Financial Literacy Quiz
Answer Key
ApexMath

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1. Calculate the simple interest earned on \$2,500 at a rate of 4% per year for 3 years.

Step 1: Write the simple interest formula.

$$I = P \cdot r \cdot t$$

Step 2: Identify the values. The principal is $P = 2500$, the annual rate is $r = 0.04$, and the time is $t = 3$ years.

Step 3: Substitute and multiply.

$$I = 2500 \times 0.04 \times 3 = 100 \times 3 = 300$$

$$\boxed{\$300}$$

2. A loan of \$1,200 is taken out with a simple interest rate of 6% per year. What is the total amount to be repaid after 5 years?

Step 1: First, calculate the interest earned using $I = P \cdot r \cdot t$.

$$I = 1200 \times 0.06 \times 5 = 72 \times 5 = 360$$

Step 2: Add the interest to the original principal to get the total repayment.

$$A = P + I = 1200 + 360 = 1560$$

$$\boxed{\$1{,}560}$$

3. Calculate the amount in an account after 2 years if \$1,000 is invested at 5% compounded annually.

Step 1: Write the compound interest formula.

$$A = P\left(1 + r\right)^n$$

Step 2: Identify the values. $P = 1000$, $r = 0.05$, and $n = 2$ years.

Step 3: Substitute the values.

$$A = 1000\left(1 + 0.05\right)^2 = 1000\left(1.05\right)^2$$

Step 4: Evaluate the exponent, then multiply.

$$(1.05)^2 = 1.1025 \qquad \Rightarrow \qquad A = 1000 \times 1.1025 = 1102.50$$

$$\boxed{\$1{,}102.50}$$

4. If \$5,000 is invested at 4% compounded semi-annually, what is the interest rate per period (i) and the number of periods (n) for a 3-year term?

Step 1: Find the periodic rate i. Semi-annual means 2 compounding periods per year, so divide the annual rate by 2.

$$i = \frac{r}{m} = \frac{0.04}{2} = 0.02$$

Step 2: Find the total number of periods n. Multiply the number of years by the number of periods per year.

$$n = t \times m = 3 \times 2 = 6$$

$$\boxed{i = 0.02, \quad n = 6}$$

5. Calculate the future value of \$2,000 invested for 5 years at 6% compounded monthly.

Step 1: Write the compound interest formula.

$$A = P\left(1 + \frac{r}{m}\right)^{mt}$$

Step 2: Identify the values. $P = 2000$, $r = 0.06$, $m = 12$ (monthly), $t = 5$ years.
Step 3: Calculate the periodic rate and the total number of periods.

$$i = \frac{0.06}{12} = 0.005 \qquad n = 12 \times 5 = 60$$

Step 4: Substitute and compute.

$$A = 2000\,(1.005)^{60} \approx 2000 \times 1.34885 \approx 2697.70$$

$$\boxed{\$2{,}697.70}$$

6. Which formula is used for continuous compounding?

Explanation: When interest is compounded continuously, the number of compounding periods per year approaches infinity. Taking that limit of the standard compound interest formula produces a special result involving e, Euler's number.
The formula is:

$$A = Pe^{rt}$$

where P is the principal, r is the annual rate, t is the time in years, and $e \approx 2.71828$.

$$\boxed{A = Pe^{rt}}$$

7. You deposit \$100 every month into an account paying 6% compounded monthly. What is the value after 10 years?

Step 1: Recognize this as a future value of an ordinary annuity (payments at the end of each period). Write the formula.

$$FV = PMT \cdot \frac{(1+i)^n - 1}{i}$$

Step 2: Identify the values. $PMT = 100$, $i = \dfrac{0.06}{12} = 0.005$, $n = 10 \times 12 = 120$.
Step 3: Substitute.

$$FV = 100 \cdot \frac{(1.005)^{120} - 1}{0.005}$$

Step 4: Evaluate the exponent first, then simplify.

$$(1.005)^{120} \approx 1.81940 \qquad \Rightarrow \qquad FV = 100 \cdot \frac{1.81940 - 1}{0.005} = 100 \cdot \frac{0.81940}{0.005}$$

$$FV = 100 \times 163.8793 \approx 16{,}387.93$$

$$\boxed{\$16{,}387.93}$$

8. How much must you invest now to receive \$1,000 a year for 5 years at 4% compounded annually?

Step 1: This is the present value of an ordinary annuity. Write the formula.

$$PV = PMT \cdot \frac{1 - (1+i)^{-n}}{i}$$

Step 2: Identify the values. $PMT = 1000$, $i = 0.04$, $n = 5$.
Step 3: Substitute.

$$PV = 1000 \cdot \frac{1 - (1.04)^{-5}}{0.04}$$

Step 4: Evaluate the exponent, then simplify.

$$(1.04)^{-5} \approx 0.82193 \qquad \Rightarrow \qquad PV = 1000 \cdot \frac{1 - 0.82193}{0.04} = 1000 \cdot \frac{0.17807}{0.04}$$

$$PV = 1000 \times 4.45182 \approx 4451.82$$

$$\boxed{\$4{,}451.82}$$

9. Calculate the monthly payment for a \$300,000 mortgage at 5% interest for 25 years.

Step 1: Write the loan payment (amortization) formula.

$$PMT = P \cdot \frac{i(1+i)^n}{(1+i)^n - 1}$$

Step 2: Identify the values. $P = 300{,}000$, $i = \frac{0.05}{12} \approx 0.004167$, $n = 25 \times 12 = 300$.
Step 3: Substitute.

$$PMT = 300{,}000 \cdot \frac{0.004167 \times (1.004167)^{300}}{(1.004167)^{300} - 1}$$

Step 4: Evaluate $(1.004167)^{300} \approx 3.48695$, then simplify.

$$PMT = 300{,}000 \cdot \frac{0.004167 \times 3.48695}{3.48695 - 1} = 300{,}000 \cdot \frac{0.014529}{2.48695} \approx 300{,}000 \times 0.005846$$

$$PMT \approx 1753.77$$

$$\boxed{\$1{,}753.77 \text{ per month}}$$

10. What is the effective annual rate (EAR) for a 12% nominal rate compounded monthly?

Step 1: Write the EAR formula. This converts a nominal rate into the true annual rate after compounding.

$$EAR = \left(1 + \frac{r}{m}\right)^m - 1$$

Step 2: Identify the values. $r = 0.12$, $m = 12$ (monthly).
Step 3: Substitute.

$$EAR = \left(1 + \frac{0.12}{12}\right)^{12} - 1 = (1.01)^{12} - 1$$

Step 4: Evaluate and convert to a percentage.

$$(1.01)^{12} \approx 1.12683 \qquad \Rightarrow \qquad EAR = 1.12683 - 1 = 0.12683$$

$$EAR \approx 12.68\%$$

$$\boxed{EAR \approx 12.68\%}$$

11. What is the difference between an ordinary annuity and an annuity due?

Explanation: Both types involve equal, regular payments, but the timing differs.

- An **ordinary annuity** has payments made at the *end* of each period (e.g., a typical loan repayment).
- An **annuity due** has payments made at the *beginning* of each period (e.g., rent paid at the start of the month).

Because annuity due payments are made one period earlier, each payment earns one extra period of interest, making the future value slightly higher than an ordinary annuity.

$$\boxed{\text{Annuity due payments are made at the } \textit{start} \text{ of each period.}}$$

12. In a typical amortized loan, as time passes, the portion of the payment going towards interest:

Explanation: Each fixed payment covers interest first, and the remainder reduces the principal (the amount owed). As the outstanding balance decreases over time, there is less principal for interest to be charged on. Therefore, the interest portion of each payment gets smaller over time, and the principal portion grows.

$$\boxed{\text{Decreases}}$$

13. Which compounding frequency results in the highest future value?

Explanation: The more frequently interest is compounded, the more often earned interest is added back to the principal, and the more interest earns interest. For the same nominal annual rate, the ranking from lowest to highest future value is:

$$\text{Annually} < \text{Semi-annually} < \text{Quarterly} < \text{Monthly} < \text{Daily} < \text{Continuously}$$

Daily compounding produces the highest future value among the standard discrete compounding options.

$$\boxed{\text{Daily}}$$

14. Using the Rule of 72, approximately how long will it take for an investment to double at a 9% interest rate?

Step 1: Write the Rule of 72 formula.

$$t \approx \frac{72}{r}$$

where r is the annual interest rate expressed as a percentage (not a decimal).

Step 2: Substitute $r = 9$.

$$t \approx \frac{72}{9} = 8$$

$$\boxed{t \approx 8 \text{ years}}$$

15. Find the time (t) in years if $I = \$120$, $P = \$1{,}000$, and $r = 6\%$ simple interest.

Step 1: Start with the simple interest formula and solve for t.

$$I = P \cdot r \cdot t \qquad \Rightarrow \qquad t = \frac{I}{P \cdot r}$$

Step 2: Substitute the known values. Remember to convert the rate: $r = 0.06$.

$$t = \frac{120}{1000 \times 0.06} = \frac{120}{60} = 2$$

$$\boxed{t = 2 \text{ years}}$$

16. What is the present value of \$5,000 to be received in 4 years at 6% compounded annually?

Step 1: Write the present value formula. This is the compound interest formula solved for P.

$$PV = \frac{FV}{(1+r)^n}$$

Step 2: Identify the values. $FV = 5000$, $r = 0.06$, $n = 4$.
Step 3: Substitute.

$$PV = \frac{5000}{(1.06)^4}$$

Step 4: Evaluate the denominator, then divide.

$$(1.06)^4 \approx 1.26248 \qquad \Rightarrow \qquad PV = \frac{5000}{1.26248} \approx 3960.47$$

$$\boxed{\$3{,}960.47}$$

17. Calculate the payment (PMT) needed to reach \$1,000,000 in 40 years at 7% compounded annually.

Step 1: This is a sinking fund — we need to find the regular deposit to reach a future value. Rearrange the future value of an annuity formula to solve for PMT.

$$FV = PMT \cdot \frac{(1+i)^n - 1}{i} \qquad \Rightarrow \qquad PMT = FV \cdot \frac{i}{(1+i)^n - 1}$$

Step 2: Identify the values. $FV = 1{,}000{,}000$, $i = 0.07$, $n = 40$.
Step 3: Substitute.

$$PMT = 1{,}000{,}000 \cdot \frac{0.07}{(1.07)^{40} - 1}$$

Step 4: Evaluate $(1.07)^{40} \approx 14.97446$, then simplify.

$$PMT = 1{,}000{,}000 \cdot \frac{0.07}{14.97446 - 1} = 1{,}000{,}000 \cdot \frac{0.07}{13.97446} \approx 1{,}000{,}000 \times 0.005009$$

$$PMT \approx 5009.14$$

$$\boxed{\$5{,}009.14 \text{ per year}}$$

18. If a credit card charges 19.99% annual interest compounded daily, what is the daily interest rate?

Step 1: To find the daily rate, divide the annual nominal rate by the number of days in a year.

$$i_{\text{daily}} = \frac{r}{365}$$

Step 2: Substitute $r = 0.1999$.

$$i_{\text{daily}} = \frac{0.1999}{365} \approx 0.0005477$$

Step 3: Convert to a percentage.

$$0.0005477 \times 100 \approx 0.05477\%$$

$$\boxed{i_{\text{daily}} \approx 0.05477\%}$$

19. If inflation is 3% per year, how much will a \$50 item cost in 10 years?

Step 1: Inflation compounds just like interest. Use the compound growth formula.

$$A = P(1+r)^t$$

Step 2: Identify the values. $P = 50$, $r = 0.03$, $t = 10$.

Step 3: Substitute.

$$A = 50 \times (1.03)^{10}$$

Step 4: Evaluate the exponent, then multiply.

$$(1.03)^{10} \approx 1.34392 \qquad \Rightarrow \qquad A = 50 \times 1.34392 \approx 67.20$$

$$\boxed{\$67.20}$$

20. If you want your money to quadruple in 12 years, what annual interest rate (compounded annually) do you need?

Step 1: Set up the compound interest equation. Quadrupling means the final amount is $4P$.

$$4P = P(1+r)^{12}$$

Step 2: Divide both sides by P to cancel it.

$$4 = (1+r)^{12}$$

Step 3: Take the 12th root of both sides.

$$1 + r = 4^{1/12}$$

Step 4: Solve for r and convert to a percentage.

$$r = 4^{1/12} - 1 \approx 1.1225 - 1 = 0.1225$$

$$r \approx 12.25\%$$

$$\boxed{r \approx 12.25\%}$$

21. A sinking fund is used to:

Explanation: A sinking fund is a savings strategy where equal, regular deposits are made over time so that a specific large sum of money is available at a future date. For example, a business might set up a sinking fund to replace equipment, or a person might use one to save for a down payment on a home.

$$\boxed{\text{Save for a future large expense}}$$

22. What is the present value of a perpetuity paying \$100 per year at 5% interest?

Step 1: A perpetuity is an annuity that pays forever. Its present value formula simplifies to:

$$PV = \frac{PMT}{r}$$

Step 2: Substitute $PMT = 100$ and $r = 0.05$.

$$PV = \frac{100}{0.05} = 2000$$

$$\boxed{\$2{,}000}$$

23. Which is better for a saver: 5% compounded quarterly or 4.95% compounded daily?

Step 1: Convert both to their effective annual rate (EAR) using:

$$EAR = \left(1 + \frac{r}{m}\right)^m - 1$$

Step 2: Calculate EAR for 5% compounded quarterly ($m = 4$).

$$EAR_{\text{quarterly}} = \left(1 + \frac{0.05}{4}\right)^4 - 1 = (1.0125)^4 - 1 \approx 1.05095 - 1 = 5.095\%$$

Step 3: Calculate EAR for 4.95% compounded daily ($m = 365$).

$$EAR_{\text{daily}} = \left(1 + \frac{0.0495}{365}\right)^{365} - 1 \approx 1.05074 - 1 = 5.074\%$$

Step 4: Compare. $5.095\% > 5.074\%$, so the quarterly option is better.

$$\boxed{5\% \text{ compounded quarterly}}$$

24. If $r = 8\%$ compounded annually, what is the value of i for an annuity with annual payments?

Explanation: The periodic rate i is found by dividing the annual nominal rate by the number of compounding periods per year. Since the compounding is annual ($m = 1$), there is no division needed.

$$i = \frac{r}{m} = \frac{0.08}{1} = 0.08$$

$$\boxed{i = 0.08}$$

25. The "principal" in a financial context refers to:

Explanation: In any loan or investment, the principal is the original sum of money before any interest is added or deducted. It is the base amount on which interest is calculated. For example, if you borrow \$5,000 from a bank, the principal is \$5,000 regardless of what interest accumulates over time.

$$\boxed{\text{The initial amount borrowed or invested}}$$

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