6.7 Reducing balance depreciation

If an item depreciates by the **reducing balance depreciation** method, its value reduces by a fixed value each time period. The rate is a percentage of the previous value of the item.

Reducing balance depreciation can be known as diminishing value depreciation.

Reducing balance depreciation can be expressed by the recurrence relation:

$$V_{n+1} = RV_n$$

where V_n is the value of the asset after n depreciating periods and $R = 1 - \frac{r}{100}$, where r is the depreciation rate.

Worked Example 15

Suppose the new $15 000 printing press considered in Worked example 13 was depreciated by the reducing balance method at a rate of 20% p.a. of the previous value.

a) Generate a depreciation schedule using a recurrence relation for the first 5 years of work for the press.

$V_0 = 15000$

$R = 1 - \frac{r}{100}$

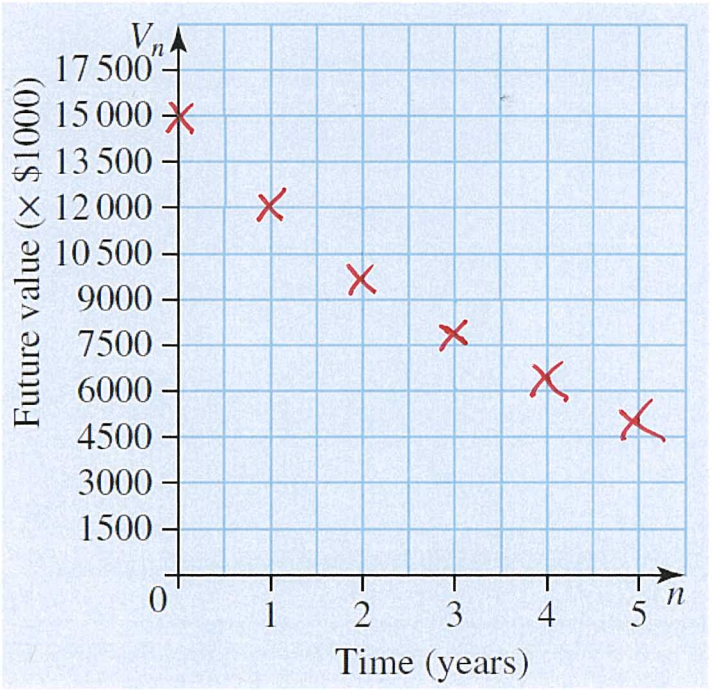
$= 1 - \frac{20}{100} = 0.8$

Time n (years)	$V_{n+1} = RV_n$	Future value V_n ($)
0	$V_0 = 15000$	15000
1	$V_1 = 15000$	$0.8 \times 15000 = 12000$
2	$V_2 = 12000$	$0.8 \times 12000 = 9600$
3	$V_3 = 9600$	$0.8 \times 9600 = 7680$
4	$V_4 = 7680$	$0.8 \times 7680 = 6144$
5	$V_5 = 6144$	$0.8 \times 6144 = 4915.20$

b) What is the future value after 5 years?

$4915.20

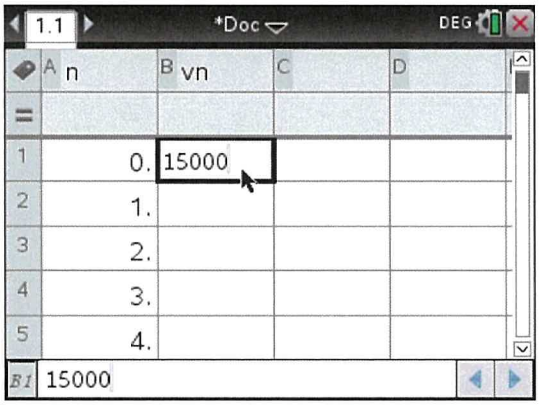
c) Draw a graph of future value against time.



Worked Example 15 on CAS calculator

On a lists & spreadsheet page

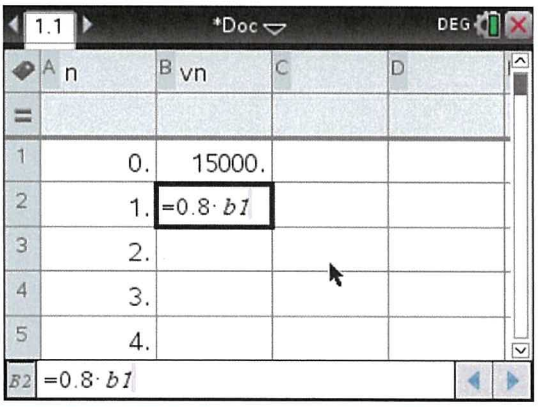
- Label column A "n" and column B "V_n"
- Enter 0 to 5 in the n column and the starting value 15000 (V_0) in cell b1.



In cell b2

- Enter the equation "=0.8·*b1*"

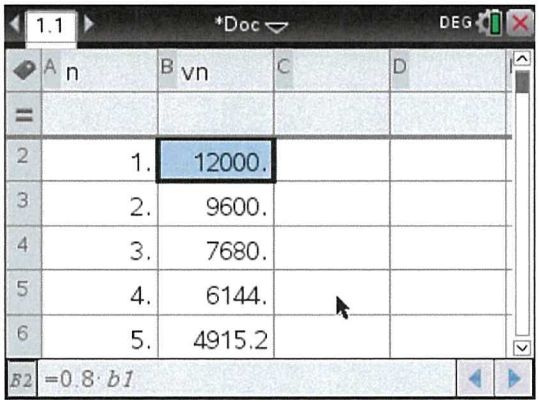
Note: This equation is just $V_{n+1}=R\cdot V_n$ where R=0.8, $\left(R = 1 - \frac{r}{100}\right)$, and $r = 20\%$ p. a.



Press enter, then

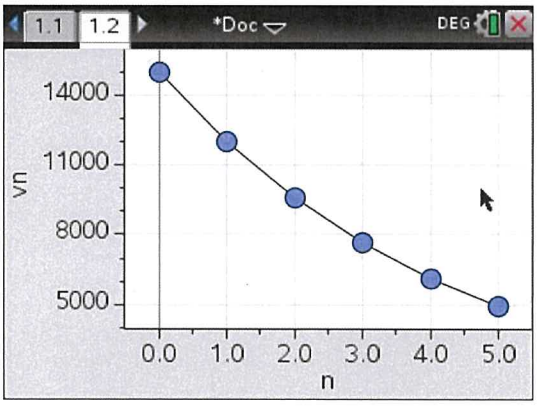
- fill down (menu 3 3) until n=5

V_n=$4915.20 when n=5. So, this is the value of the press after 5 years



Add a Data & Statistics page

- Label the x-axis "n" and the y-axis "V_n"



The Australian Tax Office (ATO) allows depreciation of an asset as a tax deduction, meaning that the depreciation reduces an individuals or businesses amount of tax to be paid. If using the reducing balance method, less tax will be paid at the beginning of the asset's life compared to the end of the asset's life, whereas a flat rate depreciation will have the same amount deducted for the asset's lifetime.

A comparison between the two depreciation methods.

Worked Example 16

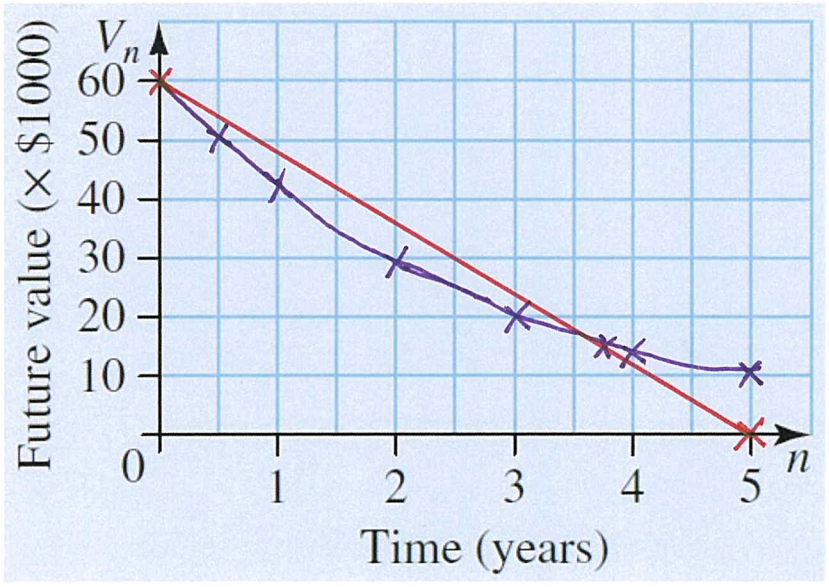
A transport business has bought a new bus for $60 000. The business has the choice of depreciating the bus by a flat rate of 20% of the cost price each year or by 30% of the previous value each year.

a) Generate depreciation schedules using both methods for a life of 5 years.

d = 20% of \$60 000
= \$12000 per year

Flat rate			Reducing balance		
Time n (years)	Depreciaton d (\$)	Future value V_n (\$)	Time n (years)	$V_{n+1} = RV_n$	Future value V_n (\$)
0	–	60000	0	V_0 =	60 000
1	12 000	48000	1	V_1 = 0·7×60000	42000
2	12000	36 000	2	V_2 = 0·7×42000	29400
3	12000	24 000	3	V_3 = 0·7×29400	20580
4	12000	12000	4	V_4 = 0·7×20580	14406
5	12000	0	5	V_5 = 0·7×14406	10084·20

b) Draw graphs of future value against time for both methods on the same set of axes.



c) After how many years does the reducing balance future value become greater that the flat rate future value?

The future value for the reducing balance method is greater than that of the flat rate method after 4 years.

Reducing balance depreciation formula

The reducing balance depreciation formula is:

$$V_n = V_0 R^n$$

V_n = book value after time, n
R = rate of depreciation $\left(= 1 - \frac{r}{100}\right)$
V_0 = cost price
n = time since purchase

Worked Example 17

The printing press from Worked example 13 was depreciated by the reducing balance method at 20% p.a. What will be the future value and total depreciation of the press after 5 years if it cost $15 000 new.

$V_0 = 15000$
$r = 20$ $\Rightarrow$ $R = 1 - \frac{20}{100} = 0.8$
$n = 5$.

depreciation formula $V_n = V_0 R^n$

$= 15,000 \times (0.8)^5$

$= \$4915.2$

Total depreciation $= V_0 - V_5$

$= 15000 - 4915.20$

$= 10084.80$

The future value of the press, after 5 years will be $4915.20 and its total depreciation is $10084.80

Effective life

We may know the scrap value of an item and we want to determine how long before the item reaches this value, i.e. it's useful or **effective life.**

In this case we use the reducing balance formula.

Worked Example 18

A photocopier purchased for $8000 depreciates by 25% p.a. by the reducing balance method. If the photocopier has a scrap value of $1200, how long will it be before this value is reached?

$V_n = \$1200$, $V_0 = \$8000$, $r = 25\%$ p.a.

$R = 1 - \frac{r}{100} = 1 - \frac{25}{100} = 0.75$

$V_n = V_0 R^n$

$1200 = 8000 \times (0.75)^n$

solve for n, $n = 6.59$ years.

so $n = 7$ years

It will take 7yrs to reach scrap value.

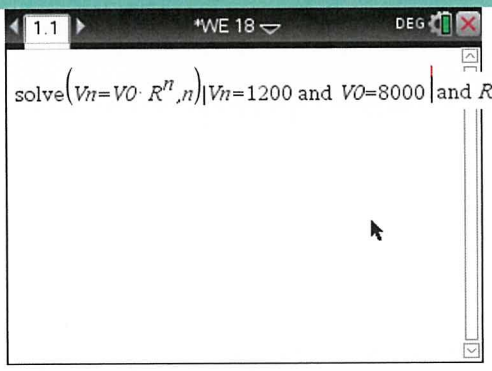
Worked Example 18 on CAS calculator

On a calculator page
Using the Solve function
Enter the reducing balance depreciation formula

$$V_n = V_o R^n$$

$$R = \left(1 - \frac{r}{100}\right)$$

and set the values of V_n=1200, V_0=8000 and R=0.75 using | symbol on the CAS



Top Tip: You could save this document on your CAS and just change the values

Press enter

The answers is n=6.5945

As the depreciation is calculated once a year, we need to round this up to n=7 years!

Answer: It will take 7 years for the photocopier to reach its scrap value