22 ½ This can be solved in at least two ways. Firstly, write down all the 36 combinations of possible numbers such as

1,1 *1,2* 1,3 *1,4,* 1,5 *1,6*
2,1 2,2 *2,3* 2,4 *2,5* 2,6
3,1 etc.

Of these half have an even number and an odd number (some italic above).

Alternatively, consider that the first can be either odd of even (any number at all). That leaves half of the possible second numbers to give an odd and an even number altogether. So the probability is ½.

23 ¼ Each smaller rectangle is half the area of the next larger one. So the area of the middle sized rectangle would be half of the complete one if it were not covered by the smallest rectangle. But the smallest rectangle has an area half of the complete white rectangle. So the area of the unshaded rectangle ABCD is ¼ of the whole rectangle.

24 30% If there were 100 voters, half voted. Of this half, 60% of the 50 voters voted for the wining party. That is 60% of 50 = 30 voters. So 30 out of 100 voters voted for the winning party; i.e. 30%.

25 3456 Possible codes in which each number is one more than the previous digit are: 1 2 3 4, 2 3 4 5, 3 4 5 6, 4 5 6 7, 5 6 7 8 and 6 7 8 9. The only code here which is a multiple of four is 3 4 5 6.

Some possibilities for further problems

Q2 Can your pupils think of anything with an odd number of legs?

Q5 Can you pass through every hexagon when going in and coming out at the square sign?

Q6 Other kings and queens of Britain may have been on the throne for longer than Henry III. Has our present queen been on the throne the longest so far?

Q9 Your pupils can explore how many matches are needed for a base of 3 or 4 matches? Be careful if you have a base of six or more! Why?

Q10 Can your pupils think of other reasons why someone might get a birth date wrong? E.g. give a year such as 1856 or 3011.

Q12 Pupils can examine the targets when extending this problem for more weeks. The numbers obtained (1, 3, 7, 15, 31, 63 ...) are all one less than powers of 2. Pupils may be able to calculate answers to the longer problems without doing the addition sums.

Q14 Pupils can draw several different patterns which will shade in half of each square. Or even try other fractions too.

Q17 Pupils could start with identical but different shapes, such as two squares, two equilateral triangles, two isosceles triangles or two parallelograms, and see what shapes they can get.

Q18 Pupils could work out other ways of calculating the ages of their grannies and granddads.

Q20 How about these: a) 2c + 2d = 80p and 3d + 2d = 120p (c = 40p and d = 0p!)
b) 2c + 2d = 80p and 2c + 3d = 120p (cakes are free!)
c) 2c + 2d = 80p and 3d + 3c = 120p (impossible to calculate)

Pupils could make up their own similar problems and see what happens.

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Primary Mathematics Challenge - November 2011

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 C (11) P2 A (16)

1 C 7 Seven days in a week so seven apples.

2 C 396 6 × 66 = 396.

3 D 5/9 Five small squares out of nine are shaded black.

4 D 23 5 × 2 + 3 × 3 + 4 = 23.

5 D  You pass through these numbers: 6, 1, 2, 3, 3, 1, 1 to the octagon.

6 C Henry III Henry 1 (36 yrs), Henry II (35 yrs), Henry III (56 yrs), Henry IV (14 yrs) and Henry V (9 yrs).

7 E  Try it with a paper rectangle!

8 E no difference Suppose one toy costs 50p with none of the offers. Working through the first four alternatives gives 25p for one toy. So the answer is E.

9 A 5 Five more matches are needed to make the edges from the base to the point at the top.

10 D Teflon Neoprene lies with the month of the year; Nylon lies with the day of the month; Formica lies because of the year (2012) and Trogamid lies because there are only 28 or 29 days in each February.

11 E 120 Calculate in metres: 30000 ÷ 250 = 120. Or work in km: four laps make up one km so the number of circuits is 4 × 30 = 120.

12 B 4 He saves £1 + £2 + £3 + £4 = £15. So it takes Owen four weeks.

13 A 1000 One revolution of the wheel takes the car 1m forward. So it will need 1000 revolutions to make 1km.

14 B  The shaded areas are half in shapes A, C and D. The shaded area in B is clearly more than half (compare with C). The shaded area in E is less than that of B so the largest shaded area is in shape B.

15 D 2 000 It will take Sennet 8 × 100 + 12 × 100 = 800 + 1200 = 2 000 seconds.
Easier – it will take 20 seconds for each foot. 20 × 100 = 2 000 sec.

16 D £30 Gus and Harry each paid £5 (total £10) to cover Ian's lunch. So each lunch cost £10. The total bill was therefore£30.

17 A rhombus A rhombus would need two equal sides in both original triangles, so a rhombus is impossible with these triangles.

18 E 69 Granny's age is 2 × 4 × 8 + 5 = 69.

19 D 2017 2012 is divisible by 2. 2013 is divisible by 3. 2015 is divisible by 5. 2019 is divisible by 3. But 2017 is a prime number.

20 B 20p Pupils can write out these sentences in full English but we can use simple algebra: 2c + d = 80p and 3c + 2d = 130p. If we double the first equation we get *4c + 2d = 160p.* Subtracting we can see that c = 30p. That means that d = 20p.

21 8 There are six chapters containing a total of 48 pages. So there are 48 ÷ 6 = 8 pages in each chapter.