SUMPUZZLES

USER GUIDE

AIM OF THE APP

Children often misunderstand the equals sign. The equals sign (=) is a statement showing that two sides of the equation have the same value. A lot of children incorrectly believe it is telling them to calculate an answer to write after the equals sign.

EXAMPLE:

When given 9+7= children think '=' means add the numbers, so they write 16.
Because of this, they often miscalculate questions like 9+7= □ +5.
They may incorrectly write 16 in the box or add all of the numbers up and write 21.
The correct answer to this would be 11, since 9+7=16 and 11+5=16 therefore 9+7=11+5.

Sum Puzzles aims to bridge the gap in understanding the equals sign. Research has shown that better knowledge of the equals sign in early learning can lead to more success in algebra later on. An incorrect understanding can limit students' capabilities.

The puzzles in the app encourage students to swap one side of the equals sign for the other, to change an equation into its result.

EXAMPLE OF HOW TO SWAP ONE SIDE OF THE EQUALS SIGN FOR THE OTHER:

$4 \times 3 + 25 = 12 + 25 = 37$

$4 \times 3 = 12$

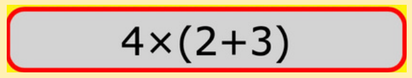
Here, the student is using 4x3=12 to change the 4x3 to 12.

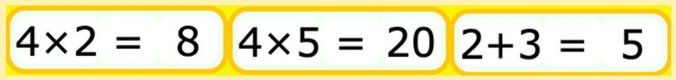
The app can also be used for the students to create their own puzzles.

HOW TO SOLVE PUZZLES

In each puzzle, we are given 3 pieces of information:

1. A red number in a white box 

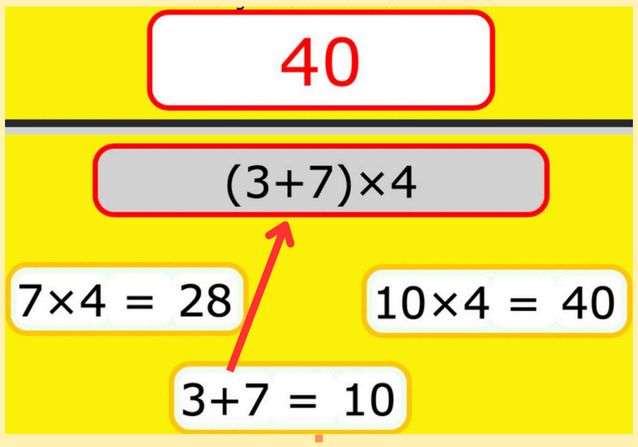
2. An expression in a grey box 

3. A selection of smallerexpressions 

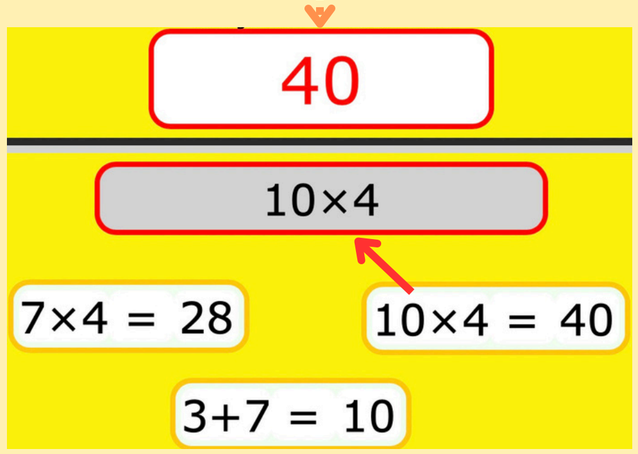
GOAL:

The students must change the expression in the grey box to the number in the white box. They do this by matching parts of the expression in the grey box to equivalent expressions in the smaller boxes.

EXAMPLE:



- Here we need to change the expression in the grey box to make 40.
- We can drag the ‘3+7’ (from the small box) ontop of the ‘3+7’ (in the grey box). Now the grey box reads ‘10x4'.



- Then, drag the ‘10x4’ from the small box to the grey box.
- Now the value of the grey box is 40.
- The substitution is complete. The number in the white box will then turn from red to green to show the puzzle is solved.

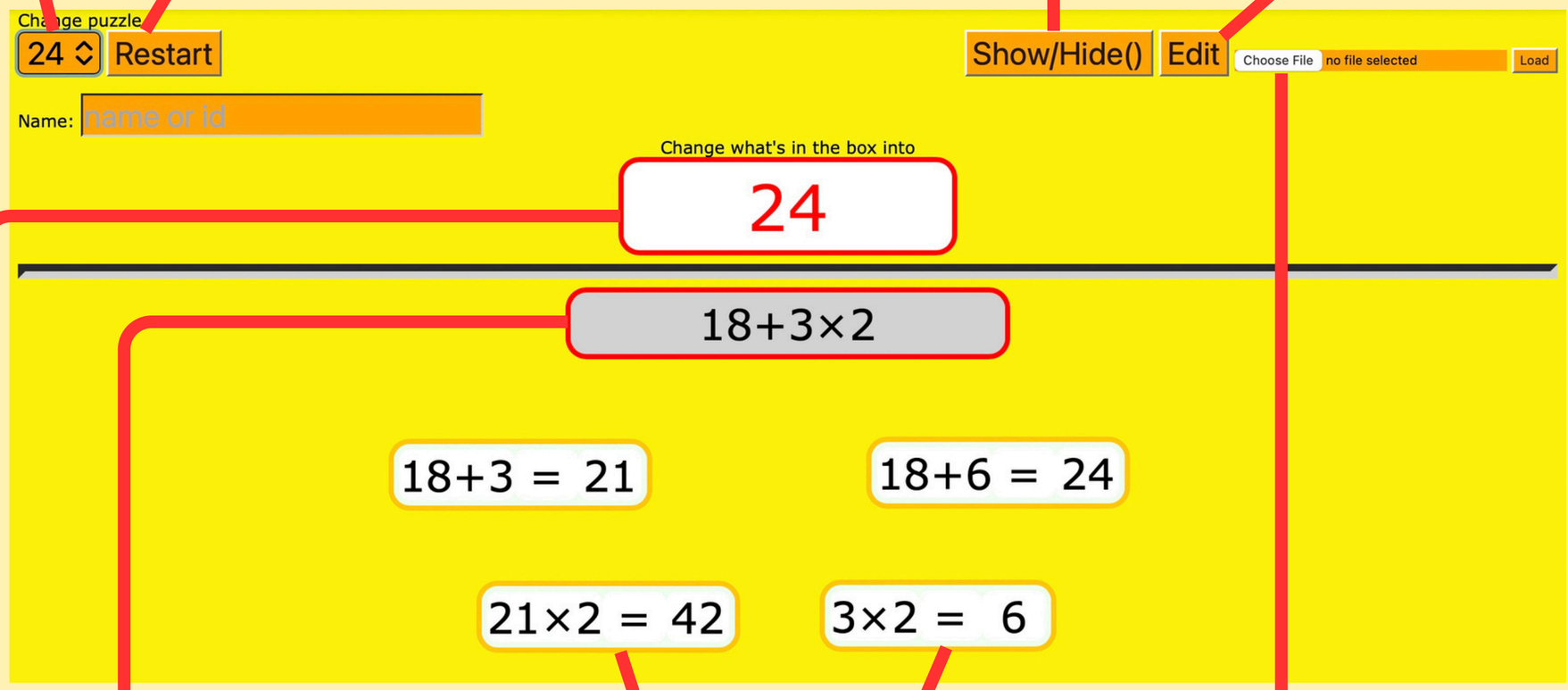
THE SUM PUZZLES HOME PAGE

Use this drop list to change between puzzles.

The ‘Restart’ button can be used to reset the puzzle to its original state, if the student gets stuck and wants to try again.

Shows or hides the brackets in the grey box equation (e.g. ‘18+3x2’ or ‘18+(3x2)’).

Allows student to edit the current puzzle on screen by changing the values in each box.



The students goal is to form the number in the white box from the equation in the grey box.

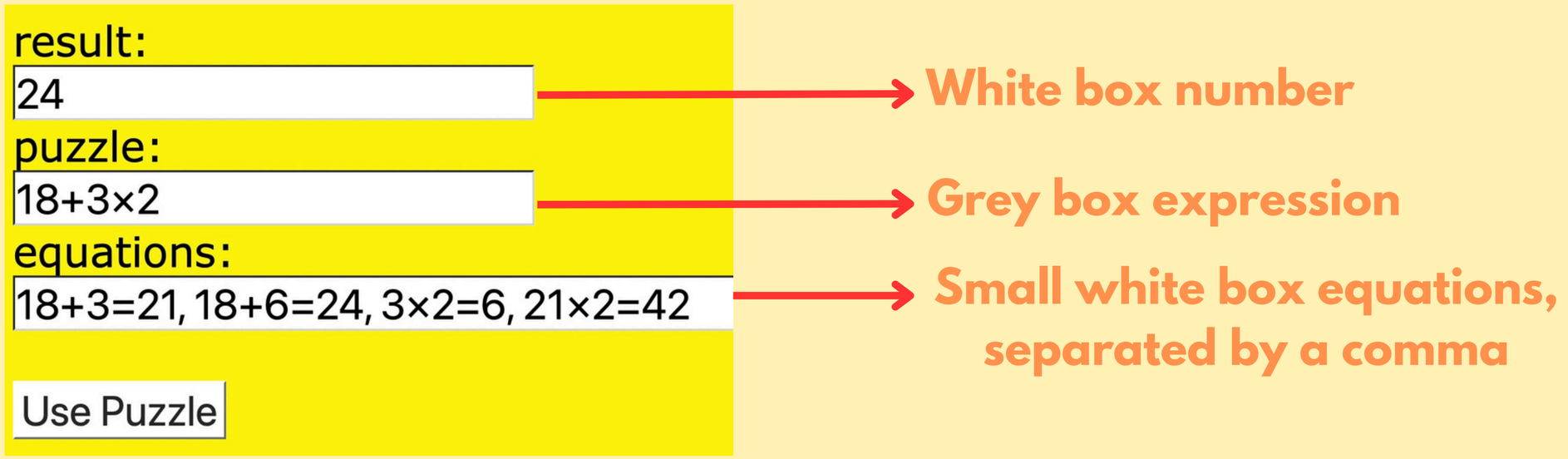
The smaller expressions in the white boxes can be dragged for substitutions.

This button allows you to upload your own puzzles. This is explained in the next page.

CREATING NEW PUZZLES

Encouraging your students to form their own puzzles is very beneficial. It allows them to deepen their understanding of the equals sign beyond only solving puzzles. It enables them to combine and apply multiple aspects of their learning.

EDIT CURRENT:



Input the required values and then click ‘Use Puzzle’ to create the interactive puzzle.

The following is a more advanced way to add your own puzzles:

INPUT NEW : To upload a selection of new puzzles from a file, the file should include your questions in this format:

{"result":"50","puzzle":"31+19","equations":"31=23+8, 19+8=27, 8+19=19+8, 27+23=50, 23+27=27+23"},

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[

{"result":"50","puzzle":"31+19","equations":"31=23+8, 19+8=27, 8+19=19+8, 27+23=50, 23+27=27+23"},

{"result":"74","puzzle":"40+34","equations":"34=30+4, 30+40=70, 4+70=74, 4+70=70+4, 40+30=30+40"},

{"result":"152","puzzle":"65+87","equations":"87=80+7, 65=5+60, 7+5=12, 80+60=140, 140+5=5+140, 140+12=152,
80+60=60+80"},

{"result":"315","puzzle":"109+206","equations":"109=109+9, 206=200+6, 6+9=15, 200+100=300, 300+15=315,
6+9=9+6, 200+100=100+200, 300+9=9+300, 100+9=9+100"},

{"result":"23","puzzle":"143+77","equations":"77=11+33, 143=50+43, 33+43=52, 50+11=80, 11+43=65, 52+80=23,
11+33=33+11, 80+52=52+80, 43+11=11+43, 65+33=33+65"}

]
```

Here is an example of a file containing 5 puzzles.
Write each new puzzle within curly brackets and state the chosen terms for the result, puzzle and equations. Separate each puzzle with a comma.

Then, click the ‘Load’ button to upload your questions into the app.

EXAMPLES OF EQUATIONS

There are many different types of equations to use in the puzzles other than the standard format (e.g. 23+14=37)

EXAMPLE:

If our grey box expression is $46+11\times2$

Here are some equations we could use in the smaller boxes :

1. Partition a number into smaller parts $11=10+1$
2. Change the order of numbers in the equation $10+1=1+10$
3. Change the numbers to make the equation easier $46+22=48+20$
4. Use operations that cancel each other out $46+2-2=46$
5. Use the distributive law by expanding brackets $2\times(10+1)=20+2$
6. Reverse the standard format, putting the number first $68=48+20$

This example in the Sum Puzzles app: