CAMBRIDGE TECHNOLOGY IN MATHS

Year 11
Reviewing linear equations for the ClassPad

CONTENTS

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Example: Equations containing fractions

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

Solution

Remember that the line separating the numerator and the denominator (the vinculum) acts as a bracket.

Multiply by 6, the lowest common denominator.

$$\begin{aligned} \frac{x-3}{2} \times 6 - \frac{2x-4}{3} \times 6 &= 5 \times 6 \\ 3(x-3) - 2(2x-4) &= 5 \times 6 \\ 3x - 9 - 4x + 8 &= 30 \\ 3x - 4x &= 30 + 9 - 8 \\ -x &= 31 \\ x &= \frac{31}{-1} \\ &= -31 \end{aligned}$$

Check: $\text{LHS} = \frac{-31-3}{2} - \frac{2 \times -31 - 4}{3}$

$= \frac{-34}{2} - \frac{-66}{3} = -17 + 22 = 5$

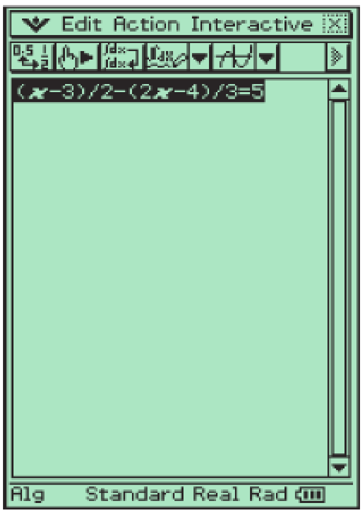
$\text{RHS} = 5$

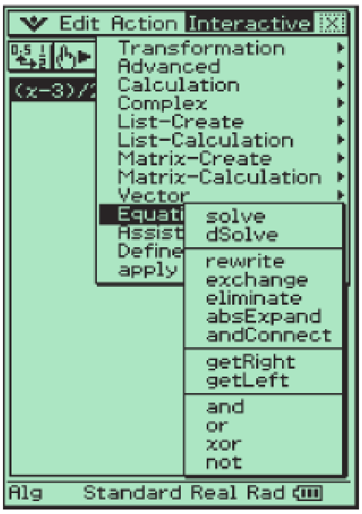
$\therefore$ solution is correct.

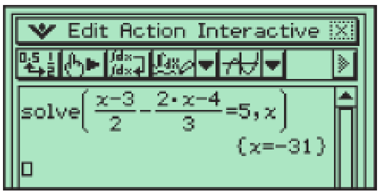
Using the Casio ClassPad

In the Main screen enter the equation and highlight it using the stylus (remember to use brackets since the numerators have more than one term).

Select **Interactive—Equation/Inequality—solve** and ensure the variable selected is x.







Original location: Chapter 1 Example 5 (p.4-5)

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Example: Literal equation

Solve $ax + b = cx + d$ for x.

Solution

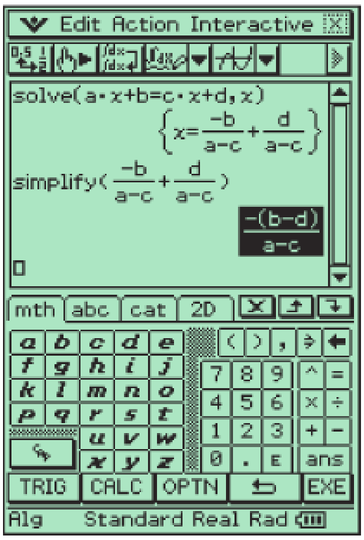
$$\begin{aligned} ax + b &= cx + d \\ ax - cx &= d - b \\ (a - c)x &= d - b \\ x &= \frac{d - b}{a - c} \end{aligned}$$

Using the Casio ClassPad

Turn on the keyboard and select VAR (bottom right of screen). This will bring up the variables (bold italics).

Enter the equation and highlight the equation (* is not required if using the VAR entry screen). Select **Interactive—Equation/ Inequality—solve** and ensure the variable selected is x.

If necessary the answer may be simplified further by copying the part of the answer after the $=$ sign into the next line and selecting **Interactive—Transformation—simplify**.



Example: Simultaneous equations

Solve the equations $2x - y = 4$ and $x + 2y = -3$.

Solution

1 By substitution

$$2x - y = 4 \quad (1)$$
$$x + 2y = -3 \quad (2)$$

First express one unknown from either equation in terms of the other unknown.

From equation (2) we get $x = -3 - 2y$.

Then substitute this expression into the other equation.

Equation (1) then becomes $2(-3 - 2y) - y = 4$ (reducing it to one equation in one unknown)

Solving (1)

$$-6 - 4y - y = 4$$
$$-5y = 10$$
$$y = -2$$

Substituting the value of y into (2) $x + 2(-2) = -3$

$$x = 1$$

Check in (1): LHS $= 2(1) - (-2) = 4$

RHS $= 4$

Note: This means that the point (1, –2) is the point of intersection of the graphs of the two linear relations.

2 By elimination

$$2x - y = 4 \quad (1)$$
$$x + 2y = -3 \quad (2)$$

If the coefficient of one of the unknowns in the two equations is the same, we can eliminate that unknown by subtracting one equation from the other. It may be necessary to multiply one of the equations by a constant to make the coefficients of x or y the same for the two equations.

To eliminate x, multiply equation (2) by 2 and subtract the result from equation (1).

Equation (2) becomes $2x + 4y = -6 \quad (2')$

Then

$$2x - y = 4 \quad (1)$$
$$2x + 4y = -6 \quad (2')$$

Subtracting (1) – (2′):

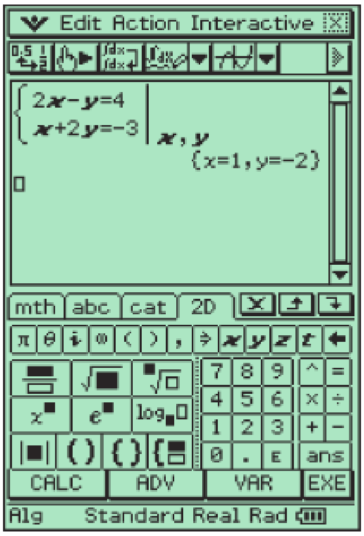
$$-5y = 10$$
$$y = -2$$

Now substitute for y in equation (1) to find x, and check as in **substitution** method.

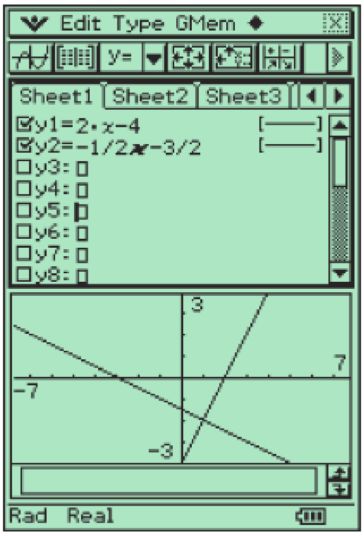
Using the Casio ClassPad

To solve simultaneous equations algebraically, turn on the keyboard and select 2D—{.

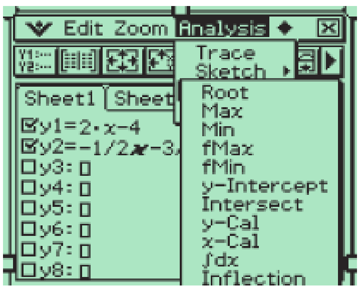
Enter the two equations into the two lines and type x,y in the bottom right square to indicate the variables. Select **EXE**.

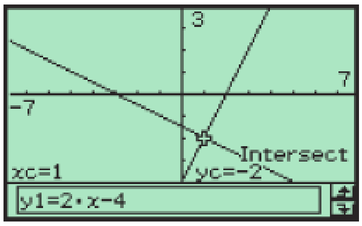


The simultaneous equations can also be solved graphically. First the equations need to be rearranged to make y the subject. In this form the equations are $y = 2x - 4$ and $y = -\frac{1}{2}x - \frac{3}{2}$. Enter these in the Graph&Tab area as shown. Select both equations by ticking the box at the left, then press to produce the graph.



To find the solution click into the graph screen to select it, then click **Analysis—G-Solve—Intersect.**





Example: Solving linear inequations

Solve the inequality $\frac{2x+3}{5} > \frac{3-4x}{3} + 2$.

Solution

$$\frac{2x+3}{5} > \frac{3-4x}{3} + 2$$

$$\frac{2x+3}{5} - \frac{3-4x}{3} > 2$$

Obtain the common denominator on the left-hand side:

$$\frac{3(2x+3)}{15} - \frac{5(3-4x)}{15} > 2$$

Therefore $\quad 3(2x+3) - 5(3-4x) > 30$

and $\quad 6x + 9 - 15 + 20x > 30$

Therefore $\quad 26x - 6 > 30$

and $\quad x > \frac{36}{26}$

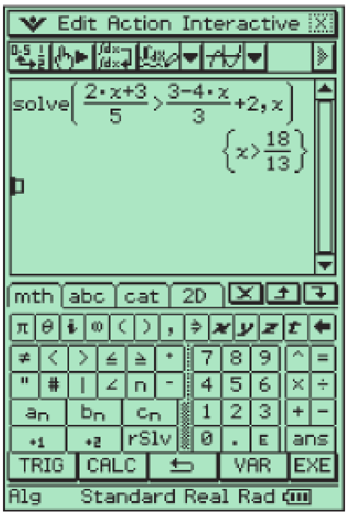
$$\therefore x > \frac{18}{13}$$

Using the Casio ClassPad

Use Main to find the solution to $\frac{2x+3}{5} > \frac{3-4x}{3} + 2$.

Enter, then highlight the inequation $(2x+3)/5 > (3-4x)/3 + 2)$, then select **Interactive**—**Equation/ Inequality**—**Solve** and ensure the variable is x.

Note: To find inequality signs, turn on the keyboard, select the **mth** tab and, if necessary, click the **OPTN** button at the bottom to give you the keyboard screen shown here.



Example: Using and transposing formulae

For each of the following make c the subject of the formula.

a $e = \sqrt{3c - 7a}$ **b** $\frac{1}{a} - \frac{1}{b} = \frac{1}{c-2}$

Solution

a $e = \sqrt{3c - 7a}$

Square both sides of the equation.

$e^2 = 3c - 7a$

Therefore $3c = e^2 + 7a$ and $c = \frac{e^2 + 7a}{3}$

b $\frac{1}{a} - \frac{1}{b} = \frac{1}{c-2}$

Establish common denominator on left-hand side of the equation.

$$\frac{b-a}{ab} = \frac{1}{c-2}$$

Take the reciprocal of both sides.

$$\frac{ab}{b-a} = c - 2$$

Therefore $c = \frac{ab}{b-a} + 2$

Using the Casio ClassPad

Use Main and **Interactive—Equation/Inequality—solve** to give c as the subject of the formula $\frac{1}{a} - \frac{1}{b} = \frac{1}{c-2}$.

Enter, then highlight the equation $1/a - 1/b = 1/(c-2)$. Select **Interactive—Equation/Inequality—solve** and select c as the variable.

(If necessary, copy the solution, then use **Interactive—Transformation—simplify** to produce a neater answer.)