



CREST Mathematics Olympiad (CMO) Worksheet *for*

Class 8



Topic

Playing with Numbers



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Worksheet on Playing with Numbers

1. What is the difference between P and Q in the given problem?



$$\begin{array}{r}
 21546 \\
 \times \quad 9P \\
 \hline
 150Q22 \\
 193914x \\
 \hline
 20Q9962
 \end{array}$$

- a. 0
b. -1
c. -2
d. 2
2. What is the value of a, b and c in the following expression?
- $$a75 - 372 + 72b - 365 + 9c2 = 1801$$
- a. $a = 4, b = 1, c = 8$
b. $a = 4, b = 2, c = 8$
c. $a = 8, b = 1, c = 4$
d. $a = 8, b = 2, c = 4$
3. If 57AB91 is divisible by 11, then which of the following relationships between A and B is true?
- a. $A = B - 5$ or $A = -6 - B$
b. $B = A - 5$ or $A = -6 - B$
c. $A = B - 5$ or $A = -6 + B$
d. $B = A - 5$ or $A = -6 + B$
4. In a two-digit number, the sum of the digits is 11. If the difference between a number and the number obtained by reversing the digits is 27, then what is the number?
- a. 37
b. 47
c. 73
d. 74
5. In a three-digit number, the sum of a hundred's place digit and a unit's place digit is 7. The ten's place digit is two-fifths of a hundred place digit. If the difference between a three-digit number and a number obtained by reversing the digits is 297, what is the number obtained by reversing the digits?

- a. 225
- b. 522
- c. 235
- d. 532

Answer Key

1. $b - (-1)$

Explanation: The value of P should be between 1 and 9 to satisfy the multiplication. Further, the multiplication is performed as follows:

$$\begin{array}{r}
 1445 \\
 \times 97 \\
 \hline
 150822 \\
 193914x \\
 \hline
 2089962
 \end{array}$$

— Carry while multiplying by 9.

— Carry while multiplying by 7.



Difference between P and Q in the given problem = $7 - 8 = -1$

2. $c - a = 8, b = 1, c = 4$

Explanation: The arithmetical operations are shown as:

a

$$\begin{array}{r}
 875 \\
 - 372 \\
 \hline
 503
 \end{array}$$

6

$$\begin{array}{r}
 + 721 \\
 \hline
 1224
 \end{array}$$

c

$$\begin{array}{r}
 942 \\
 - 365 \\
 \hline
 859
 \end{array}$$

Use the hit-and-trial method to perform operations,

$$875 - 372 + 721 - 365 + 942 = 1801$$

Hence, $a = 8$, $b = 1$, $c = 4$

3. $d - B = A - 5$ or $A = -6 + B$

Explanation: A number '57AB91' is divisible by 11 if the difference between the sum of digits at odd places and even places should be either 0 or divisible by 11.

Sum of digits at odd places = $5 + A + 9 = 14 + A$

Sum of digits at even places = $7 + B + 1 = 8 + B$

$$\text{Difference} = (14 + A) - (8 + B)$$

$$= 14 + A - 8 - B$$

$$= 6 + A - B$$

If the difference is 0, then

$$\Rightarrow 6 + A - B = 0$$

$$\Rightarrow A - B = -6$$

$$\text{Hence, } A = -6 + B$$

OR

If the difference is 11, then

$$6 + A - B = 11$$

$$\Rightarrow A - B = 11 - 6$$

$$\Rightarrow A - B = 5$$

$$\Rightarrow A = 5 + B$$

$$\text{Hence, } B = A - 5$$

4. $d - 74$

Explanation: In a two-digit number, let the ten's digit be x and the unit's digit be y .

$$\text{Number } (xy) = 10x + y$$

By reversing the order of the digits,

$$\text{Unit's digit} = x \text{ and ten's digit} = y$$

$$\text{Reversed number } (yx) = 10y + x$$

$$\text{Sum of a two-digit number} = 11$$

$$\Rightarrow x + y = 11 \dots\dots\dots(i)$$

Difference between a two-digit number and the number obtained by reversing the digits is 27.

$$\Rightarrow (10x + y) - (10y + x) = 27$$

$$\Rightarrow 10x + y - 10y - x = 27$$

$$\Rightarrow 9x - 9y = 27$$

$$\Rightarrow 9(x - y) = 27$$

$$\Rightarrow x - y = 3 \dots\dots\dots(ii)$$

Adding (i) and (ii),

$\begin{array}{rcl} x + y & = & 11 \dots\dots\dots(i) \\ x - y & = & 3 \dots\dots\dots(ii) \\ \hline 2x & = & 14 \end{array}$	
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$$\therefore x = 7$$

Using (i),

$$\begin{aligned}
 x + y &= 11 \\
 \Rightarrow 7 + y &= 11 \\
 \Rightarrow y &= 11 - 7 \\
 \therefore y &= 4 \\
 \text{Hence, Number} &= 10x + y = 10 \times 7 + 4 = 70 + 4 = 74
 \end{aligned}$$

5. a - 225

Explanation: In a three-digit number, let the hundred's digit be x, ten's digit be y and the unit's digit be z.

$$\text{Number (xyz)} = 100x + 10y + z$$

By reversing the order of the digits,

Hundred's digit = z

Ten's digit = y

Unit's digit = x

$$\text{Reversed number (zyx)} = 100z + 10y + x$$

Sum of the hundred's digit and the unit's digit is 7.

$$\Rightarrow x + z = 7 \dots\dots\dots(i)$$

Difference between a three-digit number and a number obtained by reversing the digits

$$\Rightarrow 100x + 10y + z - (100z + 10y + x) = 297$$

$$\Rightarrow 100x + 10y + z - 100z - 10y - x = 297$$

$$\Rightarrow 99x - 99z = 297$$

$$\Rightarrow 99(x - z) = 297$$

$$\Rightarrow x - z = 3 \dots\dots\dots(ii)$$

Using the elimination method,

$ \begin{array}{rcl} x + z & = & 7 \quad \dots\dots\dots(i) \\ x - z & = & 3 \quad \dots\dots\dots(ii) \\ \hline 2x & = & 10 \end{array} $	
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$$\therefore x = 5$$

Using (ii),

$$x - z = 3$$

$$\Rightarrow z = x - 3$$

$$\Rightarrow z = 5 - 3$$

$$\therefore z = 2$$

The ten's place digit is two-fifths of a hundred place digit.

$$\Rightarrow y = \frac{2}{5} \times x$$

$$\Rightarrow y = \frac{2}{5} \times 5$$

$$\Rightarrow y = 2$$

$$\text{Number (xyz)} = 522$$

$$\text{Reversed number (zyx)} = 225$$

The number obtained by reversing the digits is 225.

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