

# SOFTWARE DEVELOPER

A DEEP DIVE FOR SKILLS-BASED HIRING

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# Occupation Overview: Software Developers

## Foundational Competencies

- **Programming:** Writing computer programs for various purposes.
- **Complex Problem Solving:** Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
- **Systems Analysis:** Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.
- **Critical Thinking:** Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
- **Systems Evaluation:** Identifying measures or indicators of system performance and the actions needed to improve or correct performance relative to the goals of the system.
- **Operations Analysis:** Analyzing needs and product requirements to create a design.
- **Active Learning:** Understanding the implications of new information for both current and future problem solving and decision making.
- **Technology Design:** Generating or adapting equipment and technology to serve user needs.
- **Troubleshooting:** Determining causes of operating errors and deciding what to do about it.
- **Coordination:** Adjusting actions in relation to others' actions.

## Occupation-Specific Competencies

- **Intermediate Software Development:** Demonstrated proficiency in the use of object-oriented techniques, user experience and responsive design, web mobility, back-end processes, communication tools (such as AJAX), web services (including REST), a web framework, version control, and a development life-cycle methodology (such as Agile).
- **Intermediate Core Coding Languages:** Demonstrated proficiency developing simple front-end, back-end and/or mobile applications utilizing core coding languages (e.g., Java, C#, Objective C, JavaScript) on a development platform; integrating data storage (including SQL), libraries, methods, interfaces, and objects; and using code analysis and debugging techniques; web developers need to be able integrate HTML, CSS, web services (including REST), and a web framework (such as Angular or Spring MVC) into applications.
- **Basic Web Development:** Basic familiarity with such commonly-used web development languages as AJAX, XML, HTML 5, and JavaScript.
- **Basic General Database:** Demonstrated proficiency with SQL basics (e.g., selecting, inserting, updating, deleting records), at least one database management software application, and database fundamentals such as normalization, schemas, and relationships.
- **Basic Systems Design and Implementation:** Demonstrated ability to assist customers in the gathering of requirements and design, implement, and support simple technology solutions to existing business problems.
- **Basic Tech Support:** Familiarity with the use of some components of commonly-used computer hardware, software, applications, etc. and a basic ability to diagnose customer problems and provide troubleshooting and issue resolution support.
- **Basic Scripting:** Familiarity with the use of common scripting languages, such as PERL, Python, or shell scripts.
- **Basic Testing:** Demonstrated ability to design tests, create test scripts, ensure that test cases mimic user usage, execute and validate unit tests, and use appropriate test tools for their own changes. Familiarity with system and performance testing.
- **Basic Information Security - Software Developer:** Familiarity with software assurance best practices and their use in software development.
- **Basic Software Quality Assurance:** Demonstrated ability to design individual tests; create test scripts; and conduct tests and inspections of software to evaluate performance against requirements, quality, and performance. Includes the use of test tools such as LoadRunner and Jmeter.

## Job Description (Example)

Develop, create and modify general computer applications software or specialized utility programs. Analyze user needs and develop software solutions. Design software or customize software for client use with the aim of optimizing operational efficiency. May analyze and design databases within an application area, working individually or coordinating database development as part of a team. May supervise computer programmers.

- Design, develop, troubleshoot, and debug software for new and existing applications.
- Verify and optimize code and product stability, security, and performance.
- Analyze and understand complex business requirements, determine optimum software design and architecture, and write programs that meet specifications as needed.
- Perform analysis on external products and/or services to determine suitability for implementation in applications.
- Maintains consistent use of established architecture standards and practices.

## Activities (Example List)

- Design, build, or maintain web sites, using authoring or scripting languages, content creation tools, management tools, and digital media.
- Modify existing software to correct errors, allow it to adapt to new hardware, or to improve its performance.
- Perform or direct web site updates.
- Write, design, or edit web page content, or direct others producing content.
- Confer with managing/development teams to prioritize needs, resolve conflicts, develop content criteria, or choose solutions.
- Back up files from web sites to local directories for instant recovery in case of problems.
- Develop and direct software system testing and validation procedures, programming, and documentation.
- Confer with systems analysts, engineers, programmers, and others to design systems and obtain information on project limitations and capabilities, performance requirements, and interfaces.
- Analyze user needs and software requirements to determine feasibility of design within time and cost constraints.
- Translate security requirements into application design elements and perform secure programming and identify potential flaws in codes to mitigate vulnerabilities.

## Prioritized Foundational Competencies: Software Developers

Most Common Required Competencies	
1	<b>Programming:</b> Writing computer programs for various purposes; able to write programs that build toward a goal, stay within pre-defined requirements and project scope, and meet quality expectations; ideally, understands how a given program creates business value and helps end-users and directs project to maximize value and end-user impact.
2	<b>Critical Thinking:</b> Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems; able to critically assess the approach currently being used and adjust to improve; open to change; able to independently propose new solutions and approaches; considers tradeoffs (e.g., cost, time, quality) when proposing ideas.
3	<b>Coordination:</b> Adjusting actions in relation to others' actions; able to improve overall team performance and think through how individual decisions impact broader team; aware of overall team goals and context, not being too absorbed in personal work; writes code others can read and maintain; able to ask questions, take criticism, and share failures openly.

Most Preferred Competencies	
1	<b>Programming:</b> <i>See previous.</i>
2	<b>Complex Problem Solving:</b> Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions; able to decompose problems into smaller, inter-related sub-components; able to iterate over time and improve; ability to estimate key parameters (e.g., time, quality, cost) and make recommendations informed by these estimates.
3	<b>Active Learning:</b> Understanding the implications of new information for both current and future problem solving and decision making; open to learning; not afraid of failing (“failing fast is just as important as getting things right”); comfortable with ambiguity and interested and able to embrace new things (e.g., languages, teamwork styles).

Most Evolving Competencies	
1	<b>Technology Design:</b> Evolution driven by internet and profusion of tools, sources, etc.; changes increase complexity of technology and customer needs; increase value of generating or adapting equipment and technology to serve user needs and leveraging external sources (e.g., APIs, libraries, software) that can improve productivity and performance.
2	<b>Programming:</b> Evolution due to increased number and complexity of computer programming languages and changing customer goals; changes make it more important to identify customer goals and purposes while staying within pre-defined requirements and project scope and meeting quality expectations ideally, able to create business value and directs project to maximize value and end-user impact.
3	<b>Systems Analysis:</b> Evolution driven by diversity (three mobile systems, two desktop systems, screen sizes), need for scalability, growth of libraries, and new development styles (e.g., agile); changes increase value of being able to determine how systems should work and how changes in conditions, operations, and the environment will affect outcomes.

Most Common Break Point Competencies	
1	<b>Coordination:</b> <i>See previous.</i>
2	<b>Critical Thinking:</b> <i>See previous.</i>
3	<b>Programming:</b> <i>See previous.</i>

Most Hard-to-Find Competencies	
1	<b>Complex Problem Solving:</b> <i>See previous.</i>
2	<b>Critical Thinking:</b> <i>See previous.</i>
3	<b>Coordination:</b> <i>See previous.</i>

## Prioritized Occupation-Specific Competencies: Software Developers

Most Common Required Competencies	
1	<b>Basic Web Development:</b> Basic familiarity with such commonly-used web development languages as AJAX, XML, HTML 5, CSS, and JavaScript.
2	<b>Basic General Database:</b> Demonstrated proficiency with SQL basics (e.g., selecting, inserting, updating, deleting records), at least one database management software application, and database fundamentals such as normalization, schemas, and relationships.
3	<b>Intermediate Core Coding Languages:</b> Demonstrated proficiency developing simple front-end, back-end and/or mobile applications utilizing one or more core coding languages (e.g., Java, C#, Objective C, JavaScript) on a development platform; integrating data storage (including SQL), libraries, methods, interfaces, and objects; and using code analysis and debugging techniques.

Most Common Break Point Competencies	
1	<b>Basic Web Development:</b> <i>See previous.</i>
2	<b>Basic General Database:</b> <i>See previous.</i>
3	<b>Intermediate Software Development:</b> Demonstrated proficiency in the use of object-oriented techniques, user experience and responsive design, web mobility, back-end processes, communication tools (such as AJAX), web services (including REST), a web framework, version control, and a development life-cycle methodology (such as Agile).

Most Preferred Competencies	
1	<b>Intermediate Software Development:</b> <i>See previous.</i>
2	<b>Intermediate Core Coding Languages:</b> <i>See previous.</i>
3	<b>Basic Web Development:</b> <i>See previous.</i>

Most Hard-to-Find Competencies	
1	<b>Basic Systems Design and Implementation:</b> Demonstrated ability to assist customers in the gathering of requirements and design, implement, and support simple technology solutions to existing business problems.
2	<b>Intermediate Core Coding Languages:</b> <i>See previous.</i>
3	<b>Basic Testing:</b> Demonstrated ability to design tests, create test scripts, ensure that test cases mimic user usage, execute and validate unit tests, and use appropriate test tools for their own changes. Familiarity with system and performance testing.

Most Evolving Competencies	
1	<b>Basic Web Development:</b> Evolution driven by new development languages, increased complexity of current development languages, and evolving consumer needs; changes increase value of adaptability and on-the-spot learning; employees should also be willing to share new information with co-workers.
2	<b>Intermediate Core Coding Languages:</b> Evolution due to new and increasingly complex hardware (e.g., computers, tablets, mobile phones), new coding languages, and database storage software; changes increase value of active learning and utilizing new methods of moderately-complex code analysis and debugging in light of increased complexity.
3	<b>Basic Systems Design and Implementation:</b> Evolution driven by emergence of new business problems and increasing complexity of technology solutions; changes make it more important to be able to effectively and accurately diagnose customer problems and implement innovative technological solutions.

# Occupation Deep Dive: Software Developers

## Job Titles Within This Occupation

- Software Development Engineer
- Java Software Developer
- .Net Developer
- Software Developer
- Web Developer
- Applications Developer
- Applications Engineer
- Front-end Developer
- User Interface (UI) Developer
- Java Software Engineer
- User Experience (UX) Designer

- ERP Applications Developer
- Senior Developer
- Software Architect
- Technical Architect
- Solutions Architect
- Junior Software Developer
- Software Engineer
- Full-Stack Developer
- Ruby on Rails Developer
- Back-end Developer
- Technical Co-founder

- Junior Developer
- Programmer

## Certification and Education Preferences (Example)

- Angular JS certification
- Oracle Certified
- Salesforce Certification
- Microsoft Certified Technology Specialist (MCTS)

## Tools Used (Example List)

- JAVA
- JavaScript
- SQL
- LINUX
- Microsoft C#
- .NET Programming
- Oracle
- Angular JS
- Cordova
- Node JS
- Spring Framework
- CSS/LESS/SASS
- Browser Devtools
- Visual Studio.NET
- Visual Studio
- Eclipse
- IntelliJ
- Git
- Subversion
- Maven
- JIRA
- HTML
- React
- Ember
- Angular
- Python
- Ruby on Rails
- Django
- NoSQL
- Docker

## Other Relevant Foundational Competencies

1	Judgment and Decision Making
2	Active Listening
3	Speaking
4	Reading Comprehension
5	Time Management
6	Monitoring
7	Writing
8	Management of Personnel Resources
9	Persuasion
10	Quality Control Analysis
11	Social Perceptiveness
12	Instructing
13	Service Orientation
14	Operation Monitoring
15	Science
16	Learning Strategies
17	Negotiation
18	Operation and Control
19	Management of Material Resources
20	Equipment Selection
21	Management of Financial Resources
22	Installation
23	Equipment Maintenance
24	Repairing
25	

## Other Relevant Occupation-Specific Competencies

1	Mobile Development
2	Scripting
3	Database Administration
4	Core Operating Systems
5	General Data Techniques
6	Product Management
7	Web Front-end
8	Business Process and Analysis
9	Microsoft Office
10	UI/UX Design
11	Big Data
12	Data Storage
13	Graphic Design
14	General Networking Tools and Concepts
15	IT/Hardware
16	Business Solutions
17	Network Protocols
18	Microsoft Project Management Tools
19	Server Administration
20	Business Intelligence
21	Web Design
22	System Administration
23	Information Security
24	Software Administration
25	



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