



Essential GCSE Maths 14.12

This question makes use of the Isaac equation editor, you can find instruction on [how to use the equation editor here](#).

Expand and simplify:

Part A Expand and simplify

$$(x + 1)(x + 2)(x + 3)$$

The following symbols may be useful: x

Part B Expand and simplify

$$(x - 5)(2x - a + 4)$$

The following symbols may be useful: a , x

Part C Expand and simplify

$$(x - 3)(x - 7)^2$$

The following symbols may be useful: x

$$\left(\frac{1}{x} + 5\right)(3x^2 - 9)$$

The following symbols may be useful: x

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Essential GCSE Maths 12.16

Write the following statements in algebra.

Part A Write the statement in algebra

α is twice β .

The following symbols may be useful: α , β

Part B Write the statement in algebra

α cubed is the same as γ squared.

The following symbols may be useful: α , γ

Part C Use your equations

$\beta = 2$ and γ is a positive integer.

Find the value of γ .



Essential GCSE Maths 12.14

A postman delivers mail to four houses. House 1 receives $3l$ letters and p parcels. House 2 receives $7l$ letters. House 3 receives $5l$ letters and $2p$ parcels. House 4 receives p parcels.

Part A Write the information as an equation

Write an equation for the total number of items the four houses receive, T . Simplify your answer as far as possible.

The following symbols may be useful: T , l , p

Part B Write an equation for W

Assuming that the weight of a letter is 80 g and the weight of a parcel is 550 g, write an equation for W , the total weight in kilograms of the items delivered to the four houses.

The following symbols may be useful: W , l , p



Essential GCSE Maths 15.8

Simplify the following, factorising if possible:

Part A Simplify

$$3x^2 \times 2a \times ax^3$$

The following symbols may be useful: a , \times

Part B Simplify

$$7p \times \frac{1}{2}x^2 \div \frac{p}{4} - 7x$$

The following symbols may be useful: p , \times

Part C Simplify

$$3c \times \left(\frac{1}{2}x\right)^2 \times 8c^2x + 4c^3$$

The following symbols may be useful: c , \times



Algebraic manipulation 5.4

GCSE A Level



Consider the following equations

$$w_x = \frac{c \cos \theta - v}{1 - \frac{v \cos \theta}{c}}$$

$$w_y = \frac{c \sin \theta}{\gamma \left(1 - \frac{v \cos \theta}{c}\right)}$$

where $\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$.

Find an expression for $w = \sqrt{w_x^2 + w_y^2}$ in terms of one of either v , c or θ .

The following symbols may be useful: c , $\cos()$, $\sin()$, $\tan()$, θ , v , w

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Partial Fractions 2

A Level Further A



The function $\frac{w+2}{(w-1)(w+1)(2w+1)}$ can be written as $\frac{A}{(w-1)} + \frac{B}{(w+1)} + \frac{C}{(2w+1)}$. Using the substitution method find the constants A , B and C .

Part A Find A

Find the constant A .

The following symbols may be useful: A , B , C

Part B Find B

Find the constant B .

The following symbols may be useful: A , B , C

Part C Find C

Find the constant C .

The following symbols may be useful: A , B , C



Partial Fractions 1

A Level Further A



The function $\frac{2x-1}{(3x-2)(x-1)}$ can be written as $\frac{A}{3x-2} + \frac{B}{x-1}$. Find A and B .

Part A Find A

Find the constant A .

Part B Find B

Find the constant B .

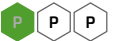


Algebraic manipulation 4.1

GCSE



A Level



Rearrange each of the following equations to make the indicated symbol the subject.

Part A Find b if $1/4a - c/3b = 1$

Make b the subject of the equation $\frac{1}{4a} - \frac{c}{3b} = 1$.

The following symbols may be useful: a , b , c

Part B Find q if $p = 2/q^2 + 3/r$

Consider the equation $p = \frac{2}{q^2} + \frac{3}{r}$. Show that if you make q the subject of this equation it can be written in the form $q = \pm S$ and find an expression for S .

The following symbols may be useful: S , p , r

Part C Find x if $1/x^2 - a/z^2 = b$

Consider the equation $\frac{1}{x^2} - \frac{a}{z^2} = b$. Show that if you make x the subject of this equation it can be written in the form $x = \pm Y$ and find an expression for Y .

The following symbols may be useful: Y , a , b , z

Part D Find m if $m/a + n/b = c$

Make m the subject of the equation $\frac{m}{a} + \frac{n}{b} = c$.

The following symbols may be useful: a , b , c , m , n

Part E Find s if $2/r - 5/s = 6$

Make s the subject of the equation $\frac{2}{r} - \frac{5}{s} = 6$.

The following symbols may be useful: r , s

Part F Find r if $1/p = 1/q + 1/r$

Make r the subject of $\frac{1}{p} = \frac{1}{q} + \frac{1}{r}$.

The following symbols may be useful: p , q , r

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Matrix Non-Commutativity



Which of the following pairs of matrices A and B are such that $AB = 0$ and $BA \neq 0$ for non-zero a and b ?

☐

$$A = \begin{pmatrix} a & -b \\ a & -b \end{pmatrix}$$

$$B = \begin{pmatrix} b & b \\ a & a \end{pmatrix}$$

☐

$$A = \begin{pmatrix} a & b \\ a & b \end{pmatrix}$$

$$B = \begin{pmatrix} a & b \\ a & b \end{pmatrix}$$

☐

$$A = \begin{pmatrix} a & b \\ a & b \end{pmatrix}$$

$$B = \begin{pmatrix} b & b \\ a & a \end{pmatrix}$$

☐

$$A = \begin{pmatrix} -a & -b \\ a & -b \end{pmatrix}$$

$$B = \begin{pmatrix} b & b \\ a & -a \end{pmatrix}$$



2x2 Matrix Inversion

Let the matrix **A** be

$$\mathbf{A} = \begin{pmatrix} 3 & -2 \\ 4 & -3 \end{pmatrix}$$

Calculate the matrices listed below. In each case, your result will have the form

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}.$$

Part A Inverse of **A**

Find the inverse of **A**.

Give your answer in the form of a bracketed list (a, b, c, d) .

Do not include ANY spaces.

Part B $\mathbf{A}\mathbf{A}^{-1}$

Find $\mathbf{A}\mathbf{A}^{-1}$.

Give your answer in the form of a bracketed list (a, b, c, d) .

Do not include ANY spaces.

Part C $\mathbf{A}^{-1}\mathbf{A}$

Find $\mathbf{A}^{-1}\mathbf{A}$.

Give your answer in the form of a bracketed list (a, b, c, d) .

Do not include ANY spaces.
