

HW 4

- 1) Sincich, Ex. 3.7, 3.16.
- 2) Sincich, Ex. 3.18, 3.105.
- 3) Sincich, Ex. 4.1, 4.13, 4.14.
- 4) Compute the expected value (μ) and the standard deviation (σ) for the discrete random variable X that takes values 1,2,4 with probabilities 0.2, 0.4, 0.4, respectively.
- 5) Sincich, Ex. 4.29.
- 6) Sincich, Ex. 4.33. For each game, your probability of picking the spread-adjusted winner is 50%.
- 7) Sincich, Ex. 4.35, 4.37, 4.40.
- 8) Sincich, Ex. 4.52.

- 9) What is the probability of obtaining 4 of a kind in a 5-card poker hand dealt from a fresh deck? (An example of 4 of a kind is 4 kings, together with one non-king).

- 10) For the New York 6/51 Lotto discussed in class, show that the probability of winning Fourth Prize (matching 4 winning numbers and the bonus number) is $1/27,287$ and the probability of winning Fifth Prize (matching 4 winning numbers but not the bonus number) is $1/1,269$.

- 11) Read the attached Mr. Lotto article on the New York Numbers from the Daily News. In this game, three digits (from 0 to 9) are drawn at random, with replacement. We will verify some of the numbers given by Mr. Lotto.
 - A) In a “straight” bet, the player predicts the numbers, in order. Show that the probability of winning a straight bet is 1 in 1,000.
 - B) In a “combo” (combination, also called “boxed play”), you select the three numbers, and you win if these numbers come up in any order. Show that there are 120 no-match combos, that is, combinations where no digit is repeated.
 - C) Mr. Lotto says that no-match combos are drawn about 72% of the time. Show that in fact the probability that the number drawn will have no repeated digits is exactly 72%.
 - D) Show that there are 90 double-digit combos, such as 1-2-2, and 10 triple-digit combos, such as 1-1-1. Note that adding the number of no-match, double-digit and triple-digit combos gives $120+90+10=220$. This explains Mr. Lotto’s claim that “The game features just 220 unique digit combinations.”

- 12) Suppose a 40-year-old male purchases a \$100,000 10-year term life policy from an insurance company, meaning that the insurance company must pay out \$100,000 if the insured male dies within the next 10 years.
- A) Use the accompanying life table to determine the insurance company's expected payout on this policy. (Hint: Remember that your universe here is the set of males 40 and older).
The age intervals in the table contain all ages from the lower limit up to (but not including) the upper limit.
- B) What would be the expected payout if the same policy were taken out by a 50-year-old male?

NUMBER OF DEATHS AT VARIOUS AGES
OUT OF 100,000 AMERICAN MALES BORN ALIVE

Age Interval	0-1	1-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80 and Over	Total
Number of Deaths	1,527	495	927	1,901	2,105	4,502	10,330	19,954	28,538	29,721	100,000

- 13) A multiple-choice quiz has 20 questions. Each question has five possible answers, of which only one is correct.
- A) What is the probability that sheer guesswork will yield at least 10 correct answers?
- B) What is the expected number of correct answers by sheer guesswork?
- C) Suppose 5 points are awarded for a correctly answered question. How many points should be deducted for an incorrectly answered question, so that for a student guessing randomly, the expected score on a question is zero? (Most standardized tests use this method to set penalties for guessing).
- D) If a student is able to correctly eliminate one option as a possible correct answer but is still guessing randomly, what happens to his/her expected score for that question? Use your answer to C) as the number of points being deducted for an incorrect answer.
- 14) The No-Tell Motel has 15 bedrooms. From past experience, the manager knows that 20% of the people who make room reservations don't show up. The manager accepts 20 reservations. If a customer with a reservation shows up and the motel has run out of rooms, it is the motel's policy to pay \$100 as compensation to the customer. What is the expected value of the compensation that the motel must pay?
- 15) Suppose that X and Y are random variables with $\text{Var}(X)=1$, $\text{Var}(Y)=4$ and $\text{Cov}(X,Y)=1.5$.
- A) Evaluate the correlation, $\text{Corr}(X,Y)$
- B) Evaluate $\text{Var}(X+Y)$
- C) Evaluate $\text{Var}(X-Y)$.

MR LOTTO

Numbers game evens the odds

IF FAVORABLE ODDS is your aim, New York Numbers should be your game.

All you have to do to win is match the three digits drawn each night. The odds of getting all three numbers in the exact order drawn — a straight win — are 1 in 1,000. The payoff is \$500 for a \$1 bet.

But there are easier alternatives.

The game features just 220 unique digit combinations. Only 120 winning possibilities are no-match combos, such as 1-2-3. No-match combos are drawn about 72% of the time, or nearly three out of four days. If you hit with one of these, you win \$80 for a \$1 boxed play, a bet where your picks may be drawn in any order.

Twenty-seven percent of all New York Numbers combos are double-digit, such as 1-2-2. The game features 90 of these. They show up on average every fourth drawing and pay a healthy \$160 per \$1 bet.

Lastly, there are triple-digit combos, such as 1-1-1, which account for 1% of the wins and must be played straight. A triple-digit number



should hit about once every 100 drawings.

Now that you know *all* the odds, you can select a type of bet along with the numbers you want to play.

Doubles may be a good bet if they haven't hit in two weeks.

Triples may be probable if they are nearing or past the 100-game mark without a hit.

And no-match combos

are good plays most of the time.

Notable Numbers

305: These three digits haven't been drawn together in more than a year. Not since 11/21/86 has 305 been drawn, and 035 hasn't been drawn since 4/29/92.

553: Double 5's haven't been drawn in the last 62 days. 553 hasn't hit in any order — 535, 355 or 533 — since 2/21/95.

Daily News lottery columnist Stephen Allensworth is the publisher of the New York and New Jersey Weekly Lottery News, sold at most lottery agents. Send questions and comments to: Mr. Lotto, c/o New York Daily News, Box 3311, 450 W. 33rd St., New York, N.Y. 10001