

An Invitation to Higher Mathematics

Math 215, Fall Semester, 2001

Problems & Exercises

Week 8 – October 8–12

30. (*turn in Monday, October 15*)

Let $A = \{a, b, c\}$ and $B = \{1, 2, 3, 4\}$.

a) What is the cardinality of the cartesian product $A \times B$?

b) Give an explicit bijection $f: \mathbb{N}_n \rightarrow A \times B$ where $n = |A \times B|$.

c) Give a second bijection $g: \mathbb{N}_n \rightarrow A \times B$ distinct from your answer to part a.

d) How many *possible* bijections are there between the sets $\mathbb{N}_n$ and $A \times B$?

31. (*turn in Monday, October 15*)

Of the 170 students who took all the first year core modules last year, 124 liked Reasoning, 124 liked Algebra, 124 liked Calculus, 10 liked only Reasoning, nobody liked only Algebra, 4 liked only Calculus and 2 liked none of the modules. How many students liked all three core modules?

32. (*turn in Monday, October 15*)

Let $A = \{1, 2, 3, 4\}$. List all of the elements of its *power set* $\mathcal{P}(A)$.

(For discussion of power sets see page 70 in the text.)

33. (*turn in Monday, October 15*)

For the set $B = \{\alpha, \beta, \gamma\}$.

a) Find all of the functions from B to the set $\{0, 1\}$. Write down the functions explicitly using a table with rows for the elements of B , and a column for each function.

b) For each of the functions f you list in part a) write down the set $B_f = f^{-1}(1)$. What can you say about the collection of sets you obtain?