

Money: Earning, Borrowing, Investing & Trade

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Earning Money

Gross Pay	Total earned before any deductions.
Net Pay	Take-home pay after all deductions.
Wage	Hourly rate $\times$ hours worked.
Salary	Fixed annual amount $\div$ 12.
Overtime	$\times 1.5$ (time-and-a-half); $\times 2$ (double time).
Commission	% of qualifying sales value.
Deductions	Tax + National Insurance + Pension.
Gross = Basic + Overtime + Commission	
Net Pay = Gross Pay – Total Deductions	

Percentage Toolkit (Used Everywhere)

Find % of amount	$\frac{\%}{100} \times \text{amount}$
% Change	$\frac{\text{new} - \text{old}}{\text{old}} \times 100$
Increase by $k\%$	$\times (1 + k/100)$ e.g. $+20\% \rightarrow \times 1.20$
Decrease by $k\%$	$\times (1 - k/100)$ e.g. $-30\% \rightarrow \times 0.70$
Reverse %	$\text{original} = \frac{\text{value after}}{\text{multiplier}}$
Reverse trap: After $+25\%$, price is £150. Original = $\frac{150}{1.25} = £120$. Never subtract 25% from £150.	

Simple Interest vs. Compound Interest

Simple Interest (SI) — same fixed amount on the original principal each period.

$$I = \frac{P \times R \times T}{100} \quad A = P + I$$

P =Principal R =Rate (% p.a.)
 T =Time (yrs) A =Total ($P + I$)

Ex: £4 800 at 3.5% , 5 yrs: $I = £840$; $A = £5 640$

Compound Interest (CI) — interest added to balance and earns further interest each period.

$$A = P \left(1 + \frac{r}{100} \right)^n \quad I = A - P$$

r =rate **per period** (%) n =number of periods

Non-annual: $r_{\text{per}} = r_{\text{ann}}/k$; $n_{\text{total}} = \text{yrs} \times k$

Ex: £5 500 at 4% , 6 yrs: $A = 5500 \times (1.04)^6 = £6 959.26$
 CI earns **£139.26 more** than SI here.

Growth, Depreciation & Decay

Any repeated % change: same CI structure, r as a **decimal**.

$$A = P(1 \pm r)^n \quad n = \frac{\log(A/P)}{\log(1 \pm r)}$$

Growth ($+r$) Savings, inflation, population.

Depreciation ($-r$) Vehicles, equipment, assets.

Decay ($-r$) Drug levels, radioactive decay.

Ex: Motorbike £11 600 at 25% /yr for 4 yrs:
 $A = 11600 \times (0.75)^4 = £3 670$

Find n : Revenue £3.6m at 9% /yr exceeds £6m after
 $n = \frac{\log(6/3.6)}{\log(1.09)} = 5.93 \Rightarrow \mathbf{6 \text{ complete years}}$

Borrowing: Loans, APR & Hire Purchase

APR True yearly cost incl. all fees. Higher APR = more expensive. Always compare APRs.

Loan Fixed monthly instalments over an agreed term.

HP Deposit + instalments; own the item only after the final payment.

Total repaid = Instalment $\times$ Months

Interest paid = Total Repaid – Principal

HP total = Deposit + (Instalment $\times$ Months)

Extra HP cost = HP Total – Cash Price

Ex: £10 000 at £312.50/month $\times$ 36:
 Total = £11 250; Interest = £1 250

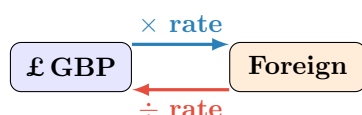
Always compare total repaid, not just monthly payment.

Buying & Selling: Profit, Loss, Discount, VAT & Best Buy

Concept	Formula	Worked Example
Profit	$SP - CP$	Bought £64, sold £80 $\Rightarrow$ Profit = £16
Loss	$CP - SP$	Bought £90, sold £72 $\Rightarrow$ Loss = £18
% Profit/Loss	$\frac{\text{Profit or Loss}}{CP} \times 100$ (<i>always over CP</i>)	$\frac{16}{64} \times 100 = 25\%$ profit
Target SP	$CP \times (1 + \text{profit decimal})$	45% on £640: $640 \times 1.45 = £928$
Reverse (loss)	$SP \div \text{loss multiplier} = CP$	£357 after 16% loss: $\frac{357}{0.84} = £425$
Discount	$\text{Sale Price} = \text{Original} \times (1 - d)$	35% off £115: $115 \times 0.65 = £74.75$
Rev. discount	$\text{Original} = \text{Sale Price} \div (1 - d)$	Paid £110 after 45% off: $\frac{110}{0.55} = £200$
Add VAT (20%)	$\text{Price excl. VAT} \times 1.20$	£1 300 excl. $\rightarrow 1300 \times 1.20 = £1 560$
Remove VAT (20%)	$\text{Price incl. VAT} \div 1.20$	£1 416 incl. $\rightarrow \frac{1416}{1.20} = £1 180$
Best Buy	Price per unit (p/g, p/ml...); lowest wins	180 tabs £21.60 = 12p/tab vs. 30 tabs £4.50 = 15p/tab

Foreign Currency Exchange

Rate: £1 = (rate) foreign units.



- **Commission:** Deduct from £**first**, then convert.
- **Return trip:** Two conversions; rates may differ each way.

Ex A: £1 = CHF 1.13

£620 $\rightarrow$ CHF: $620 \times 1.13 = \text{CHF } 700.60$

CHF 508.50 $\rightarrow$ £: $508.50 \div 1.13 = \text{£ } 450.00$

Ex B (commission): 3% on £1 200; £1=€1.17:

Pounds after comm.: $1200 - 36 = \text{£ } 1164$

Euros received: $1164 \times 1.17 = 1361.88$

Common Traps & Pitfalls

1. **Gross vs. Net:** Given net? Use a *reverse %* to find gross. Adding the tax rate to net is wrong.
2. **SI vs. CI:** “Simple” $\rightarrow I = PRT/100$. “Compound” $\rightarrow A = P(1 + r/100)^n$. Wrong formula = wrong marks.
3. **Compounding Frequency:** Annual rate, monthly compounding $\rightarrow r/12$ per period; count months not years.
4. **Reverse %:** After $+k\%$: divide by $(1 + k/100)$. After $-k\%$: divide by $(1 - k/100)$. Never add/subtract the % from the current value.
5. **% Profit Base:** Profit/loss % is **always** over **CP**, not SP. Using SP gives a lower, incorrect percentage.
6. **VAT Inclusion:** Excl. VAT $\rightarrow \times 1.20$. Incl. VAT $\rightarrow \div 1.20$. Subtracting 20% from an inclusive price is always wrong.
7. **Best-Buy Units:** Convert all to the **same unit** before dividing. Larger packs are not always cheaper per unit.
8. **Currency Direction:** £ $\rightarrow$ foreign: **multiply**. Foreign $\rightarrow$ £: **divide**. Deduct commission in £*before* applying the rate.

Quick Exam Shortcuts & Keyword Cues

- “**overtime / commission**” $\Rightarrow$ Gross = basic + OT + commission; Net = Gross – deductions.
- “**simple interest**” $\Rightarrow I = PRT/100$; fixed amount every year. Find $R: \frac{100I}{PT}$; find $T: \frac{100I}{PR}$.
- “**compound interest**” / “**compounded monthly/quarterly**” $\Rightarrow A = P(1 + r/100)^n$; adjust $r = r_{\text{ann}}/k$ and $n = \text{yrs} \times k$.
- “**depreciates**” / “**decays**” $\Rightarrow A = P(1 - r)^n$ (r as decimal). e.g. 18%/yr $\rightarrow (0.82)^n$.
- “**after how many years?**” $\Rightarrow$ Trial substitution or $n = \log(A/P)/\log(1 \pm r)$. Round **up** for both “exceed” and “fall below”.
- “**hire purchase**” / “**total cost of borrowing**” $\Rightarrow$ Total = instalment $\times$ months; subtract principal for interest paid.
- “**original price before discount / rise**” $\Rightarrow$ Reverse %: divide known price by the multiplier.
- “**incl. VAT**” $\Rightarrow \div 1.20$. “**excl. VAT**” $\Rightarrow \times 1.20$. “**best value**” $\Rightarrow$ price per unit (same unit); lowest wins.