

2.3 Compare investment growth and stated loan schedules

Name: _____ Class: _____ Date: _____

Total: 24 marks

KEY WORDS simple interest 单利 • compound interest 复利 • principal 本金

Objective

Compare investment growth and stated loan schedules. Original GAC004-aligned practice, not an official assessment. Show the method as well as the result. All applied scenarios are invented classroom problems.

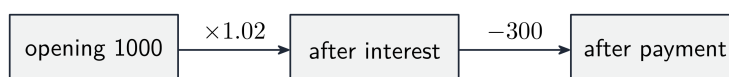
1 Key knowledge and worked examples

■ **Key knowledge:** a rate has a period and a loan balance changes after payments

Principal 本金 is the initial amount invested or borrowed. **Simple interest** 单利 uses $I = Prt$ at a stated rate r per period and time t in matching periods. **Compound interest** 复利 uses $A = P(1 + r)^n$ when the rate and compounding period match and no other cash flows apply.

For the loan convention used here, interest is added to the opening balance and a payment is then subtracted: $B_n = B_{n-1}(1 + r) - M$. A final payment may need adjustment to avoid a negative balance. Compare total payments and fees under the same stated schedule. All examples use invented classroom terms, with no actual lending or investment advice.

■ **Worked example:** interest then payment, in that order



Known: opening balance 1000 units, period rate 2%, end-of-period payment 300 units. Interest comes before payment under this stated convention.

$$B_1 = B_0(1 + r) - M$$

$$B_1 = 1000(1.02) - 300 = 720$$

The next period's interest uses 720, not the original principal.

$$B_2 = B_1(1 + r) - M = 720(1.02) - 300 = 434.40$$

2 Practice

2.1 Find the simple interest on 800 units at 5% per year for 3 years. [2]

2.2 Find the value of 800 units after 2 years at 5% compounded annually, with no other cash flows. [2]

2.3 A nominal teaching rate is 12% per year, compounded monthly at 1% per month. Find the value of 1000 units after 6 months, to 2 decimal places. [3]

2.4 A loan opens at 600 units. Each month adds 1% interest before a 100-unit payment. Find the balances after the first two months. [3]

3 Exam-style questions

3.1 Two investments start with 2000 units. A pays simple interest at 6% per year for 3 years. B pays 5.5% compounded annually for 3 years. There are no charges or other cash flows. Find each final value and the difference to 2 decimal places. State which final value is higher under these assumptions. [6]

Solutions

2.1

Rate and time both use years.

$$I = Prt = 800(0.05)(3) = 120$$

Interest 120 units.

2.2

Apply two annual multipliers.

$$A = P(1 + r)^n = 800(1.05)^2 = 882$$

Value 882 units.

2.3

Use the specified monthly rate with six monthly periods.

$$A = P(1 + r_m)^n$$

$$A = 1000(1.01)^6$$

Correct matching rate and period.

$$A = 1000(1.01)^6 \approx 1061.52$$

Value 1061.52 units.

2.4

Use the stated interest-before-payment recurrence.

$$B_n = B_{n-1}(1 + r) - M$$

$$B_1 = 600(1.01) - 100 = 506$$

First balance 506.

$$B_2 = 506(1.01) - 100 = 411.06$$

Second balance 411.06.

3.1

A adds simple interest to principal.

$$A_S = P(1 + rt) = 2000(1 + 0.06(3)) = 2360$$

A value 2360. B uses repeated multiplication.

$$A_C = P(1 + r)^n = 2000(1.055)^3 = 2348.48275$$

B value 2348.48 to two decimal places.

$$\Delta = A_S - A_C = 2360 - 2348.48275 \approx 11.52$$

Difference 11.52. A's final value is higher under the specified terms. This does not compare risk, availability or any unstated conditions.

3.2

Use the recurrence with interest first.

$$B_n = B_{n-1}(1 + r) - M$$

$$B_1 = 1000(1.02) - 300 = 720$$

First balance.

$$B_2 = 720(1.02) - 300 = 434.40$$

Second balance.

$$B_3 = 434.40(1.02) - 300 = 143.088$$

Third balance. Period 4's final payment includes its interest.

$$M_4 = B_3(1 + r) = 143.088(1.02) = 145.94976 \approx 145.95$$

Final payment 145.95.

$$T = 3M + M_4 = 3(300) + 145.94976 \approx 1045.95$$

Total paid 1045.95.

$$I = T - P = 1045.94976 - 1000 \approx 45.95$$

Total interest 45.95. Carry unrounded balances through this mathematical model; an actual contract may specify a different rounding rule.