

INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2A LIFE INSURANCE

MAY 2006 EXAMINATIONS

MARKING GUIDE

Level of Difficulty

PAPER ONE

Question	Syllabus Aims	Units	Knowledge & Understanding	Straight-forward Judgement	Complex Judgement	Total Marks
1 (a) (i)	1,2,5	1, 2	3			3
1 (a) (ii)	1,2,5	1, 2	3			3
1 (b)	3	1		2		2
1 (c)	4,7	2			6	6
2 (a)	5, 8	2, 3	6			6
2 (b) (i)	1, 2, 5, 8	1, 2, 3		5		5
2 (b) (ii)	1, 2, 5, 8	1, 2, 3		2		2
2 (b) (iii)	1, 2, 5, 8	1, 2, 3			2	2
2 (c)	1, 2, 5, 8	1, 2, 3			3	3
3 (a)	1, 2, 14	1, 4	2			2
3 (b)	1, 2, 14, 16	1, 4, 5	2			2
3 (c)	1, 6, 14, 16	1, 2, 4, 5		6		6
3 (d)	3, 14, 16	1, 4, 5			4	4
4 (a)	2,7,8,10,13	1, 2, 3, 4	3			3
4 (b)	2,7,8,9,10,13	1, 2, 3, 4		3		3
4 (c)	7,8,10,13,14	2, 3, 4		3		3
4 (d)	8, 10, 13, 14	3, 4			10	10
5 (a)	1, 2, 3, 6, 7, 12	1, 2, 4	2	4		6
5 (b)	2, 3, 12	1, 4		4		4
5 (c)	2, 3	1			8	8
6 (a)	8, 9, 13	3, 4	3			3
6 (b)	8, 9	3		3		3
6 (c)	5, 8, 9, 13	2, 3, 4		4		4
6 (d)	4, 5, 7	2			7	7
TOTAL			24	36	40	100

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QUESTION 1

(14 Marks)

Analysis

Component	Aim	KU	SJ	CJ	Total
Part (a) (i)	1,2,5	3			3
Part (a) (ii)	1,2,5	3			3
Part (b)	9		2		2
Part (c)	4,7			6	6
Total		6	2	6	14

Question

You are an actuary working for a medium sized life insurance company operating in Australia. Your company sells individual investment and lump sum risk products. Your products are currently sold as follows:

- **70% by a wholly owned financial planning subsidiary that only sells your company's products.**
- **30% by independent advisers who also sell products from other companies.**

The profitability of these products has reduced over the last 5 years due to market competition.

To increase sales and improve profitability, the Marketing Manager has proposed that the company introduce new individual investment and lump sum risk products that will be sold via direct marketing campaigns in magazines and newspapers. The existing distribution channels will not have access to these new products.

The direct marketing method would involve using a short form application where risk applicants are required to answer 5 basic health questions and are either granted or denied cover on the basis of their answers.

The application allows a choice from one of the following options:

OPTION	1	2	3
	Risk Business Sum Insured		
YRT	\$50,000	\$100,000	\$250,000
TPD	\$25,000	\$50,000	\$125,000
Trauma	\$25,000	\$50,000	\$125,000
Single premium investment amount	\$1,000	\$2,000	\$5,000

Applications for investment products will be automatically accepted, even if the client is declined for risk business.

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As the company will receive advertising coverage through its direct marketing campaigns, the magazine and newspaper advertisements it currently uses will be discontinued.

As market research indicates that premium rates and fees for direct-marketed products are higher than for products that are not direct-marketed, the Marketing Manager expects profits from sales of direct-marketed products to increase by this difference.

(a) Explain whether the direct-marketed

(i) Investment products (3 marks)

(ii) Risk products (3 marks)

would be expected to generate the additional profit anticipated by the Marketing Manager.

(b) How would you determine the incidence (i.e. mortality, morbidity) assumptions for use in pricing the new risk products? (2 marks)

(c) What risks might arise from these changes in relation to your current distribution channels? (6 marks)

QUESTION 1: SOLUTION

(14 Marks)

(a)

(i) Investment product

It is unlikely that 100% of the difference in fees between the direct marketed investment products and the investment products that are not direct-marketed will result in profit as:

- The investment amounts for direct-marketed products are generally much smaller than for products that are not direct-marketed. Hence, the unit costs relative to the investment amount would thus be correspondingly higher for those activities that are purely variable with the number of policies.
- There may be costs incurred in the existing advertising that are currently not included in the costs of the investment products that are not direct-marketed.
- The response rate for direct marketing campaigns may be lower than expected, making the advertising cost per policy more expensive than expected/budgeted.
- The lack of a needs analysis, combined with the low investment amounts could lead to a higher turnover of investments, thus resulting in lower profit than on the products that are not direct-marketed.

However, these 'costs' need to be compared with the commission and the existing advertising budget that would be saved on the direct-marketed products to determine the actual profitability of the product.

Marking guide:

- **1 mark for effect of smaller investment amount;**
- **1 mark for advertising costs vs. direct campaign costs;**
- **1 mark for response rate;**
- **1 mark for lapse rate;**
- **1 mark for comparison between costs and other savings;**

to a maximum of 3 marks (KU).

(ii) Risk products

It is unlikely that 100% of the difference in premiums between the direct marketed risk products and risk products that are not direct-marketed will result in profit as:

- The average sums insured would be lower for the direct-marketed products, resulting in higher unit costs relative to premium, thus reducing profitability.
- The average mortality is likely to be worse due to the reduced underwriting and increased anti-selection, resulting in increased claims.
- The short form application combined with the marketing method would be expected to result in a higher ratio of declines, thus driving up unit costs relative to the case where there are no declines. However, since underwriting only involves assessing five basic questions, the overall cost may be cheaper.
- Advertising costs as per i).
- Response rate as per i).
- The lapse rate is likely to be higher due to lack of need for product, small sums insured and high premium rates, thus resulting in reduced profitability.

However, these changes would need to be compared with the 'savings' on commission and underwriting and the existing advertising budget to determine the true expected profitability.

Note to markers: The candidate should be non-committal in the response as there is not enough information to make a conclusion either way.

Marking guide:

- **1 mark for effect of smaller average sums insured;**
- **1 mark for mortality increase;**
- **½ mark for additional cost of heavy decline rate;**

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- ½ mark for advertising costs;
- ½ mark for response rate;
- ½ mark for lapse rate;
- 1 mark for cost reduction from underwriting and other savings;

to a maximum of 3 marks (KU).

(b) The incidence assumptions would be determined as follows:

- I would use population rates as a starting point, to be adjusted by an estimate of the proportion of deaths in each year that are attributable to causes that would generally be known to the client and diagnosed.
- I would remove these from the rates to determine the incidence assumption on the basis that these would be removed from the experience as declined cases.
- I would discuss with reinsurers as to appropriate mortality/morbidity rates to be used for direct-marketed products.
- I would need to consider the target market for the magazines and newspapers. For example, advertising in the Financial Review would probably bring a very different customer profile compared to advertising in a trashy tabloid. Socio-economic and occupation class of customer base could have a major impact on mortality / morbidity, especially with respect to TPD risk.
- I would need to consult with underwriters/claims staff on the likely impact of the 5 basic health questions in screening out applicants with higher mortality/morbidity risks.

Note to markers: It is equally possible to start with insured rates and load them up. An answer using this method should also be awarded full marks, provided its deficiencies are pointed out and adjustments required are noted.

Marking guide:

- ½ mark for population as a starting point, to be adjusted;
- ½ mark for adjustment due to declines;
- ½ mark for discussing with reinsurers;
- ½ mark for considering target market;
- ½ mark for considering underwriting questions;

to a maximum of 2 marks (SJ).

(c) The risks to the current distribution channels that might arise from the direct marketing strategy are:

- That the independent advisors are unhappy with the competition with the direct-marketed product and write their business with other companies – thus reducing sales.
- That the tied advisers are unhappy with the competition and leave to work for other employers, thus reducing sales and increasing costs due to the need to replace them.
- That the change in advertising spend may result in fewer leads being generated for the tied sales staff, which could produce dissatisfaction (as above) and/or reduced sales.

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- If the new product is more profitable it may result in pressure to reduce the existing product sales and sales staff, resulting in additional costs and disruption to the business.
- The unhappy advisers may take business with them, usually the clients easiest to re-underwrite (or may arrange take-over terms) resulting in higher lapse rates and increasing insured risk incidence rates on the existing products.
- The need for resources and management time to be diverted to the new distribution channel may result in less attention being given to existing distribution channels, resulting in a reduction in the volume and/or quality of the business being generated from existing distribution channels.

Marking guide:

- **1 mark for independent advisers reducing sales;**
- **1 mark for tied agents moving elsewhere/reducing sales;**
- **1 mark for the costs of replacing tied agents;**
- **1 mark for lead generation reducing due to shift of advertising;**
- **½ mark for pressure to reduce sales force if new product profitable;**
- **1 mark for increased lapse rate;**
- **1 mark for increase in incidence rates on existing business;**
- **½ mark for cost of resources being diverted;**

to a maximum of 6 marks (CJ).

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QUESTION 2

(18 Marks)

Analysis

Component	Aim	KU	SJ	CJ	Total
Part (a)	5, 8	6			6
Part (b) (i)	1, 2, 5, 8		5		5
Part (b) (ii)	1, 2, 5, 8		2		2
Part (b) (iii)	1, 2, 5, 8			2	2
Part (c)	1, 2, 5, 8			3	3
Total		6	7	5	18

Question

You are an actuary working for SureThing Mutual Life (SML), a successful Australian group life insurer. SML has built up a considerable block of business, which is now reinsured on a surplus basis with a retention of \$450,000 per life insured.

The company is expanding into the Australian individual risk market to allow it to grow while taking advantage of the existing skills and structure of the company.

The Board is concerned that individual business is riskier than group due to anti-selection and the highly competitive individual market.

The business plan assumes the following:

Year	Lives in force
1	15,000
2	45,000
3	125,000

- **All new business is written at the start of the year**
- **There are no terminations**
- **The average premium rate for the period is \$1.580 per \$'000 sum insured**
- **The average sum insured is \$299,860 (see table below for the distribution of sums insured)**
- **Gross claims ratio (i.e. gross claims/gross in force annual premium) is 60% and uniformly distributed**
- **The distribution of the sums insured is as follows:**

Band (\$)	Average sum insured (\$)	Proportion of lives
0 - 200,000	152,000	48%
200,001 - 500,000	285,000	34%
500,001 - 750,000	625,000	16%
750,001 plus	1,500,000	2%

You have been asked to provide your opinion on the suitability of two reinsurance tenders. The main aspects of each of the tenders are as follows:

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Tender from Reinsurer A

Quota Share of 40%/60% (i.e. reinsurer takes 40% of all risks) with premium rates being those of SML. Commission payable is:

Policy year (PY) 1	100%
Policy year 2	60%
Policy year 3 onwards	20%

Tender from Reinsurer B

Surplus with retention of \$200,000 per life insured. Premium rates are those of Reinsurer B, with the average premium (before applying the first year's selection discount) expected to be \$1.012 per \$'000 sum insured. A 100% selection discount applies in the first policy year.

- (a) Calculate the expected net payment from each of the reinsurers over the first 3 years of the treaty. Your analyst has already commenced some of the calculations for the tender from Reinsurer A.

Year	Ave. Sum Insured \$	No. of lives	Gross Premium (PY 1) \$'000	Gross Premium (PY 2) \$'000	Gross Premium (PY 3) \$'000	Total gross premium \$'000	R/I Prem \$'000	Gross claims \$'000	R/I claims \$'000	R/I Comm \$'000	Net R/I payt \$'000
1	299,860	15,000	7,107	-	-	7,107	2,843	4,264	1,706		
2	299,860	45,000	14,213	7,107	-	21,320	8,528	12,792	5,117		
3	299,860	125,000	37,902	14,213	7,107	59,222	23,689	35,533	14,213		

(6 marks)

- (b) Draft a memorandum to the Board advising them of:

(i) The suitability of each of the reinsurance tenders for the proposed business plan, taking into account the various factors that have an impact on SML's profitability. (5 marks)

(ii) A view on profitability beyond the 3-year business plan. (2 marks)

(iii) A recommendation on the tender to be accepted. (2 marks)

- (c) How would your advice on reinsurance tenders be affected if the Board's main strategic priority were the stability of profits? Would stability of profits be in the interest of the company? (3 marks)

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QUESTION 2: SOLUTION

(18 marks)

(a) Tender A

Year	Average Sum Insured \$	No. of lives	Gross Premium (PY 1) \$'000	Gross Premium (PY 2) \$'000	Gross Premium (PY 3) \$'000	Total gross premium \$'000	R/I Prem \$'000	Gross claims \$'000	R/I claims \$'000	Reins Comm \$'000	Net payt from reins \$'000
1	299,860	15,000	7,107	-	-	7,107	2,843	4,264	1,706	2,843	1,706
2	299,860	45,000	14,213	7,107	-	21,320	8,528	12,792	5,117	7,391	3,980
3	299,860	125,000	37,902	14,213	7,107	59,222	23,689	35,533	14,213	19,141	9,665
Total						87,649	35,060	52,589	21,036	29,375	15,351

Direct premium for average sum insured = $\$1.580 \times 299.86 = \473.78 .

IF premium = $\$473.78 \times \text{number of lives, years 1-3}$.

Reinsurance premium = $40\% \times \text{IF premium, years 1-3}$.

Reinsurance commission calculated as 100% of New reinsurance premium (Years 1-3)
 Plus 60% of First Renewal reinsurance premium (Years 2, 3)
 Plus 20% of Second or subsequent reins premium (Year 3)

Reinsurance claim = $60\% \times \text{reinsurance premium, years 1-3}$.

Net payment from reinsurance = reins commission + reins claim – reins premium, years 1-3.

Tender B

Distribution of sums insured

Band	Average sum insured	Proportion	Average sum reinsured	Average reins premium
0 - 200,000	152,000	48%	-	-
200,001 - 500,000	285,000	34%	85,000	29.2468
500,001 - 750,000	625,000	16%	425,000	68.8160
750,001 plus	1,500,000	2%	1,300,000	26.3120
		100%		124.3748

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Year	Reins Prem \$'000	Reins Comm \$'000	Reins Claim \$'000	Net payt from reins \$'000
1	1,866	1,866	1,748	1,748
2	5,597	3,731	5,243	3,377
3	15,547	9,950	14,564	8,967
Total	23,010	15,547	21,555	14,092

Average sum reinsured = (average sum insured – 200,000) in each band.

Average reinsurance premium = “Proportion” x \$1.012 x average sum reinsured / 1000
in each band. Sum across bands = \$124.3748.

Reinsurance premium = \$124.3748 x number of lives, years 1-3.

Reinsurance commission calculated as 100% of New reinsurance premium, years 1-3.

Reinsurance claim = 60% x 1.58/1.012 x reinsurance premium
OR

Reinsurance claim = average sum reinsured x 1.58/1000 x number of lives x 60%

Net payment from reinsurance = reins commission + reins claim – reins premium, years 1-3.

Marking guide:

- **1 mark for reinsurance commission tender A;**
- **½ mark for net payment from reinsurer tender A;**
- **1 mark for average sum reinsured tender B;**
- **1 mark for reinsurance premium per life tender B;**
- **½ mark for reinsurance premiums tender B;**
- **½ mark for reinsurance commission tender B;**
- **1 mark for reinsurance claims tender B;**
- **½ mark for net payment from reinsurer tender B;**

to a maximum of 6 marks (KU).

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(b)

Memorandum

To: Board of SML
From: A. N. Actuary

Date: 9th May 2006

Subject: Proposed reinsurance arrangements

This memorandum is intended to inform the Board of the suitability of Tenders A and B, and to provide my recommendation on the preferred tender.

(i) Suitability of the two tenders:

Tender A

- In the early years of the new contract this tender is expected to provide a reinsurance profit (of \$15.35m over three years) to the ceding company (i.e. to SML).
- This is due to the high level of new business growth in conjunction with the high early reinsurance commission that are expected to be experienced in the early years of the contract. This would not be expected to continue if growth slowed (as it will at some stage) or if the treaty was closed to new business.
- Three years is too short a period to use to perform a valid comparison, particularly with a treaty of this style, where there is a high early reinsurance commission.
- Due to the nature of the cover, i.e. the sharing of all risks, it is expected that the reinsurer would provide greater support to the insurer, which would be very valuable with this new venture.
- The underwriting involvement in all risks will be of great value as this is a new venture with different underwriting requirements and knowledge.
- The sharing of risk on a quota share basis means that the reinsurer will share in all the risks of the company, thus sharing the poor performance if the experience is poor overall.
- The quota share arrangement means that the insurer is vulnerable to large one off claims, as SML will need to pay 60% of these.
- Lower levels of capital are needed for quota share arrangements as the new business strain is reduced more under a quota share arrangement.

Marking guide for Tender A suitability:

- **1 mark for recognising profit to insurer in early or growth years;**
- **1 mark for short period for evaluation;**
- **1 mark for expected greater support;**
- **1 mark for underwriting involvement;**
- **1 mark for sharing of poor experience overall;**
- **1 mark for large claim exposure;**
- **1 mark for lower levels of capital;**

to a maximum of 3 marks (SJ).

Tender B

- In the early years of the new contract this tender is expected to provide a reinsurance profit to the ceding company, although less than that of A.
- As this is a surplus arrangement on a risk premium basis it is expected that there would be lower support available to the insurer, a disadvantage for this tender over A.
- The lack of underwriting support would lead to the majority of the underwriting decisions being made by the inexperienced insurer, which could affect the incidence of claims.
- While large risks are covered by the reinsurer, thus providing smoother profits, this could be at the expense of higher overall claim rates. Thus the profit may be lower but smoother under this option.
- Capital requirements are not reduced as much as the quota share arrangement.

Marking guide for Tender B:

- ½ mark for recognising profit to insurer in early or growth years;
- 1 mark for lower support being a disadvantage in these circumstances;
- 1 mark for lack of underwriting support affecting overall profit;
- 1 mark for stability of profit;
- 1 mark for capital requirements;

to a maximum of 2 marks (SJ).

(ii) Post Year 3 profitability:

- SML's post Year 3 profitability will depend on the relative cost of reinsurance when the growth in new business slows down and the business approaches a "steady-state".
- Under Tender A, the reinsurance cost is $(100\% - 60\% - \text{Average Reins Commission Rate})$ of Reins. Premiums, assuming a Gross Claims ratio of 60%. For Tender A, Reins. Premiums = 40% of Gross Premiums. Hence reinsurance cost = $(16\% - 40\% \times \text{Average Reins Commission Rate})$ of Gross Premiums.
- Under Tender B, the reinsurance cost is $(100\% - 60\% \times 1.58/1.012 - \text{Average Reins Commission Rate})$ of Reins. Premiums, assuming a Gross Claims ratio of 60%. For Tender B, Reins. Premiums = 26% of Gross Premiums. Hence reinsurance cost = $(1.64\% - 26\% \times \text{Average Reins Commission Rate})$ of Gross Premiums.
- Hence, Tender A is cheaper if a high proportion of the portfolio consists of new business. However, this level of new business growth (i.e. as a proportion of the portfolio) becomes increasingly difficult to achieve as the portfolio grows. Hence ultimately, Tender A will be more expensive, as would be expected for this type of treaty, given the additional support that would be expected to be provided to the insurer.

Marking guide:

- 1 mark for discussion of relative costs;
- 1 mark for the view that Tender A will ultimately be more expensive;

to a total of 2 marks (SJ).

(iii) Recommendation:

Thus, on balance and assuming profitable pricing, I would recommend Tender A rather than Tender B given the lower capital requirements, the resources available to the company and the support provided by Tender A. In addition, the cost of the two arrangements and the level of expected claims support are comparable.

Marking guide:

- 1 mark for formatting and language being appropriate;
- 1 mark for recommendation;

to a total of 2 marks (CJ).

- (c) Tender A provides less protection against large claims. Hence if the main priority is stability of profits, then I would recommend Tender B since the company's liability is capped at the retention level even for large claims.

Stability of profits

Decisions made solely on these lines may not be in the best interests of the company, either long or short term. For example, overall claims may be higher, leading to lower profitability (i.e. the claims ratio for policies with sums insured less than the retention level may be higher than 60%).

In addition, as this is a mutual company, the interests of the policyholders have to be considered from the perspective of solvency and capital.

Marking guide:

- 1 mark for reinsurance recommendation;
- 1 mark for long-term aspects being considered;
- 1 mark for recognition of policyholders' interests;

to a total of 3 marks.

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QUESTION 3

(14 Marks)

Analysis

Component	Aim	KU	SJ	CJ	Total
Part a)	1, 2, 14	2			2
Part b)	1, 2, 14, 16	2			2
Part c)	1, 6, 14, 16		6		6
Part d)	3, 14, 16			4	4
Total		4	6	4	14

Question

A friend of yours from high school, Cathy, has approached you, as an actuary, to ask if you can explain a problem that she and her aunt, Marsha, are having with their insurance arrangements.

Cathy's uncle, George, is an insurance adviser. He has sold his wife, Marsha, and your friend, Cathy, non-participating endowment policies. Both policies have a sum insured of \$250,000 and provide this payment at age 60 or on prior death.

Cathy and Marsha have recently been comparing the details of their cover and have determined the following information:

	Marsha	Cathy
Age at commencement	40 years	21 years
Duration in force	12 years	4 years
Annual premium	\$ 11,253	\$ 5,224
Total premiums paid to date	\$ 135,036	\$ 20,896
Surrender value	\$ 143,722	\$ 14,419

Cathy has asked you the following questions. Identify the points you would make to answer Cathy's questions.

- (a) Both policies provide the same sum insured and benefit coverage. We would expect that the premium would be roughly = (Sum Insured)/(policy term). When we compare the actual premium to this calculation Marsha has a ratio of 90% while I have a ratio of 81%. Why is this so? (2 marks)
- (b) The surrender value is 106% of premiums paid for Marsha, but only 69% for me. Why is it so low for me? (2 marks)
- (c) If I had invested these premiums in a unit linked equity trust product (where I have seen one with a return of 15% p.a. for the last year), would I be better off now? (6 marks)
- (d) What advice can you give me about choosing whether to continue with the endowment policy or cash it in and invest in a unit linked equity contract? (4 marks)

QUESTION 3: SOLUTION

(14 marks)

(a) The comparison of premium to the ratio, Sum Insured/policy term, are different for Cathy and Marsha's policies for the following reasons:

- The premium calculation takes into account a number of things including company expenses and interest.
- The effect of interest will be much greater over a longer time period as the earlier premiums will earn interest for a longer period. Thus Cathy's ratio would be lower than that of Marsha's.
- The policy also pays the sum insured on death prior to maturity. As Cathy is younger at commencement the average mortality included in the premium would be lower than that of Marsha's, thus making Cathy's premiums cheaper.

Marking guide:

- **1 mark for premium takes more than just premium and time into account;**
- **1 mark for time effect of interest;**
- **1 mark for different policy terms;**
- **1 mark for any other reasonable points;**

to a maximum of 2 marks (KU).

(b) The differences in surrender values for the policies are due to the following factors:

- The ratios that have been calculated are influenced by a number of different things, not just the premiums paid.
- Marsha has been paying premiums for a longer period to date, so there will be a greater build up of interest.
- The costs of selling and setting up the contract have to be recouped from premiums received. These costs are spread over a number of years of a policy. If the policy were to surrender after 4 years there is a higher proportion of un-recouped expenses that need to be taken from the surrender value than if the policy has been in force for 12 years.

Marking guide:

- **½ mark for ratio influenced by many things;**
- **½ mark for interest build up;**
- **1 mark for un-recouped expenses;**
- **1 mark for any other reasonable points;**

to a maximum of 2 marks (KU).

(c) If the premiums for Cathy's policy had been invested in a unit linked equity trust product, she may or may not be better off depending on the following:

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- The actual investment return over the past 4 years. The 15% return is only a one year return and equity returns are highly variable. What was earned last year is no guide to what was previously earned and will be earned in the future.
- In addition to investment returns, the fees and charges also need to be considered so that the value of the unit linked equity trust product can be compared with the Surrender Value of the Endowment policy.
- Should the value of the unit linked equity trust product be higher, this does not necessarily mean that Cathy will be better off in the future. Under the Endowment policy, there is a guarantee of a payment of \$250,000 at maturity. There is no such guarantee with the equity investment. In addition, the Endowment policy provides death cover where the full sum insured is payable if Cathy dies within the term of the contract. The Endowment policy also provides a guaranteed investment earning rate and stability of growth versus the volatility of an equity investment.

Marking guide:

- **1 mark for considering if Cathy is better off based on the past 4 years;**
- **1 mark for one year investment return, no guide to the future;**
- **1 mark for fees and charges;**
- **1 mark for guarantee at maturity;**
- **1 mark for death benefit;**
- **1 mark for guaranteed earning rate;**
- **1 mark for any other reasonable points;**

to a maximum of 6 marks (SJ).

(d)

- My first piece of advice is that you need to see a licensed financial planner who will go through your assets, debts and needs and provide you with a full financial plan.
- When doing this you need to think about why you took this cover out in the first place and whether the death cover might be useful, say to provide protection to your family to cover a mortgage or other debt.
- You also need to consider that there is accrued value within the contract that is not included in the surrender value. This means that the underlying value of the policy is higher than the surrender value as expenses of early surrender are recouped by the company. If you surrender now you will lose this accrued value that will come to you in time.
- It can be seen from Marsha's policy that the surrender value increases over a longer duration in force.
- There is also the guarantee of payment and the value of this to consider when looking at the alternative.
- You also need to consider your appetite for risk, as the returns of an equity trust will be highly volatile and sometimes negative, whereas with the endowment policy they are guaranteed.

Marking guide:

- **Deduct 1 mark if need for proper licensed financial advice is not mentioned;**
- **1 mark for considering debt protection;**
- **1 mark for accrued value compared to surrender value;**

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- 1 mark for example of Marsha's policy;
- 1 mark for value of guarantee;
- 1 mark for volatility of equity returns and guarantee under endowment;
- 1 mark for any other reasonable points;

to a maximum of 4 marks (CJ).

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QUESTION 4

(19 Marks)

Analysis

Component	Aim	KU	SJ	CJ	Total
Part (a)	2,7,8,10,13	3			3
Part (b)	2,7,8,9,10,13		3		3
Part (c)	7,8,10,13,14		3		3
Part (d)	8, 10, 13, 14			10	10
Total		3	6	10	19

Question

Immaculate Life Ltd (ILL) is a medium sized company that has been very active in the yearly renewable term insurance market for many years. As ILL's market share has been falling in recent years, the valuation results have been reviewed to identify the sources of experience profit for the business. This review has indicated that expense experience has been favourable.

ILL have asked you, a consulting actuary, to perform an expense experience analysis for ILL and provide some advice on updating expense assumptions. The results of your analysis indicate that the Actual to Expected ratios for ILL are:

Expense type	A/E ratio
Initial fixed per policy costs	0.77
Initial variable per premium costs	0.68
Renewal fixed per policy costs	0.73
Renewal variable per premium costs	0.75

As a result of this ILL have decided to issue a new, competitive product using expense assumptions that reflect the actual experience of the product. This product will replace the existing product, which will be closed to new business.

The valuation experience indicates that experience other than expenses has been as expected (i.e. best estimate). Pricing incorporates a profit margin.

Additional reserves are also required to support this business. The capital required to support this business is expected to be on average 12% of premium received.

- (a) Identify how the results of your expense analysis may explain the sales experience for the existing product. (3 marks)**
- (b) Taking the existing product in isolation, how will the release of the new product be expected to affect the experience of the existing product? (3 marks)**

- (c) What are the factors influencing the planned profitability of the new product relative to the old product? (3 marks)
- (d) Following the launch of the new product it is apparent that sales have increased dramatically. What is the expected overall financial effect on shareholders for the combined new and old products? (10 marks)

QUESTION 4: SOLUTION

(19 Marks)

(a)

The expense analysis explains the sales experience of the existing product as follows:

- The A/E experience indicates that the product can be administered for much less than the premium being charged supports.
- If this is the case for ILL it is possible that the actual costs of administering the business for competitors is similar.
- Competitors in this situation would have reduced premium rates or spent money on increasing sales (e.g. commission improvements, advertising).
- This will result in a reduction in sales for ILL with their less competitive product.
- Also, the company is under-spending on its sales support costs. Firstly, it is spending less than originally budgeted. Doing so would lead independent advisers to be less inclined to promote the product. Under-spending on sales support appears to be the greatest deviation from expected expenses.

Marking guide:

- **1 mark for overcharging for expenses;**
- **1 mark for competitor costs likely to be similar to ILL;**
- **1 mark for competitor actions;**
- **1 mark for resulting in reduced sales;**
- **1 mark for under-spending issue;**
- **1 mark for any other reasonable points made;**

to a maximum of 3 marks (KU).

(b)

The release of the new product will affect the experience of the old product as follows:

- Sales will cease, so there will be no new business on the old product.
- The new product will look more attractive than the old product to existing policyholders, with lower premium rates, so lapses are likely to increase.
- The health of some existing policyholders may have deteriorated, resulting in a loading or decline if they take the new product. Thus the less healthy will remain and the more healthy will lapse the old policy, increasing the expected mortality of the old product (i.e. selective lapsation).

- With the reduction in in-force business on the old product the unit cost will increase, thus the A/E for expenses (particularly renewal) will be expected to increase on the old product.

Marking guide:

- **1 mark for no sales;**
- **1 mark for increase in lapses;**
- **1 mark for selective lapsation and affect on mortality;**
- **1 mark for increase in expense unit costs;**
- **1 mark for any other reasonable points made;**

to a maximum of 3 marks (SJ).

(c)

Factors affecting the profitability of the new product relative to the old product are as follows:

- The premium rates to be charged for the product, as profit will have a direct relationship to any change in these rates.
- The expense assumptions used as there will no longer be experience profits arising from expenses and natural variation in the actual experience will result in small experience profits and losses from time to time.
- Sales volume is very important as one of the issues faced by ILL is loss of market share. It is intended that this new product will improve market share and this would result in higher sales volumes and hopefully lower unit expenses. This would result in experience profits. Sales volumes will also affect the absolute level of profits produced by the product.
- Mortality is a minor issue in this situation and would not be expected to affect the new product any differently than the existing product.
- The same could be said for lapses.

Marking guide:

- **1 mark for premium rates;**
- **1 mark for expenses;**
- **1 mark for sales volume;**
- **½ mark for mortality no effect;**
- **½ mark for lapses no effect;**

to a maximum of 3 marks (SJ).

(d)

The overall profitability of the new and old products combined will be affected by the following issues:

- Expense experience profit from the existing product will decline as the product runs off.
- Profits for business which switch from the old product to the new product will reduce due to the reduction in premium rates.
- Overall mortality experience should not be significantly changed in respect of in force business as the lives insured will be much the same. Healthy lives will be re-underwritten in the new product if they switch. Unhealthy lives are likely to stay with the old product.
- Increase in sales of new and profitable business.
- New business is not as profitable as old, so there will be a reduction in profit to shareholders per policy, but there could be an overall increase in profit if sales volumes are sufficiently large. The profit to shareholders will depend on the loss of in force business and increase in new business. Hopefully high new business sales of the new product (with lower unit profits) will be sufficient to replace the lower volumes and higher unit profits of the old product.
- Significant capital required to support new sales. As sales have increased greatly it is likely that this is higher than the capital released on the reduction in the in force business of the old product.
- Thus, while sales remain strong the shareholders would be expected to experience a net cash outflow for the first few years of the new product, replaced with a steady profit flow once growth eases off.
- There is a cost to redeveloping the product that would need to be taken into account and would thus reduce future profitability as the contract is priced using actual expenses.
- Can possibly reduce unit costs due to the effect of the extra sales.

Marking guide:

- **1 mark for reduction in expense experience profit;**
- **1 mark for reduction in margins for in force business switching;**
- **1 mark for only small change in mortality;**
- **1 mark for new sales likely to be profitable;**
- **2 marks for new product less profitable per unit than old product, but higher sales;**
- **2 marks for capital requirement impacts (including capital strain);**
- **1 mark for recognising later profit release and reduction in growth;**
- **1 mark for profit effect of developing the new product;**
- **1 mark for unit cost reduction;**
- **1 mark each for any other reasonable points;**

to a maximum of 10 marks (CJ).

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QUESTION 5

(18 Marks)

Analysis

Component	Aim	KU	SJ	CJ	Total
Part a)	1, 2, 3, 6, 7	2	4		6
Part b)	2, 3		4		4
Part c)	2, 3			8	8
Total		2	8	8	18

Question

As the product actuary at Star City Funds Management (SCFM) you are responsible for the non-superannuation retail unit trusts of the company.

You are currently undertaking a review of a product that includes, as one investment option, a unit linked Capital Stable fund. The following information has been published in your Product Disclosure Statement (PDS) regarding this fund:

“ Investment strategy

The Capital Stable fund invests in a diversified mix of Australian and international assets with a strong bias towards defensive assets. The fund is actively managed in accordance with SCFM’s investment process. Daily unit prices are not guaranteed and vary with movements in the underlying value of fund assets. Under the Capital Stable Investment strategy a negative return is expected in one in ten years.”

	Benchmark	Range
	%	%
Australian shares	15.0	10 – 20
International shares	2.5	0 – 5
Property securities	2.5	0 – 5
Aust. fixed interest	40.0	25 – 55
Internat. fixed interest	10.0	5 – 15
Cash	30.0	10 – 50
Total	100.0	

The asset allocation at the end of April 2006 was as follows:

	%
Australian shares	30
International shares	10
Property securities	10
Australian fixed interest	25
International fixed interest	15
Cash	10
Total	100

The assets of the fund (current total value of \$180 million) are managed by an external asset management company. The investment management contract specifies an investment mandate that is exactly the same as in the PDS (i.e. the Investment Strategy above). This has remained unchanged since the launch of the fund some years ago.

- (a) Comment on the suitability of the current asset allocation and identify the implications this raises for the company. (6 marks)
- (b) Equity prices have recently fallen. The result is a 15% reduction in asset values for the fund. What liability may the fund manager (SCFM) have in this situation? (4 marks)
- (c) Assuming the company decided to make a compensation payment to affected unit holders, how should compensation be determined and how should the process be managed? (8 marks)

QUESTION 5: SOLUTION

(18 marks)

(a) The asset allocation is highly inappropriate as:

- Current holdings are unreasonably out of line with the benchmark published in the PDS, and are outside the allowable ranges for some asset classes.
- The current holding is not in line with the investment strategy published in the PDS, as the current holding is only moderately biased toward defensive assets.
- Clients are expecting reasonably low and stable returns along with low risk and volatility, whereas this allocation is very high risk with higher long-term (but more volatile) returns.
- The level of growth assets is much higher than would generally be expected for a capital stable fund.

Marking guide:

- ½ mark for benchmark asset comparison;
- ½ mark for investment strategy issues;
- ½ mark for client expectations re risk, return and volatility;
- ½ mark for level of growth assets too high for capital stable;
- ½ mark for any other reasonable points made;

to a maximum of 2 marks (KU).

The issues this raises for the company are:

- The company is in breach of its PDS.
- This may cause it problems with the regulators, who may impose restrictions or conditions on the company's ability to accept new business, along with requiring investigation, rectification and compensation. This may extend to problems with the market and intermediaries (e.g. historical fund performance results, as well as reputation etc.)
- Potential for adverse media coverage and/or adviser reaction, possibly resulting in increased numbers of current investors leaving and/or reduced levels of new business.

- ASIC could proceed with legal action on the basis of unfair trading or false and misleading advertising, particularly if they receive complaints from clients.
- An unfavourable market shift could result in significant investor compensation costs to the company, particularly in the event that asset values fall.
- Contract and/or management issues with the third party asset manager are evident, as they apparently have not been complying with their contract.
- Rectifying the situation will require the sale and purchase of a significant level of assets in different classes, which will increase investment costs for the fund.
- Identifying how it arose and how to avoid the situation arising again.

Marking guide:

- **1 mark for PDS breach;**
- **1 mark for regulator/market issues;**
- **1 mark for reputation effect on withdrawals and sales;**
- **1 mark for ASIC legal action potential;**
- **1 mark for exposure to unfavourable market shift;**
- **1 mark for contract issues with 3rd party asset manager;**
- **1 mark for asset-related cost of rectification of situation;**
- **1 mark for analysing and avoiding the situation again;**
- **1 mark for any other reasonable points made;**

to a maximum of 4 marks (SJ).

- (b) The fund manager (SCFM) may be legally liable to indemnify affected clients based on the difference between the actual unit prices and those that would have been calculated with the asset allocation at the maximum/minimum allowable range (as appropriate) for each of the asset classes.

This liability includes withdrawals at understated prices, new entrants at overstated prices and in force clients (with or without “switching”) who suffered any loss or disadvantage in their investment results.

The fund manager may have a case for seeking recourse against the asset management company, as it is in breach of its contract. However, the fund manager must sort out its liability to clients and then separately try to recover from the asset manager, as it has issued the promise to the client and thus was responsible for administering the outsourced arrangement appropriately.

The administrative cost of identifying the error, fixing systems, compensating unit holders and managing the entire process will result in the company being liable for additional costs.

Trust distributions (and accompanying tax statements) will be affected as well as actual unit prices. The company must ensure that all these are correct/rectified if not correct.

Marking guide:

- **1 mark for fund manager being liable for investor compensation;**
- **1 mark for method of determining degree of liability, based on price differences;**

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- **1 mark for liability to different sorts of investors;**
- **1 mark for ability to recover from asset manager separately;**
- **1 mark for costs of managing the fix;**
- **1 mark for impact on Trust distributions;**
- **1 mark for any other reasonable points made;**

to a maximum of 4 marks (SJ).

(c) The best method determining the compensation and for managing the process is as follows (some of these are iterative in practice):

- Discuss at an early stage with the regulator, to ensure remediation strategy meets their requirements and avoid any potential duplication or waste.
- Consider suspending or “quarantining” withdrawals, if possible, under the contract. This may make it easier to clean up the situation, but a risk is that it could potentially trigger a run on the company.
- Identify the date at which the fund first breached its published benchmark ranges.
- Determine or estimate the degree of difference in asset allocation to benchmark and/or to max/min range (as appropriate) for each day since first breach. This is so that a set (or sets) of “correct” prices can be derived, as a basis for compensation of differences between “actual” daily prices and “correct” daily prices. Some of the steps below expand on how this may be achieved in practical terms.
- Identify the return on each component of the fund, i.e. each asset class day-on-day (or the value of each asset class in the fund on each day if this is easier). Actual asset classes or appropriate asset indices may be used to determine the return on each asset component.
- Reapportion the value of assets each day so that it is reflective of the benchmark and/or max/min ranges (as appropriate).
- Identify the corresponding adjusted (i.e. correct) unit price for each day.
- Identify any adversely treated clients, i.e. withdrawals, new entrants, in force clients.
- In the case of a unit trust all clients would require adjustment, even if “advantaged”.
- Check the tax status of the fund and/or the clients. This may require negotiation with (or approval by) the ATO.
- Compensate each client as required. Consider cash reimbursement, additional units, or adjusted unit price, as appropriate to each category of affected investor. In practice, this is a very large exercise in itself, needing careful and thorough project management and documentation.
- Communicate with each client about the problem and how they will be compensated.
- Reset the current unit price and asset allocation and allow processing to recommence. It would also be necessary to revise historical fund performance results for various periods. The price information will need to be provided to third parties (e.g. Bloomberg) that provide industry data.
- Rework any distributions made over the period and tax statements relating to these distributions (or stored information regarding these depending on how the administration system stores information). There is a particular issue if a distribution was made to an advantaged client in the intervening period, as it may be difficult if not impossible to retrieve any cash. An adjustment to the next distribution may be required, which would drag the process out.

Marking guide:

- **1 mark for early discussion with regulators – and reasons;**
- **1 mark for considering suspending withdrawals – with pros & cons;**
- **½ mark for reverting to date of first breach;**
- **1 mark for calculation of “correct” prices, based on asset mix differences;**
- **1 mark for “method” of determining correct prices/asset values;**
- **½ mark for recognising series of daily new prices required;**
- **1 mark for identifying categories of adversely treated clients;**
- **1 mark for unit trust requiring all clients affected to be rectified, whether advantaged or disadvantaged;**
- **1 mark for checking the tax status – ATO;**
- **1 mark for compensation – range of options;**
- **1 mark for communication to unit holders;**
- **1 mark for adjusting current unit price, asset allocation, and historical fund performance;**
- **1 mark for correcting distributions and associated tax statements or information relating to the distribution;**

to a maximum of 8 marks (CJ).

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QUESTION 6

(17 Marks)

Analysis

Component	Aim	KU	SJ	CJ	Total
Part a)	8, 9, 13	3			3
Part b)	8, 9		3		3
Part c)	5, 8, 9, 13		4		4
Part d)	4, 5, 7			7	7
Total		3	7	7	17

Question

You are an actuary working in the group life area of We'll Save You Life Insurance (WSY). You have been asked to re-price the death only premium for a large group life scheme that your company has had on the books for some years. Your pricing is to cover the scheme for the next 3 years.

The results of an experience analysis show the following results:

Policy year	Loss ratio
2001	92%
2002	88%
2003	87%
2004	85%
2005	81%

The loss ratio is defined as claims paid/premiums received. Premium rates have remained unchanged for the five years of data above. The size and composition of the scheme has been stable over the period of data above.

Your expense analysis indicates an Actual to Expected ratio of 105% for each of the 5 years. Expenses are currently priced as 10% of premium.

- What factors should you consider when determining the mortality and expense assumptions to be used in the pricing basis? (3 marks)
- What factors should you consider to determine the mortality trend to be allowed for in the pricing basis? (3 marks)
- You have been asked to consider incorporating mortality experience profits earned up until the end of policy year 2005 into your current pricing. Identify the issues this would raise. (4 marks)
- A representative of the group life scheme has suggested that a profit share be incorporated into the scheme for each policy year as follows:

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Profit Share = Maximum[zero , 50% * (90% Premium received – Claims paid)]

Explain your views on this suggestion.

(7 marks)

QUESTION 6: SOLUTION

(17 marks)

(a)

The factors to consider when determining the mortality and expense assumptions are as follows:

- The loss ratio indicates that mortality is a large proportion of the premium rate, thus any changes in mortality experience over time will have a large effect on premiums.
- The extent to which this is taken into account would depend on the rigour around the experience results and the trend represented as well as competitiveness of the product.
- Industry trends (e.g. safety improvements) are also important for mortality in group life schemes; such trends need to be allowed for in the pricing.
- The premium includes a loading for the cost of running the business. If this cost is higher than anticipated this will result in an experience loss.
- To protect profitability any worsening of expense experience should be included in the rates. Competitiveness will be reflected in the degree to which improvements are passed on through improved rates to clients.

Marking guide:

- **1 mark for mortality large part of premium;**
- **1 mark for extent taken into account depends on confidence and competition;**
- **1 mark for industry trends important in mortality;**
- **1 mark for expenses allowed for up to expected in premium rates;**
- **1 mark for extent taken into account depends on degree, direction and competitive influences;**
- **1 mark for any other reasonable points;**

to a maximum of 3 marks (KU).

(b)

The factors to consider when determining the mortality trend to be considered in pricing are as follows:

- The ratio decreased over the last five years. This indicates mortality has been steadily improving.
- While some of this could be due to late reporting of claims, it is unlikely that this action would cause a trend over this many years. (No marks for this, but markers should note that stating reporting of claims as a reason for such a degree of change should not be allowed as an answer).
- If the trend were extrapolated by 18 months to get the average loss ratio for the pricing mid point, we would be giving the scheme credit for expected experience that may not

emerge. If the premium were set without extrapolating we may find that we are receiving too little.

- The loss ratio in 2005 may have been abnormally low and may rise again next year due to statistical fluctuations.
- It would be prudent, given that the premiums have to support the business for 3 years, to set premiums using a loss ratio of around 85%, thus lagging the mortality improvement to a degree.
- Check with reinsurers for experience on other similar schemes; check other industry experience.

Marking guide:

- **1 mark for stating loss ratio trends;**
- **1 mark for extrapolation of trend could lead to too low a premium;**
- **1 mark for variability of experience;**
- **1 mark for choosing loss ratio above that indicated by the trend line;**
- **1 mark for reinsurers/ industry experience;**
- **1 mark for any other reasonable points;**

to a maximum of 3 marks (SJ).

(c)

If past experience profits are incorporated into pricing, the following issues will be raised:

- The purpose of insurance is to pay claims that the company would not be able to support themselves. Profit for doing this should stay with the insurer. Insurance is about the pooling of risk. Some schemes will result in profit and some loss. This overall risk/responsibility is taken on by the insurer and profit results from the experience from profitable and loss making schemes.
- Mortality is variable from year to year. There is no guarantee that the trend will continue for this scheme or that the experience won't change and become loss making. Therefore profits should be taken when they occur.
- There should be some compensation for the risk of a 3-year pricing guarantee on these schemes.
- The profit already earned would already have been paid to shareholders or placed in reserves for other purposes.

Marking guide:

- **1 mark for purpose of insurance (including pooling of risks);**
- **1 mark for variability of mortality;**
- **1 mark for compensation for risk taken in form of profit;**
- **1 mark for recognising already paid out;**
- **1 mark for any other reasonable points;**

to a maximum of 4 marks (SJ).

(d)

Issues regarding the suggested profit sharing basis are as follows:

- There is no allowance for carried forward losses in the profit share. Thus WSY shares its profit with clients but not its losses. Averaged across all scenarios WSY would be worse off and would need to be compensated for this somehow in the profit share formula.
- Profit sharing costs WSY in terms of lower profits – WSY needs to be compensated for this loss of potential profits (for example, by increasing premium rates).
- There is no specific allocation for capital and cost of capital in the profit share.
- As expenses are currently priced at 10% of premium, this formula leaves no margin for premium to cover the risk being taken by the company (e.g. adverse experience).
- Current expenses are 105% of that priced for, so this formula allows for a profit being paid to the client that is not being earned by the company due to expense overruns.
- Assuming the formula was sharing profit after expenses, it would not be reasonable to do this on a 50/50 basis when the insurer is taking all the risk.
- Given the client's current experience it is likely that a profit would be payable on the current rates, although this may alter when/ if the premium rates are repriced.
- Would need to incorporate the anticipated cost of the profit share into the premium, which may result in an overall increase. The client may find this confusing if they are expecting a profit share on the old premium basis.
- The profit share may, however, allow us to continue to charge the higher premium while giving a benefit to the client based on good experience. The formula would need some changes before this could happen.
- The viability of self-experience profit sharing depends on the size of the scheme in question. A very small scheme will have very volatile experience and is not suitable for profit sharing (the scheme either has zero claims, in which case the profit share would pay back 50% of the premium less 10% expenses, or there would be a claim resulting in a loss). Self-experience profit sharing is only viable for very large schemes.
- Charging the existing premiums and including a profit share arrangement would be better for risk management than reducing premiums and allowing for no profit sharing, since if claims experience is poor, there is no reduction in premiums.
- No allowance has been made for RBNA and IBNR claims in the formula.
- No allowance for late premiums as the formula is based upon premiums received.

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Marking guide:

- 1 mark for no carry forward of losses;
- 1 mark for loss of upside profit if profit sharing;
- 1 mark for no margin made for cost of capital;
- 1 mark for expense overrun means would be giving away required income;
- 1 mark for problems of 50/50 share c/f 50/50 risk;
- 1 mark for recent experience would result in profit payable on this basis;
- 1 mark for incorporation of profit share may result in premium increase;
- 1 mark for opportunity to keep premiums and allow discount with experience;
- 1 mark for viability of the profit share;
- 1 mark for better risk management than premium reduction;
- 1 mark for no IBNR;
- 1 mark for no allowance for late premiums;
- 1 mark for any other reasonable points;

to a maximum of 7 marks (CJ).

END OF SOLUTIONS