



First Mathematics Challenge – June/July 2020

Answers and notes

These notes provide a brief look at how the problems can be solved.

Often there are more ways of solving a problem than the one given and not all ways are given here.

P1 D 5 (Given on paper) P2 D 6 P3 1/2 A

1	A	Triangle	Only the yellow triangle appears in all five circles. The other shapes appear a variety of times but none in all five circles.
2	D	8	The even numbers are 28, 30, 32, 34, 36, 38, 40, 42, eight in all
3	D	13	The answer has to be one more than a number which divides exactly by 2, 3 and 4. 13 and 25 both fit the bill but 13 is the smaller of the two and so is the answer since the smallest one in the list is the one asked for.
4	E	6	For each shirt, there are two choices of shorts. Since there are three shirts there are $3 \times 2 = 6$ choices altogether
5	C	5	There are 7 equal pieces remaining and half the pizza is made up of 6 slices so 5 have been taken.
6	E	-5	Working backwards from the 5 in the right hand box, to get 5 by adding on 2 we must have begun with 3 in the empty box. So to get 3 from 8 we must have subtracted 5.
7	D	48	Of the answers given, only C, D and E, meet the condition of digits summing to 12; of these D and E meet the condition of the difference between the digits being 4; but only D is less than 50.
8	B	7	There are 6 single triangles but there is composite triangle in the middle of the diagram which means that there are 7 triangles altogether.
9	C	4	This question is an example of bar modelling. Tom is the basis of the comparison so he is the standard unit, Farhat is half the standard unit and Jess is three times the standard unit. So we have four and a half units in all which represent 18 apples. Hence a unit, or Tom's share, is four apples.
10	B	Always even	Multiplication of a whole number by 2 always produces an even number no matter what whole number we start with.
11	C	4	Three 8s are 24, but there are 28 pupils in the class so 4 more pencils are needed if every pupil is to have a pencil, hence another pack must be bought making 4 packs altogether.
12	D	9	From the first number statement, the number hidden by the red square is 5. So the number hidden by the blue triangle in the second number statement is 9.
13	E	88 cm	There are four days from the end of Monday until Friday so Tan adds $4 \times 5 = 20$ cm to the 68 cm he had by the end of Monday giving 88 cm of knitting altogether.
14	A	42	There are $2+4+6=12$ blocks already to which need to be added a stair of 8 blocks, one of 10 blocks and one of 12, i.e. 42 blocks altogether.
15	B	4	There has to be an even number of 5p coins otherwise the amount could not be made up solely by 2p coins. This means that only B and D are possible answers. Clearly D, six 5p coins,



			means that only one 2p is needed to make the 32p, giving 7 coins when the question said that there were 10 originally.
16	B	50 ml	A quarter is a third of the given amount in the bottle, 150 ml. Hence the bottle holds a third of 150 ml, i.e. 50 ml, when a quarter full.
17	E	11.43	The school clock shows 11.30 but is 5 minutes slow so the actual time is 11.35. Mr. Punctual's watch is 8 minutes fast and so is showing 8 minutes in front of the actual time, i.e. 11.43.
18	A	56 metres	There 8 spaces between the 9 cones and so the total distance is $7 \times 8 = 56$ metres
19	D	41	$5 + 6 = 11$. $5 \times 6 = 30$. Then $11 + 30 = 41$
20	B	1/4	In the small square on the left that is divided into 4 by its diagonals, the red shaded area is a quarter of that square. There are then 8 squares left and the remaining red shaded area is composed of one whole square and two half squares, i.e. of two squares, a quarter of the 8 remaining squares. Hence the whole of the red shaded area is a quarter of the 9 squares.

Possibilities for further exploration

6) A number chain or number machine such as in this question offer opportunities for pupils to experiment with, for example, how many different ways can you get from 4 to 5 in three steps using basic arithmetic operations?

Restrictions could be added such as, you must always use divide by 3 at some point. These explorations give pupils the opportunity to practice basic arithmetic skills and mental arithmetic.

9) This question involves bar modelling, a major plank of the teaching for mastery armoury.

14) There is a story that a famous mathematician, having been set the task by his teacher of adding up all the numbers from 1 to a 100 simply added the first and the last, found the average and multiplied the answer by how many numbers there are from 1 to a hundred, rather than writing them all down and adding them all up. This process can be carried out to add up a sequence of numbers that increase by adding on the same fixed amount each time. In the question, the first step requires 2 blocks, the second 4 blocks, the third 6 blocks, and so on, adding on two each time. Therefore for the 6 stairs, the last stair needs 12 blocks, the average of the first and the last is $(2+12)/2$ which is 7. There are 6 stairs so the total number of blocks is $6 \times 7 = 42$. Such sequences are called Arithmetic Progressions and since they rely on the adding of a constant to get the next term they may be explored even at an elementary level. E.g. how many blocks make the 15th stair? Such a series has a second term of 8 and its seventh term is 20. What is the fourth term?

15) Which sums of money can be made from which set of coins offer many possibilities for exploration and practice of basic arithmetic.