

Are there any Homework Questions you would like to see on the board?

pp. 468-469 # 1 – 3, 5, 8, 12

Today's Learning Goal(s):

By the end of the class, I will be able to:

- Solve problems that involve calculating the principal that must be invested today to obtain a given amount in the future.

Warm-Up

1. Solve for P.

$$\text{a) } \frac{15}{2} = \frac{P(2)}{2}$$

$$7.5 = P$$

$$\text{b) } \frac{15}{2^3} = \frac{P(2)^3}{2^3}$$

$$1.875 = P$$

$$\text{a) } P=7.5 \quad \text{b) } P=1.875$$

p. 468

I

2. Complete the table.

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

	Principal (\$)	Annual Interest Rate (%)	Time (years)	Compounding Frequency	Rate for the Compounding Period, i (%)	Number of Compounding Periods, n	Amount (\$)	Interest Earned (\$)
a)	400.00	5	15	annually				
b)	750.00	13	5	semi-annually				
c)	350.00	2.45	8	monthly	$\frac{0.0245}{12}$	96	425.70	75.70
d)	150.00	7.6	3	quarterly				
e)	1000.00	4.75	4	daily	$\frac{0.0475}{365}$	$4 \times 365 = 1460$	1209.23	

c) $A = ?$ $r = 2.45\%$
 $= 0.0245$
 $P = 350$
 $i = \frac{0.0245}{12}$
 $n = 8 \times 12 = 96$

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

$$= 350 \left(1 + \frac{0.0245}{12}\right)^{96}$$

$$= 425.699$$

$$= \$425.70$$

$I = A - P$
 $= 425.70 - 350$
 $= \$75.70$

p. 469 8. If \$350 grows to \$500 in 3 years, what is the annual interest rate assuming that interest is compounded annually?

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

$$500 = 350(1+r)^3$$

$$\frac{500}{350} = (1+r)^3$$

$$\sqrt[3]{\frac{500}{350}} = 1+r$$

$$\sqrt[3]{\frac{500}{350}} - 1 = r$$

$$r = 0.1262$$

$$\therefore r = 12.62\%$$

$A = P + I$ or $I = A - P$

$$\frac{500}{350} = (1+x)^3$$

$$25 = (1+x)^3$$

$$\sqrt[3]{25} = 1+x$$

$$25 = y^2$$

$$\sqrt{25} = y$$

MCF 3MI

8.3 Compound Interest: Determining Present Value

$$A = P(1+i)^n \quad \text{or} \quad \frac{A}{(1+i)^n} = P$$

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

Ex. 1: Upon the birth of your first child, you decide to invest some money so that she could have a \$16 000 gift on her 16th birthday. You purchase a compound-interest government bond that pays 8%/a, compounded annually. After the initial amount is invested, there will be no further transactions until the bond reaches maturity.

What is the "present value" that you must invest when the child is born?

$$A = 16\,000$$

$$P = ?$$

$$i = \frac{0.08}{1}$$

$$n = 16 \times 1 = 16$$

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

$$16\,000 = P(1+0.08)^{16}$$

$$\frac{16\,000}{(1+0.08)^{16}} = P$$

$$P = 4\,670.247$$

you must invest \$4 670.25 now.

Ex. 2: Use the same info from Ex. 1.

If you decided to wait until she is 13 and then invest a lump sum to save the same gift, what is the present value?

$$A = 16\,000$$

$$P = ?$$

$$i = \frac{0.08}{1}$$

$$n = 3 \times 1 = 3$$

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

$$16\,000 = P(1+0.08)^3$$

$$\frac{16\,000}{(1+0.08)^3} = P$$

$$P = 12\,701.315$$

you must invest \$12 701.32 when she is 13.

Ex. 3: You invest money that you will need in 6 years. The interest rate is $6\frac{3}{4}\%$ /a, compounded quarterly. Determine the present value you need to invest, if 6 years from now, you will need \$750.

$$\begin{aligned}
 A &= 750 & A &= P(1+i)^n \\
 P &= ? & 750 &= P\left(1 + \frac{0.0675}{4}\right)^{24} \\
 i &= \frac{0.0675}{4} & \frac{750}{\left(1 + \frac{0.0675}{4}\right)^{24}} &= P \\
 n &= 6 \times 4 & P &= 501.926 \\
 &= 24 & &
 \end{aligned}$$

$\left. \begin{aligned} r &= 6\frac{3}{4}\% \\ &= 6.75\% \\ &= 0.0675 \end{aligned} \right\}$

you must invest \$501.93 now.

Ex. 4: You have \$3000 in your savings account. You intend to buy a laptop computer and printer, and invest the remainder for 2 years, compounding monthly at an annual interest rate of 3%/a. You want to have \$2000 in your account 2 years from now. Determine the amount you can spend on the laptop and printer.

$$\begin{aligned}
 A &= 2000 & A &= P(1+i)^n \\
 P &= ? & 2000 &= P\left(1 + \frac{0.03}{12}\right)^{24} \\
 i &= \frac{0.03}{12} & \frac{2000}{\left(1 + \frac{0.03}{12}\right)^{24}} &= P \\
 n &= 2 \times 12 & P &= 1883.670 \\
 &= 24 & &= 1883.67
 \end{aligned}$$

$\left. \begin{aligned} \text{Spend} &= 3000 - 1883.67 \\ &= 1116.33 \end{aligned} \right\}$

you can spend \$1116.33 on the laptop and the printer.

Revisit Today's Learning Goals

Homework: p. 476-477 # 1, 2, 8, 10

Begin completing your UNIT ASSIGNMENT!!

Revisit Today's Learning Goals

Today's Homework:

pp. 476-477 # 1, 2, 8, 10

Continue completing your UNIT ASSIGNMENT!!