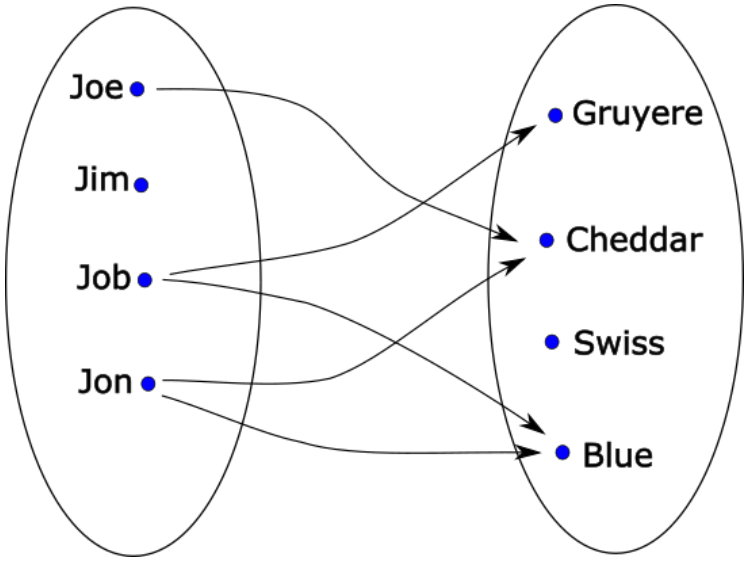
Activity 29 – Introduction to Proof

relations

(1) There is a relation from the set of people to the set of colors that can be defined loosely by: $x\mathsf{R}y$ if and only if x's favorite color is y. Suppose the set of people is just $\{Abby, Bob, Cindy, Dave, Ella\}$. Further, suppose that Bob and Ella both like blue, Abby and Cindy like pink, and Dave prefers green. Draw this relation using a Venn diagram with arrows.

(2) Below is the Venn-diagram-with-arrows picture for a small subset of the "people and the cheeses they like" relation.



Who doesn't like any cheese? What disgusting cheese is not liked by anyone? What changes would need to be made to this scenario to produce a relation that was a function?

(3) Write the relation in the last problem as a set of ordered pairs.

(4) Define a relation on $\mathbb{R}$ by $x\mathsf{R}y \iff x^2 = y^2$. Use set-builder notation to write R as a set of ordered pairs and sketch a graph of R as a subset of the Cartesian plane.

(5) Define a relation on $\mathbb{R}$ by $x\mathsf{R}y \iff x^2 - y^2 = 1$. Sketch a graph of R as a subset of the Cartesian plane.

(6) Consider the following set of trigonometric functions:

$$A \;=\; \{\cos(x), \sin(x), -\cos(x), -\sin(x)\}.$$

Give the digraph (with vertex set A) of the relation

$$\mathsf{R} \;=\; \{(f(x), g(x)) \,|\, g(x) = f'(x)\}.$$