THE ENGLISH SCHOOL NICOSIA
YEAR 3 MID-PROGRAMME ENTRY EXAMINATIONS 2023

MATHEMATICS 3rd of June 2023

Time allowed: 2 hours

Instructions to candidates
In the boxes below write your name and surname.
Answer all the questions in the spaces provided.
Without sufficient working, correct answers may be awarded no marks.

Information to candidates
This paper has 22 questions.
There are 20 pages in this question paper including the cover page.
Full marks may be obtained for answers to all questions.
The total marks for this paper are 120.
The marks for parts of a question are shown in round brackets, e.g. **(2)**
Total marks for each question are given at the end of that question, e.g. **Total: 4 marks**

Calculators are allowed.

Advice for candidates
Write your answers neatly and in good English.
Work steadily through the paper.
Do not spend too long on one question.
Show all stages in any calculations.

Materials required for the paper
Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Surname:	Name:
	Total Marks:

1. An antique bowl increased in value by 25% in 2015 and by 22% in 2016. Its value then fell by 30% in 2017. What was the overall percentage change in its value over this 3 year period?

..... **(3)**

2. a) A line has equation $y = 2x - 3$.

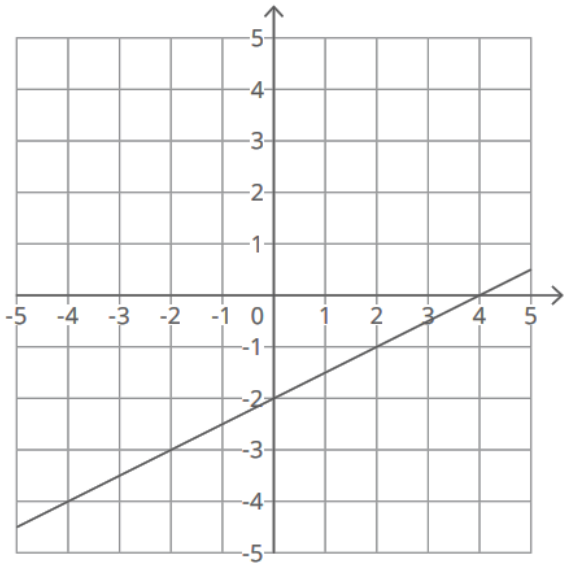
i) What is the y-intercept of the line?

..... **(1)**

ii) What is the gradient of the line?

..... **(1)**

b) Find the equation of the straight line below.



..... **(2)**

Total: 4 marks

3. Two values, a and b, are directly proportional. When a = 3, b = 5.

a) Find the value of b when a = 6.

…… **(1)**

b) Find the value of a when b = 500.

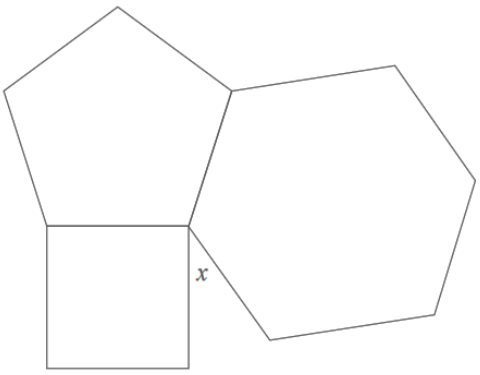
…… **(1)**

c) Write an equation for a in terms of b.

…… **(3)**

Total: 5 marks

4. Given the shapes below are regular polygons, find the size of the angle marked x.



…… **(4)**

5. Solve the equations below:

a) $2x^2 - 7 = 11$

…… **(4)**

b) $\frac{1}{3}x + 12 = 24$

…… **(2)**

c) $\frac{3}{4}(x + 2) = 2(x - 3)$

…… **(4)**

d) $20 - 3(2x - 7) = 5(x + 5) - 6$

…… **(4)**

Total: 14 marks

6. In the space below, construct an isosceles triangle with sides 5cm, 3cm and 3cm. You must clearly show all your construction arcs.

(2)

7. A water bottle in the shape of a cylinder holds 1 litre of water when full. Its height is 15 cm.

Work out the radius of the water bottle. Give your answer correct to 1 d.p.

..... cm

(3)

8. a) Expand each of the following, simplifying where possible.

i) $(2x + 1)(x - 5) =$

…… **(2)**

ii) $(7w - 1)^2 =$

…… **(2)**

iii) $(3k - 1)(k + 5)(k - 2) =$

…… **(3)**

b) Make p the subject of the formula

$r = 8p^2 + 20$

…… **(3)**

Total: 10 marks

9. The table gives the populations of each of five countries in 2014:

COUNTRY	POPULATION
China	1.4×10^9
India	1.3×10^9
USA	3.2×10^8
Ethiopia	9.7×10^7
Mexico	1.2×10^8

You must show all your workings.

a) Which country had the **least population** in 2014?

…… **(1)**

b) Calculate the **total population** of these five countries in 2014.
Give your answer in standard form.

…… **(2)**

c) In 2014, there were more people living in China than were living in the USA.
How many **more**? Give your answer in standard form.

…… **(2)**

d) In 2014, the population of India was k **times** the population of Mexico.
Work out the value of k. Give your answer to the nearest whole number.

…… **(2)**

Total: 7 marks

10. Calculate the **upper bound** of M, showing all steps.

$$M = \frac{4K}{A - G}$$

$K = 100,$ *to the nearest ten*

$A = 64,$ *to the nearest unit*

$G = 0.8,$ *to the nearest 1 decimal place*

Give your <u>answer to the nearest unit.</u>

…… **(4)**

11. A gardener plants 80 seeds and 64 of them produce healthy plants.

a) What is his estimated probability that a seed produces a healthy plant? Give your answer as a fraction in its simplest form.

…… **(2)**

b) If 12500 seeds were planted, how many healthy plants can the gardener expect to obtain?

…… **(2)**

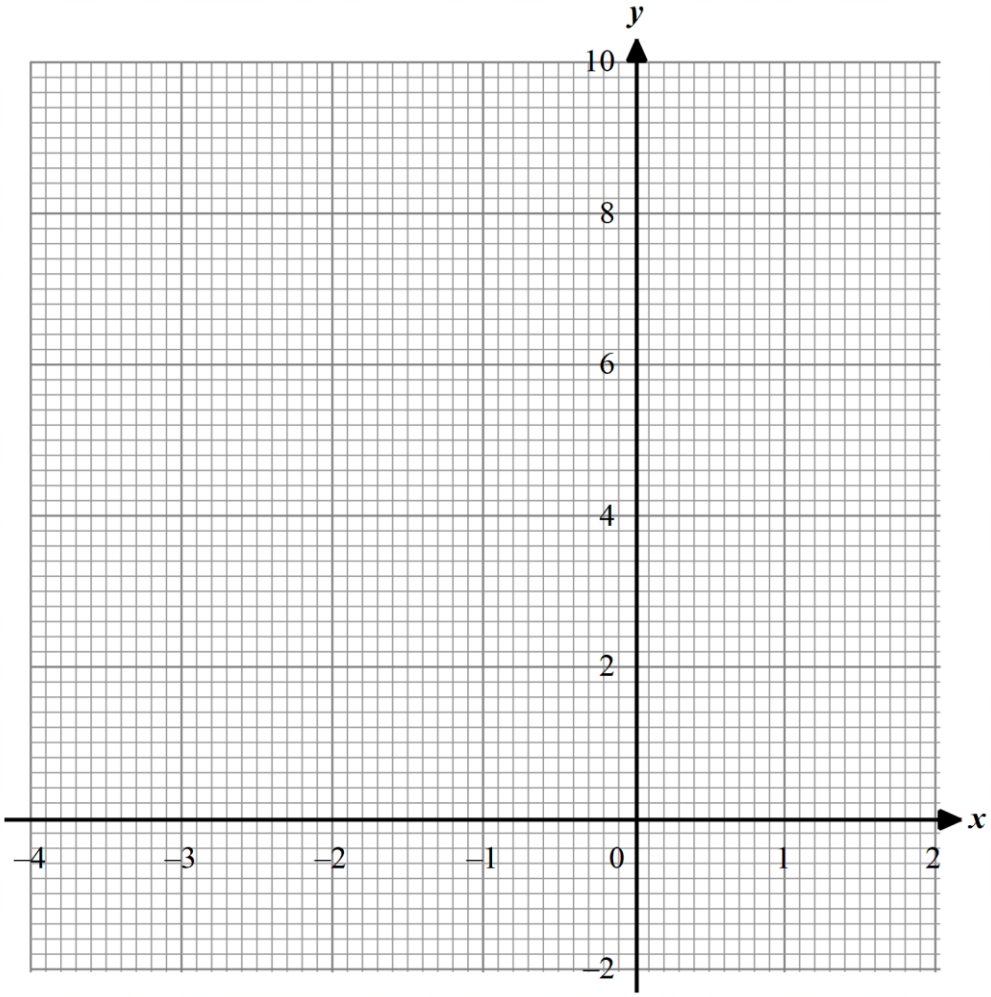
Total: 4 marks

12. a) Complete the table of values for $y = x^2 + 2x$

x	-4	-3	-2	-1	0	1	2
y			0				

(1)

b) On the grid, draw the graph of $y = x^2 + 2x$



(1)

c) What is the smallest possible value of y in the equation $y = x^2 + 2x$?

y= …… **(1)**

d) Use your graph to find the solutions of the equation $x^2 + 2x = 5$. Give your answers correct to 1 decimal place.

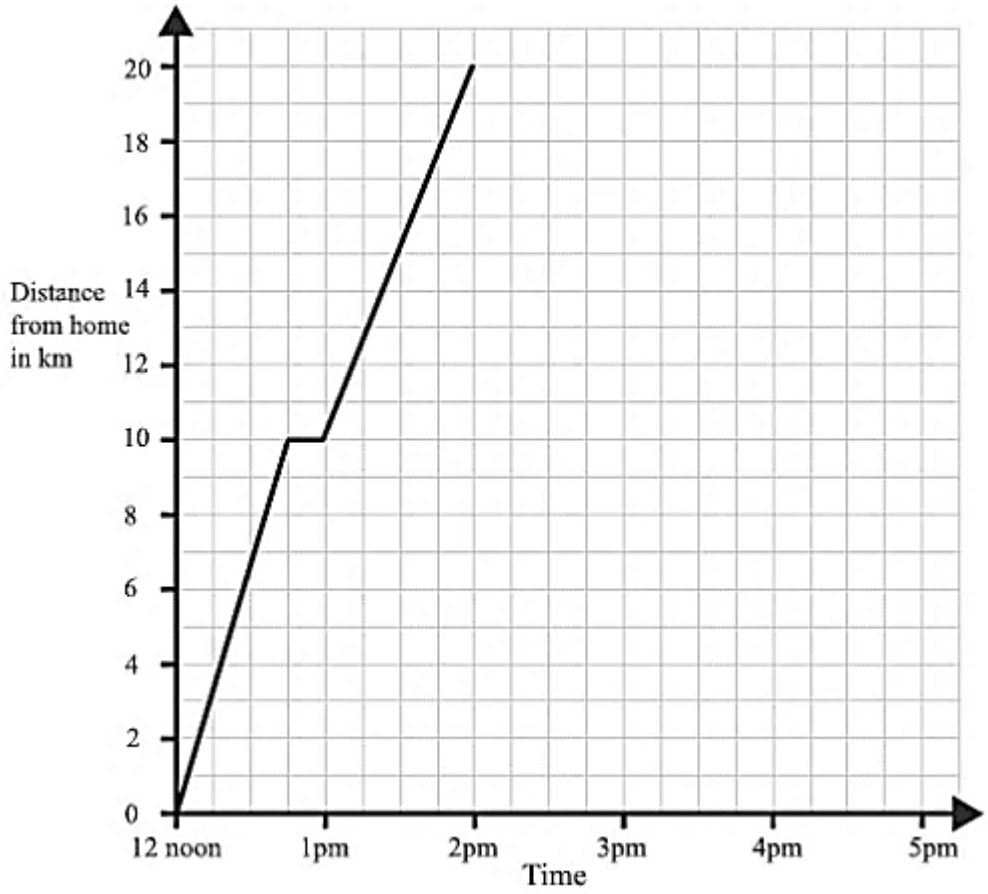
x_1= ……

x_2= ……

(3)

Total: 6 marks

13. Andrew left home at 12 noon to go for a cycle ride.
The travel graph represents part of his journey.



Andrew stopped for a rest.

a) For how many minutes did he rest?

..... minutes **(1)**

b) Find his distance from home at 1:30pm.

..... km **(1)**

c) Work out Andrew's average speed at the beginning of his journey before he stopped for a rest. Give your answer in km/h, correct to 1 decimal place.

..... km/h **(2)**

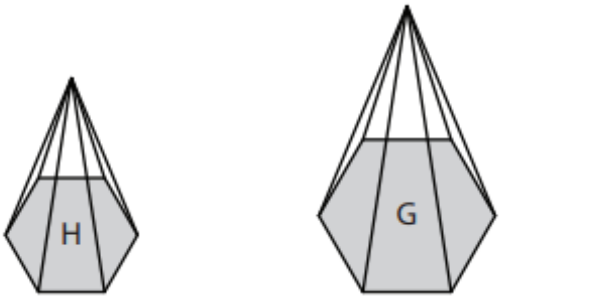
Andrew stopped for another rest at 2pm.
He rested for one hour.
Then he cycled home at a steady speed of 16km/h.

d) Complete the travel graph to show Andrew's time when resting for the second time and his journey home. What time did he arrive home?

..... **(3)**

Total: 6 marks

14. Solid G is an enlargement of solid H.



a) What is the scale factor of the enlargement?

Scale factor =..... **(1)**

b) State the **area** scale factor of the enlargement.

Area scale factor=..... **(1)**

Solid H has a total surface area of 50 cm^2.

c) Work out the total surface area of solid G.

.....cm^2

(2)

Solid G has a volume of 256 cm^3.

d) Work out the volume of solid H.

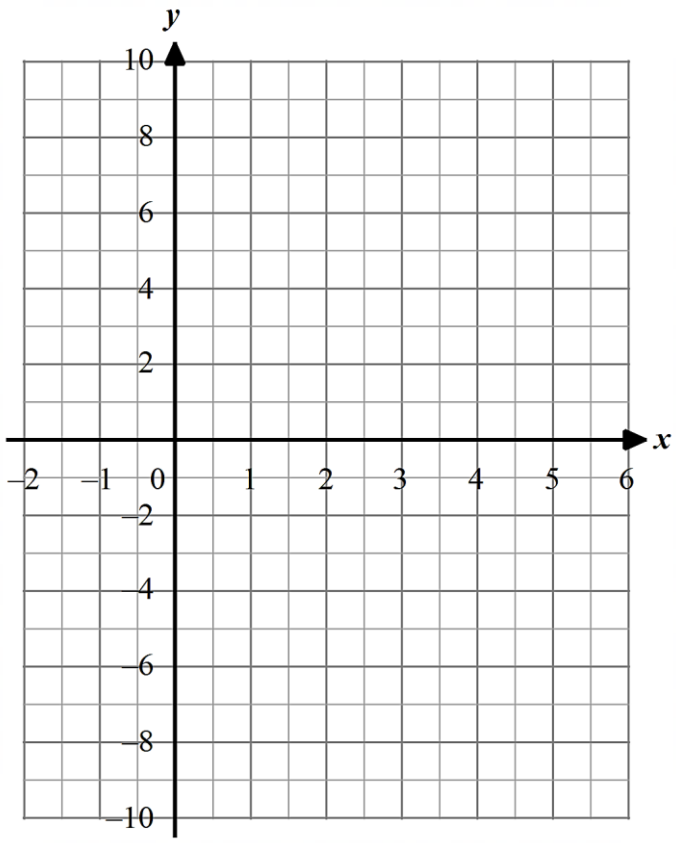
.....cm^3

(2)

Total: 6 marks

15. A straight line passes through the points (1, -4) and (3, 4).

a) By plotting both points on the coordinate grid, draw the graph of the straight line.



(1)

b) Find the equation of the straight line. You must show all steps in your working.

..... **(3)**

c) State the coordinates of the point where the straight line cuts the x-axis.

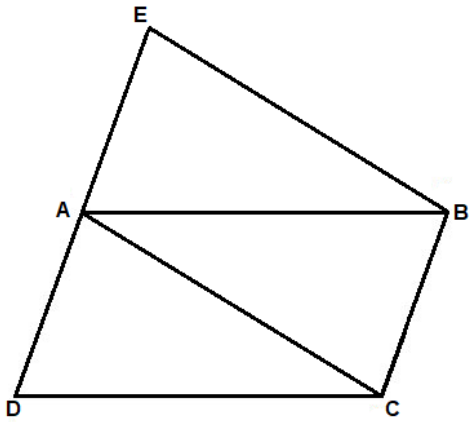
..... **(2)**

d) Write down the equation of a line with the same gradient passing through (0, -2).

..... **(2)**

Total: 9 marks

16. Given that ABCD is a parallelogram, and that A is the midpoint of DE, prove that ΔAEB *and* ΔADC are congruent. You must give reasons for each stage of your proof.

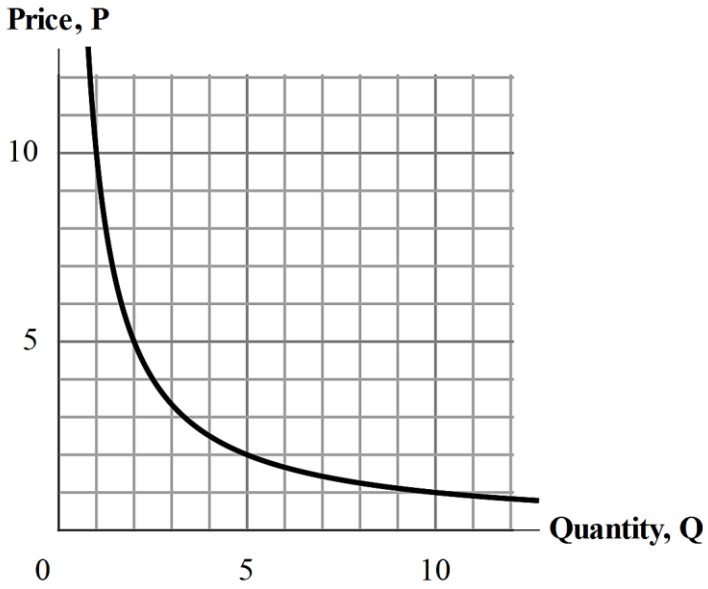


(4)

17. The interior angle of a regular polygon is 108° greater than its exterior angle. How many sides does this polygon have?

…… **(3)**

18. The graph shows the relationship between quantity Q and price P.



a) Use the graph to find P when Q = 5.

…… **(1)**

b) P is inversely proportional to Q. Work out a formula connecting Q and P.

…… **(3)**

Total: 4 marks

19. Factorise each of the following completely:

a) $4a^2 + 16a$

..... **(2)**

b) $x^2 - 4x - 21$

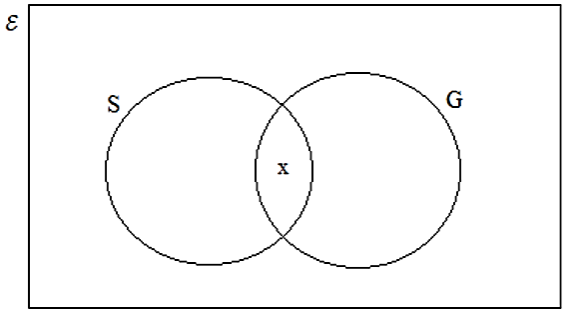
..... **(2)**

c) $2x^2 - 50$

..... **(2)**

Total: 6 marks

20. 70 pupils in a sports centre are surveyed. The pupils can only use the swimming pool and the gym. 34 pupils use the swimming pool. 40 pupils use the gym. 15 pupils use neither the swimming pool nor the gym.



a) Write down an expression, in terms of x, for the number of pupils who use the swimming pool but not the gym.

..... **(1)**

b) By forming an equation in terms of x, work out how many pupils use both the swimming pool and the gym.

..... **(3)**

Total: 4 marks

21. Two right-angled triangles KLM and MNK are joined together to make the triangle LMN.

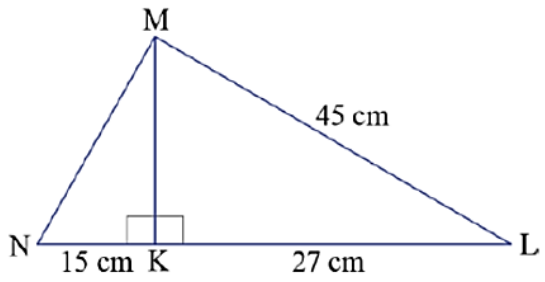


diagram is not accurately drawn

a) Calculate the area of triangle LMN.

…… **(4)**

b) Calculate the length of MN.

…… **(2)**

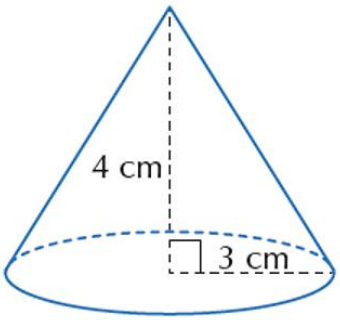
c) Calculate the angle MLK, giving your answer correct to 1 d.p.

…… **(2)**

Total: 8 marks

22. Find the total surface area of the solid cone.

Give your answer in terms of π.



…… **(4)**

THE END

EXTRA PAPER