A Level Maths

Summer Bridging Work

Contents

Information for Prospective A Level Maths Students

If you intend to take A Level Maths, please complete **and mark** the Bridging to A Level Maths practice paper over the summer. There is also a series of Corbett Maths worksheets and supporting videos that would be useful to complete, found in the Further preparation work file. If you intend to take Double Maths you must complete these worksheets.

All students with a 7 at GCSE or without a GCSE / iGCSE qualification in Mathematics (e.g. many international students) will be tested on the mathematical content below at the start of Year 12 to confirm suitability for A-level Maths. Please complete sufficient preparation, including the practice paper. You will be allowed a scientific calculator and dictionary for the test.

Please note that the topics below are those that all prospective students should be confident with.

<u>Pre-requisite knowledge & revision list</u>

NUMBER
- Percentages skills, including compound interest & depreciation,   e.g. I have £2,000 invested in a bank for 5 years at 3% per year. What interest do I earn in total ?
- Standard Form calculations, e.g. write in standard form $(2.3 \times 10^{-3}) + (8 \times 10^{-4})$
- Proportionality, e.g. working with expressions such as y=$\mathbf{k}x^3$ and y = $\mathbf{k}$/x
- The nth term of an arithmetic series and formula for the sum of an arithmetic series

ALGEBRA
- Simplifying expressions including those with indices, e.g. simplify $(2y^4m^{-3})^3$
- Factorising expressions (putting into brackets), e.g. $6k^2 + 8k = 2k(3k +4)$
- Manipulating surds including "rationalising" a denominator
- Solving linear equations
- Solving quadratic equations by factorising and using the quadratic formula
- Completing the square, e.g. write $6x -x^2$ in the form $a - (x + b)^2$ where a and b are numbers, and its use to find max / min values on a quadratic curve
- Re-arranging equations, including with a repeated factor, e.g. make x the subject of $3x- 5 = d + ax$
- Solving simultaneous equations, including a pair of linear equations and also a linear & a quadratic equation
- Simplifying algebraic fractions and solving equations involving algebraic fractions
- Solving linear and quadratic inequalities
- Functions e.g. f(x) = 2x +1, g(x) = x + 7 including inverse and composite functions, e.g. gf(3)

GEOMETRY
- Trigonometry including the Sine and Cosines rules and application in 3 dimension (3D) problems
- Area of any triangle (please refer to formula sheet)
- Pythagoras' theorem including line length and application in 3D problems
- Volume and surface area of prisms, pyramids & spheres (please refer to formula sheet)
- Equation of a straight line, and gradients & equations of parallel and perpendicular lines
- Area and perimeter of circles and sectors of a circle

STATISTICS & PROBABILITY
- Calculating simple averages from a list of numbers and estimating a mean from a grouped frequency table
- Calculating simple theoretical probabilities for individual events & using tree diagrams to calculate probabilities for combined events, involving multiplication & addition rules

<u>Useful resources</u>

"Headstart to A-Level Maths" published by CGP ISBN 978 1 78294 792 9   www.cgpbooks.co.uk
Corbett Maths GCSE worksheets, available on-line www.corbettmaths.com
Maths genie worksheets, available on-line www.mathsgenie.co.uk

Useful preparation for A Level Maths - selected video tutorials and exercises from Corbett Maths

The following resources are taken from the AQA Level 2 Further Maths section on the Corbett Maths website.   https://corbettmaths.com/more/further-maths/

You need to select the "More" tab first of all.

They would really enable you to get a head start to A Level Maths.

If you have taken IGCE or GCSE Maths , you may have met some of these topics before. I particularly recommend the topics in red for these students.

Number

Surds (rationalising denominators)   Video   Practice Questions   Answer

Algebra

Function Notation   Video   Practice Questions   Answers

Composite Functions   Video   Practice Questions   Answers

Inverse Functions   Video   Practice Questions   Answers

Domains and Ranges   Video   Practice Questions   Answers

Expanding Brackets (Pascal's triangle)   Video   Practice Questions   Answers

Factorising Quadratics   Video   Practice Questions   Answers

Algebraic Fractions (add/subtract)   Video   Practice Questions   Answers

Algebraic Fractions (multiply)   Video   Practice Questions   Answers

Algebraic Fractions (divide)   Video   Practice Questions   Answers

Algebraic Fractions (equations)   Video   Practice Questions   Answers

Changing the Subject   Video   Practice Questions   Answers

Factor Theorem   Video   Practice Questions   Answers

Algebraic Long Division   Video   Practice Questions   Answers

Factorising Cubics   Video   Practice Questions   Answers

Solving Cubics   Video   Practice Questions   Answers

Completing the Square (x²)   Video   Practice Questions   Answers

Completing the Square (ax²)   Video   Practice Questions   Answers

Exponential Graphs   Video   Practice Questions   Answers

Sketching Quadratics   Video   Practice Questions   Answers

Solving Quadratics (Completing the Square) Video Practice Questions Answers

Simultaneous Equations (non-linear)   Video   Practice Questions   Answers

Quadratic Inequalities   Video   Practice Questions   Answers

Fractional Indices   Video   Practice Questions   Answers

Negative Indices   Video   Practice Questions   Answers

Equations with indices/roots   Video   Practice Questions   Answers

Algebraic Proof   Video   Practice Questions   Answers

Linear Sequences   Video   Practice Questions   Answers

Geometry

Trig Identities   Video   Practice Questions   Answers

Trig Graphs   Video   Practice Questions   Answers

Solving Trigonometric Equations: Introduction   Video

Solving Trigonometric Equations 1   Video   Practice Questions   Answers

Solving Trigonometric Equations 2   Video   Practice Questions   Answers

Calculus

Introduction   Video   Practice Questions   Answers

Differentiation   Video   Practice Questions   Answers

Differentiation after Rearranging   Video   Practice Questions   Answers

Gradient of a Curve   Video   Practice Questions   Answers

Equation of a Tangent   Video   Practice Questions   Answers

Equation of a Normal   Video   Practice Questions   Answers

Increasing/Decreasing Function   Video   Practice Questions   Answers

d2y/dx2   Video   Practice Questions   Answers

Stationary Points   Video   Practice Questions   Answers

Application of Differentiation   Video   Practice Questions   Answers

Sketch curve knowing maxima/minima   Video   Practice Questions   Answers

Coordinates Geometry

Gradient   Video   Practice Questions   Answers

Parallel Lines   Video   Practice Questions   Answers

Equation of a Line   Video   Practice Questions   Answers

Equation of a Circle (centre is the origin)   Video   Practice Questions   Answers

Equation of a Circle (centre **not** the origin)   Video   Practice Questions   Answers

Perpendicular Lines   Video   Practice Questions   Answers

Equation of a Tangent to a Circle   Video   Practice Questions   Answers

Practice paper for prospective 'A' Level Mathematics Students

(90 mins)

Name……………………………..

This paper prepares you for starting the A level Maths course in September. Please complete it & then mark it using the worked solutions provided.

You may use:

- a scientific calculator
- a translation dictionary

Some Vocabulary Hints:

Factorise means **put back into brackets**,
e.g. factorise $4x - 6$ answer : $2(2x + 3)$

Solve means to **work out the value** of a variable, e.g. x or y, as a number (including as a fraction or decimal)
e.g. solve $2x + 1 = 6$ answer: $x = 2.5$

"Round to one decimal place" means allowing one number only to the right of the decimal point

e.g. 1.345 rounded to 1 decimal place is 1.3

e.g. 12.468 rounded to one decimal place is 12.5

International GCSE Mathematics
Formulae sheet – Higher Tier
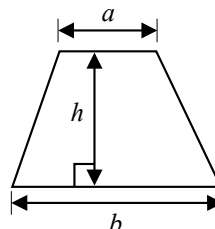
Arithmetic series

Sum to n terms, $S_n = \dfrac{n}{2}\ [2a + (n-1)d]$
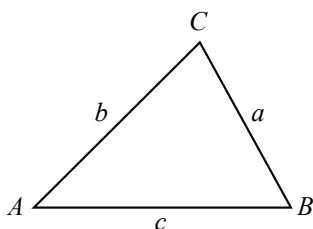
The quadratic equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by:

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

Area of trapezium $= \dfrac{1}{2}(a + b)h$
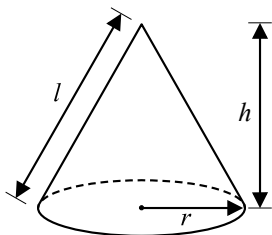
Trigonometry

In any triangle ABC

Sine Rule $\quad \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine Rule $\quad a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \dfrac{1}{2}ab\sin C$

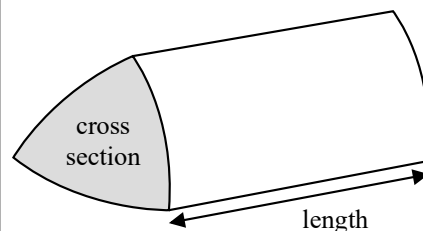**Volume of cone** $= \dfrac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$
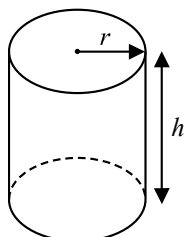
Volume of prism
= area of cross section × length

Volume of cylinder $= \pi r^2 h$
**Curved surface area
of cylinder** $= 2\pi rh$

Volume of sphere $= \dfrac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$
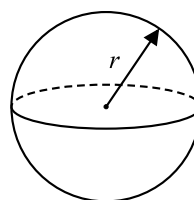
1 (*a*) Factorise $6y^2 + 18yt$

....
(1)

(*b*) Solve $3(m + 7) = 12 - 5m$
Show clear algebraic working.

$m =$ ....
(3)

(*c*) Solve the inequality $8w + 7 < 41$

....
(2)

(*d*) Solve this equation. Give your solutions correct to 3 significant figures.

$2m^2 + 6m = 7$

....
(3)

(*d*) Solve the inequality $w^2 + w > 6$

....
(3)

2   (*a*) Simplify $g^8 \div g^2$

....
(1)

(*b*) Simplify $6e^2m^7 \times 3em^4$

....
(2)

(*c*) Simplify $(64a^6c^2)^{\frac{1}{2}}$

....
(2)

(*d*) Factorise $4x^2 - 81$

....
(1)

(*e*) Make k the subject of $f = \sqrt{\dfrac{1-2k}{3}}$

…………………..(3)

3. Here are the first 5 terms of an arithmetic sequence.

$$100, \quad 95, \quad 90, \quad 85, \quad 80$$

i) Find an expression, in terms of n, for the nth term of the sequence.

....
(Total 2 marks)

ii) Find the sum of the first 50 terms of the sequence.

....
(Total 2 marks)

4 Simplify fully $\dfrac{12x^2 - 3}{6x^2 + 5x - 4}$

....

(3 marks)

---

5. Toby invested £4500 for 2 years in a savings account.
He was paid 4% per annum compound interest.

How much did Toby have in his savings account after 2 years?

£ ....

(Total 3 marks)

6. Calculate the area of this sector

Diagram **NOT** accurately drawn

2.45 m   105°   2.45 m
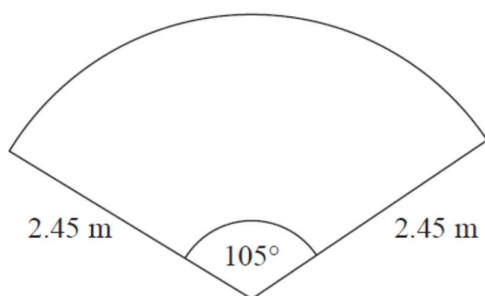
……………………
(3 marks)

7. R is inversely proportional to the square of c.

When $c = 3$, $R = 20$

(*a*) Find a formula for R in terms of c.
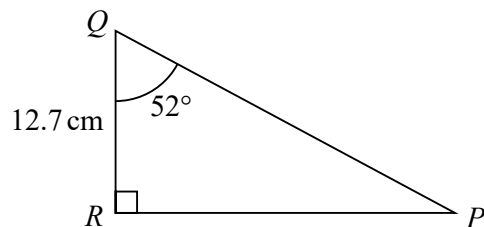
……………………
(3)

(*b*) Calculate R when $c = 2$

$c =$……………………
(2)

8.

Diagram **NOT** accurately drawn

Work out the length of RP.   Give your answer correct to 3 significant figures.

....cm **(2)**

9.   (a) Show that $(5 - \sqrt{8})(7 + \sqrt{2}) = 31 - 9\sqrt{2}$

Show each stage of your working.

(3)

(b) Show that the following expression can be written in the form $a + \sqrt{b}$

where a and b are whole numbers:

$$\frac{7}{\left(3 - \sqrt{2}\right)}$$

(2)

10. (a) Solve $\dfrac{2w - 3}{7} + \dfrac{2w - 5}{3} = 2$

Show clear algebraic working.

$w = $ ....

(3)

(b) Make e the subject of the formula $\qquad t = \sqrt{\dfrac{3e+7}{e-3}}$

....
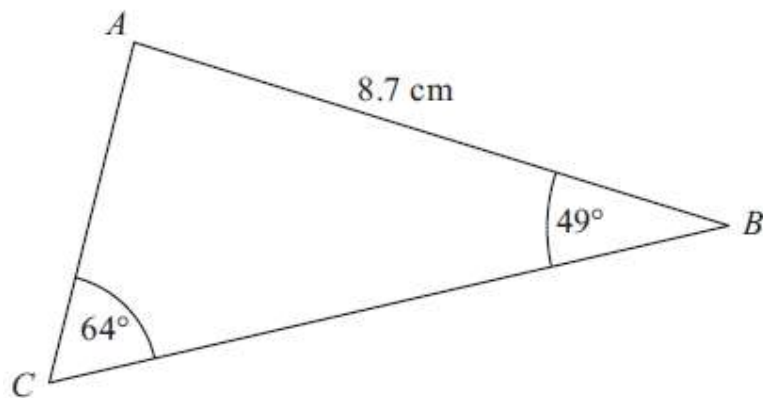
(4)

_____

11.

A

8.7 cm

49° B

64°

C Diagram **NOT** accurately drawn

ABC is a triangle.   *AB* = 8.7 cm.
Angle *ABC* = 49°.   Angle *ACB* = 64°.

   b. Calculate length AC, giving your answer to 3 significant figures.

. . . . cm

   a.   Hence work out the area of triangle ABC, giving your answer to 3 significant figures.

…………………………………. cm²

(5 marks)

12   f is the function such that $f(x) = \sqrt{4-x}$ and $f(x) \geqslant 0$

g is the function such that $g(x) = 3 - 5x$

  i)   Work out   g(3)

.............................(2)

  ii)   Find   fg(*x*)
  Give your answer in its simplest form.

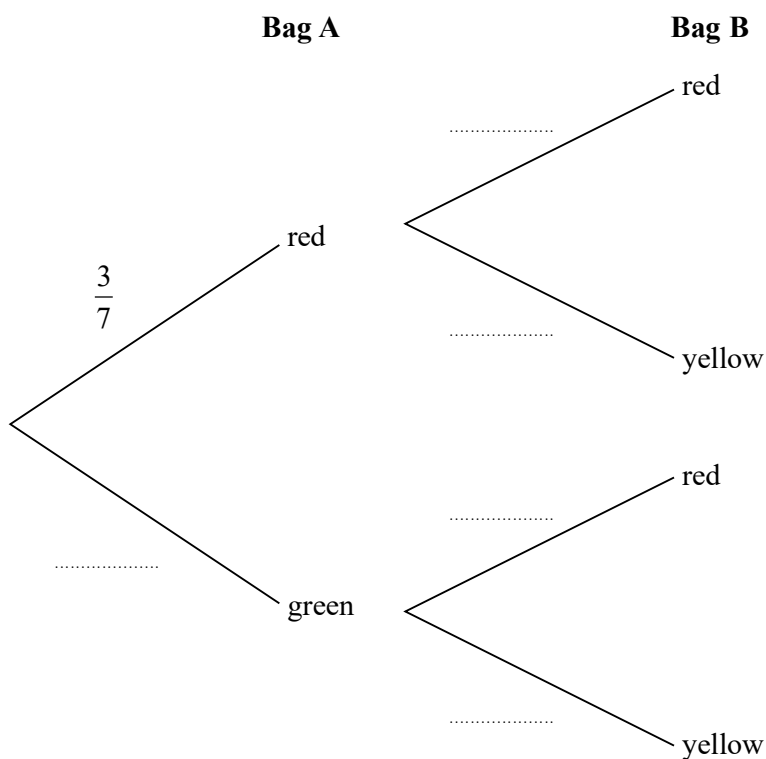fg(*x*) = ...

(2)

13 Genevieve has two bags of marbles, bag **A** and bag **B**.

In bag **A** there are only 3 red marbles and 4 green marbles.
In bag **B** there are only 4 red marbles and 5 yellow marbles.

Genevieve takes at random one marble from each bag.

(*a*) Complete the probability tree diagram.

(2)

(*b*) Work out the probability that Genevieve takes two red marbles.

....

(2)

(4 marks)

14 a) $\dfrac{5^{n^2}}{5^6} \times \dfrac{5^{n^2-5n}}{5^3} = 125$ where $n > 0$

Work out the value of n.
Show clear algebraic working.

$n =$ ....

(4 marks)

b) Write 7.8×10^4 as an ordinary number.

.... (1)

c) Work out $(4.62 \times 10^5) \times (5 \times 10^{-2})$ giving your answer in standard form

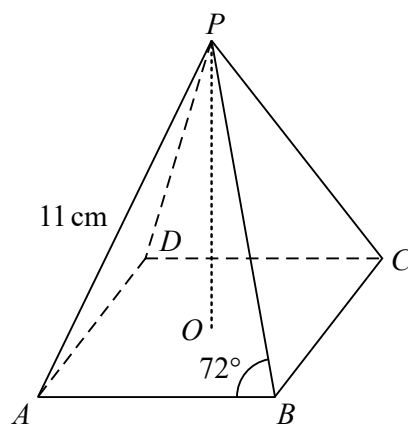.. (1)

15

Diagram **NOT** accurately drawn

The diagram shows a pyramid with a horizontal square base.
The vertex, P, of the pyramid is vertically above the centre, O, of the base.
The triangular faces of the pyramid are congruent isosceles triangles.

In triangle ABP
$PA = PB = 11$ cm and angle $PBA = 72°$

Work out the height, OP, of the pyramid.
Give your answer correct to 3 significant figures.

....cm

(**4 marks**)

16 The table gives information about the examination scores of 30 students.

Score	Frequency
1 – 20	1
21 – 40	5
41 – 60	8
61 – 80	10
81 – 100	6

Work out an estimate for the mean score of the 30 students.

....
(3 marks)

17 Solve the simultaneous equations

$$2x^2 + 3y^2 = 14$$
$$x = 2y - 3$$

Show clear algebraic working.

....

(5 marks)

18   The diagram shows a solid cone.

Diagram **NOT** accurately drawn

l cm

$2\sqrt{3}$ cm
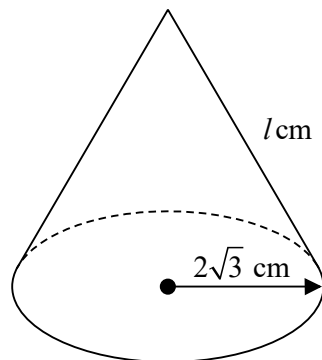
The radius of the base of the cone is $2\sqrt{3}$ cm.
The slant height of the cone is l cm.
The **total** surface area of the cone is 36π cm^2

Work out the exact value of l.

Give your answer in the form $2\sqrt{a}$ where a is an integer.

$l =$ ....

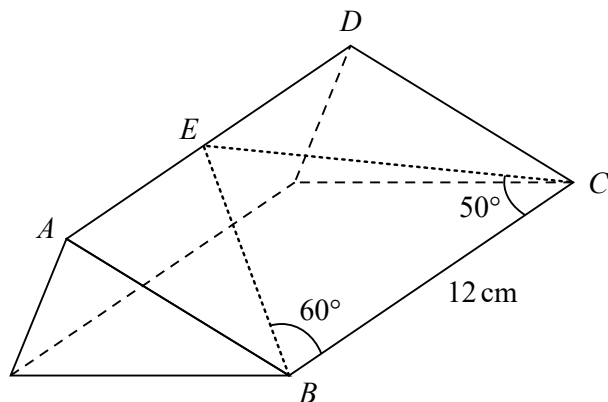**(5 marks)**

19 The diagram shows a triangular prism.

Diagram **NOT** accurately drawn

The point E lies on AD.

Angle $EBC = 60°$ Angle $ECB = 50°$ Angle $ABC = 90°$ Angle $BAD = 90°$
$BC = 12$ cm

Work out the length of AB.   Give your answer correct to 3 significant figures.

.... cm

(4 marks)

___

<div align="center">End (Total : 90 marks)</div>