

## Comparing compounding periods

Calculate the amount of money I will have in my account if I invest \$10,000.00 at $12 \%$ p.a. for a period of 2 years compounded:
i. Annually (yearly)
ii. Quarterly
iii. Monthly
iv. Fortnightly
v. Weekly
vi. Daily

## Annually

( $r$ and $n$ must be in terms of years!)
$V_{2}=$ ?
$V_{0}=\$ 10,000$
$r=12 \%$ pa (yearly)
$R=$ growth rate $=1+\frac{12}{100}$
$=1.12$
$\mathrm{n}=2$ years
$V_{2}=V_{0}\left(1+\frac{r}{100}\right)^{n}$
$V_{2}=10000(\mathbf{1 . 1 2})^{\mathbf{2}}$
$=\$ 12544.00$


## Quarterly

( $r$ and $n$ must be in terms of quarters!)
$\mathrm{V}_{8}=$ ?
$V_{0}=\$ 10,000$
$r=12 \%$ pa (yearly)
$=\frac{12}{4}$
= 3\% pq (per quarter)
$R=$ growth rate $=1+\frac{3}{100}$ $=1.03$
$\mathrm{n}=2$ years
$=2 \times 4$
$=8$ quarters
$V_{8}=V_{0}\left(1+\frac{r}{100}\right)^{n}$

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$V_{8}=10000(1.02)^{8}$
$=\$ 12667.70$

## Monthly

( $r$ and $n$ must be in terms of months!)

$$
\begin{aligned}
& V_{24}=\text { ? } \\
& V_{0}=\$ 10,000 \\
& r=12 \% \text { pa (yearly) } \\
& =\frac{12}{12} \\
& =1 \% \mathrm{pm} \text { (per month) } \\
& R=\text { growth rate }=1+\frac{1}{100} \\
& \text { = } 1.01 \\
& \mathrm{n}=2 \text { years } \\
& =2 \times 12 \\
& \text { = } 24 \text { months }
\end{aligned}
$$

$$
\begin{aligned}
& V_{24}=V_{0}\left(1+\frac{r}{100}\right)^{n} \\
& V_{24}=10000(\mathbf{1 . 0 1})^{\mathbf{2 4}} \\
& \quad=\$ 12697.35
\end{aligned}
$$



## Fortnightly

( $r$ and $n$ must be in terms of fortnights!)
$\mathrm{V}_{52}=$ ?
$V_{0}=\$ 10,000$
$r=12 \%$ pa (yearly)
$=\frac{12}{26}=\frac{6}{13}$
$=\frac{6}{13} \% \mathrm{pf}$ (per fortnight)
$R=$ growth rate $=1+\frac{(6 / 13)}{100}$
$=1+\frac{6}{1300}$
$\mathrm{n}=2$ years
$=2 \times 26$
$=52$ fortnights

$$
\begin{aligned}
V_{52} & =V_{0}\left(1+\frac{r}{100}\right)^{n} \\
V_{52} & =10000\left(\mathbf{1}+\frac{\mathbf{6}}{\mathbf{1 3 0 0}}\right)^{52} \\
& =\$ 12705.47
\end{aligned}
$$

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## Weekly

( $r$ and $n$ must be in terms of weeks!)

$$
\begin{aligned}
& V_{104}=? \\
& V_{0}=\$ 10,000 \\
& r=12 \% \text { pa (yearly) } \\
& =\frac{12}{52}=\frac{3}{13} \\
& \\
& =\frac{3}{13} \% \text { pw (per week) } \\
& R=\text { growth rate = } 1+\frac{(3 / 13)}{100} \\
& \\
& =1+\frac{3}{1300} \\
& \mathrm{n}
\end{aligned}=2 \text { years } .
$$

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$$
\begin{aligned}
& V_{104}=V_{0}\left(1+\frac{r}{100}\right)^{n} \\
& V_{104}=10000\left(\mathbf{1}+\frac{\mathbf{3}}{\mathbf{1 3 0 0}}\right)^{\mathbf{1 0 4}} \\
& \quad=\$ 12708.98
\end{aligned}
$$

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## Daily

( $r$ and $n$ must be in terms of days!)
$\mathrm{V}_{730}=$ ?
$V_{0}=\$ 10,000$
$r=12 \%$ pa (yearly)
$=\frac{12}{365}=$
$=\frac{12}{365} \% \mathrm{pd}$ (per day)
$R=$ growth rate $=1+\frac{(12 / 365)}{100}$
$=1+\frac{12}{36500}$
$\mathrm{n}=2$ years
$=2 \times 365$
$=730$ days


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$$
\begin{aligned}
& V_{730}=V_{0}\left(1+\frac{r}{100}\right)^{n} \\
& V_{730}=10000\left(\mathbf{1}+\frac{\mathbf{1 2}}{\mathbf{3 6 5 0 0}}\right)^{\mathbf{7 3 0}} \\
& \quad=\$ 12711.99
\end{aligned}
$$

NB: The shorter the period duration the higher the interest return.

