



MATHEMATICS CHALLENGE FOR YOUNG AUSTRALIANS
PRIMARY: YEARS 5, 6 and 7
WARM UP PROBLEM 04

Gridlock

Jack found a game on the internet called Gridlock:

<div style="border: 1px solid black; width: 20px; height: 20px; background-color: #cccccc; margin: 5px;"></div>	×	<div style="border: 1px solid black; width: 20px; height: 20px; background-color: #cccccc; margin: 5px;"></div>	=	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px;"></div>		<div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px; text-align: center;">1</div>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px; text-align: center;">2</div>
			+				
<div style="border: 1px solid black; width: 20px; height: 20px; background-color: #cccccc; margin: 5px;"></div>	×	<div style="border: 1px solid black; width: 20px; height: 20px; background-color: #cccccc; margin: 5px;"></div>	=	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px;"></div>		<div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px; text-align: center;">3</div>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px; text-align: center;">4</div>
			+				
<div style="border: 1px solid black; width: 20px; height: 20px; background-color: #cccccc; margin: 5px;"></div>	×	<div style="border: 1px solid black; width: 20px; height: 20px; background-color: #cccccc; margin: 5px;"></div>	=	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px;"></div>		<div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px; text-align: center;">5</div>	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px; text-align: center;">6</div>
<i>GRIDLOCK</i>				=	<i>GRIDLOCK</i>		
<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">Calculate</div>				<div style="border: 1px solid black; width: 20px; height: 20px; border-radius: 50%; margin: 5px;"></div>	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">Reset +</div>		<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">Reset ×</div>

To play the game you have to drag the numbers 1 to 6 into the shaded boxes in the grid. When you click Calculate the computer multiplies the numbers across the rows and puts the answers in the boxes on the right of the equal signs. It

then adds these answers and puts the total in the circle at the bottom. If the answer is even, you win. If it is odd, you lose. Jack dragged the numbers to the shaded boxes as shown below. He clicked and the computer gave him the answer 29.

6 × 1 = 6

2 × 4 = 8

5 × 3 = 15

GRIDLOCK = *GRIDLOCK*

- Jack played several games and kept getting odd answers. 'You can't win at this game', he complained. Show that Jack is wrong.
- If the button is clicked, then all five operation signs become + and if the button is clicked, then all five operation signs become ×. If Jack clicks on one of these reset buttons, then he will always win, and if he clicks on the other he will always lose. Explain why for each case.
- Jack found a game called Gridlock Two. It has nine shaded boxes into which you have to drag the numbers 1 to 9. The computer adds across each row and then multiplies the answers. Again, if the answer is even, you win, and if it is odd, you lose. Jack dragged the numbers into the shaded boxes as shown, and won.

The screenshot shows a game interface for 'GRIDLOCK'. It features three rows of numbers in boxes, each followed by an equals sign and a result box. The first row shows 1 + 3 + 4 = 8. The second row shows 2 + 8 + 5 = 15. The third row shows 9 + 6 + 7 = 22. Below these rows are three empty boxes for input. The text 'GRIDLOCK' is displayed in a stylized font. A mouse cursor is pointing at a 'Calculate' button. A circular button with the number '2640' is also visible. The text 'TWO' is displayed in a stylized font. A button labeled '1 → 10' is located at the bottom right.

- (a) Show an arrangement of numbers that loses.
- (b) Jack clicked the $1 \rightarrow 10$ button, which changed the 1 into a 10. Now Jack always wins. Explain why.