Mark Scheme (Results)

Summer 2019

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme.
  Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

- **Types of mark**
  - o M marks: method marks
  - o A marks: accuracy marks
  - o B marks: unconditional accuracy marks (independent of M marks)
- **Abbreviations**
  - o cao – correct answer only
  - o ft – follow through
  - o isw – ignore subsequent working
  - o SC - special case
  - o oe – or equivalent (and appropriate)
  - o dep – dependent
  - o indep – independent
  - o awrt – answer which rounds to
  - o eeoo – each error or omission
- **No working**
  If no working is shown then correct answers normally score full marks
  If no working is shown then incorrect (even though nearly correct) answers score no marks.

- **With working**

  If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

  If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.

  If a candidate misreads a number from the question. Eg. Uses 252 instead of 255; method marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review. If there is a choice of methods shown, then mark the method that gains the lowest marks, unless the answer on the answer line makes clear the method that has been used.

  If there is no answer on the answer line then check the working for an obvious answer.

- **Ignoring subsequent work**

  It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. Incorrect cancelling of a fraction that would otherwise be correct.

  It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.

  Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

- **Parts of questions**

  Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded to another.
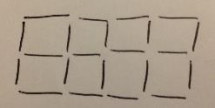
Question		Working	Answer	Mark	Notes
1	(a)		−8, −5, 0, 1, 3	1	B1
	(b)		2.082, 2.28, 2.5, 2.805, 2.85	1	B1
	(c) (i)		14	1	B1
	(ii)		19	1	B1
					Total 4 marks

Question		Working	Answer	Mark	Notes
2	(a)		Bar drawn to 12	1	B1
	(b)		Bogota, Lima	1	B1
	(c)		Manila	1	B1
	(d)		11	1	B1
	(e)	90 : 60 oe			M1 or for an answer of 2 : 3
			3 : 2	2	A1 cao
					Total 6 marks

3	(a)		Diameter	1	B1
	(b)		Chord	1	B1
	(c)		Sector shaded	1	B1 accept the semicircle shaded
					Total 3 marks

4	(a)		A	1	B1
	(b) (i)		D	1	B1
	(ii)		3	1	B1
	(c)		Octagon	1	B1 accept regular octagon
					Total 4 marks

5	(a)		$\frac{16}{20}$	1	B1
	(b)		12 squares shaded	1	B1
	(c)		80	1	B1
	(d)	48 ÷ 4 × 5 **or** 48 × 5 ÷ 4 **or** 48 ÷ 0.8 **or** 48 × 1.25 oe			M1 for a complete method
			60	2	A1
					Total 5 marks

6	(a)		Correct shape drawn	1	B1
	(b)	7, 12, 17, 22, 27, 32, 37 **or** 5 × 7 + 2 **or** 17 + (4 × 5) 7 + (6 × 5)			M1 for adding 5 and continuing to at least pattern 7 (allow one error) **or** for a correct diagram **or** any correct method which would lead to 37
			37	2	A1
	(c)	7, 12, 17, 22, 27, 32, 37, 42, 47, 52, 57, 62 **or** 5*n* + 2 = 62 **or** 62 ÷ 5 (= 12.4)			M1 for continuing the sequence to at least 62 (list of values may be seen in earlier parts of question)
			12	2	A1
	(d)	For identifying all terms in sequence end in 2 or 7 **or** none of the numbers end in 3 **or** method to count on as far as 122 e.g. No, 122 and 127 are both in sequence oe e.g. No, 122 in sequence **or** method to find *n* when term is 123 e.g. solving 5*n* + 2 = 123 or (123 – 2) ÷ 5 (= 24.2) **or** e.g. 121 not multiple of 5 or 121 ÷ 5 not whole number/it's a decimal	No with reason	1	B1
					Total 6 marks

7	(a)									Fully correct table	2	B2 fully correct table (B1 for 4 or 5 or 6 correct entries)

Table for 7(a):

	1	2	3	4	5	6
1	1	2	3	4	**5**	**6**
2	**2**	4	**6**	8	10	**12**
3	3	6	**9**	12	**15**	18

	(b)			M1 for $\frac{a}{18}$ where $0 < a < 18$ or for $\frac{4}{b}$ where $b > 4$
			$\frac{4}{18}$	2	A1 oe accept 0.22(2…..) or 22.(2…..)%
	(c)	$\frac{'8'}{18}, \frac{'6'}{18}$ **or** '8','6' **or** 0.4(4..), 0.3(3..) **or** 40%, 30% or better			M1 ft from their complete table for two figures that can be used for comparison, one of which must be correct
			Yes oe with reason	2	A1
					Total 6 marks

8	(a)	(8 × 0.58) (= 4.64)			M1 for a method to work out the cost of 8 pencils
		23.62 – (8 × 0.58) (= 18.98) **or** 23.62 – ('4.64') (= 18.98)			M1 for a method to work out the cost of 13 rulers
			$1.46	3	A1
	(b)	15 ÷ 0.62 (= 24.193….) **or** 24 **or** 14.88			M1
		15 – '24' × 0.62 **or** 15 – '14.88' **or** (24.1(935…..) – 24) × 0.62 **or** 0.193(548…) × 0.62			M1 for a complete method
			$0.12	3	A1

					Total 6 marks
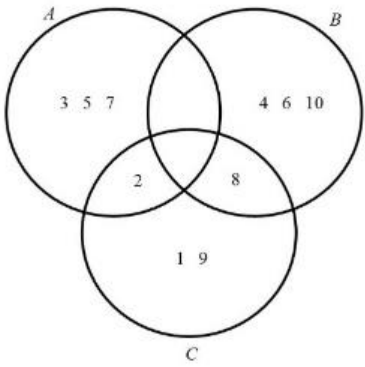
9	(a)	e.g. $x + 2$ **or** $3x + 6$ **or** $3(x + 2)$			M1
		e.g. $x + x + 2 + 3x + 6$ **or** $5x + 8$ **or** $x + x + 2 + 3(x + 2)$			M1 dep
			$T = 5x + 8$	3	A1 accept $T = 8 + 5x$ (SC B2 $T = 5x + a$ where $a \neq 0$ **or** $T = bx + 8$ where $b \neq 0$)
	(b)	e.g. $r - 7 = 4g$ or $\dfrac{r}{4} = g + \dfrac{7}{4}$ **or** $-4g = 7 - r$ or $-g = \dfrac{7-r}{4}$ **or** $-g = \dfrac{r-7}{4}$ oe **or** $\dfrac{r-7}{4}$ oe			M1 for a first step of subtracting 7 **or** dividing by 4 in a correct equation
			$g = \dfrac{r-7}{4}$	2	A1 oe
	(c)	e.g. $6y - 2y = 8 + 3$ **or** $2y - 6y = -3 - 8$ oe e.g. $4y - 3 = 8$ **or** $6y = 2y + 11$ **or** $-3 = -4y + 8$ **or** $6y - 11 = 2y$			M1 for correct rearrangement with y terms on one side and numbers on the other side e.g. $6y - 2y = 8 + 3$ or for the correct simplification of either y terms or numbers on one side in a correct equation e.g. $4y - 3 = 8$ or $6y = 2y + 11$
		e.g. $4y = 11$ **or** $-4y = -11$ **or**			M1 for correct rearrangement with y terms on one side and numbers on the other **and** correct simplification of terms on both sides **or** for $4y - 11 = 0$ **or** for $11 - 4y = 0$

			$\frac{11}{4}$	3	A1 dep on M1 accept 2.75 or $2\frac{3}{4}$ oe Award full marks for a correct answer if at least 1 method mark awarded **If no correct algebraic working then award no marks**
					Total 8 marks
10	(a)		Triangle drawn with correct intersecting arcs 7 cm from A and 7 cm from B	2	B2 for triangle drawn with correct intersecting arcs 7 cm from *A* and 7 cm from *B* within the overlay (B1 for two intersecting arcs within the overlay **or** accurate triangle drawn with no arcs)
	(b)	Two pairs of intersecting arcs with equal radius centre *D* and *E*			M1 for arcs that intersect within guidelines **or** correct perpendicular bisector without arcs.
			Correct bisector with arcs	2	A1
					Total 4 marks

11	(a)	e.g. $1190 \times \frac{5}{7}$ oe (= 850) **or** $1190 \times 0.71(42857143)$ $1190 \times \frac{2}{7}$ oe (= 340) **or** $1190 \times 0.28(57142857)$			M1 for method to calculate cost for Calvin or cost for Jenny	M2 for $1190 \times \frac{3}{7}$ oe **or** $1190 \times 0.42(857143)$
		e.g. $1190 \times \frac{5}{7} - 1190 \times \frac{2}{7}$ oe **or** '850' – '340'			M1 for a complete method to calculate the difference in cost	
			£510	3	A1	
	(b)	e.g. 3500×0.12 oe (= 420) **or** 3500×0.88 oe (= 3080)			M1 for a correct method to find 12% or 88% of 3500	
		e.g. $(3500 \times 0.88) \div 220$ **or** $(3500 \div 220) \times 0.88$ **or** $(3500 - '3500 \times 0.12') \div 220$ **or** $(3500 - '420') \div 220$ **or** '3080' $\div 220$ oe			M1 for a complete method	
			14	3	A1	
						Total 6 marks

12		x	−2	−1	0	1	2	3	Correct line between x = −2 and x = 3	3	B3 for a correct line between x = −2 and x = 3
		y	−7	−4	−1	2	5	8			

(−2, −7) (−1, −4) (0 ,−1)
(1, 2) (2, 5) (3, 8)

Correct line between x = −2 and x = 3

3

B3 for a correct line between x = −2 and x = 3

(B2 for a correct straight line segment through at least 3 of (−2, −7) (−1, −4) (0, −1) (1, 2) (2, 5) (3, 8) **or** for all of (−2, −7) (−1, −4) (0, −1) (1, 2) (2, 5) (3, 8) plotted but not joined)

(B1 for at least 2 correct points stated (may be in a table) or plotted **or** for a line drawn with a positive gradient through (0,−1) **or** for a line with a gradient of 3)

Total 3 marks

13		$95 \times 8 + 105 \times 12 + 115 \times 15 +$ $125 \times 10 + 135 \times 3 \ (= 5400)$ **or** $760 + 1260 + 1725 + 1250 + 405$ $(= 5400)$			M2 for at least **4** correct products added (need not be evaluated) **or** If not M2 then award: M1 for consistent use of value within interval (including end points) for at least **4** products which must be added or correct midpoints used for at least **4** products and not added
		'5400' ÷ '48'			M1 dep on at least M1 Allow division by their Σf provided addition or total under column seen
			112.5	4	A1 oe accept 112 or 113 from correct working Accept 112.5 with no working Do not accept 112 or 113 with no working
					Total 4 marks

14	(a)	**Examples** There are no members that are in both *A* and *B* No members in common (in *A* and *B*) No numbers the same (in *A* and *B*) *B* has even numbers. *A* has odd numbers except 2 which is not in *B* Nothing in *A* is in *B* oe No overlap A and B don't share any numbers Nothing in the intersection of *A* and *B*	Correct statement	1	B1 for a statement which indicates correct meanings for intersection and empty set
	(b)		1 and 9	1	B1
	(c)	e.g.	1, 2, 8, 9	2	B2 for fully correct (B1 for 3 or 4 correct with no more than one addition or a fully correct Venn diagram)
					Total 4 marks

15	$\pi \times 7^2 \times 20$ (= 3078.76...) or 980π			M1 for complete method to find volume
		3080	2	A1 for answer in range 3077.2 − 3080
				Total 2 marks

16	(a)	4×120 (= 480)			M1
		e.g. $120 \div 2 \times 5$ (= 300) **or** $120 \times 0.4 \times 7$ (= 336) **or** $(120 - '60' - '48') \times 8$ (= 96) **or** $120 \times 0.1 \times 8$ (= 96)			M1 for a method to find the income for one of the selling prices
		e.g. $(120 \div 2 \times 5) + (120 \times 0.4 \times 7) + ((120 - '60' - '48') \times 8)$ (= 732) **or** $(120 \div 2 \times 5) + (120 \times 0.4 \times 7) + (120 \times 0.1 \times 8)$ (= 732) **or** '300' + '336' + '96' (= 732)			M1 for a complete method to find the total income
		e.g. $\dfrac{'732'-'480'}{'480'} \times 100$ **or** '252' ÷ '480' × 100 **or** $\left(\dfrac{'732'}{'480'} \times 100\right) - 100$ or 152.5 – 100 **or** $\left(\dfrac{'732'}{'480'} - 1\right) \times 100$ or 0.525 × 100			M1 for a complete method to find the percentage profit
			52.5	5	A1 accept 53
	(b)	e.g. $1 + 0.2$ (= 1.2) **or** 100(%) + 20(%) (= 120(%)) **or** $\dfrac{15}{120}$ (= 0.125) oe			M1
		e.g. $15 \div 1.2$ **or** $15 \div 120 \times 100$ **or** $15 \times 100 \div 120$			M1 dep
			12.5(0)	3	A1 accept (£)12.5, (£)12.50p, 1250p if the £ sign is crossed out
					Total 8 marks

16 ALT	(a)	4 × 120 (= 480)			M1
		e.g. 120 ÷ 2 × 1 (= 60) **or** 120 × 0.4 × 3 (= 144) **or** (120 – '60' – '48') × 4 (= 48) **or** 120 × 0.1 × 4 (= 48)			M1 for a method to find the profit of one of the books
		e.g. (120 ÷ 2 × 1) + (120 × 0.4 × 3) + ((120 – '60' – '48') × 4) (= 252) **or** (120 ÷ 2 × 1) + (120 × 0.4 × 3) + (120 × 0.1 × 4) (= 252) **or** '60' + '144' + '48' (= 252)			M1 for a complete method to find the total profit
		'252' ÷ '480' × 100 oe			M1 for a complete method to find the percentage profit
			52.5	5	A1 accept 53
	(b)	e.g. 1 + 0.2 (= 1.2) **or** 100(%) + 20(%) (= 120(%)) **or** $\dfrac{15}{120}$ (= 0.125) oe			M1
		e.g. 15 ÷ 1.2 **or** 15 ÷ 120 × 100 **or** 15 × 100 ÷ 120			M1 dep
			12.5(0)	3	A1 accept (£)12.5, (£)12.50p, 1250p if the £ sign is crossed out
					Total 8 marks

17	(a)	$\dfrac{15}{6}$ **or** $\dfrac{6}{15}$ **or** $\dfrac{4.2}{6}$ **or** $\dfrac{6}{4.2}$ oe 2.5 **or** 0.4 **or** 0.7 **or** 1.4(2857......)			M1 for a correct scale factor, accept ratio notation eg 6 : 15
			10.5	2	A1 oe
	(b)	19.5 ÷ 2.5 **or** 19.5 × 0.4 oe **or** $4.2 \times \dfrac{19.5}{(a)}$			M1 If using *DF* ft their answer from part (a)
			7.8	2	A1 oe
					Total 4 marks

18		e.g. 30 × 26.8 (= 804) **or** 13 × 25 (= 325) **or** (26.8 – 25) × 30 **or** 1.8 × 30			M1 for finding the total marks for the boys or the total test marks
		e.g. (30 × 26.8 − 13 × 25) ÷ (30 − 13) (= 28.1764...) **or** ('804' – '325') ÷ (30 – 13) (= 28.1764...) **or** ('804' – '325' ÷ 17) (= 28.1764...) **or** ((26.8 – 25) × 30) ÷ 17 + 25 (= 28.1764...) **or** '1.8' × 30 ÷ 17 + 25 (= 28.1764...)			M1 for a complete method to find the mean mark for the girls
			28.2	3	A1 accept 28.15 – 28.2 (accept without working) (Accept 28 from complete working)
					Total 3 marks

19		$(x) \times 1000$ **or** $(x) \div 60$ **or** $(x) \div 60 \div 60$ **or** $(x) \times 1000 \div 60$ oe			M1 for at least **one** of $\times\,1000$ **or** $\div\,60$ **or** $\dfrac{5}{18}$ oe
		$x \times \dfrac{1000}{60 \times 60}$ oe			M1 (dep) for a complete correct method
			$\dfrac{5}{18}x$	3	A1 accept $0.2\dot{7}x$ **or** $0.2\overline{7}x$ **or** $\dfrac{x}{3.6}$ **or** $\dfrac{1}{3.6}x$
					Total 3 marks

Using elimination then substitution					
20		e.g. $x + 2y = -0.5$ $+\ 6x - 2y =\ \ 32$ $(7x = 31.5)$	e.g. $3x + 6y = -1.5$ $-\ 3x - y =\ \ 16$ $(7y = -17.5)$		M1 for a correct method to eliminate x or y: coefficients of x or y the same **and** correct operation to eliminate selected variable
		e.g. '4.5' + 2y = −0.5 **or** 3 × '4.5' − y = 16	e.g. $x + 2 \times$ '−2.5' = −0.5 **or** 3x − '−2.5' = 16		M1 (dep) for substituting their value found of one variable into one of the equations **or** for repeating above method to find second variable
			$x = 4.5$ $y = -2.5$	3	A1 (dep on first M1) for both solutions
					Total 3 marks

		Using substitution				
20		$3(-0.5 - 2y) - y = 16$ $(7y = -17.5)$ **or** $\dfrac{16+y}{3} + 2y = -0.5$ $(7y = -17.5)$	$3x - \left(\dfrac{-0.5 - x}{2}\right) = 16$ $(7x = 31.5)$ **or** $x + 2(3x - 16) = -0.5$ $(7x = 31.5)$			M1 for correctly writing x or y in terms of the other variable and correctly substituting (condone any one arithmetic error)
		e.g. $x = -0.5 - 2'{-}2.5'$ or $x = \dfrac{16 + '-2.5'}{3}$	e.g. $y = \dfrac{-0.5 - '4.5'}{2}$ or $y = 3'4.5' - 16$			M1 (dep) for substituting their value found of one variable into one of the equations
				$x = 4.5$ $y = -2.5$	3	A1 (dep on first M1) for both solutions
						Total 3 marks

21		$\tan(BCA) = \frac{234}{356}$	$\tan(ABC) = \frac{356}{234}$			M1 candidates that use Pythagoras to find BC can gain M1 for $\cos BCA = \frac{356}{\sqrt{234^2+356^2}}$ **or** $\sin BCA = \frac{234}{\sqrt{234^2+356^2}}$ **or** $\sin ABC = \frac{356}{\sqrt{234^2+356^2}}$ **or** $\cos ABC = \frac{234}{\sqrt{234^2+356^2}}$
		$(BCA =)$ $\tan^{-1}\left(\frac{234}{356}\right)$ $(=33(.317...))$	$(ABC =)$ $\tan^{-1}\left(\frac{356}{234}\right)$ $(=56(.682...))$			M1 (dep) complete method to find angle BCA or ABC
		$270 + '33.317...'$	$360 - '56.682...'$			M1 complete method
				303	4	A1 accept 303 – 303.4
						Total 4 marks

22	(a)		$y = 5x - 3$ oe	2	B2 fully correct equation eg $y = 5x + -3$ or $y - -3 = 5(x - 0)$
					If not B2 then B1 for
					$y = 5x$ or $y = 5x + a$ or $y = bx - 3$ ($b \neq 0$) or ($L=$) $5x - 3$
	(b)	$x \geq 0$, $x \leq 2$, $y \geq 1$, $y \leq 3$ or	$0 \leq x \leq 2$ $1 \leq y \leq 3$	2	B2 fully correct oe
					(B1 for 2 or 3 out of 4 inequalities correct)
					(Treat double−ended inequalities as two separate inequalities)
					(SC B2 $y > 3$, $y < 1$, $x < 0$, $x > 2$)
					Accept <, ≤, > and ≥ throughout
					Total 4 marks