

1 CHAPTER OVERVIEW

Your visual roadmap through the chapter

Simple Interest

Fixed % of the original principal; $I = Prn$

1

Compounding

Interest earned on principal + accrued interest; annual, by parts, or continuous

2

Discounting

Finding the present value of a future cash flow — the reverse of compounding

3

WHAT IT'S ABOUT

Interest is the extra amount paid for the use of borrowed money — simple (fixed on the principal) or compound (accumulated over time). Discounting reverses compounding to find present value.

WHY IT MATTERS FOR QAB

Compounding and discounting let a business compare and evaluate present and future cash flows for investment and borrowing decisions — the basis of later discounted cash flow topics.

EXAM SKILLS REQUIRED

Apply simple and compound interest formulas; adjust rates for sub-annual compounding; calculate effective annual rates; discount future cash flows to present value.

2 KEY DEFINITIONS

Source-based terminology, exam-ready

Interest

The extra amount an investor receives (or a borrower pays) after investing/borrowing a sum, at a certain rate, for a certain time.

Key word: cost of money

Simple Interest

Annual interest that is a fixed percentage of the original amount (the principal) borrowed or invested.

Key word: fixed on principal

Compounding

The process of accumulating interest on an investment over time, so that interest is then earned on that interest too.

Key word: interest on interest

Future Value (FV / Sn)

The accumulated investment plus interest — the amount paid by a borrower or received by an investor at the end of the period.

Key word: value later

Present Value (PV / So)

The initial investment or principal amount; also the current-day equivalent of a future cash flow.

Key word: value today

Discounting

Estimating the present-day equivalent of a future cash flow at a given interest rate; the reverse of compounding.

Key word: reverse of compounding

Discount Factor

The inverse of a compounding factor for the same period and rate; multiplying by it is the same as dividing by the compounding factor.

Key word: $1/(1+r)^n$

Nominal vs Effective Rate

Nominal (stated) rate is the loan's "face value" rate; effective rate accounts for the compounding frequency and gives the true annual cost.

Key word: stated vs true rate

3 CORE CONCEPT

Explained in exam-oriented language

CONCEPT → Simple vs Compound Interest

MEANING

Simple interest stays constant each period; compound interest grows each period since it's charged on principal + accrued interest.

PURPOSE

Model how a loan or investment accumulates value over time.

APPLICATION

Loans, deposits, and investments repaid/accumulated periodically or in a lump sum.

CONCEPT → Discounting

MEANING

Finding today's equivalent value of money to be received/paid in the future.

PURPOSE

Compare cash flows that occur at different points in time on a like-for-like basis.

APPLICATION

Evaluating investment offers, loan-repayment alternatives, and future purchase goals.

4 KEY RULES & PRINCIPLES

Every source rule, exam-ready

RULE 1 Rates are annual unless stated

- For periods under a year, pro-rate the annual simple interest rate by the fraction of the year

RULE 2 Compounding by parts

- Divide the annual rate by the number of parts in the year (m)
- Multiply the number of years by m to get total periods

RULE 3 Continuous compounding

- Interest calculated at every smallest instance, using e^m
- Not realistic in practice, but useful theoretically

RULE 4 Nominal vs effective rate

- Nominal rate is not directly comparable across different compounding periods
- Restate to effective annual rate before comparing loans/investments
- Effective rate is generally higher than nominal — more frequent compounding raises it further

RULE 5 Discounting is the reverse of compounding

- Discount factor = inverse of the compounding factor for the same r and n
- Multiplying by the discount factor = dividing by the compounding factor

RULE 6 Comparing cash flows

- Discount every cash flow to its present value before comparing
- The option with the higher present value is preferable

5 FORMULA ZONE

Every formula supported by the source text

SIMPLE INTEREST

$$I = P r n \quad | \quad S = P(1 + r n)$$

P=principal, **r**=period interest rate, **n**=number of periods, **S**=amount repayable, **I**=interest charge.

COMPOUND INTEREST

$$S_n = S_o (1 + r)^n$$

$(1+r)^n$ is the compounding factor. **S_o**=principal/present value, **S_n**=future value.

COMPOUNDING BY PARTS

$$S_n = S_o (1 + r/m)^{n \times m}$$

m = number of compounding parts per year.

CONTINUOUS COMPOUNDING

$$S_n = S_o e^{r n}$$

Interest compounded at every smallest instant.

EFFECTIVE ANNUAL RATE

$$\text{Effective annual rate} = (1 + r)^n - 1$$

r=known rate for a known period, **n**=number of times that period fits into one year.

PRESENT VALUE (DISCOUNTING)

$$PV = FV \times 1/(1+r)^n$$

$1/(1+r)^n$ is the discount factor — the inverse of the compounding factor.

6 CALCULATION ROADMAP

General path for any financial mathematics question

1- Read Question

Identify P, r, n and what's required

2- Identify Type

Simple, compound, or discounting?

3- Select Formula

Adjust r and n for the compounding frequency

4- Substitute

Put known values into the formula

5- Calculate & Check

Solve, recheck, state final answer

7 STEP-BY-STEP METHODS

Kept separate — do not mix methods

METHOD A · Simple Interest

- 1 Identify P, r (annual) and n (in years, pro-rated if less than a year)
- 2 For interest only: substitute into $I = Prn$
- 3 For amount repayable: substitute into $S = P(1+rn)$
- 4 If P, r or n is unknown, rearrange and solve algebraically

METHOD C · Compounding by Parts / Continuously

- 1 Identify the annual rate r and parts per year m (or use e for continuous)
- 2 By parts: divide r by m, multiply n by m
- 3 Substitute into $S_n = So(1+r/m)^{n \times m}$ or $S_n = So e^{rn}$
- 4 Calculate S_n

METHOD B · Compound Interest (Annual)

- 1 Identify So , r and n
- 2 Substitute into $S_n = So(1+r)^n$
- 3 Calculate the compounding factor $(1+r)^n$ first
- 4 Multiply by So to find S_n ; subtract So for interest earned

METHOD D · Effective Annual Rate

- 1 Identify the known rate r and how many times that period fits in a year (n)
- 2 Substitute into $(1+r)^n - 1$
- 3 Calculate and express as a percentage
- 4 Use this to compare rates quoted for different periods

METHOD E · Present Value / Discounting

- 1 Identify the future value (FV), rate r and number of periods n
- 2 Calculate the discount factor $1/(1+r)^n$, or read it from a discount table
- 3 Multiply FV by the discount factor
- 4 State the present value; compare PVs if evaluating alternatives

8 DIFFERENT CASES / SCENARIOS

Recognise the situation, pick the right route

IF interest is a fixed % of the ORIGINAL principal only

→ USE **simple interest**: $I = Prn$, $S = P(1 + rn)$

IF interest is earned on principal PLUS accrued interest

→ USE **compound interest**: $S_n = S_0(1 + r)^n$

IF the period given is less than a year

→ **Pro-rate** the annual rate by the fraction of the year

IF compounding happens m times per year (e.g. quarterly)

→ USE r/m for the rate and $n \times m$ for the periods

IF compounding is described as continuous

→ USE $S_n = S_0 e^{rn}$

IF comparing loans/rates quoted for different periods

→ Convert each to its **effective annual rate** first

IF asked for the value TODAY of a future amount

→ USE **discounting**: $PV = FV \times 1/(1 + r)^n$

IF a discount-rate table is provided

→ Read the factor at the intersection of the rate column and period row

9 COMPARISON TABLES

Don't confuse these!

	Simple Interest	Compound Interest
Basis of interest	Original principal only	Principal + all accrued interest to date
Formula	$S = P(1 + rn)$	$S_n = S_0(1 + r)^n$
Growth pattern	Same interest amount every period	Interest amount increases every period

	Compounding	Discounting
Direction	Present value → Future value	Future value → Present value
Formula	$S_n = S_0(1 + r)^n$	$PV = FV \times 1/(1 + r)^n$
Factor used	Compounding factor $(1 + r)^n$	Discount factor = inverse of compounding factor

	Nominal Rate	Effective Rate
Meaning	The "face value" / stated rate of a loan	The true annual cost, accounting for compounding frequency
Comparability	Not directly comparable across different compounding periods	Always comparable on a like-for-like annual basis
Relative size	Generally lower	Generally higher (rises with compounding frequency)

10 READING A DISCOUNT-FACTOR TABLE

How to interpret the source table

Each column of a discount table represents a discount rate (r); each row represents a number of periods (n). The value at the intersection of the correct rate column and period row is the **discount factor** for that r and n — multiply it directly by the future cash flow to get its present value, instead of calculating $1/(1 + r)^n$ by hand.

11 WORKED CALCULATION LOGIC

Method students must reproduce in the exam

GIVEN → FORMULA → SUBSTITUTION → CALCULATION → ANSWER

A person expects to receive Rs 13,310 in 3 years. At an interest rate of 10%, what is the present value of this amount?

GIVEN: $FV = 13,310$, $r = 0.1$, $n = 3$

FORMULA: $PV = FV \times 1/(1+r)^n$

SUBSTITUTION: $PV = 13,310 \times 1/(1.1)^3$

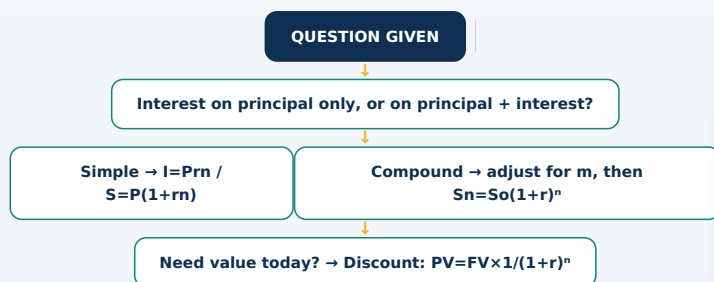
CALCULATION: $PV = 13,310 \times 1/1.331 = 13,310 \times 0.7513$

FINAL ANSWER: $PV = \text{Rs. } 10,000$ — the person would be indifferent between Rs. 10,000 today and Rs. 13,310 in 3 years

12 EXAM QUESTION PATTERNS

- **Direct calculation** — find I , S or S_n from given P , r , n
- **Solve for unknown** — rearrange to find P , r or n
- **Compounding frequency** — annual, by parts, or continuous
- **Effective rate** — calculate and compare loan/investment options
- **Present value** — discount a single future cash flow
- Comparing offers — evaluate which alternative has the higher PV

14 QUICK DECISION TREE



13 EXAM TRAPS

⚠ WATCH OUT

- ✗ **Simple vs compound mix-up** — applying $S=P(1+rn)$ when interest should compound, or vice versa.
- ✗ **Forgetting to pro-rate** the rate (or periods) for sub-annual timeframes.
- ✗ **Using the annual rate directly** in compounding by parts instead of dividing by m (and multiplying n by m).
- ✗ **Nominal/effective confusion** — comparing loans by their nominal rates instead of effective annual rates.
- ✗ **Wrong table cell** — swapping the rate column and period row when reading a discount table.

CHAPTER 5 IN 60 SECONDS

Simple: $I=Prn$, $S=P(1+rn)$

Compound: $S_n=So(1+r)^n$

By parts: $S_n=So(1+r/m)^{n \times m}$

Continuous: $S_n=So e^{rn}$

Effective rate: $(1+r)^n - 1$

PV: $FV \times 1/(1+r)^n$

Discount factor = inverse of compounding factor

Trap: always adjust r & n for compounding frequency