IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

MATHEMATICAL STUDIES
STANDARD LEVEL
PAPER 1

Tuesday 7 May 2002 (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.
- Write the make and model of your calculator in the box below *e.g.* Casio *fx-9750G*, Sharp EL-9600, Texas Instruments TI-85.

Calculator

Make	Model

EXAMINER	TEAM LEADER	IBCA
TOTAL /120	TOTAL /120	TOTAL /120

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. Solutions found from a graphic display calculator should be supported by suitable working. For example, if graphs are used to find a solution, you should sketch these as part of your answer. Incorrect answers with no working will normally receive ***no*** *marks.*

1. A rectangle has length 2.6×10^4 and width 1.9×10^4. Find each of the following, giving your answer in the form $a \times 10^k$, where $1 \leq a < 10$ and $k \in \mathbb{Z}$.

(a) The area of the rectangle;

(b) The perimeter of the rectangle.

Working:

Answers:

(a) _____

(b) _____

2. In the following ordered data, the mean is 6 and the median is 5 .

2, *b*, 3, *a*, 6, 9, 10, 12

Find each of the following

(a) the value of *a* ;

(b) the value of *b* .

Working:

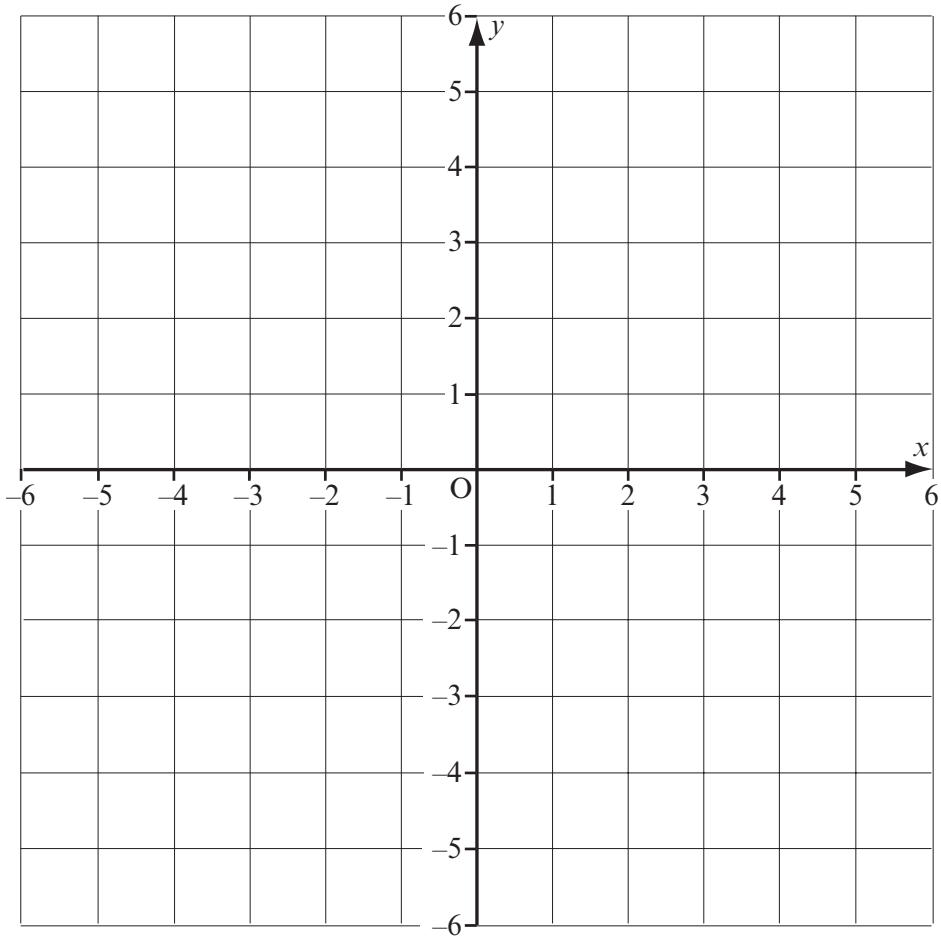
Answers:

(a) _____

(b) _____

3. Given the position vectors $\boldsymbol{v} = \begin{pmatrix} 1 \\ 5 \end{pmatrix}$ and $\boldsymbol{w} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$:

(a) On the grid below, draw and label the vectors $\boldsymbol{v}$ and $\boldsymbol{w}$.



(b) If $\boldsymbol{u} = \boldsymbol{v} + \boldsymbol{w}$, find the magnitude of vector $\boldsymbol{u}$.

Working:

Answer:

(b) _____

4. Andrew is at point A in a park. A deer is 3 km directly north of Andrew, at point D . Brian is 1.8 km due west of Andrew, at point B .

(a) Draw a diagram to represent this information.

(b) Calculate the distance between Brian and the deer.

(c) Brian looks at Andrew, and then turns through an angle θ to look at the deer. Calculate the value of θ .

Diagram: (a)

Working:

Answers:

(b) _____

(c) _____

5. A triangle ABC has $AB = 10\,\text{cm}$, $AC = 12\,\text{cm}$ and $A\widehat{C}B = 24°$. It is possible to draw **two** different triangles with these measurements. Calculate the **two** possible values for $A\widehat{B}C$.

Working:

Answers:

6. Consider the graphs of the following functions.

(i) $y = 7x + x^2$;

(ii) $y = (x - 2)(x + 3)$;

(iii) $y = 3x^2 - 2x + 5$;

(iv) $y = 5 - 3x - 2x^2$.

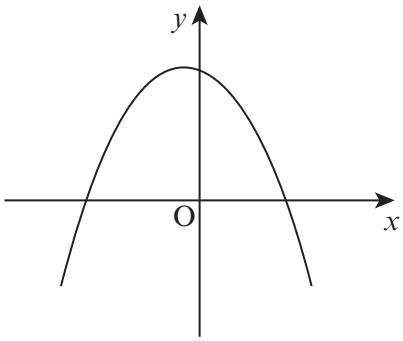
Which of these graphs

(a) has a y-intercept below the x-axis?

(b) passes through the origin?

(c) does not cross the x-axis?

(d) could be represented by the following diagram?



Working:

Answers:

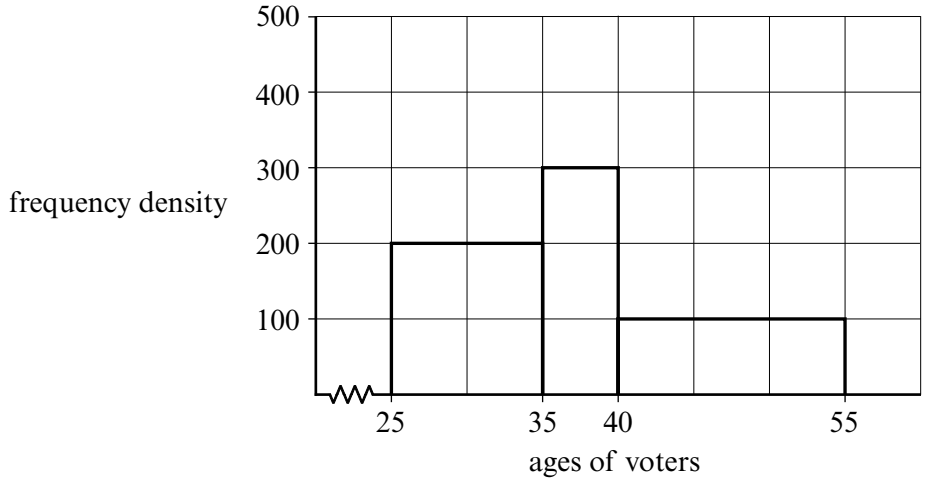
(a) _____

(b) _____

(c) _____

(d) _____

7. The ages of voters in an election are represented in the frequency density histogram below.



(a) How many voters were there between the ages of 35 and 40?

(b) Which of the three age groups had the most voters?

(c) What is the probability that a voter picked at random is between the ages of 25 and 35?

Working:

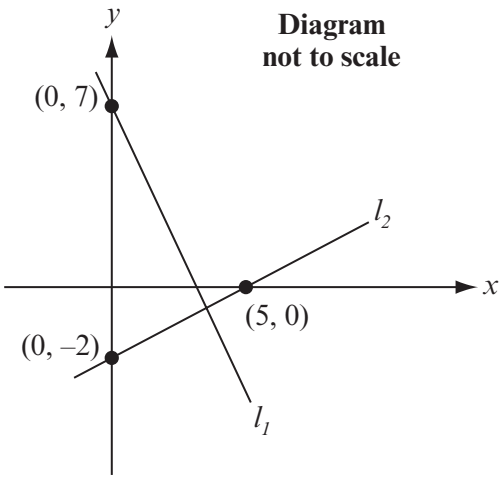
Answers:

(a) _____

(b) _____

(c) _____

8. The following diagram shows the lines l_1 and l_2, which are perpendicular to each other.



(a) Calculate the gradient of line l_1.

(b) Write the equation of line l_1 in the form $ax + by + d = 0$ where a, b and d are integers, and $a > 0$.

Working:

Answers:

(a) _____

(b) _____

9. The cost c, in Australian dollars (AUD), of renting a bungalow for n weeks is given by the linear relationship $c = nr + s$, where s is the security deposit and r is the amount of rent per week.

Ana rented the bungalow for 12 weeks and paid a total of 2925 AUD.

Raquel rented the same bungalow for 20 weeks and paid a total of 4525 AUD.

Find the value of

(a) r, the rent per week;

(b) s, the security deposit.

Working:

Answers:

(a) _____

(b) _____

10. (a) Find the solution of the equation $x^2 - 5x - 24 = 0$.

(b) The equation $ax^2 - 9x - 30 = 0$ has solution $x = 5$ and $x = -2$. Find the value of a.

Working:

Answers:

(a) _____

(b) _____

11. The exchange rate from US dollars (USD) to French francs (FFR) is given by 1 USD = 7.5 FFR. Give the answers to the following correct to **two** decimal places.

(a) Convert 115 US dollars to French francs.

(b) Roger receives 600 Australian dollars (AUD) for 2430 FFR. Calculate the value of the US dollar in Australian dollars.

Working:

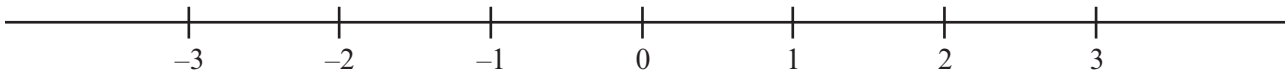
Answers:

(a) _____

(b) _____

12. (a) Solve the inequality $3 - 2(x + 5) > x - 6$.

(b) Represent the solution to part (a) on the number line below.



Working:

Answer:

(a) _____

13. Consider the statement '*If a figure is a square, then it is a rhombus*'.

(a) For this statement, write in words

(i) its converse;

(ii) its inverse;

(iii) its contrapositive.

(b) Only one of the statements in part(a) is true. Which one is it?

Working:

Answers:

(a) (i) _____

_____

(ii) _____

_____

(iii) _____

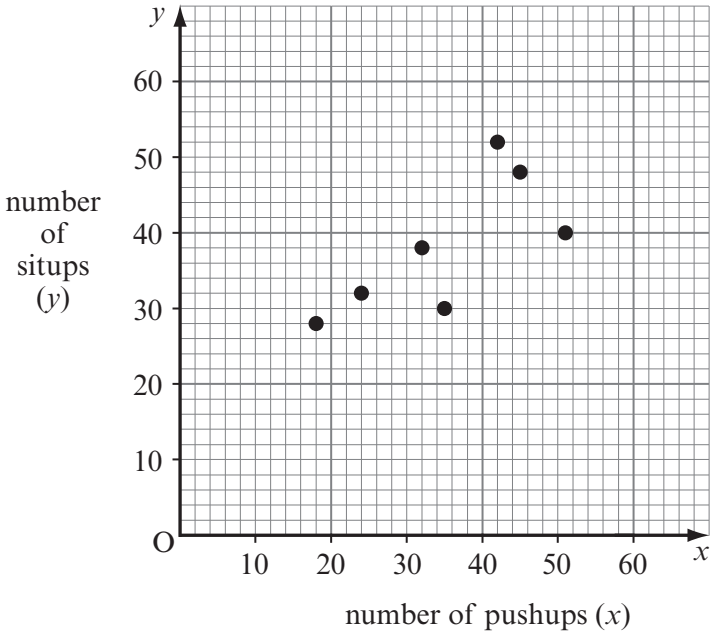
_____

(b) _____

14. Eight students in Mr. O'Neil's Physical Education class did pushups and situps. Their results are shown in the following table.

Student	1	2	3	4	5	6	7	8
number of pushups (x)	24	18	32	51	35	42	45	25
number of situps (y)	32	28	38	40	30	52	48	52

The graph below shows the results for the first seven students.



(a) Plot the results for the eighth student on the graph.

(b) If $\bar{x} = 34$ and $\bar{y} = 40$, draw a line of best fit on the graph.

(c) A student can do 60 pushups. How many situps can the student be expected to do?

Working:

Answer:

(c) _____

15. The following diagram shows the graph of $y = 3^{-x} + 2$. The curve passes through the points $(0, a)$ and $(1, b)$.

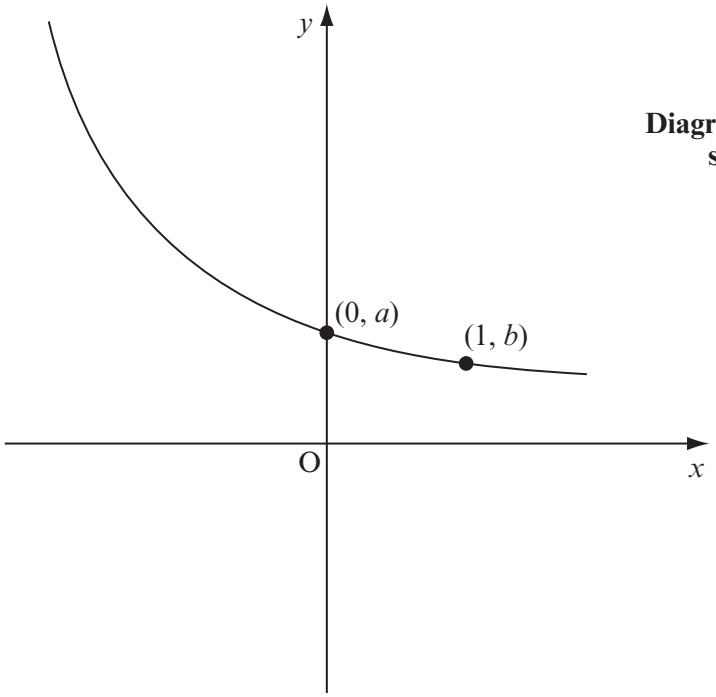


Diagram not to scale

(a) Find the value of

(i) a;

(ii) b.

(b) Write down the equation of the asymptote to this curve.

Working:

Answers:

(a) (i) _____

(ii) _____

(b) _____