公司理财练习答题册

Financial Markets and NPV

金融市场与净现值

留白作答版 | 详细中文题解 | 重要术语中英对照

使用说明

本册依据课程材料 *Financial market and NPV (Q&A)* 重排。前半部分仅保留题目与充足答题空间；后半部分将题目再次列出，并附中文推导与计算过程；最后整理重要术语、公式和英文题干识别要点。原材料中已含有英文参考计算，本册对其进行了重新核算与中文化整理。

主题关键词：时间价值、现值与终值、年金、APR 与 EAR、净现值、贷款摊还

目录与学习路径

建议使用方式 先在 Part I 独立完成计算；遇到卡点时只回看 Part III 的公式速查；完成后再对照 Part II 的逐题题解，尤其检查现金流发生时点与利率口径。

目录

目录与学习路径 **2**

Part I 练习与答题空间 **4**

一、综合与计算题 4

二、单项选择题 18

Part II 详细中文题解 **29**

一、综合与计算题详解 29

二、单项选择题详解 37

Part III 重要术语与公式速查 **43**

一、核心术语中英对照 43

二、公式速查 45

三、英文题干识别与高频易错点 46

本专题最核心的三条主线

1. 单笔现金流：在现值与终值之间移动现金流，核心是折现/复利因子。
2. 年金现金流：先识别是普通年金、预付年金还是增长年金，再决定公式。
3. 决策问题：把未来收益折回今天，计算 NPV 或等价价值后进行比较。

Part I

练习与答题空间

一、综合与计算题

1. Simple Interest versus Compound Interest ｜单利与复利比较

Original question
First City Bank pays 7.2 percent simple interest on its savings account balances, whereas Second City Bank pays 7.2 percent interest compounded annually. If you made a deposit of $7,300 in each bank, how much more money would you earn from your Second City Bank account at the end of eight years?

关键考点：单利终值、复利终值、二者差额。**作答区：**

2. Calculating Present Values ｜计算单笔现金流现值

Original question
For each of the following, compute the present value.

Present Value	Years	Interest Rate	Future Value
	17	12%	$16,832
	9	8%	$48,318
	23	10%	$886,073
	35	19%	$550,164

关键考点：现值折现、折现期数与利率。**作答区：**

3. Calculating the Number of Periods ｜求达到目标终值所需时间

Original question
Solve for the unknown number of years in each of the following.

Present Value	Years	Interest Rate	Future Value
$610	?	7%	$1,389
$940	?	8%	$1,821
$26,350	?	9%	$289,715
$43,500	?	11%	$430,258

关键考点：对数求期数，识别复利增长。**作答区：**

4. Future Value under Different Compounding Frequencies ｜不同计息频率下的终值

Original question
What is the future value in 11 years of $1,200 invested in an account with an APR of 8.3 percent: (a) compounded annually; (b) compounded semiannually; (c) compounded monthly; (d) compounded continuously; and (e) why does the future value increase as the compounding period shortens?

关键考点：APR、离散复利、连续复利、计息频率比较。

小问	计息方式	你的答案
(a)	Annually ｜每年复利	
(b)	Semiannually ｜每半年复利	
(c)	Monthly ｜每月复利	
(d)	Continuously ｜连续复利	
(e)	原因解释	

计算与解释区：

5. Calculating Annuities ｜退休储蓄与退休提款

Original question

You are planning to save for retirement over the next 30 years. To do this, you will invest $800 per month in a stock account and $200 per month in a bond account. The return of the stock account is expected to be 11 percent, and the bond account will pay 6 percent. When you retire, you will combine your money into an account with a 5 percent return. All interest rates are APRs with monthly compounding. How much can you withdraw each month from your account assuming a 25-year withdrawal period?

关键考点：两个储蓄年金终值之和、退休期普通年金现值、月利率口径。**现金流梳理区：**

正式计算区：

6. Calculating Rates of Return ｜比较两项投资的年化收益率

Original question

You are trying to choose between two different investments, both of which have up-front costs of $75,000. Investment G returns $135,000 in 6 years. Investment H returns $225,000 in 10 years. Which of these investments has the higher return?

关键考点：单笔投资的隐含复合年收益率、不可直接比较绝对收益。

投资	初始投入	到期现金流	持有年限
G	$75,000	$135,000	6 年
H	$75,000	$225,000	10 年

作答区：

7. Calculating Annuity Values | 多目标退休规划

Original question

Bilbo Baggins wants to save money to meet three objectives. First, he would like to be able to retire 30 years from now with retirement income of $14,000 per month for 25 years, with the first payment received 30 years and 1 month from now. Second, he would like to purchase a cabin in Rivendell in 10 years at an estimated cost of $400,000. Third, after he passes on at the end of the 25 years of withdrawals, he would like to leave an inheritance of $1.5 million to his nephew Frodo. He can afford to save $2,150 per month for the next 10 years. If he can earn an EAR of 10 percent before he retires and an EAR of 7 percent after he retires, how much will he have to save each month in Years 11 through 30?

关键考点：EAR 转换月有效利率、退休目标现值、阶段性储蓄、终值缺口。

请先在草稿中标出四个关键时点： 今天；第 10 年购买木屋；第 30 年退休；第 55 年最后一次提款并留下遗产。

现金流图与设元区：

计算区（可分“退休所需资金”“已有资金”“待补缺口”三块）：

二、单项选择题

本部分请先选出最合适的答案，再在每题下方写出关键公式或判断依据。除非题干明确说明“first day / beginning”，年金付款通常按期末发生处理。

1. Car lease value ｜汽车租赁现值

A car dealer is willing to lease you a car for $319 per month for 60 months. Payments are due on the first day of each month starting with the day you sign the lease contract. If your cost of money is 4.9 percent, compounded monthly, what is the current value of the lease?

☐ A. $16,235.42

☐ B. $17,906.14

☐ C. $16,689.54

☐ D. $17,882.75

☐ E. $17,014.34

2. Insurance settlement ｜保险赔偿现值

You have been awarded an insurance settlement of $211,400 that is payable one year from today. What is the minimum amount you should accept today in exchange for this settlement if you can earn 6.3 percent on your investments?

☐ A. $198,871.12

☐ B. $207,239.13

☐ C. $224,718.20

☐ D. $198,525.36

☐ E. $335,555.56

3. Mortgage loan ｜住房抵押贷款总利息

You borrow $199,000 to buy a house. The mortgage rate is 5.5 percent, compounded monthly. The loan period is 30 years, and payments are made monthly. If you pay for the house according to the loan agreement, how much total interest will you pay?

☐ A. $207,764

☐ B. $218,086

☐ C. $185,059

☐ D. $198,161

☐ E. $211,086

4. NPV of a house purchase ｜购房转售的净现值

Jannat is purchasing a house today for $172,800, and expects to resell it in one year for $197,100. Using a discount rate of 6.75 percent, what is the expected net present value?

☐ A. $20,305.04

☐ B. $11,469.68

☐ C. $11,837.00

☐ D. $19,310.50

☐ E. $18,463.70

5. Continuous compounding ｜连续复利的有效年利率

What is the effective annual rate of 10.25 percent compounded continuously?

☐ A. 10.86%

☐ B. 10.98%

☐ C. 11.11%

☐ D. 10.79%

☐ E. 11.04%

6. Growing salary contract ｜增长工资合同现值

Michaela has been offered an employment contract for ten years at a starting salary of $65,000 with guaranteed raises of 5 percent per year. What is the current value of this offer at a discount rate of 7 percent?

☐ A. $638,724.17

☐ B. $558,845.85

☐ C. $602,409.91

☐ D. $630,500.00

☐ E. $525,000.00

7. Holding period ｜土地持有年限

Some years ago, Zaid purchased a small parcel of land for $5,500. That land has appreciated at 11 percent annually and is now valued at $89,760. How long has Zaid owned this land?

☐ A. 26.76 years

☐ B. 32.43 years

☐ C. 23.28 years

☐ D. 36.39 years

☐ E. 29.12 years

8. Present value of payments ｜分期收款现值

Sanghyuk will receive payments of $550 per month for ten years. What are these payments worth today at a discount rate of 6 percent, compounded monthly?

☐ A. $53,737.08

☐ B. $49,540.40

☐ C. $49,757.69

☐ D. $48,808.17

☐ E. $51,523.74

9. Affordable car price ｜可负担的汽车价格

Kwame is willing to pay $185 per month for four years for a car payment. If the interest rate is 4.9 percent per year, compounded monthly, and he makes a cash down payment of $2,500, what price car can he afford to purchase?

☐ A. $8,342.05

☐ B. $10,961.36

☐ C. $10,549.07

☐ D. $8,533.84

☐ E. $8,686.82

10. Student loan payment ｜学生贷款月供

Assume you graduate with $26,800 in student loan debt at an interest rate of 4.25 percent, compounded monthly. If you want to have this debt paid in full within seven years, how much must you pay each month?

☐ A. $3,883.00

☐ B. $369.42

☐ C. $4,506.48

☐ D. $375.54

☐ E. $1,174.60

Part II

详细中文题解

一、综合与计算题详解

1. 单利与复利比较

Original question
First City Bank pays 7.2 percent simple interest; Second City Bank pays 7.2 percent interest compounded annually. Deposit $7,300 in each for eight years. How much more money would you earn in the compound-interest account?

中文题意
两家银行本金与年利率相同，差别只在于：第一家利息不再生息；第二家每年的已获利息继续参与下一年的计息。求第 8 年末第二家账户比第一家多出的金额。

步骤 1: 单利账户的终值为

$$FV_{\text{simple}} = 7{,}300\big(1 + 0.072 \times 8\big) = \$11{,}504.80.$$

步骤 2: 年复利账户的终值为

$$FV_{\text{compound}} = 7{,}300(1.072)^8 = \$12{,}731.55.$$

步骤 3: 由于两笔投资本金相同，终值差额也就是复利账户多赚的利息：

$$\Delta FV = 12{,}731.55 - 11{,}504.80 = \boxed{\$1{,}226.75}.$$

理解关键：单利的利息增长是线性的；复利的利息增长是指数型的。期限越长，二者差距越明显。

2. 计算单笔现金流现值

Original question
For each row, compute the present value from the given future value, number of years, and interest rate.

中文题意
你未来会收到一笔钱。若今天资金能够按给定利率增长，今天等价的一笔钱是多少?

统一公式： $PV = \dfrac{FV}{(1+r)^t}$.

年数 t	利率 r	未来值 FV	代入过程	现值 PV
17	12%	$16,832	$16{,}832/(1.12)^{17}$	$2,451.49
9	8%	$48,318	$48{,}318/(1.08)^{9}$	$24,171.03
23	10%	$886,073	$886{,}073/(1.10)^{23}$	$98,955.00
35	19%	$550,164	$550{,}164/(1.19)^{35}$	$1,248.38

现象解释：第四行未来值看似很大，但 19% 的高折现率持续 35 年，导致折现因子极小，所以其今天的价值只有约 $1,248.38。现值由“金额、时间、利率”共同决定，不能只看未来金额。

3. 求达到终值所需的期数

Original question
Solve for the unknown number of years in each case.

中文题意
已知今天投入金额、每年收益率和未来目标金额，求需要等待多少年。

步骤 1: 从复利公式出发：$FV = PV(1+r)^t$。

步骤 2: 两边取自然对数，解出期数：

$$t = \frac{\ln(FV/PV)}{\ln(1+r)}.$$

PV	r	FV	计算式	t
\$610	7%	\$1,389	$\ln(1{,}389/610)/\ln(1.07)$	12.16 年
\$940	8%	\$1,821	$\ln(1{,}821/940)/\ln(1.08)$	8.59 年
\$26,350	9%	\$289,715	$\ln(289{,}715/26{,}350)/\ln(1.09)$	27.82 年
\$43,500	11%	\$430,258	$\ln(430{,}258/43{,}500)/\ln(1.11)$	21.96 年

易错点：收益率为每年复利率，因此 r 与 t 的频率必须一致；若题目改成月利率，期数也必须以月计。

4. 不同计息频率下的终值

Original question
What is the future value in 11 years of $1,200 invested at an APR of 8.3 percent under annual, semiannual, monthly, and continuous compounding? Explain the comparison.

中文题意
名义年利率（APR）固定为 8.3%，但一年内的复利次数不同。求各方案 11 年后的终值，并解释为什么计息越频繁终值越高。

若一年复利 m 次，则 $FV = PV\left(1+\frac{APR}{m}\right)^{mt}$；连续复利时，$FV = PVe^{APR\cdot t}$。

计息方式	计算过程	终值
每年复利 $m=1$	$1{,}200(1.083)^{11}$	$2,884.66
每半年复利 $m=2$	$1{,}200(1+0.083/2)^{22}$	$2,935.52
每月复利 $m=12$	$1{,}200(1+0.083/12)^{132}$	$2,980.76
连续复利	$1{,}200e^{0.083\times 11}$	$2,990.14

第 (e) 问答案：在 APR 相同的前提下，计息越频繁，越早产生的利息就越早加入本金并继续生息，因此终值提高。连续复利是该 APR 下计息频率趋于无限时的极限。

5. 退休储蓄与退休提款

Original question

Save $800 per month in a stock account earning 11% APR and $200 per month in a bond account earning 6% APR for 30 years. At retirement, combine the balances in an account earning 5% APR and withdraw monthly for 25 years. All rates are compounded monthly. Find the monthly retirement withdrawal.

中文题意

储蓄阶段有两份普通年金，各自按不同月利率积累 360 个月；退休当天合并余额，并将其看作之后 300 个月提款年金的现值。

步骤 1: 储蓄阶段均为期末缴款的普通年金终值。股票账户的月利率为 $0.11/12$：

$$FV_S = 800\frac{(1+0.11/12)^{360}-1}{0.11/12} = \$2{,}243{,}615.79.$$

债券账户的月利率为 $0.06/12$：

$$FV_B = 200\frac{(1+0.06/12)^{360}-1}{0.06/12} = \$200{,}903.01.$$

步骤 2: 退休时总余额：

$$W_0 = FV_S + FV_B = \$2{,}444{,}518.80.$$

步骤 3: 提款阶段为 25 年、共 300 个月的普通年金，月利率为 $0.05/12$。设每月提款额为 C：

$$2{,}444{,}518.80 = C\frac{1-(1+0.05/12)^{-300}}{0.05/12}.$$

步骤 4: 年金现值因子为 171.0600，所以

$$C = \frac{2{,}444{,}518.80}{171.0600} = \boxed{\$14{,}290.41 \text{ per month}}.$$

时点意识： 退休储蓄“终值”的时点，正好是退休提款“现值”的时点，因此可以直接把两部分衔接起来。

6. 比较两项投资的年化收益率

Original question

Both investments cost $75,000 today. Investment G returns $135,000 in 6 years; investment H returns $225,000 in 10 years. Which has the higher return?

中文题意

投资期限不同，不能只比较到期拿回多少钱；应把每一项投资换算为复合年收益率。

步骤 1: 对 G:

$$75{,}000(1+r_G)^6 = 135{,}000 \quad \Longrightarrow \quad r_G = \left(\frac{135{,}000}{75{,}000}\right)^{1/6} - 1 = 10.29\%.$$

步骤 2: 对 H:

$$75{,}000(1+r_H)^{10} = 225{,}000 \quad \Longrightarrow \quad r_H = \left(\frac{225{,}000}{75{,}000}\right)^{1/10} - 1 = 11.61\%.$$

步骤 3: 比较结果：$11.61\% > 10.29\%$，所以 **Investment H 的年化收益率更高**。

判断原则：不同期限的投资，应比较可比口径的收益率，例如年化复合收益率，而不是比较累计利润总额。

7. 多目标退休规划

Original question

Bilbo will retire in 30 years and needs $14,000 per month for 25 years, beginning one month after retirement; he will buy a $400,000 cabin in 10 years and leave $1.5 million at the end of retirement. He saves $2,150 per month during Years 1–10. With EAR 10% before retirement and EAR 7% after retirement, find the monthly saving required in Years 11–30.

中文题意

先算退休时刻必须拥有多少钱，再算现有储蓄计划到退休能形成多少钱，两者差额由第 11–30 年的每月储蓄补足。利率是 EAR，必须先转为月有效利率。

步骤 1: 将 EAR 转成月有效利率：

$$i_{\text{pre}} = (1.10)^{1/12} - 1 = 0.797414\% \text{ /月}, \qquad i_{\text{post}} = (1.07)^{1/12} - 1 = 0.565415\% \text{ /月}.$$

步骤 2: 计算退休时需要的资金。退休后的生活费是 300 期普通年金：

$$PV_{\text{income}} = 14{,}000 \frac{1 - (1 + i_{\text{post}})^{-300}}{i_{\text{post}}} = \$2{,}019{,}847.52.$$

退休末需留下的遗产在退休时的现值为：

$$PV_{\text{bequest}} = \frac{1{,}500{,}000}{(1 + i_{\text{post}})^{300}} = \$276{,}373.77.$$

因此退休时目标财富为：

$$W_{30} = 2{,}019{,}847.52 + 276{,}373.77 = \$2{,}296{,}221.28.$$

步骤 3: 计算前 10 年每月储蓄 $2,150 的积累值：

$$FV_{10} = 2{,}150 \frac{(1 + i_{\text{pre}})^{120} - 1}{i_{\text{pre}}} = \$429{,}707.29.$$

第 10 年购买木屋后，剩余财富为 $429{,}707.29 - 400{,}000 = \$29{,}707.29$；继续增长至退休时：

$$FV_{30,\text{old}} = 29{,}707.29(1 + i_{\text{pre}})^{240} = \$199{,}855.80.$$

步骤 4: 因此第 11–30 年的新储蓄必须在退休时累积为：

$$2{,}296{,}221.28 - 199{,}855.80 = \$2{,}096{,}365.48.$$

设这 240 个月每月末储蓄为 C：

$$2{,}096{,}365.48 = C \frac{(1 + i_{\text{pre}})^{240} - 1}{i_{\text{pre}}}.$$

于是

$$C = \boxed{\$2{,}918.68 \text{ per month}}.$$

高频错误：题目给的是 EAR，而现金流按月发生；不能直接使用 $EAR/12$。正确做法是使用 $i_m = (1 + EAR)^{1/12} - 1$。

二、单项选择题详解

1. 汽车租赁现值

Original question
A car dealer leases a car for $319 per month for 60 months. Payments are due on the first day of each month, beginning today. Cost of money is 4.9% compounded monthly. Find the current value.

中文题意
第一笔租金今天立即支付，因此这不是普通年金，而是预付年金。

月利率 $i = 0.049/12$。先求普通年金现值，再向前移动一期：

$$PV_{\text{due}} = 319\left[\frac{1-(1+i)^{-60}}{i}\right](1+i) = \$17{,}014.34.$$

答案：E. $17,014.34

2. 保险赔偿现值

Original question
An insurance settlement of $211,400 is payable one year from today. Find the minimum amount acceptable today if investments earn 6.3%.

中文题意
把一年后的确定现金流折回今天；接受更低金额将使你不如等待一年领取赔偿。

$$PV = \frac{211{,}400}{1.063} = \$198{,}871.12.$$

答案：A. $198,871.12

3. 住房抵押贷款总利息

Original question
Borrow $199,000 at 5.5% compounded monthly for 30 years, paid monthly. Find total interest paid.

中文题意
先利用贷款现值公式求月供，再用“总还款减本金”得到总利息。

步骤 1: $i = 0.055/12$，$n = 360$。月供满足：

$$199{,}000 = C\frac{1-(1+i)^{-360}}{i}, \qquad C = \$1{,}129.90.$$

步骤 2: 总利息为：

$$360 \times 1{,}129.90 - 199{,}000 = \$207{,}764\text{(约)}.$$

答案：A. $207,764

4. 购房转售的净现值

Original question
Buy a house today for $172,800 and sell it in one year for $197,100. With a discount rate of 6.75%, find expected NPV.

中文题意
今日购房支出是时点 0 的现金流；一年后出售收入必须先折现。

$$NPV = -172{,}800 + \frac{197{,}100}{1.0675} = \$11{,}837.00.$$

答案：C. $11,837.00

5. 连续复利的有效年利率

Original question
What is the effective annual rate of 10.25 percent compounded continuously?

中文题意
连续复利报价 r 转换成一年实际增长率时，应使用指数函数。

$$EAR = e^{0.1025} - 1 = 0.107937 \approx 10.79\%.$$

答案：D. 10.79%

6. 增长工资合同现值

Original question
A ten-year employment contract has a starting salary of $65,000 and guaranteed annual raises of 5%. Find its present value at a 7% discount rate.

中文题意
将第一年年末薪酬视作首笔现金流，之后每年增长 5%，形成 10 期增长年金。

$$PV = \frac{C_1}{r-g}\left[1 - \left(\frac{1+g}{1+r}\right)^n\right] = \frac{65{,}000}{0.07-0.05}\left[1 - \left(\frac{1.05}{1.07}\right)^{10}\right] = \$558{,}845.85.$$

答案：B. $558,845.85

7. 土地持有年限

Original question
Land purchased for $5,500 is now worth $89,760 after appreciating at 11% annually. Find the ownership period.

中文题意
这是一笔单笔资产的复利增长，未知量是时间。

$$89{,}760 = 5{,}500(1.11)^t \quad \Longrightarrow \quad t = \frac{\ln(89{,}760/5{,}500)}{\ln(1.11)} = 26.76 \text{ 年}.$$

答案：A. 26.76 years

8. 每月收款流的现值

Original question
Receive $550 per month for ten years. Find the value today at 6% compounded monthly.

中文题意
题干没有说第一笔立即收到，故按月末收款的普通年金处理。

$$PV = 550\frac{1-(1+0.06/12)^{-120}}{0.06/12} = \$49{,}540.40.$$

答案：B. $49,540.40

9. 可负担的汽车价格

Original question
Pay $185 per month for four years and make a $2,500 cash down payment. At 4.9% compounded monthly, what price car can be afforded?

中文题意
汽车总价格等于今天首付，加上未来月供序列在今天的现值。

$$PV_{\text{payments}} = 185\frac{1-(1+0.049/12)^{-48}}{0.049/12},$$
$$\text{Car price} = 2{,}500 + PV_{\text{payments}} = \$10{,}549.07.$$

答案：C. $10,549.07

10. 学生贷款月供

Original question
Student loan debt is $26,800 at 4.25% compounded monthly. Find the monthly payment that fully repays it in seven years.

中文题意
贷款余额是未来 84 笔等额月供的现值。

$$26{,}800 = C\frac{1-(1+0.0425/12)^{-84}}{0.0425/12} \quad\Longrightarrow\quad C = \$369.42.$$

答案：B. $369.42

Part III

重要术语与公式速查

一、核心术语中英对照

English term	中文翻译	理解与使用场景
Financial market	金融市场	资金在不同主体之间转移、定价与交易的市场体系。
Net present value (NPV)	净现值	未来现金流现值减去初始投资；正 NPV 表示创造价值。
Time value of money	货币时间价值	同金额的货币在不同时间点价值不同。
Present value (PV)	现值	未来现金流折算到今天的等价价值。
Future value (FV)	终值 / 未来值	当前资金按收益率增长至未来某时点的价值。
Simple interest	单利	利息只按初始本金计算，不让已获利息继续生息。
Compound interest	复利	利息进入本金并继续生息；产生“利滚利”。
Compounding	复利计息 / 终值化	把今天的价值向未来移动。
Discounting	折现	把未来价值移回今天。
Discount rate	折现率	反映机会成本与风险补偿的价值转换率。
Lump sum	单笔现金流	仅在一个时点出现的一笔付款或收款。
Annuity	年金	等间隔、等金额的一系列现金流。
Ordinary annuity	普通年金 / 后付年金	每期末发生现金流；未特别说明时通常采用此设定。
Annuity due	预付年金 / 先付年金	每期初发生现金流；如“first day”或“beginning today”。
Growing annuity	增长年金	现金流以固定增长率逐期增长，如工资合同。
APR (annual percentage rate)	年百分率 / 名义年利率	若说明按月复利，月利率通常为 $APR/12$。
EAR (effective annual rate)	有效年利率 / 实际年利率	一年内实际增长率，已包含复利频率影响。
Continuous compounding	连续复利	复利频率趋于无限，终值使用 PVe^{rt}。
Mortgage	抵押贷款 / 房贷	通常通过固定月供逐步偿还本金及利息。
Loan amortization	贷款摊还	按期偿还贷款余额的过程。

English term	中文翻译	理解与使用场景
Cash down payment	现金首付款	购买时立即支付的金额，应直接计入今天的价格。
Retirement withdrawal	退休提款	退休后按期领取的现金流，常以年金现值求退休时所需财富。
Inheritance / bequest	遗产 / 遗赠目标	规划期末希望保留的终值，需折回规划基准时点。

二、公式速查：先识别现金流，再选公式

1. 单笔现金流

$$FV = PV(1+r)^t, \qquad PV = \frac{FV}{(1+r)^t}, \qquad t = \frac{\ln(FV/PV)}{\ln(1+r)}.$$

2. 一年复利 m 次与连续复利

$$FV = PV\left(1+\frac{APR}{m}\right)^{mt}, \qquad FV_{\text{continuous}} = PVe^{rt}, \qquad EAR = \left(1+\frac{APR}{m}\right)^m - 1.$$

连续复利报价的有效年利率：$EAR = e^r - 1$。

3. 普通年金与预付年金

$$PV_{\text{OA}} = C\frac{1-(1+i)^{-n}}{i}, \qquad FV_{\text{OA}} = C\frac{(1+i)^n-1}{i}, \qquad PV_{\text{AD}} = PV_{\text{OA}}(1+i).$$

4. 增长年金现值

若第一笔现金流在一年后发生，且每年按 g 增长：

$$PV = \frac{C_1}{r-g}\left[1-\left(\frac{1+g}{1+r}\right)^n\right], \qquad r \neq g.$$

5. 净现值规则

$$NPV = -C_0 + \sum_{t=1}^{T}\frac{CF_t}{(1+r)^t}.$$

若 $NPV > 0$，项目在给定折现率下创造价值；若 $NPV < 0$，则不应接受。

三、英文题干识别与高频易错点

题干信号词	应立即想到的处理方式
“one year from today” / “in 10 years”	明确未来时点，单笔现金流通常需要折现或复利。
“payments are due on the first day”	预付年金；相对于普通年金，多乘一个 $(1+i)$。
“payments per month for ten years”	期数通常为 10×12；月利率与现金流频率必须一致。
“APR compounded monthly”	月利率 $i = APR/12$；不要把 APR 直接用于月现金流。
“EAR” 与月度现金流同时出现	月有效利率 $i = (1+EAR)^{1/12} - 1$，不是简单除以 12。
“compounded continuously”	使用 e^{rt}；若求有效年利率，用 $e^r - 1$。
“starting salary ... raises of 5%”	识别为增长年金，关注第一笔工资发生时点。
“total interest”	先求每期还款，再用总还款额减去原始借款本金。
“expected NPV”	把未来预期收入折现后减去今天支出。

考前检查清单

1. 现金流发生在期初还是期末？是否为 annuity due？
2. 利率是 APR 还是 EAR？复利频率是否与现金流频率一致？
3. 题目问的是现值、终值、期数、还款额、总利息还是 NPV？
4. 使用计算器后，是否保留足够中间精度，只在最终答案处四舍五入？

本资料用于课堂练习与复习。题目依据所提供的课程文件重新排版；解答中的数值已按题设复核。