

## HSCP Maths Mash-up #16

No calculators, abaci, or props!

1. How much change (in pence) would you receive if you bought as many pencils costing 21 pence each as you could with just a £2 coin?

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2. If you listed the positive factors of 18 together with those of 24, how many different numbers would you have?

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3. If a football match ends in a 3-3 draw, how many different half-time scores are possible?

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4. A netball league awards certain whole numbers of points to teams for wins and draws and no points for losses. After ten matches, one particular team has seven wins, three draws, and 44 points. How many points has a team with five wins and two draws?

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5. The lottery syndicate of Alice, Bob, Carol, Dan, and Eve, has a lucky week; they share out its winnings equally. After a fortnight, Alice, Bob, and Carol have each spent half of their shares, Dan has spent a third, and Eve has spent a quarter. Between them, they have £700 left. What were the original shares?

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6. Which of the following statements are true?
  - A. "An equilateral triangle is an isosceles triangle."
  - B. "A square is a rectangle."
  - C. "A rhombus is a kite."
  - D. "A parallelogram is a trapezium."

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7. A paper ribbon of length 36 units is divided up into four shorter ribbons, which are then laid end-to-end in a straight line and labelled A,B,C,D in order. A straight line is drawn to connect the centre points of A and B, and another to connect the centre points of C and D. What is the sum of the lengths of these two lines?

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8. Three boxes each contain apples or pears or both. Each box contains the same number of pieces of fruit. The first box contains all twelve of the apples and one-ninth of the pears. How many pieces of fruit are in each box?

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9. One day, Alice, Bob, and Carol take it in turns, in that order, and starting with Alice, each to read a page of a 40-page-long storybook. The next day, Bob is absent, but Alice and Carol read the storybook again, taking pages in turns, and starting with Alice as before. In total, how many pages of the storybook were read by the same reader on both days?

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10. Together, the two five-digit positive whole numbers M and N contain all ten digits from 0 to 9. What is the lowest possible difference between M and N?

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11. A rectangle has its corners labelled P,Q,R,S, in clockwise or anticlockwise order. Point X lies on side RS such that  $PX = RX$  and  $SX = PS$ . The rectangle is cut into two pieces along PX. The two pieces are reassembled, without overlapping and without turning either piece over, by matching up two sides of equal length. How many different shapes are possible?  
[As with all problems of this nature, try to enumerate all the possibilities by drawing diagrams, not by actually cutting up a rectangle!]

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12. The  $n$ th term of a sequence is given by  $200 - (n^2/2)$ . What is the value of the first term of the sequence which is less than zero?

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13. What is the lowest whole number by which 3150 must be multiplied to make a square number?

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14. The cells of the top row of a grid of five columns by four rows are populated with A,B,<blank>,C,D (from left to right). All the cells in the grid must be populated with the letters A,B,C,D such that no two cells which share a corner contain the same letter. Which letter will populate the bottom-right corner cell?

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15. A square is both *inscribed* by a circle (the circle touches, but does not cross, each side of the square) and *circumscribed* by another circle (each corner of the square lies on this circle). What is the ratio of the area of the large circle to the area of the small circle?

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16. Triangle ABH is both right-angled and isosceles, with the right angle at corner H. Square P is the largest possible square enclosed by ABH (such that one of its corners lies on line AB and the opposite corner is coincident with H). Square Q is the largest possible square enclosed by ABH such that one of its sides lies along line AB. What is the ratio of the area of P to the area of Q?

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