

12 Days of Christmas Maths Puzzles

Solutions

1. How many presents?

12 Drummers Drumming	12
Eleven Pipers Piping	11
Ten Lords a Leaping	10
Nine Ladies Dancing	9
Eight Maids a Milking	8
Seven Swans a Swimming	7
Six Geese a Laying	6
Five Golden Rings	5
Four Calling Birds	4
Three French Hens	3
Two Turtle Doves	2
and a Partridge in a Pear Tree	1
Total	=78

(counting the partridge in a pear tree as one gift)

There is a shortcut for adding consecutive numbers:

Notice

$$12 + 0 = 12$$

$$11 + 1 = 12$$

$$10 + 2 = 12$$

$$9 + 3 = 12$$

$$8 + 4 = 12$$

$$7 + 5 = 12$$

and 6 left over

$$6 \times 12 = 72$$

$$\begin{array}{r} +6 \\ 72 \\ \hline \end{array}$$

$$78$$

There is a famous story about the great mathematician Gauss. When he was a child in school the teacher asked the class to add up all the numbers between 1 and 100. Presumably the teacher thought he would get a long break to do something else. However the young Gauss put his hand up and said 5,050. He had spotted this technique.

2) the First 6 moves:

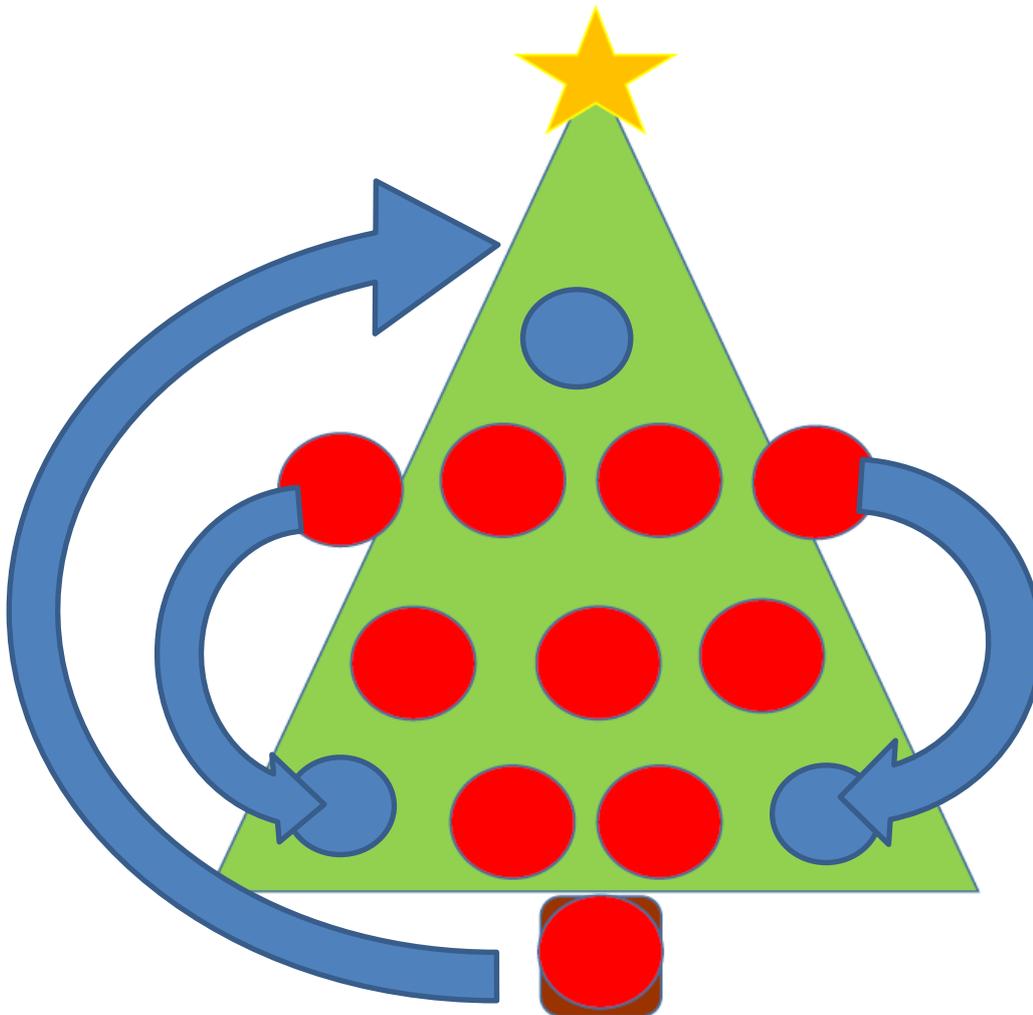


- You can do this with coins or counters anywhere
- It is move number 3 where most people go wrong
- Aim to have alternating places reindeer / elf / reindeer / elf / reindeer/elf
- If you have two of the same on adjacent places then you will have gridlock.

3)

Day 3:

An elf got quite confused decorating this Christmas tree. Can you rearrange the decorations so that the tree looks like this? Can you do it moving only 3 of the red decorations?



Day 4:

There are 6 people sitting around a rectangular Christmas table for dinner. Jack is at one end of the table. Clodagh is sitting across from Isabel and beside Leo. Robert is across from Jack. Leo and Robert are not sitting beside each other. Where is Alice sitting?

Alice is sitting opposite Leo and between Jack and Isabel.

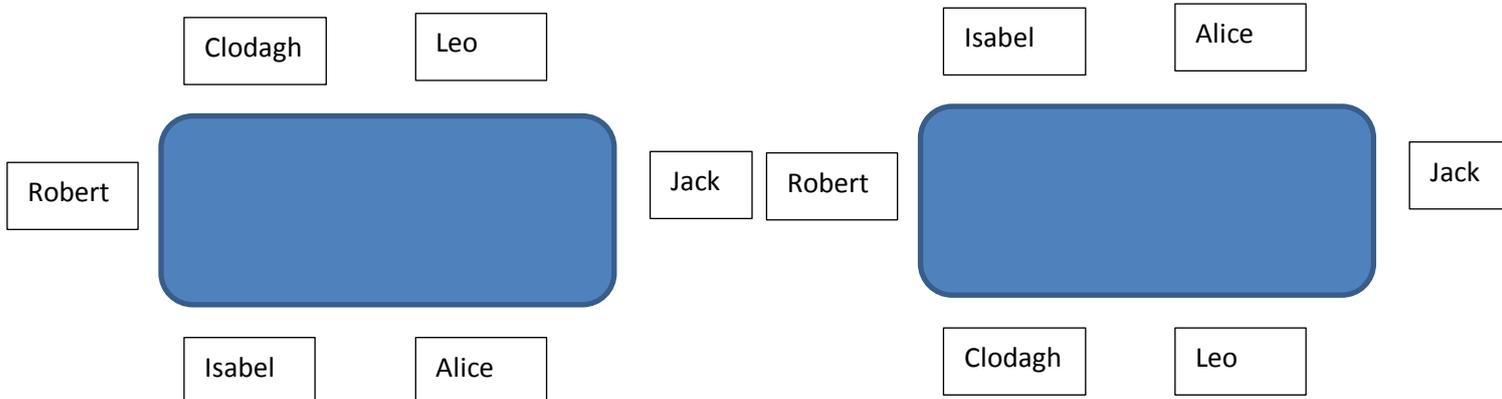
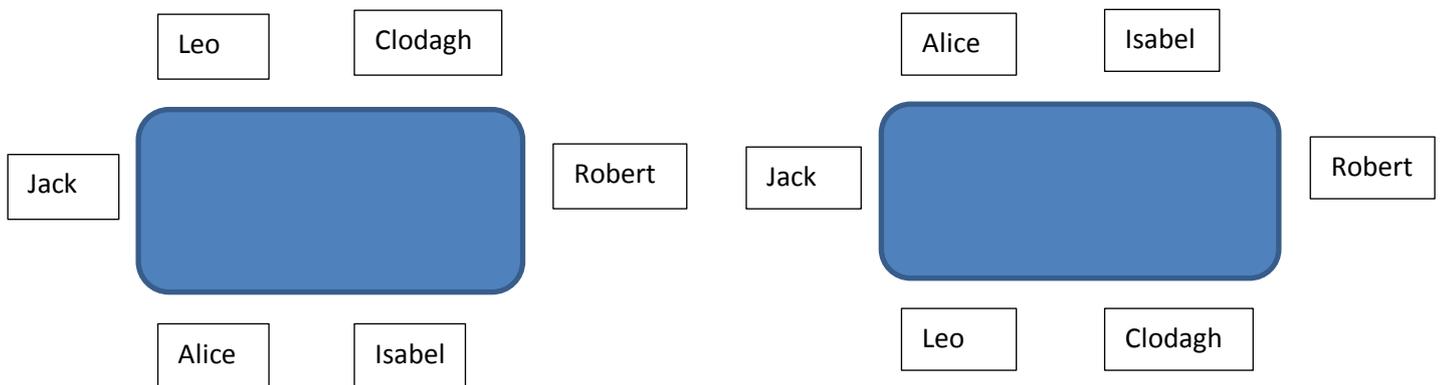
Place Jack at one end.

Robert is straight across from Jack

Leo is not sitting beside Robert so Leo must be beside Jack.

Clodagh is opposite Isabel.

It could be any of the following 4 seating plans:



Day 5:

The elves have learnt some tricks in maths class and want to try it on you. Take any two digit number (where both digits are different). Reverse the digits to form a second number. Subtract the smaller number from the bigger number and write down your answer. Now do it again. Do you notice anything about all of your answers?

Take 23

81

63

53

$$\begin{array}{r} 32 \\ -23 \\ \hline = 9 \end{array}$$

$$\begin{array}{r} 81 \\ -18 \\ \hline =63 \end{array}$$

$$\begin{array}{r} 63 \\ -36 \\ \hline =27 \end{array}$$

$$\begin{array}{r} 53 \\ -35 \\ \hline =18 \end{array}$$

All answers will be a multiple of 9

Day 6:

Three-fifths of the sweets in a bowl are red and the rest are blue. Marta eats 20 sweets and the number of red sweets left is now five-sevenths of the total sweets. If there were 90 sweets in the bowl to start with how many blue sweets did Marta eat?

90 sweets at start

$\frac{3}{5}$ are red that is $\frac{3}{5} \times 90 = 54$ are red

$\frac{2}{5}$ are blue that is $\frac{2}{5} \times 90 = 36$ blue

Marta eats 20 sweets therefore there are 70 sweets left

$\frac{5}{7}$ are red that is $\frac{5}{7} \times 70 = 50$ sweets are red.

Only 4 red sweets were eaten therefore $20 - 4 = 16$ blue sweets were eaten by Marta.

Day 7:

Mrs. Claus is baking her Christmas cake. She gets the bag of sugar which is 80% full. She pours out 10% of the sugar from the bag to make the cake. The remaining sugar in the bag now weighs 1728 g. How much does a full bag of sugar weigh?

This one is a little tricky.

There is 80% of the original contents left in the bag.
10% of this amount is removed. That is 10% of 80% which is 8%

Therefore there is 72% of original contents left

$$72\% = \frac{72}{100}$$

If we let x represent the original contents then

$$\frac{72}{100}x = 1728$$

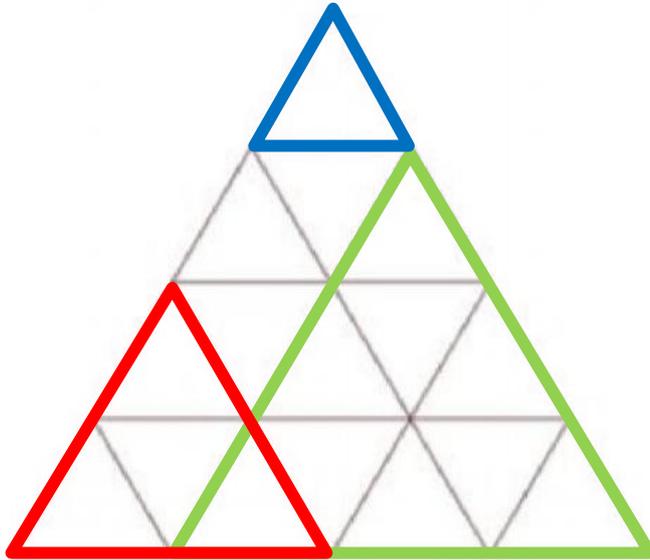
$$72x = 172800$$

$$x = \frac{172800}{72}$$

$$x = 2400g$$

Day 8:

3:



How many triangles are there altogether?

16 blue triangles

10 standing on their base (as shown)

6 standing on a vertex

7 red triangles

6 standing on their base

1 standing on its vertex

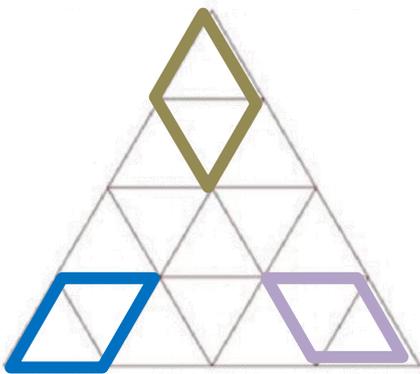
3 green triangles (all standing on a base)

1 large triangle (outline of whole shape)

27 in all.

How many rhombuses?

3:

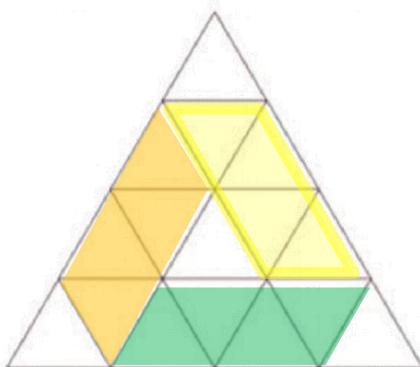


18 small
6 blue
+6 purple
+ 6 tan

3:

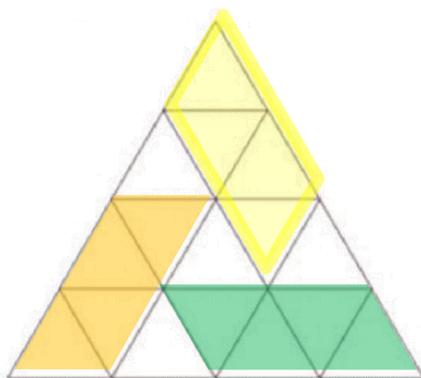
18 medium

3 green
+3 yellow
+ 3 orange



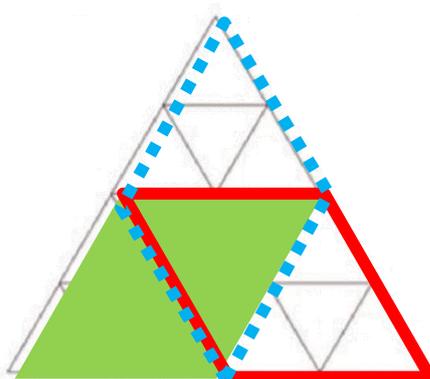
3:

3 green
+3 yellow
+ 3 orange



3 large

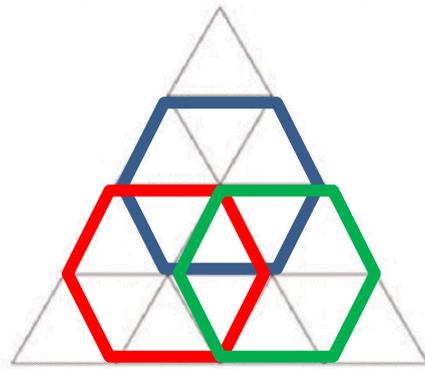
3:



= 39 rhombuses.

How many hexagons?

3:



3 hexagons

Additional challenge:

What if you added another row on the bottom?
What would happen if you took one away?

Day 9: (Nrich problem 613)

Christmas trees are planted in a rectangular array of 10 rows and 12 columns. The farmer chooses the shortest tree in each of the columns and then marks the tallest of these 12 shortest trees with a letter A. Then the farmer chooses the tallest tree from each of the rows and marks the shortest of these 10 tallest trees with a letter B. Which is the taller tree, A or B?

Solution at

<http://nrich.maths.org/613/solution>

Day 10: (Nrich problem 1993)

On Christmas Eve the children of one family left a note for Santa saying that all the girls would like a puzzle each and all the boys would like a book each. They left Santa this riddle to solve: The girls have twice as many sisters as brothers and the boys have five times as many sisters as brothers. How many puzzles and how many books did Santa leave for the children?

Solution at

<http://nrich.maths.org/1993>