

## COMBINATORICS REVIEW

1. A team is made from five boys and five girls.
  - a) How many different ways can a captain, assistant captain and two other players be chosen?
  
  - b) If the captain and assistant captain must be a boy and a girl, how many different ways can the four-person team be chosen?

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2. A committee consists of ten people.
  - a) How many ways can a subcommittee of three people be selected from the committee?
  
  - b) How many ways can an executive subcommittee consisting of a treasurer, president and secretary be elected from the committee?

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3. From a deck of 52 cards, how many 5-card hands can be formed in each case?
  - a) There are only aces or face cards.
  
  - b) There are only numbered cards (no letters).
  
  - c) There are 2 clubs and 3 diamonds.
  
  - d) There are at least 4 red cards.
  
  - e) There are exactly 3 fives.
  
  - f) There are exactly 2 queens and exactly 2 hearts

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4. From a deck of 52 cards, how many 5-card hands can be formed in each case?
- a) There is exactly one pair.
  - b) There are exactly 2 pairs.
  - c) There is exactly 3 of a kind.
  - d) There is exactly 4 of a kind.
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5. The Super 7 lottery requires you to choose 7 numbers from 1 to 47. The 649 lottery requires you to choose 6 numbers from 1 to 49. To win, the numbers chosen must match the numbers drawn by the lottery corporation.
- a) Winning which of the two lotteries do you think is more likely?
  - b) How many ways are there to match all the numbers in each lottery?
  - c) How many ways are there to match exactly 4 numbers in each lottery?
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6. From an intersection (point A) you must travel 12 blocks west and 9 blocks north (point B). Assuming all routes are possible,
- a) How many pathways consisting of 21 blocks are possible?
  - b) If you must pass through the intersection 7 blocks west and 4 blocks north of point A, how many pathways consisting of 21 blocks are possible ?
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7. There are 8 boys and 12 girls in a drama club. How many ways can a committee of 5 be selected in each case:
- a) There must be at least 2 boys.
  - b) There must be at least 2 girls.
  - c) There must be more girls than boys.
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8. In a student council election, there are 3 candidates for president, 3 for secretary, and 2 for treasurer. If you may vote for at least one position, and vote for one of the candidates for that position, how many different ways can a ballot be marked?
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9. A multiple choice test has 15 questions, with 5 possible answers for each question.
- a) If you guessed the answer to each question, how many different ways would there be to answer the test?
  - b) If you knew that there were exactly 3 A's, B's, C's, D's and E's, how many answer keys are possible?
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10. A lock combination can contain 3 numbers from 0 to 59. How many combinations are possible if the first number is a multiple of 5, the second number is a multiple of three, and the third number must be different than the first two?
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11. Solve:

a)  ${}_n C_2 = 15$

b)  $3({}_n C_4) = {}_n P_3$

c)  $\frac{4!(n-5)!}{(n-3)!} = 4$

d)  ${}_{12} C_x = {}_{12} C_y$

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12. 9 horses run a race.

a) How many ways can a gambler bet on the first three finishing order?

b) If two horses are tied, how many finishing orders are possible?

c) If only 6 horses ran the race, but there were 9 numbered stalls, how many starting arrangements were possible?

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13. You and six others are sitting in a row at a theatre. How many seating orders are possible if
- There are no restrictions.
  - You are sitting beside your friend.
  - You are not sitting beside your friend.
  - You are sitting beside your friend, but at the end of the row.
  - You are at one end and your friend is at the other end of the row.
  - There are 3 couples and each couple is sitting together.
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14. How many flavours of gelato are there if there are 1521520 ways of making triple scoop cones (three different flavours)? (Order not a factor)
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15. a) Expand:  $(x + 1)^{10}$

b) Expand:  $\left(3x - \frac{y}{2}\right)^9$

c) Find the middle term in the expansion of  $(a + 2b)^{12}$

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