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

N05/5/MATSD/SP1/ENG/TZ0/XX

88057401

MATHEMATICAL STUDIES
STANDARD LEVEL
PAPER 1

Thursday 3 November 2005 (afternoon)

1 hour

Candidate session number

0	0							

INSTRUCTIONS TO CANDIDATES

- Write your session 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.

Maximum marks will be given for correct answers. Where an answer is wrong, some marks may be given for 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, e.g. if graphs are used to find a solution, you should sketch these as part of your answer.

1. Given the equation $p = r^2 + 2qr$.

(a) Calculate the exact value of p when $q = 3.6$ and $r = 24$.

(b) Write your answer correct to two significant figures.

(c) Express your answer to (b) in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$.

Working:

Answers:

(a) _____

(b) _____

(c) _____

2. (a) Factorise the expression $x^2 - 25$.

(b) Factorise the expression $x^2 - 3x - 4$.

(c) Using your answer to part (b), or otherwise, solve the equation $x^2 - 3x - 4 = 0$.

Working:

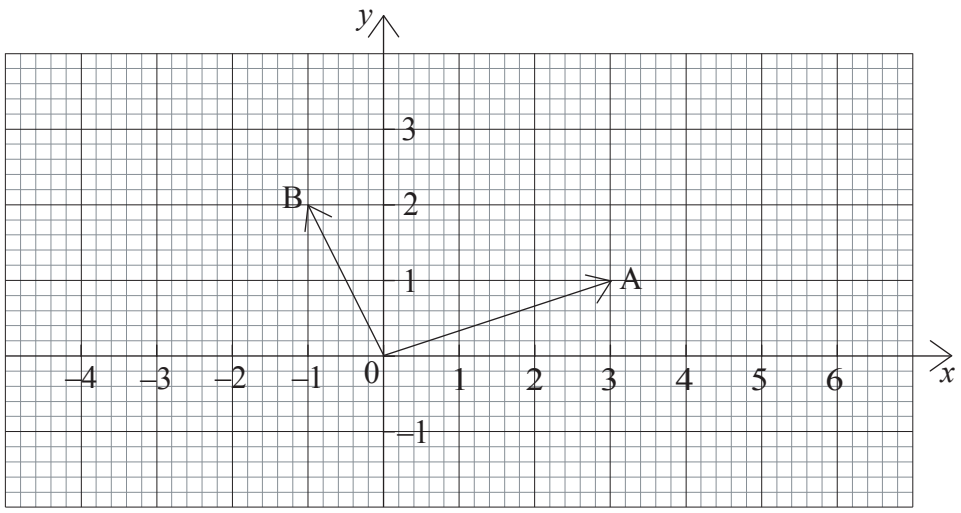
Answers:

(a) _____

(b) _____

(c) _____

3. The vectors $\vec{OA}$ and $\vec{OB}$ are shown in the diagram below.



(a) Write down the vector $\vec{AB}$ in component form.

The vector $\vec{OC} = 2\vec{OB}$.

(b) Draw the vector $\vec{OC}$ on the diagram.

(c) Write down the vector $\vec{AC}$ in component form.

(d) Calculate $|\vec{AC}|$.

Working:

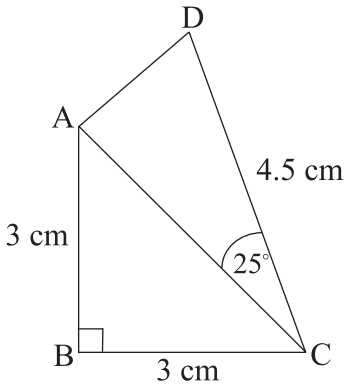
Answers:

(a) _____

(c) _____

(d) _____

4.



In the diagram, AB = BC = 3 cm, DC = 4.5 cm, angle $\mathrm{ABC} = 90^\circ$ and angle $\mathrm{ACD} = 25^\circ$.

(a) Calculate the length of AC.

(b) Calculate the area of triangle ACD.

(c) Calculate the area of quadrilateral ABCD.

Working:

Answers:

(a) _____

(b) _____

(c) _____

5. The table below shows the cost of travelling by train in Amsterdam between different areas (zones) of the city.

Number of zones travelled	Cost First Class	Cost Second Class
0 – 8	2.16 euros	1.36 euros
9 – 12	2.95 euros	1.93 euros
13 – 16	3.86 euros	2.50 euros
17 – 20	4.54 euros	2.95 euros
21 – 24	5.33 euros	3.40 euros

Janneke is travelling **first class** from one part of the city to another. She is travelling through 10 zones.

(a) Write down the cost of her ticket.

Joost has a student card that entitles him to a reduction of **40 %** on all fares.

(b) Calculate how much Joost pays for a **second class** ticket for 23 zones.

The student card costs **15** euros.

(c) Calculate how many journeys of 23 zones in **second class** that Joost must make to cover the cost of his student card.

Working:

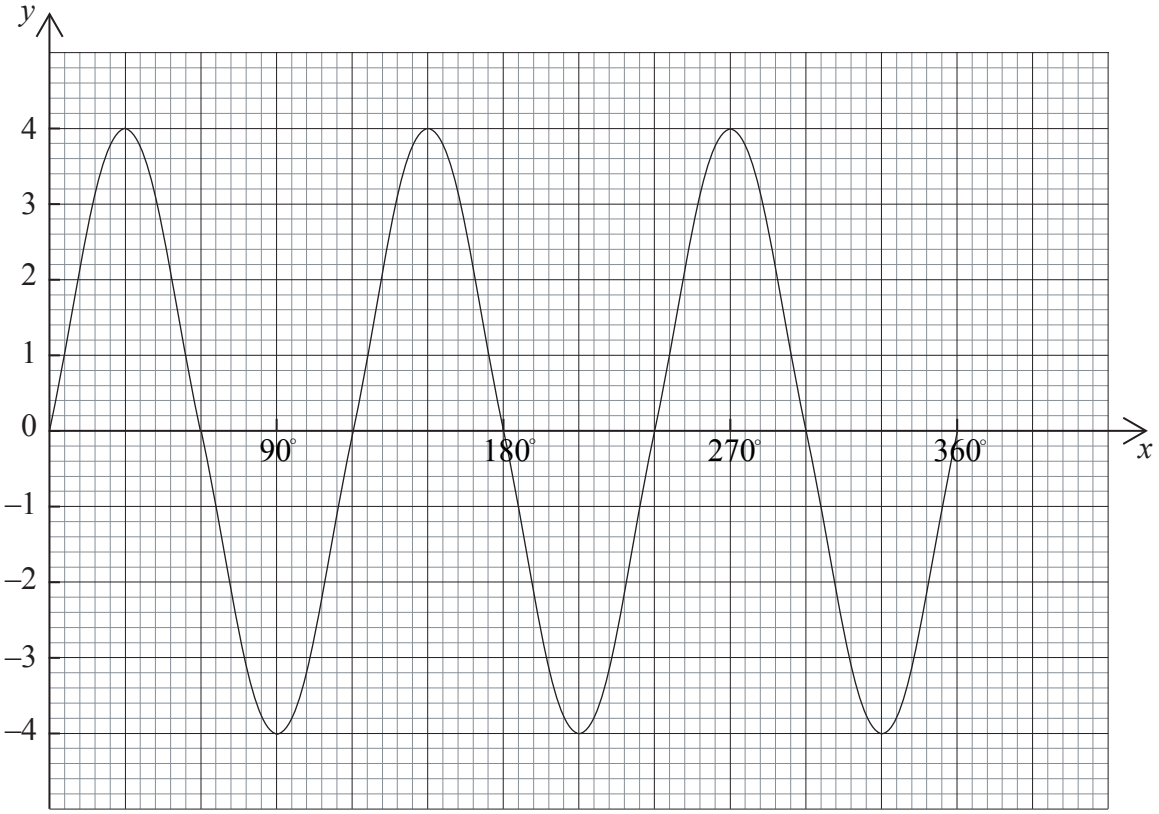
Answers:

(a) _____

(b) _____

(c) _____

6.



The graph represents the function $y = 4\sin(3x)$.

(a) (i) Write down the period of the function.

(ii) Write down the amplitude of the function.

(b) Draw the line $y = 2$ on the diagram.

(c) Using the graph, or otherwise, solve the equation $4\sin(3x) = 2$ for $0^\circ \leq x \leq 90^\circ$.

Working:

Answers:

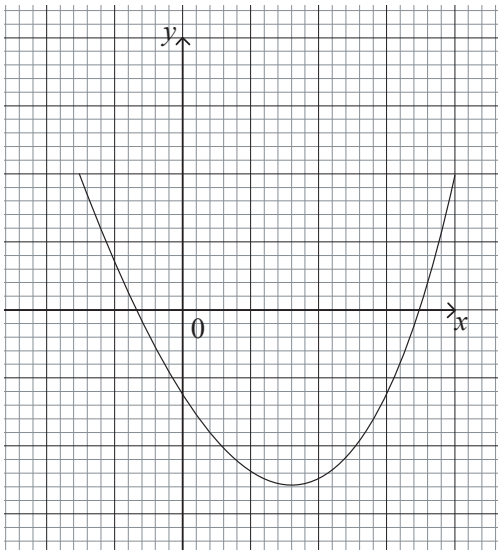
(a) (i) _____

(ii) _____

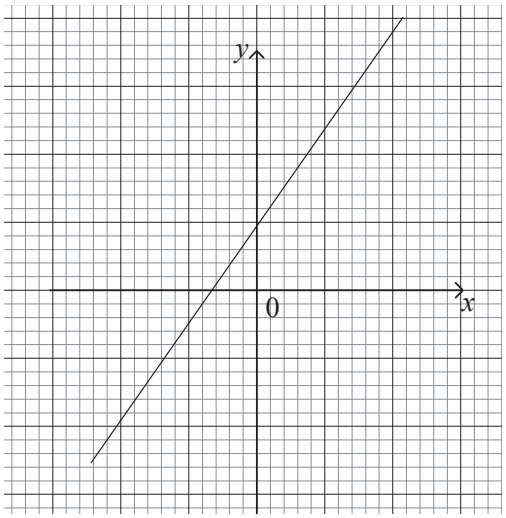
(c) _____

7. The diagrams below include sketches of the graphs of the following equations where a and b are **positive** integers.

1.



2.



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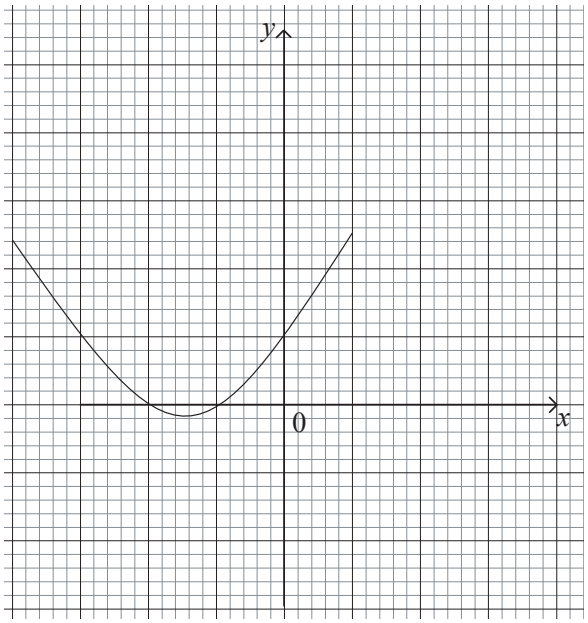

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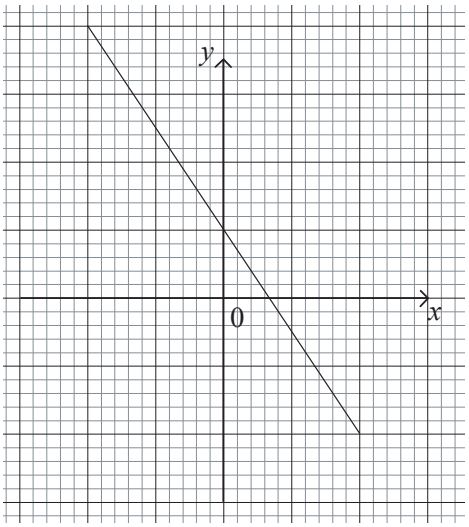
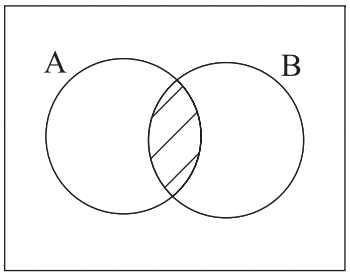


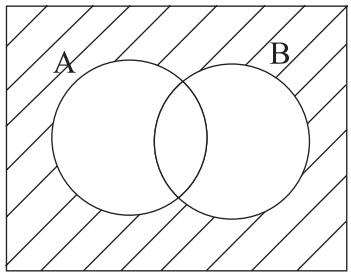
Complete the table to match each **equation** to the correct **sketch**.

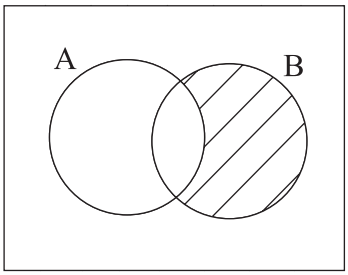
	Equation	Sketch
(i)	$y = ax + b$	
(ii)	$y = -ax + b$	
(iii)	$y = x^2 + ax + b$	
(iv)	$y = x^2 - ax - b$	

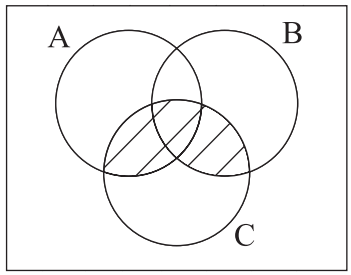
Working:

8. Write down an expression to describe the shaded area on the following Venn diagrams:

(a) 

(b) 

(c) 

(d) 

Working:

Answers:

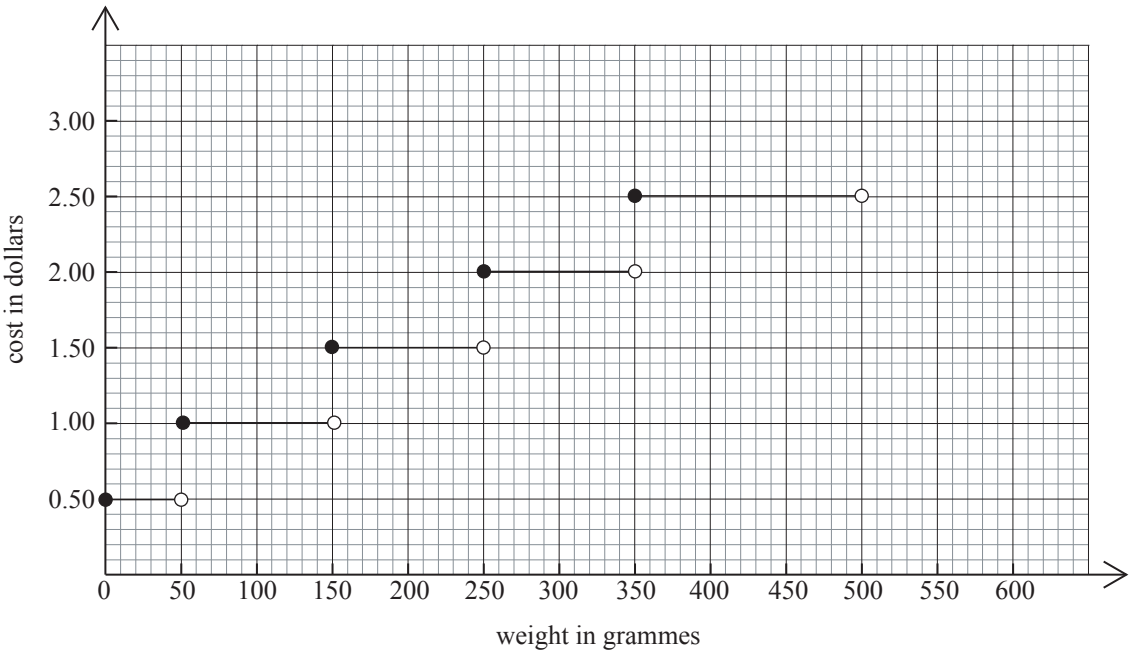
(a) _____

(b) _____

(c) _____

(d) _____

9. The graph shows the cost, in dollars, of posting letters with different weights.



(a) Write down the cost of posting a letter weighing 60 g.

(b) Write down the cost of posting a letter weighing 250 g.

Kathy pays 2.50 dollars to post a letter.

(c) Write down the range for the weight, w, of the letter.

Working:

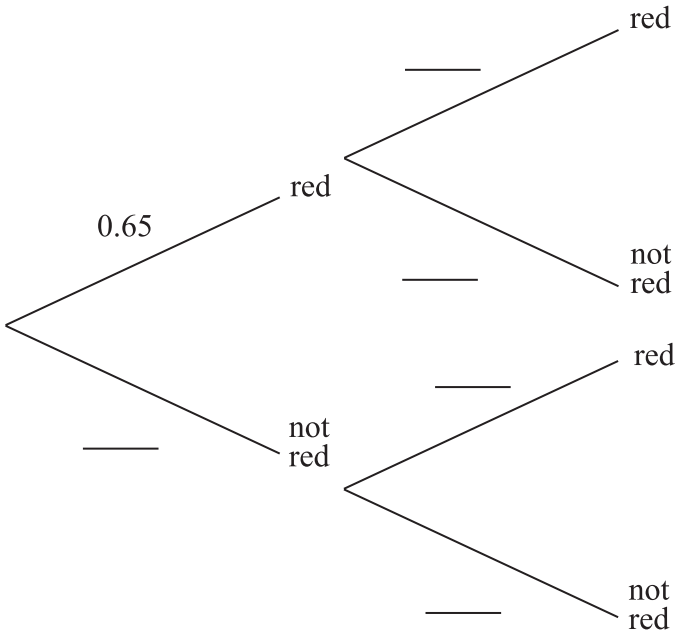
Answers:

(a) _____

(b) _____

(c) _____

10. Jim drives to work each day through two sets of traffic lights.
The probability of the first set of traffic lights being red is 0.65.
If the first set is red then the probability that the next set of traffic lights is red is 0.46.
If the first set is not red, the probability that the next set is red is 0.72.



(a) Complete the tree diagram above.

(b) Calculate the probability that the second set of traffic lights is red.

Working:

Answers:

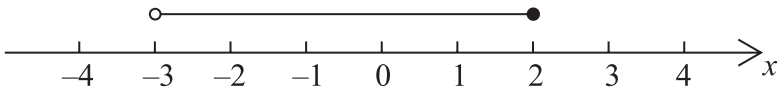
(b)

11. Complete the Truth Table for the compound proposition $(p \wedge \neg q) \Rightarrow (p \vee q)$.

p	q	$\neg q$	$(p \wedge \neg q)$	$(p \vee q)$	$(p \wedge \neg q) \Rightarrow (p \vee q)$
T	T	F	F		
T	F	T	T		
F	T	F		T	
F	F		F	F	

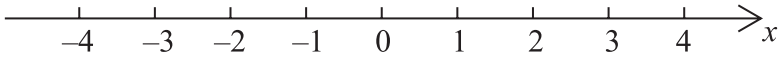
Working:

12. (a) Write down the inequality represented below.



(b) Solve for x the inequality $6-5(x+2)\geq 1$

(c) Mark your answer for (b) on the number line below.



Working:

Answers:

(a) _____

(b) _____

13. (a) The first term of an arithmetic sequence is –16 and the eleventh term is 39.
Calculate the value of the common difference.

(b) The third term of a geometric sequence is 12 and the fifth term is $\frac{16}{3}$.
All the terms in the sequence are positive.
Calculate the value of the common ratio.

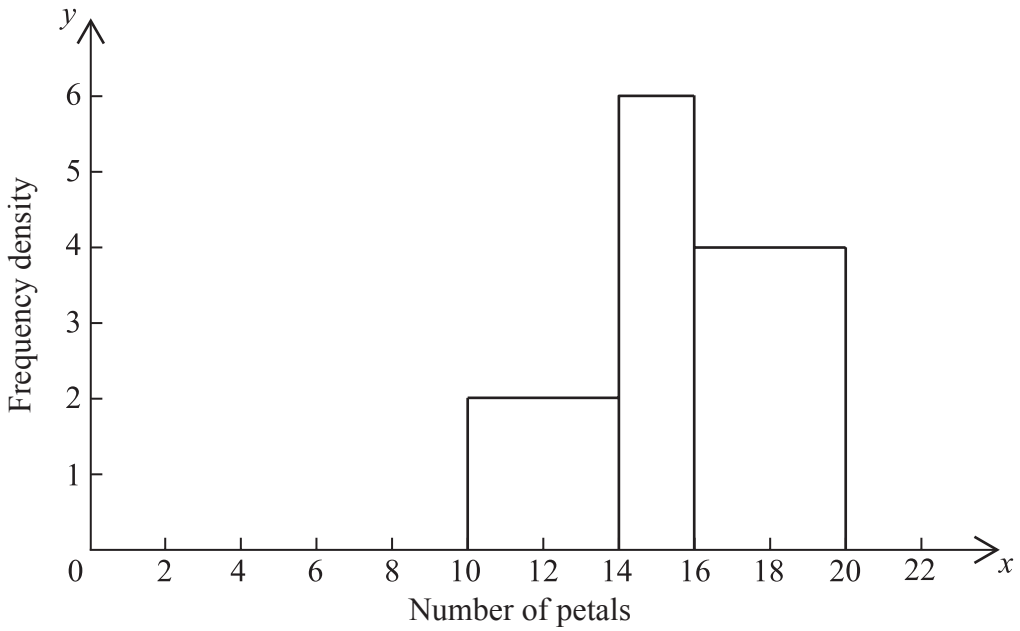
Working:

Answers:

(a) _____

(b) _____

14. The diagram shows the frequency density histogram for the number of petals on roses.



The information is displayed in the frequency table below.

Number of petals (x).	Frequency
$10 < x \leq 14$	a
$14 < x \leq 16$	12
$16 < x \leq 20$	b

(a) Find the values of a and b.

(b) State the modal group.

(c) Calculate an estimate of the mean number of petals.

Working:

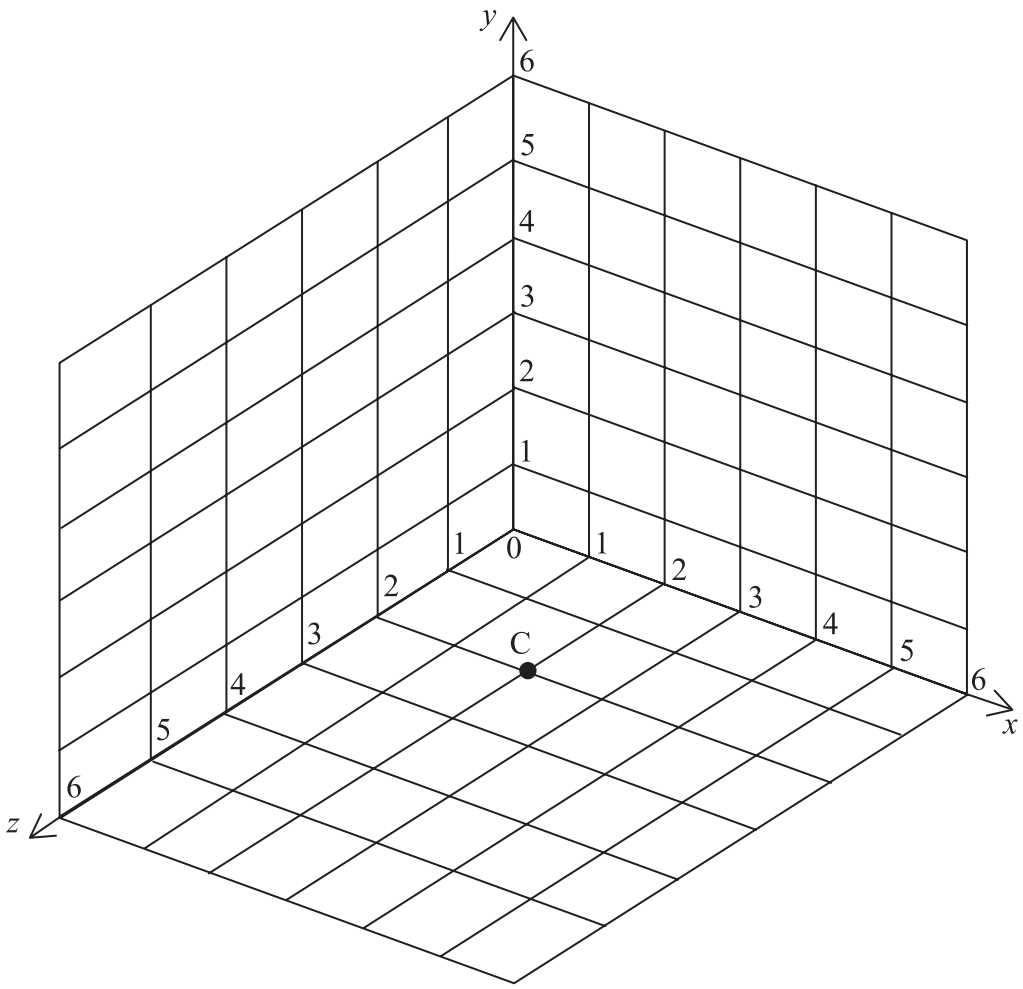
Answers:

(a) _____

(b) _____

(c) _____

15.



The point $C(2, 0, 2)$ is plotted on the diagram above.

(a) On the diagram, plot the points $A(5, 2, 0)$ and $B(0, 3, 4)$.

(b) Calculate the coordinates of M, the mid-point of AB.

(c) Calculate the length of AB.

Working:

Answers:

(b) _____

(c) _____