

MAS224, Actuarial Mathematics: Problem Sheet 3

Post your solutions to the starred questions in the **orange box** on the **second floor** of the Maths building by **12 noon on Monday, 4th February 2008**. Do not forget to staple all pages together and write your name and student number at the top of the front sheet.

Give monetary values to the nearest penny and all other numerical answers to 4 decimal places. Interest rates should be given as percentages.

- 1*. John Doe opens up a regular savings account into which he pays £100 each month in advance for the next 10 years. How much will his regular investments have grown to in 10 years time if the interest rate on the account is fixed at 0.5% per month?

Jane Roe also invests £100 each month in advance for 10 years. The interest rate is variable. Initially the AER is 7%, however it falls to 6% after 3 years and remains at that rate for the remaining period. How much will her investments have grown to in 10 years time?

- 2*. A loan is taken out for £25,000. Repayments are to be made monthly in arrears. The AER is 10%.

(a*) If the loan is to be repaid over 20 years, find the monthly repayment.

(b) (no marks) Instead a repayment of £300 per month is made (until the amount outstanding is less than £300 when the amount outstanding will be paid). How long will it take to repay the money and what will the final payment be?

- 3*. (a) Jane Grey is repaying three loans. The first is a loan of £5,000 taken out exactly 3 years ago and being paid back over a 10 year period by annual payments in arrears. The APR charged on the loan is 10%. The second loan is for £10,000 taken out exactly a year ago and being paid back over a ten year period by annual payments in arrears. The APR charged is 12%. The third for £3,000 was taken out 2 years ago and is being paid back over a three year period by annual payments in arrears. The APR charged on this loan is 15%.

Find the annual repayments for each of the loans and the total annual repayment $£P$.

Find the total amount outstanding for the three loans. Assume that each loan payment due at the present time has just been paid.

(b) No penalty is imposed for repaying the loans early. A secured loan is taken out to pay off the outstanding amount of the loans. An APR of 6% is to be charged on this secured loan.

(i) Find the repayment level required to pay off the secured loan by equal annual payments in arrears for 10 years.

(ii) If instead the combined original payment of $£P$ per annum (see part (a)) is continued annually in arrears, give the schedule of payments until the bank loan is paid. Note that the final payment required is likely to be smaller than the combined payment (you shouldn't have a negative amount of the loan outstanding!) . State the amount of this final payment.