Algebra questions
(Taken from 2016 GCSE exam sample papers: foundation tier)

1 (a) Solve.

    (i) $2x = 18$

                                (a)(i) $x =$ .... **[1]**

    (ii) $x + 2 = 5$

                                   (ii) $x =$ .... **[1]**

    (iii) $\dfrac{x}{3} = 15$

                                   (iii) $x =$ .... **[1]**

(b) (i) Find the value of t when $g = 4$ and $h = 7$.

        $t = 12g - 5h$

                                 (b)(i) $t =$ .... **[2]**

    (ii) Rearrange to make r the subject.

        $4r - p = q$

                                   (ii) .... **[2]**

8 (b)   Write an expression for the total cost, in pounds, of
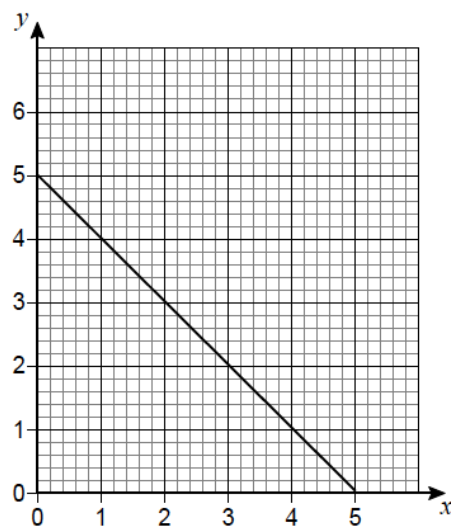
x jumpers at £15 each

and

y shirts at £12 each.

[1 mark]

Answer _____

17   Here is the graph of $y = 5 - x$ for values of x from 0 to 5

17 (a)   On the same grid, draw the graph of $y = x + 1$ for values of x from 0 to 5

[2 marks]

17 (b)   Use the graphs to solve the simultaneous equations

$y = 5 - x$ and $y = x + 1$

[1 mark]

$x =$ _____

$y =$ _____

22 Henry is thinking of having a water meter.

These are the two ways he can pay for the water he uses.

Water Meter

A charge of £28.20 per year

plus

91.22p for every cubic metre of water used

1 cubic metre = 1000 litres
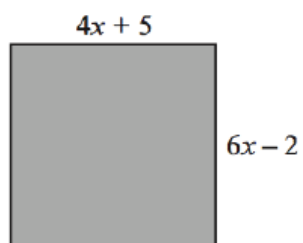
No Water Meter

A charge of £107 per year

Henry uses an average of 180 litres of water each day.

Use this information to determine whether or not Henry should have a water meter.

25. The diagram shows a square.
All the lengths are measured in centimetres.

$$4x + 5$$

$$6x - 2$$

Diagram not drawn to scale

Use an algebraic method to find the length of one side of the square. [5]

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25 Here are the first four terms of an arithmetic sequence.

6   10   14   18

(a) Write an expression, in terms of n, for the nth term of this sequence.

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(2)

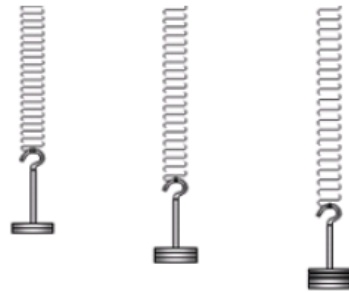The nth term of a different arithmetic sequence is $3n + 5$

(b) Is 108 a term of this sequence?
  Show how you get your answer.

(2)

(Total for Question 25 is 4 marks)

10   In an experiment, different masses are hung on a spring.

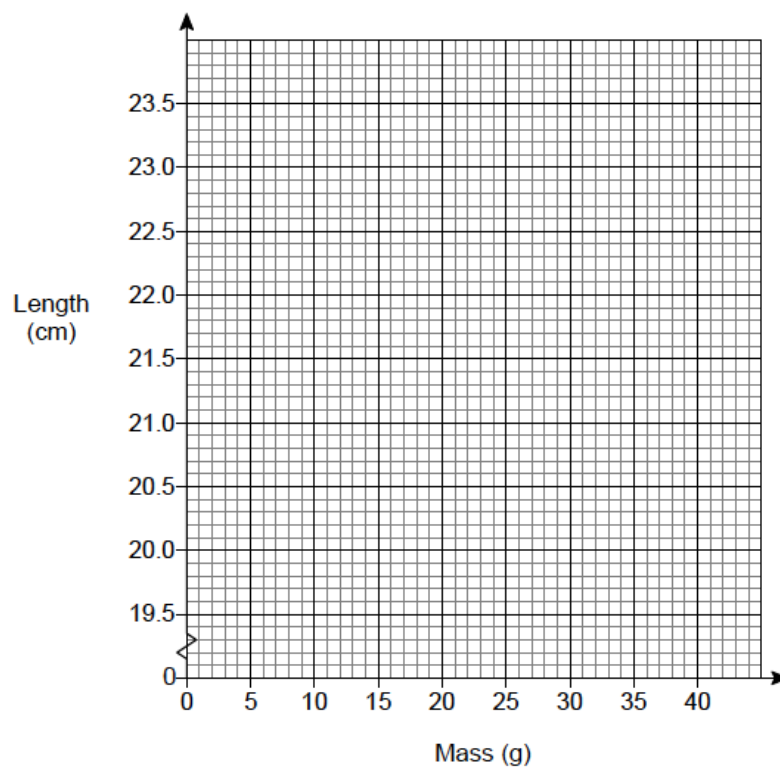The length of the spring is measured for each mass.

Mass (g)	10	20	30	40
Length (cm)	20.8	21.6	22.4	23.2

10 (a)   Draw a graph to show the length of the spring for masses from 10 g to 40 g

[2 marks]

10 (b) Estimate the length of the spring with no mass hung on it.

[1 mark]

Answer _____ cm

10 (c) How much longer is the spring with a 35 g mass than with a 15 g mass?

[2 marks]

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_____

_____

Answer _____ cm

6. Charlie has x pens.
Lisa has 3 more pens than Charlie.
Julian has twice as many pens as Lisa.
How many pens do Charlie, Lisa and Julian have altogether?
Simplify your answer as far as possible. [4]

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19. A ball is dropped from a height of 840 cm onto a floor.
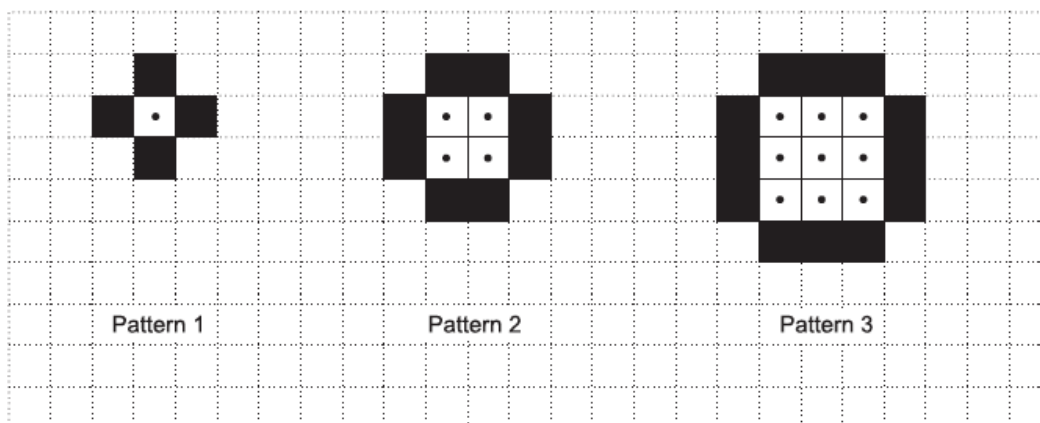After each bounce it rises to a height that is half of the distance it has just fallen.

840 cm

After how many bounces will the ball fail to reach a height of 1 m for the first time?
You must show all your working. [3]

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12 Here are the first three patterns in a sequence.

Pattern 1   Pattern 2   Pattern 3

(a) Draw Pattern 4 in this sequence on the grid below.
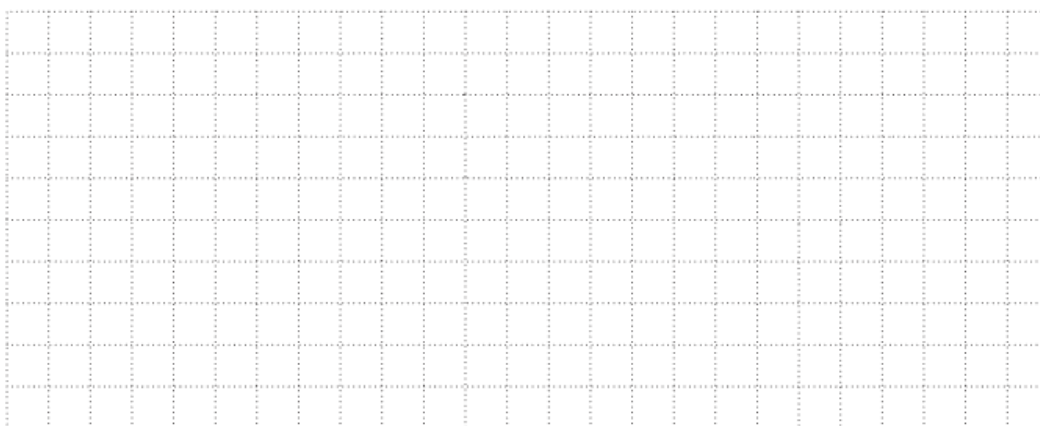
[2]

(b) Pattern 3 has 9 dotted squares and 12 black squares.

How many **dotted** squares will there be in Pattern 8?

(b) .... [2]

(c) Write an expression for the number of **black** squares in the *n*th pattern.

(c) .... **[2]**

(d) Sally looks at the patterns.
She says

> If the pattern number is odd, the total number of squares will be odd.
> If it is even, the total number of squares will be even.

Explain clearly why Sally is right for **all** patterns in the sequence.

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.... **[6]**