A grade - Surds

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Question	Maximum Mark	Mark Awarded
1	2	
2	2	
3	5	
4	4	
5	3	
6	5	
Total Mark		

Education Achievement Service
for South East Wales
Gwasanaeth Cyflawni Addysg
i Dde Ddwyrain Cymru

1.

(a) Express $\sqrt{75}$ in the form $a\sqrt{b}$, where a and b are whole numbers. [2]

2.

(c) Evaluate $\dfrac{(7-\sqrt{3})(7+\sqrt{3})}{2}$.

State clearly whether your answer is rational or irrational. [2]

3. *(a)* Evaluate $6\sqrt{5} \times 2\sqrt{5}$.

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[2]

(b) Evaluate $\left(7\sqrt{2} - 4\sqrt{2}\right)^4$.

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[3]

4.

(c) Evaluate $(\sqrt{3})^6$.

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[1]

(d) Simplify $(2 + 3\sqrt{2})(5 - \sqrt{2})$.

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[3]

5. Evaluate $\left(\sqrt{50}-3\sqrt{2}\right)^2$. [3]

6. Simplify

$$\frac{\left(5\sqrt{3}\right)^2-\frac{2\sqrt{18}}{\sqrt{2}}}{\sqrt{32}\times\sqrt{2}}$$

and state whether your answer is rational or irrational. [5]

Marking Scheme

1.

Methods in Mathematics June 2015 Unit 1 Higher Tier	Mark	Comment
15.(a) $5\sqrt{3}$ or accept a = 5 with b = 3	B2	B1 for sight of 3×25 or $3\times5\times5$ Do not accept $3\sqrt{25}$, etc
(b) 2.4×10^{29}	B2 4	B1 for numerator 9.6×10^{23}, or for their numerator correctly divided by 4×10^{-6} provided equivalent difficulty

2.

Unit 2 GCSE Maths November 2015 HigherTier	MARK	FINAL MARK SCHEME Comment
14.(a) $x = 0{\cdot}3818181.....$ and $100x = 38{\cdot}181818....$ with an attempt to subtract 378/990 or 21/55 or equivalent.	M1 A1	Or $10x$ and $1000x$, or equivalent. Or a complete alternative method. An answer of $37{\cdot}8/99$ gains M1 only. Mark final answer. Do not ignore incorrect cancelling.
(b) (±) 1/10 or (±) 0.1	B2	B1 for 10^{-1} or $1/_4\sqrt{10000}$ or $1/10000^{1/4}$ or $(1/10000)^{1/4}$
(c) $[49 + 7\sqrt{3} – 7\sqrt{3} – \sqrt{3}\sqrt{3}]$ (/2) or equivalent = 23 AND rational.	M1 A1 6	Mark final answer. FT from 1 incorrect term or from $[49 + a – a – 3]$ (/ 2) for SC1.

3.

15.(a) 60 (b) 324	B2 B3 5	B1 for sight of $\sqrt{5}\times\sqrt{5} = 5$ B2 for $(3\sqrt{2})^4$ with an attempt to evaluate, $81\times$ ..or ..$\times4$, OR 18×18 B1 for $(3\sqrt{2})^4$ OR multiply pair brackets to 18

4.

13.(a) 0.25 (b) $4(x – 20)(x + 20)$ (c) 27 (d) $10 +15\sqrt{2} - 2\sqrt{2} - 6$ $= 4 + 13\sqrt{2}$	B2 B3 B1 B2 B1 9	B1 for 2 correct steps, following through 1 error: reciprocal, cube root, square. B1 for an answer of 1/4 B2 for $(2x – 40)(2x + 40)$ or other correct partially factorised including a correct pair of brackets B1 for $4(x \ldots 20)(x \ldots20)$ or $(2x \ldots 40)(2x\ldots40)$ B1 for any 3 of the 4 terms correct CAO. Mark final answer

5.

$(\sqrt{(2\times25)} - 3\sqrt{2})^2$ or $(\sqrt{(2\times5\times5)} - 3\sqrt{2})^2$ or sight of $\sqrt{50} = 5\sqrt{2}$ in working		M1	OR M1 $50 - 3\sqrt{50}\sqrt{2} - 3\sqrt{50}\sqrt{2} + 18$ any 3 terms correct (accept as terms given in table)
$(5\sqrt{2} - 3\sqrt{2})^2$ $(= (2\sqrt{2})^2)$		m1	m1 $50 - 30 - 30 + 18$ any 3 terms correct or $50 - 60 + 18$ with -60 correct and 1 other term (accept as terms given in table)
	8	A1	CAO A1 8

6.

$(5\sqrt{3})^2 = 25 \times 3$ $(= 75)$	✓	B1	For first three marks, accept a correct product of integers in each case, e.g. $2 \times 2 \times 2$ (=8).
$\frac{2\sqrt{18}}{\sqrt{2}} = 2 \times \sqrt{9}$ $(= 2 \times 3 = 6)$	✓	B1	
$\sqrt{32} \times \sqrt{2} = \sqrt{64}$ $(= 8)$	✓	B1	
(Answer =) 69/8 or equivalent.	✓	B1	C.A.O. Equivalent answer must be simplified. So B0 for $(75 - 6) / 8$. ISW.
Rational	✓	B1	F.T. 'their final answer' provided at least 2 out of first 3 B1s are awarded.

Examiner's Comments

1. (a) Many candidates do not fully understand surd notation and break 75 down into a products of factors, even though this technique was used correctly to answer an earlier question in the paper.

(b) Many candidates worked the numerator incorrectly, giving 9.6 × 1046. The second stage was often incorrect also, as candidates did not work with the numerator power of ten subtract the denominator power of ten, instead of realising ' - - ' was 'actually '+'.

*This comment originally referred to question **15** on paper **4363/02 (21/05/2015)***

2. (a) This was often well done, though there were some place value errors in multiplying the recurring decimal by a power of 10.

(b) Many candidates recognised that the negative index meant taking a reciprocal, but very often the power of ¼ was then treated as if multiplying by ¼, resulting in an incorrect final answer of 1/2500.

(c) Most candidates attempted to expand the brackets here, though 7 × √3 caused difficulty and was often given as √21. The need to divide by 2 was sometimes missed, as was the requirement to state whether the final answer was rational or irrational.

*This comment originally referred to question **14** on paper **4352/02 (06/11/2015)***

3. Q15 Candidates have little understanding of surds. Clearly the fact that √5×√5 = 5 is not well known or understood.

Many candidates did not realise that like terms can be collected in part (b), that is 7√2√ - 4√2 is actually equivalent to 3√2.

*This comment originally referred to question **15** on paper **4363/02 (06/11/2013)***

4. Q.13 Many candidates demonstrated misunderstanding of surds and indices. This does seem to be an area of weakness. Common errors are difficult to categorised as they were so wide spread.

*This comment originally referred to question **13** on paper **4363/02 (06/11/2012)***

5. Many candidates have difficulties with evaluating using knowledge of surds. The errors were generally from misunderstanding the topic.

*This comment originally referred to question **17** on paper **4370/05 (26/05/2016)***

6. Fluent manipulation of surds was essential in this question. There were some excellent solutions. Common errors however included misinterpreting $(5\sqrt{3})^2$ to be

$(5 + \sqrt{3})^2$ or giving $2\sqrt{18}$ to be $\sqrt{36}$. It was surprising that some candidates stated a final rational fraction to be 'irrational'.

*This comment originally referred to question **17** on paper **3300/05 (08/11/2016)***