

## 7.5 Reducing balance and flat rate loan comparisons

In reducing balance loans, interest is calculated on the current balance. Since the balance reduces, the amount of interest charged also reduces.

In contrast, **flat rate loans**, charge a fixed amount of interest as a percentage of the original amount borrowed. This is calculated at the start of a loan and added to the amount borrowed. Since it is a flat rate based on a fixed amount, the simple interest formula is used to calculate the interest:

$$I = \frac{v_0 r n}{100}$$

### Worked Example 16

A loan of \$12 000 is taken out over 5 years at 12% p.a. Find:

#### i) a flat rate loan

a) the monthly repayment

$$V_0 = \underline{12,000}$$

$$r = \underline{12}$$

$$n = \underline{5}$$

$$I = \frac{V_0 r n}{100}$$

$$= \frac{12,000 \times 12 \times 5}{100}$$

$$= \$7,200$$

$$\text{repayments} = 12 \times 5 = 60$$

Now,  $V_n = V_0 + I = 12,000 + 7,200 = \$19,200 \Rightarrow \text{repayment} = \$19,200 \div 60 = \$320/\text{month.}$

b) the total amount of interest paid

The interest paid is \$7,200

#### ii) a reducing balance loan.

a) the monthly repayment

Using the Financial Solver

Enter the following:

$$n \text{ (N):} = \underline{60}$$

$$r \text{ (I%):} = \underline{12}$$

$$P \text{ (PV):} = \underline{12,000}$$

$$\text{Pmt:} = \underline{\hspace{2cm}}$$

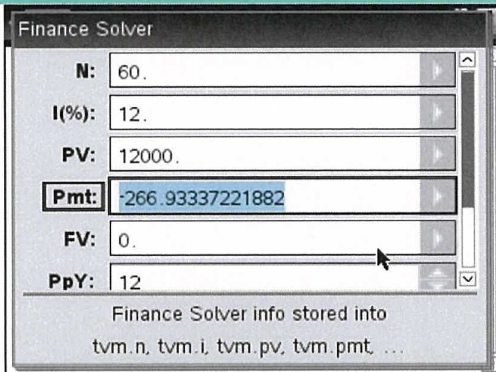
$$\text{FV:} = \underline{0}$$

$$\text{PpY:} = \underline{12}$$

$$\text{CpY:} = \underline{12}$$

Place the cursor on Pmt:

Press ENTER to solve.



b) the total amount of interest paid if the money is borrowed on:

$$\begin{aligned} \text{Total Interest} &= \text{repayments} \times \text{payment} - \text{Principal.} \\ &= 266.93 \times 60 - 12,000 \\ &= \$4015.80 \end{aligned}$$

In the last example, the difference between the two loan types is significant. For the reducing balance loan, each month \$53.07 less is repaid and overall \$3184.20 less interest is paid. Choosing a reducing balance loan rather than a flat rate loan results in a smaller repayment value or a shorter term and in both cases an interest saving. Now let us consider what flat rate of interest is equivalent to the rate for a reducing balance loan.

### Worked Example 17

A reducing balance loan of \$25 000 is repaid over 8 years with monthly instalments and interest charged at 9% p.a. (debited monthly). Find:

a) the repayment value

$$n = 8 \times 12 = 96$$

<p>Using the Financial Solver Enter the following:</p> <p><math>n</math> (N): = <u>96</u></p> <p><math>r</math> (I%): = <u>9</u></p> <p><math>P</math> (PV): = <u>25000</u></p> <p>Pmt: = _____</p> <p>FV: = <u>0</u></p> <p>PpY: = <u>12</u></p> <p>CpY: = <u>12</u></p> <p>Place the cursor on Pmt: Press ENTER to solve.</p>	
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The monthly repayment is \$ 366.26

b) the total amount of interest paid

$$\begin{aligned} \text{Total Interest} &= \text{payment} \times \text{no. of repayments} - \text{Principal.} \\ &= 366.26 \times 96 - \$25,000 \\ &= \$10,160.96 \end{aligned}$$

c) the equivalent flat rate of interest for a loan in which all other variable<sup>s</sup> are the same.

$$\text{Interest from reducing balance loan.} = \$10,160.96$$

$$V_0 = 25,000 \text{ and } n = 8 \text{ years.}$$

$$\text{re-arrange } I = \frac{V_0 r n}{100}, \text{ for } r: r = \frac{I \times 100}{V_0 n.}$$

$$\text{rate} = \underline{5.08\%}$$

The equivalent flat rate of interest is 5.08%

### Worked Example 18

A loan of \$76 000 is repaid over 20 years by quarterly instalments of \$2205.98 and interest is charged quarterly at 10% p.a. of the outstanding balance.

Find:

a) the total amount of interest paid is: Total Interest =  $\text{Pmt} \times N - \text{PV}$ , so first calculate  $n$ .

Calculate the value of  $n$ :  $n = 20 \times 4 = 80$

$$\begin{aligned}\text{Now, Total Interest} &= 80 \times \$2205.98 - \$76,000 \\ &= \$100,478.40\end{aligned}$$

The total amount of interest paid is \$100,478.40

b) the amount which can be borrowed on a flat rate loan in which all other variables are the same as above

$$\begin{aligned}\text{Interest} &= \$100,478.40, \quad r = 10\%, \quad n = 20 \text{ years} \\ \text{Solve } I &= \frac{V_0 r n}{100}, \text{ for } V_0 = \frac{I \times 100}{r \times n} \\ &= \frac{100,478.40 \times 100}{10 \times 20} \\ &= \$50,239.20 \\ \text{So, for a flat rate loan, } &\$50,239.20 \text{ can be borrowed.}\end{aligned}$$

c) the difference in the amount borrowed between the two types of loans

$$\begin{aligned}\text{The difference in the amount borrowed} \\ \text{is } & \$76000 - 50239.20 \\ &= \$25760.80\end{aligned}$$

So, Under the same conditions a \$76000 reducing balance loan is equivalent to a \$50,239.20 flat rate loan.