INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

August 2015

Subject CA3 – Communications

Paper 2

Time allowed: 2 hours

INSTRUCTIONS TO THE CANDIDATE

1. *The work you submit MUST be saved in Microsoft PowerPoint 2007 format, e.g. using the pptx file extension.*
2. *You have two hours to prepare and upload your exam attempt.*
3. *You may print one copy of your slides in preparation for giving the presentation tomorrow. You are not permitted to make any further copies of your presentation.*
4. *Copies of Formulae and Tables and core reading for subjects CT1–CT8 inclusive and CA1 will be available electronically during the exam. These documents are for your use during the exam period only and not for general use. No other material can be referred to.*
5. *In addition to this paper you should have available your own electronic calculator from the approved list, http://www.actuaries.org.uk/research-and-resources/documents/exam-policies*
6. *You are not permitted to use the internet to help you during the exam.*
7. *You are required to work through the exam assignment without assistance from another person. You are reminded that by undertaking this exam you are bound by the Institute and Faculty of Actuaries' Examinations Rules and Regulations. By submitting your files you are confirming that all material is entirely your own work and you wish this to be taken into account for this assessment. Only the first submission will be accepted.*
8. *Save your work regularly. Saving your work is your responsibility so failure to do so will not be a significant mitigating circumstance.*
9. *At the end of the exam, save your presentation and follow the upload instructions that have been provided. All related material that you have printed including slides, notes, etc. must be confidentially stored until we have informed you to delete/destroy them once the exam is over. Do NOT log off the application until you receive confirmation of receipt from the Online Education Team.*
10. *If you encounter any difficulties please email online_exams@actuaries.org.uk or call the Online Education Team on +44 (0)1865 268255.*
11. *Professional behaviour is mandatory and no material relating to the exam may be disclosed or discussed with others, nor used in a further attempt at the exam. Failure to comply with this will be deemed to be a breach of the examination regulations and may result in disciplinary action.*

PLEASE NOTE THAT THE CONTENT OF THIS PAPER IS CONFIDENTIAL AND STUDENTS ARE NOT TO DISCUSS OR REVEAL THE CONTENTS UNDER ANY CIRCUMSTANCES.

You work as a nearly qualified actuary for XYZ Building Society which recruits a number of graduates onto its training programme each year. The graduate training programme requires them to rotate through several different roles over the first 2 years including working in the mortgage department.

Your manager (Christophe) has asked you to take part in the trainees' induction training. He has left you the following instructions:

Fred

As you know we have our new graduate intake starting next week and as part of their training I would like you to give them a short presentation on mortgages. Some of them may be aware of what a mortgage is. However as the majority of them are relatively young their perception is likely to be that house prices only ever increase.

I'd like you to give them an explanation of how a repayment mortgage and interest only mortgage work. Then in order to tailor the presentation to what we actually sell it would be good if you could also give the trainees some details on our niche market. You should include numerical details of how a repayment mortgage actually works in this section. As you are aware our niche sector of the market is first time buyers and they typically only stay 5 years in their first property, so for your illustrations you might want to consider what happens over five years as well as over the whole term. As part of your presentation please could you also include an illustration on how house prices have varied in the past. I would also like the trainees to understand what "negative equity" is and in particular how it can arise for our customers, perhaps with a simple example.

Your slot is for 10.30 am and they have a break for refreshments at 10.40 am with sessions resuming as 11 am. Please make sure you don't go over the ten minutes allocated for your slot.

Regards
Christophe

Prepare your presentation lasting no longer than 10 minutes.

In order to assist you in your presentation, Christophe has arranged for a junior actuarial student to provide you with some further information and figures.

Background on XYZ Building Society mortgages

XYZ Building Society currently only sells repayment mortgages although we have sold interest only mortgages in the past. The formulae used to calculate mortgage payments on each type of mortgage are as follows:

Interest only mortgage (IOM)

Annual payment (IOM) = Mortgage loan amount × annual interest rate
(Full mortgage loan amount is outstanding at the end of the mortgage term and the client needs to arrange for repayment of the full mortgage loan amount by alternative finance.)

Repayment mortgage (RM)

Mortgage loan Amount = MLA
Interest rate = i% per annum
Annual payment = AP
Term of mortgage = n years
$v = 1 / (1 + i)$
$MLA = AP \times (1 - v^n) / i$
Rearranging to solve for AP get: $AP = MLA \times i / (1 - v^n)$

We currently only sell repayment mortgages and our target market (where we sell 99.95% of our business) is first time buyers. Our typical first time buyer has usually saved up a deposit of £5,000 and they are looking to buy a property that costs £105,000 so they need to borrow £100,000 from XYZ. They usually only stay in the first property they buy for 5 years. We have a term of 25 years for these mortgages and our mortgage interest rate is 5% p.a. On such a mortgage the AP would be £7,095.25 (= $100{,}000 \times 0.05 / (1 - 0.952381^{25})$; where $0.9582381 = 1 / (1 + 0.05)$).

The calculation of how AP actually repays the mortgage over 25 years for £100,000 at an interest rate of 5% p.a. works as follows:

Year	Mortgage outstanding (£)	AP (£)	Interest on mortgage outstanding (included in AP) (£)	implies: mortgage capital repaid (£)
0	100,000.00	7,095.25	5,000.00	2,095.25
1	97,904.75	7,095.25	4,895.24	2,200.01
2	95,704.75	7,095.25	4,785.24	2,310.01
3	93,394.74	7,095.25	4,669.74	2,425.51
4	90,969.23	7,095.25	4,548.46	2,546.78
5	88,422.44	7,095.25	4,421.12	2,674.12
6	85,748.32	7,095.25	4,287.42	2,807.83
7	82,940.49	7,095.25	4,147.02	2,948.22
8	79,992.27	7,095.25	3,999.61	3,095.63
9	76,896.64	7,095.25	3,844.83	3,250.41
10	73,646.22	7,095.25	3,682.31	3,412.93
11	70,233.29	7,095.25	3,511.66	3,583.58
12	66,649.71	7,095.25	3,332.49	3,762.76
13	62,886.95	7,095.25	3,144.35	3,950.90
14	58,936.05	7,095.25	2,946.80	4,148.44
15	54,787.61	7,095.25	2,739.38	4,355.87
16	50,431.74	7,095.25	2,521.59	4,573.66
17	45,858.08	7,095.25	2,292.90	4,802.34
18	41,055.74	7,095.25	2,052.79	5,042.46
19	36,013.28	7,095.25	1,800.66	5,294.58
20	30,718.70	7,095.25	1,535.94	5,559.31
21	25,159.39	7,095.25	1,257.97	5,837.28
22	19,322.11	7,095.25	966.11	6,129.14
23	13,192.97	7,095.25	659.65	6,435.60
24	6,757.38	7,095.25	337.87	6,757.38
25	0.00			

The table below shows an index of property prices over the last 30 years from 1985 to 2015 that reflects the mortgage market suitable to XYZ. The table also shows the percentage change in property prices over both the previous year and also over the previous 5 year period. Negative equity occurs when the value of an asset used to secure a loan (in our case the property on which we have secured a mortgage) is less than the outstanding balance on the loan.

Year	Index	% Change over 1 year	% Change over 5 years
1985	100.0	n/a	n/a
1986	114.0	14.0%	n/a
1987	141.4	24.0%	n/a
1988	178.1	26.0%	n/a
1989	221.9	24.6%	n/a
1990	192.3	–13.3%	92.3%
1991	183.1	–4.8%	60.6%
1992	169.0	–7.7%	19.5%
1993	154.2	–8.8%	–13.4%
1994	160.4	4.0%	–27.7%
1995	163.0	1.6%	–15.2%
1996	165.1	1.3%	-9.8%
1997	180.2	9.1%	6.6%
1998	202.5	12.4%	31.3%
1999	215.9	6.6%	34.6%
2000	260.0	20.4%	59.5%
2001	284.1	9.3%	72.1%
2002	321.4	13.1%	78.4%
2003	405.1	26.0%	100.0%
2004	434.6	7.3%	101.3%
2005	454.7	4.6%	74.9%
2006	464.4	2.1%	63.5%
2007	519.7	11.9%	61.7%
2008	536.7	3.3%	32.5%
2009	428.7	–20.1%	–1.4%
2010	472.5	10.2%	3.9%
2011	473.6	0.2%	2.0%
2012	474.0	0.1%	–8.8%
2013	498.2	5.1%	–7.2%
2014	526.1	5.6%	22.7%
2015	586.2	11.4%	24.1%

All the information provided is correct for the purposes of the question. You are not expected to consider the costs of arranging a mortgage or buying or selling a property in your presentation.

END OF PAPER