Financial Applications - Interest

Nelson Page 481 #s 3, 4, 6, 7 & 11, Page 490 #s 1, 4, 10 & 11, Page 498 #s 1, 2 & 5

Nov 4-10:28 AM

Warm Up

Expand and simplify the following binomial: $(3x - 2y)^4$

$$= 1(3x)^4(-2y)^0 + 4(3x)^3(-2y)^1$$
$$+ 6(3x)^2(-2y)^2 + 4(3x)^1(-2y)^3$$
$$+ 1(3x)^0(-2y)^4$$

$$= 81x^4 - 216x^3y + 216x^2y^2 - 96xy^3 + 16y^4$$

```
        1
      1   1
    1   2   1
  1   3   3   1
1   4   6   4   1
```

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Simple Interest

- Interest earned or paid only on the original sum of money invested or borrowed
- The initial amount of money borrowed or invested is called the principal
- Interest is calculated by:

$$I = Prt$$

where,

      I = interest paid/owed
      P = prinicpal
      r = interest rate (convert to a decimal)
      t = # of years

Also, the final amount, A, can be calculated using:

$$A = P + I$$

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Compound Interest

- Interest calculated at regular periods and added to the principal for the next period
- Calculated by:

$$A = P(1 + i)^n$$

where,

      A is the total value of the loan or investment
      P is the principal
      i is the interest rate per compounding period
        [= r/(# of compounding periods per year)]
      n is the # of compounding periods
        [= # of years x # of compounding periods per year]
      NOTE: r is the interest rate (as a decimal) per year

If solving for the present value we can use a different form which is:

$$P = A(1 + i)^{-n}$$

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Example

Determine the amount and interest earned for $4000 invested for 4 years at 3% per annum (/a), compounded semi-annually.

$$A = P(1+i)^n$$

$$A = 4000(1+0.015)^8$$

$$A = 4000(1.015)^8$$

$$A = \$4505.97$$

$$I = A - P = \$505.97$$

Semi-annual = 2

$P = 4000$

$i = \dfrac{0.03}{2} = 0.015$

$n = 4(2) = 8$

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Example

Determine the amount and interest earned for $500 invested for 3 years at 5% /a compounded monthly.

$$A = P(1+i)^n$$

$$A = 500\left(1 + \frac{0.05}{12}\right)^{36}$$

$$A = \$580.74$$

$$I = A - P = \$80.74$$

Monthly = 12

$P = 500$

$i = \dfrac{0.05}{12}$

$n = 3(12) = 36$

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Example

Determine the present value and interest earned on an investment that will be worth $4000 in 2 years, when the interest rate is 3.5% /a compounded quarterly.

$$P = A(1+i)^{-n}$$

$$P = 4000\left(1 + \frac{0.035}{4}\right)^{-8}$$

$$P = \$3730.71$$

$$I = A - P = \$269.29$$

Quarterly = 4

$$A = 4000$$

$$i = \frac{0.035}{4}$$

$$n = 2(4) = 8$$

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Example

Determine the present value and interest payable on a loan that will be worth $10000 in 4 years when the interest rate is 4% /a compounded monthly.
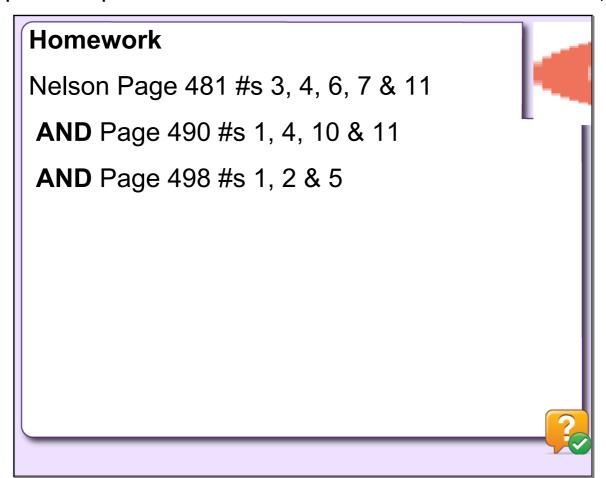
$$P = A(1+i)^{-n}$$

$$P = 10000\left(1 + \frac{0.04}{12}\right)^{-48}$$

$$P = \$8523.71$$

$$I = A - P = \$1476.29$$

Monthly = 12

$$A = 10000$$

$$i = \frac{0.04}{12}$$

$$n = 4(12) = 48$$

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Homework

Nelson Page 481 #s 3, 4, 6, 7 & 11

 AND Page 490 #s 1, 4, 10 & 11

 AND Page 498 #s 1, 2 & 5

Mar 19-7:45 AM