GCSE Foundation Mathematics
Practice Test 6: 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) $5x + 6x$

   (b) $13y - 7y$

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

   (d) $12p - 4p + 3q - q$

2. Expand these expressions:

   (a) $8(x + 4)$

   (b) $3(5y - 2)$

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

   (d) $7(2m - 4n)$

3. Expand and simplify:

   (a) $6(x + 1) + 2(x - 7)$

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

   (c) $5(a - 2) + 3(4a + 6)$

   (d) $2(4p + 5) - 5(p - 3)$

4. Factorise these expressions:

   (a) $16x + 24$

   (b) $20y - 15$

   (c) $18a + 24b$

   (d) $22p - 33q$

5. Simplify these expressions involving powers:

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

   (b) $y^{13} \div y^6$

   (c) $(a^2)^5$

   (d) $3x^5 \times 4x^3$

Section B: Linear Equations

6. Solve these equations:
   (a) $x + 12 = 19$
   (b) $y - 9 = 5$
   (c) $8a = 32$
   (d) $\frac{b}{4} = 9$
7. Work out:
   (a) $7x + 1 = 22$
   (b) $6y - 4 = 14$
   (c) $2a + 13 = 7$
   (d) $4b - 11 = 9$
8. Solve these equations:
   (a) $6(x + 3) = 24$
   (b) $3(y - 4) = 9$
   (c) $5(a + 2) = 35$
   (d) $2(4b - 3) = 14$
9. Solve these equations with unknowns on both sides:
   (a) $4x + 7 = x + 19$
   (b) $9y - 3 = 5y + 13$
   (c) $7a + 1 = 4a + 13$
   (d) $6b - 8 = 2b + 12$
10. Solve these equations involving fractions:
   (a) $\frac{x}{8} + 2 = 5$
   (b) $\frac{y}{3} - 5 = 2$
   (c) $\frac{7a}{4} = 14$
   (d) $\frac{4b+1}{3} = 5$

Section C: Formulae and Substitution

11. Given that $R = \frac{V}{I}$, find R when:
   (a) $V = 24$ and $I = 3$
   (b) $V = 36$ and $I = 4$
   (c) $V = 45$ and $I = 5$
12. Given that $D = M \times V$, find D when:
   (a) $M = 8$ and $V = 7$
   (b) $M = 12$ and $V = 5$
   (c) $M = 6.5$ and $V = 4$
13. Given that $K = \frac{1}{2}mv^2$, find K when:

(a) $m = 6$ and $v = 4$
(b) $m = 8$ and $v = 3$
(c) $m = 10$ and $v = 2$

14. The formula for the volume of a cone is $V = \frac{1}{3}\pi r^2 h$. Find V when ($\pi = 3.14$):

(a) $r = 4$ and $h = 9$
(b) $r = 6$ and $h = 5$
(c) $r = 3$ and $h = 8$

15. Make the subject of the formula:

(a) $y = 8x - 5$. Make x the subject.
(b) $R = \frac{V}{I}$. Make V the subject.
(c) $D = M \times V$. Make M the subject.
(d) $K = \frac{1}{2}mv^2$. Make m the subject.

Section D: Inequalities

16. Solve these inequalities:

(a) $x + 4 > 10$
(b) $y - 6 < 3$
(c) $7a \geq 21$
(d) $\frac{b}{5} \leq 6$

17. Solve these inequalities:

(a) $6x + 1 > 19$
(b) $4y - 9 < 11$
(c) $8a + 3 \geq 27$
(d) $5b - 13 \leq 7$

18. Solve these inequalities:

(a) $-3x > 12$
(b) $-7y < 21$
(c) $-a + 4 \geq 1$
(d) $-5b - 6 \leq 9$

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

(a) $5 < x \leq 9$
(b) $-3 \leq x < 4$
(c) $-1 < x < 6$
(d) $0 \leq x \leq 4$

20. Show these inequalities on a number line:

(a) $x > 6$
(b) $x \leq -1$
(c) $-2 < x \leq 3$
(d) $1 \leq x < 8$

Section E: Sequences

21. Find the next three terms in these sequences:

    (a) $7, 13, 19, 25, \ldots$

    (b) $9, 16, 23, 30, \ldots$

    (c) $45, 39, 33, 27, \ldots$

    (d) $5, 11, 17, 23, \ldots$

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

    (a) $7, 12, 17, 22, 27, \ldots$

    (b) $2, 16, 54, 128, 250, \ldots$

    (c) $35, 28, 21, 14, 7, \ldots$

    (d) $6, 12, 24, 48, 96, \ldots$

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

    (a) $10, 15, 20, 25, \ldots$

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

    (c) $22, 17, 12, 7, \ldots$

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

24. Use the nth term formula to find:

    (a) The 7th term of the sequence $9n + 4$

    (b) The 16th term of the sequence $5n - 3$

    (c) The 20th term of the sequence $2n + 8$

    (d) Which term of the sequence $8n - 7$ equals 57?

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

    (a) $7, 21, 63, 189, \ldots$

    (b) $2, 12, 72, 432, \ldots$

    (c) $81, 27, 9, 3, \ldots$

    (d) $6, 30, 150, 750, \ldots$

26. A sequence has first term $a = 8$ and term-to-term rule "add 9".

    (a) Write down the first 5 terms.

    (b) Find the nth term formula.

    (c) Which term equals 71?

Section F: Problem Solving with Algebra

27. I think of a number, multiply by 3, then add 8. The result is 35. What was my original number?

28. The perimeter of a rectangle is 34 cm. If the length is p cm and the width is $(p - 3)$ cm, find the value of p.

29. In a right-angled triangle, one angle is x° and another angle is $(2x + 5)^\circ$. Find the value of x.

30. Daniel is r years old. His aunt is four times his age minus 3 years. The sum of their ages is 37. How old is Daniel?

31. A number pattern starts: $12, 19, 26, 33, \ldots$

    (a) Find the nth term.

    (b) Which term has value 75?

    (c) Is 110 a term in this sequence? Explain your answer.

32. A fitness class costs £8 registration fee plus £6 per session. If the total cost is £62, how many sessions were attended?

33. A book club charges £15 membership fee plus £4.50 per book. If the total cost is £42, how many books were purchased?

34. The sum of three consecutive integers is 72. Find the three integers.

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

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