OCR 06 Algebra (Foundation)

1. Simplify $7a + 3b - 2a + 5b$.

2. Simplify $x^4 \times x^7$.

3. Simplify fully $8y^8 \div 2y^3$.

4. Which of these is an identity?

$$4x - 5 = 19 \qquad 4(x - 5) = 4x - 20$$

5. Write down the next two terms in this sequence.

2, 5, 9, 14, 20, ….., …..

6. Find the value of x in the following.

$$8x - 5 = 5x + 22.$$

7. Simplify $3(2x + 5) - 2(x + 3)$.

8. Rearrange $v^2 = u^2 + 2as$ to make u the subject.

9. Solve these simultaneous equations.

$$3x + 2y = 7$$
$$x + 5y = 24$$

10. Factorise $x^2 - 11x + 18$.

11. The formula for calculating the final velocity of an object moving with constant acceleration is $v = u + at$ where u is the initial velocity, v is the final velocity, a is the acceleration and t is the time. Yinka uses this formula to calculate the final velocity when the initial velocity is 5 m/s, the acceleration is 2 m/s^2 and the time taken is 8 seconds. His working is shown below.

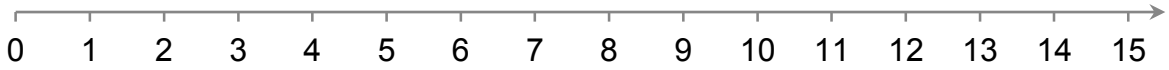
$$v = u + at$$
$$v = 5 + 2 \times 8$$
$$v = 7 \times 8$$
$$v = 56 \text{ m/s}$$

Identify the error in Yinka's working and calculate the correct answer.

12. A sequence is given by the formula $3n - 7$. Show that 140 is a term in this sequence.

13. The values x, 6, 8, 14, 22, 36, 58, y form part of a sequence. Show that $x + y = 96$.

14. Represent the solutions to the inequality $4y - 7 > 35$ on the number line below.



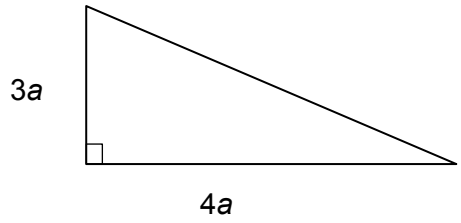
15. A rectangle has width $(3x + 5)$ cm and length $(5x + 7)$ cm. A square has sides of length $(2x + 3)$ cm. Show that the perimeter of the rectangle is twice the perimeter of the square.

16. The area of a circle is $40.7\,\text{cm}^2$. Find the radius of the circle and give your answer to 3 significant figures.

17. Francesca is double Kieron's age and Chun is 7 years younger than Kieron. The sum of the three individuals' ages is 109. How old is each individual?

18. A triangle has angles $(3x + 15)°$, $(2x - 5)°$ and $(x + 20)°$.
Work out the size of the largest angle.

19. Give an expression in terms of *a* for the length of the hypotenuse of the right-angled triangle shown below.



20. A rectangle has width $(x - 3)$ cm and length $(x + 4)$ cm. The area of the rectangle is $60\,\text{cm}^2$.
Work out the perimeter of the rectangle in cm.

Answers

1. $5a + 8b$

2. x^{11}

3. $4y^5$

4. $4(x-5) = 4x - 20$ because it is true for all values of x.

5. 27 and 35

6. $8x - 5 = 5x + 22$
   $3x - 5 = 22$
   $3x = 27$
   $x = 9$

7. $3(2x+5) - 2(x+3) = 6x + 15 - 2x - 6$
   $= 4x + 9$

8. $v^2 = u^2 + 2as$
   $u^2 = v^2 - 2as$
   $u = \sqrt{v^2 - 2as}$

9. $3x + 2y = 7$ multiplied by 5 gives $15x + 10y = 35$
   $x + 5y = 24$ multiplied by 2 gives $2x + 10y = 48$
   Subtracting gives $13x = -13$
   $x = -1$
   Substituting in $3x + 2y = 7$ gives $3 \times (-1) + 2y = 7$
   $-3 + 2y = 7$
   $2y = 10$
   $y = 5$

10. $(x-2)(x-9)$

11. Yinka has not used BIDMAS. He has added 5 + 2 to get 7 and then multiplied 7 by 8 to get 56. He should have worked out 2 × 8 first to get 16 and then added this to 5. The correct answer is 21 m/s.

12. $3n - 7 = 140$
    $3n = 147$
    $n = \frac{147}{3} = 49$
    As n is an integer, 140 is a term in the sequence.

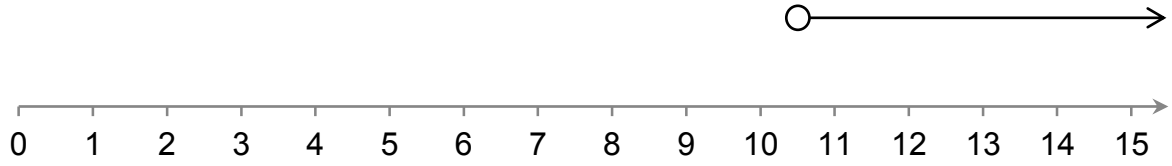
13. The numbers are part of a Fibonacci type sequence so $x = 2$ (from $8 - 6$) and $y = 94$ (from $36 + 58$). $2 + 94 = 96$.

14. $4y - 7 > 35$

$4y > 42$

$y > \frac{42}{4}$

$\therefore y > 10.5$



15. Perimeter of rectangle is $2(3x + 5 + 5x + 7) = 16x + 24$

Perimeter of square is $4(2x + 3) = 8x + 12$

$16x + 24 = 2(8x + 12)$ so the perimeter of the rectangle is twice that of the square.

16. $r = \sqrt{\frac{40.7}{\pi}} = 3.60$ cm

17. $K + 2K + K - 7 = 109$

$4K = 116$

$K = 29$

Kieron is 29, Francesca is 58 and Chun is 22.

18. $(3x + 15) + (2x - 5) + (x + 20) = 180$

$6x + 30 = 180$

$6x = 150$

$x = 25$

The largest angle is given by $3x + 15 = 75 + 15 = 90^\circ$.

19. Using Pythagoras' theorem:

$c^2 = (3a)^2 + (4a)^2$

$= 9a^2 + 16a^2$

$= 25a^2$

$c = \sqrt{25a^2} = 5a$

20. $(x - 3)(x + 4) = 60$

$x^2 + x - 12 = 60$

$x^2 + x - 72 = 0$

$(x + 9)(x - 8) = 0$

$x + 9 = 0$ and $x - 8 = 0$ so $x = -9$ and $x = 8$

x cannot be negative so $x = 8$ and the perimeter is $2(x - 3 + x + 4) = 4x + 2 = 4 \times 8 + 2 = 34$ cm.

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GCSE (9–1)

MATHEMATICS

Section Check In

Assessment Objective	Qu.	Topic	R	A	G
AO1	1	Simplify an algebraic expression by collecting like terms			
AO1	2	Simplify algebraic products			
AO1	3	Simplify algebraic quotients			
AO1	4	Recognise the difference between an equation and an identity			
AO1	5	Generate terms by spotting a pattern			
AO1	6	Solve a linear equation with an unknown on both sides of the equation			
AO1	7	Simplify an algebraic expression by multiplying a single term over a bracket			
AO1	8	Change the subject of a formula			
AO1	9	Solve simultaneous equations			
AO1	10	Factorise a quadratic expression			
AO2	11	Use a kinematics formula			
AO2	12	Use the formula for the *n*th term of a sequence			
AO2	13	Recognise a special sequence			
AO2	14	Represent an inequality on a number line			
AO2	15	Form an algebraic expression in context			
AO3	16	Find the radius of a circle			
AO3	17	Solve a problem by setting up and solving an equation			
AO3	18	Form and solve an equation to solve a problem in context			
AO3	19	Form and simplify an expression using Pythagoras' theorem			
AO3	20	Form and solve a quadratic equation			

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