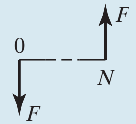
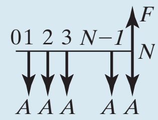
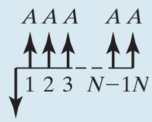
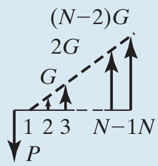
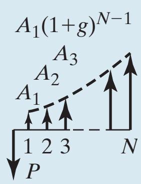
TABLE 3.4 Summary of Discrete Compounding Formulas with Discrete Payments

Flow Type	Factor Notation	Formula	Excel Command	Cash Flow Diagram
SINGLE	Compound amount $(F/P, i, N)$	$F = P(1+i)^N$	$=\mathrm{FV}(i, N, P,, 0)$	
	Present worth $(P/F, i, N)$	$P = F(1+i)^{-N}$	$=\mathrm{PV}(i, N, F,, 0)$	
EQUAL PAYMENT SERIES	Compound amount $(F/A, i, N)$	$F = A\left[\dfrac{(1+i)^N - 1}{i}\right]$	$=\mathrm{PV}(i, N, A,, 0)$	
	Sinking fund $(A/F, i, N)$	$A = F\left[\dfrac{i}{(1+i)^N - 1}\right]$	$=\mathrm{PMT}(i, N, P, F, 0)$	
	Present worth $(P/A, i, N)$	$P = A\left[\dfrac{(1+i)^N - 1}{i(1+i)^N}\right]$	$=\mathrm{PV}(i, N, A,, 0)$	
	Capital recovery $(A/P, i, N)$	$A = P\left[\dfrac{i(1+i)^N}{(1+i)^N - 1}\right]$	$=\mathrm{PMT}(i, N,, P)$	
GRADIENT SERIES	Linear gradient Present worth $(P/G, i, N)$	$P = G\left[\dfrac{(1+i)^N - iN - 1}{i^2(1+i)^N}\right]$		
	Conversion factor $(A/G, i, N)$	$A = G\left[\dfrac{(1+i)^N - iN - 1}{i[(1+i)^N - 1]}\right]$		
	Geometric gradient Present worth $(P/A_1, g, i, N)$	$P = \begin{cases} A_1\left[\dfrac{1-(1+g)^N(1+i)^{-N}}{i-g}\right] \\ A_1\left(\dfrac{N}{1+i}\right) \text{(if } i = g\text{)} \end{cases}$		

Summary of Project Analysis Methods

Analysis Method	Description	Single Project Evaluation	Mutually Exclusive Projects: Revenue Projects	Mutually Exclusive Projects: Service Projects
Payback period PP	A method for determining when in a project's history it breaks even. Management sets the benchmark PP°.	$PP < PP^{\circ}$	Select the one with shortest PP	
Discounted payback period PP(i)	A variation of payback period when factors in the time value of money. Management sets the benchmark $PP^{\bullet}$.	$PP(i) < PP^{\bullet}$	Select the one with shortest PP(i)	
Present worth PW(i)	An equivalent method which translates a project's cash flows into a net present value	$PW(i) > 0$	Select the one with the largest PW	Select the one with the least negative PW
Future worth FW(i)	An equivalence method variation of the PW: a project's cash flows are translated into a net future value	$FW(i) > 0$	Select the one with the largest FW	Select the one with the least negative FW
Capitalized equivalent CE(i)	An equivalence method variation of the PW of perpetual or very long-lived project that generates a constant annual net cash flow	$CE(i) > 0$	Select the one with the largest CE	Select the one with the least negative CE
Annual equivalence AE(i)	An equivalence method and variation of the PW: a project's cash flows are translated into an annual equivalent sum	$AE(i) > 0$	Select the one with the largest AE	Select the one with the least negative AE
Internal rate of return IRR	A relative percentage method which measures the yield as a percentage of investment over the life of a project: The IRR must exceed the minimum required rate of return (MARR).	IRR > MARR	Incremental analysis: If $IRR_{A2\text{-}A1} > MARR$, select the higher cost investment project, A2.	
Benefit–cost ratio BC(i)	An equivalence method to evaluate public projects by finding the ratio of the equivalent benefit over the equivalent cost	$BC(i) > 1$	Incremental analysis: If $BC(i)_{A2\text{-}A1} > 1$, select the higher cost investment project, A2.	

Summary of Useful Excel's Financial Functions (Part A)

<table>
<tr><th colspan="2">Description</th><th>Excel Function</th><th>Example</th><th>Solution</th></tr>
<tr><td>Single-
Payment</td><td>Find: F
Given: P</td><td>=FV($i\%$, N, 0, $-P$)</td><td>Find the future worth of $500 in 5 years at 8%.</td><td>=FV(8%, 5, 0, −500)
=$734.66</td></tr>
<tr><td>Cash
Flows</td><td>Find: P
Given: F</td><td>=PV($i\%$, N, 0, F)</td><td>Find the present worth of $1,300 due in 10 years at a 16% interest rate.</td><td>=PV(16%, 10, 0, 1300)
=($294.69)</td></tr>
<tr><td></td><td>Find: F
Given: A</td><td>=FV($i\%$, N, A)</td><td>Find the future worth of a payment series of $200 per year for 12 years at 6%.</td><td>=FV(6%, 12, −200)
=$3,373.99</td></tr>
<tr><td>Equal-
Payment-
Series</td><td>Find: P
Given: A</td><td>=PV($i\%$, N, A)</td><td>Find the present worth of a payment series of $900 per year for 5 years at 8% interest rate.</td><td>=PV(8%, 5, 900)
=($3,593,44)</td></tr>
<tr><td></td><td>Find: A
Given: P</td><td>=PMT($i\%$, N, $-P$)</td><td>What equal-annual-payment series is required to repay $25,000 in 5 years at 9% interest rate?</td><td>=PMT(9%, 5, −25000)
=$6,427.31</td></tr>
<tr><td></td><td>Find: A
Given: F</td><td>=PMT($i\%$, N, 0, F)</td><td>What is the required annual savings to accumulate $50,000 in 3 years at 7% interest rate?</td><td>=PMT(7%, 3, 0, 50000)
=($15,552.58)</td></tr>
<tr><td></td><td>Find: NPW
Given: Cash flow series</td><td>=NPV($i\%$, series)</td><td>Consider a project with the following cash flow series at 12% ($n = 0$, −$200; $n = 1$, $150, $n = 2$, $300, $n = 3$, 250)?</td><td>=NPV(12%, B3:B5)+B2
=$351.03</td></tr>
<tr><td>Measures
of
Investment
Worth</td><td>Find: IRR
Given: Cash flow series</td><td>=IRR(values, guess)</td><td><table><tr><th></th><th>A</th><th>B</th></tr><tr><td>1</td><td>Period</td><td>Cash Flow</td></tr><tr><td>2</td><td>0</td><td>−200</td></tr><tr><td>3</td><td>1</td><td>150</td></tr><tr><td>4</td><td>2</td><td>300</td></tr><tr><td>5</td><td>3</td><td>250</td></tr></table></td><td>=IRR(B2:B5, 10%)
=89%</td></tr>
<tr><td></td><td>Find: AW
Given: Cash flow series</td><td>=PMT ($i\%$, N, −NPW)</td><td></td><td>=PMT(12%, 3, −351.03)
=$146.15</td></tr>
</table>

Summary of Useful Excel's Financial Functions (Part B)

Description		Excel Function	Example	Solution
Loan Analysis Functions	Loan payment size	=PMT(i%, N, P)	Suppose you borrow \$10,000 at 9% interest to be paid in 48 equal monthly payments. Find the loan payment size.	=PMT(9%/12, 48, 10000) =(\$248.45)
	Interest payment	=IMPT(i%, n, N, P)	Find the portion of interest payment for the 10th payment.	=IPMT(9%/12, 10, 48, 10000) =(\$62.91)
	Principal payment	=PPMT(i%, n, N, P)	Find the portion of principal payment for the 10th payment.	=PPMT(9%/12, 10, 48, 10000) =(\$185.94)
	Cumulative interest payment	=CUMIMPT(i%, N, P, start_period, end_period)	Find the total interest payment over 48 months.	=CUMIMPT(9%/12, 48, 10000, 1, 48) =\$1,944.82
	Interest rate	=RATE(N, A, P, F)	What nominal interest rate is being paid on the following financing arrangement? Loan amount:\$10,000, loan period: 60 months, and monthly payment: \$207.58.	=RATE(60, 207.58, −10000) =0.7499% APR = 0.7499% × 12 = 9%
	Number of payments	=NPER(i%, A, P, F)	Find the number of months required to pay off a loan of \$10,000 with 12% APR where you can afford a monthly payment of \$200.	=NPER(12%/12, 200, −10000) =69.66 months
Deprecia-tion functions	Straight-line	=SLN(cost, salvage, life)	Cost = \$100,000, S = \$20,000, life = 5 years	=SLN(100000, 20000, 5) =\$16,000
	Declining balance	=DB(cost, salvage, life, period, month)	Find the depreciation amount in period 3.	=DB(100000, 20000, 5, 3, 12) =\$14,455
	Double declining balance	=DDB(cost, salvage, life, period, factor)	Find the depreciation amount in period 3 with α = 150%,	=DDB(100000, 20000, 5, 3, 1.5) =\$14,700
	Declining balance with switching to straight-line	=VDB(cost, salvage, life, strat_period, end_period, factor)	Find the depreciation amount in period 3 with α = 150%, with switching allowed.	=VDB(100000, 20000, 5, 3, 4,1.5) =\$10,290