Q9 Children might like to create their own versions of this problem, varying the fractions/proportions used of different ingredients

Q11 Try to investigate how the totals and products of three numbers vary when three dice are thrown!

Q12 Children could make their own cards up and investigate how many such cards are needed to create different shapes

Q13 If we are limited to positive integers, how many possibilities are there for *a* and *b*? Pupils could investigate different equations which have a different number of unknown letters.

Q16 Can children create other seemingly plausible (but actually impossible) problems? Can they explain why/where the 'impossibility' occurs?

Q19 Children could draw and measure the angles in other similarly drawn triangles. Can they generalize their results?

Q23 What if the two cars started at the same place, but went in opposite directions? When would they then meet?

Q24 What if the knitting club met on different days of the week? Does this make a difference?

Q25 For those children who are less secure with percentages, try starting with 1000 units of energy!

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The Mathematical Association

Primary Mathematics Challenge *Finals*

Answers and Notes

February 2011

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	**C**	24	
P2	**E**	4 > 3	

1	**D**	204	11 × 17 = 187, but 12 × 17 = 204 is closer to 200.
2	**E**	£6 ÷ 7	£6 divided by 7 gives 85p each with 5p left over.
3	**D**	4	4 wins (12 points) + 1 draw (2 points) + 2 losses (2 points) total up to 16 points altogether.
4	**D**	1201	2011 divided by 4 gives a remainder of 3, so the last three digits are 201 and so the first digit must be 1. Hence 1201.
5	**C**	5	Taking 2 #s away from either side tells us that 15 = 3 × #. So # = 5. Other children may prefer to use trial and error!
6	**B**	183kg	Adding all three totals gives 366kg, which is the weight of two Dads, two Mums and two Alices. So one of each must weigh 366 ÷ 2 = 183kg.
7	**A**	9	The first year when this happens again is 2020, so in 9 years.
8	**C**	4	We need to find a number with the same number of letters in its name as its value. The only number to satisfy this condition is 4.
9	**E**	160ml	When one has quarters of quarters, it helps to think in sixteenths. So four sixteenths of the bottle is stewed slime, and one quarter of the rest equals three sixteenths. Therefore, 9/16 of the bottle is 90ml and so the whole bottle is 160ml.

10 **B** 2
If the median and mode are equal in a set of five numbers, then at least three of the numbers are the same. In this case, these three numbers are 4. As the range is 4, the smallest and largest numbers must have a difference of 4. But a mean of 4 implies the five numbers add up to 20. So the smallest and largest numbers add up to 8 and have a difference of 4, and are therefore 2 and 6.

11 **B** 14
90 is a multiple of 5, so the product of the remaining two numbers is 18 – they must therefore equal 3 and 6. So the sum is 3 + 5 + 6 = 14.

12 **B** 8
This problem is best worked out in rough…!

13 **C** 2
As $a + b + c = 10$ and $a + b = 6$, so $c = 4$. As $c + d = 6$, then $d = 2$. Without any further information, we cannot say for sure what the values of a and b are (as if there are 4 letters to find the value of, we must start with 4 equations in order to be able to work out all 4 values).

14 **C** 32
Dividing the square into quarters helps us see that exactly half the square is shaded. 8 × 8 = 64, and half of 64 is 32.

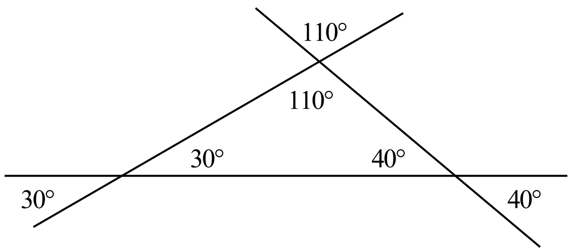
15 **E** 20
Ten chairs will have units digit equal to 7, and ten chairs will have tens digits equal to 7. 10 + 10 = 20.

16 **E** impossible
12 miles at 6 mph takes two hours already, leaving no time in which to cover the remaining 12 miles. Therefore it is impossible!

17 **E** £1 990 000
(5 × £1000) + £5000 = £ 10 000. Now £2 000 000 – £10 000 equals £1 990 000.

18 **C** 90cm^3
Volume of wedge is ‘area of cross-section’ multiplied by width. Area of cross-section is ½ × 6cm × 10cm = 30cm^2. Volume is therefore 30cm^2 × 3cm = 90cm^3.

19 **D** 110°



As shown in the diagram overleaf, opposite angles are equal, so two of the angles of the triangle are 30° and 40°. The remaining angle must therefore equal 180° – (30° + 40°) = 110°, which is the value of its own opposite angle!

20 **D** 6
The only square numbers with an odd number for the tens digit are 16 and 36. So Doris has six 1p coins.

21 **E** 75
40 teenage tadpoles weigh the same as 30 jolly jellyfish. Now 30 ÷ 2 = 15, and so 30 jolly jellyfish weigh the same as (15 × 5) = 75 nuclear newts.

22 **E** 12
It is probably easiest to try out each solution in turn.

23 **B** 18 seconds
For every circuit that the faster car makes, see where the slower car lands up. After 9 seconds, the slower car has completed ¾ of a circuit; after 18 seconds, the slower car has completed 1½ circuits and has now caught up with the faster car, so to speak.

24 **B** 15
If June 1st is a Monday, then the first Monday in July is July 6th, with the first Monday in August being August 3rd. The total of these dates is 1 + 6 + 3 = 10. Trying each year in turn gives a highest total of 15.

25 **A** 27.1
At the end of the first year, 90% of the energy is used. At the end of the second year, 10% of 90 = 9, so 90% – 9% = 81%. 10% of 81 = 8.1, so 81% – 8.1% = 72.9%. The total reduction is therefore 100% – 72.9% = 27.1%.

Some possibilities for further problems

Q2 What if Robyn shares £7 with 8 people, or £8 with 9 people, and so on. Will there be any patterns resulting in the amounts of money Robyn is allowed to keep?

Q3 Try inventing different scoring systems for the chess challenge. Are there any scoring systems that work particularly well for good players or for bad players?

Q4 Experiment with different sequences of numbers and shapes. Can children guess what numbers or shapes will come in what position?

Q6 Can children work out how much each person weighs?