GCSE Foundation Mathematics
Practice Test 5: 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) $7x + 4x$
   (b) $12y - 5y$
   (c) $2a + 6b - a + 3b$
   (d) $10p - 3p + 5q - 2q$

2. Expand these expressions:
   (a) $7(x + 1)$
   (b) $6(2y - 3)$
   (c) $-5(2a + 4)$
   (d) $8(3m - 2n)$

3. Expand and simplify:
   (a) $3(x + 5) + 4(x - 2)$
   (b) $6(2y + 1) - 2(y - 4)$
   (c) $2(a - 5) + 4(3a + 2)$
   (d) $5(2p + 1) - 4(p - 2)$

4. Factorise these expressions:
   (a) $14x + 21$
   (b) $24y - 16$
   (c) $9a + 12b$
   (d) $15p - 20q$

5. Simplify these expressions involving powers:
   (a) $x^6 \times x^4$
   (b) $y^{11} \div y^3$
   (c) $(a^3)^4$
   (d) $6x^3 \times 2x^4$

Section B: Linear Equations

6. Solve these equations:
   (a) $x + 8 = 16$
   (b) $y - 3 = 11$
   (c) $7a = 28$
   (d) $\frac{b}{6} = 5$
7. Work out:
   (a) $5x + 6 = 21$
   (b) $4y - 3 = 17$
   (c) $3a + 10 = 1$
   (d) $6b - 5 = 13$
8. Solve these equations:
   (a) $2(x + 4) = 16$
   (b) $5(y - 2) = 15$
   (c) $6(a + 1) = 30$
   (d) $4(3b - 2) = 28$
9. Solve these equations with unknowns on both sides:
   (a) $6x + 4 = 2x + 16$
   (b) $8y - 1 = 4y + 11$
   (c) $2a + 12 = a + 17$
   (d) $9b - 6 = 3b + 12$
10. Solve these equations involving fractions:
    (a) $\frac{x}{7} + 3 = 6$
    (b) $\frac{y}{5} - 4 = 1$
    (c) $\frac{6a}{5} = 12$
    (d) $\frac{3b+4}{2} = 7$

Section C: Formulae and Substitution

11. Given that $C = \pi d$, find C when ($\pi = 3.14$):
    (a) $d = 8$
    (b) $d = 12$
    (c) $d = 5.5$
12. Given that $T = 2\pi\sqrt{\frac{l}{g}}$, find T when ($\pi = 3.14$):
    (a) $l = 4$ and $g = 10$
    (b) $l = 9$ and $g = 10$
    (c) $l = 16$ and $g = 10$
13. Given that $W = Fd$, find W when:

(a) $F = 15$ and $d = 8$
(b) $F = 24$ and $d = 5$
(c) $F = 18$ and $d = 6$

14. The formula for the surface area of a sphere is $A = 4\pi r^2$. Find A when ($\pi = 3.14$):

(a) $r = 3$
(b) $r = 5$
(c) $r = 2.5$

15. Make the subject of the formula:

(a) $y = 6x + 1$. Make x the subject.
(b) $C = \pi d$. Make d the subject.
(c) $W = Fd$. Make F the subject.
(d) $A = 4\pi r^2$. Make r the subject.

Section D: Inequalities

16. Solve these inequalities:

(a) $x + 1 > 6$
(b) $y - 7 < 2$
(c) $5a \geq 20$
(d) $\frac{b}{8} \leq 2$

17. Solve these inequalities:

(a) $7x + 3 > 24$
(b) $5y - 8 < 17$
(c) $6a + 4 \geq 22$
(d) $3b - 14 \leq 1$

18. Solve these inequalities:

(a) $-5x > 15$
(b) $-4y < 12$
(c) $-a + 9 \geq 6$
(d) $-2b - 5 \leq 3$

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

(a) $1 < x \leq 4$
(b) $-6 \leq x < 0$
(c) $-4 < x < 2$
(d) $2 \leq x \leq 7$

20. Show these inequalities on a number line:

(a) $x > 1$
(b) $x \leq -4$
(c) $-5 < x \leq 0$
(d) $4 \leq x < 8$

Section E: Sequences

21. Find the next three terms in these sequences:

    (a) $5, 12, 19, 26, \ldots$

    (b) $8, 14, 20, 26, \ldots$

    (c) $40, 35, 30, 25, \ldots$

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

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

    (a) $6, 11, 16, 21, 26, \ldots$

    (b) $1, 8, 27, 64, 125, \ldots$

    (c) $30, 24, 18, 12, 6, \ldots$

    (d) $5, 10, 20, 40, 80, \ldots$

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

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

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

    (c) $24, 19, 14, 9, \ldots$

    (d) $5, 12, 19, 26, \ldots$

24. Use the nth term formula to find:

    (a) The 11th term of the sequence $8n - 3$

    (b) The 13th term of the sequence $2n + 5$

    (c) The 18th term of the sequence $6n - 1$

    (d) Which term of the sequence $7n + 1$ equals 50?

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

    (a) $6, 18, 54, 162, \ldots$

    (b) $1, 7, 49, 343, \ldots$

    (c) $48, 24, 12, 6, \ldots$

    (d) $4, 20, 100, 500, \ldots$

26. A sequence has first term $a = 4$ and term-to-term rule "add 7".

    (a) Write down the first 5 terms.

    (b) Find the nth term formula.

    (c) Which term equals 53?

Section F: Problem Solving with Algebra

27. I think of a number, subtract 3, then multiply by 4. The result is 32. What was my original number?

28. The perimeter of a rectangle is 30 cm. If the length is k cm and the width is $(k - 2)$ cm, find the value of k.

29. In a right-angled triangle, one angle is x° and another angle is $(x + 40)^\circ$. Find the value of x.

30. Lucy is t years old. Her grandfather is three times her age plus 10 years. The sum of their ages is 54. How old is Lucy?

31. A number pattern starts: $11, 17, 23, 29, \ldots$

    (a) Find the nth term.

    (b) Which term has value 71?

    (c) Is 95 a term in this sequence? Explain your answer.

32. A swimming pool membership costs £50 joining fee plus £15 per month. If the total cost for one year is £230, how many months was the membership active?

33. A pizza delivery service charges £2.50 delivery fee plus £8.50 per pizza. If the total bill is £36.50, how many pizzas were ordered?

34. The sum of five consecutive integers is 85. Find the five integers.

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

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