

MA 581 Qualifier Problems: Spring 2007

1. A fair coin is tossed until the first heads appears. Then, a fair, six-sided die is rolled as many times as the coin was tossed.
 - a. Find the probability that the experimenter requires between 5 and 20 tosses (inclusive) to get her first heads on the coin.
 - b. Find the probability that the die *never* rolls a “5.”
 - c. Suppose this experiment is conducted, and the experimenter’s die tosses *never* rolled a “5.” Find the probability that she had needed to toss the coin exactly 7 times.

2. The r.v. X has pdf $f(x)=cx^2$, for $0<x<3$, and $f(x)=0$ for other values of x .
 - a. Find the value of c .
 - b. Find the standard deviation of X .
 - c. Find $E(e^X/X^2)$.
 - d. Define the *terce* of a r.v. to be a number t satisfying $P(X>t)= 1/3$. Find the *terce* of X .
 - e. Suppose X and Y are iid, each having pdf $f(x)=cx^2$, for $0<x<3$, and $f(x)=0$ for other values of x . Find the covariance of $X+Y$ and X , that is, $\text{cov}(X+Y, X)$.