# OCR 06 Algebra (Higher)

1. Simplify .
2. Simplify .
3. A function is given by. Write an expression for the inverse of this function.
4. A value, *x*, is input into this function.





*x*

*y*

The output, *y*, is then input into this function.





*y*

*z*

Complete the function below.

…..

.....

*x*

*z*

1. Find the value of *x* in the following.

.

1. Write  in the form .
2. Simplify .
3. Rearrange the formula  to make *x* the subject.
4. Factorise .
5. Find the formula for the *n*th term of the quadratic sequence 5, 12, 25, 44, 69, ….
6. Kasim adds together two fractions. His working is shown below.



Identify Kasim’s error and calculate the correct answer.

1. By completing the square, show that the solutions to the equation  are and .
2. Prove algebraically that the difference between the squares of two consecutive **odd** integers is even.
3. A formula for the *n*th term of the sequence 6, 11, 20, 33,… is . Write down a formula for the *n*th term of the sequence 10, 15, 24, 37,... and use it to show that 240 is a term of this sequence.
4. The equation  has a solution between 4 and 5.

Show that this solution is 4.3 to one decimal place.

1. List the integer values that satisfy both of the inequalities  and .
2. A Fibonacci type sequence is given by .

 and . Write expressions for the third and fifth terms. If the third term is 11 and the fifth term is 39, find the values of *a* and *b*.

1. The area of the triangle below is 14.28 cm2. Find the value of *x*.

30°

6.8 cm

**Not to scale**

*x* cm

1. A straight line has equation . A circle has equation . Find the coordinates of the points of intersection of the circle and the straight line. Give your answers correct to 3 significant figures.
2. Sarah wants to make a rectangular pen for her rabbits. One side of the pen will be a brick wall and she has 16 m of wire fencing for the other three sides. Find possible values for *x* if the area of the pen is at least 24 m2.

Brick wall

*x* m

### Answers

1. 
2. 
3. 





*x*

*z*

1. 









1. Complete the square:



1. 
2. 











1. 
2. 
3. Kasim has just added the numerators and added the denominators of the fractions. He should have written each fraction over a common denominator and then just added the numerators.
4. 









 or 

1. Let the two odd numbers be  and 




Subtracting gives









If *x* is an integer,  is an integer so  is even.

1. Each term is 4 larger than the corresponding term in the first sequence so the formula for the *n*th term is 







 or 

*n* can only be a positive integer so  and therefore 240 is a term in the sequence.

1. Try 

Try 

As there is a sign change between  and , 4.3 is a solution to one decimal place.

1. 











The integers which satisfy both inequalities are in the interval  so 0, 1, 2 and 3.

1. The first term is *a*; the second term is *b*; the third term is *a* + *b*; (the fourth term is *a* + 2*b*); the fifth term is 2*a* + 3*b*.

Form two simultaneous equations:





Substituting gives 

Substituting gives 

1. Area of triangle 



cm

1. Substitute  into 







Using the quadratic formula: 

 or –0.9266…i.e. 1.73 or –0.927 (to 3 significant figures)

Substitute into 

If 

If 

So the coordinates of the points of intersection are (1.73, 2.45) and (–0.927, –2.85).

1. Let the width be *x*







 (in metres)

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| **Assessment Objective** | **Qu.** | **Topic** | **R** | **A** | **G** |  | **Assessment Objective** | **Qu.** | **Topic** | **R** | **A** | **G** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| AO1 | 1 | Simplify an expression involving products of powers |  |  |  |  | AO1 | 1 | Simplify an expression involving products of powers |  |  |  |
| AO1 | 2 | Simplify an expression involving quotients of powers |  |  |  |  | AO1 | 2 | Simplify an expression involving quotients of powers |  |  |  |
| AO1 | 3 | Write an expression for an inverse function |  |  |  |  | AO1 | 3 | Write an expression for an inverse function |  |  |  |
| AO1 | 4 | Complete a composite function |  |  |  |  | AO1 | 4 | Complete a composite function |  |  |  |
| AO1 | 5 | Solve a linear equation involving brackets and unknowns on both sides of the equation |  |  |  |  | AO1 | 5 | Solve a linear equation involving brackets and unknowns on both sides of the equation |  |  |  |
| AO1 | 6 | Complete the square |  |  |  |  | AO1 | 6 | Complete the square |  |  |  |
| AO1 | 7 | Factorise a quadratic expression to simplify an algebraic fraction |  |  |  |  | AO1 | 7 | Factorise a quadratic expression to simplify an algebraic fraction |  |  |  |
| AO1 | 8 | Rearrange a formula where the subject appears twice |  |  |  |  | AO1 | 8 | Rearrange a formula where the subject appears twice |  |  |  |
| AO1 | 9 | Factorise a quadratic expression where *a*  0 or 1 |  |  |  |  | AO1 | 9 | Factorise a quadratic expression where *a*  0 or 1 |  |  |  |
| AO1 | 10 | Find a formula for the *n*th term of a quadratic sequence |  |  |  |  | AO1 | 10 | Find a formula for the *n*th term of a quadratic sequence |  |  |  |
| AO2 | 11 | Add two algebraic fractions |  |  |  |  | AO2 | 11 | Add two algebraic fractions |  |  |  |
| AO2 | 12 | Solve a quadratic equation by completing the square |  |  |  |  | AO2 | 12 | Solve a quadratic equation by completing the square |  |  |  |
| AO2 | 13 | Use algebra to construct a proof |  |  |  |  | AO2 | 13 | Use algebra to construct a proof |  |  |  |
| AO2 | 14 | Use a formula for the *n*th term of a quadratic sequence |  |  |  |  | AO2 | 14 | Use a formula for the *n*th term of a quadratic sequence |  |  |  |
| AO2 | 15 | Find an approximate solution to a cubic equation |  |  |  |  | AO2 | 15 | Find an approximate solution to a cubic equation |  |  |  |
| AO3 | 16 | Solve two linear inequalities |  |  |  |  | AO3 | 16 | Solve two linear inequalities |  |  |  |
| AO3 | 17 | Set up and solve two simultaneous equations to solve a problem involving sequences |  |  |  |  | AO3 | 17 | Set up and solve two simultaneous equations to solve a problem involving sequences |  |  |  |
| AO3 | 18 | Substitute values into a formula and solve to find an unknown |  |  |  |  | AO3 | 18 | Substitute values into a formula and solve to find an unknown |  |  |  |
| AO3 | 19 | Solve linear and quadratic simultaneous equations and use the quadratic formula |  |  |  |  | AO3 | 19 | Solve linear and quadratic simultaneous equations and use the quadratic formula |  |  |  |
| AO3 | 20 | Set up and solve a quadratic inequality in one variable in context |  |  |  |  | AO3 | 20 | Set up and solve a quadratic inequality in one variable in context |  |  |  |