19. (3 points)

Given the following data as of December 31, 2018:

Accident/ Calendar Year	Cumulative Reported Claims ($000s)	Earned Premium ($000s)
2016	7,200	10,400
2017	6,300	11,000
2018	4,700	11,500

Cumulative Age-to-Ultimate Factors			
12-Ult	24-Ult	36-Ult	48-Ult
1.764	1.260	1.050	1.000

Annual Trends	
Claims	3.0%
Premium	2.0%

Effective Date	Rate Change
July 1, 2016	4.0%
July 1, 2017	2.0%

- All policies have an annual term and are written evenly throughout the year.

Calculate ultimate claims for accident year 2017 using the Cape Cod technique.

CONTINUED ON NEXT PAGE

QUESTION 19	
TOTAL POINT VALUE: 3	**LEARNING OBJECTIVE(S): A2, B3**

SAMPLE ANSWERS

Sample 1

Via parallelogram method, average rate level is:
2016: 0.875(1) + 0.125(1.04) = 1.005
2017: 0.125(1) + 0.75(1.04) + 0.125(1.04)(1.02) = 1.0376
2018: 0.125(1.04) + 0.875(1.04)(1.02) = 1.0582

On-level factors to bring to 2018 level:
2016: 1.0608/1.005 = 1.0557
2017: 1.0608/1.0376 = 1.0224
2018: 1.0608/1.0582 = 1.002

Trended, On-Level Used-Up Earned Premium, at 2018 level:
2016: 10,400 x 1.0557 x 1.02^2 x 1/1.05 = 10,879
2017: 11,000 x 1.0224 x 1.02 x 1/1.26 = 9,106
2018: 11,500 x 1.002 x 1 x 1/1.764 = 6,536
Sum = 26,521

Trended Claims
2016: 7,200 x 1.03^2 = 7,638
2017: 6,300 x 1.03 = 6,489
2018: 4,700 x 1 = 4,700
Sum = 18,827

Estimated Claims Ratio = 18,827/26,521 = 0.710
De-trend back to 2017 levels: 0.710(1.02/1.03) = 0.703

Calculate AY 2017 Ultimate Claims (use On-Level EP)
AY 2017 Ult (000) = 6,300 + 0.703(1 – 1/1.26)(11,000)(1.0224) = 7,932

Sample 2

AY	On-level prem factors
2016	(1.02 x 1.04) / (0.125 x 1.04 + 0.875 x 1) = 1.0555
17	(1.02 x 1.04) / (.125 x 1 + .75 x 1.04 + .125 x 1.02 x 1.04) = 1.0224
18	(1.02 x 1.04) / (0.125 x 1.04 + .875 x 1.02 x 1.04) = 1.0025

AY	AY 17 on-level factors
2016	1.0555 / 1.0225 = 1.0324
2017	1
2018	0.9805

AY	claim trend	prem trend	% reported

2016	(1.03)	(1.02)	95.24%
17	1	1	79.37%
18	(1.03)^-1	(1.02)^-1	56.69%

AY	claim	prem (used up)
16	7416	10430.196
17	6300	8730.7
18	4563.107	6266.885
	18279	25428

ECR = 18279 / 25428 = 71.89%

AY 17 ultimate claims
11000 x 71.89% x (1-79.37%) + 6300
7,391,400

EXAMINER'S REPORT

Candidates were expected to calculate ultimate claims for a single accident year using the Cape Cod technique. This included adjusting historical premium and claims using the given rate changes and annual trends.

Aside from the two solutions shown, candidates could choose various combinations of trending/detrending and on-leveling/de-leveling, which are all mathematically equivalent and result in the same final answer.

Common mistakes included:

- Failing to detrend and back out rate change from expected claims ratio to be on 2017 level.
- Developing claims to ultimate for use in expected claims ratio calculation.
- Failing to calculate used up premium, and instead using full trended on-level earned premium in expected claims ratio calculation.
- Selecting or averaging individual expected claims ratios for each accident year, as opposed to calculating a single expected claims ratio for all years combined.
- Using incorrect trend periods when trending premium and claims.
- Only calculating expected ultimate claims equal to earned premium times expected claims ratio, when the correct ultimate should be based on reported claims plus expected unreported claims.
- Calculating ultimate claims for the wrong accident year.