

Friday 11 January 2013 – Morning

GCSE APPLICATIONS OF MATHEMATICS

A381/01 Applications of Mathematics 1 (Foundation Tier)

Candidates answer on the Question Paper.

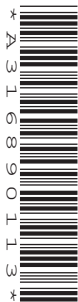
OCR supplied materials:

None

Other materials required:

- Scientific or graphical calculator
- Geometrical instruments
- Tracing paper (optional)

Duration: 1 hour



Candidate forename		Candidate surname	
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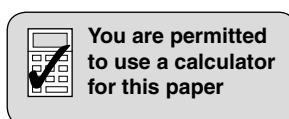
Centre number							Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

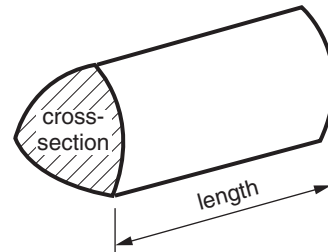


Formulae Sheet: Foundation Tier

Area of trapezium = $\frac{1}{2} (a + b)h$



Volume of prism = (area of cross-section) \times length



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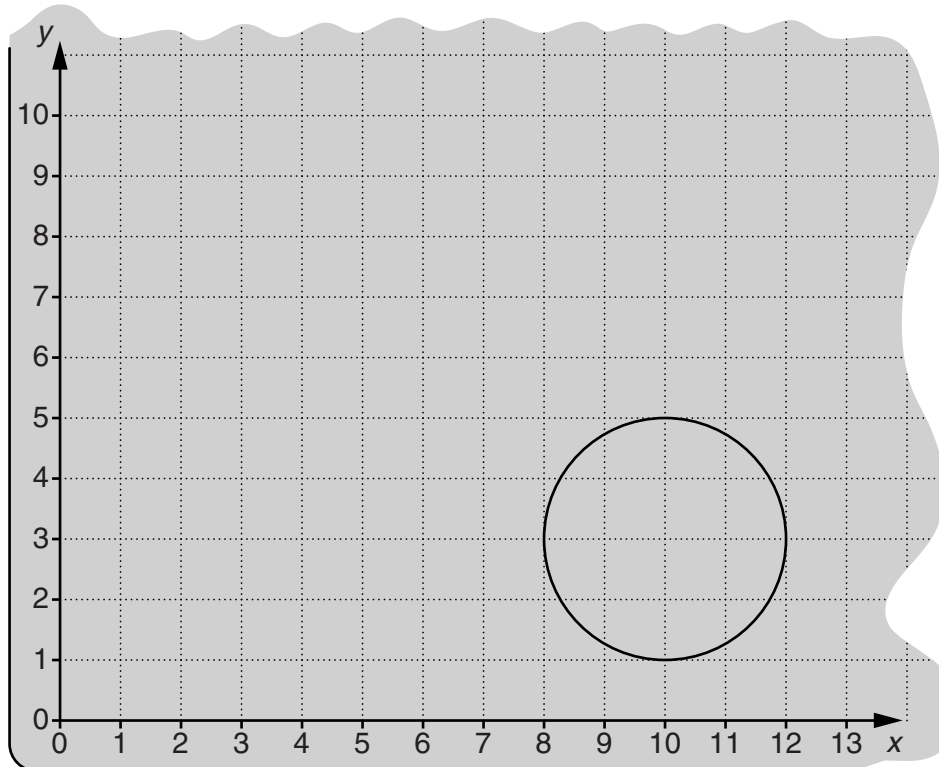
- 1 Coordinates are used to locate shapes on a screen.

The diagram below shows part of a screen's coordinate grid.

Software engineers use instructions to plot points, lines and circles.

Here are three instructions for Amy's graphing calculator:

- **Plot (a, b)** plots a point at (a, b)
- **Line $((a, b), (c, d))$** draws a straight line from the point (a, b) to the point (c, d)
- **Circle $(r, (a, b))$** draws a circle of radius r units with centre at (a, b) .



- (a) Draw the effects of these instructions on the grid above.

(i) **Plot $(7, 10)$** [1]

(ii) **Line $((0, 0), (5, 5))$** [1]

- (b) Complete this instruction for the circle shown on the grid above.

(b) **Circle $(\underline{\hspace{1cm}}, (\underline{\hspace{1cm}}, \underline{\hspace{1cm}}))$** [2]

2 BMX bikes are popular stunt and racing bikes.

(a) An average BMX weighs about 12 kg.

(i) Write 12 kg in grams.



(a)(i) _____ g [1]

(ii) A racing BMX weighs $\frac{3}{4}$ of the weight of an average BMX.

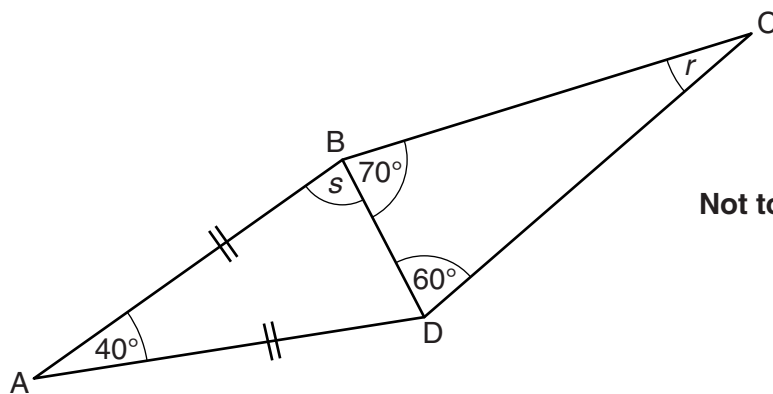
How many kilograms does a racing BMX weigh?

(ii) _____ kg [1]

(b) An important part of a BMX is its frame.

ABCD is a drawing of a BMX frame.

AB and AD are the same length.



Not to scale

(i) Calculate the size of the angle marked r .

(b)(i) _____ ° [1]

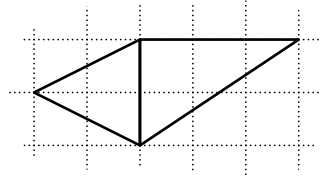
(ii) Calculate the size of the angle marked s .

(ii) _____ ° [2]

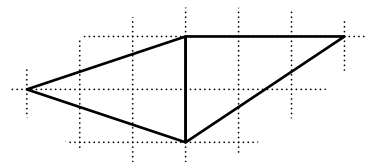
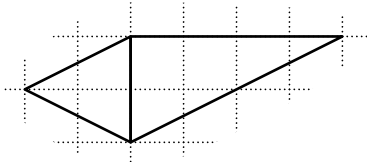
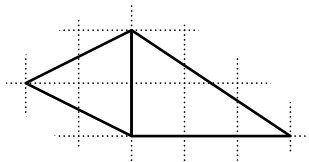
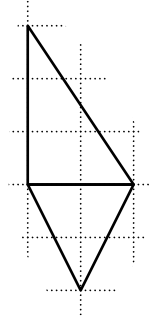
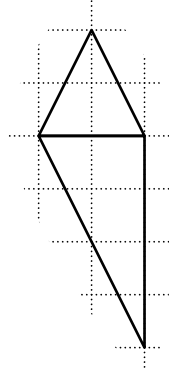
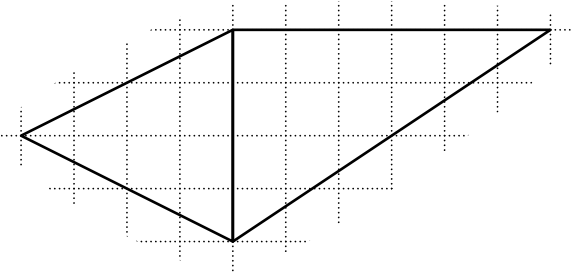
(iii) Explain why ABCD is not a parallelogram.

_____ [2]

(c) This is a drawing of a different BMX frame.



Put a tick (✓) inside each of the shapes which are congruent to the shape above.



[2]

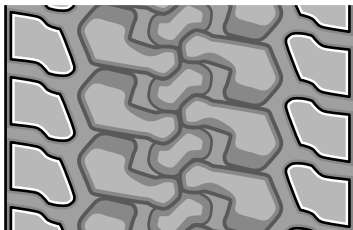
(d) (i) The spokes of BMX bikes can get damaged. Replacement spokes cost £15 for 50.

At this rate, what is the cost of one spoke?



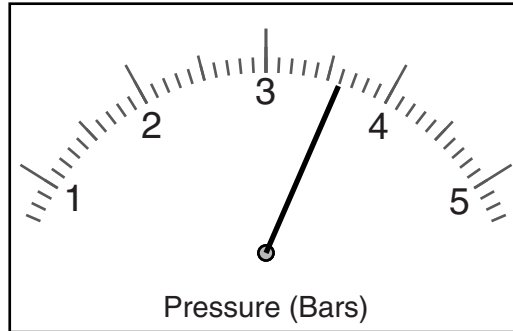
(d)(i) £ _____ [2]

(ii) Measure the width of this part of a BMX tyre in millimetres.



(ii) _____ mm [1]

- (e) (i)* Jan uses her BMX for stunts.
She uses her brother’s tyre pressure gauge to measure her BMX’s tyre pressure.
It shows this pressure, measured in Bars.



Jan finds this in a book:

To change a pressure in Bars into a pressure in psi (pounds per square inch):
multiply the pressure in Bars by 14.

BMX stunt riders usually have their tyres at a pressure of 60psi.

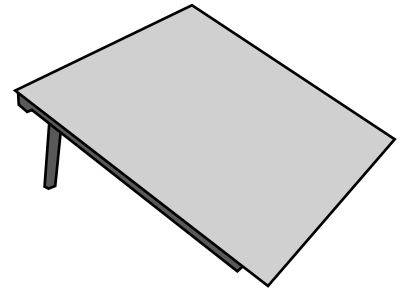
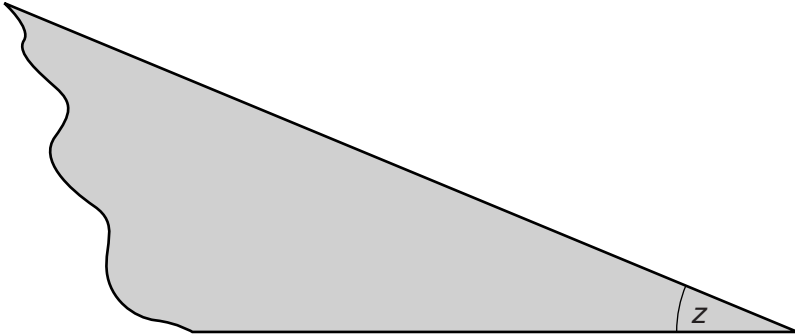
By how much does Jan need to change her tyre pressure?
Give your answer in psi.

[4]

- (ii) Jan does stunts using a wedge ramp.

The diagram below shows the angle, z , the wedge ramp makes with the ground.

Measure the angle z .

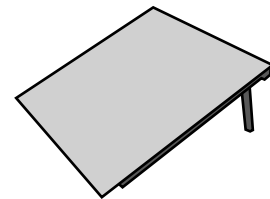


(e)(ii) _____ ° [1]

- (iii) Jan found a formula on a BMX website which gave the height, h metres, above the ground that a biker can jump after leaving the ramp.

Complete her calculation to find the value of h in metres.

$$h = \frac{9^2}{20} + 1$$



(iii) _____ m [2]

- (iv) Write your answer to part (e)(iii) correct to the nearest whole number.

(iv) _____ m [1]

3 (a) (i) Pencils were first mass produced in 1662.

How many years ago was this?



(a)(i) _____ [1]

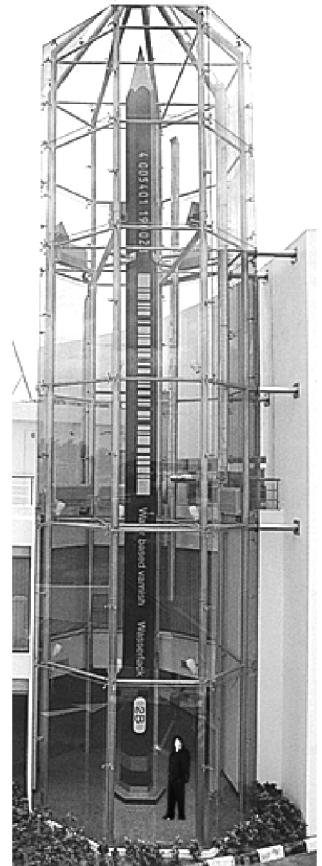
(ii) 2008 was the 150th anniversary of the first time an eraser was fitted to a pencil.

In what year was the first time an eraser was fitted to a pencil?



(ii) _____ [1]

(iii) This is a photo of a man standing by the world's longest pencil.



Estimate:

the length of the real pencil

and the width of the real pencil.

[3]

- (iv) Each year 14 billion pencils are made in the world.
50% of these are made in China.

How many pencils are made each year in China?

(iv) _____ billion pencils [1]

- (b) The 'lead' in pencils is a mixture of graphite, clay and wax.
HB pencil lead is 70% graphite, 25% clay and the rest is wax.

(i) What percentage of HB pencil lead is wax?

(b)(i) _____ % [1]

(ii) What fraction of HB pencil lead is graphite?
Give your fraction in its simplest form.

(ii) _____ [2]

- 4 (a) On a marketing website there is a large collection of TV company logos. There are 150 rows of logos! These are 5 of the rows.



- (i) Use the information above to calculate how many TV company logos there are altogether on the marketing website. Show your method clearly.

(a)(i) _____ [2]

- (ii) According to the website's author the number of TV company logos on the website is only $\frac{1}{5}$ of his **total** collection of TV company logos.

How many TV company logos does the author have in their collection?

(ii) _____ [2]

(b) Here are some TV company logos.

Under each logo put a tick (✓) if it has reflection symmetry or a cross (✗) if it does not.
 On the next row put a tick (✓) if the logo has rotation symmetry or a cross (✗) if it does not.



Reflection symmetry _____ _____ _____ [1]

Rotation symmetry _____ _____ _____ [1]

(c) Only about one in a hundred TV company logos have any symmetry.

What percentage of TV company logos have any symmetry?

(c) _____ % [1]

(d) A famous symmetrical logo is the one for Sun Microsystems.



Complete this sentence.

The logo has _____ lines of reflection symmetry and
 rotation symmetry order _____ .


[2]

5 Mandy and her three children like ice cream.

(a) Mandy makes her own ice cream.

She uses this recipe for vanilla ice cream that she found on the internet.

Vanilla ice cream



**SERVES
FOUR**

Ingredients

4 eggs
80 g sugar
400 ml single cream
5 ml vanilla essence

May be made without an ice cream maker

One of the children has a birthday party.

How much of each ingredient will Mandy need to make ice cream for the 12 children at the party?

(a) _____ eggs
 _____ g sugar
 _____ ml single cream
 _____ ml of vanilla essence
[3]

Mandy buys an ice cream maker.

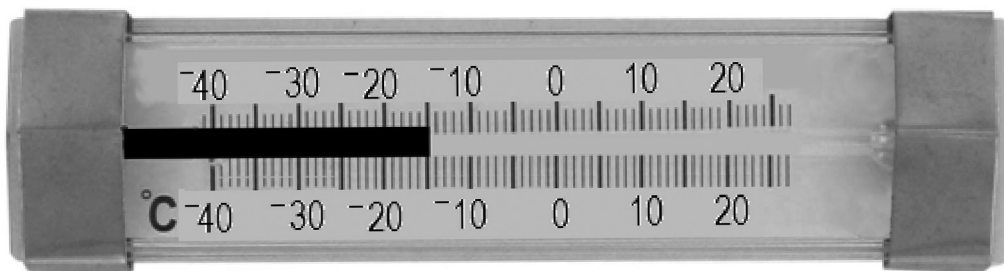
- (b) The ice cream maker cost £30.
It makes a litre of ice cream each time.
The ingredients cost about £1 for a litre.
Their usual supermarket ice cream costs £1.65 a litre.

How many litres of ice cream will Mandy need to make to save enough money to cover the cost of the ice cream maker?

(b) _____ litres [3]

- (c) The inner bowl of the ice cream maker has to be cooled to -18°C before using.

This is the temperature in the freezer.



How much more does the temperature in the freezer need to drop, so that the inner bowl is at the correct temperature?

(c) _____ $^{\circ}\text{C}$ [1]

- (d) Mandy finds this information in a book about ice cream making.

Fluffiness of ice cream is measured by its overrun.

The higher the overrun the more fluffy the ice cream.

The volume of mixture put into the ice cream maker and the volume of ice cream it produces are measured.

$$\text{Volume of ice cream produced} = \frac{(\text{overrun} + 100) \times (\text{volume of mixture})}{100}$$

$$\text{Overrun} = \frac{(\text{volume of ice cream produced} - \text{volume of mixture}) \times 100}{(\text{volume of mixture})}$$

- (i) What is the overrun for an ice cream mixture that has a volume of 500ml and which produces 980ml of ice cream?

(d)(i) _____ [2]

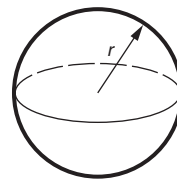
- (ii) Soft ice cream, as sold from ice cream vans, has an overrun of 30. Mandy has 500ml of ice cream mixture.

What volume of soft ice cream, as sold from ice cream vans, can she produce?

(ii) _____ ml [2]

- 6 The volume of a sphere is 487 cm^3 .

The radius, r , of this sphere is given by this calculation.



$$r = \sqrt[3]{\frac{3 \times 487}{4 \times 3.142}}$$

- (a) Round each of 487 and 3.142 correct to one significant figure.

(a) _____ and _____ [1]

- (b) Use your answers to part (a) to estimate r .

(b) _____ cm [1]

TURN OVER FOR QUESTION 7

7 Megan thinks of a number.

She carries out the following steps.

Step 1: Subtract 3 from the number

Step 2: Multiply the answer by 2

Step 3: Subtract 5 from the answer

(a) Megan thinks of 13.

What is her final answer?

(a) _____ [1]

(b) (i) Megan uses x to represent the number she thinks of.

Write down, and simplify, an expression in terms of x , for her final answer.

(b)(i) _____ [2]

(ii) Megan thinks of a **new** number.
Her final answer is -3 .

Write an equation in x and solve it to find Megan's new number.

(ii) _____ [2]

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