St Bede's Catholic College

Year 11 into 12 Transition Work

Mathematics

Year 12 Summer Work 2024-2025

Exam board: Edexcel

Course length: Two years

Link to specification:
https://qualifications.pearson.com/en/qualifications/edexcel-a-levels/mathematics-2017.html

Exam structure:

3 Exams at the end of 2 years:

Paper 1: Pure Mathematics 33% 2 hours 100 marks
Paper 2: Pure Mathematics 33% 2 hours 100 marks
Paper 3: Mechanics and Statistics 33% 2 hours 100 marks

A level mathematics uses many of the skills you developed at GCSE. The big difference is that you will be expected to recognise where you use these skills and apply them quickly and efficiently.

Your success at A level Pure Mathematics will depend on how willing you are to maintain and perfect these skills.

Please find a list of topics below that are important for you to understand fully before embarking on the A-Level Course. If you are unsure on any topic please watch the videos on the links attached before attempting the questions.

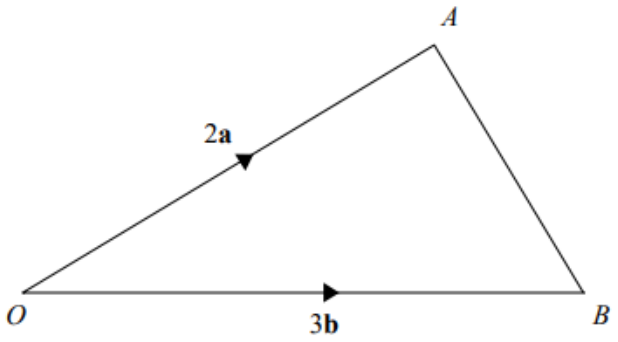
Please **complete** the questions by **printing and writing** on this booklet or on **lined paper** and your answers to these questions will be handed in during the second week back in September. During the third week you will be given a short test on these topics to check your understanding.

It is important that you aim for **no less than 75%** on this test.

Vectors, Simultaneous Equations, Functions, Surds, Index Laws, Types of Graphs, Straight Line Graphs Regions, Solving Quadratics and Rearranging Equations.

A) Vectors - https://www.mathsgenie.co.uk/vectors.html

Q1



$\overrightarrow{OA} = 2\mathrm{a}$

$\overrightarrow{OB} = 3\mathrm{b}$

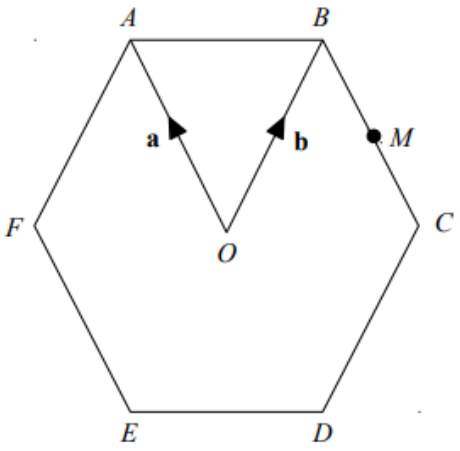
P is the point on AB such that AP:PB = 3:2

$\overrightarrow{OP} = k(4\boldsymbol{a} + 9\boldsymbol{b})$

Find the value of k

Q2

ABCDEF is a regular hexagon with centre *O*.



$\overrightarrow{OA} = a$

$\overrightarrow{OB} = b$

M is the midpoint of *BC*.
X is the point on *AB* extended, such that *AB*:*BX* = 3:2

Prove that *E*, *M* and *X* are on the same straight line.

B) Simultaneous Equations https://www.mathsgenie.co.uk/simultaneous.html and https://www.mathsgenie.co.uk/simultaneous-quadratic.html

Q1 Solve each of the following pairs of simultaneous equations

a)

$$2x + 3y = 10$$
$$5x + 2y = 3$$

b)

$$8x + 4y = 5$$
$$6x - 8y = 1$$

Q2 Solve each of the following pairs of simultaneous equations

a)

$$y = x^2 - x - 6$$
$$y = x + 2$$

b)

$y = 2x + 3$

$y(5 - x) = 20$

C) Functions - https://www.mathsgenie.co.uk/functions.html

Q1

Given that $f(x) = x^2 - 3$ find:

a) $f(10)$

b) $f(-1)$

c) $Find: f^{-1}(x)$

Q2

Given that $f(x)=2x-4$ and $g(x)=3x+5$

a) Find: $gf(3)$

.....

b) Work out an expression for: $f^{-1}(x)$

.....

c) Solve: $f(x)=g(x)$

Q3

Given that $f(x) = 3x + 1$ and $g(x) = x^2$

(a) Find $fg(x)$

(b) Work out an expression for $gf(x)$

D) Surds- https://www.mathsgenie.co.uk/surds.html

Q1 Write the following in the form $a\sqrt{b}$

a) $\sqrt{44}$

b) $\sqrt{320}$

c) $\sqrt{75}$

d) $\sqrt{304}$

e) $\sqrt{\frac{32}{25}}$

f) $\sqrt{\frac{27}{16}}$

g) $\sqrt{\frac{50}{9}}$

e) $\sqrt{\frac{496}{304}}$

Q2 Write each of the following as a single surd in its simplest form

a) $4\sqrt{7}-3\sqrt{7}+6\sqrt{7}$

b) $4\sqrt{2}-\sqrt{50}+\sqrt{98}$

c) $\sqrt{3}\left(7+2\sqrt{3}\right)$

d) $\left(\sqrt{7}-\sqrt{3}\right)\left(\sqrt{7}+\sqrt{3}\right)$

E) Index Laws - https://www.mathsgenie.co.uk/indices2.html

Q1 Evaluate (i.e. work out)

a) 2^{-3}

b) $25^{\frac{1}{2}}$

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

d) $\left(\frac{64}{27}\right)^{-\frac{4}{3}}$

e) $\left(6\frac{1}{4}\right)^{\frac{1}{2}}$

Q2 Simplify the following expressions

a) $7^3 \times 7^4$

b) $\dfrac{3^4 \times 3^6}{3^5}$

c) $\left(4^3\right)^8$

d) $\dfrac{2^5 \times 2^9}{\left(2^3\right)^5}$

e) $4x^3 \times 2x^5$

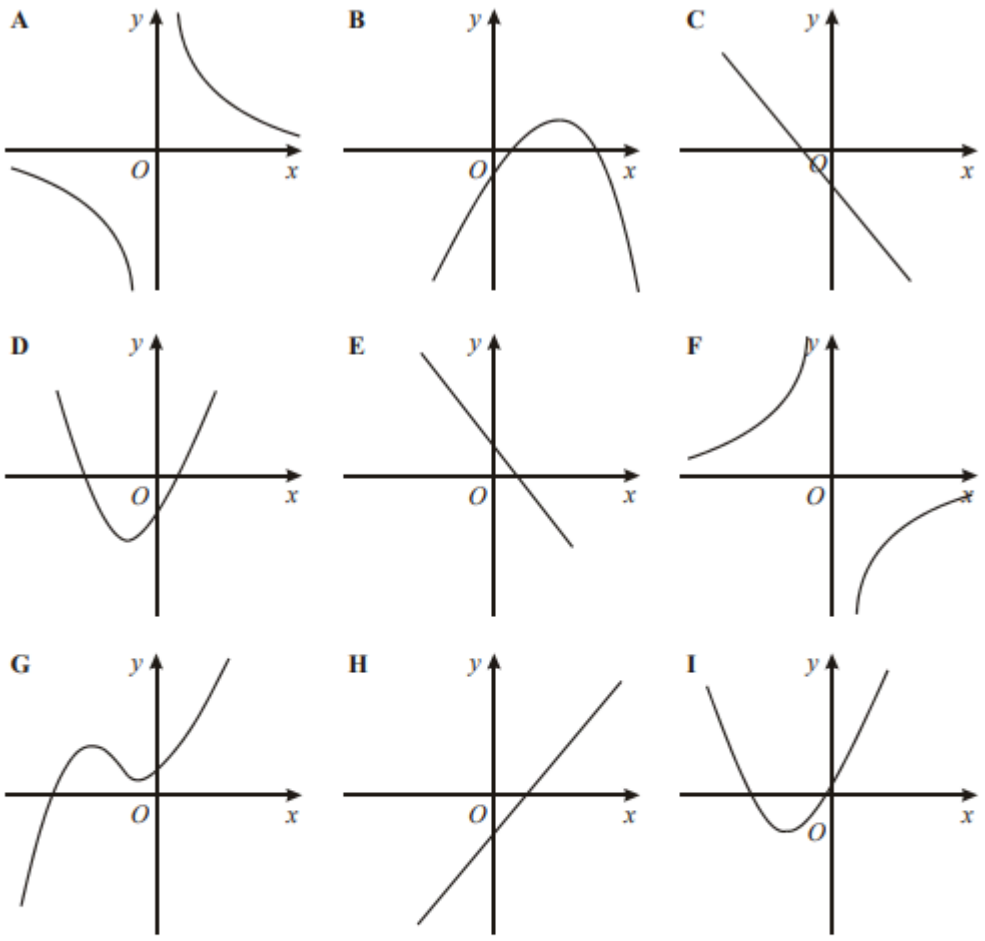
f) $(3a)^3$

g) $\left(-2p^2q^3\right)^4$

h)

$$\frac{2x^2y^3z \times 6x^4yz^3}{\left(9xy^4z^2\right)^2}$$

F) Types of Graphs - https://www.mathsgenie.co.uk/cubic-reciprocal.html



1. Write down the letter of the graph which could have the equation

$(i)\ y=3x-2$ ..... (1)

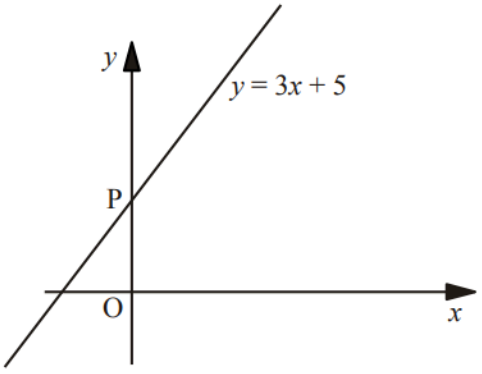
$(ii)\ y=2x^2+5x-3$ ..... (1)

$(iii)\ y=\frac{3}{x}$ ..... (1)

G) Straight Line Graphs https://www.mathsgenie.co.uk/equation-of-a-line.html

Q1

.



(a) The line $y=3x+5$ crosses the y axis at P.
What is the value of y at P?

..... (1)

(b) Write down the equation of another line which is parallel to $y=3x+5$

..... (1)

(c) Work out the equation of a line that is perpendicular to the line and goes through the point (1, 3).

H) Regions - https://www.mathsgenie.co.uk/inequalities-on-graphs.html

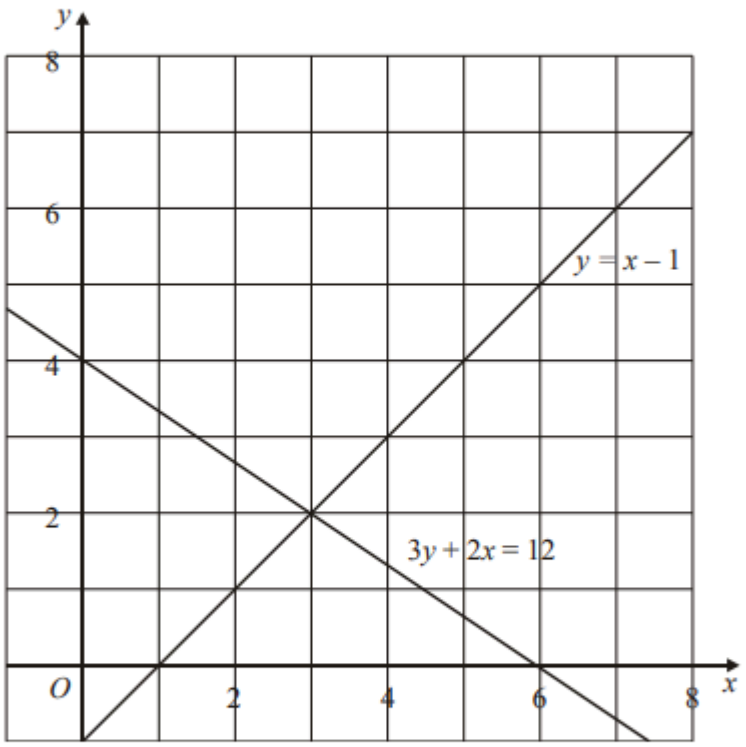
Q1

The graphs of the straight lines with equations

$3y + 2x = 12$ and

$y = x - 1$

have been drawn on the grid.



$3y + 2x > 12$ **$y < x - 1$** **$x < 6$**

x and y are integers.

On the grid, mark with a cross (×), each of the **four** points which satisfies **all** 3 inequalities.

I) **Solving Quadratics = https://www.mathsgenie.co.uk/solving-quadratics.html**

Q1 Solve the following equations without using a calculator. Show your workings.

a) $x^2 + 15x + 54 = 0$

b) $3x^2 - x - 14 = 0$

c) $9x^2 + 12x + 4 = 0$

f)

$$x + 1 = \frac{6}{x}$$

J) Completing the square.

Solve the following equations using completing the square. Give your answer in surd form
https://www.mathsgenie.co.uk/completing-the-square.html

a) $x^2 + 12x + 20 = 0$

b) $3x^2 - 7x = 1$

J) Rearranging Equations

Q1 Solve the following equations using completing the square. Give your answer in surd form
https://www.mathsgenie.co.uk/changing-the-subject2.html

a) Make u the subject $v^2 = u^2 + 2as$

b) Make t the subject $s = ut + \frac{1}{2}at^2$

c) Make x the subject $mx + 10 = nx + 20$