AQA Level 2 Further Maths Paper 2
2019 “Predicted Content”

Name: .....

Class: .....

1 Find the values of a, b, and c such that
$3x^2 + 4x - 5 = a(x + b)^2 + c$.

2 **a)** A is the intersection point of the lines $l_1 : y = 2x - 4$ and $l_2 : -3x + 4y = -11$. Find the coordinates of A.

b) The line l_3 goes through the points $B(12,0)$ and $C(9,4)$.

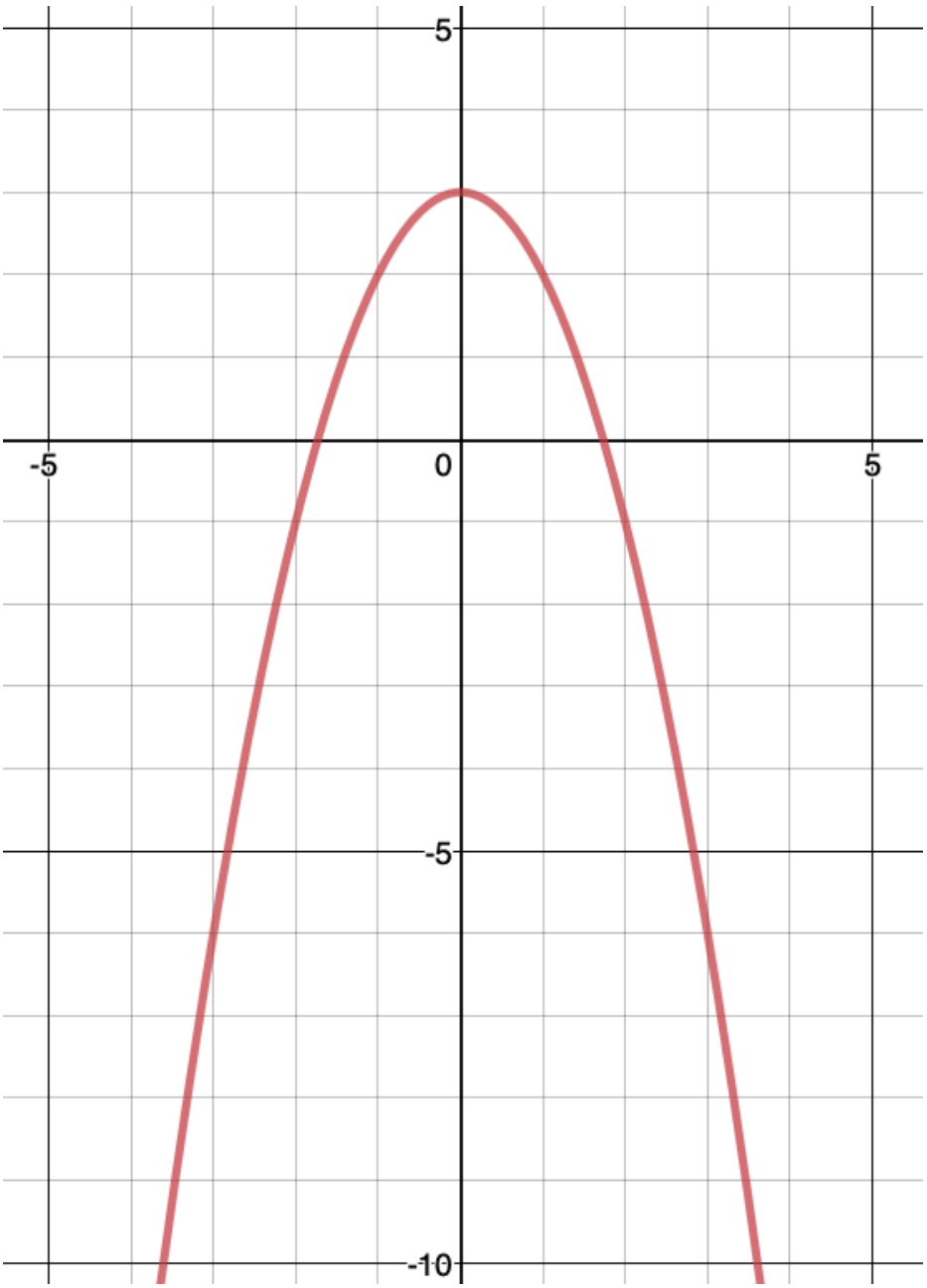
i) Show that the point $C(9,4)$ also lies on line l_2.

ii) Find the equation of the line l_3.

iii) Let the point D be the intersection of the lines l_3 and l_1. Find the coordinates of D.

iv) Explain why the triangle ACD must be right angled.

3 The graph of $y = 3 - x^2$ is shown below. By plotting a suitable linear function, find approximate solutions to the equation $x^2 + 2x - 4 = 0$.



4 Find the exact value of $\sqrt{12} + \sqrt{48} - \sqrt{75}$.

5 Solve $x^3 = 2\sqrt{2}$ giving your anger as a power of 2.

6 Prove algebraically that the sum of five consecutive numbers is always a multiple of 5.

7 Solve the simultaneous equations $xy = 12$ and $5x - 2y = 7$.

8 A sequence is defined by the nth term formula $u_n = \dfrac{4-n}{n^2+2}$.

a) What is the value of the first negative term of this sequence?

b) What is the limiting value of this sequence as $n \to \infty$?

9 **a)** Quadratic Sequence 1 is defined by the nth term rule $u_n = n^2 + 3n + 1$. Write down the first five terms of this sequence.

b) The first five terms of Quadratic Sequence 2 are $5, 16, 31, 50, 73$. Find the nth term of this sequence.

c) A third quadratic sequence is formed by adding the terms of Quadratic sequence 1 to the respective terms of Quadratic sequence 2. What is the nth term of this third sequence? And what is the value of the 10th term?

10 **a)** Find the radius of the circle with centre $(4,3)$ which passes through the point $A(7,5)$.

b) The tangent at A meets the $x-$axis at the point B. Find the angle ABO where O is the origin.

11 Three points $A(1,2)$, $B(6,3)$ and $C(5,8)$ lie in the plane.

a) Show that AB and BC are perpendicular.

b) Find the area of the triangle ABC.

12 The points A and B are the intersection points of the circle centre $(4,2)$ and radius 5 and the line $7x - y = 51$. Find the length of the chord AB.

13 Simplify $\dfrac{x^2-4}{x^2-2x-3} \times \dfrac{x+1}{x^2+x-6}$

14 **a)** Show that $(x + 3)$ is a factor of of $f(x) = -x^3 - 2x^2 + 5x + 6$.

b) Hence find the three distinct roots of $f(x) = 0$.

c) Sketch $f(x)$.

15 Given that $y = x(3 + x^2)$ work out the rate of change of y with respect to x at the instant $x = 4$.

16 Factorise fully $(x + 1)(x + 4)^2 + 5(x + 4)^4$

17 A is the point $(1,10)$ and O is the origin.

a) Show that A lies on the curve $y = 3x^2 + 4x + 3$.

b) Prove that the line OA is a tangent to the curve $y = 3x^2 + 4x + 3$

18 Show that $y = 2x^3 + 12x^2 + 24x + 5$ has only one stationary point and that this point is a point of inflection.

19 In the triangle ABC with sides a, b and c (where the common convention that side c is opposite the vertex C etc has been used), the angle at A is $30°$ and the angle at B is $45°$. Find the exact value $\frac{a}{c}$.

20 A sandwich box is a cuboid and measures 15 cm by 10 cm by 5 cm. What is the length of the longest item of cutlery that could be placed inside the box.

21 A plane flies due north from town A a distance of 20 miles to town B. it then flies due west a distance of 30 miles to town C. Find the bearing of town C from town A and the distance the plane would have flown if it had flown from A to C along this bearing.

22

a) Sketch the graph $y = \cos(x)$

b) How many solutions are there to the equation $\cos(x) = \frac{1}{3}$ where $90^\circ < x < 270^\circ$?

c) How many solutions are there to the equation $\cos(x) = 3$ for $-360^\circ \leq x \leq 360$?

23 Given that $\cos(210°) = -\frac{\sqrt{3}}{2}$ work out the value of $\cos(150°)$.

24 Prove $\frac{1}{\cos^2(x)} - \tan^2(x) = 1$

25 In Physics the lens equation relates the focal length, f, of a lens to the distance of the object from the lens, u, and the distance of the image from the lens, v. This relationship is expressed as

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

Rearrange to make v the subject.