Discuss these with your partner(s)

1. Let $P(x)$ be the predicate "$x^2 \geq x$"
   (a) What are the truth values of $P(2)$? $P(\frac{1}{2})$?, $P(-1)$?
   (b) If the domain is $D = \mathbb{Z}$, find the truth set of $P(x)$
   (c) If the domain is $D = \mathbb{R}$, find the truth set of $P(x)$

2. Let $Q(x)$ be the predicate "$x^4 \geq x$". Determine the truth value of each statement.
   (a) $\forall x \in \mathbb{Z}, Q(x)$
   (b) $\forall x \in \mathbb{R}, Q(x)$
   (c) $\exists x \in \mathbb{R}$ such that $Q(x)$

3. Rewrite the following informally without quantifiers or variables:
   (a) $\forall x \in \mathbb{Z}$, if $x > 0$, then $x^2 > 0$
   (b) $\exists x \in \mathbb{R}$ such that $x^2 = 9$

   From Rachelle DeCoste

4. Let $\mathbb{R}$ be the domain of the predicate variable x. Which of the following are true and which are false? Give counter examples for those that are false.
   (a) $x > 2 \implies x^2 > 4$
   (b) $x^2 > 4 \implies x > 2$
   (c) $x^2 > 4 \iff |x| > 2$

   Epp, Exercise 3.22

5. Determine the true value of each statement.
   (a) $\exists a, b, c \in \mathbb{Z}$ such that $a^2 + b^2 = c^2$
   (b) $\exists a, b, c \in \mathbb{Z}$ such that $a^3 + b^3 = c^3$