

# EXAMINATION

19 April 2007 (pm)

## Subject CA3 — Communications

*Time allowed: Three hours*

### ***INSTRUCTIONS TO THE CANDIDATE***

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*
2. *You have 15 minutes at the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*
3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*
4. *Attempt Question 1 AND Question 2.*

### ***AT THE END OF THE EXAMINATION***

*Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.*

*In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator.*

**1** You have received the following letter from a friend:

Dear Bob,

Good to see you on the golf course last weekend and to catch up on your news. From what you were saying of your current role, I wondered if you could throw any light on a problem I've got at work at the moment:

We currently issue mailings to 10,000 customers each month. The mailings are sent out by a mailing company on our behalf, and include a voucher which can be exchanged for goods to the value of £5. On average we get 6 customers each month who contact us to complain that the voucher was not included.

Last month we changed the mailing company, and the number of complaints increased by 50% to 9. I was concerned and complained to the new mailing company. However, the mailing company is telling me that the number of complaints varies every month and so this result isn't significant. Surely a 50% increase must mean there's an underlying problem?

Other than this problem, business seems to be going very smoothly at the moment. I had hoped to spend a little more time on the golf course. However we now plan to move house so this seems unlikely. This may take a while to organise though: judging by our customers, the rate of house moves is down. We had 20% fewer letters returned by the post office marked "gone away" from the last batch: down from our average of 200 to 160.

Look forward to another game soon.

Best wishes,

John

You have completed the following calculations, using a normal approximation to a binomial distribution:

	<i>Vouchers missing</i>	<i>Gone-Away</i>
<i>N</i>	10,000	10,000
Mean	6	200
<i>P</i>	0.0006	0.02
Variance = $Np(1 - p)$	5.9964	196
Standard Deviation = $\sqrt{\text{Variance}}$	2.4488	14
95% significance factor on normal distribution	1.645	1.645
Factor $\times$ standard deviation	4.03 (= $2.4488 \times 1.645$ )	23.03 (= $14 \times 1.645$ )
95% significance level	$6 + 4.03 = 10.03$	$200 - 23.03 = 176.97$
91.7% (1 in 12) significance factor on normal distribution	1.383	1.383
Factor $\times$ standard deviation	3.39	19.36
91.7% significance level	$6 + 3.39 = 9.39$	$200 - 19.36 = 180.64$
99.8% significance factor on normal distribution	2.88	2.88
Factor $\times$ standard deviation	7.05	40.32
99.8% significance level	$6 + 7.05 = 13.05$	$200 - 40.32 = 159.68$

You have also noted that if the company had failed to send out 20% of the mailings, you would expect this to reduce the numbers returned as “gone away” to 160 and to reduce the average number of complaints to just over five.

Draft a letter to your friend in approximately 450 words. You should address the following issues:

1. The increase in the number of complaints.
2. The fall in the number of mailings returned marked “gone away”.
3. The relative significance attached to differing sample sizes.
4. The effect of the mailing company not sending out all the letters.

### Notes

1. In the general economy there has been no change in the level of house-moves.
2. You are not expected to do any further calculations.

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2 As an actuary at a life insurance company, you have been asked by the HR Manager to deliver a presentation to a group of new employees in the customer services team. Your presentation is to provide an overview of the following three products currently sold by your company:

- a decreasing term assurance
- a with profits whole of life policy (with premiums payable to age 90)
- a with profits endowment assurance

You have gathered the following information from the pricing team:

			<i>Decreasing term assurance</i>	<i>With profits whole of life assurance</i>	<i>With profits endowment assurance</i>
	Entry Age		£	£	£
Premium (p.a.)	30 yrs		100	1,250	4,000
	50 yrs		250	2,500	4,500
Surrender value (age 30 at inception)	5 yrs		Nil	6,000	20,000
	10 yrs		Nil	15,000	50,000
	15 yrs		Nil	25,000	90,000
Surrender value (age 50 at inception)	5 yrs		Nil	12,000	25,000
	10 yrs		Nil	25,000	55,000
	15 yrs		Nil	45,000	90,000
Paid up sum assured (age 30 at inception)	5 yrs		Nil	12,000	25,000
	10 yrs		Nil	30,000	60,000
	15 yrs		Nil	50,000	95,000
Paid up sum assured (age 50 at inception)	5 yrs		Nil	15,000	25,000
	10 yrs		Nil	40,000	60,000
	15 yrs		Nil	60,000	95,000

The table provides an illustration of the premiums, surrender values and paid up sum assured for a male policyholder for a basic sum assured of £100,000 and term of 20 years. The surrender values and paid up sums assured include an allowance for simple reversionary bonuses declared to date.

Draft a presentation of 6 to 9 slides covering the following points:

- Key features of each product (to include type of product i.e. life or savings, type of premium, when benefit is paid, term, whether or not medical underwriting is required).
- The key rating factors that affect the premium for each product (see Note (4)).
- Comparison of the relative surrender values for each product.
- Comparison of the relative paid up sums assured for each product.

## Notes

1. Assume that the employees have never worked for a life insurance company previously.
2. You have been told that the meanings of the following terms were covered at an earlier training session:
  - Premium
  - Term
  - Sum assured
  - Bonus
3. You can ignore the impact of legislation and regulation.
4. Factors that affect the premium for each product include age, sex, sum assured, interest rates, lifestyle (for example smoker status and pastimes), family medical history, policy term, occupation, residential address.
5. For the decreasing term assurance, it is assumed that the sum assured runs down annually based on a loan interest rate of 8% p.a.
6. For the with profits whole of life and endowment policies, the simple reversionary bonus rate is assumed to be 2% p.a.
7. The paid up sum assured is the reduced value of the sum assured if no future premiums are paid but the policy runs to maturity. It allows for bonuses already added.
8. The surrender values and paid up sums assured are based on the following:  
  
Asset growth (net of expenses): 5.5% p.a.  
Mortality tables: TM/TF92 tables
9. You should assume that the information given above is factually correct.

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**END OF PAPER**