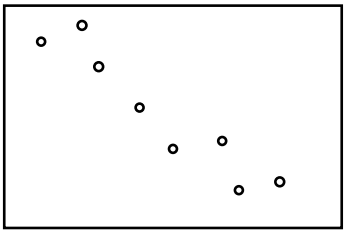
**Duration: 50 minutes**
Instructions: Answer all questions, without the use of notes, books or calculators. Partial credit will be awarded for correct work, unless otherwise specified. The total number of points is 100.

1. (20 points: 4 each) Exactly one of the following statements is true. Choose which one is the correct one and explain why the others are false. You may do so by either presenting the correct version or give a counterexample.
   (a) Chebyshev's Inequality asserts that the proportion of data values that lie within $k$ standard deviations from the mean is approximately $1 - 1/k^2$.
   (b) For a normal data set, about 95% of data lies within plus and minus two standard deviations of the mean.
   (c) If events $E$ and $F$ are mutually exclusive, then they are independent.
   (d) The mean of a data set almost always exceeds its median.
   (e) The correlation of the data in the scatter plot on the right is about 0.9.



2. (20 points total) Consider the data set with eight values:
$$4, \quad 7, \quad 9, \quad 0, \quad 9, \quad 4, \quad 8, \quad 0$$
   (a) (7 points) Find the sample mean and sample median.
   (b) (8 points) Draw a box plot for the data set.
   (c) (5 points) Write down the expression to calculate the standard deviation.

3. (20 points: 10 each) The joint probability density function of random variables $X$ and $Y$ is given by
$$f(x,y) = \begin{cases} C\sin(x+y), & 0 < x < \dfrac{\pi}{2}, 0 < y < \dfrac{\pi}{2} \\ 0, & \text{otherwise} \end{cases}.$$
   (a) Find the constant $C$.
   (b) What is the probability that $X > Y$?

4. (20 points) A fair coin is flipped 5 times. Let $Z$ be the difference between the number of heads flipped and the number of tails flipped. (**Note that the difference can be negative.**)
   (a) (5 points) Find all values that $Z$ may take on.
   (b) (10 points) Find the probability mass function of $Z$.
   (c) (5 points) What is the expectation of $Z$?

5. (20 points) Three different airlines, called AM, UN, and SW, fly out of Ontario. AM airline has 70 flights per day, of which 10% are late departures. UN airline has 50 flights per day, of which 8% are late. SW has 65 flights per day, of which 13% are late. You randomly hear someone at the airport complaining about their late flight, but do not hear them say which airline. What is the probability that they are traveling on an SW flight?