Cambridge International Examinations
In collaboration with Nazarbayev Intellectual Schools, Kazakhstan
Grade 12

MATHEMATICS **Grade 12**

Paper 1 **May 2014**

MARK SCHEME

Maximum Mark: 30

This document consists of **5** printed pages and **1** blank page.

CAMBRIDGE International Examinations

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Marks awarded

- The number of marks awarded for each part of the question should be recorded in the 'For Examiner's Use' column at the right side of the page using the annotations indicated in the mark scheme e.g. M1 A1
- Half marks cannot be awarded.
- The total number of marks should be added for each question and written on the front of the question paper, added up to give the final total for the paper.
- If a question instructs the candidates to use a particular method then that method must be used.
- In other questions any valid alternative method is acceptable, and candidates should be awarded equivalent marks for reaching a comparable stage in their solution.
- Particular care should be taken when marking questions where the working leads to a given solution – the candidate must provide a full justification of the result.
- If a question requires an exact solution then the candidate must use exact values throughout their working.

Annotations and abbreviations

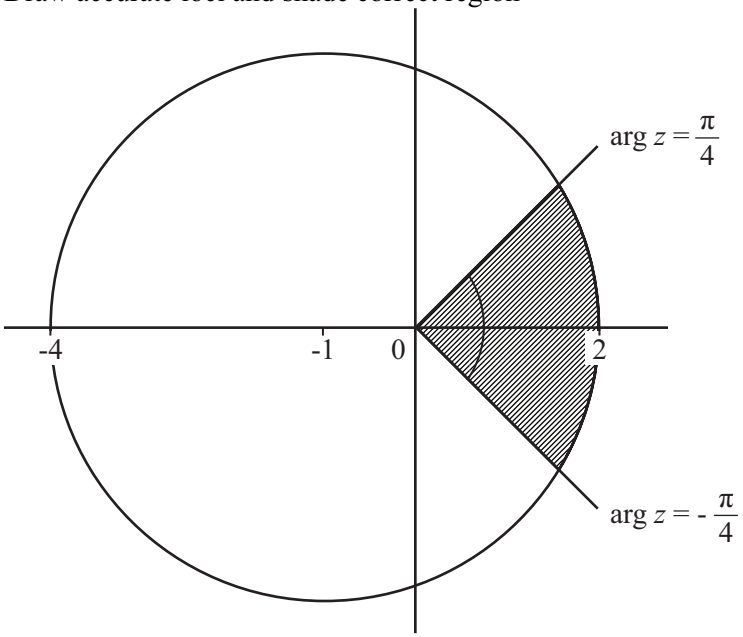
M Marks are awarded for using a correct method and are not lost for purely numerical errors.

A Marks are awarded for an accurate answer and depend on the preceding M marks. Therefore M0 A1 cannot be awarded.

B Marks are independent of M marks and are awarded for a correct final answer or correct intermediate stage.

Where follow through **(ft)** is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer, whether or not it was correct.

Question	Answer	Mark	Additional Guidence
1	State completely factorised form $(x+2)(x-2)(x^2+4)$	B1	
2	State $\frac{3}{2}$ or 1.5 or equivalent	B1	
3	State 14	B1	If method involves 'long division', 14 must be identified as remainder
4	State both -1 and 2 and no others	B1	
5	State $-\frac{1}{2}$ or $-\frac{2}{4}$ or equivalent	B1	If there is subsequent work to conclude $x = +\frac{1}{2}$, award B0
6	State both $x = 0$ and $y = x + 5$ and no others	B1	
7	State $\ln\frac{3}{2}$ or $\ln 1.5$	B1	If $\pm$ retained in final answer, award B0
8	Differentiate to obtain $5 - \frac{6}{x+1}$ and conclude with 3	B1	
9	Differentiate to obtain $4e^{\frac{1}{2}x} + 2xe^{\frac{1}{2}x}$ and conclude with -2	B1	
10	Integrate to obtain ke^{2x}, any non-zero constant k, and show correct application of the two limits Obtain $3e^{2x}$ and hence $3e - 3$	M1 A1	or 3(e – 1)
11	Integrate to obtain $-\frac{2}{3}\cos 3x$ and hence $\frac{2}{3}$ (from correct work only)	B1	
12	State $\frac{1}{4}\pi$ or equivalent	B1	
13	State both $y = \arccos x$ for Diagram 1 and $y = \cot x$ for Diagram 2	B1	
14	State $\cos x$	B1	
15	State $x^2 + y^2 + z^2 = 30$	B1	

16	Obtain $s = -2$ and hence both $b = -7$ and $c = -6$	B1	
17	State (6, –9, –7)	B1	If answer given as position vector 6**i** – 9**j** – 7**k**, award B1 If ratio 1:2 used instead and answer (4,–8,–3) or 4**i** – 8**j** – 3**k** is obtained, award B1
18	Equate scalar product $2a - 4 - 10$ to zero and conclude with a=7	B1	
19	Simplify $(4 - 2\mathrm{i})(1 + 2\mathrm{i}) - 3(1 - 2\mathrm{i})$ and obtain $5 + 12\mathrm{i}$	B1	
20	Draw (part of) any circle with centre (apparently) on real axis, and any two half-lines starting from the origin Draw accurate loci and shade correct region  	M1 A1	Accept attempt showing only the relevant part of the correct circle
21	State $\cos(-\frac{2}{5}\pi) + \mathrm{i}\sin(-\frac{2}{5}\pi)$ or $\cos(-0.4\pi) + \mathrm{i}\sin(-0.4\pi)$	B1	
22	State $x = A\cos 2t + B\sin 2t$	B1	
23	Attempt simplification of at least two powers of z including z^4 or show that successive powers of z involve arguments of form $\frac{1}{4}n\pi$ State n is a multiple of 4 or $n = 4, 8, 12, \ldots$ or clear equivalent	M1 A1	

24	Attempt values of $\sin\theta$ and $\cos\theta$ using right-angled triangle or identity Obtain $\sin\theta = \frac{1}{\sqrt{10}}$ and $\cos\theta = \frac{3}{\sqrt{10}}$ and hence $\sin 2\theta$ is $\frac{3}{5}$ or $\frac{6}{10}$ or 0.6	M1 A1	
25	State at least one of $ad - bc = k$, $(a+1)(d+1) - bc = k+1$ Use two correct statements to confirm $a + d = 0$ (with sufficient detail present because the answer is given in the question)	B1 B1	

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