Chapter 3 *Rapid* Review

Main Heading	Review Material	MyOMLab
THE IMPORTANCE OF PROJECT MANAGEMENT (p. 62)	The management of projects involves three phases: 1. *Planning*—This phase includes goal setting, defining the project, and team organization. 2. *Scheduling*—This phase relates people, money, and supplies to specific activities and relates activities to each other. 3. *Controlling*—Here the firm monitors resources, costs, quality, and budgets. It also revises or changes plans and shifts resources to meet time and cost demands.	Concept Questions: 1.1–1.4 **VIDEO 3.1** Project Management at Hard Rock's Rockfest
PROJECT PLANNING (pp. 62–65)	Projects can be defined as a series of related tasks directed toward a major output. ■ **Project organization**—An organization formed to ensure that programs (projects) receive the proper management and attention. ■ **Work breakdown structure (WBS)**—Defines a project by dividing it into more and more detailed components.	Concept Questions: 2.1–2.4 Problems: 3.1–3.2
PROJECT SCHEDULING (pp. 65–66)	■ **Gantt charts**—Planning charts used to schedule resources and allocate time. Project scheduling serves several purposes: 1. It shows the relationship of each activity to others and to the whole project. 2. It identifies the precedence relationships among activities. 3. It encourages the setting of realistic time and cost estimates for each activity. 4. It helps make better use of people, money, and material resources by identifying critical bottlenecks in the project.	Concept Questions: 3.1–3.4 Problem: 3.3
PROJECT CONTROLLING (pp. 66–67)	Computerized programs produce a broad variety of PERT/CPM reports, including (1) detailed cost breakdowns for each task, (2) total program labor curves, (3) cost distribution tables, (4) functional cost and hour summaries, (5) raw material and expenditure forecasts, (6) variance reports, (7) time analysis reports, and (8) work status reports.	Concept Questions: 4.1–4.2 **VIDEO 3.2** Project Management at Arnold Palmer Hospital
PROJECT MANAGEMENT TECHNIQUES: PERT AND CPM (pp. 67–71)	■ **Program evaluation and review technique (PERT)**—A project management technique that employs three time estimates for each activity. ■ **Critical path method (CPM)**—A project management technique that uses only one estimate per activity. ■ **Critical path**—The computed *longest* time path(s) through a network. PERT and CPM both follow six basic steps. The activities on the critical path will delay the entire project if they are not completed on time. ■ **Activity-on-node (AON)**—A network diagram in which nodes designate activities. ■ **Activity-on-arrow (AOA)**—A network diagram in which arrows designate activities. In an AOA network, the nodes represent the starting and finishing times of an activity and are also called *events*. ■ **Dummy activity**—An activity having no time that is inserted into a network to maintain the logic of the network. A dummy ending activity can be added to the end of an AON diagram for a project that has multiple ending activities.	Concept Questions: 5.1–5.4 Problems: 3.4–3.14 Virtual Office Hours for Solved Problems: 3.1, 3.2
DETERMINING THE PROJECT SCHEDULE (pp. 71–77)	■ **Critical path analysis**—A process that helps determine a project schedule. To find the critical path, we calculate two distinct starting and ending times for each activity: ■ *Earliest start (ES)* = Earliest time at which an activity can start, assuming that all predecessors have been completed ■ *Earliest finish (EF)* = Earliest time at which an activity can be finished ■ *Latest start (LS)* = Latest time at which an activity can start, without delaying the completion time of the entire project ■ *Latest finish (LF)* = Latest time by which an activity has to finish so as to not delay the completion time of the entire project ■ **Forward pass**—A process that identifies all the early start and early finish times. $ES = \text{Max}\{EF \text{ of all immediate predecessors}\}$ (3-1) $EF = ES + \text{Activity time}$ (3-2) ■ **Backward pass**—A process that identifies all the late start and late finish times. $LF = \text{Min}\{LS \text{ of all immediate following activities}\}$ (3-3) $LS = LF - \text{Activity time}$ (3-4)	Concept Questions: 6.1–6.4 Problems: 3.15, 3.16

Chapter 3 *Rapid* Review *continued*

Main Heading	Review Material	MyOMLab
	■ **Slack time**—Free time for an activity. Slack = LS − ES or Slack = LF − EF (3-5) The activities with zero slack are called *critical activities* and are said to be on the critical path. The critical path is a continuous path through the project network that starts at the first activity in the project, terminates at the last activity in the project, and includes only critical activities.	Virtual Office Hours for Solved Problem: 3.3 ACTIVE MODEL 3.1
VARIABILITY IN ACTIVITY TIMES (pp. 77–82)	■ **Optimistic time** (a)—The "best" activity completion time that could be obtained in a PERT network. ■ **Pessimistic time** (b)—The "worst" activity time that could be expected in a PERT network. ■ **Most likely time** (m)—The most probable time to complete an activity in a PERT network. When using PERT, we often assume that activity time estimates follow the beta distribution. Expected activity time $t = (a + 4m + b)/6$ (3-6) Variance of activity completion time $= [(b - a)/6]^2$ (3-7) σ_p^2 = Project variance = Σ (variances of activities on critical path) (3-8) Z = (Due date − Expected date of completion)/σ_p (3-9) Due date = Expected completion time + ($Z \times \sigma_p$) (3-10)	Concept Questions: 7.1–7.4 Problems: 3.17–3.27 Virtual Office Hours for Solved Problems: 3.4, 3.5, 3.6
COST-TIME TRADE-OFFS AND PROJECT CRASHING (pp. 82–85)	■ **Crashing**—Shortening activity time in a network to reduce time on the critical path so total completion time is reduced. $$\text{Crash cost per period} = \frac{\text{(Crash cost – Normal cost)}}{\text{(Normal time – Crash time)}} \quad (3\text{-}11)$$	Concept Questions: 8.1–8.4 Problems: 3.28–3.33 Virtual Office Hours for Solved Problem: 3.7
A CRITIQUE OF PERT AND CPM (pp. 85–86)	As with every technique for problem solving, PERT and CPM have a number of advantages as well as several limitations.	Concept Questions: 9.1–9.4
USING MICROSOFT PROJECT TO MANAGE PROJECTS (pp. 86–88)	Microsoft Project, the most popular example of specialized project management software, is extremely useful in drawing project networks, identifying the project schedule, and managing project costs and other resources.	Concept Questions: 10.1–10.4

Self Test

■ **Before taking the self-test,** refer to the learning objectives listed at the beginning of the chapter and the key terms listed at the end of the chapter.

LO 3.1 Which of the following statements regarding Gantt charts is true?
- **a)** Gantt charts give a timeline and precedence relationships for each activity of a project.
- **b)** Gantt charts use the four standard spines: Methods, Materials, Manpower, and Machinery.
- **c)** Gantt charts are visual devices that show the duration of activities in a project.
- **d)** Gantt charts are expensive.
- **e)** All of the above are true.

LO 3.2 Which of the following is true about AOA and AON networks?
- **a)** In AOA, arrows represent activities.
- **b)** In AON, nodes represent activities.
- **c)** Activities consume time and resources.
- **d)** Nodes are also called *events* in AOA.
- **e)** All of the above.

LO 3.3 Slack time equals:
- **a)** ES + t.
- **b)** LS − ES.
- **c)** zero.
- **d)** EF − ES.

LO 3.4 The critical path of a network is the:
- **a)** shortest-time path through the network.
- **b)** path with the fewest activities.
- **c)** path with the most activities.
- **d)** longest-time path through the network.

LO 3.5 PERT analysis computes the variance of the total project completion time as:
- **a)** the sum of the variances of all activities in the project.
- **b)** the sum of the variances of all activities on the critical path.
- **c)** the sum of the variances of all activities not on the critical path.
- **d)** the variance of the final activity of the project.

LO 3.6 The crash cost per period:
- **a)** is the difference in costs divided by the difference in times (crash and normal).
- **b)** is considered to be linear in the range between normal and crash.
- **c)** needs to be determined so that the smallest cost values on the critical path can be considered for time reduction first.
- **d)** all of the above.

Answers: LO 3.1. c; LO 3.2. e; LO 3.3. b; LO 3.4. d; LO 3.5. b; LO 3.6. d.