

1 Let X and Y be sets with $|X| = 4$ and $|Y| = 7$.

- (a) How many subsets does X have? How many of these are *proper* subsets?
- (b) What is $|X \times Y|$?
- (c) How many functions are there from X to Y ?
- (d) How many functions are there from Y to X ?

2 Let $f: X \rightarrow Y$ and $g: Y \rightarrow Z$ be maps of sets. The composition $g \circ f: X \rightarrow Z$ may be diagrammed as

$$X \xrightarrow{f} Y \xrightarrow{g} Z.$$

- (a) Prove that if f and g are both injective, then $g \circ f$ is injective.
- (b) Prove that if f and g are both surjective, then $g \circ f$ is surjective.
- (c) Conclude that if f and g are both bijections, then $g \circ f$ is a bijection.