Example of a Proof Using the Pigeonhole Principle

1. At ORD airport an average of 1,042 flights take off per day. Prove that at least two of these flights must take off within 90 seconds of each other.

   Proof.
   Number of flights in a day

   The number of flights per day is given.
   There are 1,042 flights in a day.

   Number of 90-second intervals in a day

   The total number of seconds in a day is

   $$24\ hrs/day \times 60\ min/hr \times 60\ sec/min \quad = \quad 86,400\ sec/day$$

   So the number of 90-second intervals in a day is:

   $$86,400/90 \quad = \quad 960$$

   There are 960 90-second intervals in a day.

   Conclusion

   Since there are more flights in a day than 90-second intervals, by the Pigeonhole Principle, two flights must be in the same 90-second interval. □