Marking guide | Algebra

Algebra practice test 1

16 questions | 39 marks | 55 minutes

A balanced review of expressions, fractions, equations and formulas.

Equivalent correct methods earn the corresponding marks.

1. Simplify $8x - 3x + 2$. [2 marks]

Collect $8x - 3x$.

Answer: $5x + 2$

2. Simplify $4a + 7b - a - 2b$. [2 marks]

Collect each variable separately.

Answer: $3a + 5b$

3. Expand $3(2p - 5)$. [2 marks]

Multiply both terms by 3.

Answer: $6p - 15$

4. Expand and simplify $2(x + 4) - 3(x - 1)$. [2 marks]

The expansion is $2x + 8 - 3x + 3$.

Answer: $-x + 11$

5. Factorise $18m + 12$. [2 marks]

Extract the greatest common factor 6.

Answer: $6(3m + 2)$

6. Factorise $10x^2y - 15xy$. [2 marks]

Extract $5xy$.

Answer: $5xy(2x - 3)$

7. Simplify $\frac{9a}{12a}$ and state its restriction. [2 marks]

Reduce $\frac{9}{12}$ after cancelling nonzero a.

Answer: $\frac{3}{4}$, $a \neq 0$

8. State the restrictions for $\frac{x+1}{x(x-5)}$. [2 marks]

Either denominator factor can be zero.

Answer: $x \neq 0, 5$

9. Simplify $\frac{2}{x} + \frac{3}{x}$. [2 marks]

The denominator is already common.

Answer: $\frac{5}{x}$, $x \neq 0$

10. Simplify $\frac{1}{x} + \frac{2}{x+1}$. [3 marks]

Use common denominator $x(x+1)$: numerator $x + 1 + 2x$.

Answer: $\frac{3x+1}{x(x+1)}$, $x \neq 0, -1$

11. Solve $\frac{x}{4} + \frac{1}{3} = \frac{5}{6}$. [3 marks]

Multiply by 12: $3x + 4 = 10$.

Answer: $x = 2$

12. Make h the subject of $V=\pi r^2 h$. [2 marks]

Divide by πr^2.

Answer: $h=\frac{V}{\pi r^2}$ for $r\neq 0$.

13. A club shares a fixed fee of 48 dollars equally among n people, in addition to 7 dollars each. Write the cost per person as one fraction and state the practical domain. [3 marks]

Add $7+\frac{48}{n}$ using denominator n.

Answer: $\frac{7n+48}{n}$ dollars; positive whole-number n.

14. Find the real domain of $f(x)=\frac{\sqrt{x-2}}{x-6}$. [3 marks]

Combine the nonnegative-radicand and nonzero-denominator conditions.

Answer: $x\geq 2$, $x\neq 6$

15. Solve $\frac{x+4}{x-1}=\frac{5}{x-1}$, checking the candidate. [3 marks]

The restriction is $x\neq 1$. Clearing gives $x+4=5$, so the only candidate 1 is excluded.

Answer: No solution.

16. Consider the formula $y=ax+2x$. [4 marks]

(a) Make x the subject and state any condition on a. [2 marks]

Factor the right side as $x(a+2)$ before dividing.

Answer: $x=\frac{y}{a+2}$ for $a\neq -2$.

(b) Explain the solutions when $a=-2$. [2 marks]

The original formula becomes $y=0$; division by $a+2$ is not allowed.

Answer: If $y=0$, every real x works. If $y\neq 0$, none work.