****

YEAR 10 MATHS – ALGEBRA & NUMBER

TARGET GRADE 7 OR 8

SUMMER LEARNING PROGRAMME

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**Indices Powers and Roots**

**1.** (a) Write down the value of 

 (1 mark)

(b) Write down the value of (4*xy*)0

 (1 mark)

(c) If 2*x = * find the value of *x.*

 (2 marks)

**2.** (a) Evaluate 490.5 × 3–2

 Give your answer as a fraction.

 (3 marks)

(b) Work out 

 (2 marks)

**3.** (a) Work out 81 *x*2–3

Give your answer as a mixed number.

 (3 marks)

 (b) Work out 125

Give your answer as a fraction.

 (2 marks)

**4.** Simplify fully

(a) 

Give your answer as a power of 3.

 (1 mark)

(b) 

Give your answer as a fraction.

 (2 marks)

**5.** (a) Find the value of 

 (1 mark)

(b) Find the value of 8*x*0

 (1 mark)

**6.** Express  as a fraction.

 (2 marks)

**7.** (a) Work out 

 (2 marks)

(b) Work out 

 (2 marks)

**8.** (a) Find the value of *x* in 4*x* = 

 (1 mark)

 (b) Find the value of *y* in 8*y* = 2

(1 mark)

(c) Write down the value of 

 (2 marks)

**9.** (a) Write down the value of 110

 (1 mark)

 (b) Find the value of 8

 (2 marks)

**10.** (a) If 3*x* = , find the value of *x*.

 (2 marks)

(b) If 4*y* =  , find the value of *y*.

 (2 marks)

**11.** (a) Find the value of (0.25)–1

 (1 mark)

(b) Find the value of 

 (2 marks)

**Surds**

**1.** Rationalise the denominator of 

 Simplify your answer fully.

 (3 marks)

**2.** Find values of *a* and *b* such that

(2 + 3)(4 – 3) = *a* + *b*3

(2 marks)

**3.** Write each of these in the form *p*, where *p* is an integer.

(a) 

 (2 marks)

(b) 

(2 marks)

(c) 

(2 marks)

**4.** (a) Simplify +

 (2 marks)

(b) Rationalise 

 (1 mark)

**5.** (a) Rationalise the denominator and simplify fully 

 (2 marks)

(b) By simplifying ,

write 

in its simplest form.

 (3 marks)

**6.** (a) Simplify 

 (2 marks)

(b) Hence simplify



 giving your answer in its simplest surd form.

 (3 marks)

**7.** Rationalise the denominator and simplify fully 

 (2 marks)

**8.** (a) Simplify fully 

You **must** show your working.

 (2 marks)

(b) Rationalise the denominator and simplify 

 (2 marks)

**9.** Simplify fully 

 (2 marks)

**10.** Show that is an integer.

(2 marks)

**11.** Work out 

 Give your answer in the form ** where *a* and *b* are integers.

 (3 marks)

**12.** Simplify fully 

 (4 marks)

**13.** Express  +  in the form *p*

 (2 marks)

**14.** Show that 

 (3 marks)

**15.** (a) By rationalising the denominator, simplify 

 (2 marks)

(b) Show that 

 (2 marks)

**16.** Rationalise and simplify 

 (2 marks)

**Algebraic Fractions**

**1.** Solve the equations

(a) 

 (3 marks)

(b) 

 (4 marks)

**2.** Solve the equation

 = 2

 You **must** show all your working.

 (4 marks)

**3.** Solve the equation

 = 2

You **must** show all your working.

 (4 marks)

**4.** Solve the equation 

 (4 marks)

**5.** Solve the equation = 1

(4 marks)

**6.** Solve the equation 

(5 marks)

**7.** Solve the equation 

 (5 marks)

**8.** Solve this equation    = 

 (7 marks)

**9.** Solve the equation 

 (5 marks)

**10.** Simplify fully 

 (4 marks)

**11.** Simplify fully



 (4 marks)

**14.** Simplify 

 (4 marks)

**Changing the Subject of a Formula**

**1.** Make *x* the subject of the formula



 (4 marks)

**2.** Make *x* the subject of the formula

*a*(*x* – *b*) = *a*2 + *bx*

 (4 marks)

**3.** Rearrange 

 to make *x* the subject.
Simplify your answer as much as possible.

 (4 marks)

**4.** Rearrange the formula 3*y* + 2 =  to make *x* the subject.

 (4 marks)

**5.** Make *x* the subject of the formula

 *y = *

(4 marks)

**Completing the Square**

**1.** You are given that (*x* + a)2 + b = *x*2 – 6*x* + 13.

 Find the values of a and b.

 (3 marks)

**2.** Find the values of *a* and *b* such that

 *x*2 + 10*x* + 40 = (*x + a*)2 + *b*

 (2 marks)

**3.** Find the values of *a* and *b* such that

*x*2 – 10*x* + 18 = (*x* – *a*)2 + *b*

 (2 marks)

**4.** Find the values of *a* and *b* such that

*x*2 + 6*x* – 3 = (*x* + *a*)2 + *b*

 (2 marks)

**5.** Find the values of *a* and *b* such that

*x*2 + 8*x* – 5 ≡ (*x* + *a*)2 + *b*

 (2 marks)

**6.** Find the values of *a* and *b* such that



 (3 marks)

**7.**Find the values of *a* and *b*.

 *x*2  8*x* + 10 = (*x*  *a*)2 + *b*

 (3 marks)

**8.** Find the values of *a* and *b* such that

*x*2 + 6*x* – 3 = (*x* + *a*)2 + *b*

 (2 marks)

**Linear/Non-Linear Simultaneous Equations**

**1.** Solve the simultaneous equations

*y* = *x* + 2

*y* = 3*x*2

 You **must** show your working.
Do **not** use trial and improvement.

 (5 marks)

**2.** Solve the simultaneous equations

 *y* = 2*x* – 5
*x*2 + *y*2 = 25

You **must** show your working.
Do **not** use trial and improvement.

 (6 marks)

**3.** Solve the simultaneous equations

*y* = 3*x*2

5*x* + *y* = 2

 (5 marks)

**4.** Solve the simultaneous equations.

*y* = *x* + 7

*x*2 + *y*2 = 25

 YOU **must** show your working.

 Do **not** use trial and improvement.

(7 marks)

**Algebraic Proof**

**1.**

****

 **(5 marks)**

**2.**

****

**(4 marks)**

**3.**

****

**(4 marks)**

**Triangle Operations Questions**

**1.** Two integers, *a* and *b*, are combined using the operation ⯆ in the following way.

a ⯆ *b* = *a* 2 + *a* – 4*b* – *b* 2

1. Find all solutions to the equation *x* ⯆ 2 = 0

**(4 marks)**

1. If*a* is 4 greater than *b*, prove that *a* ⯆ *b* is always a multiple of 5.

**(4 marks)**

**2.**

****

**(4 marks)**