**FollowUp**

* **FollowPlease be careful with children handling the dice. Dice should never go in their mouth as they can be a choking hazard!**

**Dice Legend**

| Black Dice | Addition |
| --- | --- |
| Red Dice | Subtraction |
| Green Dice | Multiplication |
| Purple Dice | Square & square root |
| White Die  | Operators, + - x |
| White Numbers“Basic” | On 8-sided dice will have the numbers 2-9 |
| Yellow Numbers“Advanced” | On 8-sided dice will have the numbers 6-13 |

**Type of Game:** Like most of our games, FollowUp can be played as a competitive or co-operative games. It is especially effective as a co-operative game for kids just learning their basic number skills.

**Who Should Play:** Anyone working on their addition skills is ready for basic FollowUp, with subtraction and multiplication skill being required to play the more advanced FollowUp.

 **Materials Needed:** You can play FollowUp with as few as 3 black dice and you will add the fourth black dice and then up to three red dice and then two green dice as the players progress.

**Skills Reinforced:** Players will learn that sometimes it doesn’t matter in what order they perform the steps of a problem and that there is more than one way to get the correct answer. They will be asked to verbalize why they did what they did. In the more advanced version players will learn that in most multi-operational problems the correct “order of operations” is critical to getting the correct answer.

**How to play:** At all levels, FollowUp is played by taking turns. At the beginning level, what you do on your turn will depend on what the other player did on their turn. At the more advanced level there will be a definite order that the steps need to be taken in, and players will take turns making their decision and explaining why they made it.

* **Basic level:** With two players one of them rolls any three black dice and adds whichever two of them they choose. Then the other player adds that sum to the third die.For example, if you rolled a 4, 6 and a 9 the first player could add any two of them together and say (for example) “Four plus six is ten” at which point the other player (or teacher or parent) would say “and ten plus nine is nineteen.” Of course, there are three different ways those three numbers could be added and the players could see how quickly they can work through all three combinations.It won’t be long before the players will be ready to add the fourth black die and now the process requires three steps to get the final total, with many more different ways to get there. For example, if you rolled a 5, 7, 8 and a 10 the first player might say “Five plus ten is fifteen” at which point the second player has three options of things to say. They could say “And seven plus eight is fifteen” in which case the next player (you could play with two or three players) would say “And fifteen plus fifteen is thirty.” Of course, the second player could have said “And fifteen plus seven is 22”, in which case the next player would have finished by saying “And twenty two plus eight is thirty.” Players can then talk about the order that they would have done the problem by themselves, all the while getting more familiar with working with numbers without worrying about how rapidly they could do it, as well as seeing that there is not only one way to solve the problem.
* **FollowUp with subtraction:** As soon as we add a red die or two to the problem, the number of different “orders” in which the problem may completed goes way, way up.Parents and teachers need to be aware that if three black dice and two red dice are used, it is possible to get an answer less than zero, so to avoid that possibility (and to greatly increase the “orders” that players will have to choose from, we will explain this version with four black and two red dice. So, let’s say that you roll a black 6, 6 8 and 13 and a red 2, 8 and 12. There are way too many possible ways to do this problem to try to list them all, but here is one possible example, remembering that on each step the player whose turn it is can only use the numbers on two dice or the number that the previous player came up with on their turn. So, the first player might say “Six plus six is twelve” in which case the next player might choose to say “And twelve plus eight is twenty.” (In these multi-step problems it makes sense to have the players move dice off to the side after they have been used.) At this point the next player may choose to finish the addition portion of the problem and say “And twenty plus thirteen is thirty three” which would leave the next three turns as subtraction problems, with each player simply deciding which red number to subtract from the current total. Of course, the addition does not need to be completed before any subtraction takes place. In fact the very first player could have grabbed the black 8 and the red 8 and said “Eight minus eight is zero” and eliminated those two dice. Lots of different “orders” in which the problem can be computed, and lots of opportunities for players to see how other players saw the problem, all the while just getting more familiar with working with numbers. By the way, the purpose of FollowUp is not to see “who can do it faster”, but for the competitive types who want to try that, simply roll the four black dice and the three red dice and see who can get the answer quickest. Even then, it will be interesting for the players to talk about how they did the problem.
* **Multi-step FollowUp (PEMDAS):** When players are ready to work on “order of operations” FollowUp is a great co-operative and non-threatening way to do it. Players must not only know the correct order of operations, but know that in MathPro anytime you use two or more dice of the same color in a problem those dice have parentheses around them, and that operation will thus be done first. For example, if the teacher rolls two black dice (a 4 and a 7) and a green 6 and a red 5 the player who goes first has to say something like “The two black dice have parentheses around them so I am going to add 4 plus 7 first” at which point the second player must say something like “I know that in the correct order of operations we multiply before we add or subtract, so I am going to multiply 11 times 6 and get 66” at which point the next player says something like “And the last step is to subtract, so I am going to subtract 5 from 66 and get 61.
* Of course, it is possible to use two or more dice of more than one color on the same problem, but knowing the correct order of operations makes the order to the problem clear. For example, if you rolled two green dice, two black dice and two red dice, all three colors of dice would have parentheses around them, in which case the players must be aware that they are to multiply first, after which they add or subtract or subtract and then add. After playing FollowUp with subtraction the players should understand that it doesn’t matter if they add or subtract first.