PMP Equations

By: Mohamed Naser, Sep2023

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PMP Equations

No.	Topic	Equation	Equation Explanation	Example Problem with Solution
1	Actual Cost (AC)	AC	Actual Cost (AC) represents the total costs actually incurred or spent on a project. It is a direct measure of project expenses.	If the actual cost incurred on a project at a given time is $15,000, then AC = $15,000.
2	Planned Value (PV)	PV	Planned Value (PV) represents the authorized budget allocated to the work scheduled to be completed by a specific point in time.	If the planned budget for a project at a given time is $10,000, then PV = $10,000.
3	Earned Value (EV)	EV	Earned Value (EV) represents the value of work performed and completed in a project at a specific point in time.	EV = (% of Work Completed) * Total Budget. In your case, the project actual progress is at 80%, and the total

				budget is $1,000,000. So, to calculate EV = (80%) * $1,000,000, EV = 0.8 * $1,000,000, EV = $800,000
4	Cost Variance (CV)	CV = EV - AC	Cost Variance (CV) measures the cost performance by calculating the difference between earned value (EV) and actual cost (AC).	If EV = $10,000 and AC = $12,000, then CV = $10,000 - $12,000 = -$2,000.
5	Schedule Variance (SV)	SV = EV - PV	Schedule Variance (SV) assesses the schedule performance by finding the difference between earned value (EV) and planned value (PV).	If EV = $8,000 and PV = $10,000, then SV = $8,000 - $10,000 = -$2,000.
6	Earned Value Management (EVM)	CPI = EV / AC	Cost Performance Index (CPI) measures cost efficiency by comparing earned value (EV) to actual cost (AC).	If EV = $800 and AC = $1,000, then CPI = $800 / $1,000 = 0.8. (Overbudget)
7	Earned Value Management (EVM)	SPI = EV / PV	Schedule Performance Index (SPI) measures schedule efficiency by comparing earned value (EV) to planned value (PV).	If EV = $800 and PV = $1,000, then SPI = $800 / $1,000 = 0.8. (Behind schedule)
8	Estimate at Completion (EAC)- **Bad estimation**	EAC=AC+ETC	This formula calculates the Estimate at Completion when it's assumed that the current estimation was not accurate and cannot be used for the remaining works.	If BAC=$14,000, AC = $12,000, ETC = $4,000, then EAC = $12,000 + $4,000 = $16,000.
9	Estimate at Completion (EAC) - No Additional Variance – **budget rate**	EAC = AC + (BAC - EV)	This formula calculates the Estimate at Completion when it's assumed that the current variances will continue without any additional variances (parallel to budget).	If AC = $12,000, BAC = $20,000, and EV = $15,000, then EAC = $12,000 + ($20,000 - $15,000) = $17,000.
10	Estimate at Completion (EAC) – **Tough performance**	EAC = BAC/CPI	This formula estimates the EAC by assuming that the the project is difficult and performance will remain the same till end.	If BAC = $20,000 and CPI = 0.8, then EAC = $20,000 / 0.8] = $25,000.
11	Estimate at Completion (EAC) – **cost and schedule constraints**	EAC = AC + [(BAC - EV) / (CPI * SPI)]	In this equation, it's assumed that the remaining work will be performed at the cumulative Cost Performance Index CPI, in addition to	If AC = $12,000, BAC = $20,000, EV = $15,000, CPI = 1.25, and SPI = 0.9, then EAC = $12,000 + [($20,000 - $15,000) / (1.25 * 0.9)] = $19,200.

			having schedule or milestone constrains.	
12	To-Complete Performance Index (TCPI)	TCPI = (BAC - EV) / (BAC - AC)	TCPI predicts the required cost performance to achieve the project's budget at completion (BAC) based on the current performance. TCPI= Remaining Works / Remaining Money	If BAC = $100,000, EV = $20,000, and AC = $30,000, then TCPI = ($100,000 - $20,000) / ($100,000 - $30,000) = 1.25.
13	Three-Point Estimation (Simple Average)	TE = (O + M + P) / 3	Three-Point Estimation calculates the expected duration or cost by averaging optimistic (O), most likely (M), and pessimistic (P) estimates.	If O = 5 days, M = 10 days, and P = 20 days, then the Estimation = (5 + 10 + 20) / 3 = 11.6 days.
14	Three-Point Estimation (Beta – PERT- Weighted Average)	PERT Estimation = (O + 4M + P) / 6	Program Evaluation and Review Technique (PERT) estimation calculates expected duration using optimistic (O), most likely (M), and pessimistic (P) estimates.	If O = 5 days, M = 10 days, and P = 20 days, then PERT Estimation = (5 + 4 * 10 + 20) / 6 = 10.83 days.
15	Float (Total Float and Free Float)	Total Float = LF - EF or LS - ES	Total Float is the amount of time an activity can be delayed without delaying the project's completion date.	If LF = 33 and EF = 20, then Total Float = 33 - 20 = 13 days.
16	Probability and Impact Matrix (Risk Analysis)	Risk Score = Probability * Impact	The Risk Score helps prioritize risks based on their likelihood (Probability) and potential impact (Impact).	If Probability = 0.3 and Impact = 4, then Risk Score = 0.3 * 4 = 1.2.
17	Expected Monetary Value (EMV)	EMV = Probability * Impact	EMV is used to calculate the expected financial outcome of a risk by multiplying the Probability by the Impact.	If Probability = 0.4 and Impact (impact cost in case the risk happened) = $10,000, then EMV = 0.4 * $10,000 = $4,000.
18	Communication Channels	n(n-1) / 2	This formula calculates the total number of communication channels in a project with n stakeholders.	If there are 5 stakeholders, then the total channels = 5(5-1) / 2 = 10 channels. If there are 2 persons added then the total channels = 7(7-1) / 2 = 21 channels. And added channel are 21-10=11channels.
19	Present Value (PV) and Future Value (FV)	PV = FV / (1 + r)^n	PV calculates the current worth of a future sum of money (FV) considering a discount rate (r) and time (n) periods.	If FV = $5,000, r = 0.05, and n = 3 years, then PV = $5,000 / (1 + 0.05)^3 = $4,315.46.

20	Internal Rate of Return (IRR)	NPV = 0 = CF0 + (CF1 / (1 + IRR)) + (CF2 / (1 + IRR)^2) + ... + (CFn / (1 + IRR)^n)	NPV is used to determine the IRR, which is the discount rate at which the net present value (NPV) equals zero.	Solve for IRR when CF0 = -$10,000, CF1 = $3,000, CF2 = $4,000, and CF3 = $5,000.
21	Expected Monetary Value (EMV) for Decision Trees	EMV = Σ(Probability * Value)	EMV is used in decision tree analysis to calculate the expected value of various decision alternatives based on probabilities and values.	If Decision A has a Probability of 0.6 and Value of $10,000, and Decision B has a Probability of 0.4 and Value of $8,000, then EMV = (0.6 * $10,000) + (0.4 * $8,000) = $9,200.
22	Present Value of Annuity (PVA)	PVA = PMT * [(1 - (1 + r)^-n) / r]	PVA calculates the present value of a series of equal payments (PMT) made over time, considering a discount rate (r) and the number of periods (n).	If PMT = $1,000, r = 0.06, and n = 5 years, then PVA = $1,000 * [(1 - (1 + 0.06)^-5) / 0.06] = $4,212.74.
23	Standard Deviation (PERT Analysis)	Standard Deviation = (P - O) / 6	Standard Deviation in PERT analysis estimates the variability in project completion time based on optimistic (O) and pessimistic (P) estimates.	If O = 10 days and P = 20 days, then Standard Deviation = (20 - 10) / 6 = 1.67 days.
24	Benefit-Cost Ratio (BCR)	BCR = (PV of Benefits) / (PV of Costs)	BCR evaluates the profitability of an investment by comparing the present value of benefits to the present value of costs.	If PV of Benefits = $40,000 and PV of Costs = $30,000, then BCR = $40,000 / $30,000 = 1.33.
25	Return on Investment (ROI)	ROI = (Net Profit / Investment) * 100	ROI measures the profitability of an investment by calculating the percentage return relative to the initial investment.	If Net Profit = $20,000 and Investment = $50,000, then ROI = ($20,000 / $50,000) * 100 = 40%.
26	Work Performance Data (WPD)	WPD = Output from Executing a Process	WPD includes data on project work performance collected during the execution of project activities.	Examples of WPD include completed deliverables, test results, and issue logs.
27	Net Present Value (NPV)	NPV = ∑(Cash Flows / (1 + r)^n)	NPV evaluates the attractiveness of an investment by summing the present values of expected cash flows over time, considering a discount rate (r) and periods (n).	If cash flows for five years are -$5,000, $1,000, $2,000, $2,500, and $3,000 with a discount rate of 0.1 (10%), then NPV = -$5,000 / (1 + 0.1)^1 + $1,000 / (1 + 0.1)^2 + $2,000 / (1 + 0.1)^3 + $2,500 / (1 + 0.1)^4 + $3,000 / (1 + 0.1)^5 = $314.88.
28	Cost Performance Index (CPI)	CPI = EV / AC	Cost Performance Index (CPI) measures cost efficiency by calculating the ratio of earned value (EV) to actual cost (AC).	If EV = $15,000 and AC = $12,000, then CPI = $15,000 / $12,000 = 1.25.

29	Schedule Performance Index (SPI)	SPI = EV / PV	Schedule Performance Index (SPI) assesses schedule efficiency by finding the ratio of earned value (EV) to planned value (PV).	If EV = $9,000 and PV = $10,000, then SPI = $9,000 / $10,000 = 0.9.
30	Payback Period	Payback Period = Initial Investment / Annual Cash Flow	Payback Period calculates the time required to recover the initial investment based on annual cash flows.	If the initial investment is $50,000, and the annual cash flow is $20,000, then the Payback Period = $50,000 / $20,000 = 2.5 years.

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