Marking guide | Financial mathematics

Financial mathematics - practice test 1

16 questions | 44 marks | 60 minutes

All amounts are Australian dollars. Use the stated classroom models; exclude fees, tax and other transactions unless given. Round final currency to cents unless asked otherwise.

Equivalent correct methods earn the corresponding marks.

1. Write the growth factor for a 7% increase. [2 marks]

$1 + 0.07 = 1.07.$

Answer: 1.07

2. Find the yearly simple interest on 1200 dollars at 5%. [2 marks]

$1200(0.05) = 60.$

Answer: 60 dollars

3. Find the total after 3 years on 1200 dollars at 5% simple interest. [2 marks]

$1200(1 + 0.05 \times 3) = 1380.$

Answer: 1380 dollars

4. Find the total after 3 years on 1200 dollars at 5% annual compound interest. Round to cents. [2 marks]

$1200(1.05)^3 = 1389.15.$

Answer: 1389.15 dollars

5. State the period rate and number of periods for nominal 8% annually compounded quarterly over 2 years. [2 marks]

$\frac{0.08}{4} = 0.02$ and $4 \times 2 = 8$.

Answer: 2% quarterly; 8 periods.

6. An account model starts at 3000 dollars with nominal 6% annually compounded quarterly for 2 years. Find its balance to cents. [3 marks]

$3000(1.015)^8 = 3379.4777\ldots$.

Answer: 3379.48 dollars

7. A 900-dollar asset loses 10% of current value annually. Find its value after 2 years. [2 marks]

$900(0.9)^2 = 729$.

Answer: 729 dollars

8. An asset starts at 1800 dollars and loses 200 dollars per year under a straight-line model. Find its value after 5 years. [2 marks]

$1800 - 200(5) = 800$.

Answer: 800 dollars

9. A 200-dollar item is discounted 20%, then 10%. Find its final price and total percentage discount. [3 marks]

$200(0.8)(0.9) = 144$. The retained factor is 0.72.

Answer: 144 dollars; 28% discount.

10. A price is 276 dollars after a 15% increase. Find its original value. [3 marks]

$\frac{276}{1.15} = 240.$

Answer: 240 dollars

11. A saving rule is $B_{n+1} = 1.03B_n + 100$, with $B_0 = 500$. [4 marks]

(a) Find the first closing balance. [2 marks]

$500(1.03) + 100 = 615.$

Answer: 615 dollars

(b) Find the second closing balance. [2 marks]

$615(1.03) + 100 = 733.45.$

Answer: 733.45 dollars

12. A loan starts at 1500 dollars. Each month it adds 2% interest, then a 300-dollar repayment. [4 marks]

(a) Find the first closing balance. [2 marks]

$1500(1.02) - 300 = 1230.$

Answer: 1230 dollars

(b) How much of the first payment reduces the amount below its opening value? [2 marks]

Interest was 30 dollars; $300 - 30 = 270$.

Answer: 270 dollars

13. A spreadsheet uses B = opening, C = decimal rate, D = end deposit and E = closing. Write the formula for E4. [2 marks]

The interest is applied to the opening balance before the deposit is added.

Answer: E4 = B4*(1+C4)+D4

14. A final fee-free model balance is 1820 dollars. A 35-dollar fee is charged only at the end. Find the adjusted balance. [2 marks]

$1820 - 35 = 1785.$

Answer: 1785 dollars

15. Why can a model starting at 2000 dollars not be judged better than one starting at 1000 dollars solely because it has a larger final balance? [3 marks]

Compare returns using matching initial amounts, durations, conventions and fees.

Answer: The initial contributions differ.

16. A fund starts at 1000 dollars, earns 4% annually, and then pays a 10-dollar fee at each year end. [6 marks]

(a) Find the first two closing balances. [3 marks]

$B_1 = 1000(1.04) - 10 = 1030;\ B_2 = 1030(1.04) - 10 = 1061.2.$

Answer: 1030 dollars; 1061.20 dollars.

(b) Find the difference from the no-fee year-2 balance and explain why it is not exactly 20 dollars. [3 marks]

No-fee balance is 1081.6. Difference $= 1081.6 - 1061.2 = 20.4.$

Answer: 20.40 dollars; the first fee also loses interest.