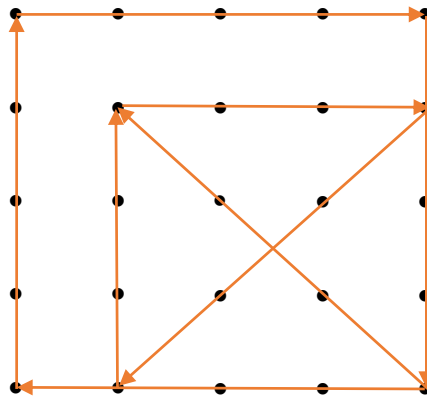


The Haberdashers' Aske's Boys' School

Mathematics Department Puzzle Sheet 2017

1. The taps on my bathtub fill my bath with water at different rates. When the cold tap is turned on fully by itself, it will fill the bath with water in 6 minutes. When the hot tap is turned on fully by itself, it will fill the bath with water in 12 minutes. How long will it take to fill the bath with water when both taps are turned on fully together? **4 mins**
2. In the 5 x 5 grid of dots below, without taking your pen off the paper, show how you can pass through all 25 dots using 8 straight lines. You may start anywhere you like, but you cannot go outside the grid with any line. You may visit dots more than once.



Start here, go round big square clockwise first

3. A blind-folded man is handed a deck of 52 cards and told that exactly 10 of these cards are facing up. He is asked to divide those cards into two piles, each with the same number of cards facing up. He can't peek, get help, or damage the cards, but may use any strategy that occurs to him to do so. How can he do it? **Deal out a pile of ten cards, then turn that pile over. Both the pile of ten and the remaining 42 will have the same number of cards face up.**
4. I am thinking of a "special" two-digit number. My number is special because if you add the sum of its digits to the product of its digits, you get the original number. What could my number be? Is there more than one "special" number? **19, 29, 39, 49, etc.**
5. The year 1978 had an unusual property. When you add the 19 to the 78, the total is the same as the middle two digits (97). What will be the next year to have this same property? **2307**