

Solutions

1 Four-pin bowling

Score 5 by knocking down 1 and 4, or 2 and 3.

Score 6 by knocking down 2 and 4, or 1, 2 and 3.

Score 7 by knocking down 3 and 4, or 1, 2 and 4.

2 Gob-stopper

Five different ways to pay 6p:

5p + 1p
 2p + 2p + 2p
 2p + 2p + 1p + 1p
 2p + 1p + 1p + 1p + 1p
 1p + 1p + 1p + 1p + 1p + 1p

Six different ways to pay 7p:

5p + 2p
 5p + 1p + 1p
 2p + 2p + 2p + 1p
 2p + 2p + 1p + 1p + 1p
 2p + 1p + 1p + 1p + 1p + 1p
 1p + 1p + 1p + 1p + 1p + 1p + 1p

3 Pick a pair

There are six different sums and six different (positive) differences.

- | | |
|----------------|----------------|
| 1. $1 + 2 = 3$ | 2. $2 - 1 = 1$ |
| $1 + 4 = 5$ | $4 - 2 = 2$ |
| $2 + 4 = 6$ | $4 - 1 = 3$ |
| $1 + 8 = 9$ | $8 - 4 = 4$ |
| $2 + 8 = 10$ | $8 - 2 = 6$ |
| $4 + 8 = 12$ | $8 - 1 = 7$ |

Adapt the puzzle by using larger numbers.

4 Snakes and ladders

Watching out for snakes, there are four different ways to get to 16 in two throws:

1 then 6; 3 then 4; 4 then 3; 5 then 2.

5 Bean-bag buckets

- The highest score is 12 (3 bags in 4).
- Score 6 in three ways:
 1 bag in 4 and 2 bags in 1, or
 1 bag in 1, 1 bag in 2 and 1 bag in 3, or
 3 bags in 2.
- Score 9 in three ways:
 1 bag in 1 and 2 bags in 4, or
 1 bag in 2, 1 bag in 3, 1 bag in 4, or
 3 bags in 3.
- Besides 6, 9 and 12, other possible scores are:
 3: 3 bags in 1
 4: 2 bags in 1, 1 bag in 2
 5: 2 bags in 1, 1 bag in 3, or
 1 bag in 1, 2 bags in 2
 7: 1 bag in 1, 2 bags in 3, or
 2 bags in 2, 1 bag in 3, or
 1 bag in 1, 1 bag in 2, 1 bag in 4
 8: 2 bags in 2, 1 bag in 4, or
 1 bag in 2, 2 bags in 3, or
 1 bag in 1, 1 bag in 3, 1 bag in 4
 10: 1 bag in 2, 2 bags in 4

Adapt this puzzle by using larger numbers.

6 Crossword

¹ T	W	² O		³ S	I	X
		N		E		
⁴ T	W	E	L	V	E	
E				E		
N		⁵ N	I	N	E	

7 Gold bars

Move two bars from pile 1 to pile 3.
 Move one bar from pile 4 to pile 2.

8 Ride at the fair

The amounts up to 20p that **cannot** be made from exactly three coins are:

1p, 2p, 10p, 18p, 19p.

Lucy could have given her Mum:

$$3p = 1p + 1p + 1p$$

$$4p = 2p + 1p + 1p$$

$$5p = 2p + 2p + 1p$$

$$6p = 2p + 2p + 2p$$

$$7p = 5p + 1p + 1p$$

$$8p = 5p + 2p + 1p$$

$$9p = 5p + 2p + 2p$$

$$11p = 5p + 5p + 1p$$

$$12p = 5p + 5p + 2p$$

$$13p = 10p + 2p + 1p$$

$$14p = 10p + 2p + 2p$$

$$15p = 5p + 5p + 5p$$

$$16p = 10p + 5p + 1p$$

$$17p = 10p + 5p + 2p$$

9 Sum up

If each number can be used only once:

$$9 = 2 + 3 + 4$$

$$10 = 2 + 8$$

$$11 = 3 + 8$$

$$12 = 4 + 8$$

$$13 = 2 + 3 + 8$$

$$14 = 2 + 4 + 8$$

$$15 = 3 + 4 + 8$$

Other solutions are possible if numbers can be repeated.

Other totals:

$$5 = 2 + 3$$

$$6 = 2 + 4$$

$$7 = 3 + 4$$

$$17 = 2 + 3 + 4 + 8$$

10 Birds' eggs

There are 10 possibilities:

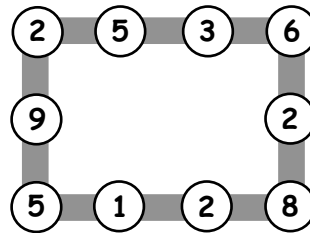
1, 1, 17 1, 7, 11 3, 3, 13 5, 5, 9

1, 3, 15 1, 9, 9 3, 5, 11 5, 7, 7

1, 5, 13 3, 7, 9

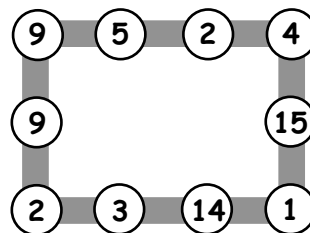
11 Number lines

1. For example:



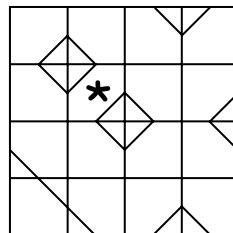
Other solutions are possible.

2. For example:

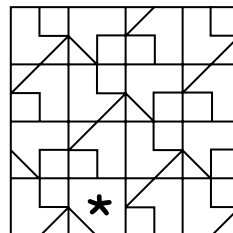


12 Odd one out

1.



2.



13 Line of symmetry

There are five other ways for Gopal to arrange the squares:

red, green, blue, blue, green, red
 green, red, blue, blue, red, green
 green, blue, red, red, blue, green
 blue, red, green, green, red, blue
 blue, green, red, red, green, blue

What if Gopal has eight squares: two red, two blue, two green and two yellow? How many different symmetrical lines can he make now? (24)

14 Card sharp

- There are 10 different ways to choose three cards with a total of 12:
 0, 3, 9 1, 2, 9 2, 3, 7 3, 4, 5
 0, 4, 8 1, 3, 8 2, 4, 6
 0, 5, 7 1, 4, 7
 1, 5, 6
- There are 9 different ways to choose four cards with a total of 12:
 0, 1, 2, 9 0, 2, 3, 7 1, 2, 3, 6
 0, 1, 3, 8 0, 2, 4, 6 1, 2, 4, 5
 0, 1, 4, 7 0, 3, 4, 5
 0, 1, 5, 6
- No.

Adapt the puzzle by changing the total.

15 Jack and the beanstalk

Jack can climb the beanstalk like this:

left, left, right, right
 left, right, left, right (as shown)
 left, right, right, left
 right, left, right, left
 right, left, left, right
 right, right, left, left

16 Monster

Alesha can use these coins to pay 45p:

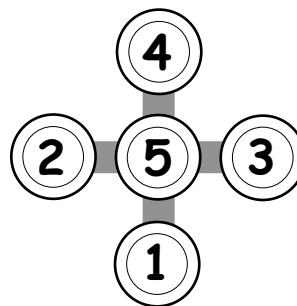
two 20p and one 5p
 one 20p, two 10p and one 5p
 one 20p, one 10p and three 5p
 one 20p and five 5p
 four 10p and one 5p
 three 10p and three 5p
 two 10p and five 5p
 one 10p and seven 5p
 nine 5p

There are 13 different ways to pay 50p using only silver coins. First add 5p to each of the ways for 45p. The other four possibilities are:

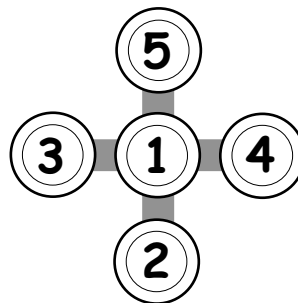
two 20p and one 10p
 one 20p and two 10p
 five 10p
 one 50p

17 Cross-road

Each line adds up to 10.



Each line adds up to 8.



18 Fireworks

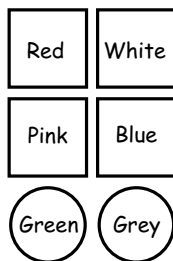
For 19 stars:

- 5 fireworks made 3 stars and 1 made 4 stars, or
- 1 firework made 3 stars and 4 made 4 stars

For 25 stars:

- 3 fireworks made 3 stars and 4 fireworks made 4 stars, or
- 7 fireworks made 3 stars and 1 firework made 4 stars

19 Coloured shapes



20 Ones and twos

Some higher scores:

$2 \times 2 \times 2 = 8$	$2 + 1 = 3$
$1 + 1 + 1 = 3$	$2 + 1 = 3$
$8 \times 3 = 24$	$2 + 1 = 3$
	$3 \times 3 \times 3 = 27$

21 Birthdays

Answer: Paul is 15.

Most pupils will guess then try to improve.

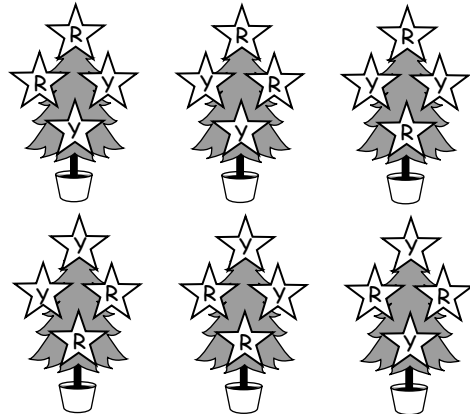
For example, try 10:

$10 \times 2 = 20$ $20 + 5 = 25$ too small

22 Christmas tree

There are 16 different ways:

- 1 way for 4 red;
- 1 way for 4 yellow;
- 4 ways for 3 red and 1 yellow;
- 4 ways for 1 red and 3 yellow;
- 6 ways for 2 red and 2 yellow (shown below).



23 At the toyshop

There are 9 tricycles and 2 go-carts, or 4 tricycles and 5 go-carts.

24 Ben's numbers

There are 16 different numbers in Ben's list:

5, 14, 23, 32, 41, 113, 122, 131, 212, 221, 311, 1112, 1121, 1211, 2111, 11111.

What if the digits add up to 4, or if they add up to 6? How many different numbers are there now?

25 Spot the shapes 1

1. There are 9 triangles.
2. There are 18 rectangles.