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1. The number can be made by adding a 3-digit number with its reversal. Can you find the other two ways of making a total of 747 in this way?

$$\begin{array}{r} 225 \\ +522 \\ \hline 747 \end{array} \qquad \begin{array}{r} 324 \\ +423 \\ \hline 747 \end{array}$$

There are two ways like this. but there is another way, $\begin{array}{r} 720 \\ +027 \\ \hline 747 \end{array}$

Can you find all the totals between 700 and 800 that can be made from a number plus its reversal?

2) the ways are - 706, 707, 726, 727, 746, 747, 766, 767, 786, 787.

Can you explain how you know you have found all possible totals?

3) So first i thougth that the no. will be always a palindrome, because of this - (ABC is a 3-digit no.)

$$\begin{array}{r|c|} & H\ T\ O \\ & A\ B\ C \\ + & C\ B\ A \\ \hline & (A+C)(2B)(A+C) \end{array}$$

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in the figure above, you can see why it's a palindrome. because when we reverse then add a no., in one's place comes-(A+C) ten's place-(B+B)or(2B) hundred's place-(C+A). now you can see why hundred's place no.= one's place no. because (of course) (A+C)=(A+C), the hundreds place will be seven as well as as the one's place. and the ten's place will be 2B. So five possibilities. but why couldn't 2B > 10 be right? in this case hundreds place-1 = One's place. which would give One's place no. = 6. which would give 5 more, total = 10 possibilities.

How many 3-digit numbers between 300-400? 800-900?

4) 302, 303, 322, 323, 342, 343, 362, 363, 382, 383, there are ten possibilities between 300-400. 807, 808, 827, 828, 847, 848, 867, 868, 887, 888, ten between 800-900.

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How to make a total of 1251 by adding 3-digit number and its reversal?

5) you can add this, 675 + 576 also 774+477, 873+378, 972+279.

Can you find all the totals between 1200 and 1300 that can be made from a number plus its reversal (there are more than five)

6) 1211, 1212, 1231, 1232, 1251, 1252, 1271, 1272, 1291, 1292 are the answer.

And what about totals between 1900 and 2000?

7) there are only five this time because no.s 1900-2000 are very big and you have to add big no.s. anyways the answer is 1918, 1938, 1958, 1978, 1998.

Are there any numbers between 200 and 300 that can be made by subtracting a 3-digit number from its reversal? (there are fewer than five)

8) there is only one, 297. I'll show you why. let's take ABC no. we know that ABC - CBA = something between 200-300. let's write ABC = 100A + 10B + C (expanded

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form) so CBA will become (100C+10B+A) So Answer (100A+10B+C)-(100C+10B+A). in both the no.s there is 10B So we will cancel it out. the answer=(100A+C)-(100C+A)=(100A-100C)+(C-A). but (100A-100C) =(100(A-C)). (A has to be bigger than C because it can't borrow anything. right?) so let's call A-C=X i think you know that C-A=-X. So answer=(100X)+(-X)= (100x)-x = 99x. now we have the answer 99x=multiple of 99. and as there is only one in 200-300 the answer is 297.

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Are there any numbers between 1200 and 1300 that can be made by subtracting a four-digit number from it's reversal?

9) the no.s are - 1278, 1269

Have you found all the possibilities? Explain how do you know?

Y

10) let's consider ABCD as a no., ABCD-DCBA = Something between 1200-1300. now you know that ABCD = (1000A + 100B + 10C + D) and, DCBA = (1000D + 100C + 10B + A). so answer = (1000A + 100B + 10C + D) - (1000D + 100C + 10B + A) = (1000A - 1000D) + (100B - 100C) + (10C - 10B) + (D - A) = (1000 (A-D) + (100(B-C)) + (10(C-B) + (D-A). suppose (A-D) = x, (B-C) = y). the answer = (1000(x)) + (100(y)) + (10(-y)) + (-x) = (1000x - x) + (100y - (10y) = (999x) + (90y). but remember that (B-C) = Negative is possible So (999x) + (90y) > 1200. here if B > C then (90y) > 0. so A-D = 1 (if A-D > 1 then answer will be above 2000) maybe (A = 2, D = 1) so 999 + 90y > 1200. so 201 < 90y < 301, there is one multiple of 90 in 201-301

270.999+270=1269. but waits there is another answer, because of C>B. in this case if we do A-D=1 the answer will be below 999 (because B-C=Negative so 999-90y<999<1200) so in this case A-D=2. So 1300>(1998-90y)>1200. so ((1998-1200)>90y) or 789>90y but remember that (789-90y)<90. the only no. that follows the rule is 720 so 1998-720=1278 the second no. (in this case B<C or B>C both are possible because B is in hundreds place, so it can borrow from thousands place.) I hope you understand why there are only 2 possibilities.