Substitution into Formulae

This worksheet tests your ability to substitute numerical values into algebraic expressions and formulae. Remember to follow the order of operations (BODMAS/PEMDAS) and use brackets correctly, especially with negative numbers.

Basic Substitution (Positive Values)

1. Given the expression $E = 5x + 3y$, find the value of E when $x = 4$ and $y = 2$.

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2. The formula for the area of a trapezium is $A = \frac{1}{2}(a + b)h$. Find A when $a = 6$ cm, $b = 10$ cm, and $h = 5$ cm.

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3. Find the value of P when $m = 3$ and $n = 5$, given the formula $P = 2m^2 - n$.

4. The expression for the circumference of a circle is $C = 2\pi r$. Use $\pi \approx 3.14$ to find C when $r = 7$.

Substitution with Negative and Squared Values

5. Find the value of y when $x = -3$, given the expression $y = 4x - 7$.

6. Given $V = a^2 + 2b$, calculate V when $a = -5$ and $b = 10$.

7. The equation for a line is $y = -2x - 1$. Find the value of y when $x = -4$.

8. Find the value of T when $p = 2$, $q = -1$, and $r = -3$, given $T = pq - 3r$.

9. Calculate R when $m = -2$, given the formula $R = (m - 1)^2 + m^3$.

Complex Formulae (Fractions, Roots, and Brackets)

10. Use the formula $D = \frac{y_2 - y_1}{x_2 - x_1}$ to find D when $y_2 = 10$, $y_1 = 4$, $x_2 = -5$, and $x_1 = 7$.

11. The formula for the distance between two points is $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. Find d when $x_2 = 5$, $x_1 = 1$, $y_2 = -2$, and $y_1 = 1$.

12. Find the value of S when $n = 4$ using the formula $S = \frac{n(n+1)}{2}$.

13. Calculate K when $a = 5$ and $b = -1$, given $K = 2(a - 3b)^2 - 10$.

Substitution and Rearrangement (Reverse Problems)

14. The formula for the area of a rectangle is $A = lw$. If the area $A = 45\ \text{cm}^2$ and the width $w = 5\ \text{cm}$, find the length l.

15. The formula for converting Celsius (C) to Fahrenheit (F) is $F = \frac{9}{5}C + 32$. A temperature is measured at 86°F. Find the temperature in Celsius (C).

16. The volume of a cylinder is $V = \pi r^2 h$. If the volume $V = 100\pi$ and the radius $r = 5$, find the height h.

17. The equation for the velocity of an object is $v = u + at$. If the final velocity $v = 30$, initial velocity $u = 10$, and time $t = 4$, find the acceleration a.

18. Given the equation $y = 3(x + 5) - 1$, if $y = 23$, find the value of x.