General Certificate of Secondary Education

GCSE AQA Mathematics (Grade 9-1) Higher Tier

Centre name					
Centre number					
Candidate number					

Practice Set 1
Paper 3: Calculator

Time allowed: 1 hour 30 minutes

Surname
Other names
Candidate signature

In addition to this paper you should have:
- A pen, pencil and eraser.
- A ruler.
- A protractor.
- A pair of compasses.
- A calculator.

Instructions to candidates
- Write your name and other details in the spaces provided above.
- Answer all questions in the spaces provided.
- In calculations show clearly how you worked out your answers.
- Calculators may be used — if your calculator doesn't have a π button, take the value of π to be 3.142

Information for candidates
- There are 80 marks available for this paper.
- The marks available are given in brackets at the end of each question.
- You may get marks for method, even if your answer is incorrect.

Advice to candidates
- Work steadily through the paper.
- Don't spend too long on one question.
- If you have time at the end, go back and check your answers.

For examiner's use			
Q	Mark	Q	Mark
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	
Total			

Leave blank

Answer ALL the questions.

Write your answers in the spaces provided.

You must show all of your working.

1 The number n expressed as a product of prime factors is $2^3 \times 3^2 \times 5$.

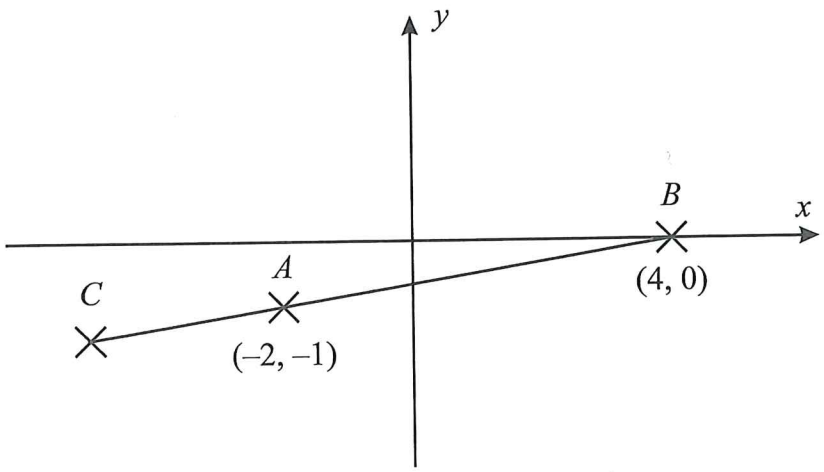
What is n^2 as a product of prime factors? Circle your answer.

$2^5 \times 3^4 \times 5^3$ $\quad$ $(2^3 + 2^3) \times (3^2 + 3^2) \times (5 + 5)$

$2^6 \times 3^4 \times 5^2$ $\quad$ $4^6 \times 9^4 \times 25^2$

[Total 1 mark]

2 A, B and C are points on a coordinate grid. CAB is a straight line.



(a) Circle the column vector that translates point A onto point B.

$\begin{pmatrix} 1 \\ 6 \end{pmatrix}$ $\quad$ $\begin{pmatrix} -1 \\ 6 \end{pmatrix}$ $\quad$ $\begin{pmatrix} 6 \\ 1 \end{pmatrix}$ $\quad$ $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$

[1]

(b) AB is twice the length of AC. Using your answer to part (a), circle the column vector that translates point A onto point C.

$\begin{pmatrix} -3 \\ -\frac{1}{2} \end{pmatrix}$ $\quad$ $\begin{pmatrix} -\frac{1}{2} \\ -3 \end{pmatrix}$ $\quad$ $\begin{pmatrix} -2 \\ -\frac{1}{2} \end{pmatrix}$ $\quad$ $\begin{pmatrix} 3 \\ \frac{1}{2} \end{pmatrix}$

[1]

[Total 2 marks]

3 Lola has a recipe for lentil soup.

Leave blank

Lentil Soup ***(4 servings)***

100 g lentils	2 sticks of celery
240 g carrots	1 litre vegetable stock
180 g sweet potato	

(a) How many grams of lentils would she need to make a soup for n people?
Circle your answer.

$25n$ grams $2.5n$ grams 2500 grams $6.25n$ grams

[1]

(b) She plans to make the lentil soup for a party of 25 people.
She only has 500 g of sweet potato.

How much more sweet potato does she need to buy?

..... g

[3]

[Total 4 marks]

Leave blank

4 Anton is on holiday in Mexico.
The exchange rate is £5 = 126 pesos

He finds a camera that he bought in the UK for £79.99 on sale for 1800 pesos.

Explain where the camera is cheaper and by how much.
Give your answer in pounds.

.....

.....

.....

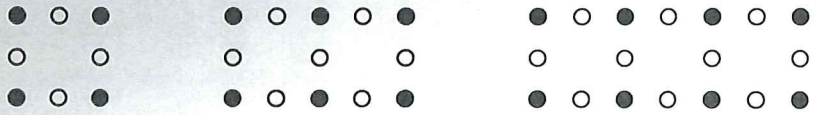
.....

.....

.....

[Total 3 marks]

5 The first three patterns of a sequence are shown below.



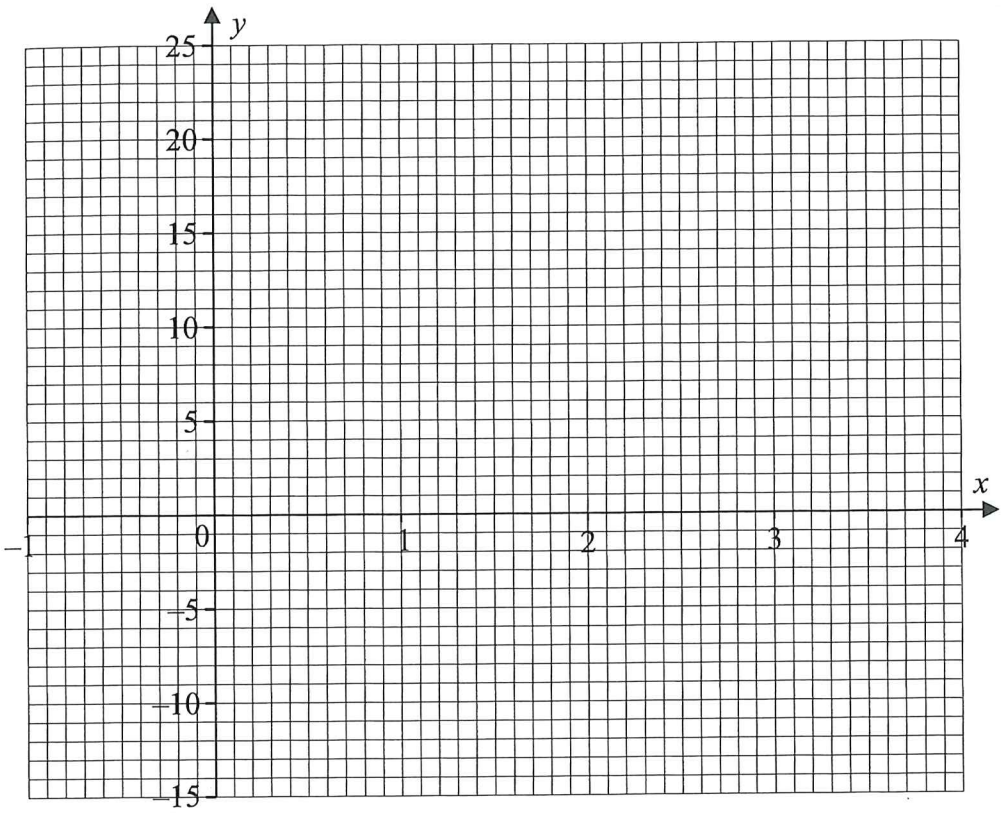
How many white dots will be in the 1000th pattern?

.....

[Total 2 marks]

Leave blank

6 (a) Draw the graph with equation $y = 3x - 4$ for values of x between -1 and 4.



[2]

(b) Write down the equation of the graph parallel to $y = 3x - 4$ that passes through the point $(-1, 0)$.

.....

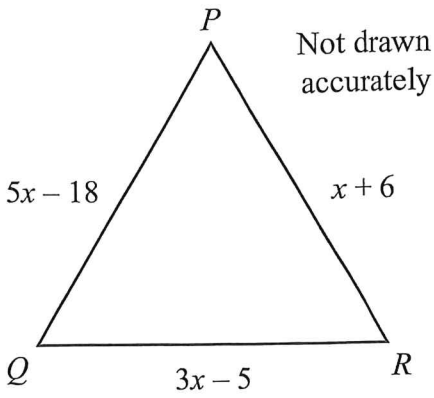
[2]

[Total 4 marks]

Leave blank

7 The diagram shows the triangle PQR with sides of length $5x - 18$, $3x - 5$ and $x + 6$.

Is triangle PQR equilateral?
You must show your working.



[Total 4 marks]

8 Chris is decorating cupcakes for a party. He has 5 different colours of icing, $n + 1$ different fondant animals and $n - 1$ types of sprinkles.

Each cupcake will have icing, a fondant animal and sprinkles on it.

There are 120 different ways to decorate the cupcakes.
What is the value of n?

$n =$ .....

[Total 2 marks]

Leave blank

9 The mean of the numbers x, 7, 13 and y is 8.
The range of the numbers is 16.
x is a negative integer.

Find the values of x and y.

$x =$ .....

$y =$ .....

[Total 4 marks]

10 John completes a 400 m wheelchair race in 64.5 seconds.
The distance is correct to the nearest metre and the time to the nearest half second.

Work out the lower bound of his average speed.

..... m/s

[Total 3 marks]

Leave blank

11 A metal cone has a height of 4.3 cm and the radius of its base is 1.2 cm.
The mass of the cone is 17.5 g.

Work out the density of the cone in g/cm^3.
Give your answer to a suitable degree of accuracy.

Volume of a cone $= \frac{\pi r^2 h}{3}$

..... g/cm^3

[Total 3 marks]

12 A regular polygon has n sides and interior angles of 160°.

Find the size of each interior angle in a regular polygon with $4n$ sides.

..... °

[Total 3 marks]

13 The table shows the population and area of four countries.

Leave blank

Country	Population	Area (km^2)
Afghanistan	3.26×10^7	6.52×10^5
Austria	8.67×10^6	8.39×10^4
Morocco	3.33×10^7	4.47×10^5
Malaysia	3.05×10^7	3.30×10^5

(a) Which two countries are closest in terms of their population?
You must show your working.

.....

.....

.....

.....

[2]

(b) Population density is measured as the number of people per square kilometre.
Which country has the greatest population density?

.....

[2]

[Total 4 marks]

Leave blank

14 Kelvin drops a rubber ball from a height of 140 cm onto concrete.
After each bounce, the ball rises to a height 24% less than the height it fell from.

(a) What height would the ball bounce to after it has hit the ground for the 5th time?
Give your answer to 1 decimal place.

..... cm
[3]

(b) How many times will the ball have bounced when it fails to reach a height of 10 cm for the first time?

.....
[2]

[Total 5 marks]

15 Joel has been asked to paint the wooden table tops and sides on the outdoor tables at the café he works at. There are 20 tables to be painted.

Leave blank

Each table has a cylindrical top with a diameter of 90 cm and is 3 cm thick.

He has a 2.5 litre tin of paint with the following guidelines.

Covers 12 m^2 per litre

Allow 2 coats

(a) Can he paint all of the tables using his tin of paint?
You must show your working.

.....

[5]

(b) Describe any assumptions that you made when calculating your answer to part (a).

.....

.....

.....

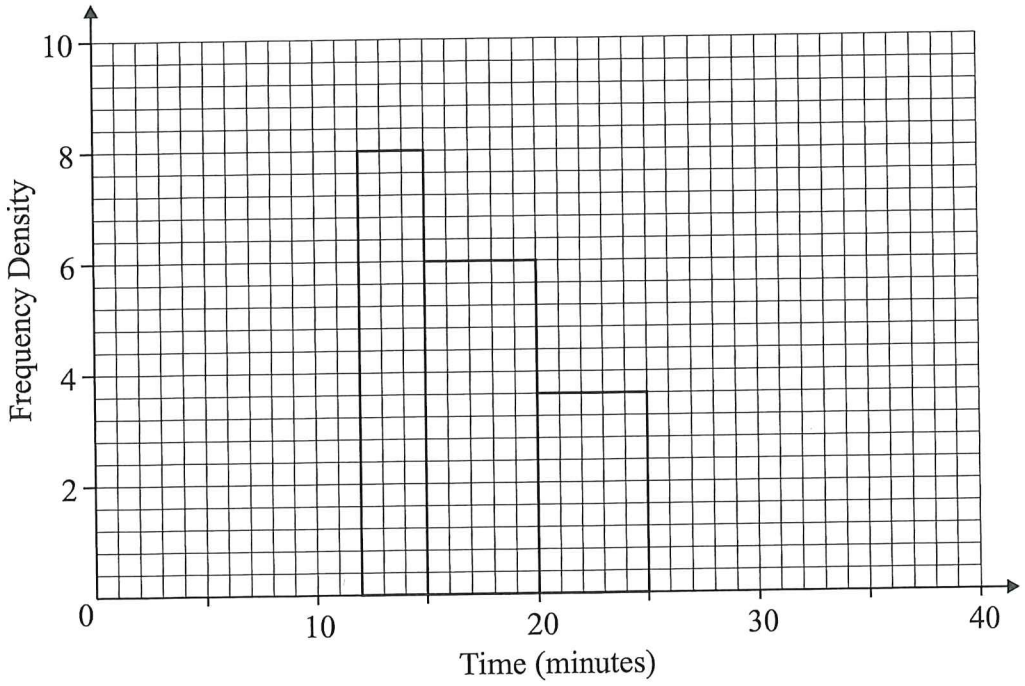
[1]

[Total 6 marks]

16 The frequency table and histogram show the times taken by entrants to complete a fun run.

Leave blank

Time (m) in minutes	Frequency
$10 \leq m < 12$	8
$12 \leq m < 15$	
$15 \leq m < 20$	30
$20 \leq m < 25$	
$25 \leq m < 40$	30



(a) Complete the histogram and frequency table.

[4]

(b) Harry competed in the fun run. He boasts to his friends that the fun run was 10 km long. Do you think Harry is telling the truth? Tick a box.

Yes ☐ No ☐

Give a reason for your answer.

.....

.....

.....

.....

[2]

[Total 6 marks]

17 Solve the following inequality.

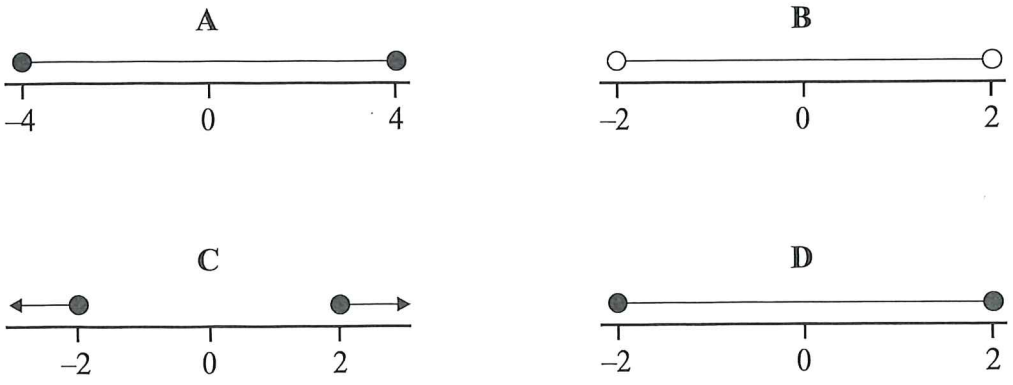
Leave blank

(a) $x^2 - 1 \leq 3(x + 3)$

.....

[4]

(b) Circle the letter of the number line that represents the set $\{x : 4 \geq x^2\}$



[1]

[Total 5 marks]

18 (a) Show that the equation $x^3 + 4x^2 - 13 = 0$ has a solution between the values $x = 1$ and $x = 2$.

Leave blank

[2]

(b) Show that the equation above can be rearranged to give $x = \sqrt{\dfrac{13 - x^3}{4}}$

[2]

(c) Use the iteration formula $x_{n+1} = \sqrt{\dfrac{13 - x_n^3}{4}}$, with $x_0 = 1.5$, to find an estimate for a solution of $x^3 + 4x^2 - 13 = 0$ to 2 decimal places.

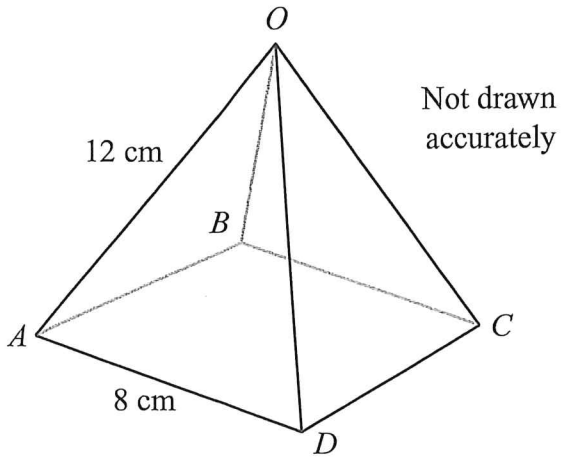
$x =$ .....

[3]

[Total 7 marks]

19 *OABCD* is a square based pyramid.
The vertex *O* is vertically above the centre of the horizontal base *ABCD*.
OA = 12 cm and *AD* = 8 cm

Leave blank



(a) Find the vertical height of the pyramid.
Give your answer in the form $a\sqrt{b}$, where a and b are integers.

..... cm
[3]

(b) Find the angle *OA* makes with the base *ABCD*.
Give your answer to 3 significant figures.

..... °
[3]

[Total 6 marks]

Leave blank

20 A bag contains red beads and blue beads.
The probability of picking out a red bead is r.
One bead is picked out from the bag, its colour noted, and then it is replaced.
A second bead is then picked out.

The probability that exactly one of the beads is red is $\frac{4}{9}$.

(a) Find the possible values of r. Give your answer as a fraction in its simplest form.

$r =$ ..... and $r =$ .....

[4]

(b) Isaac counts the number of beads in the bag and says,
"The number of blue beads and the number of red beads are both odd."

Do you think Isaac is correct? Tick a box.

Yes ☐ No ☐

Explain your answer.

.....

.....

.....

.....

.....

[2]

[Total 6 marks]

[TOTAL FOR PAPER = 80 MARKS]