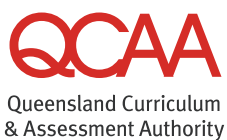


Retrospective

2015 Queensland Core Skills Test

Multiple Choice (MC) I & II (Part 1 of 5)



For all Queensland schools

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Manager
Publishing Unit
Email: publishing@qcaa.qld.edu.au

Multiple Choice (MC) I & II

The 2015 MC subtest consisted of two testpapers, each with 25 verbal and 25 quantitative items. For an item, the facility (F) is the proportion of students who gave the correct response; it is expressed as a percentage. For the 2015 MC subtest, the average facility (AF) was 51%. The average facility on verbal items was 49%, and on quantitative items was 53%. The average facility for MC I was 51%, and for MC II was 51%. Males performed a little better than females (the average facility for males was 54% and for females 50%). On MC I, average facilities for items ranged from 16% (item 47) to 88% (item 5), and on MC II from 30% (item 96) to 80% (items 55 and 57).

Within the verbal domain, stimulus materials included extracts from novels, plays, academic texts, memoirs, quotations, short stories, cartoons, anecdotes, and literary criticism. Within the quantitative domain, stimulus materials included formulae, algebraic expressions, diagrams and graphs. Areas covered included English language and literature, philosophy, religion, civics, biology, physics, politics, history, geography, and both pure and applied mathematics.

The following table summarises data about the 23 units that made up the 2015 MC subtest. The main Common Curriculum Elements (CCEs) tested in each unit are listed. The order of the CCEs for each unit does not reflect the order of the items, nor does it imply a cognitive hierarchy. The baskets into which CCEs are grouped are shown in Appendix 3.

MC I & II 2015 summary

Unit	Item	Key	Basket	F	AF (%)	Common Curriculum Elements
1 <i>Truth</i> (cartoon)	1	B	α	37	37.0	5 <i>Interpreting the meaning of pictures/illustrations</i>
2 <i>Turner</i> (character sketch)	2	B	α	54	58.3	4 <i>Interpreting the meaning of words</i> 43 <i>Analysing</i> 44 <i>Synthesising</i>
	3	A	θ	61		
	4	A	θ	60		
3 <i>Algebraic processes</i> (algebraic expressions)	5	D	ϕ	88	64.7	19 <i>Substituting in formulae</i> 38 <i>Generalising</i>
	6	D	ϕ	70		
	7	A	β	36		
4 <i>Health</i> (personal anecdote)	8	B	α	66	60.0	4 <i>Interpreting the meaning of words</i> 11 <i>Summarising/condensing written text</i> 29 <i>Comparing/contrasting</i> 33 <i>Inferring</i>
	9	A	π	76		
	10	C	β	66		
	11	B	α	65		
	12	A	π	41		
	13	B	θ	46		
5 <i>Skipping stones</i> (calculations, formulae, graphs)	14	C	ϕ	78	53.3	6 <i>Interpreting the meaning of diagrams and maps</i> 7 <i>Translating from one form to another</i> 19 <i>Substituting in formulae</i> 32 <i>Deducing</i> 37 <i>Applying a progression of steps to achieve the required answer</i> 38 <i>Generalising from information</i>
	15	B	α	39		
	16	D	ϕ	46		
	17	C	θ	73		
	18	A	β	55		
	19	D	α	45		
	20	C	α	46		
	21	D	θ	44		
6 <i>Hannah</i> (short story)	22	B	θ	59	51.8	28 <i>Empathising</i> 33 <i>Inferring</i> 43 <i>Analysing</i>
	23	D	θ	58		
	24	B	θ	44		
	25	D	α	46		
7 <i>Polygons</i> (diagram, geometry)	26	C	ϕ	60	54.0	16 <i>Calculating</i> 19 <i>Substituting in formulae</i> 32 <i>Deducing</i>
	27	B	ϕ	58		
	28	C	ϕ	47		
	29	C	θ	51		
8 <i>Sweet potatoes</i> (graphs)	30	C	β	60	46.8	6 <i>Interpreting the meaning of diagrams and graphs</i> 30 <i>Classifying</i> 41 <i>Hypothesising</i>
	31	D	α	36		
	32	B	α	44		
	33	D	θ	47		

Unit	Item	Key	Basket	F	AF (%)	Common Curriculum Elements
9 <i>Obama</i> (memoir)	34	B	π	54	48.3	10 <i>Using vocabulary appropriate to a context</i> 28 <i>Empathising</i> 33 <i>Inferring</i> 43 <i>Analysing</i>
	35	D	θ	63		
	36	A	θ	41		
	37	C	α	35		
10 <i>Magic trick</i> (mathematical rules)	38	B	ϕ	60	51.7	32 <i>Deducing</i> 37 <i>Applying a progression of steps to achieve the required answer</i> 41 <i>Hypothesising</i>
	39	A	θ	55		
	40	C	θ	40		
11 <i>Bolt</i> (play, character sketches)	41	C	θ	49	45.6	10 <i>Using vocabulary appropriate to a context</i> 26 <i>Explaining to others</i> 33 <i>Inferring</i> 43 <i>Analysing</i>
	42	A	θ	71		
	43	B	π	59		
	44	D	θ	49		
	45	A	π	33		
	46	C	θ	42		
	47	D	θ	16		
12 <i>Napkins</i> (diagrams)	48	A	β	59	50.3	49 <i>Perceiving patterns</i> 50 <i>Visualising</i>
	49	A	β	35		
	50	D	β	57		
13 <i>Milky Way</i> (cartoon)	51	D	α	51	51.0	5 <i>Interpreting the meaning of pictures/illustrations</i>
14 <i>Gossip</i> (commentary)	52	A	α	66	52.3	4 <i>Interpreting the meaning of words</i> 33 <i>Inferring</i> 43 <i>Analysing</i>
	53	D	θ	49		
	54	C	θ	42		
15 <i>Maze</i> (diagrams, rules)	55	A	α	80	72.0	6 <i>Interpreting the meaning of diagrams</i> 32 <i>Deducing</i> 36 <i>Applying strategies to trial and test ideas</i> 37 <i>Applying a progression of steps to achieve the required answer</i>
	56	C	θ	69		
	57	C	β	80		
	58	B	ϕ	57		
	59	A	β	74		
16 <i>Silk</i> (novel)	60	B	θ	46	49.5	28 <i>Empathising</i> 33 <i>Inferring</i> 43 <i>Analysing</i> 45 <i>Judging/evaluating</i>
	61	C	θ	38		
	62	B	θ	52		
	63	D	θ	56		
	64	D	α	51		
	65	A	θ	54		

Unit	Item	Key	Basket	F	AF (%)	Common Curriculum Elements
17 <i>Hydrographs</i> (graphs, diagram)	66	B	α	68	55.0	6 <i>Interpreting the meaning of diagrams and graphs</i> 15 <i>Graphing</i> 16 <i>Calculating</i> 31 <i>Interrelating ideas, themes and issues</i>
	67	C	ϕ	63		
	68	C	α	75		
	69	B	β	52		
	70	C	π	35		
	71	B	ϕ	68		
	72	D	β	48		
	73	D	ϕ	31		
18 <i>Hope</i> (quotations)	74	C	β	54	43.4	29 <i>Comparing/contrasting</i> 38 <i>Generalising</i> 43 <i>Analysing from information</i>
	75	A	β	57		
	76	C	θ	40		
	77	A	θ	35		
	78	B	β	31		
19 <i>Muffins</i> (applied mathematics)	79	C	θ	48	48.0	32 <i>Deducing</i>
20 <i>Billiard tables</i> (diagrams, rules)	80	B	ϕ	54	43.7	6 <i>Interpreting the meaning of diagrams</i> 16 <i>Calculating</i> 19 <i>Substituting in formulae</i> 32 <i>Deducing</i> 37 <i>Applying a progression of steps to achieve the required answer</i>
	81	D	α	54		
	82	A	θ	47		
	83	D	ϕ	46		
	84	D	ϕ	63		
	85	B	ϕ	63		
	86	C	θ	33		
21 <i>Lord of the Rings</i> (literary criticism)	87	D	α	62	43.3	4 <i>Interpreting the meaning of words</i> 11 <i>Summarising/condensing written text</i> 28 <i>Empathising</i> 29 <i>Comparing/contrasting</i> 38 <i>Generalising from information</i> 43 <i>Analysing</i>
	88	B	β	41		
	89	A	π	45		
	90	A	θ	36		
	91	C	α	42		
	92	A	β	34		
22 <i>Peano-Jordan</i> (counting, algebra)	93	C	ϕ	44	44.8	16 <i>Calculating</i> 37 <i>Applying a progression of steps to achieve the required answer</i> 51 <i>Identifying shapes in two and three dimensions</i>
	94	B	ϕ	49		
	95	D	α	56		
	96	A	ϕ	30		
23 <i>Rational thought</i> (commentary)	97	A	θ	41	46.0	11 <i>Summarising/condensing written text</i> 29 <i>Comparing/contrasting</i> 43 <i>Analysing</i> 45 <i>Judging/evaluating</i>
	98	A	θ	55		
	99	B	π	44		
	100	D	β	44		
Average facility on subtest					51.2	

MC I commentary

This section gives a brief outline of the main aims of each unit. Two units (5 and 11) are singled out for detailed analysis.

Unit 1 *Truth*

This single-item unit required students to extract essential meaning from a cartoon about the search for truth.

Unit 2 *Turner*

This unit is based on a short character sketch about a famous social anthropologist.

Unit 3 *Algebraic processes*

This unit required students to understand and manipulate algebraic expressions and equations.

Unit 4 *Health*

This unit required comprehension of a piece by John Mortimer comparing the modern fad for exercise and traditional forms of religious observance.

Unit 5 *Skipping stones*

This unit looked at some of the mathematics behind the pastime of stone skipping.

Item 14: This item required students to determine the minimum launch velocity, V , by substituting the values for a specific stone into the formula provided. Careful substitution of the values with the correct units and attention to the order of operations when using a calculator were essential for determining V to be 3.8 m/s.

Option C is the key. Option A is based on the use of $2d$ instead of d^2 which gives 0.6 m/s, while using d instead of d^2 leads to 0.9 m/s (option B). Option D uses correct substitution but omits to find the square root.

Item 15: Close examination of the relationships indicated by the formula reveals that for stones with the same d (longest dimension), the smaller a stone's mass the slower the launch velocity, V . Therefore, stone F, with a slower launch velocity, must have a smaller mass than stone G. Recognition of this allowed for options A and C to be eliminated. Since the formula requires a square root to be found, the mass of stone F needs to be one-quarter that of stone G in order for V_F to be half V_G . Option B is the key. If stone F had a mass half

that of G, F would still need a launch velocity of $\sqrt{\frac{1}{2}} = \frac{1}{1.4}$, or 0.70 that of the heavier stone G (option D).

Students may have substituted k and d into the equation then calculated and compared the result for stones of different masses to arrive at the answer. This would be a more time-consuming approach.

Item 16: This item required students to rearrange the terms in the formula to make d the subject.

Manipulating the terms associated with $\sqrt{\quad}$ and d^2 increases the difficulty of the item. When rearranging the terms, adhering to the order of operations was essential to arrive at option D which is the key. Options A and B both incorrectly showed V as the numerator. The square root operation was not managed correctly in option C. Substitution of a specific set of values into the original formula, then testing the values against each of the options, was a valid but more time-consuming alternative method.

Item 17: This item is based on Figure 1, which represents a four-skip throw. The key, option C, is arrived at by calculating $0.8 \times 0.8 \times 4.5$. Option A is determined by $(1 - 0.8) \times 4.5$. Option B gives the distance for X_4 and option D gives the distance for X_2 .

Item 18: This item required students to generalise. The schematic view of a four-skip throw, Figure 1, helped model the relationship between the first skip and the n th skip. Those options with 0.8 included as the denominator, i.e. options B and D, actually increase the skipping distance. After the first skip each subsequent skip is 80% or 0.8 of the preceding skip. Therefore option A with $0.8^{n-1} X_1$ is the key.

Items 19 to 21 are based on an experiment in which it was recorded whether or not a spinning disc skipped for a selection of the tilt angles α , impact angle β and launch velocities. Zones on the figures indicated when the disc skipped or did not skip. Students were required to interpret the relevant information from Figures 3a and 3b.

Item 19: This item was based on Figure 3b (launch velocity fixed at 3.5 m/s). The widest range of impact angles over which the disc skipped was required. Option B shows the widest range of angle β , but within this range there are impact angles (values of β) for which the disc does not skip. The range given in option A was the next widest but the range includes impact angles at which the disc does not skip. Of the two remaining options, option D specified the widest range across which the disc skips and so is the key.

Item 20: Both Figures 3a and 3b were required for this item. Options A and D use Figure 3a where it shows that at a launch velocity of 2.4 m/s there were no tilt angles at which the disc skips. Figure 3a also shows that a disc launched at 4.4 m/s with a tilt angle of 50° will not skip. Options B and C use Figure 3b which was generated with a launch velocity of 3.5 m/s. For option B, the intersection of $\alpha = 20^\circ$ and $\beta = 44^\circ$ lies in the no skip zone. The intersection of $\alpha = 43^\circ$ and $\beta = 19^\circ$, with the launch velocity of 3.5 m/s (option C) lies in the skip zone. Option C is therefore the key.

Item 21: This item required students to make generalisations based on the experimental conditions and/or results that were presented. The lines on the graphs separate where skipping did or did not occur depending on launch velocity and tilt angle. Option A is an invalid interpretation as Figure 3a shows a no skip zone below a launch velocity of 2.4 m/s. This does not mean that no launch velocities below 2.4 m/s were tested, but that the disc simply did not skip at the lower launch velocities. Figure 3b is the focus for option B. If angles α and β have an inverse relationship, as one increases the other would decrease. Figure 3b shows this is the case for some combinations of the angles but not for all. Option B is not a valid statement. Option C is not a valid statement as it is a combination of the three experimental conditions tested, i.e. launch velocity and tilt and impact angles that determines whether there is skip or no skip. In Figure 3b there are tilt angles for which skip occurs at more than one impact angle so β is not the most important determinant of whether the disc skips or not. Figure 3b deals with a single launch velocity so to investigate 'at high launch velocities' for option D, Figure 3a must be investigated. This graph shows that for launch velocities below 2.8 m/s, the disc does not skip at any tilt angle. At velocities above 2.8 m/s, it begins to skip across a narrow range of tilt angles but as the launch velocity increases the range widens as shown by the 'arms' of the line in Figure 3a diverging. Therefore option D is the key.

Unit 6 *Hannah*

This unit is based on a piece from a short story which focuses on an interaction between two characters, a young girl selling items in a car-boot sale, and one of her customers. Many of the items were intended to pick up on the subtle nature of the interaction between them.

Unit 7 *Polygons*

This unit combined elements of geometry and algebra, by looking at the side-lengths and areas of inscribed regular polygons.

Unit 8 *Sweet potatoes*

This unit is based on an experiment investigating the mass of sweet potatoes grown under various conditions. Students were required to read and understand an expository text that set out the framework of the experiment, and then to interpret a pair of graphs that modelled data collected during the experiment.

Unit 9 *Obama*

The text for this unit is from a memoir by American president Barack Obama. In it Obama comments on the impact on his life of his parents' mixed-race marriage. Some of the items in this unit dealt with word meanings, others with comprehension, while others required students to assess more subtle tonalities and sub-texts.

Unit 10 *Magic trick*

This unit uses a simple, but clever, magic trick involving coloured tokens. Students were required to comprehend instructions and to make correct deductions.

Unit 11 *Bolt*

The verbally rich text in this unit is from the *Dramatis Personae* of Robert Bolt's famous stage play *A Man For All Seasons*. Rationales for the options provided in the items for this unit are given below.

Item 41: Option A is not correct as there is no evidence that More tries and fails to be outgoing; rather, that he is outgoing by nature. Option B is not correct as the comment about More's behaviour when under pressure is intended to emphasise that this sort of behaviour is unnatural for him but the text makes clear that for More the 'norm' is otherwise. Option C is the key as the notion of 'balanced' is underwritten by 'natural moderation' in the text; we gain the impression that More is strongly empathetic. Option D is not correct as the notion that More has mood swings is countered by the reference to 'natural moderation' in line 3.

Item 42: Option A is the key as 'at odds with himself' relates back to 'longing to be rescued from himself', 'self-doubt' and 'unhappy face' in the text, while 'at odds with the world' draws from 'self-doubt to enter the world of affairs'. Option B is not correct as nearly the opposite is true — too much talent yet not enough ambition. Option C is not correct as there is no evidence in the text that Rich's academic sensibilities would be wasted at the royal court. Option D is not correct as, in fact, Rich is comfortable with neither doing nor thinking — he is caught in a sort of paralysis of doubt.

Item 43: This is a vocabulary item that required students to understand that 'banked-down' connotes 'suppressed', or 'locked up'. Option B is the key.

Item 44: To answer this item correctly, students were required to appreciate the strong irony present in the last part of the text. Option A completely misses the irony — there is nothing at all humble about the Duke of Norfolk. Option B is easily relatable to the first part of the text, which refers to Norfolk as a sportsman and soldier; but in fact Norfolk is hardly a leader at all, being aware of his moral and intellectual insignificance. Option C is not correct as though Norfolk is clearly a duty-bound man, the text has little to say about his personal inclinations. Option D is the key as 'awareness of his limitations' is supported by 'aware of his moral and intellectual insignificance' in the text, while 'self-importance' is the correct, i.e. ironic reading of 'untouchably convinced that his acts and ideas are important because they are his'.

Item 45: Option A is the key as the notion of 'ill-equipped' is supported in the text by 'troubled by and defiant toward both'. Option B is not correct as the text paints Alice More as vain, but does not give this as the primary cause of her marital problems; indeed, she 'worships' her husband. Option C is too positive a reading of the tone of the text, even if it finds some support in 'impressive close to'; there is no comment on Alice's intellect in the text. Whatever social shackles exist are of her own manufacture. Option D is not correct as it is not that Alice wants too much, only that her desires find themselves in eternal conflict with each other.

Item 46: For option A it is difficult to draw 'ignorance' from the text's 'subtle and serious'; likewise, the text makes clear that Cromwell drives his own destiny, and therefore cannot be said to be 'blinded'. Option B is not correct as to 'cradle' gross crimes is clearly not to 'investigate' them, but to instigate and nurture them. Option C (key): 'clever' relates to 'subtle and serious', 'worst deeds' is a direct rephrasing of 'gross crimes', 'making ... seem reasonable' is a fair rendering of 'cradle ... in the name of effective action'. Option D is not correct as the notion of self-sacrifice does not sit easily with the text's characterisation of Cromwell as conceited.

Item 47: Option A is not correct as 'the values of ordinary people' is not a plausible rendering of 'a mental footpath as narrow as a peasant's', which clearly suggests Chapuys' narrow-minded mentality. Option B is not correct as 'much on his dignity as' is an expression that means 'prides himself on being', and 'carries himself with dignity'. The text says nothing about Chapuys' origins, whether humble or otherwise. Option D is the key as Chapuys likes to think of himself as a 'man of the world' whereas in fact his outlook is as 'narrow as a peasant's'.

Unit 12 *Napkins*

This unit which is based on procedural information about how to fold paper napkins involved pattern recognition and visualising.

MC II commentary

In this section, the main aims of each unit are briefly outlined. Two units (16 and 20) are singled out for detailed analysis.

Unit 13 *Milky Way*

This single-item unit required students to understand the essential meaning of a cartoon. Students were required to interpret the illustration as referring to dullness and mundanity, and then to relate that to the general understanding of the Milky Way galaxy, which is of grandeur, awesomeness and beauty.

Unit 14 *Gossip*

This unit is based on a short piece from a book commenting on the role of gossip in society.

Unit 15 *Maze*

This unit is based on a maze consisting of nine ‘rooms’, each connected to other rooms by three ‘corridors’. The items required students to investigate pathways and make deductions about movements through the maze.

Unit 16 *Silk*

The two passages in this unit are from the novel *Silk* by Alessandro Baricco and focus on the subtleties of an interaction between two characters.

Item 60: This item required students to infer the meaning of the word ‘prudence’ from its context. Students were required to understand that ‘prudence’ is something other than being open and truthful and that Joncour rejects ‘prudence’. Option B is the key as Joncour is careful to tell the whole truth plainly; thus, he is not avoiding trouble by ‘concealing information’. Option C is not correct because this is arguably what Joncour did in fact do; it is not a course of action that he rejected. Option D is not correct because the behaviour described is not ‘prudent’, nor does the passage imply that Joncour acts unscrupulously in telling ‘everything that was true’. Option A is not correct as Joncour is said to have been guided in his actions by instinct rather than by ‘reason’, whereas a rejection of ‘prudence’ in terms of Option A would lean toward the use of reason and the downplaying of feelings.

Item 61: This item required students to identify a reason for Joncour’s rejection of prudence. To answer this item, it is necessary to glean from both passages that Joncour was in the weaker position and that he had already given Hara Kei reason to doubt his honesty. Joncour rejected ‘prudence’ (further deceitful behaviour) to try to rebuild credibility with Hara Kei. Option C is the key. Option A is not correct as it ignores Joncour’s truthfulness in giving an account of himself. Option B is not correct because Joncour has shown himself willing to use deceit in the recent past. Option D is not correct because Joncour rejects ‘prudence’ in the context of making disclosures about himself, not as a means of confronting Hara Kei.

Item 62: This item focuses on the manner in which Joncour speaks about himself. Joncour, we are told, said everything ‘in the same tone, and with barely visible gestures ... hypnotic ... melancholy and neutral’. Students were required to infer a reason for this behaviour by noticing that, like Hara Kei, Joncour conceals all but the facts required by maintaining a carefully controlled, neutral tone of voice, and by suppressing any clues as to his attitudes or feelings. For this reason, option B is the key. Option A is not correct, because a person who really thinks they are not being understood would not limit their means of communication (by suppressing intonation and gestures) nor would they go into such detail as Joncour did. Option C is not correct because there is no hint of anxiety or struggle in Joncour’s manner. In fact, Joncour’s ‘hypnotic’

manner might even be read as an attempt to control Hara Kei. Option D is a misreading of the context and of Joncour. The details that he relates do not bore him, nor are they obnoxious to him; rather, they are ‘crucial’ to his gaining Hara Kei’s business.

Item 63: In this item, students were directed to lines 7–10 of Passage 2 and were required to assess Joncour’s behaviour. Up to this point in the narrative, Joncour has given little away concerning his attitude toward Hara Kei or his own feelings. In the lines indicated, Joncour drops his eyes, notices his cup of tea, picks it up, turns it searchingly, drinks and sets the cup down again. If there is any ‘anger’ (option A), or ‘lack of regard’ (option B), or ‘embarrassment’ (option C) in these actions, we have no way of discovering it. What is evident is that Hara Kei’s revelation about the fish eggs requires a response, and Joncour uses the tea to gain time before answering. The key is therefore option D.

Item 64: This item required students to assess Hara Kei’s manner throughout the interview. Option A is not correct as Hara Kei is not aloof in Passage 2, but allows himself to joke frankly with Joncour about their business dealings. The fact that he gave worthless fish eggs instead of silkworm eggs casts some doubt on his generosity. Option B is not correct as Hara Kei does not always act in a formal manner during the interview: he unwinds with a smile and a laugh in Passage 2, yet his demeanour in Passage 1 (lines 9–11), as well as the incident with the eggs, would tend to unnerve rather than reassure. Option C is not correct since Hara Kei’s initial request, ‘try to tell me who you are’, is made politely, even though it might have something of a challenge in it. His later request to see Joncour again is respectful and allows Joncour to decide whether or not he will return. Option D is the key since Hara Kei is very comfortable throughout the interview and he avoids any extremes in language or action.

Item 65: In this item, students were required to make a judgment about Joncour’s way of doing business in Japan. Students needed to recognise that Joncour is both courageous and shrewd in the face of danger: he meets Hara Kei’s inscrutability with his own, he is not deceived by the fish eggs, he pays ‘the most invincible man in Japan’ fool’s gold, and he defends his part in these business dealings to Hara Kei’s face. The key is option A. Option B is not correct because Joncour surrenders nothing to Hara Kei, but even lays down the terms by which he will pay for the silkworm eggs. Option C is not correct because there is sufficient evidence that Joncour is prepared to challenge Hara Kei when he deems it necessary. Option D is not correct because Joncour is quite prepared to be underhanded and deceitful when needed.

Unit 17 Hydrographs

This unit required students to understand data presented in the form of graphs, relating to the measurement of water flows following rainstorms.

Unit 18 Hope

This unit required students to compare and contrast seven comments about hope, along with a dictionary definition.

Unit 19 Muffins

This single-item unit required students to organise the given data and deduce an answer through calculation.

Unit 20 Billiard tables

This essentially geometrical unit makes use of an artificial scenario involving a computer game similar to billiards (the resemblance with the real game is merely notional).

Item 80: This item required students to use Pythagoras’ theorem to find the total distance travelled by the ball as shown on Figure 1. One method of finding the correct answer is to see that the total distance travelled as the sum of the hypotenuses of the right-angled isosceles triangles formed by the path of the ball. The sides of the two large triangles are 4 units long. The hypotenuse of one of these triangles is $\sqrt{4^2 + 4^2}$, which is 5.656 units. The sides of the two smaller triangles are 2 units long. The hypotenuse of one of these triangles is $\sqrt{2^2 + 2^2}$, which is 2.828 units. The total distance is $2 \times 5.656 + 2 \times 2.828$ which gives 16.968 and rounds

up to 17 units. Option B is the key. Option A can result if a student simply counts the 12 lines in the individual squares and wrongly thinks that the total length is 12 units and rounds up to 14 as the nearest option. In Option C a hypotenuse length is incorrectly multiplied by 4, since there are four triangles visible in Figure 1. Option D would be chosen if a student wrongly thinks that $\sqrt{4^2 + 4^2}$ is the same as $\sqrt{(4 + 4)^2}$ and similarly for $\sqrt{2^2 + 2^2}$ and finds the hypotenuse lengths of 8 and 4; $2 \times 8 + 2 \times 4 = 24$.

Item 81: In this item, students were required to determine at which corner a ball will stop for two other billiard tables of different sizes. All billiard tables are presented in an $m \times n$ configuration. In a 3×2 table, a ball shot from Q will rebound from the top side at a point one unit from the right side, then from the right side at its halfway point, then from the bottom side at a point one unit from the right side; the ball will then reach the P corner of the table. In a 4×3 table, a ball shot from Q will rebound from the top side one unit from the right side, then from the right side at a point one unit from the top side, then from the bottom side at a point two units from the right side, then from the left side at a point one unit from the top side, then from the top side one unit from the left side; the ball will then reach the R pocket. Using Figure 1 to set up these two tables and then to sketch the path of the balls would be useful. Option D is the key. Option A would be chosen if using an incorrect table, e.g. a 2×3 table instead of a 3×2 . Option B gives the correct destination for the 4×3 table, but not for the 3×2 . Option C would be chosen if a correct method is used while incorrectly thinking that the tables are 2×3 and 3×4 respectively.

Item 82: This item required students to find how many times a ball shot on a 5×4 table will traverse the lengths m and n . As the tables are always longer than they are wide, the number of times the distance n is traversed will be greater than the number of times the distance m is traversed by the time a ball reaches a pocket. For this reason, option A is the key and the other options are incorrect due to miscounting or confusing m and n . Using Figure 1 to sketch the ball's path on a 5×4 table and tallying the times the lengths m and n are traversed is also a valid though more time-consuming method of obtaining the answer.

Item 83: This item required students to determine what proportion of the billiard table is shaded blue. The first two lines, indicating the path of the ball, divide the table into three sections. One section is 8 square units, one is 2 square units and the section shaded blue is 14 square units. The proportion of the table shaded blue is $\frac{14}{24} = \frac{7}{12}$. The key is option D. Option A is chosen after miscounting the half square units of the shaded area to give 12 of 24 (or 10 of 20) to obtain $\frac{1}{2}$. Option B is chosen after incorrectly dividing the table along the first path line only, and placing 16 over 24 to arrive at $\frac{2}{3}$. Option C is found by incorrectly placing 10 over 14, to obtain $\frac{5}{7}$.

Item 84: In this item, students were required to substitute values into a given formula and then to solve the equation to obtain the key. Option D is the key. The other options are based on predicted mistakes during the solving process. Option A is obtained if 2 is incorrectly subtracted from 11 instead of added. Option B is found if 24 alone is divided by 3; that error results in the value 5. Option C is achieved if 11 is incorrectly multiplied by 3 and if 2 is taken from 24 so that 22 is subtracted from 33.

Item 85: This item required students to find the number of points scored in a game based upon the number of rebounds achieved on a billiard table. In this game, one point is awarded for the first rebound, and each additional rebound is awarded twice the points of the preceding rebound. In order to get a score of 63, a player needs a table that will give six rebounds that are scored: $1 + 2 + 4 + 8 + 16 + 32 = 63$. Option B is the key. Option A is based on miscounting the number of rebounds. Option C is obtained if the score is doubled until a result near to '63' is found. This is from the seventh rebound (64). Option D involves the double error of doubling incorrectly as in Option C and miscounting the resultant number of rebounds.

Item 86: This item introduces the idea that the ball may be shot from Q at any angle between 0° and 90° , rather than at 45° only. The ball is shot at an angle so that the ball first rebounds from the right side of the table, 1.5 units from corner R. Students were required to find where the ball first rebounds from the top side of the table. Option C is the key. If students measured 1.5 units up from R on the right side of the table and drew the path line from Q to that point, then using an equal angle drew the next path line to the left side it would hit one unit from P, and then, once again with an equal angle drew a line to show the rebound it would

hit a point that would be 0.5 units directly above S. This last line will cross the top side at a point 4 units from P. Option A is obtained if the units from S instead of P were counted. The other options result from the careless drawing of lines or measuring of angles.

Unit 21 *Lord of the Rings*

This unit includes a short comprehension piece about attitudes toward the literary merit of Tolkien's *The Lord of the Rings*.

Unit 22 *Peano-Jordan*

This unit is based on a technique for estimating the areas of irregular, closed shapes, especially those with curved boundaries. Students were required to understand and apply the given rules and processes.

Unit 23 *Rational thought*

This unit is based on an adapted extract and sits squarely within the broader debate that sees some sort of conflict between religion and science, between non-rational and rational modes of thought. To attend to the items students were required to manage the conceptual and linguistic loading of the text.

Common Curriculum Elements (CCEs) and the MC format

Of the 49 CCEs, the following cannot be tested directly in MC format, though a few CCEs such as graphing, summarising and manipulating equipment, may be tested at 'second order' i.e. indirectly:

- 11 *Summarising/condensing written text*
- 12 *Compiling lists/statistics*
- 13 *Recording/noting data*
- 14 *Compiling results in a tabular form*
- 15 *Graphing*
- 20 *Setting out/presenting/arranging/displaying*
- 21 *Structuring/organising extended written text*
- 22 *Structuring/organising a mathematical argument*
- 26 *Explaining to others*
- 27 *Expounding a viewpoint*
- 46 *Creating/composing/devising*
- 53 *Observing systematically*
- 55 *Gesturing*
- 57 *Manipulating/operating/using equipment*
- 60 *Sketching/drawing.*

These CCEs can be validly tested in Short Response (SR) format.

Queensland Curriculum & Assessment Authority

PO Box 307, Spring Hill QLD 4004 Australia
Level 7, 154 Melbourne Street, South Brisbane

T + 61 7 3864 0299

F + 61 7 3221 2553

www.qcaa.qld.edu.au