Voorbeelden van opgaven voor een mondeling eindexamen
Meike Akveld, Januari 2011

1. **Vector Geometry**

   Suppose we define a new product for vectors by

   $$\mathbf{u} * \mathbf{v} = -\frac{1}{2}\,\mathbf{u} \times \mathbf{v}$$

   Here $\times$ denotes the normal vector product.

   (a) What sort of object is $\mathbf{u} * \mathbf{v}$?

   (b) Can you give three geometric properties of this new product?

2. **Vector Geometry**

   Consider the equation

   $$3x + 2y - z = 6$$

   (a) What is the geometric interpretation of this equation?

   (b) Can you find the parametrised equation of this plane?

   (c) Suppose we substitute one of the parameters, say t, by $\sin t$. What is now parametrised?

   (d) And what if we substitute the other parameter, say s, by e^s?

3. **Analysis**

   Consider the functions $f(x) = 2x + 1$ and $g(x) = \frac{1}{x}$.

   (a) What can you say about these functions?

   (b) Determine $f \circ g$ and $g \circ f$.

   (c) Determine $f \circ f$, $f \circ f \circ f$ and $f^{(n)}$ – can you prove this?

   (d) The same for g.

4. **Analysis**

   (a) What do mathematicians mean by $\mathbb{Z}$?

   (b) Can you name two integers whose product is equal to their sum.

   (c) Are there any other such integers? Can you express this relation with an equation – solve it for y

   (d) What sort of function is this? Graph?

   (e) Can we now answer the original question for certain?

5. **Vector Geometry and Combinatorics**

   (a) Can you explain what is meant by the following notation $\begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$?

   (b) Can you give another vector of the same length? Any more with integer coefficients?

   (c) If we just permute these three components, how many different vectors do you get?

   (d) Seen as position vectors, where do the endpoints lie, and why? (circle on sphere of radius $\sqrt{14}$)