

### Further Maths Daily Questions - Week 1 Monday 1

Given that  $z = 2 - 3i$  is a root of  $p(z) = z^3 - 3z + 52$ , fully factorise  $p(z)$  and state all the roots. Plot these on an Argand diagram.

## Further Maths Daily Questions - Week 1 Monday 2

Prove, by induction,  $\sum_{r=1}^n r^2 - 3r = \frac{1}{3}(n-4)n(n+1)$

### Further Maths Daily Questions - Week 1 Tuesday 1

For two  $n \times n$  non-singular matrices  $\mathbf{A}$  and  $\mathbf{B}$ , prove that  $(\mathbf{AB})^{-1} = \mathbf{B}^{-1}\mathbf{A}^{-1}$ .

### Further Maths Daily Questions - Week 1 Tuesday 2

Let  $\alpha, \beta$  and  $\gamma$  be roots of  $p(x) = x^3 + x^2 - 17x + 15$ .

Find:

a)  $\alpha^2 + \beta^2 + \gamma^2,$

b)  $\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma},$

c) the polynomial (with integer coefficients) which has roots  $\frac{1}{\alpha}, \frac{1}{\beta}$  and  $\frac{1}{\gamma}.$

### Further Maths Daily Questions - Week 1 Wednesday 1

- a) Find the vector equation,  $\mathbf{r}_1$ , of the line,  $l_1$  which passes through  $A(1,3,-2)$  and  $B(1,4,4)$ .
- b) The line  $l_1$  intersects the line  $l_2$ , with equation  $\mathbf{r}_2 = \begin{pmatrix} -13 \\ 2 \\ 12 \end{pmatrix} + \mu \begin{pmatrix} 7 \\ 0 \\ -10 \end{pmatrix}$  at the point  $P$ . Find the coordinates of  $P$ .

### Further Maths Daily Questions - Week 1 Wednesday 2

The point  $P(x, y)$  is rotated  $90^\circ$  anticlockwise about the origin and then reflected in the line  $y = x$  to give the coordinate  $Q(3, -4)$ .

- a) Find the single matrix which represents the combined transformation.
- b) Find the coordinates of  $P$ .

### Further Maths Daily Questions - Week 1 Thursday 1

- a) Sketch, on an Argand diagram, the loci  $|z| = 3$  and  $|z - 1| = 2$ .
- b) Find the coordinates of any points where these two loci intersect.

### Further Maths Daily Questions - Week 1 Thursday 2

Find all invariant lines of the form  $y = mx + c$  for the transformation that is

represented by the matrix  $\mathbf{M} = \begin{pmatrix} -\frac{3}{5} & \frac{4}{5} \\ \frac{4}{5} & \frac{3}{5} \end{pmatrix}$ .



## Further Maths Daily Questions - Week 1 Friday 1

Using standard results find an expression for the sum  $\sum_{r=1}^n 3r^3 + 2r^2 + 13$

### Further Maths Daily Questions - Week 1 Friday 2

For which values of  $a$  is the matrix  $\mathbf{M} = \begin{pmatrix} 1+a & 2 \\ 3-a & 3a \end{pmatrix}$  singular?