Lorem Ipsum International AS & A Level

Lorem Ipsum International Examinations
Lorem Ipsum International Advanced Subsidiary and Advanced Level

MATHEMATICS **9709/43**

Paper 4: Also Pure Mathematics **October/November 2017**

MARK SCHEME

Maximum Mark: 20

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Examiner Report.

Lorem Ipsum will not enter into discussions about these mark schemes.

Question paper could be generated by removing the `\printanswer` command at the beginning of the tex file for this paper, if you have it.

This mark scheme contains 3 pages, of which 0 are empty.

1 It is given that $\frac{1}{\infty} = 0$.

a Prove $-8 = 10$. [2]

1' for attempts at rotation, e.g: $-18 = 0$
1' for complete and correct proof.

Rotate both side 90° counter-clockwise: $-18 = 0$
Divide both side by 1: $-8 = \frac{0}{1}$
In right hand side, dividing by 1 is the same as multiply by 1: $-8 = 10$

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b Hence prove $\frac{1}{0} = \infty$. [2]

1' for attempts at multiplying both side by -1: $8 = -10$
1' for complete and correct proof: Rotate both side 90° clock-wise: $\infty = \frac{1}{0}$

Total: 4.

2 **a** Prove the identity "opinion $-\ \pi =$ onion". [1]

Rewrite π as pi, and removing pi from o**pi**nion gives onion.

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b Prove the identity $\frac{7}{s} = 0 \mod 2$. [3]

1' for rewriting 7 as $seven$. Do **not** award the mark if the candidate wrote seven in a sans-serif font.
1' for dividing s from $seven$, giving $even$.
1' stating that $even$ implies $0 \mod 2$.

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c Explain why obtuse triangles are always sad. [1]

Because it is never right.

Total: 5.

3 **a** Prove the following identity: [3]

$$\frac{1}{8}\left(4\cos\left(4\theta+\sqrt{\sin\left(\frac{\theta}{2}\right)}\right)+\cos\left(8\theta+2\sqrt{\sin\left(\frac{\theta}{2}\right)}\right)+3\right)=\cos^4\left(2\theta+\frac{1}{2}\sqrt{\sin\left(\frac{\theta}{2}\right)}\right)$$

3' for correct proof.

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b Hence solve $\frac{1}{8}\left(4\cos\left(4\theta+\sqrt{\sin\left(\frac{\theta}{2}\right)}\right)+\cos\left(8\theta+2\sqrt{\sin\left(\frac{\theta}{2}\right)}\right)+3\right)=\tan\theta$ for $0<x<2\pi$.

[3]

Solutions are $\theta \approx 0.2807$ and $\theta \approx 3.3216$.

1' for attempting to use change-of-sign with $\cos^4\left(2\theta+\frac{1}{2}\sqrt{\sin\left(\frac{\theta}{2}\right)}\right)-\tan\theta=0$

1' for one correct solution.
1' for another correct solution.

Total: 6.

4 It is given that John has 3 apples, and he then lost 1 apple.

a Show that John has 2 apples left. [1]

1' for correct application of subtraction.

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b Hence calculate the mass of the Sun. [3]

1' for attempting to calculate mass from volume (1.412×10^{27} m^3) and average density (1408 kg/m^3).
1' for correct answer and **1**' for correct unit: 1.988×10^{30} kg

It is given that 1000 gram = 1 kilogram.

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c Write 1 instagram in gram. [1]

$$\int 1\,\text{instagram}\,\mathrm{d}t$$

Comment: Since instagrams are a snapshot of grams at a specific point in time, to convert grams to instagrams you simply need to take the derivative. To convert instagrams back into grams you use instagration. See `https://www.reddit.com/r/shittyaskscience/comments/1dicsm`

Total: 5.