

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?

$$4x - 5 = 19$$

$$4(x - 5) = 4x - 20$$

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

$$2, 5, 9, 14, 20, \dots, \dots$$

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/s² and the time taken is 8 seconds. His working is shown below.

$$v = u + at$$

$$v = 5 + 2 \times 8$$

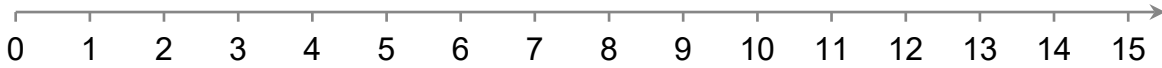
$$v = 7 \times 8$$

$$v = 56 \text{ m/s}$$

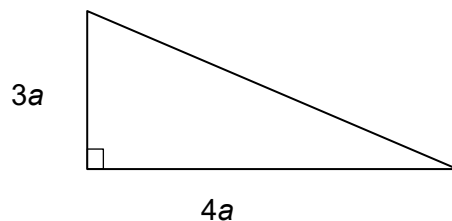
Identify the error in Yinka's working and calculate the correct answer.

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 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 $(3x + 15)^\circ$, $(2x - 5)^\circ$ and $(x + 20)^\circ$.
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 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

$$\begin{aligned}
 6. \quad 8x - 5 &= 5x + 22 \\
 3x - 5 &= 22 \\
 3x &= 27 \\
 x &= 9
 \end{aligned}$$

$$\begin{aligned}
 7. \quad 3(2x + 5) - 2(x + 3) &= 6x + 15 - 2x - 6 \\
 &= 4x + 9
 \end{aligned}$$

$$\begin{aligned}
 8. \quad v^2 &= u^2 + 2as \\
 u^2 &= v^2 - 2as \\
 u &= \sqrt{v^2 - 2as}
 \end{aligned}$$

$$\begin{aligned}
 9. \quad 3x + 2y &= 7 \text{ multiplied by 5 gives } 15x + 10y = 35 \\
 x + 5y &= 24 \text{ multiplied by 2 gives } 2x + 10y = 48 \\
 \text{Subtracting gives } 13x &= -13 \\
 x &= -1 \\
 \text{Substituting in } 3x + 2y &= 7 \text{ gives } 3 \times (-1) + 2y = 7 \\
 -3 + 2y &= 7 \\
 2y &= 10 \\
 y &= 5
 \end{aligned}$$

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

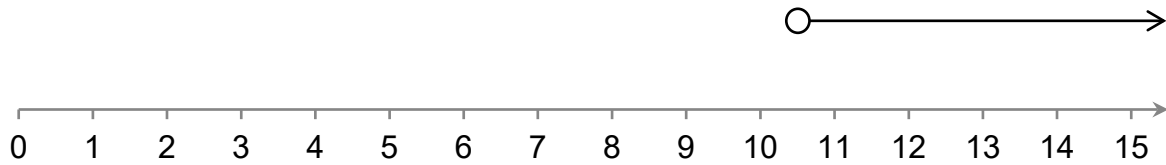
11. Yinka has not used BIDMAS. He has added $5 + 2$ to get 7 and then multiplied 7 by 8 to get 56. He should have worked out 2×8 first to get 16 and then added this to 5. The correct answer is 21 m/s.

$$\begin{aligned}
 12. \quad 3n - 7 &= 140 \\
 3n &= 147 \\
 n &= \frac{147}{3} = 49
 \end{aligned}$$

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 $36 + 58$). $2 + 94 = 96$.

$$\begin{aligned}
 14. \quad & 4y - 7 > 35 \\
 & 4y > 42 \\
 & y > \frac{42}{4} \\
 \therefore & y > 10.5
 \end{aligned}$$



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

$$\text{Perimeter of square is } 4(2x + 3) = 8x + 12$$

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

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

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

$$4K = 116$$

$$K = 29$$

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

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

$$6x + 30 = 180$$

$$6x = 150$$

$$x = 25$$

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

19. Using Pythagoras' theorem:

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

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

$$= 25a^2$$

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

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

$$x^2 + x - 12 = 60$$

$$x^2 + x - 72 = 0$$

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

$$x + 9 = 0 \text{ and } x - 8 = 0 \text{ so } x = -9 \text{ and } x = 8$$

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

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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			
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AO3	19	Form and simplify an expression using Pythagoras' theorem			
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