

Risk Management

E L E V E N

Let's start this chapter with a story. A project manager was working on a hardware/software installation in an area where hurricanes are a relatively frequent occurrence when a hurricane struck.

Not long after the hurricane was over, the project manager was telling people what a great job his team had done and how quickly they had recovered from the disaster. Would you have been proud of yourself if you were the project manager? Before you answer, consider the following information:

- The activity the team was working on required three days to complete.
- The project manager had warning that the hurricane was coming.
- They had to recover from the disaster.

Instead of being excited about how quickly his team was able to recover from the hurricane, the project manager—and the sponsor—should have questioned the wisdom of scheduling the implementation at a time when there was a strong probability of a hurricane coming.

A project manager's work should not focus on dealing with problems; it should focus on preventing them. Had the project manager performed risk management¹ on his project, he would have considered the threat of a hurricane and worked with his team as part of the project planning effort to identify possible actions to take if a hurricane was forecast for implementation weekend. Then, when one actually was forecast, the team could have reacted according to the plan, probably moving the implementation to another weekend and avoiding the damage and rework that resulted from the disaster. This is the value of risk management.

QUICKTEST

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INITIATING	PLANNING <small>(This is the only process group with a set order.)</small>	EXECUTING	MONITORING & CONTROLLING	CLOSING
Select project manager	Determine development approach, life cycle, and how you will plan for each knowledge area	Execute work according to the project management plan	Take action to monitor and control the project	Confirm work is done to requirements
Determine company culture and existing systems	Define and prioritize requirements	Produce product deliverables (product scope)	Measure performance against performance measurement baseline	Complete final procurement closure
Collect processes, procedures, and historical information	Create project scope statement	Gather work performance data	Measure performance against other metrics in the project management plan	Gain final acceptance of product
Divide large projects into phases or smaller projects	Assess what to purchase and create procurement documents	Request changes	Analyze and evaluate data and performance	Complete financial closure
Understand business case and benefits management plan	Determine planning team	Implement only approved changes	Determine if variances warrant a corrective action or other change request(s)	Hand off completed product
Uncover initial requirements, assumptions, risks, constraints, and existing agreements	Create WBS and WBS dictionary	Continuously improve; perform progressive elaboration	Influence factors that cause change	Solicit customer's feedback about the project
Assess project and product feasibility within the given constraints	Create activity list	Follow processes	Request changes	Complete final performance reporting
Create measurable objectives and success criteria	Create network diagram	Determine whether quality plan and processes are correct and effective	Perform integrated change control	Index and archive records
Develop project charter	Estimate resource requirements	Perform quality audits and issue quality report	Approve or reject changes	Gather final lessons learned and update knowledge bases
Identify stakeholders and determine their expectations, interest, influence, and impact	Estimate activity durations and costs	Acquire final team and physical resources	Update project management plan and project documents	
Request changes	Determine critical path	Manage people	Inform stakeholders of all change request results	
Develop assumption log	Develop schedule	Evaluate team and individual performance; provide training	Monitor stakeholder engagement	
Develop stakeholder register	Develop budget	Hold team-building activities	Confirm configuration compliance	
	Determine quality standards, processes, and metrics	Give recognition and rewards	Create forecasts	
	Determine team charter and all roles and responsibilities	Use issue logs	Gain customer's acceptance of interim deliverables	
	Plan communications and stakeholder engagement	Facilitate conflict resolution	Perform quality control	
	Perform risk identification, qualitative and quantitative risk analysis, and risk response planning	Release resources as work is completed	Perform risk reviews, reassessments, and audits	
	Go back—iterations	Send and receive information, and solicit feedback	Manage reserves	
	Finalize procurement strategy and documents	Report on project performance	Manage, evaluate, and close procurements	
	Create change and configuration management plans	Facilitate stakeholder engagement and manage expectations	Evaluate use of physical resources	
	Finalize all management plans	Hold meetings		
	Develop realistic and sufficient project management plan and baselines	Evaluate sellers; negotiate and contract with sellers		
	Gain formal approval of the plan	Use and share project knowledge		
	Hold kickoff meeting	Execute contingency plans		
	Request changes	Update project management plan and project documents		

Rita's Process Chart™

Risk Management

Where are we in the project management process?

Think about your own projects. How would it feel if you could say, "No problem; we anticipated this, and we have a plan in place that will resolve it," whenever a problem occurs? How good would you look to your boss and sponsor? How much time and money would you save that would have otherwise been spent addressing the problem? How much less stress would you have in your life? Performing risk management helps prevent many problems on projects and helps make other problems less likely or less impactful. Conversely, effective risk management helps to increase the probability and/or impact of positive risks, or opportunities. And when you eliminate threats and increase opportunities, project schedule and cost estimates can be decreased, reflecting the results of risk management efforts. These are the benefits of risk management and the reasons risk management is a required part of proper project management.

If you do not practice risk management on your projects, this may be a difficult chapter for you. The exam asks questions on this topic at a sophisticated level, and you need to recognize that risk management activities are an integral part of a project manager's daily work. The everyday impact of risk management on projects and the project manager is an incredibly important concept that you need understand before you take the exam. Through risk management, the project manager can stay in control of the project, rather than being controlled by it.

The exam tests your knowledge of the process of risk management. This process is very logical. You may be given a situation on the exam and then asked to determine which risk management process is being performed, based on the information provided. So, you must understand the actions you and your team should take in each part of the risk management process. Also expect questions on the exam that require you to analyze a situation and determine what should be done next.

We cannot stress the value of risk management enough. This chapter will provide the overview of this topic that you need for the exam. You should realize, however, there are more tools and techniques for real-world risk management than are covered here. If you are like many project managers and do not currently practice risk management on your projects, we encourage you to seek more knowledge or training on risk management. Proper risk management can greatly improve the efficiency and effectiveness of your projects and reduce stress for you and your team.

The following should help you understand how each part of risk management fits into the overall project management process:

If you want additional training in risk management, please consider our online or instructor-led risk management courses. Find more information at our website, rmcls.com.

The Risk Management Process	Done During
Plan Risk Management	Planning process group
Identify Risks	Planning process group
Perform Qualitative Risk Analysis	Planning process group
Perform Quantitative Risk Analysis	Planning process group
Plan Risk Responses	Planning process group
Implement Risk Responses	Executing process group
Monitor Risks	Monitoring and controlling process group

Defining the Concepts

As you read this chapter, remember the basic, yet very important, concepts discussed next. Make sure you are prepared to deal with exam questions that test your knowledge of such concepts at an expert level.

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Risk Management PAGE 395 Risk management is the process of identifying, evaluating, and planning responses to events, both positive and negative, that might occur throughout the course of a project. Through risk management, you increase the probability and impact of opportunities on the project (positive events), while decreasing the probability and impact of threats to the project (negative events).

Risks are identified and managed starting in initiating and are kept up to date while the project is underway. The project manager and the team look at what has happened on the project, the current status of the project, and what is yet to come—and then reassess the potential threats and opportunities.

Also, given the iterative nature of project management, a response strategy for a newly discovered risk may create other project risks, which must be identified and managed. You must be prepared for exam questions that test your knowledge and understanding of these concepts.

Threats and Opportunities A risk event is something identified in advance that may or may not happen. If it does happen, it can have positive or negative impacts on the project. Project managers often just focus on threats—what can go wrong and negatively impact the project. Do not forget that there can also be positive impacts—good risks, called opportunities! Opportunities can include such things as:

- If we can combine orders for the ZYX equipment to buy more than 20 items at once, the cost will be 20 percent less per item than planned.
- If we provide a training class to improve efficiency, work package number 3.4 could be completed two days faster than expected.
- If we can obtain a resource with more experience and a higher level of productivity in May, work on the critical path activity 4.7.2 could be done 10 percent faster.

Up to 90 percent of the threats identified and investigated in the risk management process can be eliminated by changing how the project work is planned and performed. Strategies such as using an adaptive life cycle, outsourcing some or all of the work, or selecting more skilled people within the organization to do the work may reduce risk on a project.

Uncertainty Uncertainty is a lack of knowledge about an event that reduces confidence in conclusions drawn from the data. The work that needs to be done, the cost, the time, the quality needs, the communications needs, etc. can be uncertain. The investigation of uncertainties may help identify risks.

Risk Factors When assessing risk, it's necessary to determine the following:

- The probability that a risk event will occur (how likely)
- The range of possible outcomes (impact or amount at stake)
- Expected timing for it to occur in the project life cycle (when)
- The anticipated frequency of risk events from that source (how often)

Risk Appetites and Thresholds These terms refer to the level of risk an individual or group is willing to accept. Risk *appetite* (which is also referred to as risk tolerance) is a general, high-level description of the level of risk acceptable to an individual or an organization. For example, a sponsor is willing to accept little risk to the schedule on this project. Risk *threshold* refers to the specific point at which risk becomes unacceptable. For example, the sponsor will not accept a risk of the schedule being delayed 15 days or longer. Risk appetites and thresholds vary depending on the individual or organization and the risk area. For example, an organization may have more tolerance for cost-related risks than for risks that affect customer satisfaction or their reputation in the marketplace. Risk areas can include any project constraints (scope, schedule, cost, quality, etc.), as well as risks to reputation, customer satisfaction, and other intangibles.

Look for information about individual and organizational risk appetites and thresholds to answer situational exam questions related to risk response² strategies.

Risk Averse Someone who does not want to be negatively impacted by threats is *risk averse*.

Inputs to Risk Management Risk management is very process-oriented. Expect to see risk management input and output questions on the exam; however, you should not need to memorize the inputs and outputs. As you go through this chapter, keep in mind that many of the inputs to each risk management process are the outputs of the processes that came before it.

Remember, inputs are merely, “What do I need to do this well?” or “What do I need before I can begin...?”

The next exercise will help you understand the inputs to the risk management effort. If you know Rita’s Process Chart™, you should not need to spend much time studying these inputs.

Exercise Test yourself! Explain why each of the following inputs to risk management is needed before you can adequately perform the risk management process. This is an important test. The answer table includes what you should know for the exam. Note that definitions of these inputs will not be repeated later in this chapter.

	Inputs to Risk Management	This Is an Input of What Process?	Why Is This Input Needed, and What is Included Within This Input?
1	Project charter		
2	Project management plan		

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	Inputs to Risk Management	This Is an Input of What Process?	Why Is This Input Needed, and What is Included Within This Input?
3	Project documents		
4	Enterprise environmental factors		
5	Organizational process assets		
6	Agreements		
7	Procurement documentation		
8	Work performance data and reports		

Answer There can be many answers. Here are some possible ones.

Inputs to Risk Management	This Is an Input of What Process?	Why Is This Input Needed, and What Is Included Within This Input?
1 Project charter	Plan Risk Management	The project charter indicates the initial, high-level risks identified on the project and helps you see if the overall project objectives and constraints are generally risky or not. The charter also helps identify risks based on what is and what is not included in the project.
2 Project management plan	Plan Risk Management	<p>The project management plan includes: individual knowledge area management plans; additional plans for configuration, change, and requirements; baselines for time, cost, and scope; information on the development approach and project life cycle; and the performance measurement baseline. These components are used in all the risk processes because the information included is beneficial in planning for, dealing with, and monitoring risk on projects.</p> <p>The following specific management plans and components of the project management plan listed below are frequently used during risk management.</p>
	Identify Risks	Requirements management plan The requirements management plan may include a list of the project objectives along with identified prioritization and an indication of the most critical opportunities and threats. The approach to how all the requirements are gathered, documented, and prioritized will provide vital information for the risk team.
	Identify Risks	Schedule management plan The aggressiveness of schedule objectives provides an indication of the risk of meeting those objectives. Schedule-related assumptions may indicate areas of uncertainty.
	Identify Risks	Cost management plan This plan details cost processes and assumptions that may indicate areas of uncertainty.
	Identify Risks, Plan Risk Responses	Resource management plan The resource management plan describes what resources are needed, identifies the resources available to the project, outlines assumptions, and explains how the resources will be managed. Knowing this information will help you to identify risks related to resources and assign allocation of resources to responses.

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Inputs to Risk Management	This Is an Input of What Process?	Why Is This Input Needed, and What Is Included Within This Input?
	Identify Risks, Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis, Plan Risk Responses, Implement Risk Responses, Monitor Risks	Risk management plan The risk management plan will define the project's approach to risk management and detail how risk management efforts will be conducted throughout the project, with specifics about the methods and tools to be used.
	Identify Risks	Quality management plan The requirements and assumptions included in this plan—along with information on the degree of confidence that the requirements will be achieved and the metrics that will be measured—will help you identify quality risks. The documented processes in this plan can also help minimize threats or enhance opportunities, and can help you manage risks.
	Identify Risks, Perform Quantitative Risk Analysis	Scope baseline The scope baseline can help you assess how complex the project will be and what level of risk management effort is appropriate. The baseline includes information about boundaries, acceptance criteria, constraints, and assumptions, which can indicate risks to the project.
	Identify Risks, Perform Quantitative Risk Analysis	Schedule baseline Use the schedule baseline to find any dates (deliverable deadlines or milestones, for example) that may not be completely determined. Imposed schedule constraints, dependencies between activities, and a lack of clarity regarding milestone dates or estimates are indicators of risk.
	Identify Risks, Perform Quantitative Risk Analysis, Plan Risk Responses	Cost baseline Use the cost baseline to find any costs (for example, funding requirements) that may not be completely determined. Imposed budget constraints and a lack of clarity regarding funding requirements or cost estimates are indicators of risk. The amount of contingency reserve allocated to respond to risks is another important piece of information.
3	Project documents	Project documents that can be inputs include things such as registers, logs, estimates, requirements, and forecasts. The following are project documents associated with risk management.

Inputs to Risk Management	This Is an Input of What Process?	Why Is This Input Needed, and What Is Included Within This Input?
	Plan Risk Management, Identify Risks, Perform Qualitative Risk Analysis, Plan Risk Responses	Stakeholder register Stakeholders will view the project from different perspectives and thus will be able to see risks that the team cannot. Stakeholders are involved in many aspects of risk management.
	Identify Risks, Plan Risk Responses, Implement Risk Responses, Monitor Risks	Lessons learned register The lessons learned register provides information about what worked and what didn't work on the current project and on past, similar projects. Lessons learned can be used to reduce the risk of repeating the same mistakes and take full advantage of potential opportunities.
	Identify Risks, Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis	Assumption log Reviewing this log to analyze assumptions and constraints will help to identify risks on the project.
	Identify Risks, Monitor Risks	Issue log Reviewing this log to understand when confusion and disagreement has occurred, or where it is currently occurring on the project, can help to further identify risks on the project.
	Identify Risks, Perform Quantitative Risk Analysis	Cost, duration, and basis of estimates Knowing the estimates as well as the basis of those estimates helps you determine the risk of the project not meeting the time and cost objectives.
	Identify Risks	Requirements documentation This list of project requirements can be used to identify requirements that are poorly defined or that present other sources of risk for the project.
	Identify Risks, Perform Quantitative Risk Analysis	Resource requirements The resource requirements of a project should include some quantitative assessments, which can indicate the level of risk. For example, after reviewing the resource requirements, a project manager has determined there is risk because the project does not have enough resources.
	Plan Risk Responses	Resource calendars Resource calendars will show a project manager when a resource is available. Review this calendar to verify that all resources are available as scheduled to avoid threats and find opportunities.

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Inputs to Risk Management	This Is an Input of What Process?	Why Is This Input Needed, and What Is Included Within This Input?
4 Enterprise environmental factors	Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis, Plan Risk Responses, Implement Risk Responses, Monitor Risks	Risk register The risk register is the repository of information on identified risks for the project; as such, it is an important input for prioritizing and analyzing risks, planning and implementing risk responses, and monitoring risks.
	Perform Quantitative Risk Analysis, Plan Risk Responses, Implement Risk Responses, Monitor Risks	Risk report The risk report is iterated throughout the project, and may include information about overall project risk, risk response strategies, and planned responses to individual risks. This report can also include the number of risks, types of risks, risk trends, metrics, and risk sources. Analysis of this information helps to determine which risks could have the most impact on project risk exposure.
	Perform Quantitative Risk Analysis	Cost and schedule forecasts Cost forecasts can be compared or reviewed against the cost risk analysis, and the schedule forecasts can be reviewed along with the schedule risk analysis. These comparisons can give you insight into whether the cost and schedule estimates are realistic and likely to be achieved, and they can help you determine any associated risk.
	Perform Quantitative Risk Analysis	Milestone list The milestone list provides a register of key events that will occur during the project. Use this list, along with the schedule risk analysis, to determine whether or not the schedule is realistic.
	Plan Risk Responses	Project schedule Use the project schedule to figure out how risk responses will be performed without disrupting project activities.
	Plan Risk Responses	Project team assignments These assignments list the resources that may be utilized for risk work, such as the agreed-upon risk responses.
	Plan Risk Management, Identify Risks, Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis, Plan Risk Responses	Knowing the degree of risk the organization is willing to accept—as well as the specific areas for which there is willingness to accept risk (organizational risk appetites, tolerances, and thresholds)—helps you to identify the impact of risks, rank risks, and determine which risk response strategies to use. A company's culture can add or diminish risk and should be considered when identifying risks.

	Inputs to Risk Management	This Is an Input of What Process?	Why Is This Input Needed, and What Is Included Within This Input?
5	Organizational process assets	Plan Risk Management, Identify Risks, Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis, Plan Risk Responses, Implement Risk Responses	These records may have information about risks from past, similar projects—including risk categories, formats for stating risks, risk management templates, and lessons learned—that are relevant to managing risk on the current project. Company processes and procedures for project management and risk management, or the lack of such standardized procedures, may help identify additional risks.
6	Agreements	Identify Risks	Agreements, such as a contract with an external resource, will list information that may relate to or present threats or opportunities.
7	Procurement documentation	Identify Risks	Procurement documentation provides the answer to questions including the following: How many contracts are there likely to be on the project? What is the level of expertise of those handling the contracts? Was the project manager involved before any contracts were signed? (If not, the project will have more risk and is likely to cost more.) Contracts are a way to mitigate or transfer risks in risk response planning, but they can also create risk if not managed well.
8	Work performance data and reports	Monitor Risks	Project work generates raw data and measurements (work performance data), which are analyzed to evaluate the impact of the risks that have occurred and the plans that have been implemented, determine if risks should be closed, identify updates to triggers, and look for variance and its relationship to other identified risks. Work performance reports provide the analyzed data from various control processes in a format that can be used to do risk reassessment, reserve analysis, analysis of trends and variance, etc.

There are a few additional project management plan components that are not specifically listed as inputs to this process within the *PMBOK® Guide* that may have a significant impact when planning risk management:

- **Project background information** Correspondence from before the project was approved, articles written about similar projects, and other such information will help identify risks. (Project background information is part of organizational process assets.)
- **Network diagram** The network diagram is the only place where paths that converge into one activity can be easily seen. Such path convergence makes an activity riskier than if there was no path convergence. The network diagram also helps determine the critical path and any near-critical paths. The tighter the schedule, the more risk the project has. (The network diagram is part of project documents.)

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- **Communications management plan** The communications management plan can be used to structure communications around risk. It can also help identify risks. The communications management plan helps answer questions such as, “Are there a lot of stakeholders to communicate with?” and “Where in the project are communications so important that communication errors can actually add risk to the project?” There is a strong connection between planning communications and decreasing risk.

The Risk Management Process It is very important to understand the risk management process for the exam. You must know what happens when and understand how risk management can change the way projects are managed. On large, properly managed projects where risk management has been an integral part of planning, the following occurs:

- There are no longer huge “fires” to put out every day—they are eliminated with risk response plans.
- Risks are reviewed in every meeting, triggers are monitored, and risks are addressed before they happen.
- Normally, if a risk event does occur, there is a plan in place to deal with it. Hectic meetings to develop responses are a rarity, and are only needed when an unknown risk event occurs and requires the development of a workaround.
- As a result, the project manager has time for efforts such as:
 - Monitoring and controlling the various aspects of the project, looking for deviations and trends to find them early
 - Implementing a reward system
 - Developing the team
 - Keeping stakeholders informed of project progress
 - Staying ahead of the project



The seven risk management processes are:

- Plan Risk Management
- Identify Risks
- Perform Qualitative Risk Analysis
- Perform Quantitative Risk Analysis
- Plan Risk Responses
- Implement Risk Responses
- Monitor Risks

Although the initiating and planning processes are more likely done in sequence, remember that they are often repeated during the course of the project. Risks can be identified at any time, as can responses to new risks. If a risk is uncovered after the initial risk identification process, it still must be analyzed, and responses must be planned. The risk management process is iterative.

Plan Risk Management PAGE 401

Process Plan Risk Management
Process Group Planning
Knowledge Area Risk Management

The project manager, sponsor, team, customer, other stakeholders, and experts may be involved in the Plan Risk Management process. They define how risk management will be structured and performed for the project. Since risk management is critical to the success of a project, wouldn’t it be wise to think about how you will approach risk management before you do it? Plan before you act. Part of that planning involves determining at a high level the amount and areas of potential risk on

the project. Risk management efforts should be appropriate not only to the size and complexity of the project but also to the experience and skill of the project team. Successful risk management cannot be done with just a standardized checklist of risks from past projects. Although such a checklist can be helpful in creating a plan and identifying risks, the necessary risk management effort needs to be performed on each project.

The Plan Risk Management process answers the question of how much time should be spent on risk management based on the needs of the project. This includes the risk appetite of management and other key stakeholders. This process also identifies who will be involved and how the team will go about performing risk management. Organizational procedures and templates related to risk, such as standard probability and impact matrices, are identified as part of this process and then adapted to the needs of the project.

Outputs of Plan Risk Management PAGE 405

When you have completed risk management planning, you should, of course, have a risk management plan.

Risk Management Plan

The risk management plan may include:

- **Risk strategy** This is an overall approach to managing risk throughout the life of the project.
- **Methodology** This section of the plan defines how risk management will be performed to meet the needs of the specific project. Low-priority projects will likely warrant less of a risk management effort than high-priority projects.
- **Roles and responsibilities** This section explains who will do what risk management work. Did you realize that stakeholders outside the project team may have roles and responsibilities regarding risk management?
- **Funding** This section includes the cost of the risk management process. Yes, there is a cost of doing risk management, but overall, risk management saves the project time and money by avoiding or reducing threats and by taking advantage of opportunities. This section also includes a plan for utilizing reserves in response to risks on the project.
- **Timing** This section of the plan talks about when to do risk management for the project. Risk management should start as soon as you have the appropriate inputs and should be repeated throughout the life of the project, since new risks can be identified as the project progresses and the degree of risk can change over the course of a project. Also note that time needs to be allocated in the schedule for risk management activities.
- **Risk categories** See the discussion of risk categories on the next page.
- **Stakeholder risk appetite/thresholds** Remember that risk appetite is a high-level description of an individual or group's openness to risk. Thresholds are measurable amounts of risk that an individual or group are willing to accept within a specific category—such as risk to the project schedule, budget, or the achievement of a particular project objective. The risk appetites and thresholds of key stakeholders are documented and considered in the risk management plan. This information is also considered when ranking risks based on probability and impacts, and when prioritizing which risks will be addressed in risk response planning.
- **Definitions of probability and impact** Would everyone who rates the probability of a particular risk a 7 in qualitative risk analysis mean the same thing? A person who is risk averse might think of 7 as very high, while someone who is risk prone might think of 7 as a low figure. The definitions and the probability and impact matrix (discussed later in this chapter) help standardize these interpretations and also help compare risks between projects.

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- **Reporting** This section of the plan describes reports related to the risk management effort on the project that will be created, what they will include, and to whom they will be sent. In addition, the composition of the risk register for the project is defined here.
- **Tracking** The tracking section of the plan describes how the risk management process will be audited and how the results of risk management efforts will be documented.

Risk Categories A standard list of risk categories can help ensure areas of risk are not forgotten on your projects. These categories are broad, common areas or sources of risk that the company or similar projects have experienced. They can include things such as technology changes, lack of resources, regulatory hurdles, or cultural issues. Organizations and project management offices should maintain standard lists of risk categories that all projects can use to help identify and group individual project risks. When leading risk identification efforts, you should make sure each category is considered. A risk breakdown structure (RBS) is an organizational chart that can help you identify and document risk categories.

Risk can be classified or categorized in many ways, including:

- **External** Regulatory, environmental, or governmental issues; market shifts; problems with project sites, etc.
- **Internal** Changes to schedule or budget; scope changes; inexperienced team members; issues with people, staffing, materials, and equipment, etc.
- **Technical** Changes in technology, technical processes, or interfaces, etc.
- **Commercial** Customer stability, terms and conditions within contracts, vendors, etc.
- **Unforeseeable** Only a small portion of risks (about 10 percent) are actually unforeseeable.

Research has shown over 300 potential categories of risk, including risks caused by:

- The customer
- Lack of project management effort (yes, a lack of project management effort can add risk)
- Lack of knowledge of project management by the project manager and stakeholders
- The customer's customers
- Suppliers
- Resistance to change
- Cultural differences

The following are additional examples of sources of risk:

- **Schedule** “The hardware may arrive earlier than planned, allowing work package XYZ to start three days earlier.”
- **Cost** “Because the hardware may arrive later than planned, we may need to extend our lease on the staging area—at a cost of \$20,000.”
- **Quality** “The concrete may dry to our quality standards before winter weather sets in, allowing us to start successor work packages earlier than planned.”
- **Scope** “We might not have correctly defined the scope for the computer installation. If that proves true, we will have to add work packages at a cost of \$20,000.”
- **Resources** “Our designer may be called away to work on the new project everyone is so excited about. If that occurs, we will have to use someone else, and our schedule will slip between 100 and 275 hours.”
- **Customer satisfaction (stakeholder satisfaction)** “There is a chance the customer will tell us they are unhappy with the XYZ deliverable, causing at least a 20 percent increase in time to rework the deliverable and test plans.”



Expect the phrases “sources of risk” and “risk categories” to be used interchangeably on the exam.

In addition to risk categories, risks can be classified under two main types:

- **Business risk** Risk of a gain or loss
- **Pure (insurable) risk** Only a risk of loss (such as fire, theft, or personal injury, etc.)

You may also see references to risks described as non-event risks, which fall under the following categories:

- **Variability** Risks caused by the inability to predict future changes
- **Ambiguity** Risks caused by a lack of understanding

Identify Risks PAGE 409

Process Identify Risks
Process Group Planning
Knowledge Area Risk Management

In this process, risks to the project are identified. This effort should involve all stakeholders and might even include literature reviews, research, and communicating with nonstakeholders. Sometimes, the core team will begin the process and then other team members will become involved, or there could be a special, dedicated risk team—a part of the project team focused on risk management efforts.



When you get a question about who should be involved in risk identification, the best answer is “everyone”! Each stakeholder has a different perspective of the project and can provide thoughts on opportunities and threats.

Project managers should begin looking for risks as soon as a project is first discussed. In fact, an assessment of overall project risk is included in the project charter. However, the major risk identification effort occurs during planning. The project manager will need to have skills to facilitate the identification of all risks (or as many risks as reasonably possible).

Because risk identification primarily occurs during project initiating and planning, the exam has often said that the major part of risk identification happens at the onset of the project. But keep in mind that smaller numbers of risks may also be identified later in the project. Risks should be continually reassessed. For the exam, understand that risk identification is done during integrated change control, when working with contracts, when working with resources, and when dealing with project issues.

Tools and Techniques of Identify Risks PAGE 414

The following sections discuss some risk identification tools and techniques.

Brainstorming Brainstorming is usually done in a meeting where one idea helps generate another. Tools such as the risk breakdown structure, risk categories, and prompt lists can help to identify risks.

Checklist Analysis Over time, organizations may compile lists of risks encountered on projects, which they review to help them identify relevant sources of risk for current projects. This technique also includes reviewing a checklist of generic risk categories, which is used to help identify specific risks to the project from each category.

Interviewing Also called “expert interviewing” on the exam, this technique consists of the risk team or project manager interviewing project participants, stakeholders, or experts to identify risks to the overall project or to a specific element of work.

Root Cause Analysis³ In root cause analysis, the identified risks are reorganized by their root causes to help identify more risks.

Assumption Analysis Identifying and analyzing assumptions that have been made on the project, and whether those assumptions are valid, may lead to the identification of more risks.

Constraint Analysis Constraints such as schedule or budget limitations are examined to determine the level of risk they pose.

Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis⁴ This analysis examines the project to identify its strengths and weaknesses as well as the opportunities and threats that could originate from those strengths and weaknesses.

Documentation Reviews What is and is not included in project documentation, such as the project charter, contracts, and planning documentation, can help identify risks. Those involved in risk identification might look at project documentation, as well as lessons learned, articles, and other sources, to help uncover risks. This technique used to be an RMC Trick of the Trade® for risk management and has proven to be so beneficial that it has now become standard practice.

Prompt Lists This is a list of categories that have been identified as possible sources of risk to the project. The project team can use a prompt list when identifying risks to individual elements of the project as well as risks to the overall project.

Facilitation Facilitation skills are used by the project manager in conducting meetings to identify individual and overall project risks. As a part of such a meeting, the project manager may use any of the other risk identification techniques discussed earlier in this section.

Outputs of Identify Risks PAGE 417 The Identify Risks process results in the creation of the risk register and the risk report.

Risk Register⁵ Think of the risk register as one document for the entire risk management process that will be constantly updated with information as the risk management processes are completed. The risk register becomes part of the project documents and is included in historical records that will be used for future projects.

TRICKS OF THE TRADE Notice that the risk register, including updates, is an output of several of the risk management processes. (The PMBOK® Guide lists the updated risk register under project documents updates.) Read exam questions carefully, and remember that the risk register contains different information at different points in the risk management process. For example, if the project has just started and you are in the Identify Risks process, the risk register will contain the identified risks and potential responses, not the response plans actually selected for the project, which come later.

At this point in the risk management process, the risk register includes:

- **List of risks** Risks should be stated as clearly and specifically as possible using a cause-effect format.
- **Potential risk owners** This information is noted in the risk register as potential risk owners are identified.
- **Potential risk responses** Although risk response planning occurs later, one of the things experienced risk managers know is that it is not always logical to separate the work of each part of risk management. There will be times when a response is identified at the same time as a risk. These potential responses should be added to the risk register as they are identified, and analyzed later as part of risk response planning.
- **Root causes of risks** The root causes of risks provide valuable information for use in later efforts to plan risk responses and reassess risk on the project, and as historical records to be used on future projects. Until the root cause of a risk is determined and addressed, it is likely to reoccur.
- **Updated risk categories** You will notice a lot of places where historical records and company records are updated throughout the project management process. Make sure you are aware that documenting lessons learned and communicating information to other projects do not just happen at the end of the project. As part of the risk identification effort, the project provides feedback to the rest of the company regarding new categories of risk to add to the checklist.

Other information that can be documented in the risk register includes risk triggers, potential impact of identified threats and opportunities, when each risk could occur, and when each risk will no longer present a threat or opportunity.

TRICKS OF THE TRADE A tricky question on the exam might ask, "When in the risk management process are risk responses documented?" The answer is both during Identify Risks (as potential responses) and during Plan Risk Responses (as selected response plans).

Risk Report A risk report is generated and disseminated to stakeholders to keep them apprised of risk management efforts and outcomes. After the Identify Risks process, contents of the risk register would include an overview of information about the threats and opportunities that have been identified. Updated risk reports will be updates to the remaining risk management processes.

Perform Qualitative Risk Analysis⁶

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Process Perform Qualitative Risk Analysis
Process Group Planning
Knowledge Area Risk Management

As you begin this process, you should have a long list of risks documented in the risk register. But it would be too expensive, and it would take too much time, to plan responses to all these risks. You need to analyze the risks, including their probability and potential impact on the project, to determine which ones warrant a response. The Perform Qualitative Risk Analysis process involves doing this analysis and creating a shortened list of the previously identified individual project risks. The risks on this list may then be further analyzed in the Perform Quantitative Risk Analysis process, or they may move into the Plan Risk Responses process.

Remember that qualitative risk analysis is a subjective analysis of the risks identified in the risk register. Keep in mind that this process is repeated as new risks are uncovered throughout the project.

To perform this analysis, the following must be determined:

- The probability of each risk occurring, using a standard scale (common subjective analysis scales include Low, Medium, High and 1 to 10)
- The impact (the amount at stake or the positive or negative consequences) of each risk occurring, using a standard scale, such as Low, Medium, High or 1 to 10

Risk Data Quality Assessment PAGE 423 Before you can use the risk information collected on the project, you must analyze the precision of the data. You assess the accuracy and reliability of the data, and determine if the risk is valid and whether more research is needed to understand the risk. Imagine, for example, a risk given to you anonymously. You might allow for anonymous contributions during risk identification, but all the identified risks must be defined well enough to perform a qualitative assessment.

A risk data quality assessment may include determining the following for each risk:

- Extent of the understanding of the risk
- Data available about the risk
- Quality of the data
- Reliability and integrity of the data

Risk Categorization PAGE 425 Risk categorization examines the questions of “What will we find if we regroup the risks by categories? By source? By work packages?” Think about how useful it would be to have not only a subjective assessment of the total amount of risk on the project, but also a breakdown of the risks that shows which work packages, processes, people, or other potential causes have the most risk associated with them. Such data will be helpful in risk response planning, potentially allowing you to eliminate many risks at once by eliminating one cause. Risk categories and sources of risks can be organized in a risk breakdown structure.

Probability and Impact Matrix⁷ PAGE 425 A probability and impact matrix is a data representation technique that can be used during this process. Because qualitative risk analysis is based on subjective evaluation, the rating of any one risk can vary depending on the bias of the person doing the rating and how risk averse they are. For example, one person’s score of 3 might be another person’s 7. Therefore, organizations frequently have a standard rating system to promote a common understanding of what each risk rating means. This standard is shown in a probability and impact matrix (see fig.11.1).

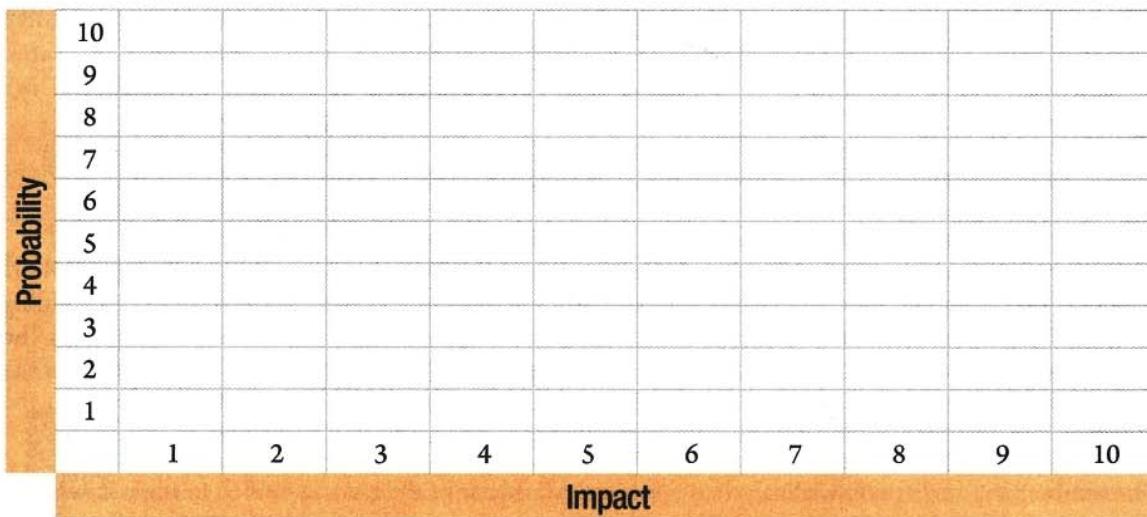


FIGURE 11.1 *Probability and impact matrix*

A key for understanding the ratings on this matrix might be documented as shown in figure 11.2.

Scale for Probability		Scale for Impact	
Rating	Interpretation	Rating	Interpretation
1–2	Low	1	No real impact
3–4	Medium	2	Small reduction of time or cost reserves
5–6	Medium-High	3	Medium reduction of time or cost reserves
7–8	High	4	Large reduction of time or cost reserves
9–10	Fact	5	Slightly over budget
		6	Over budget by 10% to 20% or project delayed by 10% to 20%
		7	Over budget by 20% to 30% or project delayed by 20% to 30%
		8	Over budget by 30% to 40% or project delayed by 30% to 40%
		9	Over budget by 40% or project delayed by 40%
		10	Project failure

FIGURE 11.2 Ratings interpretation for probability and impact matrix

The probability and impact matrix may be used to sort or rate risks to determine which ones warrant an immediate response (and will therefore be moved on through the risk process) and which ones should be put on the watch list (described later). The matrix may be standardized within the company or department, or it may be customized to the needs of the project. Such a matrix results in a consistent evaluation of low, medium, or high (or some other scale) for the project or for all projects. Use of a standardized matrix makes the risk rating process more consistent across projects.

Different charts, such as a hierarchical-type chart, can be used for cost, time, and scope if the thresholds for each type of risk are different or when risks have been categorized with more than two parameters.

Risk Parameters Assessments PAGE 423 In addition to creating a short list of risks, qualitative risk analysis includes identifying risks that should move more quickly through the process than others due to factors that are referred to as risk parameters. Some examples of risk parameters include the following:

- **Urgency** The urgency parameter indicates if the risk is likely to occur soon (requiring the response to be implemented quickly) or if the risk requires a particularly long time to plan a response. Urgent risks may be moved directly into risk response planning while the remaining risks continue through quantitative risk analysis, or the urgent risks may simply be the first ones for which you plan a response in risk response planning.
- **Dormancy** Dormancy refers to the anticipated time between when a risk occurs and when its impact is felt on the project.
- **Manageability and controllability** The manageability and controllability parameter indicates the level of difficulty involved in dealing with an identified risk, should it occur.
- **Strategic impact** Strategic impact refers to the degree to which the occurrence of a risk would affect the strategic goals of the performing organization.

Outputs of Perform Qualitative Risk Analysis PAGE 427

This process results in project documents updates. Some examples are discussed in the following sections.

Assumption Log Assumption log updates, or updates to the assumptions in the project scope statement, include new information or clarifications about documented assumptions and constraints made about the project.

Issue log The issue log should be updated to include any new issues or changes to current issues that have already been included in the log.

Risk Register The risk register should be updated to add the results of qualitative risk analysis, including:

- **Risk ranking for the project compared to other projects** Qualitative risk analysis can lead to a number to be used to rank the project in comparison to other projects (for example, this project has a risk score of 8.3). This ranking allows you to redo qualitative risk analysis after you have completed risk response planning and prove the value of your efforts. You can report, “The project now has a risk score of 4.8.” Think how this will help you prove the value of project management!
- **List of prioritized risks and their probability and impact ratings**
- **Results of other risk parameter assessments**
- **Risks grouped by categories**
- **List of risks for additional analysis and response** These are the risks that will move forward into quantitative risk analysis and/or risk response planning.
- **List of risks requiring additional analysis in the near term**
- **Watch list (noncritical risks)** These risks are documented in the risk register for observation or later review.

Risk Report Updates At the end of this process, the risk report includes the results of risk prioritization and a list of the highest-ranking risks.



Qualitative risk analysis can be used to do the following:

- Compare the risk of the project to the overall risk of other projects.
- Determine whether the project should be continued or terminated.
- Determine whether to proceed to the Perform Quantitative Risk Analysis or Plan Risk Responses processes (depending on the needs of the project and the performing organization).

Perform Quantitative Risk Analysis⁸ PAGE 428

Process Perform Quantitative Risk Analysis
Process Group Planning
Knowledge Area Risk Management

The Perform Quantitative Risk Analysis process involves numerically analyzing the probability and impact (the amount at stake or the consequences) of risks that ranked highest in qualitative risk analysis. Quantitative risk analysis also looks at how risks could affect the objectives of the project. The purpose of quantitative risk analysis is to:

- Determine which risk events warrant a response.
- Determine overall project risk (risk exposure).

- Determine the quantified probability of meeting project objectives (for example, “We only have an 80 percent chance of completing the project within the six months required by the customer,” or “We only have a 75 percent chance of completing the project within the \$80,000 budget.”).
- Determine cost and schedule reserves.
- Identify risks requiring the most attention.
- Create realistic and achievable cost, schedule, or scope targets.

**TRICKS
OF THE
TRADE**

Many people confuse qualitative and quantitative risk analysis. Remember that qualitative risk analysis is a subjective evaluation, even though numbers are used for the rating. In contrast, quantitative risk analysis is a more objective or numerical evaluation; the rating of each risk is based on an attempt to measure the actual probability and amount at stake (impact). Therefore, while the rating for a risk in qualitative risk analysis might be a 5, that same risk might be quantified as a \$40,000 cost impact in quantitative risk analysis.

As a project manager, you should always do qualitative risk analysis. Quantitative risk analysis is not required for all projects or for all risks. It may be skipped in favor of moving on to risk response planning. You should proceed with quantitative risk analysis only if it is worth the time and money. For some projects, you may have a subset of risks identified that require further quantitative analysis. But why spend time quantitatively assessing risks for a low-priority or short-term project or when the effort will provide minimal return?

The Perform Quantitative Risk Analysis process can include a lot of calculation and analysis. Luckily, the details of these efforts are not a focus of the exam. You need to know that the following actions are part of quantitative risk analysis but not how to do them beyond what is explained in this chapter:

- Further investigate the highest rated risks on the project.
- Perform data analysis to determine which risks have the most impact on the project.
- Determine how much quantified risk the project has through data analysis (that will be described later in this section).

Inputs to Perform Quantitative Risk Analysis PAGE 430 These inputs include the project management plan and scope, schedule, and cost baselines. The project management plan indicates whether, and under what circumstances, quantitative risk analysis will be performed. This includes what is detailed in the risk management plan. The baselines have data that is necessary for the numerical analysis and are used in the simulations and other tools.

The assumption log, which includes both assumptions and constraints, is reviewed to determine any assumptions or constraints that have the potential to add a degree of risk that warrants quantitative analysis.

Also note that project estimates and forecasts include milestones that must be achieved. If there is a risk that any of these are unrealistic, or if there is uncertainty that they will be able to be met, that risk may be analyzed in this process. Lastly, the risk register and risk reports include identified risks and the results of qualitative analysis of those risks. The risks with the highest probabilities and impacts are likely to require quantitative assessment.

Tools and Techniques of Quantitative Risk Analysis PAGE 431 Quantitative probability and impact can be determined in a variety of ways that make use of some or all of the following:

- Expert judgment from trained risk specialists and team members
- Data-gathering techniques, such as interviewing

- Data analysis techniques, such as simulations (like Monte Carlo), sensitivity analysis, decision tree analysis, and influence diagrams
- Interpersonal and team skills
- Representations of uncertainty
- Cost and schedule estimating
- Use of historical records from previous projects

Simulations Imagine if you could prove to the sponsor that even if the project were to be done 5,000 times, there is only a low probability that the end date they desire would be met? Would this be valuable? This is what the results of simulation techniques such as Monte Carlo analysis are all about. A Monte Carlo analysis uses the network diagram and schedule or cost estimates to “perform” the project many times and to simulate the cost or schedule results of the project. (Also see the discussion of this topic in the Schedule Management chapter.)

This technique can be extremely valuable, but there have traditionally been only one or two questions about Monte Carlo analysis on the exam. It is, however, mentioned as an answer choice a little more frequently.

TRICKS OF THE TRADE

You do not need to know how to perform this calculation for the exam. Rather, you should just understand that Monte Carlo analysis:

- Is usually done with a computer program because of the intricacies of the calculations
- Evaluates the overall risk in the project
- Determines the probability of completing the project on any specific day or for any specific cost
- Determines the probability of any activity actually being on the critical path
- Takes into account path convergence (places in the network diagram where many paths converge into one activity)
- Translates uncertainties into impacts to the total project
- Can be used to assess cost and schedule impacts
- Results in a probability distribution

Sensitivity Analysis⁹ Sensitivity analysis is a technique to analyze and compare the potential impacts of identified risks. A tornado diagram¹⁰ may be used to graphically depict the results of this analysis. Risks are represented by horizontal bars: the longest and uppermost bar represents the greatest risk, and progressively shorter horizontal bars beneath represent lower-ranked risks. The resulting graphic resembles a funnel cloud, or tornado. Figure 11.3 depicts a tornado diagram representing the impact of the threats and opportunities surrounding various milestones on the installation of a new computer system.

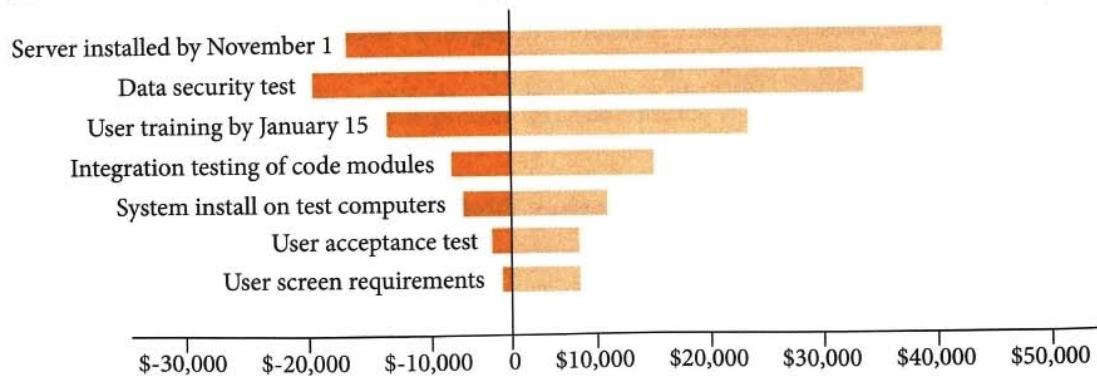


FIGURE 11.3 Tornado diagram

Decision Tree¹¹ Analysis If you have to choose between many alternatives, you should analyze how each choice benefits or hurts the project before making the decision. Decision trees can help you in this type of analysis. They are models of real situations and are used to make informed decisions about things like, “Which option should I choose?” or “How will I solve this problem?” by taking into account the associated risks, probabilities, and impacts.

There have traditionally been only one or two questions about decision trees on the exam. You should know what a decision tree is and be able to calculate a simple one from data within an exam question. The exam could also ask you to calculate the expected monetary value for cost, the expected value (or just “value”) for the schedule of a path, or the value of your decision.

Make sure you understand that a decision tree is analyzed by calculating the value of each branch. The outcome of this calculation will show the best option to select. Let’s quickly go through this value calculation, and then complete a simple exercise to calculate expected monetary value.

To evaluate a risk, you can look at the probability or the impact, but the expected value is a better measure to determine an overall ranking of risks. The formula for expected value is simply probability (P) multiplied by impact (I). The calculation for schedule results in the expected value (EV, not to be confused with Earned Value). Expected monetary value (EMV) is used for cost.

$$\text{EMV} = P \times I$$

Questions on the exam can ask, “What is the expected monetary value of the following?” Expected monetary value can also appear in questions in conjunction with decision trees and in calculating contingency reserves (both described later in this chapter).

Exercise Do not think of this as another formula you need to memorize—it is too easy. Test yourself! Complete the following chart, and you will understand this calculation for the exam without memorization.

Work Package	Probability	Impact	Expected Monetary Value
A	10%	\$20,000	
B	30%	\$45,000	
C	68%	\$18,000	

Answer See the answers in the following table.

Work Package	Probability	Impact	Expected Monetary Value
A	10%	\$20,000	\$2,000
B	30%	\$45,000	\$13,500
C	68%	\$18,000	\$12,240

Note that for opportunities, expected monetary value is often presented as a positive amount (e.g., \$3,000), whereas threats are usually presented as a negative number (e.g., -\$3,000).

The calculation of expected value is performed during quantitative risk analysis and revised during risk response planning when calculating contingency reserves for schedule and costs.

Risk Management ELEVEN

You should also know the following about decision trees for the exam:

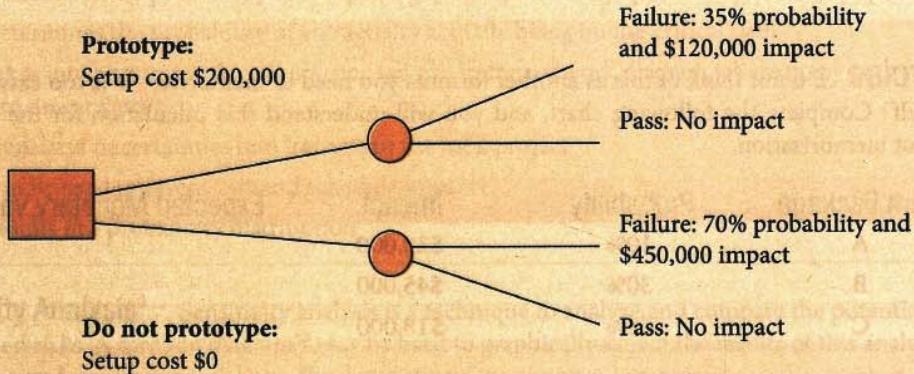
- A decision tree takes into account future events in making a decision today.
- It calculates the expected value (probability multiplied by impact) in more complex situations than the expected monetary value example previously presented. With a decision tree, you could evaluate the costs (or schedule implications) and benefits of several risk responses at once to determine which is the best option.
- It involves mutual exclusivity (previously explained in the Quality Management chapter).

TRICKS OF THE TRADE

Some examples of decision trees have the costs occurring only at the end of the project, while others have costs occurring early or in the middle of the project. Because a decision tree models all the possible choices to resolve an issue, costs can appear anywhere in the diagram, not just at the end. When you are taking the exam, don't get confused when you look at examples of decision trees. Pay attention to the data provided in the question so you can correctly interpret the answer.

The following two exercises include decision trees. The box represents a decision to be made, and the circles represent what can happen as a result of the decision.

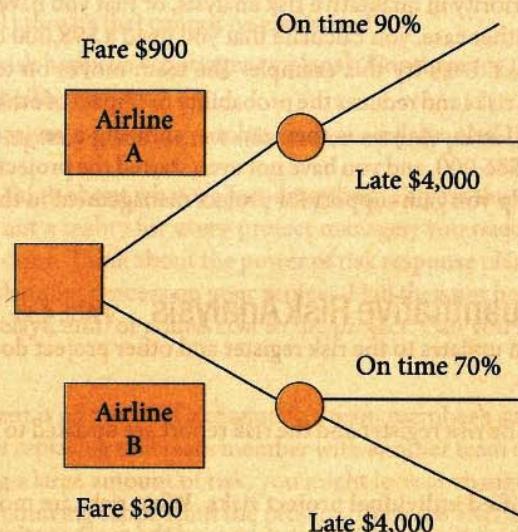
Exercise A company is trying to determine if prototyping is worthwhile on a project. They have come up with the following impacts (see the diagram) of whether the equipment works or fails. Based on the information provided in the diagram, what is the expected monetary value of each option? Which is the cheaper option—to prototype or not to prototype?



Answer If you just look at the setup cost of prototyping, it would seem like an unwise decision to spend money on prototyping. However, the analysis proves differently. Taking into account only the one future event of whether the equipment works or fails, the decision tree reveals that it would be cheaper to do the prototyping. The expected monetary value of prototyping is \$242,000; the expected monetary value of not prototyping is \$315,000.

Prototype	$35\% \times \$120,000 = \$42,000$ $\$42,000 + \$200,000 = \$242,000$
Do Not Prototype	$70\% \times \$450,000 = \$315,000$

Exercise You need to fly from one city to another. You can take airline A or B. Considering the data provided, which airline should you take, and what is the expected monetary value of your decision?



Answer If you just look at the cost of the airfare, you would choose airline B because it is cheaper. However, the airlines have different on-time-arrival rates. If the on-time-arrival rate for airline A is 90 percent, it must be late 10 percent of the time. Airline B is on time 70 percent of the time, and is therefore late 30 percent of the time. We have a \$4,000 impact for being late. The result is that you should choose airline A, with an expected monetary value of \$1,300 as shown below.

Airline A	$(10\% \times \$4,000) + \900 $\$400 + \$900 = \$1,300$
Airline B	$(30\% \times \$4,000) + \300 $\$1,200 + \$300 = \$1,500$

TRICKS OF THE TRADE

Proving the Value of Project Management

Project management saves time and money on projects. Getting your organization's executives to understand that fact can be difficult at times. How beneficial would it be if you could prove the value of project management?

Imagine that you have just done the first calculation of the expected value of all the risks that were assigned high ranking and priority in qualitative risk analysis, or that you have completed a Monte Carlo analysis for the project. In either case, you calculate that you need a \$98,000 contingency reserve on the project to accommodate risks. Let's try this example. The team moves on to the Plan Risk Responses process and eliminates some risks and reduces the probability or impact of others. The expected monetary value calculation or Monte Carlo analysis is then redone, showing a revised need for only a \$12,000 reserve. You have just saved \$86,000, and you have not even started the project yet! Can you imagine how information like that will help you gain support for project management in the real world?

Outputs of Perform Quantitative Risk Analysis

PAGE 436 The Perform Quantitative Risk Analysis process results in updates to the risk register and other project documents.

Risk Register Updates

The risk register and the risk report are updated to add the results of quantitative risk analysis, including:

- **Prioritized list of quantified individual project risks** What risks are most likely to cause trouble in terms of their effect on the critical path? What risks need the most contingency reserve?
- **The quantified probability of meeting project objectives** For example, "We only have an 80 percent chance of completing the project within the six months required by the customer." Or, "We only have a 75 percent chance of completing the project within the \$800,000 budget."
- **Trends in quantitative risk analysis** As you repeat quantitative risk analysis during project planning and when changes are proposed, you can track changes to the overall risk of the project and see any trends.
- **Initial contingency time and cost reserves needed** For example, "The project requires an additional \$50,000 and two months of time to accommodate the risks on the project." Reserves will be finalized during Plan Risk Responses.
- **Assessment of overall project risk exposure** Use overall project success (how likely it is that the project will achieve all key objectives) and any variables that may still affect the project to fully understand, at a high level, the overall risk exposure of the project.

- **Possible realistic and achievable completion dates and project costs, with confidence levels, versus the time and cost objectives for the project** For example, “We are 95 percent confident that we can complete this project on May 25th for \$989,000.”
- **Recommended risk responses** After quantitative risk analysis is performed, the risk register may include suggested responses to overall project risks and individual project risks.

Plan Risk Responses PAGE 437

Process Plan Risk Responses
Process Group Planning
Knowledge Area Risk Management

The Plan Risk Responses process involves figuring out, “What are we going to do about each top risk?” In risk response planning, you find ways to reduce or eliminate threats, and you find ways to make opportunities more likely or increase their impact. The project’s risk responses may include doing one or a combination of the following for each top risk:

- Do something to eliminate the threats before they happen.
- Do something to make sure the opportunities happen.
- Decrease the probability and/or impact of threats.
- Increase the probability and/or impact of opportunities.

For the remaining (residual) threats that cannot be eliminated:

- Do something if the risk happens (contingency plans). Contingency plans should be measurable so you can evaluate their effectiveness.
- Do something if contingency plans are not effective or are only partially effective (fallback plans).

Stop here for a moment to think about what we just described. To pass the exam, you will need to be able to envision a world that is not a reality for every project manager; you need to envision a world in which proper risk management is done. Think about the power of risk response planning. You eliminate problems (threats) while still in the planning process on your project. Had they not been eliminated, these problems could have caused stress, delays, and/or added cost to the project. Can you see the value of such efforts in your real world?

This is what risk management is all about. If a change to a team member’s availability is a top risk, you can investigate the possibility of replacing that team member with another team member who has similar skills. If a work package is causing a large amount of risk, you might look at changing the deliverable, modifying the work to produce it, or removing scope from the project. There are always options to respond to risks.

Risk management goes further than the examples just described, however. In addition to avoiding or exploiting risks, you and the team determine what to do about each of the residual risks (those that cannot be eliminated or exploited through risk response strategies). This might mean accepting these residual risks, or planning additional risk responses. You then assign the work involved in the responses to risk owners—individuals who watch out for the occurrence of a risk and implement preplanned responses.

If, while reading this book, you have found yourself thinking, “I do not have time to do that,” remember what project management can do for you. As with many other areas of project management, risk management does not really take additional time; rather, it saves huge amounts of time on projects. When you have done risk management, your project will go smoother and faster, with significantly fewer complications because avoidable problems were solved before they happened. You now have time to spend implementing reward systems, updating organizational process assets, creating lessons learned, preventing problems, assisting, coaching, and completing all the other work you might have thought you did not have time for.

Risk Management E L E V E N

When you are taking the exam, assume that all major potential problems that could have been identified in advance as risks were determined before they occurred and that there was a plan for each of these risks. With this in mind, the best answer to a question describing a major problem on the project will be the choice that talks about implementing a contingency plan, rather than one that involves discussing possible solutions to a problem after it has occurred. Many people have said that these types of questions were the reason they failed the exam. They simply made the wrong choices in situational questions. Be sure to make the transition to this way of thinking if it is unfamiliar to you.

Here are a couple of other points that can be tricky on the exam:

- Can you eliminate all threats on a project? Remember that threats can be eliminated and opportunities exploited, but the time and trouble involved in eliminating all the threats and exploiting all the opportunities on a project would probably not be worthwhile.
- Qualitative risk analysis, quantitative risk analysis, and risk response planning do not end once you begin work on a project. As noted in other parts of this book, planning is iterative. You need to review risks throughout the project, including while the project work is being done or when checking results. When you identify new risks, you then need to spend time analyzing them and planning responses, if appropriate. Risk ratings and response strategies for existing risks can change as more information about the risks and the selected response strategies becomes known. Therefore, you must review risk ratings and response strategies for appropriateness over the life of the project. This is the iterative nature of risk management. Approved change requests create the need to look for new risks that may be caused by the implemented change.

Now that you understand the philosophy of what a project manager is trying to do in the Plan Risk Responses process, let's look at the details you will need to know.

The primary input to this process is the project risk register. It has been updated throughout the risk management process, and now includes a list of risks that have been qualitatively (and possibly quantitatively) analyzed. The risks have been prioritized based on their probability and impact, among other factors. These are the risks for which responses will be planned. Another important input to this process is the cost baseline, which describes the contingency reserve that will be used in addressing identified risks. (See the discussion on reserves later in this chapter.)

Risk Response Strategies PAGE 442 When completing risk response planning, a thorough analysis must be done of the potential responses for each risk. The team, guided by the risk owner, may uncover many strategies for dealing with risks. Some of these risk response strategies, also known as risk mitigation strategies or strategies for threats and opportunities, involve changing the planned approach to completing the project, such as changes to the WBS, quality management plan, resources, communications, schedule, or budget. Other strategies, called contingency plans, involve coming up with a plan to be implemented when and if a risk occurs. It is important to make sure all options are investigated.

The choices of response strategies for threats include:

- **Avoid** Eliminate the threat by eliminating the cause, such as removing the work package or changing the person assigned to do work. Avoiding the threat might even involve expanding the scope of the project. Imagine, for example, your project team estimates there's a 75 percent likelihood of a threat occurring, but an additional level of testing or an additional activity would likely prevent this threat; expanding the scope of the project in this way would help avoid the threat.

On an overall project level, if the threat is beyond the organization's risk threshold, the project manager will need to take action to make the project acceptable. This could include removing pieces of the project that are too risky in order to avoid cancelling the entire project.

- **Mitigate** Reduce the probability and/or the impact of an individual or overall project threat, thereby making it a smaller risk and possibly removing it from the list of top risks on the project. Options for reducing the probability are considered separately from options for reducing the impact. Any reduction will make a difference, but the option with the most probability and/or impact reduction is often the option selected.
- **Transfer (deflect, allocate)** Make a party outside of the project responsible for the threat by purchasing insurance, performance bonds, warranties, or guarantees, or by outsourcing the work. Here is where the strong connection between risk and procurement (contracts) begins. In the world of properly practiced project management, risk analysis is completed before a contract is signed, and transference of risk is included in the terms and conditions of the contract.

Avoidance and mitigation are generally used for high-priority, high-impact risks. Transference, escalation (discussed below), and acceptance (also discussed below) may be appropriate for low-priority, low-impact risks as well as those with higher impact.

A response to pure risks¹²—such as fire, property damage, or personal injury—is to purchase insurance. Insurance exchanges an unknown cost impact of a known risk for a known cost impact. In the example of a risk of fire, the cost impact of the risk is unknown depending on the extent of the fire. But when insurance is purchased, the cost impact of a risk of fire becomes known; it is the cost of the insurance and the deductible. Transferring the risk by purchasing insurance does not eliminate all impacts. There may still be residual risks. For example, a project could experience schedule delays due to a fire even if fire insurance was purchased, or the cost of damage caused by the fire could exceed the amount of insurance purchased.

Transferring a risk will also leave some risk behind. For example, there is a risk that if the third party has trouble, they could cause a schedule delay. So you still need to decide what to do about any such secondary risks.

The choices of response strategies for opportunities include:

- **Exploit (the reverse of avoid)** Add work or change to the project to make sure the opportunity occurs. This could be on the individual project risk level or on the overall project risk level.
- **Enhance (the reverse of mitigate)** Increase the likelihood (probability) and/or positive impacts of the opportunity occurring. This could be related to the overall approach to scope and schedule, resources used, and project replanning as well as to individual project risks.
- **Share** Allocate ownership or partial ownership of the individual or overall project opportunity to a third party (forming a partnership, team, or joint venture) that is best able to achieve the opportunity.

Response strategies for both threats and opportunities include:

- **Escalate** A threat or an opportunity should be escalated if it is outside the scope of the project or beyond the project manager's authority. Any risks that are escalated will typically be managed at the program or portfolio level—not at the project level. Remember that escalated risk needs to be accepted by the program or portfolio manager, at which point, data on the escalation is documented, and the risk is no longer monitored at the project level.
- **Accept** Passive acceptance means to do nothing and to essentially say, "If it happens, it happens." This leaves actions to be determined as needed (workarounds) if the risk occurs. Active acceptance involves creating contingency plans to be implemented if the risk occurs and allocating time and cost reserves to the project.

Whether responding to threats or opportunities:

- Strategies must be timely.
- The effort selected must be appropriate to the severity of the risk—avoid spending more money preventing the risk than the impact of the risk would cost if it occurred.
- One response can be used to address more than one risk.
- More than one response can be used to address the same risk.
- A response can address the root cause of risk and thereby address more than one risk.
- The team, other stakeholders, and experts should be involved in selecting a strategy.

Watch out for questions about communicating risk-related information on the exam! Your risk response strategies must be communicated to the sponsor, management, and stakeholders. These parties will need to know that you are in control of the project even if there is a problem, and they may need to approve the resources to make the risk response strategies happen. Communicating about risk is essential for gaining buy-in to the strategy.

Exercise Now let's see if you can apply what you have learned. Identify the type of risk response strategy (avoid, mitigate the probability, mitigate the impact, transfer, exploit, enhance the probability, enhance the impact, share, escalate or accept) being described.

Description	Risk Response Strategy
1 Remove a work package or activity from the project.	
2 Assign a team member to frequently visit the seller's manufacturing facilities to learn about problems with deliveries as early as possible.	
3 Move a work package to a date when a more experienced resource is available to be assigned to the project.	
4 Begin negotiation for the equipment earlier than planned so as to secure a lower price.	
5 Outsource a work package so as to gain an opportunity.	
6 Notify management that there could be a cost increase if a risk occurs because no action is being taken to prevent the risk.	
7 Remove a troublesome resource from the project.	
8 Provide a team member who has limited experience with additional training.	
9 Train the team on conflict resolution strategies.	
10 Outsource difficult work to a more experienced company.	
11 Ask the client to handle some of the work.	
12 Prototype a risky piece of equipment.	
13 Notify the PMO that the testing software needed for the project could be used by three other IT groups if the enterprise solution is purchased.	

Answer

Description	Risk Response Strategy
1 Remove a work package or activity from the project.	Avoid
2 Assign a team member to frequently visit the seller's manufacturing facilities to learn about problems with deliveries as early as possible.	Mitigate the impact
3 Move a work package to a date when a more experienced resource is available to be assigned to the project.	Exploit
4 Begin negotiation for the equipment earlier than planned so as to secure a lower price.	Enhance the impact
5 Outsource a work package so as to gain an opportunity.	Share
6 Notify management that there could be a cost increase if a risk occurs because no action is being taken to prevent the risk.	Accept
7 Remove a troublesome resource from the project.	Avoid
8 Provide a team member who has limited experience with additional training.	Mitigate the probability
9 Train the team on conflict resolution strategies.	Mitigate the impact
10 Outsource difficult work to a more experienced company.	Transfer
11 Ask the client to handle some of the work.	Transfer
12 Prototype a risky piece of equipment.	Mitigate the probability
13 Notify the PMO that the testing software for the project could be used by three other IT groups if the enterprise solution is purchased.	Escalate

**TRICKS
OF THE
TRADE**

Potential risk response strategies and contingency plans must be analyzed to determine which strategy or strategies are most cost-effective and most likely to address the risk. Cost-benefit analysis and multicriteria analysis are techniques to evaluate and rank potential risk responses. You may see a question on the exam asking you to compare the cost effectiveness of various risk response options.

Outputs of Plan Risk Responses PAGE 447 The outputs of the Plan Risk Responses process are change requests, updates to the project management plan, and project documents updates.

Project Management Plan Updates The efforts spent in risk management can result in updates to the project management plan. After careful consideration and evaluation, planned risk responses may require changes to management plans that have been drafted in planning—at the overall project risk level as well as at the individual project risk level. Spend a moment now thinking about how risk response planning might lead to adjustments to the schedule, cost, quality, procurement, communications, and resource management plans, as well as to the scope, schedule, and cost baselines for the project. This concept is critical for understanding the impact risk management has on projects, especially if you don't currently do risk management on your projects.

Risk Management E L E V E N

Remember also that planning is iterative. To help you answer questions correctly on the exam and understand the flow of the planning processes, Rita's Process Chart™ represents this analysis, evaluation, and integration of the management plan changes during project planning as part of "Go back—iterations." It is expected that in the planning process, the project manager will lead the subject matter experts, assisting with project planning through many iterations of the management plans before coming up with a realistic, formal project management plan that is bought into and approved. Risk response strategies for opportunities and threats could have a wide variety of impacts on the project management plan, often necessitating refinement of management plans.

Other documents a project manager has created to help manage the project may also change as a result of risk response planning. These documents may include the assumption log, cost forecasts, the lessons learned register, the project schedule, project team assignments, the risk register, and the risk report. The risk report is updated to communicate the risks of greatest threat or opportunity, the overall project risk exposure, and the outcomes of planning related to risk responses and any anticipated changes. Can you imagine how risk response planning might affect the roles and responsibilities on a project, your stakeholder management strategy, or your quality metrics?

Risk Register Updates The risk register is updated to add the results of risk response planning, including:

- **Residual risks¹³** These are the risks that remain after risk response planning. After you have avoided, exploited, mitigated, enhanced, transferred, shared, escalated, and accepted risks (and created related contingency plans and fallback plans), there will still be risks that remain. Those residual risks that are passively accepted should be properly documented and reviewed throughout the project to see if their ranking has changed.
- **Contingency plans** Contingency plans are plans describing the specific actions that will be taken if the opportunity or threat occurs.
- **Fallback plans** These plans are specific actions that will be taken if the contingency plans are not effective. Think how prepared you will feel if you have plans for what to do if a risk occurs and what to do if the original plan does not work.
- **Risk owners** A key concept in risk response planning is that the project manager does not have to do it all, and neither does the team. Each risk must be assigned to someone who will help lead the development of the risk response and who will be assigned to carry out the risk response or "own" the risk. The risk owner can be a stakeholder other than a team member. Think about how the application of risk management could change real-world projects. The risk occurs; the risk owner takes the preapproved action determined in project planning and informs the project manager. No meeting is needed—just action! This can be very powerful.
- **Secondary risks** Any new risks created by the implementation of selected risk responses should also be analyzed as part of risk response planning. Frequently, a response to one risk will create the possibility of new risks that would otherwise not have occurred. For example, if a portion of the project work is outsourced to a seller because the project team does not have the expertise to complete the work efficiently, there may be a secondary risk of the seller going out of business. This was not a risk to the project prior to outsourcing. The discovery of secondary risks may require additional risk response planning.
- **Risk triggers¹⁴** These are events that trigger the contingency response. The early warning signs for each risk on a project should be identified so risk owners know when to take action.
- **Contracts** Before a contract is finalized, the project manager should have completed a risk analysis and included contract terms and conditions required to mitigate threats and enhance opportunities. Any contracts issued to deal with risks should be noted in the risk register.

- **Reserves (contingency)**¹⁵ Having reserves for time and cost is a required part of project management. You cannot come up with a schedule or budget for the project without them. Reserves are covered in the Cost Management chapter, but let's look at them again here.

Time and cost each have two types of reserves: contingency reserves and management reserves. Contingency reserves account for “known unknowns” (or simply “knowns”); these are items you identified in risk management. Management reserves account for “unknown unknowns” (or simply “unknowns”); these are items you did not or could not identify in risk management. Projects can have both kinds of reserves. As shown in the diagram in figure 11.4 (also shown in the Cost Management chapter), contingency reserves are calculated and become part of the cost baseline. Management reserves are estimated (for example, 5 percent of the project cost), and then these reserves are added to the cost baseline to get the project budget. The project manager has control of the cost baseline and can approve use of the contingency reserves, but management approval is needed to use management reserves. The same applies to reserves in the schedule.

Make sure you understand that reserves are not an additional cost to a project. The risk management process should result in a decrease to the project’s estimated time and cost. As threats are eliminated or their probability or impact reduced, there should be a reduction to the project’s schedule and budget. Contingency reserves are allocated for the contingency plans and fallback plans to deal with the associated, accepted opportunities and threats that remain after the risk management planning processes have been completed. No matter what you do, risks will remain in the project, and there should be a time or cost allotment for them, just as time or cost is allotted to work activities on the project.

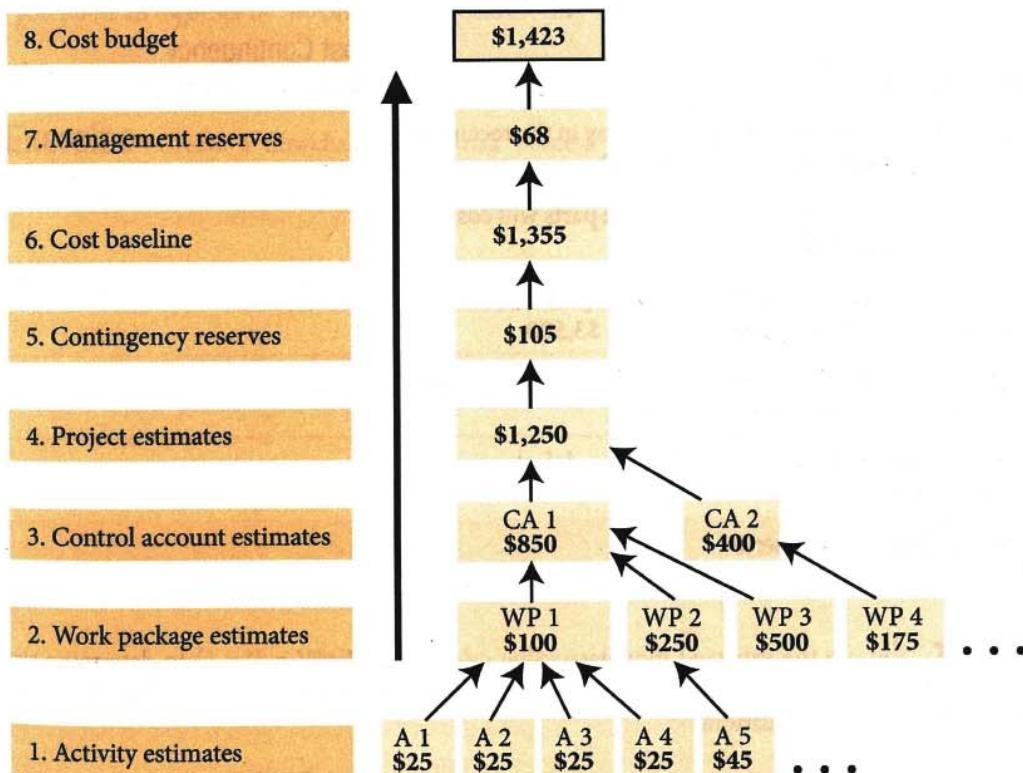


FIGURE 11.4 Creating a budget

There may be questions on the exam that ask you to calculate the contingency reserve for several risk events, which may be a combination of opportunities and threats. To do this, you must calculate the value of each risk using the equation for expected value ($P \times I$). On the exam, you may have to calculate

Risk Management ELEVEN

contingency reserves for either schedule (expected value) or cost (expected monetary value). But think about this a minute. Let's use the example for cost impacts to projects. Can you just add all the expected monetary value amounts of the opportunities and threats together and come up with one grand total for the budget? No! You'll need to subtract the total expected monetary value of the opportunities from the total expected monetary value of the threats. Why?

Opportunities will save money and time on the project if they occur. This can reduce the cost or schedule baselines. Conversely, the threats will add cost and time to the project.

We're telling you to subtract opportunities here, but didn't we tell you earlier that expected value is often presented as a positive amount for opportunities and a negative amount for threats? That's often true when the values are depicted on something like a decision tree, so you can easily identify positive and negative outcomes and their overall effect on project costs or schedule. But here we're specifically looking to determine how much money or time to set aside for the contingency reserves. Threats will require increasing the amount of contingency reserves, whereas opportunities will decrease the required reserves.

Let's try an example of calculating a contingency reserve in the next exercise.

Exercise Imagine you are planning the manufacture of modifications to an existing product. Your analysis has come up with the following information. What cost contingency reserve would you use?

Project Data	Cost Contingency Reserve Calculations
There is a 30 percent probability of a delay in the receipt of parts, with a cost to the project of \$9,000.	
There is a 20 percent probability that the parts will cost \$10,000 less than expected.	
There is a 25 percent probability that two parts will not fit together when installed, costing an extra \$3,500.	
There is a 30 percent probability that the manufacture may be simpler than expected, saving \$2,500.	
There is a 5 percent probability of a design defect, causing \$5,000 of rework.	
Total Cost Contingency Reserve	

Answer You use the expected monetary value calculation ($EMV = P \times I$) to determine the contingency reserve. The answer is \$1,075 for the total cost contingency reserve. See the following table for the detailed calculations.

Project Data	Cost Contingency Reserve Calculations
There is a 30 percent probability of a delay in the receipt of parts, with a cost to the project of \$9,000.	$30\% \times \$9,000 = \$2,700$ Add \$2,700
There is a 20 percent probability that the parts will cost \$10,000 less than expected.	$20\% \times \$10,000 = \$2,000$ Subtract \$2,000

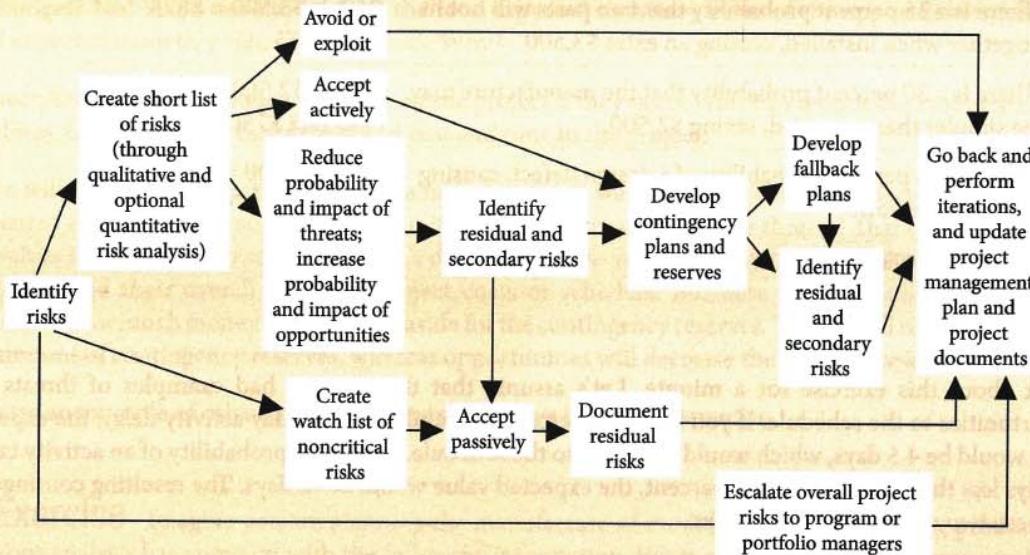
Project Data	Cost Contingency Reserve Calculations
There is a 25 percent probability that two parts will not fit together when installed, costing an extra \$3,500.	$25\% \times \$3,500 = \875 Add \$875
There is a 30 percent probability that the manufacture may be simpler than expected, saving \$2,500.	$30\% \times \$2,500 = \750 Subtract \$750
There is a 5 percent probability of a design defect, causing \$5,000 of rework.	$5\% \times \$5,000 = \250 Add \$250
Total Cost Contingency Reserve	\$1,075

Think about this exercise for a minute. Let's assume that the exercise had examples of threats and opportunities to the schedule. If you had a 30 percent probability of a 15-day activity delay, the expected value would be 4.5 days, which would be added to the schedule. And if the probability of an activity taking 10 days less than planned was 20 percent, the expected value would be -2 days. The resulting contingency for these two risks would be 2.5 days.

Now let's try another exercise. If the risk management process is new to you, the following exercise should help you put it all together by looking at it in a chart form.

Exercise Create a flowchart of the risk process from Identify Risks through Plan Risk Responses.

Answer Creating this chart will help you check whether you have understood what you read in this chapter. Your flowchart could be different than the following depiction.



You are nearing the end of the “Plan Risk Responses” section! But first, let’s examine some important concepts for the exam in this group of questions and answers. Take a few moments to test yourself.

Question What do you do with noncritical risks?

Answer Document them in a watch list, and revisit them periodically.

Question Would you choose only one risk response strategy?

Answer No, you can select a combination of choices.

Question What risk management activities are done during the execution of the project?

Answer Watching out for watch-listed (noncritical) risks that increase in importance, and looking for new risks; implement contingency plans if triggers indicate the risk is about to occur or is occurring.

Question What is the most important item to address in project team meetings?

Answer Risk.

Question How would risks be addressed in project meetings?

Answer By asking, “What is the status of risks? Are there any new risks? Is there any change to the order of importance?”

Implement Risk Responses PAGE 449

Process Implement Risk Responses
Process Group Executing
Knowledge Area Risk Management

Implementing risk responses is a new process within the PMBOK® Guide, but it is not new within risk management. Although it has not previously been called out as a separate process, it is really the heart of risk management, and where the value of proper risk management becomes

most apparent. When the preliminary work has been done well, the Implement Risk Responses process can be handled smoothly, since the previously documented plans allow for timely and effective responses to risk events.

The key to success is identifying risks in advance and then planning and preparing for their potential occurrence. Lessons learned from the current project or past, similar projects provide insight into the success of previous response plan implementation, and provide valuable input to this process.

Throughout the project, the risk register and risk report are reviewed regularly, ensuring everyone is aware of potential risks and ready to implement the planned responses as needed. Information on triggers enables the project manager, risk owner, and the team to recognize indications that a risk event is imminent. At that point, the risk owner, supported by the project manager, leads previously assigned resources in performing response activities. The consequences of threats are averted, or opportunities are taken advantage of. Risk thresholds¹⁶ are documented in the plan along with an indication of what amount of relief is required from risk responses, so the success of the implementation can be evaluated.

The beginning of this chapter included the story of a project manager who was managing a hardware/software installation during a hurricane. Let's revisit that example.

If the project manager had performed proper risk management, he would have had a plan in place to avoid the risk of a hurricane impacting his project. For example, the scheduled hardware/software implementation could have been moved to before or after the forecasted hurricane. If the project manager and the risk owners had actively monitored known risk triggers (such as weather reports, including wind speeds and the projected path of the hurricane) and then implemented a risk response plan before the hurricane reached the area, they could have successfully avoided the rework and delays, along with the costs, resulting from the hurricane. Such preparation is critical to successfully implementing a risk response.

Even though we do our best, sometimes our carefully developed plans don't have the expected result. For example, let's assume that a risk owner or the project manager in the previous story implemented a risk response plan to reschedule the implementation, causing the schedule to be extended. Although the plan was executed as intended, the hurricane caused more damage than anticipated, and the schedule had to be extended beyond the planned number of days. Such unforeseen results are managed through change requests to the cost and schedule management plans.

Project documents are updated as a result of the Implement Risk Responses process. The risk register and risk report are updated with information on responses taken, describing details on how well the responses addressed the risk and suggesting changes to future risk response plans. The project manager adds information to the lessons learned register about what worked and what didn't work when the risk response was implemented. The risk report is updated with changes to the project's risk exposure and changes to planned risk responses. Ongoing issues, such as confusion or disagreement regarding the response as it was implemented, are added to the issue log.

Monitor Risks PAGE 453

Process Monitor Risks
Process Group Monitoring & Controlling
Knowledge Area Risk Management

Risk-related questions on the exam assume that the project manager has done proper project management, including assigning risk owners, putting contingency plans in place, and taking actions as outlined in the plan. The exam also assumes the project is substantially less risky than it would have been if the project manager had not planned the project and properly handled risk management. If you do not have experience using risk management in the real world, these exam questions may be difficult. Try the next exercise. It will help you understand what project management is like when it includes risk management.

Risk Management E L E V E N

Exercise Think about the previous paragraph. Because a project manager has completed risk management activities, they are no longer focusing on dealing with problems and figuring out what should be done. So what is the project manager doing?

Spend time really thinking through the actions involved in monitoring risks. Once you have completed your own list of actions, look at our list to make sure you do them all or at least understand what they are and why they are helpful to the project. You could include things on your list that are not on ours, but check each one of those items to determine if they are accurate.

Actions Involved in Monitoring Risks

Included
Below?

1. *Identify*

2. *Assess*

3. *Monitor*

4. *Control*

5. *Review*

6. *Reassess*

7. *Recontrol*

8. *Reidentify*

9. *Reassess*

10. *Recontrol*

11. *Reidentify*

12. *Reassess*

13. *Recontrol*

14. *Reidentify*

15. *Reassess*

16. *Recontrol*

17. *Reidentify*

18. *Reassess*

19. *Recontrol*

20. *Reidentify*

21. *Reassess*

22. *Recontrol*

23. *Reidentify*

24. *Reassess*

25. *Recontrol*

26. *Reidentify*

27. *Reassess*

28. *Recontrol*

29. *Reidentify*

30. *Reassess*

31. *Recontrol*

32. *Reidentify*

33. *Reassess*

34. *Recontrol*

35. *Reidentify*

36. *Reassess*

37. *Recontrol*

38. *Reidentify*

39. *Reassess*

40. *Recontrol*

41. *Reidentify*

42. *Reassess*

43. *Recontrol*

44. *Reidentify*

45. *Reassess*

46. *Recontrol*

47. *Reidentify*

48. *Reassess*

49. *Recontrol*

50. *Reidentify*

51. *Reassess*

52. *Recontrol*

53. *Reidentify*

54. *Reassess*

55. *Recontrol*

56. *Reidentify*

57. *Reassess*

58. *Recontrol*

59. *Reidentify*

60. *Reassess*

61. *Recontrol*

62. *Reidentify*

63. *Reassess*

64. *Recontrol*

65. *Reidentify*

66. *Reassess*

67. *Recontrol*

68. *Reidentify*

69. *Reassess*

70. *Recontrol*

71. *Reidentify*

72. *Reassess*

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74. *Reidentify*

75. *Reassess*

76. *Recontrol*

77. *Reidentify*

78. *Reassess*

79. *Recontrol*

80. *Reidentify*

81. *Reassess*

82. *Recontrol*

83. *Reidentify*

84. *Reassess*

85. *Recontrol*

86. *Reidentify*

87. *Reassess*

88. *Recontrol*

89. *Reidentify*

90. *Reassess*

91. *Recontrol*

92. *Reidentify*

93. *Reassess*

94. *Recontrol*

95. *Reidentify*

96. *Reassess*

97. *Recontrol*

98. *Reidentify*

99. *Reassess*

100. *Recontrol*

Answer With risk management and proper project management, you are not doing things like figuring out what work needs to be done on the project or determining who will do a piece of work. Those efforts were already done in project planning. You are not spending much time solving problems, because you already have a plan in place for major problems. Even well-trained and experienced project managers do not always do enough to monitor risk. Read this list over carefully, and make sure you understand each of the actions. This is not a time for memorization; you are simply assessing what you know and do not know so that you can better understand these concepts and correctly answer situational questions on the exam.

The following is our list of actions involved in monitoring risks:

- Look for the occurrence of risk triggers.
- Monitor residual risks.
- Identify new risks and then analyze and plan for them. (Remember, risks can be identified anytime during the project, along with plans for how to handle the newly identified risks.)
- Evaluate the effectiveness of the risk management plan. Is it working? Does it need adjustment?
- Develop new risk responses. If a plan no longer seems like it will work, based on experience or new information, an alternate risk response or responses may be more appropriate. This review and analysis may lead to change requests.
- Collect and communicate risk status: “Four identified risks occurred last month, and all risk response plans were implemented successfully. Next month eight other risks may occur. Risk reserves are still considered adequate for covering the identified risks on this project.”
- Communicate with stakeholders about risks: “Remember that one of the major risks on the project could occur next week.”
- Determine if assumptions are still valid.
- Ensure proper risk management procedures are being followed.
- Revisit the watch list to see if additional risk responses need to be determined: “This change to the product scope might increase the impact of risk X, currently on our watch list. Let’s analyze it.”
- Recommend corrective actions to adjust to the severity of actual risk events: “This risk did not have the impact we expected, so let’s adjust the contingency plan and change what we will do if the risk reoccurs.”
- Look for any unexpected effects or consequences of risk events: “We did not expect this risk to damage the construction site. We need to decide how to fix the damage after we finish implementing the already agreed-upon contingency plan.”
- Reevaluate risk identification and qualitative and quantitative risk analysis when the project deviates from the baseline: “The project cost is over the cost baseline (or over the schedule baseline). This implies we missed some major risks. Let’s hold another risk identification session.”
- Update risk management and response plans.
- Look at the changes, including recommended corrective actions, to see if they lead to identifying more risks: “We keep having to take corrective action related to this problem. Let’s look for the root cause and identify any risks to the remainder of the project that relate to the problem.”
- Submit change requests to integrated change control.
- Update the project management plan and project documents with approved changes and any relevant information from the analysis of work performance data.
- Create a database of risk data and lessons learned that may be used throughout the organization on other projects.
- Perform variance and trend analysis on project performance data.
- Use contingency reserves and adjust for approved changes.
- Update the risk register and risk report with current risk exposure.
- Reevaluate assumptions and constraints, capture new issues, and update existing ones.
- Close out risks.

Other work that is part of the Monitor Risks process is outlined in the following sections.

Workarounds If the project has deviated from the baselines, the team may take corrective action to bring it back in line. Recommendations for such corrective actions may include workarounds. Whereas contingency responses are developed in advance, workarounds are unplanned responses developed to deal with the occurrence of unanticipated events or problems on a project (or to deal with risks that had been accepted because of unlikelihood of occurrence and/or minimal impact). Project managers who do not perform risk management spend a lot of their time creating workarounds.

Risk Reassessments Questions always seem to come up on the exam that require you to know that the team needs to periodically review the risk management plan and risk register and adjust the documentation as required. It is important to determine whether any changes or adjustments need to be made to what was planned based on information that becomes apparent once work begins. Reassessing risk is a good topic for a team meeting or even a separate meeting. Many of the actions in the previous exercise relate to this. Remember, the results of such reassessments are part of risk reviews along with newly identified risks, closing risks, additional qualitative or quantitative risk analysis of new and/or previously identified risks, and further risk response planning.

Reserve Analysis While the work is being done, reserve analysis is simply a matter of checking to see how much reserve remains and how much might be needed. It is like checking the balance in your bank account. Reserves must be protected throughout the project life cycle.

Now let's talk about a concept that can be tricky on the exam, especially for those who are not experienced in using risk management. People wanting to change the project in response to problems that have occurred may suggest using the reserves instead of adding cost or time to the project. It is important to know that a contingency reserve may only be used to handle the impact of the specific risk it was set aside for. So, if the change is part of the risk response plan that was previously accounted for in the budget, the reserve designated for that response may be used. If it is not, the project manager must take preventive or corrective action, fast track, crash, or otherwise adjust the project to accommodate or make up for the impact of the problem and its resulting changes.

Under certain circumstances, usually determined by the performing organization, management reserves may be used for situations that are within the scope of the project but were not previously identified. For example, assume that a change to the order functionality on a website has exposed a data-sharing incompatibility with the legacy inventory management system's real-time inventory data that was not previously identified. A workaround needs to be created to keep the project on track, and management reserves will be used to hire experts to fix the problem and keep the project close to the current schedule.

If identified risks do not occur, the associated time or cost reserves should be returned to the company, rather than used to address other issues on the project. Reserves are not a free amount of time or cost that can be used at will by the project manager for any needs! If you are inexperienced with risk management, make sure you understand how reserves are used and protected.

Technical Performance Analysis Technical performance analysis uses project data to compare planned versus actual completion of technical requirements determine if there is any variance from what was planned. Any variance could indicate possible risks to the project, either opportunities or threats.

Meetings Do you use “go around the room” status meetings on your projects? Are they an effective use of everyone’s time? If you have 30 people in a room and each person gets a few minutes to report status on activities that do not directly impact others in the meeting, most people in the room will consider the meeting a waste of time. Status updates can often be collected through other means, such as reports or quick one-on-one conversations between the project manager and the team member. Instead, for the exam, think of status meetings as team meetings in which the project manager can perform risk reviews and risk audits, as discussed next:

- **Risk reviews** Risk reviews are held regularly to discuss the effectiveness of planned risk responses that have been implemented on the project, and may result in the identification of new risks, secondary risks created by risk response plans, and risks that are no longer applicable. Closing of risks allows the team to focus on managing the risks that are still open. The closing of a risk will likely result in the associated risk reserve being returned to the company.
- **Risk audits¹⁷** These audits can be performed during meetings to assess the overall process of risk management on the project. The auditing process is documented in the risk management plan.

Outputs of Monitor Risks PAGE 457 As with the previous risk management processes, updates to the risk report and other project documents are a result of Monitor Risks, along with additional outputs listed here.

Work Performance Information This is the analysis of the work performance data gathered as part of project control. Examples include results of risk reviews and audits of how well risk processes are working for the project, performance measurements on schedule progress, comparisons of planned versus actual risk data, determinations of which risks can be closed or are likely to close in the near future, and variance analyses comparing the planned versus actual time and cost of implemented risk responses. This information may be added as updates to the risk register, other project documents, and the project management plan, or it could be the basis of change requests.

Risk Register Updates The Monitor Risks process will add the following to the risk register:

- Outcomes of risk reassessments and risk audits
- Results of implemented risk responses
- Updates to previous parts of risk management, including the identification of new risks
- Closing of risks that are no longer applicable
- Details of what happened when risks occurred
- Lessons learned

Change Requests The Monitor Risks process will uncover needed project changes, including changes to the cost and schedule baselines due to overall and individual project risks.

**TRICKS
OF THE
TRADE**

Read situational questions describing suggested changes resulting from risk processes carefully to determine whether the actual work of the project has begun. You will have to determine what efforts are generating the change requests to help you evaluate answer choices that you may encounter. If the work of monitoring risks is being performed, new risks may be identified or planned risk responses may need to be adjusted based on project knowledge or an evaluation of risk processes. As a result of approved changes, risk planning must again be performed appropriately, and new risks must be evaluated and ranked, which may result in more risk response planning. This will generate change requests to integrated change control. The trick here is to remember that the approved project management plan and baselines are not static while work is performed, and changes to them must go through integrated change control.

Project Management Plan Updates This process can result in updates to any component of the project management plan, including the schedule, cost, quality, and procurement management plans, as well as the resource management plan and the scope, schedule, and cost baselines for the project. These changes generally reflect approved preventive or corrective actions or changes to the plans.

Organizational Process Assets Updates The Monitor Risks process may include the creation or enhancement of risk templates, such as the risk register, checklists, and risk report, as well as updates to risk management processes and procedures. The project's risk breakdown structure and other data may be added to organizational process assets as historical records for future projects.

This list is from RMC's online course "Common Risk Management Mistakes." To learn more about this course, visit rmcls.com.

**TRICKS
OF THE
TRADE**

Common Risk Management Mistakes The exam may describe situations where the wrong thing is being done as a way of testing whether you realize it is wrong. The following are some of the common risk management mistakes people make:

- Risk identification is completed without knowing enough about the project.
- Overall project risk is evaluated using only a questionnaire, interview, or Monte Carlo analysis and thus does not identify specific individual project risks.
- Risk identification ends too soon, resulting in a brief list (20 risks) rather than an extensive list (hundreds of risks).
- Padding is used instead of the risk management process.
- The processes of Identify Risks through Perform Quantitative Risk Analysis are blended, resulting in risks that are evaluated or judged as they come to light. This decreases the number of total risks identified and causes people to stop participating in risk identification.
- The risks identified are general rather than specific (for example, "communications" rather than "poor communication of customer's needs regarding installation of system XYZ could cause two weeks of rework").
- Some things considered to be risks are not uncertain; they are facts, and are therefore not risks.
- Whole categories of risks (such as technological, cultural, marketplace, etc.) are missed.
- Only one method is used to identify risks (for example, only using a checklist) rather than a combination of methods. A combination helps ensure that more risks are identified.
- The first risk response strategy identified is selected without looking at other options and finding the best option or combination of options.
- Risk management is not given enough attention.
- Project managers do not explain the risk management process to their team during project planning.
- Contracts are signed long before risks to the project are discussed.

Exercise The Risk Management Process There may be many questions about the process of risk management on the exam. The following exercise tests if you understand what you have read.

Recreate the risk management process, including the outputs, in the tables on the following pages. Check your answers against our answers when you are done. Even with one reading of this chapter, you should get most of the actions and outputs correct. After reading the chapter a second and a third time, you should be almost 100 percent accurate. Focus on remembering the key parts of risk management, not on memorization. Create these charts three times, and you should know the process well enough for the exam.

Plan Risk Management	Identify Risks	Perform Qualitative Risk Analysis	Perform Quantitative Risk Analysis	Plan Risk Responses	Implement Risk Responses	Monitor Risks
Actions						

Risk Management ELEVEN

Plan Risk Management	Identify Risks	Perform Qualitative Risk Analysis	Perform Quantitative Risk Analysis Outputs	Plan Risk Responses	Implement Risk Responses	Monitor Risks

Answer

Plan Risk Management	Identify Risks	Perform Qualitative Risk Analysis	Perform Quantitative Risk Analysis	Plan Risk Responses	Implement Risk Responses	Monitor Risks
Actions						
<ul style="list-style-type: none"> • Answer the following questions: <ul style="list-style-type: none"> – How will you perform risk management on the project? – What risk management policies or procedures exist, and what new ones are needed? – When will the processes and procedures of risk management be performed? – How will risks be identified, and what tools will be used? – What are stakeholders' roles and responsibilities for risk management? – How will you budget for risk management? – What are the appetites and thresholds for risk? 	<ul style="list-style-type: none"> • Identify all the risks on the project. • Use tools such as brainstorming, root cause analysis, documentation review, checklists, interviews, SWOT analysis, assumptions and constraints analysis, and prompt lists to facilitate risk identification. • Involve and engage stakeholders in the risk management process. 	<ul style="list-style-type: none"> • Qualitatively determine which risk events warrant a response. • Assess the quality of the risk data. • Complete a risk urgency assessment. • Subjectively determine the probability and impact of all risks. • Determine if you will perform quantitative risk analysis or proceed directly to risk response planning. • Find ways to represent the analyzed data from qualitative risk analysis. • Document the watch list (noncritical risks). • Determine the overall risk ranking for the project. 	<ul style="list-style-type: none"> • Numerically evaluate the top risks. • Quantitatively determine which risks warrant a response. • Determine initial reserves. • Create realistic time and cost objectives. • Determine the probability of meeting project objectives. 	<ul style="list-style-type: none"> • Use risk response strategies to decrease project threats and increase opportunities. • Create contingency and fallback plans. • Determine secondary and residual risks. • Calculate final reserves. • Determine risk owners (if not already done). • Identify risk triggers. • Accept or escalate risks, where appropriate. 	<ul style="list-style-type: none"> • Implement contingency and fallback plans (risk owner and resources). • Answer questions and facilitate clarification of plan details. • Communicate with stakeholders according to the plan. 	<ul style="list-style-type: none"> • Respond to risk triggers. • Monitor residual risks. • Create workarounds. • Evaluate effectiveness of plans. • Look for additional risks; then qualify, quantify, and plan responses for them as necessary. • Revisit the watch list. • Analyze work performance data and look for trends. • Update plans. • Communicate risk status. • Close risks. • Recommend changes, including corrective and preventive actions. • Perform risk audits and risk reviews. • Perform reserve analysis.

Risk Management

E L E V E N

Plan Risk Management	Identify Risks	Perform Qualitative Risk Analysis	Perform Quantitative Risk Analysis Outputs	Plan Risk Responses	Implement Risk Responses	Monitor Risks
<ul style="list-style-type: none"> Risk management plan 	<ul style="list-style-type: none"> Risk register updates, including: <ul style="list-style-type: none"> List of risks Potential risk owners List of potential risk responses Risk report with summary information on risk details and the sources of overall project risk Project documents updates, such as lessons learned in the identification of risks for the project, any issues, and new or existing assumption and constraint information 	<ul style="list-style-type: none"> Risk register updates, including: <ul style="list-style-type: none"> Risk ranking of the project as compared to other projects List of prioritized risks Risks by category Risks needing additional analysis and response Watch list Data on probability and impact analysis Data on risk urgency Assumptions and constraints analysis updates in assumption log 	<ul style="list-style-type: none"> Project document updates, including the following updates to the risk report: <ul style="list-style-type: none"> Assessment of overall project risk exposure Probability of meeting objectives Interpreted quantitative analysis results, such as key sources of overall project risk Prioritized list of individual project risks Trends in quantitative risk analysis results Recommended risk responses Initial reserves Updates to the risk register on the specific analysis for individual project risks 	<ul style="list-style-type: none"> Change requests Updates to the project management plan and project documents, including: <ul style="list-style-type: none"> Assumption log Cost forecasts Lessons learned register Project schedule Project team assignments Risk report Updates to the risk register, including: <ul style="list-style-type: none"> Residual and secondary risks Contingency and fallback plans Risk owners Triggers Final reserves Contracts Accepted risks 	<ul style="list-style-type: none"> Change requests to project management plan, including schedule and cost baselines Updates to project lessons learned register, including the effectiveness of risk responses and recommendations for managing future risks Updates to the issue log regarding areas of confusion or disagreement Updates to the risk report regarding: <ul style="list-style-type: none"> Overall project risk exposure after implementing planned responses Changes to planned risk responses Updates to the risk register, including data on risk response implementations 	<ul style="list-style-type: none"> Work performance information Updates to the risk register and other project documents, including: <ul style="list-style-type: none"> Outcomes of risk reviews and audits New risks Closed risks Details of risk occurrences Lessons learned Workarounds Change requests, including recommended corrective and preventive actions Updates to the project management plan and organizational process assets Updates to the risk report

Practice Exam

1. Your team has worked diligently to identify a large number of risks on a pharmaceutical development project. At this time, the risk register includes risks related to government regulations, risks involved in production and testing, and risks related to introducing a new product to the already flooded market, as well as many other areas of potential risk. Before proceeding with the project, these risks must be assessed, and risk response plans must be developed for the highest-ranking risks. All the following are factors in the assessment of project risk except:
 - A. Risk events
 - B. Risk probability
 - C. Amount at stake
 - D. Insurance premiums
2. If a project has a 60 percent chance of a \$100,000 profit and a 40 percent chance of a \$100,000 loss, the expected monetary value (EMV) for the project is:
 - A. \$100,000 profit
 - B. \$60,000 loss
 - C. \$20,000 profit
 - D. \$40,000 loss
3. Assuming the ends of a range of estimates are $+/- 3$ sigma from the mean, which of the following range estimates involves the least risk?
 - A. 30 days, plus or minus 5 days
 - B. 22 to 30 days
 - C. Optimistic = 26 days, most likely = 30 days, pessimistic = 33 days
 - D. Mean of 28 days
4. Which of the following risk events is most likely to interfere with attaining a project's schedule objective?
 - A. Delays in obtaining required approvals
 - B. Substantial increases in the cost of purchased materials
 - C. Contract disputes that generate claims for increased payments
 - D. Slippage of the planned post-implementation review meeting
5. If a risk has a 20 percent chance of happening in a given month, and the project is expected to last five months, what is the probability that this risk event will occur during the fourth month of the project?
 - A. Less than 1 percent
 - B. 20 percent
 - C. 60 percent
 - D. 80 percent
6. If a risk event has a 90 percent chance of occurring, and the consequences will be \$10,000, what does \$9,000 represent?
 - A. Risk value
 - B. Present value
 - C. Expected monetary value
 - D. Contingency budget

Risk Management E L E V E N

7. Most of the project risks will be identified during which risk management processes?
 - A. Perform Quantitative Risk Analysis and Identify Risks
 - B. Identify Risks and Monitor Risks
 - C. Perform Qualitative Risk Analysis and Monitor Risks
 - D. Identify Risks and Perform Qualitative Risk Analysis
8. You are iterating the project management plan and will be meeting with the sponsors to get approval. There have been some problems on recent projects because the projects were started quickly and it was assumed that there would be few challenges. You know that the sponsors will want assurances that this project will not have similar issues. You have evaluated the approach and have planned the project, including how you will manage risk, in order to deliver a better outcome. You have a few minor risks on the watch list. What, if anything, should be done with those risks?
 - A. Document them for historical use on other projects.
 - B. Document them and revisit them during project monitoring and controlling.
 - C. Document them and set them aside because they are already covered in your contingency plans.
 - D. Document them and give them to the customer.
9. You are embarking on a new technology upgrade project that is considered key to future growth of the business. Because of the critical nature of the project, you recognize the importance of performing thorough risk management, and you want to make sure you have considered all relevant project information before beginning. All the following are always inputs to the risk management process except:
 - A. Historical information
 - B. Lessons learned
 - C. Work breakdown structure
 - D. Project status reports
10. Risk thresholds are determined to help:
 - A. The team rank the project risks
 - B. The project manager estimate the project
 - C. The team schedule the project
 - D. Management know how other managers will act on the project
11. A new project manager is beginning work on her first project. She is planning to use her training to implement many risk identification methods. She realizes that some identified risks will be managed throughout the project, while others will not be considered important enough to deal with. She is aware that risk management is ongoing throughout the project, as new risks may be identified, risk ratings may change, and the project itself may change. She realizes that all the following are common results of risk management except:
 - A. Contract terms and conditions are created.
 - B. The project management plan is changed.
 - C. The communications management plan is changed.
 - D. The project charter is changed.

12. You have identified several risks on your project for which purchasing insurance is a possibility. The insurance company your firm uses has quoted reasonable rates, and your analysis shows that purchasing insurance makes sense as a contingency plan in these cases. Your organization has a low threshold for risk but wants to keep costs in line as the profit margin on the product of this project is low. The strategy of purchasing insurance is best considered an example of risk:
- A. Escalation
 - B. Transference
 - C. Acceptance
 - D. Avoidance
13. The project has been chartered to address concerns of low levels of customer satisfaction with the help desk of a large online retailer. You and your team are considering options including upgrading computer systems and software programs, adding additional help desk staff, and improving help desk training. You realize the impact of such changes will be difficult to measure, and you are finding it challenging to evaluate the exact cost impact of risks and responses the team has identified. You should evaluate on a(n):
- A. Quantitative basis
 - B. Numerical basis
 - C. Qualitative basis
 - D. Econometric basis
14. Outputs of the Plan Risk Responses process include:
- A. Residual risks, fallback plans, and contingency reserves
 - B. Risk triggers, contracts, and a risk list
 - C. Secondary risks, process updates, and risk owners
 - D. Contingency plans, project management plan updates, and sensitivity analysis
15. Workarounds are determined during which risk management process?
- A. Identify Risks
 - B. Perform Quantitative Risk Analysis
 - C. Plan Risk Responses
 - D. Monitor Risks
16. During which risk management process is a determination made to transfer a risk?
- A. Identify Risks
 - B. Implement Risk Responses
 - C. Plan Risk Responses
 - D. Monitor Risks
17. A project manager has just finished the risk response plan for a \$387,000 engineering project. Which of the following should he probably do next?
- A. Determine the overall risk rating of the project.
 - B. Begin to analyze the risks that show up in the project drawings.
 - C. Add work packages to the project work breakdown structure.
 - D. Hold a project risk review.

Risk Management E L E V E N

18. A project manager analyzed the quality of risk data and asked various stakeholders to determine the probability and impact of a number of risks. He is about to move to the next process of risk management. Based on this information, what has the project manager forgotten to do?
 - A. Evaluate trends in risk analysis.
 - B. Identify triggers.
 - C. Provide a standardized risk rating matrix.
 - D. Create a fallback plan.
19. A project manager has assembled the project team. They have identified 56 risks on the project, determined what would trigger the risks, rated them on a risk rating matrix, tested their assumptions, and assessed the quality of the data used. The team is continuing to move through the risk management process. What has the project manager forgotten to do?
 - A. Conduct a simulation.
 - B. Perform risk mitigation.
 - C. Determine the overall risk ranking for the project.
 - D. Involve other stakeholders.
20. You are a project manager for the construction of a major new manufacturing plant that is unlike any that has been done before. The project cost is estimated at \$30,000,000, and the project will make use of three sellers. Once begun, the project cannot be cancelled, as there will be a large expenditure on plant and equipment. When managing a project, it is most important to carefully:
 - A. Review all cost proposals from the sellers.
 - B. Examine the budget reserves.
 - C. Complete the project charter.
 - D. Perform an identification of risks.
21. Your team has come up with 434 risks and 16 major causes of those risks. The project is the last in a series of projects that the team has worked on together. The sponsor is very supportive, and a lot of time was invested in making sure the project work was complete and signed off by all key stakeholders. During project planning, the team cannot come up with an effective way to mitigate or insure against a risk. It is not work that can be outsourced, nor can it be deleted. What would be the best solution?
 - A. Accept the risk.
 - B. Continue to investigate ways to mitigate the risk.
 - C. Look for ways to avoid the risk.
 - D. Look for ways to transfer the risk.
22. A project manager is quantifying risk for her project. Several of her experts are off-site, but wish to be included. How can this be done?
 - A. Perform Monte Carlo analysis using the internet as a tool.
 - B. Apply the critical path method.
 - C. Determine options for recommended corrective action.
 - D. Use facilitation techniques.

23. Having just been hired to manage a project to improve the efficiency of data processing in the accounting department, the project manager is most concerned about managing risk on the project. The timeline is short, and the sponsor's expectations are high. Which of the following would best help the project manager in her initial assessment of risks on the project?
- A. A sensitivity analysis
 - B. Her project scope statement from the project planning process
 - C. A review of enterprise environmental factors
 - D. A conversation with a project manager who worked on a similar project
24. You have been appointed as the manager of a new, large, and complex project. Because this project is business-critical and highly visible, senior management has told you to analyze the project's risks and prepare response strategies for them as soon as possible. The organization has risk management procedures that are seldom used or followed, and has had a history of handling risks badly. The project's first milestone is in two weeks. In preparing the risk response plan, input from which of the following is generally least important?
- A. Project team members
 - B. Project sponsor
 - C. Individuals responsible for risk management policies and templates
 - D. Key stakeholders
25. You were in the middle of a two-year project to deploy new technology to field offices across the country. A hurricane caused power outages just when the upgrade was near completion. When the power was restored, all the project reports and historical data were lost, with no way of retrieving them. What should have been done to prevent this problem?
- A. Purchase insurance.
 - B. Plan for a reserve fund.
 - C. Monitor the weather and have a contingency plan.
 - D. Schedule the installation outside of the hurricane season.
26. A system development project is nearing project closing when a previously unidentified risk is discovered. This could potentially affect the project's overall ability to deliver. What should be done next?
- A. Alert the project sponsor of potential impacts to cost, scope, or schedule.
 - B. Qualify the risk.
 - C. Mitigate this risk by developing a risk response plan.
 - D. Develop a workaround.
27. The cost performance index (CPI) of a project is 0.6, and the schedule performance index (SPI) is 0.71. The project has 625 work packages and is being completed over a four-year period. The team members are inexperienced, and the project received little support for proper planning. Which of the following is the best thing to do?
- A. Update risk identification and analysis.
 - B. Spend more time improving the cost estimates.
 - C. Remove as many work packages as possible.
 - D. Reorganize the responsibility assignment matrix.

Risk Management E L E V E N

28. You believe that the project you have undertaken is relatively straightforward, with less risk than most other projects you have worked on. Therefore, you do not spend a long time on risk identification. While preparing your risk responses, you identify secondary risks that could result in serious consequences later in the project. What should you do?
- Add reserves to the project to accommodate the new risks and notify management.
 - Document the risk items, and calculate the expected monetary value based on the probability and impact of the occurrences.
 - Determine the risk events and the associated costs, then add the cost to the project budget as a reserve.
 - Add a 10 percent contingency to the project budget, and notify the customer.
29. During project executing, a team member is coordinating with a supplier, and identifies a risk that is not in the risk register. It appears that the pieces of heavy equipment you have ordered from a supplier are larger than anticipated, and they may not all fit into the warehouse the team has leased to store them until they are needed. What should you do?
- Get further information on how the team member identified the risk because you already performed a detailed analysis and did not identify this risk.
 - Disregard the risk because risks were identified during project planning.
 - Inform the customer about the risk.
 - Analyze the risk.
30. During project executing, the team member who is most experienced in the programming work required for the project informs you that he has accepted a new position at another company, and has given his two weeks' notice. This is a major problem that was not included in the risk register. What should you do first?
- Create a workaround.
 - Reevaluate the Identify Risks process.
 - Look for any unexpected effects of the problem.
 - Tell management.
31. Which of the following is the primary responsibility of a risk owner?
- Identify new risks and create workarounds.
 - Respond to risk triggers and implement the planned risk responses.
 - Report to the project manager that a risk has occurred, and note the consequences.
 - Quantitatively analyze risks as assigned by the project manager.
32. A project has had some problems, but now seems under control. In the last few months, almost all the reserve has been used, and most of the negative impacts of events that had been predicted have occurred. There are only four activities left, and two of them are on the critical path. Management now informs the project manager that it would be in the performing organization's best interest to finish the project two weeks earlier than scheduled in order to receive an additional profit. In response, the project manager sends out a request for proposal for some work that the team was going to do, hoping to find another company that might be able to do the work faster. The project manager can best be said to be attempting to work with:
- Reserves
 - Opportunities
 - Scope validation
 - Threats

33. Monte Carlo analysis is used to:
- A. Get an indication of the risk involved in the project.
 - B. Estimate an activity's length.
 - C. Simulate possible quality issues on the project.
 - D. Prove to management that extra staff is needed.
34. A project team is creating a project management plan when management asks them to identify project risks and provide some form of qualitative output as soon as possible. What should the project team provide?
- A. Risk triggers
 - B. Prioritized list of risks
 - C. Contingency reserves
 - D. Probability of achieving the time and cost objectives
35. A project manager is creating a risk response plan. However, every time a risk response is suggested, another risk is identified that is caused by the response. Which of the following is the best thing for the project manager to do?
- A. Get more people involved in the Identify Risks process, since risks have been missed.
 - B. Make sure the project work is better understood.
 - C. Spend more time making sure the risk responses are clearly defined.
 - D. Document the new risks and continue the Plan Risk Responses process.
36. A watch list is an output of which risk management process?
- A. Plan Risk Responses
 - B. Perform Quantitative Risk Analysis
 - C. Perform Qualitative Risk Analysis
 - D. Implement Risk Responses
37. During the Identify Risks process, a project manager and stakeholders used various methods to identify risks and created a long list of those risks. The project manager then made sure all the risks were understood and that triggers had been identified. Later, in the Plan Risk Responses process, he took all the risks identified by the stakeholders and determined ways to mitigate them. What has he done wrong?
- A. The project manager should have waited until the Perform Qualitative Risk Analysis process to get the stakeholders involved.
 - B. More people should have been involved in the Plan Risk Responses process.
 - C. The project manager should have created workarounds.
 - D. Triggers should not be identified until the Implement Risk Responses process.
38. Since a template for team meetings does not appear to be available, you are creating one. You think it could also be used for future projects. You want to generalize the agenda template to include topics all project managers would use. Which of the following must be included as an agenda item at all team meetings?
- A. Discussion of project risks
 - B. Status of current activities
 - C. Identification of new activities
 - D. Review of project problems

Answers

1. Answer D

Explanation Insurance premiums are not factors in assessing project risk. They come into play when you determine which risk response strategy you will use.

2. Answer C

Explanation Expected monetary value is calculated by $EMV = \text{probability} \times \text{impact}$. We need to calculate both positive and negative values and then add them:

$$0.6 \times \$100,000 = \$60,000$$

$$0.4 \times (\$100,000) = (\$40,000)$$

$$\text{Expected monetary value} = \$60,000 - \$40,000 = \$20,000 \text{ profit}$$

3. Answer C

Explanation A mean of 28 days is not a range estimate, and so must be eliminated as a possible answer. When you look at the ranges of each of the other choices, you will see that 30 days, plus or minus 5 days = a range of 10 days. The range of 22 to 30 days = a range of 8 days. An optimistic estimate of 26 days, most likely estimate of 30 days, and pessimistic estimate of 33 days represents a range of 7 days. The estimate with the smallest range is the least risky, and is therefore the correct choice. Did you realize the words “ $+/- 3 \sigma$ ” are extraneous? Practice reading questions that are wordy and have extraneous data.

4. Answer A

Explanation Cost increases and contract disputes for payments will not necessarily interfere with schedule. If a post-implementation review meeting slips, it may not interfere with the project schedule. Delays in obtaining required approvals always cause time delays, and are therefore the most likely to threaten the project schedule.

5. Answer B

Explanation No calculation is needed. If there is a 20 percent chance in any one month, the chance in the fourth month is 20 percent.

6. Answer C

Explanation Expected monetary value is calculated by multiplying the probability times the impact. In this case, $EMV = 0.9 \times \$10,000 = \$9,000$.

7. Answer B

Explanation This is a tricky question. Although risks can be identified at any time throughout the project, most risks are identified during the Identify Risks process. Newly emerging risks are identified in the Monitor Risks process.

8. Answer B

Explanation Risks change throughout the project. You need to review risks at intervals during the project to ensure noncritical risks on the watch list have not become critical.

9. Answer D

Explanation Project status reports can be an input to risk management. However, when completing risk management for the first time, you would not have project status reports. Therefore, project status reports are not always an input to risk management.

10. Answer A

Explanation If you know the risk thresholds of the stakeholders, you can determine how they might react to different situations and risk events. You use this information to help assign levels of risk to each work package or activity based on their probability and impact.

11. Answer D

Explanation A contract is a tool to transfer risk. The project management plan could change to include a modified WBS and new work packages related to mitigating risk. The communications management plan could change as a way to address a risk. A change to the charter is a fundamental change to the project and may require a major adjustment to all aspects of the project management plan. It is not a common result of risk management efforts.

12. Answer B

Explanation A risk is only escalated if it is outside the scope of the project or beyond the project manager's authority, which is not the case in this scenario. Acceptance of risk means doing nothing (if it happens, it happens, or contingency plans are created). Avoidance of risk means we change the way we will execute the project so the risk is no longer a factor. Transference is passing the risk off to another party. Many people think of using insurance as a way of decreasing impact. However, purchasing insurance transfers the risk to another party.

13. Answer C

Explanation If you cannot determine an exact cost impact of the event, use qualitative estimates such as Low, Medium, and High.

14. Answer A

Explanation A risk list, process updates, and sensitivity analysis are not outputs of the Plan Risk Responses process. Residual risks, fallback plans, and contingency reserves are all outputs of the Plan Risk Responses process, making this the correct answer.

15. Answer D

Explanation Creating a workaround involves determining how to handle a risk that has occurred but that was not included in the risk register. The project must be in the Monitor Risks process if risks have occurred.

16. Answer C

Explanation Transference is a risk response strategy. Risk response strategies are determined in the Plan Risk Responses process.

17. Answer C

Explanation This situation is occurring during project planning. Planning must be completed before moving on. Determining the risk rating of the project is done during Perform Qualitative Risk Analysis, and should have already been done. Project risk reviews occur during Monitor Risks. Adding work packages that are part of the newly planned risk responses comes next in project planning. This is an example of iterating the project management plan.

18. Answer C

Explanation The project manager is in the Perform Qualitative Risk Analysis process. This process includes risk data quality assessment along with probability and impact matrix development. It appears the project manager has not yet completed the matrix, which is used to sort risks based on their probability and impact ratings. Trend analysis, the identification of triggers, and the development of fallback plans will occur later in risk management.

Risk Management E L E V E N

19. Answer D

Explanation The process the project manager has used so far is fine, except the input of other stakeholders is needed in order to identify more risks.

20. Answer D

Explanation A review of cost proposals could be done, but it is not a pressing issue based on the situation provided. Examining the budget reserves could also be done, but not until risk response planning is completed. It is always important to carefully complete a project charter, but there are other issues needing detailed attention in this situation. Since a project like this has never been done before, and there will be a large cost outlay, it would be best for the project manager to spend more time on risk management. Risk identification is the most proactive response and will have the greatest positive impact on the project.

21. Answer A

Explanation This question relates real-world situations to risk types. Did you realize the entire first paragraph is extraneous? Based on the question, you cannot remove the work to avoid it, nor can you insure or outsource it to transfer the risk. This leaves acceptance as the only correct choice.

22. Answer D

Explanation Current technology makes it possible to take advantage of input from experts, even when they are off-site. Virtual interviews or group meetings can be facilitated by the project manager for this purpose.

23. Answer D

Explanation Sensitivity analysis is a tool of quantitative risk analysis, and is used to compare risks to the project that have already been identified. Reviewing the scope statement is a good idea, but it will only provide an assessment of risk on that aspect of the project. Enterprise environmental factors involve company culture and organization, which also are not adequate to assess overall project risk. A conversation with a project manager who worked on a similar project would provide the most value, as the risks she dealt with on that project are likely to be similar to what the project manager will experience on this project.

24. Answer B

Explanation Team members will have knowledge of the project as well as the product of the project and will thus have a lot to contribute to risk responses. Those responsible for risk templates will be able to provide the templates from past projects (historical records) and will, therefore, be very important. Key stakeholders will know more about the technical work of the project and can help plan “What are we going to do about it?” Because of that, they are not likely to be the least important. The sponsor may have the least knowledge of what will work to address risks. Sponsors need to be involved in the project and help identify risks. They may even approve the response plans created by others, but they are not generally major contributors to response plans.

25. Answer C

Explanation The risk is the loss of data due to a power outage. Purchasing insurance is not related to preventing the problem. It transfers the risk. Creating a reserve fund is acceptance of the risk, and would help address the cost factors after the power failure, but it would not reduce the probability or impact of the power failure. Avoiding the hurricane by scheduling the installation at a different time reduces the power outage risk, but could have a large negative impact on the project schedule and so is not the best choice. The best choice of the options provided is to monitor the weather and know when to implement the contingency plan.

26. Answer B

Explanation A workaround is an unplanned response to an event that is occurring. The risk discussed in the question has been identified, but it is not occurring at this time, so there is no need to take the action of creating a workaround. You need to analyze the problem before talking to the sponsor. You cannot mitigate the risk until you qualify it. Qualifying the risk will help you determine how to proceed.

27. Answer A

Explanation This project has deviated so far from the baseline that updated risk identification and risk analysis should be performed.

28. Answer B

Explanation When new risks are identified, they should go through the risk management process. You need to subjectively determine the probability and impact of the risks, and if the risks are determined to pose significant threats to the project, attempt to diminish the threats through the Plan Risk Responses process. Only after these efforts should you consider adding reserves for time and/or cost. Any reserves should be based on a detailed analysis of risk. Calculating the expected monetary value of the risks is an important part of the risk management process, and the best choice presented here.

29. Answer D

Explanation First, you need to determine what the risk entails and the impact to the project, then determine what actions you will take regarding the risk.

30. Answer A

Explanation Because an unidentified problem or risk occurred, it is important to reevaluate the Identify Risks process as well as to look for unexpected effects of the problem. However, they are not your first choices. You might need to inform management, but this is reactive, not proactive, and also not the first thing you should do. Since this is a problem that has occurred, rather than a problem that has just been identified, the first thing you must do is address the risk by creating a workaround.

31. Answer B

Explanation A risk owner may be involved in developing risk responses for their assigned risk. They are also responsible for monitoring the project for triggers that indicate the risk is imminent and for managing implementation of the planned risk response.

32. Answer B

Explanation The wording of this question can be confusing. Scope validation involves meeting with the customer to gain formal acceptance, so that cannot be the best choice. Reserve is mentioned in the situation, but the use of reserves is not the primary concern. The project manager is working to make a positive impact on the project more likely to occur. Therefore, he is working with an opportunity. This may include analyzing the appropriateness of using management reserves to cover the cost of exploiting the opportunity.

33. Answer A

Explanation A Monte Carlo analysis could indicate that an estimate for an activity needs to change, but it does not indicate what the activity estimate should be. Monte Carlo is a simulation, but it does not specifically address quality. It does not deal directly with staff or resource needs either. Project risk can be assessed using Monte Carlo analysis. By considering the inputs to the weighted estimates along with the network diagram, you can get a better idea of the overall project risk.

Risk Management E L E V E N

34. Answer B

Explanation This question essentially asks, "What is an output of Perform Qualitative Risk Analysis?" The probability of achieving time and cost objectives is determined during the Perform Quantitative Risk Analysis process. Risk triggers and contingency reserves are parts of the Plan Risk Responses process. A prioritized list of risks is an output of Perform Qualitative Risk Analysis.

35. Answer D

Explanation Did you realize this question describes secondary risks? Identifying secondary risks is an important part of completing the Plan Risk Responses process. With that in mind, the best thing to do is to document the newly identified risks and continue the Plan Risk Responses process.

36. Answer C

Explanation A watch list is made up of low-priority risks that, in the Perform Qualitative Risk Analysis process, were determined to be of too low priority or low impact to require further attention at this time.

37. Answer B

Explanation Stakeholders should be included in the Identify Risks process. Some triggers may be identified in the Identify Risks process, but they are generally identified and added to the risk register in the Plan Risk Responses process. Workarounds are created as unidentified risk events occur. The project manager's error was not including others in the Plan Risk Responses process. Plan Risk Responses must include the involvement of all risk owners and possibly other stakeholders as well.

38. Answer A

Explanation Risk is so important that it must be discussed at all team meetings.