

AQA A-Level Maths 2026 Paper 3

Do not turn over the page until instructed to do so.

This assessment is out of 100 marks and you will be given 120 minutes.

When you are asked to by your teacher write your **full name** below

Name:

Total Marks: **/ 100**

Section A

- 1 The equation of a curve is $y = \sin(2x) + 2 \cos(x)$.

Find an expression for $\frac{dy}{dx}$.

$$\frac{dy}{dx} = 2 \cos(2x) - 2 \sin(x)$$

$$\frac{dy}{dx} = 2 \cos(2x) + 2 \sin(x)$$

$$\frac{dy}{dx} = -2 \cos(2x) + 2 \sin(x)$$

$$\frac{dy}{dx} = \cos(2x) - 2 \sin(x)$$

[1 mark]

- 2 Solve $|2x + 1| = 5$

$$x = -2 \text{ and } x = 3$$

$$x = -2 \text{ and } x = -3$$

$$x = 2 \text{ and } x = 3$$

$$x = 2 \text{ and } x = -3$$

[1 mark]

- 3 Which of the below is a vector of magnitude $\sqrt{32}$ in the south westerly direction?

$$\begin{pmatrix} -4 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} -4 \\ -4 \end{pmatrix}$$

$$\begin{pmatrix} -6 \\ -2 \end{pmatrix}$$

$$\begin{pmatrix} -3 \\ -3 \end{pmatrix}$$

[1 mark]

4 Find, from first principles the derivative of $y = \frac{1}{x}$.

[4 mark]

5 Solve, showing all reasoning,

$$\frac{1}{2} \times 2^{2x+4} - 2^{x+3} = -2$$

[5 marks]

6 Consider the function $f(x) = 3x \sin(x)$.

a) Show that the x -coordinates of the inflection points of the curve

$$f(x) = 3x \sin(x)$$

satisfy the equation.

$$x = 2 \cot(x)$$

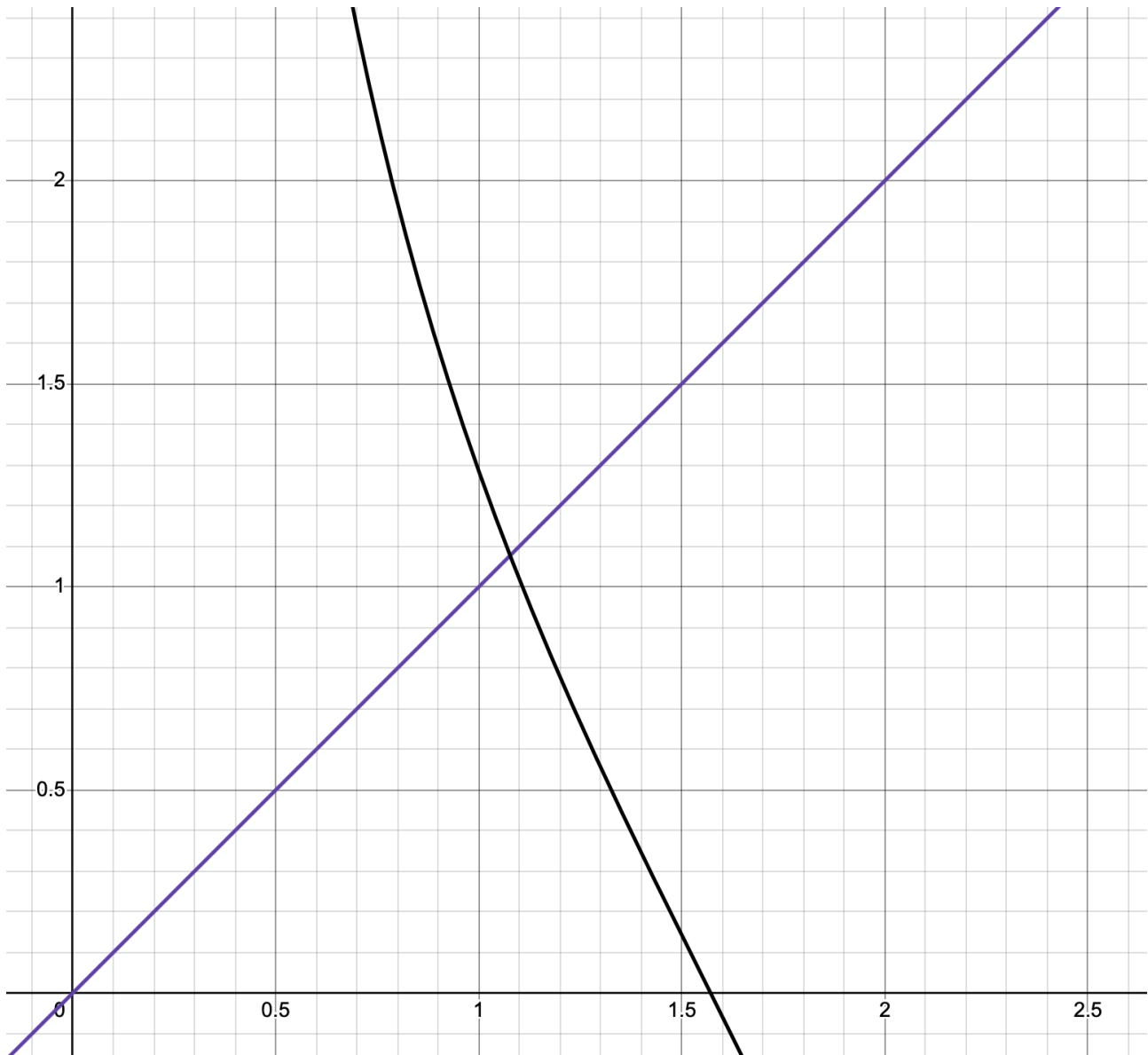
[4 marks]

- b) Jess tries to find an inflection point of the curve by using the iteration

$$x_{n+1} = 2 \cot(x_n)$$

with $x_0 = 1$.

With reference to annotations you make on the diagram below explain how you know that this iteration will not converge to an inflection point.



[3 marks]

7 Let $p(x) = 3x^4 - 4x^3 + ax^2 + bx + 17$.

Given that,

- $p(3) = -388$
- $(3, -388)$ is a stationary point on the curve.

Prove that the point with x -coordinate, $x = 3$, is the only stationary point of $p(x)$.

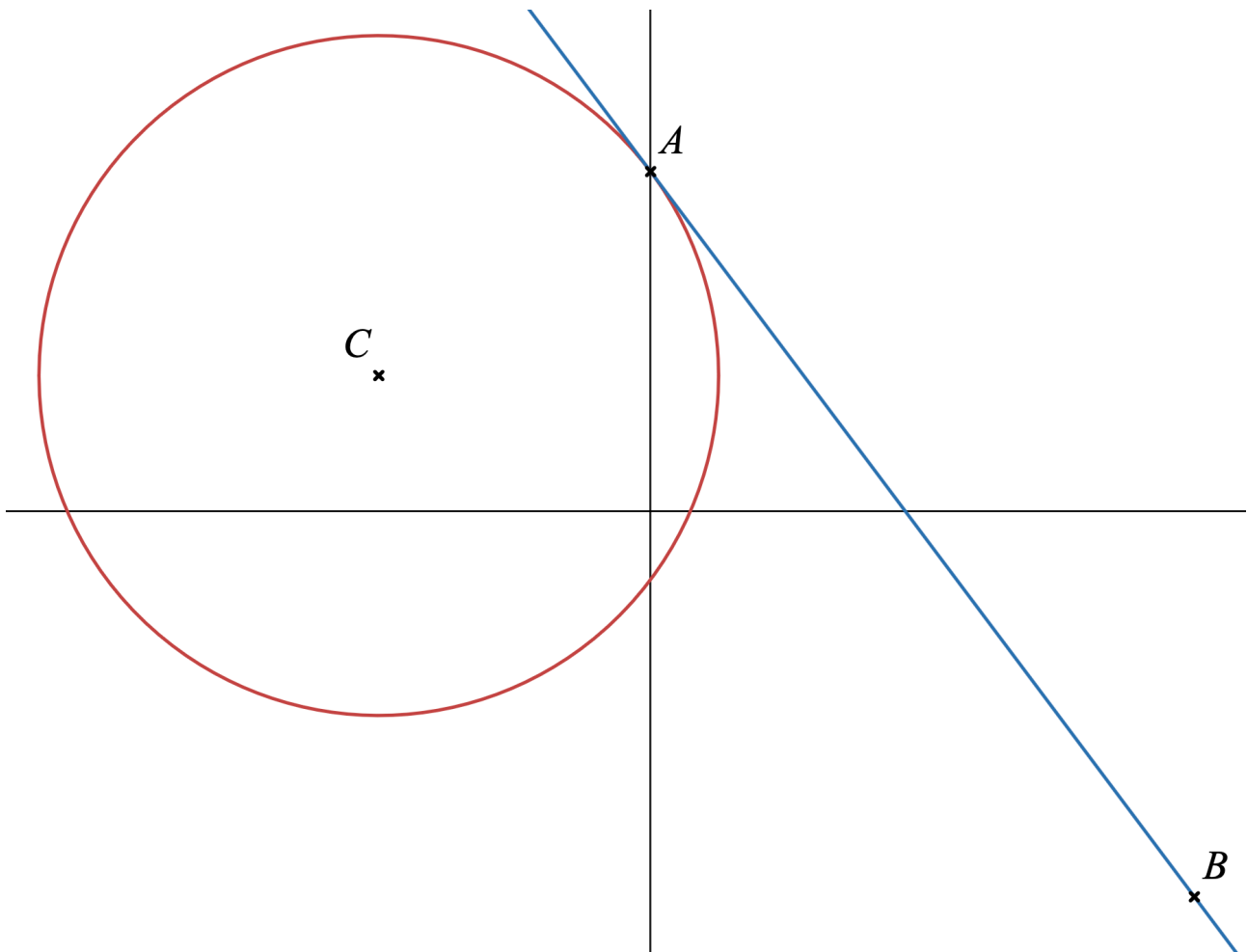
[7 marks]

- 8 The diagram below shows a circle with equation

$$x^2 + 8x + y^2 - 4y - 5 = 0$$

which has centre C and intersects the y -axis at the point A .

The straight line is a tangent to the circle at A and passes through the point $B \left(8, -\frac{17}{3} \right)$.



Find the angle ABC , in degrees to two decimal places.

[7 marks]

- 9 Using a suitable substitution find the exact value of

$$\int_0^4 \frac{2}{2 + \sqrt{1 + 2x}} dx$$

[6 marks]

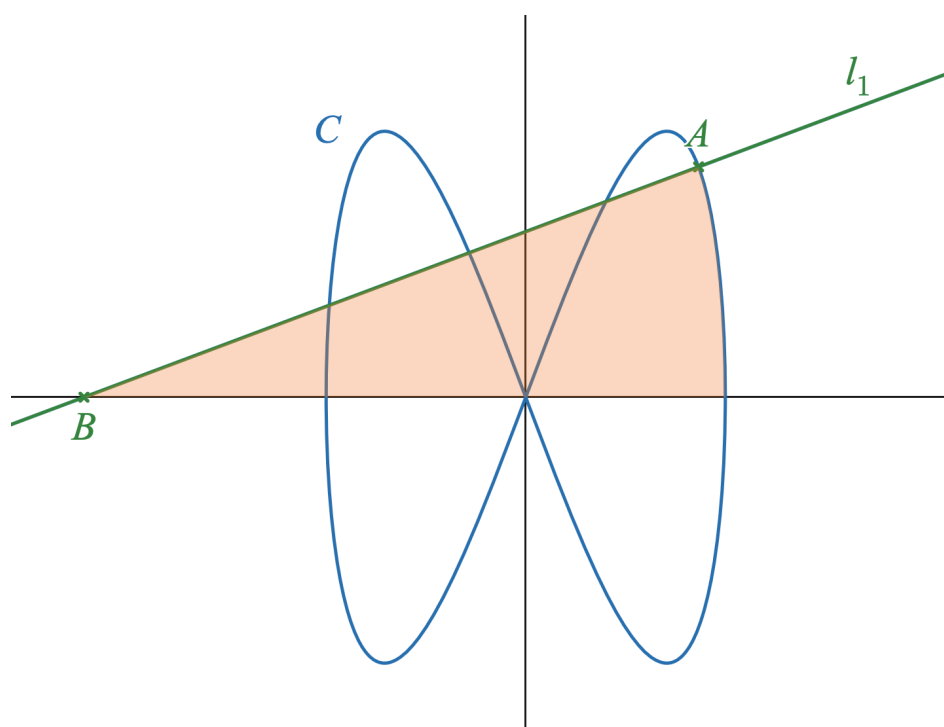
10 A curve C is defined by the parametric equations

$$x = 3 \cos(t), y = 4 \sin(2t) , 0 \leq t \leq 2\pi$$

- a) Find the equation of the normal to the curve at the point where $t = \frac{\pi}{6}$ in the form $16y - 2bx = a\sqrt{b}$ where a and b are integers to be found.

[4 marks]

- b)** The image below shows a sketch of the curve C and the normal found in (a). This normal intersects the x -axis at the point B .



Show that the shaded area is p square units where p is a prime number to be found.

[6 marks]

Section B

11 Let $X \sim N(25, 2.5^2)$

The values a and b are such that $P(a \leq x \leq b) \approx 0.68$.

Identify the correct pair of values.

$a = 22.5$ and $b = 27.5$

$a = 22.5$ and $b = 25$

$a = 20$ and $b = 30$

$a = 25$ and $b = 30$

[1 mark]

12 The discrete random variable Y is modelled as a binomial distribution $Y \sim B(n, p)$.

Given that,

- The mean of Y is 4
- The variance of Y is 3.2

What is the correct pairs of values?

$n = 20$ and $p = 0.8$

$n = 40$ and $p = 0.4$

$n = 20$ and $p = 0.2$

$n = 40$ and $p = 0.4$

[1 mark]

- 13** Emily is wishing to investigate there political affiliation of the 3300 households in her local area.

She decides to obtain a sample of 150 households.

She enlists her friend, Lily, who suggests they select every 22nd household in a list of all the households until a sample of size 150 has been collected.

- a)** What is the population for this study.

The 150 households selected

All 3300 households

Lily and Emily

Houses that vote conservative.

[1 mark]

- b)** What is the sampling method suggested by Lily.

Systematic

Opportunity

Quota

Stratified

[1 mark]

14 The mass of a Malling Centenary strawberry is modelled by a normal distribution $M \sim N(\mu, \sigma^2)$.

a) Given that

$$P(M \leq 19) = 0.1586$$

and that

$$P(N > 25) = 0.0228$$

find μ and σ .

[6 marks]

- b)** Leaf Farm tries a new growing regime and a sample of 20 berries is taken which weighs a total of 445 grams.

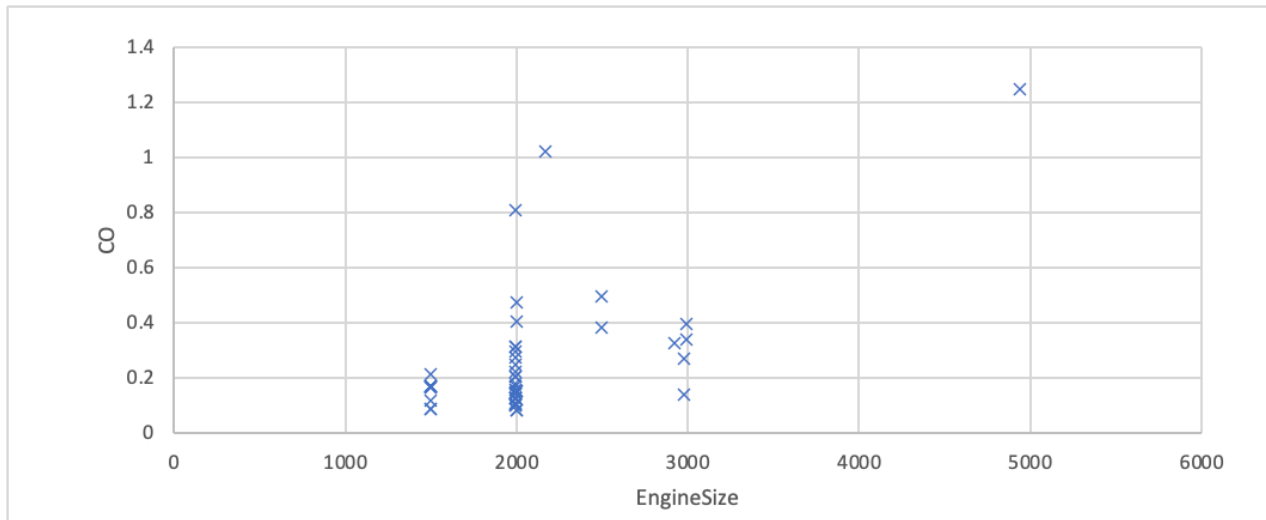
Is there evidence that the regime change has made a difference to the average weight.

Perform a hypothesis test to investigate.

[6 marks]

- 15** Charlie is using the Large Data Set to explore whether there is a correlation between engine size and CO emissions.

He produces the below scatter graph for a sample of 50 cars from a single manufacturer.



- a)** What kind of correlation is shown in the scatter graph above?

[1 mark]

- b)** Using your knowledge of the Large Data Set explain the presence of the vertical lines in the graph.

[1 mark]

- c) Charlie calculates the correlation coefficient between the engine size and CO emissions for his sample. He obtains a value of $r = 0.62$.

He therefore believes there is a positive correlation between engine size and CO emissions.

Given that for $n = 50$ the critical value for a one-tailed test at the 1 % level is 0.3281, carry out a hypothesis test at the 1 % level of significance to determine if the sample provides evidence to support Charlie's belief.

[4 marks]

- d)** Charlie's friend Elif says that using data from the large data set she can conclude that, for all cars in the UK, the engine size can be used to predict the CO emissions.

Is she correct?

[2 marks]

- 16** Jars of Little Scarlet jam (James Bond's jam of choice) are sold to retailers in trays of 48 jars.

It is known that 5 % of jars have a blurred expiry date.

- a)** Let X be the random variable "Number of jars in a tray of 48 that have a blurred expiry label".

State an assumption, in context, necessary for the binomial distribution to be used to model the random variable X .

[1 mark]

- b)** Find the probability that there is at most 2 jars with a blurred expiry date in a given tray.

[2 marks]

- c)** Given that Fine Provisions buys 8 trays. What is the probability that there are exactly 3 trays with at most 2 jars with blurred labels?

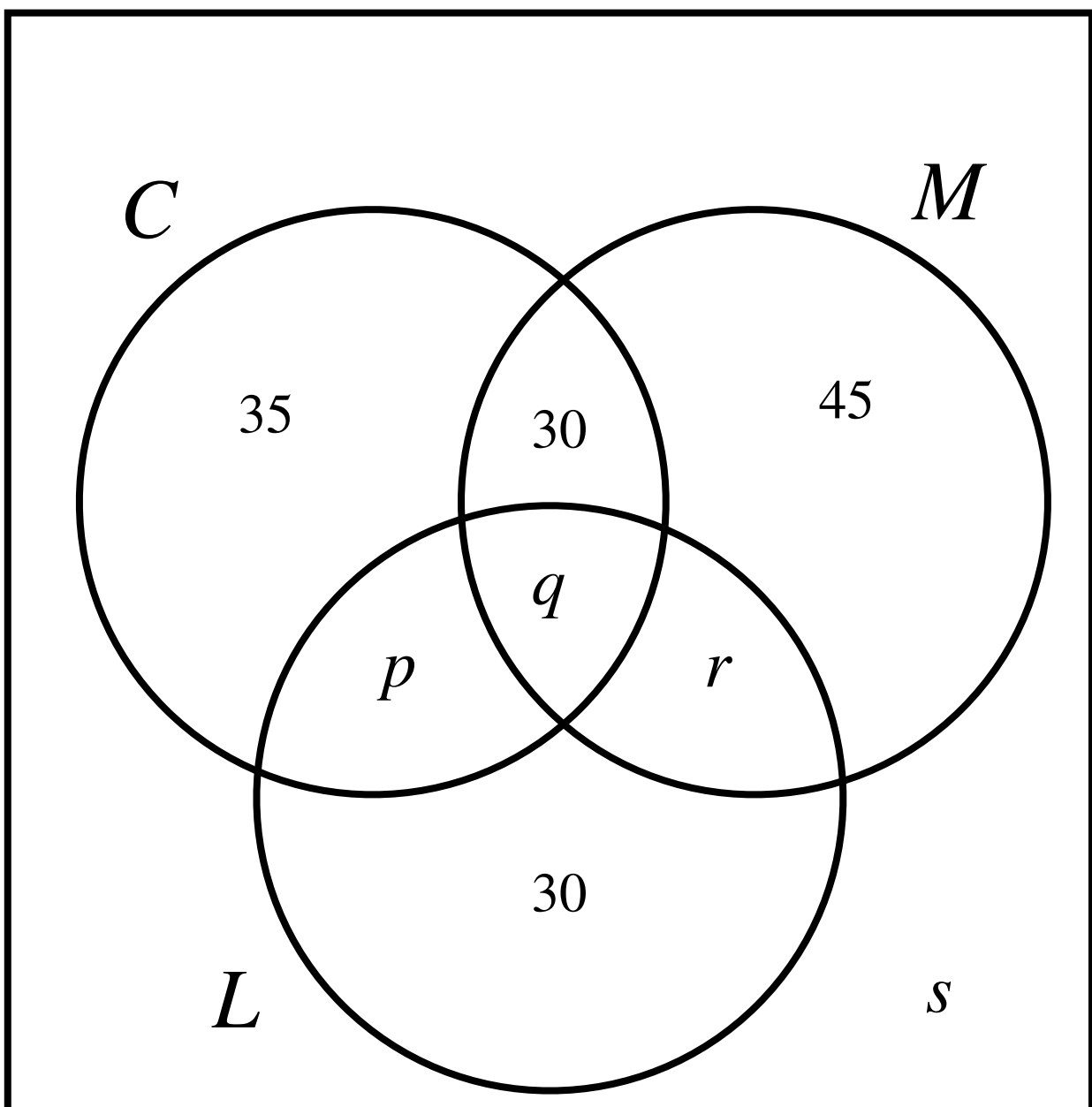
[2 marks]

- 17 In a sixth form of 220 students they are all asked whether they like to listen to three country artists.

Define the events C , M and L as follows:

- C : they like listening to The Castellows
- M : they like listening to Megan Moroney
- L : they like listening to Luke Combs

A Venn diagram is constructed showing their listening preferences as below, where p , q , r and s are whole numbers.



a) Given that 55 students like listening to both The Castellows and Megan Moroney and that $P(C) = \frac{1}{2}$,

(i) Find the value of q

[1 mark]

(ii) Find the value of p .

[2 marks]

b) Given that $P(L|M) = \frac{8}{23}$, find r .

[3 marks]

c) What is the value of s ?

[1 mark]

d) Determine, showing all reasoning, whether the events C and $M \cap L$ are independent.

[3 marks]

- 18** The discrete random variable X takes integers which are multiples of 3 from 3 to $3n$ inclusive.

The probability distribution of X is given by

$$P(X = x) = \frac{x}{k}, \quad x = 3, 6, 9, \dots, 3n$$

- a)** Show that $k = \frac{3n(n+1)}{2}$

[4 marks]

b) When $n = 21$ find the exact value of $P(15 < X \leq 28)$

[3 marks]

- c) When $n = 21$, a random value, h , of X is taken and the below quadratic equation in y is formed

$$y^2 + hy + 4h = 7$$

Find the exact probability that the equation has no real roots.

[5 marks]