Solutions

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3. Michel invests $850 at 7%/a simple interest. How long will he have to leave his investment in the bank before earning $200 in interest?

$I = Prt$

$200 = 850(0.07)t$

$\frac{200}{59.5} = \frac{59.5t}{59.5}$

$3.36 = t \Rightarrow 3.36$ years

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4. Sally has a balance of $2845 on her credit card. What rate of simple interest is she being charged if she must pay $26.19 interest for the 12 days her payment is late?

$$I = Prt$$

$$26.19 = 2845(r)\left(\frac{12}{365}\right)$$

$$\frac{26.19}{93.534} = \frac{93.534r}{93.534}$$

$$0.28 = r \Rightarrow \text{rate} = 28\%$$

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6. Mario borrows $4800 for 8.5 years at a fixed rate of simple interest. At the end of that time, he owes $8000. What interest rate is he being charged?

$$I = A - P$$

$$I = 8000 - 4800$$

$$I = 3200$$

$$I = Prt$$

$$3200 = 4800(r)(8.5)$$

$$\frac{3200}{40800} = \frac{40800r}{40800}$$

$$0.078 = r \Rightarrow \text{rate} = 7.8\%$$

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7. How much money must be invested at 6.3%/a simple interest to earn $250 in interest each month?

$$I = Prt$$

$$250 = P(0.063)\left(\frac{1}{12}\right)$$

$$\frac{250}{0.0525} = \frac{0.0525P}{0.0525}$$

$$47619.05 = P \Rightarrow \$47619.05$$

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11. Len invests $5200 at 3%/a simple interest, while his friend Dave invests $3600 at 5%/a simple interest. How long will it take for Dave's investment to be worth more than Len's?

$$A = P + Prt$$

Len $\Rightarrow A = 5200 + 5200(0.03)(t)$

$$A = 5200 + 156t$$

Dave $\Rightarrow A = 3600 + 3600(0.05)(t)$

$$A = 3600 + 180t$$

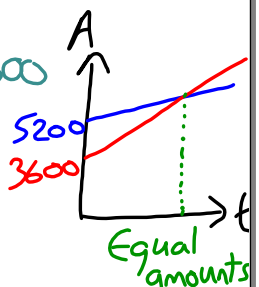
Find t for when they have equal amounts

$$\Rightarrow 3600 + 180t = 5200 + 156t$$

$$180t - 156t = 5200 - 3600$$

$$\frac{24t}{24} = \frac{1600}{24}$$

$$t = 66\frac{2}{3} \text{ years}$$



Any time after this, Dave will have more than Len

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Solutions

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1. Copy and complete the table.

	Rate of Compound Interest per Year	Compounding Period	Time	Interest Rate per Compounding Period, i	Number of Compounding Periods, n
a)	5.4%	semi-annually	5 years	$\frac{0.054}{2} = 0.027$	$5 \times 2 = 10$
b)	3.6%	monthly	3 years	$\frac{0.036}{12} = 0.003$	$3 \times 12 = 36$
c)	2.9%	quarterly	7 years	$\frac{0.029}{4} = 0.00725$	$7 \times 4 = 28$
d)	2.6%	weekly	10 months	$\frac{0.026}{52} = 0.0005$	$\frac{10}{12} \times 52 = 43\frac{1}{3}$

$i = \frac{(\text{rate} \div 100)}{\text{compounding period \#}}$

$n = \text{time in years} \times \text{compounding period \#}$

Annually = 1
Semi-annually = 2
Quarterly = 4
Monthly = 12
Bi-weekly = 26
Weekly = 52
Daily = 365

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4. For each investment, determine the future value and the total interest earned.

	Principal	Rate of Compound Interest per Year	Compounding Period	Time	A	Int
a)	$4 000	3%	annually	4 years	4502.04	502.04
b)	$7 500	6%	monthly	6 years	10740.33	3240.33
c)	$15 000	2.4%	quarterly	5 years	16906.39	1906.39
d)	$28 200	5.5%	semi-annually	10 years	48516.08	20316.08
e)	$850	3.65%	daily	1 year	881.60	31.60
f)	$2 225	5.2%	weekly	47 weeks	2332.02	107.02

Using the formula

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

where $i = \frac{(\text{rate} \div 100)}{\text{"\#"}}$ and $n = \text{time in years} \times \text{"\#"}$

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10. Eric bought a $1000 Canada Savings Bond that earns 5%/a compounded annually. Eric can redeem the bond in 7 years. Determine the future value of the bond.

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

$$A = 1000(1.05)^7$$

$$A = \$1407.10$$

$P = 1000$

$i = \frac{0.05}{1} = 0.05$

$n = 7 \times 1 = 7$

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11. Dieter deposits $9000 into an account that pays 10%/a compounded quarterly. After three years, the interest rate changes to 9%/a compounded semi-annually. Calculate the value of his investment two years after this change.

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

$A = 9000(1.025)^{12}$

$A = \$12104.00$

$P = 9000$

$i = \frac{0.10}{4} = 0.025$

$n = 3 \times 4 = 12$

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

$A = 12104(1.045)^4$

$A = \$14434.25$

$P = 12104.00$

$i = \frac{0.09}{2} = 0.045$

$n = 2 \times 2 = 4$

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Solutions

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1. Calculate the present value of each investment.

	Rate of Compound Interest per Year	Compounding Period	Time	Future Value
a)	4%	annually	10 years	$10 000
b)	6.2%	semi-annually	5 years	$100 000
c)	5.2%	quarterly	15 years	$23 000
d)	6.6%	monthly	100 years	$2 500

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

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

a) $P = 10000\left(1+\frac{0.04}{1}\right)^{-10\times1}$

$P = 10000(1.04)^{-10}$

$P = \$6755.64$

b) $P = 100000\left(1+\frac{0.062}{2}\right)^{-5\times2}$

$P = 100000(1.031)^{-10}$

$P = \$73690.81$

c) $P = 23000\left(1+\frac{0.052}{4}\right)^{-15\times4}$

$P = 23000(1.013)^{-60}$

$P = \$1059\text{6.47}$

d) $P = 2500\left(1+\frac{0.066}{12}\right)^{-100\times12}$

$P = 2500(1.0055)^{-1200}$

$P = \$3.46$

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2. Kevin and Lui both want to have $10 000 in 20 years. Kevin can invest at 5%/a compounded annually and Lui can invest at 4.8%/a compounded monthly. Who has to invest more money to reach his goal?

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

Kevin

$P = 10000\left(1+\frac{0.05}{1}\right)^{-20\times1}$

$P = 10000(1.05)^{-20}$

$P = \$3768.89$

Lui

$P = 10000\left(1+\frac{0.048}{12}\right)^{-20\times12}$

$P = 10000(1.004)^{-240}$

$P = \$3836.27$

$\Rightarrow$ Lui has to invest more

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5. Nazir saved $900 to buy a plasma TV. He borrowed the rest at an interest rate of 18%/a compounded monthly. Two years later, he paid $1429.50 for the principal and the interest. How much did the TV originally cost?

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

$$P = 1429.50\left(1+\frac{0.18}{12}\right)^{-2\times 12}$$

$$P = 1429.50(1.015)^{-24}$$

$$P = \$1000$$ ← Amount borrowed

$\Rightarrow$ Cost of TV = 900 + 1000 (900: saved; 1000: borrowed)

$= \$1900$

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