Combinatory and probability

1. In a workshop there are 4 kinds of beds, 3 kinds of closets, 2 kinds of shelves and 7 kinds of chairs. In how many ways can a person decorate his room if he wants to buy in the workshop one shelf, one bed and one of the following: a chair or a closet?

a) 168.
b) 16.
c) 80.
d) 48.
e) 56.

2. In a workshop there are 4 kinds of beds, 3 kinds of closets, 2 kinds of shelves and 7 kinds of chairs. In how many ways can a person decorate his room if he wants to buy in the workshop one shelf, one bed and one of the following: a chair or a closet?

a) 168.
b) 16.
c) 80.
d) 48.
e) 56.

3. Three people are to be seated on a bench. How many different sitting arrangements are possible if Erik must sit next to Joe?

a) 2.
b) 4.
c) 6.
d) 8.
e) 10.

4. How many 3-digit numbers satisfy the following conditions: The first digit is different from zero and the other digits are all different from each other?

a) 648.
b) 504.
c) 576.
d) 810.
e) 672.

5. Barbara has 8 shirts and 9 pants. How many clothing combinations does Barbara have, if she doesn't wear 2 specific shirts with 3 specific pants?

a) 41.
b) 66.
c) 36.
d) 70.
e) 56.

6. A credit card number has 6 digits (between 1 to 9). The first two digits are 12 in that order, the third digit is bigger than 6, the forth is divisible by 3 and the fifth digit is 3 times the sixth. How many different credit card numbers exist?

a) 27.
b) 36.
c) 72.
d) 112.
e) 422.

7. In jar A there are 3 white balls and 2 green ones, in jar B there is one white ball and three green ones. A jar is randomly picked, what is the probability of picking up a white ball out of jar A?

a) 2/5.
b) 3/5.
c) 3/10.
d) 3/4
e) 2/3.

8. Out of a box that contains 4 black and 6 white mice, three are randomly chosen. What is the probability that all three will be black?

a) 8/125.
b) 1/30.
c) 2/5.
d) 1/720.
e) 3/10.

9. The probability of pulling a black ball out of a glass jar is 1/X. The probability of pulling a black ball out of a glass jar and breaking the jar is 1/Y. What is the probability of breaking the jar?

a) 1/(XY).
b) X/Y.
c) Y/X.
d) 1/(X+Y).
e) 1/(X-Y).

10. Danny, Doris and Dolly flipped a coin 5 times and each time the coin landed on "heads". Dolly bet that on the sixth time the coin will land on "tails", what is the probability that she's right?

a) 1.
b) ½.
c) ¾.
d) ¼.
e) 1/3.

11. In a deck of cards there are 52 cards numbered from 1 to 13. There are 4 cards of each number in the deck. If you insert 12 more cards with the number 10 on them and you shuffle the deck really good, what is the probability to pull out a card with a number 10 on it?

a) 1/4.
b) 4/17.
c) 5/29.
d) 4/13.
e) 1/3.

12. There are 18 balls in a jar. You take out 3 blue balls without putting them back inside, and now the probability of pulling out a blue ball is 1/5. How many blue balls were there in the beginning?

a) 9.
b) 8.
c) 7.
d) 12.
e) 6.

13. In a box there are A green balls, 3A + 6 red balls and 2 yellow ones.
If there are no other colors, what is the probability of taking out a green or a yellow ball?

a) 1/5.
b) 1/2.
c) 1/3.
d) 1/4.
e) 2/3.

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14. The probability of Sam passing the exam is 1/4. The probability of Sam passing the exam and Michael passing the driving test is 1/6.

What is the probability of Michael passing his driving test?

a) 1/24.
b) 1/2.
c) 1/3.
d) 2/3.
e) 2/5

15. In a blue jar there are red, white and green balls. The probability of drawing a red ball is 1/5. The probability of drawing a red ball, returning it, and then drawing a white ball is 1/10. What is the probability of drawing a white ball?

a) 1/5.
b) ½.
c) 1/3.
d) 3/10.
e) ¼.

16. Out of a classroom of 6 boys and 4 girls the teacher picks a president for the student board, a vice president and a secretary. What is the probability that only girls will be elected?

a) 8/125.
b) 2/5.
c) 1/30.
d) 1/720.
e) 13/48.

17. Two dice are rolled. What is the probability the sum will be greater than 10?

a) 1/9.
b) 1/12.
c) 5/36.
d) 1/6.
e) 1/5.

18. The probability of having a girl is identical to the probability of having a boy. In a family with three children, what is the probability that all the children are of the same gender?

a) 1/8.
b) 1/6.
c) 1/3.
d) 1/5.

e) ¼.

19. On one side of a coin there is the number 0 and on the other side the number 1. What is the probability that the sum of three coin tosses will be 2?

a) 1/8.
b) ½.
c) 1/5.
d) 3/8.
e) 1/3.

20. In a flower shop, there are 5 different types of flowers. Two of the flowers are blue, two are red and one is yellow. In how many different combinations of different colors can a 3-flower garland be made?

a) 4.
b) 20.
c) 3.
d) 5.
e) 6.

21. In a jar there are balls in different colors: blue, red, green and yellow.
The probability of drawing a blue ball is 1/8.
The probability of drawing a red ball is 1/5.
The probability of drawing a green ball is 1/10.
If a jar cannot contain more than 50 balls, how many yellow balls are in the Jar?

a) 23.
b) 20.
c) 24.
d) 17.
e) 25.

22. In a jar there are 3 red balls and 2 blue balls. What is the probability of drawing at least one red ball when drawing two consecutive balls randomly?

a) 9/10
b) 16/20
c) 2/5
d) 3/5
e) ½

23. In Rwanda, the chance for rain on any given day is 50%. What is the probability that it rains on 4 out of 7 consecutive days in Rwanda?

a) 4/7
b) 3/7
c) 35/128
d) 4/28
e) 28/135

24. A Four digit safe code does not contain the digits 1 and 4 at all. What is the probability that it has at least one even digit?

a) ¼
b) ½
c) ¾
d) 15/16
e) 1/16

25. John wrote a phone number on a note that was later lost. John can remember that the number had 7 digits, the digit 1 appeared in the last three places and 0 did not appear at all. What is the probability that the phone number contains at least two prime digits?

a) 15/16
b) 11/16
c) 11/12
d) ½
e) 5/8

26. What is the probability for a family with three children to have a boy and two girls (assuming the probability of having a boy or a girl is equal)?

a) 1/8
b) ¼
c) ½
d) 3/8
e) 5/8

27. In how many ways can you sit 8 people on a bench if 3 of them must sit together?

a) 720
b) 2,160
c) 2,400

d) 4,320
e) 40,320

28. In how many ways can you sit 7 people on a bench if Suzan won't sit on the middle seat or on either end?

a) 720
b) 1,720
c) 2,880
d) 5,040
e) 10,080

29. In a jar there are 15 white balls, 25 red balls, 10 blue balls and 20 green balls. How many balls must be taken out in order to make sure we took out 8 of the same color?

a) 8
b) 23
c) 29
d) 32
e) 53

30. In a jar there are 21 white balls, 24 green balls and 32 blue balls. How many balls must be taken out in order to make sure we have 23 balls of the same color?

a) 23
b) 46
c) 57
d) 66
e) 67

31. What is the probability of getting a sum of 12 when rolling 3 dice simultaneously?

a) 10/216
b) 12/216
c) 21/216
d) 23/216
e) 25/216

32. How many diagonals does a polygon with 21 sides have, if one of its vertices does not connect to any diagonal?

a) 21
b) 170
c) 340
d) 357
e) 420

33. How many diagonals does a polygon with 18 sides have if three of its vertices do not send any diagonal?

a) 90
b) 126
c) 210
d) 264
e) 306

34. What is the probability of getting a sum of 8 or 14 when rolling 3 dice simultaneously?

a) 1/6
b) ¼
c) ½
d) 21/216
e) 32/216

35. The telephone company wants to add an area code composed of 2 letters to every phone number. In order to do so, the company chose a special sign language containing 124 different signs. If the company used 122 of the signs fully and two remained unused, how many additional area codes can be created if the company uses all 124 signs?

a) 246
b) 248
c) 492
d) 15,128
e) 30,256

36. How many 8-letter words can be created using computer language (0/1 only)?

a) 16
b) 64
c) 128
d) 256
e) 512

37. How many 5 digit numbers can be created if the following terms apply: the leftmost digit is even, the second is odd, the third is a non even prime and the fourth and fifth are two random digits not used before in the number?

a) 2520
b) 3150
c) 3360
d) 6000
e) 7500

38. A drawer holds 4 red hats and 4 blue hats. What is the probability of getting exactly three red hats or exactly three blue hats when taking out 4 hats randomly out of the drawer and returning each hat before taking out the next one?

a) 1/8
b) ¼
c) ½
d) 3/8
e) 7/12

39. Ruth wants to choose 4 books to take with her on a camping trip. If Ruth has a total of 11 books to choose from, how many different book quartets are possible?

a) 28
b) 44
c) 110
d) 210
e) 330

40. A computer game has five difficulty levels. In each level you can choose among four different scenarios except for the first level, where you can choose among three scenarios only. How many **different games** are possible? (Remember that this does not ask about how many combinations of games can be possible, its simply how many different games are possible).

a) 18
b) 19

c) 20
d) 21
e) None of the above

41. How many four-digit numbers that do not contain the digits 3 or 6 are there?

a) 2401
b) 3584
c) 4096
d) 5040
e) 7200

42. How many five-digit numbers are there, if the two leftmost digits are even, the other digits are odd and the digit 4 cannot appear more than once in the number?

a) 1875
b) 2000
c) 2375
d) 2500
e) 3875

43. In a department store prize box, 40% of the notes give the winner a dreamy vacation; the other notes are blank. What is the approximate probability that 3 out of 5 people that draw the notes one after the other, and immediately return their note into the box get a dreamy vacation?

a) 0.12
b) 0.23
c) 0.35
d) 0.45
e) 0.65

44. A six sided dice with faces numbered 1 thru 6 is rolled twice. What is the probability that the face with number 2 on it would not be facing upward on either roll?

A. 1/6
B. 2/3
C. 25/36

D. 17/18
E. 35/36

The probability that face with no. 2 on it would not face upward on 2 rolls
= probability that the first roll does not have 2 facing upward * probability that the second roll does not have 2 facing upward
= 5/6*5/6
= 25/36 (The mistake I initially created was I took the probability of occurrence of 2 '2s' as 1/36 and just subtracted it from 1 to get 35/36. But this just takes into account that 2 does not face up on either first or the second roll. We don't want it in either of the rolls).

How many different distinct ways can the letters in the word VACATION be arranged?

A. 25,375
B. 40,320
C. 52,500
D. 20,160
E. 5,040

8!/2! = 20160 (As 'A' appears twice)

Explanations:

1. The best answer is C.
You must multiply your options to every item. (2 shelves) x (4 beds) x (3 closets + 7 chairs) = 80 possibilities.

2. The best answer is C.
You must multiply your options to every item. (2 shelves) x (4 beds) x (3 closets + 7 chairs) = 80 possibilities.

3. The best answer is B.
Treat the two who must sit together as one person. You have two possible sitting arrangements. Then remember that the two that sit together can switch places. So you have two times two arrangements and a total of four.

4. The best answer is C.

For the first digit you have 9 options (from 1 to 9 with out 0), for the second number you have 9 options as well (0 to 9 minus the first digit that was already used) and for the third digit you have 8 options left.
So the number of possibilities is 9 x 9 x 8 = 648.

5. The best answer is D.
There are (8 x 9) 72 possibilities of shirts + pants. (2 x 3) 6 Of the combinations are not allowed. Therefore, only (72 – 6) 66 combinations are possible.

6. The best answer is A.
First digit is 1, the second is 2, the third can be (7,8,9), the forth can be (3,6,9), the fifth and the sixth are dependent with one another. The fifth one is 3 times bigger than the sixth one, therefore there are only 3 options there: (1,3), (2,6), (3,9).
All together there are: 1 x 1 x 3 x 3 x 3 = 27 options.

7. The best answer is C.
The probability of picking the first jar is ½, the probability of picking up a white ball out of jar A
Is 3/(3+2) = 3/5. The probability of both events is 1/2 x 3/5 = 3/10.

8. The best answer is B.
The probability for the first one to be black is: 4/(4+6) = 2/5.
The probability for the second one to be black is: 3/(3+6) = 1/3.
The probability for the third one to be black is: 2/(2+6) = 1/4.
The probability for all three events is (2/5) x (1/3) x (1/4) = 1/30.

9. The best answer is B.
Let Z be the probability of breaking the jar, therefore the probability of both events happening is Z x (1/X) = (1/Y). Z = X/Y.

10. The best answer is B.
The probability of the coin is independent on its previous outcomes and therefore the probability for “head” or “tail” is always ½.

11. The best answer is A.

The total number of cards in the new deck is 12 +52 = 64.
There are (4 + 12 = 16) cards with the number 10.
The probability of drawing a 10 numbered card is 16/64 = 1/4.

12. The best answer is E.
After taking out 3 balls there are 15 left. 15/5 = 3 blue balls is the number of left after we took out 3 therefore there were 6 in the beginning.

13. The best answer is D.
The number of green and yellow balls in the box is A+2.
The total number of balls is 4A +8.
The probability of taking out a green or a yellow ball is (A+2)/(4A+8)=1/4.

14. The best answer is D.
Indicate A as the probability of Michael passing the driving test.
The probability of Sam passing the test is 1/4, the probability of both events happening together is 1/6 so: 1/4 x A = 1/6 therefore A = 2/3.

15. The best answer is B.
Indicate A as the probability of drawing a white ball from the jar.
The probability of drawing a red ball is 1/5.
The probability of drawing both events is 1/10 so, 1/5 x A = 1/10.
Therefore A = ½.

16. The best answer is C.
The basic principle of this question is that one person can't be elected to more than one part, therefore when picking a person for a job the "inventory" of remaining people is growing smaller.
The probability of picking a girl for the first job is 4/10 = 2/5.
The probability of picking a girl for the second job is (4-1)/(10-1) = 3/9.
The probability of picking a girl for the third job is (3-1)/(9-1) = 1/4.
The probability of all three events happening is: 2/5 x 3/9 x ¼ = 1/30.

17. The best answer is B.
When rolling two dice, there are 36 possible pairs of results (6 x 6).
A sum greater than 10 can only be achieved with the following combinations: (6,6), (5,6), (6,5).
Therefore the probability is 3/36 = 1/12.

18. The best answer is E.
The gender of the first-born is insignificant since we want all children to be of the same gender no matter if they are all boys or girls.
The probability for the second child to be of the same gender as the first is: ½. The same probability goes for the third child. Therefore the answer is ½ x ½ = ¼.

19. The best answer is D.
The coin is tossed three times therefore there are 8 possible outcomes (2 x 2 x 2). We are interested only in the three following outcomes:
(0,1,1), (1,0,1), (1,1,0).
The probability requested is 3/8.

20. The best answer is A.
We want to make a 3-flower garlands, each should have three colors of flowers in it. There are two different types of blue and two different types of red.
The options are (2 blue) x (2 red) x (1 yellow) = 4 options.

21. The best answer is A.
If 1/8 is the probability of drawing a blue ball then there are 40/8 = 5 blue balls in the jar. And with the same principle there are 8 red balls and 4 green ones. 40 – 5 – 8 – 4 = 23 balls (yellow is the only color left).

22. The best answer is A.
Since we want to draw at least one red ball we have four different possibilities:

1. Drawing blue-blue.
2. Drawing blue-red.
3. Drawing red-blue.
4. Drawing red-red.

There are two ways to solve this question:
One minus the probability of getting no red ball (blue-blue):
1-2/5 x ¼ = 1-2/20 = 18/20 = 9/10/
Or summing up all three good options:
Red-blue --> 3/5 x 2/4 = 6/20.
Blue-red --> 2/5 x ¾ = 6/20.
Red-red --> 3/5 x 2/4 = 6/20.
Together = 18/20 = 9/10.

23. The best answer is C.
We have 7!/(4!*3!) = 35 different possibilities for 4 days of rain out of 7 consecutive days (choosing 4 out of seven). Every one of these 35 possibilities has the following probability: every day has the chance of ½ to rain so we have 4 days of ½ that it will rain and 3 days of ½ that it will not rain. We have ½ to the power of 7 = 1/128 as the probability of every single event. The total is 35 x 1/128 = 35/128.

24. The best answer is D.
For every digit we can choose out of 8 digits (10 total minus 1 and 4). There are four different options:

5. No even digits
6. One even digit.
7. Two even digits.
8. Three even digits.
9. Four even digits.

The probability of choosing an odd (or an even) digit is ½.
One minus the option of no even digits: 1- $(1/2)^4$= 15/16.
You can also sum up all of the other options (2-5).

25. The best answer is B.
Since 1 appears exactly three times, we can solve for the other four digits only. For every digit we can choose out of 8 digits only (without 1 and 0). Since we have 4 prime digits (2, 3, 5, 7) and 4 non-prime digits (4, 6, 8, 9), the probability of choosing a prime digit is ½.
We need at least two prime digits:
One minus (the probability of having no prime digits + having one prime digit):
There are 4 options of one prime digit, each with a probability of $(1/2)^4$.
There is only one option of no prime digit with a probability of $(1/2)^4$.
So: [1- ($(1/2)^4$+$(1/2)^4$*4)] = 11/16.

26. The best answer is D.
There are three different arrangements of a boy and two girls:(boy, girl, girl), (girl, boy, girl), (girl, girl, boy). Each has a probability of $(1/2)^3$. The total is 3*$(1/2)^3$=3/8.

27. The best answer is D.
Treat the three that sit together as one person for the time being. Now, you have only 6 people (5 and the three that act as one) on 6 places: 6!=720. Now, you have to remember that the three that sit together can also change places among themselves: 3! = 6. So, The total number of possibilities is 6!*3!= 4320.

28. The best answer is C.
First, check Suzan: she has 4 seats left (7 minus the one in the middle and the two ends), After Suzan sits down, the rest still have 6 places for 6 people or 6! Options to sit. The total is Suzan and the rest: 4*6! = 2880.

29. The best answer is C.
The worst case is that we take out seven balls of each color and still do not have 8 of the same color. The next ball we take out will become the eighth ball of some color and our mission is accomplished.
Since we have 4 different colors: 4*7(of each) +1=29 balls total.
Of course you could take out 8 of the same color immediately, however we need to make sure it happens, and we need to consider the worst-case scenario.

30. The best answer is D.
The worst case would be to take out 21 white balls, 22 green and 22 blue balls and still not having 23 of the same color. Take one more ball out and you get 23 of either the green or the blue balls. Notice that you cannot get 23 white balls since there are only 21, however, you must consider them since they might be taken out also.
The total is: 21+22+22+1= 66.

31. The best answer is E.
Start checking from the smaller or bigger numbers on the dice. We will check from bigger numbers working downwards: start with 6, it has the following options: (6,5,1), (6,4,2), (6,3,3). Now pass on to 5: (5,5,2), (5,4,3). Now 4: (4,4,4). And that's it, these are all number combinations that are possible, if you go on to 3, you will notice that you need to use 4, 5 or 6, that you have already considered (the same goes for 2 and 1). Now analyze every option: 6,5,1 has 6 options (6,5,1), (6,1,5), (5,1,6), (5,6,1), (1,6,5), (1,5,6). So do (6,4,2) and (5,4,3). Options (6,3,3) and (5,5,2) have 3 options each: (5,5,2), (5,2,5) and (2,5,5). The same goes for (6,3,3). The last option (4,4,4) has only one option. The total is 3*6+2*3+1=18+6+1 = 25 out of 216 (6^3) options.

32. The best answer is B.
We have 20 vertices linking to 17 others each: that is 17*20=340. We divide that by 2 since every diagonal connects two vertices. 340/2=170. The vertex that does not connect to any diagonal is just not counted.

33. The best answer is A.

We have 15 Vertices that send diagonals to 12 each (not to itself and not to the two adjacent vertices). 15*12=180. Divide it by 2 since any diagonal links 2 vertices = 90. The three vertices that do not send a diagonal also do not receive any since the same diagonal is sent and received. Thus they are not counted.

34. The best answer is A.
The options for a sum of 14: (6,4,4) has 3 options, (6,5,3) has 6 options, (6,6,2) has 3 options, (5,5,4) has 3 options. We have 15 options to get 14.
The options for a sum of 8: (6,1,1) has 3 options, (5,2,1) has 6 options, (4,3,1) has 6 options, (4,2,2) has 3 options, (3,3,2) has 3 options. We have 21 options to get 8.
Total: 21+15= 36/216 = 1/6.

35. The best answer is C.
The phone company already created 122*122 area codes, now it can create 124*124.
$124^2-122^2=(124+122)(124-122) = 246*2 = 492$ additional codes.
There are other ways to solve this question. However this way is usually the fastest.

36. The best answer is D.
Every letter must be chosen from 0 or 1 only. This means we have two options for every word and $2^8 = 256$ words total.

37. The best answer is A.
The first digit has 4 options (2,4,6,8 and not 0), the second has 5 options (1,3,5,7,9) the third has 3 options (3,5,7 and not 2), the fourth has 7 options (10-3 used before) and the fifth has 6 options (10-4 used before). The total is 4*5*3*7*6=2520.

38. The best answer is C.
Getting three red out of 4 that are taken out has 4 options (4!/(3!*1!)) each option has a probability of $(1/2)^4$ since drawing a red or blue has a 50% chance. 4*1/16= ¼ to get three red hats. The same goes for three blue hats so ¼+¼ =1/2.

The probability to get 3 red or 3 blue can be expressed as follows:

(Prob to get 3 red + Prob to get 3 blue)

Prob to get 3 red = Probability to get 3 red * probability to get 1 blue
= Probability to get red * Probability to get red * Probability to get red * Probability to get blue

Now, the mistake often created is this probability should take into account the following combinations (R,R,R,B), (R,R,B,R), (R,B,R,R) and (B,R,R,R)
(This in short is 4C3)

So, the probability to get 3 red = 4 * (1/2) ^ 4
= 1/4

Similarly the probability to get 3 blue hats = 4*(1/2)^4 = 1/4

So, the total probability = ¼ + ¼ = ½

39. The best answer is E.
Choosing 4 out of 11 books is: 11!/(4!*7!) = 330 possibilities.

40. The best answer is .
On four levels there are 4 scenarios = 16 different games. The first level has 3 different scenarios. The total is 19 scenarios.

41. The best answer is B.
The first digit has 7 possibilities (10 – 0,3 and 6). The other three digits have 8 possibilities each. 7*8*8*8= 3584.

42. The best answer is C.
Not considering the fact that 4 cannot appear more than once, we have a total of 4*5*5*5*5=2500. Now we deduct the possibilities where 4 does appear more than once (in this case it can appear only twice on the two leftmost even digits). In order to do so, we put 4 in the first and second leftmost digits. The rest of the digits are odd: 5*5*5=125. 2500-125=2375.

43. The best answer is B.
The chance of winning is 0.4 and it stays that way for all people since they return their note. The number of different options to choose 3 winners out of 5 is 5!/(3!*2!) = 10. Each option has a chance of 0.4*0.4*0.4*0.6*0.6 = 0.02304 * 10 = 0.2304. (There is a 0.4 chance to win and 0.6 chance to lose. So, when 3 people win, 2 have to lose. Hence, the calculation is .4*.4*.4*.6*.6 = 0.02304, but this just accounts for the possibility that the first 3 win and the last 2 lose. However, there can be 10 options for choosing this and hence the probability is 0.23

In New England, 84% of the houses have a garage and 65% of the houses have a garage and a back yard. What is the probability that a house has a backyard given that it has a garage?

- 77%
- 109%
- 19%
- None of the above.

Probability = 0.65/0.84
= 77%

In a class of 30 students, there are 17 girls and 13 boys. Five are A students, and three of these students are girls. If a student is chosen at random, what is the probability of choosing a girl or an A student?

- $\frac{19}{30}$
- $\frac{11}{15}$
- $\frac{17}{180}$
- None of the above.

Probability of choosing a girl = 17/30
Probability of choosing an A student = 2/30 (Because 3 are girls, so just consider 2 boys)

So total probability is 17+2/30 = 19/30

What is the probability that a card selected from a deck will be either an ace or a spade?

1. 2/52
2. 2/13
3. 7/26
4. 4/13
5. 17/52

Solution.Let A stand for a card being an ace, and S for it being a spade. We have to find p(A or S). Are A and S mutually exclusive? No. Are they independent? Why, yes, because spades have as many aces as any other suit. Then,

p(A or S) = p(A) + p(S) - p(A) * p(S)

With simple F/T we get:

p(A) = 4/52 = 1/13
p(B) = 13/52 = 1/4

So,

p(A or S) = 1/13 + 1/4 - 1/52 = 16/52 = 4/13

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6 persons seat themselves at round table. What is the probability that 2 given persons are adjacent?

(A) 1/5

(B) 2/5

(C) 1/10

(D) 1/7

(E) 2/15

I will go with B-2/5
6 people can be arranged in 5! ways.(total)
consider 2 persons as a single entity and then 5 people can be arranged in 4!*2 ways.

So answer is 4!*2/5! = 2/5

Q:There are 6 questions in a question paper? In how many ways can a student solve one or more questions? The way to solve one or more questions can be described as = (way to solve 1 + way to solve 2 + ... + way to solve all 6)

= 6C1 + 6C2 + 6C3 + 6C4 + 6C5 + 6C6
= 63

How many 5 letters word which consist of the letters D,I,G,I,T, are there,so that the letter I are not next to each other?
a. 36
b. 48
c.72
d. 96
e.128

NUMBER OF COMBINATION WHEN **2I** ARE NOT TOGETHER ARE
=TOTAL NUMBER OF COMBI-NUMBER OF COMBINATION WHEN **2I** ARE TOGETHER

Taking both 'Is' together, we have 4 places to fill up with 4 letters. Hence, we have 4! possibilities.

Total number of words can be 5!/2 (Divided by 2 as there are 2 'Is'.

So, the answer is 60-24 = 36

Five racers in a competition . No tie. How many possibilites A is ahead of B?

A 24

B 30

C 60

D 90

E 120

1st positiion - A is first ...that leaves 4*3*2*1 for theother positions

2nd position A is 2nd that leaves 3*1*3*2*1..... (note A is fixed in 2nd position therefore permutation is 1)

3rd position A is 3rd that leaves 3*2*1*2*1

4th position A is the 4th position 3*2*1*1*1

5th position doesnt count cos a has to finish before B !! tada...add them up =60

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2 couples and a single person are seated at random in a row of 5 chairs. What is the probability that neither of the couples sit together in adjacent chairs.

The total number of combinations to seat 5 people in 5 chairs = 5*4*3*2 = 120
Now, let us find ways to arrange ppl so that neither couples sit adjacent.
Let the first couple be c1 and c2, the second couple be c3 and c4 and the single person be s.

a) If s sits in the first chair, there are 4 possibilities for the second chair. There are 2 possibilities for the third chair (Not the partner of the person sitting in 2nd chair). There is 1 possibility for the 4th chair and 1 possibility for the 5th chair. So, in all, there are 4*2 = 8 ways. Again, due to symmetry, if s sits on the 5th chair, there are 8 possibilities.
b) If s sits on the second chair, there are 4 possibilities for the 1st chair. For the 3rd chair, there are 3 possibilities. 1 possibility each for the 4th and the 5th chair. In all, 4*3 = 12 possibilities. Again, due to symmetry, 12 possibilities if s sits on the 4th chair.
c) If s sits on the 3rd chair, there are 4 possibilities for the 1st chair. Only 2 possibilities for the 2nd chair. 1 possibility each for the 4th and 5th chairs. So, 8 possibilities in all.

Summing up all the above possibilities = 8+8+12+12+8 = 48 possibilities.

Hence, the probability that no couples sit adjacent = 48/120 = 2/5

(This is based on the concept that s sits on the first chair OR on the second chair OR on the third chair OR on the fourth chair OR on the fifth chair).

As a part of a game, 4 people each choose one number from 1 to 4. What is the likelihood that all people will choose different numbers?

A, B, C and D are the persons. A can choose 1,2,3 and 4. B can choose 1,2,3 and 4… and so on.

In all, there are 4^4 possibilities of number selections.

Out of these, the possibilities to have 4 distinct numbers = 4*3*2*1 (A has 4 selections, B has 3, C has 2 and D has 1) = 24

So, likelihood = 24/4^4 = 6/4^3 = 0.09 = 9%

Out of seven models, all of different heights, 5 models will be chosen for a photo shoot. If the 5 models stand in a line from shortest to the longest, and the 4^{th} and 6^{th} tallest models cannot be adjacent, how many different arrangements of models is possible.

The number of ways to select 5 models out of 7 is 7C5 = 21.
Now, out of these 21 ways, the way to select models such that the 4^{th} and 6^{th} are adjacent to each other are 12346, 12467, 23467, 13467 = 4 ways only.

So, when 4 and 6 cannot be adjacent, number of ways = 21-4 = 17

If 2 students are to be selected from a group of 12 students, how many possible consequences are there?

Number of consequences = 12C2 = 66 (Think of it as selecting 1,2 or 1,3 or 1,4… or 1,12, or 2,3 or 2,4…… or 11,12) Adding all these combinations, 11+10+…..+2+1 = 66

Hence, the answer is 66.
If the question is to arrange these students, it would be 12P2 = 132… because an arrangement of 1,2 would be different from 2,1

A Committee of 6 is chosen from 8 men and 5 women, so as to contain at least 2 men and 3 women. How many different committees could be formed if two of the men refuse to serve together?

A- 3510
B- 2620
C- 1404
D- 700
E- 635

There are 2 ways of selecting atleast 2 men and atleast 3 women

select 2 men and 4 women or select 3 men and 3 women

selecting 2 men can be done in 3 ways
1. select 1st non-cooperating member and select 1 member from remaining 6(we are excluding the 2nd non-cooperating member) = 1* 6c1 = 6

2. select 2nd non-cooperating member and select 1 member from remaining 6(we are excluding the 1st non-cooperating member) = 1* 6c1 = 6

3. don't select any of the cooperating members = 6c2 = 15

same way do it for the selecting 3 men

finally you get

5c4(6+6+15) + 5c3(15+15+20)

answer is 635

OR

First let me provide the answer then explain
1) Select 3 men & 3 women = 8C3*5C3
2) Select 2 men & 4 women = 8C2*5C4
So Total combinations possible = 8C3*5C3 + 8C2*5C4
3) Now from the above subtract the combinations where theose 2 men appear together.
In the first case (those 2 men appear together, we have to select only 1 other man and 3 more women)
6C1 * 5C3
In the first case (those 2 men appear together, we only need to select 4 women)
1 * 5C4
The Answer Is:
(8C3 * 5C3) + (8C2*5C4) - [6C1 * 5C3 + 1 * 5C4]
= 560 + 140 - 65 = 635

If a committee of 3 people is to be selected from among 5 married couples so that the committee does not include two people who are married to each other, how many such committees are possible?

A. 20
B. 40
C. 50
D. 80
E. 120

Total ways to select 3 people = 10 c 3 = 120
If among 3 people there 2 are married then no. of ways to select 3rd one out of rest 8 = 8c1 = 8
since there are 5 couples total ways to do this is = 8*5 = 40
But these cases are to be eliminated....
so we are left with 120 - 40 = 80 cases.....
Hence the answer.....

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2 similar examples below

1) Ten telegenic contestants with a variety of disorders are to be divided into 2 groups for a competition, each of 5 members. How many combinations are possible?

   Selecting 5 members out of 10, for group A = 10C5 = 252. Group B would have the rest of the members, and would have 1 possibility. So, 252*1 = 252

   Or, 10C5*5C5 = 252

2) Katie has 9 members that she must assign to 3 different projects. If 3 emloyees are assigned to each project and no one is assigned to multiple ones, how many diff. Combinations are possible?

   Selecting 3 members for project A out of 9, = 9C3 = 84

   Selecting 3 members for project B out of 6 = 6C3 = 20

   Selecting 3 members out of rem. 3 = 3C3 = 1

   So, total combinations = 84*20 = 1680 (Same example as the above one)

Let's permute:

Judges will select 5 finalists from 7 contenstants in a fashion show. The judges will then rank the contenstatnts and aware prices to the 3 highest ranked contestants. How many different arrangements of prize winners are possible?

= 7P5 = 7*6*5 = 210

3) Coach Miller is filling out the starting lineup for his indoor soccer team. There are 10 boys on the team, and he must assign 6 starters to the following positions: 1 goalkeeper, 2 on defense, 2 in midfield, and 1 forward. Only 2 of the boys can play goalkeeper, and they cannot play any other positions. The other boys can each play any of the other positions. How many different groupings are possible?

2C1*8C2*6C2*4C1 = 3360

How many ways the word "COMPUTER" can be arranged, where the vowels should occupy the even places?

3 vowels and 5 constn...

so 5*3*4*2*3*1*2*1... but remember because we have only 3 vowels and more than one starting position for the first vowel then we must multiply the number of possibilities by 4

= 720*4 = 2880

How many five-digit numbers are there, if the two leftmost digits are even, the other digits are odd and the digit 4 cannot appear more than once in the number?

When first digit is 2,6 or 8, the combinations are 3*5*5*5*5
When first digit is 4, the combination is 1*4*5*5*5*

Total = 2375

Alternatively,

Total numbers = 4*5*5*5*5 = 2500
Numbers when 4 is at the first 2 digits = 1*1*5*5*5 = 125

Therefore, if 4 is not to appear more than once, 2500-125 = 2375

If 6 people are to be divided to 3 different groups, each of which has 2 people. How many such groups are possible?

- i get the method of 6C2 * 4C2 * 2C2 = 90

A certain roller coaster has 3 cars, and a passenger is equally likely to ride in any 1 of the 3 cars each time that passenger rides the roller coaster. If a certain passenger is to ride the roller coaster 3 times, what is the probability that the passenger will ride in each of the 3 cars?

A-0 B-1/9 C-2/9 D-1/3 E-1

The probability to sit in a different car each time = (3*2*1)/(3*3*3) = 2/9

A gardener is going to plant 2 red rosebushes and 2 white rosebushes. If the gardener is
to select each of the bushes at random, one at a time, and plant them in a row, what is the
probability that the 2 rosebushes in the middle of the row will be the red rosebushes?
A. 1/12
B. 1/6
C. 1/5
D. 1/3
E. ½

There are 2 ways to arrange the centre 2 red bushes. There are 2 ways to arrange the 2 white bushes at the sides. So, 4 arrangements. Total arrangements would be 4*3*2 = 24

So, probability = 4/24 = 1/6

A photographer will arrange 6 people of 6 different heights for photograph by placing
them in two rows of three so that each person in the first row is standing in front of
someone in the second row. The heights of the people within each row must increase
from left to right, and each person in the second row must be taller than the person
standing in front of him or her. How many such arrangements of the 6 people are
possible?
A. 5
B. 6
C. 9
D. 24
E. 36

If a comttee of 3 people is to be selected from among 5 married couples so that the comittee does not include tw people who are married to each other , how many such committees are possible?

a) 20,b) 40), c) 50, d)80, e) 120

numbers of 3 people comttee from 10 people(5*2)

=10C3=10*9*8/6=120----------1

numbers when couple are together

5*8C1=40----------2

1-2

=80

ans is 80

How many different 6-letters sequence are there that consist of 1 A, 2 B's and 3 C's?

a) 6,b) 60, c) 120,d) 360, e) 720

OA is B

6!/(1!*2!*3!)=60

There are 20 purple balls and 30 yellow balls in box A. There are 15 purple balls and 35 yellow balls in box B. What is the probability that one ball selected randomly from the 2 box is purple? Reference key: 1/2*20/50+1/2*15/50=35/100

The probability to select either of the boxes is ½

The probability to select a purple ball from box A is 20/50 and one purple ball from box B is 15/50

So, the probability is ½*20/50 + ½*15/50)

Don't forget to omit that selection of a box.

A couple want to have four babies, for each baby, 50% are male, 50% are female. Ask for the possibility of two boys and two girls.

The propobability of a boy or a girl is ½

The possibilities are BBGG, BGGB, BGBG, GGBB, GBBG, GBGB

So, 6/16 is the probability

i.e. 6/(1/2)^

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what is the probability to get 3 heads and 2 tails on tossing a coin 5 times, in the same sequence. (i.e. first 3 heads and then 2 tails)

the probability = 1/32 (Since only one combination (HHHTT)

the probability to find either head or tail in the first 3 tosses and the other side in the last 2 would be

(HHHTT) or (TTHHH)

So, it is 2/32 = 1/16

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9 people, including 3 couples, are to be seated in a row of 9 chairs.

What is the probability that

a. None of the Couples are sitting together

b. Only one couple is sitting together

c. All the couples are sitting together

a)
1....couple 1 together.... 8!*2!
2....couple 2 together.... 8!*2!
3....couple 3 together.... 8!*2!
4....couples 1 and 2 together.... 7!*2!*2!
5....couples 1 and 3 together.... 7!*2!*2!
6....couples 3 and 2 together.... 7!*2!*2!
7....all couples together..6!*2!*2!*2!
8....Atleast 1 couple together..... 1+2+3-4-5-6+7 = 3*8!*2-3*7!*4+6!*2*2*2
= 3*2*7!*6 + 6!*8 = 6!*2 (3*7*6 - 4) = 6!*2*122
total ways = 9!
prob atleast one couple together = 6!*2*122 / 9*8*7*6! = 122*2/9*8*7 = 61/126

prob that none of the couples is together = 1-61/126 = 65/126

b) only one couple sitting together = 8-4-5-6+2*7
= 6!*2*122 - 3*7!*4+2*6!*8
= 6!*2 (122-42+8) = 88 * 6! * 2
req prob = 88 * 6! * 2/ 9! = 88*2/9*8*7 = 22/63

c) **all couples sitting together = 6!*8/9! = 8/9*8*7 = 1/63**

To verify my answers....
exactly 2 couples are together = 4+5+6-3*7 = 3*4*7! - 3*6!*8
= 3*4*6! *5 = 60*6!
prob that exactly 2 couples are together = 60*6!/9! = 60/9*8*7 = 15/126

now .....
prob of no couple together+exactly one couple together+exactly 2 couples together+ all couples together = 1
65/126+22/63+1/63+15/126 = 65+44+2+15/126 = 126/126 = 1