Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0121077895

ADDITIONAL MATHEMATICS **4037/22**

Paper 2 **October/November 2018**

2 hours

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 80.

This document consists of **15** printed pages and **1** blank page.

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Mathematical Formulae

1. ALGEBRA

Quadratic Equation

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Binomial Theorem

$$(a + b)^n = a^n + \binom{n}{1}a^{n-1} b + \binom{n}{2}a^{n-2} b^2 + \ldots + \binom{n}{r}a^{n-r} b^r + \ldots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

2. TRIGONOMETRY

Identities

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulae for ΔABC

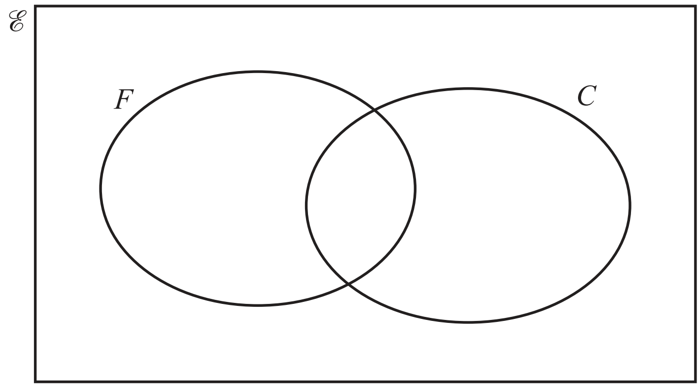
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} bc \sin A$$

1 Solve the inequality $(x-3)(x+4) > x+13$. [3]

2



There are 105 boys in a year group at a school. Some boys play football (F) and some play cricket (C).

- x boys play both football and cricket.
- The number of boys that play neither game is the same as the number of boys that play both.
- 40 boys play cricket.
- The number of boys that only play football is twice the number of boys that only play cricket.

Complete the Venn diagram and find the value of x. [5]

3 A curve has equation $y = \dfrac{x^3}{\sin 2x}$. Find

(i) $\dfrac{dy}{dx}$, [3]

(ii) the equation of the tangent to the curve at the point where $x = \dfrac{\pi}{4}$. [3]

4 Solve

(i) $2^{3x-1} = 6,$ [3]

(ii) $\log_3(y+14) = 1 + \dfrac{2}{\log_y 3}$. [5]

5 Solve the simultaneous equations

$$\frac{8^{p+1}}{4^q} = 2^{11},$$

$$\frac{3^{2p+5}}{27^{\frac{1}{3}}} = 9^{3q}.$$

[5]

6 **(a)** A 5-character code is to be formed from the 13 characters shown below. Each character may be used once only in any code.

Letters : A, B, C, D, E, F

Numbers: 1, 2, 3, 4, 5, 6, 7

Find the number of different codes in which no two letters follow each other and no two numbers follow each other. [3]

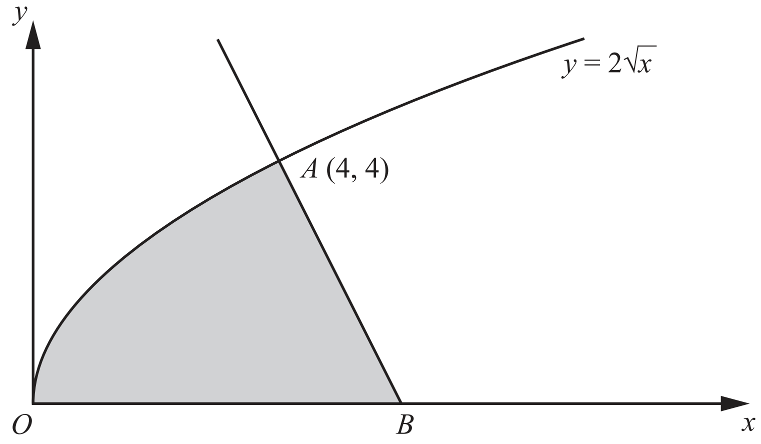
(b) A netball team of 7 players is to be chosen from 10 girls. 3 of these 10 girls are sisters. Find the number of different ways the team can be chosen if the team does not contain all 3 sisters. [3]

7 Solve the quadratic equation $\left(1-\sqrt{3}\right)x^2+x+\left(1+\sqrt{3}\right)=0$, giving your answer in the form $a+b\sqrt{3}$, where *a* and *b* are constants. [6]

8 **(i)** Show that $\frac{1}{1-\sin x}-\frac{1}{1+\sin x}=2\tan x\sec x$. [4]

(ii) Hence solve the equation $\frac{1}{1-\sin x}-\frac{1}{1+\sin x}=\operatorname{cosec} x$ for $0° \leqslant x \leqslant 360°$. [4]

9



The diagram shows part of the curve $y = 2\sqrt{x}$. The normal to the curve at the point A (4, 4) meets the x-axis at the point B.

(i) Find the equation of the line AB. [4]

(ii) Find the coordinates of B. [1]

(iii) Showing all your working, find the area of the shaded region. [4]

10 Two lines are tangents to the curve $y = 12 - 4x - x^2$. The equation of each tangent is of the form $y = 2k + 1 - kx$, where k is a constant.

(i) Find the two possible values of k. [5]

(ii) Find the coordinates of the point of intersection of the two tangents. [4]

11 The functions f and g are defined for real values of $x \geqslant 1$ by

$$f(x) = 4x - 3,$$

$$g(x) = \frac{2x+1}{3x-1}.$$

(i) Find $gf(x)$. [2]

(ii) Find $g^{-1}(x)$. [3]

(iii) Solve $fg(x) = x - 1$. [4]

12 A plane that can travel at 260 km/h in still air heads due North. A wind with speed 40 km/h from a bearing of 310° blows the plane off course. Find the resultant speed of the plane and its direction as a bearing correct to 1 decimal place. [6]

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