GCSE Foundation Mathematics
Practice Test 8: 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) $9x + 3x$

   (b) $17y - 11y$

   (c) $8a + 5b - 4a + 3b$

   (d) $16p - 7p + 6q - 4q$

2. Expand these expressions:

   (a) $6(x + 7)$

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

   (c) $-7(2a + 5)$

   (d) $9(4m - 3n)$

3. Expand and simplify:

   (a) $8(x + 3) + 4(x - 6)$

   (b) $6(3y + 1) - 5(y - 4)$

   (c) $7(a - 4) + 3(6a + 5)$

   (d) $4(2p + 9) - 6(p - 1)$

4. Factorise these expressions:

   (a) $18x + 27$

   (b) $32y - 24$

   (c) $21a + 28b$

   (d) $35p - 42q$

5. Simplify these expressions involving powers:

   (a) $x^6 \times x^5$

   (b) $y^{17} \div y^9$

   (c) $(a^4)^3$

   (d) $6x^3 \times 3x^7$

Section B: Linear Equations

6. Solve these equations:
   (a) $x + 18 = 25$
   (b) $y - 14 = 9$
   (c) $7a = 42$
   (d) $\frac{b}{8} = 7$
7. Work out:
   (a) $9x + 4 = 31$
   (b) $8y - 7 = 17$
   (c) $4a + 19 = 11$
   (d) $6b - 15 = 21$
8. Solve these equations:
   (a) $8(x + 4) = 32$
   (b) $5(y - 6) = 20$
   (c) $7(a + 3) = 49$
   (d) $4(3b - 1) = 20$
9. Solve these equations with unknowns on both sides:
   (a) $6x + 11 = x + 26$
   (b) $10y - 7 = 6y + 17$
   (c) $8a + 5 = 5a + 20$
   (d) $9b - 16 = 3b + 20$
10. Solve these equations involving fractions:
    (a) $\frac{x}{9} + 4 = 7$
    (b) $\frac{y}{5} - 8 = 2$
    (c) $\frac{9a}{7} = 18$
    (d) $\frac{5b+3}{6} = 8$

Section C: Formulae and Substitution

11. Given that $T = \frac{D}{S}$, find T when:
    (a) $D = 56$ and $S = 8$
    (b) $D = 84$ and $S = 12$
    (c) $D = 75$ and $S = 15$
12. Given that $W = F \times d$, find W when:
    (a) $F = 9$ and $d = 6$
    (b) $F = 15$ and $d = 4$
    (c) $F = 8.5$ and $d = 8$
13. Given that $P = \frac{1}{2}bh$, find P when:

(a) $b = 14$ and $h = 6$
(b) $b = 18$ and $h = 5$
(c) $b = 12$ and $h = 7$

14. The formula for the circumference of a circle is $C = 2\pi r$. Find C when ($\pi = 3.14$):

(a) $r = 8$
(b) $r = 5$
(c) $r = 9$

15. Make the subject of the formula:

(a) $y = 5x - 9$. Make x the subject.
(b) $T = \frac{D}{S}$. Make D the subject.
(c) $W = F \times d$. Make F the subject.
(d) $P = \frac{1}{2}bh$. Make b the subject.

Section D: Inequalities

16. Solve these inequalities:

(a) $x + 7 > 15$
(b) $y - 9 < 6$
(c) $8a \geq 32$
(d) $\frac{b}{9} \leq 5$

17. Solve these inequalities:

(a) $8x + 3 > 27$
(b) $6y - 13 < 17$
(c) $10a + 7 \geq 37$
(d) $7b - 19 \leq 9$

18. Solve these inequalities:

(a) $-5x > 20$
(b) $-9y < 36$
(c) $-a + 8 \geq 3$
(d) $-7b - 12 \leq 8$

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

(a) $7 < x \leq 12$
(b) $-5 \leq x < 2$
(c) $-3 < x < 8$
(d) $2 \leq x \leq 6$

20. Show these inequalities on a number line:

(a) $x > 9$
(b) $x \leq -3$
(c) $-4 < x \leq 5$
(d) $3 \leq x < 10$

Section E: Sequences

21. Find the next three terms in these sequences:

    (a) $9, 17, 25, 33, \ldots$

    (b) $12, 20, 28, 36, \ldots$

    (c) $58, 50, 42, 34, \ldots$

    (d) $7, 15, 23, 31, \ldots$

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

    (a) $11, 17, 23, 29, 35, \ldots$

    (b) $4, 32, 108, 256, 500, \ldots$

    (c) $48, 39, 30, 21, 12, \ldots$

    (d) $9, 18, 36, 72, 144, \ldots$

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

    (a) $14, 21, 28, 35, \ldots$

    (b) $8, 13, 18, 23, \ldots$

    (c) $28, 21, 14, 7, \ldots$

    (d) $11, 22, 33, 44, \ldots$

24. Use the nth term formula to find:

    (a) The 9th term of the sequence $8n + 3$

    (b) The 18th term of the sequence $7n - 5$

    (c) The 30th term of the sequence $4n + 6$

    (d) Which term of the sequence $10n - 9$ equals 81?

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

    (a) $6, 24, 96, 384, \ldots$

    (b) $4, 28, 196, 1372, \ldots$

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

    (d) $7, 35, 175, 875, \ldots$

26. A sequence has first term $a = 15$ and term-to-term rule "add 6".

    (a) Write down the first 5 terms.

    (b) Find the nth term formula.

    (c) Which term equals 93?

Section F: Problem Solving with Algebra

27. I think of a number, multiply by 5, then add 13. The result is 48. What was my original number?

28. The perimeter of a rectangle is 38 cm. If the length is r cm and the width is $(r - 5)$ cm, find the value of r.

29. In a right-angled triangle, one angle is x° and another angle is $(2x + 15)^\circ$. Find the value of x.

30. Emma is s years old. Her father is five times her age minus 12 years. The sum of their ages is 52. How old is Emma?

31. A number pattern starts: $16, 25, 34, 43, \ldots$

    (a) Find the nth term.

    (b) Which term has value 97?

    (c) Is 135 a term in this sequence? Explain your answer.

32. A gym membership costs £18 registration fee plus £12 per month. If the total cost is £114, how many months was the membership?

33. A taxi charges £3.50 initial fee plus £1.20 per mile. If the total fare is £14.90, how many miles was the journey?

34. The sum of three consecutive odd integers is 81. Find the three integers.

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

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