INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

MATHEMATICAL METHODS
STANDARD LEVEL
PAPER 1

Monday 7 May 2001 (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-9750G*, Sharp EL-9400, Texas Instruments TI-85.

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. Given the following frequency distribution, find

(a) the median;

(b) the mean.

Number (x)	1	2	3	4	5	6
Frequency (f)	5	9	16	18	20	7

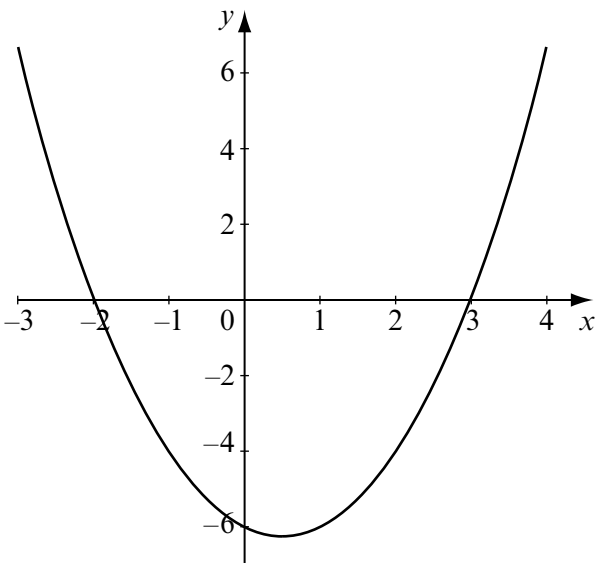
Working:

Answers:

(a) _____

(b) _____

2. The diagram shows part of the graph with equation $y = x^2 + px + q$. The graph cuts the x-axis at -2 and 3 .



Find the value of

(a) p ;

(b) q .

Working:

Answers:

(a) _____

(b) _____

3. Each year for the past five years the population of a certain country has increased at a steady rate of 2.7% per annum. The present population is 15.2 million.

(a) What was the population one year ago?

(b) What was the population five years ago?

Working:

Answers:

(a) _____

(b) _____

4. The following diagram shows a triangle with sides 5 cm, 7 cm, 8 cm.

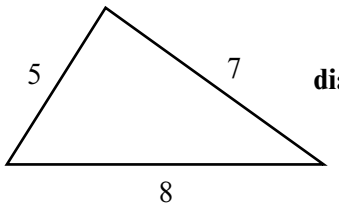


diagram not to scale

Find

(a) the size of the smallest angle, in degrees;

(b) the area of the triangle.

Working:

Answers:

(a) _____

(b) _____

5. The point $\mathrm{P}\left(\frac{1}{2}, 0\right)$ lies on the graph of the curve of $y = \sin(2x - 1)$.

Find the gradient of the tangent to the curve at P.

Working:

Answer:

6. Use the binomial theorem to complete this expansion.

$$(3x + 2y)^4 = 81x^4 + 216x^3 y + \ldots$$

Working:

Answer:

7. A bag contains 10 red balls, 10 green balls and 6 white balls. Two balls are drawn at random from the bag without replacement. What is the probability that they are of different colours?

Working:

Answer:

8. The points P , Q have coordinates P(4 , 0) , Q(–5 , 7) .

Find the equation of the line which is perpendicular to (PQ) and passes through the point P . Give your answer in the form $ax + by + c = 0$, where a , b , and c are integers.

Working:

Answer:

9. Find

(a) $\int \sin (3x + 7)\, dx$;

(b) $\int e^{-4x}\, dx$.

Working:

Answers:

(a) _____

(b) _____

10. Find the angle between the following vectors $\boldsymbol{a}$ and $\boldsymbol{b}$, giving your answer to the nearest degree.

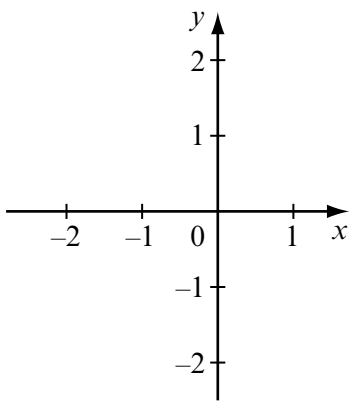
$$\boldsymbol{a} = -4\boldsymbol{i} - 2\boldsymbol{j}$$
$$\boldsymbol{b} = \boldsymbol{i} - 7\boldsymbol{j}$$

Working:

Answer:

_____

11. (a) On the following diagram, sketch the graphs of $y = e^x$ and $y = \cos x$ for $-2 \leq x \leq 1$.



(b) The equation $e^x = \cos x$ has a solution between –2 and –1 .

Find this solution.

Working:

Answer:

(b) _____

12. The function f is defined by

$$f : x \mapsto \sqrt{3 - 2x}, \qquad x \leq \frac{3}{2}.$$

Evaluate $f^{-1}(5)$.

Working:

Answer:

13. (a) Write the expression $3 \sin^2 x + 4 \cos x$ in the form $a \cos^2 x + b \cos x + c$.

(b) Hence or otherwise, solve the equation

$$3 \sin^2 x + 4 \cos x - 4 = 0 , \qquad 0° \leq x \leq 90° .$$

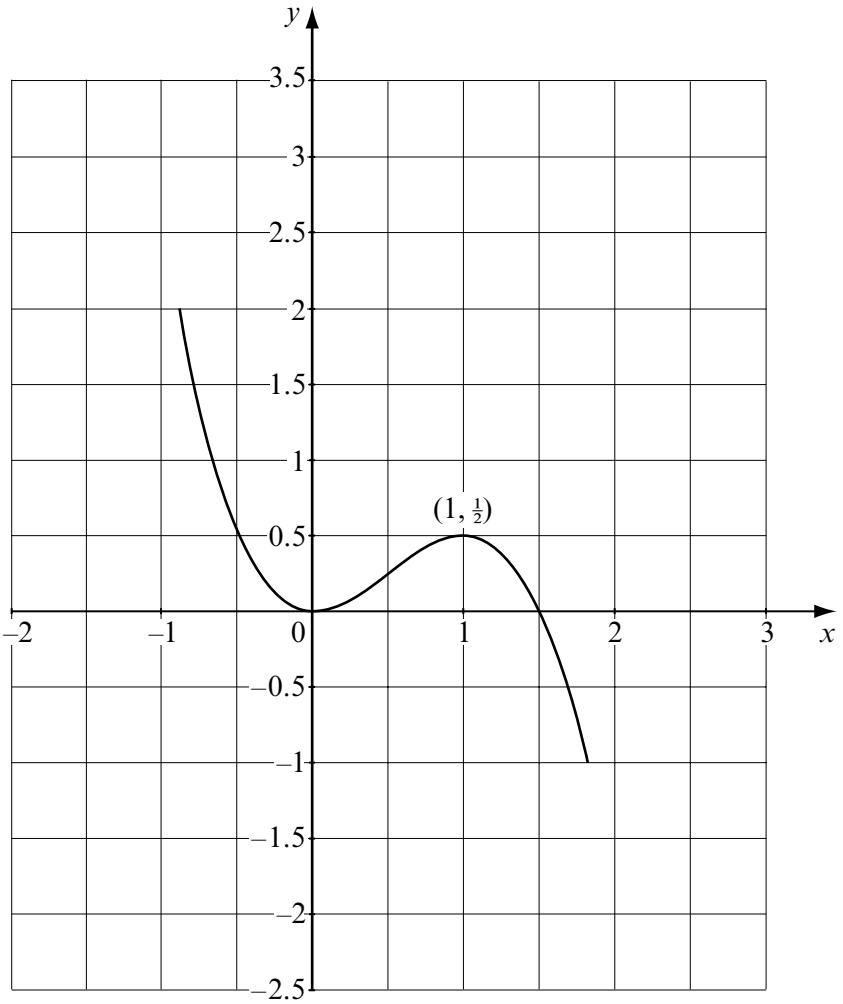
Working:

Answers:

(a) _____

(b) _____

14. The following diagram shows the graph of $y = f(x)$. It has minimum and maximum points at $(0\ ,\ 0)$ and $(1, \frac{1}{2})$.



(a) On the same diagram, draw the graph of $y = f(x - 1) + \frac{3}{2}$.

(b) What are the coordinates of the minimum and maximum points of $y = f(x - 1) + \frac{3}{2}$?

Working:

Answers:

(b) _____

15. In the following diagram, O is the centre of the circle and (AT) is the tangent to the circle at T.

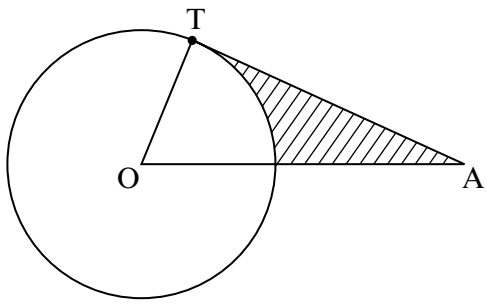


diagram not to scale

If OA = 12 cm, and the circle has a radius of 6 cm, find the area of the shaded region.

Working:

Answer: