

# Solutions to Cryptarithms

In each problem, each letter stands for a DIGIT. Every time that letter is used, it stands for the same digit. For example, if  $A = 3$  and  $B = 2$ , then the expression  $AABB$  is really  $3322$ . In the following problems, break the code and find the digits that makes each problem correct.

$$\begin{array}{r} 1. \quad AA \\ + AB \\ \hline CBA \end{array}$$

$$\begin{array}{r} 2. \quad PQ \\ + NQ \\ \hline NRR \end{array}$$

$$\begin{array}{r} 3. \quad JK \\ + KJ \\ \hline DJD \end{array}$$

$$\begin{array}{r} 4. \quad EF \\ + GG \\ \hline GHE \end{array}$$

- Clearly  $B = 0$  since  $A + 0 = A$ .  $C = 1$  since the sum of two digits cannot exceed 18. For  $A + A$  to equal  $CB$ ,  $A + A = 10$  and  $A = 5$ . Check:  $55 + 50 = 105$ .
- As in #1, the  $N = 1$ . In the second column, then  $P + 1 = 1R$ .  $P = 9$  or  $P = 8$  if 1 is carried. Then  $R$  must be 0. It can't be 1 because  $N = 1$ . If  $Q + Q = 0$ , then  $Q = 0$  or  $Q = 5$ . Since  $R = 0$ , then  $P = 5$ . This means 1 is carried into the second column and  $P = 8$ . Check:  $85 + 15 = 100$ .
- As before,  $D = 1$ .  $K + J$  cannot equal 1 since that would require a leading 0. Then  $K + J = 11$ . Since 1 is carried into the second column,  $K + J + 1 = 12$  and  $J = 2$ . Then  $K = 9$ . Check:  $29 + 92 = 121$
- As before,  $G = 1$ . In column 2,  $E + 1$  must add up to 10 or 11 if one is carried. But  $H$  cannot = 1 because  $G = 1$ . Then  $H = 0$  and  $E$  must be 8 or 9. For  $E$  to be 8, 1 must be carried from column 1 to column 2. The only way that could happen is  $9 + 9 = 18$ . Since the  $G = 1$ , this is false and  $E$  must be 9. Then  $F + 1 = 9$  and  $F = 8$ . Check:  $98 + 11 = 109$ .

$$\begin{array}{r} 5. \quad ST \\ + TV \\ \hline TLS \end{array}$$

$$\begin{array}{r} 6. \quad WXX \\ + YXZ \\ \hline YZZX \end{array}$$

$$\begin{array}{r} 7. \quad ABC \\ + DEC \\ \hline DEAE \end{array}$$

$$\begin{array}{r} 8. \quad EFGH \\ + EFGH \\ \hline MMEFG \end{array}$$

- $T = 1$ , then  $L = 0$ ,  $S = 9$ ,  $V = 8$  Check:  $91 + 18 = 109$ .
- $Y = 1$ , then  $Z = 0$ . Then  $X = 5$  and  $W = 8$ . Check:  $855 + 150 = 1005$ .
- $D = 1$ , then  $E = 0$ , then  $C = 5$ , then  $A = 9$ , then  $B = 8$ . Check:  $985 + 105 = 1090$ .
- $M = 1$ , then  $E = 5$ , then  $F = 7$ , then  $G = 8$ , then  $H = 9$ . Check:  $5789 + 5789 = 11578$

# Cryptarithms

In each problem, each letter stands for a DIGIT. Every time that letter is used, it stands for the same digit. For example, if  $A = 3$  and  $B = 2$ , then the expression  $AABB$  is really  $3322$ . In the following problems, break the code and find the digits that makes each problem correct.

$$\begin{array}{r} 1. \quad PPQQ \\ + PPQQ \\ \hline RQSPP \end{array}$$

$$\begin{array}{r} 2. \quad AA \\ \quad AB \\ + ABC \\ \hline DEEA \end{array}$$

$$\begin{array}{r} 3. \quad BEEN \\ + NET \\ \hline NBNB \end{array}$$

$$\begin{array}{r} 4. \quad STRAW \\ \quad \quad \quad \times 4 \\ \hline WARTS \end{array}$$

1.  $R = 1$ , then  $Q + Q = P$  and  $P + P = Q + 11$  and  $P$  is even. Then  $Q = 3$  and  $P = 6$ . Then  $S = 2$ . Check:  $6633 + 6633 = 13266$ .
2.  $D = 1$ , then  $E = 0$  and  $A$  is either 8 or 9. Then  $B + C = 10$ . Then  $A = 8$ ,  $B = 3$ , and  $C = 7$ . Check:  $88 + 83 + 837 = 1008$ .
3.  $B + 1 = N$ . Then  $T = 9$ . Then  $E + E + 1 = N + 10$ . Since  $N + T = B + 10$  and  $N + E + 1 = B + 10$ , then  $E + 1 = T$  and  $E = 8$ . Then  $N = 7$  and  $B = 6$ . Check:  $6887 + 789 = 7676$ .
4.  $S$  must be 1 or 2,  $W$  must be 4 or 8. Then from first and last multiplications,  $S = 2$  and  $W = 8$ .  $T$  must be 1 or 0 since nothing is carried into the last multiplication. Because 3 is carried from the first column into the second,  $T = 1$ . Then  $A = 7$ . Then  $R = 9$ . Check:  $21978 \times 4 = 87912$ .