

---

## Cross Totals

---

Crosses follow two rules:

- They must contain all the numbers from 1 to 9
- The horizontal and vertical totals must be equal.  
(We call this the **Cross Total**).

In the cross shown here, the Cross Total is 27 because:

adding horizontally:  $2+1+9+8+7 = 27$

adding vertically:  $6+4+9+3+5 = 27$

		6		
		4		
2	1	9	8	7
		3		
		5		

Which Cross Totals are possible?

Which are impossible?

Prove that you are correct.

---

---

---

---

---

---

---

---

---

---

---

	Cross Totals	Rubric	
		Points	Section points
	<p>Gives correct answers: Possible totals are 23, 24, 25, 26, (27)</p> <p><i>Partial credit</i></p> <p>Gives 3 more correct totals (2) Gives 2 more correct totals (1)</p> <p>23 is smallest possible total with 1 in the middle square.</p> <p>27 is biggest possible total with 9 in the middle square.</p> <p>An even number in the middle square is impossible.</p> <p><i>Proof</i></p> <p>Gives correct reasons such as:</p> <p>The total for numbers 1 through 9 is 45. If the the magic total is T, say <math>2T = 45 + \text{the middle number.}</math> So, the middle number must be odd , that is 1, 3, 5, 7 or 9 These middle numbers are all possible.</p>	<p>3</p> <p>(2) (1)</p> <p>1</p> <p>1</p> <p>1</p> <p>4</p>	10
	<b>Total Points</b>		<b>10</b>



