

Day 15

Secret message

ELFHOLINSRDE

Someone has just sent you and the person sitting next to you the message above, which you know to be encrypted using the permutation

$$(1\ 4\ 2)(3\ 6) \in S_6.$$

Take about 3 minutes to work together to decipher the message.

Isomorphisms

1. Which of the following functions $f: \mathbf{R}^* \rightarrow \mathbf{R}^*$ is an isomorphism?

(A) $f(x) = x^2$

(B) $f(x) = x^3$

(C) $f(x) = x^4$

(D) None of the above

2. Let \mathbf{R}^+ be the group of positive real numbers under multiplication. The exponential function $\exp : \mathbf{R} \rightarrow \mathbf{R}^+$, where $\exp(x) = e^x$, is...

- (A) an isomorphism.
- (B) not an isomorphism.

3. Consider the subgroup

$$H = \left\{ \begin{bmatrix} 1 & x \\ 0 & 1 \end{bmatrix} \mid x \in \mathbf{R} \right\}$$

of $GL(2, \mathbf{R})$. The function $\phi : \mathbf{R} \rightarrow H$ given by

$$\phi(x) = \begin{bmatrix} 1 & x \\ 0 & 1 \end{bmatrix}$$

is...

- (A) an isomorphism.
- (B) not an isomorphism.