Math 105 - 02   Quiz 2A  Spring 2010   Answer Key

\[ F = P \left( 1 + \frac{r}{n} \right)^{nt} = P(1+i)^n \quad F = P(1+Y)^t \quad Y = \left( 1 + \frac{r}{n} \right)^n - 1 \]

1. Jane invests in Certificate of Deposit that pays 5.4% annual interest compounded monthly.
   (a) What is the APY? Write your answer as a percentage rounded to 2 decimal places.
   \[ Y = \left( 1 + \frac{0.054}{12} \right)^{12} - 1 = 0.055356752….. \text{ rounds to } 5.54\% \]

   (b) If she invests $10,000 what will be the value of the account at the end of the 5 years?

   Here \( t = 5 \) years, \( r = 0.054 \), \( P = $10,000 \). So \( i = 0.054/12 = 0.0045 \) is the rate applied each month,
   and \( m = (5)(12) = 60 \) is the total number of compoundings. Using the compound interest formula:
   \[ F = 10,000(1+0.0045)^{60} = $13,091.71 \] is the amount in the account after 5 years.
   (It is also acceptable to use \( Y \): \( F = 10,000(1+0.0554)^{5} = $13,094.40 \))

2. If housing costs have risen at 5.2% per year for the past 10 years, what was the cost ten years ago of a house
   that costs $120,000 today? Round your answer using the Rule for Accuracy of Combined Numbers.

   \[ F = $120,000 \quad r = 0.052 \quad t = 10 \text{ years} \quad P = ? \]
   Solve \( 120,000 = P(1 + 0.052)^{10} \)
   Obtain: \( P = \frac{120,000}{(1.052)^{10}} = $72,280.95 \) which rounds to $72,000 to two significant figures.

3. A certain investment costs $500 and will pay you back $1300 after 9 years. What annual rate of compound
   interest is this investment earning? Write your answer as a percentage rounded to 2 decimal places.
   Solve: \( 1300 = 500(1 + r)^9 \)
   Divide by 500: \( 1300/500 = (1 + r)^9 \)
   Take 9th root: \( \left( \frac{13}{5} \right)^{\frac{1}{9}} = 1 + r \)
   Subtract 1: \( r = \left( \frac{13}{5} \right)^{\frac{1}{9}} - 1 \) Calculator: \( (\frac{13}{5})^{\frac{1}{9}} - 1 = \)
   Evaluate: \( r = 0.11200… = 11.200…\% \) which rounds to 11.20\%
Math 105 - 02 Quiz 2B Spring 2010 Answer Key

\[ F = P \left(1 + \frac{r}{n}\right)^{nt} = P(1+i)^n \quad F = P(1+i)^t \quad Y = \left(1 + \frac{r}{n}\right)^n - 1 \]

1. Jane invests in Certificate of Deposit that pays 5.1% annual interest compounded monthly.
   (a) What is the APY of her investment?
   \[ Y = \left(1 + \frac{0.051}{12}\right)^{12} - 1 = 0.052209176 \text{ rounds to } 5.22\% \]
   (b) If she invests $5000 how much will her investment be worth at the end of the 4 years?
   Here \( t = 4 \) years, \( r = 0.051, P = $5,000 \). So \( i = 0.051/12 = 0.00425 \) is the rate applied each month, and \( m = (4)(12) = 48 \) is the total number of compoundings. Using the compound interest formula:
   \[ F = 5,000(1+0.00425)^{48} = \$6,128.84 \]
   is the amount in the account after 4 years.
   (It is also acceptable to use \( Y \): \[ F = 5,000(1+0.0522)^4 = \$6,128.63 \])

2. If housing costs have risen at 4.8% per year for the past 8 years, what was the cost eight years ago of a house that costs $130,000 today? Round your answer using the Rule for Accuracy of Combined Numbers.
   \[ F = 130,000 \quad r = 0.048 \quad t = 8 \text{ years} \quad P = ? \]
   Solve \[ 130,000 = P(1 + 0.048)^8 \]
   Obtain: \[ P = \frac{130,000}{(1.048)^8} = \$89,341.47 \text{ which rounds to } \$89,000 \text{ to two significant figures.} \]

3. A certain investment costs $500 and will pay you back $1200 after 7 years. What annual rate of compound interest is this investment earning? Write your answer as a percentage rounded to 2 decimal places.
   Solve:
   \[ 1200 = 500(1 + r)^7 \]
   Divide by 500:
   \[ 1200/500 = (1 + r)^7 \]
   Take 7th root:
   \[ \left(\frac{12}{5}\right)^{\frac{1}{7}} = 1 + r \]
   Subtract 1:
   \[ r = \left(\frac{12}{5}\right)^{\frac{1}{7}} - 1 \]
   Calculate: \( \left(\frac{12}{5}\right)^{\frac{1}{7}} - 1 = \)
   Evaluate: \[ r = 0.13322... = 13.32...\% \text{ which rounds to } 13.32\% \]
1. Jane invests in Certificate of Deposit that pays 4.8% annual interest compounded monthly.

(a) What is the APY of her investment?

\[ Y = \left( 1 + \frac{0.048}{12} \right)^{12} - 1 = 0.0490702 \text{ rounds to 4.91%} \]

(b) If she invests $2,000 what will be the value of the account at the end of the 6 years?

Here \( t = 6 \) years, \( r = 0.048 \), \( P = $2,000 \). So \( i = 0.048/12 = 0.004 \) is the rate applied each month, and \( m = (6)(12) = 72 \) is the total number of compoundings. Using the compound interest formula:

\[ F = 2,000 \left( 1 + \frac{0.0491}{12} \right)^{72} = $2665.98 \] is the amount in the account after 6 years.

(It is also acceptable to use \( Y \): \( F = 2,000 \left( 1 + 0.0491 \right)^6 = $2,666.47 \))

2. If housing costs have risen at 5.6% per year for the past 12 years, what was the cost twelve years ago of a house that costs $150,000 today? Round your answer using the Rule for Accuracy of Combined Numbers.

\[ F = $150,000 \quad r = 0.056 \quad t = 12 \text{ years} \quad P = ? \]

Solve: \( 150,000 = P \left( 1 + 0.056 \right)^{12} \)

Obtain: \( P = \frac{150,000}{(1.056)^{12}} = $78,005.32 \) which rounds to $78,000 to two significant figures.

3. A certain investment costs $500 and will pay you back $1400 after 8 years. What annual rate of compound interest is this investment earning? Write your answer as a percentage rounded to 2 decimal places.

Solve: \( 1400 = 500 \left( 1 + r \right)^8 \)

Divide by 500: \( 1400/500 = \left( 1 + r \right)^8 \)

Take 8th root: \( \left( \frac{14}{5} \right)^{\frac{1}{8}} = 1 + r \)

Subtract 1: \( r = \left( \frac{14}{5} \right)^{\frac{1}{8}} - 1 \) Calculator: \( \left( \frac{14}{5} \right)^{\frac{1}{8}} - 1 = \)

Evaluate: \( r = 0.137351... = 13.7351...\% \) which rounds to 13.74%