Exercises are for your own use, as you see fit. Study on your own or with friends, ask questions in office hours and/or the Tutorial Centre, etc. Do as much or as little as you feel will be helpful.

Exercise 1.
Make a selection from the following.

(a) H&R Exercises 2.1.1–3 (examples for Predicate Logic).
(b) H&R Exercises 2.2.1–6 (syntax of Predicate Logic).
(c) H&R Exercises 2.4.1–5 (semantics: interpretations/models).
(d) H&R Exercises 2.4.6–12 (semantics: entailment, etc.)

Exercise 2.
Why is the formula \( \forall x \forall y \exists z \ f(x, y) = z \) valid, under any interpretation? (Assume predicate logic with equality).

Exercise 3.
Assume the interpretation with domain \( \mathbb{N} \), in which the following symbols have their usual meaning: constants symbol 0, function symbols \(+^{(2)}\) and \(\times^{(2)}\), and relation symbol \(=^{(2)}\).

(a) For each statement, give a formula that expresses the statement, under this interpretation.
   i. \( x \) is less than or equal to \( y \).
   ii. \( x \) is the number one.
   iii. \( x \) is a prime number.

(b) Now consider the interpretation with domain \( \mathbb{Z} \), the symbols again having their usual meaning. For each formula that you gave for the previous part, explain what it means in this new interpretation.