LEVEL 4

Level 4

N5 N6 N7 N8 N9 N10 N11 N12 C7 C8 C9 C10 C11 C12 C13
A1 A2 S6 S7 S8 S9 S10 S11 S12 D3 D4 D5

Example
3, 5, 7, 9, 11, 13, ?, ?, ?
a) Describe the number pattern. *It goes up in 2s*
b) What are the next three terms? *15, 17, 19*

1) For each number pattern:

   a) Describe the pattern

   b) Work out what the next three terms are

   (i) 2, 4, 6, 8, 10, 12, ?, ?, ?

   (ii) 1, 4, 7, 10, 13, 16, ?, ?, ?

   (iii) 5, 12, 19, 26, 33, 40, ?, ?, ?

   (iv) -2, 3, 8, 13, 18, 23, ?, ?, ?

   (v) 36, 33, 30, 27, 24, 21, ?, ?, ?

   (vi) -12, -8, -4, 0, 4, 8, ?, ?, ?

   (vii) 100, 91, 82, 73, 64, 55, ?, ?, ?

   (viii) 7, 8.5, 10, 11.5, 13, 14.5, ?, ?, ?

2) For both of the following number patterns:

   a) Describe the pattern

   b) Work out what the next three terms are

   (i) 1, 4, 9, 16, 25, 36, ?, ?, ?

   (ii) 1, 3, 6, 10, 15, 21, ?, ?, ?

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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1) Work out the next two terms for each of the following number patterns:

   a) 3, 8, 15, 24, 35, ?, ?

   b) 4, 14, 36, 76, 140, ?, ?

2) Work out the next two terms for each of the following number patterns:

   a) 1, 2, 4, 8, 16, 32, ?, ?

   b) 2, 7, 22, 67, 202, ?, ?

3) Work out the next two terms for each of the following number patterns:

   a) 1, 1, 2, 3, 5, 8, 13, 21, ?, ?

   b) 1, 2, 3, 6, 11, 20, 37, 68, ?, ?

4) Work out the next two terms for each of the following :

   a) O, T, T, F, F, S, S, ?, ?

   b) J, F, M, A, M, J, J, ?, ?

5) Choose any number between 1 and 20.
   If your number is even, halve it and write down the answer.
   If your number is odd, multiply it by three and add one. Write down the answer.
   Look at your answer and follow the same rules:
   If it is even you halve it and write down the answer.
   If it is odd you multiply by three and add one and write down the answer.
   Only stop when you get to one.

   Try more starting numbers (of any size).
   Do they all go to one?

   What about if you use 27 as the number to start with?

6) This number pattern begins with a 1.
   After that, every row can be worked out from the row above it.
   Can you work out the rule and find out what the question marks should be in the last row?

   This is a very difficult question and not many succeed.

```
                1
               1 1
               2 1
             1 2 1 1
           1 1 1 2 2 1
           3 1 2 2 1 1
         1 3 1 1 2 2 2 1
       1 1 1 3 2 1 3 2 1 1
     3 1 1 3 1 2 1 1 1 3 1 2 2 1
? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
```

Level 4

Shade the twelve squares with square numbers in them.

| 1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96
97	98	99	100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132
133	134	135	136	137	138	139	140	141	142	143	144

Level 4

N5   N6 ✓   N7   N8   N9   N10   N11   N12   C7   C8   C9   C10   C11   C12   C13
A1   A2   S6   S7   S8   S9   S10   S11   S12   D3   D4   D5

We call the numbers
1, 4, 9, 16, 25 . . . . .
square numbers because we can
arrange their number of dots into
squares.

1　　4　　9　　16　　25
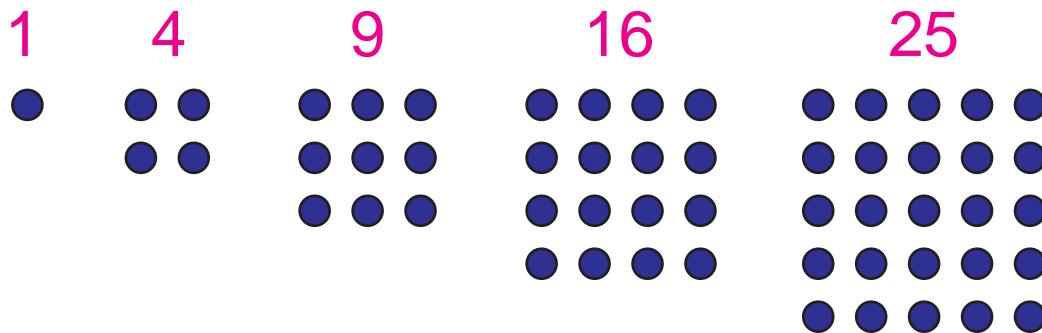
a) Can you work out what special
name is given to the numbers
1, 3, 6, 10, 15, . . .?

b) If you choose one of these special
numbers and add it to the next
one, what do you get every time?
Can you see why?

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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1)   a)   Write down the first five multiples of 3.

      b)   Write down the first five multiples of 7.

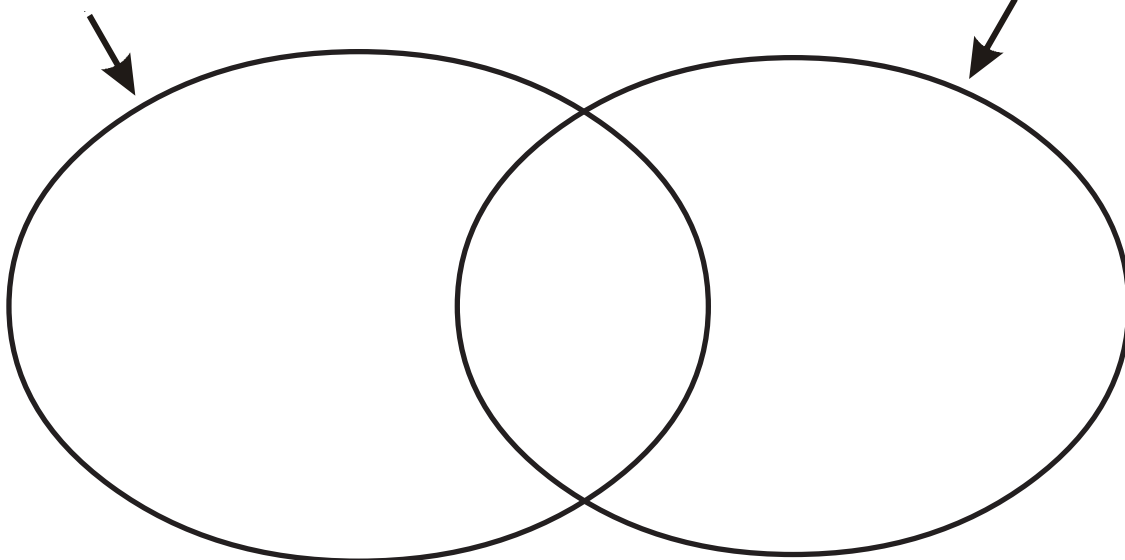   c)   Write down the first five multiples of 4.

2)   6, 12, 18, 24, 30   are the first five multiples
      of which number?

3)   What are the eighth, ninth and tenth multiples of 11?

4)   Put the correct numbers in these circles.
      Be careful of the overlaps.

*First eight multiples
of 3 in this circle*

*First eight multiples
of 4 in this circle*

Level 4

N5   N6   N7   N8   N9   N10   N11   N12   C7   C8   C9   C10   C11   C12   C13
A1   A2   S6   S7   S8   S9   S10   S11   S12   D3   D4   D5

The sieve of Eratosthenes

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Just follow these steps:

a) Cross out 1.

b) Shade in the square with 2 in it.
Now cross out all other multiples of 2.

c) Shade in the 3 square.
Cross out all other multiples of 3
(some will already be crossed out).

d) Shade in the 5 square.
Cross out all other multiples of 5.

e) Shade in the 7 square.
There should be just three other multiples of 7 which haven't already been crossed out. Cross them out.

f) Shade in every square that hasn't been crossed out.

g) Write out the numbers in every shaded square.

h) The numbers you have written down have a special name. **What is it**?

Level 4
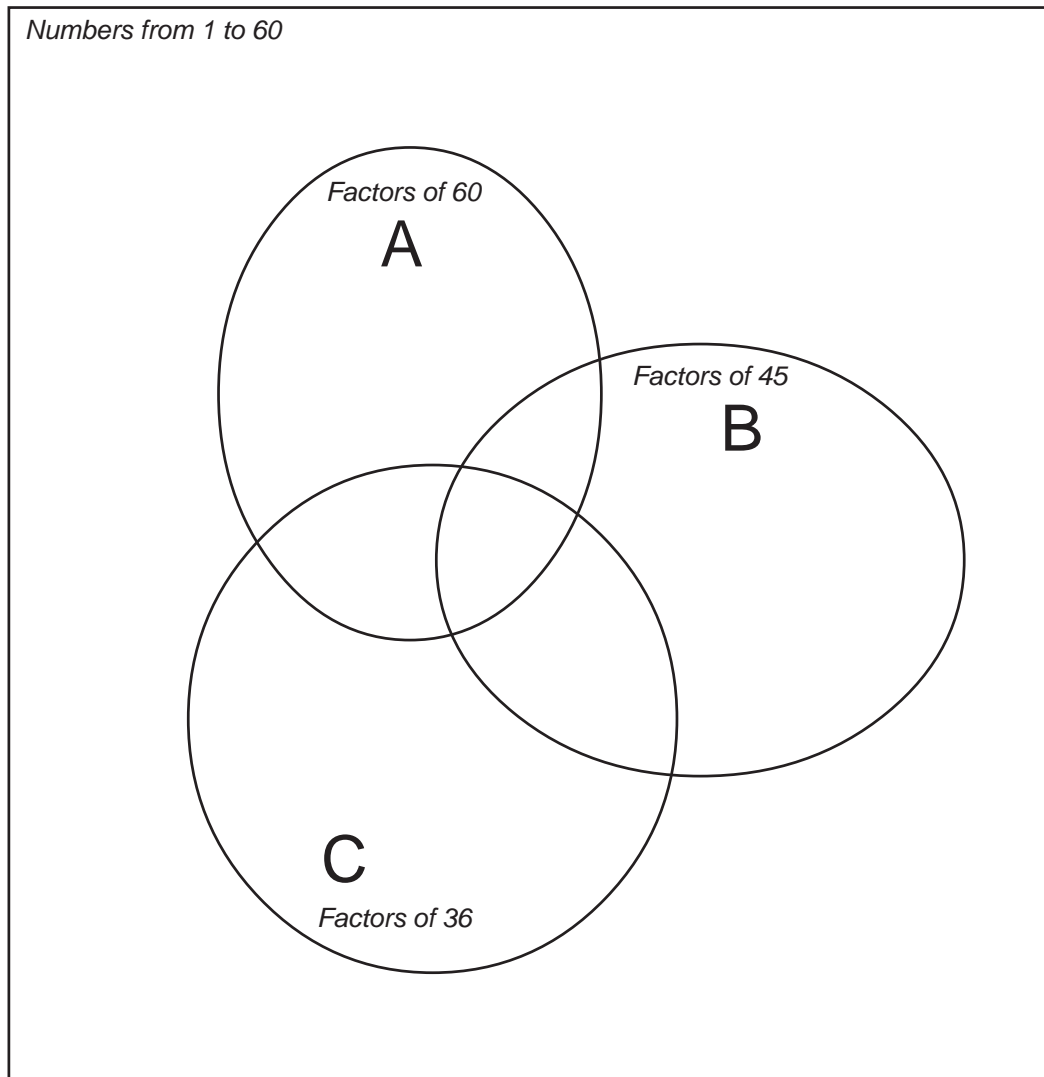
1) Write down all the factors of:

   a)   6

   b)   8

   c)   10

   d)   12

   e)   20

   f)   21

2) 100 has nine factors.

   What are they?

3) The numbers 2, 3, 5 and 7 all have exactly two factors.

   Find the next four numbers with only two factors.

4) The numbers 1, 4, 9 and 16 all have an odd number of factors.

Find the next three numbers which have an odd number of factors.

5) Put the correct numbers in the circles.
Be careful of the overlaps.

Factors of 24 in this circle

Factors of 40 in this circle
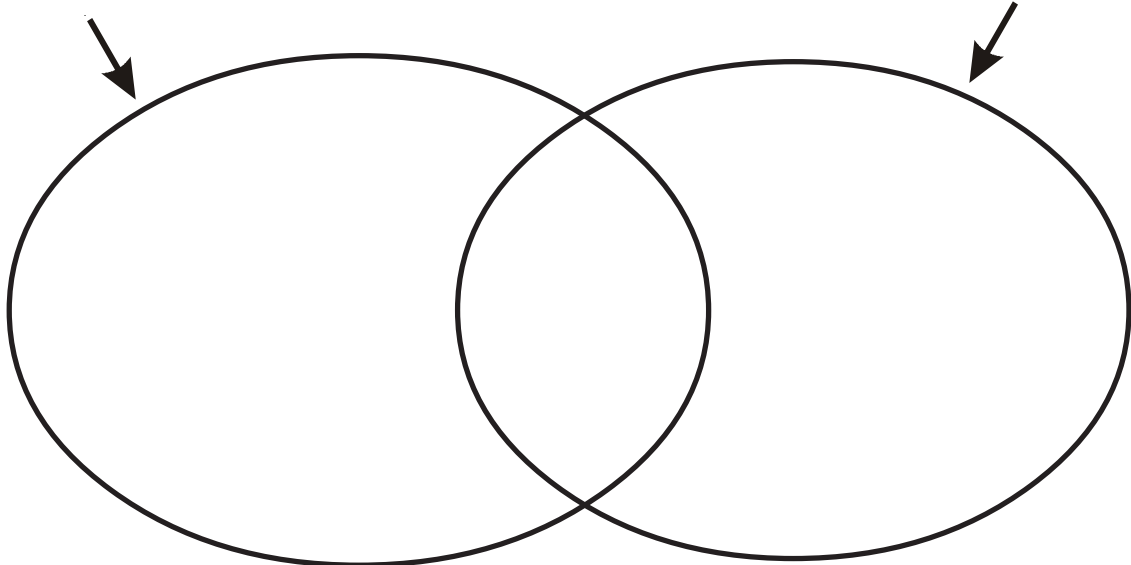
Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 | | | |

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Place all the whole numbers from 1 to 60 in the diagram below.

However, you must stick to these four rules:

1) In the rectangle you must have every whole number from 1 to 60

2) In circle A you must have all the factors of 60

3) In circle B you must have all the factors of 45

4) In circle C you must have all the factors of 36

Numbers from 1 to 60

Factors of 60

A

Factors of 45

B

C

Factors of 36

Level 4

1) 75×100 = ____

2) 102×10 = ____

3) 9×1000 = ____

4) $450 \div 10$ = ____

5) $3800 \div 10$ = ____

6) $9700 \div 100$ = ____

7) 60×1000 = _____

8) $7000 \div 100$ = ____

9) 210×1000 = _____

10) $1050000 \div 1000$ = ____

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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The table shows the approximate populations of five different places.

Place	Approximate population
London	7 000 000
Glasgow	700 000
Barnsley	70 000
Penkbridge	7 000
High Bickington	700

Complete these sentences:

The population of **Barnsley** is about **10 times** bigger than the population of ....

The population of .... is about **100 times** bigger than the population of **Barnsley**.

The population of Glasgow is about .... **times** bigger than the population of **Penkbridge**.

The population of **Barnsley** is about **10 times** smaller than the population of ....

The population of .... is about **100 times** smaller than the population of **Barnsley**.

The population of High Bickington is about .... **times** smaller than the population of **Penkbridge**.

Level 4

| N5 | N6 | N7 | N8 | N9 ✓ | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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1) What fraction of the following shapes is shaded?

a)

b)

c)

d)

e)

f)
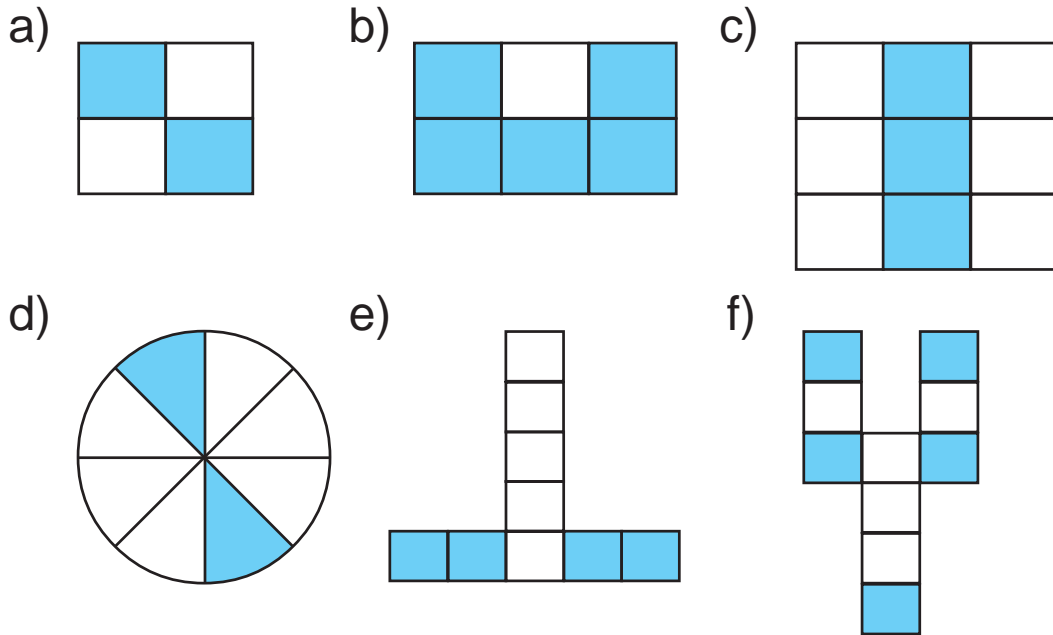
2) Shade the shapes according to the given fractions.

a) $\dfrac{5}{7}$

b) $\dfrac{1}{3}$

c) $\dfrac{25}{100}$
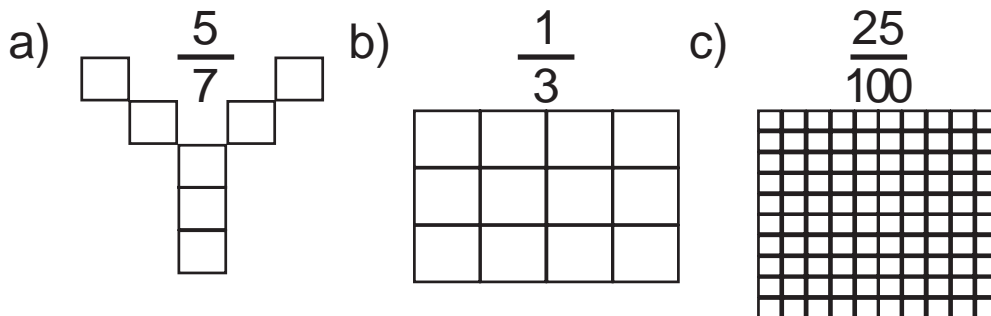
3) What percentage of the shapes below are shaded?
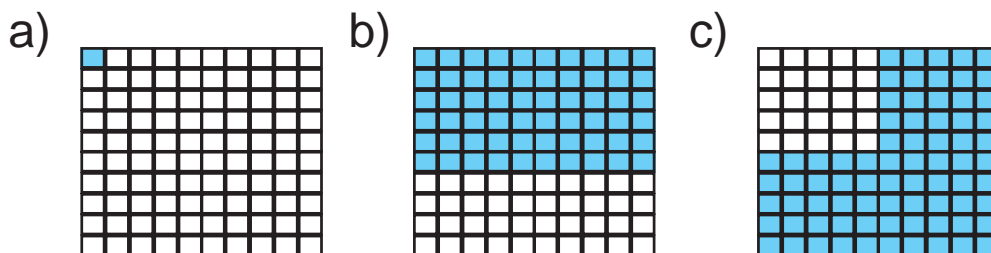
a)

b)

c)

Level 4

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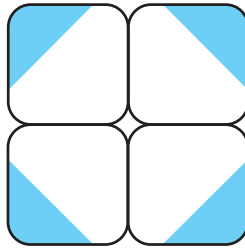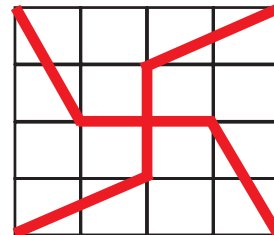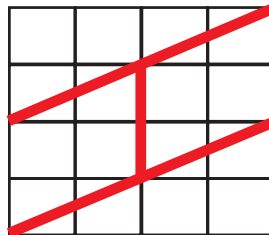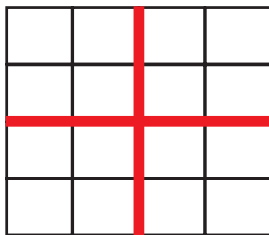
1) $\frac{1}{3}$ of this shape is shaded.
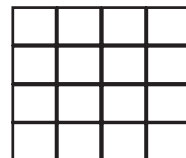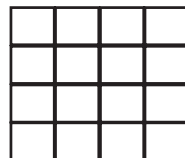
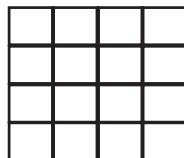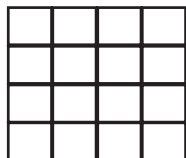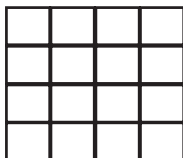a) What fraction of this diagram is shaded?

b) What fraction of this diagram is shaded?

2) These rectangles have been split into four equal pieces.

Split each of these rectangles into four equal pieces in different ways.

Level 4

1) a) 0.47   b) 0.407   c) 7.04   d) 47.4

    ____   ____   ____   ____

From the following list, match the correct way of reading each of the above numbers.

A- seven point four   F- seven zero four
B- zero point forty seven   G- forty seven point four
C- zero point four zero seven   H- four seven four
D- four seven point four   I- four seven point zero
E- seven point zero four   J- zero point four seven

2) Arrange the numbers in order of size, starting with the smallest.

    a) 1.8   0.8   8   8.1

        ___   ___   ___   ___

    b) 0.08   1.16   0.12   1.09

        ___   ___   ___   ___

    c) £4.04   £4.40   £4.14   £0.41

        ___   ___   ___   ___

    d) 3.11   3.1   3   3.011   3.001

        ___   ___   ___   ___   ___

    e) 0.2   0.022   0.202   0.222   0.22

        ___   ___   ___   ___   ___

    f) 6.06   60.06   6.606   66.06   6.066

        ___   ___   ___   ___   ___

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 ✓ | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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1) Here are some number cards.

(4) (7) (3) (1) (.)

Each card can be used once, all cards must be used,
the decimal point card cannot be at the end of a number.

a) What is the smallest number you can make?

( ) ( ) ( ) ( ) ( )

b) What is the largest number you can make?

( ) ( ) ( ) ( ) ( )

2) The times, in seconds, for the seven runners in a 100m race were:

9.96 10.03 9.92 10.26 10.37 9.99 10.00

What was the time of the winner? _____

3) I am a decimal number.
I have two figures before the decimal point and two figures after the decimal point.
I read the same forwards as backwards.
I have no zeros.
My first digit is bigger than my second digit.
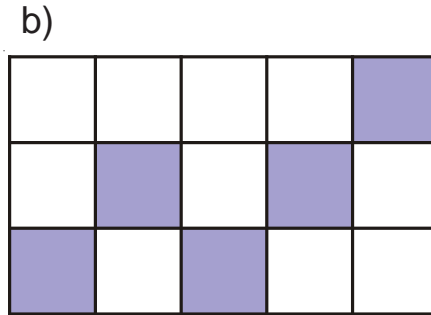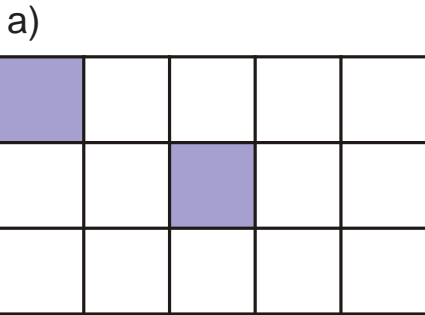The sum of my digits is 8.

What number am I? _____

Level 4

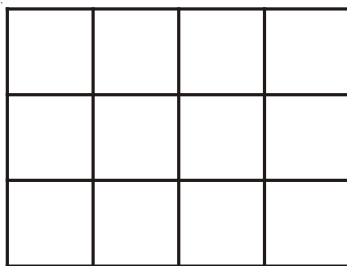| N5 | N6 | N7 | N8 | N9 | N10 | N11✓ | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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1) For each of the three grids below, write down the ratio of shaded squares to unshaded squares.
Simplify the ratios if possible.
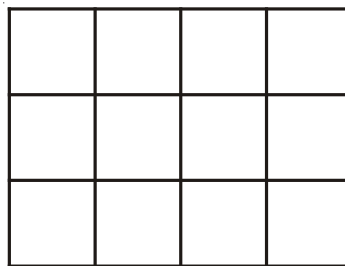
a)

b)

c)
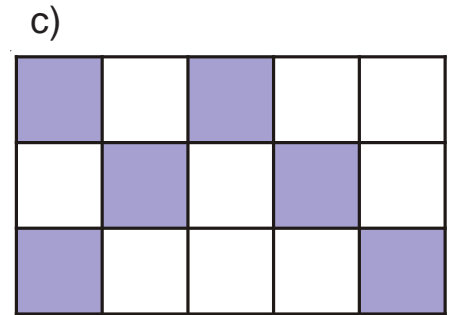
2) Shade in squares for each grid to give the correct ratios.
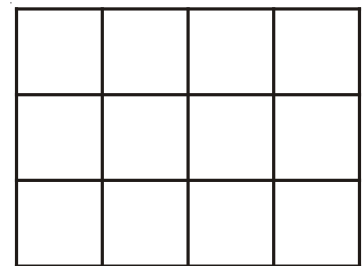
a)   Shaded Unshaded
      5   :   7

b)   Shaded Unshaded
      1   :   2

c)   Shaded Unshaded
      5   :   1

3) The instructions on a lemon squash bottle are as follows: 1 part squash to 4 parts water

a) If you put 20 ml of squash in a glass, how much water would you need?

b) If you had used 200 ml of water, how much squash should be in the drink?

c) If you want to make 500 ml of squash drink, how much squash should be used and how much water?

Level 4

1) Here we have a fine example of a Vesuvian and a Dragian.
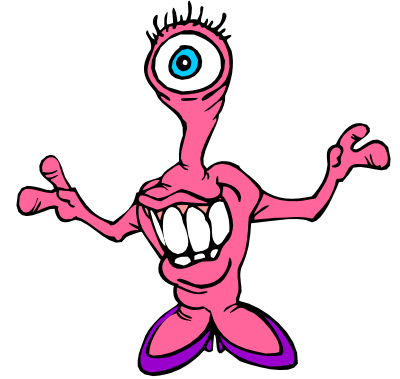
   If you count carefully you can see that the ratio of teeth is 5 : 7

   a) What is the ratio of feet?

   b) What is the ratio of eyes?
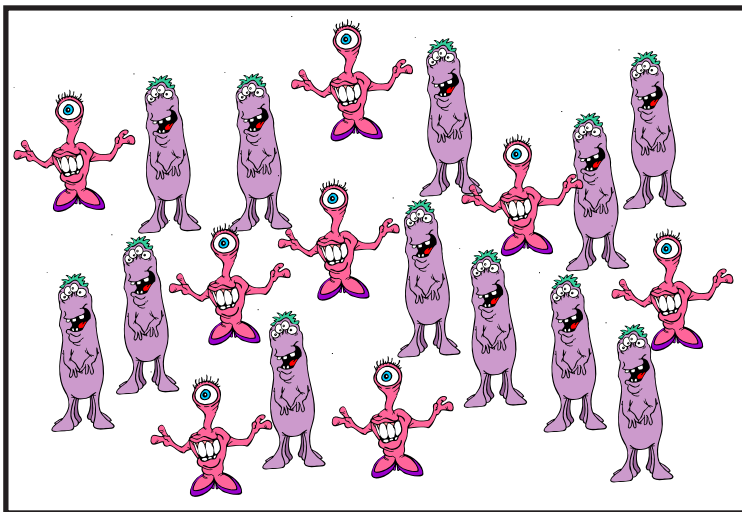
   c) What is the ratio of fingers?

   Check that you have given all ratios in the simplest form.

Vesuvian

Dragian

2) Look at this picture of Vesuvians and Dragians and work out the following:

   a) The ratio of Vesuvians to Dragians.

   b) The ratio of Vesuvian feet in the picture to Dragian feet in the picture.

   c) The ratio of Vesuvian eyes in the picture to Dragian eyes in the picture.

3) In another picture of Vesuvians and Dragians we only know two things:

   Firstly, there are more Vesuvians than Dragians.
   Secondly, there are 46 teeth altogether in the picture.

   Work out how many Vesuvians and Dragians there are in the picture.

   Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 ✓ | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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C7 Addition

1) 1524 + 4273   = ____

2) 7452 + 216   = ____

3) 24578 + 1215   = _____

4) 591 + 372 + 85   = ____

5) 9876 + 55 + 1039   = ____

6) 59.1 + 37.2   = ____

7) 24.75 + 9.98   = _____

8) 94.78 + 104.9   = _____

9) 309 + 12.5 + 631.4   = _____

10) 105 + 7.32 + 51.8 + 2804   = _____

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7✓ | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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1) In the sum on the right

    a) replace three of the digits with zeros so that the answer is 1411

    b) replace three of the digits with zeros so that the answer is 1513

    c) replace three of the digits with zeros so that the answer is 1626

    d) replace three of the digits with zeros so that the answer is 1583

```
1  1  1
2  2  2
3  3  3
4  4  4
5  5  5   +
_____
_____
```

2) Choose a number from a box and a number from a loop to make the totals in a) and b).

| 3.61 | 2.975 | 2.35 | 1.3 | 6.72 |

   (3.2)   (7.65)   (1.006)   (3.58)   (2.25)

a) [   ] + (   ) = 4.6

b) [   ] + (   ) = 11.26

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 ✓ | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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C8 Subtraction

1) 14562 – 1251   = _____

2) 6652 – 716   = _____

3) 42160 – 39215   = _____

4) 2300 – 934   = _____

5) 475.83 – 81.6   = _____

6) 68.1 – 27.3   = _____

7) 24.75 – 0.098   = _____

8) 94.78 – 36   = _____

9) 3564 – 1971.6   = _____

10) 800 – 237.62   =_____

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 ✓ | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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C8 — Just For Fun

Complete the boxes and the circles:
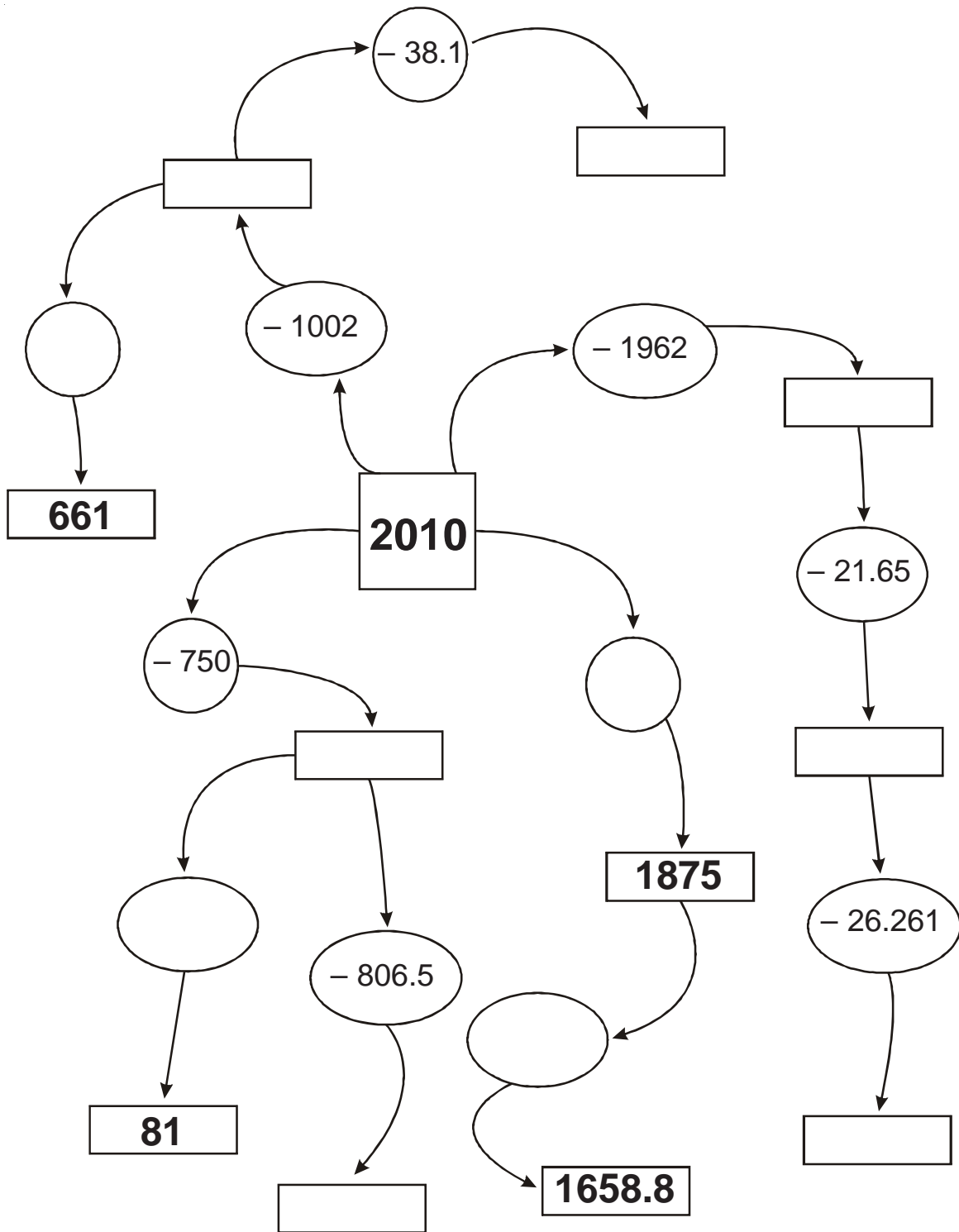
Central value: **2010**

Circles (operations): − 38.1, − 1002, − 1962, − 21.65, − 750, − 806.5, − 26.261

Given boxes: **661**, **1875**, **81**, **1658.8**

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | ✓ C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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1) 3×13 = _____

2) 55×4 = _____

3) 9×64 = _____

4) 92×5 = _____

5) 7×87 = _____

6) 342×8 = _____

7) 6×208 = _____

8) 745×4 = _____

9) 289×7 = _____

10) 113×9 = _____

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9✓ | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

1) Here are some items available from a local shop:
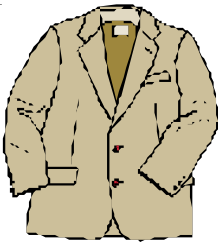
Jacket: £17   Trainers: £56   MP3 player: £32   Television: £499
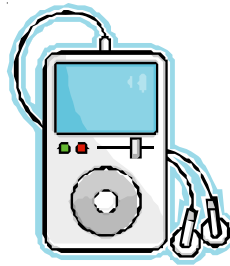
Work out the cost of:

a) 5 jackets   _____

b) 6 MP3 players   _____

c) 4 pairs of trainers   _____

d) 7 televisons   _____

2) Work out what the ✱ must be.

a)
×	20	3
✱	✱✱✱	27

answer: ✱ ✱ ✱

b)
$$\begin{array}{r} 5\ ✱ \\ 7 \\ \hline ✱\ ✱\ 2 \end{array} \times$$

Level 4

C10 Short Division

1) $786 \div 2$ = _____

2) $465 \div 5$ = _____

3) $448 \div 8$ = _____

4) $552 \div 6$ = _____

5) $801 \div 9$ = _____

6) $5976 \div 8$ = _____

7) $9080 \div 5$ = _____

8) $17801 \div 7$ = _____

9) $18054 \div 6$ = _____

10) $374877 \div 9$ = _____

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10✓ | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

1) Here are some items available from a local shop:

Watch: £ _____   Camera: £ _____   Camcorder: £ _____   Laptop: £ _____

Work out the unit price of each item knowing that:

7 watches cost £336,

5 cameras cost £380,

4 camcorders cost £1260,

6 laptops cost £7794.

2) a) If 3 chairs cost £17.40,
   how much would one of them cost?

   £_____

   b) If 7 shirts cost £34.93,
   how much would one of them cost?

   £_____

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 ✓ | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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Page 29B

1) 4×1.2 = ____

2) 6.5×3 = ____

3) 9×18.7 = ____

4) 3.6×5 = ____

5) 7×8.2 = ____

6) 6×1.39 = ____

7) 9.2×8 = ____

8) 8.35×4 = ____

9) 3.62×7 = ____

10) 25.3×9 = ____

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 ✓ | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

1) Here are some items available from a local shop:

| Milk: £1.20 | Bread: £0.65 | Lollies: £0.30 | Chocolates: £3.99 |

Work out the cost of:

a) 7 lollies, _____

b) 3 bottles of milk, _____

c) 2 loaves of bread, _____

d) 5 boxes of chocolates. _____

2) Rulers cost £0.25 each.
Pens cost £0.45 each.
Kelly buys 3 rulers and 5 pens.

Work out how much she pays.

_____

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 ✓ | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

1) Which four coins make a total of 77p?

2) Six bars of metal each weigh 2.75 kg.
   How much do they weigh altogether?

3) At a party for 171 people, 9 guests
   sat at each table.
   How many tables were there?

4) Coke cans cost 43p each.
   How many cans you buy with £6?

5) Olivia went to a cafe.
   She ordered:

   2 sausages
   Baked beans
   3 coffee
   1 juice

   Menu

Fried eggs	30p
Baked beans	45p
Sausages	38p
Coffee	65p
Tea	72p
Juice	50p

   She paid with a £5 note.
   Work out how much change she got.

Level 4

1) Cheese is on offer at £3.26 per kilogram.
   Emma buys half a kilogram.

   How much change does she receive from
   a £10 note?

2) A mug and a plate together cost £2.90.
   The mug cost 40p more than the plate.

   How much does the plate cost?

3) A man is 27 cm taller than his son, who is
   8 cm shorter than his mother. The man was born
   42 years ago and is 1.78 m tall.

   How tall is his wife?

4) A bus starts at Birmingham and makes three stops
   before reaching London.
   At Birmingham, 37 people get on.
   At Rugby, 13 people get off and 6 get on.
   At Willen, 9 people get off and 15 get on.
   At Luton, 24 people get off and 8 get on.
   How many people are on the bus when it
   reaches London?

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 ✓ | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 | | | |

1) There are 7 people in a team.
   How many teams can you make from
   131 people?

2) A motorist bought 26 litres of petrol at
   £1.19 per litre.
   a) How much did it cost?
   b) What change did he get from £50?

3) A museum trip is organised for 57
   members of a youth club. They go in
   minibuses that can each seat up to
   15 people.
   It costs £42.50 for each minibus and £172
   for the group to access the museum.
   How much will the trip cost per person?

4) Mars Bars cost 35p. Skittles cost 45p.
   Gillian bought 5 bags of Skittles and
   some Mars Bars.
   She paid with a £5 note and received
   30p change.
   How many Mars Bars did she buy?

Level 4

N5	N6	N7	N8	N9	N10	N11	N12	C7	C8	C9	C10	C11	C12	C13
A1	A2	S6	S7	S8	S9	S10	S11	S12	D3	D4	D5			

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Page 32A

1) Three consecutive integers have a sum of 105.
What are they?   ___   ___   ___

2) Using the brackets keys of your calculator,

work out the following.

a) $164 - (27 + 56)$ = _____

b) $44.8 \div (15.4 - 9.8)$ = _____

c) $(19.8 - 3.3) \div (31.2 - 16.2)$ = _____

d) $(8 \times 14.4) \div (11.1 - 4.7)$ = _____

3) If you start with 16 and press the square root key of your calculator ($\sqrt{}$) twice, the answer given is 2.

If you start with 81 and press the square root key of your calculator ($\sqrt{}$) twice, the answer given is 3.

Complete the following sentences:
a) If you start with 1296 and press the square root key of your calculator twice, the answer given is

_____ .

b) If you start with _____ and press the square root key of your calculator twice, the answer given is 5 .

Level 4

N5	N6	N7	N8	N9	N10	N11	N12	C7	C8	C9	C10	C11	C12	C13
A1	A2	S6	S7	S8	S9	S10	S11	S12	D3	D4	D5			

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1) A vintage car hire firm charges £70 for the first day's hire followed by £55 per day for all other days.

   a) How much would it cost to hire a car for 2 days?

   b) How much would it cost to hire a car for 9 days?

   c) When Sue hires a car it costs her £345.
      How many days did she hire the car for?

2) It costs 4p per copy on the school photocopier.

   a) How much would it cost to make 15 single-sided copies?

   b) Jane has to make 6 copies of a document which is double-sided (writing on both sides).
      How much will it cost?

   c) Ted copies a single-sided document but forgets how many copies he has made.
      Rather than counting them he simply looks at the bill and works it out from there.
      The bill was for £2.20.
      How many copies had he made?

Single-sided copies 4p each

Input ⟶ Multiply by 2 ⟶ Add 3 ⟶ Output
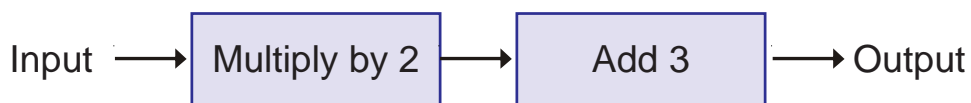
3) a) If Simon puts 7 into the number machine, what number comes out?

   b) If 100 goes in, what comes out?

   c) If 5½ goes in, what comes out?

   d) If 2.25 goes in, what comes out?

   e) If 25 comes out, what number was put in?

   f) If 8 comes out, what number was put in?

   g) If x goes in, what comes out?

Level 4

N5 N6 N7 N8 N9 N10 N11 N12 C7 C8 C9 C10 C11 C12 C13
A✓ A2 S6 S7 S8 S9 S10 S11 S12 D3 D4 D5

1) *Choose any number.*
   Add three to it.
   Multiply your result by two.
   Add six to it.
   Halve your answer.
   Subtract your original number.

   You should be left with six.
   Try to find out why you are always left with six.

---

2)

Input	Output
1	__
4	__
10	__
2.5	__
-3	__
__	30
__	48
__	-18
x	__

3)

Input	Output
1	__
4	__
10	__
2.5	__
-3	__
__	30
__	48
__	-18
x	__

---

4) Copy the table on the right.

Use this function machine to complete the table.

Input ⟶ [Multiply by itself] ⟶ [Add 5] ⟶ Output
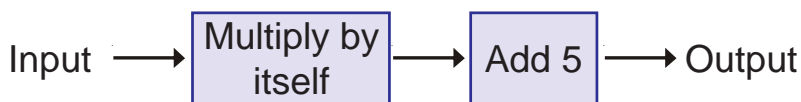
Input	Output
3	__
10	__
-4	__
__ or __	54
x	__

Level 4

1) Write down the coordinates of the crosses labelled A to J.
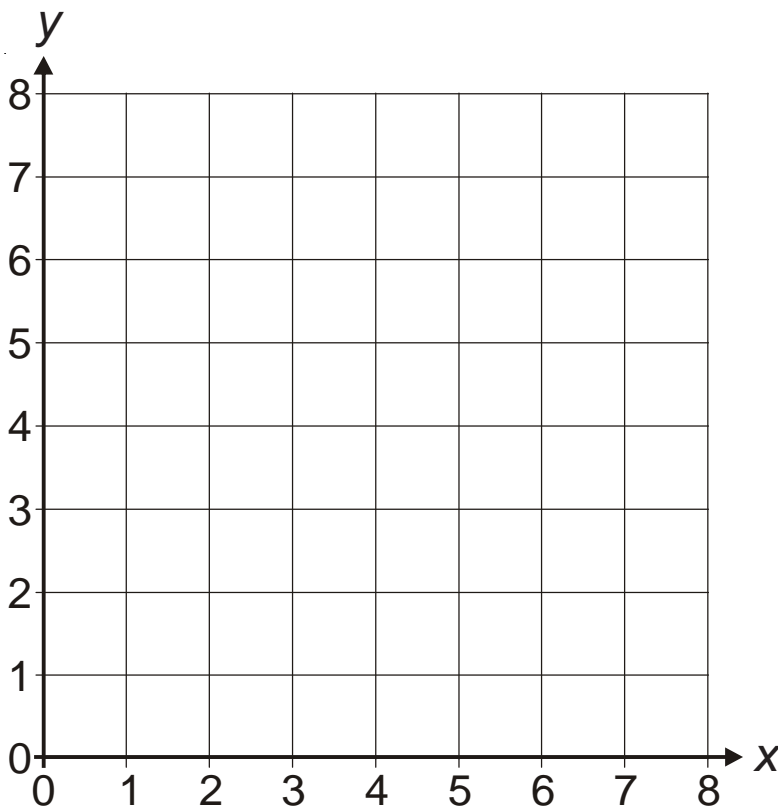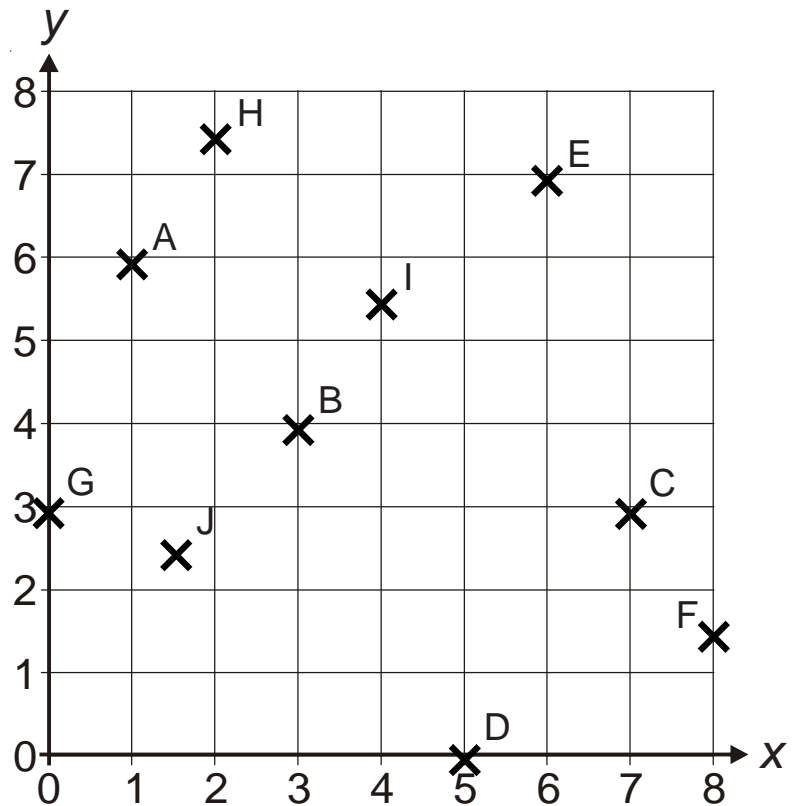
2) Put crosses at the following points and label them with the correct letters.

A (3, 7)

B (8, 4)

C (2, 5)

D (6, 0)

E (2.5, 3)

F (0, 6.5)

G (5.5, 7.5)

H (8, 8)

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |

| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |
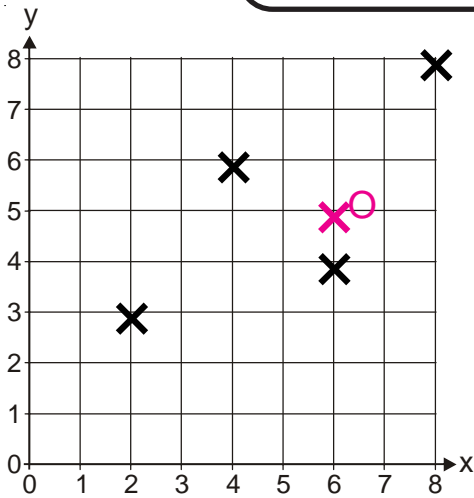
1) Sue has hidden an ostrich on the grid on the left - it is at (6, 5) and is labelled O.

Jack guesses the hiding place by shouting out coordinates.

Sue marks them on her grid and then tells Jack how far away he is from the hiding place.

Jack's first guess is (2, 3).
Sue tells him this is 6 away from the ostrich.

a) Why does she tell him his guess is 6 away?

b) He then guesses (4, 6) and she tells him it is 3 away. Why?

c) How far away is (8, 8)?

d) How far away is (6, 4)?

e) Which guess would be the furthest away?

2) *Play "Find the Ostrich" with a friend.* You both need two grids like the ones below:

a) You hide an ostrich on your left hand grid, your friend hides an ostrich on his/her left hand grid. (Coordinates must be whole numbers)

b) Choose who guesses first.

c) When your friend guesses, tell him/her how far away the guess is.

d) When you guess, mark the guess on the right hand grid.
When you are told how far away it is, write it next to your guess.

e) The first one to find the ostrich is the winner.
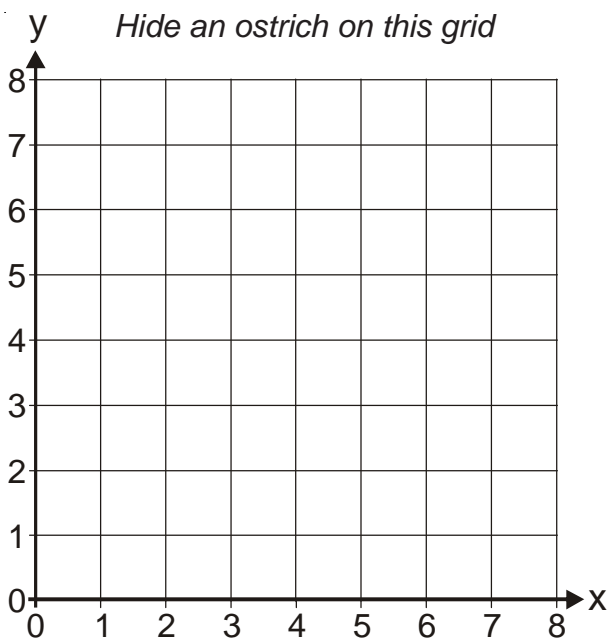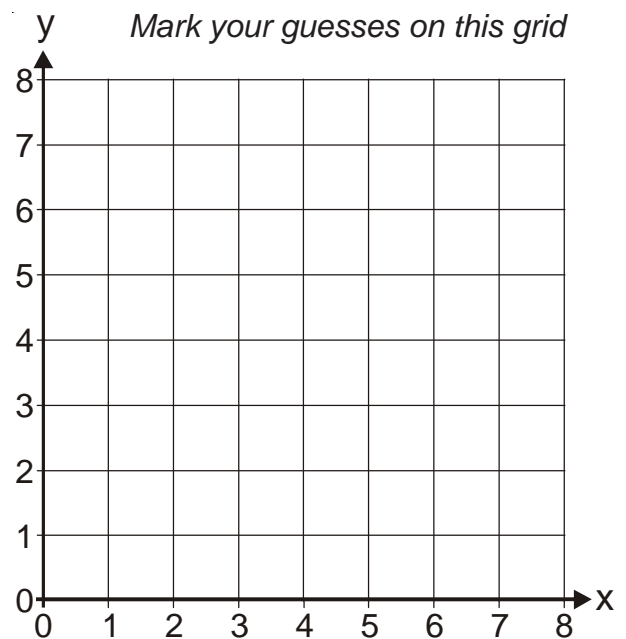
Hide an ostrich on this grid

Level 4

Mark your guesses on this grid

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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Page 34B

Print this page onto card.
Cut out the net and score along all the dotted lines with a compass point.
Put glue on the shaded tabs, fold and stick to make a **TETRAHEDRON**.
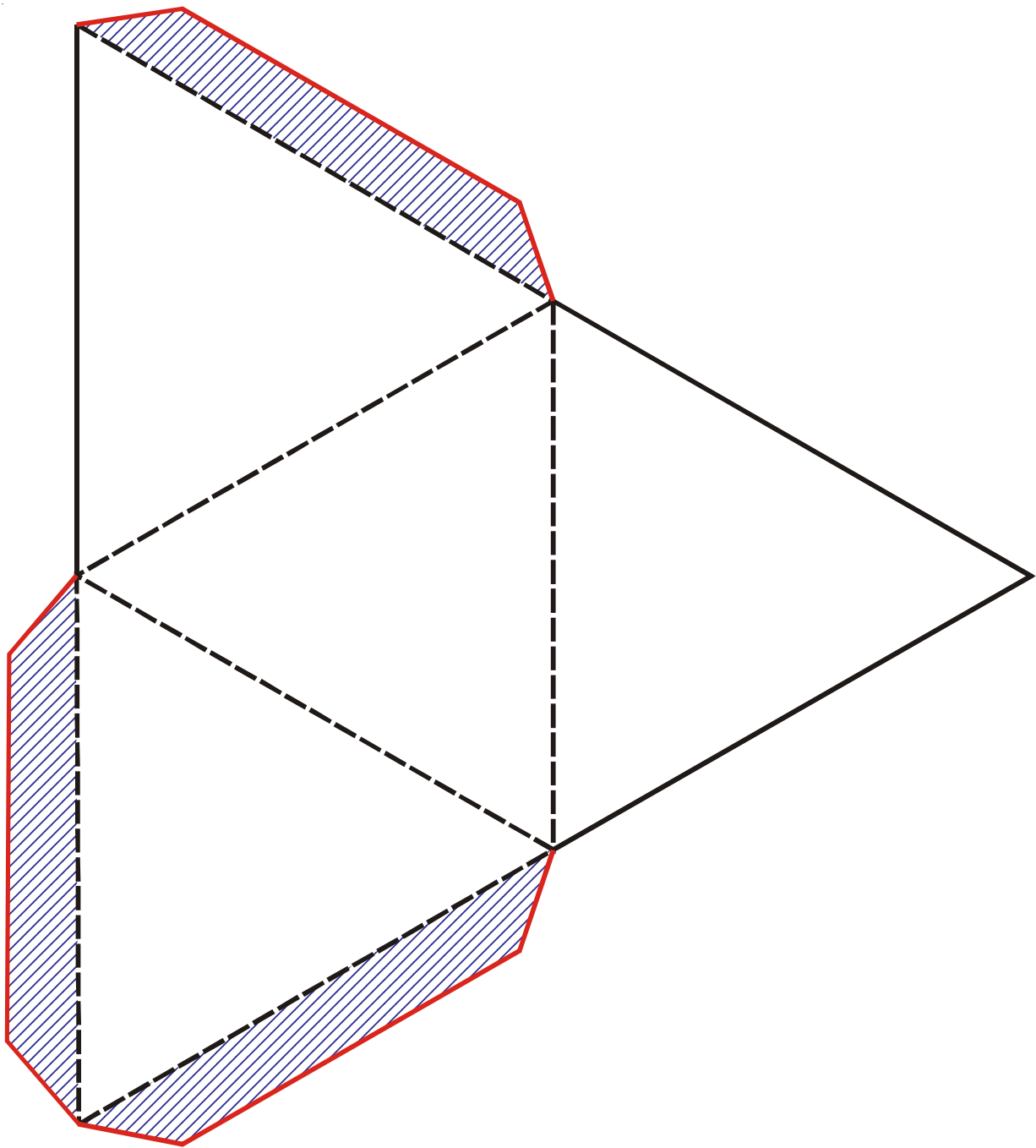
Level 4

N5 N6 N7 N8 N9 N10 N11 N12 C7 C8 C9 C10 C11 C12 C13
A1 A2 S6 S7 S8 S9 S10 S11 S12 D3 D4 D5

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S6 — Making 3D Models

Print this page onto card.
Cut out the net and score along all the dotted lines with a compass point.
Put glue on the shaded tabs, fold and stick to make a **CUBE**.

Level 4

Print this page onto card.
Cut out the net and score along all the dotted lines with a compass point.
Put glue on the shaded tabs, fold and stick to make an **OCTAHEDRON**.
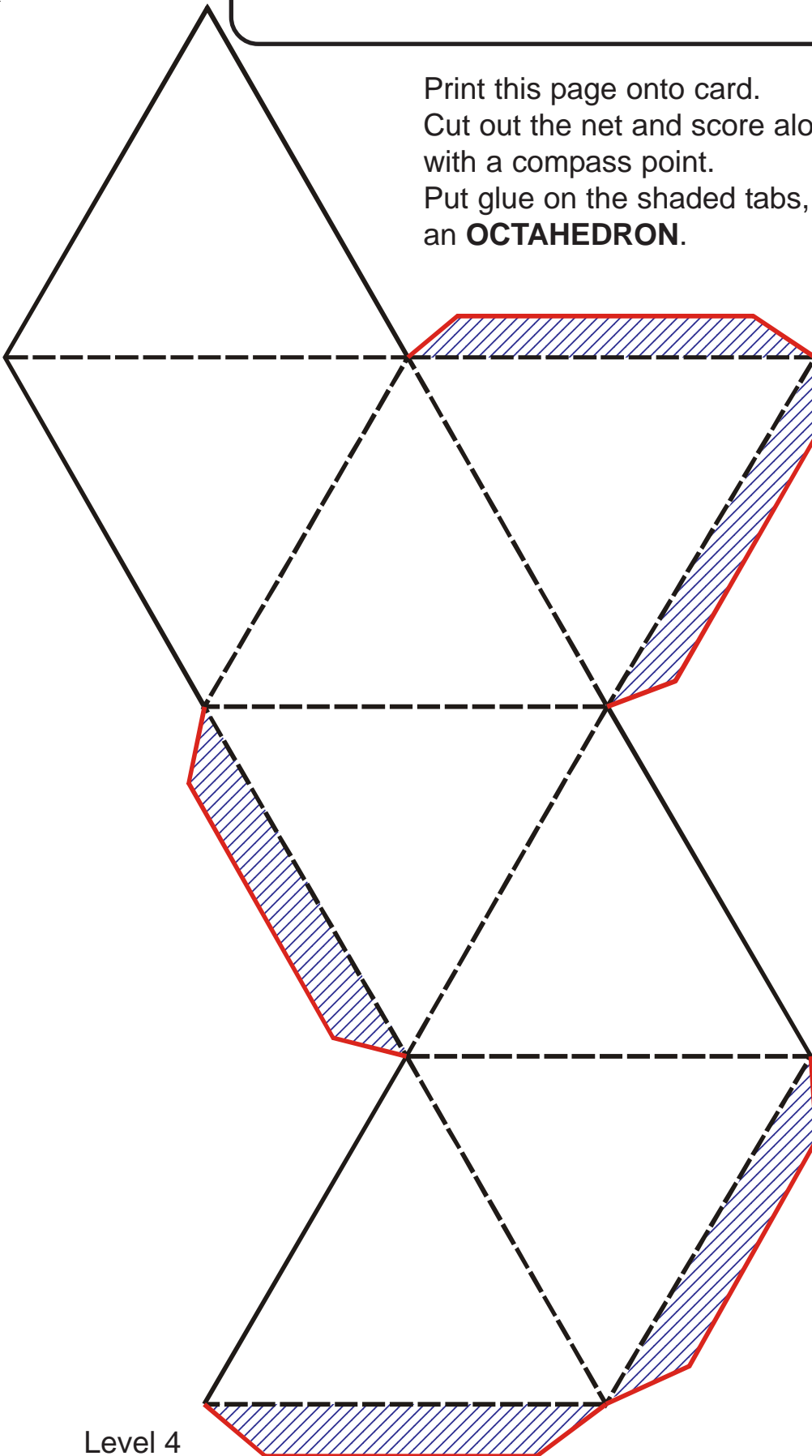
Level 4

N5 N6 N7 N8 N9 N10 N11 N12 C7 C8 C9 C10 C11 C12 C13
A1 A2 S6 S7 S8 S9 S10 S11 S12 D3 D4 D5

Print this page onto card.

Cut out, score and glue each net to make two 3D shapes.

You now have a two-piece jigsaw.

Can you fit both pieces together to make a TETRAHEDRON.

When you can do it, challenge other people to try.
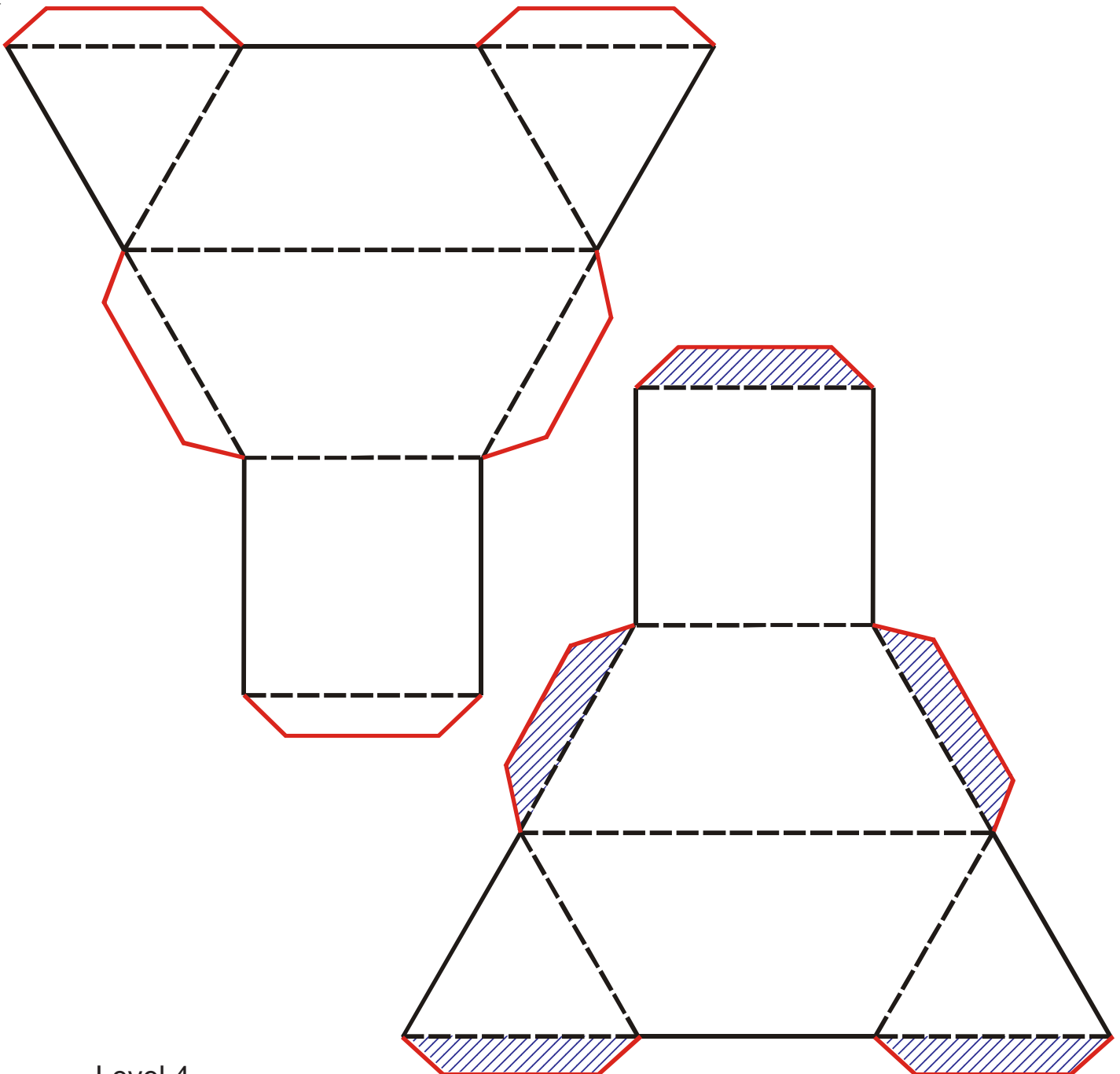
Level 4

N5	N6	N7	N8	N9	N10	N11	N12	C7	C8	C9	C10	C11	C12	C13
A1	A2	S6	S7	S8	S9	S10	S11	S12	D3	D4	D5			

In all four questions, reflect the shaded shape in the dotted mirror line.

1)
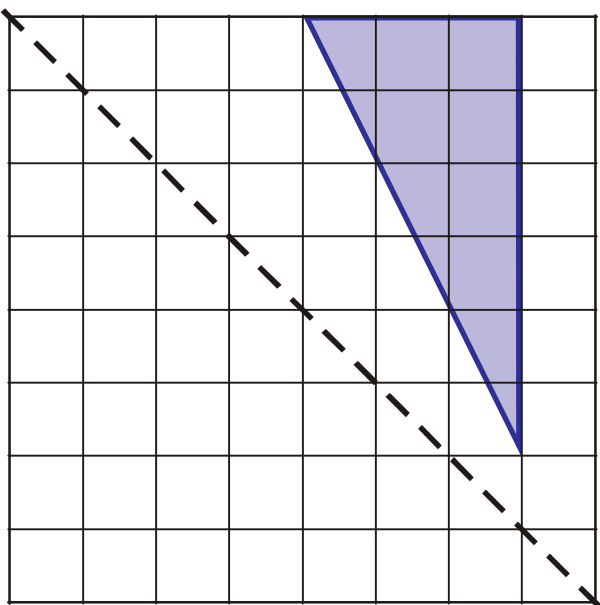
2)
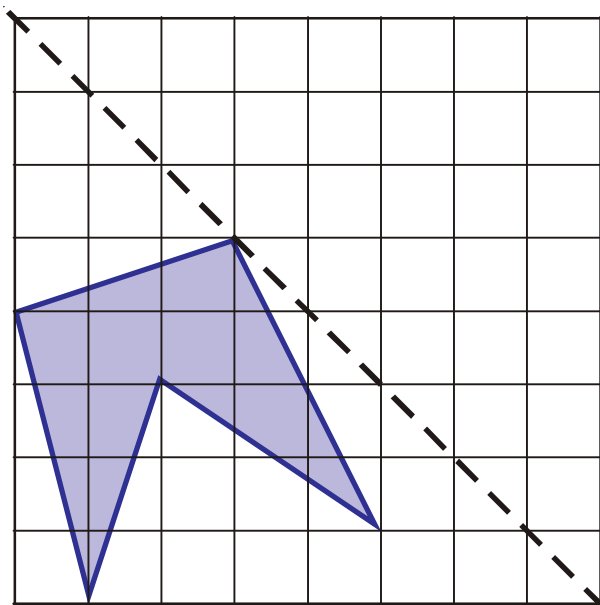
3)
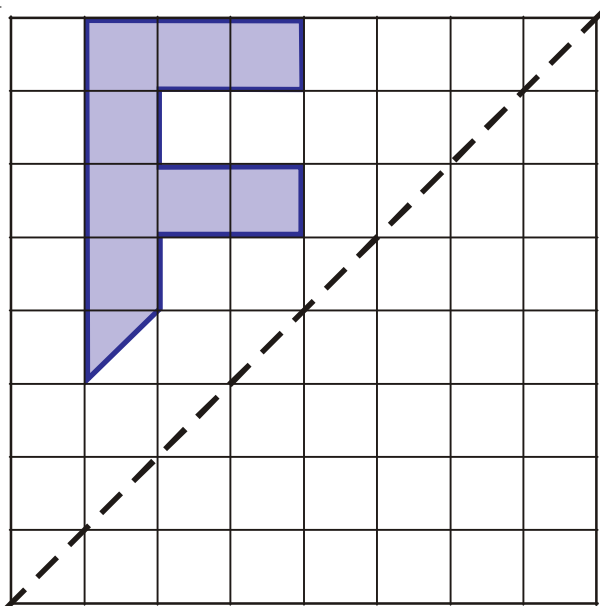
4)
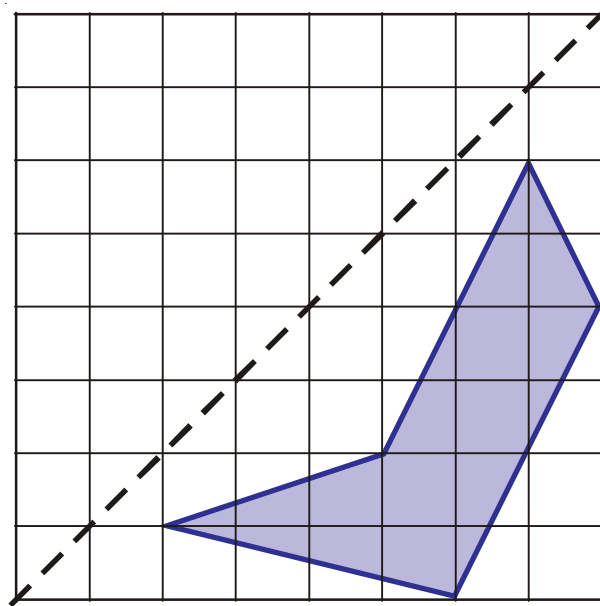
Level 4

How to use reflections to draw a Rangoli Pattern

Step 1:
On the grid on page 36E,
draw ANY three lines in the
top right section.
You can see my three lines
in this grid.
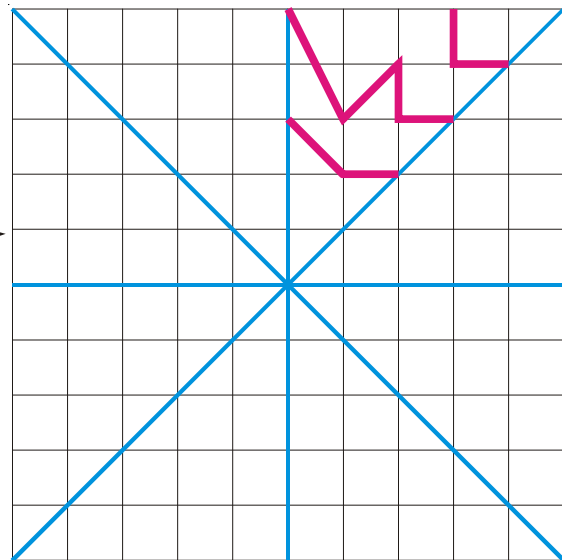
Step 2:
Reflect your lines in the
vertical mirror line.
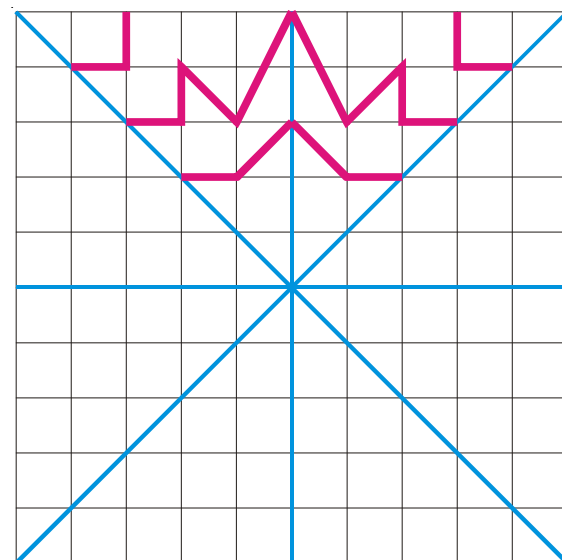
vertical mirror line

Level 4

How to use reflections to draw a Rangoli Pattern

Step 3:
Reflect the complete
pattern in the horizontal
mirror line.

horizontal mirror line
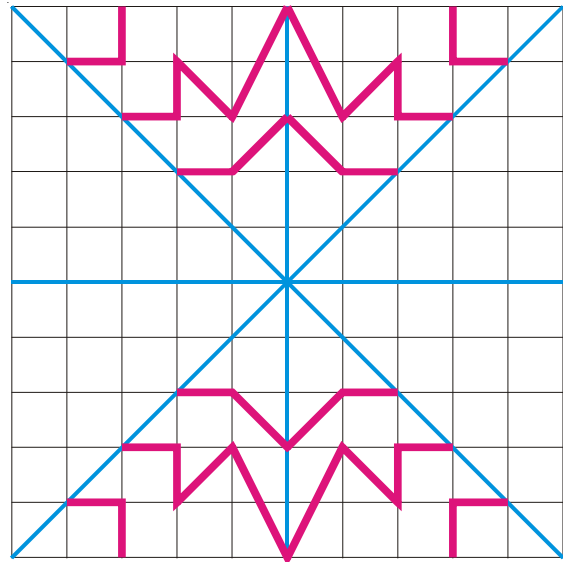
Step 4:
Choose one of the diagonal
mirror lines.
First reflect the top section
in this line and then reflect
the bottom section in the
same line.
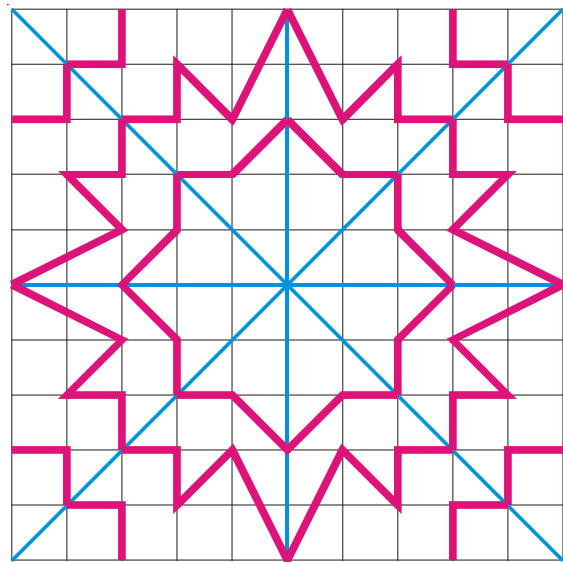
Your Rangoli design can be
coloured to give a striking
pattern.
They can also be placed side
by side as on page 36D.

Level 4
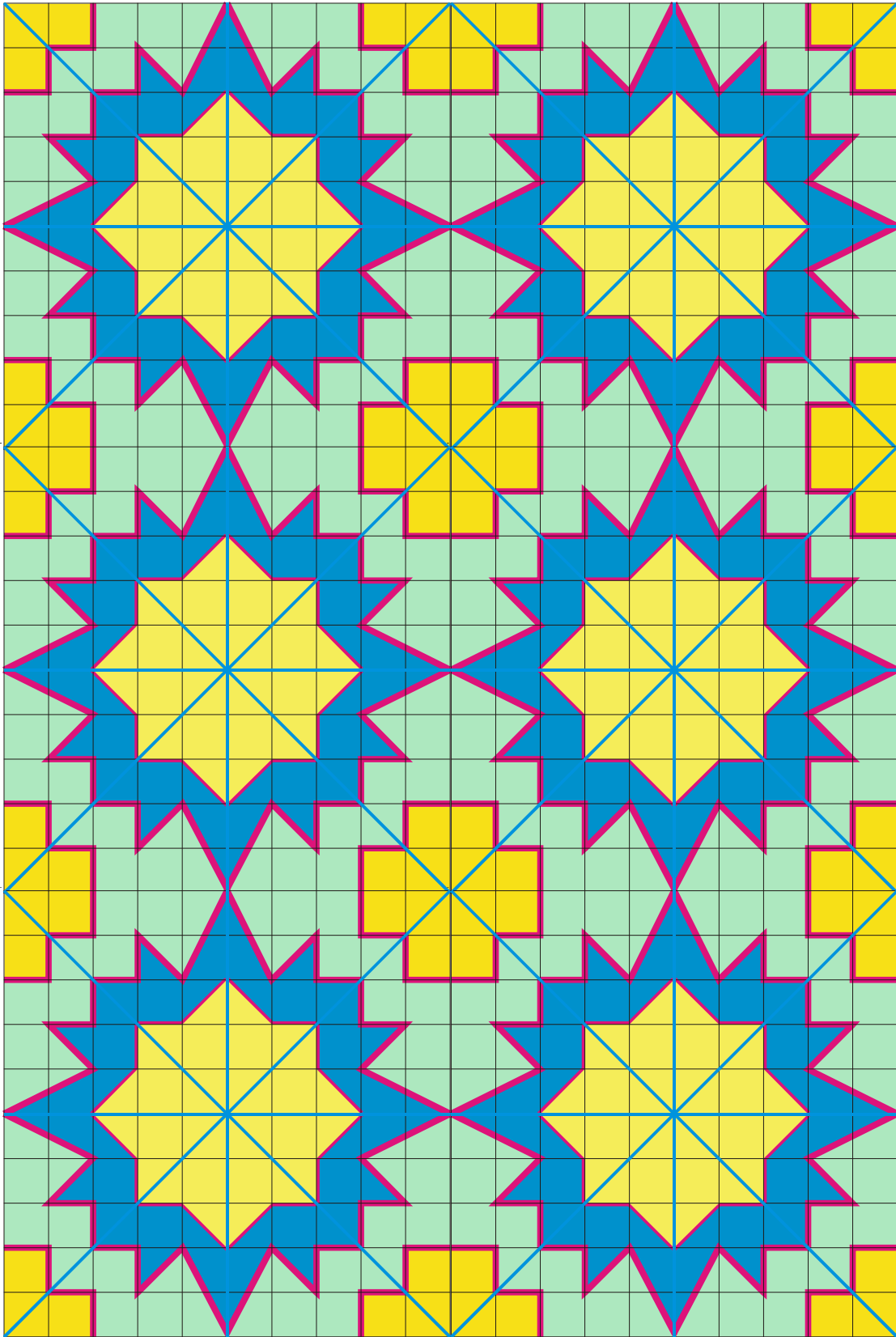
Level 4   Six Rangoli Patterns Placed Together

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |
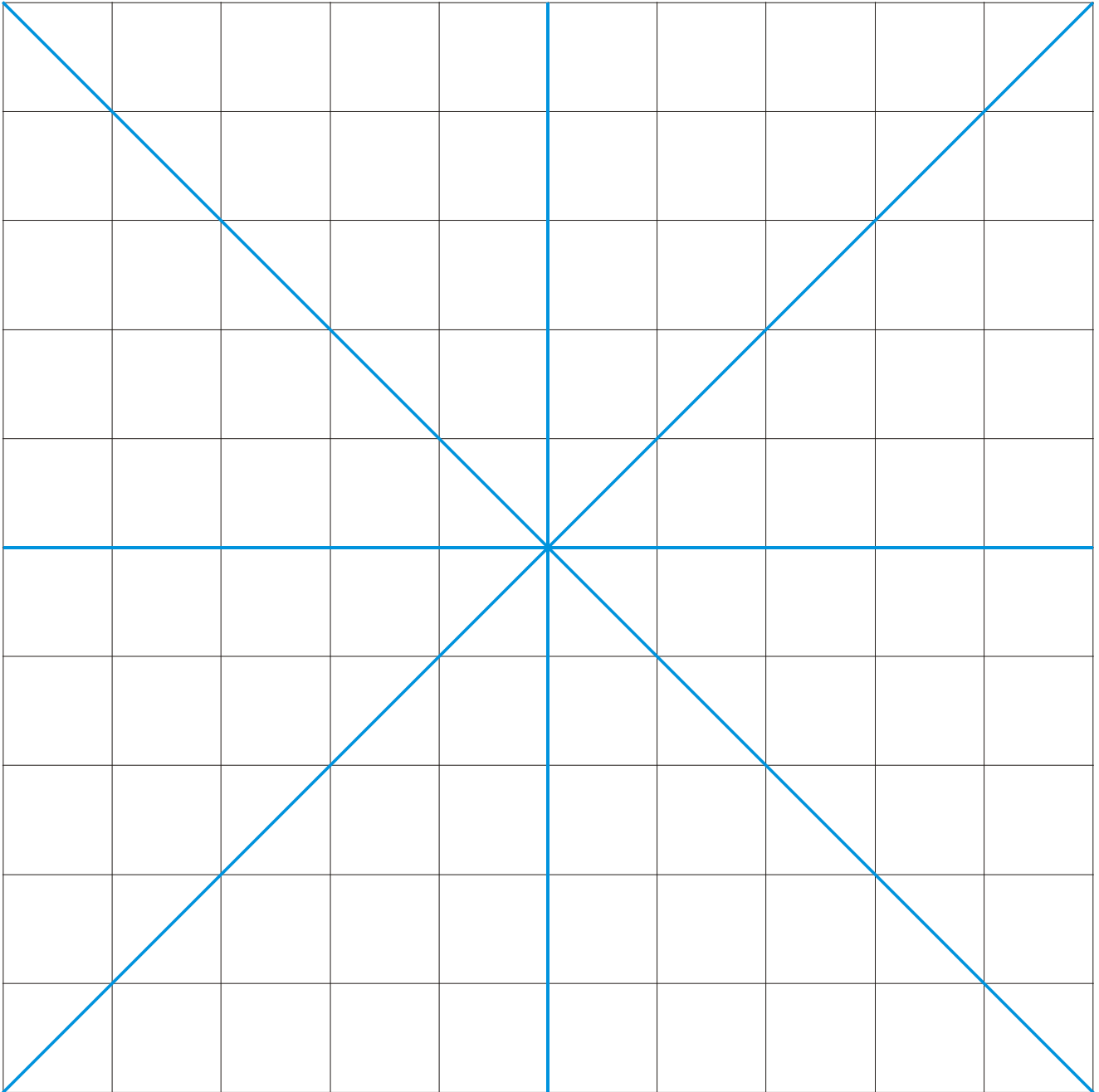
Level 4

N5　N6　N7　N8　N9　N10　N11　N12　C7　C8　C9　C10　C11　C12　C13
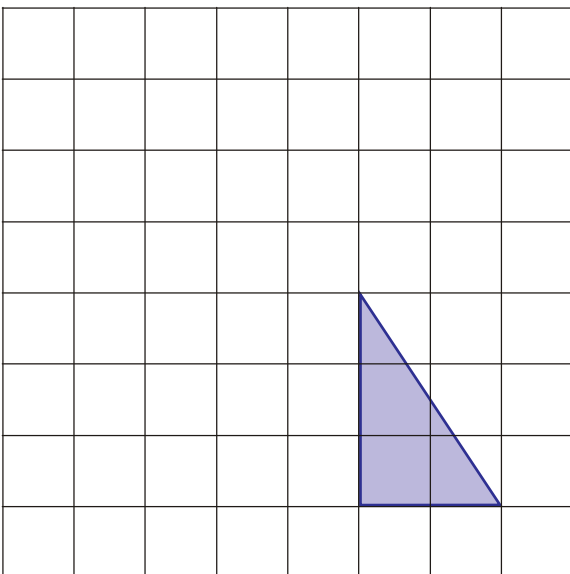A1　A2　S6　S7　S8　S9　S10　S11　S12　D3　D4　D5

1) Translate the shape 5 squares to the right and 2 squares up.
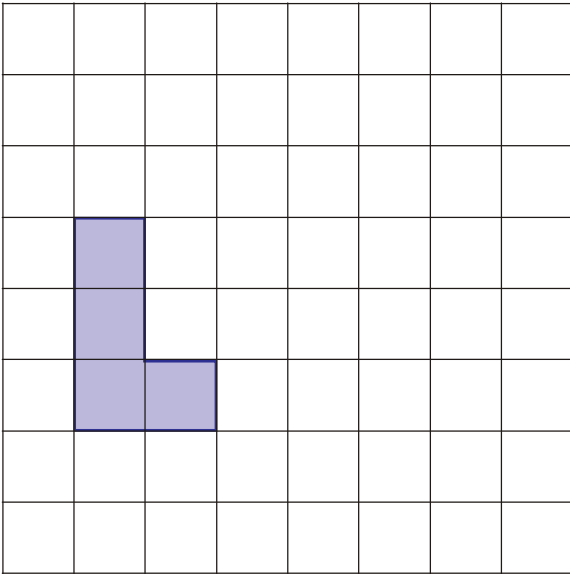
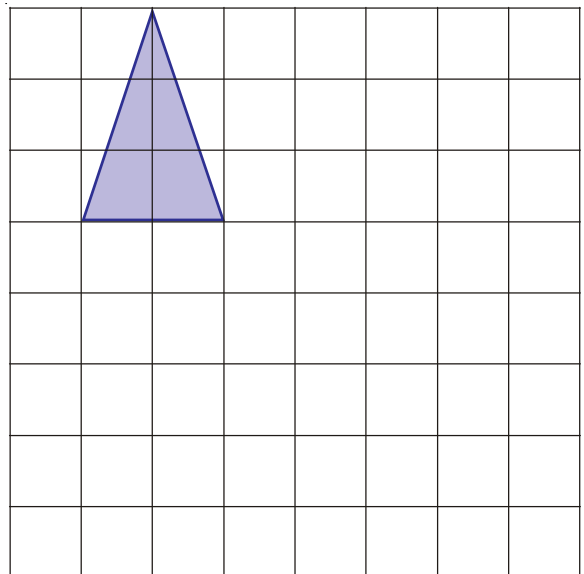2) Translate the shape 3 squares to the left and 2 squares down.
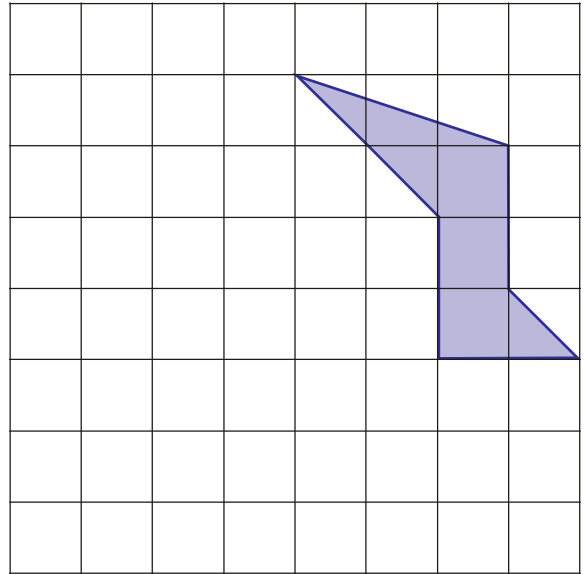
3) Translate the shape with vector $\begin{pmatrix} -4 \\ 3 \end{pmatrix}$

4) Translate the shape with vector $\begin{pmatrix} 4 \\ -5 \end{pmatrix}$

Level 4

Use tracing paper and translate the following shapes.

A with vector $\begin{pmatrix} -3 \\ -2 \end{pmatrix}$ D with vector $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$ G with vector $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$

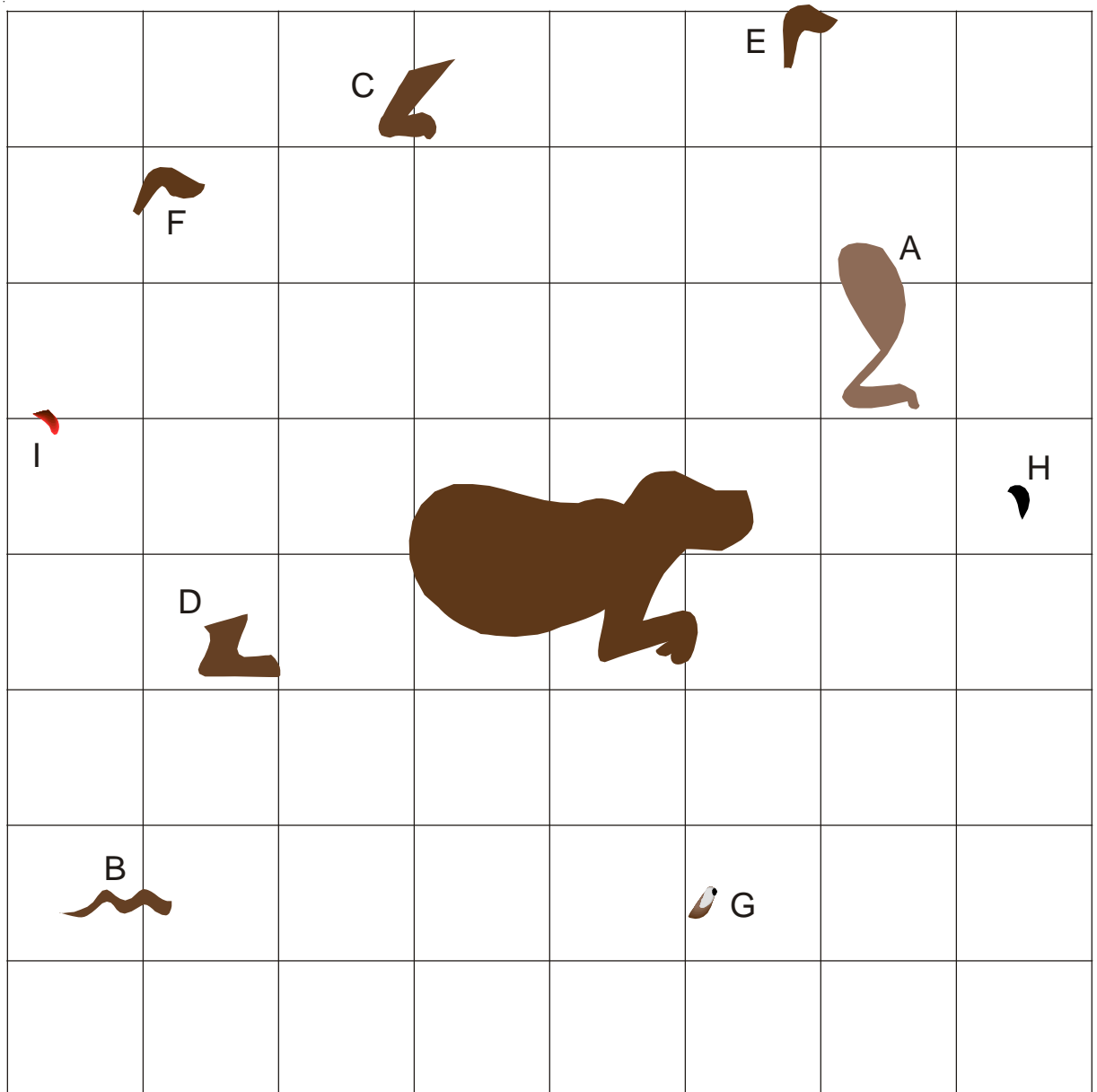B with vector $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$ E with vector $\begin{pmatrix} -1 \\ -3 \end{pmatrix}$ H with vector $\begin{pmatrix} -2 \\ 0 \end{pmatrix}$

C with vector $\begin{pmatrix} 1 \\ -4 \end{pmatrix}$ F with vector $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$ I with vector $\begin{pmatrix} 5 \\ -1 \end{pmatrix}$
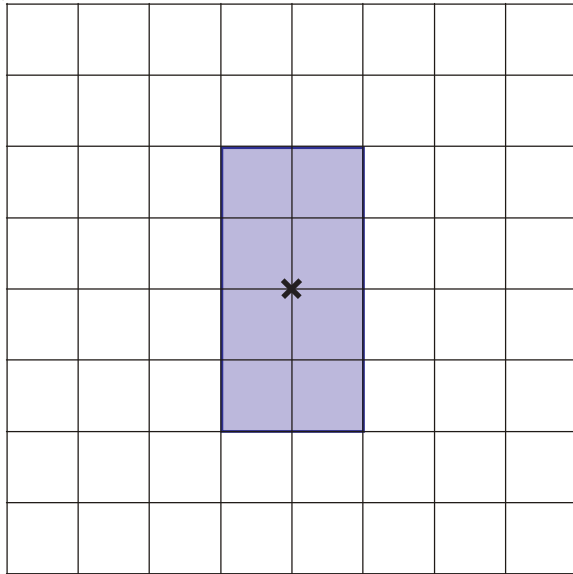
Level 4

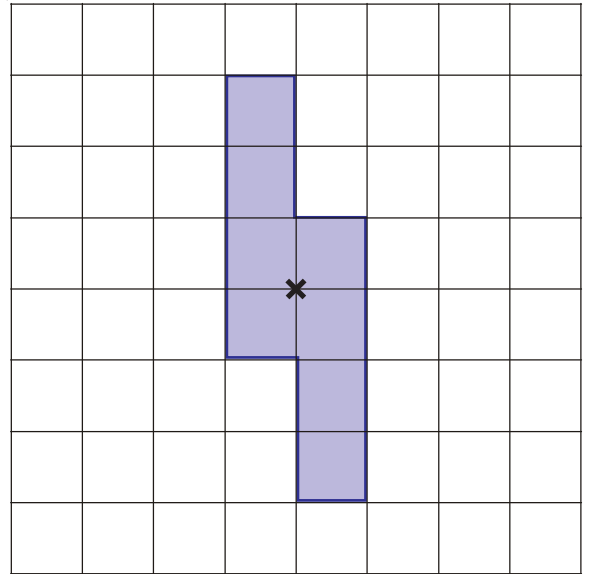| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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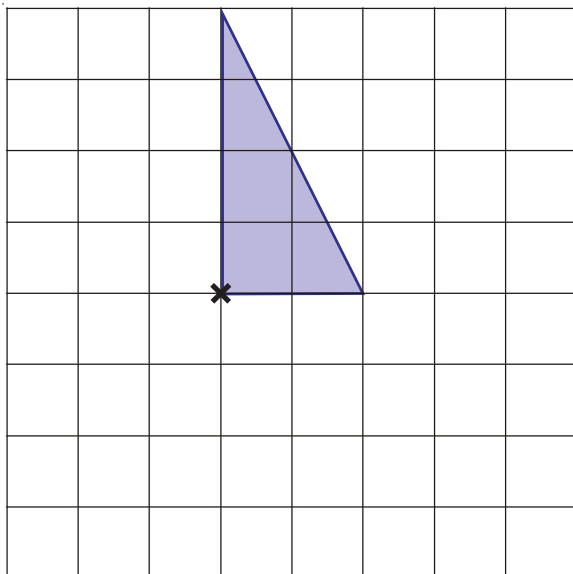
Page 37B

S9 Rotation

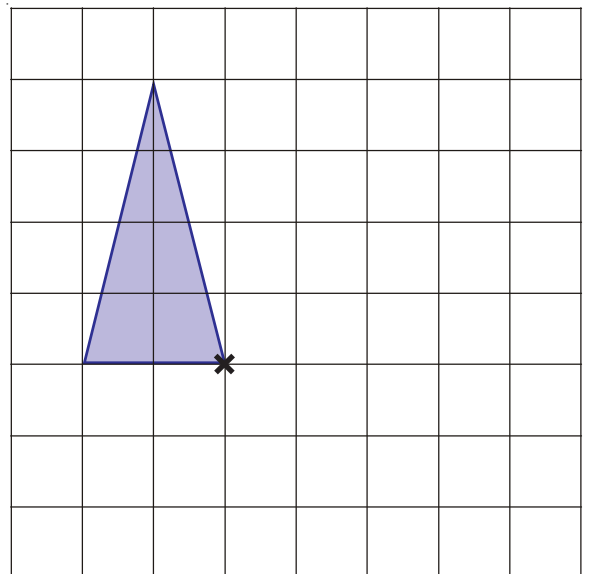1) Rotate the shape 90° about the cross.

2) Rotate the shape 90° about the cross.

3) Rotate the shape 180° about the cross.
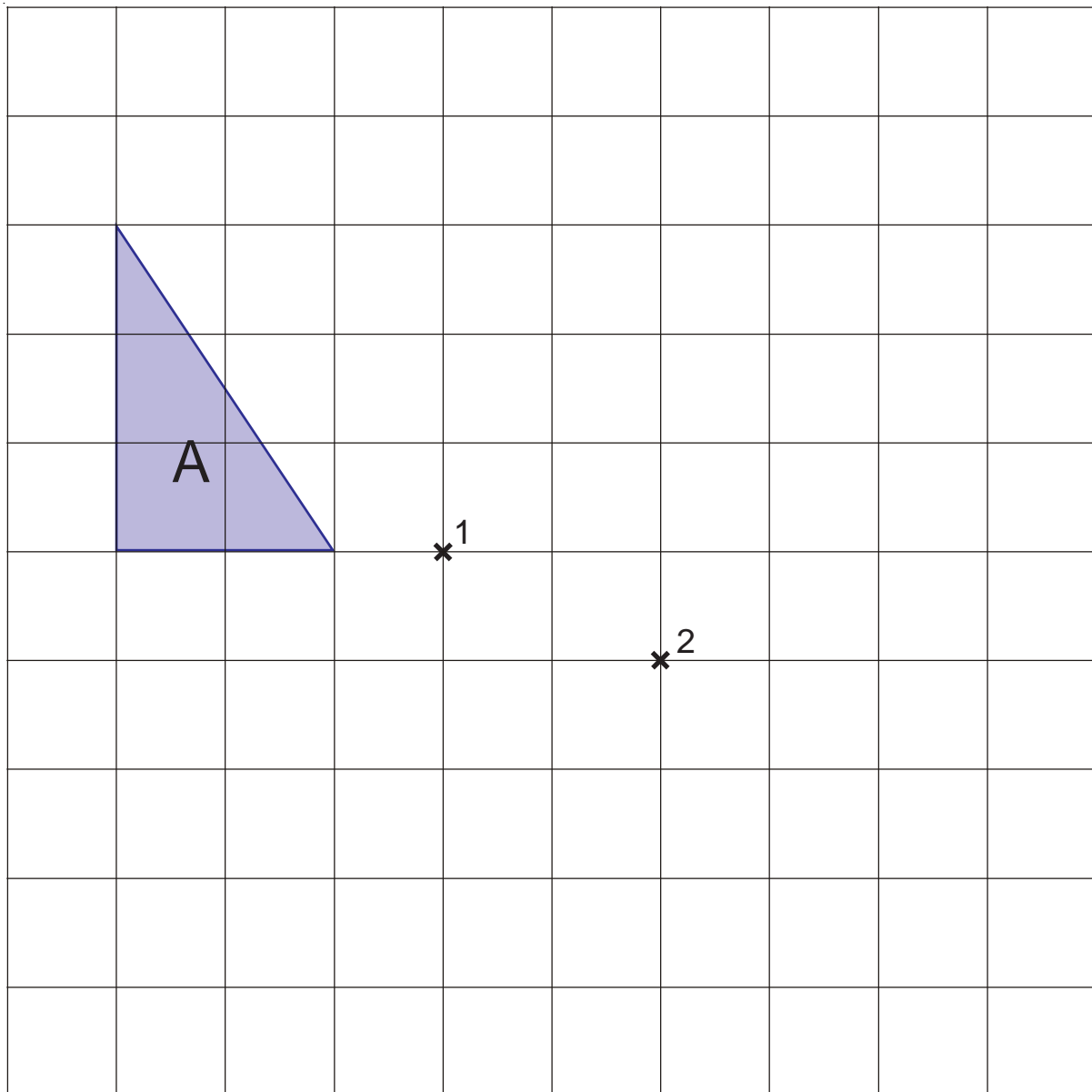
4) Rotate the shape 90° clockwise about the cross.

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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Page 38A

a) Rotate triangle A 90° clockwise about cross 1.
   Label your new triangle B.

b) Rotate triangle B 90° clockwise about cross 2.
   Label your new triangle C.

c) How many degrees would you need to rotate triangle A to get to triangle C?

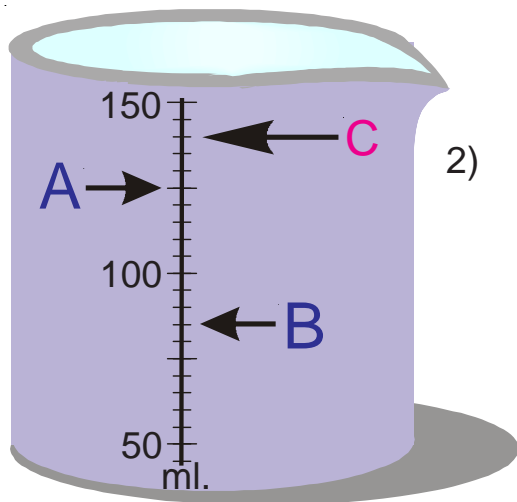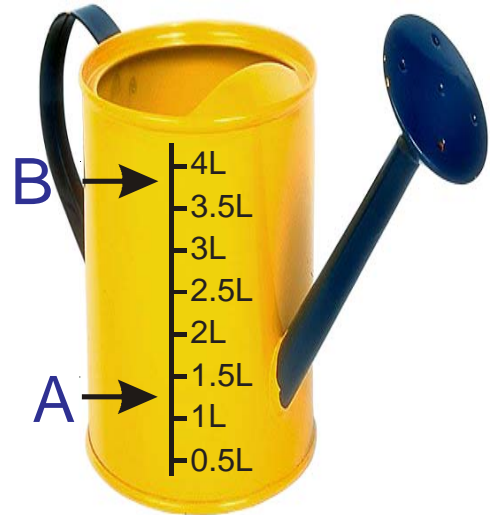d) Mark with a cross the centre of rotation to get from A to C.

Level 4

1) a) If water comes up to arrow A, how much will there be in the container?

    b) About how much water will there be if it comes up to arrow B?

B →
- 4L
- 3.5L
- 3L
- 2.5L
- 2L
- 1.5L

A →
- 1L
- 0.5L

150 ← C
A →
100
← B
50
ml.

2) a) If milk comes up to arrow A, how much milk will there be in the container?

    b) How much milk will there be if it comes up to arrow B?

    c) Draw arrow C to show 140ml of liquid.

Miles

0   10   20   30

0   10   20   30   40   50
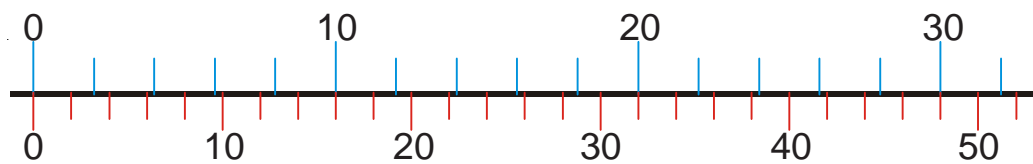
Kilometres

3) Use the scale to convert

    a) 10 miles to km.

    b) 40 km to miles.

    c) 16 miles to km.

    d) 8 km to miles.

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

1) You have eight genuine gold coins and one fake gold coin.
Each genuine coin weighs one ounce.
The fake coin weighs slightly less but not enough to detect by hand.
You are allowed to use the balance pans just twice to detect the false coin.
How do you find the fake?
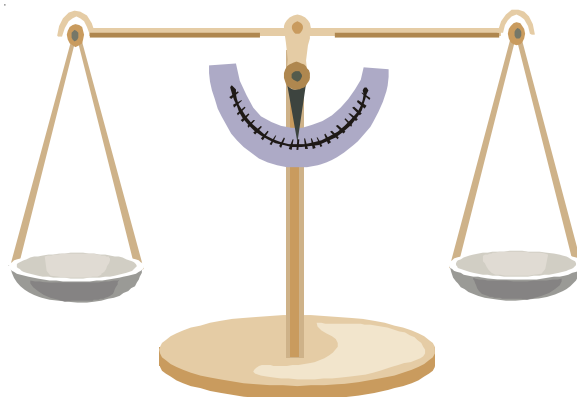
2) You have a 3 pint jug and a 5 pint jug and as much water from a tap as you like.
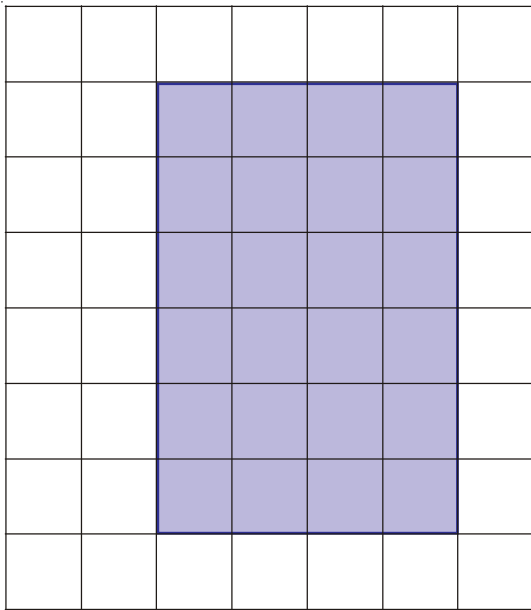How can you use the two jugs to measure out **exactly** 4 pints of water?

5 Pints

3 Pints

Level 4

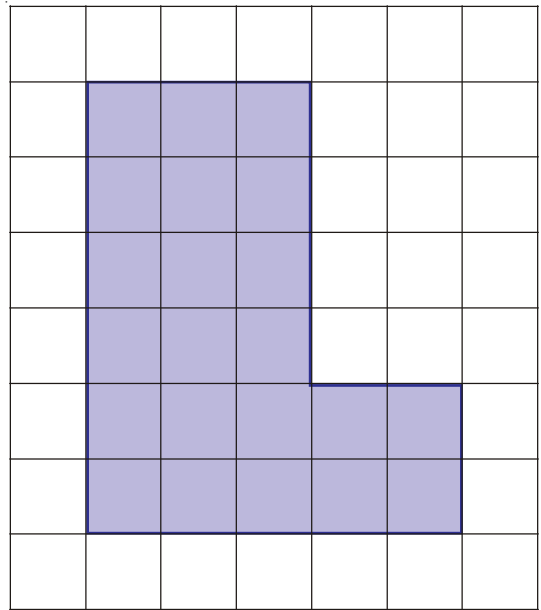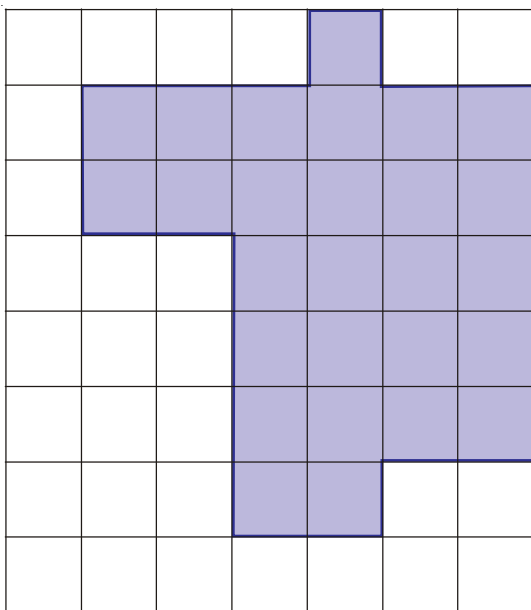| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

1) Find the perimeter of this
    rectangle on the cm grid.

2) Find the perimeter of this
    shape on the cm grid.

3) Find the perimeter of this
    shape on the cm grid.

4) Find the perimeter of this
    shape on the cm grid.
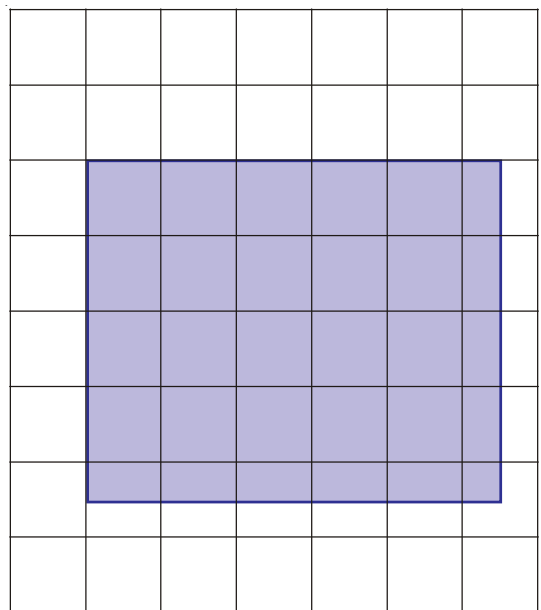
Level 4

On the dotty grid you can see a shape which has a perimeter of length 16 and an area of 7 squares.

Keeping the perimeter always 16, draw 9 more shapes which have areas of 8, 9, 10, 11, 12, 13, 14, 15 and 16 squares.

Perimeter = 16
Area = 7 squares

A

Level 4

N5 N6 N7 N8 N9 N10 N11 N12 C7 C8 C9 C10 C11 C12 C13
A1 A2 S6 S7 S8 S9 S10 S11 S12 D3 D4 D5

1) Find the area of the rectangle on this centimetre grid.
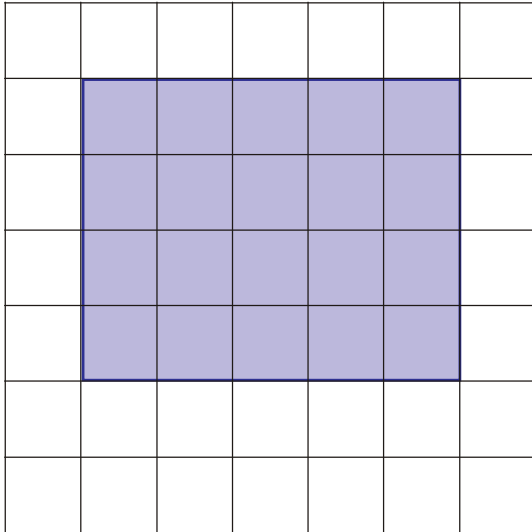
2) Find the area of the rectangle on this centimetre grid.
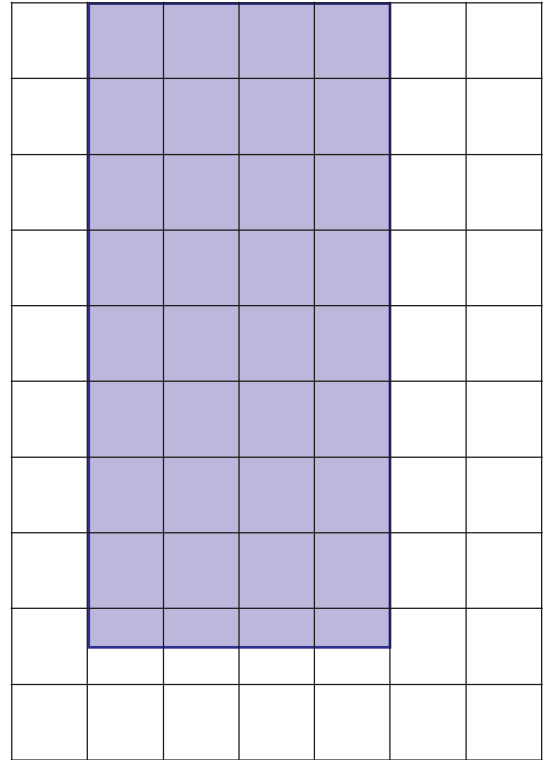
3) Find the area of the rectangle on this centimetre grid.
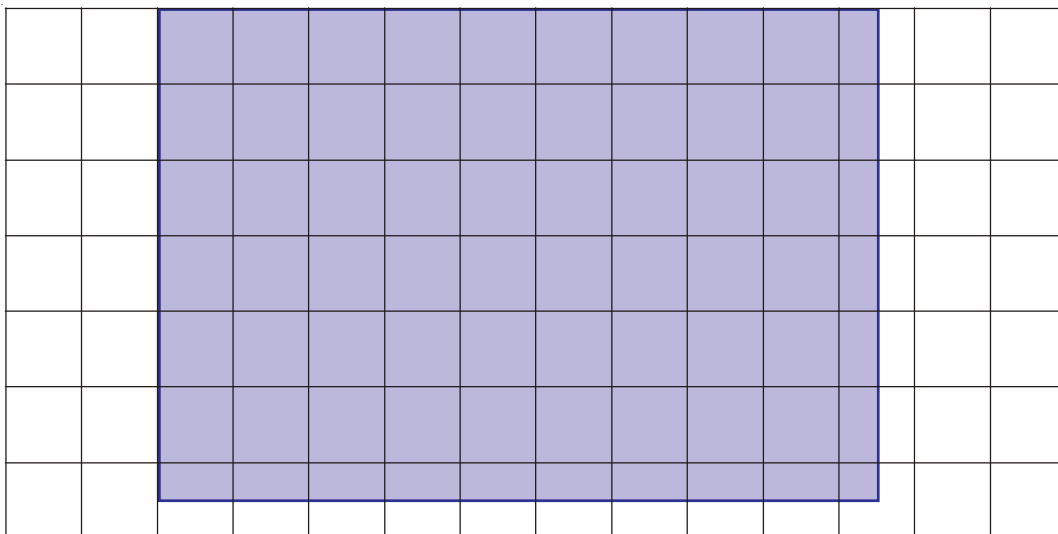
Level 4

N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13
A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S✓2 | D3 | D4 | D5

1) Draw three different-shaped rectangles with an area of 12cm² on the centimetre grid.
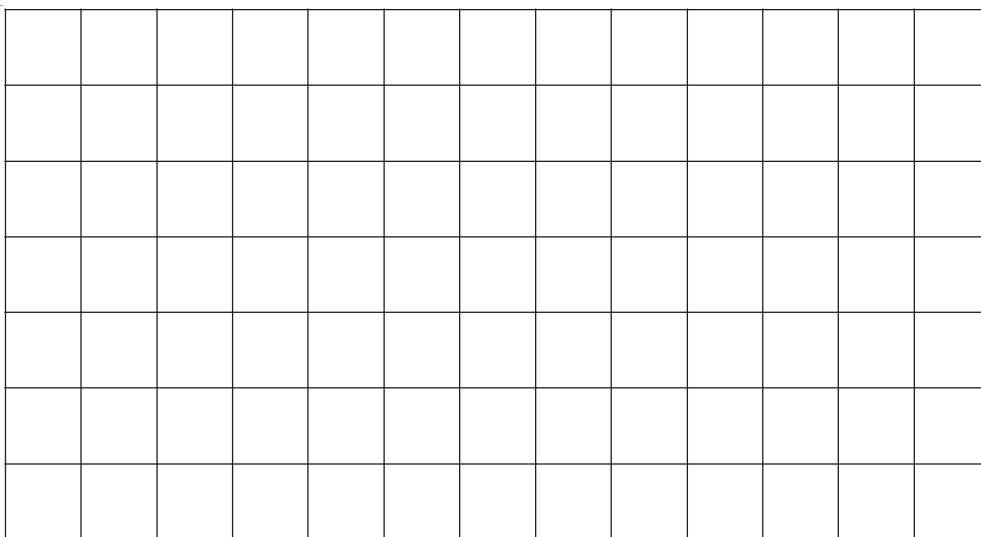
2) Find the area of the square on this centimetre grid.

This is a difficult question

3) Find the area of the square on this centimetre grid.
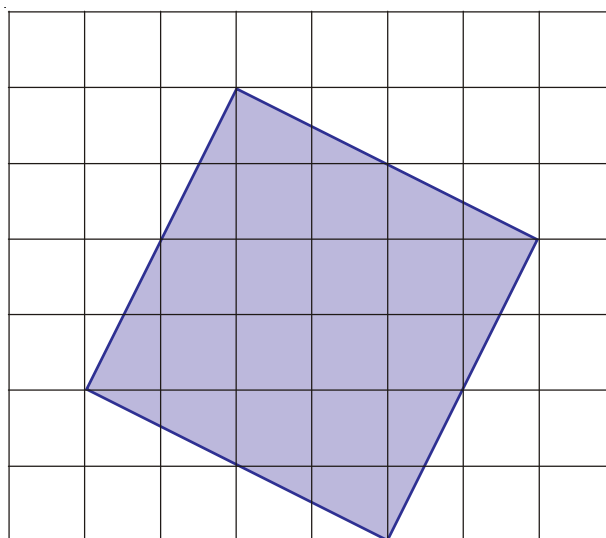
Level 4

N5 N6 N7 N8 N9 N10 N11 N12 C7 C8 C9 C10 C11 C12 C13
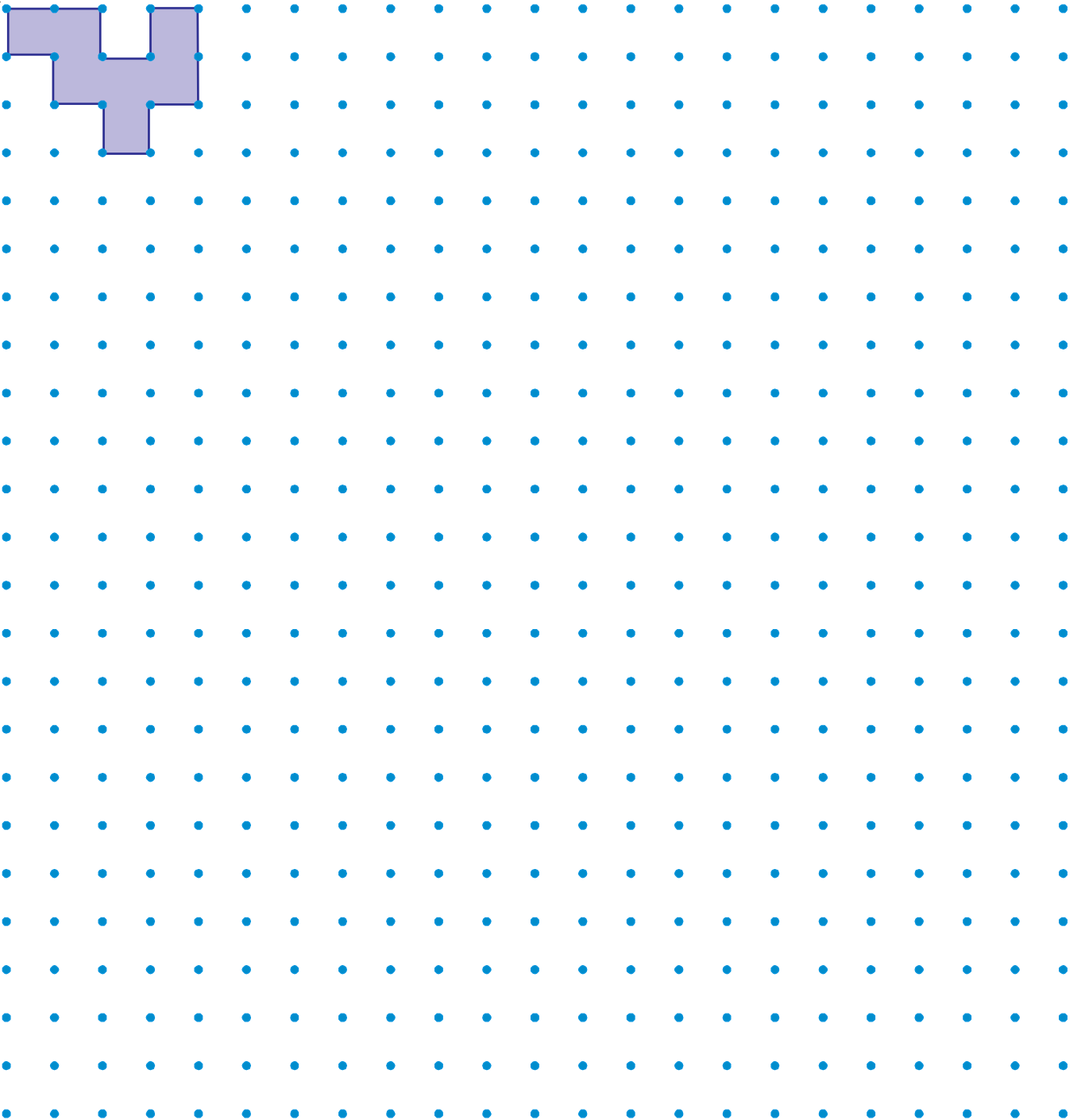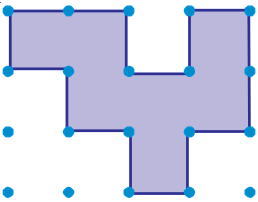A1 A2 S6 S7 S8 S9 S10 S11 S12 D3 D4 D5

Blue   Green   Red   Yellow

1) 30 students were asked which of the four colours they liked best.
The results are listed below:

Red   Green   Blue   Red   Yellow   Red   Green   Red

Green   Yellow   Red   Blue   Blue   Red   Green   Blue

Red   Green   Green   Yellow   Blue   Red   Blue

Green   Red   Red   Red   Blue   Green   Green

Record these results in a tally chart.

2) Peter asked all the pupils in his class how many children there were (including themselves) in each of their families.

These are the results:

1, 3, 2, 2, 2, 1, 3, 2, 3, 4, 2, 1, 1, 4, 2, 6, 3, 2,

2, 1, 4, 2, 3, 3, 2, 1, 2, 5, 4, 2, 1

Show these results in a tally chart.

3) A teacher asked the pupils in her class to put stickers on the board to show which pets they had. The stickers were of dogs, cats, hamsters, goldfish and snakes.

Draw a tally chart to show how many of each pet there were.
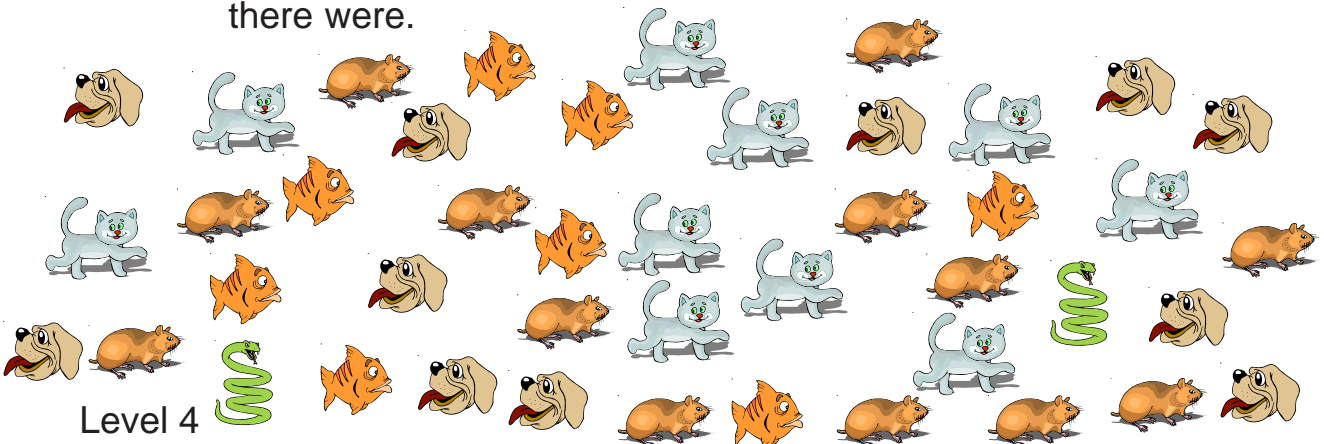
Level 4

N5 N6 N7 N8 N9 N10 N11 N12 C7 C8 C9 C10 C11 C12 C13
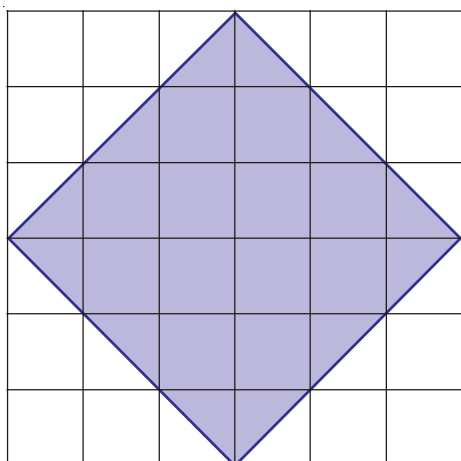A1 A2 S6 S7 S8 S9 S10 S11 S12 D3 D4 D5

This is the first paragraph of a book.

However, it is written in code where each letter has been replaced by a different letter.

Can you decode the paragraph?

There is a little bit of help at the bottom of the page.

Imjz zsmop mck dj m wmo-kww gmjh qbsos gdush mj kcos kw brcs loklkoqdkjp.

Bdp wmukrodqs kttrlmqdkj vmp qk tmlqros lkko lsmpmjqp mjh imfs qbsi vkof wko woss kj bdp gmjh. Bs vmpj'q usoz jdts.

Qbs jmis kw qbs kcos vmp Gmjts.

Some help
When you decode the paragraph you will find that:
'e' is the most common letter.
'a' is the second most common followed by
'o' third most common, then
'n' and 'r'
then 't'
then 's'.

Level 4

N5	N6	N7	N8	N9	N10	N11	N12	C7	C8	C9	C10	C11	C12	C13
A1	A2	S6	S7	S8	S9	S10	S11	S12	D3 ✓	D4	D5			

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1) Here are the Maths test marks for two mixed ability Year 7 classes.

```
43  16  68  49  31  24  83  61  55  40  72  44  45  23  48  33  20
81  63  58  41  50  59  46  35  24  13  66  99  53  47  66  48  51
33  35  40  64  50  31  37  42  35  54  97  24  33  48  53  42
```

Complete the frequency table to show all the results.

Mark	Tally	Frequency
20 and under		
21 - 30		
31 - 40		
41 - 50		
51 - 60		
61 - 70		
over 70		

2) A group of students measured their hand span (*s*) in in centimetres. Here are their results:

14.7 20.0 16.7 21.6 18.2 17.9 18.1

19.0 19.9 16.0 14.4 19.1 21.8 16.4

17.9 15.9 18.0 19.1 16.5 21.1 18.9

Complete the frequency table to show all the results.

Class interval	Tally	Frequency
$14 < s < 16$		
$16 < s < 18$		
$18 < s < 20$		
$20 < s < 22$		

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

Sally, the organiser of a slimming club, keeps data on how much weight (*w*), in kg, her 60 members have lost over the previous twelve months.

She organises the data in a two-way table.

	Men	Women	Total
0 < *w* < 5	2		6
5 < *w* < 10			14
10 < *w* < 15	7		
15 < *w* < 20	2		10
20 < *w* < 25		11	14
Total	18		

a) Complete the two-way table.

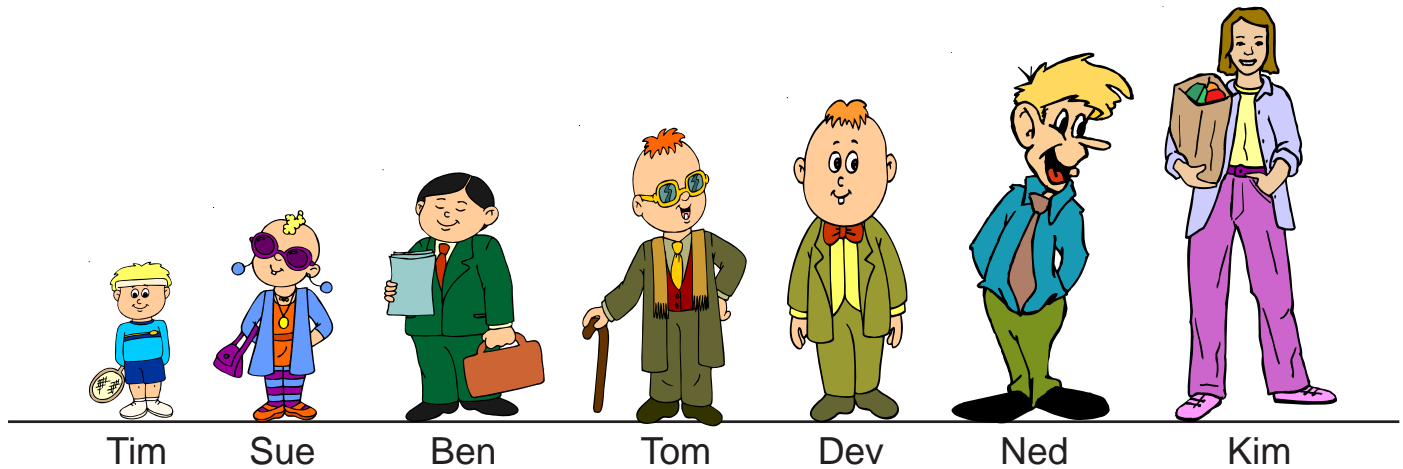b) How many members of the club were women?

c) How many women lost between 5 and 10 kg?

d) How many men lost less than 20 kg?

e) How many men lost 5 kg or more?

f) How many men and women lost 15 kg or more?

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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D5	Mode, Median and Range

Tim   Sue   Ben   Tom   Dev   Ned   Kim

1) a) In this group of seven people, which one has the median average height?

b) What are the names of the people who are below the median average height?

c) To find the range of the heights you would need to measure the height of two people. Which two?

2) A class of students were asked how many pets they own.
The answers were as follows:

1, 0, 1, 2, 1, 5, 2, 0, 1, 2, 3, 1, 4

2, 3, 1, 2, 2, 0, 1, 1, 2, 1, 3, 2

a) Find the median average number of pets per student.

b) Which number of pets is the mode?

c) What is the range of the answers?

3) Twenty children were asked what their favourite colour was.
Their answers were:
Blue, Red, Yellow, Red, Green, Red, Green, Blue, Red, Blue
Green, Blue, Red, Blue, Yellow, Red, Blue, Orange, Red, Red

a) Which colour is the modal average?
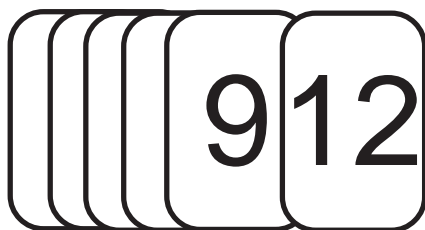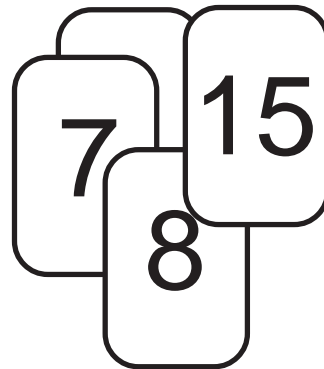
b) Why can't we find the median colour?

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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1) The heights of 18 plants, to the nearest cm, are as follows:

15, 19, 16, 12, 13, 15, 20, 18, 16, 14, 12, 18, 16, 16, 17, 15, 15, 15

   a) Find the modal height of the plants.

   b) Find the median height of the plants.

   c) Find the range of the heights.

2) You are told that the median score on these four cards is 9.5

Work out what the number is on the bottom card.

7   15   8

3) We have six cards with numbers on them and we know the following:

the modal average is 3

the median average is 5

the range is 11

Work out the numbers on the other four cards.

9 12

4) Sue rolls a dice 23 times and puts her scores into a table.

   a) What is Sue's modal score?

   b) What is Sue's median score?

   c) What is the range of Sue's scores?

Score	Frequency
1	2
2	3
3	3
4	4
5	4
6	7

Level 4

| N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 | C7 | C8 | C9 | C10 | C11 | C12 | C13 |
| A1 | A2 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | D3 | D4 | D5 |

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