

Congratulations on choosing to study A Level Mathematics! In order to succeed in the transition from GCSE to A level maths, it is important that you hit the ground running. We have therefore prepared some materials for you to work through before you come back in September.

Part of your A level course will involve some **Self Study Modules**. **Before September** you need to get started on the first one which is on Coordinate Geometry. Use the link www.tinyurl.com/CoordGeometry to watch tutorials, make notes with examples on:

- Finding the Equation of Straight Lines
- Midpoint of a line
- Distance between two points

In September you will show your notes and examples to your teacher and complete an exercise to demonstrate your understanding.

You may have heard about a 'step up' from GCSE to AS Level, and that even Grade 8/9 students at GCSE level can find the pace and content of the course challenging, especially in the first few weeks. In order to support you with this, and maximise your chances of success we are insisting on you completing the work in this booklet before you begin the course in September. All of these topics are in the GCSE syllabus. **We will be collecting this in at the end of week 1.**

The topics and questions have been chosen to reflect the maths you will use at AS and we hope that this work will help prepare you for AS studies. They have been carefully selected to help prepare you for the demands of A-level study. **Every skill tested in these questions is required throughout the course.** Web addresses of relevant video tutorials have been provided for each topic to help remind you of the methods involved in solving each type of question in case you are a little rusty. If you are still stuck on any parts of a particular section, even after watching the tutorials, complete what you can of the section then move onto the next section. This work is intended to provide a thorough preparation to your A-level maths studies. Please ensure you take sufficient time to complete the work well without rushing it at the last minute.

If you have any difficulty either finding the resources, or with any aspect of the mathematics, feel free to email maths@coombesheadacademy.org.uk. A copy of this is available online at www.tinyurl.com/StartALevelMaths

We are really excited about the prospects in A-level mathematics next year and look forward to seeing you in your first week back.

In addition to completing these also set up a Desmos account – it's a really useful graphing tool which will help with lots of your A Level Maths www.desmos.com

Yours sincerely,

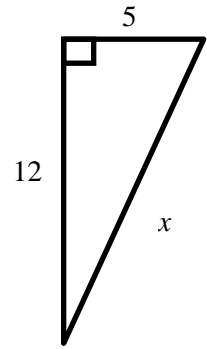
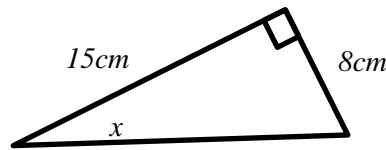
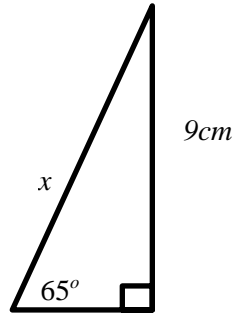
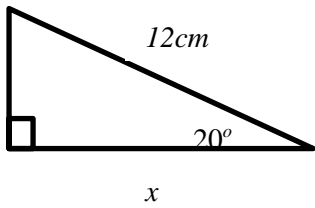
Mr M James
Coombeshead Academy

Mr D Kussel
Teign School

A-level Prep Work

Trigonometry and Pythagoras

Find x



Video: <http://tinyurl.com/trig-pythag>

Fractions (simplify your answers where possible and show all working)

1. $\frac{2}{5} + \frac{1}{3}$
2. $\frac{2}{3} - 1$
3. $5 \times \frac{1}{3}$
4. $4 \times \frac{2}{5}$
5. $8 \times \frac{1}{6}$
6. $\frac{7}{9} - \frac{5}{6}$
7. $\frac{3}{4} \times \frac{2}{5}$
8. $\frac{5}{12} \div \frac{3}{4}$
9. $\frac{2}{7} \div 4$

Videos: <http://tinyurl.com/fractionsadd>, <http://tinyurl.com/fraction-mult>

Indices

Simplify the following:

1. $a^2 \times a^3$
2. $\frac{b^5}{b^2}$
3. $(c^3)^4$
4. $(x^4 \times x^2)^3$
5. $\frac{x^4 \times x^3}{x^2}$
6. $\frac{12x^2}{2x^3 \times 8x^5}$
7. $x^{\frac{1}{2}} \times x^2$
8. $\frac{x^{\frac{1}{3}} \times x}{x^3}$
9. $27^{\frac{1}{3}}$
10. 10^{-1}
11. $16^{-\frac{1}{2}}$
12. $125^{\frac{2}{3}}$
13. $\frac{-4}{81}$
14. $\left(\frac{4}{49}\right)^{\frac{1}{2}}$
15. $\left(\frac{9}{100}\right)^{-\frac{3}{2}}$

16. Write as 8^5 as 2^x where x is an integer.

Videos: <http://tinyurl.com/index-not>

Give the gradient and y -intercept for the following lines:

1. $y = 3x - 5$
2. $2y = 3x + 8$
3. $5y + 2x - 12 = 0$
4. $y - 5 = \frac{1}{2}(x - 7)$

Does the point $(-3, -17)$ lie on the line $y = 4x - 5$?

Videos: <http://tinyurl.com/grad-intercept>

Substitute

$$\begin{array}{lllllll} x_1 = 7, & x_2 = 2, & y_1 = -3, & y_2 = 5, & a = -2, & b = -9, & c = -3, \\ x = -2, & e = \frac{1}{2}, & f = \frac{2}{3}, & g = \frac{1}{4}, & m = \frac{1}{8}, & n = \frac{27}{64}, & p = 1, \\ t = 4, & u = 1 & & & & & \end{array}$$

1. $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ 2. $\frac{x_2 + x_1}{2}$ 3. $\frac{y_2 - y_1}{\frac{x_2 - x_1}{2}}$ 4. $\sqrt{b^2 - 4ac}$

5. $5x^2$ 6. $8e^3$ 7. $\frac{f}{g}$ 8. $\frac{1}{f}$ 9. $\frac{1-e}{2+f}$ 10. $\frac{2}{5} \times 4x^3$

11. $\frac{3}{2}g^{\frac{1}{2}}$ 12. $4 \times \frac{5}{3}m^{\frac{2}{3}}$ 13. $\frac{2}{3}n^{-\frac{1}{3}}$ 14. $\left(\frac{3}{2}x^2 - \frac{1}{4}x^4\right) - \left(\frac{3}{2}p^2 - \frac{1}{4}p^4\right)$

15. $\left(-2t^3 + \frac{2}{3}t^2\right) - \left(-2u^3 - \frac{2}{3}u^2\right)$ 16. Substitute $y = -2x$ into the expression $2 - 2y^2 + 6y^3 - y^4$ and simplify

Videos: <http://tinyurl.com/subst-1>,

Expand and Simplify the Following:

1. $(x-3)(x+4)$ 2. $(x-7)^2$ 3. $12 - 3(2-x)$

4. $(x-5)(x+5)$ 5. $2(x-3) + 4(x-5)$ 6. $(x+1)^2 - 3x$

7. $(x+3)^2 + (x+2)^2$ 8. $(x+4)^2 - x(x-7)$ 9. $5(x+3)^2 - 2(x-5)^2$

10. Write $y - 5 = \frac{1}{2}(x+7)$ in the form $ay + bx + c = 0$ where a, b and c are integers

11. Write $y + 4 = -\frac{2}{3}(x-8)$ in the form $ay + bx + c = 0$ where a, b and c are integers

Videos: <http://tinyurl.com/exp-brackets>, <http://tinyurl.com/exp-brackets2>

Factorise the Following:

1. $10x^2 + 35x$ 2. $9y^2 + 12y$ 3. $16x^2y + 12y^3x$

4. $x^2 + 4x - 5$ 5. $x^2 - 10x + 21$ 6. $x^2 - 6x - 16$

7. $3y^2 - 2y - 1$ 8. $2a^2 + 9a + 4$ 9. $4x^2 + 22x + 24$

10. $x^2 - 25$ 11. $36x^2 - 100$

Videos: <http://tinyurl.com/factorise-a>, <http://tinyurl.com/factorise-b>

Solve the Following:

1. $2 - x = 4x - 8$

2. $6 - 3(x + 4) = 0$

3. $\frac{1}{2}(x + 3) - (1 - x) = 1$

4. $\frac{x}{3} - \frac{2x}{5} = 2$

5. $\frac{x+1}{2} = \frac{2x}{5}$

6. $3 + \frac{2-x}{2} = \frac{2x+1}{3}$

7. $\frac{x+2}{3} + \frac{2x-3}{4} = 2$

8. $x^2 + 2x - 35 = 0$

9. $2x^2 + 13x + 6 = 0$

10. $4(3x-1) = 9x^2$

11. $6x + x^2 = 0$

12. $4x^2 - 9 = 0$

13. $4y - 3 = 3y(y - 2)$

14. $(3x - 4)(x - 4) = -5$

15. $\frac{x+1}{3x} = \frac{x+2}{3x+1}$

16. $20 = 5t + \frac{1}{2} \times 9.81t^2$

17. $9.81 \sin 40 - x \times 9.81 \cos 40 = \frac{10}{9}$

Videos: <http://tinyurl.com/solve-linear-1>, <http://tinyurl.com/solve-linear-frac>,
<http://tinyurl.com/solve-quadr-1>, <http://tinyurl.com/solve-quadr-2>

Solve the following giving your answer in surd form and as a decimal to 1dp:

1. $x^2 + 5x - 9 = 0$

2. $x^2 - 6x - 5 = 0$

3. $2x^2 = -8x + 12$

Video: <http://tinyurl.com/solve-quad-formula>

Substitute the given values into the following equations then solve to find the remaining letter:

1. $v^2 = u^2 + 2as$

2. $v = u + at$

3. $s = ut + \frac{1}{2}at^2$

($v = 10, a = 3, s = 12$)

($v = 20, u = -4, a = 3$)

($s = -15, t = 10, u = 20$)

4. $s = \frac{1}{2}(u + v)t$

5. $v^2 = u^2 + 2as$

6. $s = ut + \frac{1}{2}at^2$

($u = 35, s = 320, t = 8$)

($v = 8, u = -3, s = 20$)

($s = -100, u = 2, a = -9.8$)

7. $u_n = a + (n-1)d$

8. $S_n = \frac{1}{2}n[2a + (n-1)d]$

9. $u_n = ar^{n-1}$

10. $S_n = \frac{a(1-r^n)}{1-r}$

11. $S_\infty = \frac{a}{1-r}$

($a = 20, n = 10, d = -2$)

($a = 5, n = 15, d = \frac{1}{2}$)

($a = 3, r = \frac{1}{2}, n = 5$)

($a = 3, r = \frac{1}{2}, n = 5$)

($S_\infty = 50, r = -\frac{1}{2}$)

Make x the subject of the following equations

1. $y = 4x - 5$ 2. $y = \frac{1}{4}x^2$ 3. $3y = 2\sqrt{x}$ 4. $5x + 2y = 10x - 8y$
5. $ax + by = 3x - 4y$ 6. $\sqrt{3}x + 5y = \sqrt{2}y - 7x$ 7. $y = \frac{x+2}{x-3}$ 8. $y \sin(30) + x \cos(30) = 20g - x \cos(60)$

Videos: <http://tinyurl.com/rearranging-1>, <http://tinyurl.com/rearranging-2>,
<http://tinyurl.com/rearranging-3>

Surds Write the following as simplified surds. Please show your working (do not use a calculator)

1. $\sqrt{50}$ 2. $\sqrt{3} \times \sqrt{5}$ 3. $2\sqrt{6} \times 3\sqrt{5}$ 4. $2\sqrt{5} \times 7\sqrt{10}$
5. $\sqrt{18} + \sqrt{50}$ 6. $2\sqrt{8} + \sqrt{72}$ 7. $\sqrt{3}(2 + 4\sqrt{3})$ 8. $(5 + \sqrt{2})(5\sqrt{3} + 4\sqrt{6})$

Rationalise the denominator of the following fractions:

1. $\frac{1}{\sqrt{3}}$ 2. $\frac{2}{\sqrt{7}}$ 3. $\frac{\sqrt{3}}{\sqrt{11}}$ 4. $\frac{5 - \sqrt{2}}{\sqrt{6}}$

Videos: <http://tinyurl.com/surds-simplify>, <http://tinyurl.com/surds-rationalise>

Properties of quadrilaterals

Draw a parallelogram, a rhombus and a trapezium. Clearly indicate which equal lengths and angles are equal and indicate any parallel sides. Give the formula for the area of each quadrilateral.

Parallelogram

Rhombus

Trapezium

Videos: <http://tinyurl.com/quadr-properties>, <http://tinyurl.com/area-quadr>

For each of the following state whether they are always, sometimes or never true. If they are sometimes true try to give an example of each case.

1. $(a + b)^2 = a^2 + b^2$ 2. $(a + b)^2 = (b + a)^2$ 3. $a \times (b \times c) = (a \times b) \times c$ 4. $a^x < 0$
5. $(a - b)^2 = (b - a)^2$ 6. $\sqrt{ab} = \sqrt{a}\sqrt{b}$ 7. $\sqrt{a} + \sqrt{b} = \sqrt{a+b}$ 8. $\left(\frac{a}{b}\right)^2 = \frac{a^2}{b^2}$
9. $\left(a\frac{b}{c}\right)^2 = a^2\frac{b^2}{c^2}$ 10. $a\frac{b}{c} = \frac{ab}{c}$ 11. $a\left(\frac{b}{c}\right) = \frac{ab}{c}$ 12. $\frac{2x+1}{3y+1} = \frac{2x}{3y}$
13. $-\frac{a}{b} = \frac{a}{-b} = \frac{a}{b}$ 14. $\frac{a+b}{c+d} = \frac{a}{c} + \frac{b}{d}$ 15. $\frac{a+b}{c+d} = \frac{a}{c+d} + \frac{b}{c+d}$ 16. $\frac{a+b}{c+d} = \frac{a}{c} + \frac{b}{d}$

Notes/comments