****

**Mathematics Applications  
YEAR 12**

**Investigation 3 – Finance**

**Semester 2 2017**

**In-class Section**

**Time allowed:** 35 minutes

**Marks Available:** 33 marks

**Materials required:** Writing implements, correction fluid/tape or eraser, ruler, Scientific or CAS calculator

**Instructions:**

1. Write your answers in the spaces provided in this Question/Answer Booklet.
2. **Show all your working clearly**. Your working should always be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks.
3. CAS calculators are be permitted to be used.
4. No notes are allowed.

1. (7 marks)  
   Two friends buy a housing unit for $183 000. Between them they manage to repay $2 625 per month. The table below summarises their monthly repayments and shows the balance at the end of each month.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Month | Amount owed | Interest | Payment | Balance |
| 1 | 183 000 | 1 098 | 2 625 | 181 473 |
| 2 | 181 473 | 1 088.84 | 2 625 | 179 936.84 |
| 3 | 179 936.84 | 1 079.62 | 2 625 | 178 391.46 |
| 4 | 178 391.46 | 1 070.35 | 2 625 | 176 836.81 |
| 5 | 176 836.81 | 1 061.02 | 2 625 | 175 272.83 |
| 6 | 175 272.83 | **(i)** | 2 625 | 173 699.47 |
| 7 | 173 699.47 | 1 042.20 | 2 625 | 172 116.67 |
| 8 | 172 116.67 | 1 032.70 | 2 625 | 170 524.37 |
| 9 | 170 524.37 | 1 023.15 | 2 625 | **(ii)** |
| 10 | 168 922.52 | 1 013.54 | 2 625 | 167 311.06 |
| 11 | **(iii)** | 1 003.87 | 2 625 | 165 689.93 |
| 12 | 165 689.93 | 994.14 | 2 625 | 164 059.07 |

1. Calculate the annual interest rate charged on this loan. [2]
2. Find the values of (i), (ii) and (iii) in the cells above. [3]
3. Find the total amount of interest paid in the 12 months. [2]
4. (7 marks)  
   Asher borrowed $15 000 to buy his car. Interest is charged on the opening balance each month at a rate of 12% per annum. Asher repays $1 200 each month (except for the final payment). The final payment cannot exceed the regular payments. The table below shows Asher’s account over the life of the loan.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Month** | **Opening Balance (to the nearest $)** | **Interest** | **Repayment** | **Closing Balance (to the nearest $)** |
| 1 | 15 000 | 150 | 1 200.00 | 13 950 |
| 2 | 13 950 | 139.50 | 1 200.00 | 12 890 |
| 3 | 12 890 | 128.90 | 1 200.00 | 11 818 |
| 4 | 11 818 | 118.18 | 1 200.00 | 10 737 |
| 5 | 10 737 | 107.37 | 1 200.00 | 9 644 |
| 6 | 9 644 | 96.44 | 1 200.00 | 8 540 |
| 7 | 8 540 | 85.40 | 1 200.00 | 7 426 |
| 8 | 7 426 | 74.26 | 1 200.00 | 6 300 |
| 9 | 6 300 | 63.00 | 1 200.00 | 5 163 |
| 10 | 5 163 | 51.63 | 1 200.00 | 4 015 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

1. Find the monthly interest rate. [1]

1. Complete the table above to find how long Asher takes to repay the loan. State the amount of the final payment. [4]
2. How much interest would Asher has paid for the loan? Show clearly how you obtained your answer. [2]

1. (9 marks)  
   Robert buys a car for $72 000. He pays a deposit of $12 000 from his savings and borrows the remaining amount from his bank. The interest on the loan is 7.5% per annum and Robert can afford to make monthly repayments of $1 800.  
     
   The spreadsheet below shows the balance and interest of the loan for the first 6 months and the last 3 months.

|  |  |  |
| --- | --- | --- |
| Month | Opening balance at the start of each month | Interest |
| 1 | 60 000 | 375 |
| 2 | 58 575 | 366.09 |
| 3 | 57 141.09 | 357.13 |
| 4 | **A** | **B** |
| 5 | 54 246.34 | 339.04 |
| 6 | 52 758.38 | 330.89 |
| . . . |  |  |
| 36 | 4 442.52 | 27.77 |
| 37 | 2 670.28 | 16.69 |
| 38 | 886.97 |  |

1. Calculate the value of A and B, correct to two decimal places. [2]
2. One of the opening balances for the first 6 months is incorrect. Identify which entry is incorrect and state the correct value of the balance. [2]
3. How long will it take for the amount owing to fall below $10 000? [1]
4. Calculate the amount of Robert’s final payment. [2]
5. What is the total amount of interest that Robert has paid? [2]
6. (10 marks)  
   In order to buy a second-hand scooter, Kim obtained a personal loan of $5 000 with monthly repayments of $440 to be paid at the end of each month. The table below shows the amount owing at the start of each month, interest payable for that month, the repayment and the amount owing at the end of each month for the first six months.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Month | Amount owing at the start of the month ($) | Interest ($) | Repayment ($) | Amount owing at the end of the month ($) |
| 1 | 5 000 | 40 | 440 | 4 600 |
| 2 | 4 600 | 36.80 | 440 | 4 196.80 |
| 3 | 4 196.80 | 33.57 | 440 | 3 790.37 |
| 4 | 3 790.37 | 30.32 | 440 | 3 380.70 |
| 5 | 3 380.70 | 27.05 | 440 | 2 967.74 |
| 6 | 2 967.74 | 23.74 | 440 | 2 551.48 |

1. Calculate the annual interest rate. [3]
2. Write a recursive formula to determine the amount owing at the end of each month. [2]
3. In which month would Kim pay off the loan? [1]
4. How much is Kim’s final repayment? [2]
5. How much did Kim actually pay for the scooter? [2]

**End of Investigation**

**This page has intentionally been left blank**

You may use this space to extend or re-attempt an answer to a question or questions and should you do so then number the question(s) attempted and cross out any previous unwanted working.