Combination math problems and answers

Permutations and combinations are used to solve problems. FactorialExample 1: How many 3-digit numbers can you do using digits 1, 2, and 3 without repetitions?method (1) that displays all possible numbers using a tree chart. We can make 6 numbers using 3 digits and without repetitions of digits.method (2) count: LOOK AT THE TREE CHART ABOVE. We have 3 choices for the first digit, 2 choices for the second digit and 1 choice for the third digit. Using the counting principle we can say: The total number of 3-digit numbers is given by3 × 2 × 1 = 6There is a special notation for the product 3 × 2 × 1 = 3! and it reads 3 factorial. In general n! read n factorial and is given byn! = n×(n - 1)×(n - 2)×...×2×1We also define 0! = 1.Example 2: How many different words can we do using the letters A, B, E and L? Solution: We have 4 choices for the first letter, 3 choices for the second letter, 2 choices for the third letter and 1 choice for the fourth letter. Hence the number of words given by 4 × 3 × 2 × 1 = 4! = 24PermutationsExample 3: How many 2-digit numbers can you do using the digits 1, 2, 3 and 4 without repeating the digits? This time we want to use 2 digits at that time to create double-digit numbers. For the first digit we have 4 choices and second digit we have 3 choices (4 - 1 used already). Using the counting principle is the number of 2-digit numbers that we can do using 4 digits given by 4 × 3 = 12The above problem is to arrange 2 digits of 4 in a certain order. This is also called permutation. The main idea in permutations is that order is important. When you use the digits 3 and 4 to create a number, the number 34 and 43 are different, and the order of the digits 3 and 4 is important. Generally, r (2-digits in the example above) permute items out of a set of n (4 digits in the example above) items are written as n P r and the formula is given byn P r = n! / (n - r)! Example 4: Calculate4 P 26 P 54 P 4Solution:4 P 2 = 4! / (4 - 2)! = 24/2 = 126 p 5 = 6! / (6 - 5)! = 6×5×4×3×2×1 / 1! = 7204 p 4 = 4 / (4 - 4)! = 4! / 0! = 4! = 4×3×2×1 = 24 (We now understand the need to define 0!= 1)Example 5: How many 3 letter words can we do with the letters of the word LOVE? Solution: There are 4 letters in the word love and create 3 letter words similar to arranging these 3 letters and order is important since LAW and VOL are different words due to the order of the same letters L, O and V. Therefore, there is a permutation problem. Number of words given by 4 P 3 = 4! / (4 - 3)! = 24Example 6: How many lines can you draw using 3 non-collinear (not in a single line) points A, B and C on a plane? Solution: You need two points to draw a line. The order is not important. Line AB is the same as line BA. The problem is to choose 2 points out of 3 to draw different lines. If we continue as we did with permutations, we get the following couple of points for drawing lines. AB , ACBA , BCCA , CBIt is a problem: line AB is same as line BA, same for lines AC and CA and BC and CB. The lines are: AB, BC and AC ; Only 3 lines. So in fact we can draw 3 lines and not 6, and that's because in this problem the order of points A, B and C is not important. This is a combination problem: combine 2 elements of 3 and are written as follows:n C r = n! [[(n - r)! r !] The number of combinations equals the number of permu divided by r! to eliminate those counted more than once because the order is not important. Example 7: Calculate 3 C 25 C 5Solution:3 C 2 = 3! / [(3 - 2)!2!] = 6 / [1 × 2] = 3 (problem with points and lines solved above in example 6)5 C 5 = 5! / [(5 - 5)!5!] = 5! / [0!5!] = 5! [1 × 5!] = 1 (there is only one way to select (without order) 5 items from 5 items and to select them all once!) Example 8:We must form a 5 a side team in a class of 12 students. How many different layers can be formed? Solution:There is nothing to indicate that the order in which team members are selected is imoportant, which is why it is a combination issue. Therefore, the number of layers given by 12 C 5 = 12! / [(12 - 5)!5!] = 792ProblemsHow many 4-digit numbers can we do using the digits 3, 6, 7 and 8 without repetitions? How many 3-digit numbers can we do using the digits 2, 3, 4, 5 and 6 without repetitions? How many 6 letter words can we do using the letters of the word LIBERTY without repetitions? In how many ways can you arrange 5 different books on a shelf? In how many ways can you choose a committee of 3 students out of 10 students? How many triangles can you do using 6 non-collinear points on a plane? A committee of 3 boys and 4 girls will be formed from a group of 10 boys and 12 girls. How many different committees can be formed from the group? In a specific country, the license plate is formed by 4 digits from the digits 1, 2, 3, 4, 5, 6, 7, 8 and 9 followed by 3 letters from the alphabet. How many license plates can be formed if neither the digits nor the letters are repeated?solutions to the above problems4! = 245 p 3 = 607 v.row 6 = 50405! = 12010 C 3 = 1206 C 3 = 2010 C 3 × 12 c 4 = 59 4009 P 4 × 26 P 3 = 47 174 400 referencesMore and link elements statistics and probability. Combinations Calculator. Calculate the number of combinations of n items taken at that time. Permutations Calculator. Calculate the number of permutations of n items taken r at the time.report this ad College Algebra Tutorial 57: Combinations WTAMU > Virtual Math Lab > College Algebra Learning Objectives After completing this tutorial, you should be able: Use combinations to solve a counting problem involving groups. Introduction In this tutorial we will go over combinations. When you need to count the number of grouping, regardless of ordering, then combinations are the way to go. Keep in mind that permutations specifically count the number of ways a task can be arranged or ordered. That is the difference between the two, permutations are with respect to and combinations are without regard to order. If you need a review about permutations, please feel free to go to Tutorial 56: Permutations. Let's see what you can do with these combinations. Training combination An arrangement of r-objects, WITHOUT regard to ORDER and without repetition, selected from n different objects is called a combination of n objects taken at a time. The number of such combinations is marked by The difference between combinations and permutations is in combinations you count groups (order is not important) and in permutations you count different ways of arranging items with respect to orders. N and r means the same in both permutation and combinations, but the formula is different. Note that the combination has an extra r! in its denominator. If you need a review on permutations or faculties, please feel free to go to Tutorial 56: Permutations. Example 1: In a conference of 9 schools, how many intraconference football matches are played during the season if teams all play each other exactly once? When teams play against each other, order doesn't matter, we count match ups. For each game there is a group of two teams playing. So we can use combinations to help us out here. Please note that if we put these layers in any kind of order, then we would have to use permutations to solve the problem. But in this case, order does not matter, so we will use combinations. First we need to find n and r : If n is the number of teams we have to choose from, what do you think n is in this problem? If you said n = 9 you are right!!! There are 9 teams in the conference. If r is the number of teams we use at a time, what do you think r is? If you said r = 2, pat yourself on the back! 2 teams play per game. Let's put these values into the combination formula and see what we get: *n=9,r=2*Eval. in ( ) * Expand 9! until it gets to 7! which is the bigger one ! in the den. *Cancel 7! s If you have a factorial key, you can insert it as 9!, divided by 7!, divided by 2! and then press enter or =. If you don't have a factor key, you can simplify it as shown above and then type it. It is probably best to simplify it first, because in some cases the numbers can be quite large and it would be cumbersome to multiply all these numbers one by one. Wow, this means there are 36 different games in the conference. Example 2: You should subtract 4 cards from a standard 52-card deck. How many different 4 shorthands are possible? This would be a combination problem, because a hand would be a group card without regard to ordering. Please note that if we put these cards in any kind of order, then we would have to use permutations to solve the problem. But in this case, order does not matter, so we will use combinations. First we need to find n and r : If n is the number of cards we have to choose from, what do you think n is in this problem? If you said n = 52 you are right!!! There are 52 cards a deck of cards. If r is the number of cards we use at a time, what do you think r is? If you said r = 4, pat yourself on the back! We want four short hands. Let's put these values into the combination formula and see what we get: *n=52,r=4*Eval. in ( ) * Expand 52! until it gets to 48! which is the bigger one ! in the den. *Cancel 48!' s If you have a factor key, you can insert it as 52!, divided by 48!, divided by 4! and then press enter or =. If you don't have a factor key, you can simplify it as shown above and then type it. It is probably best to simplify it first, because in some cases the numbers can be quite large and it would be cumbersome to multiply all these numbers one by one. Wow, this means that there are 270 725 different 4 card hands. Example 3: 3 marbles are randomly pulled from a bag containing 3 red and 5 white marbles. Answer the following questions (a - d): 3a. How many different draws are there? This would be a combination problem, because a draw would be a group of marbles without regard to order. It's like taking a handful of marbles and looking at them. Note that there are no special conditions placed on marbles that we draw, so this is a straight forward combination problem. Note that if we put these marbles in any kind of order, then we would have to use permutations to solve the problem. But in this case, order does not matter, so we will use combinations. First we have to find n and r: If n is the number of marbles we have to choose from, what do you think now is in this problem? If you said n = 8 you are right!!! There are 3 red and 5 white marbles for a total of 8 marbles. If r is the number of marbles we draw at a time, what do you think r is? If you said r = 3, pat yourself on the back! 3 marbles are pulled at a time. Let's put these values into the combination formula and see what we get: *n=8,r=3*Eval. in ( ) * Expand 8! until it gets to 5! which is the bigger one ! in the den. *Cancel 5! s If you have a factor key, you can insert it as 8!, divided by 5!, divided by 3! and then press enter or =. If you don't have a factor key, you can simplify it as shown above and then type it. It is probably best to simplify it first, because in some cases the numbers can be quite large and it would be cumbersome to multiply all these numbers one by one. Wow, this means there are 56 different draws. 3b. How many different draws would contain only red marbles? This would be a combination problem, because a draw would be a group of marbles without regard to order. It's like taking a handful of marbles and looking at them. Partly one above we looked at all possible draws. From that list we will only have those that contain only red. Let's see what the draw looks like: we need to have 3 red marbles to meet this condition: 3 RED First we need to find n and r : If n is the number of RED marbles we have to choose from, what do you think now is in If you said n = 3 you are right!!! There are a total of 3 red marbles. If r is the number of RED marbles we draw at a time, what do you think r is? If you said r = 3, pat yourself on the back! 3 RED marbles are drawn at a time. Let's put these values into the combination formula and see what we get: *n=3,r=3*Eval. inside ( ) *Cancel out 3!' s If you have a factor key, you can insert it as 3!, divided by 0!, divided by 3! and then press enter or =. If you don't have a factor key, you can simplify it as shown above and then type it. It is probably best to simplify it first, because in some cases the numbers can be quite large and it would be cumbersome to multiply all these numbers one by one. This means that there are only 1 draw out of the 56 found in part one that would contain 3 RED marbles. 3c. How many different draws would contain 1 red and 2 white marbles? This would be a combination problem, because a draw would be a group of marbles without regard to order. It's like taking a handful of marbles and looking at them. Partly one above we looked at all possible draws. From that list we will only have those containing 1 RED and 2 WHITE marbles. Let's see what the draw looks like: we need to have 1 red and 2 white marbles to meet this condition: 1 RED 2 WHITE First we have to find n and r: Together that would make up 1 draw. We must use the counting principle to help us with this. If you need a review of the basic counting principle, you may want to come to Training 55: The basic counting principle. Note how 1 draw is divided into two parts - red and white. We can't combine them together because we need a certain number of each one. So we will find out how many ways to get 1 RED and how many ways to get 2 WHITE, and using the counting principle, we will multiply these numbers together. 1 RED: If n is the number of RED marbles we have to choose from, what do you think n is in this problem? If you said n = 3 you are right!!! There are a total of 3 RED marbles. If r is the number of RED marbles we draw at a time, what do you think r is? If you said r = 1, pat yourself on the back! 1 RED marble is drawn at a time. 2 WHITE: If n is the number of white marbles we have to choose from, what do you think now is in this problem? If you said n = 5 you are right!!! There are a total of 5 white marbles. If the number of white marbles we draw at a time, what do you think r is? If you said r = 2, pat yourself on the back! 2 WHITE marbles are drawn at a time. Let's insert these values into the combination formula and see what we get: * RED: n = 3, r = 3 * WHITE: n = 5, r = 2 * Eval. inside ( ) * Expand 3! until it gets to 2! * Expand 5! until it gets to 3! *Cancel out 2! s and 3!' s If you have a factor key, you can insert it as 3!, times 5!, divided by 2!, divided by 1!, divided by 3!, divided by 2! and then press enter or =. If you do not have a factor key, you can simplify the above, and then type it in. It is probably best to simplify it first, because in some cases the numbers can be quite large and it would be cumbersome to multiply all these numbers one by one. This means that there are 30 draws that would contain 1 RED and 2 WHITE marbles. 3d. How many different draws would contain exactly 2 red marbles? This would be a combination problem, because a draw would be a group of marbles without regard to order. It's like taking a handful of marbles and looking at them. Partly one above we looked at all possible draws. From that list we will only have those containing 2 RED and 1 WHITE marbles. Remember, we need a total of 3 marbles in the draw. Since we must have 2 reds, which leaves us need 1 white to finish the draw of 3. Let's see what the draw looks like: we need to have 2 red and 1 white marbles to meet this state: 2 RED 1 WHITE First we have to find n and r: Together that would make up 1 draw. We must use the counting principle to help us with this. If you need a review of the basic counting principle, you may want to come to Training 55: The basic counting principle. Note how 1 draw is divided into two parts - red and white. We can't combine them together because we need a certain number of each one. So we will find out how many ways to get 2 RED and how many ways to get 1 WHITE, and using the counting principle, we will multiply these numbers together. 2 RED: If n is the number of RED marbles we have to choose from, what do you think n is in this problem? If you said n = 3 you are right!!! There are a total of 3 RED marbles. If r is the number of RED marbles we draw at a time, what do you think r is? If you said r = 2, pat yourself on the back! 2 RED marble is drawn at a time. 1 WHITE: If n is the number of white marbles we have to choose from, what do you think now is in this problem? If you said n = 5 you are right!!! There are a total of 5 white marbles. If the number of white marbles we draw at a time, what do you think r is? If you said r = 1, pat yourself on the back! 1 WHITE marble is drawn at a time. Let's insert these values into the combination formula and see what we get: * RED: n = 3, r = 2 * WHITE: n = 5, r = 1 * Eval. inside ( ) * Expand 3! until it gets to 2! * Expand 5! until it gets to 4! If you have a factorial key, you can insert it as 3!, times 5!, divided by 1!, divided by 2!, divided by 4!, divided by 1! and then press enter or =. If you don't have a factor key, you can simplify it as shown above and then type it. It is probably best to simplify it first, because in some cases the numbers can be quite large and it would be cumbersome to multiply all these numbers one by one. This means that there are 15 draws that would contain 2 RED and 1 WHITE marbles. Practice problems These are training issues that help bring you to the next level. It will allow you to check and see if you have an understanding said said said of problems. Mathematics works just like everything else, if you want to get good at it, then you have to practice it. Even the best athletes and musicians had help along the way and a lot of training, training, training, to become good at their sport or instrument. In fact, there is no such thing as too much practice. To get the most out of these, you should find out the problem on your own and then check your answer by clicking on the link for the answer/discussion for that issue. On the link you will find the answer as well as any steps that went in to find that answer. Practice Problems 1a - 1b: A teacher has 15 students and 5 should be selected to provide demonstrations. How many different ways can the teacher choose the protesters given the following conditions. 1a. The order of the protesters is important? (reply / discussion to 1a) Practice Issues 2a - 2c: A teacher has 14 freshmen, 15 sophomores, 8 juniors and 10 seniors and 8 names will be pulled from a hat to go for walks. How many different traits of student names, the teacher may have given the following conditions. Need extra help with these topics? WTAMU > Virtual Math Lab > College Algebra Last revised on May 20, 2011 by Kim Seward. Booked.