



**MATHEMATICAL METHODS
STANDARD LEVEL
PAPER 1**

Friday 9 November 2001 (afternoon)

1 hour

Name

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Number

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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-9600, 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. The graph of $y = x^2$ intersects the graph of $y = 3 - 2x$ at the point (1, 1) and one other point. Find the coordinates of the other point.

Working:

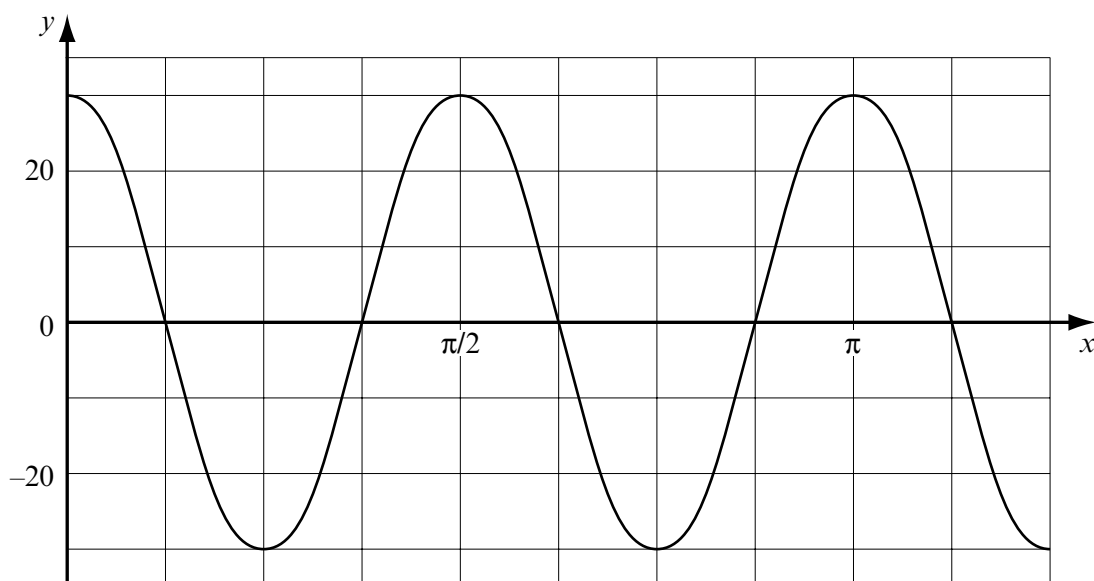
Answer:

2. A sum of \$5 000 is invested at a compound interest rate of 6.5% per annum. To the nearest dollar, what will be the total value of the investment at the end of five years?

Working:

Answer:

3. The graph of a function of the form $y = a \cos bx$ is given in the diagram below. (Note that the angle is expressed in radians.)



Determine the values of a and b .

Working:

Answers:

4. A theatre has 20 rows of seats. There are 15 seats in the first row, 17 seats in the second row, and each successive row of seats has two more seats in it than the previous row.
- (a) How many seats are in the 20th row?
- (b) How many seats are there in total?

Working:

Answers:

- (a) _____
- (b) _____

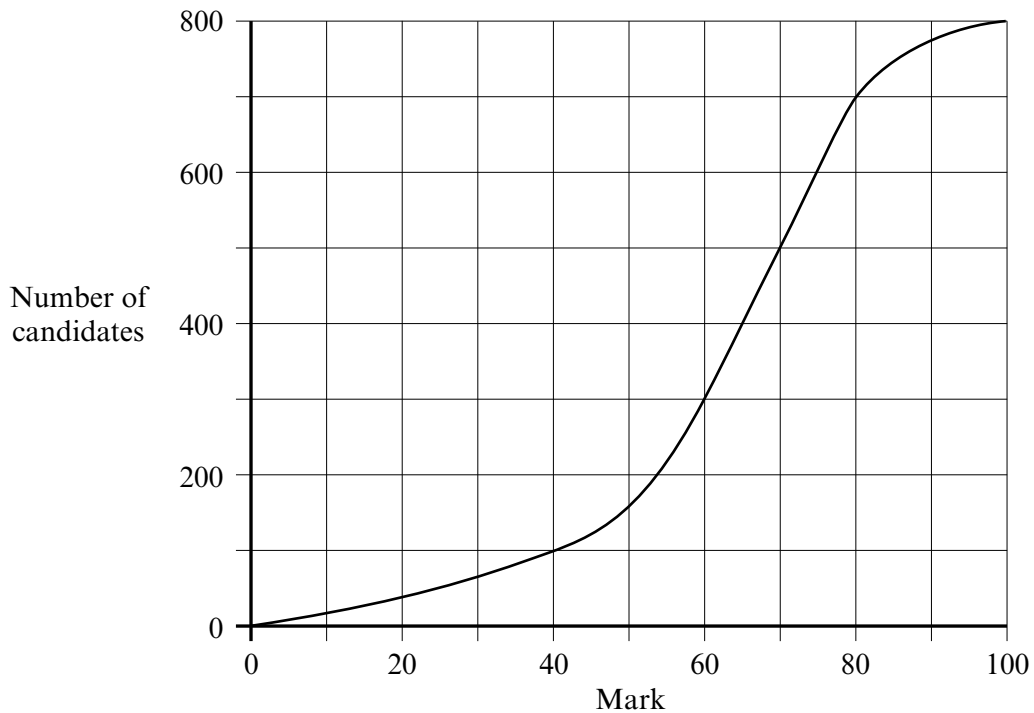
5. Each two digit number between 10 and 99 (including 10 and 99) is written on a separate slip of paper. The slips of paper are folded and placed in a box. After shaking the box, one slip is selected at random. What is the probability that the number on this slip is
- (a) a multiple of 10 ?
- (b) a multiple of 10 or a multiple of 15 ?

Working:

Answers:

- (a) _____
- (b) _____

6. A test which is marked out of 100 is written by 800 students. The cumulative frequency graph for the results of the test is given below.



- (a) How many students scored 40 marks or less on the test?
- (b) The middle 50% of test results lie between the marks a and b , where $a < b$. Write down the values of a and b .

Working:

Answers:

(a) _____

(b) _____

7. The function f is given by $f(x) = 2 \sin(5x - 3)$, where x is in radians. Find

(a) $f'(x)$;

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

Working:

Answers:

(a) _____

(b) _____

8. The velocity v in m s^{-1} of a moving body at time t seconds is given by

$$v = 50 - 10t.$$

(a) Find the value of its acceleration in m s^{-2} .

(b) The velocity may also be expressed as $v = \frac{ds}{dt}$, where s is the displacement in metres. Given that $s = 40$ when $t = 0$, find an expression for s as a function of t .

Working:

Answers:

(a) _____

(b) _____

9. The functions f and g are defined by

$$f: x \mapsto 3x, \quad g: x \mapsto x + 2.$$

- (a) Give an expression for $f \circ g$.
- (b) Find $f^{-1}(18) + g^{-1}(18)$.

Working:

Answers:

(a) _____

(b) _____

10. The function f is defined by $f: x \mapsto \frac{3}{\sqrt{9-x^2}}$.
- (a) State the domain of f .
- (b) State the range of f .

Working:

Answers:

- (a) _____
- (b) _____

11. A triangle has its vertices at $A(-1, 3)$, $B(3, 6)$ and $C(-4, 4)$.
- (a) Calculate $\vec{AB} \cdot \vec{AC}$.
- (b) Find the **cosine** of angle A of the triangle.

Working:

Answers:

- (a) _____
- (b) _____

12. The number of radioactive atoms N of a particular material present at time t years may be written in the form

$$N = 5000 e^{-kt},$$

where 5000 is the number of atoms present when $t = 0$, and k is a positive constant. It is found that $N = 2500$ when $t = 5$ years.

- (a) Determine the value of k .
- (b) At what value of t will $N = 50$?

Working:

Answers:

- (a) _____
- (b) _____

13. The quadratic function f is defined by $f: x \mapsto 3x^2 - 12x + 11$.

It may also be written in the form $f: x \mapsto 3(x - h)^2 + k$.

(a) Find the values of h and k .

(b) The graph of f is translated 3 units in the x direction and 5 units in the y direction. The translated graph is described by the equation $g: x \mapsto 3(x - p)^2 + q$. Find the values of p and q .

Working:

Answers:

(a) _____

(b) _____

14. The population P is the set of numbers $\{-3, 3, a, b\}$, and has a mean of 0 and a standard deviation of $\sqrt{17}$. Given that $b > a$, determine the values of a and b .

Working:

Answers:

15. In one of the terms in the expansion of $(x^3 - 3y^2)^5$, the powers of x and y will be identical. Find this term, giving your answer in its simplest form.

Working:

Answer:

