INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

MATHEMATICAL STUDIES
STANDARD LEVEL
PAPER 1

Thursday 2 November 2000 (afternoon)

1 hour

Name

Number

INSTRUCTIONS TO CANDIDATES

- Write your name and candidate number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all the questions in the spaces provided.
- Unless otherwise stated in the question, all numerical answers must be given exactly or to three significant figures, as appropriate.
- Write the make and model of your calculator in the box below *e.g.* Casio *fx-7400G*, Sharp EL-9400, Texas Instruments TI-80.

Calculator

Make	Model

EXAMINER	TEAM LEADER	IBCA
TOTAL /60	TOTAL /60	TOTAL /60

Maximum marks will be given for correct answers. Where an answer is wrong, some marks may be given for a correct method provided this is shown by written working. Working may be continued below the box, if necessary. (If graphs from a graphic display calculator are being used to find solutions, you should sketch these graphs as part of your answer.)

1. Let $A = 4.5 \times 10^{-3}$ and $B = 6.2 \times 10^{-4}$. Find

(a) AB;

(b) $2(A + B)$.

Give your answers in the form $a \times 10^k$, where $1 \leq a < 10$ and $k \in \mathbb{Z}$.

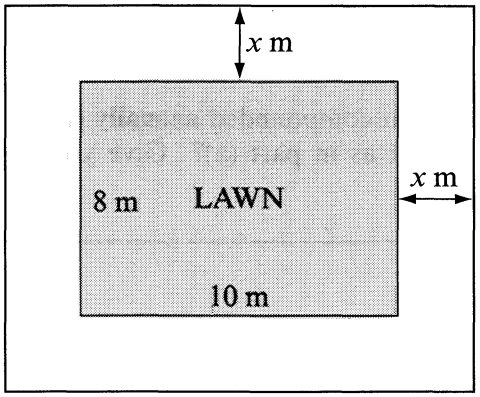
Working:

Answers:

(a) _____

(b) _____

2. The diagram below shows a path x m wide around a rectangular lawn which measures 10 m by 8 m .



(a) Write down an expression in terms of x for the area of the path.

(b) What is the width of the path when its area is 208 m^2 ?

Working:

Answers:

(a) _____

(b) _____

3. John invests X USD in a bank. The bank's stated rate of interest is 6% per annum, compounded **monthly**.

(a) Write down, in terms of X, an expression for the value of John's investment after one year.

(b) What rate of interest, when compounded **annually** (instead of monthly) will give the same value of John's investment as in part (a)? Give your answer correct to three significant figures.

Working:

Answers:

(a) _____

(b) _____

4. Nene and Deka both play netball. The probability that Nene will score a goal on her first attempt is 0.75 . The probability that Deka will score a goal on her first attempt is 0.82 .

Calculate the probability that

(a) Nene and Deka will both score a goal on their first attempts ;

(b) neither Nene nor Deka will score a goal on their first attempts.

Working:

Answers:

(a) _____

(b) _____

5. David looked at a passage from a book. He recorded the number of words in each sentence as shown in the following frequency table.

Class interval (number of words)	Frequency f
1 – 5	16
6 – 10	28
11 – 15	26
16 – 20	14
21 – 25	10
26 – 30	3
31 – 35	1
36 – 40	0
41 – 45	2

(a) Find the class interval in which the median lies.

(b) Estimate, **correct to the nearest whole number**, the mean number of words in a sentence.

Working:

Answers:

(a) _____

(b) _____

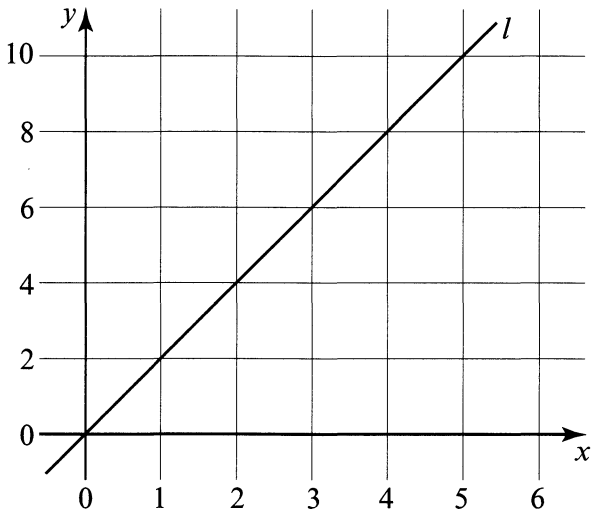
6. Mr Jones decides to increase the amount of money he spends on food by d GBP every year. In the first year he spends a GBP. In the 8th year he spends twice as much as in the 4th year. In the 20th year he spends 4000 GBP.

Find the value of d.

Working:

Answer:

7. The following diagram shows a straight line l.



(a) Find the equation of the line l.

(b) The line n is parallel to l and passes through the point $(0, 8)$. Write down the equation of the line n.

(c) The line n crosses the horizontal axis at the point P. Find the coordinates of P.

Working:

Answers:

(a) _____

(b) _____

(c) _____

8. In the diagram below $\overrightarrow{OA} = 3\boldsymbol{p}$, $\overrightarrow{OB} = 3\boldsymbol{q}$ and $\overrightarrow{OC} = 4\overrightarrow{OB}$.

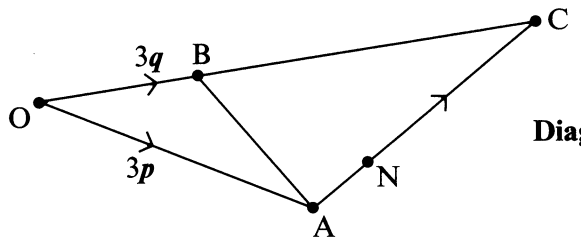


Diagram not to scale

(a) Show that $\overrightarrow{AC} = 12\boldsymbol{q} - 3\boldsymbol{p}$.

(b) Given that $\overrightarrow{AN} = \frac{1}{3}\overrightarrow{AC}$, express $\overrightarrow{ON}$ in terms of $\boldsymbol{p}$ and $\boldsymbol{q}$.

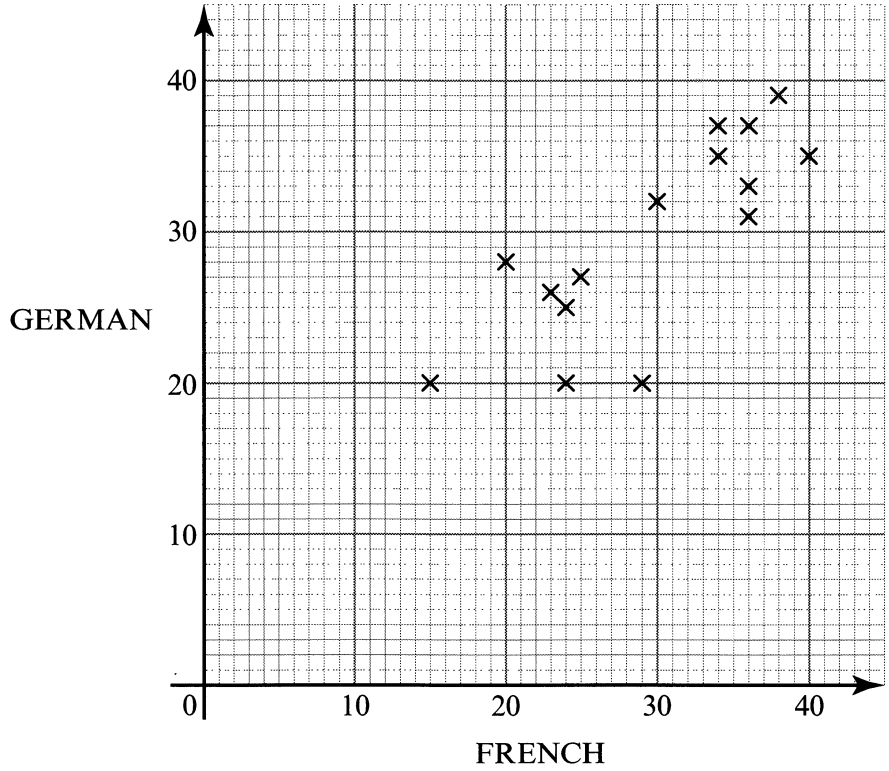
Working:

Answers:

(a) _____

(b) _____

9. The diagram below shows the marks scored by pupils in a French test and a German test. The mean score on the French test is 29 marks and on the German test is 31 marks.



(a) Describe the relationship between the marks scored in the two tests.

(b) On the graph mark the point M which represents the mean of the distribution.

(c) Draw a suitable line of best fit.

(d) Idris scored 32 marks on the French test. Use your graph to estimate the mark Idris scored on the German test.

Working:

Answers:

(a) _____

(d) _____

10. The diagram below shows an equilateral triangle ABC, with each side 3 cm long. The side [BC] is extended to D so that CD = 4 cm.

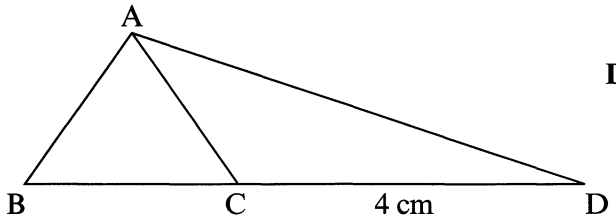


Diagram not to scale

Calculate, **correct to two decimal places**, the length of [AD].

Working:

Answer:

11. The propositions p and q are defined as follows:

p : *you have understood this topic*
q : *you will be able to do this question*

(a) Write the following proposition in symbols using p, q and logical connectives only.

'You have understood this topic, or you will not be able to do this question.'

(b) Explain, in words only, what the following symbolic proposition represents:

$$(p \wedge \neg q) \Rightarrow \neg p\,.$$

Working:

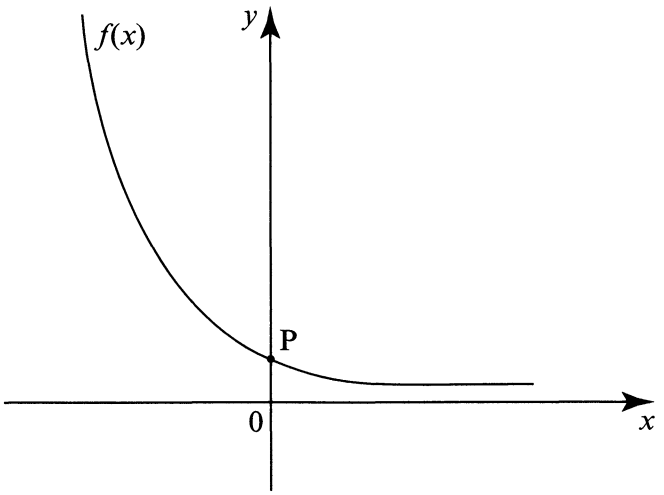
Answers:

(a) _____

(b) _____

_____

12. The following diagram shows part of the graph of an exponential function $f(x) = a^{-x}$, where $x \in \mathbb{R}$.



(a) What is the range of f?

(b) Write down the coordinates of the point P.

(c) What happens to the values of $f(x)$ as elements in its domain increase in value?

Working:

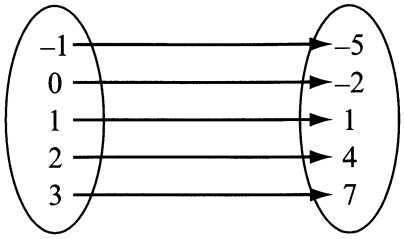
Answers:

(a) _____

(b) _____

(c) _____

13. (a) A function f is represented by the following mapping diagram.



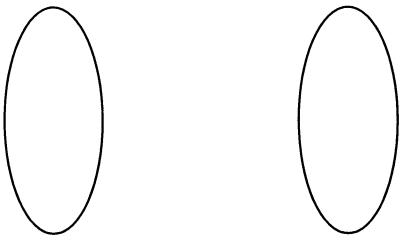
Write down the function f in the form

$$f: x \mapsto y, \quad x \in \{\text{the domain of } f\}.$$

(b) The function g is defined as follows

$$g: x \mapsto \sin 15x^\circ, \quad \{x \in \mathbb{N} \text{ and } 0 < x \leq 4\}.$$

Complete the following mapping diagram to represent the function g.



Working:

Answers:

(a) _____

14. Anthony uses the formula

$$p = \frac{27q}{r + s}$$

to calculate the value of p when, correct to two decimal places, $q = 0.89$, $r = 1.87$ and $s = 7.22$.

(a) He estimates the value **without using a calculator**.

(i) Write down the numbers Anthony could use in the formula to estimate the value of p.

(ii) Work out the estimate for the value of p that your numbers would give.

(b) A calculator is to be used to work out the actual value of p.

To what degree of accuracy would you give your calculator answer? Give a reason for your answer.

Working:

Answers:

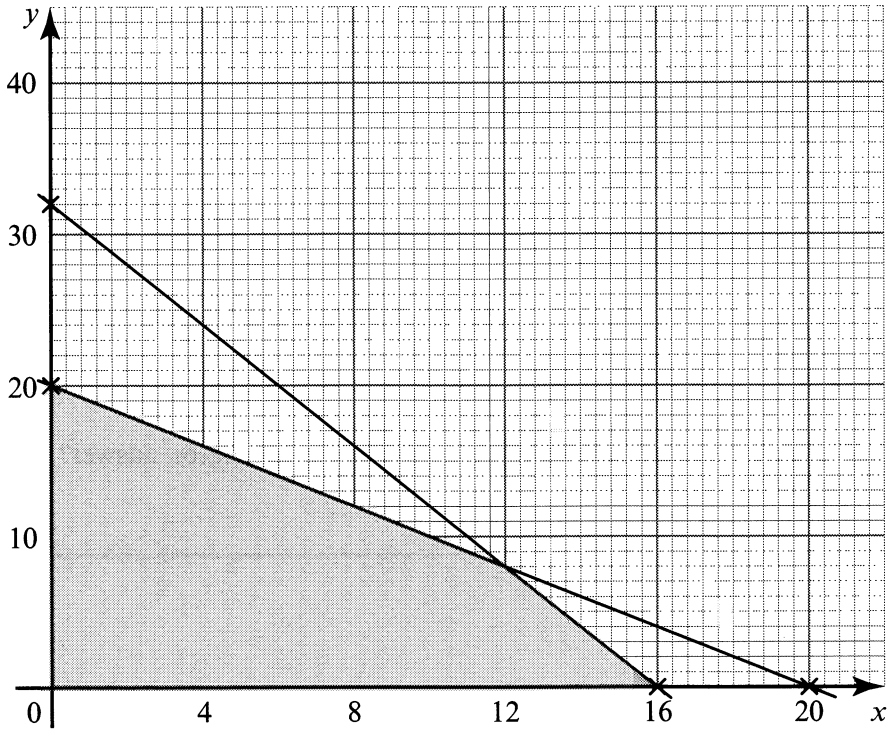
(a) (i) _____

(ii) _____

(b) _____

_____

15. The shaded region in this diagram represents the solution of a linear programming exercise.



Write down four inequalities that uniquely describe the shaded region.

Working:

Answers: