**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Block:\_\_\_\_\_\_\_**

**IB Math Studies**

**Financial Mathematics – Practice IB Questions**

**Paper 1**

**1.** A Swiss bank shows currency conversion rates in a table. Part of the table is shown below, which gives the exchange rate between British pounds (GBP), US dollars (USD) and Swiss francs (CHF).

|  |  |  |
| --- | --- | --- |
|  | Buy | Sell |
| GBP | 2.3400 | 2.4700 |
| USD | 1.6900 | 1.7700 |

 This means that the bank will **sell** its British pounds to a client at an exchange rate of
1 GBP = 2.4700 CHF.

(a) What will be the selling price for 1 USD?

 Andrew is going to travel from Europe to the USA. He plans to exchange 1000 CHF into dollars. The bank sells him the dollars and charges 2% commission.

(b) How many dollars will he receive? Give your answer to the nearest dollar.

|  |  |
| --- | --- |
| *Working:* |  |
|  | *Answers*:(a) ..................................................................(b) .................................................................. |

(Total 8 marks)

**2.** David invests 6000 Australian dollars (AUD) in a bank offering 6% interest compounded annually.

(a) Calculate the amount of money he has after 10 years.

(b) David then withdraws 5000 AUD to invest in another bank offering 8% interest compounded annually. Calculate the **total** amount he will have in both banks at the end of one more year. Give your answer correct to the nearest Australian dollar.

|  |  |
| --- | --- |
| *Working:* |  |
|  | *Answers*:(a) ..................................................................(b) .................................................................. |

(Total 8 marks)

**Paper 2**

**3.** The table shows part of a currency conversion chart. For example GBP 1 is equivalent to FFR 8.33.

|  |  |  |  |
| --- | --- | --- | --- |
|  | GBP | USD | FFR |
| GBP | 1 | *p* | 8.33 |
| USD | 0.64 | 1 | *q* |
| FFR | 0.12 | 0.19 | l |

 For all calculations in this question give your answers correct to two decimal places.

(a) Calculate the value of

(i) *p;*

(ii) *q*.

(4)

(b) Joe has USD 1500 to exchange at a bank.

(i) Assuming no commission is charged, how much in GBP will Joe receive from the bank?

(2)

(ii) Assuming the bank charges 1.5% commission,

(a) how much in GBP does Joe pay in commission?

(1)

(b) how much in GBP does Joe actually receive for his USD 1500?

(1)

(c) Joe decides to invest GBP 700 of his money in a savings account which pays interest at 5%, compounded annually.

(i) How much interest will the GBP 700 earn after 4 years?

(2)

(ii) For how many years must Joe invest his GBP 700 in order to earn at least GBP 200 in interest?

(2)

(d) After 4 years Joe has a total of GBP 900 in his savings account on an investment at 5% interest compounded annually. How much did he invest? Give your answer to the nearest one GBP.

(2)

(Total 14 marks)

**4.** (i) Celia has $20,000 to invest. There are two different options that she can choose.

 Option 1: The investment grows at a rate of 3.5% compound interest each year.
Option 2: The total value of the investment increases by $800 each year.

 The money is to be invested for 15 years.

(a) Complete the table below giving the values of the investments to the nearest dollar for the first 4 years.

(3)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **0** | **1** | **2** | **3** | **4** |
| **Option 1** | 20 000 | 20 700 |  |  |  |
| **Option 2** | 20 000 | 20 800 |  |  |  |

(b) Calculate the values of each investment at the end of 15 years.

(4)

(c) If Option 1 is chosen find the total number of complete years before the value of the investment is first greater than $25,000.

(2)

(d) If Option 2 is chosen calculate the percentage increase in the investment for the final year.

(2)

(ii) Two more Options are available to Celia. After 7 years she can change the investment conditions.

 Option 3: If Celia has chosen Option 1 she can change and then receives $800 each year
 until the end of the 15 years.
Option 4: If Celia has chosen Option 2 she can change and then receive 3.5% interest
 compounded annually.

 If Celia wishes to receive the maximum amount of money at the end of the 15 years which option should she choose?

(7)

(Total 18 marks)

**IB Math Studies – Financial Mathematics –Questions Mark Scheme**

**1.** (a) 1.7700 CHF (A2) (C2)

(b) **Method 1**
2% of 1000 CHF = 20 (A1)
Amount = 1000 – 20 (M1)
= 980 CHF (A1)
=  USD (M1)
= 553.67 USD (A1)
= 554 USD (to nearest dollar) (A1) (C6)

 **Method 2**
1.7700 CHF = 1 USD
1000 CHF =  (M1)
= 564.97175 (A1)
564.97175 × 0.98 (M1)(A1)
= 553.67 (A1)
= 554 USD (to the nearest dollar) (**ft** from answer in (a)) (A1) (C6)

[8]

**2.** (a) *A* = 6000(1.06)10 (M1)(A1)
= 10745 (AUD) (A1) (C3)

(b) 10745 – 5000
= 5745 (A1)
5000 × 1.08 + 5745 × 1.06 (M1)(M1
= 11489.80 (A1)
= 11490 (to the nearest AUD) (A1) (C5)

[8]

**3.** ***Notes:*** *If no method is shown, award (M1)(A1) if and only if answer is correct, otherwise award zero marks. However, award (M1) if* ***correct*** *method is shown; even if final answer is wrong.*

(a) (i) *p* =  = 1.56 (2 d.p.) (M1)(A1)

(ii) *q* =  = 5.26 (2 d.p.) (M1)(A1) 4

**Notes:** For parts (a)(i) and (a)(ii) accept and follow through with conversions routed via candidate’s home currency. For example:
 USD 1 = GBP 0.64
 GBP 1 = FFR 8.33
 USD 1 = FFR (0.64) (8.33)
 q = 5.33 instead of 5.26

(b) (i) GBP (1500 × 0.64) = GBP 960.00 (M1)(A1) 2

**Note:** Accept (1500 ÷ 1.56 (or candidate’s p)) = GBP 961.54

(ii) (a) (0.015 × 960) = GBP 14.40 (A1) 1

**Note:** Follow through from part (b)(i) above.

(b) (960 – 14.40) = GBP 945.60 (A1) 1

**Note:** Follow through from parts (b)(i) and (b)(ii)(a).

(c) (i) 700(1.05)4 = GBP 850.85 (M1)
Therefore interest = GBP 150.85 (A1) 2

(ii) 700(1.05)5 = 893.397... = 893.40(2 d.p.) (M1)
700(1.05)6 = 938.066... = 938.07 (2 d.p.)
therefore after 6 years (A1) 2

**Note:** Accept other correct methods.

(d) *C*(1.05)4 = 900
*C* =  (M1)

**Notes:** Award the (M1) at the point where C has been correctly isolated
Accept C =  = GBP 738

 = GBP 740 (nearest GBP) (A1) 2

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**4.** (i) (a)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 |  |  |
| Option 1 | 20000 | 20700 | **21425** | **22174** | **22950** |  |  |
| Option 2 | 20000 | 20800 | **21600** | **22400** | **23200** | (A3) | 3 |

**Notes:** Award (A2) for Option 1 all correct.
Award (A1) for Option 2 all correct.

(b) A = 20000(1.035)15 (A1)
Option 1 = 33507 (A1)
A = 20000 + 15 × 800 (A1)
Option 2 = 32000 (A1)

 **OR**

 Option 1 = 33507 (G2)
Option 2 = 32000 (G2) 4

(c) 7 years (from reading the table from GDC) (G2) 2

(d) × 100 (M1)

**Note:** Award (M1) for candidate’s difference divided by their
original times 100.

 = 2.56% (A1) 2

(ii) Option 3: 20000 × (1.035)7 + 800 × 8 (M1)(A1)
= $31845.59 (A1)
Option 4: (20000 + 7 × 800) × (1.035)8 (M1)(A1)
= $33710.31 (A1)

 **OR**

 $31845.59 (G3)
$33710.31 (G3)

 She should choose Option 4 (R1) 7

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