GCSE Foundation Mathematics
Practice Test 3: Algebra

Instructions:
Answer all questions. Show your working clearly.
Calculators may be used unless stated otherwise.
Time allowed: 90 minutes

Section A: Expressions and Simplification

1. Simplify these expressions:

   (a) $2x + 8x$

   (b) $11y - 6y$

   (c) $5a + 4b - 2a + 3b$

   (d) $8p - 5p + 4q - 3q$

2. Expand these expressions:

   (a) $6(x + 2)$

   (b) $4(3y - 5)$

   (c) $-3(4a + 7)$

   (d) $2(5m - 3n)$

3. Expand and simplify:

   (a) $4(x + 1) + 2(x - 3)$

   (b) $3(2y + 4) - 4(y - 1)$

   (c) $6(a - 1) + 2(4a + 3)$

   (d) $5(2p + 3) - 3(p - 1)$

4. Factorise these expressions:

   (a) $10x + 15$

   (b) $18y - 12$

   (c) $14a + 21b$

   (d) $16p - 24q$

5. Simplify these expressions involving powers:

   (a) $x^2 \times x^7$

   (b) $y^{10} \div y^4$

   (c) $(a^5)^3$

   (d) $2x^4 \times 6x^2$

Section B: Linear Equations

6. Solve these equations:
   (a) $x + 11 = 18$
   (b) $y - 8 = 3$
   (c) $6a = 24$
   (d) $\frac{b}{3} = 8$
7. Work out:
   (a) $4x + 1 = 17$
   (b) $3y - 8 = 13$
   (c) $5a + 9 = 4$
   (d) $2b - 7 = 9$
8. Solve these equations:
   (a) $4(x + 1) = 20$
   (b) $2(y - 3) = 8$
   (c) $3(a + 4) = 21$
   (d) $6(2b - 1) = 30$
9. Solve these equations with unknowns on both sides:
   (a) $5x + 1 = 2x + 10$
   (b) $4y - 5 = y + 7$
   (c) $3a + 9 = a + 15$
   (d) $8b - 3 = 4b + 9$
10. Solve these equations involving fractions:
    (a) $\frac{x}{4} + 1 = 5$
    (b) $\frac{y}{2} - 4 = 3$
    (c) $\frac{5a}{3} = 10$
    (d) $\frac{4b+5}{3} = 5$

Section C: Formulae and Substitution

11. Given that $V = lwh$, find V when:
    (a) $l = 6$, $w = 4$, and $h = 3$
    (b) $l = 8$, $w = 5$, and $h = 2$
    (c) $l = 7.5$, $w = 4$, and $h = 6$
12. Given that $S = 4l + 4w$, find S when:
    (a) $l = 7$ and $w = 5$
    (b) $l = 12$ and $w = 9$
    (c) $l = 6.5$ and $w = 4.5$
13. Given that $F = ma$, find F when:

(a) $m = 8$ and $a = 5$
(b) $m = 12$ and $a = 3$
(c) $m = 6.5$ and $a = 4$

14. The formula for the area of a parallelogram is $A = bh$. Find A when:

(a) $b = 12$ and $h = 7$
(b) $b = 15$ and $h = 4$
(c) $b = 8.5$ and $h = 6$

15. Make the subject of the formula:

(a) $y = 2x + 9$. Make x the subject.
(b) $V = \frac{4}{3}\pi r^3$. Make r the subject.
(c) $S = 4l + 4w$. Make l the subject.
(d) $F = ma$. Make a the subject.

Section D: Inequalities

16. Solve these inequalities:

(a) $x + 6 > 11$
(b) $y - 3 < 8$
(c) $4a \geq 16$
(d) $\frac{b}{6} \leq 3$

17. Solve these inequalities:

(a) $5x + 2 > 17$
(b) $3y - 4 < 11$
(c) $2a + 7 \geq 13$
(d) $4b - 5 \leq 15$

18. Solve these inequalities:

(a) $-4x > 8$
(b) $-5y < 15$
(c) $-a + 6 \geq 3$
(d) $-4b - 3 \leq 9$

19. Write down the integer values of x that satisfy:

(a) $3 < x \leq 7$
(b) $-2 \leq x < 3$
(c) $0 < x < 5$
(d) $-1 \leq x \leq 3$

20. Show these inequalities on a number line:

(a) $x > 4$
(b) $x \leq -2$
(c) $-3 < x \leq 2$
(d) $2 \leq x < 6$

Section E: Sequences

21. Find the next three terms in these sequences:

    (a) $2, 8, 14, 20, \ldots$

    (b) $4, 10, 16, 22, \ldots$

    (c) $30, 26, 22, 18, \ldots$

    (d) $3, 8, 13, 18, \ldots$

22. Find the first differences and state whether each sequence is arithmetic:

    (a) $4, 9, 14, 19, 24, \ldots$

    (b) $3, 12, 27, 48, 75, \ldots$

    (c) $20, 15, 10, 5, 0, \ldots$

    (d) $2, 6, 18, 54, 162, \ldots$

23. For these arithmetic sequences, find the nth term:

    (a) $6, 10, 14, 18, \ldots$

    (b) $3, 7, 11, 15, \ldots$

    (c) $16, 12, 8, 4, \ldots$

    (d) $2, 9, 16, 23, \ldots$

24. Use the nth term formula to find:

    (a) The 8th term of the sequence $6n - 1$

    (b) The 12th term of the sequence $4n + 3$

    (c) The 15th term of the sequence $5n - 2$

    (d) Which term of the sequence $3n + 4$ equals 31?

25. These are geometric sequences. Find the next two terms:

    (a) $4, 12, 36, 108, \ldots$

    (b) $5, 20, 80, 320, \ldots$

    (c) $96, 48, 24, 12, \ldots$

    (d) $2, 10, 50, 250, \ldots$

26. A sequence has first term $a = 3$ and term-to-term rule "add 6".

    (a) Write down the first 5 terms.

    (b) Find the nth term formula.

    (c) Which term equals 45?

Section F: Problem Solving with Algebra

27. I think of a number, multiply by 4, then add 5. The result is 29. What was my original number?

28. The perimeter of a rectangle is 32 cm. If the length is z cm and the width is $(z - 4)$ cm, find the value of z.

29. In a right-angled triangle, one angle is x° and another angle is $(2x + 20)^\circ$. Find the value of x.

30. Emma is w years old. Her father is 5 years older than twice her age. The sum of their ages is 44. How old is Emma?

31. A number pattern starts: $8, 13, 18, 23, \ldots$

    (a) Find the nth term.

    (b) Which term has value 58?

    (c) Is 75 a term in this sequence? Explain your answer.

32. The cost of a plumber is £40 call-out fee plus £25 per hour. If the total bill is £140, how many hours did the plumber work?

33. A cinema ticket costs £8 plus £2.50 for each snack. If the total cost is £18, how many snacks were bought?

34. The sum of three consecutive odd integers is 63. Find the three integers.

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

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