

Foundation GCSE: Substituting into a Formula

Name: _____

Class: _____

Instructions: Answer all questions. Questions are ordered from easiest (1) to hardest (20). Working out should be shown where appropriate.

1. Evaluate the formula $v = u + at$ when $u = 4$, $a = 2$, and $t = 3$.
2. Given the formula $y = 5x^2 - 3$, find the value of y when $x = -2$.
3. The formula for the area of a trapezium is $A = \frac{1}{2}(a + b)h$. Find A when $a = 6$, $b = 10$, and $h = 5$.
4. Calculate the final velocity v using $v^2 = u^2 + 2as$, given $u = 3$, $a = 4$, and $s = 7$.
5. Evaluate $T = 2\pi\sqrt{\frac{L}{g}}$ when $L = 2.5$, $g = 9.8$, and $\pi \approx 3.142$ (give your answer to 2 decimal places).
6. Evaluate $P = 2l + 2w$ when $l = 12.5$ and $w = 7.3$.
7. Find the value of $E = \frac{1}{2}mv^2$ when $m = 4$ and $v = 6$.
8. Evaluate $C = \frac{5}{9}(F - 32)$ when $F = 86$.
9. Given $V = \pi r^2 h$, calculate V using $r = 3$ and $h = 10$ (leave your answer in terms of π).
10. Evaluate $S = \frac{n}{2}[2a + (n - 1)d]$ when $n = 10$, $a = 3$, and $d = 4$.
11. Find y when $y = x^3 - 4x$ and $x = -3$.
12. Evaluate $R = \frac{V}{I}$ when $V = 240$ and $I = 12.5$.
13. Calculate $F = \frac{Gm_1m_2}{d^2}$ when $G = 6.67 \times 10^{-11}$, $m_1 = 5$, $m_2 = 8$, and $d = 2$.
14. Evaluate $A = P\left(1 + \frac{r}{100}\right)^n$ when $P = 5000$, $r = 4$, and $n = 2$.
15. Find the value of x from $ax + b = c$ when $a = 3$, $b = -7$, and $c = 14$.
16. Evaluate $z = \sqrt{x^2 + y^2}$ when $x = -9$ and $y = 12$.
17. Given $s = ut + \frac{1}{2}at^2$, find s when $u = 5$, $t = 4$, and $a = -2$.
18. Evaluate $\rho = \frac{m}{V}$ when $m = 450$ g and $V = 1.2$ liters (1 liter = 1000 cm³), giving your answer in g/cm³.
19. Calculate $Q = \sqrt{\frac{2as}{v^2 - u^2}}$ when $a = 3$, $s = 12$, $v = 10$, and $u = 4$.
20. Evaluate the quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ when $a = 1$, $b = -5$, and $c = 6$.

Answers & Worked Solutions

1. $v = 10 - 4 + (2 \times 3) = 4 + 6 = 10.$
2. $y = 17 - 5(-2)^2 - 3 = 5(4) - 3 = 20 - 3 = 17.$
3. $A = 40 - \frac{1}{2}(6+10) \times 5 = \frac{1}{2}(16) \times 5 = 8 \times 5 = 40.$
4. $v = 7.81 - v^2 = 3^2 + 2(4)(7) = 9 + 56 = 65$, so
 $v = \sqrt{65} \approx 7.81.$
5. $T = 3.17 - 2 \times 3.142 \times \sqrt{2.5/9.8} \approx 3.17.$
6. $P = 39.6 - 2(12.5) + 2(7.3) = 25 + 14.6 = 39.6.$
7. $E = 72 - \frac{1}{2}(4)(6^2) = 2 \times 36 = 72.$
8. $C = 30 - \frac{5}{9}(86 - 32) = \frac{5}{9}(54) = 5 \times 6 = 30.$
9. $V = 90\pi - \pi(3^2)(10) = \pi(9)(10) = 90\pi.$
10. $S = 210 - \frac{10}{2}[2(3) + (9)(4)] = 5[6 + 36] = 5 \times 42 = 210.$
11. $y = -15 - (-3)^3 - 4(-3) = -27 + 12 = -15.$
12. $R = 19.2 - 240/12.5 = 19.2.$
13. $F = 6.67 \times 10^{-10} - \frac{6.67 \times 10^{-11} \times 5 \times 8}{4} = 6.67 \times 10^{-10}.$
14. $A = 5408 - 5000 \left(1 + \frac{4}{100}\right)^2 = 5000(1.0816) = 5408.$
15. $x = 7 - 3x - 7 = 14 \implies 3x = 21 \implies x = 7.$
16. $z = 15 - \sqrt{(-9)^2 + 12^2} = \sqrt{81 + 144} = \sqrt{225} = 15.$
17. $s = 4 - 5(4) + \frac{1}{2}(-2)(4^2) = 20 - 16 = 4.$
18. $\rho = 0.375 - V = 1200 \text{ cm}^3$, so $\rho = 450/1200 = 0.375 \text{ g/cm}^3.$
19. $Q = 0.93 - \sqrt{\frac{72}{84}} \approx 0.926.$
20. $x = 3 - \frac{5 + \sqrt{25 - 24}}{2} = \frac{5 + 1}{2} = 3.$