Note that all of these have multiple correct answers, especially on problems 4-6 there are many, many ways of phrasing these statements.

For questions 1-3, write each statement in mathematical notation.

1) Every dog has a collar which is blue.

$$\forall_{\text{dogs}}\exists_{\text{collar}}(\text{Said color is blue})$$

2) There is a number for which the product with every real number is zero.

$$\exists_{x\in\mathbb{C}}\forall_{y\in\mathbb{R}}(xy=0)$$

Common issue: which comes first?

3) If you go swimming in January, then all the polar bears will laugh.

$$\text{You go swimming in January} \Rightarrow \forall_{\text{polar bears p}}(p \text{ will laugh})$$

For questions 4-6, write each statement in English.

4) $\forall_{x\in\mathbb{R}}\forall_{y\in\mathbb{Q}}\forall_{z\in\mathbb{Z}}(xyz+2\in\mathbb{C})$

For all real numbers, all rational numbers, and all integers, the product of all three plus two is a complex number.

5) $a\in\mathbb{R}\wedge b\in\mathbb{R}\Rightarrow(a+bi)(a-bi)\in\mathbb{R}$

If a and b are both real numbers, then $(a+bi)(a-bi)$ is also real.

6) $\forall_{\varepsilon>0}\exists_{N\in\mathbb{N}}(n\geq N\Rightarrow|a_n-L|<\varepsilon)$

For all positive epsilon, there is a natural number N in which $n\geq N$ implies $|a_n-L|$ is less than epsilon.