

CFA LEVEL I • CALCULATOR GUIDE

HP 12C Calculator Guide

Every Keystroke for Every Calculation

Step-by-step HP 12C / 12C Platinum RPN keystrokes with verified worked examples across Quantitative Methods, Fixed Income, Equity, Portfolio Management, Corporate Issuers, Financial Statement Analysis and Derivatives.

11 Chapters • Hyperlinked Navigation • Keystroke Tables • Worked Examples

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Calculator Setup & RPN Essentials

Configure the HP 12C once, learn how RPN entry and the stack work, and the clearing keys every chapter relies on

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [One-Time Setup & Thinking in RPN](#)
- [Everyday Keys — Powers, Logs, Memory & Counting](#)

One-Time Setup & Thinking in RPN

SETUP

Four settings to fix before you study

Keystrokes	Display	What it means
Clear everything: [f] [CLEAR REG] (also do this at the exam start)	all registers 0	Wipes storage, stats, financial and stack registers
Clear the financial registers only: [f] [CLEAR FIN]	n i PV PMT FV = 0	Do this before EVERY TVM problem — old values linger otherwise
Decimal places: [f] [4] (or [f] [9] for maximum precision)	4 (or 9) decimals shown	More decimals avoid rounding traps in multi-step problems
Ordinary annuity (END): [g] [END]	no “BEGIN” shown	A small “BEGIN” annunciator means annuity-due mode is still on

KEY-WORD CLUSTER

RPN — there is no [=] key

How RPN works

Type the FIRST number, press **[ENTER]** to push it onto the stack, type the SECOND number, then press the operator (**[+]** **[−]** **[×]** **[÷]**).

Example: $3 + 2 \times 4 \rightarrow$ key 3 **[ENTER]** 2 **[ENTER]** 4 **[×]** **[+]** = 11 — RPN always evaluates strictly left to right, so there is no BODMAS ambiguity to worry about.

Everyday clearing

[CLx] clears only the display / X-register (like a backspace)

[CHS] changes the sign of the number in the display

[STO] n / [RCL] n store to or recall from registers 0–9

EXAM TIP Sign convention is unchanged from any financial calculator: cash you pay out is negative, cash you receive is positive.



Everyday Keys — Powers, Logs, Memory & Counting

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KEY FUNCTIONS

Keystrokes you will use in every subject

Function	Keystrokes	Example	Result
Power y^x (base, then exponent)	1.05 [ENTER] 3 [y ^x]	1.05 ³	1.157625
n-th root (power 1/n)	1.012 [ENTER] 3 [1/x] [y ^x]	$\sqrt[3]{1.012}$	1.003984
Square root	188.8 [g] [√x]	√188.8	13.7405
Exponential e^x	0.36 [g] [e ^x]	e ^{0.36}	1.433329
Natural log	1.12 [g] [LN]	ln(1.12)	0.113329
Reciprocal	20 [1/x]	1 ÷ 20	0.05
Store / recall memory	25.92 [STO] ... [RCL]	register 1 = 25.92	Ten registers: 0 – 9
Swap X and Y (check the stack)	[x↔y]	—	Brings the previous entry back to the display
Roll the stack down	[R↓]	—	Cycles T → Z → Y → X into view
Factorial (Platinum)	5 [g] [n!]	5!	120
Combinations without n! (any 12C): choose 3 of 10	10 [ENTER] 9 [×] 8 [×] 3 [ENTER] [g] [n!] [÷]	${}_{10}C_3 = (10 \times 9 \times 8) \div 3!$	120
Days between two dates	DT1 [ENTER] DT2 [g] [ΔDYS]	dates as MM.DDYYYY	actual and 30/360 day counts shown
View a stored register	[RCL] n	n = 0 ... 9	Clear all with [f] [CLEAR REG]

EXAM TIP The 12C has no permutation key — build nPr the same way: (10 × 9 × 8) for ${}_{10}P_3 = 720$, without dividing by 3!.

2

Time Value of Money

The n , i , PV, PMT, FV keys: present value, future value, payments, rates and periods — plus discrete, continuous and effective-rate conversions

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [The TVM Keys — Solving for PV and FV](#)
- [Solving for Payment \(PMT\), Rate \(\$i\$ \) and Periods \(\$n\$ \)](#)
- [Annuity Due, Perpetuities & Deferred Cash Flows](#)
- [Discrete Compounding — Effect of Compounding Frequency](#)
- [Continuous Compounding — \$e^x\$ and LN](#)
- [Nominal \$\rightleftharpoons\$ Effective Rates — Direct Stack Arithmetic](#)

The TVM Keys — Solving for PV and FV

FORMULA

$$PV = FV \div (1 + r)^N$$
$$PV \text{ of annuity} = PMT \times (1 - (1 + r)^{-N}) \div r$$

Key any four of n, i, PV, PMT, FV → press the fifth key to solve

NUMERICAL EXAMPLE

PV of a lump sum: ₹10,000 in 5 years @ 8%

Keystrokes	Display / Result
[f] [CLEAR FIN]	0
5 [n]	n = 5
8 [i]	i = 8
10000 [FV]	FV = 10,000
0 [PMT]	PMT = 0
[PV]	PV = -6,805.83

NUMERICAL EXAMPLE

FV of ₹2,000 at the end of each year, 10 yrs @ 7%

Keystrokes	Display / Result
[f] [CLEAR FIN]	0
10 [n]	n = 10
7 [i]	i = 7
2000 [CHS] [PMT]	PMT = -2,000
0 [PV]	PV = 0
[FV]	FV = 27,632.90

KEY-WORD CLUSTER

Reading the TVM keys

- ✦ n = number of periods; i = rate per period in percent (type 8, not 0.08); **PMT** = level payment each period.
- ✦ PV comes out negative because it is the cash you pay today to receive the positive FV — just ignore the sign when reporting.
- ✦ There is no P/Y setting on the 12C: n and i are ALWAYS the number of periods and the periodic rate — you convert the frequency yourself before keying them in.

Solving for Payment (PMT), Rate (i) and Periods (n)

PMT

Home loan EMI

₹5,00,000 loan, 9% p.a., monthly payments for 20 years

Keystrokes	Display / Result
[f] [CLEAR FIN]	0
240 [n]	n = 240
9 [ENTER] 12 [÷] [i]	i = 0.75
500000 [PV]	PV = 5,00,000
0 [FV]	FV = 0
[PMT]	PMT = -4,498.63

i

Implied return

Pay ₹800 today, receive ₹1,200 in 6 years. What annual return?

Keystrokes	Display / Result
[f] [CLEAR FIN]	0
6 [n]	n = 6
800 [CHS] [PV]	PV = -800
0 [PMT]	PMT = 0
1200 [FV]	FV = 1,200
[i]	i = 6.99%

n

Doubling time

How many years for money to double at 9% p.a.?

Keystrokes	Display / Result
[f] [CLEAR FIN]	0
9 [i]	i = 9
1 [CHS] [PV]	PV = -1
0 [PMT]	PMT = 0
2 [FV]	FV = 2
[n]	n = 8.04 years

KEY-WORD CLUSTER

Non-annual periods & the stack trap

- ✦ Monthly / quarterly / semi-annual: $n = \text{years} \times m$ and $i = \text{annual rate} \div m$, keyed as rate [ENTER] m [÷] [i] so the division happens before the rate is stored.
- ✦ A computed i is a *periodic* rate — multiply it by m to report the stated annual rate.
- ✦ If PV and FV are keyed with the SAME sign and no PMT, the 12C returns a wrong or error result — flip the sign of one leg.
- ✦ Rule of 72 sanity check: $72 \div 9 \approx 8$ years, close to the exact 8.04.

Annuity Due, Perpetuities & Deferred Cash Flows

FORMULA

$$PV(\text{annuity due}) = PV(\text{ordinary annuity}) \times (1 + r)$$

NUMERICAL EXAMPLE

₹1,000 at the **START** of each year, 5 yrs @ 10%

Keystrokes	Display / Result
[g] [BEGIN]	"BEGIN" on screen
[f] [CLEAR FIN]	0
5 [n] 10 [i]	n = 5, i = 10
1000 [CHS] [PMT] 0 [FV]	PMT = -1,000
[PV]	PV = 4,169.87

EXAM TIP Check: END-mode $PV = 3,790.79 \times 1.10 = 4,169.87$. Press [g] [END] immediately afterwards!

FORMULA

$$\text{Perpetuity: } PV = PMT \div r \quad \text{Growing: } PV = C_1 \div (r - g)$$

NUMERICAL EXAMPLE

Preferred share & deferred perpetuity

Problem	Keystrokes	Result
₹5 dividend forever, $r = 8\%$	5 [ENTER] 0.08 [÷]	62.50
Same ₹5 but first payment at $t = 4$ (value at $t = 3$, then discount 3 years)	5 [ENTER] 0.08 [÷] 1.08 [ENTER] 3 [CHS] [y^x] [$\times$]	49.61
₹5 next year growing 3%, $r = 8\%$	5 [ENTER] 0.08 [ENTER] 0.03 [-] [÷]	100.00

EXAM TIP A perpetuity valued with $PMT \div r$ lands one period BEFORE the first payment — discount from there.

Discrete Compounding — Effect of Compounding Frequency

FORMULA

$$FV = PV \times (1 + r_s \div m)^{(m \times N)}$$

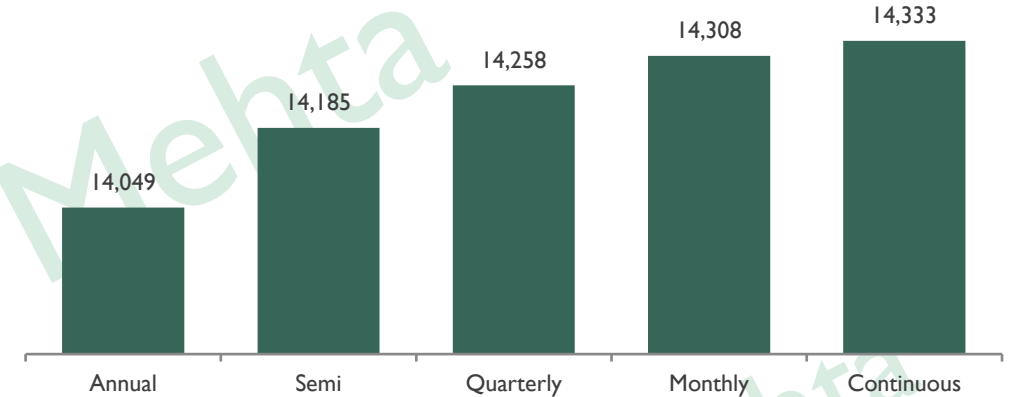
$$EAR = (1 + r_s \div m)^m - 1$$

NUMERICAL EXAMPLE

₹10,000 for 3 years at a stated 12% p.a.

FV of ₹10,000 after 3 years @ 12% stated

Keystrokes				Display / Result	
Monthly: [f][CLEAR FIN] 36 [n] 12 ENTER 12 ÷ [i] 10000 CHS [PV] 0 [PMT] [FV]				FV = 14,307.69	
Frequency	m	N	i	FV (₹)	EAR
Annual	1	3	12	14,049.28	12.0000%
Semi-annual	2	6	6	14,185.19	12.3600%
Quarterly	4	12	3	14,257.61	12.5509%
Monthly	12	36	1	14,307.69	12.6825%
Continuous	∞	—	—	14,333.29	12.7497%



EXAM TIP There is no P/Y shortcut on the 12C — always convert n and i to the actual compounding period yourself before keying them in.

Continuous Compounding — e^x and LN

FORMULA

$$FV = PV \times e^{(r \cdot t)} \quad PV = FV \times e^{(-r \cdot t)} \quad r_{cc} = \ln(1 + HPR) = \ln(S_1 \div S_0) \quad EAR = e^r - 1$$

NUMERICAL EXAMPLE

Five calculations you will meet in Quants, Portfolio Management and Derivatives

Problem	Keystrokes	Display	Answer
FV of ₹10,000 @ 12% cc for 3 years	0.12 [ENTER] 3 [*] [g] [e ^x] 10000 [*]	14,333.29	₹14,333.29
PV of ₹10,000 due in 4 years @ 8% cc	0.08 [ENTER] 4 [*] [CHS] [g] [e ^x] 10000 [*]	7,261.49	₹7,261.49
Continuously compounded return, price 50 → 56	56 [ENTER] 50 [÷] [g] [LN]	0.113329	11.33%
Effective annual rate of 12% cc	0.12 [g] [e ^x] 1 [-]	0.127497	12.75%
cc rate equivalent to an EAR of 10%	1.10 [g] [LN]	0.095310	9.53%

KEY-WORD CLUSTER

Why continuous compounding matters

- ✦ Continuously compounded returns are **additive over time**: $r(0,T) = r_1 + r_2 + \dots + r_T$, so a multi-period HPR = $e^{(\sum r)} - 1$.
- ✦ They underpin the lognormal price model (Quants) and continuous-time forward pricing, $F_0 = S_0 \times e^{(r \cdot T)}$ (Derivatives).
- ✦ The 12C has no interest-rate worksheet — e^x and LN are the only tools you need, keyed directly on the stack.

Nominal ⇌ Effective Rates — Direct Stack Arithmetic

FORMULA

$$EFF = (1 + NOM \div C)^C - 1$$

$$NOM = C \times [(1 + EFF)^{(1 \div C)} - 1]$$

NOM → EFF

12% compounded monthly

Keystrokes	Display / Result
1 [ENTER] 0.12 [ENTER] 12 [÷] [+]	1.01
12 [y ^x]	1.126825
1 [-]	EFF = 12.6825%

EFF → NOM

EAR 10.25%, semi-annual compounding

Keystrokes	Display / Result
1 [ENTER] 0.1025 [+]	1.1025
2 [1/x] [y ^x]	1.050000
1 [-] 2 [×]	NOM = 10.0000%

NUMERICAL EXAMPLE

Two-step conversion between frequencies

Task	Step 1 (NOM → EFF)	Step 2 (EFF → NOM)	Answer
8% compounded semi-annually → equivalent quarterly stated rate	1 ENTER .08 ENTER 2 ÷ + 2 y ^x 1 − → 8.16%	1 ENTER .0816 + 4 1/x y ^x 1 − ×4	7.9216%
Bond-equivalent yield 6.0086% → effective annual yield	1 ENTER .060086 ENTER 2 ÷ + 2 y ^x 1 −	—	6.0989%

EXAM TIP There is no dedicated worksheet — but the stack means you never retype a number: the EFF result sits ready for the next step.

3

Cash Flow Registers — NPV & IRR

Uneven cash flows for capital budgeting, portfolio returns and equity valuation using CF_0 , CF_j , N_j , NPV and IRR

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [NPV & IRR with the Cash Flow Registers](#)
- [Repeating Cash Flows \(\$N_j\$ \), Money-Weighted & Time-Weighted Returns](#)

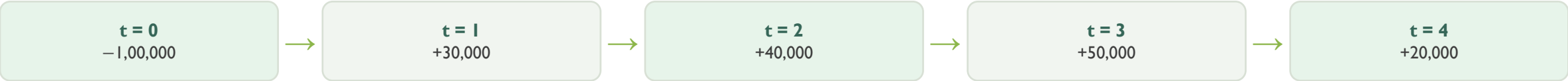
NPV & IRR with the Cash Flow Registers

FORMULA

NPV = $\sum CF_t \div (1 + r)^t$

IRR = the discount rate at which NPV = 0

PI = PV of inflows $\div$ initial outlay = $1 + NPV \div |CF_0|$



NUMERICAL EXAMPLE

Project cash flows, cost of capital 10%

Keystrokes	Display	What it means
[f] [CLEAR REG]	0	Clear all registers first
100000 [CHS] [g] [CF ₀]	CF0 = −100,000	Initial outlay
30000 [g] [CF ₁]	CF1 = 30,000	Each distinct flow gets its own [g][CF _i]
40000 [g] [CF ₂]	CF2 = 40,000	
50000 [g] [CF ₃]	CF3 = 50,000	
20000 [g] [CF ₄]	CF4 = 20,000	
10 [i] [f] [NPV]	NPV = 11,556.59	i = 10 (percent)
[f] [IRR]	IRR = 15.32	15.32% > 10% → accept

KEY-WORD CLUSTER

Decision rules

- ✦ NPV > 0 → accept; the project adds value.
- ✦ IRR > cost of capital → accept.
- ✦ PI = $1 + 11,556.59 \div 1,00,000 = 1.1156 > 1 \rightarrow$ accept.
- ✦ Mutually exclusive projects that conflict: choose the **higher NPV**.
- ✦ Payback = $2 + 30,000 \div 50,000 = 2.6$ years; discounted payback ≈ 3.15 years.

Repeating Cash Flows (N_j), Money-Weighted & Time-Weighted Returns

NUMERICAL EXAMPLE

Repeating cash flows with N_j

CF₀ = −50,000; ₹8,000 each year for years 1–5; ₹20,000 in year 6; r = 8%

Keystrokes	Display / Result
[f] [CLEAR REG]	0
50000 [CHS] [g] [CF ₀]	CF0 = −50,000
8000 [g] [CF _j]	CF1 = 8,000
5 [g] [N _j]	repeats 5 times
20000 [g] [CF _j]	CF6 = 20,000
8 [i] [f] [NPV]	NPV = −5,454.93
[f] [IRR]	IRR = 4.76%

EXAM TIP N_j = how many times in a row the PRECEDING CF_j repeats. Saves keystrokes and errors.

NUMERICAL EXAMPLE

Money-weighted return (MWRR) = IRR

Buy 1 share @ 100 (t₀); buy 1 more @ 120 (t₁); ₹2 dividend per share each year; sell both @ 130 (t₂)

Time	Investor cash flow	CF entry
t = 0	−100	CF0 = −100
t = 1	−120 + 2 = −118	CF1 = −118
t = 2	2 × (130 + 2) = +264	CF2 = 264

Keystrokes	Display / Result
100 [CHS] [g] [CF ₀] 118 [CHS] [g] [CF _j] 264 [g] [CF _j] [f] [IRR]	MWRR = 13.86%

FORMULA

Time-weighted return (TWRR)

$HPR_1 = (120 + 2 - 100) \div 100 = 22\%$ $HPR_2 = (130 + 2 - 120) \div 120 = 10\%$

Keystrokes	Display / Result
1.22 [ENTER] 1.10 [×] [g] [√x] 1 [−]	TWRR = 15.84%

4

Statistics & Probability

The Σ^+ statistics registers for mean, variance, standard deviation, covariance, correlation and regression — plus means, counting and the binomial

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [One-Variable Statistics — Mean, Variance & Standard Deviation](#)
- [Probability-Weighted Expected Return & Standard Deviation](#)
- [Two-Variable Statistics — Covariance, Correlation & Regression](#)
- [Geometric & Harmonic Means, Counting Rules and the Binomial](#)

NUMERICAL EXAMPLE

Annual returns (%): 12, −5, 8, 15, 3

Keystrokes	Display	What it means
[f] [CLEAR Σ]	n = 0	Clear the statistics registers
12 [Σ+]	n = 1	Each value entered then [Σ+]
5 [CHS] [Σ+]	n = 2	
8 [Σ+] 15 [Σ+] 3 [Σ+]	n = 5	
[g] [x]	$\bar{x} = 6.60$	Mean return 6.60%
[g] [s]	Sx = 7.8930	SAMPLE standard deviation (the 12C does not give population σ)
[x²]	62.30	Sample variance (%)

FORMULA

$$s^2 = \Sigma(X_i - \bar{X})^2 \div (n - 1)$$

KEY-WORD CLUSTER

- ✦ The 12C's [g][s] key gives the **sample** standard deviation only — for a population σ, multiply by $\sqrt{((n-1) \div n)}$.
- ✦ Coefficient of variation = $Sx \div \bar{x} = 7.8930 \div 6.60 = 1.196$.
- ✦ 95% CI for the mean: $6.60 \pm 1.96 \times 7.893 \div \sqrt{5} = 6.60 \pm 6.92$.
- ✦ Always [f] [CLEAR Σ] first — the statistics registers keep old values otherwise.

Probability-Weighted Expected Return & Standard Deviation

FORMULA

$$E(R) = \sum p_i \times R_i$$

$$\sigma^2 = \sum p_i \times (R_i - E(R))^2$$

NUMERICAL EXAMPLE

Economic scenarios

Scenario	Probability	Return
Boom	30%	20%
Normal	50%	10%
Recession	20%	−5%

EXAM TIP The I2C has no frequency-weighted data entry — key each return as many separate entries as its probability allows (e.g. in tenths), or simply compute $E(R)$ and σ^2 directly on the stack as shown.

MANUAL CHECK (direct stack arithmetic)

Keystrokes	Display / Result
0.3 [ENTER] 20 [×] 0.5 [ENTER] 10 [×] [+] 0.2 [ENTER] 5 [CHS] [×] [+]	$E(R) = 10.00\%$
0.3 [ENTER] 10 [ENTER] [x²] [×] 0.5 [ENTER] 0 [x²] [×] [+] 0.2 [ENTER] 15 [x²] [×] [+]	$\sigma^2 = 75.00 (\%)^2$
[g] [√x]	$\sigma = 8.66\%$

ALTERNATIVE

Using $\Sigma+$ with a weighted trick (10 entries)

♦ Enter the return once for every 10% of probability it carries: 20 three times (30%), 10 five times (50%), −5 twice (20%) — 10 entries total.

Keystrokes	Display / Result
[f] [CLEAR Σ]	$n = 0$
20 [$\Sigma+$] 20 [$\Sigma+$] 20 [$\Sigma+$]	$n = 3$
10 [$\Sigma+$] 10 [$\Sigma+$] 10 [$\Sigma+$] 10 [$\Sigma+$] 10 [$\Sigma+$]	$n = 8$
5 [CHS] [$\Sigma+$] 5 [CHS] [$\Sigma+$]	$n = 10$
[g] [x]	$\bar{x} = 10.00 = E(R)$
[g] [s]	$s = 9.13$ (SAMPLE, $n-1$ basis)

EXAM TIP [g][s] gives the sample ($n-1$) statistic — to match the population $\sigma = 8.66\%$ shown on the left, multiply 9.13 by $\sqrt{9 \div 10} = 8.66$.

Two-Variable Statistics — Covariance, Correlation & Regression

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NUMERICAL EXAMPLE

Monthly returns (%): Market X = 5, −2, 8, 3, −4, 6; Stock Y = 7, −4, 11, 2, −6, 9

Keystrokes	Display	What it means
[f] [CLEAR Σ]	n = 0	
7 [ENTER] 5 [Σ+]	n = 1	Y value FIRST, then X, then [Σ+]
4 [CHS] [ENTER] 2 [CHS] [Σ+]	n = 2	
11 [ENTER] 8 [Σ+] 2 [ENTER] 3 [Σ+] 6 [CHS] [ENTER] 4 [CHS] [Σ+] 9 [ENTER] 6 [Σ+]	n = 6	Remaining 4 pairs
[g] [x̄]	$\bar{x} = 2.6667$	Mean of X (press [x̄y] for $\bar{y} = 3.1667$)
[g] [s]	$S_x = 4.7188$	Press [x̄y] for $S_y = 7.0261$
4 [g] [ŷ,r]	$\hat{y} = 5.1347$	Forecast Y when X = 4%
[x̄y]	$r = 0.9913$	Correlation (appears after $\hat{y}$)

FORMULA

$$\text{Cov}(X,Y) = r \times S_x \times S_y$$
$$b = \text{Cov} \div S_x^2 \qquad a = \bar{y} - b \times \bar{x}$$
$$R^2 = r^2$$

KEY-WORD CLUSTER

Back out slope, intercept & covariance

Keystrokes	Display / Result
0.9913 [ENTER] 4.7188 [×] 7.0261 [×]	Cov = 32.8667
[RCL] [÷] 4.7188 [ENTER] [x²] [÷]	b = 1.4760 (slope = beta)
3.1667 [ENTER] 1.4760 [ENTER] 2.6667 [×] [−]	a = −0.7695 (intercept)
0.9913 [x²]	R² = 0.9827

Geometric & Harmonic Means, Counting Rules and the Binomial

KEY FORMULAS		Everything solved directly on the RPN stack		
Measure	Formula	Keystrokes	Result	
Geometric mean return (10%, −20%, 15%)	$(1+R_1)(1+R_2)(1+R_3)^{(1/3)} - 1$	1.10 [ENTER] 0.80 [*] 1.15 [*] 3 [1/x] [y ^x] 1 [−]	0.40%	
Arithmetic mean (same returns)	$\Sigma R \div n$	10 [ENTER] 20 [CHS] [+] 15 [+] 3 [÷]	1.67%	
Harmonic mean (cost averaging: ₹20, ₹25, ₹40)	$n \div \Sigma (1 \div X_i)$	20 [1/x] [ENTER] 25 [1/x] [+] 40 [1/x] [+] 1/x] 3 [*]	₹26.09	
Combinations (choose 3 of 10) — no nCr key	$(n \times (n-1) \times \dots) \div r!$	10 [ENTER] 9 [*] 8 [*] 3 [ENTER] 2 [*] 1 [*] [÷]	120	
Permutations (order 3 of 10) — no nPr key	$n \times (n-1) \times (n-2)$	10 [ENTER] 9 [*] 8 [*]	720	
Binomial: P(X = 3), n = 5, p = 0.4	${}_nC_x p^x (1 - p)^{n-x}$	10 [*] 0.4 [ENTER] 3 [y ^x] [*] 0.6 [ENTER] 2 [y ^x] [*]	0.2304	
Binomial mean & variance	np ; $np(1 - p)$	5 [ENTER] 0.4 [*] ; 0.4 [ENTER] 0.6 [*] 5 [*]	2.0 ; 1.2	

EXAM TIP Arithmetic mean ≥ geometric mean ≥ harmonic mean (1.67% > 0.40% here). Use the geometric mean for multi-period compound growth.

5

Fixed Income

Bond prices, yields, spot and forward rates, amortization schedules, duration, convexity and money-market yields

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Bond Valuation — Price from Yield-to-Maturity](#)
- [Yield-to-Maturity & Yield Conventions](#)
- [Pricing Between Coupon Dates — Full Price, Accrued Interest & Flat Price](#)
- [Pricing with Spot Rates & Implied Forward Rates](#)
- [Amortizing Bonds & Loans — the AMORT Key](#)
- [Duration & Convexity — Approximation with the TVM Keys](#)
- [Money-Market Yields — Discount Rate, Add-On Rate & Periodicity](#)

Bond Valuation — Price from Yield-to-Maturity

FORMULA

$$PV = PMT \div (1 + r)^1 + PMT \div (1 + r)^2 + \dots + (PMT + FV) \div (1 + r)^N$$

NUMERICAL EXAMPLE

5-yr, 6% semi-annual coupon, par 1,000, YTM 7%

Keystrokes	Display	What it means
[f] [CLEAR FIN]	0	
10 [n]	n = 10	5 years × 2
7 [ENTER] 2 [÷] [i]	i = 3.5	YTM ÷ 2
30 [PMT]	PMT = 30	60 ÷ 2
1000 [FV]	FV = 1,000	
[PV]	PV = -958.42	Discount bond

KEY-WORD CLUSTER

Price–yield relationship (same bond)

YTM	i	Price	Trades at
5%	2.5	1,043.76	Premium
6%	3.0	1,000.00	Par
7%	3.5	958.42	Discount

- ✦ Coupon > YTM → premium; coupon = YTM → par; coupon < YTM → discount.
- ✦ Change only i and press **[PV]** again — n, PMT and FV stay stored.

EXAM TIP Semi-annual bonds: n = years × 2, i = YTM ÷ 2, PMT = annual coupon ÷ 2. Quarterly: × 4 and ÷ 4.

Yield-to-Maturity & Yield Conventions

[◀ Back to Index](#)

NUMERICAL EXAMPLE

YTM: 10-yr, 5% annual coupon, price 92.50

Keystrokes	Display / Result
[f] [CLEAR FIN]	0
10 [n] 5 [PMT] 100 [FV]	inputs
92.5 [CHS] [PV]	PV = -92.50
[i]	YTM = 6.02%

NUMERICAL EXAMPLE

Same bond paying semi-annually

Keystrokes	Display / Result
20 [n] 2.5 [PMT] 100 [FV] 92.5 [CHS] [PV]	inputs
[i]	3.0043 (per half-year)
[ENTER] 2 [×]	YTM = 6.0086% (BEY)

KEY-WORD CLUSTER

Other yield measures

Measure	Keystrokes	Result
Current yield = coupon ÷ price	5 [ENTER] 92.5 [÷]	5.41%
Zero-coupon YTM (5-yr, price 78.35)	5 [n] 78.35 [CHS] [PV] 100 [FV] 0 [PMT] [i]	5.00%
Effective annual yield from 6.0086% semi-annual	1 ENTER .060086 ENTER 2 ÷ + 2 y× 1 -	6.0989%

EXAM TIP The quoted YTM on a semi-annual bond is the periodic yield × 2 (semi-annual bond basis). Compare bonds only on the SAME periodicity.

Pricing Between Coupon Dates — Full Price, Accrued Interest & Flat Price

FORMULA

$$PV_Full = PV \text{ (at last coupon date)} \times (1 + r)^{(t \div T)} \qquad AI = (t \div T) \times PMT \qquad PV_Flat = PV_Full - AI$$

NUMERICAL EXAMPLE

6% semi-annual bond, 3 years (6 periods) left from last coupon, YTM 5%, 60 of 180 days elapsed (30/360)

Keystrokes	Display	What it means
[f] [CLEAR FIN] 6 [n] 2.5 [i] 3 [PMT] 100 [FV] [PV]	PV = −102.7541	Value at the last coupon date
[CHS] [ENTER] 1.025 [ENTER] 60 [ENTER] 180 [÷] [y ^x] [×]	103.6033	Full (dirty / invoice) price
3 [ENTER] 60 [ENTER] 180 [÷] [×]	1.0000	Accrued interest
103.6033 [ENTER] 1 [−]	102.6033	Flat (clean / quoted) price

KEY-WORD CLUSTER

Conventions

- ✦ Buyer pays the **full price**; dealers quote the **flat price**.
- ✦ Day count: actual/actual (government bonds); 30/360 (corporate bonds) — use [g] [ΔDYS] to count actual days between two keyed dates.

Pricing with Spot Rates & Implied Forward Rates

FORMULA

$$PV = PMT \div (1 + z_1) + PMT \div (1 + z_2)^2 + (PMT + FV) \div (1 + z_3)^3 \qquad (1 + z_2)^2 = (1 + z_1)(1 + 1y1y)$$

NUMERICAL EXAMPLE

3-yr 5% annual bond; spot rates 3%, 4%, 5%

Keystrokes	Display / Result
5 [ENTER] 1.03 [÷] [STO] 1	4.8544
5 [ENTER] 1.04 [ENTER] [x²] [÷] [STO] [+] 1	+ 4.6228
1.05 [ENTER] 3 [y ^x] [1/x] 105 [×] [STO] [+] 1	+ 90.7029
[RCL] 1	Price = 100.1801
3 [n] 5 [PMT] 100 [FV] 100.1801 [CHS] [PV] [i]	YTM = 4.93%

NUMERICAL EXAMPLE

Implied forward rates from the same curve

Forward	Keystrokes	Result
1y1y	1.04 [ENTER] [x²] 1.03 [÷] 1 [-]	5.01%
2y1y	1.05 [ENTER] 3 [y ^x] 1.04 [ENTER] [x²] [÷] 1 [-]	7.03%
1y2y (annualised)	1.05 [ENTER] 3 [y ^x] 1.03 [÷] [g] [√x] 1 [-]	6.01%

EXAM TIP A bond priced off the spot curve has ONE yield (4.93%) — a weighted blend of the spot rates, closest to the longest one because most cash comes at maturity.

Amortizing Bonds & Loans — the AMORT Key

NUMERICAL EXAMPLE

₹1,00,000 fully amortizing bond / loan, 8% p.a., 5 equal annual payments

Keystrokes	Display	What it means
[f] [CLEAR FIN] 5 [n] 8 [i] 100000 [PV] 0 [FV]		Step 1: load TVM
[PMT]	PMT = -25,045.65	Level annual payment
1 [f] [AMORT]	INT = -8,000.00	Step 2: interest for year 1
[x↔y]	PRN = -17,045.65	Principal repaid in year 1
[RCL] [PV]	BAL = 82,954.35	Balance remaining after year 1
1 [f] [AMORT] (press again)	INT = -6,636.35	Continues sequentially into year 2
3 [f] [AMORT]	INT = -19,799.95 (cum.)	Key 3 to amortize 3 years in one press, from wherever you left off

Year	Interest	Principal	Balance
1	8,000.00	17,045.65	82,954.35
2	6,636.35	18,409.30	64,545.06
3	5,163.60	19,882.04	44,663.02
4	3,573.04	21,472.60	23,190.41
5	1,855.23	23,190.41	0.00

EXAM TIP Key the number of periods before [f][AMORT] to amortize several periods at once — the 12C continues from whichever period it last stopped at, so run [f][CLEAR FIN] then reload n/i/PV/PMT/FV to restart from year 1.

✦ Each payment is identical; the interest share falls and the principal share rises every year.

Duration & Convexity — Approximation with the TVM Keys

FORMULA

$$\text{ApproxModDur} = (PV_- - PV_+) \div (2 \times \Delta Y \times PV_0) \quad \text{ApproxCon} = (PV_- + PV_+ - 2PV_0) \div ((\Delta Y)^2 \times PV_0)$$

$$\% \Delta PV \approx -\text{ModDur} \times \Delta Y + \frac{1}{2} \times \text{Con} \times (\Delta Y)^2$$

NUMERICAL EXAMPLE

5-yr 6% semi-annual bond, YTM 7%, $\Delta Y = 10$ bp

Keystrokes	Display / Result
Price at 7%: 10 [n] 3.5 [i] 30 [PMT] 1000 [FV] [PV] [CHS] [STO] 0	$PV_0 = 958.4170$
7.1 [ENTER] 2 [÷] [i] [PV] [CHS] [STO] 1	$PV_+ = 954.3737$
6.9 [ENTER] 2 [÷] [i] [PV] [CHS] [STO] 2	$PV_- = 962.4808$
[RCL] 2 [RCL] 1 [−] 2 [ENTER] .001 [×] [RCL] 0 [×] [÷]	ModDur = 4.2294
[RCL] 2 [RCL] 1 [+] [RCL] 0 2 [×] [−] .001 [x²] [RCL] 0 [×] [÷]	Convexity = 21.46

KEY-WORD CLUSTER

Using the results

- ✦ Macaulay $\approx \text{ModDur} \times (1 + r \div 2) = 4.2294 \times 1.035 = 4.38$ years.
- ✦ +100 bp shock: $-4.2294 \times 0.01 + \frac{1}{2} \times 21.46 \times 0.0001 = -4.12\%$.
- ✦ PVBP $\approx (PV_- - PV_+) \div 2 \div 10 = ₹0.405$ per 1 bp.
- ✦ Money duration = $\text{ModDur} \times PV_{\text{full}} = 4.2294 \times 958.42 \approx ₹4,053.5$.

EXAM TIP Store every intermediate PV in a register (STO 0, 1, 2 ...) — Convexity is extremely sensitive to rounding, and the stack alone cannot hold three values at once.

Money-Market Yields — Discount Rate, Add-On Rate & Periodicity

FORMULA

Discount basis: $PV = FV \times (1 - \text{Days} \div \text{Year} \times DR)$ Add-on basis: $AOR = (\text{Year} \div \text{Days}) \times (FV - PV) \div PV$

NUMERICAL EXAMPLE

180-day T-bill quoted at a 5% discount rate (360-day year), $FV = 100$

Keystrokes	Display	What it means
180 [ENTER] 360 [÷] 0.05 [×] [CHS] [+] 100 [×]	97.50	Price of the T-bill
100 [ENTER] 97.5 [÷] [−]	0.025641	Holding-period return (2.5641%)
365 [ENTER] 180 [÷] [×]	0.051994	Add-on yield, 365-day basis = 5.20%
1.025641 [ENTER] 365 [ENTER] 180 [÷] [y ^x] [−]	0.052680	Effective annual (compounded) = 5.27%

KEY-WORD CLUSTER

Why the three numbers differ

- ✦ The discount rate is based on FACE value (not price) and a 360-day year — it always understates the true return.
- ✦ The add-on rate uses the PRICE paid; the effective annual rate additionally assumes compounding, so $EAR > AOR > DR$.

6

Equity

Dividend discount models, multi-stage valuation with the cash flow registers, implied returns, multiples and margin transactions

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Dividend Discount Models — Gordon Growth, Preferred & Multiples](#)
- [Multi-Stage DDM with the Cash Flow Registers](#)
- [Margin Transactions, Leverage & Holding-Period Returns](#)

Dividend Discount Models — Gordon Growth, Preferred & Multiples

FORMULA

$$V_0 = D_1 \div (r - g) = D_0(1 + g) \div (r - g) \quad V_{\text{pref}} = D \div r \quad r = D_1 \div P_0 + g \quad g = b \times \text{ROE} \quad P_0 \div E_1 = (1 - b) \div (r - g)$$

NUMERICAL EXAMPLE

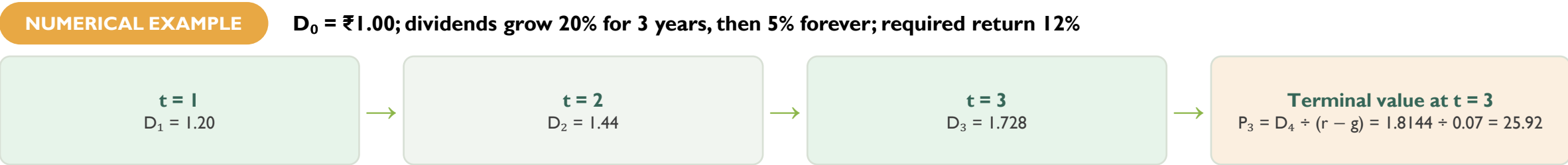
Five equity valuation calculations

Problem	Keystrokes	Result
Gordon growth: $D_0 = 2.00$, $g = 5\%$, $r = 10\%$	2 [ENTER] 1.05 [×] 0.10 [ENTER] 0.05 [−] [÷]	₹42.00
Preferred stock: ₹5 dividend, $r = 8\%$	5 [ENTER] 0.08 [÷]	₹62.50
Implied required return: $P_0 = 40$, $D_1 = 1.60$, $g = 6\%$	1.6 [ENTER] 40 [÷] 0.06 [+]	10.00%
Sustainable growth: ROE 15%, payout 40%	0.15 [ENTER] 1 [ENTER] 0.4 [−] [×]	9.00%
Justified forward P/E: payout 40%, $r = 12\%$, $g = 9\%$	0.4 [ENTER] 0.12 [ENTER] 0.09 [−] [÷]	13.33×

EXAM TIP The Gordon model needs NEXT year's dividend: multiply D_0 by $(1 + g)$ first. It only works when $r > g$.

Multi-Stage DDM with the Cash Flow Registers

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KEYSTROKES

Keystrokes	Display / Result
[f] [CLEAR REG]	CF0 = 0
0 [g] [CF ₀]	CF0 = 0
1.2 [g] [CF _j]	CF1 = 1.20
1.44 [g] [CF _j]	CF2 = 1.44
27.648 [g] [CF _j]	CF3 = 1.728 + 25.92
12 [i] [f] [NPV]	V ₀ = ₹21.90

KEY-WORD CLUSTER

Building the cash flows

- ◆ Terminal value: 1.728 [ENTER] 1.05 [*] 0.07 [÷] → **25.92** (use D_4 , not D_3).
- ◆ Put the terminal value in the SAME period as the last explicit dividend: $CF3 = D_3 + P_3 = 27.648$.
- ◆ $CF0 = 0$ because nothing is paid today; the NPV is the intrinsic value.
- ◆ Same method works for FCFE / FCFF models with a terminal value.



Margin Transactions, Leverage & Holding-Period Returns

FORMULA

$\text{Leverage ratio} = 1 \div \text{IM}$ $\text{Margin-call price} = P_0 \times (1 - \text{IM}) \div (1 - \text{MM})$ $\text{Return on equity} = (\text{Gain} + \text{Dividends} - \text{Interest}) \div \text{Equity}$

NUMERICAL EXAMPLE

Buy 100 shares @ ₹40; initial margin 50%; maintenance margin 25%

Item	Keystrokes	Result
Equity invested	100 [ENTER] 40 [*] 0.5 [*]	₹2,000
Leverage ratio	0.5 [1/x]	2.0×
Margin-call price	40 [ENTER] 1 [ENTER] 0.5 [-] [*] 1 [ENTER] 0.25 [-] [÷]	₹26.67
Return on equity if price rises to ₹44	44 [ENTER] 40 [-] 100 [*] 2000 [÷]	20% (vs. 10% unlevered)
Stock HPR: $P_0 = 50$, $P_1 = 54$, dividend 1	54 [ENTER] 50 [-] 1 [+] 50 [÷]	10%

EXAM TIP Leverage magnifies returns both ways: a 10% price fall would produce a –20% return on equity (before interest).

7

Portfolio Management

Return measures, two-asset portfolio risk, beta, CAPM and risk-adjusted performance ratios

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Return Measures — HPR, Annualised, Real & Portfolio Returns](#)
- [Two-Asset Portfolio Risk & Return](#)
- [Beta, CAPM & Risk-Adjusted Performance Measures](#)

Return Measures — HPR, Annualised, Real & Portfolio Returns

FORMULA

$$\text{HPR} = (P_1 - P_0 + D_1) \div P_0 \qquad R_{\text{annual}} = (1 + R_{\text{period}})^{(365 \div \text{days})} - 1 \qquad (1 + R_{\text{nominal}}) = (1 + R_{\text{real}})(1 + \pi)$$

NUMERICAL EXAMPLE

Return calculations tested every year

Problem	Keystrokes	Result
HPR: bought at 50, sold at 54, dividend 1	54 [ENTER] 50 [-] [+] 50 [÷]	10.00%
Annualise a 2% return earned over 45 days	1.02 [ENTER] 365 [ENTER] 45 [÷] [y ^x] [-]	17.42%
Real return: nominal 8%, inflation 3%	1.08 [ENTER] 1.03 [÷] [-]	4.85%
Portfolio return: 60% @ 10%, 40% @ 6%	0.6 [ENTER] 10 [×] 0.4 [ENTER] 6 [×] [+]	8.40%
Geometric mean return (10%, -20%, 15%)	1.1 [ENTER] 0.8 [×] 1.15 [×] 3 [1/x] [y ^x] [-]	0.40%
Multi-period cc return: 3%, -1%, 2% (cc)	0.03 [ENTER] 0.01 [-] 0.02 [+] [g] [e ^x] [-]	HPR 4.08%

EXAM TIP Money-weighted vs time-weighted returns use the cash-flow registers — see Chapter 3.



Two-Asset Portfolio Risk & Return

FORMULA

$$\sigma_p^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\rho_{12}\sigma_1\sigma_2$$

$$\text{Cov}_{12} = \rho_{12}\sigma_1\sigma_2$$

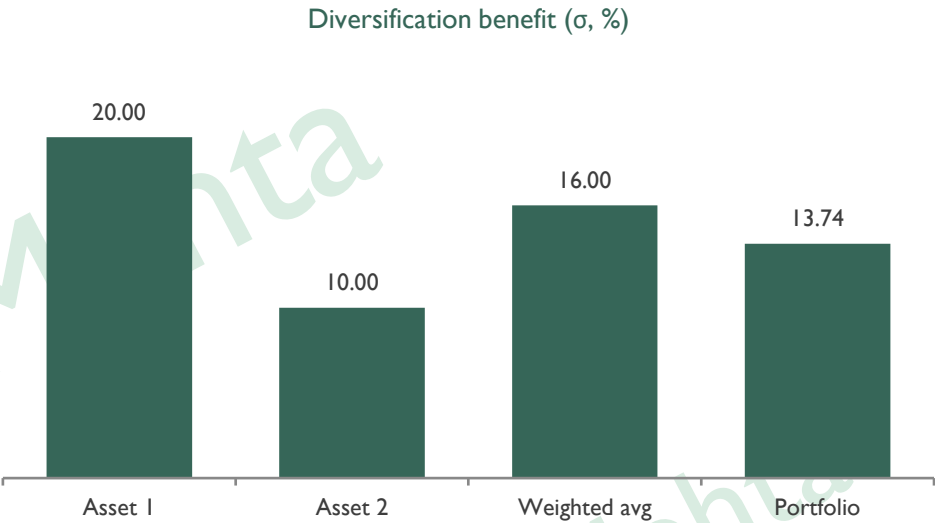
$$E(R_p) = w_1E(R_1) + w_2E(R_2)$$

NUMERICAL EXAMPLE

w = 60% / 40%; E(R) = 10% / 6%; σ = 20% / 10%; ρ = 0.3

Keystrokes	Display / Result
0.6 [x²] 20 [x²] [*] 0.4 [x²] 10 [x²] [*] [+] 2 [ENTER] 0.6 [*] 0.4 [*] 0.3 [*] 20 [*] 10 [*] [+]	$\sigma_p^2 = 188.80 \text{ (\%}^2\text{)}$
[g] [√x]	$\sigma_p = 13.74\%$
0.6 [ENTER] 10 [*] 0.4 [ENTER] 6 [*] [+]	$E(R_p) = 8.40\%$
0.3 [ENTER] 20 [*] 10 [*]	$\text{Cov} = 60 \text{ (\%}^2\text{)}$
8.4 [ENTER] 3 [-] 13.74 [÷]	$\text{Sharpe (Rf 3\%)} = 0.393$

EXAM TIP Work in percent throughout (20, not 0.20) — variance is then in %². Mixing units is the classic error.



Beta, CAPM & Risk-Adjusted Performance Measures

NUMERICAL EXAMPLE

Portfolio: $R_p = 12\%$, $\sigma_p = 15\%$, $\beta_p = 1.2$; Market: $R_m = 9\%$, $\sigma_m = 12\%$; $R_f = 3\%$

Measure	Formula	Keystrokes	Result
Beta ($\rho = 0.7$, $\sigma_i = 25\%$, $\sigma_m = 15\%$)	$\beta_i = \rho \sigma_i \div \sigma_m = \text{Cov} \div \sigma_m^2$	0.7 [ENTER] 25 [*] 15 [÷]	1.1667
CAPM required return	$R_f + \beta(R_m - R_f)$	3 [ENTER] 1.2 [ENTER] 9 [ENTER] 3 [-] [*] [+]	10.20%
Sharpe ratio	$(R_p - R_f) \div \sigma_p$	12 [ENTER] 3 [-] 15 [÷]	0.60
Treynor ratio	$(R_p - R_f) \div \beta_p$	12 [ENTER] 3 [-] 1.2 [÷]	7.50
Jensen's alpha	$R_p - \text{CAPM return}$	12 [ENTER] 10.2 [-]	1.80%
M ² (M-squared)	$(R_p - R_f) \sigma_m \div \sigma_p - (R_m - R_f)$	9 [ENTER] 15 [÷] 12 [*] 6 [-]	1.20%

KEY-WORD CLUSTER

Which risk measure?

Total risk (σ)

Sharpe ratio and M² — same ranking; use when the portfolio is the investor's whole wealth.

Systematic risk (β)

Treynor ratio and Jensen's alpha — use for a well-diversified portfolio that is part of a larger whole.

8

Corporate Issuers

Cost of debt, equity and preferred, WACC, capital budgeting shortcuts and the cost of trade credit

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Cost of Capital — Debt, Equity, Preferred & WACC](#)
- [Capital Budgeting Shortcuts & the Cost of Trade Credit](#)

Cost of Capital — Debt, Equity, Preferred & WACC

[◀ Back to Index](#)

FORMULA

$$WACC = w_d \times r_d \times (1 - t) + w_p \times r_p + w_e \times r_e \qquad r_e = R_f + \beta \times ERP \qquad r_p = D_p \div P_p$$

NUMERICAL EXAMPLE

Weights: debt 40%, equity 60%; tax rate 25%

Component	Keystrokes	Result
Pre-tax cost of debt: 10-yr 7% annual bond priced at 95	10 [n] 95 [CHS] [PV] 7 [PMT] 100 [FV] [i]	7.7363%
After-tax cost of debt	0.75 [×]	5.8023%
Cost of equity (CAPM): Rf 4%, β 1.1, ERP 6%	4 [ENTER] 1.1 [ENTER] 6 [×] [÷]	10.60%
Cost of preferred: ₹6 dividend, price ₹75	6 [ENTER] 75 [÷]	8.00%
Bond-yield-plus-risk-premium (3%)	7.7363 [ENTER] 3 [÷]	10.74%
WACC	0.4 [ENTER] 7.7363 [×] 0.75 [×] 0.6 [ENTER] 10.6 [×] [÷]	8.68%

Cost of debt = YTM

Use the market YTM on existing debt, not the coupon rate. Solve it with the TVM keys [i] and multiply by (1 – t).

Weights

Use target (or market-value) weights, not book values.

EXAM TIP Store r_d in a register: [STO] 1 after [i], then use [RCL] 1 in the WACC line.

Capital Budgeting Shortcuts & the Cost of Trade Credit

FORMULA

Cost of trade credit = $(1 + \text{Discount} \div (1 - \text{Discount}))^{(365 \div \text{days beyond discount period})} - 1$

NUMERICAL EXAMPLE

Terms “2/10, net 30” — forgo the discount?

Keystrokes	Display / Result
2 [ENTER] 98 [÷] 1 [+]	1.020408
365 [ENTER] 20 [÷] [y ^x]	1.445853
1 [-]	44.59%

EXAM TIP Days beyond discount = 30 – 10 = 20. If you can borrow below 44.59%, take the discount.

NUMERICAL EXAMPLE

Discounted payback for the Chapter 3 project (r = 10%)

Year	CF	PV (CF ÷ 1.1 ^t)	Cumulative
1	30,000	27,272.73	–72,727.27
2	40,000	33,057.85	–39,669.42
3	50,000	37,565.74	–2,103.68
4	20,000	13,660.27	+11,556.59

Keystrokes	Display / Result
3 [ENTER] 2103.68 [ENTER] 13660.27 [÷] [+]	3.15 years

9

Financial Statement Analysis

Depreciation schedules, effective-interest bond accounting, lease liabilities and growth rates

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Depreciation — Straight-Line, Double-Declining & Sum-of-Years'-Digits](#)
- [Bonds Issued at a Discount — Effective Interest Method](#)
- [Lease Liabilities, Growth Rates & Present Values in FSA](#)

Depreciation — Straight-Line, Double-Declining & Sum-of-Years'-Digits

NUMERICAL EXAMPLE

Cost ₹50,000; salvage ₹5,000; useful life 5 years

Keystrokes	Display	What it means
Depreciable base: 50000 [ENTER] 5000 [−]	45,000	Cost — salvage
Straight-line: 45000 [ENTER] 5 [÷]	9,000 / yr	Same every year
DDB rate: 2 [ENTER] 5 [÷]	0.40	200% ÷ life
Yr-1 DDB: 50000 [ENTER] 0.4 [×]	20,000	On opening BOOK value, salvage ignored
Yr-2 DDB: 30000 [ENTER] 0.4 [×]	12,000	Opening value = 50,000 — 20,000
SYD denominator: 5 [ENTER] 6 [×] 2 [÷]	15	$n(n+1) \div 2$
Yr-1 SYD: 45000 [ENTER] 5 [ENTER] 15 [÷] [×]	15,000	Base × remaining life ÷ SYD

Year	Straight-line	DDB (200%)	SYD
1	9,000	20,000	15,000
2	9,000	12,000	12,000
3	9,000	7,200	9,000
4	9,000	4,320	6,000
5	9,000	1,480*	3,000
Total	45,000	45,000	45,000

- ♦ $SL = (Cost - Salvage) \div Life$. $DDB = (2 \div Life) \times opening\ book\ value$, ignoring salvage — but never below it.
- ♦ *Year 5 DDB is capped at $6,480 - 5,000 = 1,480$; watch the running book value.
- ♦ $SYD\ year\ 1 = 45,000 \times 5 \div 15$; repeat with the remaining life for each later year.

EXAM TIP Every step above is plain stack arithmetic — the 12C has no dedicated depreciation worksheet, so build each year with [ENTER], [×] and [−] as shown.

Bonds Issued at a Discount — Effective Interest Method

NUMERICAL EXAMPLE

3-year 5% annual-coupon bonds, face ₹1,00,000, market rate 6% at issue

Keystrokes	Display	What it means
[f] [CLEAR FIN] 3 [n] 6 [i] 5000 [PMT] 100000 [FV] [PV]	PV = −97,326.99	Issue proceeds = initial carrying value
97326.99 [ENTER] 0.06 [×]	5,839.62	Year-1 interest expense (market rate × carrying value)
2 [n] [PV]	PV = −98,166.61	Shortcut: closing carrying value = PV of remaining flows

Year	Opening CV	Interest expense (6%)	Coupon paid (5%)	Discount amortised	Closing CV
1	97,326.99	5,839.62	5,000.00	839.62	98,166.61
2	98,166.61	5,890.00	5,000.00	890.00	99,056.60
3	99,056.60	5,943.40	5,000.00	943.40	1,00,000.00

KEY-WORD CLUSTER

What the analyst tests

- ✦ Interest expense = market rate at issue × opening carrying value; coupon paid = coupon rate × face.
- ✦ Discount bond: interest expense > coupon, carrying value rises to par. Premium bond: the reverse.
- ✦ Cash flow statement: coupon paid (not interest expense) is the operating (US GAAP) outflow.



Lease Liabilities, Growth Rates & Present Values in FSA

NUMERICAL EXAMPLE

Lessee: 5 annual payments of ₹10,000 IN ADVANCE, rate 7%

Keystrokes	Display / Result
[g] [BEGIN]	BEGIN
[f] [CLEAR FIN] 5 [n] 7 [i]	
10000 [CHS] [PMT] 0 [FV]	
[PV]	Liability = 43,872.11
[ENTER] 10000 [-] 0.07 [×]	Yr-1 interest = 2,371.05

EXAM TIP Payments in advance → [g] [BEGIN] mode. The first payment reduces the liability immediately, so year-1 interest is on 33,872.11. Press [g] [END] afterwards.

NUMERICAL EXAMPLE

Compound annual growth rate (CAGR)

Revenue grew from ₹120 crore to ₹180 crore over 4 years

Keystrokes	Display / Result
[f] [CLEAR FIN] 4 [n]	
120 [CHS] [PV] 180 [FV] 0 [PMT]	
[i]	CAGR = 10.67%

Direct stack alternative	Display
180 [ENTER] 120 [÷] 4 [1/x] [y ^x] 1 [-]	0.1067

✦ Same approach gives EPS growth, dividend growth or sustainable-growth checks.

10

Derivatives

Forward pricing with discrete and continuous compounding, forward value, FRAs, currency forwards, swap rates, put–call parity and binomial pricing

CALCULATIONS IN THIS CHAPTER — CLICK TO JUMP

- [Forward Pricing — Discrete & Continuous Compounding](#)
- [FRAs, Currency Forwards & Swap Fixed Rates](#)
- [Options — Put–Call Parity & One-Period Binomial Model](#)

Forward Pricing — Discrete & Continuous Compounding

FORMULA

$F_0(T) = S_0(1 + r)^T$ $F_0(T) = S_0 e^{(rT)}$ $F_0(T) = S_0 e^{((r - q)T)}$ $V_t(\text{long}) = S_t - F_0(T) \div (1 + r)^{(T - t)}$

NUMERICAL EXAMPLE

$S_0 = 100, r = 5\%, T = 6 \text{ months}$

Problem	Keystrokes	Result
Forward price, annual compounding	1.05 [ENTER] 0.5 [y ^x] 100 [×]	102.47
Forward price, continuous compounding	0.05 [ENTER] 0.5 [×] [g] [e ^x] 100 [×]	102.53
With a 2% continuous dividend yield	0.05 [ENTER] 0.02 [−] 0.5 [×] [g] [e ^x] 100 [×]	101.51
Value of the long forward after 3 months if $S_t = 104$	104 [ENTER] 102.4695 [−] 1.05 [ENTER] 0.25 [y ^x] [÷]	+2.77
Cost of carry: PV of income 1.50 reduces S_0	100 [ENTER] 1.5 [−] 1.05 [ENTER] 0.5 [y ^x] [×]	100.93

EXAM TIP At initiation a forward has zero value; its value later is the spot price minus the PV of the locked-in forward price.

FRAs, Currency Forwards & Swap Fixed Rates

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NUMERICAL EXAMPLE

Three pricing formulas built on discount factors

Problem	Formula	Keystrokes	Result
3×9 FRA rate: 90-day MRR 2%, 270-day MRR 3% (360-day year)	$(1 + r_{270} \times 270/360) \div (1 + r_{90} \times 90/360) - 1 \times 360/180$	1 ENTER .03 ENTER 270 ENTER 360 ÷ × + 1 ENTER .02 ENTER 90 ENTER 360 ÷ × + ÷ 1 - 2 ×	3.48%
1-yr USD/INR forward: S = 83.00 INR per USD, i(INR) 7%, i(USD) 5%	$F = S \times (1 + i_{\text{price}}) \div (1 + i_{\text{base}})$	83 [ENTER] 1.07 [×] 1.05 [÷]	84.58
Swap fixed rate: DF ₁ 0.97, DF ₂ 0.94, DF ₃ 0.91	$s = (1 - DF_N) \div \sum DF$	1 ENTER .91 - .97 ENTER .94 + .91 + ÷	3.19%
Discount factor from a 3-yr spot rate of 5%	$DF = 1 \div (1 + z)^T$	1.05 [ENTER] 3 [y ^x] [1/x]	0.8638

Interest-rate parity check
Higher-rate currency (INR) trades at a forward DISCOUNT: 84.58 > 83.00 INR per USD.

Swap = series of forwards
The fixed swap rate makes PV(fixed leg) = PV(floating leg) at inception, so value = 0.

Options — Put–Call Parity & One-Period Binomial Model

FORMULA

Put–call parity

$$c_0 + K \div (1 + r)^T = p_0 + S_0$$

NUMERICAL EXAMPLE

S = K = 50, r = 5%, T = 1, c = 6.00

Keystrokes	Display / Result
6 [ENTER] 50 [ENTER] 1.05 [÷] [+] 50 [–]	p ₀ = 3.62

FORMULA

Binomial

$$q = (1 + r - d) \div (u - d) \quad c_0 = (q c_u + (1 - q) c_d) \div (1 + r)$$

S₀ = 100
u = 1.20, d = 0.80
r = 5%, K = 100



At T = 1
Up: S_u = 120 → c_u = 20, p_u = 0
Down: S_d = 80 → c_d = 0, p_d = 20

KEYSTROKES

Binomial call & put

Keystrokes	Display	What it means
1.05 [ENTER] 0.8 [–] 1.2 [ENTER] 0.8 [–] [÷]	q = 0.625	Risk-neutral probability
0.625 [ENTER] 20 [×] 1.05 [÷]	c ₀ = 11.90	Call value
1 [ENTER] 0.625 [–] 20 [×] 1.05 [÷]	p ₀ = 7.14	Put value
20 [ENTER] 120 [ENTER] 80 [–] [÷]	h = 0.50	Hedge ratio (shares per call)
100 [ENTER] 100 [ENTER] 1.05 [÷] [–]	4.76	Parity check: c ₀ – p ₀ = 4.76 ✓

EXAM TIP Risk-neutral q is NOT the real-world probability of an up move — the expected payoff is discounted at the risk-free rate.



Quick Reference & Exam-Day Traps

Every key on one page and the ten RPN mistakes that cost the most marks

CALCULATIONS IN THIS CHAPTER — [CLICK TO JUMP](#)

- [Keyboard Cheat Sheet — Every HP 12C Function on One Page](#)
- [Top 10 Calculator Traps on Exam Day](#)

Keyboard Cheat Sheet — Every HP 12C Function on One Page

Function group	Keys	Variables	CFA Level I uses
Time value of money	[n] [i] [PV] [PMT] [FV]; clear: [f] [CLEAR FIN]	n, i, PV, PMT, FV; [g] BEGIN/END	PV/FV, loans, annuities, bond price & YTM, CAGR, leases
Cash flow	[g] [CF ₀] [g] [CF _j] [g] [N _j], then [f] [NPV] / [f] [IRR]	CF ₀ , CF _j (up to 20 groups), i	NPV, IRR, MWRR, multi-stage DDM, uneven streams
Amortization	[f] [AMORT]	uses stored n, i, PV, PMT; count keyed before the press	Loan & amortizing-bond schedules
Statistics	[Σ+]; [g] [x̄] [g] [s] [g] [ŷ,r]	n, Σx, Σx ² , Σy, Σy ² , Σxy	Mean, SD, covariance, correlation, regression
Power / root / log	[y ^x] [g] [√x] [g] [LN] [g] [e ^x] [1/x]	—	Compounding, continuous compounding, growth rates
Calendar	[g] [ΔDYS] DATE	DT1, DT2	Day counts for accrued interest & money market
Memory	[STO] n, [RCL] n, [x↔y], [R↓]	0 – 9, stack (X,Y,Z,T)	Hold intermediate results at full precision
Clearing	[CLx] [f] [CLEAR FIN] [f] [CLEAR Σ] [f] [CLEAR REG]	—	Reset the right register set before each new problem
Display	[f] [0]–[9]	decimal places shown	More decimals avoid rounding traps
Sign & entry	[CHS] [ENTER]	—	RPN stack entry — there is no [=] key

Top 10 Calculator Traps on Exam Day

1

Forgetting ENTER

RPN needs **[ENTER]** to push the first number before keying the second — skip it and the two numbers combine into one.

2

BEGIN mode left on

After an annuity-due or lease problem, press **[g] [END]** to switch back.

3

Financial registers not cleared

Old PMT or FV values linger. Press **[f] [CLEAR FIN]** every time.

4

Sign convention

PV and FV keyed with the same sign give a wrong or error result — enter the outflow as negative.

5

Stack confusion

An unexpected result often means a leftover value sits in Y or Z — press **[CLx]** or check with **[R↓]** before starting.

6

Sample vs population SD

[g][s] is always the SAMPLE statistic ($n-1$) — there is no population toggle like other calculators.

7

i as a decimal

Type 8 for 8%, not 0.08 — the TVM keys expect percent, but stack arithmetic (y^x) expects a decimal.

8

Semi-annual bonds

Double n, halve the coupon and the yield; multiply a computed i by 2.

9

Cash flow registers

[f] [CLEAR REG] before building a new CF_j list, and remember **[g] [N_j]** only repeats the PRECEDING flow.

10

Too few decimal places

Set **[f] [4]** or **[f] [9]** and store intermediate values with **[STO] 0–9** rather than retyping rounded numbers.

ABOUT THE AUTHOR

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Prof. Vinit Mehta is qualified as Chartered Accountant & Financial Risk Manager (F.R.M.) and has earned CFA Level II badge.

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