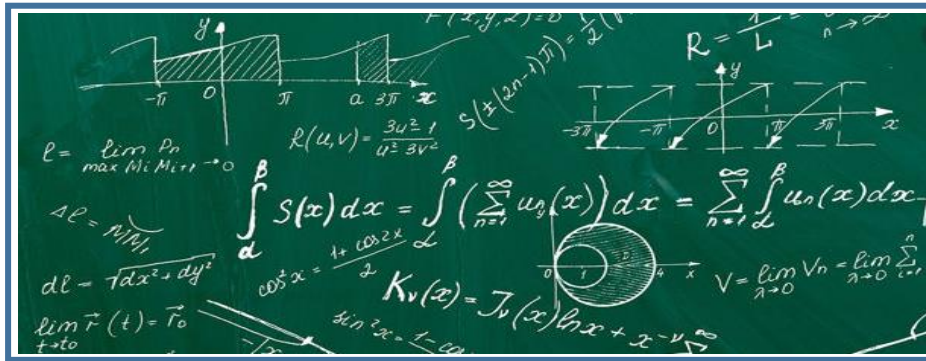


Mathematics A Level



Welcome to A Level Mathematics! By the time you start the lessons here it may be nearly three months since you studied Mathematics and you may be a little rusty. This bridging work contains a sample of questions on fundamental GCSE topics which are essential for a successful start to A Level Mathematics. It is essential that you spend time working through the questions over the summer as you will need to have a secure knowledge of these topics before you commence the course in September. You should have met all the topics before at GCSE. There is a booklet of examples for each topic and a booklet of practice questions that you need to ensure you understand and complete (they do increase in difficulty).

Enjoy the summer break and we look forward to meeting you after the holidays.

The Mathematics Department.

GETTING READY FOR A-LEVEL MATHEMATICS

Practice Questions

5 Bridging Topics to prepare you for A Level Mathematics:

1. Expanding brackets and simplifying expressions
2. Rules of indices
3. Factorising expressions
4. Completing the square
5. Solving quadratic equations

EXPANDING AND SIMPLIFYING EXPRESSIONS

Practice

1 Expand.

a $3(2x - 1)$

b $-2(5pq + 4q^2)$

c $-(3xy - 2y^2)$

2 Expand and simplify.

a $7(3x + 5) + 6(2x - 8)$

b $8(5p - 2) - 3(4p + 9)$

c $9(3s + 1) - 5(6s - 10)$

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

3 Expand.

a $3x(4x + 8)$

b $4k(5k^2 - 12)$

c $-2h(6h^2 + 11h - 5)$

d $-3s(4s^2 - 7s + 2)$

4 Expand and simplify.

a $3(y^2 - 8) - 4(y^2 - 5)$

b $2x(x + 5) + 3x(x - 7)$

c $4p(2p - 1) - 3p(5p - 2)$

d $3b(4b - 3) - b(6b - 9)$

5* Expand $\frac{1}{2}(2y - 8)$

6* Expand and simplify.

a $13 - 2(m + 7)$

b $5p(p^2 + 6p) - 9p(2p - 3)$

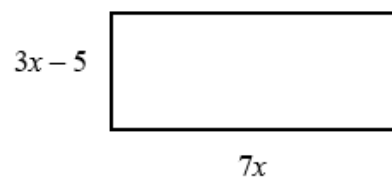
Watch out!

When multiplying (or dividing) positive and negative numbers, if the signs are the same the answer is '+'; if the signs are different the answer is '-'.

7* The diagram shows a rectangle.

Write down an expression, in terms of x , for the area of the rectangle.

Show that the area of the rectangle can be written as $21x^2 - 35x$



8* Expand and simplify.

a $(x + 4)(x + 5)$

b $(x + 7)(x + 3)$

c $(x + 7)(x - 2)$

d $(x + 5)(x - 5)$

e $(2x + 3)(x - 1)$

f $(3x - 2)(2x + 1)$

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

h $(3x - 2)(7 + 4x)$

i $(3x + 4y)(5y + 6x)$

j $(x + 5)^2$

k $(2x - 7)^2$

l $(4x - 3y)^2$

Extend

9* Expand and simplify $(x + 3)^2 + (x - 4)^2$

10* Expand and simplify.

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

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

RULES OF INDICES

Practice

1 Evaluate.

a 14^0

b 3^0

c 5^0

d x^0

2* Evaluate.

a $49^{\frac{1}{2}}$

b $64^{\frac{1}{3}}$

c $125^{\frac{1}{3}}$

d $16^{\frac{1}{4}}$

3* Evaluate.

a $25^{\frac{3}{2}}$

b $8^{\frac{5}{3}}$

c $49^{\frac{3}{2}}$

d $16^{\frac{3}{4}}$

4* Evaluate.

a 5^{-2}

b 4^{-3}

c 2^{-5}

d 6^{-2}

5* Simplify.

a $\frac{3x^2 \times x^3}{2x^2}$

b $\frac{10x^5}{2x^2 \times x}$

c $\frac{3x \times 2x^3}{2x^3}$

d $\frac{7x^3y^2}{14x^5y}$

e $\frac{y^2}{y^{\frac{1}{2}} \times y}$

f $\frac{c^{\frac{1}{2}}}{c^2 \times c^{\frac{3}{2}}}$

g $\frac{(2x^2)^3}{4x^0}$

h $\frac{x^{\frac{1}{2}} \times x^{\frac{3}{2}}}{x^{-2} \times x^3}$

Watch out!

Remember that any value raised to the power of zero is 1. This is the rule $a^0 = 1$.

6* Evaluate.

a $4^{-\frac{1}{2}}$

b $27^{-\frac{2}{3}}$

c $9^{-\frac{1}{2}} \times 2^3$

d $16^{\frac{1}{4}} \times 2^{-3}$

e $\left(\frac{9}{16}\right)^{-\frac{1}{2}}$

f $\left(\frac{27}{64}\right)^{-\frac{2}{3}}$

7* Write the following as a single power of x .

a $\frac{1}{x}$

b $\frac{1}{x^7}$

c $\sqrt[4]{x}$

d $\sqrt[5]{x^2}$

e $\frac{1}{\sqrt[3]{x}}$

f $\frac{1}{\sqrt[3]{x^2}}$

8* Write the following without negative or fractional powers.

a x^{-3}

b x^0

c $x^{\frac{1}{5}}$

d $x^{\frac{2}{5}}$

e $x^{-\frac{1}{2}}$

f $x^{-\frac{3}{4}}$

9* Write the following in the form ax^n .

a $5\sqrt{x}$

b $\frac{2}{x^3}$

c $\frac{1}{3x^4}$

d $\frac{2}{\sqrt{x}}$

e $\frac{4}{\sqrt[3]{x}}$

f 3

Extend

10* Write as sums of powers of x .

a $\frac{x^5 + 1}{x^2}$

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

c $x^{-4} \left(x^2 + \frac{1}{x^3} \right)$

FACTORISING EXPRESSIONS

Practice

1* Factorise.

a $6x^4y^3 - 10x^3y^4$

b $21a^3b^5 + 35a^5b^2$

c $25x^2y^2 - 10x^3y^2 + 15x^2y^3$

Hint

Take the highest common factor outside the bracket.

2* Factorise

a $x^2 + 7x + 12$

b $x^2 + 5x - 14$

c $x^2 - 11x + 30$

d $x^2 - 5x - 24$

e $x^2 - 7x - 18$

f $x^2 + x - 20$

g $x^2 - 3x - 40$

h $x^2 + 3x - 28$

3* Factorise

a $36x^2 - 49y^2$

b $4x^2 - 81y^2$

c $18a^2 - 200b^2c^2$

4* Factorise

a $2x^2 + x - 3$

b $6x^2 + 17x + 5$

c $2x^2 + 7x + 3$

d $9x^2 - 15x + 4$

e $10x^2 + 21x + 9$

f $12x^2 - 38x + 20$

5* Simplify the algebraic fractions.

$$\mathbf{a} \quad \frac{2x^2 + 4x}{x^2 - x}$$

$$\mathbf{b} \quad \frac{x^2 + 3x}{x^2 + 2x - 3}$$

$$\mathbf{c} \quad \frac{x^2 - 2x - 8}{x^2 - 4x}$$

$$\mathbf{d} \quad \frac{x^2 - 5x}{x^2 - 25}$$

$$\mathbf{e} \quad \frac{x^2 - x - 12}{x^2 - 4x}$$

$$\mathbf{f} \quad \frac{2x^2 + 14x}{2x^2 + 4x - 70}$$

6* Simplify

$$\mathbf{a} \quad \frac{9x^2 - 16}{3x^2 + 17x - 28}$$

$$\mathbf{b} \quad \frac{2x^2 - 7x - 15}{3x^2 - 17x + 10}$$

$$\mathbf{c} \quad \frac{4 - 25x^2}{10x^2 - 11x - 6}$$

$$\mathbf{d} \quad \frac{6x^2 - x - 1}{2x^2 + 7x - 4}$$

Extend

7* Simplify $\sqrt{x^2 + 10x + 25}$

8* Simplify $\frac{(x+2)^2 + 3(x+2)^2}{x^2 - 4}$

COMPLETING THE SQUARE

Practice

1* Write the following quadratic expressions in the form $(x + p)^2 + q$

$$\mathbf{a} \quad x^2 + 4x + 3$$

$$\mathbf{b} \quad x^2 - 10x - 3$$

$$\mathbf{c} \quad x^2 - 8x$$

$$\mathbf{d} \quad x^2 + 6x$$

$$\mathbf{e} \quad x^2 - 2x + 7$$

$$\mathbf{f} \quad x^2 + 3x - 2$$

2* Write the following quadratic expressions in the form $p(x + q)^2 + r$

$$\mathbf{a} \quad 2x^2 - 8x - 16$$

$$\mathbf{b} \quad 4x^2 - 8x - 16$$

$$\mathbf{c} \quad 3x^2 + 12x - 9$$

$$\mathbf{d} \quad 2x^2 + 6x - 8$$

3* Complete the square.

$$\mathbf{a} \quad 2x^2 + 3x + 6$$

$$\mathbf{b} \quad 3x^2 - 2x$$

$$\mathbf{c} \quad 5x^2 + 3x$$

$$\mathbf{d} \quad 3x^2 + 5x + 3$$

Extend

4* Write $(25x^2 + 30x + 12)$ in the form $(ax + b)^2 + c$.

SOLVING QUADRATIC EQUATIONS BY FACTORISATION

Practice

1* Solve

a $6x^2 + 4x = 0$

b $28x^2 - 21x = 0$

c $x^2 + 7x + 10 = 0$

d $x^2 - 5x + 6 = 0$

e $x^2 - 3x - 4 = 0$

f $x^2 + 3x - 10 = 0$

g $x^2 - 10x + 24 = 0$

h $x^2 - 36 = 0$

i $x^2 + 3x - 28 = 0$

j $x^2 - 6x + 9 = 0$

k $2x^2 - 7x - 4 = 0$

l $3x^2 - 13x - 10 = 0$

2* Solve

a $x^2 - 3x = 10$

b $x^2 - 3 = 2x$

c $x^2 + 5x = 24$

d $x^2 - 42 = x$

e $x(x + 2) = 2x + 25$

f $x^2 - 30 = 3x - 2$

g $x(3x + 1) = x^2 + 15$

h $3x(x - 1) = 2(x + 1)$

Hint

Get all terms
onto one side
of the
equation.

SOLVING QUADRATIC EQUATIONS BY COMPLETING THE SQUARE

Practice

3* Solve by completing the square.

a $x^2 - 4x - 3 = 0$

b $x^2 - 10x + 4 = 0$

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

d $x^2 - 2x - 6 = 0$

e $2x^2 + 8x - 5 = 0$

f $5x^2 + 3x - 4 = 0$

4* Solve by completing the square.

a $(x - 4)(x + 2) = 5$

b $2x^2 + 6x - 7 = 0$

c $x^2 - 5x + 3 = 0$

Hint

Get all terms
onto one side
of the
equation.

SOLVING QUADRATIC EQUATIONS BY USING THE FORMULA

Practice

5* Solve, giving your solutions in surd form.

a $3x^2 + 6x + 2 = 0$

b $2x^2 - 4x - 7 = 0$

6* Solve the equation $x^2 - 7x + 2 = 0$

Give your solutions in the form $\frac{a \pm \sqrt{b}}{c}$, where a , b and c are integers.

7* Solve $10x^2 + 3x + 3 = 5$

Give your solution in surd form.

Hint

Get all terms onto one side of the equation.

Extend

8* Choose an appropriate method to solve each quadratic equation, giving your answer in surd form when necessary.

a $4x(x - 1) = 3x - 2$

b $10 = (x + 1)^2$

c $x(3x - 1) = 10$