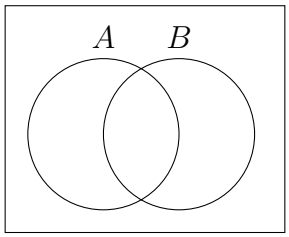
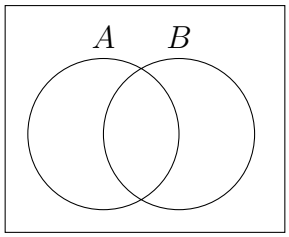
152 practice final Name: _____

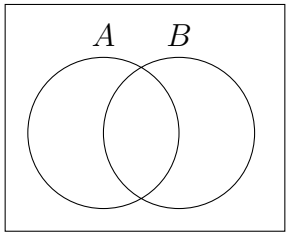
1. $A \cup B$



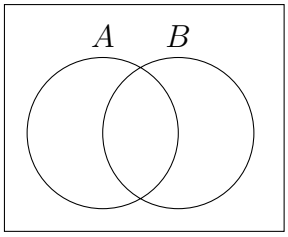
2. $A \cap B$



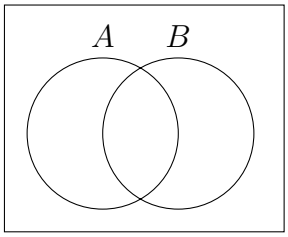
3. A^c



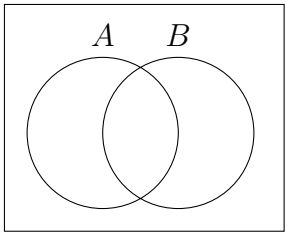
4. B^c



5. $A^c \cap B^c$

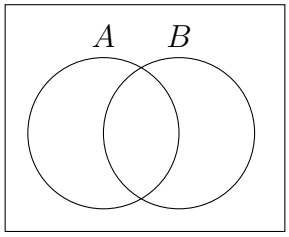


6. $(A \cup B)^c$



Suppose $P(A) = .4, P(B) = .6, P(A \cup B) = .8$

1. Fill in the Venn diagram.



2. $P(A \cap B) =$
3. $P(A^c) =$
4. $P(B^c) =$
5. $P(A|B) =$
6. $P(B|A) =$
7. $P(A^c \cap B) =$
8. $P(A^c|B) =$

Fill in the blanks:

9. $P(A|B) =$_____

10. two sets A and B are "disjoint" if _____

11. two events A and B are "independent" if _____

12. If A, B are disjoint, then $P(A \cap B) =$_____

13. If A and B are independent and $P(A) = .4, P(B) = .7$, then $P(A \cap B) =$_____

    Roll two dice. Let A be the event the total is 8, B be the event one die shows a 5. Find the following:

14. $P(A)$

15. $P(B)$

16. $P(A|B)$

17. $P(B|A)$

18. In this example, are A and B independent or dependent? Justify your answer.

    An urn contains 10 balls, 3 are red and 7 are white. You pick one at random, then **without** replacing it, you pick another. Let A be the event the first ball chosen is red, B be the event the second ball chosen is red.

19. $P(A) =$

20. $P(B|A) =$

21. $P(A \cap B) =$

22. $P(A^c) =$

23. $P(B|A^c) =$

24. $P(A^c \cap B) =$

25. $P(B) =$

26. Write the first 5 levels of Pascal's triangle.

27. Compute $\binom{10}{4}$ the number of ways you can choose 4 items from a set of 10.

There are 12 candy bars in a bag, 5 Hershy bars, 3 Mars bars, and 3 Zero bars. You select 4 at random.

28. What is the probability that all four are Hershey bars?

29. What is the probability that 2 are Hershey bars and 2 are Zero bars?

30. What is the probability that there is one of each?

Recall that if p is the probabilty of "success" in a single trial of a binomial experiment, then the probabilty of k successes and $n-k$ failures in n indepent trials is

$$\binom{n}{k} p^k (1-p)^{n-k}$$

A archer hits the bulls eye 90% of her shots. She shoots 5 times

31. What is the probability she gets exactly four bulls eyes?

32. What is the probability you get at least one bulls eye?

33. How many bulls eyes does she expect to get?

34. How many times do you "expect" to have to roll two dice before you get double sixes?

35. A raffle has 1000 tickets, each of which cost \$2. There is one first prize of \$5000, two second prizes of \$100 each and 4 third prizes of \$10 each. What it the expected value of your lottery ticket?

36. Ricky and Lucy play the following game. Ricky rolls a die and Lucy pays him \$2 if a one, two, three or four appears. But if a five or six appears Ricky pays Lucy \$5. What is Ricky's expected gain (or loss) for the game?

37. Use the formula

$$\sum_{k=0}^{\infty} ar^k = a + ar + ar^2 + ar^3 + ... = \frac{a}{1-r}$$

to add the following:

$$\frac{1}{6} + \frac{1}{6} \times \left(\frac{25}{36}\right) + \frac{1}{5} \times \left(\frac{25}{36}\right)^2 + \frac{1}{6} \times \left(\frac{25}{36}\right)^3 + \frac{1}{6} \times \left(\frac{25}{36}\right)^4 + ... = \sum_{k=0}^{\infty} \frac{1}{6} \left(\frac{25}{36}\right)^k$$

38. Sherman and Peabody take turns rolling a die. Whoever gets and five first wins. If Sherman rolls first, what it the probability that he wins?

39. Solve the quadratic equation $x = \frac{1}{3} + \frac{2}{3}x^2$

40. Lucy and Ethel play a series of games. The probability Lucy wins each game is $\frac{1}{3}$.

    What is the probability that Lucy will ever be up by one game?

41. What is the probability Lucy will ever be up by 5 games?

42. Fred and Ginger toss a coin. If it shows Heads, Ginger pays Fred one dollar but if it shows tails, Fred pays Ginger one dollar. If Fred has \$10 and Ginger has \$15, what is the probability that Fred wins all the money?

43. Jughead goes to the casino with \$100 to play craps. He bets \$10 on each game. The probability that he wins any game is 0.48. What is the probabilty he wins \$100 before he loses his \$100?

44. Suppose on average there are 3 shark attacks every year.

    Assuming that sharks attack in a Poisson distribution, what is the probability that there are no shark attacks this year?

45. What is the probability there are two or more shark attacks this year?

Some useful formulas: Unlimited credit: Peter extends Paul unlimited credit, and the probability Peter wins is p then the probability Peter is ever up by k games is

$$h = \begin{cases} 1 & \text{if} \quad p \geq \frac{1}{2} \\ \left(\frac{p}{1-p}\right)^k & \text{if} \quad p < \frac{1}{2} \end{cases}$$

Limited credit: If Peter starts with s and the total is t then put $r = \frac{1-p}{p}$ and the probability Peter wins all the money before going broke is

$$h = \begin{cases} \frac{s}{t} & \text{if} \quad p = \frac{1}{2} \\ \frac{1-r^s}{1-r^t} & \text{if} \quad p \neq \frac{1}{2} \end{cases}$$

Poisson process with expected value λ

$$P(x = k) = \frac{\lambda^k e^{-\lambda}}{k!}$$

specifically $P(x = 0) = e^{-\lambda}, P(x = 1) = \lambda e^{-\lambda}, P(x = 2) = \frac{\lambda^2 e^{-\lambda}}{2}$