## Maths @ RSA



## Introduction to A Level Mathematics Course

Name:

Welcome to maths at A level at Robert Smyth Academy. You have chosen an exciting and rewarding course that we hope that you will really enjoy and also find an interesting challenge.

This summer assignment booklet covers the key mathematical skills needed throughout your A level maths course and you have covered them all at GCSE.

This assignment is compulsory and every question in this booklet must be answered over the summer holidays and handed in on your first maths lesson of year 12 to your pure maths teacher.

You must include all of your working out for each question and adhere to the non-calculator sections which are clearly marked. Full marks will not be given for questions that do not show working out.

You are required to answer every question in this booklet. If you are struggling with a particular question, there are many places you can turn to for help. You can use your notes from GCSE, revision guides, the websites
https://www.mathsgenie.co.uk/gcse.html,
https://corbettmaths.com/contents/,
www.mymaths.co.uk,
https://www.drfrostmaths.com/
and any other maths resources to help you.

Please do not hand in incomplete assignments as we will ask you to redo it. We will use your score in this homework to advise you on whether or not you are suitable for the A level maths course.

Finally, I hope you enjoy the course and studying maths throughout year 12.


Mrs Haynes (head of maths)

## Section 1: Algebra skills

1.) Expand and simplify where possible

| $3(2 x-7)$ |  | $4 x(3 x-y)$ |  |
| :--- | ---: | :--- | :--- |
| $5(3 x+8)+2(x-5)$ | $(1)$ |  |  |
|  |  | $4(7 x-3)-2(6-x)$ |  |
| $(x+5)(x-8)$ | $(2)$ |  | $(2 x-9)(x-4)$ |
| $(x-8)^{2}$ | (2) |  | $(2 x-5)^{2}$ |
|  |  |  |  |

2.) Factorise where possible and state if it is not possible.

| $6 x-10$ |  | $12 x^{2}+15 x y$ |  |
| :--- | ---: | :--- | :--- |
| $x^{2}+9 x+20$ |  | (1) |  |
| $x^{2}+y^{2}$ | (2) |  |  |
| $x^{2}+3 x-10$ |  | $x^{2}-7 x+12$ | (2) |
| $3 x^{2}+x-2$ | (2) |  |  |
|  |  | $x^{2}+6 x+6$ | (2) |

3.) Simplify these algebraic fractions

| $\frac{4}{6 x}$ |  | $\frac{16 x}{20 x^{2}}$ |  |
| :---: | :---: | :---: | :---: |
|  | (1) |  | (1) |
| $\frac{x+3}{2 x+6}$ |  | $\frac{5 x-7}{20 x-28}$ |  |
|  | (2) |  | (2) |
| $\frac{x^{2}+7 x+12}{x^{2}+x-6}$ |  | $\frac{x^{2}-25}{2 x^{2}-6 x-20}$ |  |
|  | (3) |  | (3) |
| $\frac{x-2}{2} \times \frac{4}{x-3}$ |  | $\frac{3 x}{4} \div \frac{x}{4}$ |  |
|  | (2) |  | (2) |
| $\frac{x}{2}+\frac{x}{3}$ |  | $\frac{2 x^{2}}{9}-\frac{2 y^{2}}{3}$ |  |
|  | (2) |  | (2) |

## Section 2: Linear equations

1.) Solve these linear equations

| $4 x-7=3$ |  | $\frac{x}{3}+1=5$ |  |
| :---: | :---: | :---: | :---: |
|  | (1) |  | (1) |
| $\frac{x-2}{5}=3$ |  | $\frac{4}{x}=8$ |  |
|  | (1) |  | (1) |
| $6(3 x+5)=39$ |  | $7 x-5=3 x+3$ |  |
|  | (2) |  | (2) |
| $3(x-6)=2(5-2 x)$ |  | $\frac{2 x-3}{3}+\frac{x-2}{2}=5$ |  |
|  | (2) |  | (3) |

## Section 3: Quadratic equations

1.) Solve by factorising.

| $x^{2}-9 x+14=0$ | $x^{2}-5 x=0$ |  |  |
| :--- | :--- | :--- | :--- |
|  |  |  |  |
| $x^{2}+2 x=8$ | (3) |  |  |
|  |  | $2 x^{2}-7 x-15=0$ | (3) |
|  |  |  |  |

2.) Solve by using the quadratic formula. Give your answers to 1 decimal place.

| $x^{2}-3 x+1=0$ | $2 x^{2}+3 x-1=0$ |
| :---: | :---: |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

3.) Solve by completing the square. Give your answers in exact format.

| $x^{2}+6 x-3=0$ | $x^{2}-11 x+8=0$ |  |
| :---: | :---: | :---: |
|  |  |  |
|  |  |  |
|  | (4) |  |

4.) Solve, where possible, using an appropriate method. When it does not solve, give reasons why.

| $x^{2}-49=0$ |
| :--- |
|  |
|  |
| $0=x^{2}-11 x+24$ |

$x^{2}+5 x-2=0$
$0=x^{2}-11 x+24$
$0=x^{2}+2 x+3$
$\frac{4}{x+1}+\frac{5}{x+2}=2$

## Section 4: Simultaneous equations

1.) Solve these linear simultaneous equations

| $3 x+2 y=16$ |  |  |
| :--- | :--- | :--- |
| $x-2 y=4$ |  | $x+3 y=9$ <br> $x+y=6$ |
|  | (3) |  |
|  |  | $2 x-3 y=15$ <br> $5 x+7 y=52$ |
| $2 x+3 y=13$ |  |  |
| $4 x+7 y=31$ |  |  |
|  |  |  |

2.) Solve these simultaneous equations where one is linear and one is non-linear.

| $y=x^{2}-2 x-5$ |  |  |
| :--- | :--- | :--- |
| $y=x-1$ | $x^{2}+y^{2}=13$ <br> $5 y+x=13$ |  |
|  |  |  |
|  | (4) |  |

## Section 5: Indices and surds


1.) Simplify using laws of indices. Do not use your calculator.

| $3^{7} \times 3^{8}$ |  | $x^{10} \div x^{2}$ | $\left(2^{6}\right)^{2}$ |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $7^{0}$ | $(1)$ | (1) |  |  |
|  |  | $3 a^{2} \times 2 a^{5}$ | $\left(4 x^{3}\right)^{3}$ | (2) |
| $5^{-2} \times 5^{10}$ | (2) |  |  |  |


2.) Evaluate, showing your method clearly. You will not get any marks if you do not show your method. Do not use your calculator.

| $100^{\frac{1}{2}}$ |  | $32^{\frac{1}{5}}$ | (2) | $27^{\frac{2}{3}}$ | (3) |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | (1) |  |  |  |  |
| $16^{\overline{4}}$ |  | $2^{-2}$ |  | $5^{-3}$ |  |
|  | (3) |  | (2) |  | (2) |
| $81^{-\frac{1}{4}}$ |  | $27^{-\frac{4}{3}}$ |  | $\left(\frac{27}{125}\right)^{\frac{1}{3}}$ |  |
|  | (3) |  | (3) |  | (2) |


3.) Simplify each of the following surds into the form $a \sqrt{b}$ showing your method clearly.

You will not get any marks if you do not show your method. Do not use your calculator.

| $\sqrt{18}$ |  | $\sqrt{24}$ |  |
| :--- | ---: | :--- | :--- |
|  | (2) |  |  |
| $\sqrt{12}$ |  | $\sqrt{50}$ |  |
|  | (2) |  | (2) |
| $\sqrt{45}+\sqrt{20}$ |  | $\sqrt{27}+\sqrt{12}$ |  |
|  | (3) |  | (3) |


4.) Expand and simplify each of the following showing your method clearly. You will not get any marks if you do not show your method. Do not use your calculator.
$\sqrt{2}(3 \sqrt{2}+5)$

$$
(3+\sqrt{5})(\sqrt{5}-4)
$$

(2)
5.) Rationalise the denominator showing your method clearly. Do not use your calculator.


| $\frac{3}{\sqrt{5}}$ |  | $\frac{6 \sqrt{2}}{\sqrt{3}}$ |  |
| :--- | :--- | :--- | :--- |
| $\frac{1}{\sqrt{5}+1}$ | (2) |  |  |
|  |  | $\frac{2+\sqrt{3}}{2-\sqrt{3}}$ | (2) |
|  |  |  |  |

## Section 6: Circle theorems

1.) Find the missing angles stating reasons for each step of working out.

2.) Complete the following circle theorems.

## A radius and tangent meet....

The perpendicular bisector of a chord.....

## Section 7: Tree Diagrams

1.) A biased coin has probability of $3 / 5$ of landing on tails. The coin is dropped twice.
a.) draw a tree diagram to represent the situation.
b.) Use your tree diagram to calculate the probability the coin lands on tails both times.
c.) Use your tree diagram to calculate the probability the coin lands on tails at least once. (3)
2.) A bag contains ten coloured cubes. Three are yellow and seven are green. Two cubes are selected at random from the bag but not replaced.
a.) draw a tree diagram to represent the situation.
b.) Use your tree diagram to calculate the probability the cubes selected are different colours.
c.) Use your tree diagram to calculate the probability that the second cube to be selected is yellow.

## Marking grid

|  | Concept | Score | Out of... | Area in need of development? |
| :---: | :---: | :---: | :---: | :---: |
| Section 1 | Expanding and simplifying |  | 14 |  |
|  | Factorising |  | 20 |  |
|  | Algebraic fractions |  | 20 |  |
| Section 2 | Linear equations |  | 13 |  |
| Section 3 | Solving by factorising |  | 13 |  |
|  | Solving using quadratic formula |  | 6 |  |
|  | Solving by completing the square |  | 9 |  |
|  | Mixed questions |  | 17 |  |
| Section 4 | Linear simultaneous equations |  | 14 |  |
|  | One linear, one non-linear |  | 9 |  |
| Section 5 | Laws of indices |  | 11 |  |
|  | Harder laws of indices |  | 21 |  |
|  | Simplifying surds |  | 14 |  |
|  | Expanding and simplifying |  | 5 |  |
|  | Rationalising the denominator |  | 11 |  |
| Section 6 | Finding missing angles |  | 8 |  |
|  | Completing circle theorems |  | 2 |  |
| Section 7 | Using tree diagrams |  | 16 |  |
|  | Total |  | 223 |  |
|  | Grade |  |  |  |


| A | B | C | D | E |
| :---: | :---: | :---: | :---: | :---: |
| $\geq 179$ | $\geq 157$ | $\geq 134$ | $\geq 112$ | $\geq 90$ |

