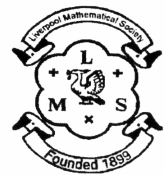
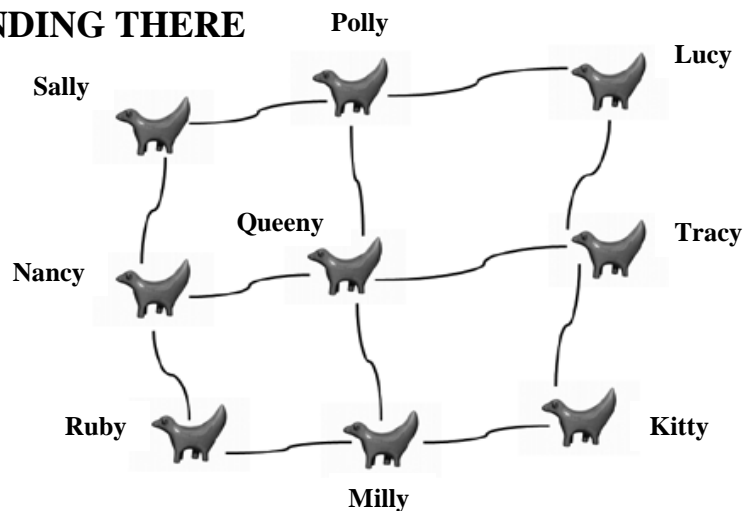




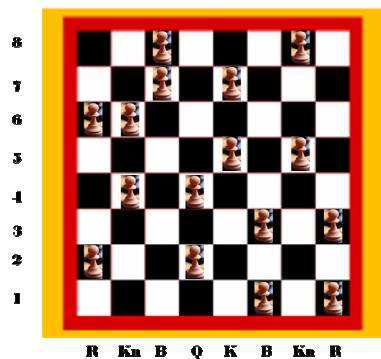
OPEN CHALLENGE '08



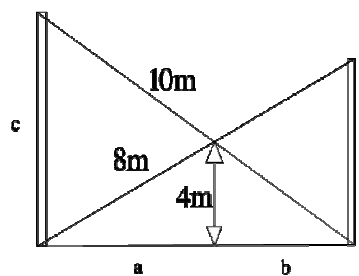
1. I SAW HER STANDING THERE



2. ALL I'VE GOT TO DO



3. NOT A SECOND TIME



Substituting gives $c^2 - \left(\frac{4c}{c-4}\right)^2 = 36$

This gives a quartic equation $c^4 - 8c^3 - 36c^2 + 288c - 576 = 0$

This can be solved using numerical methods, graphical methods or by trial and improvement.

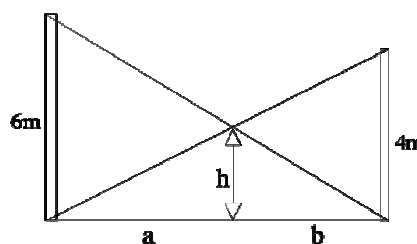
Hence $9.25 < c < 9.255$ & $(a+b) \approx 3.8m$

$$(a+b)^2 = 10^2 - c^2 = 8^2 - d^2$$

$$\therefore c^2 - d^2 = 36$$

$$\frac{4}{c} = \frac{b}{a+b} \quad \& \quad \frac{4}{d} = \frac{a}{a+b}$$

$$\text{Thus } \frac{4}{c} + \frac{4}{d} = 1 \quad \therefore d = \frac{4c}{c-4}$$



$$\text{Thus } \frac{h}{4} = \frac{3}{5} \Rightarrow h = 2.4$$

$$\text{Now } \frac{h}{4} = \frac{a}{a+b} \quad \& \quad \frac{h}{6} = \frac{b}{a+b}$$

$$\therefore \frac{a}{b} = \frac{3}{2}$$

$$\text{Now } \frac{h}{4} = \frac{\frac{a}{b}}{\frac{a}{b} + 1}$$

Thus the height at which the wires cross will always be 2.4m no matter what the distance between the masts.

Hence not a second time!

4. PLEASE MR POSTMAN

Let the number of spaces on one side of Beatle Drive be n .

Distance travelled by the postman is $\sqrt{112^2 + (64n)^2} + 2 \times 64n$

Distance suggested by Mrs Starr is $64n + 112(n+1)$

$$\text{Hence } \sqrt{112^2 + (64n)^2} + 2 \times 64n = 64n + 112(n+1)$$

$$\begin{aligned}
\therefore \sqrt{112^2 + (64n)^2} &= 112n + 112 - 64n \\
&= 48n + 112 \\
\therefore 112^2 + (64n)^2 &= (48n + 112)^2 \\
\therefore 112^2 + (64n)^2 &= (48n)^2 + 2 \times 48 \times 112n + 112^2 \\
\therefore (64^2 - 48^2)n^2 &= 2 \times 48 \times 112n \\
\therefore (64 + 48)(64 - 48)n^2 &= 2 \times 48 \times 112n \\
\therefore 112 \times 16n^2 &= 2 \times 48 \times 112n \\
\therefore n^2 &= 6n \\
\therefore n^2 - 6n &= 0 \\
\therefore n(n - 6) &= 0 \\
\therefore n = 0 \text{ or } n = 6
\end{aligned}$$

Thus the number of houses on one side of the road is 1 or 7. As there are at least 5 houses in Beatle Drive this gives 7 on one side and a total of 14 houses altogether.

5. MONEY (THAT'S WHAT I WANT)

Let John use n of every coin and note. Thus he paid $240n + 120n + 30n + 24n + 12n + 6n + 3n$ pence. This is equal to $240x$ where x is the whole number of pounds he paid.

$$\therefore 435n = 240x$$

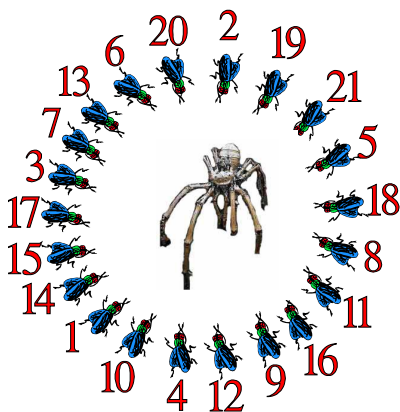
$$\therefore 29n = 16x$$

Since n & x are $\in \mathbb{N}$ and they are coprime $n = 16$ and $x = 29$ is the first pair of solutions.

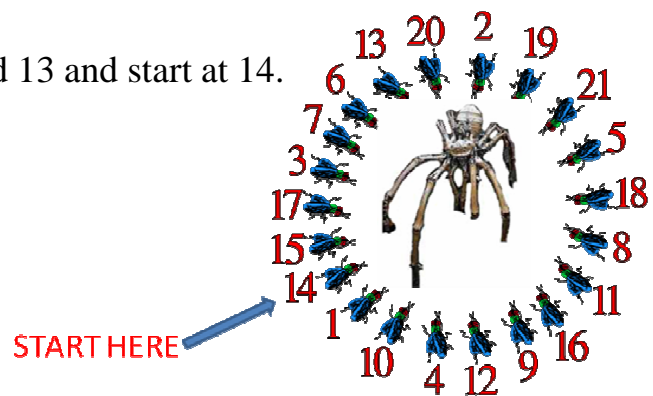
Hence John used 16 of every coin and note and paid £29 in total. Thus each album cost him $14/6$.

Note: If you include the crown (whilst technically legal tender it was not in general circulation) the above solution is 16 of every coin and note and £33 in total with each album costing $16/6$.

6. YOU'VE REALLY GOT A HOLD ON ME



Interchange 6 and 13 and start at 14.



This will also work if 10 & 14 are interchanged and she starts at 16 or 6 & 8 are interchanged and she starts at 19.

BONUS!



I SAW HER STANDING THERE



ALL I'VE GOT TO DO
NOT A SECOND TIME
PLEASE MR POSTMAN
MONEY (THAT'S WHAT I WANT)
YOU'VE REALLY GOT A HOLD ON ME

I SAW HER STANDING THERE is the odd one out as it is the only track from Please Please Me.