Detailed Marking Instructions for each question

Question			Generic Scheme	Illustrative Scheme	Max Mark
1.	(a)		**Ans: proof** •[1] Strategy: know how to calculate percentage difference in population •[2] Process: calculate percentage growth Alternative Strategy: •[1] Strategy: know to find 0·4% and add it on •[2] Process: Calculate population in 2015 and round to the nearest hundred.	•[1] $\frac{21400}{5347600} \times 100 = \ldots$ •[2] 0·4 •[1] Finding 0·4% of 5347600 and adding it on •[2] 5347600 ÷ 100 x 0·4 + 5347600 = 5369000	**2**

Notes:

Commonly Observed Responses:

1. 21400/5369000 x 100 = 0·39 = 0·4 award 1/2 ×✓

Question			Generic Scheme	Illustrative Scheme	Max Mark
	(b)		**Ans: 5 433 700** •[1] Strategy: identify multiplier •[2] Strategy: identify power •[3] Process/Communication: calculate population	•[1] 1·004 •[2] …[3] •[3] 5 433 700	**3**

Notes:

1. For an answer of 5 433 700 without working — award 3/3 ✓✓✓
2. If candidate calculates 3 annual increase accept rounding to nearest hundred for each year. ie ((2016): 5 390 500, (2017): 5 4121 00, (2018): 5 433 700) — award 3/3 ✓✓✓
3. Accept $5437600 \times 1{\cdot}004^4 = 543370$ — award 3/3 ✓✓✓
4. If candidate does $5347600 \times 1{\cdot}004^3 = 5412000$ — award 2/3 ✓×✓
5. Where an incorrect percentage is used, the working must be followed through to give the possibility of awarding 2/3 ×✓✓

   eg for an answer of 6 039 400 ($5\,369\,000 \times 1{\cdot}04^3$), with working — award 2/3 ×✓✓
6. For an answer of 5 390 500 (5 369 000 ×1·004), no working necessary — award 1/3 ✓××
7. For an answer of 16 171 400 (5 369 000 ×1·004 × 3), with working — award 1/3 ✓××
8. For an answer of 5 433 400 (5 369 000 + 21 476 × 3), with working — award 1/3 ✓××
9. For an answer of 64 400 (5 369 000 × 0·004 × 3) — award 0/3 ×××
10. For an answer of 5 433 200 (5 369 000 + 21400 × 3) — award 0/3 ×××

Commonly Observed Responses:

Question			Generic Scheme	Illustrative Scheme	Max Mark
2.			**Ans: 01:30 (on Sunday 10th)** • [1] Strategy: knows how to deal with time zone and flight time • [2] Process/Communication: state time	 • [1] evidence of adding flight time and subtracting time difference • [2] 01:30 (on Sunday 10th)	**2**

Notes:

For the following answers no working is necessary

1. For an arrival time of 17:30 (add flight time and adds time difference) award 1/2

2. For an arrival time of 08:40 (subtracts flight time then subtracting time difference) award 1/2

3. For an arrival time of 00:40 (subtracts flight time and adds time difference) award 1/2

Commonly Observed Responses:

Question			Generic Scheme	Illustrative Scheme	Max Mark
3.			**Ans:** •[1] Strategy/Process: find any one of the three angles for the April poll. •[2] Strategy/Process: find the other two angles. •[3] Communication: make one valid comment. Alternative strategy: •[1] Strategy/Process: find all three percentages for December 2013 Poll. •[2] Strategy/Process: find all three percentages for April 2014 Poll. •[3] Communication: make one valid comment.	•[1,2] Yes - 133° No - 184° Undecided - 43° •[3] eg similar proportion chose 'yes' in survey 2. larger proportion chose 'no' in survey 2. smaller proportion chose 'undecided' in survey 2. •[1] December 2013 Poll: Yes 37%, No 39% and Undecided 24% •[2] April 2014 Poll: Yes 37%, No 51% and Undecided 12% •[3] eg similar proportion chose 'yes' in survey 2. larger proportion chose 'no' in survey 2. smaller proportion chose 'undecided' in survey 2.	**3**

Notes:

1. If no calculations are attempted all comments are invalid 0/3
2. All comments must refer to percentages, fractions, proportion etc
3. If candidate assumes that there are the same number of people in each poll then •[1] is not available but •[2] can be awarded for Yes 442, No 469, Undecided 295.
   In this case only, if they refer to the number of people •[3] can be awarded comparing the number of people in each category.
4. If only one category has been considered in both opinion polls, then all three marks are available.

Commonly Observed Responses:

Question			Generic Scheme	Illustrative Scheme	Max Mark
4.	(a)	(i)	**Ans: 1:100 000** •[1] Communication: find the scale	•[1] 1:100 000	**1**
		(ii)	**Ans: 074°, 9·6 km** •[2] Communication: correct bearing •[3] Communication: distance in kilometres	•[2] 074° •[3] 9·6 km	**2**

Notes:

1. For 1cm=1km award 1/1 treat the = as bad form
2. Allow a tolerance of +/− 1° for angle
3. Allow a tolerance of +/− 0.1 km for length
4. For •[1] the leading 0 must be present in the bearing
5. Candidates must use the scale that they have found in part (a) for part (b)

Commonly Observed Responses:

1. For 1 cm : 1 km award 1/1 ✓
2. For 9·8 cm: 9·8 km award 0/1 ×

Question			Generic Scheme	Illustrative Scheme	
	(b)		**Ans: 23 (minutes)**		**3**
			•[1] Strategy: use correct speed	•[1] use 27 km/hr	
			•[2] Process: find time in hours to 3 decimal places	•[2] 10·2 ÷ 27 = 0·377… (hours)	
			•[3] Communication: find the time in minutes, and round	•[3] 0·377… × 60 = 22·66 … →23	
			Alternative strategy		
			•[1] Strategy: Compare time needed for 21 km/h and 27 km/h	•[1] use 27 km/hr and 21 km/hr	
			•[2] Process: find time in hours for both speeds to 3 decimal places	•[2] 10·2 ÷ 27 = 0·377… (hours) and 10·2 ÷ 21 = 0·845… (hours)	
			•[3] Communication: select shortest time, convert to minutes and round	•[3] 0·377… × 60 = 22·66 … →23	

Notes:

1. If candidate only uses 21 or 24 km/hr •[2] and •[3] are available.
2. For •[2] time in hours must be to at least 3 decimal places rounded or truncated.
3. In the alternative strategy, only the shortest time needs to be converted to minutes.

Commonly Observed Responses:

Question			Generic Scheme	Illustrative Scheme	Max Mark
5.	(a)	(i)	**Ans: ($)183** •[1] Strategy: identify the costs not included •[2] Process: calculate the cost for card 1	 •[1] $32 and $37 •[2] $114 + 32 + 37 = $183	**2**
		(ii)	**Ans: $157 supported by working** •[3] Strategy: identify the "missing" attraction and the two cheapest attractions •[4] Process: calculate the cost for card 2 •[5] Process: state cost of card 3 •[6] Communication: state the cheapest price	 •[3] $24, $32 and $30 •[4] $71 + $24 + $32 + $30 = $157 •[5] $180 •[6] ($)157	**4**

Notes:

1. If candidate chooses to buy two of card 2 and buys a one world observatory separately = $174 do not award •[3], •[4] is still available.

2. •[4] is available for adding at least 2 out of the 3 missing attractions to card 2 price.

Commonly Observed Responses:

Question			Generic Scheme	Illustrative Scheme	Max Mark
	(b)		**Ans: £1 gives $1·555 or $1 gives £0·643** • [1] Strategy: evidence of knowing to divide • [2] Process: state rounded answer	 • [1] 157 ÷ 100·96 or 100·96 ÷ 157 • [2] £1 gives $1·555 or $1 gives £0·643	**2**
Notes: 1. For • [2] units are essential					
Commonly Observed Responses:					

Question			Generic Scheme	Illustrative Scheme	Max Mark
6.	(a)	(i)	**Ans: 81·1** •[1] Process: calculate mean	•[1] (81·8 + 81·7 + 81·6 + 81·0 + 80·3 + 80·2) ÷ 6 = 81·1	**1**
		(ii)	**Ans: 0·72** •[2] Process: calculate $(x-\overline{x})^2$ •[3] Strategy: substitute into formula •[4] Process: calculate standard deviation	•[2] 0·49, 0·36, 0·25, 0·01, 0·64, 0·81 •[3] $\sqrt{(2\cdot56\div5)}$ •[4] 0·72	**3**

Notes:

1. Alternative method
   •[2] $\sum x = 486\cdot6$ and $\sum x^2 = 39465\cdot82$
2. Accept rounding or truncation to at least one decimal place for final answer
3. The mark •[4] can only be awarded when a two-step calculation has taken place.

Commonly Observed Responses:

Question			Generic Scheme	Illustrative Scheme	
	(b)		**Ans: two valid comments** • [1] Communication: comment regarding the mean • [2] Communication: comment regarding standard deviation	 • [1] eg on average Goodhold give a faster lap time • [2] eg lap times with Goodhold are less consistent	**2**

Notes:

1. Comments must refer to the context of the question.
2. Example of an unacceptable comment
   eg his results were more spread out with goodhold (has not mentioned lap time)
   eg On average the data for goodhold is lower(does not refer to context)

Commonly Observed Responses:

Question			Generic Scheme	Illustrative Scheme	
	(c)		**Ans: 160 (km/hr)** •[1] Strategy: correct substitution into S = D/T •[2] Strategy: know how to change km/sec to km/hr •[3] Process: find speed in km/hr	 •[1] S = 3·6/81 •[2] …× 60 × 60 •[3] 160	**3**
			Alternative Strategy •[1] Strategy: knows how to find the time in hours •[2] Strategy: consistent substitution into S = D/T •[3] Process: find speed in km/hr	 •[1] 81 ÷ 60 ÷ 60 •[2] 3·6 ÷ … •[3] 160	**3**

Notes

1. Candidates are expected to work to at least 3 significant figures throughout.
2. •[3] is only available for candidates who attempt to multiply or divide by 3600 (60×60)

Commonly Observed Responses:

1. 81 ÷ 60 ÷ 60 = 0·0225 ÷ 3·6 = 0·00625 — award 2/3 ✓×✓
2. 81 ÷ 3·6 =22·5 ⟶ 22·5 x 60 x 60 = 81000 — award 2/3 ×✓✓
3. 81 ÷ 3·6 =22·5 ⟶ 22·5 ÷ 60 ÷60 = 0·00625 — award 1/3 ××✓
4. 3·6 x 81 =291·6 ⟶ 291·6 x 60 x 60= 1049760 — award 2/3 ×✓✓
5. 3·6 x 81 =291·6 ⟶ 291·6 ÷ 60 ÷ 60= 0·081 — award 1/3 ××✓
6. 3·6 ÷ 1·35 = 2·66…. — award 1/3 ✓××

Question			Generic Scheme	Illustrative Scheme	Max Mark
7.	(a)		**Ans: (£)1100** • [1] Process: calculate 5% of £15,000 • [2] Communicate: find gross pay • [3] Process :calculate 12% of £1250 • [4] Communicate: find net pay	 • [1] £750 • [2] 750 + 500 = £1250 • [3] 12% of 1250 = £150 • [4] 1250 – 150 = 1100	**4**

Notes:

1. For an answer of £418 (working must be shown) award 4/4 if candidate **states** net pay is £1100.
2. For an answer of £418 (working must be shown) award 3/4 if candidate **does not state** net pay is £1100.

Commonly Observed Responses:

1. For net pay = 750 + 440 = 1190 award 3/4
   Candidate has found 12% of basic pay only, instead of 12% of gross pay.

2. For net pay of £1452 (commission = 5% of £23000) award 3/4

Question			Generic Scheme	Illustrative Scheme	
	(b)	(i)	**Ans: (£) 418** •[1] Process: net pay – monthly bills	 •[1] 1100 – 682 = 418	**1**
		(ii)	**Ans: 6·1(%)** •[2] Strategy: know how to find percentage increase •[3] Process: calculate percentage increase	 •[2] 15 ÷ 245 × 100 •[3] 6·1	**2**

Notes:

1. •[2] is available for calculations of the form a/b x 100 where a, b = 15 or 245 or 260 or 505.
2. Both marks are available for a trial an improvement strategy leading to an answer between 5.9% and 6.3% inclusive. Working must be shown

Commonly Observed Responses:

(b)(i)

1. £770 (from net pay calculated as £1452) award 1/1 ✓

(b)(ii)

2. 245 ÷ 260 x 100 = 94·2% leading to 100 - 94·2 = 5·8% award 1/2×✓
3. 260 ÷ 245 x 100 = 106·1% award 1/2×✓
4. 15 ÷ 260 x 100 = 5·8% award 1/2×✓

Question			Generic Scheme	Illustrative Scheme	
	(c)		**Ans: Premier bank, 24 months** • [1] Process: find the new monthly surplus • [2] Communicate: correct choice of lender	 • [1] 403 • [2] Premier Bank, 24 months	**2**

Notes:
If candidate calculates new monthly surplus that is less than £150·60 • [2] is available for "she can't afford any of the loans"

Commonly Observed Responses:

1. New monthly surplus of £755 so choose Tasko bank over 12 months (from surplus of £770) award 2/2 ✓✓

Question			Generic Scheme	Illustrative Scheme	
	(b)	(i)	**Ans: (£) 418** •[1] Process: net pay – monthly bills	 •[1] 1100 – 682 = 418	**1**
		(ii)	**Ans: 6·1(%)** •[2] Strategy: know how to find percentage increase •[3] Process: calculate percentage increase	 •[2] 15 ÷ 245 × 100 •[3] 6·1	**2**

Notes:

1. •[2] is available for calculations of the form a/b x 100 where a, b = 15 or 245 or 260 or 505.
2. Both marks are available for a trial an improvement strategy leading to an answer between 5.9% and 6.3% inclusive. Working must be shown

Commonly Observed Responses:

(b)(i)

1. £770 (from net pay calculated as £1452) award 1/1 ✓

(b)(ii)

2. 245 ÷ 260 x 100 = 94·2% leading to 100 - 94·2 = 5·8% award 1/2×✓
3. 260 ÷ 245 x 100 = 106·1% award 1/2×✓
4. 15 ÷ 260 x 100 = 5·8% award 1/2×✓

Question			Generic Scheme	Illustrative Scheme	
	(c)		**Ans: Premier bank, 24 months** • [1] Process: find the new monthly surplus • [2] Communicate: correct choice of lender	 • [1] 403 • [2] Premier Bank, 24 months	**2**

Notes:
If candidate calculates new monthly surplus that is less than £150·60 •[2] is available for "she can't afford any of the loans"

Commonly Observed Responses:

2. New monthly surplus of £755 so choose Tasko bank over 12 months (from surplus of £770) award 2/2 ✓✓

Question			Generic Scheme	Illustrative Scheme	Max Mark
8.	(a)		**Ans: 32 candles**		**3**
			•[1] Strategy: know how to use ratio	•[1] evidence of knowing how to scale up the ratio	
			•[2] Process: find total amount of wax used	•[2] 12000 + 4000 + 8000 =24000 cm^3	
			•[3] Process: find number of candles	•[3] 24000 ÷ 729 = 32·92… = 32	
			Alternative Strategy:		
			•[1] Strategy: know how to use ratio	•[1] evidence of 3/6 of 729	
			•[2] Process: finds volume of red wax available and volume of red wax in candle	•[2] 12000cm^3 & 364·5	
			•[3] Process: find number of candles	•[3] 12000 ÷ 364·5 = 32·92 rounded to 32	

Notes:

1. 36000 ÷ 729 = 49·38 = 49 candles award 1/3 ××✓
2. For an answer of 48 candles (16x3) award 0/3 ×××
3. 12000 ÷ 729 = 16·46 = 16 award 0/3 ×××

Commonly Observed Responses:

Question			Generic Scheme	Illustrative Scheme	
	(b)		**Ans: (£)2·43 or 2·42** • [1] Process: find cost of wax plus wicks • [2] Process: add 65% • [3] Process: find selling price of 1 candle	 • [1] 3 × 13·75 + 32 × 0·18 = 47·01 • [2] 47·01 × 1·65 = 77·57 • [3] 77·57 ÷ 32 = 2·424… = 2·43	**3**
Notes: **1.** Accept 2·42 or 2·43 **2.** Any rounding or truncation within the calculations must be at least to two decimal places.					
Commonly Observed Responses:					

Question			Generic Scheme	Illustrative Scheme	Max Mark
	(c)		**Ans: no supported by working**		**7**
			•[1] Strategy: knows how to find compound volume	•[1] evidence	
			•[2] Strategy: substitute into cylinder formula	•[2] $V = \pi \times 3{\cdot}5 \times 3{\cdot}5 \times 12$	
			•[3] Process: find volume of cylinder	•[3] 461·8 (or 461·58)	
			•[4] Strategy: substitute into cone formula	•[4] $V = \frac{1}{3} \times 3{\cdot}5 \times 3{\cdot}5 \times 4$	
			•[5] Process: find volume of cone	•[5] 51·3	
			•[6] Process: find the number of candles that can be made	•[6] 461·8 + 51·3 = 513·1, 12000 ÷ 513·1 = 23·38	
			•[7] Communication: valid conclusion	•[7] no he can't make 25 candles	

Notes:

1. If candidate uses 7 for the radius at •[2] mark •[4] can be awarded for radius of 7 or 3·5
2. If candidate calculates that more than 25 candles can be made •[7] can be awarded for either yes he can make 25 or no he can't make (exactly) 25.
3. •[6] is also available for 12000 ÷ 25 = 480 or 513·1 x 25 = 12827·5

Commonly Observed Responses:

Where a radius of 7 is used leading to an answer of 5·8… so no. award 6/7(•[2] lost)

[END OF MARKING INSTRUCTIONS]