debugger. The application is a Windows Services application, not a Windows Forms application like she is used to debugging.

- 1. What will Nupur need to do so that she can set breakpoints in this Services application?**
 - a. add a try-catch block to intercept the error that causes it to crash
 - b. attach a debugger to the service while it is running
 - c. use the Windows Services Control Manager to pause the application

- 2. Nupur discovers that the error may be occurring in the application's *OnStart* method, preventing the service from starting. How can she debug this type of problem?**

- a. rebuild the application as a console application
 - b. set a breakpoint at the beginning of the *OnStart* method
 - c. write code to create a simulated service to see how *OnStart* behaves

- 3. How can Nupur access the list of currently running processes?**

- a. processes are listed in the Output window
 - b. from the Debug menu by selecting Processes
 - c. processes can *only* be viewed from Windows Task Manager

hint

Windows Services applications run as processes, so they can't be debugged like Windows Forms applications.

Answers

1. To add breakpoints to a Services application, Nupur must:
 - b. **attach a debugger to the service while it is running**
2. Nupur can debug the *OnStart* method by:
 - c. **writing code to create a simulated service to see how *OnStart* behaves**
3. Nupur can see a list of processes:
 - b. **from the *Debug* menu, by selecting *Processes***

Essential details

- Windows Services applications are run using the **Windows Service Control Manager**. Because of this, you cannot simply set breakpoints and debug as you can with a Forms or WPF application.
 - To debug a Services application, you have to start the service, then attach a debugger to the associated process, and then use all of the standard Visual Studio Debugger tools.
- One implication of this debugging approach is that the service must successfully start to be debugged.
 - To debug the *OnStart* method, add code that creates a simulated service—this will show you how the *OnStart* method is executing.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/aa984342>
- <http://msdn.microsoft.com/en-us/library/7a50syb3.aspx>
- <http://msdn.microsoft.com/en-us/library/cktt23yw.aspx>

track
your score

_____ /3

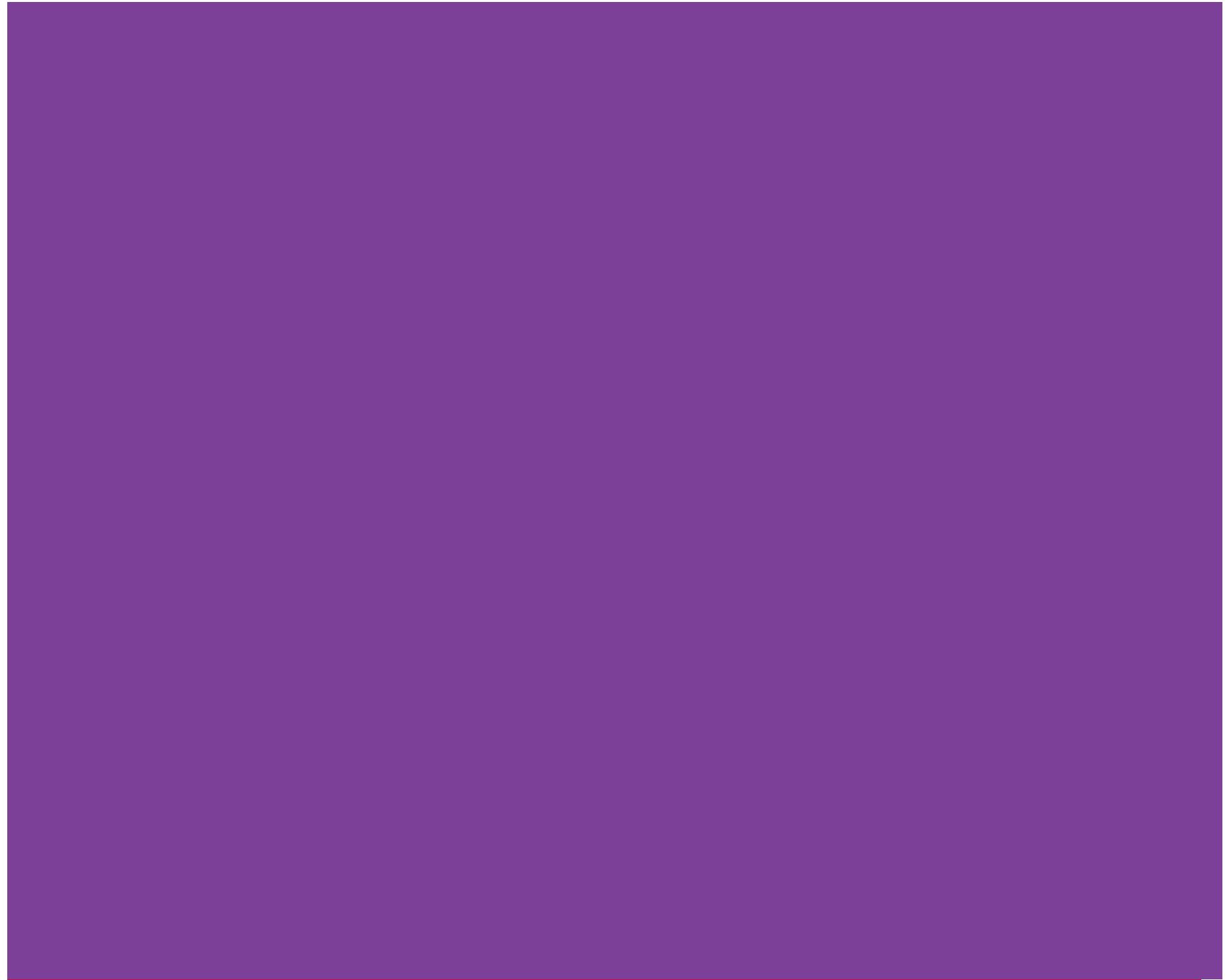
3



Creating Windows Services Applications

IN THIS CHAPTER

- 3.1 Create a Windows Services application
- 3.2 Install a Windows Services application





OBJECTIVE

CREATING WINDOWS SERVICES APPLICATIONS 3.1

Create a Windows Services application

SCENARIO: Anna is developing an application for Contoso, Ltd., that she hopes will help prevent repetitive motion injuries and eyestrain among employees who work at their computers for extended periods of time. Her application will run as a Windows Service and will track the typing activities of the current user. If the user types more than 2,000 words in a 30-minute span, Anna's application will display a notification reminding the user to take a short break before continuing. This is Anna's first attempt at creating a Services application, so she's a little unsure about how to begin.

1. What class will Anna need to extend in order to create this Services application?

- a. Service
- b. ServiceBase
- c. WindowsService

2. Identify the three basic states of a Windows Services application.

- a. installed, running, paused
- b. running, paused, stopped
- c. running, stopped, terminated

3. What method is Anna *required* to override when creating her application?

- a. OnStart
- b. OnStop
- c. OnShutdown

hint

Services applications typically run "in the background" for a long period of time.

Answers

1. The main class that must be inherited when developing a Services application is:
b. ServiceBase
2. The lifetime states of a Services application are:
b. running, paused, stopped
3. The method that Anna must override is:
a. OnStart

Essential details

- A Windows Services application has several different life-cycle states; the most important are:
 - Running (or started), Paused, and Stopped
- To create a Windows Services application, you must extend the *ServiceBase* class.
 - This class provides methods for reacting to changes from one life-cycle state to another: *OnStart*, *OnPause*, *OnStop*, *OnContinue*, *OnShutdown*
 - You also must override the *OnStart* method, and most Services applications also override the *OnStop* method.
 - Another important method in the *ServiceBase* class is *Run*, which registers the service with the Services Control Manager. It should be invoked from the application's *Main* method.
- The *ServiceBase* class also provides a variety of properties related to your service, such as *ServiceName*, which specifies how the service is identified within the Services Control Manager.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/d56de412.aspx>
- <http://msdn.microsoft.com/en-us/library/y817hyb6.aspx>

track
your score

_____ /3



OBJECTIVE

CREATING WINDOWS SERVICES APPLICATIONS 3.2

Install a Windows Services application

SCENARIO: Anna is very proud of the Services application she has developed for Contoso, Ltd. She has successfully debugged her code, and the application does a great job of monitoring users' typing practices and reminding them to take breaks when they have been typing for extended periods of time. The application will reduce the stress experienced by employees and that will make for a healthier and happier workplace.

After demonstrating the application for her manager, she has approval to deploy her project. She knows the process is a little different than installing a Windows Forms application and is eager to complete this important work.

1. What does Anna need to add to her project to be able to install her application?

- a. a custom .msi file
- b. an installer class
- c. setup.exe

2. Which class is included in her project so it can be registered with the Services Control Manager?

- a. ClickOnce
- b. OnStart
- c. ServiceInstaller

3. How can Anna create distributable files for installing her application on target computers?

- a. add a setup project to her solution
- b. press F5 to build the application
- c. run the ClickOnce application

hint

Installing a service application refers to registering the service with Services Control Manager—not setting the application up on a target computer.

Answers

1. To install the application, Anna should add:
 - b. **an installer class**
2. The class that is added to Anna's project to interact with the Services Control Manager is:
 - c. **ServiceInstaller**
3. To create distributable setup files for her application, Anna must:
 - a. **add a setup project to her solution**

Essential details

- Windows Services applications can be installed (or registered with the operating system) in two different ways:
 - manually, with a command-line utility known as the Installer Tool (installutil.exe)
 - by adding installers to the project
- **Installer classes** (or simply **installers**) perform specified actions when a project is installed.
 - Installers are added to a project via the Component Designer tool in Visual Studio.
 - Installers use two classes (ServiceInstaller and ServiceProcessInstaller) that allow you to set properties related to your service application. For example, StartType designates how your service will start: manual, automatic, or disabled.
- To make the setup files necessary to distribute an application, you'll need to create a **Setup Project**.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/sd8zc8ha.aspx>
- <http://msdn.microsoft.com/en-us/library/ddhy0byf.aspx>

track
your score

_____ /3

4

Accessing Data in a Windows Forms Application

IN THIS CHAPTER

- 4.1 Understand data access methods for a Windows Application
- 4.2A Understand databound controls (Databinding)
- 4.2B Understand databound controls (Validating databound items)





OBJECTIVE

ACCESSING DATA IN A WINDOWS FORMS APPLICATION 4.1

Understand data access methods for a Windows Application

SCENARIO: Jesper has been designing an application for the vintage record shop where he works. It's a database application that will track the store's current inventory and allow Jesper to help customers quickly find out if an album they want is in stock. He also wants to print reports to help the store's owner see what albums they need to order.

Jesper has already designed and implemented the database in Microsoft® SQL Server®, so he's ready to develop the application itself, using a disconnected data access model. This model is similar to how web browsers work: connect to a web server and download the necessary information, then disconnect and allow the user to view the data. Whenever the page needs to be refreshed, the browser connects again and re-downloads the information.

- 1. In Jesper's application, what is the in-memory cache of the database contents called?**
 - a. a connection string
 - b. a dataset
 - c. a datatable

- 2. What library of classes can Jesper use to access his database?**
 - a. ADO.NET
 - b. AJAX
 - c. XAML

- 3. What Visual Studio tool can you use to add a database connection to your project?**
 - a. Connection Explorer
 - b. Server Explorer
 - c. Solution Explorer

hint

In a disconnected data access model, an application uses a copy of the data in memory and only connects to the data source when the data is updated.

Answers

1. The in-memory representation (or copy) of data is called:
b. a dataset
2. The classes that provide data access functionality for .NET developers is:
a. ADO.NET
3. The tool that allows a connection to be added to a Visual Studio project is:
b. Server Explorer

Essential details

- In a “disconnected” access model, the application connects to a data source and retrieves (or updates) whatever it needs, and then it disconnects.
- **ADO.NET** is a library of classes that assist .NET developers with database applications. It allows developers to use a variety of data sources (SQL Server databases, XML files, application data, and so on).
 - ADO.NET is sometimes referred to as the System.Data Namespace and handles many of the details of data source interactions so that developers can focus on how they wish to use the data.
- You can add a connection to a Visual Studio project using the **Server Explorer**. In Visual Studio Express Editions, this tool is called the **Database Explorer**.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308806.aspx> (**Lessons 8 & 9**)
- <http://msdn.microsoft.com/en-us/library/0wxwcakt.aspx>

track





OBJECTIVE

ACCESSING DATA IN A WINDOWS FORMS APPLICATION 4.2A

Understand databound controls (Databinding)

SCENARIO: Jesper's record store application is progressing nicely. He has completely implemented his database, and he's designed and implemented all of the Forms that will comprise his user interface. His last step is to bind each control to the database so that the application is functional.

The most important forms in his application include an "artist overview" form and an "album details" form. The *artist overview* presents information about one artist, including a list of all that artist's albums. The *album details* Form displays extensive information about a specific album, such as the year it was released, the titles of all of the tracks, the price, and the number of copies in stock.

- 1. The *artist overview* uses TextBoxes to display (and edit) information such as the artist's name, nationality, and genre, with each TextBox bound to a single dataset field. What is this type of binding called?**
 - a. complex binding
 - b. simple binding
 - c. unique binding

- 2. Which of the following manages the connection to the dataset, allowing the user to navigate to different records?**
 - a. BindingSource
 - b. Database Explorer
 - c. DataGridView

- 3. Jesper wants to include a list of albums on his *artist overview* Form. What Forms control provides a customizable table for this type of display?**
 - a. BindingSource
 - b. DataGridView
 - c. TableAdapter

hint

Binding the controls means connecting them to the dataset so that they can display and edit information in the database.

Answers

1. The term for binding a control to a single element or field in a dataset is:
b. **simple binding**
2. Communication between bound controls and the dataset is handled by:
a. **BindingSource**
3. The control used to display dataset information in a customizable grid is:
b. **DataGridView**

Essential details

- **Data binding** is the process of connecting controls to information in a data source so that it can be displayed or changed by a user. Generally, controls can utilize simple binding or complex binding.
- **Simple binding** is intended to display and edit a single data element. It is usually used for controls such as Labels, TextBoxes, and (in WPF) TextBlocks.
- **Complex binding** is capable of displaying and editing multiple data elements. It is commonly used with controls designed to display multiple items, such as ComboBoxes.
 - The DataGridView control is an example of a control that utilizes complex binding.
- To change which record is displayed on a Form using simple binding, use a BindingSource.
 - A **BindingSource** is an intermediary between the controls on a form and the data source.
 - You can also use a **BindingNavigator** that provides a user interface for navigating with databound controls.

track



FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/beginner/bb308829.aspx \(Visual Basic\)](http://msdn.microsoft.com/en-us/beginner/bb308829.aspx)
- [http://msdn.microsoft.com/en-us/beginner/bb308827.aspx \(Visual C#\)](http://msdn.microsoft.com/en-us/beginner/bb308827.aspx)
- <http://msdn.microsoft.com/en-us/library/ef2xyb33.aspx>



OBJECTIVE

ACCESSING DATA IN A WINDOWS FORMS APPLICATION 4.2B

Understand databound controls (Validating databound items)

SCENARIO: Jesper's inventory application has been a huge success at the vintage record shop. Jesper's job is much easier, and customers are grateful that he can look up information so quickly. Even Oleg, the owner of the store, is excited about the application and has started using it himself.

Unfortunately, Oleg is not always careful about what he types into the fields. For example, sometimes he accidentally puts an artist's *genre* in the *release year* TextBox, causing problems with the database. Inaccurate data will result in plenty of confusion and wasted time for everyone involved, so Jesper plans to modify the program to check what the user enters before putting it into the dataset.

1. Verifying data before adding it to the dataset or database is called:

- a. type casting
- b. data validation
- c. autoboxing

2. Which event is useful for checking user input before allowing the user to continue?

- a. Casting
- b. LosingFocus
- c. Validating

3. The DataGridView control provides its own event for examining user input.

What is it called?

- a. e.Cancel
- b. CellCasting
- c. CellValidating

hint

Checking data for accuracy is very similar to verifying user input in other applications.

Answers

1. Checking data before changing the data source is called:
b. data validation
2. The event that can be used to examine user input is called:
c. Validating
3. The DataGridView event used to check user input is:
c. CellValidating

Essential details

- **Data validation** means verifying that values being added to a data source database are consistent with the design of the database and the requirements of the application.
 - For example, Oleg shouldn't be able to enter a negative number in the *release year* field, or enter more characters than the database can accommodate.
 - Validation isn't just limited to user input—when calculating a value, you may want to make sure it's valid before adding it to the database.
- Most of the techniques for validating input are useful in database applications, including MaskedTextBoxes.
- The DataGridView control is frequently used in data-driven applications. It provides the *CellValidating* event for checking data.
 - As with the *Validating* event, simply set *e.Cancel* to true if there's a problem.
 - You can also use the *DataGridViewRow.ErrorText* property to display a message to the user in the event of a problem.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/kx9x2fsb.aspx>
- <http://msdn.microsoft.com/en-us/library/ykdxa0bc.aspx>

track



5

Deploying a Windows Application

IN THIS CHAPTER

- 5.1A Understand Windows application deployment methods
- 5.1B Understand Windows application deployment methods
- 5.2 Create Windows setup and deployment projects



Understand Windows application deployment methods

SCENARIO: Stepan spends much of his free time in the outdoors, camping, hiking, and canoeing. Whenever school is not in session, he tries to take at least one trip. He has developed two applications to help him enjoy his hobbies. The first application helps him log his activities, downloads data from his GPS unit, and automatically posts updates to his favorite social media websites. The second is a relatively simple application for planning trips; it helps him organize his maps, plan the supplies he'll need, and keep track of weather reports in the days before he leaves. Both programs are Windows Forms applications.

He has always run the applications from his own computer, but now that his friends have seen how well they work, he would like to distribute copies for others to enjoy.

- 1. The planning application is newer and Stepan is still making frequent changes. Which deployment option checks for updates before installing the application?**
 - a. ClickOnce
 - b. Windows Installer
 - c. Both deployment options automatically check for updates.
- 2. The log application interfaces with a GPS and must install a device driver upon deployment. Which option is best suited for this application?**
 - a. ClickOnce
 - b. Windows Installer
 - c. Neither deployment option can install a device driver.
- 3. Which option will allow Stepan to distribute his applications via USB drives?**
 - a. ClickOnce
 - b. Windows Installer
 - c. Both deployment options can be distributed via USB drive.

hint

Deployment refers to packaging and distributing an application so that it can be installed on target computers.

Answers

1. If Stepan wants the installer to check for updates, the deployment method he should use is:
 - a. **ClickOnce**
2. If he wants to install a device driver he should use:
 - b. **Windows Installer**
3. Stepan's applications can be distributed via USB drives because:
 - c. **both deployment options can be distributed via USB drive**

Essential details

- The .NET Framework provides two primary technologies for deploying applications: **ClickOnce** and **Windows Installer**.
- Both technologies:
 - provide a user interface to guide users through the installation process.
 - allow for the creation of Start Menu and desktop shortcuts.
 - can be distributed by a website or by removable media.
- The advantages and features of ClickOnce include:
 - There is minimal user interaction during the installation process.
 - The technology automatically checks for updates.
 - Updates do not require complete reinstallation of application.
- Features of Windows Installer include the use of a “wizard” that assists the user with installation and the flexibility to handle a variety of installation situations.
- Windows Installer provides more control over the installation process and is flexible enough to handle unusual or complicated setup requirements.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/y18k4htb.aspx>
- <http://msdn.microsoft.com/en-us/library/e2444w33.aspx>
- <http://msdn.microsoft.com/en-us/library/6hbb4k3e>





OBJECTIVE

DEPLOYING A WINDOWS APPLICATION 5.1B

Understand Windows application deployment methods

SCENARIO: Stepan has decided to deploy his trip planning application using ClickOnce. This is a fairly small application with simple but important installation needs: installation and removal are both user-friendly, it provides an easy way for users to check for updates, and there is minimal impact on the target computer. He wants to give the application to friends using USB drives, but he also has a website he will use to host the installation files.

- 1. In addition to installing from removable media or a website, what other deployment option does ClickOnce offer?**
 - a. running the application itself from the Web or a network share
 - b. integrated peer-to-peer (p2p) distribution
 - c. deployment from Microsoft Messenger
- 2. Which of the following installation options will *not* be available with ClickOnce?**
 - a. associating the .log file extension with the application
 - b. allowing installation for multiple user accounts on the target computer
 - c. installation by a user without Administrator privileges
- 3. What is required when a user wishes to update to a new version of Stepan's ClickOnce application?**
 - a. use ClickOnce to uninstall previous version before updating
 - b. select which portions of the application to update
 - c. allow ClickOnce to update the parts of the application that have changed

hint

Applications that use ClickOnce technology are sometimes referred to as ClickOnce applications.

Answers

1. Other deployment option available with ClickOnce technology include:
 - a. **running the application from the web or a network share**
2. The following is not an option when using ClickOnce deployment:
 - b. **allowing installation for multiple user accounts on the target computer**
3. To update a ClickOnce application it is necessary to:
 - c. **allow ClickOnce to update the parts of the application that have changed**

Essential details

- **ClickOnce** is a deployment technology used to distribute self-updating applications that require minimal user interaction during installation.
- End-user installation of a ClickOnce application is very simple, does not require Administrator rights, and has no impact on other installed applications.
- ClickOnce offers three choices for deploying an application:
 - Installation from the Web or a network share
 - Installation from removable media
 - Running the application from the Web or a network share
- The user can choose to have a ClickOnce application check a website for updates when the program is launched, in the background while the user uses the application, or through the program's user interface.
- The user can specify other update-related settings, such as how frequently the application checks for updates, or forcing the user to install new releases before being able to use the application.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/142dbbz4.aspx>
- <http://msdn.microsoft.com/en-us/library/31kztyey.aspx>

track

/3



OBJECTIVE

DEPLOYING A WINDOWS APPLICATION 5.2

Create Windows setup and deployment projects

SCENARIO: Stepan's trip planning application was a hit with his friends; they are all eagerly awaiting his next creative application.

Stepan chose to use ClickOnce technology for his trip planner application, but his trip log program requires a device driver and a couple other custom installation features that require a bit more detail. He wants to display a "readme" file with information about using a GPS, and he would like to include a user manual in Microsoft Word document format. He will use Windows Installer to deploy this application.

1. How does Stepan create the deployment files necessary for his application?

- a. by adding a setup project to his solution
- b. by running the Setup And Deployment Wizard
- c. by using the Installer Tool (installutil.exe)

2. What feature will allow Stepan to install his device driver and display his "readme" file?

- a. custom actions
- b. deployment settings
- c. installation options

3. What Visual Studio tool can Stepan use to add his Microsoft Word document to the deployment files?

- a. File System Editor
- b. Server Explorer
- c. Toolbox

hint

Unlike a Windows Services application, Forms and WPF applications often do not require the use of installer classes.

Answers

1. Stepan can create deployment files for distribution:
 - a. **by adding a setup project to his solution**
2. Stepan can add his device driver installation and user manual with:
 - a. **custom actions**
3. The Visual Studio tool that allows you to add files to the deployment project is:
 - a. **File System Editor**

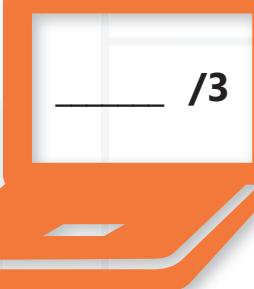
Essential details

- To use Windows Installer technology, add a setup project to your solution. Building a setup project creates setup (or installation) files to distribute your application.
- Custom actions (using **installer classes**) allow you to perform additional actions on the target computer at the end of the installation process, such as Stepan's device driver installation and "readme" file display.
- Visual Studio's File System Editor gives the developer control over where the application is installed, the addition of shortcuts, and the inclusion of additional files.
 - The File System Editor can be accessed by clicking View in the Solution Explorer and then clicking File System Editor.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/wx3b589t.aspx>
- <http://msdn.microsoft.com/en-us/library/996a3fxs.aspx>
- <http://msdn.microsoft.com/en-us/library/fyh6k4k4.aspx>

track



MTA 98-363
WEB
DEVELOPMENT
FUNDAMENTALS



1



Programming Web Applications

IN THIS CHAPTER

- 1.1 Customize the layout and appearance of a Web page
- 1.2 Understand ASP.NET intrinsic objects
- 1.3 Understand state information in Web applications
- 1.4 Understand events and control page flow
- 1.5 Understand controls
- 1.6 Understand configuration files





OBJECTIVE

PROGRAMMING WEB APPLICATIONS 1.1

Customize the layout and appearance of a Web page

SCENARIO: Cynthia has just assumed a new position as the lead designer for the campus website. She has a team of 15 fellow students to help with the job.

Her biggest challenge is to ensure that every page of the website shares a common look and feel. The website has the potential of becoming a huge site and visitors must know that they are on the Tigers website no matter where they roam.

- The Tigers' sports page contains many team pictures, schedules, and statistics.
- The library page contains tutoring schedules, book reviews, and new releases.
- Every club is interested in posting their calendars and activities.
- The news page contains recent news about events happening on campus.
- Even faculty members want pages, and there are 108 teachers!

1. What will be Cynthia's best strategy to accomplish her goal?

- a. enforce strict guidelines with the team
- b. be the chief editor of all the pages
- c. teach the team to use Cascading Style Sheets (CSS)

2. CSS is to HTML as:

- a. an outfit is to a person
- b. an apple is to an orange
- c. a car is to the road

3. The primary goal of page layout for navigation is:

- a. to provide links to every page on every page of the site
- b. ease of use
- c. to provide links to other sites

hint

When designing a Web page, "say it with style!"

Answers

1. Cynthia's best strategy is:
c. **teach the team to use Cascading Style Sheets (CSS)**

2. CSS is to HTML as:

- a. **an outfit is to a person**

Just as an outfit can add style to a person, CSS contains all the elements of style for a page.

3. Primary goal of page layout for navigation is:

- a. **ease of use**

Poor page navigation will drive visitors away.

Essential details

- **HTML** is a language for describing web pages using statements in tags (< >) that define the layout of a page.
- **CSS** is a technology to separate style from content in an HTML page.
- **Tables** (<table>) are great tools for organizing information in row and column format.
- **Embedding** saves images or files within a website's directory.
- Remember: Separate style from HTML, use tables or dividers to organize content, embed images, and provide an easy-to-use navigation system.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/ms531205\(VS.85\).aspx](http://msdn.microsoft.com/en-us/library/ms531205(VS.85).aspx)
- <http://msdn.microsoft.com/en-us/beginner/bb308760.aspx>

track
your score

_____ /3



OBJECTIVE

PROGRAMMING WEB APPLICATIONS 1.2

Understand ASP.NET intrinsic objects

SCENARIO: Juan-Carlos loves reading science fiction and spends hours and hours shopping for books online. He is fascinated that the online shopping cart keeps track of all of his shopping activities. He can select books and then change his mind, select additional books, enter special offers and coupons, and even change the quantities of books he selected; the shopping cart is always current with his most recent decisions.

Because Juan-Carlos likes to know how things work, he plans to ask his friend Kim to explain it to him. He has a few questions for Kim:

1. When I'm shopping online, how are the items I select added to the shopping cart?
2. What happens when I change my mind and delete a selection?
3. How does the website keep track of it all?

To answer Juan-Carlos's questions, Kim must brush up on her web development skills. Can you help her out?

1. What objects are used to store the book selection list?

- a. session state, application state
- b. Boolean, integer, double
- c. book, CD, magazine

2. What is meant by the expression "code behind?"

- a. code that runs on the client
- b. code that runs outside of the HTML code
- c. code that is written in Cobol

3. True or False: HTTP is a stateless protocol.

4. True or False: A response is sent from the client to the server and request is sent from the server to the client.

hint

Your shopping list would be empty without ASP or a similar web form application.

Answers

1. The objects used to store selections are:
 - a. **session state, application state**
2. Code behind is:
 - b. **code that runs on the server**
3. **True:** HTTP is a stateless protocol; it does NOT retain data from session to session.
4. **False:** A response is sent from the server to the client and a request is sent from the client to the server.

Essential details

- **Application state** enables sharing of data across multiple sessions.
- **HttpContext** is a class that includes the intrinsic objects: Request and Response.
- A **Request** retrieves posted data.
- A **Response** sends a message or data back to the client.
- A server receives requests from the client, which also stores data and provides methods to process web requests.
- **Session state** manages data sent from one page to be used by another page later.

FAST TRACK HELP

- <http://quickstarts.asp.net/QuickStartv20/aspnet/doc/pages/pages.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308760.aspx>

track
your score

_____ /4



OBJECTIVE

PROGRAMMING WEB APPLICATIONS 1.3

Understand state information in Web applications

SCENARIO: Tomas recently came to you for advice. It seems he was the victim of a phishing scam and was told by a computer technician to delete his cookies regularly to reduce the risk of future attacks. Tomas is confused because the only cookie he is familiar with goes great with milk.

You explained to Tomas that phishing is a common Internet scam typically carried out by email or instant messaging that often directs users to enter personal details (such as credit card or account numbers) at a fake website that looks and feels almost identical to the legitimate one—and it has nothing to do with a bedtime snack!

You need to further explain the concept of “cookie” to Tomas and how it relates to state management control. To answer Tomas’s questions, review some related concepts.

1. What are cookies?

- a. websites that mimic famous sites
- b. small text files containing specific client information
- c. a collection of URLs to favorite websites

2. What data types can be stored in view state?

- a. strings, integers, Boolean, arrays, arraylist, hash table and custom type converters
- b. name, IP address, URL
- c. vectors, pixels, void, and media types

3. What four levels of the ASP.NET framework assist with management control?

- a. analysis, design, code, and test
- b. client, server, host, and domain
- c. application, state, page, and request

hint

HTTP is a stateless protocol; you must use other state management features of ASP.NET to retain data from session to session and page to page.

Answers

1. Cookies are:
 - b. **small text files containing specific client information**
2. These data types can be stored in view state:
 - a. **strings, integers, Boolean, arrays, arraylist, hash table and custom type converters**
3. The four levels of the ASP.NET framework involved are:
 - c. **application, state, page, and request**

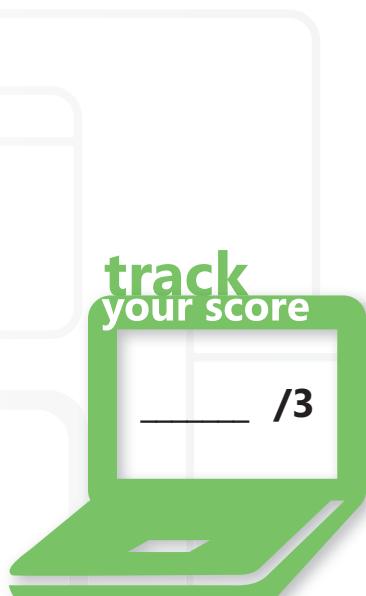
Essential details

Questions help determine the state to select: application, control, session, view state.

- How much information do you need to store?
- Does the client accept persistent or in-memory cookies?
- Do you want to store the information on the client or on the server?
- Is the information sensitive?
- What performance and bandwidth criteria do you have for your application?
- What are the capabilities of the browsers and devices that you are targeting?
- Do you need to store information per user?
- How long do you need to store the information?

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/75x4ha6s.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308760.aspx>



track
your score

_____ /3



OBJECTIVE

PROGRAMMING WEB APPLICATIONS 1.4

Understand events and control page flow

SCENARIO: Denise recently introduced Jeff to the video game *Lego Indiana Jones* on the Xbox 360. She is struggling to explain how the game progresses in terms he can relate to. He needs to understand that when he begins the game, he will choose a character, such as Indiana Jones, who possesses some initial abilities (he can use a whip). Next, he will select a map to start the quest. As he solves the puzzles along the way, he will advance from level to level.

Both Jeff and Denise are familiar with web development. It turns out that the life cycle of a character in a game is closely related to the life cycle of a web application. Denise has decided that she can use this analogy to explain the game. The following concepts will help Denise explain the game in terms that Jeff will recognize.

- 1. A web page life cycle has several stages. The start and load stages of a page life cycle are similar to:**
 - a. starting the game and choosing a character
 - b. Indy using his whip and finding tokens
 - c. introducing a new character to the game
- 2. When events triggered by the user are handled, this is similar to:**
 - a. the automatic save function that occurs during the game's progress
 - b. when the player uses the controller to move the characters forward in the game
 - c. the rendering of the background in the game to simulate a location such as Egypt
- 3. True or False:** After Indiana Jones completes the puzzle at the current level, the game is saved and he must choose another level. This is similar to the last event in the page flow—rendering the page.

hint

To understand events and control page flow, look for the "SILVER" Start, Initialize, Load, Validate, Event Handling, Render.

Answers

1. The start and load stages of a page life cycle are similar to:
 - a. **starting the game and choosing a character**
2. When events triggered by the user are handled, this is similar to:
 - b. **when the player uses the controller to move the characters forward in the game**
3. **True:** After Indiana Jones completes the puzzle for the current level, the game is saved and he must choose another level. This is similar to the last event in the page flow—rendering the page.

Essential details

- **The application life cycle** is a series of processing steps executed within an ASP.NET application when a request is made by a browser.
- **Application life cycle events** occur during the application life cycle.
- **Page life cycle events** occur when an ASP.NET page is requested by a browser, such as PreInit, Load, and Render.
- **Control events** are initiated by actions performed on specific controls, such as a Button control's Click event or a TextBox control's TextChanged event.
- **Application events** are invoked by the `HttpApplication` object (such as `BeginRequest`, `EndRequest`, and `Error`) during the lifetime of an application.
- **Session events** occur during a user's session.
- When an application starts, the page is initialized with its “outfit and abilities” and then loaded. When an event occurs, it is handled and rendered, returning the user back to the page to continue the game.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms178472.aspx>
- <http://www.asp.net/learn/videos/video-6558.aspx>





OBJECTIVE

PROGRAMMING WEB APPLICATIONS 1.5

Understand controls

SCENARIO: Your friend Margie just opened a travel agency. She has hired you to create a website for her new business—Margie’s Travel. In the first deployment of the website, Margie has asked you to provide the following features:

- A calendar
- A currency converter
- A form to request more information
- A form to sign up for future emails about upcoming events

The first step in creating a new website is to meet with the client to discuss her needs and to gather the specific requirements of the site. During your visit with Margie, you realize that this website will need several user controls, server controls, and validation controls. You will need to make many decisions to create the perfect solution for the Margie’s Travel website.

1. Which type of control is best for adding a dynamic calendar to the site?

- a. user control
- b. validation control
- c. server control

2. To ensure that the user enters the data in the correct format for the currency converter, what controls must be included?

- a. user controls
- b. validation controls
- c. web controls

3. What type of control allows the user to modify the appearance and behavior of the user interface directly from the browser?

- a. web control
- b. user control
- c. server control

hint

If you have common user interface components on multiple pages, create a user control that can be reused on other pages.

Answers

1. The type of control best for adding a dynamic calendar to your web site is a:
c. server control
2. To make sure the user enters the data in the correct format for the currency converter, include:
b. validation controls
3. The user can modify the appearance and behavior of user interface directly from the browser with a:
a. web control

Essential details

- **User controls** may contain HTML markup, web controls, and server controls, created using a visual design surface resulting in an .ascx file.
- **Server controls** can be used in .aspx pages, user controls, and other server controls, rendering HTML markup when viewed in an ASP.NET web page.
- **Web controls** define the methods, properties, and events common to all controls in the WebControls namespace.
- **Validation controls** inherit from the base Web Control class providing validation functions using very specific sets of rules that are applied to user-entered data.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/yhzc935f.aspx>
- <http://www.asp.net/learn/3.5-videos/video-221.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308760.aspx>



track
your score

_____ /3



OBJECTIVE

PROGRAMMING WEB APPLICATIONS 1.6

Understand configuration files

SCENARIO: The Tigers' school website is off to a good start and attracting many visitors, including teachers, parents, and students. Several teachers also serve as school club advisors. They asked Cynthia if they can use the website to raise funds for their organizations by enabling visitors to order school spirit clothing from the site. Cynthia is eager to help them put their plans into action—it will be good for the school and for the students.

Cynthia decides to write a program in C# to use in completing this project, but she realizes that she needs to update the web.config file to ensure that the program compiles correctly and enables debugging when the application is deployed. She needs to review a few concepts about this process so that she can efficiently make changes to the site and help the organizations meet their goals.

1. Why did Cynthia decide to update the web.config file instead of the machine.config file?

- a. she does not need a machine.config file
- b. the web.config file is used to set information for a web server, website, or specific web applications within a website
- c. changes are only allowed in the web.config file(s)

2. What language is used in the two files?

- a. XML
- b. HTML
- c. JavaScript

3. True or False: Child directories inherit the settings of the parent directory unless they are overwritten at the child level.

hint

Because there is only one machine.config file, it is easy to maintain. When you deploy a web application on a new server, you must copy the machine.config file separately.

Answers

1. Cynthia updated the web.config file instead of the machine.config file because:
 - b. **the web.config file is used to set information for a web server, website, or specific web applications within a website**
2. The language used in the two files is:
 - a. **XML**
3. **True:** Child directories inherit the settings of the parent unless they are overwritten at the child level. Each file applies settings to its directory and below, but can be changed in the sub-directories.

Essential details

- **Web.config** contains configuration settings for an ASP.NET web application.
- **Machine.config** contains the ASP.NET settings that apply to the entire web server.
- **Remoting** can be used to communicate with other application domains in the same process, or components that may exist in other processes, and so on.
- **Channels** transport messages between applications across remoting boundaries, whether between application domains, processes, or computers.

FAST TRACK HELP

- <http://www.asp.net/learn/videos/video-284.aspx>
- <http://msdn.microsoft.com/en-us/library/1xtk877y%28VS.71%29.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308760.aspx>

track
your score

_____ /3

2



Working with Data and Services

IN THIS CHAPTER

- 2.1 Read and write XML data
- 2.2 Distinguish between DataSet objects and DataReader objects
- 2.3 Call a service from a Web page
- 2.4 Understand DataSource controls
- 2.5 Bind controls to data by using data-binding syntax
- 2.6 Manage data connections and databases





OBJECTIVE

WORKING WITH DATA AND SERVICES 2.1

Read and write XML data

SCENARIO: Yan is a student at the same school where Cynthia works. He is taking a web development course and he wants to help with the school web site.

Cynthia just finished the program to enable visitors to order fundraiser items from the website, but she realizes that she needs to create a file with customer information that can be easily exchanged between different applications. She decides to use XML and asks Yan to help her create the file layout and XML tags to make sure it is a well-formed document.

The final step of the project requires extensive testing, so she is going to ask Yan to test her application before it is deployed; this is a great way for him to learn more about the web development process.

1. Why did Cynthia decide to use XML as a format for the data file?

- a. XML is an almost universally supported way of exchanging documents and data
- b. XML is easier to learn than HTML
- c. XML reduces the file size of the data file

2. What is another use of XML tags?

- a. to create web pages instead of HTML
- b. to document an application program
- c. to write an application to process data

3. True/False: XML is not case sensitive—for example, <order id = "123"> and </Order> are syntactically correct starting and ending tags, just like HTML.

hint

Download XML Notepad 2007 to make creating XML files even easier: <http://www.microsoft.com/downloads/details.aspx?familyid=72d6aa49-787d-4118-ba5f-4f30fe913628&displaylang=en>

Answers

1. Why did Cynthia decide to use XML as a format for the data file?
 - a. **XML is an almost universally supported way of exchanging documents and data**
2. What is another use of XML tags?
 - b. **to document an application program**
3. **False:** XML is case sensitive: <order id = "123"> and </Order> are not syntactically correct starting and ending tags. It is true that HTML is **not** case sensitive.

Essential details

- **XML** (eXtensible Markup Language) lets web developers create customized tags that offer flexibility in organizing data and provides an efficient means of transport for that data.
- **A well-formed XML document** meets all the syntactical requirements defined for an XML document.
- **XML validation** requires that the elements must appear in a defined structure and the content of the individual elements must conform to the declared data types specified in the schema.
- **XML Schema** is one of many schema languages used to provide a common base for data description and validation in XML documents.

FAST TRACK HELP

- <http://quickstarts.asp.net/QuickStartv20/howto/doc/XML/OverviewofXML.aspx>
- <http://msdn.microsoft.com/en-us/data/bb190600.aspx>
- <http://msdn.microsoft.com/en-us/library/1xtk877y%28VS.71%29.aspx>

track
your score



Distinguish between DataSet objects and DataReader objects

SCENARIO: The Coho Winery—located in Baden, Germany—is expanding with the purchase of another local winery. To prepare for this expansion, Coho Winery must update the website to include the additional selection of wines and initiate efficient business practices. The lead web developer, Thorsten Weinrich, has been assigned the task of updating the site to accommodate the new business demands. Thorsten realizes that the current site needs some major updates. In a discussion with the owner, he defines several new business requirements for the site.

For a positive experience, visitors must be able to:

- Search for specific wines.
- Sort the wine selection by date, color, and variety (Champagne, Burgundy, and so on).

The business manager must be able to:

- Dynamically add new wines to the selections.
- Produce reports of the current stock of wines on hand.

1. To update the information stored about the current wines available, he should use:

- a. DataSet objects
- b. DataReader objects
- c. Update objects

2. To produce reports on current inventory, he should use:

- a. DataSet objects
- b. DataReader objects
- c. Sorter objects

3. What is the main difference between DataSet and DataReader objects?

- a. DataSet objects represent multiple DataTables and provide read/write
DataReader objects represent data from one database and are read-only
- b. DataReader objects represent multiple DataTables and provide read/write
DataSet objects represent data from one database and are read-only
- c. there are no significant differences between the two

hint

Because DataSet objects may store a large amount of data in memory, they are often very resource-intensive, and should be used judiciously.

Answers

1. To update the information, he should use:

a. **DataSet objects**

These allow the user to read and update the DataTables represented by this object.

2. To produce reports on current inventory, he should use:

b. **DataReader objects**

These are a better choice when you only need to read from the database.

3. The main difference between DataSet and DataReader objects is:

a. **DataSet objects represent multiple DataTables and provide read/write access while DataReader objects represent data from one database and are read-only**

Essential details

- **DataSet** is a memory-resident representation of data that provides a consistent relational programming model regardless of the source of the data it contains.
- **DataReader** is a lightweight, high-performance data access object used for read-only access.
- **Data binding** establishes a connection between an ASP.NET web page control and a data source.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/haa3afyz.aspx>
- <http://msdn.microsoft.com/en-us/library/system.data.dataset.aspx>
- <http://msdn.microsoft.com/en-us/magazine/cc188717.aspx#S4>



track
your score

_____ /3



OBJECTIVE

WORKING WITH DATA AND SERVICES 2.3

Call a service from a Web page

SCENARIO: Margie's Travel has finished documenting the requirements for an online currency converter. The application will provide current exchange rates for all of the travel destinations offered by the agency. After reviewing the requirements and the timeline for completion, you realize that you will need additional help to complete the task.

Sanjay is a friend from college and has worked on several websites for friends and businesses. After talking to Sanjay, you both decide that the best approach is to develop the converter program in C#, and use a WFC framework to call the service application. Sanjay will create the currency conversion program and you will be responsible for implementing the call from the client.

- 1. What is the first step in creating a basic Windows Communication Foundation (WCF) service?**
 - a. configure a WFC client
 - b. create a WFC client
 - c. define a WFC service contract

- 2. What is the last step in creating the WFC service?**
 - a. compile the service code, using the ServiceModel Metadata Utility Tool (Svcutil.exe) to create the WCF client
 - b. define a WFC service contract
 - c. implement the service contract

- 3. After the service is compiled using the ServiceModel Metadata Utility Tool, what type of file is created to specify the configuration to the client?**
 - a. an HTML file
 - b. an XML file
 - c. a JavaScript file

hint

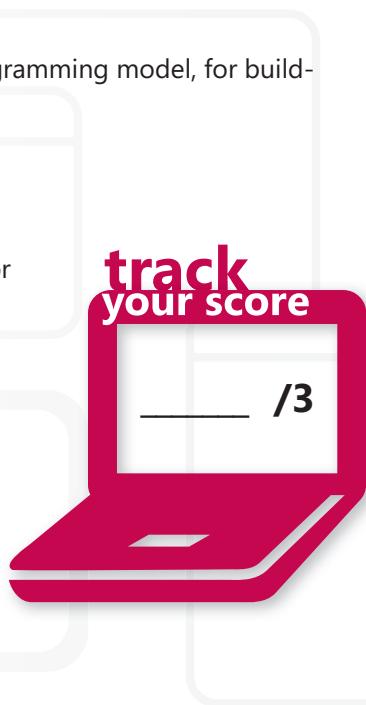
Don't reinvent the wheel every time; search for existing WFC services first because they can be used by several client applications.

Answers

1. The first step in creating a basic Windows Communication Foundation (WCF) service is:
c. define a WFC service contract
2. The last step in creating the WFC service is:
a. compile the service code using the ServiceModel Metadata Utility Tool to create the WCF client (<http://msdn.microsoft.com/en-us/library/aa347733.aspx>)
3. After the service is compiled, the file created to specify the configuration to the client is:
b. an XML file

Essential details

- **A web service** is a modular collection of Web protocol–based applications that can be mixed and matched to provide business functionality through an Internet connection.
- **WFC service** uses Windows Communication Foundation, Microsoft’s unified programming model, for building service-oriented applications.
- **The basic life cycle of a WFC application:**
 1. Define the service contract.
 2. Implement the contract.
 3. Configure the service by specifying endpoint information and other behavior information.
 4. Host the service in an application.
 5. Build a client application.



track
your score

_____ /3

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms731835.aspx>
- <http://www.asp.net/learn/videos/video-280.aspx>
- <http://www.asp.net/learn/3.5-videos/video-231.aspx>

Understand DataSource controls

SCENARIO: Thorsten has been busy finalizing the plans for the new Coho Winery website. Now that the business requirements are defined, he can begin revising the site and writing the programs to access and update the data. The data for the winery is currently held in a Microsoft® SQL Server® database and much of the new functionality of the site depends upon interactions with that data. A quick review of requirements reminds Thorsten of the tasks to be completed.

For a positive experience on the site, visitors must be able to:

- Search for specific wines
- Sort the wine selection by date, color, and variety (Champagne, Burgundy, and so on)

The business manager must be able to:

- Dynamically add new wines to the selections
- Produce reports of the current stock of wines on hand

1. Which DataSource control will Thorsten use?

- a. LinqDataSource
- b. SqlDataSource
- c. XmlDataSource

2. Which DataSource would be used to provide access to ASP.NET server controls such as TreeView or Menu Control?

- a. LinqDataSource
- b. SqlDataSource
- c. XmlDataSource

3. What is a benefit of using DataSource controls?

- a. reduce the amount of code required to access data
- b. provide quicker access to the data
- c. allow the user to access more data at one time

hint

The type of data repository being used will determine the DataSource control needed.

Answers

1. The DataSource control that Thorsten will use is:
b. **SqlDataSource**
2. The DataSource that would provide access to ASP.NET server controls such as TreeView or Menu Control is:
c. **XmlDataSource**
3. A benefit of using DataSource controls is:
a. **reduce the amount of code required to access data**

Essential details

- **LINQ** (Language Integrated Query) is a set of extensions to the Microsoft .NET Framework that encompass LINQ, set, and transform operations.
- **LinqDataSource** enables the use of LINQ in an ASP.NET Web page through markup text to retrieve and modify data from a data object.
- **ObjectDataSource** represents a business object that provides data to data-bound controls in multitier web application architectures.
- **XmlDataSource** belongs to the family of data source controls in ASP.NET, which enables a declarative data-binding model against a variety of underlying data stores.
- **SqlDataSource** represents a connection to an ADO.NET SQL database provider, such as Structured Query Language (SQL), OLEDB, ODBC, or Oracle.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms227679.aspx>
- <http://msdn.microsoft.com/en-us/library/ms178359.aspx>
- <http://www.asp.net/learn/linq-videos/>

track
your score

_____ /3

Bind controls to data by using data-binding syntax

SCENARIO: Plans for the Coho Winery website are progressing nicely. Based on the initial analysis of business requirements for the site, Thorsten determined that he needs two types of data-binding—one for displaying the information about each wine and another for updating and adding new wines to the shopping cart.

Data-binding will be ideal to incorporate user-interface controls, such as check boxes for sorting and displaying wines by year and category. Thorsten also plans to use data-binding controls to allow the user to update the list of selected wines so that the updated information propagates immediately to all of the associated forms.

1. Typically, each binding has four components:

- a. a binding target object, a path to the value in the binding source, data conversion default value, and collection view
- b. a binding target object, a target property, a binding source, and a path to the value in the binding source
- c. a target property, a binding source, data conversion default value, and a path to the value in the binding source

2. The Coho website must enable users to change the data and propagate it back to the source object. Therefore, Thorsten must use:

- a. OneWay binding
- b. TwoWay binding
- c. OneWayToSource binding

3. When would Thorsten use the empty binding syntax (Example:

`<ListBox ItemsSource="{Binding}"
IsSynchronizedWithCurrentItem="true"/>?`

- a. when he has already bound another item with the same source
- b. when he doesn't know the datasource name to bind to
- c. when he wants to bind to the entire object

hint

Spend a little extra time early in the project to save time later; set up correct data-bind controls in the beginning. When the data changes its value, the elements that are bound to the data reflect changes automatically.

Answers

1. Typically, each binding has:
 - b. a **binding target object, a target property, a binding source, and a path to the value in the binding source**
2. To enable users to change the data and propagate it back to the source object, Thorsten must use:
 - b. **TwoWay binding**

TwoWay binding causes changes to either the source property or the target property to automatically update the other
3. Thorsten would use the empty binding syntax when:
 - c. **he wants to bind to the entire object**

Essential details

- A **control** is an object in the graphical-user interface that can be manipulated by the user to perform an action.
- **Data binding** establishes a connection between the application user-interface (UI) and business logic.
- **A data-aware control** allows the control to bind to data. Data-aware controls are distinguished by the presence of the **DataSource** property.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms752347.aspx>
- <http://msdn.microsoft.com/en-us/library/aa480224.aspx>
- <http://msdn.microsoft.com/en-us/data/ff806174.aspx> (video)

track
your score

_____ /3

Manage data connections and databases

Scenario: The Coho Winery website is almost finished! The last step in completing the site requires Thorsten to establish the necessary database connections. The current database of information about the wines is stored on a Microsoft® SQL Server® computer, so he decides to keep this platform for the data repository.

Because the new wines contain the same data properties, it is just a matter of adding the new wines to the database through the UI (user-interface). Thorsten has the necessary information for securing the connection from the old website, so he just needs to add this logic to the new version.

1. Which connection object best fits the preceding scenario?

- a. OleDbConnection
- b. SqlConnection
- c. OdbcConnection

2. Thorsten knows that the database connection will be required for several interactions on the site, so he decides to use connection pooling. This is wise because:

- a. connection pooling reduces the number of times that new connections need to be opened
- b. connection pooling prevents deadlocks
- c. connection pooling automatically closes unused open connections

3. Every request executed on the database is considered a transaction object.

What command is used to undo a completed request?

- a. commit
- b. rollback
- c. undo

hint

Use the Server Explorer to connect to a database. Watch it in action at [http://msdn.microsoft.com/en-us/library/0wbeiae\(v=VS.80\).aspx](http://msdn.microsoft.com/en-us/library/0wbeiae(v=VS.80).aspx).

Answers

1. The best fit for the scenario is:
 - b. **SqlConnection**
2. Using connection pooling is wise because:
 - a. **it reduces the number of times that new connections need to be opened**
3. A completed request executed on the database can be undone with:
 - b. **rollback**

Essential details

- A **database connection** enables the user to read and write data and create Structured Query Language (SQL) objects in the database.
- **Connection objects** provide the capability to move data between a data store and an application.
- **Connection pooling** manages connections as shared resources that can be assigned from a pool of recently used connections.
- A **transaction object** allows multiple tasks to be bound together.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/ms810829\(v=MSDN.10\).aspx](http://msdn.microsoft.com/en-us/library/ms810829(v=MSDN.10).aspx)
- [http://msdn.microsoft.com/en-us/library/ms171962\(v=VS.80\).aspx](http://msdn.microsoft.com/en-us/library/ms171962(v=VS.80).aspx)
- <http://msdn.microsoft.com/en-us/library/6759sth4.aspx>

track
your score



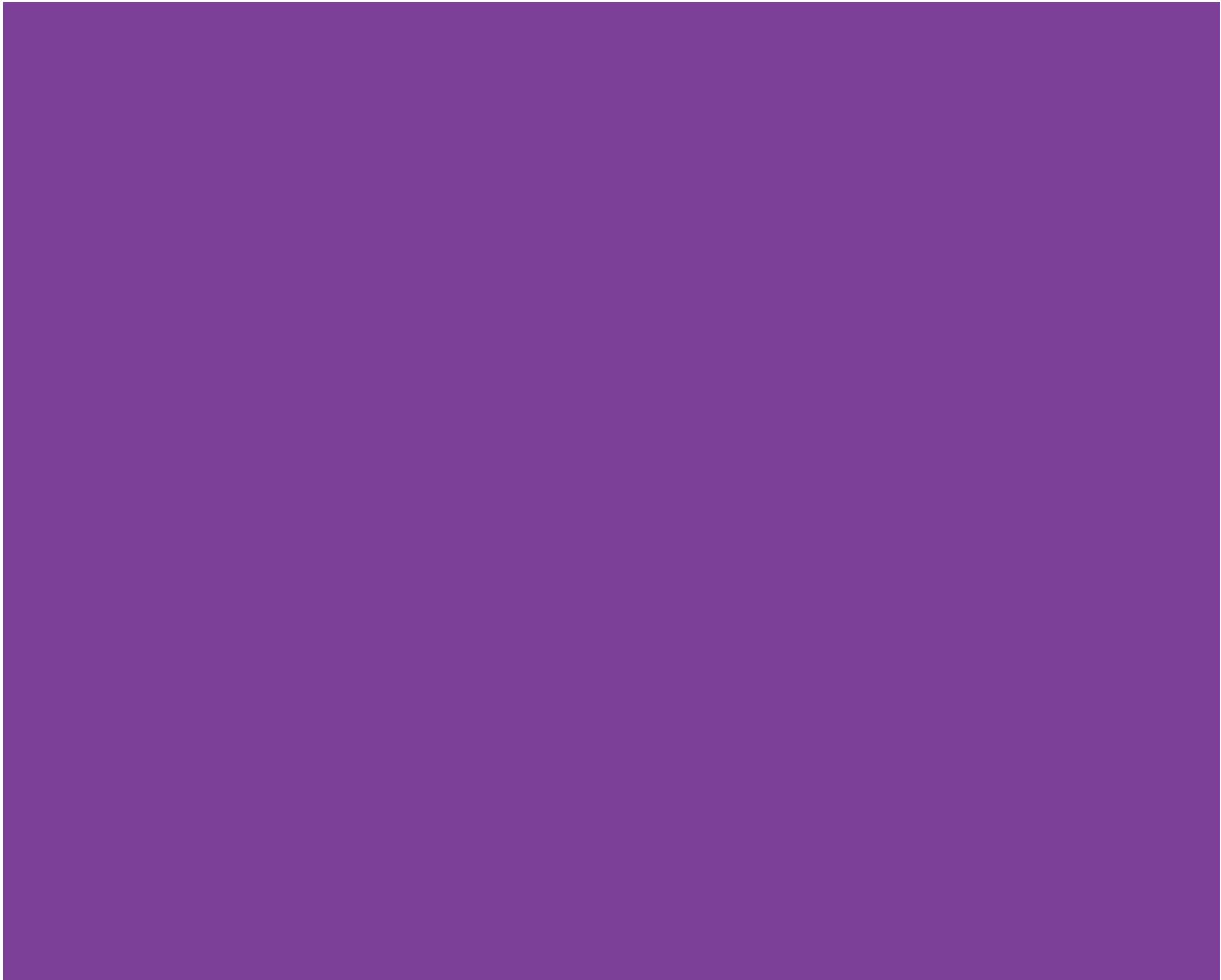
3



Troubleshooting and Debugging Web Applications

IN THIS CHAPTER

- 3.1 Debug a Web application
- 3.2 Handle Web application errors



Debug a Web application

Scenario: Nuria Gonzalez is the leader of a band that specializes in the lively Conjunto music of Northern Mexico. Nuria is the main vocalist and is supported by Jose with the button accordion, Tomás on the Bajo Sexto, Pablo playing an electric bass, and Isabelle keeping the beat on the drums.

The band is eager to make themselves known to the community. They want to tell about their music, post details about upcoming concerts, offer a newsletter, and introduce the members of the band. They've decided the best way to reach their audience is with a website. Nuria is majoring in web design in college, so she offers to create the site, find a hosting company, and keep the site updated.

To be sure that all of the band members are happy with the site, she has invited them to help with the site testing before it is made public. The first version is ready.

- 1. What type of errors does Nuria expect the testers to find?**
 - a. syntax errors
 - b. logic errors
 - c. diagnostic errors

- 2. What element can be added to the config file to assist in testing the application?**
 - a. trace element
 - b. debug element
 - c. diagnose element

- 3. What two levels of error debugging can be configured in a application to allow tracing?**
 - a. page and application level
 - b. page and site level
 - c. application and database level

hint

Find inexperienced users to test your site. Their honest opinions are critical for improving the site, so don't be defensive if they provide negative feedback or find errors.

Answers

1. Nuria expects the testers to find:
 - b. **logic errors.** Unlike logic errors, syntax errors occur in compiling.
2. The element that can be added to the config file to assist in testing is the:
 - a. **trace element**
3. The two levels of error debugging that can be configured to allow tracing are:
 - a. **page and application level**

Essential details

- **Debugging** is the process to detect, locate, and correct logical or syntactical errors in a program.
- A **custom error page** displays detailed error information to help administrators and developers troubleshoot and solve Active Server Pages (ASP) coding issues.
- **ASP.NET tracing** enables you to view diagnostic information about a single request for an ASP.NET page.
- **Trace.axd (trace viewer)** can be used to view trace information that is collected and cached by ASP.NET when tracing is enabled.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/6915t83k.aspx>
- [http://msdn.microsoft.com/en-us/library/w2faa92k\(VS.71\).aspx](http://msdn.microsoft.com/en-us/library/w2faa92k(VS.71).aspx)
- <http://msdn.microsoft.com/en-us/library/system.diagnostics.trace.aspx>

track
your score

_____ /3

Handle Web application errors

SCENARIO: The website for the Conjunto band is ready for testing, and Jose, Tomás, Isabelle, and Pablo are eager to see what Nuria has created. She has asked the musicians and some family members to help with the testing process. To provide Nuria with useful feedback and specific details for improving the site, they will need some guidance in testing techniques. Website testing requires unique skills and some background knowledge.

To provide good test questions, she needs to review the type of web-application errors the testers can expect.

- 1. What are the four levels of error handling in a web application?**
 - a. page level, application level, server level, and GUI level
 - b. code block error handling, page level, server level, and IIS level
 - c. code block error handling, page level, application level, and server level
- 2. An important test includes some common HTTP error codes. Which of the following codes should Nuria's testers expect or look for?**
 - a. 403, 404, 500, 501
 - b. 400, 401, 402, 403
 - c. 500, 502, 503, 600
- 3. What is the code block syntax for handling errors that occur during program execution?**
 - a. try....finally
 - b. try...catch...finally
 - c. try...catch...end

hint

*Plan for the worst!
Set up the code and configurations to handle unknown errors and prevent data corruption, security risks, and user frustration.*

Answers

1. The four levels of error handling are:
 - c. **code block error handling, page level, application level, and server level**
2. Nuria's testers should look for:
 - a. **403, 404, 500, 501**
3. Errors can be handled during program execution with:
 - b. **try...catch...finally**

Essential details

- In .NET programming, an **exception** is an error that occurs at run time and is *thrown* (or *raised*). Exception handlers can *catch* exceptions and try to fix the problem, report it, or ignore it.
- **HTTP** (Hypertext Transfer Protocol) is used to carry requests from a browser to a web server and to transport pages from web servers back to the requesting browser.
- **A handler** processes a particular type of message. This might be a separately defined method or an anonymous delegate (inline code).

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/aa478986.aspx>
- [http://msdn.microsoft.com/en-us/library/ms524952\(VS.90\).aspx](http://msdn.microsoft.com/en-us/library/ms524952(VS.90).aspx)
- [http://msdn.microsoft.com/en-us/library/8a9f2ew0\(VS.71\).aspx](http://msdn.microsoft.com/en-us/library/8a9f2ew0(VS.71).aspx)

track
your score



4



Working with Client-Side Scripting

IN THIS CHAPTER

- 4.1 Understand client-side scripting
- 4.2 Understand AJAX concepts





OBJECTIVE

WORKING WITH CLIENT-SIDE SCRIPTING 4.1

Understand client-side scripting

SCENARIO: Summer holiday is quickly approaching and Robin Wakefield is in charge of finding a location for this year's family reunion. He knows that several of his cousins enjoy kayaking and other outdoor activities, so he is researching locations where they can camp and kayak for the long weekend.

Robin is concerned about finding a location that works for all of his relatives, so he decides to create a family reunion website. The site will allow him to gather information from his relatives and narrow down the choices for the reunion.

Robin has decided to use the scripting language JavaScript to provide:

- a countdown to the reunion weekend
- a selection of vacation destinations in Scotland
- a form to obtain preferences (such as tent camping or hotels) and special requests
- a list of items to bring such as food items, utensils, and sporting gear
- a hangman game he created with the names of family members

Robin has many things to consider in designing the website. A quick review of client-side scripting will prove to be time well spent!

1. Which of the following is NOT a benefit of client-side scripting:

- a. it increases user interactivity
- b. it allows pages to share scripts
- c. it is functional on all browsers

2. Which of these is NOT true about linking to an external file that contains scripting code:

- a. the code is easier to maintain
- b. the number of scripts that can be attached to a page is limited
- c. the script only has to be loaded into the cache once

3. Which of the following is NOT a scripting language:

- a. Perl
- b. AJAX
- c. Java

hint

If the script applies to only one page and is small, embed directly in the HTML. Otherwise, save the script in an external file and attach to the HTML code.

Answers

1. Client-side scripting is not:
 - c. **functional on all browsers.** The browser must be enabled to run scripts.
2. The following is NOT true about linking to an external file containing the scripting code:
 - b. **The number of scripts that can be attached to one page is limited.** There is no limit.
3. The following is NOT a scripting language:
 - c. **Java.** It can be confusing, but JavaScript and Java are two different development languages with distinct purposes.

Essential details

- A **script** is a set of instructions added to an application or a utility program. On the Web, scripts are commonly used to add interactivity.
- Perl and AJAX are two scripting language that are used to create scripts that perform special or limited tasks associated with a particular application or function.
- **Client-side scripting** runs within the user's web browser and generate elements such as alert displays, confirmation boxes, and pop-up windows.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/dd584169\(office.11\).aspx](http://msdn.microsoft.com/en-us/library/dd584169(office.11).aspx)
- [http://msdn.microsoft.com/en-us/library/aa292164\(VS.71\).aspx](http://msdn.microsoft.com/en-us/library/aa292164(VS.71).aspx)
- <http://msdn.microsoft.com/en-us/library/aa479302.aspx>

track
your score



Understand AJAX concepts

SCENARIO: Robin's entire family is excited to participate in planning for the upcoming family reunion in Scotland. Everyone has ideas about the location and activities that they want to share on the site being created.

Robin is nearly finished with the first version of the website but he notices that the website loads very slowly and responds rather sluggishly. To make the site more efficient, he decides to enlist of the help of AJAX. No, this is not the name of a friend; it stands for **A**synchronous **J**avaScript **a**nd **X**ML.

Understanding the important concepts of AJAX will enable Robin to have the site up and running smoothly very soon.

- 1. If most of the information on a page does not change as the user interacts with the site, Robin can use AJAX to:**
 - a. perform partial page updates
 - b. prevent users from changing data
 - c. capture HTTP error codes
- 2. Web form applications created with AJAX feature:**
 - a. automatic login security
 - b. interactive UI elements such as progress indicators, tooltips, and pop-up windows
 - c. a design to send and receive data for each user request, including the visual design of the page
- 3. AJAX provides:**
 - a. support for most browsers
 - b. a Microsoft AJAX library that includes both JavaScript and C# programs
 - c. a timer control to send complete postbacks every five minutes

hint

If there are no changes to the design of a page when the user modifies the data content use AJAX to make your site more efficient by performing partial page updates.

Answers

1. If most of the information on the page does not change as the user interacts with the site, Robin can use AJAX to:
 - a. **perform partial page updates**
2. Web form applications created with Ajax feature:
 - b. **interactive UI elements such as progress indicators, tooltips, and pop-up windows**
3. AJAX provides:
 - b. **support for most browsers**

Essential details

- **AJAX** is a group of interrelated web development technologies that can be used to augment a Web application to communicate with a server asynchronously in the background, without interfering with the current state of the page.
- **The ASP.NET AJAX Library** is a collection of resources that enables a developer to build database-driven web applications that execute entirely within a web browser.
- **EnablePartialRendering** is a feature that enables partial rendering of a page, which in turn enables you to update regions of the page individually by using UpdatePanel controls.
- **UpdatePanel** enables sections of a page to be partially rendered without a postback.
- A timer control performs asynchronous or synchronous web page postbacks at a defined interval.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/bb397536.aspx>
- <http://www.asp.net/ajax>
- <http://www.asp.net/ajax/ajaxcontroltoolkit/samples/>

track
your score



5

Configuring and Deploying Web Applications

IN THIS CHAPTER

- 5.1 Configure authentication and authorization
- 5.2 Configure projects and solutions and reference assemblies
- 5.3 Publish Web applications
- 5.4 Understand application pools





OBJECTIVE

CONFIGURING AND DEPLOYING WEB APPLICATIONS 5.1

Configure authentication and authorization

Scenario: A group of high-school video game enthusiasts in the Dominican Republic has decided that they need an online forum to enable them to share ideas and exchange strategies for their favorite games. They agree that they want it to be a closed forum for just their group of friends. The group takes their video games very seriously!

One of the students, Manuel Machado, has created the site that will host the forum. Because the group wants the site to be private, he will add a login page for members to sign in with a special user ID and password. Manuel must consider several details for ensuring that users are correctly authenticated.

- 1. If Manuel uses a Windows-based authentication, how does the application determine the user's authorization to access the site?**
 - a. uses an authorization cookie
 - b. relies on the Windows operating system and IIS
 - c. requires the application programmer to validate users
- 2. For which applications would it be best to use Windows-based authentication?**
 - a. intranet applications
 - b. e-commerce applications
 - c. extranet applications
- 3. How does forms-based authentication determine a user's access to the site?**
 - a. redirects the user to a login page and compares the user's credentials to a list of valid users
 - b. creates a cookie that contains the user's name and role
 - c. requires the user to have a Windows account that can be authenticated by a Web server

hint

When using forms-based authentication, a login page and a process to allow users to sign out are required.

Answers

1. If Manuel uses a Windows-based authentication, the application determines the user's authorization to access the site by:
 - b. **relying on the Windows operating system and IIS**
2. It is best to use Windows-based authentication:
 - a. **for intranet applications**
3. Forms-based authentication determine a user's access to the site by:
 - a. **redirecting the user to a login page and comparing the user's credentials to a list of valid users**

Essential details

- **Authentication** is the process of validating client identity, usually by means of a designated third-party authority.
- **Forms authentication** uses an authentication ticket that is created when a user logs on to a site; then it tracks the user throughout the site.
- **Windows authentication** is an ASP.NET web application that relies on the Windows operating system to authenticate the user.
- **Authorization** determines whether an identity should be granted access to a specific resource.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/eeyk640h.aspx>
- <http://msdn.microsoft.com/en-us/library/wce3kxhd.aspx>
- <http://msdn.microsoft.com/en-us/library/330a99hc.aspx>



track
your score

_____ /3

Configure projects and solutions and reference assemblies

Scenario: Manuel Machado has finished the setup and programming for the gaming forum website. He created a sign-in screen and forum pages, and he added all of his high-school friends to the list of allowed users. The group helped complete the local testing of the site and everything appears to be working.

Manuel has selected a hosting company, A. Datum Corporation, and he needs to configure the web application and project based on the information he obtained from the hosting company. When that is complete, he can deploy the application. Manuel is very excited to see the site on the Internet and wants to be sure he knows everything he needs to know for a successful deployment.

- 1. To reduce future compilation changes to the application, what files should Manuel use to identify the system specific information needed to run the web application?**
 - a. default.html and default.config
 - b. machine.config and web.config
 - c. machine.js and web.js
- 2. Which of the following form the fundamental unit of deployment?**
 - a. assemblies
 - b. configuration files
 - c. web application projects
- 3. Why do assemblies need a strong name that is fully qualified?**
 - a. the name is used to deploy an assembly into the GAC (Global Assembly Cache)
 - b. the name is used at run time to locate the assembly and impacts the and use by an application.
 - c. the name is used to provide security permissions.

hint

A strong assembly name that is fully qualified would look similar to: myTypes, Version = 1.0.1234.0, Culture = "en-US", PublicKeyToken = b77a5c561934e089c.

Answers

1. To reduce future compilation changes to the application, Manuel should use these files to identify the system specific information:
 - b. **machine.config and web.config**
2. The fundamental unit of deployment is:
 - a. **assemblies**
3. Assemblies need to have a strong name that is fully qualified because:
 - b. **the name is used at run time to locate the assembly and impacts the scope and use by an application**

Essential details

- **Assemblies** are the building blocks of Microsoft .NET Framework applications; they form the fundamental unit of deployment, version control, reuse, activation scoping, and security permissions.
- **A Web Application Project** is a model for creating a web application (a set of clients and servers that cooperate to provide the solution to a problem); the structure and build semantics closely resemble the project model in Visual Studio® .NET.
- **A Web Site Project** is a model for creating a website (a group of related HTML documents and associated files, scripts, and databases that is served up by a server on the World Wide Web); the structure is a Windows-style arrangement of files and folders that dynamically compile when a site is opened.
- The **AppSettings** section of the configuration file contains a series of name/value pairs use for various purposes.

track
your score

_____ /3

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/bb514724.aspx>
- [http://msdn.microsoft.com/en-us/library/hk5f40ct\(VS.71\).aspx](http://msdn.microsoft.com/en-us/library/hk5f40ct(VS.71).aspx)
- <http://msdn.microsoft.com/en-us/library/yf1d93sz.aspx>

Publish Web applications

Scenario: Manuel has brushed up on his knowledge about deploying a web application and is ready to work with the A. Datum Corporation to finally get the game enthusiasts' forum on the Web.

A. Datum has informed Manuel that they will be hosting his site on their new web server that is running IIS (Internet Information Server). This is good news for Manuel because he knows that the Microsoft IIS platform provides a flexible, easy-to-maintain web server. He thinks he is ready to migrate the site to the new server.

1. When deploying an ASP.NET application, where are the configuration settings stored?

- a. Microsoft IIS metabase
- b. XML files
- c. HTML files

2. Which of these describes an MSI deployment?

- a. creates a Microsoft Windows installer package with instructions and data to install an application
- b. copies the entire directory with the application and configuration files at one time
- c. publishes a non-updatable application to the Web server

3. Manuel knows that the configuration of an ASP.NET installation depends upon the destination's version of IIS. If the A. Datum Corporation is using Windows 2000 Server®, which version of IIS will be running?

- a. IIS 5.0
- b. IIS 6.0
- c. IIS 7.0

hint

The system will automatically detect changes to the configuration files in an IIS environment; there is no need to restart IIS or reboot.

Answers

1. When deploying an ASP.NET application, the configuration settings are stored in:
 - b. XML files
2. MSI deployment:
 - a. creates a Microsoft Windows installer package with instructions and data to install an application
3. If the A. Datum Corporation is using Windows 2000 server, the version of IIS running is:
 - a. IIS 5.0

Essential details

- An **MSI file** (Microsoft Windows Installer package (.msi)) is a file containing the instructions and data required to install an application.
- **Internet Information Services** (IIS) for Microsoft Windows Server® is a flexible, secure, and easy-to-manage web server for hosting anything on the web.
- IIS 7 is built on a modular architecture. Modules, known as extensions, can be added individually so that only the extensions needed for specific functionality are installed.
- **ASP.NET configuration data** is stored in XML text files named web.config. that can appear in multiple directories in ASP.NET applications.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms178477.aspx>
- [http://msdn.microsoft.com/en-us/library/aa243945\(VS.60\).aspx](http://msdn.microsoft.com/en-us/library/aa243945(VS.60).aspx)
- <http://msdn.microsoft.com/en-us/magazine/cc163448.aspx>

track
your score

_____ /3



OBJECTIVE

CONFIGURING AND DEPLOYING WEB APPLICATIONS 5.4

Understand application pools

Scenario: Manuel has completed the deployment of his web application. He and his fellow game enthusiasts are eager to start communicating on this new forum.

While Manuel was visiting with the representative from A. Datum Corporation, the representative mentioned that Manuel's application will be assigned to an application pool. Manuel was uncertain about the impact of this on his program and decided to do a little research so that he could reassure his friends about the performance of the new forum. He felt comfortable that he would be able to answer his friends' questions after his research was completed.

1. What is an application pool?

- a. a group of one or more URLs that are served by a worker process or set of worker processes
- b. a group of configuration files that are stored in the same directory as the content
- c. something that contains any project created at an HTTP location in the new project dialog box

2. How are they useful?

- a. determine the right to access a resource
- b. provide the common language runtime with the information it needs to be aware of type implementations
- c. provide an easy way to administer a set of websites, applications, and their worker processes

3. If an error occurs when adding an application pool, what is a good place to start looking for problems?

- a. check to make sure the pool name is unique
- b. check the settings in the web.config file
- c. check the GAC (Global Assembly Cache)

hint

Using application pools significantly increases the reliability and manageability of the web infrastructure.

Answers

1. An application pool is:
 - a. **a group of one or more URLs that are served by a worker process or set of worker processes**
2. They are useful for:
 - c. **providing an easy way to administer a set of websites, applications, and their worker processes**
3. If an error occurs when adding an application pool:
 - a. **check to make sure the pool name is unique**

Essential details

- **An application pool** is a group of one or more Uniform Resource Locators (URLs) that are served by a worker process or set of worker processes.
 - Any web directory or virtual directory can be assigned to an application pool.
 - An application pool provides a convenient way to administer a set of websites and applications and their corresponding worker processes.
 - An application pool significantly increase both the reliability and manageability of a web infrastructure.

FAST TRACK HELP

- [http://technet.microsoft.com/en-us/library/cc753449\(WS.10\).aspx](http://technet.microsoft.com/en-us/library/cc753449(WS.10).aspx)
- [http://msdn.microsoft.com/en-us/library/ms525832\(VS.90\).aspx](http://msdn.microsoft.com/en-us/library/ms525832(VS.90).aspx)
- <http://msdn.microsoft.com/en-us/library/ms734677.aspx>

track
your score

_____ /3

MTA 98-364

DATABASE ADMINISTRATION FUNDAMENTALS



1



Understanding Core Database Concepts

IN THIS CHAPTER

- 1.1 Understand how data is stored in tables
- 1.2 Understand relational database concepts
- 1.3 Understand data manipulation language (DML)
- 1.4 Understand data definition language (DDL)





OBJECTIVE

UNDERSTANDING CORE DATABASE CONCEPTS 1.1

Understand how data is stored in tables

SCENARIO: High-school student Rajesh M. Patel works part-time in his dad's cycle shop in Pune, India. Pune was the first city in India to have dedicated lanes for cycles.

Raj's dad currently keeps track of his inventory using pencil and paper. Ordering parts and accessories or counting inventory takes several days. Raj is taking a database management class in school and he realizes that his dad's business could benefit greatly by implementing a database management system.

Raj needs to review a few basic concepts before he starts, and has made of list of topics he knows will be important in the first steps of the project.

- 1. Identify tables that Raj might create for the database.**
 - a. a parts table, a cycle table, and an accessories table
 - b. one table for all parts, cycles, and accessories
 - c. a table for each part, each cycle, and each type of accessory (a helmet table, a biking glove table, and so on)
- 2. Identify the fields that Raj should use for column headings of the parts table.**
 - a. part number, part name, cycle number, and cycle name
 - b. part number and quantity sold
 - c. part number, part name, quantity, color, and cycle identifier
- 3. What is the name of the data located at the intersection of a row and column?**
 - a. field
 - b. record
 - c. variable

hint

Think of a database table as an Excel® spreadsheet that contains rows and columns. The data in one table may need to reference data in another.

Answers

1. Raj will need these tables:
 - a. **a parts table, a cycle table, and an accessories table**
2. Raj should use these fields for the column headings of the parts table:
 - c. **part number, part name, quantity, color, and cycle number**
3. The name of the data located at the intersection of a row and column is:
 - a. **field**

Essential details

- A **field** is a location in a record in which a particular type of data is stored.
- A **column** is an attribute for a row or record.
- A **row** is a record within a table.
- A **table** is a database object consisting of rows and columns.
- A **record** is a data structure that is a collection of fields (elements), each with its own name and type that appear in a table as group of fields across one row.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/aa174501\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa174501(SQL.80).aspx)
- <http://msdn.microsoft.com/en-us/library/ms189104.aspx>

track
your score

_____ /3



OBJECTIVE

UNDERSTANDING CORE DATABASE CONCEPTS 1.2

Understand relational database concepts

SCENARIO: The next step for Raj in the design of the database to streamline his father's cycle business is to determine the most useful relationships between the tables. He knows that he needs to create a relational database because it will be important to conduct searches by using data in one table to find additional data in another table. Figuring out a design that best meets the needs of the cycle shop is a critical step. While reviewing his current business requirements, he realizes that he needs to add another table to include the suppliers of the parts for the cycles. This new table requires Raj to update the parts table to include a foreign key to the supplier table.

1. What is the relationship between the supplier table and the parts table?

- a. one-to-one
- b. one-to-many
- c. many-to-many

2. What is a good foreign key for the relationship between the cycle table and the parts table?

- a. part number
- b. cycle model number
- c. part name

3. What is a suggested primary key for the accessory table?

- a. accessory number
- b. accessory name
- c. accessory model

hint

The primary key must be a value that is unique to each record in the table.

Answers

1. The relationship between the supplier table and the parts table is:
 - b. **one-to-many.** Every supplier provides one-to-many parts.
2. A good foreign key for the relationship between the cycle table and the parts table is:
 - a. **part number.** Each cycle will have many unique parts.
3. A primary key for the accessory table is:
 - a. **accessory number.** Many accessories might have the same name and model.

Essential details

- Most modern database management systems implement a **relational model** in which the data is organized in relations (tables).
- A **one-to-one relationship** is an association between two tables in which the primary key value of each record in the primary table corresponds to the value in the matching field of one, and only one, record in the related table.
- A **many-to-many relationship** is a complex association between two sets of parameters in which many parameters of each set can relate to many others in the second set.
- A **parent/child relationship** is a relationship between nodes in a tree data structure in which the parent is one step closer to the root (that is, one level higher) than the child.
- **Primary Keys** are unique data identifiers.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/aa174501\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa174501(SQL.80).aspx)
- <http://www.asp.net/sql-server/videos/designing-relational-database-tables>
- [http://msdn.microsoft.com/en-us/library/aa224764\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa224764(SQL.80).aspx)

track
your score

_____ /3



OBJECTIVE

UNDERSTANDING CORE DATABASE CONCEPTS 1.3

Understand data manipulation language (DML)

SCENARIO: Raj has the cycle database setup for his dad's cycle shop in India. The next step is to work with his dad to learn what operations he will need to perform with the database. These are called **user requirements**. His dad needs the new application to perform these initial tasks (other requirements will be defined later):

- Create various inventory reports
- Produce sales reports (by cycle model, price, and so on)
- Add new inventory to the system when it arrives
- Change the cost of cycles and parts as necessary
- Remove cycles from the database when they are sold

1. What DML (data manipulation language) command must be used to indicate that a cycle was sold and should be removed from the Cycle table?

- a. DELETE FROM Cycle WHERE cycle_id = T1234
- b. REMOVE FROM Cycle WHERE cycle_id = T1234
- c. ERASE FROM Cycle WHERE cycle_id = T1234

2. What command is used to report on the current on-hand quantities of red cycles?

- a. SELECT cycle_model WHERE cycle_color = 'red'
- b. SELECT * FROM Cycle WHERE cycle_color = 'red'
- c. FIND * FROM Cycle WHERE cycle_color = 'red'

3. How is a new cycle added to the Cycle table in the database?

- a. INSERT INTO Cycle (C3425, 'Rockrider', 'red', 9999.00)
- b. ADD INTO Cycle VALUES (C3425, 'Rockrider', 'red', 9999.00)
- c. INSERT INTO Cycle VALUES (C3425, 'Rockrider', 'red', 9999.00)

hint

*Be very careful when using the **DELETE** command; it is easy to accidentally delete all rows in a table. Use a **WHERE** clause unless you want the table erased.*

Answers

1. The DML (data manipulation language) command used to indicate that a cycle was sold and should be removed from the Cycle table is:
 - a. `DELETE FROM Cycle WHERE cycle_number = T1234`
2. The command used to report on the current on-hand quantities of red cycles is:
 - b. `SELECT * FROM Cycle WHERE cycle_color = 'red'`
3. A new cycle is added to the Cycle table in the database with:
 - c. `INSERT INTO Cycle VALUES (C3425, 'Rockrider', 'red', 9999.00)`

Essential details

- Structured query language (**SQL**) is a relational database language used in querying, updating, and managing relational databases and is the de facto standard for database products.
- Data manipulation language (**DML**) is used to insert, update, and delete data and to query a database.
- Data definition language (**DDL**) is used to create, modify, or drop relational databases, entities, attributes, and other objects (e.g. views).

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms191524.aspx>
- [http://msdn.microsoft.com/en-us/library/dd787894\(BTS.10\).aspx](http://msdn.microsoft.com/en-us/library/dd787894(BTS.10).aspx)
- <http://msdn.microsoft.com/en-us/rampup/ee832799.aspx>

track
your score

_____ /3



OBJECTIVE

UNDERSTANDING CORE DATABASE CONCEPTS 1.4

Understand data definition language (DDL)

SCENARIO: Raj is making excellent progress automating his dad's cycle shop. He has reduced the amount of paperwork and provided more accurate information for his dad to maintain the current inventory.

As a result of the automation, his dad has decided that he wants to use a website to advertise and sell cycles. Raj is in charge of the next phase of this exciting change to the cycle shop business.

Raj immediately realizes that the current database schema needs to be changed. If they are going to allow users to buy from the internet, he needs to have photos of all their products, including cycles, accessories, and parts.

- 1. Which DDL command can Raj use to add a new field to the Cycle table to store the filename of the photo?**
 - a. ALTER TABLE Cycle ADD photo_file_name CHAR (30) NULL
 - b. ADD photo_file_name TO TABLE Cycle
 - c. ALTER Cycle TABLE USING photo_file_name CHAR(30) NULL
- 2. In the example in the previous question, what effect does the word `NULL` have when adding a new cycle to the table?**
 - a. requires the user to enter a filename for the photo
 - b. does not require the user to enter a filename for the photo
 - c. automatically enters a filename for the photo
- 3. What is the main difference between the DML command `DELETE` and the DDL command `DROP`?**
 - a. They accomplish the same task; therefore, there is no difference
 - b. `DELETE` removes all (or a subset of) records from the table only; it does not remove the table
 - c. `DROP` removes all records from the table only; it does not remove the table

hint

The `ALTER` command can be used to add new fields or change the format of existing fields. Example: `CHAR(20)` to `VARCHAR(35)`.

Answers

1. Raj can add a new field to the Cycle table to hold the file name of the photo with:
 - a. `ALTER TABLE Cycle ADD photo_file_name CHAR (30) NULL`
2. When adding a new cycle to the table, the word `NULL`:
 - b. **does not require the user to enter a file name for the photo**
3. The main difference between the DML command `DELETE` and the DDL command `DROP` is:
 - b. **`DELETE` removes all (or a subset of) records from the table only; it does not remove the table**

Essential details

- A **schema** is a description of a database to a database management system (DBMS) in the language provided by the DBMS.
- Data definition language (**DDL**) defines database objects including entities, attributes, views, and indexes.
- **CREATE** adds databases or objects.
- **ALTER** changes databases or objects.
- **DROP** removes databases or objects.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms175941.aspx>
- <http://support.microsoft.com/kb/180841>
- <http://msdn.microsoft.com/en-us/library/ms734677.aspx>

track
your score

_____ /3

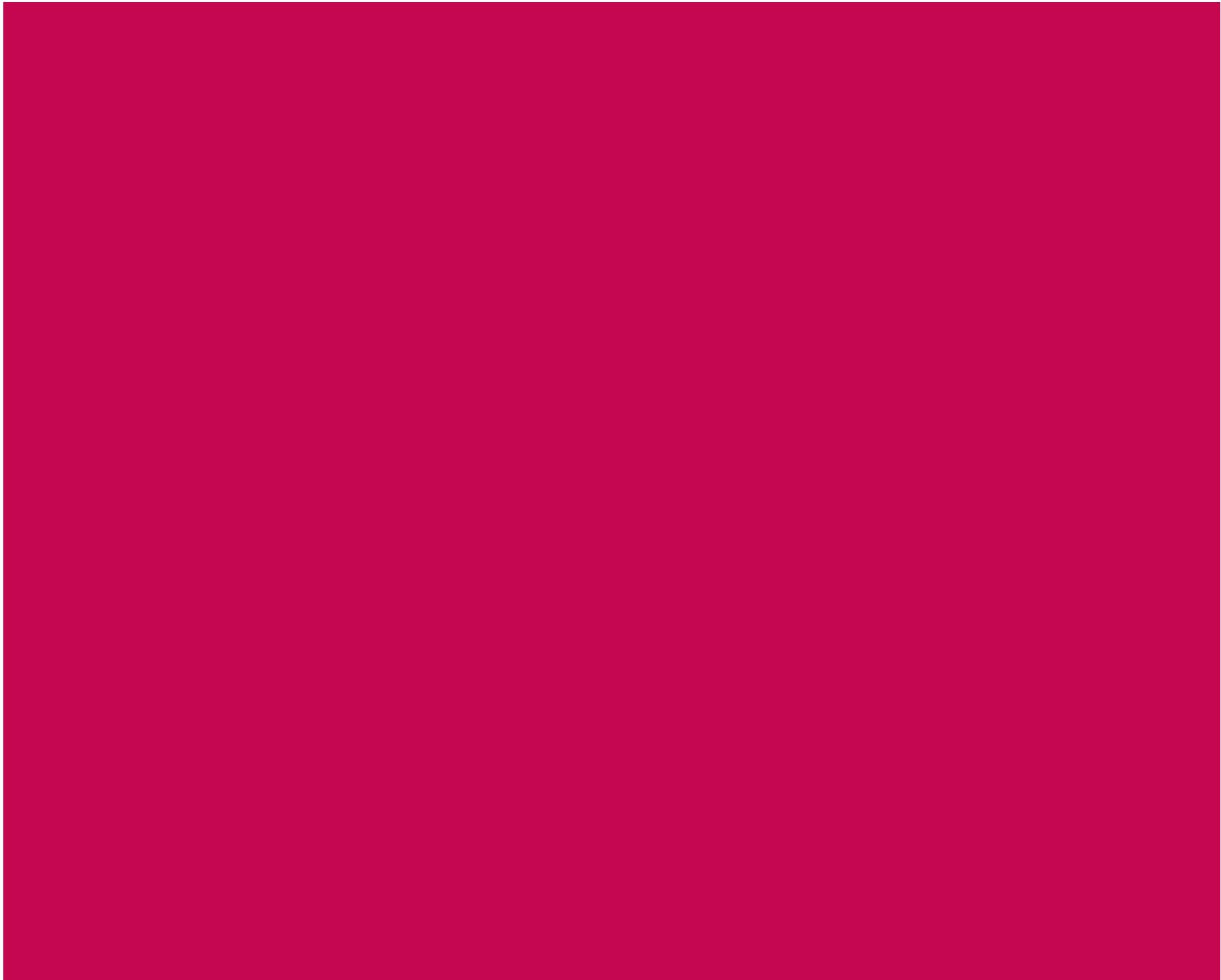
2



Creating Database Objects

IN THIS CHAPTER

- 2.1 Choose data types
- 2.2 Understand tables and how to create them
- 2.3A Create views T-SQL
- 2.3B Create views using a graphical designer
- 2.4 Create stored procedures and functions





OBJECTIVE

CREATING DATABASE OBJECTS 2.1

Choose data types

SCENARIO: Yuhong Li's son, Yan, is taking a programming course in school and he asked her advice on selecting a project for class. Yuhong suggests that Yan create a program to help organize her CD collection that she has accumulated over the years.

Yan likes the idea. He can create a database table to store all of data related to his mother's collection and use C# or Visual Basic to create a user interface to search, add, and delete information from the table.

Yan knows that defining the table fields is very important and selecting the right data type for each field is critical.

1. What data type should Yan use to store the CD label name?

- a. char or variable char
- b. name
- c. integer

2. What data type should he use to store the number of tracks on each CD?

- a. real number
- b. integer
- c. char

3. What data type should Yan use to store the duration of the song in total seconds?

- a. byte
- b. integer
- c. Boolean

hint

To avoid performance degradation, always use the smallest data type that matches the data to be stored.

Answers

1. To store the CD label name Yan should use:
 - a. **char or variable char**
2. To store the number of tracks on each CD Yan should use:
 - b. **integer.** You can't have a decimal portion of a song, and the value may be used in a math calculation such as total tracks on all albums.
3. To store the duration of the song Yan should use:
 - b. **integer.** The duration can be saved as total seconds and the application can change it back to minutes and seconds if needed.

Essential details

- **Data types** specify the possible range of values of the set, the operations that can be performed on the values, and the way in which the values are stored in memory.
- **Integer** data types store whole numbers.
- **Floating-point** data types store any real numbers.
- **Character** stores A-Z or 0-9—any digit or letter that math functions will not be applied to.
- **Boolean** stores 1 or 0, true or false.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/ff715351.aspx>
- [http://msdn.microsoft.com/en-us/library/aa258271\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa258271(SQL.80).aspx)
- [http://msdn.microsoft.com/en-us/library/aa716185\(VS.60\).aspx](http://msdn.microsoft.com/en-us/library/aa716185(VS.60).aspx)

track
your score

_____ /3



OBJECTIVE

CREATING DATABASE OBJECTS 2.2

Understand tables and how to create them

SCENARIO: Yan has gathered together all of the CDs in his mother's collection – she has more than he imagined!

He has identified the data fields he needs in his database table and the best data type for each piece of data, so he is ready to create the database tables. Yan plans to set up the table using proper ANSI SQL syntax and wants to brush up on the details before he begins.

1. Proper ANSI SQL syntax refers to a set of rules that:

- a. decide if a field can contain a blank value or not
- b. determine the size of all the data fields
- c. govern the structure and content of statements

2. Which SQL command is used to add a new table?

- a. CREATE TABLE table_name (column_name data type null/not null, column_name data type null/not null, and so on)
- b. ADD TABLE table_name (column_name data type null/not null, column_name data type null/not null, and so on)
- c. INSERT TABLE table_name (column_name data type null/not null, column_name data type null/not null, and so on)

3. Based on the information Yan has gathered, what data field can he use for a unique key to access the data in the table?

- a. artist name
- b. CD label name
- c. track name

hint

When choosing a key to the table, make sure it is unique among all of the records in your table.

Answers

1. Proper ANSI SQL syntax refers to a set of rules that:
 - c. govern the structure and content of statements
2. The SQL command used to add a new table is:
 - a. `CREATE TABLE table_name (column_name data_type null/not null, column_name data_type null/not null, etc.)`
3. The data field Yan can use for a unique key to access the data in the table is:
 - b. CD label name

Essential details

- **ANSI SQL syntax** is the grammar and rules governing the structure and content of statements.
- A **table** is a data structure usually consisting of a list of entries.
- An identifier for a record in a data file that is unique and found in only one record is called a **key**.
A Social Security number may serve as a key in an database of employees.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms365315.aspx>
- [http://msdn.microsoft.com/en-us/library/aa258255\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa258255(SQL.80).aspx)
- [http://msdn.microsoft.com/en-us/library/aa977477\(VS.71\).aspx](http://msdn.microsoft.com/en-us/library/aa977477(VS.71).aspx)



track
your score

_____ /3

Create views using T-SQL

SCENARIO: Yan is learning about views in his database management class. His instructor explained that there are two approaches to creating views: using a command line language T-SQL (Transact-SQL) or by using a graphical designer.

Yan wants to apply his new learning to the database project he is creating for his mother's CD collection. He has identified the following requirements for his application and will use T-SQL to create views:

- View all CDs sorted in alphabetical order
- Report on all CDs with a certain number of tracks
- Create a list of CDs by artist
- Calculate a count of all CDs

1. What is the best application of views and T-SQL for this project?

- a. create separate views with the information for each request
- b. create a new table for each of requirements in the list
- c. add data to the existing tables when more CDs are purchased

2. Which of the following is an important benefit of using views?

- a. allow the user to access the data in the tables directly
- b. reduce the storage requirements for the application and database
- c. use to represent summation data

3. Which code segment creates a view containing the title, artist, and year for all CDs with more than 10 tracks?

- a. CREATE VIEW CD_More_than_10 AS SELECT CD_Title, CD_Artist, CD_Year FROM CD_Collection WHERE Tracks > 10
- b. CREATE TABLE CD_More_than_10 AS SELECT CD_Title, CD_Artist, CD_Year FROM CD_Collection WHERE Tracks > 10
- c. CREATE VIEW AS CD_More_than_10 FROM CD_Collection WHERE Tracks > 10

hint

Use views to restrict access. Create a view for an employee to see only his or her payroll information in a table that contains all employees.

Answers

1. The best application of views and T-SQL for this project is to:
 - a. **create separate views with the information for each request**
2. An important benefit of using views is that views:
 - c. **can be used to represent summation data**
3. The following code creates a view containing the title, artist, and year for all CDs with more than 10 tracks:
 - a. `CREATE VIEW CD _ More _ than _ 10 AS SELECT CD _ Title, CD _ Artist, CD _ Year
FROM CD _ Collection WHERE Tracks > 10`

Essential details

- A **view** is a saved query that creates a virtual table from the result set of the query.
- A **query** is a specific set of instructions for extracting/selecting particular data.
- A **graphical designer** is an application, such as Microsoft Access, that is object-oriented and drag-and-drop driven.
- Transact-SQL (**T-SQL**) is a sophisticated query language with additional features beyond what is defined in the ANSI SQL.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/aa260642\(v=SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa260642(v=SQL.80).aspx)
- <http://msdn.microsoft.com/en-us/library/bb510741.aspx>
- <http://msdn.microsoft.com/en-us/data/ff687144.aspx>

track
your score





OBJECTIVE

CREATING DATABASE OBJECTS 2.3B

Create views using a graphical designer

SCENARIO: The views that Yan created using T-SQL were very useful for his mother. She can easily identify CDs that are in her collection using lists that can be sorted in a variety of ways. This is so much easier than creating piles of CDs on the living room floor!

Now that Yan has practice in creating views using T-SQL, he wants to create the same queries using a graphical designer. Practice with both approaches will certainly help him in his certification exam.

1. How is a graphical designer such as *JetSQL* different from T-SQL?

- a. Graphical designers use a command-line interface
- b. Graphical designers are object-oriented
- c. Graphical designers are only used for SQL Server databases

2. Identify the correct sequence of steps to create a view in Access® that uses *JetSQL*:

- a. Create a query, identify source table(s) and/or query(s), select fields, set criteria, run, and display
- b. Create a query, identify data fields, select table(s), set criteria, run, and display
- c. Create a query, identify criteria, select table(s), select fields, run, and display

3. What additional criteriona must be specified to retrieve all CDs in alphabetical order?

- a. ORDER BY
- b. WHERE
- c. SELECT

hint

With a graphical designer such as Microsoft Access, a query can select fields from tables and from previous queries.

Answers

1. A graphical designer such as *JetSQL* is different from T-SQL in that:
 - b. **graphical designers are object-oriented**
2. The correct sequence of steps to create a view in Access is:
 - a. **create a query, identify source table(s) and/or query(s), select fields, set criteria, run, and display**
3. The additional criteria to retrieve all CDs in alphabetical order is:
 - a. **ORDER BY**

Essential details

- A **view** is a saved query creating a virtual table of the result set of that query.
- A **query** is a specific set of instructions for extracting particular data.
- **Graphical designers** include applications such as Microsoft Access, which are object-oriented and drag-and-drop driven.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/aa196232\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa196232(SQL.80).aspx)
- [http://msdn.microsoft.com/en-us/library/aa140011\(office.10\).aspx](http://msdn.microsoft.com/en-us/library/aa140011(office.10).aspx)
- <http://msdn.microsoft.com/en-us/library/ms365414.aspx>

track
your score

_____ /3

Create stored procedures and functions

SCENARIO: After having gone through the process of creating the CD collection database for his mother, Yan realizes that this type of structure can be used for many other inventory databases.

He has discovered that some common functionality is available in predefined SQL functions. By utilizing these built-in, ready-to-use functions, he can increase his productivity and spend his time creating any other necessary user-defined functions. Yan has also learned to distinguish between aggregate and scalar functions.

1. What aggregate function can Yan use to calculate the total number of CDs in the CD collection database?

- a. SUM(column name)
- b. COUNT(column name)
- c. AVG(column name)

2. Yan is not quite sure how scalar functions work. Which of the following is a scalar function?

- a. FIRST(column name) returns the first field in the specified column
- b. SUM(column name) returns the total of all values in the column
- c. UCASE(column name) returns the value of the field in all uppercase letters

3. How is a stored procedure invoked?

- a. RUN (procedure name, input values)
- b. EXECUTE (procedure name, input values)
- c. PERFORM (procedure name, input values)

hint

To enforce data integrity, grant permissions for stored procedures but restrict access to the underlying tables.

Answers

1. The aggregate function Yan can use to calculate the total number of CDs in the CD collection database is:
 - b. **COUNT(column name)**
2. The following example is a scalar function:
 - c. **UCASE(column name) returns the value of the field in all uppercase letters**
3. A stored procedure is invoked with:
 - b. **EXECUTE (procedure name, input values)**

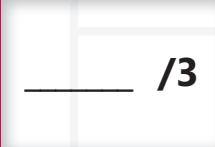
Essential details

- **Functions** are one-word commands that return a single value written in the command set of SQL.
- **Aggregate functions** return a single value, calculated from values in a column.
- **Scalar functions** return a single value, based on the input value of a single field.
- **User-defined functions** are compact segments of user-written SQL code that can accept parameters and return either a value or a table.
- **Stored procedures** are precompiled groups of SQL statements saved to the database.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/aa258901\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa258901(SQL.80).aspx)
- <http://msdn.microsoft.com/en-us/library/ms177499.aspx>
- [http://msdn.microsoft.com/en-us/library/aa214363\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa214363(SQL.80).aspx)

track
your score



3



Manipulating Data

IN THIS CHAPTER

- 3.1A Select data utilizing SELECT with simple queries
- 3.1B Select data utilizing SELECT with complex queries
- 3.2 Insert data
- 3.3 Update data
- 3.4 Delete data



Select data utilizing SELECT with simple queries

SCENARIO: Katarina Larsson has always been very athletic; she enjoys kayaking, hiking, swimming, cycling, and more. So, Katarina was thrilled when she was hired as an intern in the information systems division of Adventure Works. Katarina is studying database management in college, so this internship is a valuable experience with the benefits of experiencing athletic adventures in Nova Scotia, Canada.

Part of her new position includes writing SQL queries to analyze data about current trends in the recreational activities on the island enjoyed by residents and tourists. Katarina is ready to start creating reports on the following activities:

- hiking
- whale watching
- kayaking
- camping
- golfing

1. Which command would ensure that return visitors are only counted once when running a query against the reservation system?

- a. SELECT ONLY
- b. SELECT DISTINCT
- c. SELECT UNIQUE

2. For some of the reports it will be useful to see the results in alphabetical order.

Which command will produce an alphabetical list?

- a. ORDER BY column_name (either ASC or DESC)
- b. SORT BY column_name (either ASC or DESC)
- c. ARRANGE BY column_name (either ASC or DESC)

3. A truth table is helpful in visualizing the results of logical operators.

When comparing two fields, which condition *always* results in TRUE?

- a. the AND operator and only one field = TRUE
- b. the OR operator and at least one field = TRUE
- c. the AND operator and at least one field = FALSE

hint

The SELECT statement can retrieve data from one or many tables or views; the result is stored in a result table called result_set.

Answers

1. The command that would ensure that return visitors are only counted once is:
b. **SELECT DISTINCT**
2. The command that returns an alphabetical list is:
a. **ORDER BY column_name (either ASC or DESC)**
3. The condition that *always* results in TRUE is:
b. **the OR operator and at least one field = TRUE**

Essential details

- **SELECT** is the most-used SQL command for selecting the data from the database.
- **DISTINCT** returns only distinct (unique) values.
- **WHERE** specifies which rows to retrieve.
- **ORDER BY** specifies an order in which to return the rows.
- **Boolean logical operators**
 - **AND** displays a record if both the first condition *and* the second condition are true.
 - **OR** displays a record if either the first condition *or* the second conditions are true.
 - **Truth tables** show the relationships of the Boolean logical operators.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/aa393276\(VS.85\).aspx](http://msdn.microsoft.com/en-us/library/aa393276(VS.85).aspx)
- [http://msdn.microsoft.com/en-us/library/aa259187\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa259187(SQL.80).aspx)
- [http://msdn.microsoft.com/en-us/library/ms691985\(VS.85\).aspx](http://msdn.microsoft.com/en-us/library/ms691985(VS.85).aspx)

track
your score

_____ /3



OBJECTIVE

MANIPULATING DATA 3.1B

Select data utilizing SELECT with complex queries

SCENARIO: Nova Scotia is a beautiful location and Katrina is enjoying a variety of outdoor activities in her free time. She loves her new job at Adventure Works because it is challenging and she is learning a great deal!

She is three weeks into her internship and realizes that by applying some complex queries to the recreational trends database she will be able to produce some very enlightening reports. She decides to take some time to review the concepts for subqueries (predicate, scalar, and table), UNIONS, JOINS, and INTERSECTS.

1. Which statement best defines a predicate subquery?

- a. returns a single value; can be used in CASE expressions, WHERE clauses, ORDER BY, and SELECT
- b. returns a table based on the queries nested in the FROM clause
- c. uses extended logical constructs in the WHERE clause using AND, OR, LIKE, BETWEEN, AS, and TOP

2. What is the difference between UNION and JOIN?

- a. UNION combines the results of two SQL queries when there is the same number of columns and data types; JOIN returns rows when there is at least *one* column match.
- b. UNION combines the results of two SQL queries when there is at least *one* column match; JOIN returns rows when there is the same number of columns and data types.
- c. UNION only returns rows that appear in both tables; JOIN returns rows when there is at least *one* column match.

3. When should the INTERSECT query be used?

- a. to find all rows from the left table even if there are no matches
- b. to return all rows that appear in both tables, similar to a Boolean OR
- c. to return only the rows that appear in both tables, similar to a Boolean AND

hint

When using the UNION query, duplicates are automatically removed unless you specify UNION ALL.

Answers

1. A predicate subquery:
 - c. **uses extended logical constructs in the WHERE clause using AND, OR, LIKE, BETWEEN, AS, and TOP**
2. The difference between UNION and JOIN is:
 - a. **UNION combines the results of two SQL queries when there is the same number of columns and data types; JOIN returns rows when there is at least one column match**
3. The INTERSECT query is used:
 - c. **to return only the rows that appear in both tables, similar to a Boolean AND**

Essential details

- **UNION** combines two or more SELECT statements with an **OR** function.
- **JOIN** is used to query data from two or more tables.
- **Subqueries** nest inside another query.
- **INTERSECT** combines two or more SELECT statements with an **AND** function.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/aa393276\(VS.85\).aspx](http://msdn.microsoft.com/en-us/library/aa393276(VS.85).aspx)
- [http://msdn.microsoft.com/en-us/library/aa259187\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa259187(SQL.80).aspx)
- <http://msdn.microsoft.com/en-us/library/ms190659.aspx>

track
your score

_____ /3

Insert data

SCENARIO: Katarina gained a better understanding of the database layout through her reporting project at Adventure Works. The database manager for the team has given her a new assignment. She will be responsible for writing the SQL stored procedures that can be used by the programmers to insert, update, and delete data from the database.

Adventure Works has gathered lots of new data from tourists about their preferences for recreational activities in Nova Scotia. Katarina's first task is to insert new rows into the database to store this data. Katarina wants to refresh her memory on how to efficiently and correctly insert data into a database before she attempts this very important task.

1. When designing the `INSERT` SQL, what happens if data is missing for a particular column?

- a. The `INSERT` statement returns a syntax error.
- b. The `INSERT` statement uses the default value for the column.
- c. The `INSERT` statement inserts a `NULL` value in the column.

2. How can Katarina set up the `INSERT` to allow the programmer to copy rows from other tables?

- a. She can use the `INSERT INTO` with a `SELECT ... FROM` clause.
- b. This cannot be done with an `INSERT` command; she must use a `JOIN`.
- c. She can use row value constructors.

3. What is the correct syntax for inserting multiple rows at one time?

- a. `INSERT INTO` table (`column1, val1a), (column2, val2a);`
- b. `INSERT (column1, column2) VALUES (val1a, val1b), (val2a, val2b)` `INTO` table;
- c. `INSERT INTO` table (`column1, column2`) `VALUES (val1a, val1b), (val2a, val2b);`

hint

Be aware of the default values for each column when inserting new rows. If new data is not specified the default value is used.

Answers

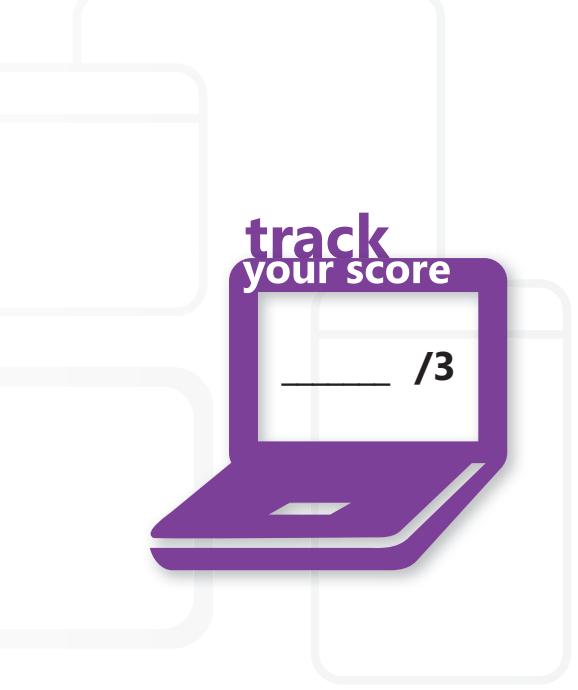
1. If data is missing for a column:
 - b. **the INSERT statement uses the default value for the column**
2. To set up the INSERT to allow the programmer to copy rows from other tables:
 - a. **use the INSERT INTO with a SELECT . . . FROM clause**
3. The correct syntax for inserting multiple rows at one time is:
 - c. **INSERT INTO table (column1, column2) VALUES (val1a, val1b), (val2a, val2b);**

Essential details

- The **INSERT INTO** statement is used to insert a new row in a table.
- The **INSERT INTO** with **SELECT** statement is used to insert a new row in a table when a sub-select is used instead of the **VALUES** clause.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms365309.aspx>
- <http://msdn.microsoft.com/en-us/library/ms188263.aspx>



track
your score

Update data

SCENARIO: Because of her extensive work in adding data and creating reports from the Adventure Works database on recreational activities, Katarina has a better understanding of the company's database organization.

The database manager for the team is pleased with her progress and has given her a new assignment. She will be responsible for writing the SQL stored procedures that will be used by the developers to insert, update, and delete data from the database.

- 1. The developer wants to update all records in a database to reflect an increase in the provincial value-added tax from 8 percent to 10 percent. Which of the following is the correct syntax?**
 - a. UPDATE RENTALS SET value _ added _ tax = .10;
 - b. SET sales _ tax _ rate = .10 IN RENTALS;
 - c. UPDATE sales _ tax _ rate = .10 IN RENTALS;
- 2. Katarina wants to update data if a condition is true and perform an alternative update if the condition is false. Which of the following is the best choice?**
 - a. CASE statement
 - b. LIKE statement
 - c. IF/THEN/ELSE statement
- 3. One of the developers mentioned that sometimes he needs to update data in one table from another table. Which of the following is the correct syntax for this type of update?**
 - a. UPDATE SET kayak = RENTALS.kayak + EQUIPMENT.kayak FROM RENTALS, EQUIPMENT;
 - b. UPDATE RENTALS SET RENTALS.kayak + EQUIPMENT.kayak;
 - c. UPDATE RENTALS SET kayak = RENTALS.kayak + EQUIPMENT.kayak FROM RENTALS, EQUIPMENT;

hint

When using a CASE statement, the ELSE statements (which returns NULL) can be omitted.

Answers

1. To update all records in a database to reflect an increase in the provincial value-added tax from 8 percent to 10 percent the developer should use:
 - a. `UPDATE RENTALS SET value _ added _ tax = .10`
2. Katarina can update data if a condition is true and perform an alternative update if the condition is false with the:
 - a. **CASE statement**
3. To update data in one table from another table, the developer should use:
 - c. `UPDATE RENTALS SET kayak = RENTALS.kayak + EQUIPMENT.kayak FROM RENTALS, EQUIPMENT`

Essential details

- `UPDATE` is used to update existing records in a table.
- The `WHERE` clause in an `UPDATE` statement specifies the rows to update.
- `CASE` creates when-then-else functionality (`WHEN` this condition is met `THEN` do this).
- The value of the case expression is the value of the first `WHEN` clause that is true.
If none is true, the result is the `ELSE`.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms189074.aspx>
- [http://msdn.microsoft.com/en-us/library/aa275660\(SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa275660(SQL.80).aspx)

track
your score

_____ /3

Delete data

SCENARIO: Katarina learned a great deal about the Adventure Works database in her last few assignments and is ready to finish her assignment of writing the SQL stored procedures that can be used by the programmers to insert, update, and delete data from the database.

The last task in this assignment is for Katarina to use SQL to delete existing data in the database. The procedures must allow for the deletion of data from single or multiple tables and these transactions must ensure data and referential integrity.

1. What happens if a WHERE statement is not included with the DELETE statement?

- a. The entire table is deleted
- b. The data from the table is deleted
- c. The user receives a syntax error

2. How are transactions useful when updating/deleting/adding records to a database?

- a. They allow multiple statements to be grouped together to avoid data integrity errors
- b. They count the number of changes to records in the table
- c. They restrict updates to only allow one statement to execute at a time

3. How can a programmer enforce data integrity rules when making changes to the records in a database?

- a. When all statements in a transaction have successfully completed, issue a commit statement
- b. When all statements in a transaction have successfully completed, issue a rollback statement
- c. When an error occurs in one statement inside a transaction, issue a commit statement and continue to the next statement

hint

To enforce data integrity when updating the database, group statements in a transaction using a commit statement.

Answers

1. If you do not include a WHERE statement in the DELETE statement:
 - b. **the data from the table is deleted**
2. Transactions are useful when updating/deleting/adding records to a database because:
 - a. **they allow multiple statements to be grouped together to avoid data integrity errors**
3. A programmer can enforce data integrity rules when making changes to the records in a database by:
 - a. **when all statements in a transaction have successfully completed, issuing a commit statement**

Essential details

- **DELETE FROM** deletes rows in a table.
- **TRANSACTIONS** are a set of two or more statements grouped into a single unit.
- **ROLLBACK** reverses changes.
- If all statements are correct within a single transaction the **COMMIT** command records the changes to the database.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/ms233823\(VS.80\).aspx](http://msdn.microsoft.com/en-us/library/ms233823(VS.80).aspx)
- <http://msdn.microsoft.com/en-us/library/ms233823.aspx>
- [http://msdn.microsoft.com/en-us/library/aa213068\(v=SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa213068(v=SQL.80).aspx)

track
your score

_____ /3

4



Understanding Data Storage

IN THIS CHAPTER

- 4.1 Understand normalization
- 4.2 Understand primary, foreign, and composite keys
- 4.3 Understand indexes





OBJECTIVE

UNDERSTANDING DATA STORAGE 4.1

Understand normalization

SCENARIO: Natasha A. Desai is a student at Ohio State University and a member of Epsilon Pi Tau, an honor society for professions in technology. The Epsilon Pi Tau chapter is conducting a fundraising campaign with alumni to raise money for their organization.

Currently all records are kept manually in filing cabinets located in the Epsilon Pi Tau house on campus. Natasha has recently completed a class in database design and has volunteered to create a database to digitally store alumni information and generate an automated mailing.

The first step was gathering the data requirements, including:

- full name and maiden name if applicable
- street address, city, state, and zip
- email address (preference for email or postal mail)
- year of graduation
- degree(s) obtained
- previous year donation(s)

Natasha wants to create the database in Microsoft Access, but she realizes that the information is not in normalized form. Answer the questions to help normalize her database design.

1. What is the goal of First Normal Form?

- a. minimize the inclusion of duplicate information
- b. identify primary and foreign keys
- c. remove columns not dependent on primary keys

2. Based on the requirements listed above, what subset(s) of data must be removed to make the database in Second Normal Form?

- a. city and state
- b. year of graduation
- c. previous year donation(s)

3. What is *not* a benefit of enforcing Second and Third Normal Forms?

- a. reduced storage requirements
- b. simplified query and update management
- c. indexed data for easy retrieval

hint

A database of addresses can be simplified by storing the zip code only in the primary table and creating a separate table of city, state, and zip.

Answers

1. The goal of First Normal Form is:
 - a. **minimize the inclusion of duplicate information**
2. To make the database in Second Normal Form, the subsets of data to remove are:
 - a. **city and state**
3. Enforcing Second and Third Normal Forms has the benefit of all except:
 - c. **indexed data for easy retrieval**

Essential details

- **Normalization** involves applying a body of techniques to a relational database to minimize the inclusion of duplicate information.
- **Normal Form** is the result of structuring (organizing) information to avoid redundancy and inconsistency and to promote efficient maintenance, storage, and updating.
- The First Normal Form (**1NF**) sets a few basic rules for a database: eliminate duplicative columns from the same table.
- The Second Normal Form (**2NF**) = 1NF + removing subsets of data that apply to multiple rows of a table and place them in separate tables.
- The Third Normal Form (**3NF**) = 2NF + removing columns that are not dependent upon the primary key.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/aa200276\(office.11\).aspx](http://msdn.microsoft.com/en-us/library/aa200276(office.11).aspx)
- [http://msdn.microsoft.com/en-us/library/aa139981\(office.10\).aspx](http://msdn.microsoft.com/en-us/library/aa139981(office.10).aspx)

track
your score

_____ /3

Understand primary, foreign, and composite keys

SCENARIO: The database of Epsilon Pi Tau alumni is progressing nicely! Natasha has applied the concepts of normalization to reduce storage requirements and simplify query and update procedures. The result of putting the database into Third Normal Form was four separate tables: demographic, zip code, degree, and donation.

The next step is to create primary, foreign, and composite keys for each table. This step will ensure a high level of data integrity and that the information is consistent and usable.

1. Identify the best primary key for the demographic table:

- a. last name
- b. alumni ID (auto-generated by the system)
- c. last name plus first name

2. Which of the following is an example of a foreign key?

- a. zip code
- b. year of graduation
- c. last name

3. What is *not* a rule for the primary key?

- a. must be unique
- b. must be numeric
- c. must contain a value other than NULL

hint

Three types of data integrity: entity focuses on the primary key, referential focuses on the foreign key, and domain specifies that values must be declared.

Answers

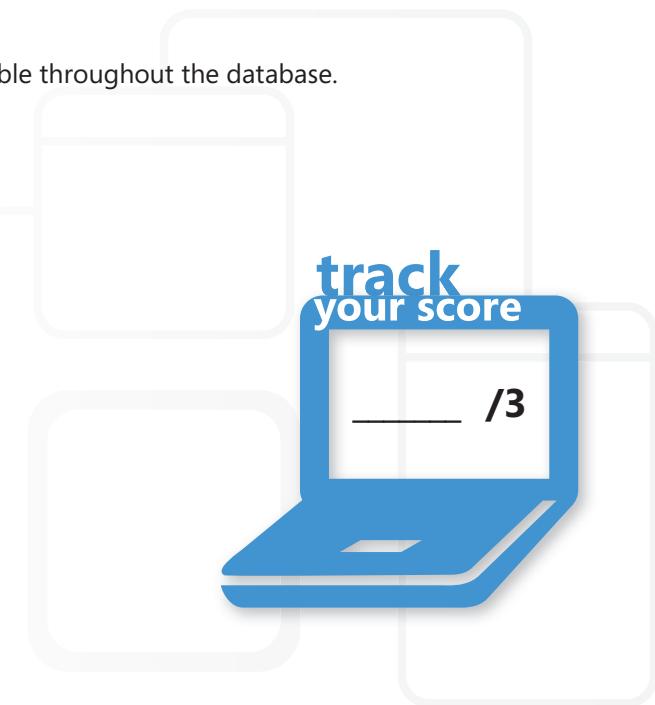
1. Identify the best primary key for the demographic table:
 - b. **alumni id (auto generated by the system)**
2. Which of the following is an example of a foreign key?
 - a. **zip code**
3. What is *not* a rule for the primary key?
 - b. **must be numeric**

Essential details

- A **primary key** serves as the unique identifier of a specific row and uniquely defines a relationship within a database.
- A **foreign key** references the primary key in another table.
- **Data integrity** ensures that data is consistent, correct, and usable throughout the database.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms191236.aspx>
- <http://msdn.microsoft.com/en-us/library/ms175464.aspx>



track
your score

_____ /3



UNDERSTANDING DATA STORAGE 4.3

Understand indexes

SCENARIO: Natasha has almost finished the design and setup of the Epsilon Pi Tau alumni database. She is at the point of determining the need for indexes that would help honor society leaders retrieve data when they plan various events and promotions or when they need to contact members.

A quick review of the goals and advantages of indexes will help Natasha decide whether indexes will be valuable for the database and worth the time it will take to create them.

- 1. Because the primary key for the demographic table is a system-defined number, what should a good clustered index be based upon?**
 - a. last name
 - b. gender
 - c. first name
- 2. Which is a characteristic of a non-clustered index?**
 - a. contains the actual data pages or records
 - b. has keywords and pointers to the data
 - c. includes foreign keys
- 3. Which is *not* a result of using indexes?**
 - a. increased speed of data retrieval
 - b. increased storage requirements
 - c. increased speed of writing records

hint

Rule of thumb: If the database will contain a large number of records, the benefits of adding an index outweigh the necessary time and effort.

Answers

1. A good clustered index for this table should be based upon:
 - a. **last name**
2. A non-clustered index:
 - b. **has keywords and pointers to the data**
3. Using indexes does not result in:
 - c. **increased speed of writing records**

Essential details

- An **index** contains keywords and associated data that point to the location of more comprehensive information, such as files and records on a disk or record keys in a database.
- In a **b-tree** structure for storing database indexes, each node in the tree contains a sorted list of key values and links that correspond to ranges of key values between the listed values.
- A **non-clustered index** is arranged similarly to the index of a book, where the index value points to the actual information.
- A **clustered index** is arranged in a special order to make retrieval of information faster with direct access to the information.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms180978.aspx>
- [http://msdn.microsoft.com/en-us/library/aa933129\(v=SQL.80\).aspx](http://msdn.microsoft.com/en-us/library/aa933129(v=SQL.80).aspx)

track
your score

_____ /3

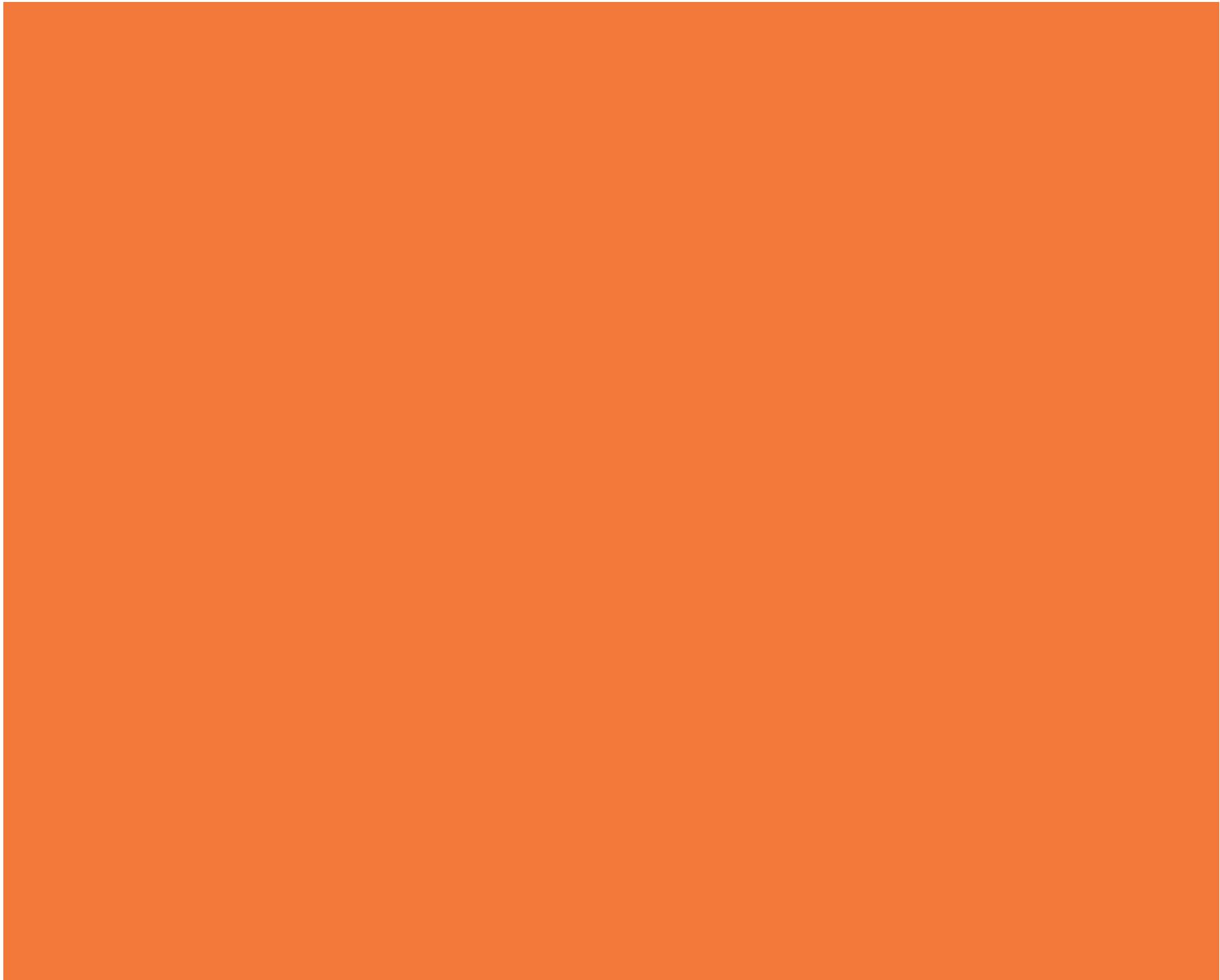
5



Administering a Database

IN THIS CHAPTER

- 5.1 Understand database security concepts
- 5.2 Understand database backup and restore



Understand database security concepts

SCENARIO: Recently there has been a great deal of media coverage about companies losing the records of customers and clients through a variety of security breaches. The Humongous Insurance Company does not want to see its name in the headlines, so officers decided to complete an internal audit to identify any possible security risks in their information systems. The team of analysts is very familiar with possible areas of risk such as physical security, internal security, and external security.

According to the auditors, the company has a sound security plan to ensure data integrity by identifying users and the actions they can perform, and to protect data from hackers. But other aspects need to be considered in a comprehensive security plan.

1. What should be included in the *physical* security plan?

- a. location of the stored user accounts and passwords
- b. location of the database administrators
- c. location of servers with restricted access

2. Which strategy is *not* related to an *internal* security plan?

- a. provide backups and operational continuity
- b. delete old and unused user accounts
- c. enforce user accounts to have strong passwords

3. Which of the following is *not* an example of a security attack?

- a. applying roles to grant access
- b. privilege escalation
- c. SQL injection

hint

In large organizations, group users by role. Use the GRANT statement to provide access according to their role.

Answers

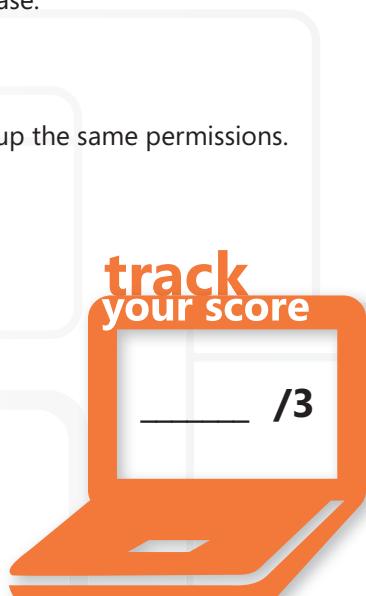
1. The physical security plan should include the:
 - c. **location of servers with restricted entry access**
2. A strategy *not* related to internal security is:
 - a. **provide backups and operational continuity**
3. The following is *not* an example of a security attack:
 - a. **applying roles to grant access**

Essential details

- A **security plan** identifies which users can do what action(s) to data in the database.
- A **physical security plan** addresses the safety of the actual location of the database.
- **Access control** ensures and restricts who can connect and what they can do.
- A **user account** provides users with access to the database.
- **Roles** grant permissions to the database. Defined roles give all users within a group the same permissions.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/aa291801\(VS.71\).aspx](http://msdn.microsoft.com/en-us/library/aa291801(VS.71).aspx)
- <http://msdn.microsoft.com/en-us/library/dd568741.aspx>



track
your score

_____ /3

Understand database backup and restore

SCENARIO: The team of analysts has completed the internal security audit of the Humongous Insurance Company. They identified a few weaknesses in the system and recommended corrective measures to minimize the associated risks. But before they can complete their final report, they need to understand the backup and recovery plan.

Before meeting with the database administrator, the group reviewed database backup and restore concepts to better understand these processes as they relate to the unique situations of the Humongous Insurance Company.

- 1. Which of the following backup strategies only copies files that have changed since the last full backup?**
 - a. partial backup
 - b. incremental backup
 - c. differential backup

- 2. In which situation is the use of a replication service recommended?**
 - a. The database must be available 24 hours a day, 7 days a week.
 - b. The database is very resource-intensive.
 - c. The company uses offsite storage for database backups.

- 3. When performing a full backup, what information is optional?**
 - a. data that has not changed
 - b. server files such as user security NAT
 - c. data that has not changed since the last full backup

hint

It is important that backup software works with locked records.

Answers

1. The backup strategies that only copies files that have changed since the last full backup is:
c. **differential backup**
2. Replication services are recommended when:
a. **the database must be available 24 hours a day, 7 days a week**
3. Optional information for a full backup includes:
b. **server files such as user security NAT**

Essential details

- **Backup** is a process of saving all critical data to re-create the database in useful form in a relatively short time.
- In a **full backup** all files are copied for possible future retrieval.
- In an **incremental backup** only files that have been changed since the last backup are copied.
- In a **differential backup** only files that have been changed since the last *full*_backup are copied.
- **Replicated services** re-create a full or incremental reproduction of the database.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms187510.aspx>
- <http://msdn.microsoft.com/en-us/library/ms188312.aspx>

track
your score

_____ /3

6



Database Concepts Review

IN THIS CHAPTER

- Database administration fundamentals review





OBJECTIVE

DATABASE CONCEPTS REVIEW

Database administration fundamentals review

SCENARIO: Congratulations! You have reached the end of the Student Study Guide for database administration. We hope you enjoyed the scenarios and are now aware of how databases touch many aspects of life in today's exciting technical world. Skills in data base administration can open doors to your future career.

The questions and hints included in this study guide will be helpful in preparation for the Database Administration certification exam.

- 1. Knowledge of which core database concepts will ensure that you are prepared for the Database Administration certification exam?**
 - a. Relational Database Management System, Data Manipulation Language, Data Definition Language, SQL
 - b. electrical engineering, data types, views, and graphical designers
 - c. database backups, development languages, and restoration techniques
- 2. Which of the following are *not* methods to manipulate data?**
 - a. select, insert, update, and delete
 - b. creation of stored procedures and functions
 - c. creation of primary and foreign keys
- 3. What is normalization?**
 - a. a technique to minimize the inclusion of duplicate information
 - b. a process used to backup and restore the database
 - c. a strategy to provide keywords and pointers to stored data

hint

Review the concepts and practice your database administration skills. Use the Fast Track links provided in each lesson to solidify your knowledge.

Answers

1. Core database concepts include:
 - a. RDBMS, DML, DDL, SQL
2. Data is not manipulated by:
 - c. creating primary and foreign keys
3. Normalization is a:
 - a. a technique to minimize the inclusion of duplicate information

Essential details

- Most modern database management systems implement a **relational model** in which the data is organized in relations (tables).
- **RDBMS** is the acronym for **Relational Data Base Management System**.
- Structured query language (**SQL**) is a database sublanguage used in querying, updating, and managing relational databases.
- Data manipulation language (**DML**) is used to insert data in, update, and query a database.
- Data definition language (**DDL**) defines all attributes and properties of a database, especially record layouts, field definitions, key fields, file locations, and storage strategy.
- **Normal Form** is the result of structuring (organizing) information to avoid redundancy and to promote efficient maintenance, storage, and updating.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/data/default.aspx>
- <http://msdn.microsoft.com/en-us/sqlserver/default.aspx>

track
your score

_____ /3

MTA 98-372

MICROSOFT .NET FUNDAMENTALS



1



Understanding .NET Framework Concepts

IN THIS CHAPTER

- 1.1 Understand basic application settings
- 1.2 Understand events and event handling in the .NET Framework
- 1.3 Understand structured exception handling in the .NET Framework





OBJECTIVE

UNDERSTANDING .NET FRAMEWORK CONCEPTS 1.1

Understand basic application settings

SCENARIO: Tomas Kutej has created a WPF database application that helps users keep track of their CD collection. He knows that some computers may have multiple users—two roommates might share a computer, with both individuals using the same application on the same computer to manage their CD collections. His database is setup to handle multiple users without mixing up the collections.

Tomas has implemented a very stylish “skinning” system that allows users to change the colors, fonts, and icon graphics in his application, giving it a customized look and feel.

1. How should the database connection string be stored in Tomas' application?

- a. As a String literal in the source code
- b. As a setting with Application scope
- c. As a setting with User scope

2. How should Tomas's application store the users' color choices

- a. As a String literal in the source code
- b. As a setting with Application scope
- c. As a setting with User scope

3. What is the file name of the configuration file created by Visual Studio for Tomas' application?

- a. app.config
- b. settings.config
- c. web.config

hint

Application Settings enable .NET developers to store data they don't want to put in the application source code.

Answers

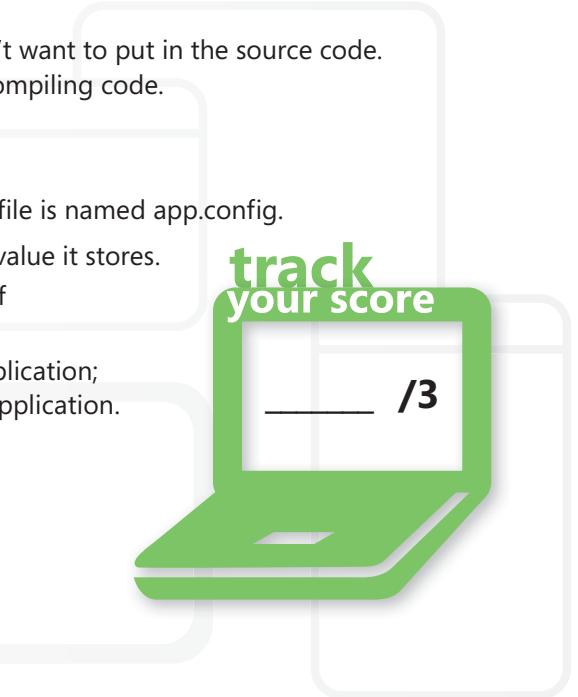
1. How should Tomas store the database connection string?
 - b. **As a setting with Application scope.** Since all users on a machine will use the same database, it does not need to be different for different users.
2. How should the application store color choices for each user?
 - c. **As a setting with User scope.** Specifying the scope as "User" enables the application to store different settings for each user of the program.
3. What is the file name of the project's configuration file?
 - a. **app.config.** Since Tomas' project is a Windows application (WPF, in this case), Visual Studio will name the file app.config by default; a Web application would use web.config.

Essential details

- Application Settings are a great place to store important data you don't want to put in the source code. Making a change to data in an Application Setting doesn't require recompiling code.
- Settings are stored in a configuration file as XML data.
 - In ASP.NET applications, this file is named web.config.
 - In client applications (Windows Forms and WPF, for example), the file is named app.config.
- Each setting includes a name, data type, and scope, in addition to the value it stores.
 - Use Application scope for settings that are universal for all users of an application, such as a database connection string.
 - Use User scope for settings that are unique to each user of the application; these settings are often used to store user preferences within an application.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/k4s6c3a0.aspx>
- <http://msdn.microsoft.com/en-us/library/wabtadw6.aspx>
- <http://msdn.microsoft.com/en-us/library/25zf0ze8.aspx>





OBJECTIVE

UNDERSTANDING .NET FRAMEWORK CONCEPTS 1.2

Understand events and event handling in the .NET Framework

SCENARIO: Gustavo Achong coaches a youth football team in his spare time and frequently uses timed drills during practices. He is working on a “stopwatch” application for his mobile phone so he doesn’t have to remember to take his stopwatch when he leaves work to go to practice.

The application has a button for starting and stopping the timer, as well as a button for clearing or resetting the timer. He uses labels to display the elapsed time (the actual timer) as well as the current time, so he doesn’t accidentally keep the children at practice too long.

- 1. Which of the following best describes what happens when a user clicks the Reset button on the stopwatch?**
 - a. A Click event is raised, and the method that clears the elapsed time is called.
 - b. A Reset event is raised, and the method that clears the elapsed time is called.
 - c. The Button delegate is raised, and the method that clears the elapsed time is called.
- 2. When using the Windows Forms Designer, where are event handlers generally created?**
 - a. The Properties panel
 - b. Solution Explorer
 - c. The Toolbox
- 3. Gustavo has a method that is called when the start button is clicked, and it initiates the elapsed time counter. What is this method?**
 - a. A delegate
 - b. An event
 - c. An event handler

hint

An event is like a signal—it indicates that some action has taken place.

Answers

1. Which of the following best describes what happens when a user clicks the Reset button on the stopwatch?
 - a. **A Click event is raised, and the method that clears the elapsed time is called.** Although the event uses a delegate, it is not the delegate that is “raised”—events are raised.
2. When using the Windows Forms Designer, where are event handlers generally created?
 - a. **The Properties panel**
3. Gustavo has a method that is called when the start button is clicked, and it initiates the elapsed time counter. What is this method?
 - c. **An event handler**

Essential details

- Many .NET applications use the **event-driven programming** model.
- In event-driven programming, the flow of program execution is determined by events that occur at run time—in other words, the application responds to events rather than following a predetermined sequence.
- An **event** is like a signal that indicates a particular action has taken place. Often, these actions are related to the user’s interaction with the user interface, such as a button click.
- All events are ignored by the application unless the developer has created **event handlers** to respond to them. These are code blocks (methods or procedures) that are called when the corresponding event is raised.
- **Delegates** are objects that refer to methods. They are used by .NET applications to link events to event handlers.

track
your score

_____ /3

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms973905.aspx>
- <http://msdn.microsoft.com/en-us/library/awbftdfh.aspx>
- <http://msdn.microsoft.com/en-us/library/ms172879.aspx>



OBJECTIVE

UNDERSTANDING .NET FRAMEWORK CONCEPTS 1.3

Understand structured exception handling in the .NET Framework

SCENARIO: Manoj Syamala plays a massively multiplayer online role playing game (MMORG) with several of his friends. He is a talented programmer and has several ideas on how to improve his group's success in the game. He created an application that looks at all the loot items the group has found and distributes them to group members in a fair, semi-random fashion.

The program reads data from a simple, comma-separated text file. After the loot has been divided among the group, it overwrites the text file with a roster listing the items that each member received.

1. Which portions of Manoj's application are most likely to need structured exception handling?

- a. Declaring and initializing variables for tracking the items received by each member
- b. Opening the text file for reading and writing
- c. Iterating through a loop to award items until all items have been distributed

2. What structure should Manoj use to handle the exception?

- a. Try-catch
- b. Catch-exception
- c. Throw-catch

3. Manoj is unable to compile his application due to errors.

What type of errors is he experiencing?

- a. Exceptions
- b. Logic errors
- c. Syntax errors

hint

Exceptions are events that are raised when the application cannot handle the current situation.

Answers

1. Which portions of Manoj's application are most likely to need structured exception handling?
 - b. **Opening the text file for reading and writing.** Attempting to open files can throw several possible exceptions, such as a *FileNotFoundException*.
2. What structure should Manoj use to handle the exception?
 - a. **Try-catch**
3. Manoj is unable to compile his application due to errors. What type of errors is he experiencing?
 - c. **Syntax errors.** Logic errors and exceptions cannot be detected by the compiler; therefore, they can't be what is preventing his application from compiling.

Essential details

- A **syntax error** is an error that occurs when code does not meet the rules (or "syntax") of the programming language in use. The compiler cannot compile code that contains syntax errors.
- A **logic error** is an error that occurs when code executes but does not behave in the intended manner. These are often described as bugs—the program runs, but doesn't work correctly.
- An **exception** is an event that is raised when a method encounters a condition that prevents it from executing. Exceptions are said to be "thrown."
- Exceptions are handled using try-catch blocks (or try-catch-finally blocks).
- Putting code in a **try block** is like saying, "Hey! This might not work, but I'm going to give it a shot!"
- A **catch block** contains code that responds to an exception if something does go wrong.
- A **finally block** executes whether an exception occurred or not, so it's a great place to close files and handle other "cleanup" chores.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308820.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308817.aspx>
- <http://msdn.microsoft.com/en-us/library/8a9f2ew0.aspx>

track
your score

_____ /3

2



Understanding Namespaces and Classes in the .NET Framework

IN THIS CHAPTER

- 2.1 Understand .NET class hierarchies
- 2.2 Understand Object Oriented Concepts in the .NET Framework
- 2.3 Understand .NET namespaces
- 2.4 Understand and create class libraries
- 2.5 Understand and use different data types in the .NET Framework
- 2.6 Understand generics



Understand .NET class hierarchies

SCENARIO: Mark Steele is a first-year computer science student who is just learning how to program with Microsoft Visual Studio. A requirement of a recent assignment is to create a program that will display the results of some calculations on the monitor using a method—but Mark is having some problems. His method, called *OutputResults()*, includes the following lines of code in Microsoft C# (with line numbers added):

```
1: public void OutputResults()
2: {
3:     MyData reportData = new MyData();
4:     System.Console.WriteLine(reportData.GetResults());
5: }
```

- 1. The *Console* class is found in which namespace?**
 - a. *reportData*
 - b. *System*
 - c. *WriteLine*
- 2. Visual Studio isn't recognizing the *MyData* class, which belongs to the namespace *DataPoints*. What is the correct fully qualified name for *MyData*?**
 - a. *DataPoints.MyData*
 - b. *System.MyData*
 - c. *MyData.DataPoints*
- 3. In addition to using a fully qualified name, what is the best way for Mark to instruct Visual Studio to find *MyData*?**
 - a. Add *MyData* to the *System* namespace.
 - b. Add a using statement.
 - c. Use the full path for the *MyData.cs* file.

hint

A "fully qualified name" includes the namespaces (and classes) to which a class belongs.

Answers

1. The *Console* class is found in which namespace?
 - b. **System**
2. Visual Studio isn't recognizing the *MyData* class, which belongs to the namespace *DataPoints*. What is the correct fully qualified name for *MyData*?
 - a. **DataPoints.MyData**. Fully qualified names include the namespace(s) followed by the class name.
3. In addition to using a fully qualified name, what is the best way for Mark to instruct Visual Studio to find *MyData*?
 - b. **Add a using statement.**

Essential details

- All classes in the .NET Framework are ultimately derived from a class called **Object**.
- An **assembly** is a collection of types and resources that are built to work together and form a logical unit of functionality.
- A **namespace** is an organizational structure for categorizing classes and for preventing name collisions (that is, two classes with the same name).
- The *System* namespace includes many classes commonly used in .NET applications (such as *Console*).
- A fully qualified name includes all of the logical hierarchy.
In our example, *Console* is a member of the *System* namespace.
Its fully qualified name is *System.Console*.

track
your score

_____ /3

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms973231.aspx>
- <http://msdn.microsoft.com/en-us/library/system.aspx>

Understand Object Oriented Concepts in the .NET Framework

SCENARIO: Boris Scholl is creating a 2D video game using XNA Game Studio, a library for Microsoft Visual C# that enables Boris to develop games for the Xbox 360 console. In his game, the player will control a spaceship that flies around and fires lasers. The object of the game is to destroy the enemy aliens without damaging any planets or civilian spaceships.

He has designed several classes: *SpaceShip*, for the player-controlled ship; *Planet* and *Civilian* for the objects the player should avoid; and an *Alien* class, which will not appear in the game but will be the basis of the three enemy aliens: *FastAlien*, *DodgyAlien*, and *TeleportingAlien*.

- 1. Which feature would ensure that every class that implements *Alien* must implement the same methods?**
 - a. Encapsulation
 - b. Interface
 - c. Polymorphism
- 2. There will be multiple *Planet* objects in the game at once. What is the term used to describe each *Planet*?**
 - a. Inherited objects
 - b. Instances
 - c. Subclasses
- 3. What feature allows Boris to treat *FastAlien*, *DodgyAlien*, and *TeleportingAlien* as objects of type *Alien*?**
 - a. Encapsulation
 - b. Inheritance
 - c. Polymorphism

hint

Classes are like blueprints or recipes for objects.

Answers

1. Which feature would ensure that every class that implements *Alien* must implement the same methods?
 - b. **Interface**
2. There will be multiple *Planet* objects in the game at once. What is the term used to describe each *Planet*?
 - b. **Instances**
3. What feature allows Boris to treat *FastAlien*, *DodgyAlien*, and *TeleportingAlien* as objects of type *Alien*?
 - c. **Polymorphism**

Essential details

- **Inheritance** allows you to create new classes that reuse, extend, and modify the behavior that is defined in other classes.
- Use the “**is a**” test to see if inheritance is appropriate. In Boris’ game, a *FastAlien* is an *Alien*, for example, so *FastAlien* could extend *Alien*. A *Planet* is not a *SpaceShip*, so it should not extend *SpaceShip*.
- **Interfaces** are like contracts that define a set of properties, methods, and events but do not provide any implementation.
- **Polymorphism** allows a derived class to be used interchangeably with its base class. This is especially useful in collections, such as a list.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308752.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308750.aspx>
- <http://msdn.microsoft.com/en-us/library/dd460654.aspx>

track
your score

_____ /3



OBJECTIVE

UNDERSTANDING NAMESPACES AND CLASSES IN THE .NET FRAMEWORK 2.3

Understand .NET namespaces

SCENARIO: Markus Rankenburg has just started an internship with Contoso, Ltd. as a developer. He is updating the company's inventory system to make use of barcode and GPS technologies to improve package tracking. Markus's supervisor wants him to use classes from the company's existing inventory system as much as possible, both to save time and because the older code has been tested thoroughly. The classes are part of a Microsoft Visual Studio project called *Inventory Project*; Markus's Visual Studio project is called *Tracking Project*.

Markus is having problems because several of his classes (Package, Barcode, and Destination) have names that already exist in *Inventory Project*. Both projects use the default namespaces defined by Visual Studio when the projects were created.

- 1. What is most likely the fully qualified name of Markus's new Package class?**
 - a. InventoryProject.Package
 - b. System.Default.Package
 - c. Windows.Form.Package

- 2. What is the best way for Markus to use classes from *InventoryProject*?**
 - a. Include a file path as part of the fully qualified name.
 - b. Add a reference to the other project's classes.
 - c. Copy and paste the code into his project.

- 3. Which line of code will allow Markus to avoid having to use fully qualified names for the ShippingSource class in *InventoryProject*?**
 - a. using ShippingSource.InventoryProject;
 - b. using InventoryProject.*;
 - c. using InventoryProject.ShippingSource;

hint

The fully qualified name, *System.Windows.Forms.Button*, refers to the common *Button* control.

Answers

1. What is most likely the fully qualified name of Markus's new Package class?
 - a. **InventoryProject.Package.** By default, Visual Studio creates a namespace with the same name as the project name.
2. What is the best way for Markus to use classes from *InventoryProject*?
 - b. **Add a reference to the other project's classes.**
3. Which line of code will allow Markus to avoid having to use fully qualified names for the *ShippingSource* class in *InventoryProject*?
 - c. **using InventoryProject.ShippingSource;**

Essential details

- A **name space** is an organizational structure for categorizing classes and for preventing name collisions.
- **Name collisions** occurs when the same name is used for different things in two separate areas that share the same namespace.
- To avoid using **fully qualified names**, add `using` (C#) or `Imports` (Visual Basic) statements to your code.
- In C#, use the `namespace` keyword:

```
namespace MyNamespace
{
    ...
}
```
- In Visual Basic, use `Namespace`:

```
Namespace MyNamespace
    ...
End Namespace
```

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/zt9tafza.aspx>
- <http://msdn.microsoft.com/en-us/library/0d941h9d.aspx>
- <http://msdn.microsoft.com/en-us/library/ms973231.aspx>

track
your score

_____ /3

Understand and create class libraries

SCENARIO: Markus Rankenburg has studied the documentation for the old inventory system at Contoso, Ltd., where his internship supervisor has asked him to enhance the company's ability to track packages. Markus spoke to the developers of the original inventory system, and they suggested that he gather the classes he needs from the old system into a few class library files. They created the first one (called `InventoryLibrary`) for him to help him get started. Markus located the completed class library on the server and is ready to begin.

Once he fully understands how the first class library works and has a chance to explore the original developers' project files, he will be able to create the additional classes needed for this new inventory assignment.

1. When Markus looks for the `InventoryLibrary` file on the server, he sees several files with that name.

Which is likely to be the class library file he needs?

- a. `InventoryLibrary.cl`
- b. `InventoryLibrary.cs`
- c. `InventoryLibrary.dll`

2. How can Markus make use of `InventoryLibrary` in his own project?

- a. Add a reference to the file in its original location.
- b. Make a copy of the file in his application folder.
- c. Add a `using` (C#) or `Imports` (Visual Basic) directive to his code.

3. What is a primary advantage of using class libraries?

- a. They build and deploy quicker than full applications.
- b. The secure source code with a basic encryption system.
- c. They are easy to maintain and distribute.

hint

Class libraries package multiple classes into one file.

Answers

1. When Markus looks for the InventoryLibrary file on the server, he sees several files with that name. Which is likely to be the class library file he needs?
 - c. **InventoryLibrary.dll**
2. How can Markus make use of InventoryLibrary in his own project?
 - a. **Add a reference to the file in its original location.** By using the original location, Markus's project will always use the most recent version.
3. What is a primary advantage of using class libraries?
 - c. **They are easy to maintain and distribute.**

Essential details

- A **class library** is a collection of classes that can be packaged as a DLL for distribution, reuse, or both.
- A **dynamic-linklibrary (DLL)** is a package of classes and associated code that is linked to your application at run time. They typically have the file extension .dll.
- To create a class library, use one of the Class Library templates in Visual Studio. When you build the project, Visual Studio creates a DLL file.
- By using class libraries, you ensure that your code is easy to reuse—and easy to maintain or revise—because you need to work with only one copy of the code.
- To use a DLL file, add a reference to the file to your project. You can do this from the Build menu in Visual Studio. Then, refer to the classes by their fully qualified names or just add a using or Imports directive.

FAST TRACK HELP

- [http://msdn.microsoft.com/en-us/library/3707x96z\(VS.80\).aspx](http://msdn.microsoft.com/en-us/library/3707x96z(VS.80).aspx)
- [http://msdn.microsoft.com/en-us/library/ms228390\(v=VS.90\).aspx](http://msdn.microsoft.com/en-us/library/ms228390(v=VS.90).aspx)

track
your score

_____ /3

Understand and use different data types in the .NET Framework

SCENARIO: Cristina Potra has a friend with an extensive collection of vintage comic books. His collection is so large—and his organization so poor—that he has a difficult time keeping track of the comic books he already owns and the comic books he plans to buy. At a recent auction, he paid a large amount of money for a comic book he already owned!

Cristina wants to help, so she offered to develop an application for tracking her friend's collection. The application will need to track each book's title, issue number, date, and condition, as well as the price paid for the book.

1. Which of the following is likely to be a reference type in Cristina's program?

- a. The issue number
- b. The purchase price
- c. The title of the book

2. Cristina made an array named comicBooks to store all the data. How can she reference the first book in the list?

- a. comicBooks.Get(0)
- b. comicBooks[0]
- c. comicBooks<0>

3. Which of the following is a good choice for storing the price of a book?

- a. double
- b. int
- c. String

hint

Reference data types store a pointer to a value, not the value itself.

Answers

1. Which is likely to be a reference type in Cristina's program?
 - c. **The title of the book.** String is a reference type, while numeric types are value types.
2. Cristina made an array named comicBooks to store all the data. How can she reference the first book in the list?
b. comicBooks [0]
3. Which of the following is a good choice for storing the price of a book?
 - a. **double.** Unlike int, double can store floating-point data. String could store the data, but it would need to be converted for use in any calculations.

Essential details

- A **data type** is a classification that determines how data is stored and what operations can be performed on the data. Types can be value types or reference types.
- **Value** refers to a data type that stores an actual value.
- **Reference** refers to a data type that stores a pointer or reference to a memory location where a value is stored.
- An **array** is a data structure that contains numerous variables of the same type.
- Square brackets generally refer to individual members of the array. The first item in the array has the index 0.
- A **collection** is a specialized class for storing and retrieving groups of related or similar data.
- Most collections implement a common set of interfaces. If you learn to use one collection type, it's easy to learn others.

track
your score

_____ /3

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms173104.aspx>
- <http://msdn.microsoft.com/en-us/library/esc8tb11.aspx>
- <http://msdn.microsoft.com/en-us/library/ybcx56wz.aspx>
- <http://msdn.microsoft.com/en-us/library/ms973231.aspx>

Understand generics

SCENARIO: Diliana Alexieva-Bosseva is part of a development team working to update an application for Fabrikam, Inc. The application manages the production schedule of the company's sports equipment factory. For example, for one week the employees make tennis rackets, and the next week they change and produce small soccer goals for young children. The application plans the schedule for the next six months, but increased demand means Diliana's team must update the application to schedule up to one year in advance.

The old application uses an `Array` to manage the collection of `ProductionItem` objects, and it throws an exception when the schedule gets beyond the original six-month limit. Another member of the team changed this to an `ArrayList`, which stores everything as the `Object` type.

- 1. How can Diliana tell the compiler to cast an instance in the `ArrayList` (named `obj`) to the `ProductionItem` type?**
 - a. `(ProductionItem) obj`
 - b. `Convert.ToProductionItem(obj)`
 - c. `Obj.ToProductionItem`
- 2. Diliana finds that this casting occasionally results in exceptions. Which of these collection types use generics to specify a type placeholder?**
 - a. `Array`
 - b. `ArrayList`
 - c. `List<T>`
- 3. What is the correct syntax for declaring a Stack called `itemStack` using generics?**
 - a. `Stack itemStack<ProductionItem>;`
 - b. `<Stack>itemStack(ProductionItem);`
 - c. `Stack<ProductionItem>itemStack;`

hint

ArrayList does not use generics, so objects in the list must be cast.

Answers

1. How can Diliana tell the compiler to cast an instance in the `ArrayList` (named `obj`) to the `ProductionItem` type?
a. `(ProductionItem) obj`
2. Dilliana finds that this casting occasionally results in exceptions. Which of these collection types use generics to specify a type placeholder?
c. `List<T>`
3. What is the correct syntax for declaring a Stack called `itemStack` using generics?
c. `Stack<ProductionItem>itemStack;`

Essential details

- Generics let you tailor a method, class, structure, or interface to the precise data type it acts upon.
- Developers often use generics when working with collections of objects in their applications.
- Generics use a template or placeholder—called a *generic type parameter*—to indicate the data type to be used when the code is executed.
- Specify these generic type parameters with angle brackets:
`<String>`
`<int>`
`<ProductionItem>`
- Collection types that take advantage of the power of generics are easy to use. You don't have to worry about converting (or *casting*) objects to the necessary data type—they already *are* that data type.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ms172193.aspx>
- <http://msdn.microsoft.com/en-us/library/ms172192.aspx>
- <http://msdn.microsoft.com/en-us/library/6sh2ey19.aspx>

track
your score

_____ /3

3



Understanding .NET Code Compilation

IN THIS CHAPTER

- 3.1 Understand the fundamentals of Microsoft Intermediate Language and Common Language Infrastructure
- 3.2 Understand the use of strong naming
- 3.3/3.4 Understand version control; Understand assemblies and metadata



Understand the fundamentals of Microsoft Intermediate Language and Common Language Infrastructure

SCENARIO: Bart Wessels is responsible for developing applications to manage an automotive racing team. His projects include programs that keep records of the cars' maintenance, performance statistics, and team employee contract and payroll information.

On a recent morning, he arrived at work to find that a damaged hard drive had destroyed some files related to a data-driven application that analyzes a car's performance on different tracks under various weather conditions, tire brands, and fuel mixtures. Luckily, the data is safe, but the executables don't seem to work—and the team's biggest sponsor is meeting with the team to review the performance data in just a few days.

- 1. Bart knows that he can execute the program by using the JIT compiler on a backup that he kept of a portable executable (PE). What type of code is in a PE file?**
 - a. Binary code
 - b. MSIL code
 - c. Native code
- 2. How does the default JIT compiler process the code from an application?**
 - a. It compiles the entire application and saves the output to disk.
 - b. It compiles the application in parts, as needed.
 - c. It compiles only those parts that are not compiled into MSIL.
- 3. Which tool would help Bart extract the MSIL code for his application?**
 - a. MSIL Assembler
 - b. MSIL Disassembler
 - c. Visual Studio Code Viewer

hint

MSIL stands for Microsoft Intermediate Language. JIT stands for Just-In-Time.

Answers

1. Bart knows that he can execute the program by using the JIT compiler on a backup that he kept of a portable executable (PE). What type of code is in a PE file?
 - b. **MSIL code.** It also contains metadata about the application.
2. How does the default JIT compiler process the code from an application?
 - b. **It compiles the application in parts, as needed.**
3. Which tool would help Bart extract the MSIL code for his application?
 - b. **MSIL Disassembler.** This tool stores the MSIL instructions in a text file.

Essential details

- No matter which .NET language is used to develop an application, the source code is translated into **Microsoft Intermediate Language (MSIL)**.
- The MSIL instructions are stored in **portable executable (PE)** format, which also stores metadata related to the application.
- MSIL is platform-independent, so it must be compiled into native code that is specific to that platform.
- Rather than compiling to native code ahead of time, .NET uses a **Just-In-Time (JIT)** compiler that translates the MSIL as the application executes.
- The JIT compiles individual methods as needed—methods that never execute are never compiled. If the user closes the application, then runs it again later, the JIT compiler repeats the process.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ht8ecch6.aspx>
- <http://msdn.microsoft.com/en-us/library/c5tkafs1.aspx>
- <http://msdn.microsoft.com/en-us/library/k5532s8a.aspx>

track
your score

_____ /3

Understand the use of strong naming

SCENARIO: Markus Rankenburg is continuing his work to update the inventory system for Contoso, Ltd. His application uses several class libraries created by the developers of the company's original inventory system.

Michael Affronti, the project manager, has uncovered a security breach in the network that the development teams use for their work. Although no damage was discovered, Michael has assessed the teams' security practices and has decided to implement new policies that will protect the project files better and offer a greater level of security and confidence for all the team members. Markus will have to adjust to these changes as he finishes up his project.

- 1. From now on, all assemblies will use strong names. Which of the following is *not* part of a strong name?**
 - a. The version number
 - b. A public key
 - c. A private key
- 2. How can the original developers share their libraries securely so that Markus's application (and others) can use them?**
 - a. Use the Global Assembly Cache (GAC) and a strong name.
 - b. Give Markus a private key to access them on the server.
 - c. Distribute a simple name and keep the strong name private.
- 3. What will Markus need to do if the original team members update the assemblies and delete the old assemblies?**
 - a. Nothing—his application will use the most recent version.
 - b. Rebuild his application against the new version.
 - c. Ask for a new public key.

hint

Strong naming uses a public key encryption model.

Answers

1. From now on, all assemblies will use strong names. Which of the following is not part of a strong name?
 - c. **A private key.** The private key is kept secure—the public key is released to developers wishing to use the assembly.
2. How can the original developers share their libraries securely so that Markus's application can use them?
 - a. **Use the Global Assembly Cache (GAC) and a strong name.**
3. What will Markus need to do if the original team members update the assemblies and delete the old assemblies?
 - b. **Rebuild his application against the new version.** The public key will change only if the developers change their private key.

Essential details

- **Strong names** provide security and unique names for assemblies.
- Strong names rely on a **public key** encryption system: a public key is distributed so that users can verify the authenticity of the assembly, which can be built only with the **private key** kept by the developer.
- A strong name includes the assembly's name, version, and a public key. It also may include information about culture and target machine architecture.
- Developers can opt to use delay signing, where the private key is not used until the assembly is ready to be distributed. This allows the developer to keep the private key more secure.
- The **Global Assembly Cache (GAC)** is a system folder used to store assemblies that are shared by multiple applications on a computer.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/magazine/cc163583.aspx>
- <http://msdn.microsoft.com/en-us/library/yf1d93sz.aspx>

track
your score

_____ /3

**OBJECTIVE****UNDERSTANDING .NET CODE COMPIRATION 3.3/3.4**

Understand version control; Understand assemblies and metadata

SCENARIO: Anna Misiec has published a small application that helps the students at her university schedule their classes each semester. The program allows the students to enter a list of courses required for graduation, download the current list of course times, and drag those courses to a blank schedule. It even provides warnings if classes overlap or a required course is left off the list.

Because the university has changed the format of their course listings, Anna has to upgrade her program; she also has decided to make some additional improvements. The new version will flag classes that are nearly full and will handle degree requirements that could be met by choosing from a list of classes rather than one specific class.

This new version is a significant update, and students will be required to upgrade if they want to use her utility—the old version (which consumers call version 1.0) will no longer work with the new system.

- 1. Which of the following would be the best version number for Anna's new release?**
 - a. 1.0.1
 - b. 1.5
 - c. 2.0

- 2. When Anna compiles her application, where is the version number stored?**
 - a. The assembly manifest
 - b. In README.TXT
 - c. As part of the executable's file name

- 3. The information stored by the compiler which describes the assembly and its contents can be referred to as what?**
 - a. An MSIL file
 - b. Metadata
 - c. The common language runtime

hint

An assembly is generally either an executable (.exe file) or a library (.dll file).

Answers

1. Which of the following would be the best version number for Anna's new release?
 - c. **2.0.** Because the new version introduces major changes (and is not compatible with v1.0), she should change the major version number.
2. When Anna compiles her application, where is the version number stored?
 - a. **The assembly manifest**
3. The information stored by the compiler which describes the assembly and its contents can be referred to as what?
 - b. **Metadata**

Essential details

- The basic building block of a .NET application is an **assembly**.
- You can think of an assembly as a collection of types and resources that form a logical unit of functionality and are built to work together.
- When an assembly is compiled, .NET also produces an **assembly manifest**—a collection of data that describe how the elements in the assembly relate to each other.
- This type of “data about data” is called “metadata.”
- Each assembly has its own version that is independent of other assemblies. By default, an application can use only the exact version of an assembly that it was built against.
- These versions are identified by number, and a .NET version number includes four parts: major version, minor version, build number, and revision.

track
your score

_____ /3

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/51ket42z.aspx>
- <http://msdn.microsoft.com/en-us/library/30azhh5b.aspx>
- <http://msdn.microsoft.com/en-us/library/1w45z383.aspx>

4

Understanding I/O Classes in the .NET Framework

IN THIS CHAPTER

- 4.1 Understand .NET file classes
- 4.2 Understand console I/O
- 4.3 Understand XML classes in the .NET Framework





OBJECTIVE

UNDERSTANDING I/O CLASSES IN THE .NET FRAMEWORK 4.1

Understand .NET file classes

SCENARIO: Sanjay Patel is a music enthusiast. Over time, he has accumulated a large number of .mp3 and .wma files from purchases through a variety of online music stores. He has organized his music into folders based on album names; each folder contains all the songs from a particular album.

When Sanjay transfers his music to his portable music player, the songs are all in one long list, and he has a difficult time finding the music he wants to listen to. However, he's learned that his music player supports .m3u playlist files, which are playlists in text file format. He is writing an application that will go through his music folders and create a playlist for each album in his collection.

- 1. Some of Sanjay's folders have playlist files already. What code can Sanjay use to check if a playlist exists?**
 - a. File.Exist
 - b. StreamReader.Exist
 - c. StreamWriter.Exist
- 2. Sanjay's code is almost working, but all his data is written to one line in the file. How can he add a line terminator?**
 - a. StreamWriter.Append
 - b. StreamWriter.Close
 - c. StreamWriter.WriteLine
- 3. What will happen if a playlist file does exist and Sanjay creates a StreamWriter object with the append parameter set to false?**
 - a. The existing file will be renamed.
 - b. The new data will be added to the end of the existing file.
 - c. The existing file will be overwritten.

hint

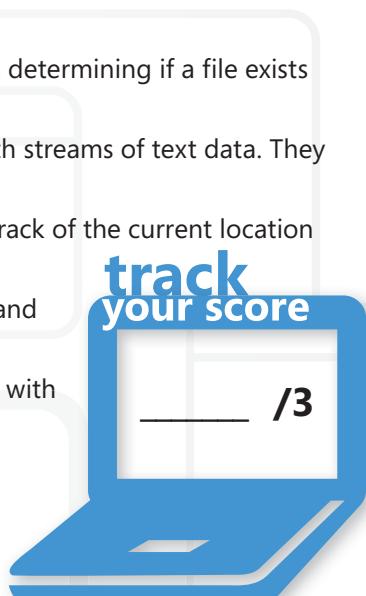
To "append" means to join components or add on to something.

Answers

1. Some of Sanjay's folders have playlist files already. What code can Sanjay use to check if a playlist exists?
 - a. **File.Exist**. The `File` class exposes many methods useful for general file handling.
2. Sanjay's code is almost working, but all his data is written to one line in the file. How can he add a line terminator?
 - c. **StreamWriter.WriteLine**. `Append` is not a member of the `StreamWriter` class; `Close` will close the file.
3. What will happen if a playlist file does exist and Sanjay creates a `StreamWriter` object with the `append` parameter set to `false`?
 - c. **The existing file will be overwritten**.

Essential details

- The `File` class provides an assortment of methods for basic file handling, such as determining if a file exists and deleting, copying, or moving a file.
- The `StreamReader` and `StreamWriter` classes expose methods for working with streams of text data. They are often used when reading and writing text files.
- `StreamReader` and `StreamWriter` move through data sequentially and keep track of the current location within the file.
- `StreamReader.Read` and `StreamReader.ReadLine` return the next character and next line, respectively, in a text stream.
- `StreamWriter.Write` and `StreamWriter.WriteLine` write data to the stream, with `WriteLine` adding a line terminator.



track
your score

_____ /3

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/db5x7c0d.aspx>
- <http://msdn.microsoft.com/en-us/library/6ka1wd3w.aspx>
- <http://support.microsoft.com/kb/304430>



OBJECTIVE

UNDERSTANDING I/O CLASSES IN THE .NET FRAMEWORK 4.2

Understand console I/O

SCENARIO: Karina Leal is a computer gaming enthusiast who loves vintage computer games. In particular, she enjoys playing text-based role-playing games (RPGs). As a novice programmer, she wants to try putting together a simple text-based RPG of her own.

Her game will describe the current scene to the player, and then wait for the player to enter a command, such as "open door." The program will then evaluate the user's input and, if it is a valid command, proceed to the next scene. She has created a console application project in Microsoft Visual Studio as a starting point for creating her game.

- 1. Which method can Karina use to display information to the player?**
 - a. System.Console.Output
 - b. System.Console.Print
 - c. System.Console.WriteLine

- 2. Which method will return a full line of text entered by the player?**
 - a. System.Console.Read
 - b. System.Console.ReadKey
 - c. System.Console.ReadLine

- 3. Which method will allow Karina to process function keys, as well as modifiers (such as SHIFT, ALT, and CTRL) typed by the player?**
 - a. System.Console.Read
 - b. System.Console.ReadKey
 - c. System.Console.ReadLine

hint

System.Console provides static methods for both input and output through the console.

Answers

1. Which method can Karina use to display information to the player?
c. **System.Console.WriteLine**
2. Which method will return a full line of text entered by the player?
c. **System.Console.ReadLine**
3. Which method will allow Karina to process function keys, as well as modifiers (such as SHIFT, ALT, and CTRL) typed by the player?
b. **System.Console.ReadKey**

Essential details

- **Console applications** rely on text input and output at the command line as a user interface. Keep in mind that other .NET applications can use console I/O as well.
- The console relies on text-based data streams for inputting and outputting information.
- **Console.WriteLine** and **Console.Write** write data to the console window; **WriteLine** adds a line terminator, which essentially moves the cursor to the start of the next line.
- **System.Console.Read**, **System.Console.ReadKey**, and **System.Console.ReadLine** return data entered by the user.
- **Read** returns a character as soon as it's typed, while **ReadLine** waits for the user to press ENTER and then returns a string.
- **.ReadKey** returns a data type that will handle function key presses, as well as modifier keys (such as SHIFT, ALT, and CTRL)

track
your score

_____ /3

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/system.console.aspx>
- <http://msdn.microsoft.com/en-us/library/0wc2kk78.aspx>
- <http://msdn.microsoft.com/en-us/library/system.console.read.aspx>



Understand XML classes in the .NET Framework

SCENARIO: Sanjay Patel has completed writing a program that scans through his music collection and creates playlist files for his portable media player. It is working great, and he is able to navigate through his collection much more easily now. In fact, many other students at his school are interested in using his software, and this has given Sanjay a new idea.

He wants to make a new version of his application that also catalogs the songs in the collection. He plans to then create a website application that will provide basic social networking for the users of his application. They will be able to see who has similar music in their collections and then interact with those users by using simple messages. They might want to suggest other music titles in the same genre or discuss recent concerts with their online acquaintances. He has decided to use Extensible Markup Language (XML) files to store the data generated as the program scans through the music files.

- 1. Which of the following is an advantage of XML in this application?**
 - a. XML provides relational database functionality.
 - b. XML provides a standardized format for transferring data.
 - c. XML is the language used to create websites.
- 2. Which class provides the methods that Sanjay will use to write the XML data to disk?**
 - a. XmlDataWriter
 - b. XmlFileWriter
 - c. XmlTextWriter
- 3. Sanjay wants to formalize the structure (schema) of his XML documents. What type of file should he use?**
 - a. A Hypertext Markup Language (HTML) file.
 - b. An XML Schema Definition (XSD) file.
 - c. A Microsoft Visual C# or Microsoft Visual Basic class.

hint

XML files are text files that use a tag-based syntax similar to HTML.

Answers

1. Which of the following is an advantage of XML in this application?
 - b. **XML provides a standardized format for transferring data.** XML does not have relational functionality, and though it is syntactically similar to HTML, it serves a different purpose.
2. Which class provides the methods that Sanjay will use to write the XML data to disk?
 - c. **XmlTextWriter**
3. Sanjay wants to formalize the structure (schema) of his XML documents. What type of file should he use?
 - b. **An XML Schema Definition (XSD) file.**

Essential details

- **Extensible Markup Language (XML)** is a markup language for formatting data in a document which is useful for storing data or transferring data between different computer platforms or applications.
- Although syntactically similar to Hypertext Markup Language (HTML), XML is used to define the structure of data, not its layout or appearance.
- **XmlTextReader** implements the abstract class **XmlReader**, which provides an efficient way to read XML data into memory. It exposes a method named Read to process one node of XML data at a time.
- **XmlTextWriter** implements **XmlWriter**, which provides pairs of methods that correspond to the paired tags in the XML output file.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/beginner/bb308816.aspx>
- <http://msdn.microsoft.com/en-us/beginner/bb308812.aspx>
- <http://msdn.microsoft.com/en-us/library/wkee9k2s.aspx>

track
your score

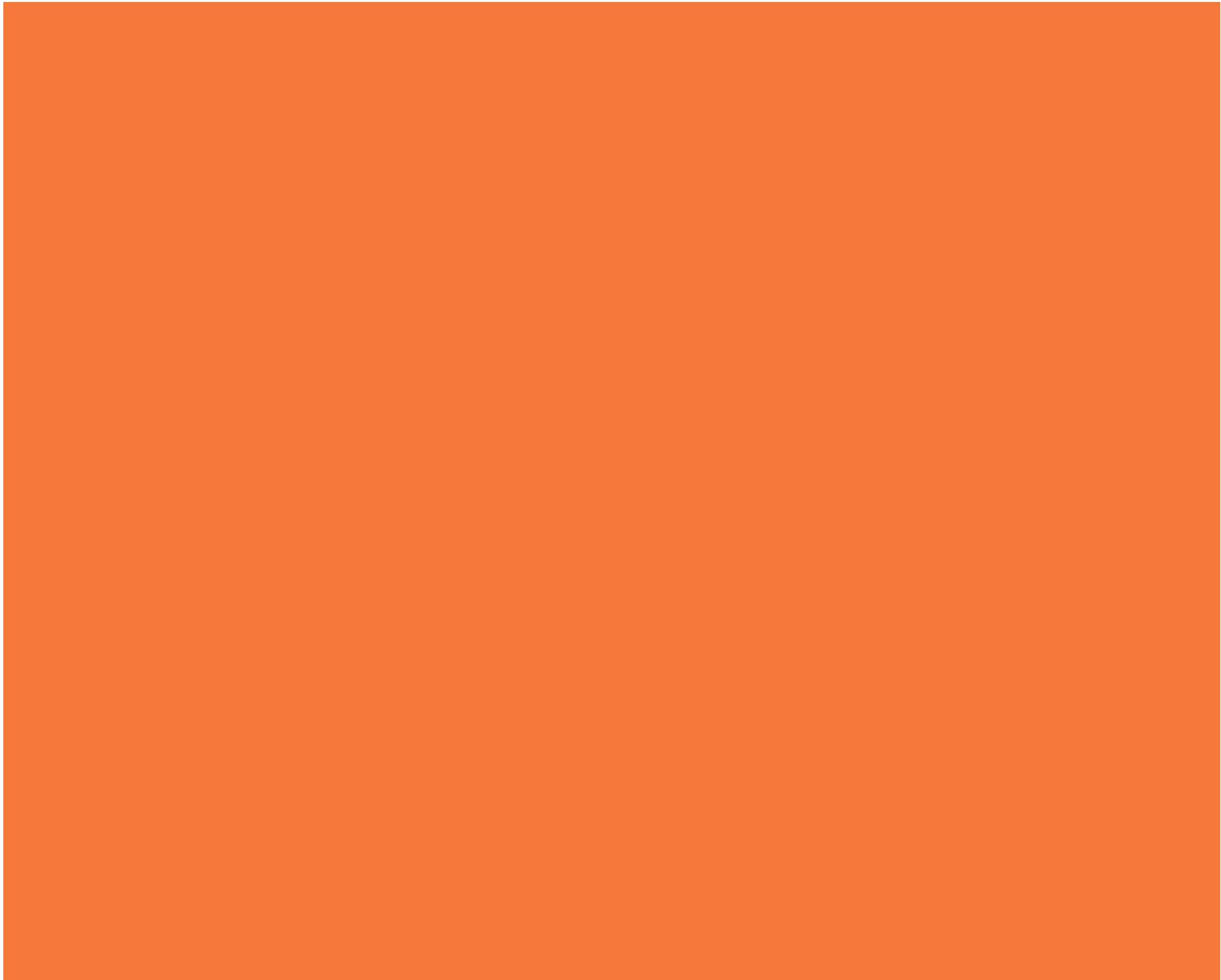
_____ /3

5

Understanding Security

IN THIS CHAPTER

- 5.1/5.2 Understand the System.Security namespace; Understand authentication and authorization



Understand the System.Security namespace; Understand authentication and authorization

SCENARIO: Enrique Gil is a computer science student and an intern at Consolidated Messenger. In class, he has been learning about implementing security systems in applications, and he has noticed that it is very similar in some ways to the physical security at the corporate offices of Consolidated Messenger.

The building uses an electronic key system along with a retina scanner for high-security areas. In addition, each employee is required to wear a name badge that is color-coded to match his or her job. Secretaries wear yellow name badges, supervisors wear green, IT personnel wear red, and managers wear blue. Visitors and interns, such as Enrique, wear a plain white name badge. That badge system corresponds with an electronic key to provide employees with access only to the areas where they are allowed entrance.

- 1. Which model best describes the security system used by Consolidated Messenger?**
 - a. Code access security
 - b. Cryptographic security
 - c. Role-based security

- 2. The employee name badge includes a photograph to help verify the employee's identity—which function does this serve?**
 - a. Authentication
 - b. Authorization
 - c. Cryptography

- 3. When an employee scans the electronic key to a door, the computer checks the job assignment and then unlocks the door if that job requires access to the area behind it. Which function is this?**
 - a. Authentication
 - b. Authorization
 - c. Cryptography

hint

In software, the authentication process often involves prompting the user for a password.

Answers

1. Which model best describes the security system used by Consolidated Messenger?
 - c. **Role-based security.** Each individual's access is determined by the role he or she plays.
2. The employee name badge includes a photograph to help verify the employee's identity—which function does this serve?
 - a. **Authentication.** Authentication refers to validating that an individual is who she or he claims to be.
3. When an employee scans the electronic key to a door, the computer checks the job assignment and then unlocks the door if that job requires access to the area behind it. Which function is this?
 - b. **Authorization.** Authorization is a check to see if the person has the right to gain access to the requested task or area.

Essential details

- The Microsoft .NET Framework uses two basic security models: **role-based security** and **code access security**.
- In role-based security, each user has a particular identity or is a member of a specified role, and that role determines the user's permissions.
- Code access security prevents potentially malicious code from executing restricted actions.
- In role-based security, authentication is the process of verifying the identity of the user.
- Authorization is the process of determining whether a person or user is allowed to perform a task.
- Security-related classes are located in the System.Security namespace.

track
your score

_____ /3

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/z164t8hs.aspx>
- <http://msdn.microsoft.com/en-us/library/system.security.aspx>
- <http://msdn.microsoft.com/en-us/library/5ba4k1c5.aspx>

6



Understanding .NET Languages

IN THIS CHAPTER

- 6.1 Understand language interoperability
- 6.2 Understand type safety





UNDERSTANDING .NET LANGUAGES 6.1

Understand language interoperability

SCENARIO: IdanPlonsky and James Alvord are longtime friends who attended high school together before moving to separate cities to go to college. Both are studying computer science, and they want to use their new programming skills to collaborate on an application. Their idea is to create a program that their high school math teacher can use to graph simple algebraic equations to display with a digital projector.

The curricula at Idan's school is different than at James' school—Idan programs using Microsoft Visual Basic, while James programs using Microsoft Visual C#.

- 1. The development teams for Visual Basic and C# have worked to ensure that each language has the same feature set as the other. What is this characteristic called?**
 - a. Language interoperability
 - b. Language compliance
 - c. Language parity

- 2. What is the name of the environment that will execute code written in any .NET language?**
 - a. Common Language Specification (CLS)
 - b. Common Language Runtime (CLR)
 - c. Microsoft Intermediate Language (MSIL)

- 3. How can Idan use one of James's C# assemblies in a Visual Basic project?**
 - a. By adding a reference to James's assembly
 - b. By having Microsoft Visual Studio convert James's assembly into Visual Basic
 - c. By converting both sets of source code to C++

hint

.NET's language interoperability features allow James and Idan to use each other's assemblies.

Answers

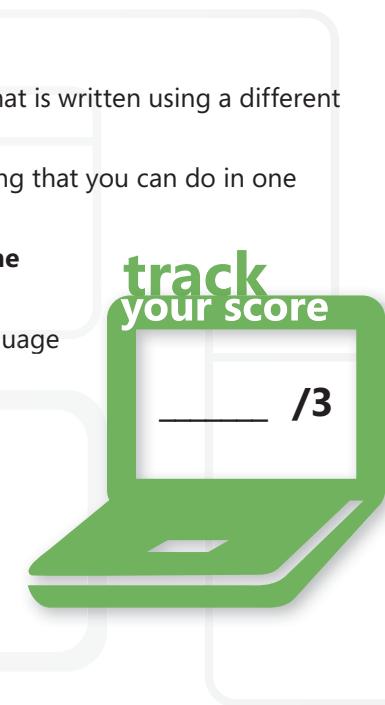
1. The development teams for Visual Basic and C# have worked to ensure that each language has the same feature set as the other. What is this characteristic called?
 - c. **Language parity.**
2. What is the name of the environment that will execute code written in any .NET language?
 - b. **Common Language Runtime (CLR).** All source code is compiled to MSIL; the CLR compiles MSIL to native code at run time.
3. How can Idan use one of James's C# assemblies in a Visual Basic project?
 - a. **By adding a reference to James's assembly.** If he has access to the project, he can simply add a reference to it; if not, James can send him a dynamic-link library (DLL) and Idan can add a reference to that.

Essential details

- **Language interoperability** refers to the ability of code to interact with code that is written using a different programming language.
- **Language parity** means that languages share the same features; that is, anything that you can do in one language, you can do in the other.
- Language interoperability is made possible by the **Common Language Runtime (CLR)**—the run-time environment that executes managed .NET code.
- Because two languages may not have perfect parity, writing code in a .NET language does not guarantee that other .NET languages can use that code.
- **Common Language Specification (CLS)** is a fundamental set of language features and rules for how those features are used.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/a2c7tshk.aspx>
- <http://msdn.microsoft.com/en-us/library/12a7a7h3.aspx>
- <http://msdn.microsoft.com/en-us/library/730f1wy3.aspx>



track
your score

_____ /3

**OBJECTIVE****UNDERSTANDING .NET LANGUAGES 6.2**

Understand type safety

SCENARIO: Jordao Moreno has taken a part-time job with Woodgrove Bank using his expert programming skills to help pay for his education. The bank tellers use an application to input transactions and provide balance information to customers. Jordao's task is to port the Microsoft Visual Basic application to Microsoft Visual C#. The original application was written in Visual Basic 6 and makes frequent use of weakly typed programming, such as the following:

```
Dim balance = 5  
deposit = "10"  
newBalance = balance + deposit
```

Jordao will have to decide how to handle this type of code as he ports it into Visual C#.

- 1. In Jordao's C# version, every variable must have an explicit data type. What is the name of this language feature?**
 - a. Strong typing
 - b. Type casting
 - c. Type safety
- 2. At what point in the development process will Jordao's C# code be verified for type safety?**
 - a. Before the code is compiled to MSIL code.
 - b. When the Microsoft Intermediate Language (MSIL) code is Just-In-Time (JIT)-compiled.
 - c. It will not be checked for type safety during development.
- 3. Which system defines how data types are declared and used in the Common Language Runtime (CLR)?**
 - a. Common Type System (CTS)
 - b. Common Language Specification (CLS)
 - c. Security policies

hint

Visual C# is a strongly typed language; it does not allow "typeless" programming.

Answers

1. In Jordao's C# version, every variable must have an explicit data type. What is the name of this language feature?
 - a. **Strong typing.**
2. At what point in the development process will Jordao's C# code be verified for type safety?
 - b. **When Microsoft Intermediate Language (MSIL) code is Just-In-Time (JIT)-compiled.** The compiler will examine the assembly's metadata and MSIL code to verify type safety.
3. Which system defines how types are declared and used in the Common Language Runtime (CLR)?
 - a. **Common Type System (CTS).**

Essential details

- **Type-safe** code is code that accesses only the memory locations that it is authorized to access. For example, type-safe code cannot read or write values in another object's private fields.
- Type safety is not mandatory, but it helps make code more secure.
- At runtime, the **Just-In-Time (JIT)** compiler performs a check to verify that the code being compiled is type-safe.
- In Visual C#, you can execute unsafe code—code that is not verifiable as type-safe—by using the `unsafe` keyword, although this is not typically used in practice.
- C# is a **strongly typed language**: every variable and constant has a type, as does every expression that evaluates to a value.
- Visual Basic allows data that is not strongly typed; most of the time, however, a Visual Basic programmer should declare types explicitly.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/hbzz1a9a.aspx>
- <http://msdn.microsoft.com/en-us/library/t2yzs44b.aspx>
- <http://msdn.microsoft.com/en-us/library/xe53dz5w.aspx>



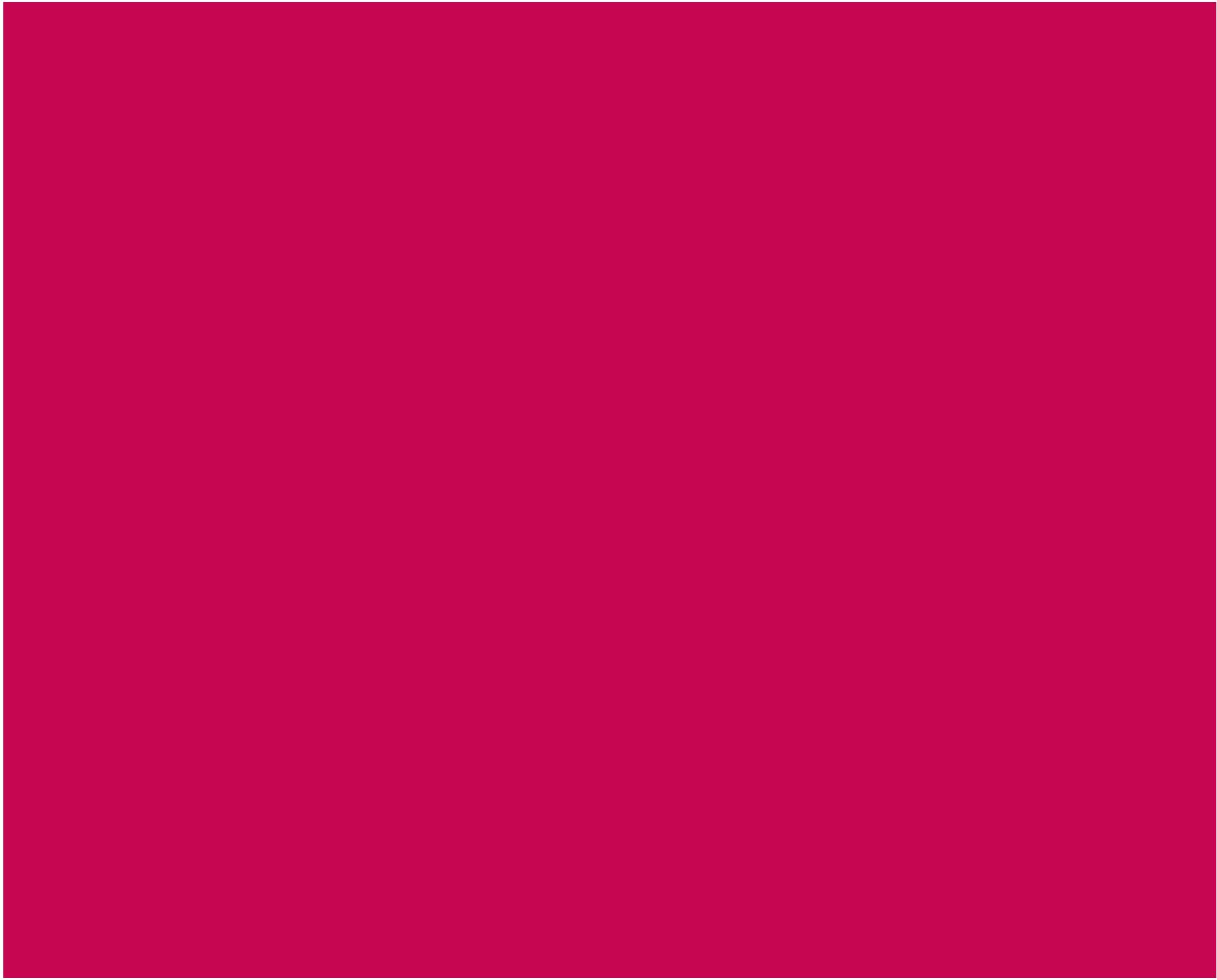
7



Understanding Memory Management

IN THIS CHAPTER

- 7.1 Understand resource allocation
- 7.2 Understand the difference between managed and unmanaged applications





OBJECTIVE

UNDERSTANDING MEMORY MANAGEMENT 7.1

Understand resource allocation

Scenario: Christa Geller learned to program in Pascal and C, and is now learning how to use Microsoft Visual Studio to create applications in Microsoft Visual Basic and Microsoft Visual C#. Based on her previous experience, she is accustomed to allocating the memory that her applications require manually, then freeing (or “disposing of”) memory when it is no longer needed. When she is not careful about allocating and releasing memory, she gets “stack overflow” errors.

Christa is surprised (and excited) to learn that she no longer needs to manage memory now that she is using Visual Basic and Visual C#—the Microsoft .NET Framework handles all that for her! Being curious, though, she wants to understand how the system works.

1. What is the name of the system that manages memory in .NET applications?

- a. Garbage collector
- b. Memory manager
- c. Resource allocator

2. When Christa creates an object, where does the .NET Framework allocate memory for the instance?

- a. On the hard disk
- b. On the heap
- c. On the stack

3. Which method can Christa use to initiate a cleanup of the heap?

- a. Collect
- b. Release
- c. Free

hint

The stack stores value data; the heap (or “managed heap”) stores reference data.

Answers

1. What is the name of the system that manages memory in .NET applications?
 - a. **Garbage collector.**
2. When Christa creates an object, where does the .NET Framework allocate memory for the instance?
 - b. **On the heap.** Reference types are stored on the heap; value types are placed on the stack.
3. Which method can Christa use to initiate a cleanup of the heap?
 - a. **Collect.** This method is part of the GC (garbage collector) class.

Essential details

- .NET Framework uses a mechanism called the **garbage collector** to manage the allocation and release of memory for an application.
- This garbage collector is represented by the GC **class**. Although it is rarely necessary to initiate the garbage collection process manually, you can do so by calling GC.Collect.
- The memory available to an application is divided into two regions: the **heap** and the **stack**.
- The **heap** is used for reference data, such as object instances. In the .NET Framework, the heap is the region managed by the garbage collector; therefore, it is referred to as the “managed heap.”
- The **stack** is used for method overhead and value data. Space in the stack is allocated and released automatically based on execution scope.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/ee787088.aspx>
- <http://msdn.microsoft.com/en-us/library/system.gc.aspx>
- <http://msdn.microsoft.com/en-us/library/0xy59wtx.aspx>

track
your score

_____ /3

**OBJECTIVE****UNDERSTANDING MEMORY MANAGEMENT 7.2**

Understand the difference between managed and unmanaged applications

SCENARIO: Christa Geller continues to learn more about developing applications in the Microsoft .NET Framework. When she looks in the folder for a project she's working on, she sees a number of files that Microsoft Visual Studio created automatically when she built the solution to her last project.

Christa expected to see an executable file—and she does. But apparently it's not the kind of executable that she anticipated. In fact, when she put the executable on a USB drive and tried to run it on her mother's computer, it wouldn't work. She didn't know that it required installation of the .NET Framework on the computer.

- 1. Christa's previous programming experience is with native code—what is native code?**
 - a. Code that does not use classes and objects
 - b. Code that is executed by the CPU
 - c. Code that can run on any system based on Microsoft Windows

- 2. What is installed as part of the .NET Framework that would run the executable that Christa has created?**
 - a. Common Language Runtime (CLR)
 - b. Visual Studio
 - c. A Windows application programming interface (API)

- 3. Which of the following is NOT a characteristic of managed code?**
 - a. Automatic memory management
 - b. Executable in any operating system
 - c. Uses a Just-In-Time (JIT) compiler

hint

Managed code is compiled when you build it, and again when it executes.

Answers

1. Christa's previous programming experience is with native code—what is native code?
 - b. **Code that is executed by the CPU.**
2. What is installed as part of the .NET Framework that would run the executable that Christa has created?
 - a. **Common Language Runtime (CLR).** Both Visual Studio and the Windows API are application development tools.
3. Which of the following is NOT a characteristic of managed code?
 - b. **Executable in any operating system.** The target operating system must have a CLR.

Essential details

- **Native code** is code that is intended to be run directly by a CPU without any additional translation or conversion. Native code is specific to a CPU/architecture.
- Native code is compiled one time—from source code to the low-level machine language.
- The **Common Language Runtime (CLR)** provides numerous services, including memory management, type safety, and a security system.
- **Managed code** is code that is executed (“managed”) by the CLR environment.
- Before it is processed by the CLR, managed code is converted to **Microsoft Intermediate Language (MSIL)**, a CPU-independent set of instructions that can be converted efficiently to native code. MSIL is created when you build a project or solution in Visual Studio.
- When the application is executed, the CLR analyzes this MSIL file(s) and compiles native code that the target machine understands.
- This last step is handled by the **Just-In-Time (JIT)** compiler, which converts MSIL into native code as the application is executing.

FAST TRACK HELP

- <http://msdn.microsoft.com/en-us/library/db5x7c0d.aspx>
- <http://blogs.msdn.com/b;brada/archive/2004/01/09/48925.aspx>
- <http://msdn.microsoft.com/en-us/library/8bs2ecf4.aspx>

track
your score

_____ /3