

Maths Sixth Form Induction Work

Bourne academy A level maths – Holiday homework

Please complete the questions below. They are all based on work that is covered in GCSE so should be familiar to you. If you are unsure how to answer the questions, there are links to the appropriate videos on Corbett maths.

Ensure that every question is completed fully to the best of your ability. Please do not leave any questions blank and ensure all of your working out is shown.

Rearranging formula

[Changing the Subject Video – Corbettmaths](#)

[Changing the Subject Advanced Video – Corbettmaths](#)

Q1

Rearrange $y + 5 = x(y + 2)$ to make y the subject of the formula.

[4]

Q2

The volume V of a cone with base radius r and slant height l is given by the formula

$$V = \frac{1}{3}\pi r^2 \sqrt{l^2 - r^2}.$$

Rearrange this formula to make l the subject.

[4]

Q3

Rearrange the equation $5c + 9t = a(2c + t)$ to make c the subject.

[4]

Q4

For the following equation, express x in terms of y .

$$\frac{x}{3y} = \frac{2x+1}{y+2}$$

[4]

Q5

Rearrange the formula $r = \sqrt{\frac{V}{a+b}}$ to make b the subject.

[4]

Quadratics

[Factorising Quadratics 1 Video – Corbettmaths](#)

[Splitting the Middle Term Video – Corbettmaths](#)

[Completing the Square Video – Corbettmaths](#)

Q1

Factorise and hence simplify $\frac{3x^2 - 7x + 4}{x^2 - 1}$. [3]

Q2

Fig. 9 shows a trapezium ABCD, with the lengths in centimetres of three of its sides.

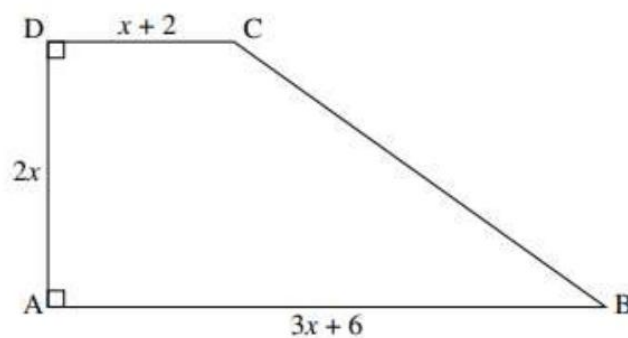


Fig. 9

This trapezium has area 140 cm^2 .

(i) Show that $x^2 + 2x - 35 = 0$. [2]

(ii) Hence find the length of side AB of the trapezium. [3]

Q3

(i) Express $2x^2 + 12x + 13$ in the form $a(x + b)^2 + c$. [4]

(ii) Solve $2x^2 + 12x + 13 = 0$, giving your answers in simplified surd form. [3]

Q4

(i) Express $5x^2 + 20x - 8$ in the form $p(x + q)^2 + r$. [4]

(ii) State the equation of the line of symmetry of the curve $y = 5x^2 + 20x - 8$. [1]

Q5

Solve the equation $y^2 - 7y + 12 = 0$.

Hence solve the equation $x^4 - 7x^2 + 12 = 0$.

[4]

Algebraic reasoning

[Expanding Three Brackets Video – Corbettmaths](#)

[Solving inequalities – Two Signs Video – Corbettmaths](#)

Q1

Expand and simplify $(x - 5)(x + 2)(x + 5)$.

[3]

Q2

Given that

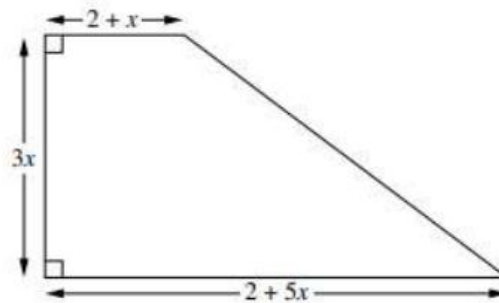
$$5x^2 + px - 8 = q(x - 1)^2 + r$$

for all values of x , find the values of the constants p , q and r .

[4]

Q3

A lawn is to be made in the shape shown below. The units are metres.



(i) The perimeter of the lawn is P m. Find P in terms of x . [2]

(ii) Show that the area, A m², of the lawn is given by $A = 9x^2 + 6x$. [2]

Q4

Given that

$$(x - p)(2x^2 + 9x + 10) = (x^2 - 4)(2x + q)$$

for all values of x , find the constants p and q . [3]

Q5

Solve the following.

$$-6 < 2x - 1 < 7$$

[3]

Straight Lines

[Finding the equation passing through two points Video – Corbettmaths](#)

[Parallel Linear Graphs Video – Corbettmaths](#)

[Perpendicular Lines Video – Corbettmaths](#)

Q1

(i) Find the coordinates of the point where the line $5x + 2y = 20$ intersects the x -axis. [1]

(ii) Find the coordinates of the point of intersection of the lines $5x + 2y = 20$ and $y = 5 - x$. [3]

Q2

Find the equation of the line which is parallel to $y = 3x + 1$ and which passes through the point with coordinates $(4, 5)$. [3]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

Q4

Use coordinate geometry to answer this question. Answers obtained from accurate drawing will receive no marks.

A and B are points with coordinates $(-1, 4)$ and $(7, 8)$ respectively.

- (i) Find the coordinates of the midpoint, M, of AB.

Show also that the equation of the perpendicular bisector of AB is $y + 2x = 12$. [6]

- (ii) Find the area of the triangle bounded by the perpendicular bisector, the y-axis and the line AM, as sketched in Fig. 12. [6]

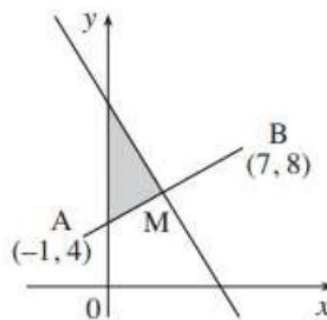


Fig. 12

**Not to
scale**

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

Q5

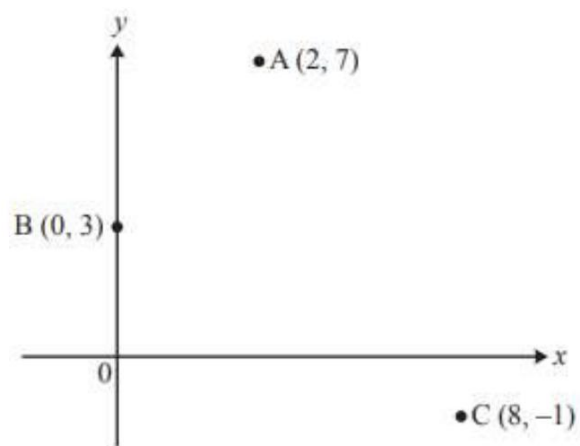


Fig. 10

Prove that angle ABC is 90° .

[3]

Algebraic fractions

[Adding algebraic fractions Video – Corbettmaths](#)

[Dividing algebraic fractions Video – Corbettmaths](#)

[Multiplying algebraic fractions Video – Corbettmaths](#)

[Simplifying algebraic fractions Video – Corbettmaths](#)

Q1

Simplify fully

$$\frac{2x^2 + 9x - 5}{x^2 + 2x - 15} \quad (3)$$

Q2

$$f(x) = \frac{2x+3}{x+2} - \frac{9+2x}{2x^2+3x-2},$$

Show that $f(x) = \frac{4x-6}{2x-1}$. (7)

Q3

Express

$$\frac{x+1}{3x^2-3} - \frac{1}{3x+1}$$

as a single fraction in its simplest form.

(4)

Q4

Express

$$\frac{2x^2+3x}{(2x+3)(x-2)} - \frac{6}{x^2-x-2}$$

as a single fraction in its simplest form.

(7)

Q5

The function f is defined by

$$f(x) = 1 - \frac{2}{(x+4)} + \frac{x-8}{(x-2)(x+4)}$$

Show that $f(x) = \frac{x-3}{x-2}$

(5)
