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Engr. 1100

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All interest rates are meant to be annual, unless specified otherwise.

Show Your Work

1) Find the total amount of money with the accrued interest, if \$800.00 is invested at 3.5% **simple interest** rate for 4 years. $P = \$800.00$, $R = 3.5\% = .035$, $t = 4$ Years.

$$A = P(1+Rt)$$
$$= 800(1+.035\times 4) = \$912.00$$

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2) Find the total amount of money with the accrued interest, if \$2500.00 is invested at 2.5% interest rate compounded daily for 4.5 years.

$P = \$2500.00$, $R = .025$, $n = 365$, $t = 4.5$ Years.

$$A = P\left(1+\frac{R}{n}\right)^{nt}$$
$$= 2500\left(1+\frac{.025}{365}\right)^{(365\times 4.5)} = \$2797.67$$

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3) At what interest rate should money be invested for it to double in 10 years, it were compounded quarterly? $A/P = 2$, $t = 10$ years, $n = 4$, $R = ?$

$$A = P\left(1+\frac{R}{n}\right)^{nt}$$
$$A/P = \left(1+\frac{R}{n}\right)^{nt}$$
$$(A/P)^{1/nt} = 1+\frac{R}{n}$$

$$\frac{R}{n} = (A/P)^{1/nt} - 1$$
$$R = n\left[(A/P)^{1/nt} - 1\right]$$
$$= 4\left[2^{\frac{1}{40}} - 1\right] = .0699$$
$$\Rightarrow R = 6.99\% = \text{APR}$$

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4) How long should you wait for you money to triple, if it were invested at 3.5% interest rate and compounded monthly? $t = ?$ $A/P = 3$, $R = .035$, $n = 12$

$$A = P(1+R/n)^{nt}$$
$$A/P = \left(1+\frac{R}{n}\right)^{nt}$$
$$\ln(A/P) = nt\ln\left(1+\frac{R}{n}\right)$$

$$t = \frac{\ln(A/P)}{n\ln(1+R/n)}$$
$$= \frac{\ln(3)}{12\ln\left(1+\frac{.035}{12}\right)}$$

$= 31.43$ Years

$= 31$ Years and 5 months and 5 days.

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5) What would your monthly payment be, if you took a loan of $200,000.00 (for 30 years) to buy a house with an interest of 4.75%.

$$\text{Monthly Payment} = \frac{200{,}000 \cdot \left(\frac{.0475}{12}\right)}{\left(1-\left(1+\frac{.0475}{12}\right)^{-(12\times 30)}\right)} = \frac{\text{Loan Amount}\cdot(r/n)}{\left(1-(1+r/n)^{-nt}\right)}$$

$$= \$1043.29$$

(11)

6) Use the ordinary annuity equation to find out how much you would have, if you deposit $350.00 every quarter for 18 years at 3.5% interest rate?

$$A = \text{Periodic Payment} \cdot \frac{\left[(1+r/n)^{nt}-1\right]}{(r/n)} \quad ; \quad P = 350{,}00,\ t = 18 \text{ Years}$$
$$n = 4,\ R = .035$$

$$= \frac{350\left((1+.035/4)^{(4\times 18)}-1\right)}{(.035/4)} = \$34898.90$$

(12)

7) Suppose you were trying to save money to buy a new machine for your shop. How much money do you need to deposit every month in an account that pays 3.5% interest rate, such that you will have $50,000.00 on you in 10 years? Sinking Fund Equation.

$$\text{Periodic Payment} = \frac{A\,(r/n)}{\left((1+r/n)^{nt}-1\right)} \qquad A = \$50{,}000{,}00,\ t = 10 \text{ Years}$$
$$n = 12,\ R = .035$$

$$= \frac{50{,}000\left(.035/12\right)}{\left((1+.035/12)^{12\times 10}-1\right)}$$

$$= \$348.60$$

(12)

8) Which is a better bank for investment? Answer the problem by finding the APY for each bank.
Bank A: 4.5% where the compounding is quarterly.
Bank B: 4.3% where the compounding is monthly.
Bank C: 4.0% where the compounding is continuous.

(15)

BANK A

$$APY = \left(1+\frac{R}{n}\right)^{n}-1$$
$$= \left(1+\frac{.045}{4}\right)^{4}-1$$
$$= .0458$$
$$APY = 4.58\%$$
$$n = 1$$

BANK B

$$APY = \left(1+\frac{R}{n}\right)^{n}-1$$
$$= \left(1+\frac{.043}{12}\right)^{12}-1$$
$$= .0439$$
$$APY = 4.39\%$$
$$n = 1$$

BANK C

$$APY = e^{R}-1$$
$$= e^{.04}-1$$
$$= .0408$$
$$APY = 4.08\%$$
$$n = 1$$

Bank A is the best bank for investment.

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