UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

7990360374

MATHEMATICS **0580/21, 0581/21**

Paper 2 (Extended) **October/November 2008**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Mathematical tables (optional)
Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN THE BARCODE

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

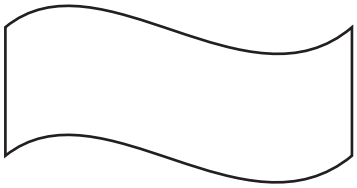
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

For Examiner's Use

This document consists of **12** printed pages.

UNIVERSITY of CAMBRIDGE International Examinations

1



For this diagram, write down

(a) the order of rotational symmetry,

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

(b) the number of lines of symmetry.

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

2

$$\begin{pmatrix} 1 & -2 \\ 0 & 1 \\ 5 & 6 \end{pmatrix}\begin{pmatrix} 3 & 4 & 8 & 7 \\ 1 & 1 & 3 & 3 \end{pmatrix}$$

The answer to this matrix multiplication is of order $a \times b$.

Find the values of a and b.

Answer $a =$ ..... $b =$ ..... [2]

---

3 Work out the value of $1 + \dfrac{2}{3 + \dfrac{4}{5+6}}$.

Answer ..... [2]

For Examiner's Use

4 A light on a computer comes on for 26 700 microseconds.

One microsecond is 10^{-6} seconds.

Work out the length of time, in seconds, that the light is on

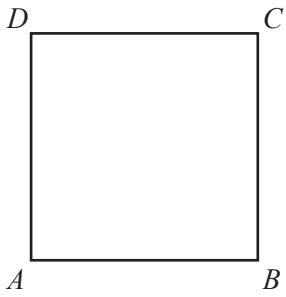
(a) in standard form,

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

(b) as a decimal.

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

5



ABCD is a square.

It is rotated through 90° clockwise about *B*.

Draw accurately the locus of the point *D*. [2]

---

6 $\sin x° = 0.86603$ and $0 \leqslant x \leqslant 180$.

Find the two values of x.

Answer $x =$ ..... or $x =$ ..... [2]

---

7 A rectangle has sides of length 6.1 cm and 8.1 cm correct to 1 decimal place.

Calculate the upper bound for the area of the rectangle as accurately as possible.

Answer ..... cm^2 [2]

---

8 **(a)** Factorise $ax^2 + bx^2$.

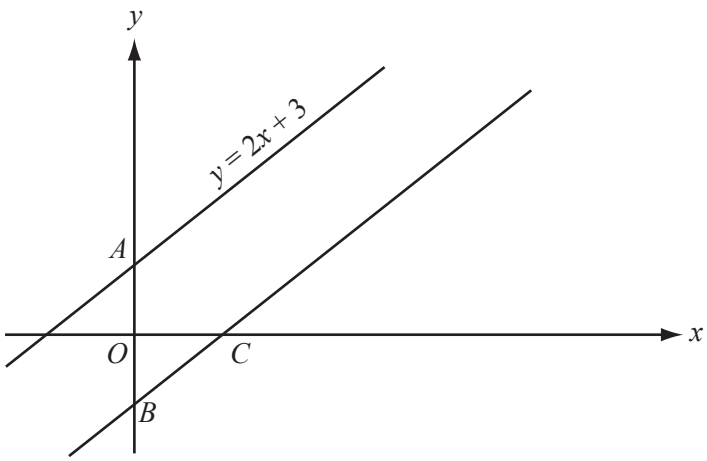
Answer(a) ..... [1]

(b) Make x the subject of the formula

$$ax^2 + bx^2 - d^2 = p^2.$$

Answer(b) $x =$ ..... [2]

9



NOT TO SCALE

The distance AB is 7 units.

(a) Write down the equation of the line through B which is parallel to $y = 2x + 3$.

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

(b) Find the co-ordinates of the point C where this line crosses the x axis.

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

---

10 Solve these simultaneous equations.

$$x + 2y - 18 = 0$$
$$3x - 4y - 4 = 0$$

Answer x = ...

y = ... [3]

For Examiner's Use

For Examiner's Use

11 Write as a single fraction in its simplest form

$$\frac{4}{2x+3} - \frac{2}{x-3}.$$

Answer ..... [3]

12 Solve the inequality $\frac{2-5x}{7} < \frac{2}{5}$.

Answer ..... [3]

13 The quantity p varies inversely as the square of $(q + 2)$.

$p = 5$ when $q = 3$.

Find p when $q = 8$.

Answer $p =$ ..... [3]

14 A spacecraft made 58 376 orbits of the Earth and travelled a distance of 2.656×10^9 kilometres.

(a) Calculate the distance travelled in 1 orbit correct to the nearest kilometre.

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

(b) The orbit of the spacecraft is a circle.

Calculate the radius of the orbit.

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

---

15 $f(x) = \cos x°$, $g(x) = 2x + 4$.

Find

(a) f(60),

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

(b) fg(88),

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

(c) $g^{-1}(f(x))$.

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

---

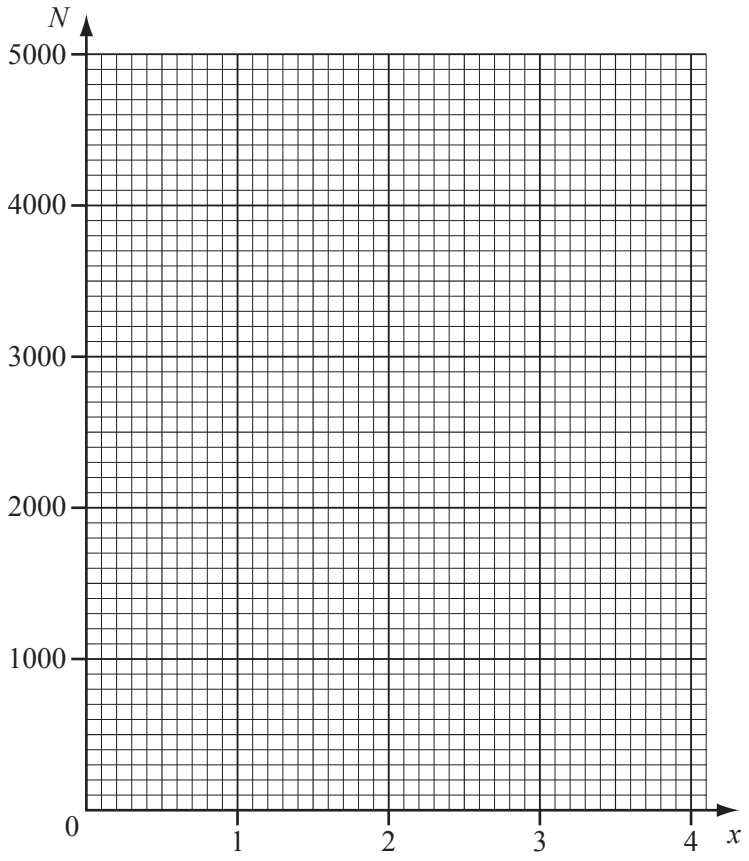
16 In an experiment, the number of bacteria, N, after x days, is $N = 1000 \times 1.4^x$.

(a) Complete the table.

x	0	1	2	3	4
N					

[2]

(b) Draw a graph to show this information.

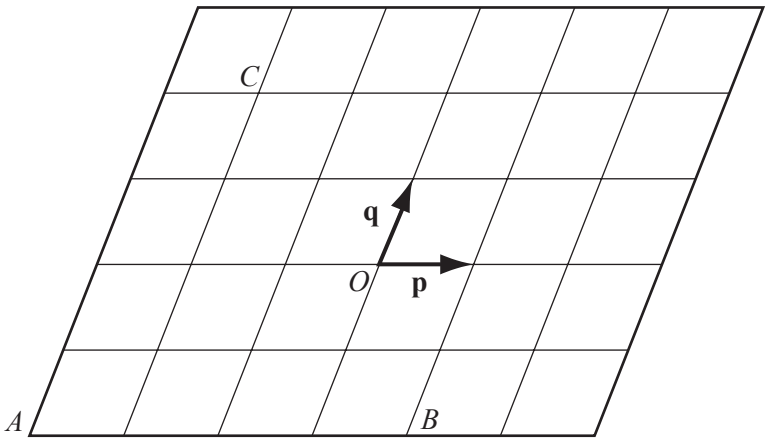


[2]

(c) How many days does it take for the number of bacteria to reach 3000?
Give your answer correct to 1 decimal place.

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

17



O is the origin. Vectors **p** and **q** are shown in the diagram.

(a) Write down, in terms of **p** and **q**, in their simplest form

(i) the position vector of the point A,

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

(ii) $\overrightarrow{BC}$,

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

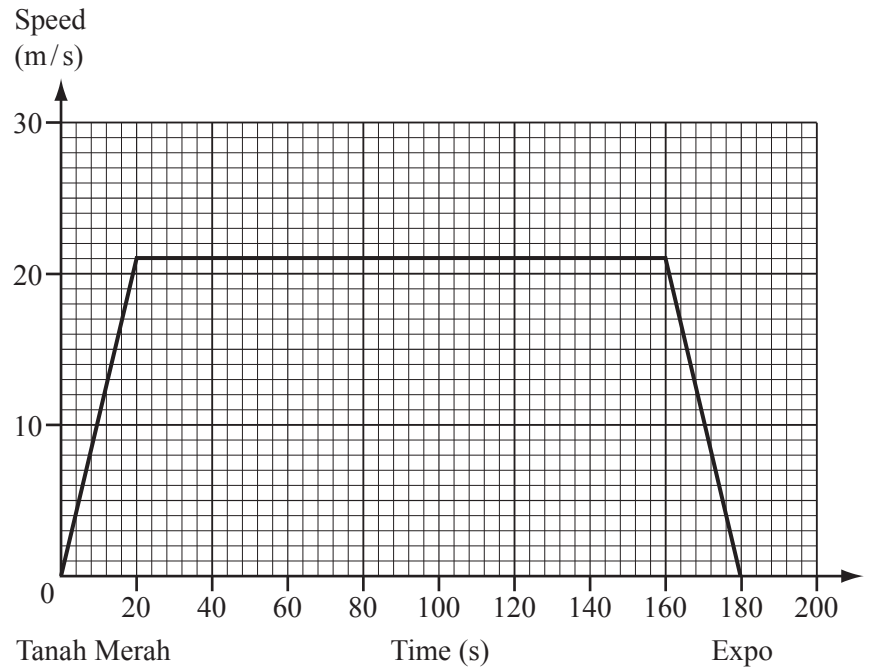
(iii) $\overrightarrow{BC} - \overrightarrow{AC}$.

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

(b) If $|\mathbf{p}| = 2$, write down the value of $|\overrightarrow{AB}|$.

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

18



The graph shows the train journey between Tanah Merah and Expo in Singapore.

Work out

(a) the acceleration of the train when it leaves Tanah Merah,

Answer(a) ..... m/s^2 [2]

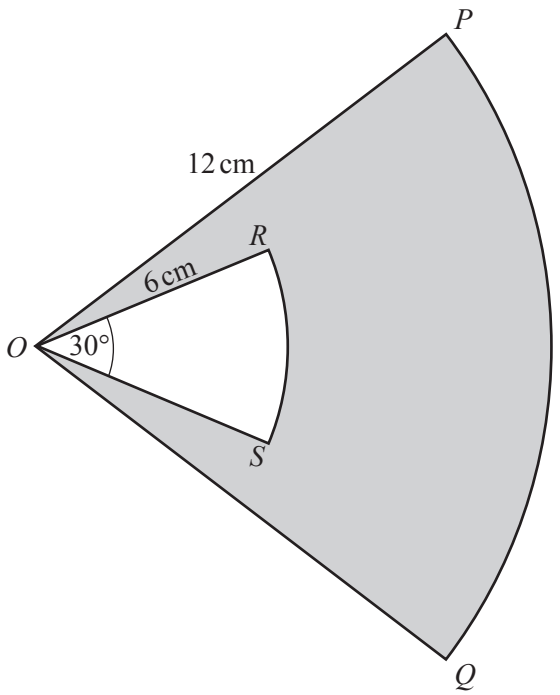
(b) the distance between Tanah Merah and Expo,

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

(c) the average speed of the train for the journey.

Answer(c) ..... m/s [1]

19



NOT TO SCALE

For Examiner's Use

OPQ is a sector of a circle, radius 12 cm, centre *O*. Angle *POQ* = 50°.

ORS is a sector of a circle, radius 6 cm, also centre *O*. Angle *ROS* = 30°.

(a) Calculate the shaded area.

Answer(a) ..... cm^2 [3]

(b) Calculate the perimeter of the shaded area, *PORSOQP*.

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

Question 20 is on page 12

20 A new school has x day students and y boarding students.

The fees for a day student are \$600 a term.
The fees for a boarding student are \$1200 a term.
The school needs at least \$720 000 a term.

(a) Show that this information can be written as $x + 2y \geqslant 1200$.

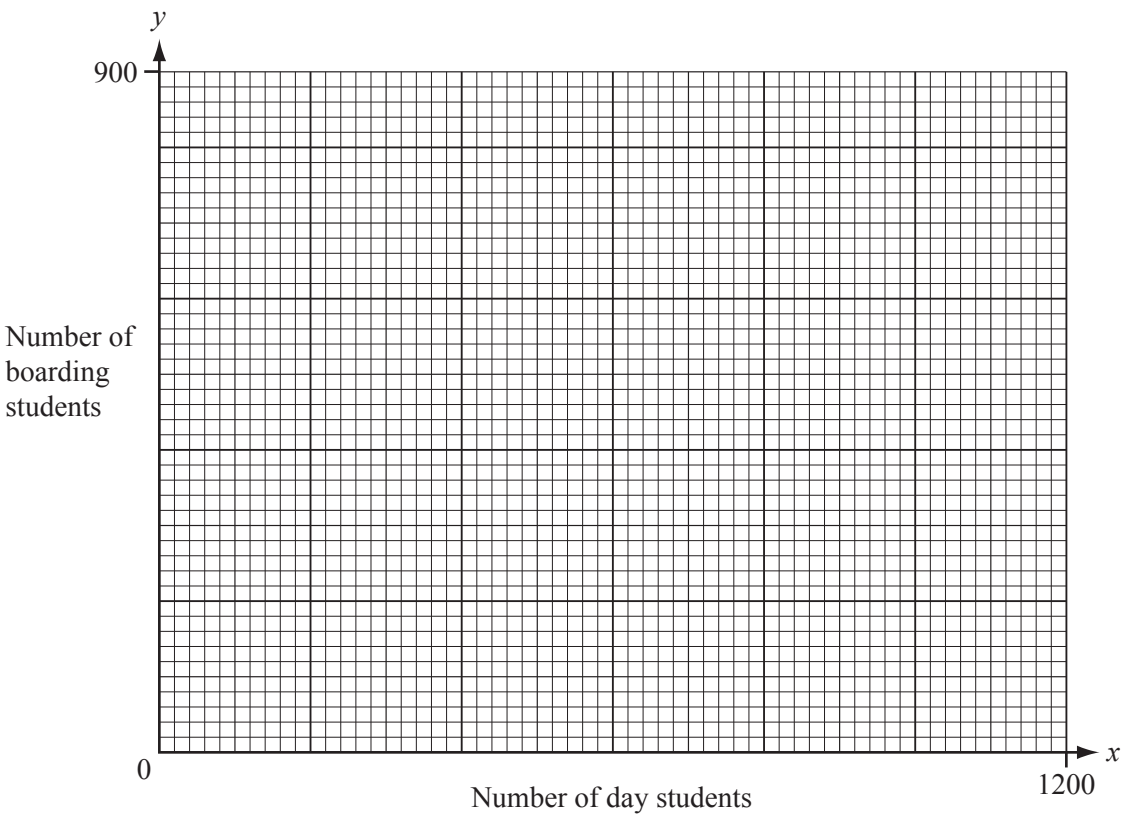
Answer (a)

[1]

(b) The school has a maximum of 900 students.
Write down an inequality in x and y to show this information.

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

(c) Draw two lines on the grid below and write the letter **R** in the region which represents these two inequalities.



[4]

(d) What is the least number of **boarding** students at the school?

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

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

MATHEMATICS **0580/22, 0581/22**

Paper 2 (Extended) **October/November 2008**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Mathematical tables (optional)
Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN THE BARCODE.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

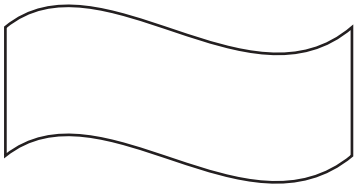
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

For Examiner's Use

This document consists of **12** printed pages.

For Examiner's Use

1



For this diagram, write down

(a) the order of rotational symmetry,

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

(b) the number of lines of symmetry.

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

2

$$\begin{pmatrix} -2 & 1 \\ 1 & 0 \\ 8 & 9 \\ 3 & 4 \end{pmatrix} \begin{pmatrix} 1 & 0 & 3 \\ 3 & 4 & 2 \end{pmatrix}$$

The answer to this matrix multiplication is of order $a \times b$.

Find the values of a and b.

Answer $a =$ ..... $b =$ ..... [2]

---

3 Work out the value of $1 + \dfrac{2}{3 + \dfrac{4}{5+6}}$.

Answer ..... [2]

---

4 A light on a computer comes on for 38 500 microseconds.

One microsecond is 10^{-6} seconds.

Work out the length of time, in seconds, that the light is on

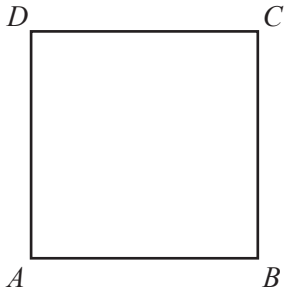
(a) in standard form,

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

(b) as a decimal.

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

5



ABCD is a square.

It is rotated through 90° clockwise about *B*.

Draw accurately the locus of the point *D*. [2]

---

6 $\sin x° = 0.707107$ and $0 \leqslant x \leqslant 180$.

Find the two values of x.

Answer $x =$ ..... or $x =$ ..... [2]

---

7 A rectangle has sides of length 2.4 cm and 6.4 cm correct to 1 decimal place.

Calculate the upper bound for the area of the rectangle as accurately as possible.

Answer ..... cm^2 [2]

---

8 **(a)** Factorise $ax^2 + bx^2$.

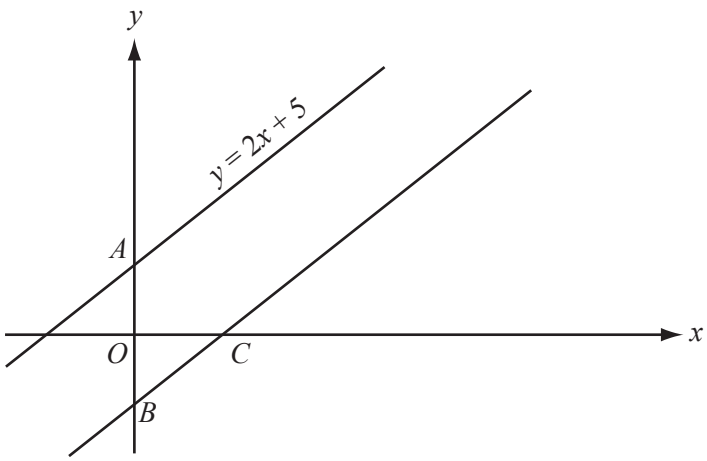
Answer(a) ..... [1]

(b) Make x the subject of the formula

$$ax^2 + bx^2 - d^2 = p^2.$$

Answer(b) $x =$ ..... [2]

9



NOT TO SCALE

The distance AB is 11 units.

(a) Write down the equation of the line through B which is parallel to $y = 2x + 5$.

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

(b) Find the co-ordinates of the point C where this line crosses the x axis.

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

---

10 Solve these simultaneous equations.

$$x + 3y - 11 = 0$$
$$3x - 4y - 7 = 0$$

Answer x = ...

y = ... [3]

For Examiner's Use

11 Write as a single fraction in its simplest form

$$\frac{5}{5x+1} - \frac{2}{2x-3}.$$

Answer ..... [3]

12 Solve the inequality $\frac{2-5x}{7} < \frac{2}{5}$.

Answer ..... [3]

13 The quantity p varies inversely as the square of $(q + 2)$.

$p = 4$ when $q = 2$.

Find p when $q = 8$.

Answer $p =$ ..... [3]

14 A spacecraft made 58 376 orbits of the Earth and travelled a distance of 2.656×10^9 kilometres.

(a) Calculate the distance travelled in 1 orbit correct to the nearest kilometre.

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

(b) The orbit of the spacecraft is a circle.

Calculate the radius of the orbit.

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

---

15 $f(x) = \tan x°$, $g(x) = 2x + 6$.

Find

(a) f(45),

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

(b) fg(87),

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

(c) $g^{-1}(f(x))$.

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

---

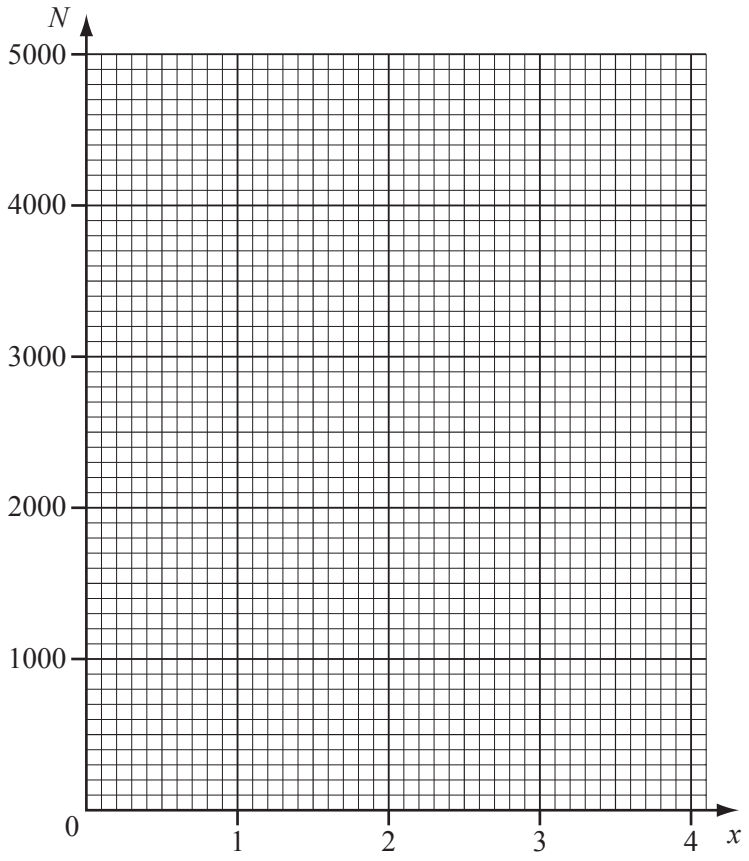
16 In an experiment, the number of bacteria, N, after x days, is $N = 1000 \times 1.4^x$.

(a) Complete the table.

x	0	1	2	3	4
N					

[2]

(b) Draw a graph to show this information.

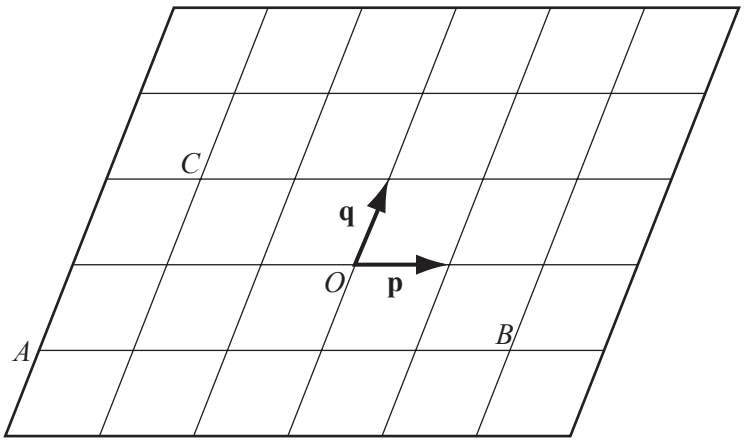


[2]

(c) How many days does it take for the number of bacteria to reach 3000?
Give your answer correct to 1 decimal place.

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

17



O is the origin. Vectors **p** and **q** are shown in the diagram.

(a) Write down, in terms of **p** and **q**, in their simplest form

(i) the position vector of the point A,

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

(ii) $\overrightarrow{BC}$,

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

(iii) $\overrightarrow{BC} - \overrightarrow{AC}$.

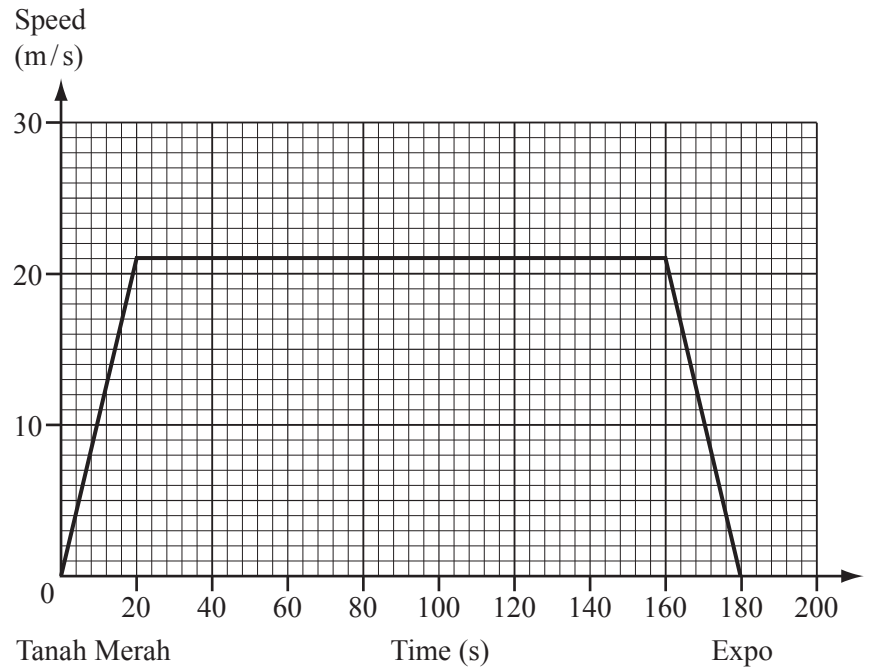
Answer(a)(iii) ..... [2]

(b) If $|\mathbf{p}| = 2$, write down the value of $|\overrightarrow{AB}|$.

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

[Turn over

18



The graph shows the train journey between Tanah Merah and Expo in Singapore.

Work out

(a) the acceleration of the train when it leaves Tanah Merah,

Answer(a) ..... m/s^2 [2]

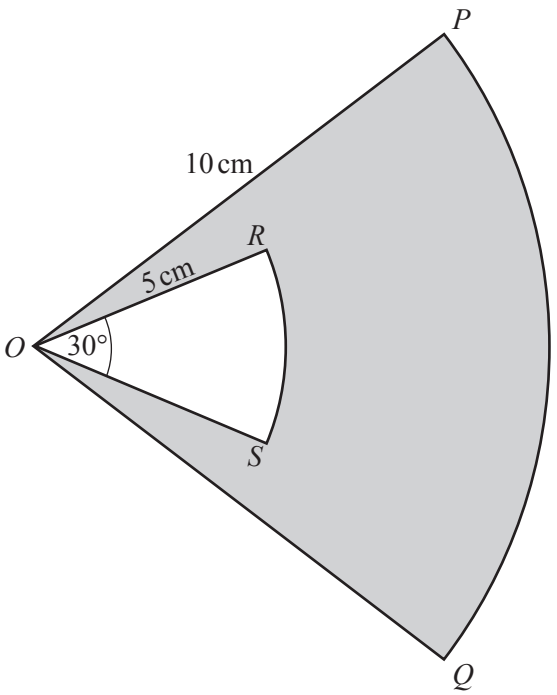
(b) the distance between Tanah Merah and Expo,

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

(c) the average speed of the train for the journey.

Answer(c) ..... m/s [1]

19



NOT TO SCALE

For Examiner's Use

OPQ is a sector of a circle, radius 10 cm, centre *O*. Angle *POQ* = 50°.

ORS is a sector of a circle, radius 5 cm, also centre *O*. Angle *ROS* = 30°.

(a) Calculate the shaded area.

Answer(a) ..... cm^2 [3]

(b) Calculate the perimeter of the shaded area, *PORSOQP*.

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

Question 20 is on page 12

For Examiner's Use

20 A new school has x day students and y boarding students.

The fees for a day student are \$600 a term.
The fees for a boarding student are \$1200 a term.
The school needs at least \$720 000 a term.

(a) Show that this information can be written as $x + 2y \geqslant 1200$.

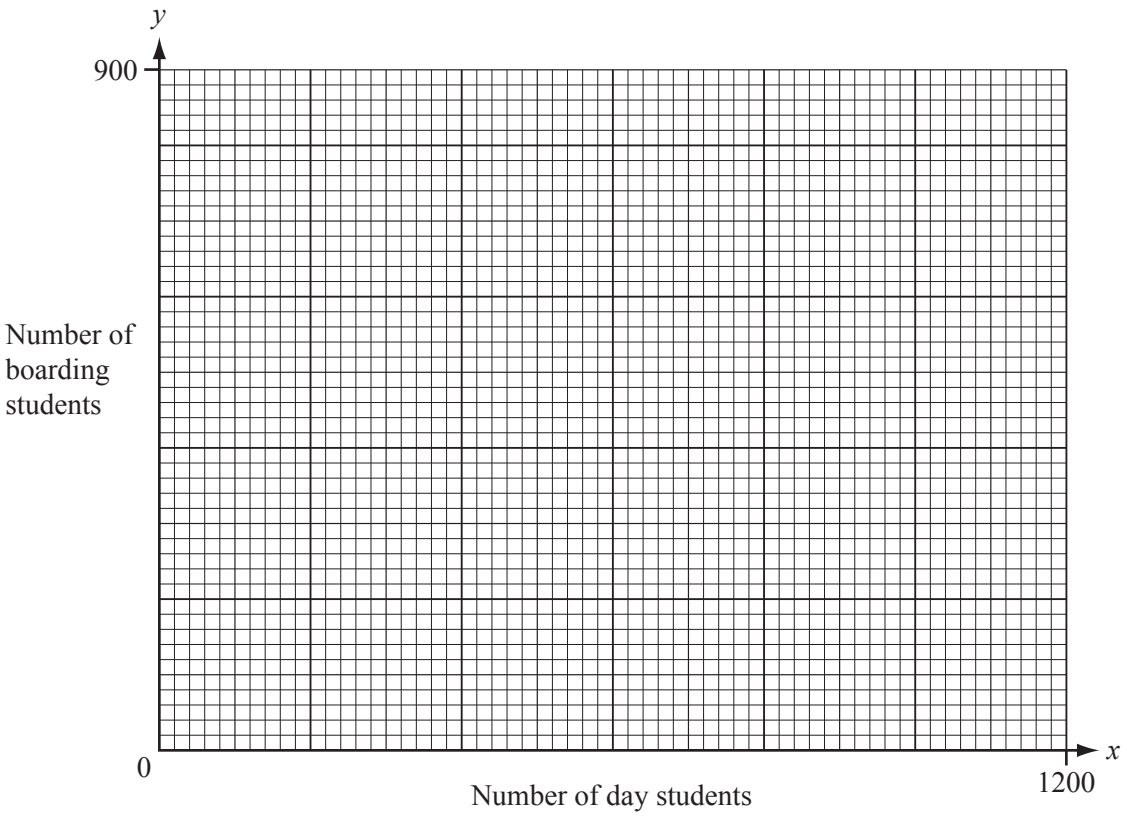
Answer (a)

[1]

(b) The school has a maximum of 900 students.
Write down an inequality in x and y to show this information.

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

(c) Draw two lines on the grid below and write the letter **R** in the region which represents these two inequalities.



[4]

(d) What is the least number of **boarding** students at the school?

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