Crosswind Learning

Version 6.1 Updated for the 2021
Project Management Professional (PMP)® Exam

Crosswind Success Series: PMP® Exam Bootcamp Manual

www.crosswindpm.com
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Version 6.1 aligned with the Project Management Institute, *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide)* - Sixth Edition, Project Management Institute Inc., 2017

12.15. Project Cost Management Formulas and Variables

Description	Formula	Variable (Component)	Example
Actual Cost (AC) represents the current amount actually spent on the project to date or during a particular time period.	The addition of actual expenses to date or during a particular time period	AC (ACWP) = actual cost (actual cost of work performed)	AC = $5,000
Earned Value (EV) represents the current amount of work (product) completed to date or during a particular time period, regardless of cost or time.	The percent complete of each activity multiplied by the planned value (PV) of the activity to date or during a particular time period	EV (BCWP) = earned value (budgeted cost of work performed)	EV = $ 4,500 or EV = $4,500 = $9,000 x 50% Complete
Planned Value (PV) represents the current amount that should have been spent on the project to date or during a particular time period.	The addition of all work that should have been completed to date or during a particular time period	PV (BCWS) = planned value (budgeted cost of work scheduled)	PV = $ 5,500
Budget at Completion (BAC) represents the total budget projected for the project. Also, it is the **sum of all planned value (PV)**.	The total amount originally (or in accordance with an approved revision) expected to be spent on the project	BAC = budget at completion	BAC = $10,000
Cost Performance Index (CPI) represents the current efficiency of spending on the project. Less than 1.0 is not good, greater than 1.0 is good, and 1.0 is on track.	CPI = EV / AC	CPI = cost performance index	CPI = 1.0 (on track: $1.00 spent, $1.00 value) CPI = 0.8 (over budget: $1.00 spent, $.80 value) CPI = 1.2 (under budget: $1.00 spent, $1.20 value)
Cost Variance (CV) represents the difference between what has been accomplished and what has been spent.	CV = EV - AC	CV = Cost Variance	CV = -$500 (spent more than allocated) CV = 0 (spent as planned) CV = $500 (spent less than allocated)

Description	Formula	Variable (Component)	Example
Schedule Performance Index (SPI) represents the current efficiency of progress on the project. Less than 1.0 is not good; greater than 1.0 is good; 1.0 is on track.	SPI = EV / PV	SPI = schedule performance index	SPI = 1.0 (on track and progressing as it should) SPI = 0.8 (behind schedule, only progressing at 80% of what was planned) SPI = 1.2 (ahead of schedule, progressing at 120% of what was planned)
Schedule Variance (SV) represents the difference between what has been accomplished and what should have been accomplished.	SV = EV - PV	SV = schedule variance	SV = -$500 (took more time than allocated) SV = 0 (time as planned) SV = $500 (took less time than allocated)
To-complete Performance Index (TCPI) represents the efficiency needed from the remaining resources to meet the cost goals of the project.	TCPI = (BAC-EV) / (BAC-AC) or (BAC-EV) / (EAC-AC)	TCPI = to-complete performance index	TCPI = 1.25 = ($1,000 - $500) / ($1,000 - $600) BAC or EAC = $1,000 EV = $500 AC = $600
Estimate at Completion (EAC) represents the current total project cost based on the current efficiency (CPI) of project spending.	EAC = BAC / CPI Or EAC = BAC / Cumulative CPI	EAC = estimate at completion	EAC = $50,000 EAC greater than BAC (over budget) EAC less than BAC (under budget)
EAC using a new estimate, represents the actual cost (AC) to date plus a new ETC.	EAC = AC + ETC	EAC = estimate at completion	EAC = $50,000 = $2,000 + $48,000
EAC using the remaining budget represents the budget needed to complete the remaining work plus the actual cost (AC). The budget needed to complete the remaining work is the budget at completion (BAC) minus the earned value (EV).	EAC = AC + BAC-EV	EAC = estimate at completion	EAC = $51,000 = $7,000 + ($50,000 - $6,000) AC = $7,000 BAC = $50,000 EV= $6,000

Description	Formula	Variable (Component)	Example
EAC using CPI also represents the budget needed to complete the remaining work plus the actual cost (AC). However, the budget required to complete the remaining work is adjusted by a performance factor, very often CPI.	$EAC = AC + \frac{BAC - EV}{CPI \times SPI}$	EAC = estimate at completion	EAC = $43,477 = $7,000 + ($50,000 - $8,000) / (1.14 x 1.01) AC = $7,000 BAC = $50,000 EV = $8,000 CPI = 1.14 SPI = 1.01
Estimate to Complete (ETC) represents the current total project cost REMAINING to be spent, based on the current efficiency (CPI) of project spending.	ETC = EAC - AC	ETC = estimate to complete	ETC = $40,000
Variance at Completion (VAC) represents the difference between the BAC and EAC.	VAC = BAC - EAC	VAC = variance at completion	VAC = $32,500
Present Value (PV) shows the amount of money needed now at the interest rate (r) for a desired future outcome (FV) over a number of periods (n).	$PV = \frac{FV}{(1+r)^n}$	(PV) present value	PV = $463.19 if FV = $1,000, r = 8%, n = 10
Future Value (FV) shows the amount of money needed in the future at the set interest rate (r) for an amount of money (PV) now over a number of periods (n).	$FV = PV \times (1+r)^n$	(FV) future value	FV = $215.89 if PV = $100, r = 8%, n = 10
The **interest rate** of an investment in a project	Provided on the exam	r (interest rate)	r = 8% = 0.08
The **number of periods of time** (months, years, etc.) of investment in a project	Provided on the exam	n (number of periods)	n = 5 years

Description	Formula	Variable (Component)	Example
PERT, while technically a type of three-point estimate, can be used with beta distributions	$c_E = \frac{c_O + 4c_M + c_P}{6}$	PERT	13.33 = ((20 + (4 x 14) + 4)) / 6
Pessimistic Cost (c_p) estimate is a worst-case estimate.	Provided on exam	c_P	$c_P = 20$
Optimistic Cost (c_O) estimate is a best-case estimate.	Provided on exam	c_O	$c_O = 4$
Most likely (c_M), or **realistic** (c_R) estimate	Provided on exam	c_M (also could be c_R, "realistic")	$c_M = 14$

12.16. Project Cost Management Terminology

Term	Description
Activity Cost Estimate	The projected cost of completing an activity
Actual Cost (AC)	The total cost accrued for an activity over a designated time period; also known as the actual cost of work performed (ACWP)
Basis of Estimates	Supporting details associated with an estimate, typically schedule or cost, that may include assumptions, constraints, level of detail, ranges, and confidence levels
Budget	The total estimate for the project, or any activity, that has been approved
Budget at Completion (BAC)	The total project budget derived from incorporating all items from the project's individual budgets; also called the sum of all planned value (PV)
Budgetary Estimate	An estimate used to put money into a company's (or project's) budget
Chart of Accounts	A structure used to monitor project cost that usually aligns with a company's accounting system and WBS of the project or program
Code of Accounts	The numbering system used to distinguish constituents of the WBS
Control Account	A specific point in the work breakdown structure (WBS) where the project scope, budget, actual cost, and schedule are combined and then compared to earned value in order to establish performance metrics
Control Costs	The process of observing project status in order to revise project costs and administer cost baseline revisions
Cost Aggregation	Adding together the work package cost estimates for high-level WBS components, including control accounts, for the purpose of establishing the value of the total project or the control account work
Cost Baseline	The authorized project budget version, exclusive of management reserves, that requires a formal control process to effect changes and is used as the basis of comparison to actual costs
Cost Management Plan	The document, part of the project or program management plan, used to describe the framing, forming, observation, and control of project costs
Cost of Quality	The total cost of achieving or failing to achieve desired quality: specifically the costs of achievement are those associated with planning, controlling, and assuring quality and the costs of failure are those associated with reworking, warranty, waste, and negative reputation
Cost Performance Index (CPI)	The ratio indicating the cost efficiency of resources, calculated by dividing earned value (EV) by actual cost (AC): a CPI of 1.0 indicates the project is proceeding as planned financially; a CPI greater than 1.0 more indicates the project is proceeding better than planned financially; and a CPI less than 1.0 indicates the project is not proceeding as well as planned financially
Cost Variance (CV)	The deficit or surplus of the budget at any specific point in time, calculated by subtracting the actual cost (AC) from the earned value (EV): a value of 0 indicates the project is on budget, a value greater than 0 indicates the project is under budget, and a value less than 0 indicates the project is over budget
Cost-benefit Analysis	A financial analysis method that compares the potential revenue derived from an opportunity to the cost of that opportunity
Definitive Estimate	A cost estimate that provides an accurate estimate of the project cost; the final cost estimate used before implementation; typically the estimate has a tolerance range of -5% to +10%

Term	Description
Determine Budget	The process of totaling the evaluations of individual activities to arrive at an authorized cost baseline
Direct Cost	Cost that is directly applicable to the project; examples include the cost of a test computer for software being created by the project, the cost of IC chips, or the costs of project labor
Earned Value (EV)	The value of the work that has been completed as of a specific point in time calculated by multiplying the completion percent of activity by its planned value, then adding the results; also known as the budgeted cost of work performed (BCWP)
Earned Value Management	A technique, effected by considering actual cost (AC), schedule (PV), and what has been accomplished (EV), that is used to determine project progress and performance
Earned Value Technique (EVT)	The technique associated with measuring the amount of completion of a work breakdown structure component, control account or project
Estimate at Completion (EAC)	The expected cost of performing all of the work in the project calculated by adding the actual cost (AC) to the estimate to complete (ETC)
Estimate Costs	The process of approximating the monetary resources required to complete the work of the project
Estimate to Complete (ETC)	The expected monetary resources required to complete the remaining work of the project; calculated by subtracting actual cost (AC) from the estimate at completion (EAC)
Fixed Formula Method	A progress reporting approach, typically applied when an activity is two reporting periods or less in duration, that assigns a percentage to an activity at its start and the remaining percentage at its completion so that the percentage at completion equals 100%; for example, if an activity is assigned 30% at its start, 70% will be added at its completion resulting in a completion percentage of 100%
Funding Limit Reconciliation	The process of comparing planned project expenses to any limitations or constraints in project funding
Indirect Cost	Cost that is not directly accrued on the project (for example, electricity, taxes, rent)
Internal Rate of Return (IRR)	A project comparison value; represents the discounted rate that zeros out the net present value (NPV)
Learning Curve Theory	A theory which states that the more of something that is produced, the lower the unit cost of it becomes due to an improvement in efficiency
Life Cycle Costing	Consideration of not just project cost, but total ownership (operations and support) cost of the item created by the project
Net Present Value (NPV)	A value used in capital budgeting, in which the present value of cash inflow is subtracted from the present value of cash outflows; compares the value of a dollar today versus the value of that same dollar in the future, after taking inflation and return into account
Opportunity Cost	The amount associated with bypassing one opportunity in favor of another; as an example, if the pursuit of project B with a value of $75K is elected over the pursuit of project A with a value of $50K, $50k value of project A will not be realized
Parametric Modeling	Application of a mathematical model used to estimate project components (schedule, cost, scope) by having other variables entered into the application
Performance Measurement Baseline (PMB)	The comparison of project execution to the approved and integrated scope, schedule, and budget (exclusive of management reserves, but inclusive of contingency reserves) for the purpose of gauging and administering performance
Plan Cost Management	The process of establishing policies, procedures, and documentation for the planning, execution, and monitoring and controlling of cost-related project items

Term	Description
Planned Value (PV)	The total value of the work scheduled as of a certain point in time; also known as the budgeted cost of work scheduled (BCWS)
Profit	Money made after expenses have been subtracted from revenue
Profit Margin	Ratio between revenues and profit on a project, product, or initiative
Project Cost Management	The processes required to estimate, budget, disburse, administer, and regulate costs in order to complete the project within the approved budget
Project Funding Requirements	The forecast of project costs based on the cost baseline for the total project plus any anticipated liabilities; the forecast can be applied to specific time periods rather than to the project as a whole
Rough Order of Magnitude (ROM) Estimate	A cost estimate, performed early in the project, of the completion cost of the project; the tolerance range is -25% to +75%.
S Curve	Graphic representation of costs, work, and other quantities over time so that the planned value, earned value, and actual cost of the work can be seen
Schedule Performance Index (SPI)	A measure of project schedule efficiency calculated by dividing the earned value (EV) by the planned value (PV): a value of 1.0 indicates the work is being performed as expected, a value greater than 1.0 means the work is being performed ahead of schedule, and a value of less than 1.0 means the work is being performed behind schedule
Schedule Variance (SV)	A determination of schedule performance calculated by subtracting the planned value (PV) from the earned value (EV): if the result is zero, the project is performing as expected; if the result is positive, the project is ahead of schedule; if the result is negative, the project is behind schedule
Sunk Cost	Money that has already been spent on a project; should not be considered when selecting or evaluating a project
Tangible Cost/ Benefit	Easily measurable cost or benefit of a project; measured in dollars
To-complete Performance Index (TCPI)	The ratio that represents the cost performance required to complete the work of the project given the remaining resources; calculated by dividing the remaining project work by the remaining budget (BAC - EV / BAC - AC)
Variance At Completion (VAC)	The projected amount the project will be over or under budget based on the difference between the budget at completion (BAC) and the estimate at completion (EAC)
Weighted Milestone Method	An approach to the earned value method in which an activity with a duration exceeding two reporting periods is broken down into smaller activities with durations limited to two reporting periods or less

The source for the above definitions is the Glossary of the Project Management Institute,
A Guide to the Project Management Body of Knowledge, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017

12.17. Project Cost Management Tests and Exercises

12.17.1. Situational Earned Value Exercises

Answers are in section 12.18.1.

Earned Value Exercise #1

You are managing a project to build a product. The project has seven activities, each with a finish-to-start relationship. Below is project baseline information indicating the planned schedule and budgeted cost of each activity. **Calculate anything with a dollar value to the nearest cent (for example, $456.32) and anything else to three digits (for example, 1.024).** Recommendation: Use a basic calculator or your calculations could have rounding variance. **Product Release 1.0 row is a summary activity reflecting the contents below it.**

Planned

Activity Name	% Complete	Baseline Duration	Baseline Start	Baseline Finish	Baseline Cost
Product Release 1.0	**0%**	**240 days**	**01/06/xx**	**12/05/xx**	**$295,000.00**
Requirements	0%	30 days	01/06/xx	02/14/xx	$30,000.00
Design	0%	60 days	02/17/xx	05/09/xx	$70,000.00
Proof of Concept	0%	30 days	05/12/xx	06/20/xx	$45,000.00
Build Product	0%	45 days	06/23/xx	08/22/xx	$60,000.00
Test Product	0%	45 days	08/25/xx	10/24/xx	$60,000.00
Deploy Product	0%	30 days	10/27/xx	12/05/xx	$30,000.00
Product Release Complete	0%	0 days	12/05/xx	12/05/xx	$0.00

The project is currently in the middle of the execution phase and the date is **June 20th**. The information in the chart below provides the schedule and cost information to date.

Actual

Activity Name	% Complete	Actual Duration	Actual Start	Actual Finish	Actual Cost
Product Release 1.0	**47.63%**	**122 days**	**01/06/xx**	**NA**	**$147,000.00**
Requirements	100%	35 days	01/06/xx	02/21/xx	$32,000.00
Design	100%	60 days	02/24/xx	05/16/xx	$70,000.00
Proof of Concept	90%	27 days	05/19/xx	NA	$45,000.00
Build Product	0%	0 days	NA	NA	$0.00
Test Product	0%	0 days	NA	NA	$0.00
Deploy Product	0%	0 days	NA	NA	$0.00
Product Release Complete	0%	0 days	NA	NA	$0.00

Using the calculations from the data tables, provide a status report on the project by answering the following questions. Calculate to the nearest cent for dollars and three significant digits for everything else.

1. What measurement is used to determine whether the project is ahead of schedule, behind schedule, or on time, and how much is the amount?

2. What measurement is used to determine the rate of the project's progress according to plan and what is its value?

3. Based on these schedule measurements, is the project on schedule, behind schedule, or on time?

4. At what percentage rate is the project progressing compared to its planned baseline rate of progression?

5. What measurement is used to determine whether the project is over budget, under budget, or if it is breaking even, and how much is the difference?

6. What measurement is used to determine the spending efficiency of the project, and what is its value?

7. Based on these measurements, is the project over budget, under budget, or breaking even?

8. Currently, the project is making how many cents for every dollar spent?

9. Based on the current status and performance of the project, how much do you estimate the project will cost at completion? On what measurement do you base this estimate?

10. How much money must be spent from this point forward to complete the project? What calculations have you made to support this figure?

11. Will the project be over budget, under budget, or right on target at completion? What information do you have to support this estimate?

12.17.2. Project Cost Management Practice Test

Answers are in section 12.18.2.

1. Activity A is worth $200, is 100% complete, should have been done on day one, and actually cost $200. Activity B is worth $75, is 90% complete, should have been done on day two, and actually cost $120 so far. Activity C is worth $200, is 75% complete and should have been done on day three, and has cost $175 so far. The total budget is $1,000. What is the planned value as of day two?

   (A) $275.00
   (B) -$417.50
   (C) $495.00
   (D) -$275.00

2. You are a member of a project team that is doing a capital expansion upgrade project. Typically, your projects do not include capital assets. Which of the following documents are most likely to be updated first to reflect the change in project type?

   (A) Cost estimates
   (B) Cost baseline
   (C) Cost management plan
   (D) Issue log

3. Project A has an NPV of $150K over three years. Project B has an NPV of $330K over six years. Project C has an NPV of $170K over six years. Which of the following do you select?

   (A) Project A
   (B) Project B
   (C) Project C
   (D) Project A and C

4. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What is the CPI?

   (A) 0.45
   (B) 0.50
   (C) 0.40
   (D) 1.00

5. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What is the total value of the project?

(A) $7,500
(B) $2,250
(C) $5,000
(D) $10,000

6. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What is the EV?

(A) $7,500
(B) $2,250
(C) $5,000
(D) $10,000

7. Company-wide server upgrades are an example of what type of project cost?

(A) Variable indirect
(B) Variable
(C) Fixed
(D) Fixed direct

8. The project team has just created cost estimates for their project. They are working with the accounting department to get access to the chart of accounts. What process are they getting ready to do next?

(A) Estimate costs
(B) Determine budget
(C) Control costs
(D) Manage stakeholder engagement

9. The infrastructure project is behind schedule and over budget. So far, $3M has been spent on the project. The sponsor is considering if it should allow the project to continue. What should he consider the $3M that has been spent so far?

(A) The amount for phase one
(B) Sunk cost
(C) The budgeted cost of work performed
(D) Opportunity cost

10. The highway project is in the middle of planning when the project manager presents a status reporting method to the team. The team members haven't heard of this method before. It's called earned value. To attain buy-in from the team, the project manager begins to explain what earned value status reporting can do for the project, explaining that it will measure which of the following?

    (A) Schedule and cost
    (B) Scope, schedule, and cost
    (C) Scope and cost
    (D) Scope and schedule

11. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What is the amount of work that should have been done so far?

    (A) $7,500
    (B) $2,250
    (C) $5,000
    (D) $4,500

12. Project A has an NPV of $275K over 2.5 years. Project B has an IRR of 3.2%. Project C has a BCR of 0.89:1. Project D has four people on it and is encountering scope creep. Which of the following projects stand the greatest chance of getting canceled?

    (A) Project A
    (B) Project B
    (C) Project C
    (D) Project D

13. You are a project manager for a shopping cart project. You are doing earned value to monitor project performance. The CPI is .65 and the SPI is 1.1. What will you use to graphically display this information?

    (A) Pareto diagram
    (B) Control chart
    (C) Burndown chart
    (D) S curve

14. You are the project manager for a distributed system project. You have spent $5000 so far and have a spending efficiency of 0.8 so far. How much work have you done so far?

(A) $5000
(B) $4000
(C) $6000
(D) $2000

15. The project management team has performed earned value analysis on its project and discovered that the project is behind schedule and over budget. The SPI is 0.82 and the CPI is 0.73. The team is trying to determine how efficient it needs to be with the remaining resources to complete the project on budget. Which of the following is the team trying to calculate?

(A) Cost variance
(B) Cost performance index
(C) Estimate to complete
(D) To-complete performance index

16. What is the range of a rough order of magnitude (ROM) estimate?

(A) -10% to +10%
(B) -5% to +10%
(C) -25% to +75%
(D) -300% to +75%

17. The project is using a new server that cost $25,000. The project manager is told to set up depreciation for the server over a five-year schedule, with the server having a value of $0 at the end of five years. Standard depreciation will be used in the calculation. What is the amount per year the server will depreciate?

(A) $5,000
(B) $10,000
(C) $2,500
(D) Not enough information

18. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What is the ETC?

(A) $11,666.67
(B) $16,666.67
(C) $5,000
(D) $0

19. Which of the following shows the remaining amount to be spent on the project based on current spending efficiency?

(A) Cost variance
(B) Estimate to complete
(C) Estimate at completion
(D) Budget remaining

20. You are the project manager for a main street restoration project. Tracking cost is extremely important as the budget cannot accommodate overruns. The cost performance index is currently 0.90. The sponsor is asking how much is needed to finish the project, based on current cost performance metrics. Which of the following best describes what the sponsor is requesting?

(A) Estimate at completion
(B) Estimate to complete
(C) Variance at completion
(D) To-complete performance index

21. You are the production manager for the double down tour. You are mapping out your tour dates and setting the budget based on the last tour. You are aware that some of your tour date locations have gone union since you were there last, and this could result in local product cost increases. In setting up the budget which of the following would you most likely review to address these potential overruns?

(A) Risk register
(B) Cost estimates
(C) Cost baseline
(D) Change requests

22. The project team is planning an upgrade to a client's website and infrastructure. During planning, the team members are confronted with the cost options for a data communications line to connect to the servers. They consider the cost of purchasing the communication line for the time they need to develop the project. After that, the customer takes over the purchase of the line. They are also considering a long-term commitment that the customer can make with the communication line provider, which provides a less costly solution over the use of the system. What type of analysis is the team considering?

(A) Life cycle costing
(B) Make-or-buy analysis
(C) Fixed cost
(D) Procurement planning

23. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What do you expect the project to cost at completion based on the current performance?

(A) $11,666.67
(B) $16,666.67
(C) $5,000
(D) $0

24. The planning process group is progressing. The team has involved a number of expert opinions in trying to approximate the costs needed to complete project activities. This process is known as?

(A) Determine budget
(B) Control costs
(C) Analogous estimating
(D) Estimate costs

25. Which of the following is an example of fixed formula status reporting?

(A) Getting status updates from the project team
(B) PV multiplied by % complete
(C) The project manager updating the status reports quantitatively
(D) 30%/70% rule

26. The project is using some application and database servers in the development environment. The finance department explains that the servers will be depreciated using the double declining balance (DDB) format. This is an example of what?

(A) Fixed cost
(B) Fixed direct cost
(C) Accelerated depreciation
(D) Standard depreciation

27. The project team is developing rules for reporting updates on the project. The majority of their activities are less than two reporting periods long. Which format is best to use in this case?

(A) Fixed formula progress reporting
(B) Weighted milestone
(C) Earned value
(D) Forecast reporting

28. You have $1,000 today and can earn 8%. In future years, how much money will this be worth?

(A) $1,175
(B) $883
(C) $1,202
(D) Not enough information

29. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What is the SPI?

(A) 0.45
(B) 0.50
(C) 0.40
(D) 1.00

30. Your project has an SPI of 0.8 and a CPI of 1.2. What best describes this project?

(A) Over budget and behind schedule
(B) Under budget and ahead of schedule
(C) Over budget and ahead of schedule
(D) Under budget and behind schedule

12.18. Project Cost Management Answers for Tests and Exercises

12.18.1. Situational Earned Value Exercise Answers

Earned Value Exercise #1 Answers

You are managing a project to build a product. The project has seven activities, each with a finish-to-start relationship. Below is project baseline information indicating the planned schedule and budgeted cost of each activity. **Calculate anything with a dollar value to the nearest cent (for example, $456.32) and anything else to three digits (for example, 1.024).** Recommendation: Use a basic calculator or your calculations could have rounding variance. **Product Release 1.0 row is a summary activity reflecting the contents below it.**

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Design	0%	60 days	02/17/xx	05/09/xx	$70,000.00
Proof of Concept	0%	30 days	05/12/xx	06/20/xx	$45,000.00
Build Product	0%	45 days	06/23/xx	08/22/xx	$60,000.00
Test Product	0%	45 days	08/25/xx	10/24/xx	$60,000.00
Deploy Product	0%	30 days	10/27/xx	12/05/xx	$30,000.00
Product Release Complete	0%	0 days	12/05/xx	12/05/xx	$0.00

The project is currently in the middle of the execution phase and the date is June 20th. The information in the chart below provides the schedule and cost information to date.

Actual

Activity Name	% Complete	Actual Duration	Actual Start	Actual Finish	Actual Cost
Product Release 1.0	**47.63%**	**122 days**	**01/06/xx**	**NA**	**$147,000.00**
Requirements	100%	35 days	01/06/xx	02/21/xx	$32,000.00
Design	100%	60 days	02/24/xx	05/16/xx	$70,000.00
Proof of Concept	90%	27 days	05/19/xx	NA	$45,000.00
Build Product	0%	0 days	NA	NA	$0.00
Test Product	0%	0 days	NA	NA	$0.00
Deploy Product	0%	0 days	NA	NA	$0.00
Product Release Complete	0%	0 days	NA	NA	$0.00

Earned Value Exercise #1 Status Report Answers

1. What measurement is used to determine whether the project is ahead of schedule, behind schedule, or on time, and how much is the amount?

   SV – schedule variance

   First, you must determine the value of the following:
   AC = $147,000 (actual cost to date)
   PV = $145,000 (what was the planned value of the work to date)
   EV = $140,500 (what is the value of the work done to date)
   $30,000 + $70,000 + (90% of $45,000 = $40,500) = $140,500

   SV = EV – PV **SV = $140,500 – $145,000 = -$4,500**

2. What measurement is used to determine the rate of the project's progress according to plan and what is its value?

   SPI – schedule performance index
   SPI = EV / PV **SPI = $140,500 / $145,000 = 0.969**

3. Based on these schedule measurements, is the project on schedule, behind schedule, or on time?

   The project is behind schedule.

4. At what percentage rate is the project progressing compared to its planned baseline rate of progression?

   The project is progressing at 96.9% of the rate of the original plan.

5. What measurement is used to determine whether the project is over budget, under budget, or if it is breaking even, and how much is the difference?

   CV – cost variance
   AC = $147,000 (actual cost to date)
   PV = $145,000 (what was the planned value of the work to date)
   EV = $140,500 (what is the value of the work done to date)
   $30,000 + $70,000 + (90% of $45,000 = $40,500) = $140,500
   CV = EV – AC **CV = $140,500 – $147,000 = -$6,500**

6. What measurement is used to determine the spending efficiency of the project and what is its value?

   CPI – cost performance index
   CPI = EV / AC **CPI = $140,500 / $147,000 = 0.956**

7. Based on these measurements, is the project over budget, under budget, or breaking even?

   The project is over budget.

8. Currently, the project is making how many cents for every dollar spent?

   The project is making 96 cents on every dollar it spends.

9. Based on the current status and performance of the project, how much do you estimate the project will cost at completion? On what measurement do you base this estimate?

   The estimate at completion (EAC) is the value that tells what the project is expected to cost at the end, based on the project spending efficiency. This estimate is calculated in a variety of ways. Use BAC / CPI to calculate EAC. The BAC (budget at completion) is $295,000 and the CPI (cost performance index) is 0.956. This gives an EAC of $308,577.40.

10. How much money must be spent from this point forward to complete the project? What calculations have you made to support this figure?

    This is the ETC (estimate to complete). Calculate it by subtracting AC (actual cost) from the EAC (estimate at completion). $308,577.40 - $147,000 = $161,577.40

11. Will the project be over budget, under budget, or right on target at completion? What information do you have to support this estimate?

    Based on the estimate at completion, the project will be over budget.

    The budget at completion (BAC) is $295,000 and the estimate at completion (EAC) is $308,577.40.

    The variance at completion (VAC) is BAC - EAC and in this project is $13,577.40 over budget.

12.18.2. Project Cost Management Practice Test Answers

We recommend that you download answer sheets from the Crosswind website, so you can practice the test as many times as you like.

1. Activity A is worth $200, is 100% complete, should have been done on day one, and actually cost $200. Activity B is worth $75, is 90% complete, should have been done on day two, and actually cost $120 so far. Activity C is worth $200, is 75% complete and should have been done on day three, and has cost $175 so far. The total budget is $1,000. What is the planned value as of day two?

   Correct Answer: (A) $275.00
   Explanation: The planned value as of day two is $275.00. Obtain this value by adding the planned value (PV) of Activity A ($200) and B ($75), which should have been done as of day two on the project. [Crosswind Manual 12.14.1; *PMBOK® Guide* 7.4.2.2]

2. You are a member of a project team that is doing a capital expansion upgrade project. Typically, your projects do not include capital assets. Which of the following documents are most likely to be updated first to reflect the change in project type?

   Correct Answer: (C) Cost management plan
   Explanation: The cost management plan provides guidance about how to manage the money aspects of the project. The cost management plan would likely be modified to reflect the change in cost types. Those changes would then provide any guidance on cost estimates, the cost baseline and related documents. Issue log is a distractor. [Crosswind Manual 12.10, *PMBOK® Guide* 7.1]

3. Project A has an NPV of $150K over three years. Project B has an NPV of $330K over six years. Project C has an NPV of $170K over six years. Which of the following do you select?

   Correct Answer: (B) Project B
   Explanation: Project B is the most attractive project because it has the highest dollar amount. The years listed with the NPV are distracters because they are already factored into the dollar amount of the project. Project A and C are of less value than Project B. [Crosswind Manual 12.2; No *PMBOK® Guide* Reference]

4. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What is the CPI?

   Correct Answer: (A) 0.45
   Explanation: The formula for calculating the CPI (cost performance index) is CPI = EV / AC. In this instance three steps are required. First, determine the BAC (budget at completion), which is the sum of all PV (planned value): $1,500 per day cost multiplied by five days equals a BAC of $7,500. Second, calculate the EV (earned value) by multiplying the BAC by the percentage complete: $7,500 BAC multiplied by 30% complete equals an EV of $2,250. Third, calculate the CPI by dividing the EV by the AC (actual cost): $2,250 EV divided by $5,000 AC equals a CPI of 0.45. Note that planned value is defined as the work that should have been completed to date or during a particular time period (in this case, through day five of the project since the percentage complete relates to the overall project.) [Crosswind Manual 12.14.1; *PMBOK® Guide* 7.4.2.2]

5. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What is the total value of the project?

Correct Answer: (A) $7,500
Explanation: The total value of the project is the equivalent of the project budget or the BAC (budget at completion). To determine the BAC multiply the cost per day times the number of days the project is scheduled to take: $1,500 per day cost multiplied by five days equals a BAC of $7,500. [Crosswind Manual 12.14.1; *PMBOK® Guide* 7.4.2.2]

6. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What is the EV?

Correct Answer: (B) $2,250
Explanation: The formula for calculating the EV (earned value) is EV equals percentage complete of each activity (or in this case the entire project) multiplied by BAC (budget at completion). In this instance, two steps are required. First, determine the BAC for the project: $1,500 per day cost multiplied by five days equals a BAC of $7,500. Second, calculate the EV by multiplying the BAC by the percentage complete: $7,500 BAC multiplied by 30% complete equals an EV of $2,250. Note that planned value is defined as the work that should have been completed to date or during a particular time period. In this case, the time period is defined as "through day five of the project," since the percentage complete relates to the overall project. [Crosswind Manual 12.14.1; *PMBOK® Guide* 7.4.2.2]

7. Company-wide server upgrades are an example of what type of project cost?

Correct Answer: (A) Variable indirect
Explanation: This type of cost typically increases for every server and is not likely associated with a specific project. Therefore, variable indirect is the best description. Variable is not the best answer. Fixed and fixed direct cost descriptions don't fit this type of cost except in one instance: If the question had limited the server upgrades to a fixed license fee for a web server used in a web project, the answer would have been (C) Fixed. [Crosswind Manual 12.1; No *PMBOK® Guide* Reference]

8. The project team has just created cost estimates for their project. They are working with the accounting department to get access to the chart of accounts. What process are they getting ready to do next?

Correct Answer: (B) Determine budget
Explanation: They have just completed the cost estimates process. In getting access to the chart of accounts they will be setting up the budget next. This process is called determine budget. Control costs follows determine budget. Manage stakeholder engagement is a distractor. [Crosswind Manual 12.13, PMBOK® Guide 7.3]

9. The infrastructure project is behind schedule and over budget. So far, $3M has been spent on the project. The sponsor is considering if it should allow the project to continue. What should he consider the $3M that has been spent so far?

Correct Answer: (B) Sunk cost
Explanation: Sunk cost is one that has already been spent on the project. It shouldn't be taken into consideration when determining whether to continue on the project. There is nothing in the situation about phasing the project. The budgeted cost of work performed is the earned value (EV). Opportunity cost doesn't apply here. [Crosswind Manual 12.5; No *PMBOK® Guide* Reference]

10. The highway project is in the middle of planning when the project manager presents a status reporting method to the team. The team members haven't heard of this method before. It's called earned value. To attain buy-in from the team, the project manager begins to explain what earned value status reporting can do for the project, explaining that it will measure which of the following?

Correct Answer: (B) Scope, schedule, and cost
Explanation: Earned value deals with scope, schedule, and cost. Actual cost (AC) shows cost. Planned value (PV) shows the state of the schedule. Earned value (EV) shows scope. The formulas that work with these three variables show how the three are interacting together. [Crosswind Manual 12.14.1; *PMBOK® Guide* 7.4.2.2]

11. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What is the amount of work that should have been done so far?

Correct Answer: (D) $4,500
Explanation: To determine the PV (planned value) for the days already worked, multiply the cost per day by the number of days worked: $1,500 multiplied by three days equals $4,500. Note that planned value is defined as the work that should have been completed either to date or during a particular time period (in this case, to date through day three). [Crosswind Manual 12.14.1; *PMBOK® Guide* 7.4.2.2]

12. Project A has an NPV of $275K over 2.5 years. Project B has an IRR of 3.2%. Project C has a BCR of 0.89:1. Project D has four people on it and is encountering scope creep. Which of the following projects stand the greatest chance of getting canceled?

Correct Answer: (C) Project C
Explanation: Project C has a negative BCR because it is creating less revenue than the cost. Project A and B have positive financials. Project D appears to have some issues, but we don't know enough about it to determine anything else. [Crosswind Manual 12.2; No *PMBOK® Guide* Reference]

13. You are a project manager for a shopping cart project. You are doing earned value to monitor project performance. The CPI is .65 and the SPI is 1.1. What will you use to graphically display this information?

Correct Answer: (D) S curve
Explanation: The S curve graphic shows three things. It shows the work that should have been done, the work done, and the money spent to get it done. All are measured in dollars. Comparing work done to should have been done tells the state of the schedule. Comparing work done to money spent tells the state of the budget. The pareto diagram shows cumulative defect by count of defects. The control chart shows output over time. The burndown chart shows how much work has been done and is remaining in the current sprint. [Crosswind Manual 12.14.5, *PMBOK® Guide* 7.4.2.2]

14. You are the project manager for a distributed system project. You have spent $5000 so far and have a spending efficiency of 0.8 so far. How much work have you done so far?

Correct Answer: (B) $4,000.00
Explanation: This calculation is basically a reverse CPI, or cost performance index calculation. The CPI formula is earned value (EV) divided by actual cost (AC). The question provides the actual cost of $5000 and a cost performance index of 0.8. To date $4000 of work is done, divided by $5000 spent, giving you a cost performance index or spending efficiency of 0.8. [Crosswind Manual 12.14.1, *PMBOK® Guide* 7.4.2.2]

15. The project management team has performed earned value analysis on its project and discovered that the project is behind schedule and over budget. The SPI is 0.82 and the CPI is 0.73. The team is trying to determine how efficient it needs to be with the remaining resources to complete the project on budget. Which of the following is the team trying to calculate?

Correct Answer: (D) To-complete performance index
Explanation: The to-complete performance index (TCPI) shows the efficiency needed of the remaining resources to come in on budget. Cost variance (CV) shows the difference between work done and what was paid for it. Cost performance index (CPI) shows the ratio between the work done and what was paid for it. The estimate to complete (ETC) shows the amount remaining to be spent based on the current spending efficiency (CPI). [Crosswind Manual 12.14.1; *PMBOK® Guide* 7.4.2.2]

16. What is the range of a rough order of magnitude (ROM) estimate?

Correct Answer: (C) -25% to +75%
Explanation: The range of a rough order of magnitude (ROM) estimate is -25% to +75%. The other answers are distracters. [Crosswind Manual 12.12; *PMBOK® Guide* 7.2]

17. The project is using a new server that cost $25,000. The project manager is told to set up depreciation for the server over a five-year schedule, with the server having a value of $0 at the end of five years. Standard depreciation will be used in the calculation. What is the amount per year the server will depreciate?

Correct Answer: (A) $5,000
Explanation: To calculate this value, determine a few values first. What is the value of the asset at the end of the schedule? What is the amount of the asset to begin with? What is the number of years of the depreciation schedule? First, subtract the ending value of the asset from the beginning value of the asset ($25K - $0 = $25K). The $25K is then divided by the years (5) of the depreciation schedule. This calculation results in $5K per year of depreciation. [Crosswind Manual 12.6.1; No *PMBOK® Guide* Reference]

18. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What is the ETC?

Correct Answer: (A) $11,666.67
Explanation: The formula for calculating the ETC (estimate to complete) is ETC = EAC – AC. In this instance five steps are required. First, determine the BAC (budget at completion) by multiplying the cost per day by the number of days it will take to complete the project: $1,500 x 5 = a BAC of $7,500. Second, calculate the EV (earned value) by multiplying the BAC by the percentage complete: $7,500 BAC x 30% complete = an EV of $2,250. Third, calculate the CPI (cost performance index) by dividing the EV by the AC (actual cost): $2,250 EV divided by $5,000 AC = a CPI of .45. Fourth, calculate the EAC (estimate at completion) by dividing the BAC by the CPI: $7,500 / .45 = $16,666.67. Fifth, subtract the AC from the EAC: $16,666.67 - $5,000 = $11,666.67. [Crosswind Manual 12.14.1; *PMBOK® Guide* 7.4.2.2]

19. Which of the following shows the remaining amount to be spent on the project based on current spending efficiency?

Correct Answer: (B) Estimate to complete
Explanation: Estimate to complete (ETC) shows the remaining amount to be spent on a project based on spending efficiency. This value is the difference between actual cost (AC) and estimate at completion (EAC). Estimate at completion (EAC) is a forecast of total project cost, based on spending efficiency. Cost variance (CV) is the difference between the amount of work done and what was paid for it. Budget remaining is a distracter. [Crosswind Manual 12.14.1; *PMBOK® Guide* 7.4.2.2]

20. You are the project manager for a main street restoration project. Tracking cost is extremely important as the budget cannot accommodate overruns. The cost performance index is currently 0.90. The sponsor is asking how much is needed to finish the project, based on current cost performance metrics. Which of the following best describes what the sponsor is requesting?

Correct Answer: (B) Estimate to complete
Explanation: The estimate to complete (ETC) is the remaining to be spent forecast, based on the current spending efficiency (CPI). The estimate at completion (EAC) is a total forecast, based on the current spending efficiency (CPI). Variance at completion (VAC) is the amount expected to be over (or under) budget, based on the current spending efficiency (CPI). To-complete performance index (TCPI) is the spending efficiency needed to finish the project on budget. [Crosswind Manual 12.14.1, *PMBOK® Guide* 7.4.2.2]

21. You are the production manager for the double down tour. You are mapping out your tour dates and setting the budget based on the last tour. You are aware that some of your tour date locations have gone union since you were there last, and this could result in local product cost increases. In setting up the budget which of the following would you most likely review to address these potential overruns?

Correct Answer: (A) Risk register
Explanation: Cost estimates are created, and it sounds like the budget is being created. Given the uncertainty of some of the locations having changed their working structure, the risk register would be the document that would contain information about those potential changes. The cost baseline would show the rate at which work is expected to be done and the total project cost. Change requests are a distractor. [Crosswind Manual 12.13, *PMBOK® Guide* 7.3]

22. The project team is planning an upgrade to a client's website and infrastructure. During planning, the team members are confronted with the cost options for a data communications line to connect to the servers. They consider the cost of purchasing the communication line for the time they need to develop the project. After that, the customer takes over the purchase of the line. They are also considering a long-term commitment that the customer can make with the communication line provider, which provides a less costly solution over the use of the system. What type of analysis is the team considering?

Correct Answer: (A) Life cycle costing
Explanation: Life cycle costing looks at the long-term cost of something, instead of simply what it costs to create it. This can increase project cost but in the long run save the owner of the system money. The other answers are distracters. [Crosswind Manual 12.7; No *PMBOK® Guide* Reference]

23. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What do you expect the project to cost at completion based on the current performance?

Correct Answer: (B) $16,666.67
Explanation: The formula for calculating the EAC (estimate at completion) is EAC = BAC / CPI. In this instance four steps are required. First, determine the BAC (budget at completion) by multiplying the cost per day by the number of days it will take to complete the project: $1,500 x 5 = $7,500. Second, calculate the EV (earned value) by multiplying the BAC by the percentage complete: $7,500 x 30% = $2,250. Third, calculate the CPI (cost performance index) by dividing the EV by the AC (actual cost): $2,250 / $5,000 AC = .45. Fourth, calculate the EAC by dividing the BAC by the CPI: $7,500 / .45 = $16,666.67. [Crosswind Manual 12.14.1; *PMBOK® Guide* 7.4.2.2]

24. The planning process group is progressing. The team has involved a number of expert opinions in trying to approximate the costs needed to complete project activities. This process is known as?

Correct Answer: (D) Estimate costs
Explanation: Estimate Costs obtains an approximation of the resource costs for activities or work packages. Determine Budget sums the costs to the individual work packages or activities to establish an authorized cost baseline. Control Costs manages the cost of the project. Analogous estimating is a distracter. [Crosswind Manual 12.11; *PMBOK® Guide* 7.2]

25. Which of the following is an example of fixed formula status reporting?

Correct Answer: (D) 30%/70% rule
Explanation: The 30%/70% rule is an example of fixed formula progress reporting. It means that when the activity starts, it is given a 30% complete status and will not receive the remaining 70% until it is fully complete. PV x percentage complete of each activity is the formula for earned value. The other answers are distracters. [Crosswind Manual 12.8; No *PMBOK® Guide* Reference]

26. The project is using some application and database servers in the development environment. The finance department explains that the servers will be depreciated using the double declining balance (DDB) format. This is an example of what?

Correct Answer: (C) Accelerated depreciation
Explanation: Double declining balance and sum of the digits are both examples of accelerated depreciation. DDB is not standard depreciation. The other answers are distracters. [Crosswind Manual 12.6.2; No *PMBOK® Guide* Reference]

27. The project team is developing rules for reporting updates on the project. The majority of their activities are less than two reporting periods long. Which format is best to use in this case?

Correct Answer: (A) Fixed formula progress reporting
Explanation: Fixed formula uses a partial credit approach such as 50/50 and is ideal when an activity is short, such as two or less reporting periods long. The weighted milestone approach is ideal when an activity is over two reporting periods in length. Earned value shows the status of the scope, schedule, and cost of the project. Forecast reporting focuses on what is getting ready to be done on the project. [Crosswind Manual 12.8; No *PMBOK® Guide* Reference]

28. You have $1,000 today and can earn 8%. In future years, how much money will this be worth?

Correct Answer: (D) Not enough information
Explanation: To calculate future value (FV), you need to have a present value (PV), an interest rate, and the time period involved. Therefore, without a time period in the question there is not enough information to answer the question. [Crosswind Manual 12.3, 12.4; No *PMBOK® Guide* Reference]

29. You are having a home theater room added to your house. The project should take five days and cost $1,500 per day to complete. After three days, the project is 30% complete and $5,000 has been spent. What is the SPI?

Correct Answer: (B) 0.50
Explanation: The formula for calculating the SPI (schedule performance index) is SPI = EV / PV. In this instance three steps are required. First, determine the PV (planned value): $1,500 per day cost multiplied by three days equals a PV of $4,500. Second, calculate the EV (earned value) by multiplying the BAC (budget at completion), since the percentage complete refers to the entire project, by the percentage complete: $7,500 x 30% = $2,250. Third, calculate the SPI by dividing the EV by the PV: $2,250 / $4,500 = 0.5. Note that planned value is defined as the work that should have been completed to date or during a particular time period (in this case, through day three of the project). [Crosswind Manual 12.14.1; *PMBOK® Guide* 7.4.2.2]

30. Your project has an SPI of 0.8 and a CPI of 1.2. What best describes this project?

Correct Answer: (D) Under budget and behind schedule

Explanation: A performance index (Cost or CPI, and schedule or SPI) ideally is 1.0. Less than 1.0 is considered bad. For example, behind schedule or over budget. Greater than 1.0 is considered good. For example, ahead of schedule or under budget. In this case, the SPI of .8 means the schedule is progressing at 80% of the rate planned. The CPI of 1.2 means that the project is getting $1.20 value or work out of every dollar spent. [Crosswind Manual 12.14.1, *PMBOK® Guide* 7.4.2.2]