Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2950468632

ADDITIONAL MATHEMATICS **0606/13**

Paper 1 **October/November 2020**

2 hours

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Blank pages are indicated.

© UCLES 2020

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 $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

Arithmetic series $u_n = a + (n-1)d$

$$S_n = \frac{1}{2}n(a+l) = \frac{1}{2}n\{2a + (n-1)d\}$$

Geometric series $u_n = ar^{n-1}$

$$S_n = \frac{a(1-r^n)}{1-r} \quad (r \neq 1)$$

$$S_\infty = \frac{a}{1-r} \quad (|r| < 1)$$

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

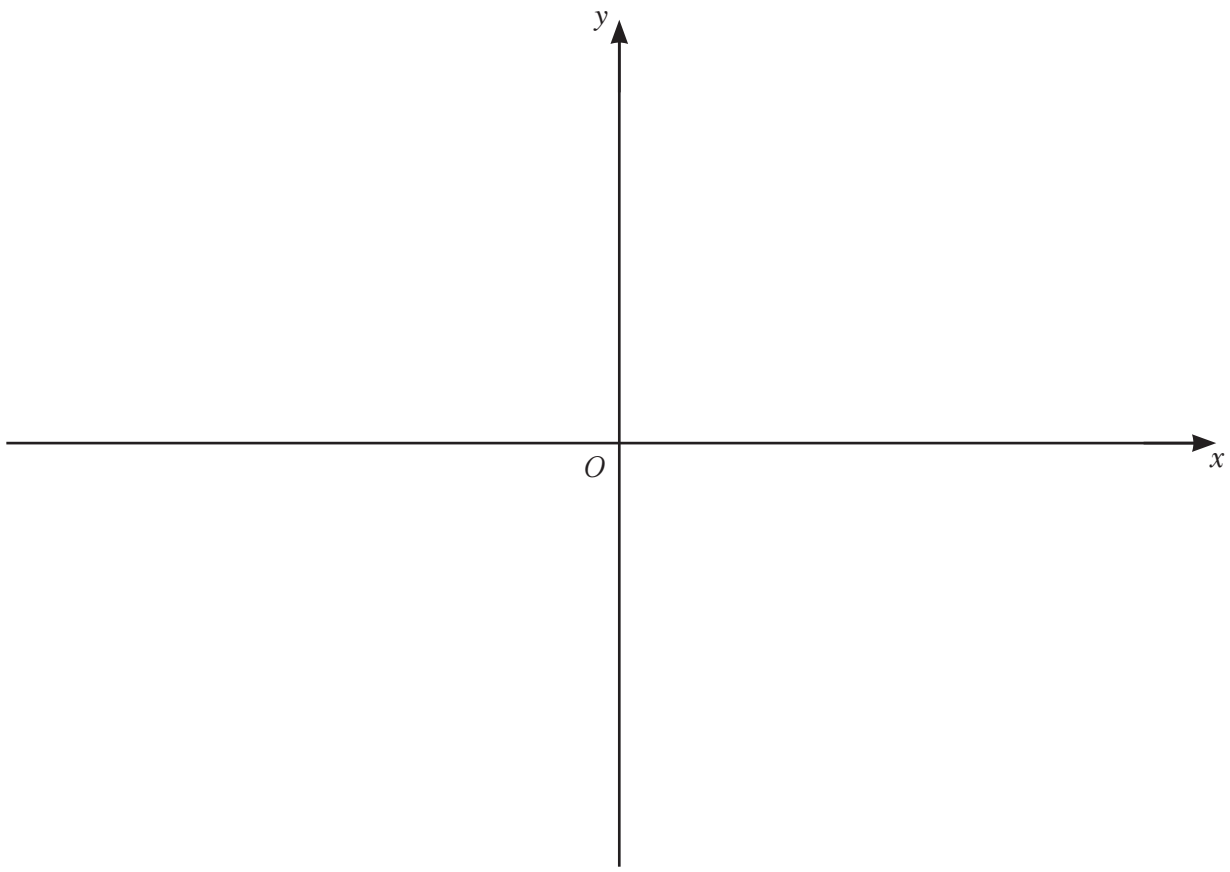
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

© UCLES 2020

1 **(a)** On the axes below, sketch the graph of $y = (x-2)(x+1)(3-x)$, stating the intercepts on the coordinate axes.



[3]

(b) Hence write down the values of x such that $(x-2)(x+1)(3-x) > 0$. [2]

2 **(a)** Given that $y = \dfrac{e^{2x-3}}{x^2+1}$, find $\dfrac{dy}{dx}$. [3]

(b) Hence, given that y is increasing at the rate of 2 units per second, find the exact rate of change of x when $x = 2$. [3]

© UCLES 2020

3 **(a)** $f(x) = 4\ln(2x-1)$

(i) Write down the largest possible domain for the function f. [1]

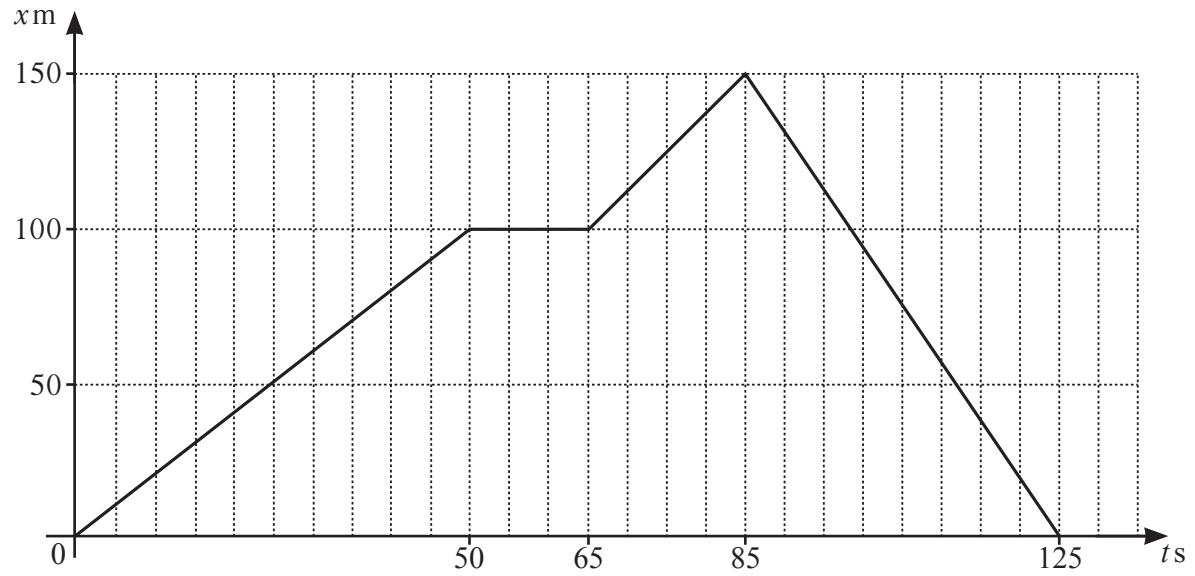
(ii) Find $f^{-1}(x)$ and its domain. [3]

(b) $g(x) = x+5 \quad \text{for } x \in \mathbb{R}$

$h(x) = \sqrt{2x-3} \quad \text{for } x \geqslant \frac{3}{2}$

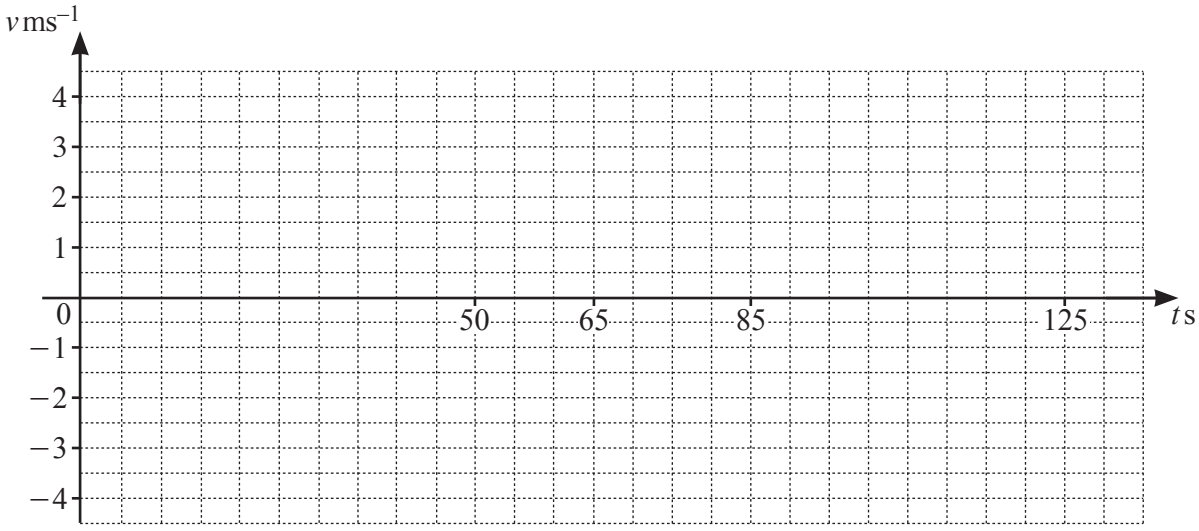
Solve $gh(x) = 7$. [3]

4 (a)



The diagram shows the x–t graph for a runner, where displacement, x, is measured in metres and time, t, is measured in seconds.

(i) On the axes below, draw the v–t graph for the runner. [3]



(ii) Find the total distance covered by the runner in 125 s. [1]

© UCLES 2020

(b) The displacement, x m, of a particle from a fixed point at time t s is given by $x = 6\cos\left(3t + \frac{\pi}{3}\right)$. Find the acceleration of the particle when $t = \frac{2\pi}{3}$. [3]

5 Given that the coefficient of x^2 in the expansion of $(1+x)\left(1-\frac{x}{2}\right)^n$ is $\frac{25}{4}$, find the value of the positive integer n. [5]

6 It is known that $y = A \times 10^{bx^2}$, where A and b are constants. When $\lg y$ is plotted against x^2, a straight line passing through the points (3.63, 5.25) and (4.83, 6.88) is obtained.

(a) Find the value of A and of b. [4]

Using your values of A and b, find

(b) the value of y when $x = 2$, [2]

(c) the positive value of x when $y = 4$. [2]

© UCLES 2020

7 The polynomial $\mathrm{p}(x) = ax^3 + bx^2 - 19x + 4$, where a and b are constants, has a factor $x + 4$ and is such that $2\mathrm{p}(1) = 5\mathrm{p}(0)$.

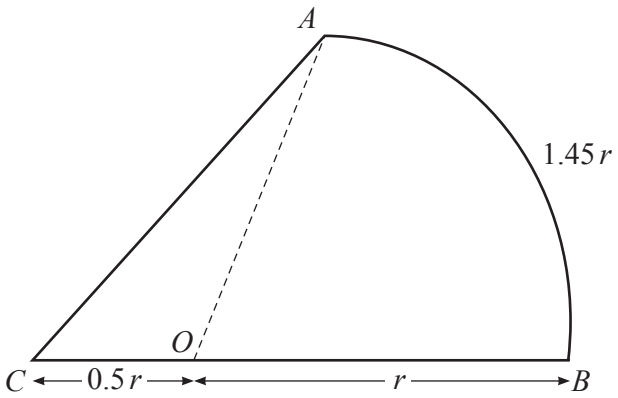
(a) Show that $\mathrm{p}(x) = (x+4)(Ax^2 + Bx + C)$, where A, B and C are integers to be found. [6]

(b) Hence factorise $\mathrm{p}(x)$. [1]

(c) Find the remainder when $\mathrm{p}'(x)$ is divided by x. [1]

© UCLES 2020

8 In this question all lengths are in centimetres.



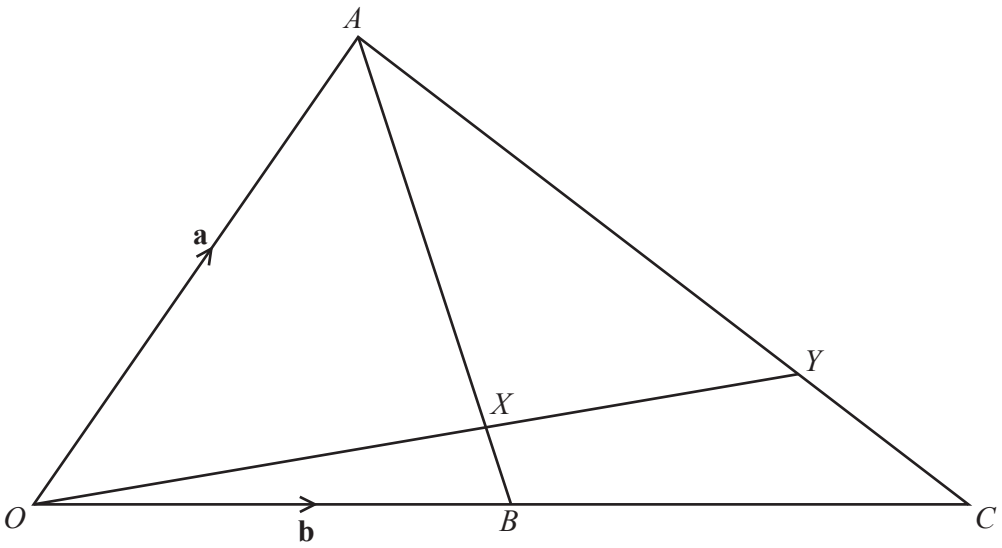
The diagram shows the figure ABC. The arc AB is part of a circle, centre O, radius r, and is of length $1.45r$. The point O lies on the straight line CB such that $CO = 0.5r$.

(a) Find, in radians, the angle AOB. [1]

(b) Find the area of ABC, giving your answer in the form kr^2, where k is a constant. [3]

(c) Given that the perimeter of ABC is 12 cm, find the value of r. [4]

9



The diagram shows the triangle OAC. The point B is the midpoint of OC. The point Y lies on AC such that OY intersects AB at the point X where $AX : XB = 3:1$. It is given that $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

(a) Find $\overrightarrow{OX}$ in terms of **a** and **b**, giving your answer in its simplest form. [3]

(b) Find $\overrightarrow{AC}$ in terms of **a** and **b**. [1]

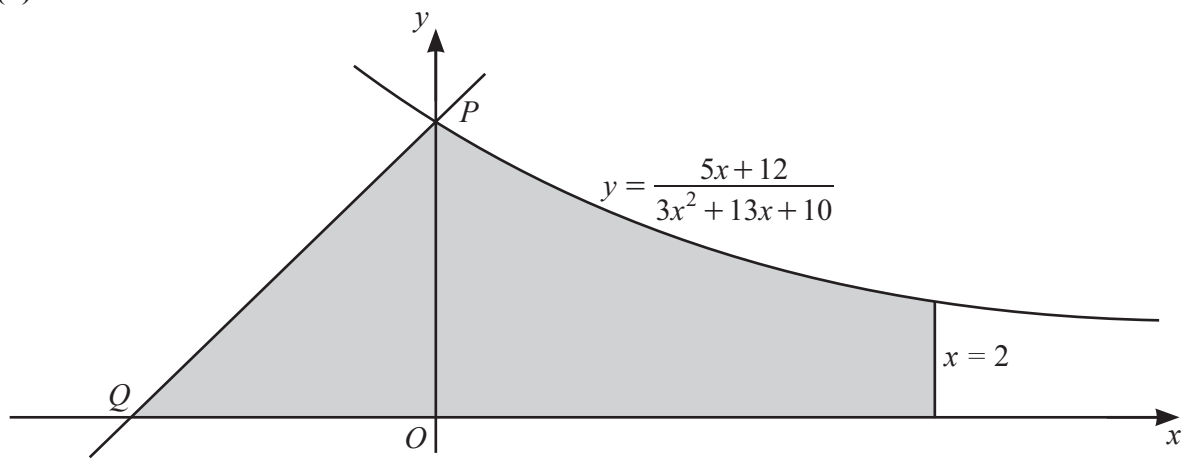
© UCLES 2020

(c) Given that $\overrightarrow{OY} = h\overrightarrow{OX}$, find $\overrightarrow{AY}$ in terms of **a**, **b** and h. [1]

(d) Given that $\overrightarrow{AY} = m\overrightarrow{AC}$, find the value of h and of m. [4]

10 **(a)** Show that $\frac{1}{x+1}+\frac{2}{3x+10}$ can be written as $\frac{5x+12}{3x^2+13x+10}$. [1]

(b)



The diagram shows part of the curve $y=\frac{5x+12}{3x^2+13x+10}$, the line $x=2$ and a straight line of gradient 1. The curve intersects the y-axis at the point P. The line of gradient 1 passes through P and intersects the x-axis at the point Q. Find the area of the shaded region, giving your answer in the form $a+\frac{2}{3}\ln\left(b\sqrt{3}\right)$, where a and b are constants. [9]

© UCLES 2020

Additional working space for question 10

Question 11 is printed on the next page.

11 **(a)** Given that $2\cos x = 3\tan x$, show that $2\sin^2 x + 3\sin x - 2 = 0$. [3]

(b) Hence solve $2\cos\left(2\alpha + \frac{\pi}{4}\right) = 3\tan\left(2\alpha + \frac{\pi}{4}\right)$ for $0 < \alpha < \pi$ radians, giving your answers in terms of π. [4]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

© UCLES 2020