The Association of Teachers of Mathematics
for mathematics educators
primary, secondary and higher

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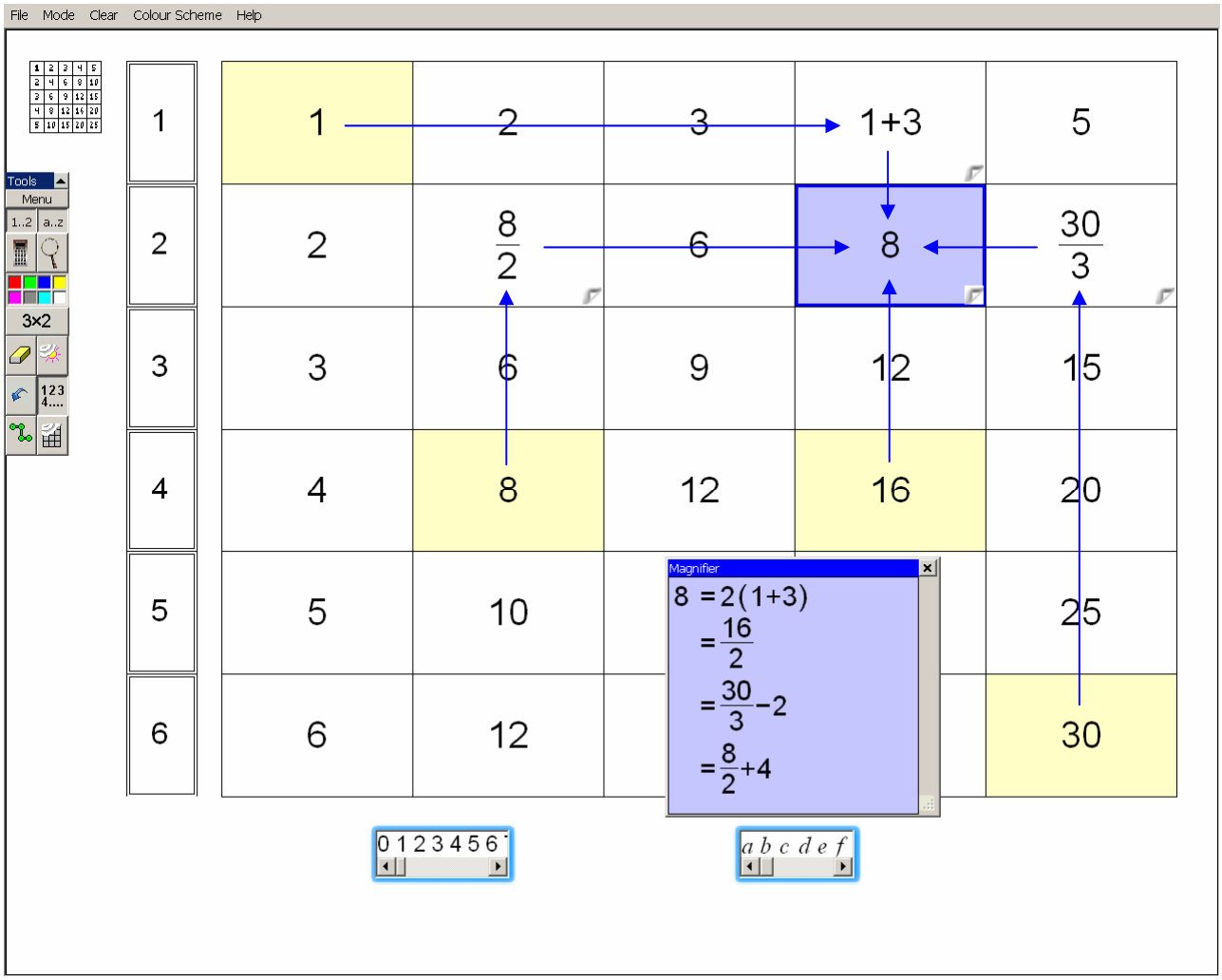
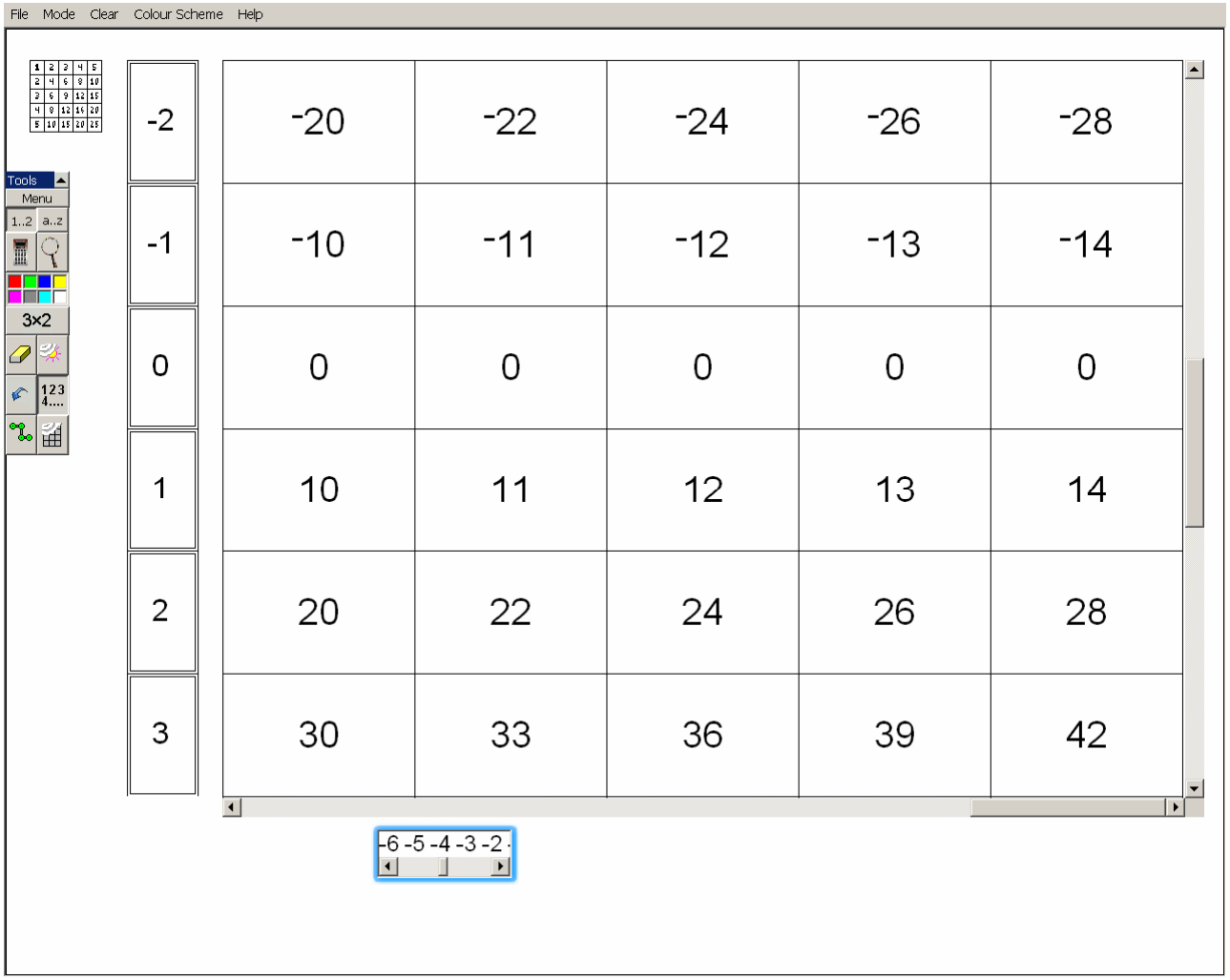
Grid Algebra an ATM Publication

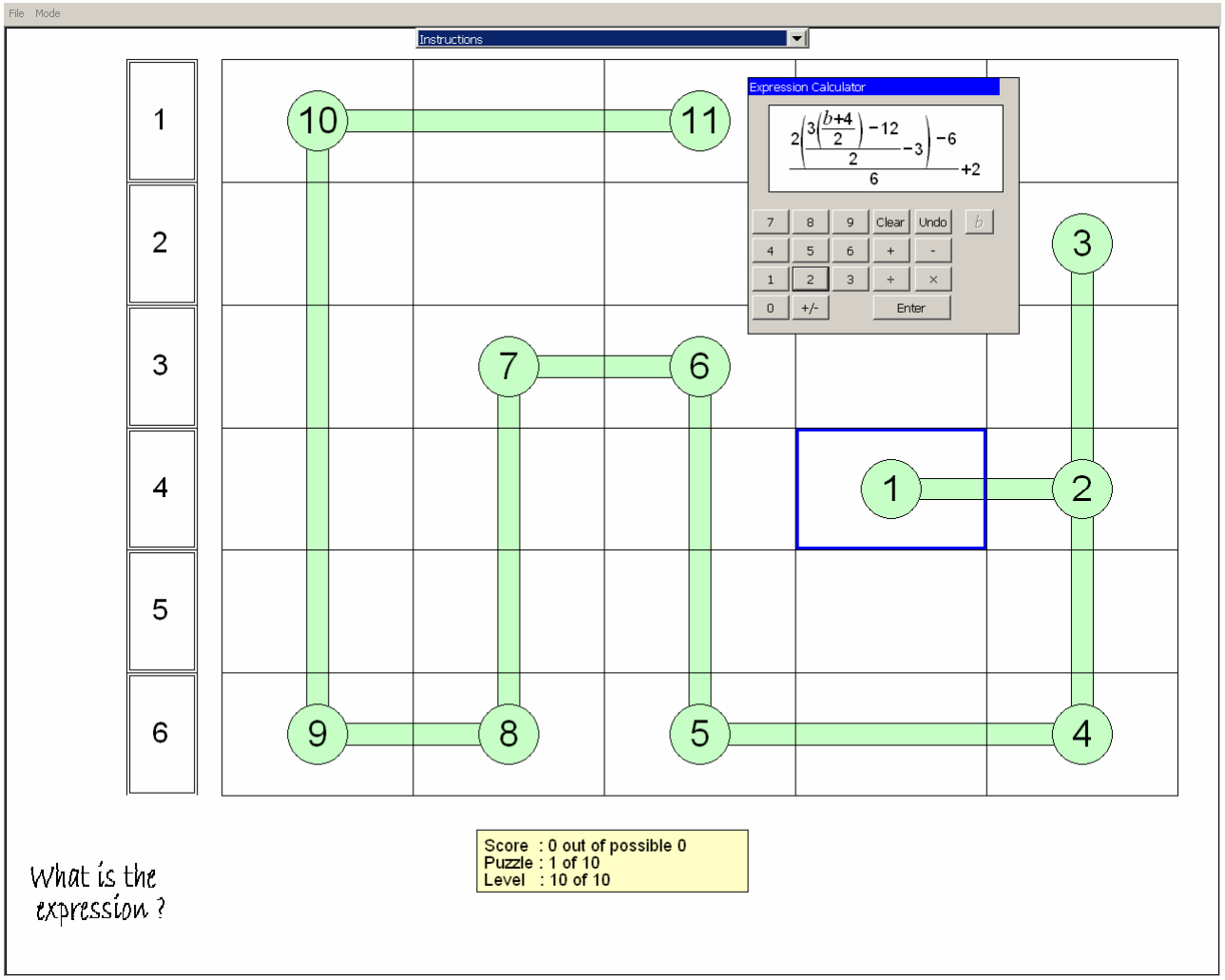
Screenshots and Example Worksheets for KS3+4/Secondary

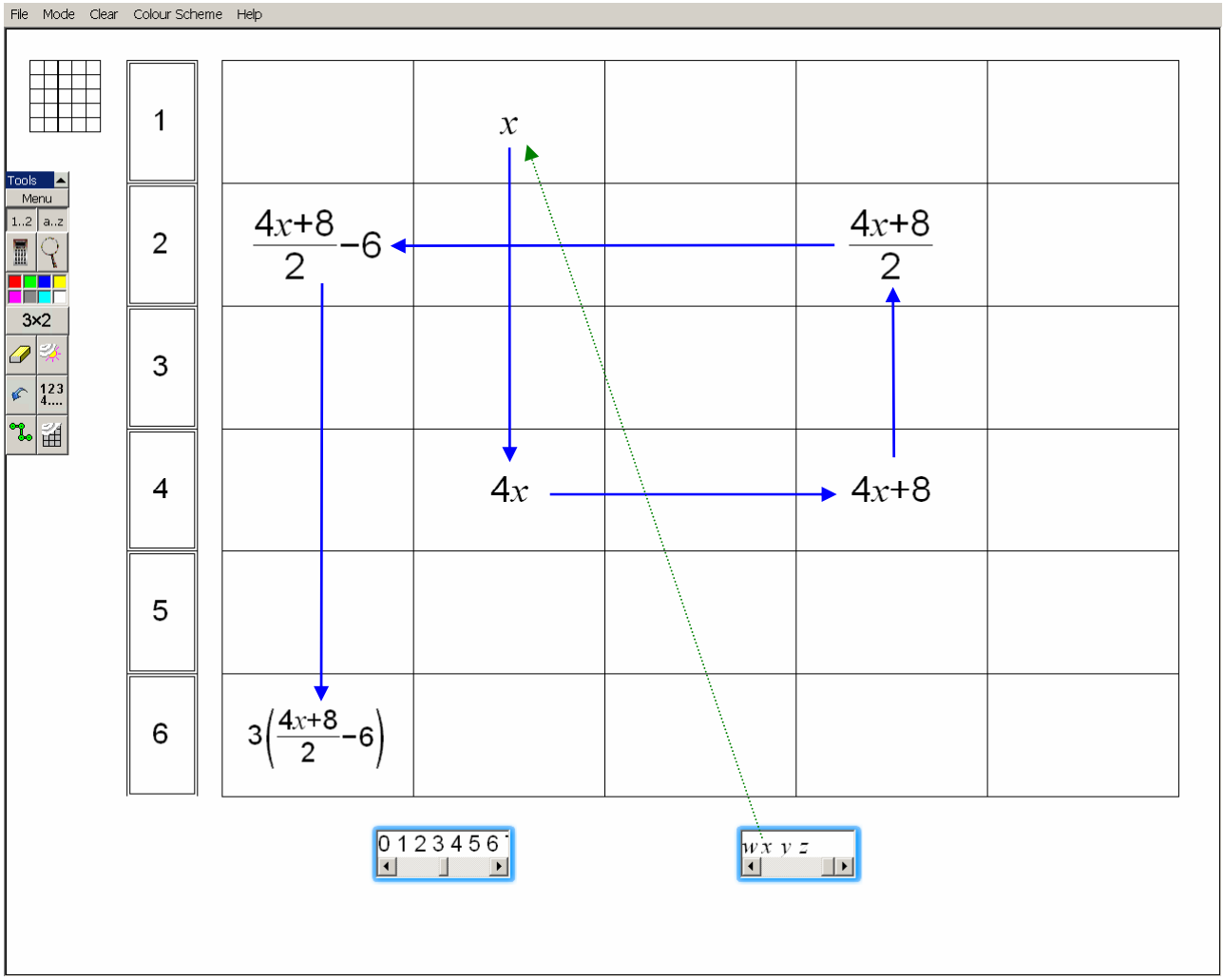
Grid Algebra is available from ATM at: **http://www.atmbuy.net/sof071**

Screenshots

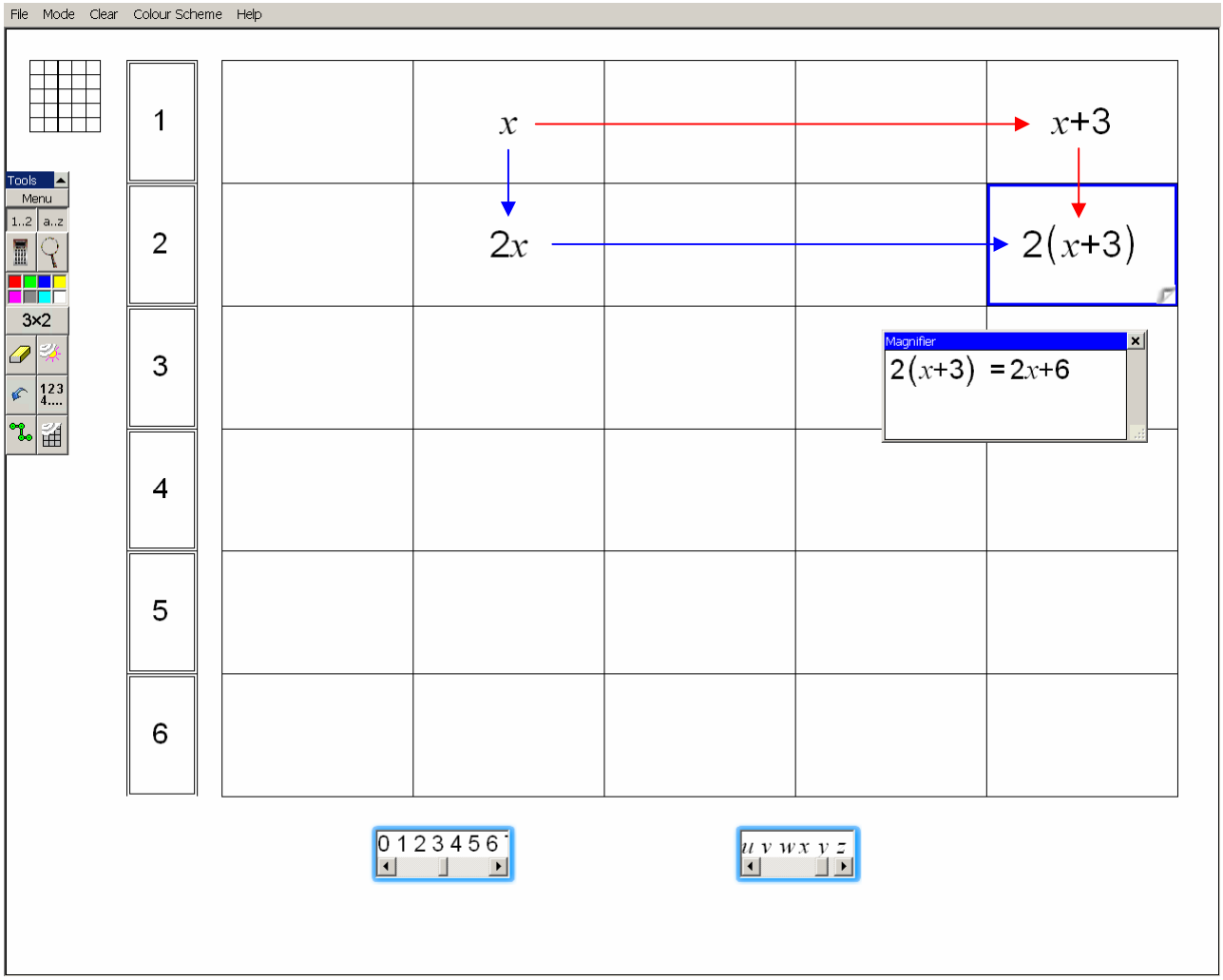


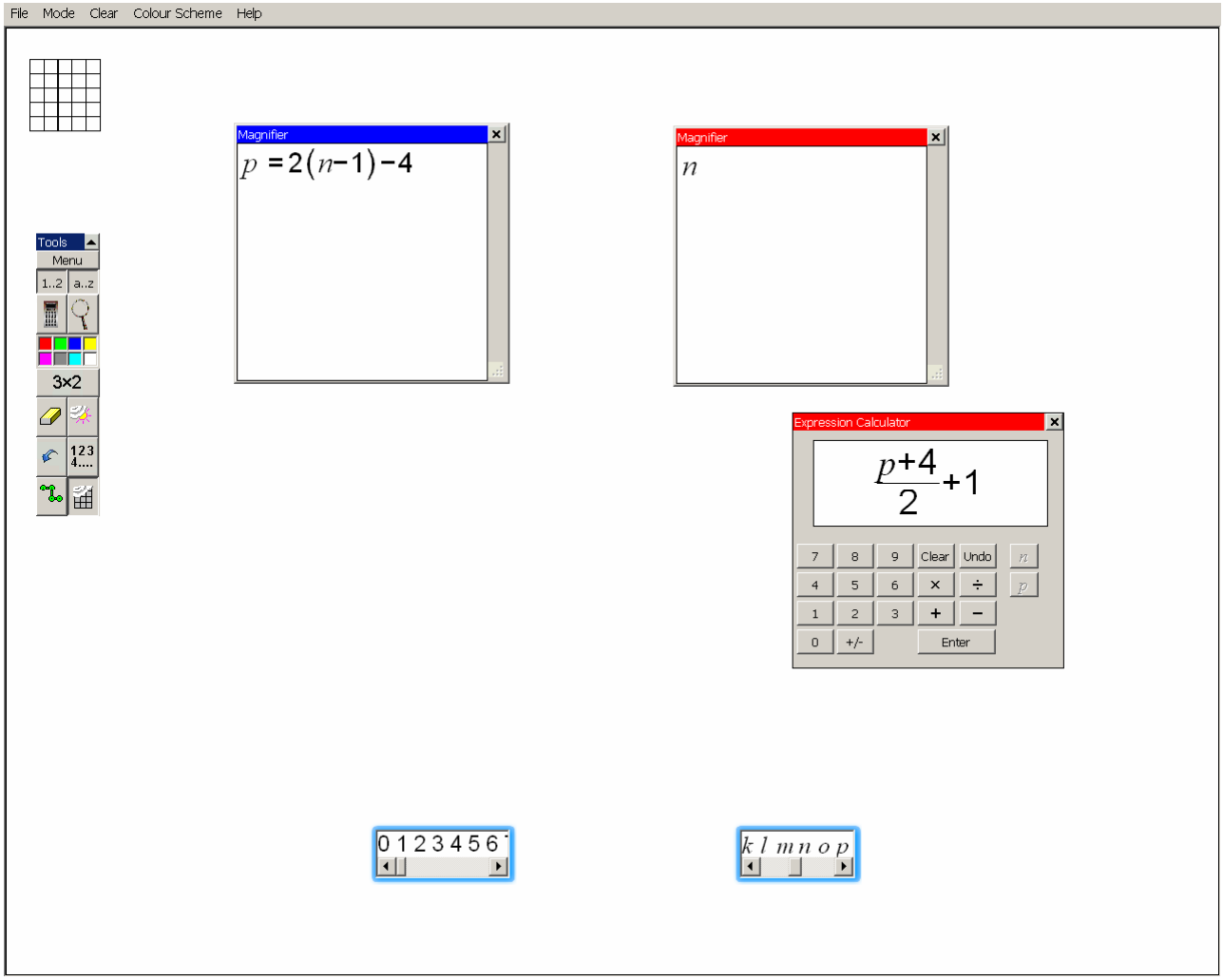

File Mode Clear Colour Scheme Help
Tools
Menu
3×2
-2 -20 -22 -24 -26 -28
-1 -10 -11 -12 -13 -14
0 0 0 0 0 0
1 10 11 12 13 14
2 20 22 24 26 28
3 30 33 36 39 42
-6 -5 -4 -3 -2

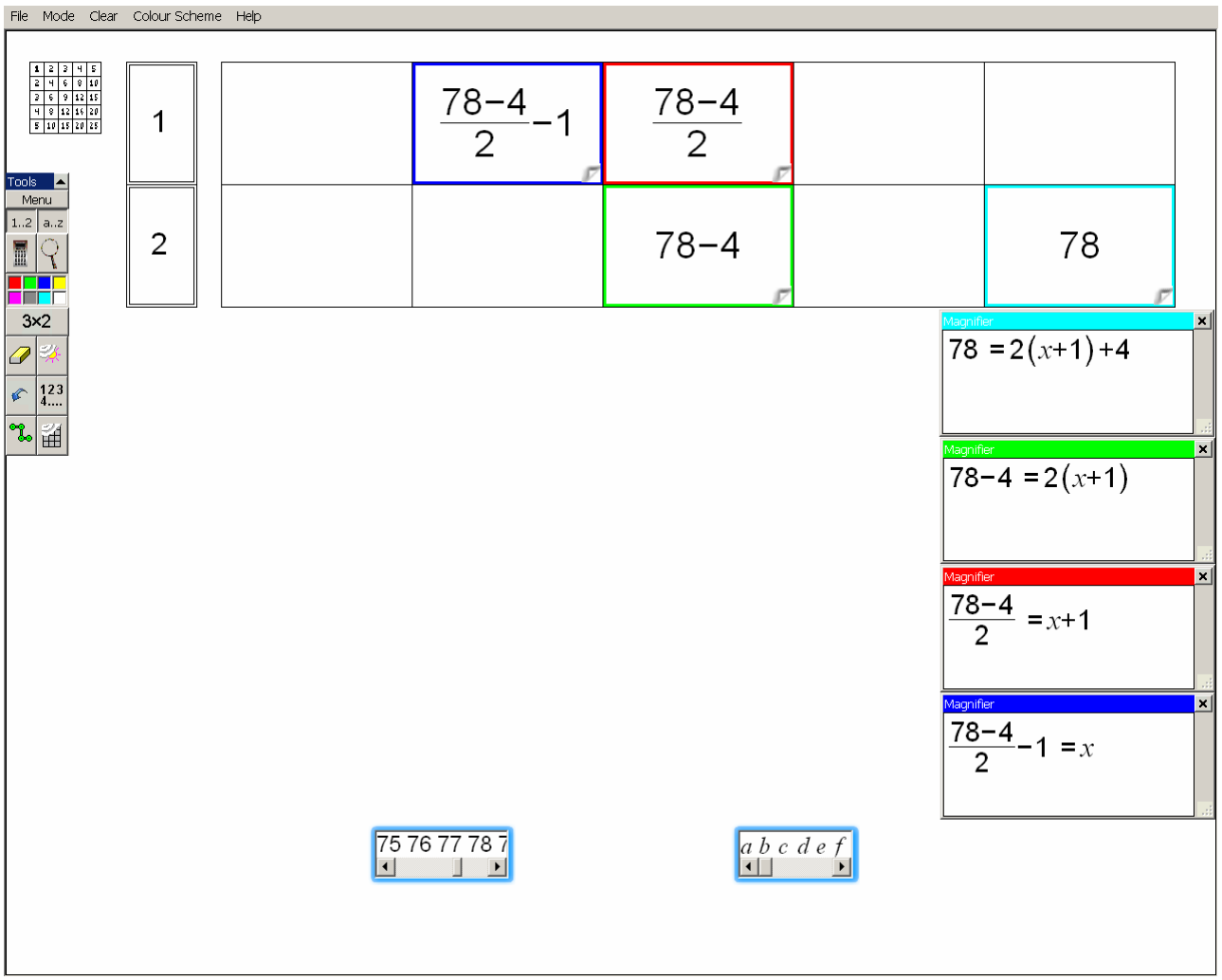

File Mode
Instructions
1
2
3
4
5
6
10
11
7
6
3
1
2
9
8
5
4
Expression Calculator
$2\left(\frac{3\left(\frac{b+4}{2}\right)-12}{2}-3\right)-6$ / 6 +2
7 8 9 Clear Undo b
4 5 6 + -
1 2 3 ÷ ×
0 +/- Enter
Score : 0 out of possible 0
Puzzle : 1 of 10
Level : 10 of 10
What is the expression ?

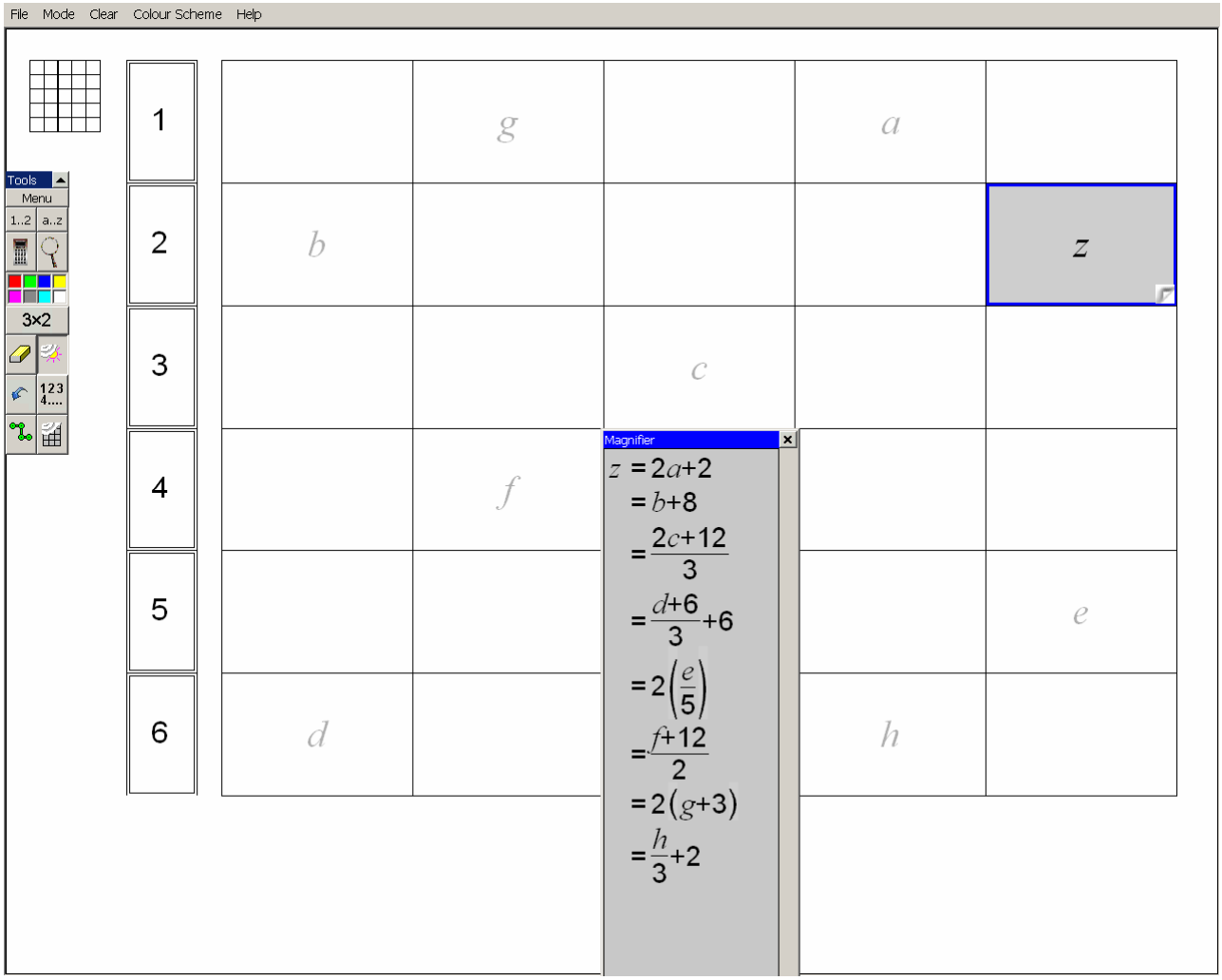


An expression being built from a series of movements


File Mode Clear Colour Scheme Help
Tools
Menu
1..2
a..z
3×2
123
4....
1
2
3
4
5
6
x
x+3
2x
2(x+3)
Magnifier
2(x+3) =2x+6
0 1 2 3 4 5 6
u v w x y z


File Mode Clear Colour Scheme Help
Magnifier
$p=2(n-1)-4$
Magnifier
n
Tools
Menu
1..2
a..z
3×2
123
4....
Expression Calculator
$\frac{p+4}{2}+1$
7 8 9 Clear Undo n
4 5 6 × ÷ p
1 2 3 + −
0 +/- Enter
0 1 2 3 4 5 6
$k\ l\ m\ n\ o\ p$

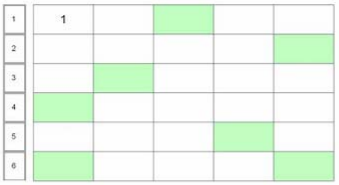

File Mode Clear Colour Scheme Help
Tools
Menu
3×2
1
2
$\frac{78-4}{2}-1$
$\frac{78-4}{2}$
$78-4$
78
Magnifier
$78=2(x+1)+4$
Magnifier
$78-4=2(x+1)$
Magnifier
$\frac{78-4}{2}=x+1$
Magnifier
$\frac{78-4}{2}-1=x$
75 76 77 78 7
a b c d e f

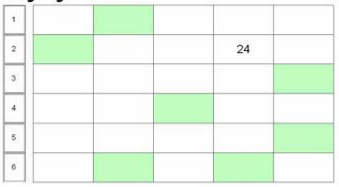

File Mode Clear Colour Scheme Help
Tools
Menu
1..2
a..z
3×2
123
4....
1
2
3
4
5
6
g
a
b
z
c
f
e
d
h
Magnifier
z = 2a+2
= b+8
= (2c+12)/3
= (d+6)/3 +6
= 2(e/5)
= (f+12)/2
= 2(g+3)
= h/3 +2

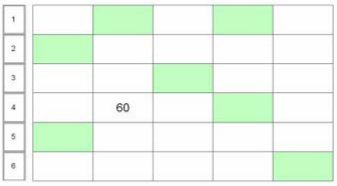
Worksheets suitable for Grid Algebra at KS3+4/Secondary

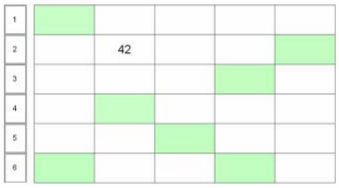
Which number goes here? Six rows.

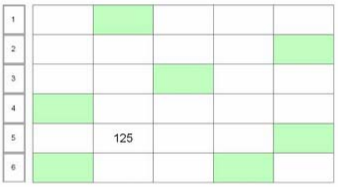
Write in the numbers which should be in the highlighted cells:

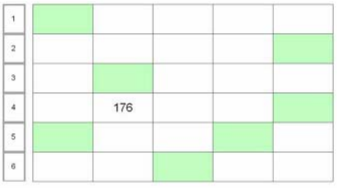




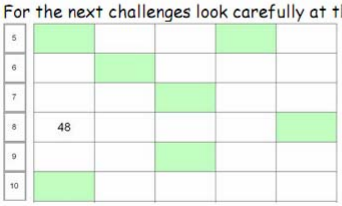


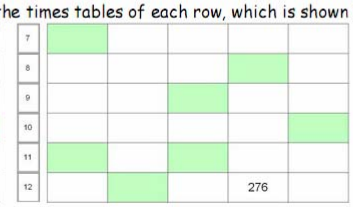


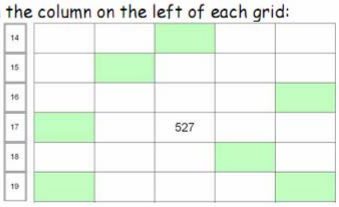




For the next challenges look carefully at the times tables of each row, which is shown in the column on the left of each grid:

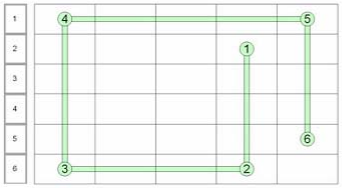


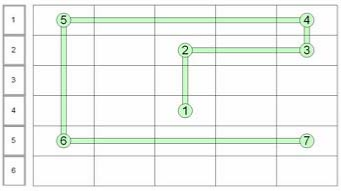


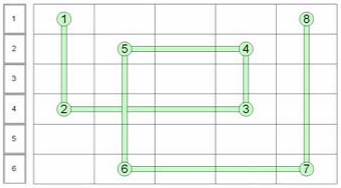


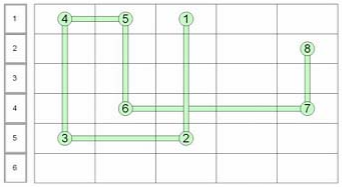
Journeys - large grids

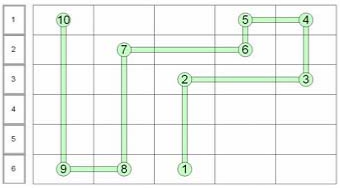
Starting with the letter *n*, write the expression which would result in each of the following journeys:

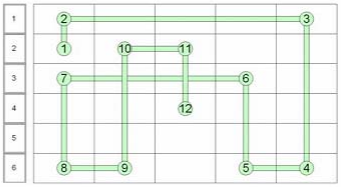


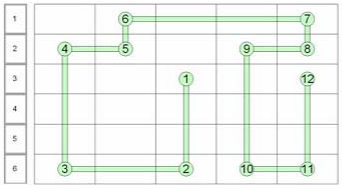


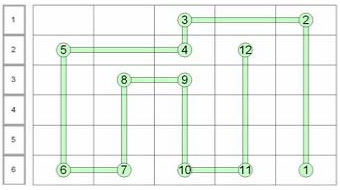


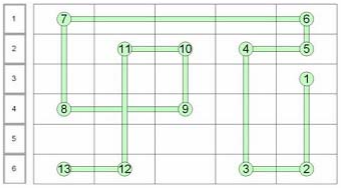












Make these! 6 rows

Try to make these expressions through dragging on the grid.

For each one draw the route you took on a blank grid (be careful to right the start number in the correct cell and then draw arrows from there to show the journey).

Then Click on 'Clear' at top of screen and choose 'All cells'. All the cells will be cleared. Then press on the 'Fill grid' button  on the toolbar and go onto the next question.

Question 1:
$\frac{5+20}{5}$

Question 2:
$6\left(\frac{20}{5}-3\right)$

Question 3:
$2\left(\frac{18}{3}+4\right)$

Question 4:
$\frac{15\times 2-18}{3}$

Question 5:
$6\left(\frac{16-12}{4}+2\right)$

Question 6:
$3\left(\frac{12}{4}-1\right)+9$

Question 7:
$\frac{4\times 5-15}{5}+3$

Question 8:
$\frac{2(3\times 2+4)-12}{4}$

Question 9:
$\frac{\frac{30}{2}-9}{3}+1$

Question 10:
$2\left(\frac{12\times 2-18}{3}+6\right)$

Question 11:
$3\left(\frac{4\times 5-10}{5}+1\right)$

Question 12:
$\frac{3(4+6-8)+12}{2}+3$

Question 13:
$\frac{3\left(\frac{8+12}{2}-6\right)+12}{6}$

Question 14:
$\frac{\frac{6(4-3)+12}{2}+3}{3}$

Question 15:
$2\left(3\left(\frac{18+12}{6}-1\right)-9\right)$

Question 16:
$2\left(3\left(\frac{25}{5}-2\right)-6+3\right)$

Question 17:
$\frac{3(2(1+3)-4)+6}{2}$

Question 18:
$5\left(\frac{2(6+4)-12}{4}-1\right)+15$

Question 19:
$\frac{2\left(3\left(\frac{10+5}{5}-1\right)+9\right)-24}{3}$

Question 20:
$\frac{6\left(\frac{4(5-3)+8}{4}-1\right)-12}{\frac{2}{3}}+3$

A lesson idea for Grid Algebra at KS3+4/Secondary

Grid Algebra: Journeys

Topics

Order of operations
Formal notation

Difficulty range

From ★ ★
To ★ ★ ★ ★ ★

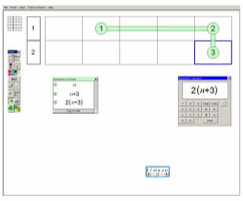
Preparation

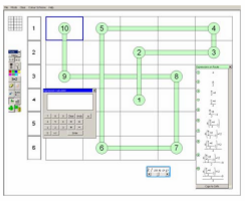
It is assumed students are familiar with making journeys around the grid. It would be useful for them to have worked on the lesson idea *Getting to know the grid*.
Load grid: *Journeys*.
Description of the grid: 5 columns, tables 1 to 2, do not allow negatives.

Activity (assuming an interactive whiteboard or projection – adapt for a computer room)

- Choose a letter, say n, from the letter box at the bottom of the screen and drag it into a cell.
- Click on the 'Route' button on the toolbar and get the two extra buttons appearing at the bottom of the toolbar. Click on the 'New route' button and make a route starting from the cell with n in. At this stage do not make the journey too long, perhaps involving just three cells. When you have finished click again on the 'New Route' button to indicate you have finished making the route.
- Click on the 'Expression Calculator' button on the toolbar and drop the expression calculator into the last cell of the journey.
- The task is to enter in the expression, starting with n, which represents the journey.
- As a check click on the 'Expression Window' button on the toolbar and a window will appear showing the expressions built up along the journey to the final cell. If you wish to do so you can press the 'Copy to cells' button Copy to Cells in the expression window and all the expressions will be copied into their respective cells on the grid. If you want the drawing of the route to disappear then click again on the 'Route' button.
- Repeat the process with other routes, each one getting increasingly longer.
- Take the students into a computer room and get them to create journeys and draw them onto the handout *Grid – 2 rows small* (or a different number of rows depending upon level of challenge wanted) and write down on another sheet the expressions obtained at the end of each journey. These sheets can then be swapped between students for them to work out the final expressions of each journey.

Examples of screens





Extensions/Simplifications

- Start with a number rather than a letter.
- Change the grid to have a fewer or larger number of tables shown.
- Have a fewer or larger number of steps on the journey.

Related Resources

- Handouts:
  - *Journeys small grids*
  - *Journeys large grids*
  - *Grid – 2 rows small* (or a different number of rows depending upon level of challenge wanted. These can be found under General resources)
- Grid Algebra Tasks:
  - *Find the journey (letters)*
  - *Find the journey (numbers)*
  - *Find the journey (letters – small grids)*
  - *Find the journey (numbers – small grids)*
  - *Make the expression (letters)*
  - *Make the expression (letters – small grids)*
  - *Make the expression (numbers)*
  - *Make the expression (numbers – small grids)*
  - *What is the expression?*

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