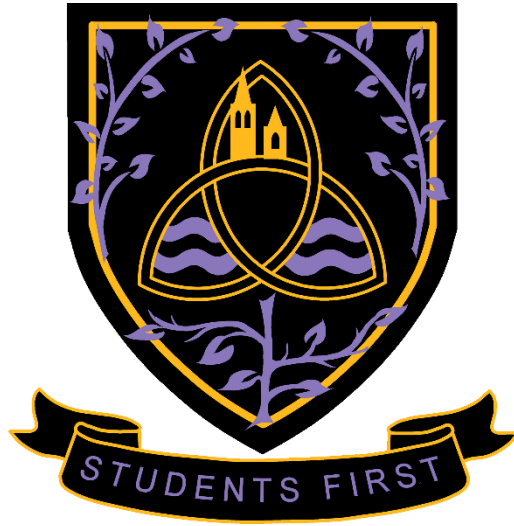


# MATHEMATICS

# A LEVEL



# TRANSITION PACK 2021

NAME

# GCSE to A Level

This booklet has been designed to help you move from being a successful GCSE Mathematics student into an A Level student. The jump to A Level is larger than many students think and by spending time completing this pack you will ensure that you are ready to tackle your new course in September.

Over the summer holidays you may need to refer to revision materials to remind yourself of the content.

Please RAG the topics that are covered in this booklet. It will give you and your teacher an indication of areas of weakness so that we can best support you.

	R	A	G
Brackets			
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## **Brackets**

**Expand and simplify:**

a)  $(x + 4)(x - 4)$

b)  $(x + 9)(x - 5)$

c)  $(2x + 5)(x + 2)$

d)  $(3x + 8)(2x - 4)$

e)  $(5x - 6)(3 - 5x)$

f)  $(2x - 5)(x + 7)$

g)  $4(3x - 5) - 2(4x - 1)$

h)  $3x(4 - 2x) + 5x(3x - 2)$

(i)  $(x + 3)^3$

j)  $(2x + 3)(x - 2)(x + 2)$

## **Factorising**

**Factorise:**

a)  $4x^2y - 10xy$

b)  $12xy + 4y$

c)  $3p^2q - 12pq$

d)  $x^2 - 25$

e)  $x^2 + 10x + 21$

f)  $x^2 + 3x - 28$

g)  $x^2 + x - 12$

h)  $x^2 + 7x - 18$

i)  $x^2 + 10x + 25$

j)  $2x^2 + 7x + 3$

k)  $3x^2 + 16x + 5$

l)  $4x^2 - 25$

m)  $2x^2 - 50y^2$

n)  $(x + 1)^2 + 4(x + 1)$

o)  $6x^2 - 23x - 4$

## Solving linear equations

Solve:

a)  $8x = 3x + 15$

b)  $10x + 1 = 7x + 10$

c)  $5(2x - 2) = 2(4x + 3)$

d)  $19x - 6 = 15x + 14$

e)  $10x + 1 = x - 17$

f)  $12x + 7 = 12 - 8x$

g)  $14 - 3(2x + 3) = 2$

h)  $8 - (x + 3) = 4$

i)  $8 - 4x = 0$

j)  $\frac{x}{2} + 5 = 11$

k)  $\frac{1}{3}(2x + 1) = 5$

l)  $\frac{x}{4} + 3 = 5 - \frac{x}{3}$

## Algebraic fractions MATHEMATICS

Simplify:

a)  $\frac{x+2}{3} + \frac{x+3}{2}$

b)  $\frac{2x+5}{4} - \frac{2x-3}{3}$

c)  $\frac{2}{3+2x} + \frac{3}{2x-3}$

d)  $\frac{2}{4y+3} - \frac{5}{3y-2}$

**Solve:**

a)  $\frac{x+1}{4} + \frac{x+2}{5} = 2$

b)  $\frac{x-2}{7} = 2 + \frac{3-x}{14}$

c)  $\frac{3}{2x-1} + \frac{3}{2x+1} = 2$

d)  $\frac{2}{x+3} + \frac{1}{x+1} = 1$

## Simultaneous equations

**Solve the simultaneous equations:**

a)  $3x + 5y = 11$   
 $2x + 4y = 8$

b)  $3x + 2y = 10$   
 $4x - 3y = 19$

c)  $3x - y = 7$   
 $x + 3y = 9$

d)  $3m + n = 11$   
 $7m - 3n = 31$

e)  $4x + y = 24$   
 $3x - 2y = 7$

f)  $4m - 3n = 0$   
 $2m - n = 2$

## Solving Quadratics

A. Use the quadratic formula to solve to 2 decimal places.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

a)  $3x^2 + 8x - 2 = 0$

b)  $2x^2 - 7x + 2 = 0$

c)  $5x^2 + 8x + 2 = 0$

d)  $4x^2 - 7x - 10 = 0$

B. By factorising, solve:

a)  $x^2 + 10x + 21 = 0$

b)  $2x^2 + 7x + 3 = 0$

c)  $x^2 + 7x + 12 = 0$

d)  $2x^2 + 11x + 5 = 0$

e)  $x^2 + 7x = 0$

f)  $9x^2 - 64 = 0$

g)  $6x^2 - 5x - 4 = 0$

h)  $8x^2 = 24x - 10$

## Changing the subject

Make  $x$  the subject of the following formula:

a)  $Tx - C = J$

b)  $Ax^2 + B = C$

c)  $\sqrt{gx - h} = K$

d)  $g + px = G^2$

e)  $3x - C^3 = T$

f)  $\frac{Fx}{G} + h = W$

g)  $a - Tx = Cx + g$

h)  $T - x = \frac{Hx}{P}$

i)  $p = \frac{2x+3}{5x-2}$

## Completing the square

Complete the square:

a)  $x^2 + 8x + 10$

b)  $x^2 - 4x + 9$

c)  $x^2 + 12x + 37$

d)  $x^2 - 5x + 11$

e)  $x^2 + 7x + 37$

f)  $x^2 - 5x - 1$

g) Sketch the graph of  $y = x^2 - 4x + 3$ . Label clearly any turning points on the graph.

## Harder simultaneous equations

Solve:

a)  $x^2 + y^2 = 5$   
 $y = x + 1$

b)  $3x - y = 7$   
 $7y^2 - 6xy + 8 = 0$

## Indices

Simplify:

a)  $m^5 \times m^4$

b)  $\frac{m^9}{m}$

c)  $(m^7)^3$

d)  $5m^7 \times 3m^5$

e)  $\frac{12m^5}{4m}$

f)  $(12m^3)^0$

g)  $3b^4c^2 \times 3bc$

h)  $(2m^3)^5$

i)  $(2m)^6 - 8(m^3)^2$

Evaluate:

a)  $16^{0.5}$

b)  $144^{1/2}$

c)  $2^{-3}$

d)  $27^{-1/3}$

e)  $(0.04)^{1/2}$

f)  $\left(\frac{27}{64}\right)^{-1/3}$



## **Surds**

**Simplify:**

a)  $\sqrt{125}$

b)  $\sqrt{63}$

c)  $\sqrt{500}$

d)  $\sqrt{162} + \sqrt{8} + \sqrt{50}$

e)  $\sqrt{98} - \sqrt{18}$

f)  $\sqrt{48} + \sqrt{27} - \sqrt{12}$

g)  $4\sqrt{6} - \sqrt{6}$

**Find:**

a)  $3\sqrt{5} \times \sqrt{5}$

b)  $\sqrt{3} \times \sqrt{3} \times \sqrt{3}$

c)  $7\sqrt{2} \times 3\sqrt{2}$

d)  $9\sqrt{7} \times 2\sqrt{7}$

**Expand and simplify:**

a)  $5\sqrt{3} (2 - \sqrt{3})$

b)  $3\sqrt{3} (5\sqrt{3} + 7)$

c)  $(2 + \sqrt{3})(2 + \sqrt{3})$

d)  $(5 - \sqrt{3})(2 + \sqrt{3})$

e)  $(3 - \sqrt{3})(5 - \sqrt{3})$

f)  $(7 - 3\sqrt{3})(5 + 2\sqrt{3})$



## Extension questions – not for the faint hearted!!

1. Expand and simplify  $(x + 3)^2 + (x - 4)^2$

2. Expand and simplify.

**a**  $\left(x + \frac{1}{x}\right)\left(x - \frac{2}{x}\right)$

**b**  $\left(x + \frac{1}{x}\right)^2$

3. Make  $x$  the subject of the following equations.

**a**  $\frac{p}{q}(sx + t) = x - 1$

**b**  $\frac{p}{q}(ax + 2y) = \frac{3p}{q^2}(x - y)$

4. Simplify  $\sqrt{x^2 + 10x + 25}$

5. Simplify  $\frac{(x+2)^2 + 3(x+2)^2}{x^2 - 4}$

6. Solve the simultaneous equations  $3x + 5y - 20 = 0$  and  $2(x + y) = \frac{3(y - x)}{4}$ .

7. Find the set of values of  $x$  for which  $2x + 1 > 11$  and  $4x - 2 > 16 - 2x$ .

8. Find the value of  $\left(\frac{1}{0.16}\right)^{1.5}$

9. Given that  $x(a + bx)(a - bx) \equiv 25x - 4x^3$ , find the value of  $b^{-a}$ .

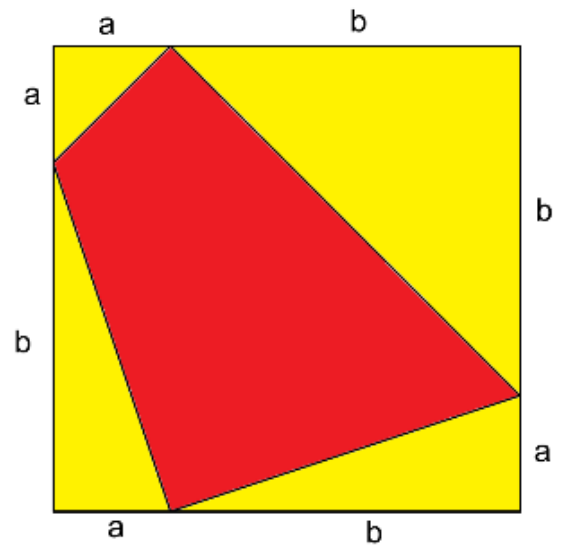
10. Solve  $\sqrt{(33 + \sqrt{x})} = 6$

11.  $x^{\frac{3}{2}} = 8$  where  $x > 0$  and  $y^{-2} = \frac{25}{4}$  where  $y > 0$  Work out the value of  $\frac{x}{y}$ .

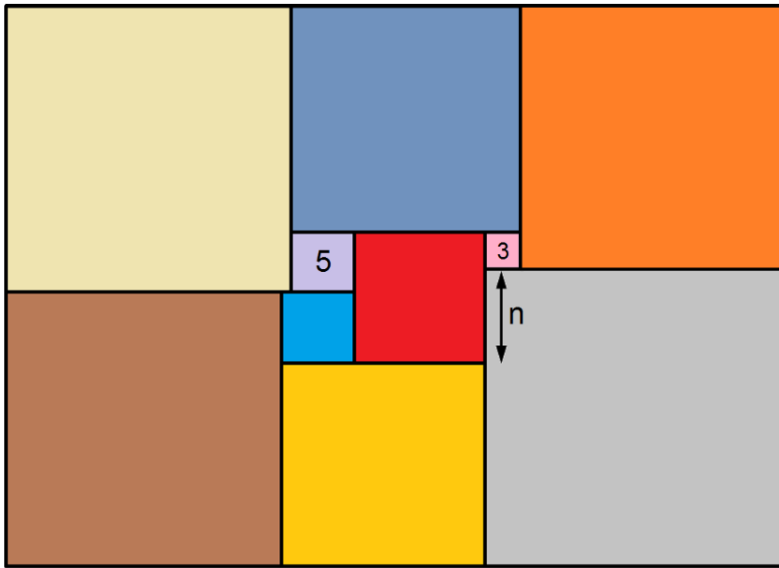
12.  $f(n) = n^2 + n$

Show that  $f(n + 1) - f(n) = 2n + 2$

Show that the quadrilateral is half the square



Write down as many expressions for area as you can.



How have you lost a square?

