Evaluating expressions: substitute, then order of operations

[ ] 1. Substitute in brackets: $3x^2 - 2x + 1$ at $x = -2$ becomes $3(-2)^2 - 2(-2) + 1$. The bracket keeps the sign and turns $2x$ into $2 \times$ (value).
[ ] 2. Order of operations: brackets, exponents, multiply and divide left to right, add and subtract left to right. $3(4) + 4 + 1 = 17$.

Step	PEMDAS / BODMAS	Covers
1	Parentheses / Brackets	( ), [ ], the top and bottom of a fraction, everything under a root
2	Exponents / Orders	powers and roots
3	Multiplication and Division	one step, left to right
4	Addition and Subtraction	one step, left to right

Worked examples

Expression	Value	Working	Answer
$5x + 7$	$x = 3$	$5(3) + 7$	22
x^2	$x = -5$	$(-5)^2$	25 (not -25)
$-x^2$	$x = -5$	$-(-5)^2$	-25
$2(a + b) - 3b$	$a = 4, b = -2$	$2(2) + 6$	10
$(x + 3)/(x - 1)$	$x = 5$	8/4	2
$2x^3$	$x = -1$	$2(-1)$	-2
$A = \frac{1}{2}bh$	$b = 10, h = 7$	$\frac{1}{2}(10)(7)$	35
$F = 9C/5 + 32$	$C = 25$	$45 + 32$	77
$\sqrt{(a^2 + b^2)}$	$a = 3, b = 4$	$\sqrt{25}$	5
$4 - 2(x - 1)$	$x = -3$	$4 - 2(-4)$	12

The traps

[ ] x^2 at $x = -3$ is 9: bracket the negative.
[ ] $2x$ at $x = 5$ is 10, not 25.
[ ] Left to right for × and ÷, and for + and -.
[ ] A fraction bar and a root sign are brackets.
[ ] Evaluate gives a number; solve finds x.

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Twenty practice questions

1. $4x - 1$ at $x = 2$ = _____

2. $10 - 3x$ at $x = 4$ = _____

3. $x^2 + 1$ at $x = 3$ = _____

4. x^2 at $x = -4$ = _____

5. $-x^2$ at $x = -4$ = _____

6. $2x^2 - x$ at $x = -3$ = _____

7. $(x - 2)(x + 2)$ at $x = 5$ = _____

8. $3a + 2b$ at $a = 2, b = 5$ = _____

9. $a^2 - b^2$ at $a = 6, b = 4$ = _____

10. $ab - c$ at $a = -2, b = 3, c = -5$ = _____

11. $(p + q)/2$ at $p = 7, q = 11$ = _____

12. $12/x + x$ at $x = 4$ = _____

13. $x/3 + 1$ at $x = 2/3$ = _____

14. $5(x - 3) + 2x$ at $x = 3$ = _____

15. $2x^3$ at $x = 2$ = _____

16. $(-x)^2$ at $x = 3$ = _____

17. $3x - 2y$ at $x = 1/2, y = -1$ = _____

18. $\sqrt{(x + 9)}$ at $x = 16$ = _____

19. $P = 2l + 2w$ at $l = 8, w = 5$ = _____

20. $d = 5t^2$ at $t = 3$ = _____

Answers

1) 7 2) -2 3) 10 4) 16 5) -16 6) 21 7) 21 8) 16 9) 20 10) -1 11) 9 12) 7 13) 11/9 14) 6 15) 16 16) 9 17) 7/2 18) 5 19) 26 20) 45

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