Solutions for KS2/KS3 maths transition work

Most of these problems are designed to be open ended and there are usually many approaches to finding correct solutions. The aim of the problems is to make you think and explore the maths rather than just to find answer.

The solutions here may not be the only possible answers and the approaches shown are examples.

Reach 100

There are 4 possible solutions, made up of 2 sets of numbers, repeated in a different order.

2	**3**
1	**8**
23 21 38 18 100	

2	**1**
3	**8**
21 23 18 38 100	

1	**2**
4	**7**
12 14 27 47 100	

1	**4**
2	**7**
14 12 47 27 100	

There is a digit pattern with the placement of the digits in the boxes

tens (a)	tens and ones (b)
tens and ones (c)	ones (d)

The sum of the units must be 20 and the sum of the tens equals 80. So we know that the units column will have two of the same number. An important thing to consider is that there must be a carry-over from the ones to the tens because the ones digit ends in zero. If there is a large number that repeats though, we know that the answer will definitely be higher than ten and if there are three more different numbers, so the answer of the ones column will be 20. There will be a carryover of 2. So the total of the tens column will be 80. So if the tens column is meant to equal 10 (the value is 100) and there is a carryover of two than the other numbers will equal 8 (10-2=8).

Zios and Zepts

There are two possible ways to make 52 legs:

4 Zepts and 8 Zios

or

7 Zepts and 1 Zio

Knowing multiples of three and multiples of seven are helpful with this problem.

Two Primes Make One Square

Square number	Sum of primes (examples)	Notes
1		Not possible as 1 and 0 are not prime
4	2+2	
9	2+7	
16	5+11 or 3+13	
25	2+23	
36	13+23 or 7+29	
49	2+47	
64	13+51 or 5+59 or 11+53	
81	2+79	
100	11+89 or 17+83 or 47+53	
121		Not possible as 119 is not prime
144	5+139	
169	2+167	
196	3+193	
225	2+223	
256	5+251	
289		Not possible as 287 is not prime
324	7+317	
361	2+359	
400	3+397	

- Even square numbers may have more than one solution (the table only shows example solutions)
- Odd square numbers can only be found if the number two less than the square is prime as the only even prime is 2.

Magic Vs

- The centre (bottom) circle is included in both totals
- The centre number must be odd
- The total of all the numbers is 15 and if the centre number was even, the total of the remaining numbers would be odd and could not be divided equally between the two arms.
- There are eight arrangements with each of the three odd numbers in the centre, therefore there are twenty-four solutions

5,2,1,3,4	1,5,3,2,4	1,4,5,2,3
5,2,1,4,3	1,5,3,4,2	1,4,5,3,2
2,5,1,3,4	5,1,3,2,4	4,1,5,2,3
2,5,1,4,3	5,1,3,4,2	4,1,5,3,2
3,4,1,5,2	2,4,3,1,5	2,3,5,1,4
3,4,1,2,5	2,4,3,5,1	2,3,5,4,1
4,3,1,5,2	4,2,3,1,5	3,2,5,1,4
4,3,1,2,5	4,2,3,5,1	3,2,5,4,1

You can also find the number of permutations by considering how many possibilities there are for each circle:

Middle circle: 3 possibilities

Circle 1: 4 possibilities

Circle 2: 1 possibility

Circle 3: 2 possibilities

Circle 4: 1 possibility

Number of permutations $3 \times (4 \times 1 \times 2 \times 1) = 24$

Neighbourly Addition

For the odd side of the road

- If we add an odd number of houses, then the total will always be odd (e.g. for three houses: odd + odd + odd = odd).
- If we add an even number of houses, then the total will always be even because the sum of each pair of odd number is even (odd + odd = even).
- The total will always be a multiple of the number of houses that have been added. For example, when adding three house numbers the total will be a multiple of three.
- The total will be middle number multiplied by the number of houses.

Algebraically for three houses:

If the middle house number is n, the house number before is $n-2$ and the house number after is $n+2$

When we add these numbers, we get:

$(n-2)+n+(n+2)$

$=(n+n+n)+(-2+2)$

$=3n$

- $3n$ is a multiple of 3 (three lots of n).
- As n is the middle house number, the total is three lots of the middle number.

For the even side of the road:

- The total will always be even as we are only adding even numbers.
- The total will always be a multiple of the number of houses that have been added.

Algebraically for four houses:

If the first house number is n, the second house number is $n+2$, the third is $n+4$, and the fourth is $n+6$.

When we add these number, we get:

$n+(n+2)+(n+4)+(n+6)$

$=(n+n+n+n)+(2+4+6)$

$=4n+12$

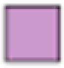
$=4(n+3)$

- 4 times anything (in this case $n+3$) is a multiple of 4.

Shape Times Shape

One approach would be:

Step	Notes
The red triangle is zero	Anything multiplied by zero equals zero
The yellow rhombus is one	Anything multiplied by one stays the same
The purple square is two	The only number that has a square and cube below twelve (except one) is two
The orange oval is four	Two squared ($2^3 = 2 \times 2$)
The yellow semi-circle is eight	Two cubed ($2^3 = 2 \times 2 \times 2$)
The blue rectangle is three	The only other square number under twelve is 9 ($3^2 = 9$)
The green star is nine	Three squared
The red circle is twelve	Rectangle (three) times oval (four)
The green triangle is six	Rectangle (three) times square (two)
Purple star is five and blue hexagon is ten	Five and ten are the only remaining numbers where one is double the other ( x  = )

0	
1	
2	
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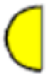
8	
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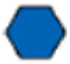
10	
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12