

Activity 3.10 – Loan repayment

In previous exercises we have used the fill handle to copy a formula across or down a worksheet. As we have filled it, the values in the formula have changed *relative* to its position e.g. =sum(B4:B8) =sum(D4:D8) =sum(E4:E8) etc.

Sometimes we do not want this to happen. In this exercise we will find out how to fill formulas without changing them as they go.

1. Start *Excel* and enter the labels in the cells indicated below.

	A	B	C	D	E	F
1	Loan Repayments					
2						
3		Principal:			Interest:	
4						
5		Time (months):				
6		Repayment:				
7						

This worksheet will calculate how much it will cost each month to pay off a loan.

2. a In C5 enter 6, and in D5 enter 12.
b Select *both* C5 and D5 with your mouse and then drag the fill handle across to H5:

	A	B	C	D	E	F	G	H	I
1	Loan Repayments								
2									
3		Principal:			Interest:				
4									
5		Time (months):	6	12					
6		Repayment:							
7									

6, 12, 18, 24, 30, and 36 should appear. Centre these values.

Time (months):	6	12	18	24	30	36
Repayment:						

There are three things that affect the amount that has to be paid each month in repaying a loan:

- the amount of money borrowed (the principal); e.g. a loan of \$5 000 has higher monthly repayments than \$2 000
- the rate of interest; e.g. 9% has higher repayments than 7%
- the time the loan is taken for; e.g. 12 months has higher repayments per month than 24 months because the money has to be paid off in less time.

The formula to carry out the repayment calculation is:

$$\text{monthly repayment} = \text{principal} * (1 + \text{rate} * \text{time in years}) / \text{time in months}$$

3. a In C3 enter \$5 000 (this will be the amount we wish to borrow, the principal).
b In F3 enter 14% (this is the interest rate).
c In C6 enter the formula: =C3*(1+F3*C5/12)/C5
d The value 891.6667 appears. Format this as currency (\$).

This shows that to pay back a loan of \$5 000 at 14% interest in six months you must pay \$891.67 each month.

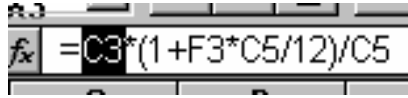
4. We will now see why filling this formula across, as it is, will not work.
a Click on C6 and drag the fill handle across to H6. The following happens:

Time (months):	6	12	18	24	30	36
Repayment:	\$891.67	\$ -	#VALUE!	\$0.01	\$ -	\$ -

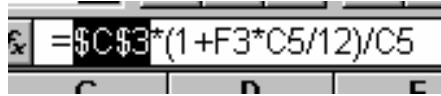
What has gone wrong? In turn click on C6, then D6, then E6, etc., and look in the cell contents display to see what has happened.

As the formula was copied across it is no longer pointing at the principal (F3) or the interest (C5), but the cells *relative* to its new positions (F4, F5, F6, etc, and C6, C7, C8, etc.).

- b To rectify this, first delete the contents of cells D6 to H6.
- c Click on cell C6 and in the cell contents display use your mouse to select the C3:



Press the function key F4 at the top of your keyboard *once*:



The C3 changes to \$C\$3.

- d Repeat for the F3 so that the formula looks like: =\$C\$3*(1+\$F\$3*C5/12)/C5 then click on the tick or press *Enter*.
- e Now using the fill handle copy the formula across once again.

Principal:	\$5 000		Interest:	14%		
Time (months):	6	12	18	24	30	36
Repayment:	\$891.67	\$475.00	\$336.11	\$266.67	\$225.00	\$197.22

Success! If you look in the cell contents display for D6 to H6 you will see that the formula has continued to point at C3 and F3 as it was copied across.

The use of the dollar sign \$ *anchors* the cell reference. As the fill across takes place the formula keeps pointing at the anchored cells C4 and F3.

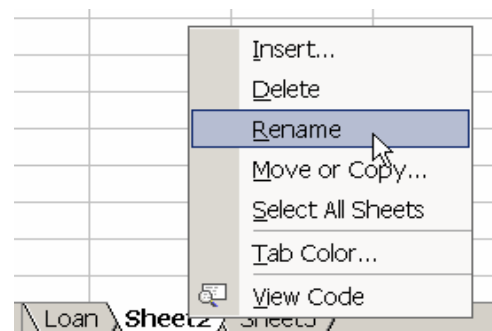
Using the \$ sign to anchor a cell is called an *absolute* cell reference. Copying without anchoring the cell is called a *relative* cell reference.

- 5. Save this worksheet as *HPI*.
- 6. Use the table to find the answers the following questions by filling in the values given:
 - a Ann intends to borrow \$3 500 at 17% interest. What will be her monthly repayments over 2 years (24 months)?
 - b Mike wants to borrow \$5 000 for a car at 18% interest. He can afford \$250 per month. How long should he take the loan for?
 - c Jane wants to borrow \$2 500 for a holiday at 21% interest. She can afford \$200 per month. How long should she take the loan for?

Activity 3.11 – Loan table

In this exercise we are going to look at some more absolute addressing by making a loan look up table. We will place this on *Sheet2* of the same workbook, and use the same formula from the last activity.

- 1. a If necessary start *Excel* and open *HPI* from the last activity.
- b Move to the bottom of the screen and click on the *Sheet2* tab to move to the next worksheet.
- c We can move between the worksheets by just clicking on the tabs at the bottom. To tell them apart we will name each.
In turn *right* click on each worksheet tab and rename them as *Loan* and *Principal* using the fly out menu that appears.
(Note: if you wish each tab can also be a different colour.)



- d Enter the following on the new sheet. (If you wish you can copy parts from the first sheet).

	A	B	C	D
1	Loan Repayments			
2				
3		Principal:	\$5 000	
4				
5			Time (months)	
6		Rate		
7				

- e In C6 and D6 enter 6 and 12 and fill them across as in the last exercise. Centre them. (Alternatively copy these values from the *Loan* worksheet.)
 f In B7 enter 7%, in B8 enter 7.5%.
 g Select *both* B7 and B8 with your mouse and then drag the fill handle down to B15.

The diagram illustrates the process of copying data. On the left, a spreadsheet shows cells B7 (7%) and B8 (7.50%) selected, with a fill handle being dragged down to B15. An arrow points to the right, where the resulting spreadsheet shows the data copied down to B15 and then across to C6 and D6. The 'Rate' column (B7-B15) contains values from 7% to 11% in 0.50% increments. The 'Time (m)' column (C6-D6) contains the values 6 and 12.

- h Centre these values and format them to one decimal place.

2. We will now make the loan look up table.

- a In cell C7 enter the following formula $=C3*(1+B7*C6/12)/C6$
 b When we fill this formula across and down we want to anchor the C3 so that it keeps pointing at the principal.

Select the C3 in the formula and press the function key F4 once so that it changes to $=\$C\$3*(1+B7*C6/12)/C6$.

- c When we fill the formula across we want it to keep pointing at the interest rate in column B, but when we fill it down we want the interest rate to increase relative to the row.

To do this we need to anchor the column but *not* the row.

Select the B7 in the formula and press the function key F4 *three* times so that it changes to $=\$C\$3*(1+\$B7*C6/12)/C6$.

- d When we fill the formula down we want it to keep pointing at the months in row 6, but when we fill it across we want the months to increase relative to the column.

To do this we need to anchor the row but not the column.

In turn select each C6 in the formula and press the function key F4 *twice* so that each changes to C\$6. The formula should now look like:

$=\$C\$3*(1+\$B7*C\$6/12)/C\$6$

- e Press *Enter* or click the green tick .
 f Use the fill handle to copy the formula down, and then across.