INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

MATHEMATICAL METHODS
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

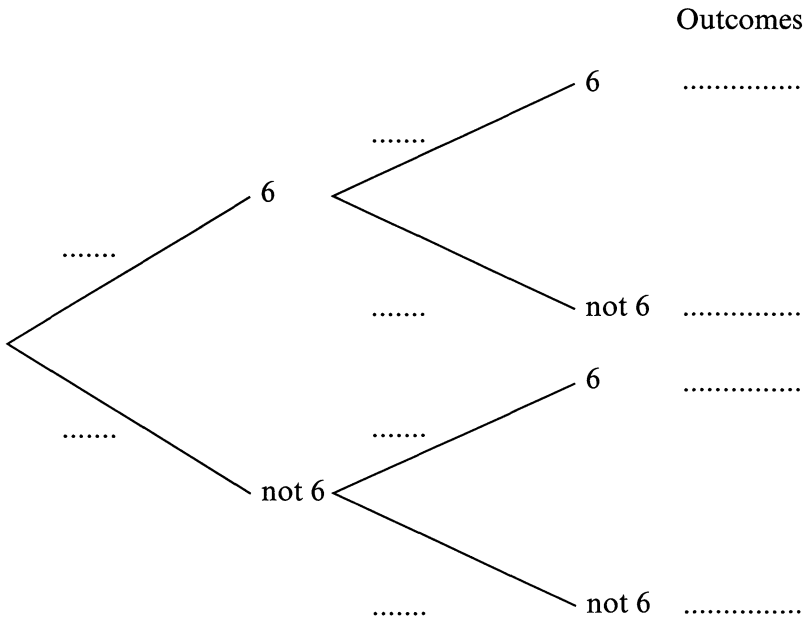
Make	Model

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. Where graphs from a graphic display calculator are being used to find solutions, you should sketch these graphs as part of your answer.

1. Two ordinary, 6-sided dice are rolled and the total score is noted.

(a) Complete the tree diagram by entering probabilities and listing outcomes.



(b) Find the probability of getting one or more sixes.

Working:

Answer:

(b) _____

2. The table shows the scores of competitors in a competition.

Score	10	20	30	40	50
Number of competitors with this score	1	2	5	k	3

The mean score is 34. Find the value of k .

Working:

Answer:

3. A curve with equation $y = f(x)$ passes through the point $(1, 1)$. Its gradient function is $f'(x) = -2x + 3$.

Find the equation of the curve.

Working:

Answer: _____

4. Given that $\sin\theta = \frac{1}{2}$, $\cos\theta = -\frac{\sqrt{3}}{2}$ and $0° \leq \theta \leq 360°$,

(a) find the value of θ;

(b) write down the **exact** value of $\tan\theta$.

Working:

Answers:

(a) _____

(b) _____

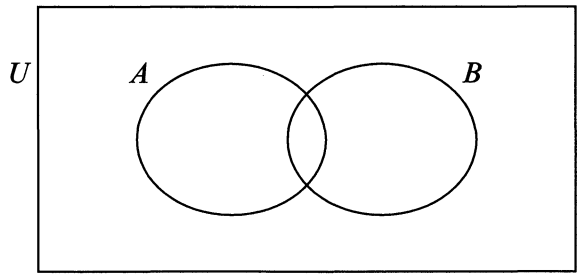
5. The line L passes through the origin and is parallel to the vector $2\boldsymbol{i} + 3\boldsymbol{j}$.

Write down a vector equation for L.

Working:

Answer:

6. The following Venn diagram shows a sample space U and events A and B.



$n(U) = 36$, $n(A) = 11$, $n(B) = 6$ and $n(A \cup B)' = 21$.

(a) On the diagram, shade the region $(A \cup B)'$.

(b) Find

(i) $n(A \cap B)$;

(ii) $\mathrm{P}(A \cap B)$.

(c) Explain why events A and B are not mutually exclusive.

Working:

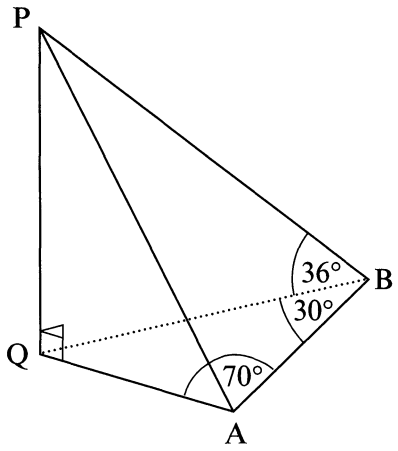
Answers:

(b) (i) _____

(ii) _____

(c) _____

7. The diagram shows a vertical pole PQ, which is supported by two wires fixed to the horizontal ground at A and B .



$BQ = 40$ m
$P\widehat{B}Q = 36°$
$B\widehat{A}Q = 70°$
$A\widehat{B}Q = 30°$

Find

(a) the height of the pole, PQ ;

(b) the distance between A and B .

Working:

Answers:

(a) _____

(b) _____

8. Given that $f(x) = (2x + 5)^3$, find

(a) $f'(x)$;

(b) $\int f(x)\,dx$.

Working:

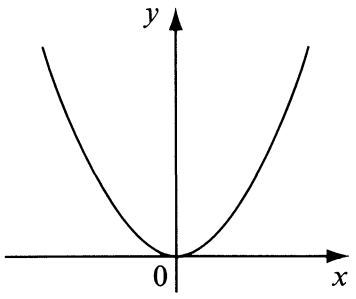
Answers:

(a) _____

(b) _____

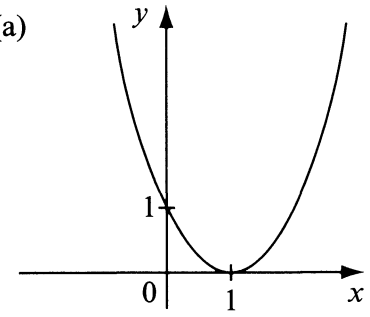
9. The diagrams show how the graph of $y = x^2$ is transformed to the graph of $y = f(x)$ in three steps.

For each diagram give the equation of the curve.

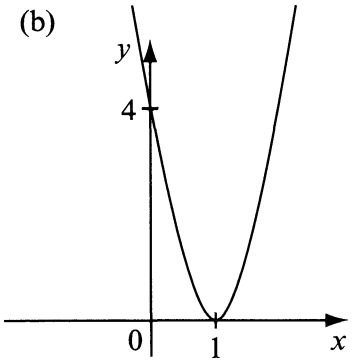


$y = x^2$

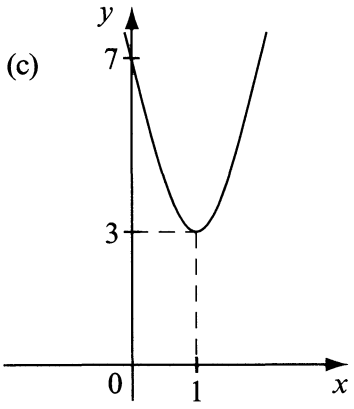
(a)



(b)



(c)



Working:

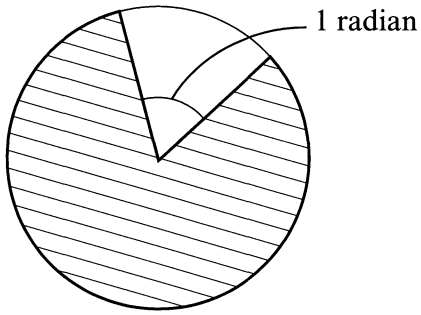
Answers:

(a) _____

(b) _____

(c) _____

10. The diagram shows a circle of radius 5 cm .



Find the perimeter of the shaded region.

Working:

Answer:

11. $f(x) = 4 \sin \left(3x + \frac{\pi}{2}\right)$.

For what values of k will the equation $f(x) = k$ have no solutions?

Working:

Answers:

12. $1000 is invested at the beginning of each year for 10 years.

The rate of interest is fixed at 7.5% per annum. Interest is compounded annually.

Calculate, giving your answers to the nearest dollar

(a) how much the first $1000 is worth at the end of the ten years ;

(b) the total value of the investments at the end of the ten years.

Working:

Answers:

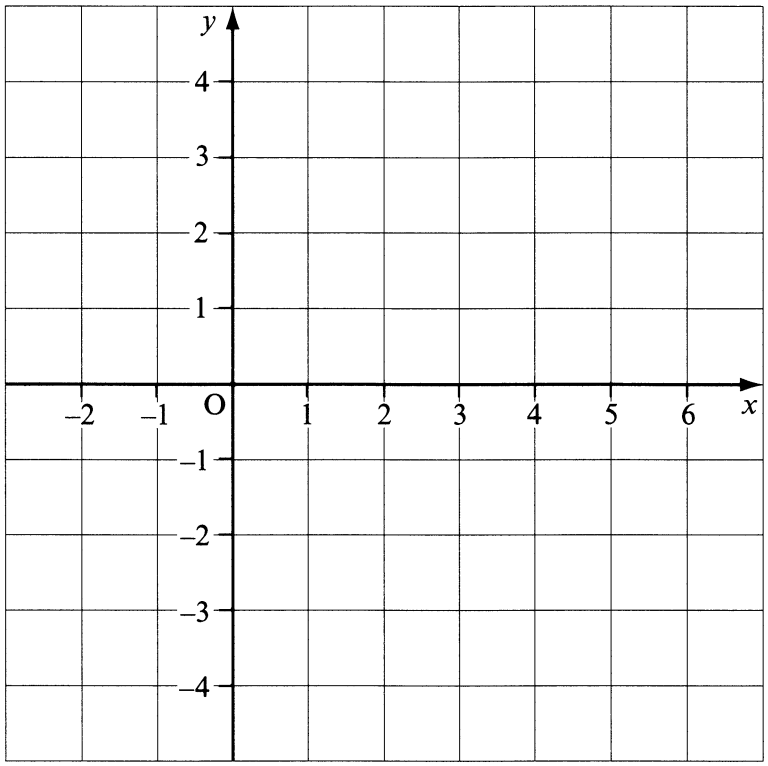
(a) _____

(b) _____

13. The triangle ABC is defined by the following information

$\overrightarrow{OA} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$, $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$, $\overrightarrow{AB} \cdot \overrightarrow{BC} = 0$, $\overrightarrow{AC}$ is parallel to $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$.

(a) On the grid below, draw an accurate diagram of triangle ABC.



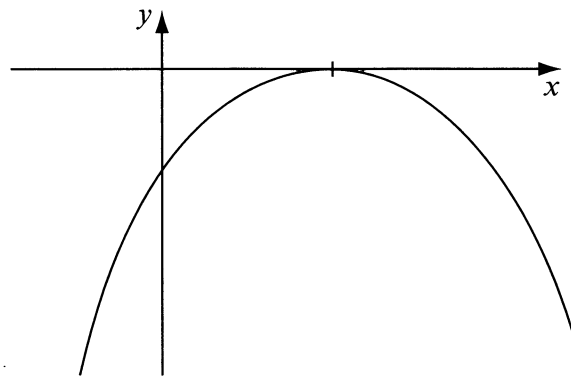
(b) Write down the vector $\overrightarrow{OC}$.

Working:

Answer:

(b) _____

14. The diagram shows the graph of the function $y = ax^2 + bx + c$.

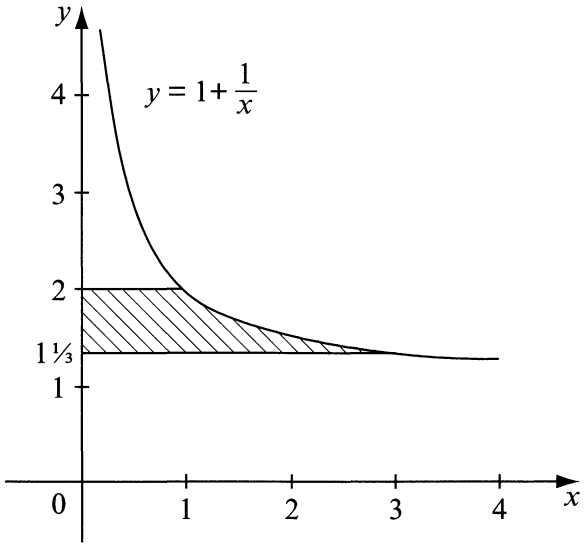


Complete the table below to show whether each expression is positive, negative or zero.

Expression	positive	negative	zero
a			
c			
$b^2 - 4ac$			
b			

Working:

15. The diagram shows the graph of the function $y = 1 + \frac{1}{x}$, $0 < x \leq 4$. Find the **exact** value of the area of the shaded region.



Working:

Answer: _____