Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

1404301964

ADDITIONAL MATHEMATICS **0606/11**

Paper 1 **October/November 2017**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator

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 **16** printed pages.

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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

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

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

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

Formulae for ΔABC

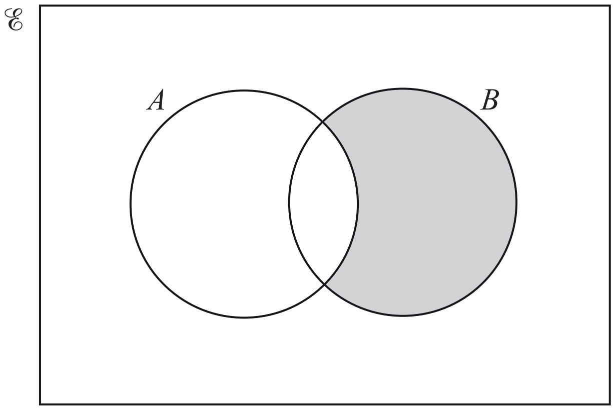
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

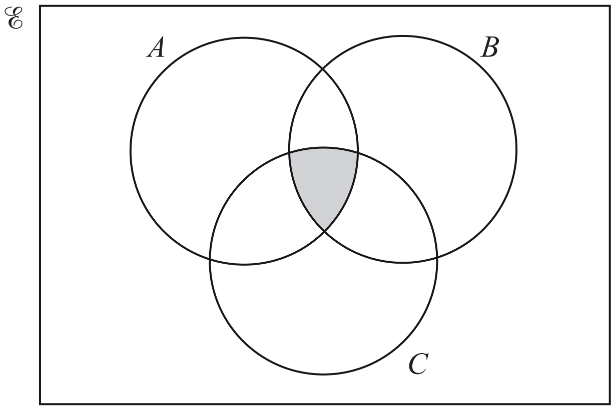
1 Express in set notation the shaded regions shown in the Venn diagrams below.

(i)



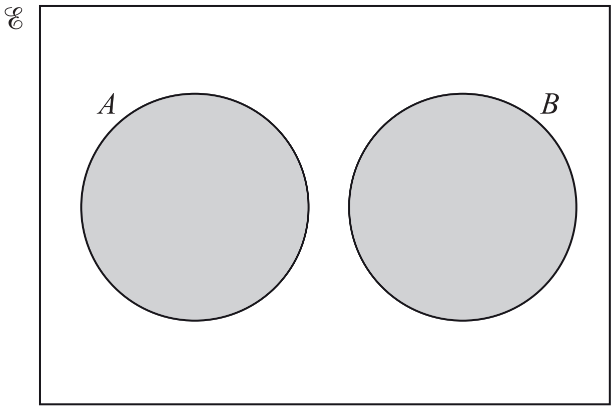
.... [1]

(ii)



.... [1]

(iii)



.... [1]

2 The polynomial $\mathrm{p}(x)$ is $ax^3 + bx^2 - 13x + 4$, where a and b are integers. Given that $2x - 1$ is a factor of $\mathrm{p}(x)$ and also a factor of $\mathrm{p}'(x)$,

(i) find the value of a and of b. [5]

Using your values of a and b,

(ii) find the remainder when $\mathrm{p}(x)$ is divided by $x + 1$. [2]

3 **(a)** Given that $T = 2\pi l^{\frac{1}{2}} g^{-\frac{1}{2}}$, express l in terms of T, g and π. [2]

(b) By using the substitution $y = x^{\frac{1}{3}}$, or otherwise, solve $x^{\frac{2}{3}} - 4x^{\frac{1}{3}} + 3 = 0$. [4]

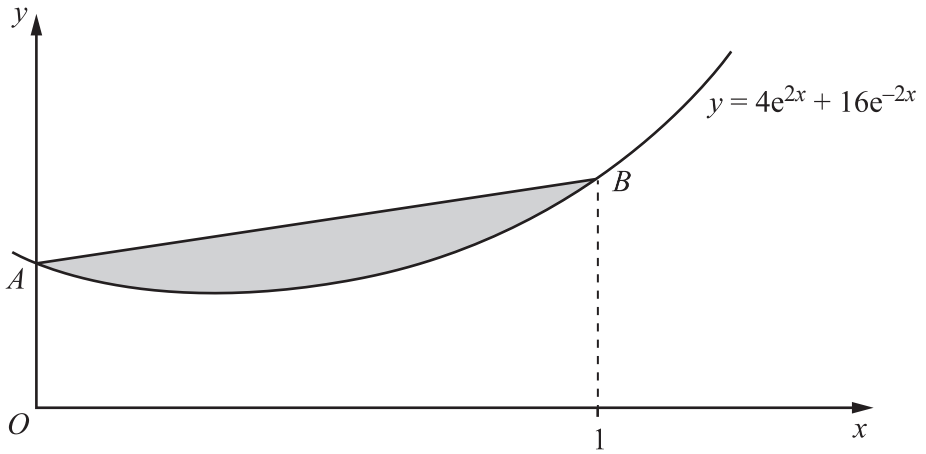
4 When $\lg y$ is plotted against x^2 a straight line is obtained which passes through the points (4, 3) and (12, 7).

(i) Find the gradient of the line. [1]

(ii) Use your answer to part **(i)** to express $\lg y$ in terms of x. [2]

(iii) Hence express y in terms of x, giving your answer in the form $y = A\left(10^{bx^2}\right)$ where A and b are constants. [3]

5



The diagram shows part of the graph of $y = 4e^{2x} + 16e^{-2x}$ meeting the y-axis at the point A and the line $x = 1$ at the point B.

(i) Find the coordinates of A. [1]

(ii) Find the y-coordinate of B. [1]

(iii) Find $\int (4e^{2x} + 16e^{-2x})\,dx$. [2]

(iv) Hence find the area of the shaded region enclosed by the curve and the line AB. You must show all your working. [4]

6 **(a)** Functions f and g are such that, for $x \in \mathbb{R}$,

$$f(x) = x^2 + 3,$$

$$g(x) = 4x - 1.$$

(i) State the range of f. [1]

(ii) Solve $fg(x) = 4$. [3]

(b) A function h is such that $\mathrm{h}(x) = \dfrac{2x+1}{x-4}$ for $x \in \mathbb{R}$, $x \neq 4$.

(i) Find $\mathrm{h}^{-1}(x)$ and state its range. [4]

(ii) Find $\mathrm{h}^{2}(x)$, giving your answer in its simplest form. [3]

7 **(i)** Write $\ln\left(\frac{2x+1}{2x-1}\right)$ as the difference of two logarithms. [1]

A curve has equation $y = \ln\left(\frac{2x+1}{2x-1}\right) + 4x$ for $x > \frac{1}{2}$.

(ii) Using your answer to part **(i)** show that $\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{ax^2 + b}{4x^2 - 1}$, where a and b are integers. [4]

(iii) Hence find the x-coordinate of the stationary point on the curve. [2]

(iv) Determine the nature of this stationary point. [2]

8 **(a)** 10 people are to be chosen, to receive concert tickets, from a group of 8 men and 6 women.

(i) Find the number of different ways the 10 people can be chosen if 6 of them are men and 4 of them are women. [2]

The group of 8 men and 6 women contains a man and his wife.

(ii) Find the number of different ways the 10 people can be chosen if both the man and his wife are chosen or neither of them is chosen. [3]

(b) Freddie has forgotten the 6-digit code that he uses to lock his briefcase. He knows that he did not repeat any digit and that he did not start his code with a zero.

(i) Find the number of different 6-digit numbers he could have chosen. [1]

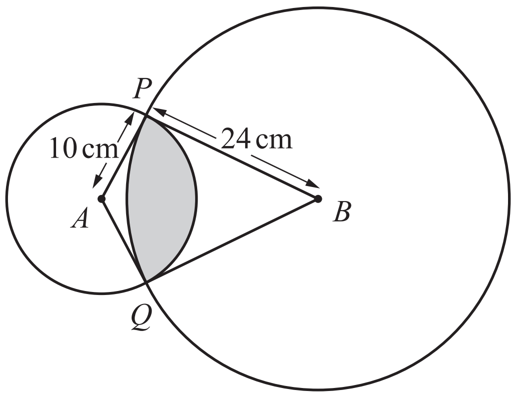
Freddie also remembers that his 6-digit code is divisible by 5.

(ii) Find the number of different 6-digit numbers he could have chosen. [3]

Freddie decides to choose a new 6-digit code for his briefcase once he has opened it. He plans to have the 6-digit number divisible by 2 and greater than 600 000, again with no repetitions of digits.

(iii) Find the number of different 6-digit numbers he can choose. [3]

9



The diagram shows a circle, centre A, radius 10 cm, intersecting a circle, centre B, radius 24 cm. The two circles intersect at the points P and Q. The radii AP and AQ are tangents to the circle with centre B. The radii BP and BQ are tangents to the circle with centre A.

(i) Show that angle PAQ is 2.35 radians, correct to 3 significant figures. [2]

(ii) Find angle PBQ in radians. [1]

(iii) Find the perimeter of the shaded region. [3]

(iv) Find the area of the shaded region. [4]

Question 10 is printed on the next page.

10 **(a)** Solve $3\operatorname{cosec} 2x - 4\sin 2x = 0$ for $0° \leqslant x \leqslant 180°$. [4]

(b) Solve $3\tan\left(y - \frac{\pi}{4}\right) = \sqrt{3}$ for $0 \leqslant y \leqslant 2\pi$ radians, giving your answers in terms of π. [4]

