

# Examples 6 in Rationals in Arithmetic 3

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## Examples 6 in Rationals

$$0. \quad \frac{1+2+3+4+5+6+7+8+7+6+5+4+3+2+1}{88888888 \times 88888888}$$

$$1. \quad 1 - \frac{1}{10} - \frac{1}{100} - \frac{1}{1000} - \dots - \frac{1}{10000000000}$$

$$2. \quad \frac{1234567890}{1234567891^2 - 1234567890 \times 1234567892}$$

$$3. \quad \left(1 + \frac{1}{2}\right) \times \left(1 - \frac{1}{2}\right) \times \left(1 + \frac{1}{3}\right) \times \left(1 - \frac{1}{3}\right) \times \left(1 + \frac{1}{100}\right) \times \left(1 - \frac{1}{100}\right)$$

## Suggestions or Solutions To the Examples 6 in Rationals

$$0. \quad \frac{1+2+3+4+5+6+7+8+7+6+5+4+3+2+1}{88888888 \times 88888888}$$

To begin with, we can have

$$\begin{array}{r} 1+2+3+4+5+6+7+8+ \\ 7+6+5+4+3+2+1 \\ \hline 8+8+8+8+8+8+8+8 = 8 \times 8 \end{array}$$

So we get

$$\begin{aligned} \frac{1+2+3+4+5+6+7+8+7+6+5+4+3+2+1}{88888888 \times 88888888} &= \frac{8 \times 8}{88888888 \times 88888888} \\ &= \frac{8 \times 8}{8 \times 11111111 \times 8 \times 11111111} = \frac{8 \times 8}{8 \times 8 \times 11111111^2} = \frac{1}{11111111^2} \end{aligned}$$

And we have

$$11^2 = 121$$

$$111^2 = 12321$$

$$1111^2 = 1234321$$

So by the same token, we can get  $11111111^2 = 123456787654321$

$$\text{Thus, we get } \frac{1+2+3+4+5+6+7+8+7+6+5+4+3+2+1}{88888888 \times 88888888} = \frac{1}{123456787654321}.$$

$$1. \quad 1 - \frac{1}{10} - \frac{1}{100} - \frac{1}{1000} - \dots - \frac{1}{10000000000}$$

To begin with, we know  $\frac{1}{10} = 0.1$ ,  $\frac{1}{100} = 0.01$ ,  $\frac{1}{1000} = 0.001$ , and so forth.

So we get

$$1 - \frac{1}{10} - \frac{1}{100} - \frac{1}{1000} - \dots - \frac{1}{10000000000}$$

$$= 1 - (0.1 + 0.01 + 0.001 + \dots + 0.0000000001)$$

$$= 1 - 0.1111111111$$

$$= 0.8888888889$$

$$2. \quad \frac{1234567890}{1234567891^2 - 1234567890 \times 1234567892}$$

Assuming first,  $1234567890 = A$ , we can get

$$1234567891 = A + 1, \text{ and } 1234567892 = A + 2.$$

So next, we get

$$\frac{1234567890}{1234567891^2 - 1234567890 \times 1234567892} = \frac{A}{(A+1)^2 - A(A+2)}$$

$$= \frac{A}{A^2 + 2A + 1 - A^2 - 2A} = \frac{A}{1} = A$$

$$\text{Thus, we get } \frac{1234567890}{1234567891^2 - 1234567890 \times 1234567892} = 1234567890.$$

$$3. \quad \left(1 + \frac{1}{2}\right) \times \left(1 - \frac{1}{2}\right) \times \left(1 + \frac{1}{3}\right) \times \left(1 - \frac{1}{3}\right) \times \left(1 + \frac{1}{100}\right) \times \left(1 - \frac{1}{100}\right)$$

$$= \frac{3}{2} \times \frac{1}{2} \times \frac{4}{3} \times \frac{2}{3} \times \frac{101}{100} \times \frac{99}{100} = \frac{1}{1} \times \frac{1}{1} \times \frac{1}{1} \times \frac{2}{1} \times \frac{101}{100} \times \frac{33}{100} = \frac{101}{100} \times \frac{66}{100}$$

$$= \frac{6666}{10000} = \frac{3333}{5000}$$