

Mathematical formulae for papers 1 and 2



BOTSWANA EXAMINATIONS COUNCIL
in collaboration with
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
Botswana General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER



MATHEMATICS **0563/02**
Paper 2 **October/November 2009**
2 hours

Candidates answer on the Question Paper.
Additional Materials: Geometrical instruments
Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces provided at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on this question paper.
If working is needed for any question it must be shown below that question. Omission of essential working will result in loss of marks.
Do not use staples, paper clips, highlighters, glue or correction fluid.
The number of marks is given in brackets [] at the end of each question or part question.
The total of the marks for this paper is 75.
If the degree of accuracy is not specified in the question and if the answer is not exact, the answer should be given to three significant figures. Answers in degrees should be given to one decimal place.
In any question where the value of π is required, use the value from your calculator or take π as 3.142.

For Examiner's Use

This document consists of **16** printed pages.

Surface area and volume of solids

Name of solid	Total surface area	Volume
cone	$\pi r^2 + \pi r l$	$\frac{1}{3} \pi r^2 h$
pyramid		$\frac{1}{3}$ base area \times height
sphere	$4\pi r^2$	$\frac{4}{3} \pi r^3$

Trigonometry

Sine Rule $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Area of a triangle $= \frac{1}{2} ab \sin C$

1 The table below shows the mass of nutrients in 40 g of cereal.

Nutrients	Mass (g)
Fibre	1.2
Protein	3.0
Carbohydrates	34.0
Other nutrients

Calculate

(a) the mass of other nutrients,

Answer (a) g [1]

(b) the percentage of fibre, by mass, in the cereal,

Answer (b)..... [2]

(c) the mass of carbohydrates in 100 g of the cereal.

Answer (c)..... g [2]

2 (a) Solve the equation $\frac{3y-7}{5} = \frac{y}{2}$.

Answer (a) [2]

(b) Calculate the value of

$$\sqrt{4.2 + \frac{7}{4.2} - \frac{11}{4.2^2}}$$

giving your answer correct to 2 decimal places.

Answer (b) [2]

3 Ogaufi changed P900 into Rands to pay for the service of his car in South Africa. The exchange rate was P1 to R1.3213.

(a) How many Rands did he get?

Answer (a) R [2]

(b) The following day Ogaufi had to change all his Rands back into Pula as his trip got cancelled. The exchange rate was now P1 to R1.3480. How many Pula did he get from this transaction?

Answer (b) P..... [2]

(c) How much, in Pula, did Ogaufi lose in the two transactions?

Answer (c) P..... [1]

- 4 In a 'Win a House' competition, customers send the message 'HOUSE' to a telephone company as many times as they can. The value of the house that could be won depends on the number of messages sent by the customer. The table below shows the number of messages sent and the value of the house that could be won.

Number of messages	Value of house (Pula)
1 to 5	260 000
6 to 9	280 000
10 to 14	320 000
15 to 18	365 000
≥ 19	400 000

- (a) Write down the smallest possible number of messages that qualify a customer to win a house valued at P280 000.

Answer (a) [1]

- (b) Each message sent costs P5.

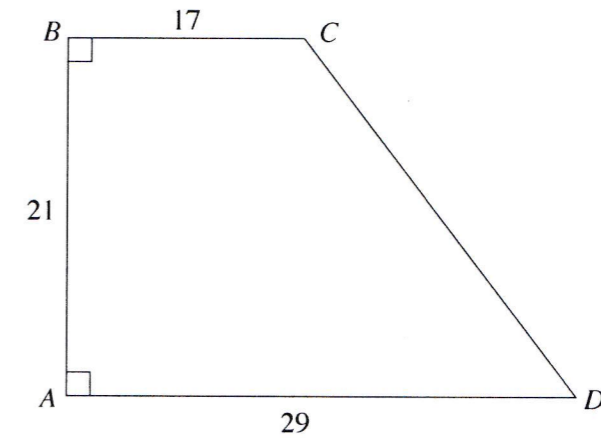
- (i) Find the least amount of money that the customer has to spend to qualify to win a house valued at P365 000.

Answer (b)(i) P..... [1]

- (ii) A customer spends P65 on the messages. What is the value of the house they qualify to win?

Answer (b)(ii) P..... [2]

- 5 (a) The diagram below shows a trapezium $ABCD$. $AB = 21$ cm, $AD = 29$ cm, $BC = 17$ cm and $\hat{BAD} = \hat{ABC} = 90^\circ$.



- (i) Calculate the area of the trapezium.

Answer (a)(i) cm² [2]

- (ii) The trapezium is a cross-section of a prism of volume 4560 cm³.

Calculate the length of the prism.

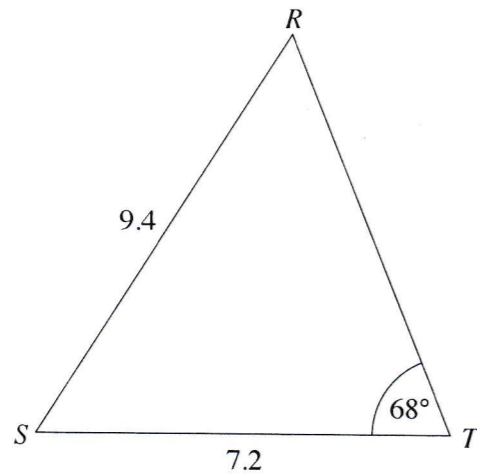
Answer (a)(ii) cm [2]

- (b) A cylinder of height 3.25 cm has the same volume as the prism in part (a) (ii).

Calculate the diameter of the cross-section of the cylinder.

Answer (b)..... cm [3]

- 6 The diagram shows a triangle RST .
 $RS = 9.4$ m, $ST = 7.2$ m and $\hat{S}TR = 68^\circ$.



Calculate

- (a) $\hat{S}RT$,

Answer (a)..... [3]

- (b) the area of the triangle,

Answer (b)..... m² [2]

- (c) the shortest distance between the point S and the side RT .

Answer (c)..... m [2]

- 7 The table below shows the heights, h cm, of a group of 28 pupils.

Height, h (cm)	Number of pupils	Cumulative frequency
$100 \leq h < 110$	2	2
$110 \leq h < 120$	5	7
$120 \leq h < 130$	10	
$130 \leq h < 140$	5	
$140 \leq h < 150$	4	
$150 \leq h < 160$	2	

- (a) A pupil is selected at random from the group.
 State, with a reason, the range in which the pupil's height is most likely to lie.

Answer (a).....

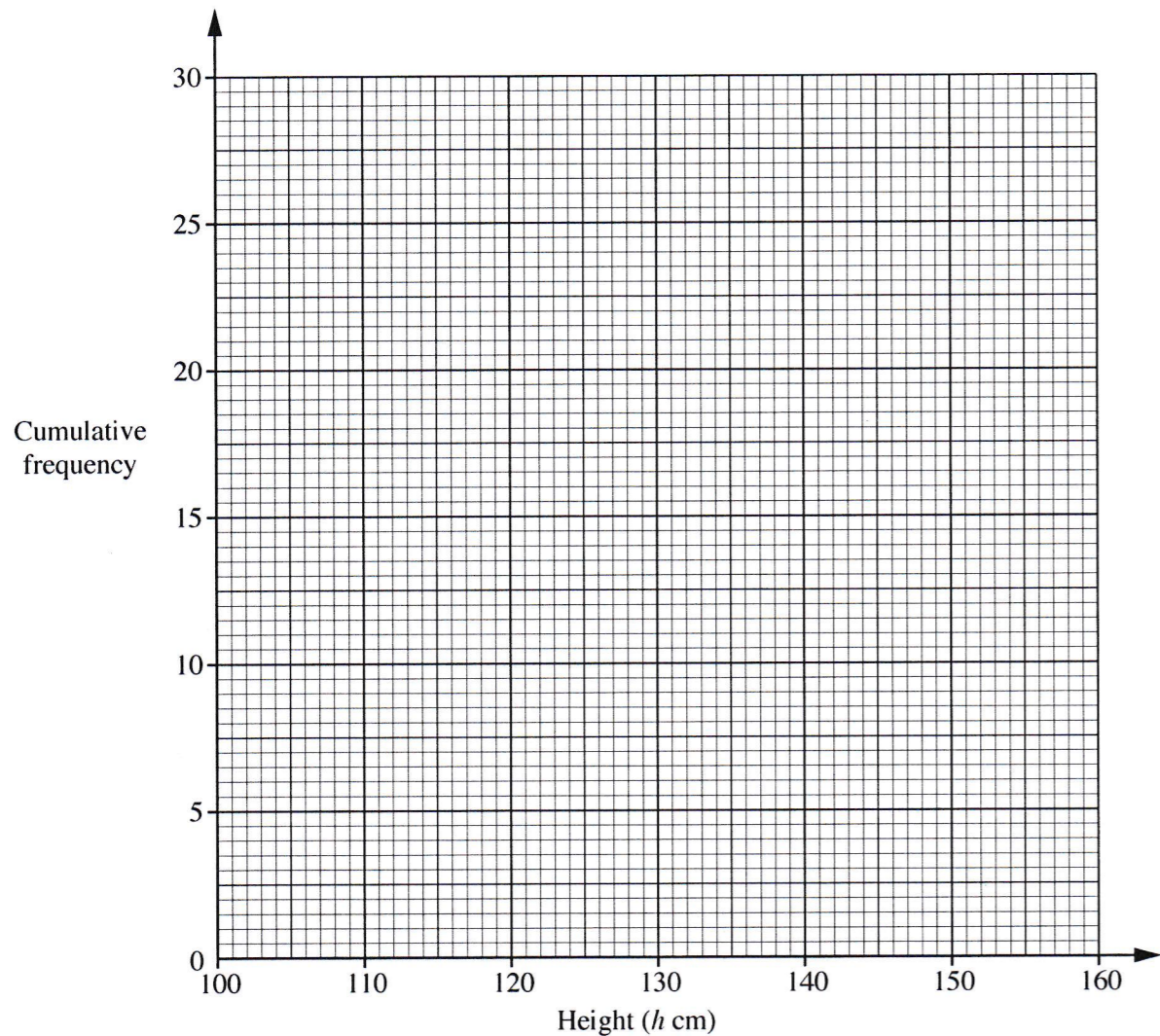
.....

..... [1]

- (b) Complete the cumulative frequency column of the table.

[1]

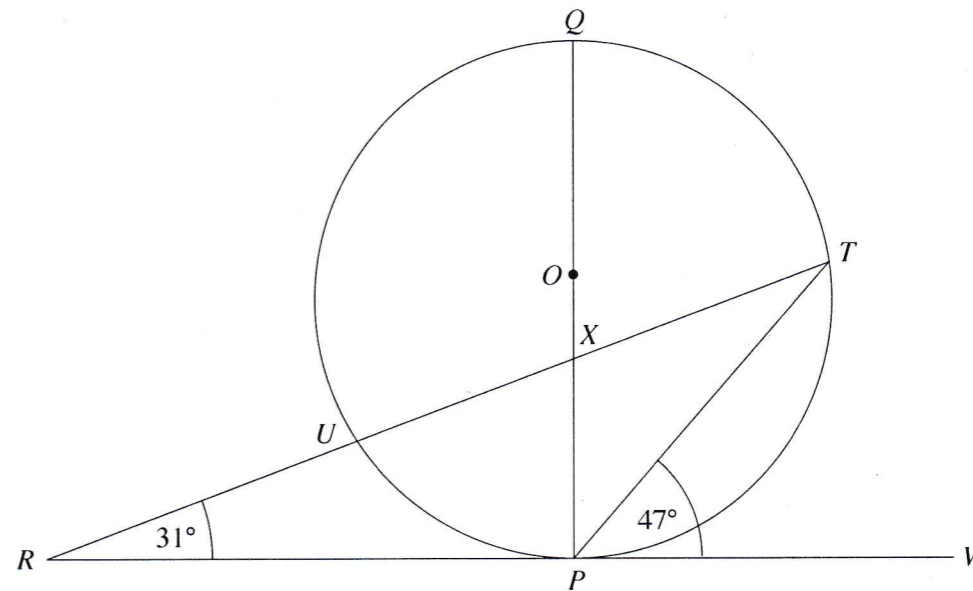
(c) On the axes provided below, draw the cumulative frequency curve for the distribution. [3]



(d) Use the graph to estimate the 70th percentile of the heights.

Answer (d)..... cm [2]

8 The points Q, T, P and U lie on the circumference of a circle centre O as shown. RW is a tangent to the circle at P . Lines RT and QOP intersect at X , $\hat{TPW} = 47^\circ$ and $\hat{TRP} = 31^\circ$.



(a) State, with a reason, the size of \hat{RPQ} .

Answer (a).....

[2]

(b) Explain why $\hat{RXP} = \hat{QXT}$.

Answer (b).....

[1]

(c) Calculate

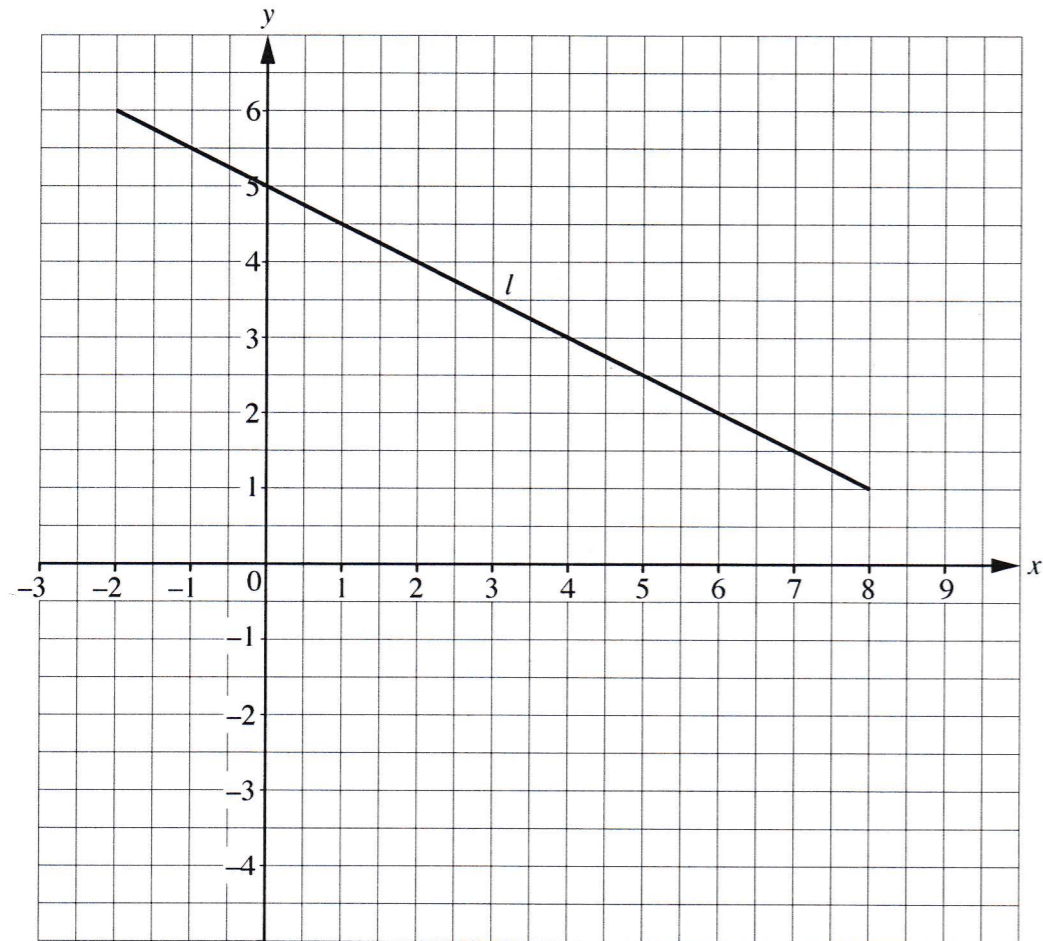
(i) \hat{QPT} ,

Answer (c)(i) [2]

(ii) \hat{PXT} .

Answer (c)(ii) [2]

9 The diagram below shows the graph of line l .

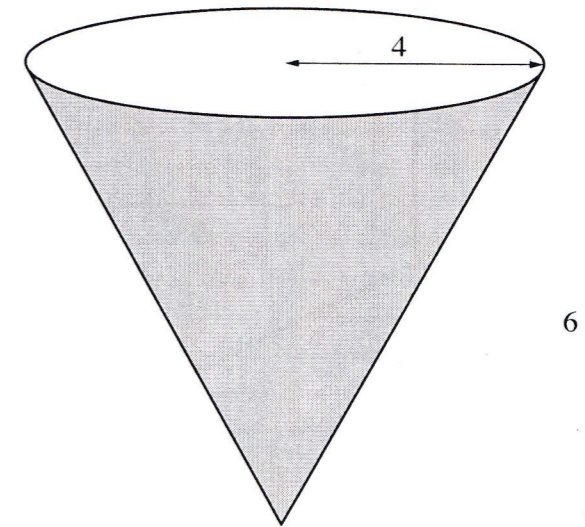


- (a) Find the equation of the line l .
- (b) On the same axes, draw the graph of the line $2y = 3x + 6$ and label it n . [2]
- (c) Using your graph, or otherwise, find the value of x and the value of y satisfying both the equation of the line l and the equation of line n .

Answer (a)..... [2]

(c) $x = \dots\dots\dots$, $y = \dots\dots\dots$ [2]

10 The diagram below shows a toy which is in the form of a solid cone. The cone has a radius of 4 cm and a height of 6 cm.



- (a) Show that the slant height of the cone is 7.21 cm, correct to 3 significant figures.

Answer (a).....

..... [2]

- (b) (i) Calculate the curved surface area of the toy.

Answer (b)(i) cm² [2]

- (ii) The curved surface is to be covered with material which costs 35 t/cm². Calculate the total cost of the material required.

Answer (b)(ii) P..... [2]

(c) Calculate the volume of the toy.

Answer (c) cm³ [2]

(d) The toy has a mass of 50 g.
Calculate the density of the material used to make the toy.

Answer (d) g/cm³ [2]

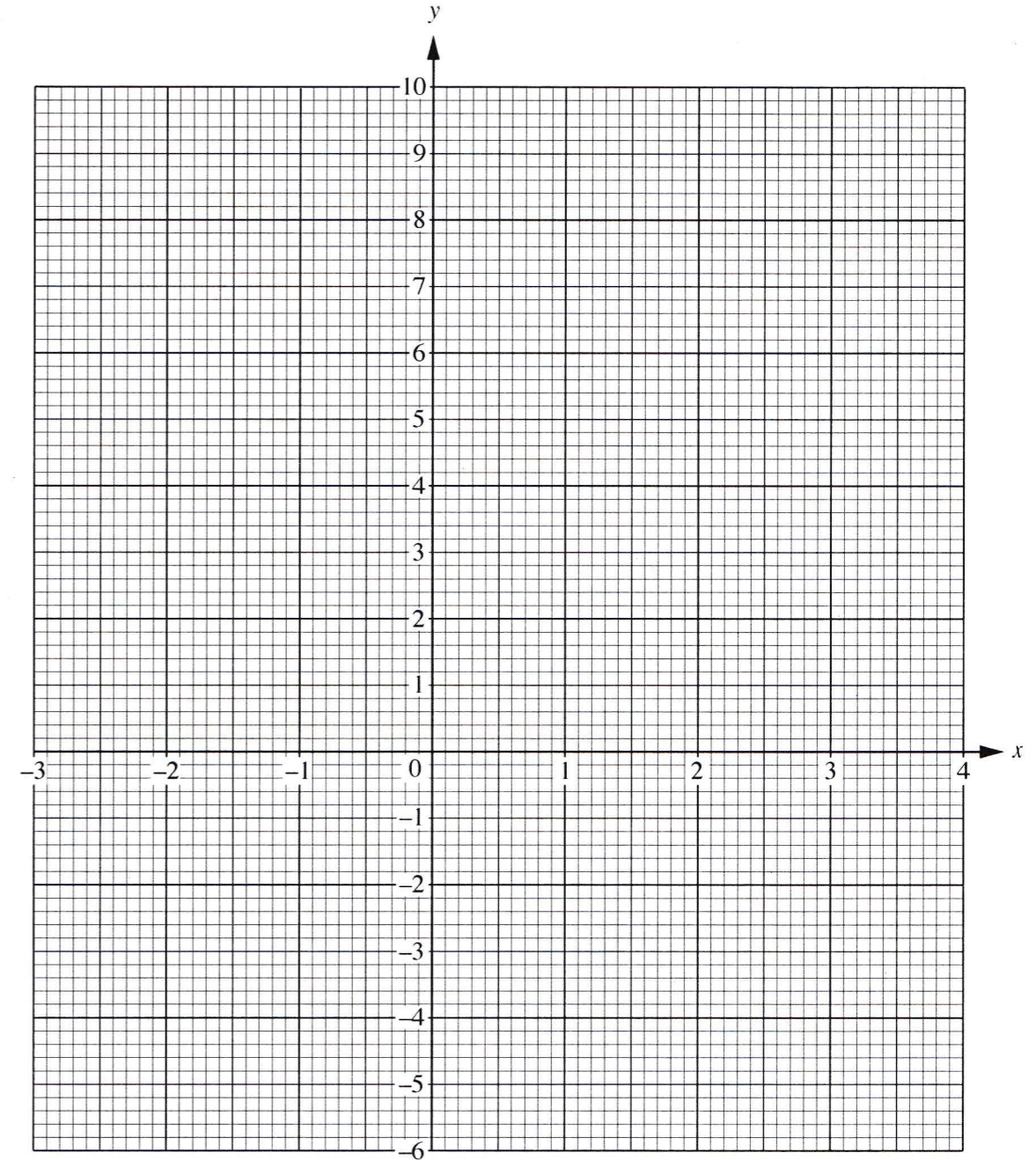
11 The table below shows some values of x and corresponding values of y for $y = x^2 - 2x - 5$.

x	-3	-2	-1	0	1	2	3	4
y	p	3	-2	-5	-6	-5	-2	3

(a) Calculate the value of p .

Answer (a)..... [1]

(b) Using the axes provided, draw the graph of $y = x^2 - 2x - 5$ for $-3 \leq x \leq 4$. [3]



(c) Use the graph to estimate the solutions to the equation $x^2 - 2x - 5 = -4$.

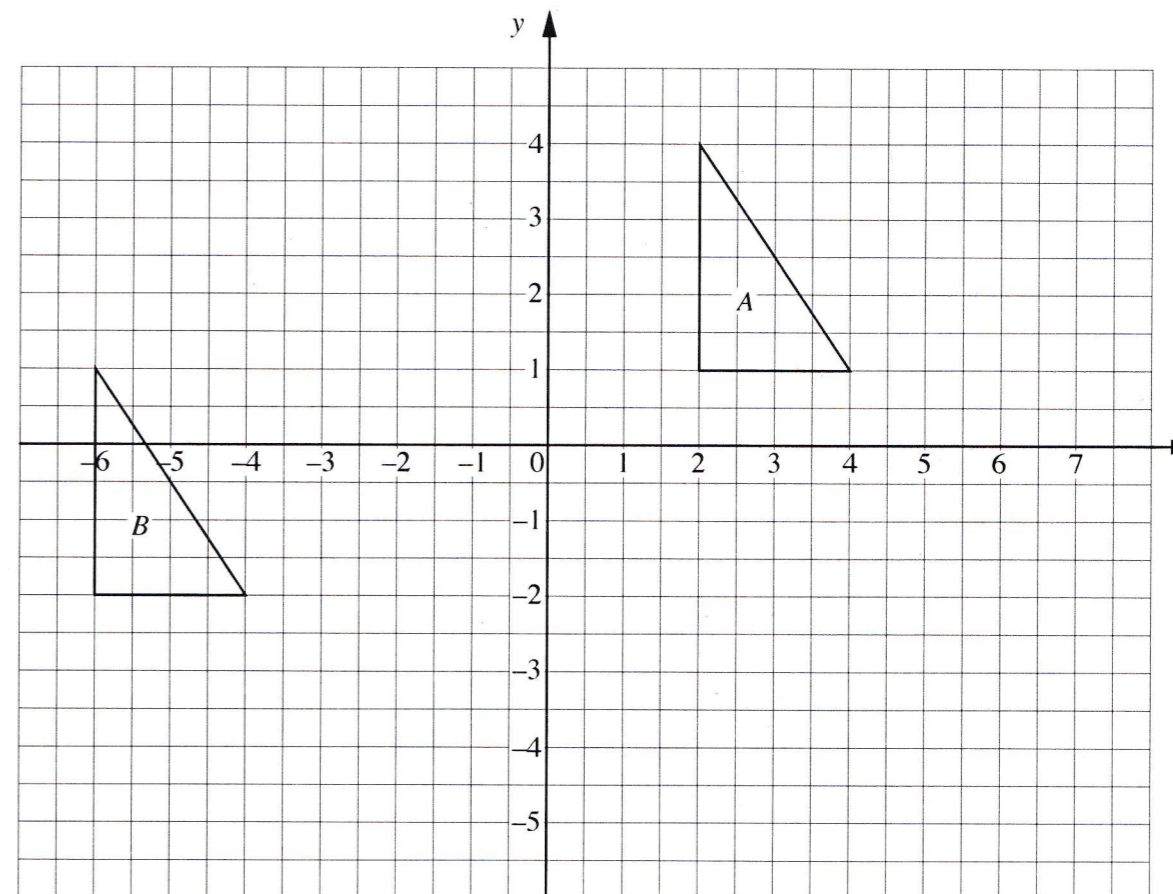
Answer (c) $x = \dots\dots\dots$, or $x = \dots\dots\dots$ [2]

(d) Write down the equation of the line of symmetry for the graph of $y = x^2 - 2x - 5$.

Answer (d)..... [1]

[Question 12 is printed on the next page.]

12 The diagram shows triangles A and B .



(a) Describe fully the transformation which maps triangle A onto triangle B .

Answer (a).....

..... [2]

(b) Triangle C is the image of triangle A under a reflection in the line $x = 3$.
Draw and label triangle C .

[2]

(c) Triangle D is the image of triangle A under a rotation of 90° clockwise about $(2, -2)$.
Draw and label triangle D .

[2]