PC11 Ch 7 Hand-in 2023

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PreCalc 11 Chapter 7 Assignment – hand in for completion marks

Name: Key

Complete the following questions showing all work and steps where applicable.

1. A principal of $700 was invested at an annual interest rate of 4%. It earned $46.67 simple interest. For how long was the money invested?

$P = \$700$

$r = 0.04$

$t = ?$

$I = 46.67$

$\frac{I}{Pr} = \frac{Prt}{Pr}$

$t = \frac{I}{Pr}$

$t = \frac{46.67}{(700)(0.04)} = 1.666785714$ years

0.666785714×12 months $\doteq 8$ months

1 year and 8 months

2. A principal of $1200 is invested at an annual simple interest rate of 5.3%. What is the amount after 5 months?

$A = ?$

$P = 1200$

$r = 0.053$

$t = \frac{5}{12}$

$A = P(1 + rt)$

$= 1200\left(1 + 0.053\left(\frac{5}{12}\right)\right)$

$= \$1226.50$

3. Travis needs $25 000 to buy a car in 5 years. He is offered an investment that pays 6.3% interest compounded monthly. What is the principal that Travis should invest today?

$P = ?$

$A = 25,000$

$t = 5$

$r = 0.063$

$n = 12$

$\frac{A}{(1+\frac{r}{n})^{nt}} = \frac{P(1+\frac{r}{n})^{nt}}{(1+\frac{r}{n})^{nt}}$

$P = \frac{A}{(1+\frac{r}{n})^{nt}}$

$= \frac{25\,000}{\left(1+\frac{0.063}{12}\right)^{(12\times 5)}}$

$= \$18,259.76$

4. Suppose you are 10 years old, and your grandmother invests $5000 into a stock that gives an average rate of return of 5.1%, compounded annually. Suppose this investment continues until you retire at age 65. Calculate the amount of the investment when you are 65 years old. $65-10 = 55$ years

$A = ?$
$P = 5000$
$r = 0.051$
$t = 55$
$n = 1$

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$
$$= 5000\left(1 + \frac{0.051}{1}\right)^{(1\times 55)}$$
$$= \$77,111.54$$

A = final or future value
P = principal (initial amount)
I = interest
r = annual interest rate (as a decimal number)
t = time (in years)
n = number of compounding periods per year

5. A principal of $100 is deposited in a savings account each month at an interest rate of 4.5%, compounded monthly. What is the amount of this annuity after 50 years?

$A = ?$
$R = 100$
$i = \frac{0.045}{12}$
$n = 12 \times 50 = 600$

$$A = \frac{R\left[(1+i)^n - 1\right]}{i}$$
$$= \frac{100\left[\left(1 + \frac{0.045}{12}\right)^{600} - 1\right]}{\left(\frac{0.045}{12}\right)}$$
$$= \$225,277.15$$

A = final or future value
PV = present value
R = the regular deposit or payment amount
i = interest rate per compounding period
n = total number of payments

6. Alexa borrows $40 000 to buy a car. She repays the loan over 5 years. The dealership offers an interest rate of 0.99%, compounded monthly. What is Alexa's monthly repayment on the loan?

$PV = 40000$
$i = \frac{0.0099}{12}$
$R = ?$
$n = 12 \times 5 = 60$

$$i(PV) = \left(\frac{R\left[1-(1+i)^{-n}\right]}{i}\right) i$$
$$\frac{(i)(PV)}{\left[1-(1+i)^{-n}\right]} = \frac{R\left[1-(1+i)^{-n}\right]}{\left[1-(1+i)^{-n}\right]}$$
$$R = \frac{(i)(PV)}{\left[1-(1+i)^{-n}\right]}$$
$$= \frac{\left(\frac{0.0099}{12}\right)(40\,000)}{\left[1-\left(1+\frac{0.0099}{12}\right)^{-60}\right]} = \$683.58$$

7. Riley needs to buy hockey equipment. The store offers an interest rate of 1.99%, compounded monthly for 2 years. Riley's monthly repayment is $100. What is the present value of the equipment?

$PV = ?$
$i = \frac{0.0199}{12}$
$R = 100$
$n = 12 \times 2 = 24$

$$PV = \frac{R\left[1-(1+i)^{-n}\right]}{i}$$
$$= \frac{100\left[1-\left(1+\frac{0.0199}{12}\right)^{-24}\right]}{\left(\frac{0.0199}{12}\right)}$$
$$= \$2350.96$$

8. A GIC earns a simple interest rate of 4.25% annually. Determine how much you would have to invest to have $1500 after 3 years.

$A = 1500$
$P = ?$
$r = 0.0425$
$t = 3$

$$\frac{A}{1+rt} = \frac{P(1+rt)}{1+rt}$$

$$P = \frac{A}{1+rt}$$

$$= \frac{1500}{(1 + 0.0425 \times 3)}$$

$\$1330.38$

9. You borrow $50 from your cousin and promise to pay them back $75 in 12 days. What is the simple interest rate on this loan?

$P = 50$
$A = 75$
$t = \frac{12}{365}$
$r = ?$

$$A = P + Prt$$

$$75 = 50 + (50)(r)\left(\frac{12}{365}\right)$$

$$25 = (r)(50)\left(\frac{12}{365}\right)$$

$$\frac{25}{\left[(50)\left(\frac{12}{365}\right)\right]} = r$$

$r = 15.208333\ldots$

$\Rightarrow 1520.83\%$

10. Christiano deposited his money in a high-interest savings account. If the account earns 2.8% compounded monthly, how much would he have after 5 years if he deposited $990?

$A = ?$
$P = 990$
$r = 0.028$
$n = 12$
$t = 5$

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

$$= 990\left(1 + \frac{0.028}{12}\right)^{(12 \times 5)}$$

$= \$1138.59$

A = final or future value
P = principal (initial amount)
I = interest
r = annual interest rate (as a decimal number)
t = time (in years)
n = number of compounding periods per year

⇒ annuity

11. Saanvi will need to start putting money away every month into RESPs so she will have enough saved to pay for her daughter's post-secondary tuition. Her daughter is currently 2 years old, and she wants to be ready for when her daughter is 18 years old. Financial advisors say you should have $100,000 saved for a bachelor's degree. How much money should Saanvi start depositing every 3 months (4 times per year) into a RESP that averages 2.8% interest compounded quarterly?

A = final or future value
PV = present value
R = the regular deposit or payment amount
i = interest rate per compounding period
n = total number of payments

(future amount)

$A = 100,000$

$R = ?$

$i = \frac{0.028}{4}$

$n = 16 \times 4 = 64$

$18 - 2 = 16$ years

$$i(A) = \left(\frac{R\left[(1+i)^n - 1\right]}{i}\right) i$$

$$(A)(i) = R\left[(1+i)^n - 1\right]$$

$$\frac{(A)(i)}{\left[(1+i)^n - 1\right]} = R$$

$$R = \frac{(100\,000)\left(\frac{0.028}{4}\right)}{\left[\left(1+\frac{0.028}{4}\right)^{64} - 1\right]} = \$1243.92$$