Chapter 16

BUDGETING: CAPITAL EXPENDITURES, RESEARCH AND DEVELOPMENT EXPENDITURES, AND CASH; PERT/COST

MULTIPLE CHOICE

Question Nos. 12-15 and 17-19 are AICPA adapted.
Question Nos. 11, 21-22, and 25 are ICMA adapted.
Question Nos. 10, 16, 20, 23, and 24 are CIA adapted.

C 1. In a Program Evaluation and Review Technique system (PERT), reducing total time can be accomplished only by:
- **A. adding another shift**
- **B. shortening a slack path**
- **C. shortening the critical path**
- **D. working overtime**
- **E. using sensitivity analysis**

C 2. The type of research a company undertakes for modifying existing finished goods so as to enhance or at least maintain its competitive position by providing better quality or performance is known as:
- **A. basic research**
- **B. safety, health, and convenience research**
- **C. product improvement**
- **D. new product development**
- **E. capacity improvement**

C 3. A useful and absolutely essential tool that is used by management to determine payments for bond requirements, income tax installments, and pension and retirement funds is the:
- **A. production budget**
- **B. projected or forecast income statement**
- **C. cash budget**
- **D. expense budget**
- **E. capital expenditures budget**

D 4. At the beginning of a budget period, prepaid rent was $3,000. Rent expense for the period is expected to equal $18,000, while prepaid rent at the end of the period is expected to equal $2,000. The cash required for the rent payments is:
- **A. $19,000**
- **B. $18,000**
- **C. $20,000**
- **D. $17,000**
- **E. $23,000**

SUPPORTING CALCULATION:

$18,000 - ($3,000 - $2,000) = $17,000

D **5.** **In preparing a cash budget, the data concerning cash requirements for dividends and loans is most likely found in the:**
- **A. expense budget**
- **B. sales budget**
- **C. plant and equipment budget**
- **D. treasurer's budget**
- **E. budgeted balance sheet**

D **6.** **The planning method whose major use is in the determination of the longest time duration for the completion of an entire project is:**
- **A. probabilistic budgets**
- **B. the fiscal responsibility system**
- **C. zero-base budgeting**
- **D. PERT or CPM**
- **E. PPBS**

B **7.** **The planning procedure that is used principally in governmental and nonprofit agencies and requires a manager to justify an entire budget rather than just budget increases is:**
- **A. cash forecasting**
- **B. zero-base budgeting**
- **C. the fiscal responsibility system**
- **D. PERT**
- **E. PPBS**

B **8.** **In using the PERT system and estimating the expected time for each activity, the formula requires that the optimistic time value be given a weighting of:**
- **A. 1/4**
- **B. 1**
- **C. 4**
- **D. 6**
- **E. 1/2**

C **9.** **The estimated times for the completion of an activity are: optimistic, 2 days; most likely, 6 days; and pessimistic, 16 days. The expected time would then be:**
- **A. 6 days**
- **B. 8 days**
- **C. 7 days**
- **D. 16 days**
- **E. none of the above**

SUPPORTING CALCULATION:

$$\frac{2 + 4(6) + 16}{6} = 7$$

E 10. Zero-base budgeting:

A. emphasizes the relationship of effort to projected annual revenues
B. involves the review of changes made to an organization's original budget
C. does not provide a projection of annual expenditures
D. is a method peculiar to budgeting by program
E. involves the review of each cost component from a cost/benefit perspective

A 11. A budget system referred to as the "planning, programming, budgeting system (PPBS)":

A. classifies budget requests by activity and estimates the benefits arising from each activity
B. presents the plan for a range of activity so that the plan can be adjusted for changes in activity levels
C. drops the current month or quarter and adds a future month or a future quarter as the current month or quarter is completed
D. consolidates the plans of the separate requests into one overall plan
E. divides the activities of individual responsibility centers into a series of packages that are ranked ordinally

A 12. The E. Mundo Company is preparing its cash budget for the month of May. The following information is available concerning its accounts receivable:

Estimated credit sales for May	**$ 200,000**
Actual credit sales for April	**$ 150,000**
Estimated collections in May for credit sales in May	**20%**
Estimated collections in May for credit sales in April	**70%**
Estimated collections in May for credit sales prior to April	**$ 20,000**
Estimated write-offs in May for uncollectible credit sales	**$ 8,000**
Estimated provision for bad debts in May for credit sales in May	**$ 7,000**

The estimated cash receipts from accounts receivable collections in May are:

A. $165,000
B. $157,000
C. $158,000
D. $150,000
E. none of the above

SUPPORTING CALCULATION:

($200,000 x .2) + ($150,000 x .7) + $20,000 = $165,000

B 13. Schmidlap Company is preparing its cash budget for the month of April. The following information is available concerning its inventories:

Inventories at beginning of April	**$ 90,000**
Estimated purchases for April	**440,000**
Estimated cost of goods sold for April	**450,000**
Estimated payments in April for purchases in March	**75,000**
Estimated payments in April for purchases prior to March	**30,000**
Estimated payments in April for purchases in April	**75%**

The estimated cash disbursements for inventories in April are:

A. $411,250
B. $435,000
C. $405,000
D. $442,500
E. none of the above

SUPPORTING CALCULATION:

$75,000 + $30,000 + ($440,000 x .75) = $435,000

D 14. Shula, Inc. is preparing its cash budget for the month of November. The following information is available concerning its inventories:

Inventories at beginning of November	**$ 180,000**
Estimated cost of goods sold for November	**900,000**
Estimated inventories at end of November	**160,000**
Estimated payments in November for purchases prior to November	**225,000**
Estimated payments in November for purchases in November	**80%**

The estimated cash disbursements for inventories in November are:

A. $704,000
B. $1,057,000
C. $945,000
D. $929,000
E. none of the above

SUPPORTING CALCULATION:

($880,000* x .8) + 225,000 = $929,000
***$180,000 + *x* - $160,000 = $900,000**
***x* = $880,000**

D 15. A formal diagram of the interrelationships of complex time series of activities is:

A. linear programming
B. Poisson distribution models
C. Monte Carlo models
D. PERT
E. the method of least squares

D 16. The most appropriate technique for determining the longest time required to complete a particular project would be:
- **A. integer programming**
- **B. game theory**
- **C. queuing theory**
- **D. Program Evaluation and Review Technique (PERT)**
- **E. regression analysis**

E 17. Program Evaluation and Review Technique (PERT) is a system that uses:
- **A. probabilistic budgets**
- **B. least squares method**
- **C. linear programming**
- **D. economic order quantity formula**
- **E. network analysis and critical path methods (CPM)**

D 18. In a Program Evaluation and Review Technique (PERT) system, activities along the critical path:
- **A. intersect at a corner point described by the feasible area**
- **B. may be delayed without affecting completion time**
- **C. follow the line of best fit**
- **D. have a slack of zero**
- **E. have a positive slack**

A 19. The quantitative technique that would be most useful for analyzing the interrelationships of time and activities to discover potential bottlenecks is:
- **A. Program Evaluation and Review Technique (PERT)**
- **B. regression analysis**
- **C. probabilistic budgeting**
- **D. queuing theory**
- **E. linear programming**

E 20. The use of PERT or CPM might apply when planning for:
- **A. the installation of a new computer system**
- **B. the development of a new product**
- **C. the construction of a new office building**
- **D. project development**
- **E. all of the above**

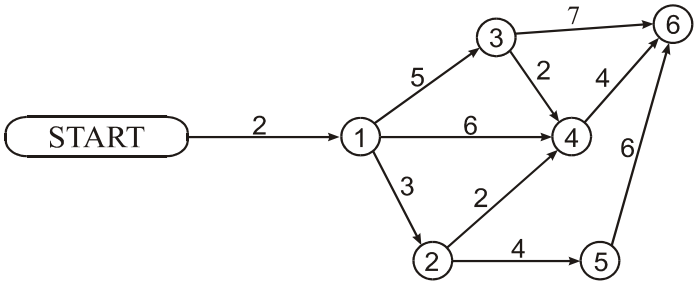
D 21. A factory has several small construction and repair projects for the maintenance crew to perform. There are a limited number of painters, woodworkers, and electricians. The method that will help provide the fastest completion of all jobs is:
- **A. transportation algorithms**
- **B. queuing theory**
- **C. time-series analysis**
- **D. PERT/CPM analysis**
- **E. linear programming**

B **22.** **Critical Path Method (CPM) is a technique for analyzing, planning, and scheduling large, complex projects by determining the critical path from a single time estimate for each event in a project. The critical path:**

A. **is the shortest time path from the first event to the last event for a project**
B. **is the longest time path from the first event to the last event for a project**
C. **is the maximum amount of time an activity may be delayed without delaying the total project beyond its target time**
D. **is the earliest starting time an activity for a project can begin**
E. **is the pessimistic time estimate for an activity of a project**

C **23.** **The network shown in Figure 16-1 was developed by using the Program Evaluation and Review Technique (PERT) to aid in scheduling the development of a new product. The critical path is:**

A. **1 - 3 - 6**
B. **1 - 2 - 4 - 6**
C. **1 - 2 - 5 - 6**
D. **1 - 3 - 4 - 6**
E. **1 - 4 - 6**



SUPPORTING CALCULATION:

1 - 3 - 6 = 14
1 - 3 - 4 - 6 = 13
1 - 4 - 6 = 12
1 - 2 - 4 - 6 = 11
1 - 2 - 5 - 6 = 15

D 24. Using the following data, compute the cash financing needs or excess cash to invest.

Cash balance, beginning	$ 20,000
Collections from customers	150,000
Disbursements:	
For direct materials	25,000
For other costs and expenses	30,000
For payroll	75,000
For income taxes	6,000
For machinery purchase	30,000
Minimum cash balance desired	20,000

A. excess cash—$4,000
B. excess cash—$14,000
C. financing need—$10,000
D. financing need—$16,000
E. none of the above

SUPPORTING CALCULATION:

$20,000 + $150,000 - $25,000 - $30,000 - $75,000 - $6,000 - $30,000 - $20,000
= ($16,000)

A 25. CMR is a retail mail-order firm that currently uses a central collection system that requires all checks to be sent to its Boston headquarters. An average of five days is required for mailed checks to be received, four days for CMR to process them, and one-and-a-half days for the checks to clear through the bank. A proposed lock-box system would reduce the mail and process time to three days, and the check clearing time to one day. CMR has an average daily collection of $100,000. If CMR should adopt the lock-box system, its average cash balance would increase by:
A. $650,000
B. $250,000
C. $800,000
D. $400,000
E. none of the above

SUPPORTING CALCULATION:

Mail and processing savings	= (5 + 4 - 3) x $100,000	=	$600,000
Clearing savings	= (1.5 - 1) x $100,000	=	50,000
		=	$650,000

D 26. The research and development budget is considered best for:
A. balancing the research and development program
B. coordinating the program with the company's other projects
C. checking certain phases of nonfinancial planning
D. all of the above
E. none of the above

B 27. The only research and development costs that should be expensed in the period incurred are those that are:
- **A. conducted for others**
- **B. unique to chemical manufacturers**
- **C. unique to extractive industries**
- **D. incurred by government regulated enterprise**
- **E. none of the above should be expensed**

A 28. The treasurer's budget indicates cash requirements for all of the following, *except:*
- **A. commercial expenses**
- **B. dividends**
- **C. interest on bonus**
- **D. donations**
- **E. income tax**

B 29. Benefits of a computerized budgeting process include all of the following *except:*
- **A. shortening the planning cycle**
- **B. reducing the need for planning**
- **C. time to reconsider planning assumptions**
- **D. operating analysis capability**
- **E. plans can be updated continuously**

C 30. Prospective financial information should include all of the following *except:*
- **A. a description of what management intends to present**
- **B. a summary of significant assumptions**
- **C. an auditor's opinion**
- **D. a caveat that the expected results may not be achieved**
- **E. a format similar to the historical financial statements**

PROBLEMS

PROBLEM

1.
Cash Receipts Budget. Astro Co. bills its customers for sales on account at the end of each month, with terms of 2/10/EOM, n/45. Fifty percent of credit sales are paid within the discount period, while 30% are paid at the end of the next period. Fifteen are paid at the end of the second following month, but these customers pay a 2% service charge on any balance due. Receivables are recorded at gross. The following data are given for the last two months and for the next two months:

	Last Two Months		Next Two Months	
	August	September	October	November
Cash sales	$20,400	$18,000	$46,200	$31,500
Credit sales	40,000	90,000	60,000	52,000
Other receipts	2,000	—	—	4,600

Required: **Prepare a cash receipts budget for the two-month period, October and November.**

SOLUTION

Astro Co.
Cash Receipts Budget
For October-November, 19--

	October	November
Cash sales	$ 46,200	$31,500
Other receipts	—	4,600
Credit sales:		
August:		
Late (15% x $40,000)	6,000	—
Service charge (2% x $6,000)	120	—
September:		
Discount taken	44,100[1]	—
Current (30% x $90,000)	27,000	—
Late (15% x $90,000)	—	13,500
Service charge (2% x $13,500)	—	270
October:		
Discount taken	—	29,400[2]
Current (30% x $60,000)	—	18,000
Total receipts	$123,420	$97,270

[1] $90,000 x 50% = $45,000 gross
$45,000 x 2% = $900 discount
$45,000 - $900 = $44,100 net

[2] $60,000 x 50% = $30,000 gross
$30,000 x 2% = $600 discount
$30,000 - $600 = $29,400 net

PROBLEM

2.

Four-Month Cash Budget. The management of Island Novelties Co. is preparing a cash budget for the next four-month period. Relevant data for this budget are:

	March	April	May	June
Credit sales	$60,000	$55,000	$90,000	$75,000

Credit sales were $40,000 in January and $48,000 in February. In July, credit sales are estimated at $105,000. Collections on account are made at the rate of 75% in the month following the sale and 20% in the second month following the sale.

Variable expenses other than purchases are equal to 30% of sales; 75% of both variable expenses and purchases are paid in the month incurred, while 25% are paid in the next month. Cost of goods sold is equal to 50% of sales, and purchases are made so that the ending inventory is maintained at a level equal to 60% of the needs for the next month's sales. Fixed expenses are $3,000 per month.

Required: **Prepare a cash budget for the four-month period, March through June, indicating the net increase (or decrease) in the cash balance for each month.**

SOLUTION

Island Novelties Co.
Cash Budget
For March-June, 19--

	March	April	May	June
Receipts from sales in:				
January	$ 8,000	—	—	—
February	36,000	$ 9,600	—	—
March	—	45,000	$ 12,000	—
April	—	—	41,250	$ 11,000
May	—	—	—	67,500
Total receipts	$ 44,000	$ 54,600	$ 53,250	$ 78,500
Disbursements for:				
Variable expenses:				
February	$ 3,600	—	—	—
March	13,500	$ 4,500	—	—
April	—	12,375	$ 4,125	—
May	—	—	20,250	$ 6,750
June	—	—	—	16,875
Fixed expenses	3,000	3,000	3,000	3,000
Purchases:				
February	6,900	—	—	—
March	21,375	7,125	—	—
April	—	28,500	9,500	—
May	—	—	30,375	10,125
June	—	—	—	34,875
Total disbursements	$ 48,375	$ 55,500	$ 67,250	$ 71,625
Net cash increase (decrease)	$ (4,375)	$ (900)	$ (14,000)	$ 6,875

Additional computations:

	February	March	April	May	June
Purchases:					
Beginning inventory (60% of 50% of current month's sales)	**$14,400**	**$18,000**	**$16,500**	**$27,000**	**$22,500**
Cost of goods sold (50% of current month's sales)	**24,000**	**30,000**	**27,500**	**45,000**	**37,500**
Ending inventory (60% of 50% of next month's sales)	**18,000**	**16,500**	**27,000**	**22,500**	**31,500**
Cost of goods sold + ending inventory - beginning inventory = purchases	**$27,600**	**$28,500**	**$38,000**	**$40,500**	**$46,500**

PROBLEM

3.
Four-Month Cash Budget. Bagel Factory Inc. prepared cash estimates for the next four months. The following estimates were developed for certain items:

Item	March	April	May	June
Cash sales	**$10,000**	**$6,000**	**$8,000**	**$11,000**
Credit sales	**5,000**	**2,000**	**6,000**	**9,000**
Payroll	**2,000**	**1,500**	**2,500**	**3,000**
Purchases	**3,000**	**2,600**	**2,800**	**4,000**
Other expenses	**2,500**	**2,400**	**2,600**	**2,800**

In February, credit sales totaled $9,000, and purchases totaled $5,000. January credit sales were $12,000. Accounts receivable collections amount to 30% in the month after the sale and 60% in the second month after the sale; 10% of the receivables are never collected. Payroll and other expenses are paid in the month incurred. Seventy-five percent of the purchases are paid in the month incurred, and the remainder are paid in the following month. A $15,000 tax payment is due on June 15. The cash balance was $5,000 on March 1. The company wants a minimum cash balance of $5,000 per month.

Required:

(1) Prepare a cash budget for the four-month period, March through June.
(2) List the amount of funds available for investing or required for borrowing in each month.

SOLUTION

(1)

Bagel Factory Inc.
Cash Budget
For March-June, 19--

	March	April	May	June
Receipts from:				
Cash sales	$ 10,000	$ 6,000	$ 8,000	$ 11,000
January credit sales (60% x $12,000)	7,200	—	—	—
February credit sales:				
30% x $9,000	2,700	—	—	—
60% x $9,000	—	5,400	—	—
March credit sales	—	1,500	3,000	—
April credit sales	—	—	600	1,200
May credit sales	—	—	—	1,800
Total receipts	$ 19,900	$ 12,900	$ 11,600	$ 14,000
Disbursements for:				
Payroll	$ 2,000	$ 1,500	$ 2,500	$ 3,000
Other expenses	2,500	2,400	2,600	2,800
February purchases (25% x $5,000)	1,250	—	—	—
March purchases	2,250	750	—	—
April purchases	—	1,950	650	—
May purchases	—	—	2,100	700
June purchases	—	—	—	3,000
Tax payment	—	—	—	15,000
Total disbursements	$ 8,000	$ 6,600	$ 7,850	$ 24,500
Net increase (decrease) in cash	$ 11,900	$ 6,300	$ 3,750	$ (10,500)
Cash balances:				
Beginning	5,000	5,000	5,000	5,000
Ending	$ 16,900	$ 11,300	$ 8,750	$ (5,500)

(2)

Available for investing	$ 11,900	$ 6,300	$ 3,750	—
Needed to borrow	—	—	—	$ 10,500[1]

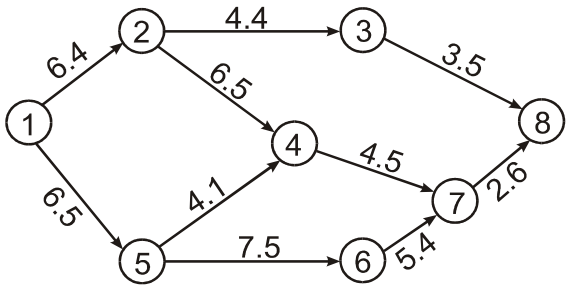
[1]**$5,500 + $5,000 minimum cash balance**

PROBLEM

4.
Identifying Critical Path in PERT Network. Jacques Company prepares a bid to salvage a sunken treasure ship. The PERT network in Figure 16-2 on page 222 is developed to reflect the activities needed to recover the ship. The numbers in the line segments represent expected completion times in days for activities.

Required:

(1) Identify the critical path and the total time expected for completion.
(2) The company is informed that Steps 5-6 could be shortened by up to two days for a cost of $1,000 per day or fraction of a day shortened. Each day or fraction of a day shortened would result in a cost savings of $3,000 before the expenses required to affect the savings. Show the net savings, as well as the new completion time, as a result of shortening the time required on Steps 5-6.



SOLUTION

(1)

Paths	Completion Time (Days)
1 - 2 - 3 - 8	15.8
1 - 2 - 4 - 7 - 8	20.0
1 - 5 - 4 - 7 - 8	17.7
1 - 5 - 6 - 7 - 8	22.0

(2) Steps 5-6 may be shortened by as much as two days before the path 1-2-4-7-8 would become critical. Savings would equal 2($3,000 - $1,000), or $4,000. The new completion time is 22 - 2 = 20 days.

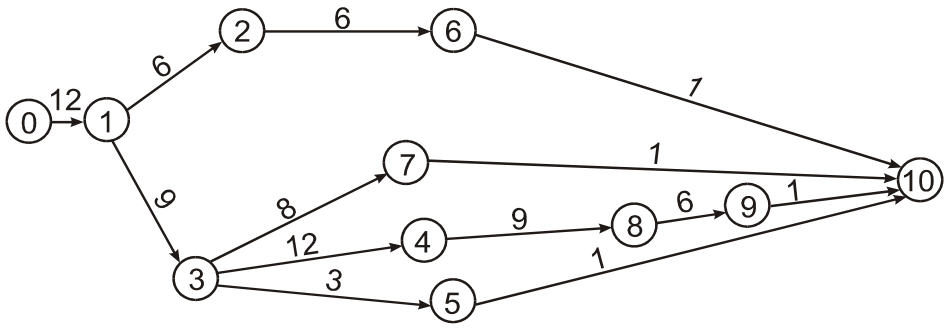
PROBLEM

5.
Critical Path; Completion Time in PERT Network. F Troop is experiencing difficulties constructing a fort on the Red River. Col. Storch proposes that a PERT network be used to organize the construction activities for the fort. Each activity, together with its immediate predecessor activity and the completion time for the activity, is given below:

Activity	Type of Activity	Predecessor Activity	Completion Time (in Weeks)
1	Clear trees	0	12
2	Sort trees by size	Clear trees	6
3	Strip trees into logs	Clear trees	9
4	Construct walls	Strip trees into logs	12
5	Construct gate	Strip trees into logs	3
6	Build turret	Sort trees by size	6
7	Build captain's house	Strip trees into logs	8
8	Build officers' houses	Construct walls	9
9	Build enlisted personnel's barracks	Build officers' houses	6
10	Hold completion ceremony	All others	1

Required: **Diagram a PERT network to represent the activities on page 234. Show the completion time above each path. Identify the critical path and show the completion time in weeks.**

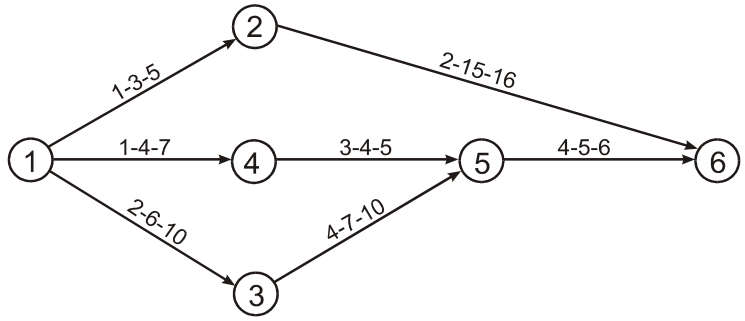
SOLUTION



Paths	Completion Time (Weeks)
0 - 1 - 2 - 6 - 10	25
0 - 1 - 3 - 7 - 10	30
0 - 1 - 3 - 4 - 8 - 9 - 10 (critical path)	49
0 - 1 - 3 - 5 - 10	25

PROBLEM

6.
PERT Network. A company is faced with the following PERT network situation (time in days):



Required:

(1) Calculate t_e (expected time) for each activity. For each activity, the estimates are t_o, t_m, t_p, in that order.
(2) Calculate the total time for each path and identify the critical path as well as total time for other paths.

SOLUTION:

(1)

Activity	(t_o	+	t_m(4)	+	t_p)	=	Total	÷	6	=	t_e
1-2	1		3(4)		5		18		6		3
1-3	2		6(4)		10		36		6		6
1-4	1		4(4)		7		24		6		4
2-6	2		15(4)		16		78		6		13
3-5	4		7(4)		10		42		6		7
4-5	3		4(4)		5		24		6		4
5-6	4		5(4)		6		30		6		5

(2)

Path	t_os	Total t_e
1 - 2 - 6	3 + 13	16
1 - 4 - 5 - 6	4 + 4 + 5	13
1 - 3 - 5 - 6	6 + 7 + 5	18 critical path