# Solutions and commentary on 2022
# First Mathematics Challenge Paper

| Question | Answer | Commentary |
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| 1 | C, 9 | Pupil might count the even numbers, 10, 12, 14, …. or reason that from 9 to 26 there are 18 numbers and half of them must be even |
| 2 | A, 3 | Counting up there are 7 blue triangles and 4 green circles. Hence there are 3 more triangles than circles. The question is essentially about finding the necessary information and then using it to answer the question |
| 3 | B, 3 | The division sum of 30 divided by 12 shows that more than two sheets of stickers are needed. But the stickers come on complete sheets so 3 sheets have to be bought to allow every child in the class to receive a sticker. |
| 4 | D, 8/25 | The whole square is made up of 25 smaller, equal squares. In the shaded part of the big square are 6 of the smaller squares and 4 half smaller squares giving 8 shaded smaller squares in all. So the fraction of the whole square that is shaded is 8/25. |
| 5 | E, 12 | Squares have 4 sides, so 9 squares have a total of 36 sides. Triangles have 3 sides and so from the 3 times table, 12 triangles are needed to get 36 sides. |
| 6 | D, 28p | Bonnie has 4 different coins so she has one of the combinations, 1p, 2p, 5p, 10p: 1p, 2p, 5p, 20p: 1p, 2p, 10p, 20p: 1p, 5p, 10p, 20p: 2p, 5p, 10p, 20p. Adding each one up gives 18p, 28p, 33p, 36p and 37p. But the answer has to be between 20p and 30p, which agrees with 28p. However this is a very long winded way of doing it. The minimum requirement to meet the condition of being over 20p is that you need the 20p coin. Once you have that, to be less than 30p, you cannot have the 10p coin, and so the combination that works is 1p, 2p, 5p, 20p, giving 28p in total. |
| 7 | E, 2003 | Each of the given answers could be added in turn to 2022 but again this is quite a long-winded way of doing it. All numbers in the 5 times table end in 5 or 0. 2022 ends in a 2 so you need to be adding either a 3 or an 8 in the units column to give a 5 or a 0. None of the answers given ends in 8 and 2003 is the only one ending in 3. |
| 8 | D, 41 | The question is about using two operations in the right order. There are 8 grandchildren each receiving 4 sweets, so 8X4=32 sweets have been distributed. But there are 9 left in the jar meaning that the jar began with 32+9 = 41 sweets in it |
| 9 | E, S | The letters M, A, T, and H each have at least one of a vertical or horizontal line of symmetry, or mirror line. The letter S possesses neither. |
| 10 | B, 3 | It is essential to find the number in the blank square first from 28 – 4 =24. To get 8 by division as the final answer, the 3 times table tells us that 3X8 = 24 and hence the answer is 3. |
| 11 | B, 135 minutes | The best way to do this is by adding on from 8.45 until 9.00 which is 15 minutes. There are then 2 hours from 9.00 until 11.00 which is 120 minutes. Adding 15 and 120 gives the answer of 135 minutes. |
| 12 | A, 5765 | Each clue allows the elimination of one or more of the padlocks pictured. The first clue is that the sum of the first and last digits is 10, which eliminates D, the sum of first and last digits being 9. The second clue says that the third digit has to be a multiple of 3, which eliminates C where the third digit is 4. The third clue says that the second digit is greater than the third digit. This eliminates B where |

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| | | the second and third digits are equal each bring 9. The final clue tells us that most of the digits are odd which works for A and not the other remaining padlock, E, where there are two even and two odd digits. |
| 13 | E, 96g | If Munchy Monster ate 4/5 of the chocolate bar, then 1/5 remains and this is 24g. So 4X24 = 96 grams were eaten |
| 14 | C, 7 | Sam has to pick a shirt and a tie to wear to school and he has to wear the colour blue. If Same picks the blue shirt, then any tie ensures he is wearing blue. Hence 3 combinations. If he picks the red shirt either the blue tie or the blue bow tie ensures he is wearing blue. Hence 2 combinations and similarly for the yellow shirt. Which means 3+2+2 = 7 combinations. |
| 15 | C, 30p | What has to be spotted here is that Vicky Sponge buys exactly one cupcake more than Marzi Pan but the same number of biscuits. Hence the difference between what the two children paid is the price of the cupcake, £1.90 - £1.60 = 30p |
| 16 | B, 6 | 4 blue monsters balance a green monster so it will take 12 blue monsters to balance 3 green monsters which in turn balance 2 yellow monsters. Hence 6 blue monsters will balance 1 yellow monster – an example of multiplicative reasoning. Some daily newspapers carry similar questions on their puzzle pages. |
| 17 | C, 4$^{th}$ | This question is probably best done by bar modelling. Suppose the unknown bit of the bar is the number finishing before Anwar. Then there is Anwar and then there are the number who finished after Anwar, that is 5 plus the number finishing in front of Anwar. Altogether there are 12 children in the race and so, in algebra we have $x + 1 + x +5 = 12$, which means $x = 3$, or 3 children finished ahead of Anwar so he finished in 4$^{th}$ place. |
| 18 | E, 54 | We are looking for two numbers that add up to 9 and multiply together to give 20. Either by looking at pairs of factors of 20, 1 and 20, 2 and 10, 4 and 5, or pairs of numbers summing to give 9, the two numbers are 4 and 5. Thus Dr. Getwell is either 45 or 54, but we are told that is age is an even number and so must be 54. |
| 19 | C, 4 | The aeroplane, boat, car and doll can be replaced by A, B, C and D respectively for this explanation. B must be next to C and so we can have BC. But C must be next to A so we have BCA. D can therefore be placed either at the left or the right of the arrangement giving DBCA or BCAD. However, if B must be next to C, we can also have CB. C being next to A gives ACB. And now D can go at the left or the right giving DACB or ACBD. All four arrangements are different and so under the given conditions Erin has four ways to arrange the models in a line on the shelf. |
| 20 | B, 4km | Sampath swims on 5 days and each day swims 3 km more than the day before. So, whatever distance he swam the first day, he swims this distance every day. On the second day he swims 3 km more than he did on the first day, on the third day he swims 6 km more than on the first day, on the fourth day he swims 9 km more than on the first day and on the fifth day he swims 12 km more than on the first day.<br><br>Therefore in total he swims 5 times what he swam on the first day plus the extras each day, 3 + 6 + 9 + 12 and altogether he swims 50 km. The extras come to 30 km so the remaining 20 km must be the 5 times what he swam on the first day, that is 4km. The question is probably best represented by a series of bars underneath each other each showing how much Sam swam each day and then summing i.e. putting the bars together in a line to show they equal 50 km with 5 lots of the swim on the first day and the extras done each day totalling to 30 km. |