VISUAL 11.1 ▲ Warm-Up

For Questions 1 – 4 indicate whether the formula is associated with continuous compounding, annual compounding, no compounding, or multiple intra-year compounding, and explain the purpose of the formula.

1. Total = P(1 + nr)

2. Total = $P\left(1 + \frac{r}{k}\right)^{nk}$

3. Total = $P\left(1 + \frac{r}{1}\right)^{n}$

4. Total = $P\,e^{rt}$

Match and solve each interest calculation problem, with the corresponding formula in 1-4.

5. Suppose $4000 is invested at 7 percent interest and the investment is compounded annually. Find the investment value after 10 years.

6. Suppose $4000 is invested at 7 percent interest and the investment is compounded quarterly. Find the investment value after 10 years.

7. Suppose $4000 is invested at 7 percent interest and the investment is compounded continuously. Find the investment value after 10 years.

8. Suppose $4000 is invested in an account with 7 percent interest for 10 years, but the interest is not compounded. Find the value of the investment after 10 years.

VISUAL 11.2 ▲ The Time Value of Money: Computing Present Value

A dollar received today is more valuable than a dollar received one year from today.

1. The formula for the future value of an original principal after one year with an interest rate, r, is

Future value = original principal (1 + r)

2. Solve this equation for original principal.

3. What would the original principal be if the interest rate was 8 percent and you wanted to end up with a dollar one year from now?

4. The question above is the same as "How much would you be willing to pay today for the future payment of $1 received one year from today?"

Let the original principal be referred to as present value.

Present Value of payment received one year from today = $\frac{\text{Future Value}}{(1 + r)^1}$

In symbols: $PV = \frac{FV}{(1 + r)^1}$

where FV is the future value and r is the interest rate expressed in decimal form.

5. Calculate the Present Value of the future payment of $1, one year from today when the interest rate r = 10%.

A general Present Value calculation for payment n years from today:

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

VISUAL 11.3 ▲ The Future Value of an Annuity

PMT represents Constant Annual Payment

r represents interest rate for each payment interval in decimal form

n represents the number of payment intervals in the future for which the computation is being made

$$\text{Future value} = \text{PMT}\ \frac{\{(1 + r)^n - 1\}}{r}$$

This formula can be used to calculate the future value of payments you make to an account for any future purpose.