

HSCP Maths Mash-up #14

No calculators, abaci, or props!

1. Pat has six coins. The highest and lowest amounts he is able to make with just five of the coins are £4.60 and £2.70 respectively. What is the total value of Pat's six coins?
2. 259 people attend Alice's and Bob's engagement party. There are three times as many couples as singletons. How many couples attend?
3. Each one of a group of twenty rugby fans prefers either rugby union or rugby league—no-one is indifferent. Nine of the fans prefer rugby union. Eight of the fans are male. Eight of the female fans prefer rugby league. How many male fans prefer rugby union?
4. In the equation " BA " — " AB " = " $C6$ ", the letters A,B,C represent different digits, and A is less than B. What is the value of C?
5. A rectangle, with its corners labelled P,Q,R,S, in clockwise or anticlockwise order, is such that side PQ is twice as long as side QR. The midpoints of PQ and RS are respectively labelled M and N. How many right-angled triangles can be drawn using any three of the points P,Q,R,S,M,N as corners?
6. Helen took 1 hour 28 minutes to run the second half of a marathon, some 10% longer than it took her to run the first half. What time did she set for the whole marathon?
7. A 'long knight' moves on a chessboard. A single move consists of moving three squares over edges of squares in one direction and one square at right angles to the first direction. What is the lowest number of moves a long knight requires to go from one corner square on an otherwise empty standard (eight-by-eight) chessboard to the corner square diagonally opposite?
8. Consider the square. Which of the following shapes is it *not*: rectangle, rhombus, parallelogram, trapezium, kite, quadrilateral?
9. What is the lowest possible sum of two whole numbers whose product is 240?
10. Bags A and B both contain red and blue balls. Bag A contains 14 blue balls and precisely as many red balls as bag B contains blue balls. Bag B also contains 30 red balls. When two blue balls are taken from bag A and placed into bag B, the probability of picking a red ball is the same for both bags. What is the original probability of picking a red ball from bag B?
11. Two cubes, C and D, are resting on horizontal ground. Both cubes have the same weight, but the edge length of cube D is 20% longer than the edge length of cube C. What is the pressure exerted on the ground by cube C, given as a percentage of the pressure exerted by cube D?
12. The finite cyclic sequence 1,0,2,4,1,0,2,4,...,1,0,2,4 has precisely one thousand terms. What is the highest number of terms which can be erased from this sequence such that the sum of the remaining terms is 1024?
13. Which digit D makes both of the three-digit numbers " $1D3$ " and " $5D7$ " prime?
14. Ben places dominoes on a five-by-five board of squares such that each domino covers precisely two squares. He stops when he cannot place another domino. When he stops, what is the highest possible number of squares which may still be uncovered?

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15. What is the radius length (in units) of a sphere whose volume in cubic units is the same value as its surface area in square units?

16. Phil has a pair of ropes whose different lengths, in combination, have a special property: the ratio of the length of the longer to the length of the shorter is the same as the ratio of their combined length to the length of the longer. If the shorter rope is 1 unit long, precisely how long is the longer rope?
