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Quants

Number System

Imp. A 2 digit number increases by 36 when the digits are reversed. How many such numbers exist? → To be solved using the standard form.

$23 = 2\times10+3$. (Standard form)

original $\underline{a}\ \underline{b} = 10a+b$.

reversed $\underline{b}\ \underline{a} = 10b+a$.

$ba - ab = 36$ →

$(10b+a) - (10a+b) = 36$.

$10b+a-10a-b = 36$

$9b-9a = 36$.

$b-a=4 \Rightarrow b = a+4$

a	b
1	5
2	6
3	7
4	8
5	9

$15 \to 51$

$26 \to 62$

$37 \to 73$

$48 \to 84$.

$59 \to 95$

Imp. 2 important concepts about a 2 digit no.

$ab = 10a+b$.

$ba = 10b+a$.

difference ⇒ $ba-ab = 9b-9a = 9(b-a)$

$ab-ba = 9a-9b = 9(a-b)$

$= 9 \times$ difference of the digits.

Sum ⇒ $ab+ba = 11a+11b = 11(a+b) = 11 \times$ sum of the digits.

$15 \to 51$

$51-15 = 36 = 9\times4 = 9(5-1)$

$51+15 = 66 = 11\times6 = 11(5+1)$

Imp. ab is a 2 digit number such that it follows the following rule

$$\begin{array}{r} a\ b \\ +\ a\ b \\ \hline c\ b\ b \end{array}$$

find a, b, c

$b = 0$

00.

$$\begin{array}{r} 1\ \ \ \\ 1\,5 \\ +\,1\,5 \\ \hline \end{array}$$

$$\begin{array}{r} 1\ \ \ \\ 0 \\ +\ 0 \\ \hline 0 \end{array}$$ $+1$

2

$$\begin{array}{r} 60 \\ +60 \\ \hline 120 \end{array}$$

$$\begin{array}{r} ab \\ 50 \\ +50 \\ \hline 100 \\ cbb \end{array}$$

$b = 0$

$a = 5$

$c = 1$

$$\begin{array}{r} 10 \\ +10 \\ \hline 20 \end{array}$$

$$\begin{array}{r} 49 \\ +49 \\ \hline 98 \end{array} \qquad \begin{array}{r} 50 \\ +50 \\ \hline 100 \end{array}$$

$$\begin{array}{r} +15 \\ \hline 30 \end{array}$$

0 2

ab is a 2 digit number such that

$$\begin{array}{r} ab \\ \times\ ab \\ \hline abb \end{array}$$

find a, b

$a = 1, b = 0$

$$\begin{array}{r} 15 \\ \times\ 15 \\ \hline 75 \\ 15\times \\ \hline 225 \end{array}$$

$15 \times 15 = 225$
$25 \times 25 = 625$
$35 \times 35 = 1225$

$16 \times 16 = 256$
$26 \times 26 = 676$
$36 \times 36 = 1296$

$0 \times 0 = 0$
$1 \times 1 = 1$
$5 \times 5 = 5$
$6 \times 6 = 6$

b.

0, 5, 6, 1

$b = 0$

$b = 1$ ✗ $b = 6$

$b = 5$ ✓

$10 \times 10 = 100$
$20 \times 20 = 400$
$30 \times 30 = 900$
$40 \times 40 = 1600$

$21 \times 21 = 441$
$31 \times 31 = 961$
$41 \times 41 = 1681$

Qwp. ab is a 2 digit number such that the square of the number is a 3 digit number. How many such numbers exist?

2 digit numbers → 10 to 99

$10^2 = 100$
$11^2 = 121$
$12^2 = 144$
$13^2 = 169$
⋮

$10^2 = 100$
$20^2 = 400$
$30^2 = 900$
$40^2 = 1600$

$31^2 = 961$
$32^2 = 1024$

$$\begin{array}{r} 32 \\ \times 32 \\ \hline 1024 \end{array}$$

ab → 10 to 31 = 22 = 31 − 10 + 1

Qwp. Perfect squares of 2 digit numbers

$10^2 = 100$
$20^2 = 400$
$30^2 = 900$

$ab^2 = abb$

$11^2 = 121$
$22^2 = 484$
$26^2 = 676$

aba

$12^2 = 144$

abb

$13^2 = 169$
$14^2 = 196$
$16^2 = 256$
$17^2 = 289$
$18^2 = 324$

$15^2 = 225$
$21^2 = 441$

$ab^2 = ccb$

$ab^2 = abb$ or cbb.

aba

$13^2 = 169$.

$14^2 = 196$.

$31^2 = 961$

$24^2 = 576$.

$26^2 = 676$.

$22^2 = 484$

$28^2 = 784$

$18^2 = 324$

$19^2 = 361$

$23^2 = 529$.

$24^2 = 576$.

$25^2 = 625$.

$27^2 = 729$

$28^2 = 784$

$29^2 = 841$

$31^2 = 961$

ab is a 2 digit number such that a is less than b. How many such numbers are possible?

1. _ : 2, 3, 4, 5, 6, 7, 8, 9 → 8 ✓
2. _ : 3, 4, 5, 6, 7, 8, 9 → 7 ✓
3. _ : 4, 5, 6, 7, 8, 9 → 6 ✓
4. _ : 5, 6, 7, 8, 9 → 5 ✓
5. _ : 6, 7, 8, 9 → 4 ✓
6. _ : 7, 8, 9 → 3 ✓
7. _ : 8, 9 → 2 ✓
8. _ : 9 → 1 ✓

$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 = 36$

9, 9, 9, 9

ab is a 2 digit odd number such that a is less than b.

How many such numbers are there?

1. _ : 3, 5, 7, 9 → 4
2. _ : 3, 5, 7, 9 → 4
3. _ : 5, 7, 9 → 3
4. _ : 5, 7, 9 → 3
5. _ : 7, 9 → 2
6. _ : 7, 9 → 2
7. _ : 9 → 1
8. _ : 9 → 1

$4 + 4 + 3 + 3 + 2 + 2 + 1 + 1 = 20$