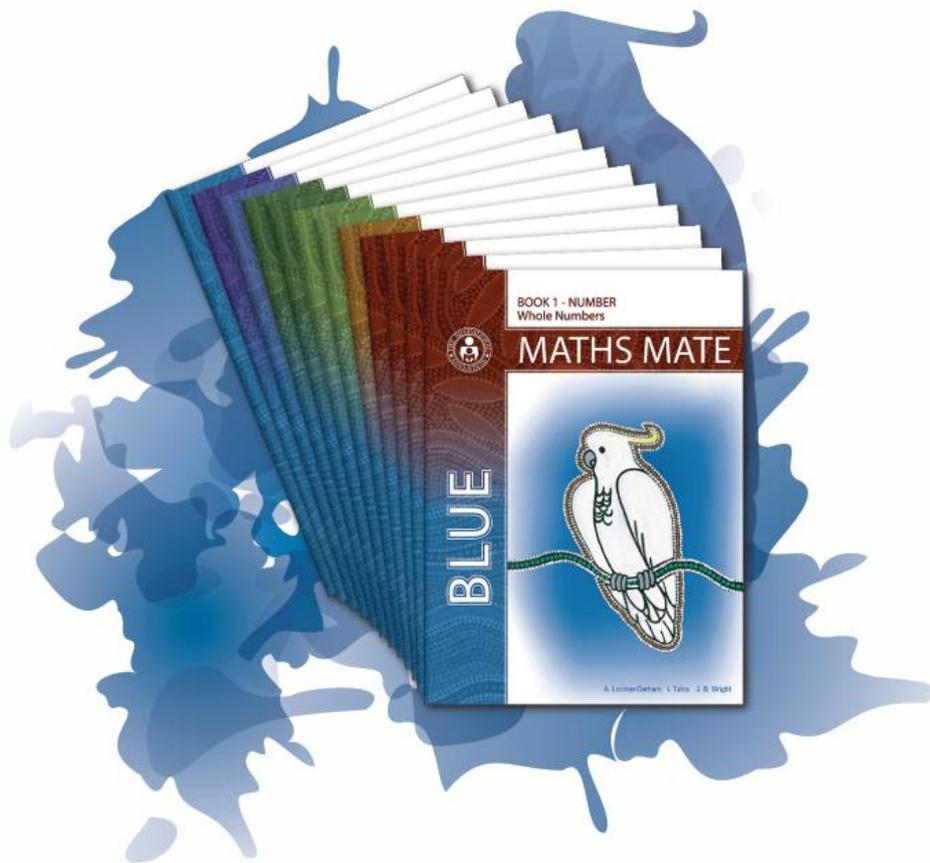




THE EDUCATIONAL ADVANTAGE

BLUE TEXTBOOK



Sample Pages

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BOOK 1 - NUMBER

Whole Numbers

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Fried Circuits

A massive bolt of lightning has caused a power outage at the MCG. Your job is to rewire the fried circuits and restore power to the light towers, one tower at a time. Take too long and the footy game will not go ahead. See how many of the towers you can save without exceeding ten minutes per circuit.

To rewire a circuit:

- All numbers must be included as part of a wire.
- The numbers included as part of each wire must add to 10.
- No wires may cross or share a space with another wire.
- Wires may only run horizontally or vertically.

EXAMPLE #01

	①		⑤		⑦
	①				
		⑧	③		③
			④		⑤
	⑥	②		④	
			⑨	②	

SOLUTION #01

	①		⑤		⑦
	①				
		⑧	③		③
			④		⑤
	⑥	②		④	
			⑨	②	

BEGINNER #01

⑧	⑥			
			③	
		④		
	②	⑦		

BEGINNER #02

	⑧			③
		⑤		⑤
	⑦			
			②	

BEGINNER #03

⑦	②			
			④	
	⑧			
			⑥	③

BEGINNER #04

	⑥		⑤	
	⑤		④	
	⑨			
			①	

EASY #01

5		7			
				8	
	1	5		4	
	2				
	6				
		9		3	

EASY #02

5	3	4	2		5
				1	
	6	7	9	8	

EASY #03

9			5		
			8		
7				2	5
	6				
	3			4	1

EASY #04

	8		5	2	
5				9	
7	6		3		
				1	4

MODERATE #01

	5				2	
		4		3		
6				8		
9			3			
					2	7
				1		

HARD #01

							1
	3				4		
					7		
	1		8				
					1		
			1			6	8
	6				3		
9			2				

1.2 ADDITION OF WHOLE NUMBERS

1.2.1 Adding Whole Numbers

A dodgy batch of calculators has arrived at your school. Buttons keep falling off. The company has given the school a refund, but instead of using it to order more calculators your maths teacher has decided to make do with the broken ones and spend the money saved on a massive end of year party.

There are many Broken Calculator problems in the pages ahead. To solve them you are going to need to get creative and think flexibly about numbers.

For example, you might need to use a broken calculator to solve $9 + 5$, but the number 9 is missing! What would you type instead and how would you know it's the same as pressing $9 + 5$?

One student might solve the problem by pressing $8 + 1 + 5$, then explain "I know this is the same because 8 and 1 makes 9." Another student might type $10 + 4$, then explain, "I know it's the same because I added 1 to the 9 and took away one from the 5."

There are many ways to solve these problems, the most important thing is being able to explain how you know what you typed into the broken calculator was the same as the equation you were given.

Do not work out the answer (in this case 14) then write a random equation (like $28 \div 2$) to equal that number. The point of this challenge is to mimic the process, not the answer.



To add using a vertical algorithm:

- Write the numbers under each other.
- Align the digits according to their place value, units with units, tens with tens, etc.
- Always add from right to left (add the digits in the units column first, then the tens column, followed by the hundreds column, and so on).
- If the digits add to more than 9, carry the 10 to the next column.

1. Set up the vertical algorithm and add the following numbers.

a) $1854 + 124$

$$\begin{array}{r} 1854 \\ + 124 \\ \hline 1978 \end{array}$$

Units: $4 + 4 = 8$
Tens: $5 + 2 = 7$
Hundreds: $8 + 1 = 9$
Thousands: $1 + 0 = 1$

b) $3227 + 360$

$$\begin{array}{r} + \\ \hline \hline \end{array}$$

c) $4627 + 1298$

$$\begin{array}{r} 4627 \\ + 1298 \\ \hline 5925 \end{array}$$

carry 1 ten and 1 hundred to the next columns respectively

U: $7 + 8 = 15$
15 units = 1 ten and 5 units
Carry 1 ten to the tens column.
T: $2 + 9 + \text{carried } 1 = 12$
12 tens = 1 hundred and 2 tens
Carry 1 hundred to the next column.
H: $6 + 2 + \text{carried } 1 = 9$
Th: $4 + 1 = 5$

d) $7546 + 872$

$$\begin{array}{r} + \\ \hline \hline \end{array}$$

Strategies:



- Save time and effort by adding numbers that go well together first, like 1390 and 110.
- OR Replace numbers like 990 with 1000 then take away 10 at the end.
- OR Replace numbers like 299 with 300 then take away 1 at the end, etc.

Use these strategies to answer the following 6 additions. Explain your reasoning.

e) $250 + 73 + 150$

I add $250 + 150$ to make 400, then $400 + 73 = 473$

f) $4238 + 1400 + 600$

g) $4893 + 651 + 107$

h) Add 4210 and 990

i) Sum of 5625 and 199

j) $54943 + 2900$

2. Fill in the missing digits in the additions below.

a)

$$\begin{array}{r} 1 \square 2 \\ \square 4 \square \\ + 971 \\ \hline 2 \square 38 \end{array}$$

b)

$$\begin{array}{r} 159 \\ + \square 5 \square \\ \hline 9 \square 1 \end{array}$$

c)

$$\begin{array}{r} 16\square \\ 208 \\ + 3\square 9 \\ \hline \square 60 \end{array}$$

3. Find the answer to each sum given that nine different digits are used in each question.

a)

$$\begin{array}{r} \square 0 \square \\ + 1 \square 4 \\ \hline \square 8 \square \end{array}$$

b)

$$\begin{array}{r} 7 \square 6 \\ + \square 1 \square \\ \hline 9 \square 0 \end{array}$$

c)

$$\begin{array}{r} \square 4 2 \\ + 1 \square 5 \\ \hline \square \square \square \end{array}$$

4. In these squares each row, each column and each diagonal add to the same number. Fill in the squares.

a)

		17
	15	19
13		

b)

12		
14	10	6

c)

7		1	
		8	11
	3	10	
9		15	4

Sudo-clue: #02

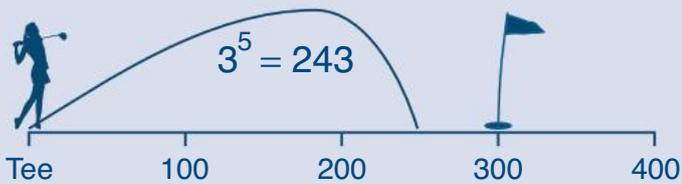
Place the numbers 1 to 9 on the grid using these clues:

- The smallest number is in the top left corner.
- The largest even number is in the middle square.
- The bottom row is made up of all even numbers.
- The number 2 is not in a corner.
- The largest number is directly below the 3.
- The last two numbers in Row A add to 8.
- Multiplying the last two numbers in Column 1 makes 28.

	1	2	3
A			
B			
C			

1.6.3 Evaluating Powers of Whole Numbers

POWER GOLF: Choose a base and a power (both between 0 and 9) to write an expression that is as close to 300 as possible.



Can you get closer to 300 than this golfer's shot?

Can you reach the hole at exactly 300 by playing a second shot?

What is the shortest hole that can't be completed in two shots?



To evaluate a power, multiply the base by itself as many times as indicated by the exponent.

$$\begin{array}{ccccccc}
 & & \text{Exponent} & & & & \\
 \text{Base} & \text{---} & 2^3 & = & 2 \times 2 \times 2 & = & 8 \\
 & \text{---} & \text{Exponent Form} & & \text{Expanded Form} & & \text{Simplified}
 \end{array}$$

Special cases: Any number raised to the power of zero (except 0) equals 1.

Example: $6^0 = 1$

Any number raised to the power of one equals the number itself.

Example: $6^1 = 6$

1. Calculate:

a) 3^5
 $= 3 \times 3 \times 3 \times 3 \times 3$
 $= 9 \times 9 \times 3 = 81 \times 3$
 $= 243$

3 multiplied by itself,
5 times

b) 2^4

c) 4^3

d) 1^5

e) 2^6

f) 8^1

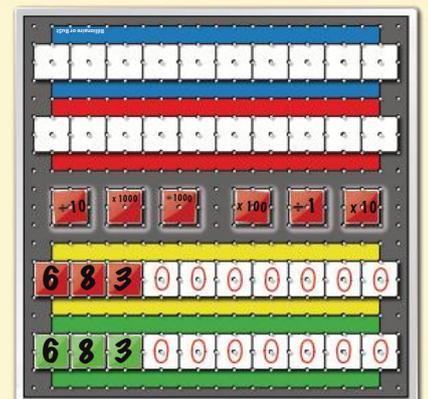
g) 7^0

h) 5^3

Tag 2 Players 15-25 Minutes

Corner and catch your opponent as the chaser or avoid your pursuer as the runner. Players strategically select actions (multiplying or dividing by powers of 10) to catch or avoid one another with the decimal place indicating their location.

Instructions at: thinksquare.com.au/games/tag/



Power Golf

Instructions:

For each hole, create powers that add or subtract to the exact length required for the hole being played.
Each power (eg. $3^4 = 81$) represents one shot.

Example:

On a 100 metre par 3 hole you could play:
 $2^6 = 64$ followed by $6^2 = 36 \Rightarrow 64 + 36 = 100$
 or $5^3 = 125$ followed by $5^2 = 25 \Rightarrow 125 - 25 = 100$
 Either way you have taken 2 shots, giving you a score of 2 for the hole. A birdie! (A birdie is 1 better than par.)

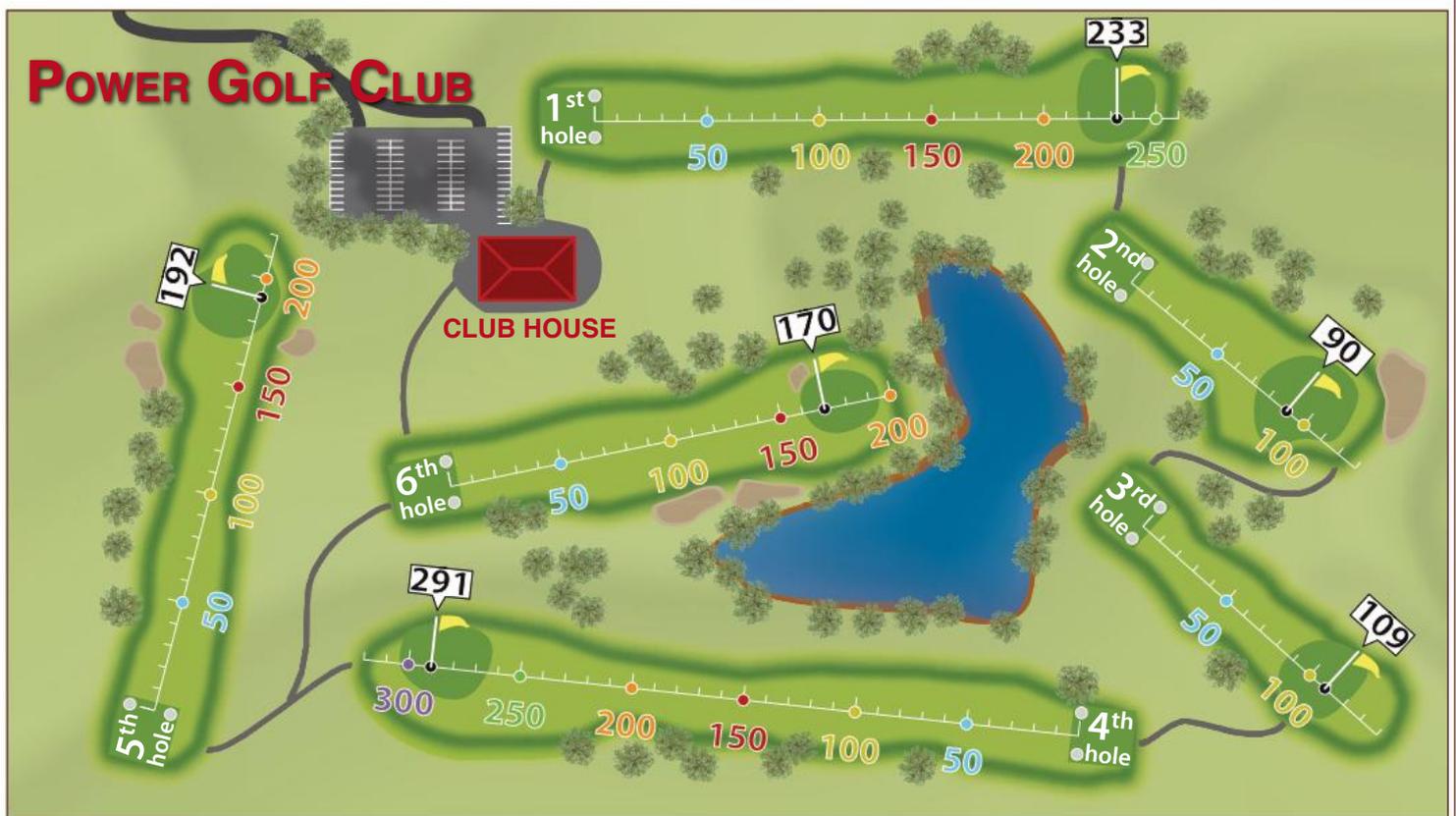
Restrictions:

- No shot is allowed to travel more than 400 m.
- Only the numbers 0 - 9 can be used as bases or powers.
- You must complete all six holes without using any of the numbers 0 - 9 more than 5 times.

Aim:

In golf, the lowest score wins. Par for these 6 holes is a score of 18. Your aim is to score less than 18.

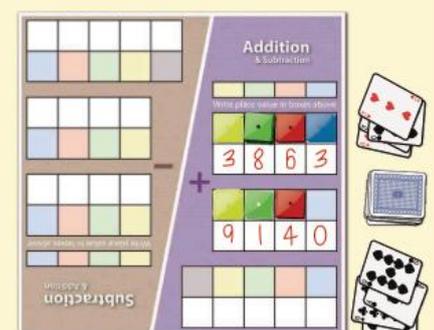
Score Card				
Hole	Par	Length	Powers (Shots)	Score
1	3	233		
2	3	90		
3	3	109		
4	3	291		
5	3	192		
6	3	170		
TOTAL FOR 6 HOLES				



Ten Thousand 2 Players 10-20 Minutes

Work together with a partner to select and place random digits (0-9) to create two four-digit numbers that add to as close to 10,000 as possible.

Instructions at: thinksquare.com.au/games/ten-thousand/



1.12 BOOK 1 - Whole Numbers REVIEW

Multiple Choice

- Which digit in 10 274 is in the tens place?
A 1 **B** 0 **C** 4 **D** 7
- The value of the underlined digit in 2563 is:
A 5 **B** 50 **C** 500 **D** 5000
- Select the largest number:
A 7104 **B** 7140 **C** 7410 **D** 7401
- 2198 rounded to the nearest hundred is:
A 2190 **B** 2200 **C** 2290 **D** 2100
- What is the number of zeros in the result of the multiplication 140×1000 ?
A 3 **B** 4 **C** 5 **D** 6
- What is the remainder of the division $3267 \div 4$?
A 0 **B** 1 **C** 2 **D** 3
- What is $5 \times 5 \times 5 \times 5$ in exponent form?
A 5^3 **B** 20 **C** 5^4 **D** 625
- Which number is not a square number?
A 25 **B** 81 **C** 120 **D** 144
- Which calculation is correct for 3^5 ?
A $5 \times 5 \times 5$
B 3×5
C $3 \times 3 \times 3 \times 3 \times 3$
- What is the lowest common multiple of 4 and 14?
A 2 **B** 14 **C** 28 **D** 56
- What is the highest common factor of 12 and 18?
A 6 **B** 3 **C** 2 **D** 36
- Which is not a prime number?
A 7 **B** 9 **C** 11 **D** 13
- As a product of its prime factors, 36 is:
A $3 \times 3 \times 4$
B $2 \times 3 \times 6$
C $2 \times 2 \times 3 \times 3$

Short Answer

- What is the value of the underlined digit?
a) 4208 **b)** 11967
- Re-order from smallest to largest.
a) 75, 1075, 750, 1705, 1057

b) 3062, 3620, 3206, 3602, 3026

- Round these numbers to the nearest ten:
a) 4506 **b)** 399
- Evaluate the following:
a) $3289 + 19\,562$ **b)** $7043 - 855$

$$\begin{array}{r} + \\ \hline \end{array}$$

$$\begin{array}{r} - \\ \hline \end{array}$$

c) 4122×6 **d)** 738×15

$$\begin{array}{r} \times \\ \hline \end{array}$$

$$\begin{array}{r} \times \\ \hline \end{array}$$

- e)** 504×100 **f)** $18\,000 \div 100$
- g)** $2096 \div 4$ **h)** $1488 \div 12$
- i)** 8^2 **j)** 2^4
- k)** $\sqrt{49}$ **l)** $\sqrt{121}$

1.12 BOOK 1 - Whole Numbers REVIEW

5. Use BOMDAS and calculate:

a) $12 - 4 + 6$ b) $27 \div 3 \times 10$

c) $40 - 4 \times 8$ d) $35 - 5 \times 4 + 9$

e) $23 + (8 - 3) - 12$ f) $7 + (12 - 5) \times 2$

6. List the multiples of 6 less than 40.

.....

7. What is the lowest common multiple (LCM) of 6 and 20?

8. List the factors of 36 in order from smallest to largest:

.....

9. What is the highest common factor (HCF) of 15 and 35?

10. True or False?

a) 12 is a composite number

b) 15 is a prime number

c) 3 is a factor of 111

d) 1916 is divisible by 4

e) 2020 is divisible by 10

f) 2021 is divisible by 5

11. List all the prime numbers between 10 and 30.

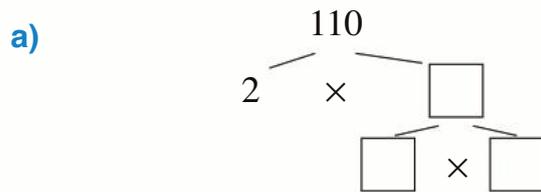
.....

12. Choose the composite numbers from this list:

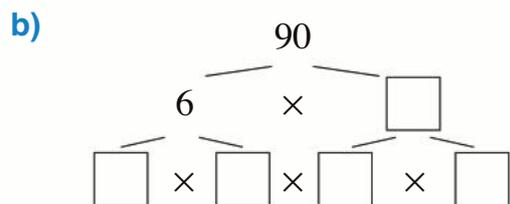
40, 41, 42, 43, 44, 45, 46, 47, 48, 49

.....

13. Express the following numbers as a product of their prime factors, by first completing the factor trees:



110 =

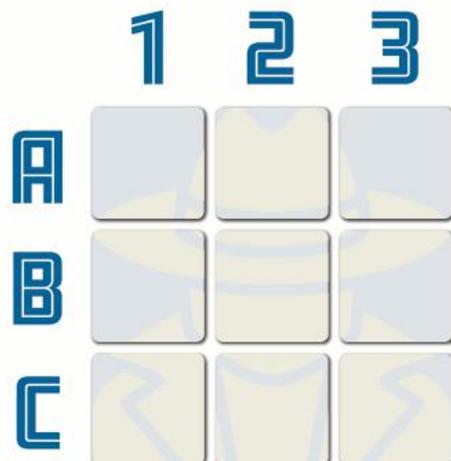


90 =

14. **Sudo-clue: #06**

Place the numbers 1 - 9 in the grid by using these clues:

- The three numbers in Row A add to 6.
- The three numbers in Row B add to 15.
- The three numbers in Column 1 multiply to give 28.
- The three numbers in Column 2 multiply to give 90.



Mathematic - tac - toe

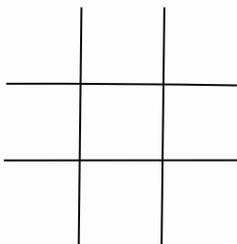
Instructions:

This is a two-player game. One player is the attacker and the other is the defender. The attacker wins when three numbers in any row, column or diagonal add to 15. The defender wins when all the rows, columns, and diagonals equal more or less than 15.

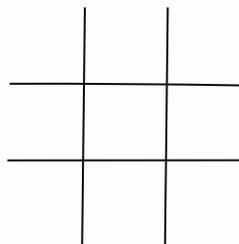
Rules:

1. Each player takes turns placing a number, 1 through 9, on the board below. A number cannot be used more than once.
2. Either attacker or defender can start but the first number cannot be placed in the middle square.

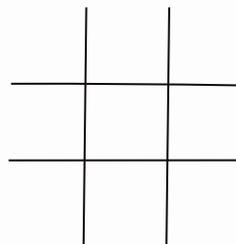
Game 1



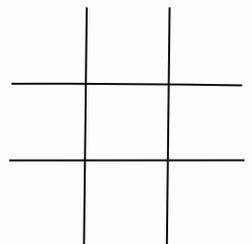
Game 2



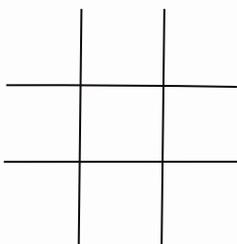
Game 3



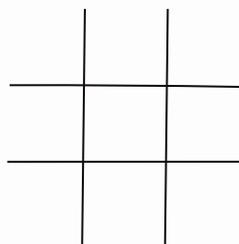
Game 4



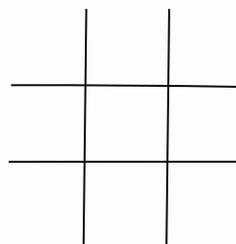
Game 5



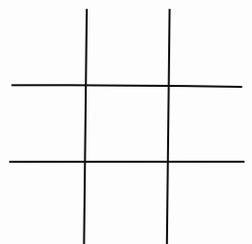
Game 6



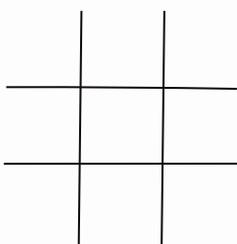
Game 7



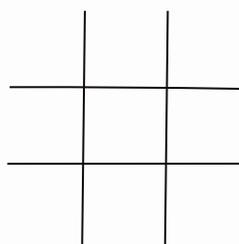
Game 8



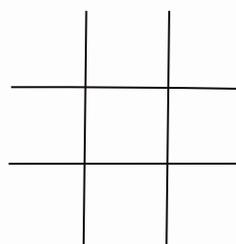
Game 9



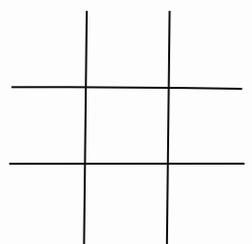
Game 10



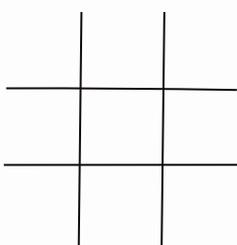
Game 11



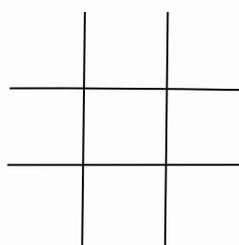
Game 12



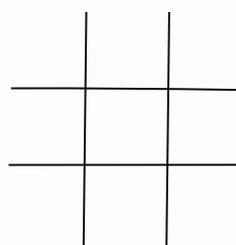
Game 13



Game 14



Game 15



Game 16

