Forming equations

1 Match each equation to the part-whole model it represents.

$y + 7 = 18$

$2y + 4 = 18$

$3y = 18$
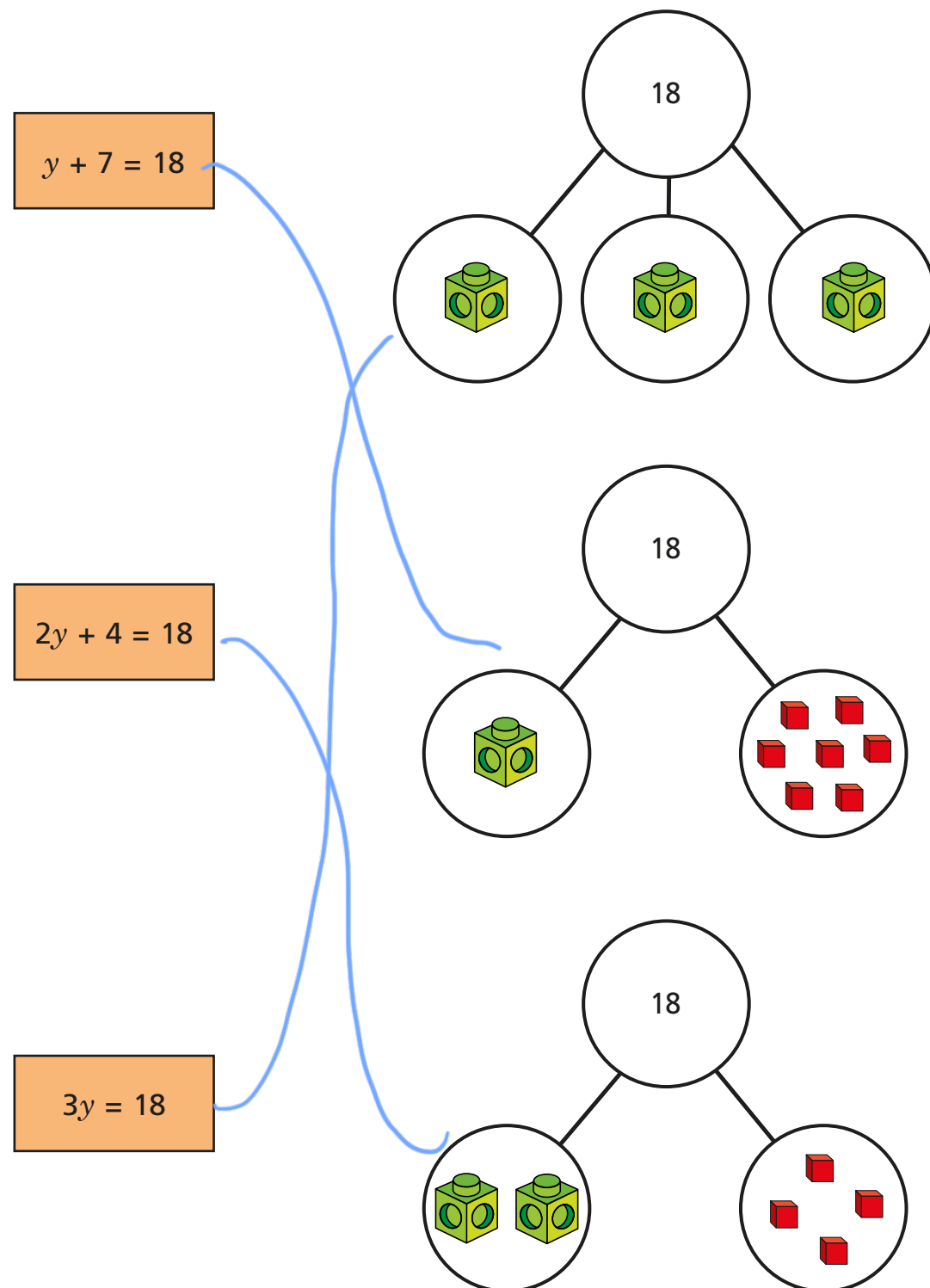
2 A shop sells these items.

£s £5 £h £m £1 £21

a) The total cost of a scarf and a book is £17

Form an equation to represent this information.

$$5 + s = 17$$

b) The total cost of 2 packets of balloons and a hat is £11
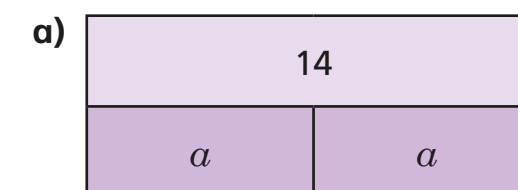
Form an equation to represent this information.

$$2 + h = 11$$

c) The total cost of a pair of headphones, a scarf and 2 boxes of marbles is £39
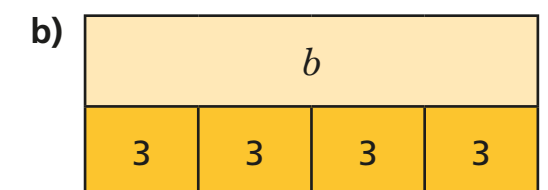
Form an equation to represent this information.

$$21 + s + 2m = 39$$

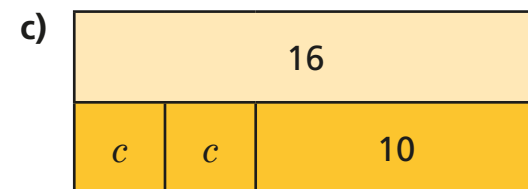Create your own problem like this for a partner.
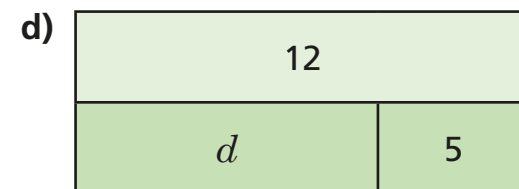
3 Write equations to represent the bar models.

a)

14	
a	a

$$2a = 14$$

b)

b			
3	3	3	3

$$\frac{b}{4} = 3$$

c)

16	

c	c	10

$2c + 10 = 16$

d)

12	

d	5

$d + 5 = 12$

Is there more than one possible equation for each?

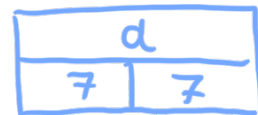**4** Draw a bar model to represent each equation.
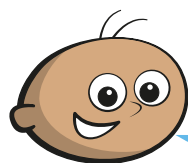
a) $3a = 21$ **c)** $6 + 9 = c$

21		
a	a	a

c	
6	9

b) $2b + 6 = 10$ **d)** $\dfrac{d}{2} = 7$

10		
b	b	6

d	
7	7

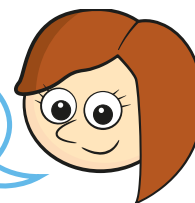**5** Tommy and Rosie are thinking of a number each.

Write an equation to represent each problem.
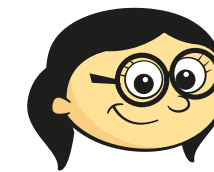
I subtract 3 from my number. I get the answer 10

I have doubled my number and added 5 My answer is 19

$x - 3 = 10$ $2x + 5 = 19$

6 Annie has a number trick.

Whatever number you choose, I will make your answer be 5

Here is Annie's trick.

Step 1: think of a number

Step 2: double it

Step 3: add 10

Step 4: divide by 2

Step 5: take away the number you first thought of

a) Pick a starting number and follow the steps.

Did you get the answer 5?

b) Use multilink cubes and base 10 ones to represent each step of Annie's trick.

What do you notice?

c) Write an expression for each step of Annie's trick.

x

$2x$

$2x + 10$

$x + 5$

5

d) Create your own problem like this for a friend.

Solve simple one-step equations

1 Write an equation for each part-whole model.

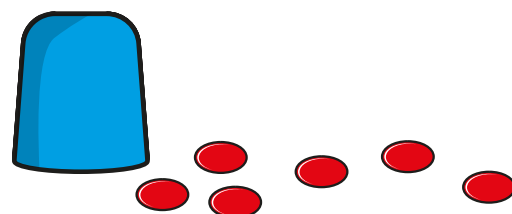Work out the value of the multilink cube in each equation.

a)

$\blacksquare =$ ☐

b)

$\blacksquare =$ ☐

2 There are some counters under the cup.

There are 10 counters in total.

a) If c is the number of counters under the cup, explain why

$c + 6 = 10$

b) Work out the value of c. $c =$ ☐

c) How many counters are under the cup?   ☐

3 Write algebraic equations to represent the bar models.

Find the value of a in each one.

a)

8	
a	a

$a =$ ☐

c)

a		
3	3	3

$a =$ ☐

b)

15	
a	10

$a =$ ☐

d)

a	
7	6
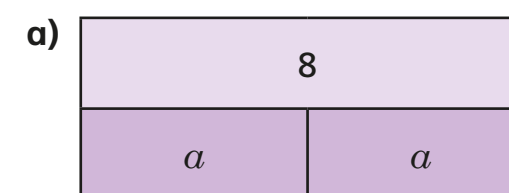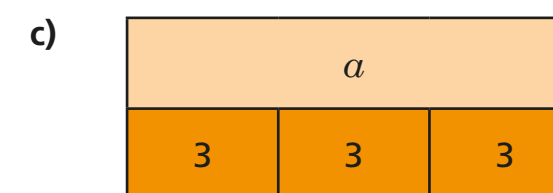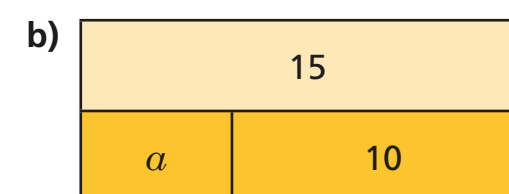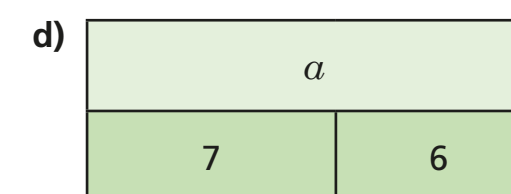
$a =$ ☐

4 Nijah is solving the equation $x - 8 = 20$

$$x - 8 = 20$$
$$x = 20 - 8$$
$$x = 12$$

What mistake has Nijah made?

_____

_____

5 Solve the equations.

a) $x + 7 = 20$

$x = \boxed{13}$

b) $10y = 80$

$y = \boxed{8}$

c) $4m = 22$

$m = \boxed{5 \cdot 5}$

d) $g - 3 = 15$

$g = \boxed{18}$

e) $32 = t - 5$

$t = \boxed{37}$

f) $\frac{u}{6} = 3$

$u = \boxed{18}$

6 Filip thinks of a number.

He subtracts 5 from his number.

He ends up with 10

Write an algebraic equation to represent Filip's problem.

$\underline{\quad x - 5 = 10 \quad}$

Solve the equation to work out his number.

$\boxed{15}$

7 Dexter builds a tower.

Each block is $2a$ high.

He uses 7 blocks.

$2a$
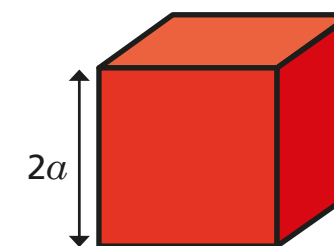
The total height of his tower is 42 cm.

Write an equation to represent the height of Dexter's tower and find the value of a.

$14a = 42$

$a = \boxed{3}$ cm

8 Work out the value of each shape.

Write the equations that you solved to find the value of each shape.

$= 40$

$= 20$

$\overset{\text{=}}{32}$

$\heartsuit = \boxed{10}$ $\bigstar = \boxed{6}$ $\triangle = \boxed{2}$

Work out the missing total of each row and column.

Compare answers with a partner.

Solve two-step equations

1 Here is a part-whole model.

a) Write an equation for the part-whole model.

_____

b) Solve the equation to work out the value of

 = ☐

2 If each multilink cube represents x, form and solve an equation to find the value x.
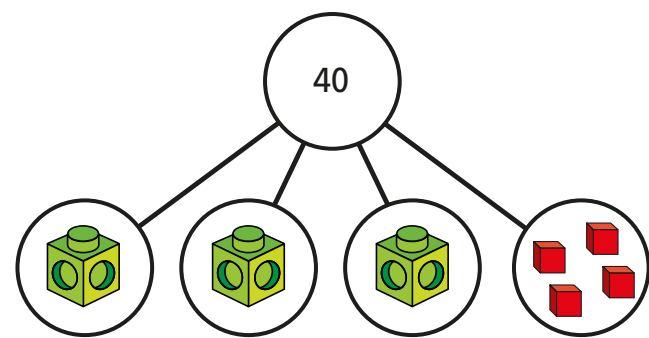
$x =$ ☐

3 There is the same number of counters under each cup.

There are 16 counters in total.

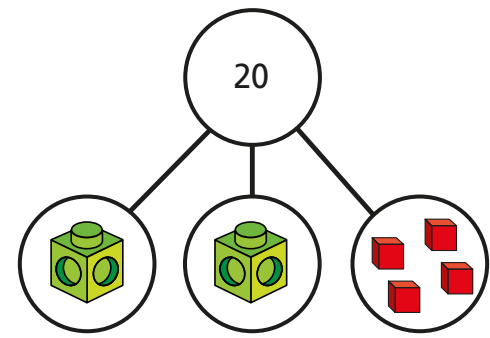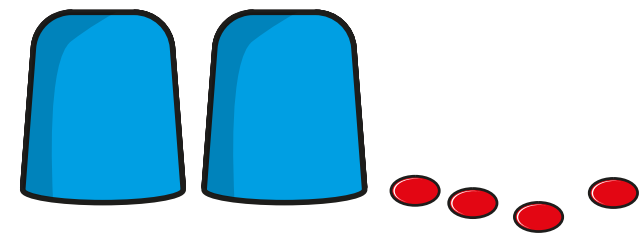**a)** Use y to represent the number of counters under each cup.

Write an equation in terms of y.

_____

b) Solve the equation to find the value of y.

$y =$ ☐

c) How many counters are under each cup?

☐

4 Write an algebraic equation to represent each bar model.

Find the values of a and b.

a)

21		
a	a	9

b)

46	
$3b$	10
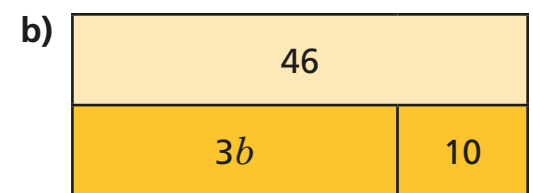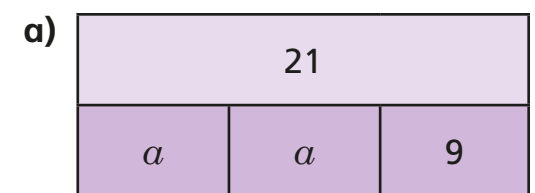
$a =$ ☐

$b =$ ☐

5 Solve the equations.

a) $5x + 1 = 31$

$x = \boxed{6}$

b) $3x - 3 = 9$

$x = \boxed{4}$

c) $4p - 11 = 3$

$p = \boxed{3.5}$

d) $9 = 2y + 8$

$y = \boxed{0.5}$

e) $10g - 2 = 46$

$g = \boxed{4.8}$

f) $4 + 3y = 28$

$y = \boxed{8}$

6 Dani thinks of a number.

She doubles it and adds 3

She gets the answer 15

a) Write an equation to represent Dani's problem.

$$2x + 3 = 15$$

b) Solve the equation to find her number.

$\boxed{6}$

7 Alex is y years old.

Her friend Brett is 3 years older.

The total of their ages is 25

How old are Alex and Brett?

Alex is $\boxed{11}$ Brett is $\boxed{14}$

8

£1.52

£1.20

a) Work out the cost of one banana and one orange.

One banana costs $\boxed{32p}$ One orange costs $\boxed{28p}$

b) Compare methods with a partner.

1 **a)** Here is an equation.

$$\bigcirc + \blacksquare = 12$$

Find six possible pairs of values for the circle and square.

e.g.

🟢	1	2	3	4	5	6
🟦	11	10	9	8	7	6

b) Here is another equation.

$$x + y = 12$$

Find six possible pairs of values for x and y.

e.g.

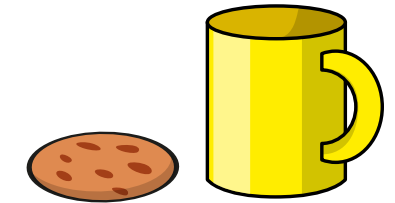| x	1	2	3	4	5	6
y	11	10	9	8	7	6

c) What is the same and what is different about part a) and part b)?

Answers are the same, representations are different.

2 Kim buys these two items from a cafe.

The total cost is 90p.

a) What could the cost of each item be?

e.g.

🍪	10p	20p	30p	40p	50p	60p
☕	80p	70p	60p	50p	40p	30p

b) Compare answers with a partner.

c)

> A coffee could cost 90p.
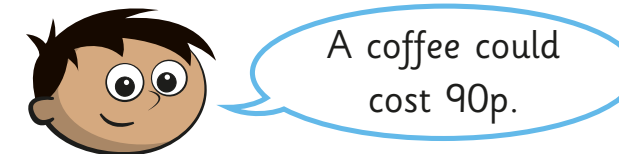
Is this possible? __No__

Explain your answer.

The cookie wouldn't cost anything.

3 a and b are whole numbers.

$$a + b = 8$$

Complete the table to show different possible values for a and b.

a	0	1	2	3	4	5	6	7
b	8	7	6	5	4	3	2	1
$a + b$	8	8	8	8	8	8	8	8

What patterns do you notice?

4 c and d are both numbers less than 20

$$c - d = 4$$

Complete the table to show possible values for c and d.

c	19	18	17	16	15	14	13	12
d	15	14	13	12	11	10	9	8
$c - d$	4	4	4	4	4	4	4	4

5 a and b are integers.

$$ab = 24$$

List all the possible values for a and b.

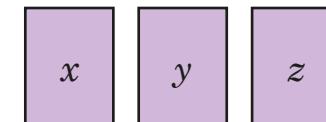| a	1	2	3	4	6	8	12	24
b	24	12	8	6	4	3	2	1

6 Some scales are balanced.
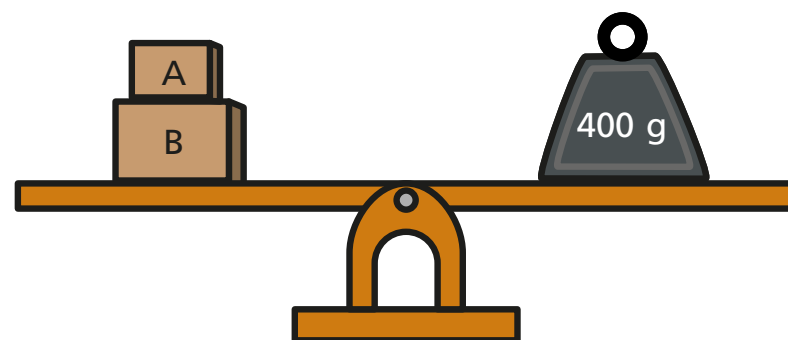
What could the masses of the boxes be?

eg A = | 100g | B = | 300g |

7 Rosie has three number cards.

| x | | y | | z |

- The sum of the cards is 12
- x is greater than y and y is greater than z.
- All the numbers are greater than zero.

List all the possible values of x, y and z.

x	9	8	7	6	7	6	5
y	2	3	4	5	3	4	4
z	1	1	1	1	2	2	3

8 Eva is plotting co-ordinates (x, y) on a grid.

She is only plotting co-ordinates where $x + y = 10$

Plot all the points Eva can plot on the grid.
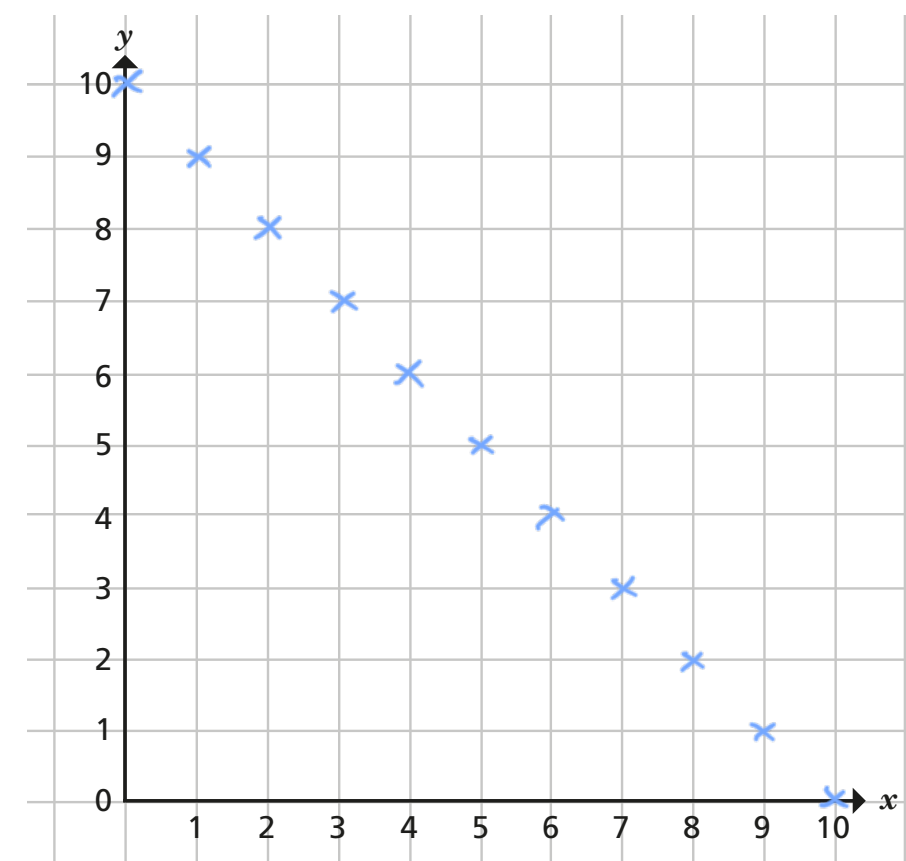
1 Class 6 are trying to solve a number puzzle.

$$\triangle + \triangle + \bigcirc = 10$$

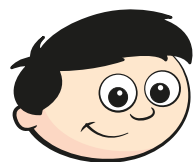**a)**

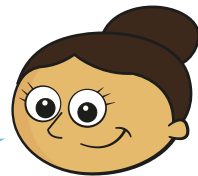Dexter: The triangle could be 3 and the circle could be 4

Do you agree with Dexter? _Yes_

Explain why.

_3 + 3 + 4 = 10_

b)

Dora: The triangle is worth 4

What is the value of the circle in Dora's number puzzle?

$\bigcirc = \boxed{2}$

c) Find other pairs of values that the triangle and circle could equal.

Find three pairs.

$\triangle = \boxed{1}$ $\bigcirc = \boxed{8}$ $\triangle = \boxed{5}$ $\bigcirc = \boxed{0}$

$\triangle = \boxed{2}$ $\bigcirc = \boxed{6}$

2 a and b are whole numbers.

$$2a + b = 14$$

Complete the table to show different possible values for a and b.

a	0	1	2	3	4	5	6	7
$2a$	0	2	4	6	8	10	12	14
b	14	12	10	8	6	4	2	0
$a + b$	14	14	14	14	14	14	14	14

3 c and d are both integers less than 15 but greater than zero.

$$3c - d = 2$$

Complete the table to show different possible values for c and d.

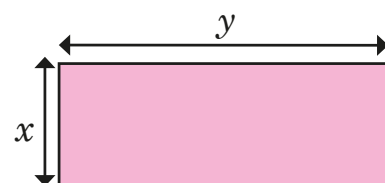| c	1	2	3	4	5
$3c$	3	6	9	12	15
d	1	4	7	10	13
$3c - d$	2	2	2	2	2

b) Explain why there are no other possible values for c and d.

If c was 16 d would be greater than 15

4 x and y are both multiples of 5 less than 100

If $2x = y$, circle the possible values of x and y.

$x = 20, y = 20$

$x = 10, y = 20$ ✓

$x = 20, y = 10$

$x = 35, y = 70$ ✓

$y = 90, x = 45$ ✓

5 Here is a rectangle.

x and y are both integers.

The rectangle has a perimeter of 28 cm.

a) Write an equation to represent the perimeter of the rectangle.

$2x + 2y = 28$

b) List all the possible pairs of values for x and y.

$x = 1 \quad y = 13$ $x = 5 \quad y = 9$

$x = 2 \quad y = 12$ $x = 6 \quad y = 8$

$x = 3 \quad y = 11$

$x = 4 \quad y = 10$

Compare answers with a partner. How do you know you have found all the possible values?

6 Aisha is buying some stationery for school.

She spends exactly £1

pencil 10p

pen 15p

List the possible combinations of pencils and pens that Aisha could have bought.

10 pencils   6 pens & 1 pencil

2 pens & 7 pencils

4 pens & 4 pencils

7 Ron has four digit cards.

- Two of the cards have the same value.
- All of the cards are less than 10 but greater than zero.
- All of the cards are odd.
- The sum of the four cards is 24

Find two possible sets of cards.

Set 1   1   5   9   9

Set 2   1   7   7   9

8 $2ab = 48$

a) Find a pair of possible values for a and b.

e.g. $a = \boxed{6}$ $b = \boxed{4}$

b) Work with a partner to find as many pairs of values as you can.