Countdown to your final Maths exam ... part 5 (2017)

Examiners Report & Markscheme

Examiner's Report

Q1. No Examiner's Report available for this question

Q2. The correct answer was often seen but not always the result of the most straightforward method. Many candidates found the length *DF* by Pythagoras and then used sine or cosine. Some even attempted to use the sine rule. However, many choosing these alternative approaches made careless mistakes in their algebraic manipulation and failed to score as a result.

A significant number started well with "tan = $\frac{86}{37}$" but could go no further.

Q3. No Examiner's Report available for this question

Q4. No Examiner's Report available for this question

Q5. This question was not always attempted. When it was attempted, a common error was for students to calculate $10^2 + 5^2$ rather than $10^2 - 5^2$ in their application of Pythagoras' Theorem. Premature rounding led some students to lose accuracy in their answers and consequently score 3 out of the 4 marks available.

Q6. Many students did not recognise that this was a trigonometry question and attempted to use angle rules for parallel lines or triangles to calculate the angles, scoring no marks. A few did manage to write down SOHCAHTOA in one form or other but were unable to use it. Some students tried to substitute 24 and 15 into the same formula, eg tan$x$=15/24. Many of those who did use trigonometry appropriately were successful at finding *BD*. Unfortunately some of those who found *BD* as 13.24 rounded it prematurely to 13 and consequently lost the accuracy in their final answer. Some used cos and found *AD* but thought it was *BD*. After finding *BD* the majority used Pythagoras' theorem to find the hypotenuse *CD* (usually successfully) but then many just left this as their answer, unsure how to proceed. Students finding *CD* did not get any more marks unless they then went on and used it correctly to find angle *BCD*. Relatively few students managed a fully correct solution with an answer in the given range.

Q7. No Examiner's Report available for this question

Q8. This was generally answered poorly. Many were not aware of what was required and attempted to incorrectly simplify the expression as $8e^2$ or $8e^3$. Of those that attempted to factorise, many students gave 3*e* or 3 as a factor.

In part (b) many gained a mark for expanding the bracket with only the most able students going on to isolate the terms in *k*. A few students gained the correct answer by trial and improvement. Students need to be made aware that using the method of trial and improvement in questions such as this is a risky strategy as they will either score all the marks for a correct answer or no marks at all.

Students seem to have very little understanding of the process of changing the subject of the formula. In part (c) those that had some understanding commonly did the operations in the wrong order, leading to $a = (f - 1) \times 2$. Others simply swapped *f* and *a*.

Q9. The two approaches of using "area of a triangle = $\frac{1}{2}$absinC" to find the area of half the parallelogram and finding the "vertical height" of the parallelogram were both commonly seen. Students who used the former were often successful, other students less so. Some students attempted to split the shape into a rectangle and two triangles but this approach was not often completed successfully. A small proportion of students split the parallelogram by joining B to D then tried to use the 20° angle formed in the formula $\frac{1}{2}$ absinC but again this was not successful. Weak students either did not attempt the question or simply calculated "7 × 5".

Q10. This was the first question on the paper that was poorly attempted. The preferred route taken by candidates was to find either AB or AC, which was nearly always correctly done. Most of these candidates then went on to substitute their values into ½abSinC with just a few using the wrong value for the included angle. A few candidates, having found the slant height, used it as the perpendicular height of the triangle when calculating the area using ½ b×h, resulting in the loss of marks. It was rare to see the triangle split into two right angled triangles and tan54 used to find the height, though those who chose this route usually did it well.

Q11. No Examiner's Report available for this question

Q12. No Examiner's Report available for this question

Q13. Part (a) was usually correctly answered well with students showing a sound understanding of Pythagoras. A few did try to find an angle first and then work out the distance from the tree to the tower. In part (b), many students were able to correctly find the size of one of the angles but the understanding of bearings was poor. Some students insisted on finding an angle using either, or in some cases both, the sine or cosine rules. Often this lead to inaccuracies, as a result of premature approximations. A significant number of students simply measured the angle with a protractor ignoring the fact that the diagram was not drawn to scale.

Q14. Both parts seemed to be beyond many students entered for this exam. Part (a) was a test of knowledge of circle theorems. Students could answer by using the classical 'The angle in a semi circle is a right angle' but reference to the alternate segment theorem was also accepted.
In part (b) students were expected to use sine to find the opposite, then double to get the diameter followed by using cosine to get the required length. Many students clearly had no knowledge of trigonometry so scored no marks. Others showed confusion between sine, cosine and tangent and also generally scored no marks. Some lost a mark because of premature approximation – they truncated 8 sin35° to 4, so their diameter was 8 and 8cos70° was outside the allowed tolerance. This also tended to happen for those who used a combination of cosine and Pythagoras's Theorem in triangle *ABO* and a combination of sine and Pythagoras's Theorem in triangle *DBC*, although they could earn the three method marks.

Mark Scheme

Q1.

Paper 1MA1: 1F			
Question	Working	Answer	Notes
(a)		$\frac{\sqrt{3}}{2}$	B1
(b)		6	M1 starts process eg $\sin 30 = \frac{x}{12}$ A1 answer given

Q2.

PAPER: 5MB3H_01				
Question	Working	Answer	Mark	Notes
		66.7	3	M1 for $\tan (y =) \frac{86}{37} (= 2.3243..)$ M1 (dep) for $\tan^{-1}$ "2.32(43..)" = or $\tan^{-1} (\frac{86}{37})$ (accept 'shift tan' or 'inv tan' for $\tan^{-1}$) A1 for answer in the range 66.6° to 66.8° [SC: B1 for an answer in the range 23.2 to 23.3 if M0 scored]

Q3.

Question	Working	Answer	Mark	AO	Notes
(a)		5	B	1.3a	B1
(b)		26	B	1.3a	B1

Q4.

Question	Working	Answer	Notes
(a)		$4x + 6y$	M1 for $4x$ or $6y$ A1 for $4x + 6y$ or $2(2x + 3y)$
(b)		$5(2x - 3)$	B1 cao
(c)		4	M1 for method to isolate terms in p on one side and constants on the other side A1 cao

Q5.

PAPER: 5MB3H_01				
Question	Working	Answer	Mark	Notes
		9.54	4	M1 for $10^2 - 5^2$ (= 75) or (BD =) $10 \times \cos 30$ (= 8.66...) M1 for "75" + 4^2 (= 91) or "8.66..."^{2} + 4^2 (= 91) M1 for $\sqrt{(10^2 - 5^2 + 4^2)}$ or $\sqrt{(\text{"8.66..."}^2 + 4^2)}$ A1 for 9.53 − 9.54

Q6.

PAPER: 1MA0/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
		28.9	5	M1 for $\sin 62 = \frac{BD}{15}$ or $\frac{BD}{\sin 62} = \frac{15}{\sin 90}$ oe M1 for ($BD =$) $15 \times \sin 62$ or $\frac{15}{\sin 90} \times \sin 62$ oe (= 13.24...) M1 for $\tan BCD = \frac{\text{"13.24"}}{24}$ oe or $\tan BDC = \frac{24}{\text{"13.24"}}$ with BDC clearly identified M1 for $BCD = \tan^{-1}\frac{\text{"13.24"}}{24}$ oe or $BDC = \tan^{-1}\frac{24}{\text{"13.24"}}$ with BDC clearly identified A1 for 28.8 – 28.9 **OR** M1 for $\cos(90 - 62) = \frac{BD}{15}$ M1 for ($BD =$) $15 \times \cos(90 - 62)$ (= 13.24...) M1 for $\tan BCD = \frac{\text{"13.24"}}{24}$ oe or $\tan BDC = \frac{24}{\text{"13.24"}}$ with BDC clearly identified M1 for $BCD = \tan^{-1}\frac{\text{"13.24"}}{24}$ oe or $BDC = \tan^{-1}\frac{24}{\text{"13.24"}}$ with BDC clearly identified A1 for 28.8 – 28.9

Q7.

Question	Working	Answer	Notes
(a)		explanation	C1 for "incorrect expansion of brackets" oe
(b)		explanation	C1 for "has not obtained both solutions" oe

Q8.

PAPER: 1MA0_1F					
Question		**Working**	**Answer**	**Mark**	**Notes**
	(a)		$e(3e + 5)$	1	B1 for $e(3e + 5)$
	(b)		4	3	M1 for intention to expand brackets eg $7k - 21$ **or** division of all terms on RHS by 7 as a first step M1 for correct method to isolate terms in k in an equation A1 cao
	(c)		$a = 2f - 1$	2	M1 for a correct first step eg intention to multiply both sides by 2 A1 cao

Q9.

PAPER: 1MA0_2H				
Question	Working	Answer	Mark	Notes
		22.5	3	M1 for $\frac{1}{2} \times 7 \times 5 \times \sin 40$ or $\frac{1}{2} \times 7 \times 5 \times \sin(180 - 40)$ M1 (dep M1) for doubling the area of the triangle A1 for 22.4 – 22.5 OR M1 for complete method to find height of parallelogram, eg 5 sin40° M1 (dep M1) for complete method to find the area of the parallelogram, eg 7 × 5sin40° A1 for 22.4 – 22.5

Q10.

PAPER: 1MA0_2H				
Question	Working	Answer	Mark	Notes
		49.5	4	M1 for $\tan 54 = \frac{\text{height}}{6}$ M1 for (height =) 6 × tan54 (=8.2-8.3) M1 for $\frac{1}{2} \times$ '8.258..' × 12 A1 for 49.2 - 50 **OR** M1 for $\cos 54 = \frac{6}{AC}$ M1 for $(AC =) \frac{6}{\cos 54}$ (=10.2(07...)) M1 for $\frac{1}{2} \times 12 \times$ '10.207' × sin54 A1 for 49.2 - 50 **OR** M1 for $\frac{AC}{\sin 54} = \frac{12}{\sin 72}$ M1 for $(AC =) \frac{12}{\sin 72} \times \sin 54$ (=10.2(07...)) M1 for $\frac{1}{2} \times 12 \times$ '10.207' × sin54 A1 for 49.2 – 50

Q11.

Question	Working	Answer	Mark type	AO	Notes
(a)		$p + c$	B	1.3a	B1
(b)		82.4°F	M A	1.3a 1.3a	M1 for correct substitution A1 cao
(c)		4.5	M A	1.3a 1.3a	M1 for subtracting 20 from both sides or dividing all terms by 4 A1 for 4.5 oe
(d)		$x(3x – 2)$	B	1.3a	B1

Q12.

Paper 1MA1:3F			
Question	Working	Answer	Notes
(a)		5	B1 cao
(b)		12	B1 cao
(c)		d^5	B1

Q13.

Paper: 5MB3H_01					
Question		Working	Answer	Mark	Notes
	(a)		5.0	3	M1 for $2.1^2 + 4.5^2$ or 4.41+20.25 or 24.66 M1 for $\sqrt{(2.1^2 + 4.5^2)}$ or $\sqrt{24.66}$ A1 for answer in the range 4.9 to 5.0
	(b)		115	4	M1 for a correct method to find the angle at the tower (A) or the angle at the tree (B), eg. $\tan(A) = \frac{4.5}{2.1}$ (= 2.14…) or $\tan(B) = \frac{2.1}{4.5}$ (= 0.46…) M1 for $\tan^{-1}\left(\frac{4.5}{2.1}\right)$ (= 64.98..) or $\tan^{-1}\left(\frac{2.1}{4.5}\right)$ (= 25.01…) A1 for 64.9(8...) or 25.0(1...) A1 for 115 or ft 180 – "64.98..." or 90 + "25.01"

Q14.

Question		Working	Answer	Mark	Notes
*	(a)			1	C1 for a complete reason eg Angles in a semicircle are 90°, alternate segment theorem
	(b)		2.75	4	M1 for 7 × sin 35 M1 for 7 × sin 35 × 2 M1 (indep) for "*DB*"× cos 70 A1 2.74 - 2.75