

**AQA Level 2 Further Mathematics Relay - Page 1**

**1)**  $(x - 3)$  is a factor of  $x^3 + ax^2 - 10x - 24$ .  
Find and pass on the value of  $a$ .

**3)** Receive the value  $b$ .  
Find the gradient of  $y = 3x^2 + 4x - 6$  at  $x = b$ .  
Pass on the digit sum of the answer.

**5)** Receive the value  $a$ .  
Solve the equation  $a + 3 \tan(x) = 0$  in the range  $-180^\circ \leq x \leq 180^\circ$ .  
Pass on the number of solutions.

**7)** Receive the value  $x$ . The pyramid  $ABCDV$ , where  $V$  is the vertex has a square base of side length 10 cm and height  $x$  cm. The vertex is directly above the centre,  $X$ , of the base  $ABCD$ . Let  $M$  be the midpoint of side  $AB$ . Find the angle  $VMX$ .  
Pass on the digit in the first decimal place.

**9)** Receive the fraction  $\frac{a}{b}$ .  
Work out the image of the point  $(2,1)$  under the transformation  $\begin{pmatrix} a & \frac{-a}{37} \\ -1 & \frac{b}{3} \end{pmatrix}$ .  
Pass on the  $y$ -coordinate of the image point.

**11)** Receive the value  $a$ .  
Solve the inequality  $x^2 - ax + 6 < 0$ . Give the solution in the form  $c < x < d$ .  
Pass on  $d$ .

**13)** Receive the value  $a$ .  
Consider the function  $f(x) = x^2 - a$ ,  $x > 0$ . Find the intersection point of  $f(x)$  and  $f^{-1}(x)$  in the form  $(d, d)$ .  
Pass on  $d$ .

**15)** Receive the value  $z$ .  
Find the values  $x$  and  $y$  such that  $\begin{pmatrix} x & 3 \\ 1 & y \end{pmatrix} \begin{pmatrix} z \\ 2 \end{pmatrix} = \begin{pmatrix} 10 \\ -6 \end{pmatrix}$   
Pass on the value  $y$ .

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**2)** Receive  $k$ .

The matrix  $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$  represents an enlargement of scale factor  $k$  followed by a reflection in the line  $y = x$ .  
Pass on the value of  $b + c$ .

**4)** Receive the value  $m$ .

Find in the form  $an^2 + bn + c$  the  $n$ th term of the sequence  
 $2, m + 6, 22, 38, 58$   
Pass on the value of  $b$ .

**6)** Receive  $a$ .

$(x - a)$  and  $(x + 4)$  are both factors of  $x^3 + 3x^2 + bx + c$ .  
Find the values of  $b$  and  $c$ . Pass on  $\frac{bc}{2}$ .

**8)** Receive the value  $a$ .

Find the equation of the normal at  $x = a$  to the curve  
 $y = x^2 + 5x - 6$ .  
Pass on the  $y$ -intercept as a fraction.

**10)** Receive the value  $b$ .

Find the centre of the circle  
 $x^2 + 2bx + y^2 + 4y - 20 = 0$   
Pass on the radius.

**12)** Receive the value  $d$ .

Find the intersection point of the circle with equation  $(x - 2)^2 + (y - 2)^2 = 25$  and the straight line which passes through the points  $(0, d)$  and  $(d, 1)$ .  
Pass on the  $x$ -coordinate of the intersection point that has integer coordinates.

**14)** Receive  $a$ .

The function  $f(x) = 4x^3 + bx^2 + c$  passes through the point  $(1, 9)$  and has gradient 120 at  $x = a$ .  
Find  $b$  and  $c$ .  
Pass on the value of  $b$ .

**16)** Receive  $m$ .

Solve  
 $\cos^2(x) + m \sin(x) + m = 0$ ,  
giving your answers, in degrees, to 3 decimal places.