

## Answers

### Money talk: Compound Interest and Repayment of Student Loan

**Exercise 1:** The standard student loan is £4195 per year of study. Calculate how much will a student owe in 4 years after the graduation if the loan is not repaid back, taking the annual inflation rate as 4%. Use either the formula or year by year calculations.

Using formula:

$$A = P \times \left(1 + \frac{R}{100}\right)^T$$

$P$  = original investment (principal) = 4195

$R$  = rate % per annum = 4

$T$  = time in years = 4

$$A = 4195 \times \left(1 + \frac{4}{100}\right)^4 = 4195 \times (1 + 0.04)^4 = 4195 \times 1.04^4 = 4195 \times 1.1698 = \\ = \text{£}4907.56$$

Year by year calculations:

Student loan after the 1<sup>st</sup> year (even before student starts to repay it):

Interest on the loan after the 1<sup>st</sup> year:

$$\text{Interest}_1 = 4195 \times 4 / 100 = 167.8$$

$$\text{Loan}_1 = \text{Original Amount} + \text{Interest}_1 = 4195 + 167.8 = \text{£}4362.80$$

Interest on the loan after the 2nd year:

$$\text{Interest}_2 = 4362.8 \times 4 / 100 = 174.51$$

$$\text{Loan}_2 = \text{Loan}_1 + \text{Interest}_2 = 4362.80 + 174.51 = \text{£}4537.31$$

Interest on the loan after the 3rd year:

$$\text{Interest}_3 = 4537.31 \times 4 / 100 = 181.49$$

$$\text{Loan}_3 = \text{Loan}_2 + \text{Interest}_3 = 4537.31 + 181.49 = \text{£}4718.80$$

Interest on the loan after the 4th year:

$$\text{Interest}_4 = 4718.80 \times 4 / 100 = 188.75$$

$$\text{Loan}_4 = \text{Loan}_3 + \text{Interest}_4 = 4718.80 + 188.75 = \text{£}4907.55$$

**Exercise 2:** The standard student loan is £4195 per year of study. Work out how much will a student owe when the pension age is reached taking the annual inflation rate as 4% if the loan is not repaid back.

Using formula:

$P$  = original investment (principal) = 4195

$R$  = rate % per annum = 4

$T$  = time in years = 10, 15, 20, 25, 30, 35, 40

$$A = 4195 \times \left(1 + \frac{4}{100}\right)^{25} = 4195 \times (1 + 0.04)^{25} = 4195 \times 1.04^{25} = 4195 \times 2.6658 =$$

= £11,183.18

MONEY TALK				
<i>(MINE ALWAYS SAYS, 'GOOD BYE!')</i>				
INITIAL AMOUNT (Principal)	NUMBER OF YEARS TILL PENSION AGE (time)	INFLATION RATE PER YEAR	INITIAL AMOUNT INCREASED BY (1+rate/100)^time	MONEY OWED AT PENSION AGE
4195	10	0.04	1.4802	£6,209.62
4195	15	0.04	1.8009	£7,554.96
4195	20	0.04	2.1911	£9,191.76
4195	25	0.04	2.6658	£11,183.18
4195	30	0.04	3.2434	£13,606.05
4195	35	0.04	3.9461	£16,553.84
4195	40	0.04	4.8010	£20,140.28

**Exercise 3:** Depending on how much the teachers' salary and the inflation rate are likely to be over the next years, work out how many years will it take someone to repay a one year student loan.

Student loan after the 1<sup>st</sup> year (even before student starts to repay it):  
Current inflation rate from 1 September 2005 is 3.2%.

$$\text{Loan}_1 = 4165 + 4195 \times 3.2 / 100 = \text{£}4329.24$$

Teachers Starting Salary = £19,000

$$\text{Amount assessed for loan repayment} = \text{Teacher's Salary} - \text{Threshold } \text{£}15,000 = 19000 - 15000 = 4000$$

$$\text{Money to pay} = 9\% \text{ of } \text{£}4000 = 4000 \times 9 / 100 = 360$$

$$\text{Remaining debt at the end of the 1}^{\text{st}} \text{ year: } 4329.24 - 360 = 3969.24 \text{ etc}$$

MONEY TALK							
STUDENT LOAN REPAYMENT							
NUMBER OF YEARS	1	2	3	4	5	6	7
MONEY OWED AT THE BEGINNING OF THE YEAR	4195.00	3969.24	3646.26	3132.94	2513.19	1783.61	940.69
INTEREST RATE, %	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%
YEAR INTEREST	134.24	127.02	116.68	100.25	80.42	57.08	30.10
MONEY OWED AT THE END OF THE YEAR	4329.24	4096.26	3762.94	3233.19	2593.61	1840.69	970.79
TEACHERS SALARY	19000	20000	22000	23000	24000	25000	26000
TEACHERS' SALARY MINUS THRESHOLD 15,000	4000	5000	7000	8000	9000	10000	11000
MONEY TO PAY	360	450	630	720	810	900	990
REMAINING DEBT	3969.24	3646.26	3132.94	2513.19	1783.61	940.69	-19.21