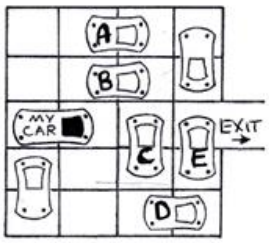
Primary Mathematics Challenge - November 2022

Answers and Notes

These notes provide a brief look at how the problems can be solved. There are sometimes many ways of approaching problems - not all can be given here. Suggestions for further work based on some of these problems are also provided.

P1 D (111) P2 A (1)

1	**A**	3	A 5p, a 2p and a 1p will give the smallest number of coins to make 8p.
2	**A**	80p	25 miles cost 20p so 100 miles will cost 80p.
3	**C**	15	There are 5 cats eating 3 treats each which gives 15 treats each day. Lucky cats!
4	**E**	west	Turning 180° from east will change Chippy to be flying west.
5	**B**	3 mph	Ringa takes 20 minutes to cycle 1 mile. In one hour, at this speed, she would cycle 3 miles.
6	**C**	6	We need 6 small equilateral triangles to fill the sphinx.
7	**B**	3	One parrot, one cat and one dog have a total of 10 legs. The Pet Rescue Home has the same number of each animal. With 30 legs altogether, there must be 3 of each animal.
8	**C**	4 sec	The gap between the spider and the slug closes at 7 + 4 = 11 cm/sec. As they are 44 cm apart, it will take 4 seconds for the gap to close. But how fast can slugs go? 4 cm/sec does seem fast for a slug!
9	**D**	27	The teacher has 9 pairs of socks, and he wears each for three days. So he will need to wash them all after 9 × 3 = 27 days.
10	**D**	24 cm	In each triangle, the length of the two full lines adds up to twice the length of the dotted side of the triangle. The dotted line is 12 cm long so the sum of the lengths of the full lines is 24 cm.
11	**E**	5 for the price of 2	If you are paying the price of 2 Niblets[tm], the best offer is to ask for 5 packets.
12	**C**	5	Move cars A and B to the left. Move car C up to the car park edge. Move car D to the left, and car E down. You can now drive your car out of the car park.
13	**D**	9	The next year for the digit total to be 6 is 2031. This is in 9 years.
14	**C**	3	Four snack bars would contain 30 g of sugar. Too much. Three snack bars will contain 22.5 g which is within this limit.
15	**A**	£50 for 6 months	£50 for 6 months: £100 a year. £26 for 3 months: £104 a year. £18 for 2 months: £108 a year Annual payment of £120: £120 a year £9 a month: 9 x 12 = £108 a year. Response A is the cheapest.
16	**D**	1 hour	The first train, travelling at 50 mph will travel 150 miles in three hours. So the high speed train, at 150 mph, will take one hour.
17	**E**	120	The only option which is both a multiple of 4 and a multiple of 5 is 120.
18	**B**	38 m	The length of the top rectangle must be 42 ÷ 6 = 7 m. The length of the lower rectangle must be 20 ÷ 4 = 5 m. The length of the joined sides is 3 m. Adding the lengths of the sides from the top going clockwise gives: 7 + 6 + 2 + 4 + 5 + 4 + 4 + 6 = 38 m.
19	**D**	1	The fractions look horrendous but they simplify to 1/3 + 1/2 + 1/6 = 1.
20	**D**	1477	24 minutes is 24 × 60 = 1440 seconds. So Budimir held his breath for 1440 + 37.36 = 1477.36 seconds which is 1477 seconds to the nearest second.
21		48 cm^2	The area of the top right triangle ½ × 8 × 8 = 32 cm^2. The area of the



		top left triangle is ½ × 5 × 7 = 17.5 cm^2. The area of the bottom triangle is ½ × 15 × 3 = 22.5 cm^2. The area of the rectangle is 15 × 8 = 120 cm^2. So the area of the shaded triangle is 120 - 32 - 17.5 - 22.5 = 48 cm^2.
22	198 cm	The three lengths of wood across the whole top, middle and bottom are 36 cm each totalling 108 cm. There are six other lengths of 15 cm each, totalling 90 cm. So the length of wood used is therefore 108 + 90 = 198 cm.
23	45%	The percentage of children who like both netball and tennis is 60 % of 75 % = 45%.
24	36°	Each interior angle of a regular pentagon is 108°. There are three pentagons which meet to create the acute angle which will be 360° - 3(108°) = 360° - 324° = 36°.
25	49 cm^2	Every shaded shape in this diagram has an unshaded shape of equal area. So the total area of the shaded part in the diagram is ½ × 14 × 7 = 49 cm^2.

Some possibilities for further problems

P2 This question raises an important issue. The question 'How many rectangles have been drawn in this problem?' has the answer 2 because a square has all the properties of a rectangle – but the rectangle does not have all the properties of the square. Again, 'How many parallelograms are there here?' has the answer 4 as all the rectangles are also parallelograms. On a pedantic note, could the triangle be a quadrilateral which has one side of length zero?

Q1 Pupils can construct a table showing the smallest number of coins needed to make up to 20p and see if they can spot any patterns.

Q8 This question uses the idea of relative velocity. We can think of swimmers swimming up and down a river, or someone walking along a train corridor which is moving down the track etc.

Q9 Adding a small difficulty: suppose your maths teacher has 19 socks. How would that change the calculation?

Q12 Visit *www.transum.org/Maths/Investigation/CarPark/* for lovely examples of car park problems.

Q14 We are all responsible for looking after our own health. Perhaps your pupils could take an interest in the numbers on food packets and tins.

Q16 Dr B Ching is well known to readers of *Private Eye*. Dr Beeching was the man who, in the 1960s, wrote a report which recommended the closure of many UK railway lines.
The problem in this question uses inverse ratio. If a train travels at twice the speed of another train, it will take half as long to do the journey.
Here is another problem using inverse ratio: if a man takes six days to dig a hole, how many days will it take two men working at the same rate to dig an identical hole?

Q17 A harder question: Mrs Cox is putting apples into bags that each contains either 4 apples or 5 apples. Pupils could list the number of apples which she could have used with none left over.