

WA1 Practice Paper

Algebraic manipulation, equations and simultaneous equations

35 marks | Suggested time: 55 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. Suggested solutions start after the question paper.

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1. Expansion and simplification [3 marks]

(a) Expand and simplify: $3(2x - 5) - 2(x + 4)$. [1]

(b) Expand and simplify: $(2x - 3)(x + 5)$. [2]

Answer: [3]

2. Factorisation [4 marks]

Factorise completely.

(a) $12a^2b - 18ab^2$ [1]

(b) $x^2 - 9x + 20$ [1]

(c) $3y^2 - 27$ [2]

Answer: [4]

3. Algebraic fractions [4 marks]

Simplify each expression. State any values of x that must be excluded.

(a) $\frac{6x^2 - 24}{3x + 6}$ [2]

(b) $\frac{2}{x - 1} + \frac{3}{x + 1}$ [2]

Answer: [4]

4. Linear equation [3 marks]

Solve the equation.

$$\frac{2x - 1}{3} - \frac{x + 2}{4} = 2$$

Answer: [3]

5. Quadratic equations [4 marks]

Solve each equation by factorisation.

(a) $x^2 + 2x - 15 = 0$ [2]

(b) $2y^2 - 7y + 3 = 0$ [2]

Answer: [4]

6. Simultaneous equations [5 marks]

Solve the simultaneous equations.

$$3x + 2y = 19$$

$$2x - 3y = 4$$

Answer: [5]

7. Changing the subject [5 marks]

The formula connecting P, a, b and h is

$$P = \frac{h(a + b)}{2}$$

- (a) Find P when $h = 6$, $a = 4$ and $b = 9$. [1]
- (b) Make b the subject of the formula. [2]
- (c) Find b when $P = 48$, $h = 8$ and $a = 5$. [2]

Answer: [5]

8. Ticket prices [7 marks]

At a science exhibition, 3 adult tickets and 2 student tickets cost \$47.

Two adult tickets and 5 student tickets cost \$57.

- (a) Let an adult ticket cost \$a and a student ticket cost \$s. Form two equations. [2]
- (b) Find the price of each type of ticket. [3]
- (c) A group buys 4 adult tickets and 6 student tickets. A 10% discount applies to the total. Find the amount paid. [2]

Answer: [7]

End of question paper

WA1 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. Expansion and simplification [3]

(a) $6x - 15 - 2x - 8 = 4x - 23$.

(b) $2x^2 + 10x - 3x - 15 = 2x^2 + 7x - 15$.

Suggested marking: (a) 1 for answer; (b) 1 for expansion, 1 for simplification.

Watch out: Multiply every term in each bracket.

2. Factorisation [4]

(a) $6ab(2a - 3b)$.

(b) $(x - 4)(x - 5)$, since $-4 - 5 = -9$ and $(-4)(-5) = 20$.

(c) $3(y^2 - 9) = 3(y - 3)(y + 3)$.

Suggested marking: (a) 1; (b) 1; (c) 1 for common factor, 1 for complete factorisation.

Watch out: Factorise the difference of two squares after taking out the common factor.

3. Algebraic fractions [4]

(a) $\frac{6(x - 2)(x + 2)}{3(x + 2)} = 2(x - 2), x \neq -2$.

(b) $\frac{2(x + 1) + 3(x - 1)}{(x - 1)(x + 1)} = \frac{5x - 1}{x^2 - 1}, x \neq 1, -1$.

Suggested marking: Each part: 1 for valid simplification, 1 for answer with restrictions.

Watch out: Restrictions come from the original denominators.

4. Linear equation [3]

Multiply by 12: $4(2x - 1) - 3(x + 2) = 24$.

$8x - 4 - 3x - 6 = 24; 5x = 34$.

$x = \frac{34}{5} = 6.8$.

Suggested marking: 1 for clearing fractions, 1 for collecting terms, 1 for answer.

Watch out: Multiply both sides, including the constant, by 12.

5. Quadratic equations [4]

(a) $(x + 5)(x - 3) = 0$, so $x = -5$ or 3 .

(b) $(2y - 1)(y - 3) = 0$, so $y = \frac{1}{2}$ or 3 .

Suggested marking: Each part: 1 for factorisation, 1 for both roots.

Watch out: A product equal to zero means at least one factor equals zero.

6. Simultaneous equations [5]

Multiply the first equation by 3: $9x + 6y = 57$.

Multiply the second equation by 2: $4x - 6y = 8$.

Add: $13x = 65$, so $x = 5$.

Substitute: $15 + 2y = 19$, so $y = 2$.

Check: $2(5) - 3(2) = 4$.

Suggested marking: 1 for each correctly scaled equation; 1 for elimination; 1 for x ; 1 for y .

Watch out: Check both values in the original equations.

7. Changing the subject [5]

(a) $P = 6(4 + 9) \div 2 = 39$.

(b) $2P = h(a + b)$, so $\frac{2P}{h} = a + b$.

$b = \frac{2P}{h} - a$, where $h \neq 0$.

(c) $b = 2(48) \div 8 - 5 = 7$.

Suggested marking: (a) 1; (b) 1 for dividing by h , 1 for isolating b ; (c) 1 substitution, 1 answer.

Watch out: Divide the entire product by h before subtracting a .

8. Ticket prices [7]

(a) $3a + 2s = 47$; $2a + 5s = 57$.

(b) $15a + 10s = 235$ and $4a + 10s = 114$.

Subtract: $11a = 121$, so $a = 11$.

$33 + 2s = 47$, so $s = 7$. Adult: \$11; student: \$7.

(c) Total = $4(11) + 6(7) = \$86$. Amount paid = $0.90(86) = \$77.40$.

Suggested marking: (a) 1 each equation; (b) 1 elimination, 1 each price; (c) 1 total, 1 discounted cost.

Watch out: The discount applies to the whole group cost.