

## Nerdo the Mathnificant The Big Finish

### Overview

This is trick where a volunteer picks a card at random and then rolls a die. By using the steps I give them, they compute a single number which I then use to guess their card and number.

### Materials

Small deck of cards  
Large deck of cards  
Calculator  
Paper and pencil  
Small die  
Large die

### Steps

1. Have a volunteer pick a card at random. Show the card to the audience where Nerdo can't see it. Place the card back in the deck.
2. Since this is about math, we need to change the card into a number. Have volunteer determine what each suit should be worth i.e. hearts=100, diamonds=200, clubs=300, spades=400. Write this down to use later. Tell volunteer each card is worth its stated value with Jack=11, Queen=12 and King=13.
3. Have volunteer compute card number. i.e. king spades = 413. Volunteer writes this down on their paper.
4. Nerdo turns his back and volunteer rolls a die. This is the Die number.
5. Now the tricky part. Nerdo turns his back to volunteer and faces the audience. Have volunteer use a calculator to add the Card and Die number. Write this down. Have volunteer use a calculator to subtract the die number from the card number. Write this down. Multiply the two totals.
6. Write the final number on the overhead. Check to see if everyone agrees.
7. Nerdo turns around and solves the card and number rolled.
8. Repeat if needed and this time allow volunteer to pick card and number not at random.

### Math

Walk students through steps,  
X= card number, Y=die number

Write an expression for addition step	$X+Y$
Write an expression for subtraction step	$X-Y$
Write an expression for multiplication step	$(X+Y)(X-Y)$
Simplify multiplication step	$X^2 - Y^2$

I then worked back words adding Y<sup>2</sup> (1,4,9,16,25,36) to the volunteer number until I reached one of the following numbers.

	100	200	300	400	Suit
1	10201	40401	90601	160801	
2	10404	40804	91204	161604	
3	10609	41209	91809	162409	
4	10816	41616	92416	163216	
5	11025	42025	93025	164025	
6	11236	42436	93636	164836	
7	11449	42849	94249	165649	
8	11664	43264	94864	166464	
9	11881	43681	95481	167281	
10	12100	44100	96100	168100	
11J	12321	44521	96721	168921	
12Q	12544	44944	97344	169744	
13K	12769	45369	97969	170569	
Card					

Notes on chart:

1. The first number (or two numbers) is the suit digit of the suit squared. i.e. 160801 gives 16 which is 4 squared which is in my example spades. Exceptions: 400 numbers will always be the first 2 digits and 13K will be 17.
2. The value of the car can be seen in the last two digits which is the value squared. For example, 25 is five squared, 81 is 9 squared. Exceptions: Jacks and higher are actually the last three numbers but you can't see it. For example 21 is actually 121 which is 11 squared.
3. The Die number is the square root of the number I add back to the Volunteer Number. See example below for details.
4. The third digit from the left is always even until the card reaches 10 or higher.

### Example

1. Volunteer picks King of Diamonds which has a card number of 213. The die number is 6.
2. Adding the numbers = 219, Subtracting the numbers = 207.
3. Multiplying the numbers gives 45333, which is given to Nerdo.
4. Because of the leading number is 4, take the square root which is 2 which represents the diamonds (200).
5. Nerdo then goes through the following process add 1-6 squared to the volunteered number.
 

45333 + 1 = 45334	34 is not a perfect square so it is not the number
45333 + 4 = 45337	37 is out for the same reason.
45333 + 9 = 45342	42 is out
45333 + 16 = 45349	49 is a perfect square but since the third digit is odd it is not our number.
45333 + 25 = 45358	58 is not a perfect square

$45333 + 36 = 45369$  69 is part of 169 which is 13 squared.

6. Since we got 13 squared at the end of the number, that means the card was a King and since we added 36 or 6 squared to get it, that means the die number was 6.
7. So the volunteer picked the King of Diamonds and rolled a 6.