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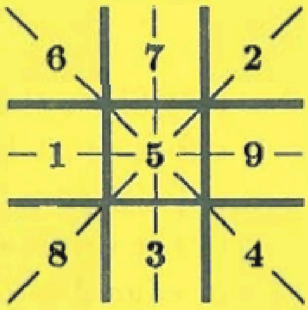
1991 Q11

11. There are several sets of three different numbers whose sum is 15 which can be chosen from $\{1,2,3,4,5,6,7,8,9\}$. How many of these sets contain a 5?

(A) 3 **(B)** 4 **(C)** 5 **(D)** 6 **(E)** 7

11. **(B)** After the 5 is selected, a sum of 10 is needed. There are four pairs that yield 10: 9+1, 8+2, 7+3, 6+4. Thus there are four 3-element subsets which include 5 and whose sum is 15.

Note. In the classic 3×3 "magic square" there are 4 lines through the middle of the square. The sum of the numbers along each line equals 15 and includes the number 5.



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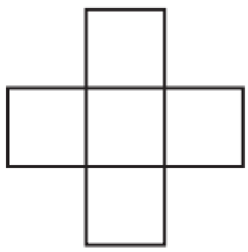
1999 Q11

11. Each of the five numbers 1,4,7,10, and 13 is placed in one of the five squares so that the sum of the three numbers in the horizontal row equals the sum of the three numbers in the vertical column. The largest possible value for the horizontal or vertical sum is



(A) 20 **(B)** 21 **(C)** 22 **(D)** 24 **(E)** 30

OR

Since the horizontal sum equals the vertical sum, twice this sum will be the sum of the five numbers plus the number in the center. When the center number is 13, the sum is the largest, $[10 + 4 + 1 + 7 + 2(13)]/2 = 48/2 = 24$. The other four numbers are divided into two pairs with equal sums.

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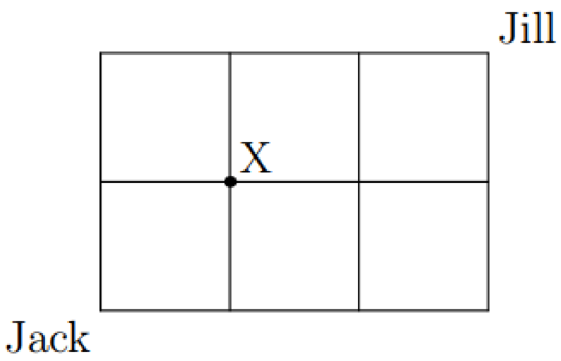
2014 Q11

11. Jack wants to bike from his house to Jill's house, which is located three blocks east and two blocks north of Jack's house. After biking each block, Jack can continue either east or north, but he needs to avoid a dangerous intersection one block east and one block north of his house. In how many ways can he reach Jill's house by biking a total of five blocks?

(A) 4 **(B)** 5 **(C)** 6 **(D)** 8 **(E)** 10

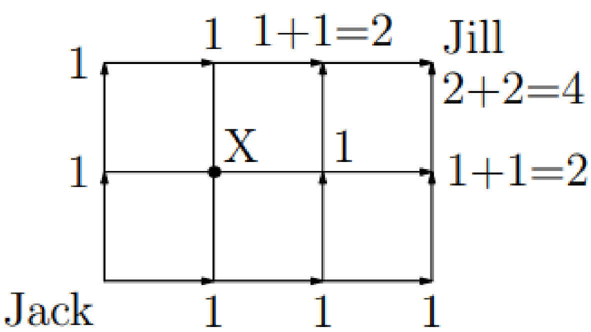
11. **Answer (A):** Let E represent traveling a block east and N represent traveling a block north. To avoid the dangerous intersection the first two blocks must be EE or NN. So there 4 possible paths: EEENN, EENEN, EENNE, and NNEEE.



OR

In the following diagram, the numbers indicate the number of ways to get to each of the intersections. In each case, the number of ways to get to any particular

intersection is the sum of the numbers of ways to get to any of the intersections leading directly to it. Thus, there are four paths to Jill's house, avoiding the dangerous intersection.



2000 Q11

11. The number 64 has the property that it is divisible by its units digit. How many whole numbers between 10 and 50 have this property?

(A) 15 **(B)** 16 **(C)** 17 **(D)** 18 **(E)** 20

11. **Answer (C):** Twelve numbers ending with 1, 2, or 5 have this property. They are 11, 12, 15, 21, 22, 25, 31, 32, 35, 41, 42, and 35. In addition, we have 33, 24, 44, 36, and 48, for a total of 17. (Note that 20, 30, and 40 are not divisible by 0, since division by 0 is not defined.)

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1990 Q12

12. There are twenty-four 4-digit whole numbers that use each of the four digits 2, 4, 5, and 7 exactly once. Listed in numerical order from smallest to largest, the number in the 17th position in the list is

A) 4527 B) 5724 C) 5742 D) 7245 E) 7524

12. B One-fourth of the 24 numbers in the list begin with each of the four given digits. Those in positions 1 - 6 begin with 2; those in positions 7 - 12 begin with 4; those in positions 13 - 18 begin with 5. Thus the desired number is the fifth one beginning with 5: 5247, 5274, 5427, 5472, $\boxed{5724}$, 5742.

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1993 Q12

12. If each of the three operation signs, $+, -, \times$, is used exactly ONCE in one of the blanks in the expression

$$5 \_\_ 4 \_\_ 6 \_\_ 3$$

then the value of the result could equal

(A) 9 **(B)** 10 **(C)** 15 **(D)** 16 **(E)** 19

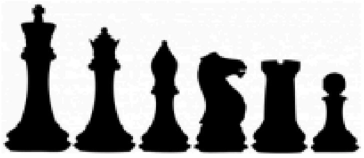
12. **(E)** The six permutations of $+$, $-$ and $\times$ yield these results:

$$5 \times 4 + 6 - 3 = 20 + 6 - 3 = 23$$
$$5 \times 4 - 6 + 3 = 20 - 6 + 3 = 17$$
$$5 + 4 \times 6 - 3 = 5 + 24 - 3 = 26$$
$$5 - 4 \times 6 + 3 = 5 - 24 + 3 = -16$$
$$5 + 4 - 6 \times 3 = 5 + 4 - 18 = -9$$
$$5 - 4 + 6 \times 3 = 5 - 4 + 18 = 19.$$

The only result listed is 19.

2017 Q13

13. Peter, Emma, and Kyler played chess with each other. Peter won 4 games and lost 2 games. Emma won 3 games and lost 3 games. If Kyler lost 3 games, how many games did he win?

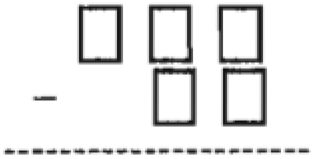


(A) 0 **(B)** 1 **(C)** 2 **(D)** 3 **(E)** 4

13. **Answer (B):** Whenever a person wins a game, another person loses that game. So the total number of wins equals the total number of losses. Peter, Emma, and Kyler lost $2+3+3=8$ games altogether, and Peter and Emma won $4+3=7$ games in total. Therefore, Kyler won 1 game.

1989 Q14

14. When placing each of the digits 2,4,5,6,9 in exactly one of the boxes of this subtraction problem, what is the smallest difference that is possible?



A) 58 B) 123 C) 149 D) 171 E) 176

14. C The smallest difference occurs when the minuend is as small as possible and the subtrahend is as large as possible. Thus $245 - 96 = 149$ is the smallest difference.

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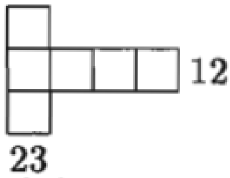
1996 Q14

14. Six different digits from the set

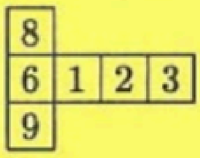
$$\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$$



are placed in the squares in the figure shown so that the sum of the entries in the vertical column is 23 and the sum of the entries in the horizontal row is 12. The sum of the six digits used is

(A) 27 (B) 29 (C) 31 (D) 33 (E) 35

14. **(B)** Determine that one suitable arrangement of the digits is as indicated, and then compute



$$8+6+9+1+2+3=29.$$

OR

Since $7+8+9=24$, the digits in the column must be 6, 8, and 9 in some order. The sum of the digits in the row that are not also in the column must be at least $1+2+3=6$. Then the square common to both the column and the row contains at most $12-(1+2+3)=12-6=6$. Therefore, the 8 or 9 cannot be used in the common square, and hence that square must contain the digit 6. Thus the digits are 1, 2, 3, 6, 8, and 9, which have a sum of 29.