OBJECTIVES

Calculate the present value of a single deposit investment.

Calculate the present value of a periodic deposit investment.

You will need:
• Student Papers
• Calculator
• Textbook
• Notebook Paper
• Pen or Pencil
No Ear Buds!!!!

Cell Phones: Down & Dark
What do you want to buy or pay for in the future?

• How do you decide how much to put away each month in order to buy a car in the future?

• Your Aunt leaves you money. How much of it should you put away so that with interest, it will be enough to pay for college?
2 ways reach a financial goal.

1. One single deposit that will earn interest income over time.

2. Make systematic (regularly scheduled) deposits.
Present value of a SINGLE deposit investment

\[
P = \frac{B}{\left(1 + \frac{r}{n}\right)^{nt}}
\]

- \(P\) = present value (principal)
- \(B\) = future value
- \(r\) = annual interest rate (converted)
- \(n\) = number of times interest is compounded annually
- \(t\) = length of investment in years
Mr. and Mrs. Johnson know that in 6 years, their daughter Ann will attend State College. She will need about $20,000 for the first year’s tuition.

How much should the Johnsons deposit into an account that yields 1.5% interest, compounded annually, in order to have that amount?

Round your answer to the nearest cent.
Mr. and Mrs. Johnson know that in 6 years, their daughter Ann will attend State College. She will need about $20,000 for the first year’s tuition. How much should the Johnsons deposit into an account that yields 1.5% interest, compounded annually, in order to have that amount? Round your answer to the nearest cent.

\[ P = \text{present value} \]
\[ B = \text{future value} \quad $20,000 \]
\[ r = \text{rate} \quad .015 \]
\[ n = \text{number of compounds} \quad 1 \]
\[ t = \text{years} \quad 6 \]

\[
P = \frac{B}{\left(1 + \frac{r}{n}\right)^{nt}}
\]
Mr. and Mrs. Johnson know that in 6 years, their daughter Ann will attend State College. She will need about $20,000 for the first year’s tuition. How much should the Johnsons deposit into an account that yields 1.5% interest, compounded annually, in order to have that amount? Round your answer to the nearest cent.

\[ P = \frac{20,000}{\left(1 + \frac{.015}{1}\right)^{1\cdot6}} \]

\[ P = \frac{20,000}{1.015^6} \]

\[ P = \frac{20,000}{1.0938} \]

\[ P = 18,290.84 \]

Example 1

- **P** = present value
- **B** = future value $20,000
- **r** = rate .015
- **n** = number of compounds 1
- **t** = years 6

$18,290.84$
Example 2 – You try it!

Raven just got an inheritance and she wants to put enough of it away so that she will have $100,000 in 10 years in order to buy a home.

How much must she deposit in that account now at a 0.95% interest rate, compounded daily, in order to meet that goal? Round up to the nearest cent.
Example 2 – You try it!

Raven just got an inheritance and she wants to put enough of it away so that she will have $100,000 in 10 years in order to buy a home. How much must she deposit in that account now at a 0.95% interest rate, compounded daily, in order to meet that goal? Round up to the nearest dollar.

\[
P = \frac{B}{\left(1 + \frac{r}{n}\right)^{nt}}
\]

\[
P = \frac{100,000}{\left(1 + \frac{.0095}{365}\right)^{365 \times 10}}
\]

\[
P = \frac{100,000}{\left(1 + \frac{.0095}{365}\right)^{3650}}
\]

\[
P \approx \frac{100,000}{1.095^{3650}}
\]

\[
\approx \frac{100,000}{1.34885}
\]

\[
\approx 74,150.53
\]
Example 2 – You try it!
Raven just got an inheritance and she wants to put enough of it away so that she will have $100,000 in 10 years in order to buy a home. How much must she deposit in that account now at a 0.95% interest rate, compounded daily, in order to meet that goal? Round up to the nearest dollar.

\[ P = \frac{100,000}{\left(1 + \frac{.0095}{365}\right)^{365\cdot10}} \]

\[ P = \frac{100,000}{(1 + .00026205)\cdot365}\]

\[ P = \frac{100,000}{1.026205\cdot365}\]

\[ P = \frac{100,000}{365.9098}\]

\[ P = 90,937.41 \]

$90,937.41
Present value of a PERIODIC deposit investment

\[ P = \frac{B \cdot \frac{r}{n}}{\left(1 + \frac{r}{n}\right)^{nt} - 1} \]

- \( P \): periodic deposit (principal)
- \( B \): future value
- \( r \): annual interest rate (converted)
- \( n \): number of times interest is compounded annually
- \( t \): length of investment in years
Nick wants to install central air conditioning in his home in 3 years. He estimates the total cost to be $15,000. How much must he deposit monthly into an account that pays 1.4% interest, compounded monthly, in order to have enough money? Round up to the nearest cent.
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\[ P = \text{periodic deposit} \]
\[ B = \text{future value} \]
\[ r = \text{rate} \]
\[ n = \text{number of compounds} \]
\[ t = \text{years} \]

\[ P = \frac{B \cdot \frac{r}{n}}{\left(1 + \frac{r}{n}\right)^{nt} - 1} \]

\[ P = \frac{15,000 \cdot \frac{0.014}{12}}{\left(1 + \frac{0.014}{12}\right)^{12 \cdot 3} - 1} \]

Example 3
Nick wants to install central air conditioning in his home in 3 years. He estimates the total cost to be $15,000. How much must he deposit monthly into an account that pays 1.4% interest, compounded monthly, in order to have enough money? Round up to the nearest cent.

\[ P = \frac{15,000 \cdot 0.014}{12 \cdot 3} \left( 1 + \frac{0.014}{12} \right)^{12 \cdot 3} - 1 \]

\[ P = \frac{15,000 \cdot 0.014}{12 \cdot 3} = 408.22 \]

\[ P = 408.22 \]
Example 3 – You try it!

Write the formula to find the present value of an x-dollar balance that is reached by periodic investments made semiannually for y years at an interest rate of r.

\[ P = \frac{B \cdot r}{n} \left( 1 + \frac{r}{n} \right)^{nt} - 1 \]

\( P = \) periodic deposit

\( B = \) future value

\( r = \) rate

\( n = \) number of compounds

\( t = \) years
Example 3 – You try it!

Write the formula to find the present value of an \( x \)-dollar balance that is reached by periodic investments made semiannually for \( y \) years at an interest rate of \( r \).

\[
P = \frac{x \cdot \frac{r}{2}}{\left(1 + \frac{r}{2}\right)^{2y} - 1}
\]

- \( P \) = periodic deposit
- \( B \) = future value
- \( r \) = rate
- \( n \) = number of compounds
- \( t \) = years

Example:

\[
P = \frac{100 \cdot 0.05}{\left(1 + \frac{0.05}{2}\right)^{2 \cdot 2} - 1} = \frac{5}{1.1025 - 1} = \frac{5}{0.1025} = 48.98
\]
Randy wants to have saved a total of $5,000 to purchase a car in the future. He is willing to set up a direct deposit account with a 1.2% APR, compounded monthly, but is unsure of how much to periodically deposit for varying lengths of time. Graph a present value function for Randy’s situation for up to 60 months (5 years).
Randy wants to have saved a total of $5,000 to purchase a car in the future. He is willing to set up a direct deposit account with a 1.2% APR, compounded monthly, but is unsure of how much to periodically deposit for varying lengths of time. Graph a present value function for Randy’s situation for up to 60 months (5 years).

\[
P = \frac{B \cdot r}{n (1 + \frac{r}{n})^{nt} - 1}
\]

- \(P\) = periodic deposit
- \(B\) = future value \$5,000
- \(r\) = rate 0.012
- \(n\) = number of compounds 12
- \(t\) = years \(nt=x\)
Randy wants to have saved a total of $5,000 to purchase a car in the future. He is willing to set up a direct deposit account with a 1.2% APR, compounded monthly, but is unsure of how much to periodically deposit for varying lengths of time. Graph a present value function for Randy’s situation for up to 60 months (5 years).

\[
P = \text{periodic deposit} \quad y
\]
\[
B = \text{future value} \quad \$5,000
\]
\[
r = \text{rate} \quad .012
\]
\[
n = \text{number of compounds} \quad 12
\]
\[
t = \text{years} \quad nt=x
\]

\[
P = \frac{5,000 \cdot .012}{12} \left(1 + \frac{.012}{12}\right)^x - 1
\]
Randy wants to have saved a total of $5,000 to purchase a car in the future. He is willing to set up a direct deposit account with a 1.2% APR, compounded monthly, but is unsure of how much to periodically deposit for varying lengths of time. Graph a present value function for Randy’s situation for up to 60 months (5 years).

**Change the window:**
X can be from ____ to ____ months (5 years).
Y can be from ____ to ____.

\[
P = \frac{5,000 \cdot 0.012}{12} \left( \frac{1 + 0.012}{12} \right)^x - 1
\]
Randy wants to have saved a total of $5,000 to purchase a car in the future. He is willing to set up a direct deposit account with a 1.2% APR, compounded monthly, but is unsure of how much to periodically deposit for varying lengths of time. Graph a present value function for Randy’s situation for up to 60 months (5 years).

\[
P = \frac{5,000 \cdot 0.012}{12} \left(1 + \frac{0.012}{12}\right)^x - 1
\]
How much should he deposit each month in order to buy a car in 1 year?

$$P = \frac{5,000 \cdot 0.012}{12} \left( \frac{1 + \frac{0.012}{12}}{1 + \frac{0.012}{12}} \right)^x - 1$$

$414$
How much should he deposit each month in order to buy a car in 2 years or 3 years?

\[ P = \frac{5,000 \cdot 0.012}{12} \left( 1 + \frac{0.012}{12} \right)^x - 1 \]

2 years = $206
3 years = $136
Please work on your assignment. It is due at the end of next class.

Read Pg: 115 to 118
Do Pg 119: #2-10

#10