Q1.

ABD is a right angled triangle.

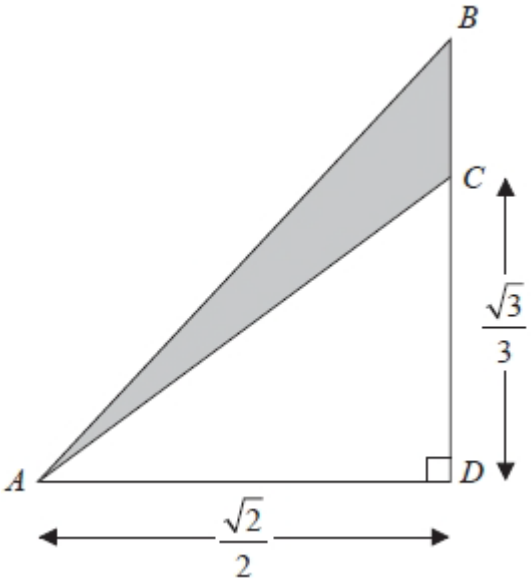

Diagram **NOT** accurately drawn

All measurements are given in centimetres.

C is the point on *BD* such that *CD* = $\frac{\sqrt{3}}{3}$

AD = *BD* = $\frac{\sqrt{2}}{2}$

Work out the exact area, in cm^2, of the shaded region.

..... cm^2

(Total for question = 3 marks)

Q2.
Here is a trapezium.

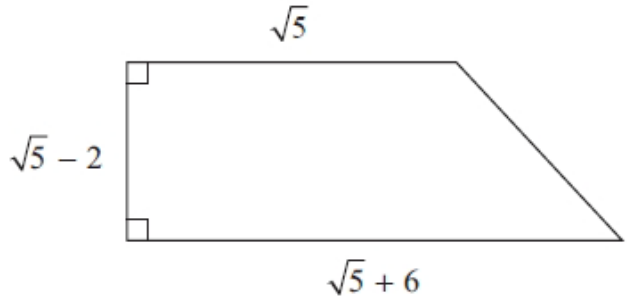

Diagram **NOT** accurately drawn

All measurements shown are in centimetres.

Work out the area of the trapezium.
Give your answer in cm^2 in the form $a\sqrt{5} + b$ where a and b are integers.

.....cm^2

(Total for question = 3 marks)

Q3.
Simplify fully $(\sqrt{a} + \sqrt{4b})(\sqrt{a} - 2\sqrt{b})$

.....

(Total for question = 3 marks)

Q4.
Write $(5 - \sqrt{5})^2$ in the form $a + b\sqrt{5}$, where a and b are integers.

.....

(Total for Question is 2 marks)

Q5.
Expand $(1 + \sqrt{2})(3 - \sqrt{2})$

Give your answer in the form $a + b\sqrt{2}$ where a and b are integers.

.....

(Total for Question is 2 marks)

Q6.

(a) Express $5\sqrt{27}$ in the form $n\sqrt{3}$, where n is a positive integer.

.....

(2)

(b) Rationalise the denominator of $\frac{21}{\sqrt{3}}$

.....

(2)

(Total for Question is 4 marks)

Q7.

(a) Factorise $y^2 - 5y - 14$

.....

(2)

(b) Expand and simplify $(2\sqrt{5} + 1)(3\sqrt{5} - 1)$

.....

(2)

(c) Write $\frac{6}{\sqrt{12}}$ in the form $\sqrt{n}$, where n is an integer.

.....

(2)

(Total for question = 6 marks)

Q8.

The perimeter of a square is $\sqrt{120}$ cm. Work out the area of the square.

Give your answer in its simplest form.

..... cm^2

(Total for Question is 3 marks)

Q9.

* The diagram shows a triangle *DEF* inside a rectangle *ABCD*.

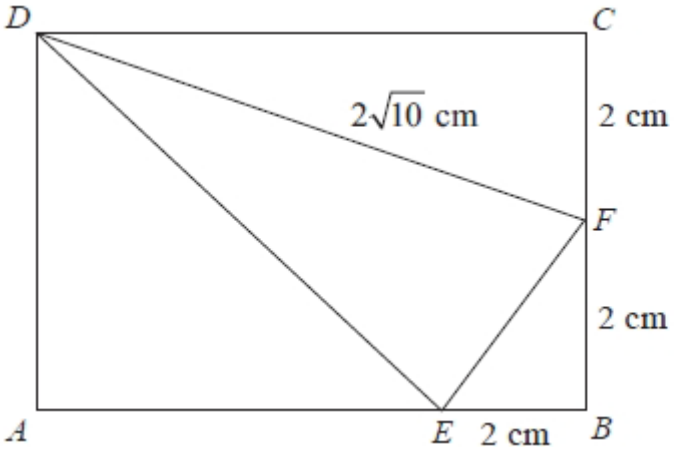

Diagram **NOT** accurately drawn

Show that the area of triangle *DEF* is 8 cm^2.
You must show all your working.

(Total for question = 4 marks)

Q10.

S is a geometric sequence.

(a) Given that $(\sqrt{x} - 1),\ 1 \text{ and } (\sqrt{x} + 1)$ are the first three terms of S, find the value of *x*.
You must show all your working.

.....

(3)

(b) Show that the 5th term of S is $7 + 5\sqrt{2}$

(2)

(Total for question = 5 marks)

Examiner's Report

Q1.
Very few attempted this question and of those that did few gained full marks. Areas of triangles were attempted to gain partial credit, but often ' $\frac{1}{2}$ ' was omitted. Working was often poorly presented and attempts at simplifying surds were generally weak.

Q2.
Only a very small minority of students was able to substitute the given expressions into the formula for the area of a trapezium, despite that also being on the formula sheet.
When they did, about half then went on to gain full marks.

Q3.
No Examiner's Report available for this question

Q4.
Many students were unable to deal with the surds. Many of those that could expand the two brackets wrote − 5 as the last term rather than + 5. This led to an incorrect answer of 20 − 10√5. Many others could not correctly combine the two 'middle' terms writing an answer of 30 + 10√5 whilst others gave an answer of 30 − 55.

Q5.
Few students scored full marks in this question but many scored 1 mark. Most of these students were able to expand the brackets to obtain 4 terms, but many made errors in dealing with the surds or with the signs. Common errors here were 3 × √2 = √6 and 2 × √2 = √4.

Q6.

In part (a) of this question approximately 10% of candidates could express $5\sqrt{27}$ as $15\sqrt{3}$, with a further 10% of candidates making some progress in breaking down to $\sqrt{9\times3}$, $\sqrt{9}\ \sqrt{3}$ or .

In part (b) about one quarter of candidates knew that multiplying both the numerator and the denominator by $\sqrt{3}$ (or a multiple of $\sqrt{3}$) was the key to rationalising the denominator and most of these candidates were successful in expressing $\frac{21}{\sqrt{27}}$ as $7\sqrt{3}$ or an acceptable equivalent (e.g.). A common error seen was multiplication of only the denominator by . Other candidates progressed as far as = , only to conclude their argument with "5 + $\frac{21\sqrt{3}}{3}$ = $8\sqrt{3}$ ".

Q7.
Part (a) was a standard trinomial factorisation and many candidates were able to show their skill. Many other candidates gained one mark by a nearly correct factorisation (the signs incorrect). They could have checked that their answer was correct by expanding and simplifying, as this skill is generally done more accurately.

Part (b) was an example of expanding brackets including surds and most candidates were able to supply four terms. Often the first term was wrong, being written as 6√5 instead of, for example, 6√25.

Surprisingly, some candidates gave their final answer as 30 + √5 − 1
Most candidates were well-primed to gain at least one mark in part (c) by multiplying numerator and denominator by √12 , although only a few could go on to simplify their expression to get √3 , with the answer being left as $\frac{\sqrt{12}}{2}$ or as √6

Q8.
This question was not done well. Few candidates could correctly write down the length of one side of the square, and many of those that could were unable to deal correctly with the subsequent calculations, often simplifying √120 ÷ 4 to √30.

Q9.
Only a very few students attempted this question and some just wrote 2 × 2 × 2 = 8 for answer. Some students gained 1 mark for the squaring and subtracting because they forgot the bracket around the $(2\sqrt{10})^2$. 2√10 = 5 was a common error, very few candidates found *CD* = 6 and those who did find *CD* correctly did not take it any further.
Some students made assumptions about the triangle *DEF*, any assumption made must be justified for any answer to be fully correct.

Q10.
The vast majority of students could make no progress with this question designed to test top grade students. Some students confused the geometric sequence with an arithmetic sequence and involved addition of the terms (rather than multiplication).

For part (b) there were again few attempts worth any credit with some students starting their working by using their calculator to write down the value of $7 + 5\sqrt{2}$ as a decimal.

The best students gave clear, concise and full solutions to this question.

Mark Scheme

Q1.

Question	Working	Answer	Mark	Notes
		$\frac{1}{4}-\frac{\sqrt{6}}{12}$	3	M1 for $\frac{1}{2}\times\frac{\sqrt{2}}{2}\times\frac{\sqrt{2}}{2}$ or $\frac{1}{2}\times\frac{\sqrt{2}}{2}\times\frac{\sqrt{3}}{3}$ M1 for $\frac{1}{2}\times\frac{\sqrt{2}}{2}\times\frac{\sqrt{2}}{2}-\frac{1}{2}\times\frac{\sqrt{2}}{2}\times\frac{\sqrt{3}}{3}$ A1 for $\frac{1}{4}-\frac{\sqrt{6}}{12}$ oe OR M1 for (BC =) $\frac{\sqrt{2}}{2}-\frac{\sqrt{3}}{3}$ M1 for $\frac{1}{2}\times\left\{\frac{\sqrt{2}}{2}-\frac{\sqrt{3}}{3}\right\}\times\frac{\sqrt{2}}{2}$ A1 for $\frac{1}{4}-\frac{\sqrt{6}}{12}$ oe

Q2.

5MB2H November 2016					
Question	**Working**	**Answer**	**Mark**	**Notes**	**Type**
	$\frac{(\sqrt{5}+\sqrt{5}+6)}{2}\times(\sqrt{5}-2)$ $(\sqrt{5}+3)(\sqrt{5}-2)$ $5+3\sqrt{5}-2\sqrt{5}-6$ $\sqrt{5}(\sqrt{5}-2)+\frac{6(\sqrt{5}-2)}{2}$ $5-2\sqrt{5}+3\sqrt{5}-6$	$\sqrt{5}-1$	3	M1 for $\frac{(\sqrt{5}+\sqrt{5}+6)}{2}\times(\sqrt{5}-2)$ M1 for expansion $5+3\sqrt{5}-2\sqrt{5}-6$ with 3 terms out of 4 correct including signs or all 4 terms correct ignoring signs A1 cao OR M1 for $\sqrt{5}(\sqrt{5}-2)+\frac{6(\sqrt{5}-2)}{2}$ M1 for expansion $5-2\sqrt{5}+3\sqrt{5}-6$ with 3 terms out of 4 correct including signs or all 4 terms correct ignoring signs A1 cao	E

Q3.

Question	Working	Answer	Notes
	$(\sqrt{a}+2\sqrt{b})(\sqrt{a}-2\sqrt{b})$ $\sqrt{a}\times\sqrt{a}-2\sqrt{a}\sqrt{b}+$ $2\sqrt{b}\sqrt{a}-2\sqrt{b}\times2\sqrt{b}$	$a-4b$	M1 for expansion of brackets or $\sqrt{4b}=2\sqrt{b}$ M1 for a or $(-4b)$ A1 cao

Q4.

PAPER: 5MB2H_01					
Question		Working	Answer	Mark	Notes
			$30-10\sqrt{5}$	2	M1 for 4 terms correct with or without signs or 3 out of exactly 4 terms correct (the terms may be in an expression or table) or $25-10\sqrt{5}+5$ A1 cao

Q5.

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
		$3-\sqrt{2}+3\sqrt{2}-\sqrt{2}\sqrt{2}$	$1+2\sqrt{2}$	2	M1 for 4 terms correct ignoring signs or 3 out of no more than 4 terms correct A1 cao

Q6.

Question	Working	Answer	Mark	Notes
(a)	$5\sqrt{9\times3}$	$15\sqrt{3}$	2	M1 for sight of $\sqrt{9\times3}$ or $\sqrt{9}\ \sqrt{3}$ or $3\sqrt{3}$ A1 for $15\sqrt{3}$ (accept $n = 15$)
(b)		$7\sqrt{3}$	2	M1 for $\frac{21\sqrt{3}}{\sqrt{3}\sqrt{3}}$ A1 for $7\sqrt{3}$ (accept $\frac{21\sqrt{3}}{3}$)

Q7.

5MB2H/01 June 2015				
Question	Working	Answer	Mark	Notes
(a)		$(y-7)(y+2)$	2	B2 cao (B1 for $(y\pm7)(y\pm2)$)
(b)		$\sqrt{5}+29$	2	M1 expand brackets, with at least 3 correct terms including signs or 4 correct terms ignoring signs eg $2\sqrt{5}\times3\sqrt{5}-2\sqrt{5}+3\sqrt{5}-1\times1$ A1 for $\sqrt{5}+29$ or $29+\sqrt{5}$
(c)		$\sqrt{3}$	2	M1 for $\frac{6}{\sqrt{12}}\times\frac{\sqrt{12}}{\sqrt{12}}$ oe or $\sqrt{12}=2\sqrt{3}$ A1 cao

Q8.

PAPER: 5MB2H_01					
Question		Working	Answer	Mark	Notes
			7.5	3	B1 for length given as $\frac{\sqrt{120}}{4}$ oe M1 for squaring $\frac{\sqrt{120}}{4}$ or $\frac{120}{4\times4}$ oe A1 for $\frac{120}{16}$ oe or $7\frac{1}{2}$ or 7.5 oe SC B1 for $\sqrt{30}\times\sqrt{30}$

Q9.

PAPER: 1MA0/1H				
Question	**Working**	**Answer**	**Mark**	**Notes**
		8	4	M1 for $(2\sqrt{10})^2 - 2^2$ (= 36) A1 for (CD =) 6 M1 (dep on M1) for '6' × 4 – $\frac{1}{2}$ × '6' × 2 – $\frac{1}{2}$ × 2 × 2 – $\frac{1}{2}$ × ('6' – 2) × 4 C1 for area of 8 from fully correct working

Q10.

Question	Working	Answer	Mark	Notes
(a)		2	M1	for start to express the common ratio algebraically, eg $1/(\sqrt{x} - 1)$ or $(\sqrt{x} + 1)/1$ or $\sqrt{x} + 1 = k \times 1$ or $1 = k \times (\sqrt{x} - 1)$
			M1	for setting up an appropriate equation in x, eg $1/(\sqrt{x} - 1) = (\sqrt{x} + 1)/1$
			C1	for convincing argument to show $x = 2$
(b)		Shown	M1	for expressing the relationship between the common ratio, one of the first three terms of the sequence and the fifth term, eg 5th term = 3rd term × (common ratio)^2
			C1	for a complete explanation to include eg, $(\sqrt{2}+1)(\sqrt{2}+1)^2 = 7 + 5\sqrt{2}$