Countdown to your final Maths exam …
Higher Tier only … Part 2 (2020)
Recurring Decimals, Fractional/Negative Indices and Surds
Examiners Reports & Markscheme

Examiners Reports

Q1. A question ordering recurring decimals has never been set before, but most students were able to gain some credit. One was the most common score seen. This was normally gained for having three of the decimals in the correct relative order, although many gained the mark for showing understanding of the notation, eg 0.2464646.

Q2. This question was well attempted by most candidates but few achieved full marks. Common repeated errors included writing 0.750750… instead of 0.75050…, not multiplying 0.75050… so that the when the two recurring decimals were subtracted a terminating decimal was left or not being able to subtract their, often correct, decimal values. The weaker candidates saw 0.750 and wrote 3⁄4 as their answer.

Q3. There were a variety of acceptable approaches to the solving of this question but full marks demanded an algebraic approach at some point. Most students were able to at least begin to convert each of the given recurring decimals to a fraction and thus gain credit.

A popular incorrect approach however was to let say x be equal to the given product followed by, for example, 10x = 1.3636... × 2.222... This gained no marks.

Q4. Part (a) of this question was answered quite well, with a good number knowing that the power of $\frac{1}{2}$ is the square root. The common incorrect response was to halve 100 and get 50

In part (b) fractional indices to this degree proved harder. There were a large number of students who dealt with the power simply as a fraction and attempted to find $\frac{2}{3}$ of 125. However, getting as far as 5 allowed many to score 1 mark. A small proportion of students were able to complete the solution to 25

Q5. (Part (a) was answered well by those students with an understanding of indices, however very few were able to gain any credit in part (b) with 3 being a common incorrect answer. In part (c), multiplication of two brackets was quite well attempted although sign errors were common. Only a few were able to accurately complete the calculation with mistakes such as −√36 −√36 = −√72 and √12 × √3 = 12√3 or 3√12 being common.

Q6. 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

Q7. One third of candidates knew that raising a number to power $^1\!/_3$ is equivalent to taking the cube root and so successfully evaluated $27^{1/3}$ in part (a) of this question.

Part (b) discriminated well between those candidates who understood negative indices, those who understood fractional indices and those who could combine both concepts. Over 40% of candidates made some progress in finding the value of $25^{-½}$ with just over 25% of candidates completing the question successfully. Most of the candidates who presented a partially correct solution were able to evaluate $25^{½}$. Fewer candidates were able to interpret a negative index as a reciprocal. Commonly seen incorrect answers include 5, − 5, − 12.5 and 12.5 .

Markscheme

Q1.

Question	Working	Answer	Mark	Notes
		0.246, $0.\dot{2}4\dot{6}$ $0.2\dot{4}\dot{6}$, $0.24\dot{6}$	M1	for correct use of recurring symbol eg $0.2\dot{4}\dot{6} = 0.24646\ldots$ **or** 3 terms in the correct relative position
			A1	cao

Q2.

		Working	Answer	Mark	Notes
		$x = 0.7505050\ldots$ $10x = 7.505050\ldots$ $1000x = 750.505050\ldots$ $990x = 743$ OR $100x = 75.0505050\ldots$ $99x = 74.3$	$^{743}/_{990}$	3	M1 for 0.75050(50….) or 0.7 + 0.050(5050….) M1 (dep) for two recurring decimals that, when subtracted, leave a terminating decimal A1 for $^{743}/_{990}$

Q3.

Question	Working	Answer	Mark	Notes
			M1	for the start of a method to convert 0.22.. to a fraction, eg $10y = 2.22..$ or $(y=)\frac{2}{9}$
			M1	for the start of a method to convert 0.13636... to a fraction, $10x = 1.3636..$ or $100x = 13.6363\ldots$ or $1000x = 136.3636..$ or $(x=)\_\frac{13.5}{99}$ or $(x=)\frac{135}{990}$
			C1	for correct arithmetic and concluding the proof
				OR
			M1	for $0.1\dot{3}\dot{6} \times 0.\dot{2} = 0.\dot{0}\dot{3}$ $(= z)$
			M1	for complete method to find two appropriate recurring decimals the difference of which is a rational number, eg. $100z = 3.0303\ldots, (z =)\ 0.0303\ldots$ or $\frac{3}{99}$
			C1	for correct arithmetic and concluding the proof

Q4.

Question	Working	Answer	Mark	Notes
(a)		10	B1	accept ±10
(b)		25	M1	for $(\sqrt[3]{125})^2$ **or** $\sqrt[3]{125} = 5$ **or** $125^2 = 15625$ **or** $\sqrt[3]{125^2}$
			A1	cao

Q5.

PAPER: 1MA0_1H					
Question		Working	Answer	Mark	Notes
	(a)		$\frac{1}{8}$	1	B1 for $\frac{1}{8}$ oe
	(b)		1.5	1	B1 for 1.5 oe
	(c)		3	2	M1 for $\sqrt{12}\times\sqrt{12} - \sqrt{12}\times\sqrt{3} - \sqrt{3}\times\sqrt{12} + \sqrt{3}\times\sqrt{3}$ or $\sqrt{144} - \sqrt{36} - \sqrt{36} + \sqrt{9}$ oe. with no more than one sign error A1 cao OR M1 for writing $(\sqrt{12} - \sqrt{3})$ as $(2\sqrt{3} - \sqrt{3})$ $(= \sqrt{3})$ A1cao

Q6.

PAPER: 1MA0_1H				
Question	Working	Answer	Mark	Notes
		Proof	3	M1 for $(x =)$ 0.04545(...) or $1000x = 45.4545(...)$, accept $1000x = 45.\dot{4}\dot{5}$ or $100x = 4.54545(...)$, accept $100x = 4.\dot{5}\dot{4}$ or $10x = 0.4545(...)$,accept $10x = 0.\dot{4}\dot{5}$ M1 for finding the difference between two correct, relevant recurring decimals for which the answer is a terminating decimal A1 (dep on M2) for completing the proof by subtracting and cancelling to give a correct fraction eg $\frac{45}{990} = \frac{1}{22}$ or $\frac{4.5}{99} = \frac{1}{22}$

Q7.

Question	Working	Answer	Mark	Notes
(a)		3	1	B1 cao
(b)		⅕	2	M1 $\frac{1}{25^{\frac{1}{2}}}$ or $\sqrt{25} = 5$ A1 ⅕ or 5^{-1} or 0.2