

Discrete Math HW 5: Learning goals S2, S3, P2

S2: I can evaluate and construct sets using union, intersection, difference, and complement of sets, and sets defined via set builder notation.

Exercise 1 Let A , B , and C represent the following sets:

$$A = \{5, 8, 13, 20\}$$

$$B = \{n \mid n \in \mathbb{N} \wedge n < 10\}$$

$$C = \{10k \mid k \in \mathbb{Z}\}$$

Write out the elements in the sets corresponding to each expression below.

(a) $A - B$

(b) $B \cap C$

(c) $A \cap B \cap C$

(d) $\{x \mid (x \in C \cup A) \wedge (|x| \leq 10)\}$

Exercise 2 Complete the Disco exercises in s2b.disco, which you can find linked from the course website.

S3: I can list all the elements in a power set, Cartesian product, or disjoint union of sets, or count them without listing them all.

Exercise 3 List all the elements of $\mathcal{P}(\{3, 5, 7\})$.

Exercise 4 List all the elements of $\mathcal{P}(\{1, 2, 3, 4\})$.

Exercise 5 List all the elements of $\{1, 2\} \times \{-3, -4, -5\}$.

Exercise 6 List all the elements of $\{A\} \times \{B, C, D, E\}$.

Exercise 7 List all the elements of $\{A, B, C\} \times \{X, Y, Z\}$.

Exercise 8 Evaluate: $|\mathcal{P}(\{1, \dots, 5\})|$.

Exercise 9 Evaluate: $|\{A, B, C, \dots, Z\} \times \{1, 2, 3, \dots, 10\}|$.

P2: I can reproduce proofs about sets, set operations, and the subset relation.

Do at least one of the following exercises.

Exercise 10 Prove that for all sets S and T ,

$$\overline{S \cap T} = \bar{S} \cup \bar{T}.$$

Exercise 11 Prove that for all sets S , T , and U ,

$$S \cup (T \cap U) = (S \cup T) \cap (S \cup U).$$

