Countdown to your final Maths exam ... part 14 (2018)

Examiners Report & Markscheme

Mark Scheme

Q1.

		Working	Answer	Mark	Notes
	(a)		$6n - 3$	2	M1 for attempt to establish linear expression in n with coefficient of 6 e.g. $6n + k$ where k is an integer (accept $n = 6n - 3$ for one mark) A1 cao
	(b)		No + Reason	1	C1 ft from their answer to part (a) for decision and explanation eg " stating no and because all the terms in the sequence are odd **and** 150 is even" **or** "no and '$6n - 3$' = 150, $n = 153/6$ ... so n is not an integer" **or** Continuing the sequence to show terms 147 **and** 153 and state "no as 150 is not in the sequence" oe

Q2.

Question	Working	Answer	Mark	Notes
		92, 65, 23	P1	for two of x, $4x$ and $4x - 27$ (where x is the smallest angle)
			P1	(dep) for equation summing their three angles to 180, eg $x + 4x + 4x - 27 = 180$
			P1	(dep P1) for correct process to simplify their algebraic expression, eg $9x - 27$ (=180)
			P1	for correct process to solve their equation of the form $ax + b = 180$
			A1	for three correct angles (order irrelevant)

Q3.

Question	Working	Answer	Mark	Notes
(a)		$2\mathbf{b}$	B1	oe
(b)		$\mathbf{b} - \mathbf{a}$	B1	oe
(c)		$-\mathbf{a} - \mathbf{b}$	B1	ft oe

Q4.

Question		Working	Answer	Mark	Notes
	(a)		6	1	B1 cao
	(b)		11	1	B1 cao
	(c)	(s, Δ) = (2,1), (3,3), (4,5), (5,7), (6, 9), (7, 11), (8, 13), (9, 15), (10, 17)	17	2	M1 for relating number of triangles to number of stars for at least one pattern greater than Pattern 7, eg (8, 13), (9, 15) or (10, 17) or for identifying Pattern 9 A1 cao

Q5.

5MB2F/01 June 2015				
Question	**Working**	**Answer**	**Mark**	**Notes**
		80, 75 reason	2	B1 cao B1 for correct reason, e.g. take 5 (each time)

Q6.

Question		Working	Answer	Mark	Notes
	(a)		Odd	1	B1 cao
	(b)		$5n$	1	B1 cao
	(c)		$\frac{t}{4}$	1	B1 oe

Q7.

Question	Working	Answer	Mark	Notes
		Tea £1.40	P1	for setting up two appropriate equations eg $3t + 2c = 7.80$, $5t + 4c = 14.20$
		Coffee £1.80	M1	for method to eliminate one variable, condone one arithmetic error
			M1	for method to substitute found variable or start again
			A1	Tea £1.4(0) and Coffee £1.8(0) with amounts linked to correct drinks

Q8.

Question		Working	Answer	Mark	Notes
			$4n + 2$	2	B2 for $4n + 2$ oe (eg $4\times n + 2$ or $n4 + 2$, ...) or nth = $4n + 2$ (B1 for a linear expression in $4n$ e.g. $4n + a$ ($a \neq 2$) or $n = 4n + 2$) (B0 for $n = 4n$ and $n + 4$)

Q9.

PAPER: 5MB1F_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
		$\frac{x+x+5+2x}{3}$	2	M1 for intention to add x, $x + 5$, $2x$ or $4x + 5$ seen or ambiguous answer, e.g. "$4x + 5$" ÷ 3 A1 for $\frac{x+x+5+2x}{3}$ oe

Q10.

Question		Working	Answer	Mark	Notes
		$(x + x + 3 + 2x) \div 3$ $= (4x + 3) \div 3$	$\frac{x+x+3+2x}{3}$ oe	2	M1 $x + x + 3 + 2x$ (=$4x+3$) oe or $4x + 3 \div 3$ oe A1 $\frac{x+x+3+2x}{3}$ oe

Q11.

Question		Working	Answer	Mark	Notes
*		$x+2 + 2x+3 + 2x + x + 3 + 2$ $= 6x + 10$ $=2(3x + 5)$ OR Half way round × 2 = $(x+2 + 2x+3) \times 2$ $= 3x + 5$ Perimeter = $2(3x + 5)$	Proof	4	B1 for $x + 2$ or $2x + 3$ seen M1 for perimeter = "$x+2$" + "$2x+3$" + $2x + x + 3 + 2$ oe A1 for $6x + 10$ C1 (dep) for factorising $6x + 10$ to give $2(3x + 5)$ OR B1 for $x + 2$ or $2x + 3$ seen M1 for $2 \times$ ("$x+2$" + "$2x+3$") A1 for $6x + 10$ C1 (dep) for doubling $3x + 5$ to give perimeter = $2(3x + 5)$

Q12.

		Working	Answer	Mark	Notes
		$2x$ $x+3$ $x+2x+x+3$	$x+2x+x+3$	2	M1 $2x$ or $x+3$ A1 $x+2x+x+3$ oe

Q13.

PAPER: 5MB3F_01					
Question		Working	Answer	Mark	Notes
			6 or −6	3	M1 for $43 - 7$ (=36) or $\sqrt{43}$ M1 for correct order of operations −7 then intention to square root A1 for 6 or −6 or both OR M1 for $x^2 - 7 = 43$ M1 for adding 7 to both sides A1 for 6 or −6 or both

Q14.

Question	Working	Answer	Mark	Notes
(a)(i)		16	1	B1 cao
(ii)		Reason	1	B1 add 3 or 3 ×5+1or 3n+1
(b)		25	1	B1 cao
(c)		Yes with reason	1	B1 for "Yes" and "keep adding 3" oe 3×11+1 or 11th term or multiple of 3 plus 1

Q15.

Question	Working	Answer	Mark	Notes
		72	4	M1 for "x" + 24 or "x" – 24 or for "g" and 5"g" M1 for forming an appropriate equation eg $x + 24 = 5(x - 24)$ or for $(5g - g) \div 2 = 24$ or $g = 12$ M1 for correct operations to isolate x terms and non-x terms in an equation of the form $ax + b = cx + d$ or $ax + b = c(x + d)$ or $x = 36$ or for 6 × "12" oe A1 cao

Q16.

Question	Working	Answer	Mark	Notes
(a)	$1 - 0.3 - 0.1 - x$	$0.6 - x$	2	M1 for $0.3 + 0.1 + x + P(2) = 1$ oe A1 $0.6 - x$ or $^6/_{10} - x$ or $1 - (0.4 + x)$ or $1 - 0.3 - 0.1 - x$
(b)	$0.3 + 0.1$	0.4	1	B1 cao
(c)		$300x$	1	B1 for $300x$, $x \times 300$ oe

Q17.

PAPER: 5MB3F_01					
Question		Working	Answer	Mark	Notes
	(i)		$N = 3x + 7$	5	M1 for $x + x + 3 + x + 4$ (=N) A1 cao
	(ii)		21		M1 ft for 61 = "$3x + 7$" M1 for isolating the x A1 ft "18" + 3 OR M1 for choosing a value of x and stating x, $x+3$, $x+4$ M1 for adding their values A1 ft

Q18.

Question		Working	Answer	Mark	Notes
			13.75	5	M1 for finding perimeter of rectangle e.g. $5x+5+5x+5+4x+4x$ $(=18x+10)$ M1 for finding perimeter of trapezium e.g. $9x-2+7x-2+10x$ $(=26x-4)$ M1 for equation e.g. $26x-4=18x+10$ (or $8x=14$) A1 for finding the value of x as 1.75 B1 ft for subs of x into $5x+5$ and evaluated (=13.75)

Q19.

Question		Working	Answer	Mark	Notes
	(a)		29	1	B1 cao
	(b)(i)		45	2	B1 ft from (a)
	(ii)		Explanation		B1 for a complete method to generate the eleventh term.

Q20.

Question	Working	Answer	Mark	Notes
		130	4	M1 for setting up two correct equations eg $3p+4c=440$ $4p+3c=470$ M1 for adding the two equations eg $7p+7c=910$ or for a correct method to eliminate one variable (allow one error) M1 for a method to find $p+c$ eg $910\div7$ or for a complete method to find both p and c ($p=80$, $c=50$) A1 for 130 or £1.30(p) NB: Allow any letters for variables. Allow a non-algebraic approach eg 7 kg potatoes and 7 kg carrots costs a total of 910

Q21.

PAPER: 5MB3H_01					
Question		Working	Answer	Mark	Notes
*		eg $2a+3c=28.2$ $3a+5c=44.75$ $6a+9c=84.6$ $6a+10c=89.5$ $c=4.9$ $2a+14.7=28.2$ $2a=13.5$ $a=6.75$	Adult ticket £6.75 Child ticket £4.90	5	M1 for correctly stating both equations algebraically M1 for correct process to eliminate one variable (condone one arithmetic error) M1 (dep) for correct substitution of their found value to find other variable OR (indep) correct process to eliminate second variable (condone one error in arithmetic) A1 for 6.75 or 4.9 C1 for Adult ticket £6.75 and Child ticket £4.90 in correct money notation

Examiner's Report

Q1. Questions on finding the *n*th term of an arithmetic sequence regularly appear on our papers so it is surprising to see so many answers of $n + 6$ instead of $6n - 3$.
In part (b), a multitude of solutions fell short of the mark because they were incomplete, eg 'they are all odd', without mentioning that 150 was even or saying that the value of n or $^{153}/_{6}$ is not an integer without stating the equation $6n - 3 = 150$. It was also commonly thought that, because 15 was in the sequence, 150 was as well.

Q2. Correct answers were quite common and it was pleasing that some of these came from an algebraic approach. However, such algebraic attempts were rare. Many of the students using algebra got no further than writing down expressions for the three angles. Sometimes only two of the three expressions were correct, usually x and $4x$. The third angle proved to be the most problematic, with incorrect expressions such as $x - 27$ and just -27 seen. Relatively few students were able to use their three expressions to set up an equation. The majority of correct answers came from a trials approach rather than from an algebraic method. Students who used a trials approach that did not result in the correct answer gained no marks.

Q3. Vector geometry is new to foundation specification. Very few students understood what to do at all and as a result very few marks were scored.

Q4. Almost all students identified correctly the number of stars in Pattern 5 and most students also identified the number of triangles in Pattern 6, though some students counted the number of triangles in the next pattern, Pattern 5.

More able students also answered part (c) correctly. Some less able students drew an incorrect diagram which consisted of a parallelogram formed from the triangles rather than a trapezium. ome students found the number of triangles corresponding to the pattern with 5 stars then doubled this to find the number of triangles corresponding to the pattern with 10 stars, a clearly incorrect strategy.

Q5. This question was done. Most students were able to write down the next two terms in the sequence and explain how they got their answer. A common incorrect answer in part (ii) was "all multiples of 5".

Q6. Overall, this question was answered very poorly. In part (a), few students identified $2n - 1$ as an odd number. Incorrect answers included 'even' and 'prime' but many students gave numerical answers or expressions involving n. Students were slightly more successful in part (b). Many of the incorrect answers were attempts at expressions in n, eg $5n + 5$ and $n + 5$, but answers such as '25' and '$n = 5$' were also quite common. Part (c) was answered very poorly. Common incorrect answers were '$4t$', '$4t - 1$' and '$t = 4$'.

Q7. Forming and solving simultaneous equations proved to be where many students stopped gaining marks. Many students attempted to solve this problem through a trial and improvement method, normally with little or no success. Of those who gained a mark for forming 2 equations, many then had no strategy for solving them. Those who did have a strategy often made arithmetic errors leading to incorrect answers.

Q8. The majority of candidates were able to score at least one mark, and often two marks, on this question. $4n - 2$, $4n + 6$, $n = 4n + 2$ and $4n$ were all common responses each gaining one mark. The most common incorrect answers seen gaining no credit were $n + 4$ and $2n \pm 4$. Some candidates wrote 22, the next term of the sequence, as their final answer.

Q9. This question was answered very poorly. Students struggled to write down correct expressions for the number of cars Harry and Regan each sold. Common errors included writing $5x$, rather than $x + 5$, for the number of cars Harry sold and either x^2 or $x + 5 \times 2$, instead of $2x$, for the number of cars Regan sold. Some students were awarded one mark for adding three correct expressions but $4x + 5$ was usually then given as the final answer. Very few students attempted to divide their total by 3. Many students did not appear to appreciate that Regan sold twice as many cars as Dan or that the question asked for the *mean number* of cars sold.

Q10. Many attempted an addition of the algebraic terms, though it was not always clear whether this showed understanding of working towards the mean. Where this was done, some credit was given. Many better candidates made the error of expressing their answer ambiguously, for example as $4x + 3 \div 3$. There were very few completely correct answers. But this was the last question on the paper.
Q11. Very few candidates were able to show a clear set of steps starting with correctly identifying the missing sides on the diagram, then adding their terms, arriving at $6x + 10$ and then showing that this factorises to $2(3x + 5)$, however, they did realise that they needed to show some working out and rarely did candidates just offer a purely worded answer.

Many failed to attempt this question leaving a blank response. Some expanded $2(3x + 5)$ but did nothing else so also achieved no marks. A few candidates did start by identifying the missing sides achieving b1 for $x + 2$ or $2x + 3$ and some went on to also achieve m1 for adding the sides, however, there were frequent examples of incorrect simplifying eg $2x + 3 = 5x$ both in candidates working out and written by the diagram.

Some of these candidates did however manage to pick up M1 by demonstrating that they understood that for perimeter they needed to add all the terms for the side lengths though often failed to get A1 as they had incorrectly

assigned numbers to the missing sides or incorrect algebraic terms.

Q12. This question was answered surprisingly poorly. Many candidates gave an incorrect answer with no working and got no marks. Those who first wrote down separate expressions for the number of pets Agatha and Isabel each had could often be awarded one mark for a correct expression. Common errors included writing x^2 rather than $2x$ for the number of pets Agatha had and either $3x$ or x^3 instead of $x + 3$ for the number of pets Isabel had. Some candidates wrote the correct expressions but did not add them or forgot to add x for Katie. Many candidates did not appear to appreciate that Isabel had three more pets than Katie or that the question asked for the **total number** of pets. A very common incorrect answer was $2x + 3$. Some candidates wrote $\times 2 + 3$ or tried to substitute numbers to give the total number of pets.

Q13. Students attempted this question well and often gained full marks, though not needed, it was rare to see -6 as the other possible answer. Common errors included not using the inverse operations or, if they did, not performing them in the correct order.

Q14. 98% of candidates scored at least 1 mark on part (a) with nearly 90% scoring both available with an explanation of how the next term could be found. In order to score the second mark it was important for candidates to not only mention the term to term difference of 3 but also note that the sequence was increasing and so 3 needed to be added. Some candidates gave the correct nth term rule 3n + 1 instead.

75% of candidates gave the correct 8th term of the sequence in part (b). The most common errors involved giving the 9th term 28 or 24 from 8 × 3. 50% of candidates gave a correct explanation in part (c) with incorrect answers referring only to multiples of 3 or the alternating odd and even terms of the sequence.

Q15. This question proved to be beyond most students. Some did attempt an algebraic approach but this was not generally successful as they could not cast the problem into the form of finding the solution of an algebraic equation. This was usually because they had no clear idea of what their "x" stood for and how this could be used to express the final amounts Gemma and Betty had and so get a valid equation. For those attempting an algebraic method, $x - 24 = 5x$ was the most common approach, leading to $x = 6$ (sic). A few students used a trial and improvement approach – if they found the correct final amounts for the two girls and clearly stated this they were awarded three marks and if they went to state the total, all four marks

Q16. In part (a) most candidates knew that the probabilities added to unity but many were unable to write a suitable expression. Answers which put a letter y (say) in the empty box and then went on to $x + y + 0.1 + 0.3 = 1$ were awarded one mark and if they rewrote this correctly in the form y = they were given the second mark. Answers such as p(2) = 0.6 – x or p(2) = 1 – (0.4 + x) were given full marks but not 2 = 0.6 – x or x = 0.6 – x

Part (b) was very well done but many candidates had problems with part (c) where the expression np was often not known.

Q17. At this stage in the paper there were many who failed to attempt this question. Of those who did, the weaker students attempted it by numerical methods, which all too frequently resulted in no marks. Of those who did attempt some algebra, the equation was sometimes not equated to N, but did attract some marks in (b) when simplified, though some students rejected their algebra in (a) for a numerical approach in (b).

Q18. This was another question which was often left blank. Those who did attempt it seemed to understand what was meant by perimeter and gave correct expressions for both shapes. If they simplified the perimeter of the trapezium they often put +4 instead of -4 and some left the number out completely. The perimeter of the rectangle was sometimes given as $9x + 5$, because the candidate had only considered the two labelled sides of the rectangle.

A significant number of students found the perimeters of the trapezium and rectangle but rather than equate them, they set them both to zero or 360 and tried to solve which resulted in two values for x and nowhere to go from there. Once the correct equation was formed, most students were able to solve it to find a value for x but some failed to substitute this value into $5x + 5$ to find the length of ST. Cases of trial and improvement were also seen.

Q19. Very few incorrect answers were seen in part (a).

Part (b) saw most candidates obtain the result of 45, although 41 and 49 were also answers presented. Many candidates answered this correctly with an increased number using the nth term rule, even though this was not asked for specifically. Another common reason given was 'add 4 each time'. Quite frequently a B1 mark was lost because the answer was a number other than 45 even though their explanation was correct.

Q20. There were not many students who successfully found the total cost of 1 kg of potatoes and 1 kg of carrots. Of those that did, most tried to solve their equations simultaneously rather than go directly to 7 kg potatoes + 7 kg carrots costs 910 pence which could lead directly to the correct answer. Some did score one mark for setting up two appropriate equations using + and = but then struggled to continue. The most common error was to see two equations written as 3 kg + 4 kg = 440 with 4 kg + 3 kg = 470 which scored no marks.

Q21. Most students did not realise that they needed to set up a pair of simultaneous equations. The students who did successfully set up two equations sometimes got no further than this. It was surprising to see just how many students mistakenly based their method on working out £28.20 ÷ 5 and £44.75 ÷ 8. Attempts using a trial and improvement approach were again frequently seen. They were almost always unsuccessful.