

WA2 Practice Paper

Algebra and number patterns

25 marks | Suggested time: 40 minutes

Name: Class: Date:

Answer all questions. Show your working. A scientific calculator may be used. Give non-exact answers to 3 significant figures unless stated otherwise.

School WA topic coverage may differ. The suggested solutions start after the question paper.

1. Substitution [1 marks]

Find the value of the expression when $x = -3$ and $y = 2$.

$$\frac{x^2y - 2xy}{x^3}$$

Answer: [1]

2. Simplifying expressions [1 marks]

Simplify:

$$-4(2x + 3) + 3x$$

Answer: [1]

3. Factorisation [3 marks]

(a) Factorise: [1]

$$7mx + 21my$$

Answer: [1]

(b) Factorise: [2]

$$8(x - 2y) + c(2y - x)$$

Answer: [2]

4. Algebraic fractions [3 marks]

Simplify:

$$\frac{3(x + 2)}{7} - \frac{3x}{2}$$

Answer: [3]

5. Expanding brackets [2 marks]

Expand and simplify:

$$2(3a + b) - 5(b - a)$$

Answer: [2]

6. Solving an equation [3 marks]

Solve:

$$\frac{3}{x-2} = \frac{5}{3x}$$

Answer: [3]

7. Decreasing number pattern [3 marks]

The first four terms are 5, 3, 1, -1.

(a) Find an expression in n for the n th term. [1]

Answer: [1]

(b) Explain why -240 is not a term. [2]

Answer: [2]

8. Increasing number pattern [4 marks]

The first five terms are 17, 23, 29, 35, 41.

(a) Find an expression in n for the n th term. [2]

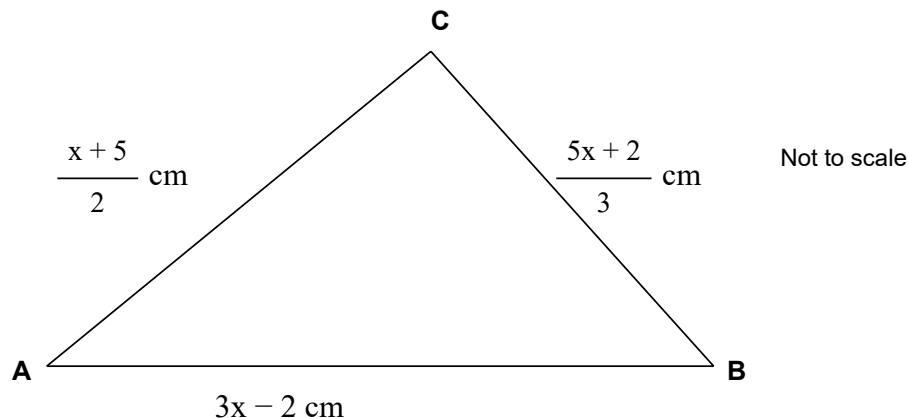
Answer: [2]

(b) Determine whether 1200 is a term. Show your reasoning. [2]

Answer: [2]

9. Forming an equation [5 marks]

Triangle ABC has the side lengths shown. Its perimeter is 15 cm. Form an equation in x and solve it.



Answer: [5]

End of question paper

WA2 Suggested Worked Solutions

Use these solutions after attempting the paper. Other mathematically valid methods may be accepted. The mark allocations are suggestions for this practice paper, not an official school marking scheme.

1. Substitution [1]

$$\frac{x^2y - 2xy}{x^3} = \frac{(-3)^2 \times 2 - 2(-3)(2)}{(-3)^3}$$
$$= \frac{18 + 12}{-27} = -\frac{10}{9}$$

Suggested marking: 1 for the exact answer.

Watch out: Use brackets around negative values when substituting.

2. Simplifying expressions [1]

$$\begin{aligned} & -4(2x + 3) + 3x \\ &= -8x - 12 + 3x \\ &= -5x - 12 \end{aligned}$$

Suggested marking: 1 for the simplified expression.

Watch out: Multiply every term inside the bracket by -4 .

3. Factorisation [3]

(a) The common factor is $7m$.

$$7mx + 21my = 7m(x + 3y)$$

(b) Notice that $2y - x = -(x - 2y)$.

$$\begin{aligned} & 8(x - 2y) + c(2y - x) \\ &= 8(x - 2y) - c(x - 2y) \\ &= (8 - c)(x - 2y) \end{aligned}$$

Suggested marking: (a) 1; (b) 1 for matching the brackets and 1 for factorising.

Watch out: Reversing a subtraction changes its sign.

4. Algebraic fractions [3]

Use the common denominator 14.

$$\begin{aligned}\frac{3(x+2)}{7} - \frac{3x}{2} \\&= \frac{6(x+2)}{14} - \frac{21x}{14} \\&= \frac{6x + 12 - 21x}{14} \\&= \frac{12 - 15x}{14}\end{aligned}$$

Suggested marking: 1 for equivalent fractions, 1 for combining the numerators, 1 for simplification.

Watch out: Multiply both numerator and denominator when changing a denominator.

5. Expanding brackets [2]

$$\begin{aligned}2(3a + b) - 5(b - a) \\&= 6a + 2b - 5b + 5a \\&= 11a - 3b\end{aligned}$$

Suggested marking: 1 for expansion and 1 for collecting like terms.

Watch out: $-5 \times (-a) = +5a$.

6. Solving an equation [3]

The denominators require $x \neq 2$ and $x \neq 0$.

$$\frac{3}{x-2} = \frac{5}{3x}$$

Multiply both sides by $3x(x-2)$.

$$\begin{aligned}9x &= 5(x-2) \\9x &= 5x - 10 \\4x &= -10 \\x &= -\frac{5}{2} = -2.5\end{aligned}$$

Check by substitution: both sides equal $-2/3$. The answer does not violate either denominator restriction.

Suggested marking: 1 for clearing denominators, 1 for rearranging, 1 for the answer.

7. Decreasing number pattern [3]

(a) The common difference is -2 .

$$T(n) = 5 + (n - 1)(-2) = 7 - 2n$$

(b) Test whether the proposed term has a positive integer position.

$$7 - 2n = -240$$

$$2n = 247$$

$$n = 123.5$$

123.5 is not an integer, so -240 is not a term.

Suggested marking: (a) 1; (b) 1 for testing n , 1 for the justified conclusion.

Watch out: A sequence position must be a positive integer.

8. Increasing number pattern [4]

(a) The common difference is 6.

$$T(n) = 17 + (n - 1)6 = 6n + 11$$

(b) Set the expression equal to 1200.

$$6n + 11 = 1200$$

$$n = \frac{1189}{6} = 198 \frac{1}{6}$$

This is not an integer, so 1200 is not a term.

Suggested marking: (a) 1 for the difference, 1 for the expression; (b) 1 for solving, 1 for the justified conclusion.

9. Forming an equation [5]

The three side lengths add to the perimeter.

$$(3x - 2) + \frac{5x + 2}{3} + \frac{x + 5}{2} = 15$$

Multiply every term by 6 to clear both denominators.

$$6(3x - 2) + 2(5x + 2) + 3(x + 5) = 90$$

$$18x - 12 + 10x + 4 + 3x + 15 = 90$$

$$31x + 7 = 90$$

$$31x = 83$$

$$x = \frac{83}{31}$$

Check the sides:

$$AB = \frac{187}{31} \text{ cm}; BC = \frac{159}{31} \text{ cm}; AC = \frac{119}{31} \text{ cm}$$

$$\text{Perimeter} = \frac{187 + 159 + 119}{31} = 15 \text{ cm}$$

The longest side is shorter than the sum of the other two, so these lengths form a valid triangle.

Suggested marking: 1 for the equation, 2 for clearing denominators and expansion, 1 for rearranging, 1 for the answer.

Watch out: Keep the exact fraction rather than rounding x during the check.