

Grade 9 Mathematics Worksheet

Equation and expression

Questions:

1. If $2x - 1 = \sqrt{37}$, then $a < x < b$. Find a and b if they are consecutive integers.
2. Represent the following as a simplified expression:
 - a) $(-5)(-5)(-5)(-5)$
 - b) $4x^2y + \frac{1}{2}x^3 - xy$ where $x = -2$ and $y = \frac{2}{3}$
 - c) $\frac{4(3x + y)^2}{y}$ if $y = \frac{x}{2}$
 - d) $\frac{3x}{2y}$ if $x = 5 \times 10^{-23}$ and $y = 2 \times 10^{-42}$

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Solution

$$\begin{aligned}
 1. \quad 2x - 1 &= \sqrt{37} \\
 \therefore 2x &= \sqrt{37} + 1 \\
 \therefore x &= \frac{\sqrt{37} + 1}{2}
 \end{aligned}$$

This answer is irrational since $\sqrt{37}$ is irrational. Thus the closest to $\sqrt{37}$ is the root of 36 which is 6.

So:

$$x = \frac{6+1}{2} = 3,5. \text{ That will make } 3 < x < 4$$

$$2. \quad a) \quad (-5)(-5)(-5)(-5) = (-5)^4 = 5^4 (= 625)$$

$$\begin{aligned}
 b) \quad 4x^2y + \frac{1}{2}x^3 - xy \Big|_{\substack{x=-2 \\ y=\frac{2}{3}}} \\
 &= 4(-2)^2\left(\frac{2}{3}\right) + \frac{1}{2}(-2)^3 - (-2)\left(\frac{2}{3}\right) \\
 &= \frac{32}{3} - \frac{1}{4} + \frac{4}{3} \\
 &= \frac{128-3+16}{12} \\
 &= \frac{141}{12} \\
 &= \frac{47}{4}
 \end{aligned}$$

$$\begin{aligned}
 c) \quad \frac{4(3x+y)^2}{y} \Big|_{y=\frac{x}{2}} &= \frac{4(3x+\frac{x}{2})^2}{\frac{x}{2}} \\
 &= \frac{2}{x} \times \frac{4(3x+\frac{x}{2})^2}{1} \\
 &= \frac{8\left(9x^2 + 2(3x)\left(\frac{x}{2}\right) + \frac{x^2}{4}\right)}{x} \\
 &= \frac{72x^2 + 3x^2 + \frac{1}{4}x^2}{x} \\
 &= 72x + 3x + \frac{1}{4}x \\
 &= \frac{75 \times 4 + 1}{4}x \\
 &= \frac{301x}{4}
 \end{aligned}$$

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$$\begin{aligned}
 \text{d) } \frac{3x}{2y} & \Big|_{x=5 \times 10^{-23} \text{ and } y=2 \times 10^{-42}} \\
 &= \frac{3(5 \times 10^{-23})}{2(2 \times 10^{-42})} \\
 &= \frac{15 \times 10^{-23}}{4 \times 10^{-42}} \\
 &= 3,75 \times 10^{19}
 \end{aligned}$$

Notes to Teacher

Learners need not solve the problem algebraically. They can identify that 6 is a close approximation and then divide the two consecutive numbers by two.

For (a) we are not interested in the answer of 625. We are interested in how the structure of the question has been changed to show the understanding of the use of the power and the absorption of the negative sign.

The notation for substitution into expressions can be emphasised to learners.