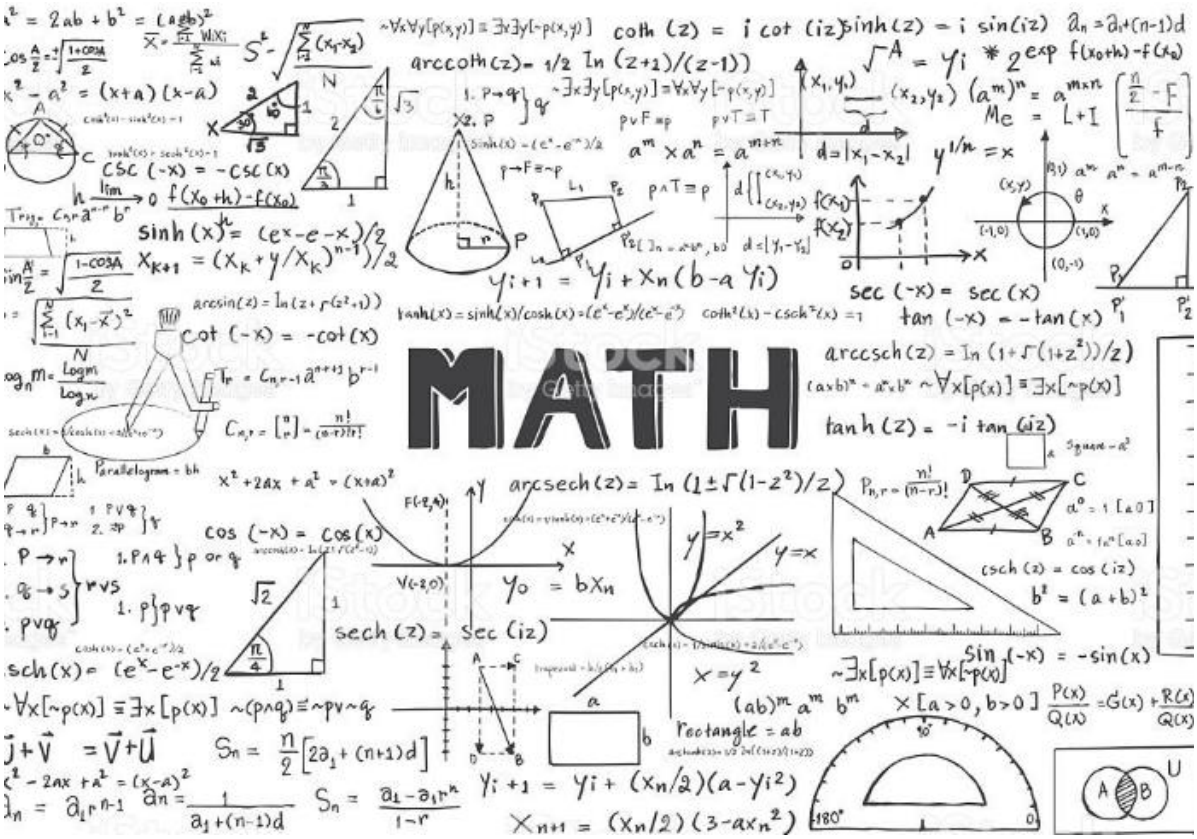
Taverham Sixth Form
One vision. Our passion. Your future.

Essential Topics
A Level Mathematics



Name .....

You must complete this booklet and bring it with you to your first class in September

Skills you should have

Below is the list of the skills you should be confident with before starting the A-level maths course:

Basic algebra (non-calculator)

- simplifying algebraic expressions by collecting like terms
- general laws of indices
- expanding and factorising expressions (one term outside)
- laws of indices for all rational exponents (positive, negative, fractions)

Quadratic functions (non-calculator)

- plotting graphs of quadratic functions
- expanding and factorising quadratics (two brackets)
- solving quadratic equations by factorising
- solving quadratic equations using the formula

Equations and inequalities (non-calculator)

- solving simultaneous linear equations by elimination
- solving simultaneous linear equations by substitution
- solving linear inequalities

Sine rule and cosine rule (calculator allowed)

- using the sine rule to find missing sides and angles
- using the cosine rule to find missing sides and angles
- using sine rule, cosine rule, trig ratios and Pythagoras in problems

These are all GCSE topics so there is nothing here which you have not already covered.

In this booklet we have four sections of questions to help you keep up to date. Please complete and bring with you to hand in on the June induction days.

Section A

These are all questions that you should definitely be able to answer, even if you have to refresh your memory with your books.

Section B

A second set of questions which are slightly harder, but you should be able to have a good go.

Section C

Harder Grade 8 and 9 questions. Just see what you can do!

Section D

Some calculator work using trigonometry, the sine and cosine rule.

Section A (definitely)

1. (a) Work out the value of $\frac{2}{3} \times \frac{3}{4}$

Give your answer as a fraction in its simplest form

.....

(2)

(b) Work out the value of $1\frac{2}{3} + 2\frac{3}{4}$

Give your answer as a fraction in its simplest form

.....

(3)

(Total 5 marks)

2. (a) Simplify

(i) $p^2 \times p^7$

.....

(ii) $x^8 \div x^3$

.....

(iii) $\dfrac{y^4 \times y^3}{y^5}$

.....

(3)

(b) Expand $t(3t^2 + 4)$

.....

(2)

(Total 5 marks)

3. Simplify fully $(3xy^2)^4$

.....

(2)

4. Solve the simultaneous equations

$2x + 3y = 6$

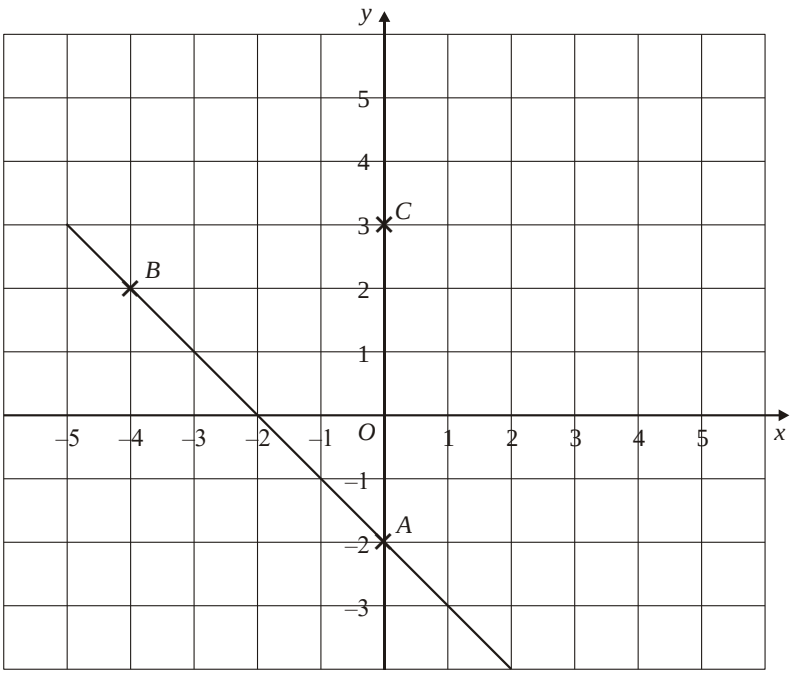
$3x - 2y = 22$

$x =$ .....

y = ...

(4)

5.



In the diagram *A* is the point (0, –2)

B is the point (–4, 2)

C is the point (0, 3)

Find an equation of the line that passes through *C* and is parallel to *AB*

.....

(4)

6. Solve $2(5x + 3) = 3x - 22$

x = ...

(4)

7. (a) Factorise $x^2 + 6x + 8$

.....

(2)

(b) Solve $x^2 + 6x + 8 = 0$

x = ...

or x = ...

(1)

(Total 3 marks)

Section B (should be able to…)

1. (a) Complete the table for $y = x^2 - 3x + 1$

x	–2	–1	0	1	2	3	4
y	11		1	–1		1	5

(2)

(b) On a set of axes draw the graph of $y = x^2 - 3x + 1$

(2)

(c) Use your graph to find an estimate for the minimum value of y

y = ...

(1)

(Total 5 marks)

2. A straight line has equation $y = 4x - 5$.

(a) Find the value of x when $y = 1$.

x = ...

(2)

(b) Write down the equation of the straight line that is parallel to $y = 4x - 5$ and passes through the point (0, 3)

.....

(2)

(c) Rearrange the equation $y = 4x - 5$ to find x in terms of y.

x = ...

(2)

(Total 6 marks)

3. (a) List all the possible integer values of n such that $-2 \leq n < 3$

.....

(2)

(b) Solve the inequality $4p - 8 < 7 - p$

.....

(2)

(Total 4 marks)

4. (a) Solve $\frac{40-x}{3} = 4 + x$

x = ...

(3)

(b) Simplify fully $\frac{4x^2 - 6x}{4x^2 - 9}$

.....

(3)

(Total 6 marks)

5. Make *u* the subject of the formula $D = ut + kt^2$

u = ...

(2)

6. Work out

$$\frac{(5+\sqrt{3})(5-\sqrt{3})}{\sqrt{22}}$$

Give your answer in its simplest form.

.....

(3)

7. (a) Write $x^2 + 12x - 5$ in the form $(x+a)^2 + b$

.....

(2)

(b) Hence or otherwise solve the equation $x^2 + 12x - 5 = 0$

.....

(2)

(Total 4 marks)

Section C (might be able to…)

1. (a) Factorise $2x^2 - 35x + 98$

.....

(1)

(b) Solve the equation $2x^2 - 35x + 98 = 0$

.....

(2)

(Total 3 marks)

2. Make x the subject of

$5(x - 3) = y(4 - 3x)$

x = ...

(4)

3. Solve the equation

$$\frac{7}{x+2} + \frac{1}{x-1} = 4$$

.....

(7)

4. Solve the simultaneous equations

$x^2 + y^2 = 29$

$y - x = 3$

x = ...

y = ...

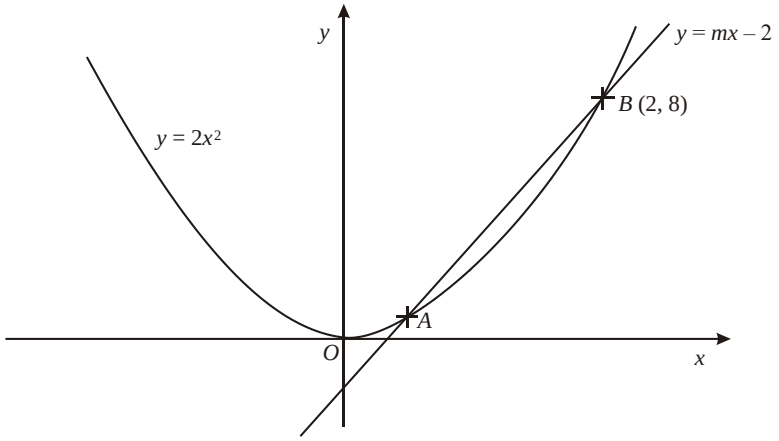
(7)

5. (a) Find the equation of the straight line which passes through the point (0, 3) and is perpendicular to the straight line with equation $y = 2x$

.....

(2)

(b) The graphs of $y = 2x^2$ and $y = mx - 2$ intersect at the points A and B. The point B has coordinates (2, 8). Find the coordinates of the point A.



.....

(2)

(Total 4 marks)

6. Evaluate

(a) 3^{-2}

.....

(b) $36^{\frac{1}{2}}$

.....

(c) $27^{\frac{2}{3}}$

.....

(d) $\left(\frac{16}{81}\right)^{-\frac{3}{4}}$

.....

(Total 5 marks)

7. Peter cuts a square out of a rectangular piece of metal

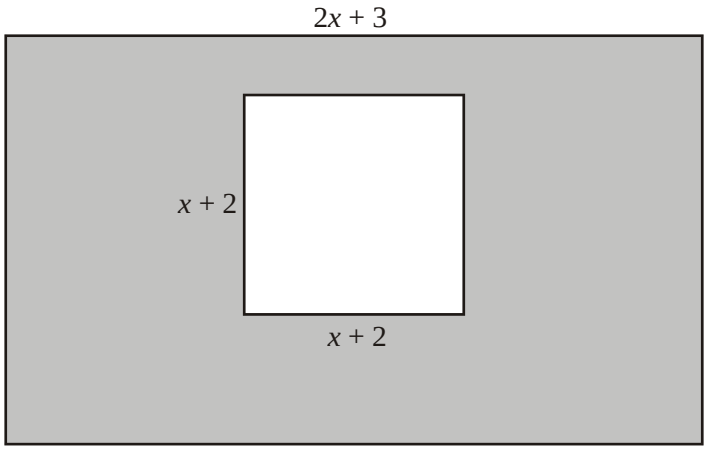


Diagram **NOT** accurately drawn

The length of the rectangle is $2x + 3$
The width of the rectangle is $x + 4$.
The length of the side of the square is $x + 2$.
All measurements are in centimetres.

The shaded shape in the diagram shows the metal remaining.

The area of the shaded shape is 20 cm^2.

(a) Show that $x^2 + 7x - 12 = 0$

.....

(4)

(b) (i) Solve the equation $x^2 + 7x - 12 = 0$

Give your answers correct to 4 significant figures

.....

(3)

(ii) Hence, find the perimeter of the square

Give your answer correct to 3 significant figures.

.....cm

(1)

(Total 8 marks)

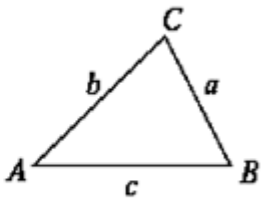
Section D: (calculator work…)

In any triangle ABC

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

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

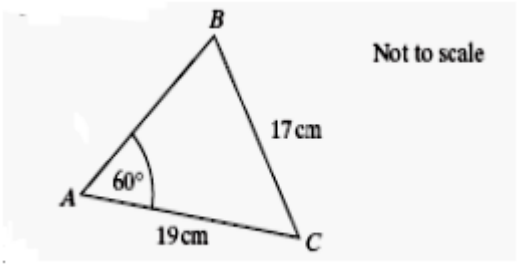


1. *ABC* is a triangle

AC = 19 cm

BC = 17 cm

*A*ngle *BAC* = 60°



Calculate the size of angle *ABC*

.....

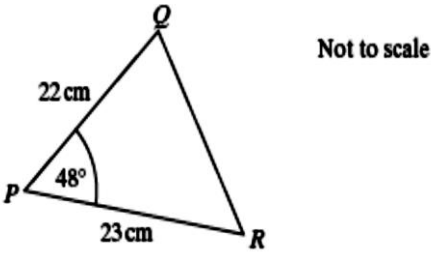
(3)

2. *PQR* is a triangle

PR = 23 cm

PQ = 22 cm

*A*ngle *QPR* = 48°



Calculate the length of *QR*

Give your answer to an appropriate degree of accuracy

.....

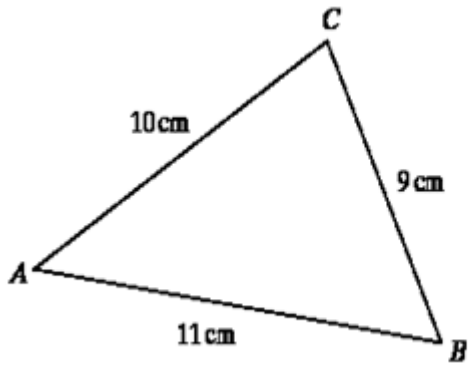
(4)

3. In triangle *ABC*:

AB = 11 cm

BC = 9 cm

CA = 10 cm



Not to scale

Find the area of triangle *ABC*

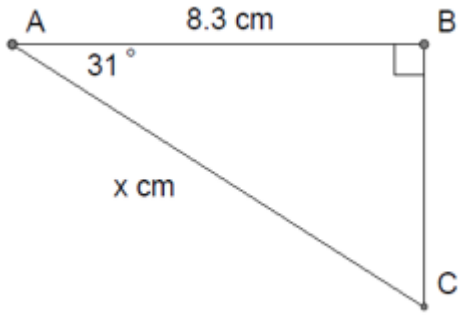
.....

(5)

4. *ABC* is a right-angled triangle

AB = 8.3 cm

*A*ngle *CAB* = 31°



Find the length of AC (marked x in the diagram).

Give your answer to a suitable degree of accuracy

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