Portland Place School

Sixth Form A Level Mathematics Transition Booklet

Name:

Welcome to Mathematics at Portland Place

This Transition work is designed to help you to bridge the gap between your GCSE studies and AS/A Level.

Why do Transition work?

Preparation is crucial for studying A levels. A levels require you to be an independent learner. Although you have fewer subjects, A levels require different study skills and the volume of work is greater due to the increased demand of depth and detail. The exercises in this booklet will ensure that you are ready for the exciting challenges of becoming an A level student in September. It may be necessary to complete some of the tasks on separate sheets of paper. You have the choice of either typing or handwriting your responses. Each subject will be slightly different, but they will all require you to use the skills you will need for A level: independent enquiry; evidence of reading around the subject and enthusiasm and interest.

Is Transition work assessed?

Yes. In September, your subject teacher will ask you for your Transition work and it will be assessed. Teachers will be able to diagnose your strengths and weaknesses and begin to support and challenge you in a more targeted way.

You must bring all the work with you to your first Year 12 Mathematics lesson in September.

Information about the courses and exams

Exam board:	Edexcel
Examinations:	For AS Level, you sit two examinations at the end of year 1 (Year 12):
	1 x Pure (2 hours), 1 x Statistics/Mechanics (1 hour 15 min)
	For A Level, you sit all three papers at the end of year 2 (Year 13):
	2 x Pure (2 hours), 1 x Statistics/Mechanics (2 hours)
Lessons:	5 lessons a week in total; 3 lessons Pure and 2 lessons
	Statistics/Mechanics

Contents overview year 1

Pure

Topic 1 - Proof
Topic 2 - Algebra and functions
Topic 3 - Coordinate geometry in the (x,y) plane
Topic 4 - Sequences and series
Topic 5 - Trigonometry
Topic 6 - Exponential and logarithms
Topic 7 - Differentiation
Topic 8 - Integration
Topic 9 - Vectors

Statistics/Mechanics

Section A: Statistics
Topic 1 - Statistical sampling
Topic 2 - Data representation/ interpretation
Topic 3 - Probability
Topic 4 - Statistical distributions
Topic 5 - Statistical hypothesis testing

Section B - Mechanics
Topic 6 - Quantities and units in mechanics
Topic 7 - Kinematics
Topic 8 - Forces and Newton's laws

Preparation ahead of September

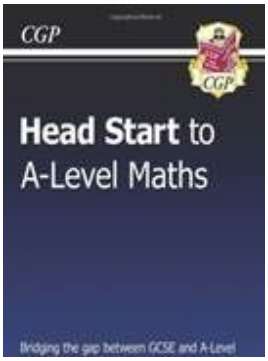
The amount of time required for the Transition work included in this booklet is not long (3-4 hrs). **We recommend significantly more time to be spent during the summer to ensure you come properly prepared.** Naturally, the harder you found the GCSE syllabus, the more time you are likely to need to put in. It is crucial you have a sound understanding and fluency on the following as you will regularly be using these skills:

Pure	**Statistics/Mechanics**
Factorising/solving quadratics	Venn diagrams/set notation
Difference of two squares	Cumulative Frequency/Box plots
Laws of indices	Interquartile range vs range
Fractional and negative indices	Averages from frequency tables
Surds	Probability
Inequalities	Sample space and tree diagrams
Graphs and transformation of graphs	Histograms
Trigonometry	Interpreting data
Simultaneous equations (elimination/substitution)	Commenting on results and trends
Changing subject of formula	
Algebraic fractions	
Calculations with decimals/negatives/fractions	
Gradients and equations of straight lines	
Circle theorems	

Within the first few weeks in September, you will be assessed on the topics above. Any students showing lack of fluency with above will be asked to do extra work to catch up, as not knowing this will significantly impede your work and progress.

You might find your GCSE textbook to be sufficient to go over above, alternatively look ahead using the A level textbooks (see next page). You may also find the following resource helpful:

Head start to AS Mathematics (new 2017, by CGP)



Useful websites

Throughout the course, the following websites are regularly used. You may find them useful as you prepare over the summer.

www.examsolutions.net

www.physicsandmathstutor.com

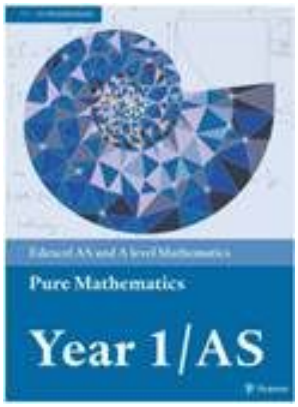
www.mathsgenie.co.uk

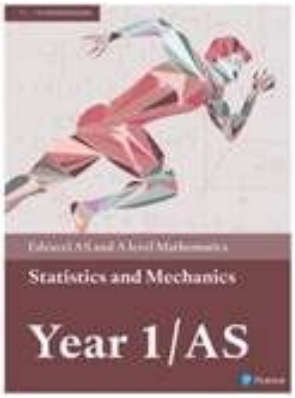
www.mymaths.co.uk

www.mathspapers.com

What you need to get before starting in September

- Textbooks: (year 1)
  -Edexcel AS and A level Mathematics Pure Mathematics Year 1/AS
  ISBN: 9781292183398 (Pearson)
  -Edexcel AS and A level Mathematics Statistics & Mechanics Year 1/AS
  ISBN: 9781292183282 (Pearson)





- Advanced scientific calculator - Casio FX-991EX Classwiz (recommended) or Texas TI-30X pro are *minimum standard requirement for new A level*

Please note: Ofqual's subject-level conditions and requirements for Mathematics and Further Mathematics state that calculators used must include the following features:

- an iterative function
- the ability to compute summary statistics and access probabilities from standard statistical distributions
- the ability to perform calculations with matrices up to at least order 3 x 3 (FM only)

Transition work

To be completed and handed in during your first lesson in September.

Task 1

What are the different ways to solve quadratic equations? Clarify each of the method; why they are useful and when. Example(s) of each method should be used.

Use the space you need on separate pieces of paper to hand in.

Task 2

On the next page, you will find some instructions. These will make a design using eight straight lines. You are to try and complete this design and clarify how many (and which) of the instructions are needed to complete this.

Again, use the space you need on separate pieces of paper to hand in for this task.

Task 3

Complete the questions that focuses on problem solving from GCSE. Your teacher will look at your written communication and how clear and systematic your methods are, along with the skill and knowledge you are showing.

The design has two lines of reflection symmetry	The design uses eight straight lines	The line $y = -\frac{11}{2}$ is a line of reflection symmetry	Two lines pass through the point (0,5)
The y axis is a line of reflection symmetry	One of the lines passes through the points (-8,-10) and (3,1)	Two perpendicular lines cross at (0,-2)	Four lines intersect at $\left(\frac{7}{2}, -\frac{11}{2}\right)$
Two lines pass through the point (0,-16)	Four of the lines form a square	Four of the lines form a rhombus	One of the lines has a gradient that is three times the gradient of another line
The design has rotation symmetry about the point $\left(0, -\frac{11}{2}\right)$	Two of the lines intersect at (-7,5)	Two of the lines intersect at (-7,-16)	The length of each side of the square in the design is $\frac{7}{\sqrt{2}}$ units

Problem solving - Task 3

1 Fernando chooses three different whole numbers between 1 and 40.

The first number is a square number.

The second number is 4 multiplied by the first number.

The third number is a prime number and is less than the first number.

The sum of the numbers is 50.

Find the three numbers.

(3 marks)

2 Given that

$S = 2^3 \times 3^2 \times 7^3$ and $T = 2^4 \times 3^3 \times 7^2$

write down, as a product of its prime factors:

a S^2

(1 mark)

b the highest common factor (HCF) of S and T

(1 mark)

c the lowest common multiple (LCM) of *S* and *T*.

(1 mark)

3 Here are some properties of a number:

- It is a common factor of 264 and 504.
- It is a common multiple of 4 and 6.
- It is between 20 and 100.

What is the number?

(4 marks)

4 **a** Write $2(3x + 5) + 4(2x – 1) + 4$ in the form $a(bx + c)$ where a, b and c are integers and $a > 1$.

(3 marks)

b Is $2(3x + 5) + 4(2x – 1) + 4$ divisible by an even number? Explain your answer.

(2 marks)

5 Adam, Craig and Gary play hockey.

Adam has scored twice as many goals as Craig.

Gary scores 7 more goals than Craig.

Altogether they score 51 goals.

How many more goals did Adam score than Gary?

(5 marks)

6 The nth term of an arithmetic progression is $4n - 3$ where n is a positive integer.

a Determine whether 84 is a term in the arithmetic progression.

(2 marks)

b Find an expression for the sum of the nth term and the $(n + 1)$th term of this sequence.

Give your answer in its simplest form.

(2 marks)

c The sum of two consecutive numbers in the sequence is 70.

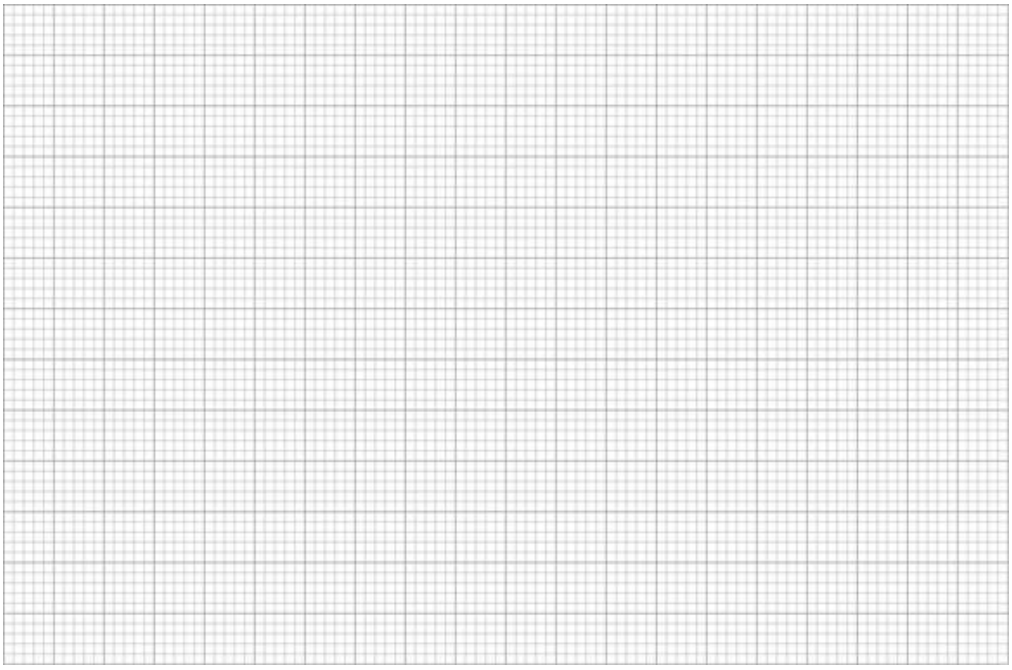
Find the largest of these two terms.

(2 marks)

7 The table shows the population of England (in millions) from 2002 to 2014.

2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
49.6	49.9	50.1	50.5	50.8	51.1	51.5	51.8	52.2	52.7	53.1	53.6	54.0

a Use this information to draw a graph and predict the population in England in 2020.



(4 marks)

b Make two comments explaining why your prediction in part **a** might not be reliable.

(1 mark)

8 Jaden wants to invest his savings.

Here are the interest rates offered by two banks:

Bank A	Bank B
Interest: 6% for the first year. 5.5% for the second year. 3% for the third, fourth and fifth year. All interest earned is reinvested. Withdrawals allowed at any time.	Interest: 4.5% per year compound interest. No withdrawals until the end of 5 years.

Jaden has £20 000 he wants to invest.

a Calculate how much would be in each account after 5 years.

Show your working.

(4 marks)

b Suggest, with a reason, which account Jaden would be likely to choose.

(2 marks)

9 For every £18 Claire earns she spends £12 on living expenses.

$\frac{3}{5}$ of her living expenses are used for rent. The remainder of her living expenses is spent on household bills. What percentage of what Claire earns is spent on household bills?

(3 marks)

10 Javid makes a large container of fruit juice by mixing orange juice and mango juice in the ratio 3 : 7. Orange juice costs £6 per 4 litres. Mango juice costs £5 per 10 litres. Javid sells his fruit juice in 2-litre bottles for £2 per bottle. Calculate how much profit he makes for each bottle he sells.

(5 marks)

11 Mark and Nathan shared some money in the ratio 6 : 20

Nathan gave 40% of his money to Mark.

Write the ratio of Mark's money to Nathan's money in its simplest form.

(4 marks)

12 A plane leaves the airport and travels east for 2.5 hours at a speed of 240 miles per hour.

It then travels south for 500 miles.

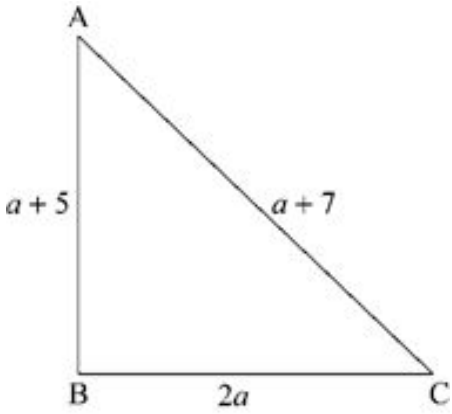
a Calculate the distance of the plane from the airport.

(2 marks)

b Calculate the bearing of the plane from the airport.

(2 marks)

13 Here is a right-angled triangle ABC.



AB is (a + 5) cm

BC is (2a) cm

AC is (a + 7) cm

Calculate the value of the perimeter of the triangle. Give your answer as a whole number in cm.

..... cm

(5 marks)

14 A kite is 30 m from the ground. A cyclist observes it flying when he looks up at an angle of 20°.

After 15 seconds, the cyclist has to look up at an angle of 60° to see the kite.

Calculate the speed of the cyclist. Give your answer in km/h.

..... km/h

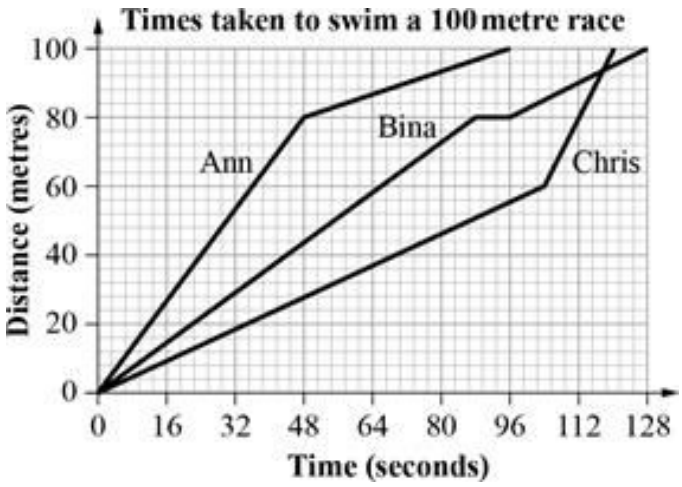
(6 marks)

15 Write an expression for the gradient of the line **perpendicular to** the line segment joining

$(3p, 6)$ to $(-2p, 10)$.

(2 marks)

16 Ann, Bina and Chris swim a 100 metre race. The distance-time graph shows the race.



a Who won the race? Give a reason for your answer.

(1 mark)

b One of the swimmers got cramp part way through the race and had to pause.

Which swimmer was this? Give a reason for your answer.

(1 mark)

c Describe the race.

(4 marks)

[Total marks: 72]