Centre Number	Candidate Number

Candidate Name _____

THE MINISTRY OF EDUCATION, BOTSWANA
in collaboration with

UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

Botswana General Certificate of Secondary Education

MATHEMATICS 0563/2

PAPER 2

Wednesday **8 NOVEMBER 2000** Morning 2 hours

Candidates answer on the question paper.
Additional materials:
Electronic calculator
Geometrical instruments

TIME 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

If working is needed for any question it must be shown below that question.

Omission of essential working will result in loss of marks.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

The total of the marks for this paper is 75.

If the degree of accuracy is not specified in the question and if the answer is not exact, the answer should be given to three significant figures. Answers in degrees should be given to one decimal place.

In any question where the value of π is required use the value from your calculator or take π as 3.142.

This question paper consists of 14 printed pages and 2 blank pages.

[Turn over

Mathematical formulae for papers 1 and 2

Surface area and volume of solids

Name of solid	Total surface area	Volume
cone	$\pi r^2 + \pi rl$	$\frac{1}{3}\pi r^2 h$
pyramid		$\frac{1}{3}$ base area × height
sphere	$4\pi r^2$	$\frac{4}{3}\pi r^3$

Trigonometry

Sine Rule $\quad \dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$

$\quad\quad\quad\quad\quad\quad \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Area of a triangle $\quad = \dfrac{1}{2}ab \sin C$

For Examiner's use

1 **(a)** The mass of an amoeba is 0.000 000 067 g.
Write down this mass in grams in standard form.

Answer (*a*) ..... g [2]

(b) Evaluate $\frac{24.97}{49.3078 \times 99.305}$, correct to three significant figures.

Answer (*b*) ..... [3]

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2 Solve the inequalities

(a) $3x - 1 \leqslant 2$,

Answer (*a*) ..... [1]

(b) $-2(x + 2) > 4$.

Answer (*b*) ..... [2]

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3 **(a)** Mrs Lefatshe bought 15 metres of cloth. The cost of one metre is P69.95.

(i) How much did she have to pay?

Answer (*a*)(i) P ..... [1]

(ii) She cut out 2 pieces, each 6.13 metres long, from the cloth.
How long, in centimetres, is the remaining piece?

Answer (*a*)(ii) ..... cm [2]

(b) In a science laboratory a student measured the thickness of four types of cardboard paper using a micrometer. The results of the measurements in metres were:

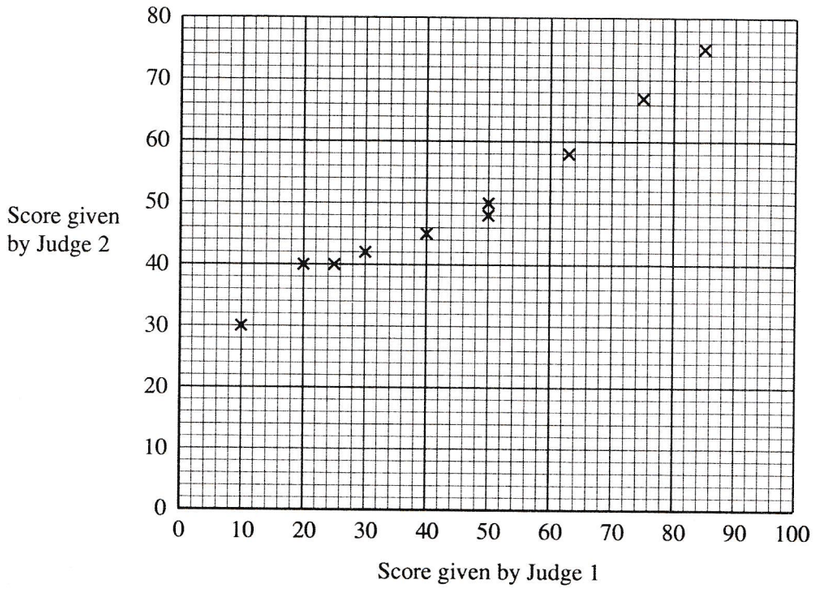
2×10^{-3}, 6×10^{-4}, 1.2×10^{-3}, 7×10^{-4}.

Arrange the measurements in order of size starting with the smallest.

Answer (*b*) ..... [2]

For Examiner's use

4 At a regional Mathematics and Science Fair, 10 students' projects were seen by 2 judges. The scores, in percent, given by Judge 1 and Judge 2 are represented in the scatter graph as shown.



The scores given by the two judges correlate positively.

(a) Draw the line of best fit. [1]

(b) Use your line to answer the following questions.

(i) One project was seen by Judge 1 only and she gave 45%. What score do you expect Judge 2 would have given for the same project?

Answer (*b*)(i) ..... % [1]

(ii) Another project was seen by Judge 2 only and given 55%. What score do you expect Judge 1 would have given?

Answer (*b*)(ii) .....% [1]

For Examiner's use

5 **(a)** In a sequence, the next term is found by multiplying the previous term by 4 and then subtracting 1. Starting with 3, write down the next 3 terms of the sequence.

Answer (a) ..... [2]

(b) The nth term of another sequence is given by $5n + 3$. If the nth term is 498, what is the value of n?

Answer (b) ..... [1]

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6 **(a)** The equation of a straight line is $3x - 5y - 15 = 0$.

(i) Write this equation in the form $y = mx + c$.

Answer (a)(i) ..... [2]

(ii) Write down the coordinates of the point where the line crosses the y-axis.

Answer (a)(ii) ..... [1]

(b) A line segment CD has endpoint coordinates $C(-1, 2)$ and $D(p, q)$. $M(2, -2)$ is the midpoint of the line segment CD.

(i) Find the coordinates of the endpoint D.

Answer (b)(i) D (....., ...) [2]

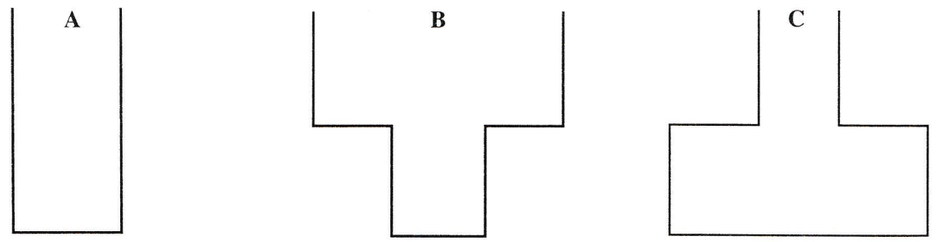
(ii) Calculate the distance between points C and M.

Answer (b)(ii) ..... [2]

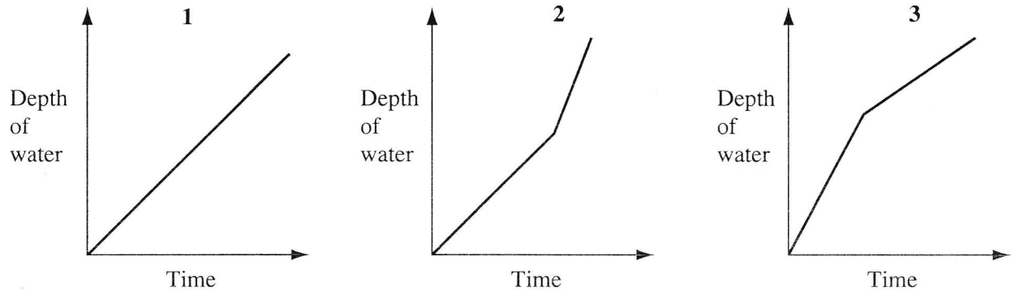
[Turn over

For Examiner's use

7 The following containers are each filled with water at a steady rate.



The graphs below represent the depth of water against time for each of the containers.



(a) Match the graphs with the containers.

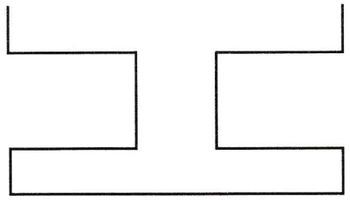
Answer (a) **A** .....

B .....

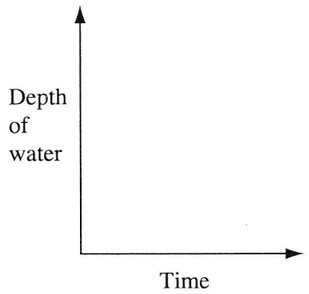
C ..... [1]

For Examiner's use

(b) The container below is also filled with water at a steady rate.



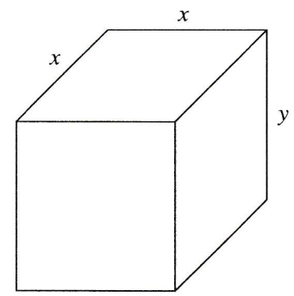
On the axes provided, sketch the graph of the depth of water against time for the container. [2]



For Examiner's use

For Examiner's use

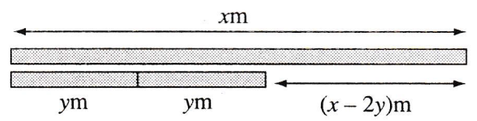
8 **(a)** The volume of the cuboid shown is given by $V = x^2y$.



Find the volume if $x = 1.2$ cm and $y = 3.7$ cm.

Answer (*a*) .....cm^3 [1]

(b) A rope has length x metres. Two pieces each of length y metres are cut off and the length of the remaining piece is given by $(x - 2y)$ m as shown.



Find the length of the remaining piece given that $x = 17\frac{1}{4}$ m and $y = 6\frac{3}{4}$ m.

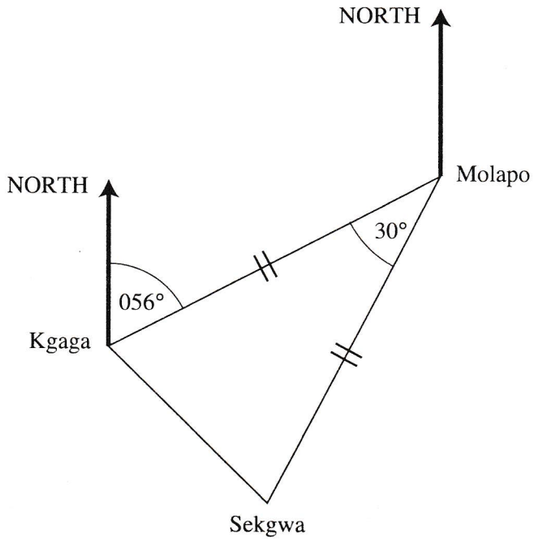
Answer (*b*) ..... m [2]

(c) Factorise

$$6p + p^2 + 9.$$

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

9 The diagram shows the positions of 3 villages: Kgaga, Molapo and Sekgwa. The bearing of Molapo from Kgaga is 056°.



(a) Find the bearing of Kgaga from Molapo.

Answer (*a*) ..... [2]

The three villages are joined by 3 straight roads. The acute angle at Molapo is 30° as shown on the diagram. The distance from Kgaga to Molapo is the same as the distance from Molapo to Sekgwa.

(b) Calculate the acute angle at Sekgwa.

Answer (*b*) ..... [2]

The distance from Kgaga to Molapo is 40 km.

(c) Calculate

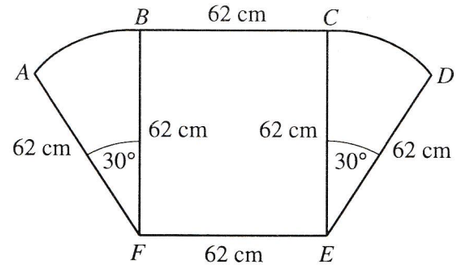
(i) the distance from Kgaga to Sekgwa,

Answer (*c*)(i) ..... km [2]

(ii) the area of the triangular region enclosed by the 3 roads.

Answer (*c*)(ii) .....km^2 [2]

10 The diagram shows a mirror *ABCDEF*, in which *BCEF* is a square of side 62 cm.
ABF is a sector of a circle of radius 62 cm, centre *F*, and *CDE* is a sector of a circle of radius 62 cm, centre *E*.
Angle *AFB* = angle *CED* = 30°.



(a) Calculate

(i) the length of the arc *AB*,

Answer (*a*)(i) ..... cm [2]

(ii) the perimeter of the mirror.

Answer (*a*)(ii) ..... cm [1]

(b) Calculate the area of

(i) sector *CDE*,

Answer (*b*)(i) ..... cm^2 [2]

(ii) the mirror *ABCDEF*.

Answer (*b*)(ii) ..... cm^2 [2]

(c) Given that the length 62 cm in the diagram is correct to two significant figures, complete the statement below to show the lower and upper bounds for this length.

Answer (*c*) ..... cm $\leqslant$ length < ..... cm [1]

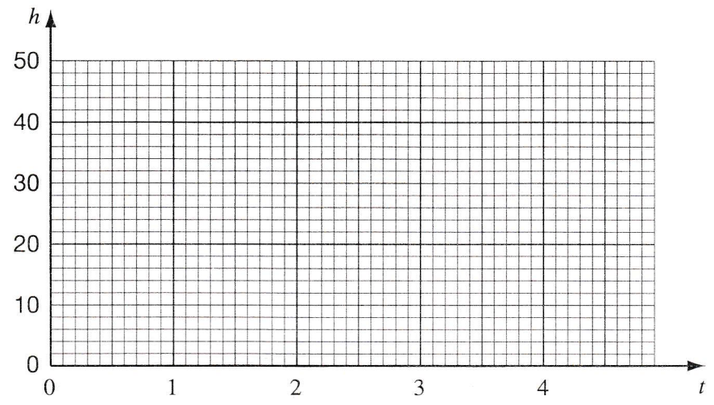
11 A stone is dropped from the top of a building. The height, h metres, of the stone above the ground is given by $h = 45 - 5t^2$, where t seconds is the time after the stone is dropped.

(a) Complete the table below to find the values of h corresponding to the given values of t.

t (s)	0	0.5	1	1.5	2	2.5	3
h (m)							

[2]

(b) On the axes provided below, draw the graph of h against t.



[3]

(c) Using your graph or otherwise, find the value of t when the stone is 10 m above the ground.

Answer (*c*) ..... [1]

12 **(a)** In January 1997 the number of pupils at a school was 450.
Given that the number of pupils at the school in January 1998 was 645, find the percentage increase in the number of pupils correct to 3 significant figures.

Answer (*a*) ..... % [2]

(b) **(i)** Kagiso invested P5000 at 9% simple interest for 3 years. How much money will she have in her account at the end of 3 years?

Answer (*b*)(i) P ..... [2]

(ii) Setshogo invested the same amount of P5000 at 9% compound interest for 3 years. How much money will he have in his account at the end of 3 years?

Answer (*b*)(ii) P ..... [2]

(iii) Who will have more money in the account at the end of 3 years and by how much?

Answer (*b*)(iii) ..... [1]

13 **(a)** Construct triangle ABC where $AB = 6$ cm, $BC = 4$ cm and $AC = 8$ cm.
The point A has been marked for you.

A
•

[2]

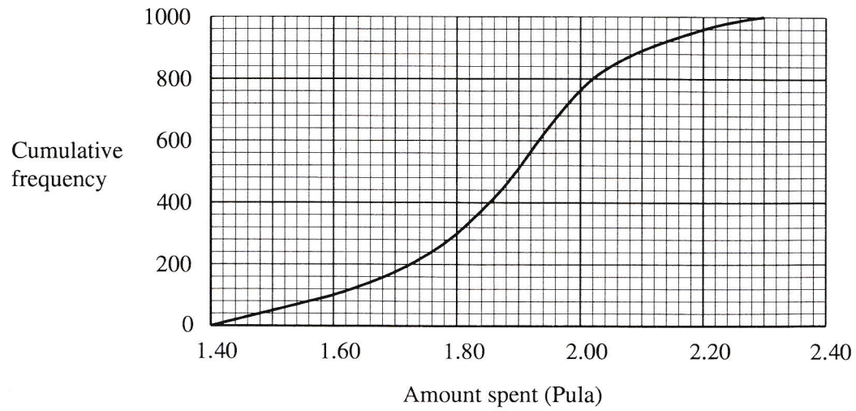
(b) On your diagram above, construct the locus of the points which are equidistant from A and C.
Label it l. [2]

(c) On your diagram above, construct the locus of all points that are 4 cm from A. [1]

(d) What is the geometric relation between the locus in part **(b)** and the locus in part **(c)**?

Answer (*d*) ..... [1]

14 One thousand people employed by a company were asked to state the amount of money they spend on food daily. The cumulative frequency curve shows the results.



(a) Use the curve to find an estimate for

(i) the median amount of money spent,

Answer (*a*)(i) P ..... [1]

(ii) the interquartile range.

Answer (*a*)(ii) P ..... [3]

(b) The company announced that it would bear the expenses of those who spent P2.00 or less. How many employees will benefit from this?

Answer (*b*) ..... [1]

(c) What is the probability that an employee picked at random will spend P2.00 or less per day?

Answer (*c*) ..... [1]