Topic test | Algebra

Algebra applications test

Name: _____ Date: _____

16 questions | 45 marks | 60 minutes

Apply algebra to costs, rates, formulas and the limits of a model.

No calculator needed.

1. A craft set contains $4x + 3$ red tiles and $2x + 5$ blue tiles. Write the total in simplified form. [2 marks]

2. A rectangular display has sides $x + 3$ and $2x + 1$ metres. Write its perimeter in simplified form. [2 marks]

3. Five identical boxes each hold $3a - 2$ objects. Expand the total count. [2 marks]

4. A club record shows $24n + 18$ points. Factorise it using the greatest numerical common factor. [2 marks]

5. For n booked seats, a model gives price $P = \frac{12n + 36}{n}$. Simplify the formula and state a practical domain. [3 marks]

6. A task takes x hours for one worker and $2x$ hours for another. Write their combined rate in tasks/hour. [3 marks]

7. Two tank capacities are $3p$ and $5p$ litres. Express the fraction of total capacity belonging to the first tank, with a sensible condition on p. [3 marks]

8. A supplier divides $6(x+1)$ dollars among $3(x+1)$ accounts. What is the ratio, and what algebraic value is excluded? [2 marks]

9. A printed formula is $T=\frac{5p-(p+2)}{p-1}$. Simplify it and state its restriction. [3 marks]

10. A cost of 84 dollars is shared equally among n students. Each pays 7 dollars. Find n and check the answer in the original model. [3 marks]

11. A machine gives outputs $y=kt+3t$. Make t the subject and identify the parameter value that needs separate treatment. [3 marks]

12. A car trip is modelled by $d = vt$. Make v the subject, then explain why a zero-duration trip needs separate treatment. [3 marks]

13. A ramp model uses $L = \sqrt{x - 4}$ metres. A student chooses $x = 1$. Explain why this is invalid over the real numbers and state the allowed algebraic inputs. [3 marks]

14. A booking formula is $C = \frac{n+2}{n-3}$. The organiser asks when $C = \frac{5}{n-3}$. Solve and decide whether the result is valid. [3 marks]

15. A company quotes two unit-cost models, $A = 4 + \frac{24}{n}$ and $B = 6 + \frac{12}{n}$, for positive whole-number n. Find when the quoted unit costs are equal and find that cost. [4 marks]

16. Mia simplifies $F = \frac{2x+6}{x+3}$ to 2. [4 marks]

(a) State the excluded value of the original expression. [1 mark]

(b) Evaluate both forms at $x = 5$. [1 mark]

(c) Can the simplified formula be used to give the original expression a value at $x = -3$? Explain. [2 marks]