

HSCP Maths Mash-up #1

No calculators, abaci, or props!

1. Among the children in the Walton family, each child has at least one sister and at least one brother. What is the smallest possible number of children in the family?
2. How many of the whole numbers 987, 876, 765, 654, 543, 432, 321 are multiples of 3?
3. A tiling pattern consists entirely of white square tiles, on each of which is printed a blue square whose corners are the midpoints of the sides of the tile. What proportion of the pattern is coloured blue?
4. The difference between $\frac{1}{3}$ of n and $\frac{1}{4}$ of n is 3. What is n ?
5. Fold a sheet of paper in half, then in half again, and again, and again, and once more. Punch a hole all the way through the folded sheet, then unfold the sheet fully. How many holes are there in the unfolded sheet?
6. The faces of a cube are painted such that any two faces which have an edge in common are painted different colours. What is the smallest number of colours required to do this?
7. The sum of four of the five fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$, $\frac{1}{9}$, $\frac{1}{18}$ is 1. Which of the fractions is not in the sum?
8. A square-based pyramid has all of its corners cut off. How many edges does the resulting shape have?
9. Sir Lance has a lot of tables and chairs in his castle. Each round table seats five people and each rectangular table seats eight people. What is the smallest number of tables he will need to use to seat 35 guests and himself, without any of the seating around these tables remaining unoccupied?
10. The sock drawer contains ten identical red socks, eight identical blue socks, and four identical green socks. If socks are taken from the drawer at random, what is the smallest number of socks which must be taken to be sure of a red pair?
11. Two discs each have a positive whole number on both sides. They are tossed up and allowed to land. The sum of the two numbers showing could be either 2, 4, 9, or 11. What are the pairs of numbers on each disc?
12. I cut a piece of paper into ten pieces. Then I cut one of these pieces into ten smaller pieces. Then I cut one of these pieces into ten smaller pieces. Finally I cut one of these pieces into ten tiny pieces. How many pieces have I cut the original sheet of paper into?
13. Scream Eggs are packed in boxes of either five or twelve. What is the smallest number of full boxes required to pack precisely one thousand Scream Eggs?
14. Ignoring all rotations and reflections of the whole figure, there are only two different ways to overlap a rectangle measuring 7 by 9 units with a rectangle measuring 6 by 8 units such that two sides of one rectangle are each *colinear* with a side of the other rectangle (and hence also one corner of one rectangle *coincides* with a corner of the other rectangle). The area of the enclosed region *outside* the overlap is measured (in square units) in each of the two configurations. What is the sum of these two areas?

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15. A swimming club has three categories of members: junior, senior, veteran. The number of members in any one category is never less than ten. The ratio of junior to senior members is 3:2 and the ratio of senior to veteran members is 5:2. What is the lowest possible total number of members in the swimming club?
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16. A tennis league has twenty competitors. How many matches are required for everyone to have played everyone else precisely once?
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17. Knave of Hearts: "I stole the tarts."
Knave of Clubs: "The Knave of Hearts is lying."
Knave of Diamonds: "The Knave of Clubs is lying."
Knave of Spades: "The Knave of Diamonds is lying."
How many of the four Knaves are telling the truth?
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18. A rectangular garden is surrounded by a path of constant width. The distance along the outside edge of the path is 24 metres longer than the perimeter of the garden. What is the width (in metres) of the path?
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19. In a pirate's trunk there are five chests. In each chest there are four boxes, and in each box there are ten gold coins. The trunk, the chests, and the boxes are all locked. One-Eyed Jack unlocks nine locks and takes all the coins in all the boxes he unlocks. What is the smallest number of gold coins he could take?
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20. Alice, Bob, Carlos, and Dominique are in the forest picking mushrooms.
Bob picks twice as many mushrooms as Alice.
Dominique picks three times as many mushrooms as Carlos.
Alice picks seven more mushrooms than Carlos.
Bob picks three more mushrooms than Dominique.
How many mushrooms does each mushroom-picker pick?
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