# AQA Level 2 Certificate in **FURTHER MATHEMATICS (8365/1)**

Paper 1

Specimen 2020

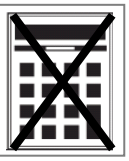
Time allowed: 1 hour 45 minutes

## Materials

**For this paper you must have:**

- mathematical instruments

You may **not** use a calculator



## Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the bottom of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

## Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer booklet.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

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Candidate signature _____

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Answer **all** questions in the spaces provided.

**1 (a)** $\dfrac{y^6 \times y}{y^m} = y^4$

Circle the value of $m$.

**[1 mark]**

– 2 1.5 2 3

**1 (b)** $a^n \times a^5 = a^5$

Work out the value of $n$.

**[1 mark]**

Answer _____

**1 (c)** $(c^5)^p = (c^2)^6$

Work out the value of $p$.

**[2 marks]**

Answer _____

**2** Solve $\sqrt[3]{7x-13} = 2$

**[2 marks]**

$x =$ _____

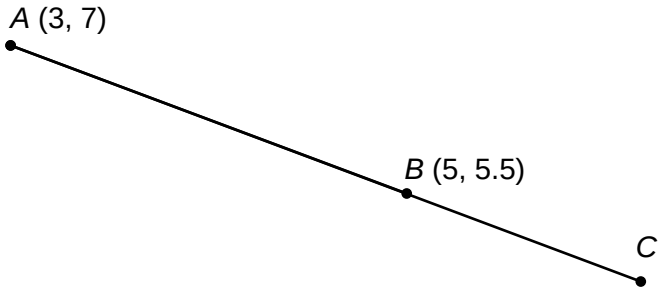
**3** $3a(2x - 1) + 4(ax + 5) \equiv 60x + b$

Work out the values of $a$ and $b$.

**[4 marks]**

$a =$ _____ $b =$ _____

**4** *ABC* is a straight line with *AB* : *BC* = 5 : 2

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Work out the coordinates of *C*.

**[4 marks]**

Answer ( _____ , _____ )

**5** $y = 2x^{10} - \frac{3}{x^2}$

Work out $\frac{dy}{dx}$

**[3 marks]**

Answer _____

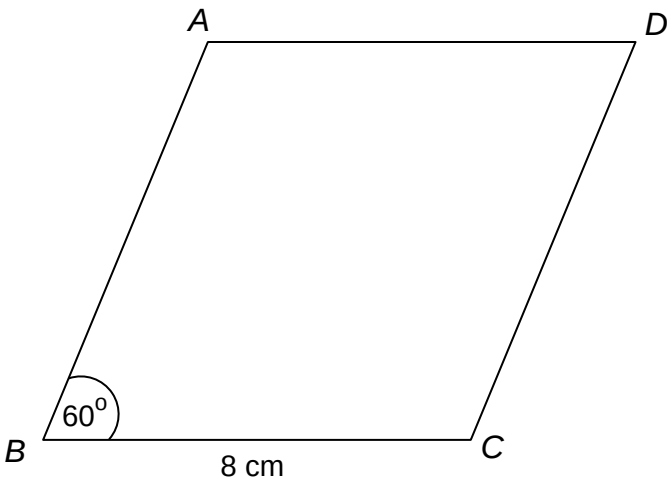
**6** Simplify fully $\frac{15x^2y - 5xy^2}{12x - 4y}$

**[3 marks]**

Answer _____

**7** *ABCD* is a rhombus with side length 8 cm

Angle *ABC* = $60^o$

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Work out the area of the rhombus.

Give your answer in the form $a\sqrt{b}$ cm$^2$ where $a$ and $b$ are integers.

**[3 marks]**

Answer _____ cm$^2$

**8** The curve $y = 2x^3 - 3x^2 - 12x + 6$

has a maximum point at $L$ (–1, 13)

has a minimum point at $M$ (2, –14)

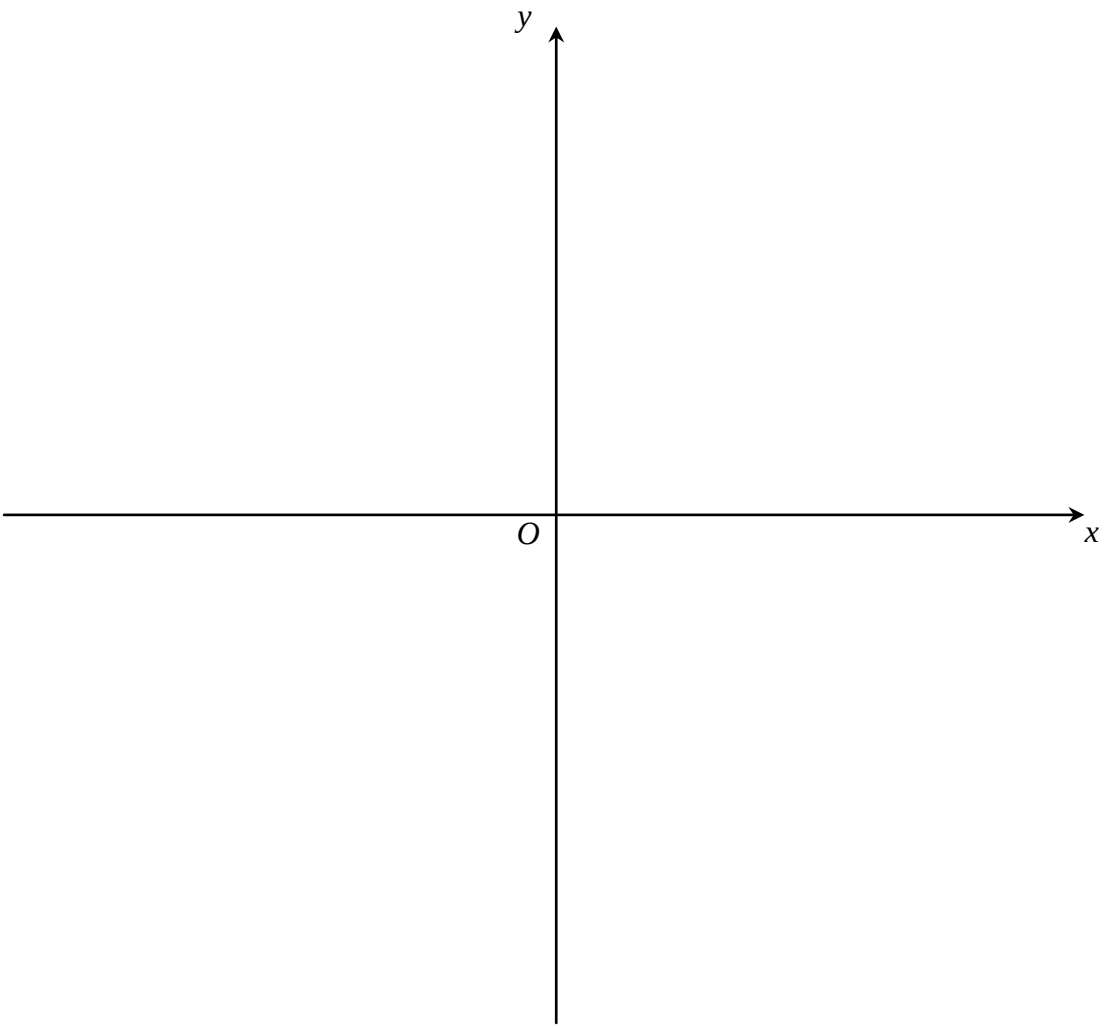
intersects the $y$-axis at $N$.

The curve crosses the $x$-axis at three distinct points.

On the axes below, sketch the curve.

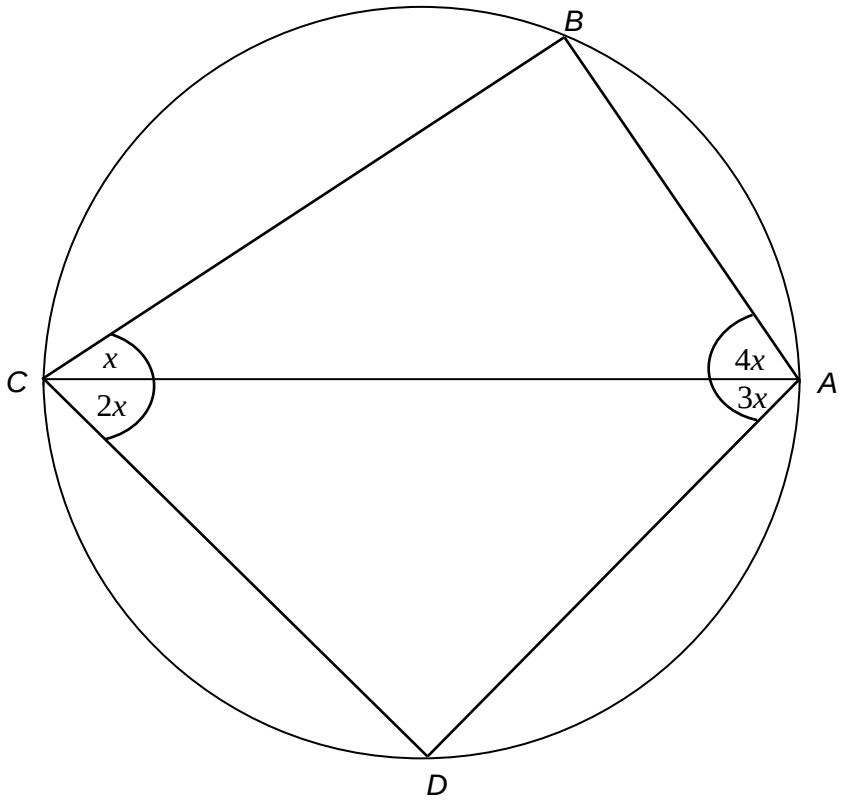
Label the points $L$, $M$ and $N$ on your sketch.

**[3 marks]**



**9** *A*, *B*, *C* and *D* are points on a circle.

$\angle BCA = x$ $\angle ACD = 2x$ $\angle CAD = 3x$ $\angle CAB = 4x$

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Prove that *AC* is a diameter.

**[4 marks]**

**10** $f(x) = \left(\frac{9x}{2}\right)^{-1}$

$g(x) = \sqrt{1 - px^3}$ where $p$ is a constant.

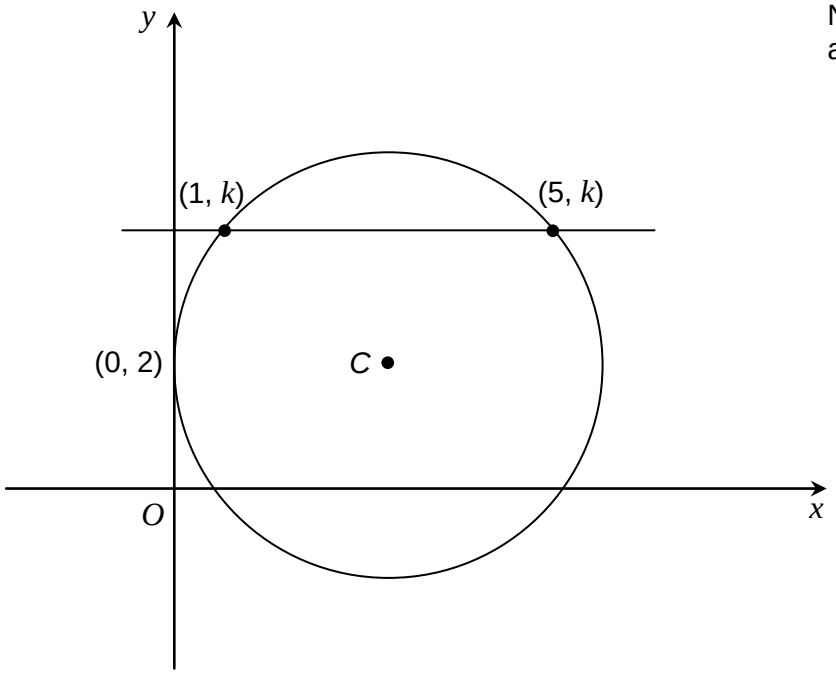
Given that $f\left(\frac{1}{3}\right) = g\left(\frac{1}{3}\right)$ work out the value of $p$.

**[5 marks]**

Answer _____

**11** A circle, centre $C$, touches the $y$-axis at the point (0, 2)

The line $y = k$ intersects the circle at the points (1, $k$) and (5, $k$)

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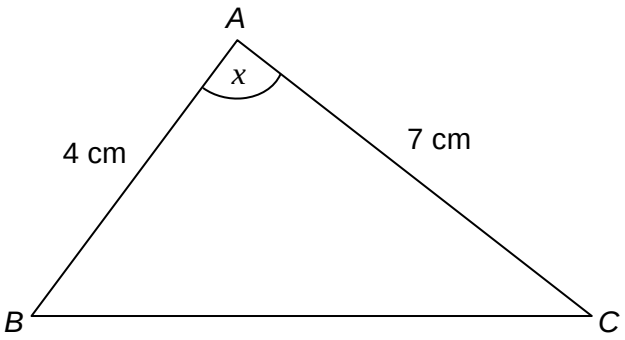
Work out the equation of the circle.

**[3 marks]**

Answer _____

**12** $AB = 4$ cm $AC = 7$ cm $\cos x = -\frac{2}{7}$




Work out the length of $BC$.

**[3 marks]**

Answer _____ cm

**13** Rearrange $t = \frac{3w^3 + a}{w^3 - 2}$ to make $w$ the subject.

**[5 marks]**

Answer _____

**14** Rationalise and simplify $\dfrac{\sqrt{3}-7}{\sqrt{3}+1}$

Give your answer in the form $a+b\sqrt{3}$ where $a$ and $b$ are integers.

**[4 marks]**

Answer _____

**15** Point $A$ lies on the curve $y = x^2 + 5x + 8$

The $x$-coordinate of $A$ is $-4$

**15 (a)** Show that the equation of the normal to the curve at $A$ is $3y = x + 16$

**[5 marks]**

**15 (b)** The normal at $A$ also intersects the curve at $B$.

Work out the $x$-coordinate of $B$.

**[4 marks]**

Answer _____

**16** The coefficient of the $x^4$ term in the expansion of $(2x + a)^6$ is 60

Work out the possible values of $a$.

**[4 marks]**

Answer _____

**17** Solve the simultaneous equations

$$2a + b - c = 8$$
$$4a - 3b - 2c = -9$$
$$6a + 3b + c = 0$$

**[5 marks]**

$a =$ _____ $b =$ _____ $c =$ _____

**18** Solve $x^{-\frac{2}{3}} = 12\frac{1}{4}$

**[3 marks]**

$x =$ _____

**19** $f(x) = 2x^3 - 12x^2 + 25x - 11$

Use differentiation to show that $f(x)$ is an increasing function for all values of $x$.

**[4 marks]**

**20 (a)** Show that $2\cos^2\theta \equiv 2 - 2\sin^2\theta$

**[1 mark]**

**20 (b)** Hence, solve $2\cos^2\theta + 3\sin\theta = 3$ for $0 < \theta < 180^\circ$

**[4 marks]**

Answer _____

**END OF QUESTIONS**

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