

## 5.3 Present Value

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

P= Principal OR Present Value

A= Amount OR Future Value

i= interest rate per compound period (as a decimal)

n= # of compound periods

This same formula can be used to find the present value of a future amount:

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

$$\frac{A}{(1 + i)^n} = P \star$$

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

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

Ex. 1 An investment account earns 6%/a, compounded monthly. How much would Tom have to deposit now to have \$20 000 in 4 years?

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

$$P = ?$$

$$A = 20\,000$$

$$i = \frac{0.06}{12} = 0.005$$

$$n = 4 \times 12 \\ = 48$$

$$P = 20000(1 + 0.005)^{-48} \\ = 20000(1.005)^{-48} \\ = \$15\,741.96$$

Ex. 2 Jessica borrowed money from a bank at 8.2%/a, compounded semi-annually. At the end of 5 years she had to pay back \$8 500. How much money did she borrow originally?

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

$$P = ?$$

$$A = 8500$$

$$i = \frac{0.082}{2} = 0.041$$

$$n = 5 \times 2 \\ = 10$$

$$P = 8500(1.041)^{-10} \\ = \$5687,37$$

**Creditor:** the person/company who lends the money

**Discount:** to sell an investment at less than its usual price

Ex. 3 Matt owes \$7000 that is due in 4 years from now. He wants to pay off his debt early and the creditor is willing to discount his loan at 4.5%/a, compounded quarterly. How much would the creditor be willing to accept today?

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

$$P = ?$$

$$A = 7000$$

$$i = \frac{0.045}{4} = 0.01125$$

$$n = 4 \times 4 = 16$$

$$P = 7000 (1.01125)^{-16}$$
$$= \$5852.77$$

Ex. 4 Jake borrows \$12 000 for a car at 5.8%/a compounded monthly for 4 years.

a) How much does Jake owe at the end of 4 years?

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

$$P = 12000$$

$$A = ?$$

$$i = \frac{0.058}{12} = 0.0048$$

$$n = 4 \times 12 = 48$$

$$= 12000(1.0048)^{48}$$

$$= \$15100.92$$

b) The creditor plans to sell the loan to a different creditor discounted at 5 %/ a, compounded quarterly. How much will the new creditor pay now for the loan?

$$P = ?$$

$$A = 15100.92$$

$$i = \frac{0.05}{4} = 0.0125$$

$$n = 4 \times 4 = 16$$

$$P = 15100.92(1.0125)^{-16}$$

$$= 12378.92$$

c) How much does the original creditor make if he holds the loan for the 4 years?

$$15100.92 - 12000$$

$$= 3100.92$$

How much does he make if he sells it to the new creditor now?

$$12378.92 - 12000$$

$$= 378.92$$

How much does the new creditor make on the loan after the 4 years?

$$15100.92 - 12378.92$$

$$= 2722$$

Why would the original creditor sell the loan?

- To free up money
- Reduce risk

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