17. (3 points)

An insurer is deciding on a proportional reinsurance strategy for the upcoming two years. A reinsurer proposes the following sliding-scale commission with a carry-forward provision. The contract will be identical for the second year.

Minimum Commission:	12.5% at an 80% loss ratio
Sliding 1:1 to	27.5% at a 65% loss ratio
Sliding .5:1 to a Maximum	35% at a 50% loss ratio

Assume the insurer places no value on the carry-forward provision after the second year, and ignore the time value of money (i.e., assume a 0% interest rate).

The following table details the expected loss distribution of the underlying business:

Range of Loss Ratios	Average Loss Ratio in Range	Probability of Being in Range
0% - 50%	43%	0.15
50% - 60%	57%	0.25
60% - 80%	68%	0.45
80% or above	85%	0.15

Calculate the reinsurer's expected technical ratio for each year if the insurer buys the sliding-scale commission contract for both years.

CONTINUED ON NEXT PAGE

SAMPLE ANSWERS AND EXAMINER'S REPORT

QUESTION 17

TOTAL POINT VALUE: 3 | **LEARNING OBJECTIVE(S): C4**

SAMPLE ANSWERS

3 points

Sample 1

Year 1

	Tech Ratio	P	
0	43 + 35 = 78	0.15	Yr 1 expected tech ratio =90.075%
50	57 + 35 – 5 × 0.7 = 88.5	0.25	
60	68 + 27.5 – 3 = 92.5	0.45	
80	85 + 12.5 = 97.5	0.15	

Year 2 (15% of the time)

	Tech	
0	43 + 35 = 78	Yr $2_{15\%}$ = 87.2%
50	57 + 35 – 0.5 × 12 = 86	
60	68 + 27.5 – 8 = 87.5	
80	85 + 12.5 = 97.5	

Yr 2 Total = 0.85 × 90.075 + 0.15 × 87.2 = 89.6%

Sample 2

$ELR_{YR1} = ELR_{YR2}$ = 43% (0.15) + 57% (0.25) + 68% (0.45) + 85% (0.15) = 64.05%

Year 1 Expected Commission	
Range of LR	Commission @ Avg LR
0 – 50	35%
50 – 60	(65% - 57%) (0.5) + 27.5% = 31.5%
60 – 80	(80% - 68%) + 12.5% = 24.5%
80 +	12.5%

Expected Yr1 Commission = 0.15 (35%) + 0.25 (31.5%) + 0.45 (24.5%) + 0.15 (12.5%) = 26.025%

Year 2 Expected Commission Only the 80+ group will be affected (we will add 5% to the LR's for the purpose of calculating commission)		
Range of LR	Modified Avg LR	Commission
0 – 50	43% + 5% = 48%	35%
50 – 60	62%	29%
60 – 80	73%	19.5%

80 +	86%	12.5%

Expected commission for 80+ group = 0.15 (35%) + 0.25 (29%) + 0.45 (19.5%) + 0.15 (12.5%) = 23.15%
Expected Yr2 Commission = 0.15 (23.15%) + (1 – 0.15) (26.025%) = 25.59%
Expected Technical Yr1 = 26.025% + 64.05% = 90.075%
Expected Technical Yr2 = 89.64%

Sample 3

Range	Prob	Avg LR	Commission	Yr1 Tech Ratio = 0.15(0.43 + 0.35) +0.25(0.57 + 0.315) + 0.45(0.68 + 0.245) + 0.15(0.85+0.125) = 0.90075
0 – 50	0.15	43%	35%	
50 – 60	0.25	57%	31.5%	
60 – 80	0.45	68%	24.5%	
80 +	0.15	85%	12.5%	

Next calculated expected carryforward. Assume only carryforward LR above max.
E(carry forward) = 0.15(0.85 – 0.80) = 0.0075

Year 2

Range	Prob	Avg LR	LR for Comm	Commission	Technical Ratio
0 – 50	0.15	43%	43.75%	35%	78%
50 – 60	0.25	57%	57.75%	31.125%	88.125%
60 – 80	0.45	68%	68.75%	23.75%	91.75%
80 +	0.15	85%	85.75%	12.5%	97.5%

Expected Year 2 Technical Ratio = 0.15(0.78) + 0.25(0.88125) + 0.45(0.9175) + 0.15(0.975) = 89.64%

EXAMINER'S REPORT

Candidates were expected to determine the effect of a carryforward provision on the cost of a reinsurance contract. Candidates needed to determine the technical ratio for both year 1 and year 2, taking the possible carryforward provision into account.

To receive full credit, candidates were expected to calculate the technical ratios for both years. There were several mathematically equivalent ways to do this. Most candidates correctly calculated the technical ratio for year 1, but struggled with the calculation of the second year.

Common mistakes included:

- Ignoring Year 2 completely and only calculating the technical ratio for Year 1
- Assuming that there was no possibility of the carryforward provision being triggered in year 2, and that therefore the technical ratio in year 2 would equal that of year 1
- Calculating Year 1 and Year 2 correctly but forgetting to weight together for the final answer.