



**MATHEMATICAL STUDIES  
STANDARD LEVEL  
PAPER 1**

Friday 8 November 2002 (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.
- 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 /120	TOTAL /120	TOTAL /120

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. Solutions found from a graphic display calculator should be supported by suitable working. For example, if graphs are used to find a solution, you should sketch these as part of your answer. Incorrect answers with no working will normally receive **no** marks.

1. Consider the numbers 5, 0.5,  $\sqrt{5}$  and  $-5$ . Complete the table below, showing which of the number sets,  $\mathbb{N}$ ,  $\mathbb{R}$  and  $\mathbb{Q}$  these numbers belong to.

*Working:*

*Answers:*

	$\mathbb{N}$	$\mathbb{R}$	$\mathbb{Q}$
5			✓
0.5	✗		
$\sqrt{5}$	✗		
$-5$		✓	

2. A poll was taken of the leisure time activities of 90 students.

60 students watch TV ( $T$ ), 60 students read ( $R$ ), 70 students go to the cinema ( $C$ ).

26 students watch TV, read **and** go to the cinema.

20 students watch TV and go to the cinema only.

18 students read and go to the cinema only.

10 students read and watch TV only.

(a) Draw a Venn diagram to illustrate the above information.

(b) Calculate how many students

(i) only watch TV;

(ii) only go to the cinema.

*Diagram:*

*Working:*

*Answers:*

(b) (i) \_\_\_\_\_

(ii) \_\_\_\_\_

3. The diagram below shows a part of the graph of  $y = a^x$ . The graph crosses the  $y$ -axis at the point P. The point Q (4, 16) is on the graph.

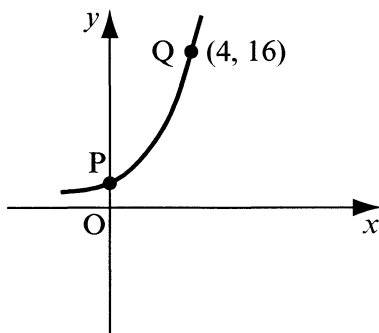


diagram not  
to scale

Find

- (a) the coordinates of the point P ;
- (b) the value of  $a$  .

*Working:*

*Answers:*

- (a) \_\_\_\_\_
- (b) \_\_\_\_\_

4. Consider the following statements.

$p$ : students work hard  
 $q$ : students will succeed

(a) Write the following proposition in symbols using  $p$ ,  $q$  and logical connectives only.

*If students do not work hard, then they will not succeed.*

(b) Complete the following truth table, relating to the statement made in part (a), and decide whether the statement is logically valid.

$p$	$q$			
T	T			
T	F			
F	T			
F	F			

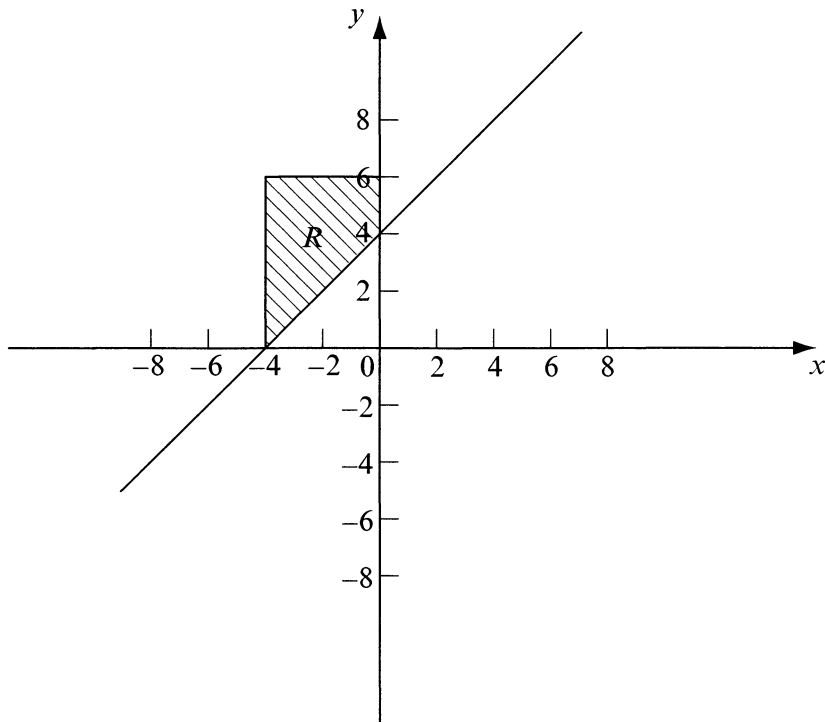
*Working:*

*Answers:*

(a) \_\_\_\_\_

(b) \_\_\_\_\_

5. The diagram below shows a shaded region  $R$ .



Write down the four inequalities which define the shaded region.

*Working:*

*Answers:*

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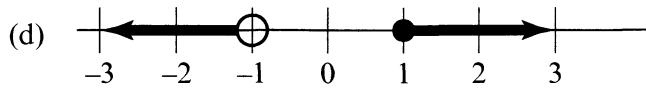
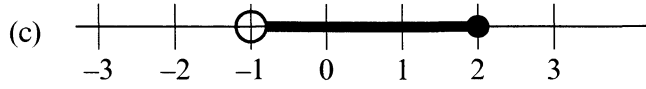
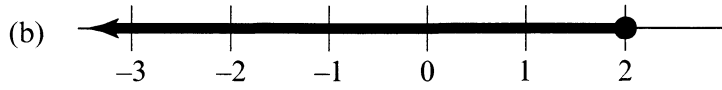
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6. Heinrich rolls two 6-sided dice at the same time. One die has three red sides and three black sides. The other die has the sides numbered from 1 to 6. By means of a tree diagram, table of outcomes or otherwise, answer each of the following questions.
- (a) How many different possible combinations can he roll?
  - (b) What is the probability that he will roll a red and an even number?
  - (c) What is the probability that he will roll a red or black and a 5?
  - (d) What is the probability that he will roll a number less than 3?

<p><i>Working:</i></p>	<p><i>Answers:</i></p> <p>(a) _____</p> <p>(b) _____</p> <p>(c) _____</p> <p>(d) _____</p>
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7. The diagrams below represent inequalities in  $x$ .



Write down the inequality represented in each diagram.

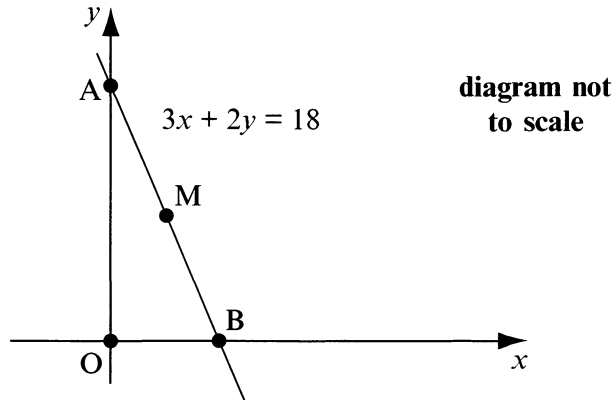
*Working:*

*Answers:*

- (a) \_\_\_\_\_
- (b) \_\_\_\_\_
- (c) \_\_\_\_\_
- (d) \_\_\_\_\_



8. The diagram below shows the line with equation  $3x + 2y = 18$ . The points A and B are the  $y$  and  $x$ -intercepts respectively. M is the midpoint of [AB].



Find the coordinates of

- (a) the point A ;
- (b) the point B ;
- (c) the point M .

*Working:*

*Answers:*

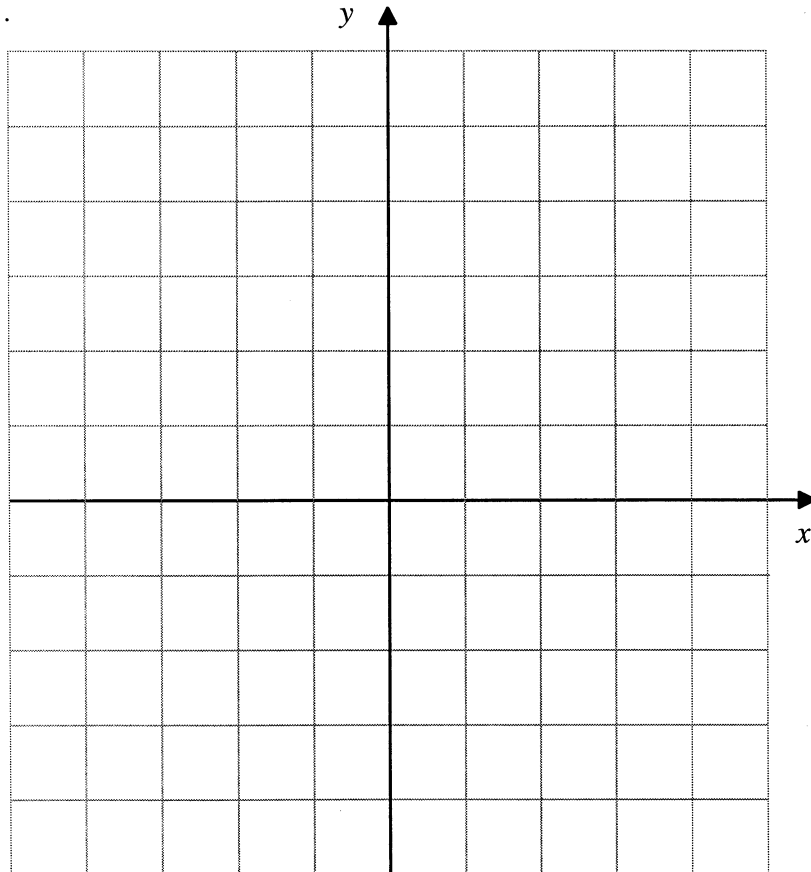
- (a) \_\_\_\_\_
- (b) \_\_\_\_\_
- (c) \_\_\_\_\_

9. Let  $m = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$  and  $n = \begin{pmatrix} -1 \\ 5 \end{pmatrix}$ .

(a) On the grid below, draw and label the vectors

(i)  $n$ ;

(ii)  $3m$ .



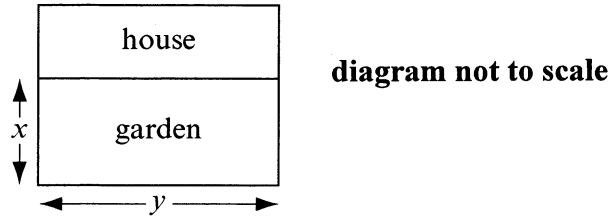
(b) Write the vector  $n + 3m$  as a column vector.

*Working:*

*Answer:*

(b) \_\_\_\_\_

10. Mrs Harvey wants to put a 50 m long fence around her rectangular garden. She only needs to fence in 3 sides because the other side is alongside her house.



The width of the garden is denoted by  $x$ , and the length by  $y$ .

- (a) Write an expression for  $y$  in terms of  $x$ .
- (b) Write an expression for the area,  $A$ , of the garden, in terms of  $x$ .
- (c) If the area is  $200 \text{ m}^2$ , find the dimensions of the garden.

*Working:*

*Answers:*

- (a) \_\_\_\_\_
- (b) \_\_\_\_\_
- (c) \_\_\_\_\_

11. Keisha had 10 000 USD to invest. She invested  $m$  USD at the *Midland Bank*, which gave her 8 % annual interest. She invested  $f$  USD at the *First National Bank*, which gave 6 % annual interest. She received a total of 640 USD in interest at the end of the year.
- (a) Write two equations that represent this information.
  - (b) Find the amount of money Keisha invested at each bank.

<p><i>Working:</i></p>	
	<p><i>Answers:</i></p> <p>(a) _____</p> <p>(b) _____</p>

12. Frederick had to change British pounds (GBP) into Swiss francs (CHF) in a bank. The exchange rate is 1 GBP = 2.5 CHF. There is also a bank charge of 3 GBP for each transaction.
- (a) How many Swiss francs would Frederick buy with 133 GBP?
  - (b) Let  $s$  be the number of Swiss francs received in exchange for  $b$  GBP. Express  $s$  in terms of  $b$ .
  - (c) Frederick received 430 CHF. How many British pounds did he exchange?

*Working:*

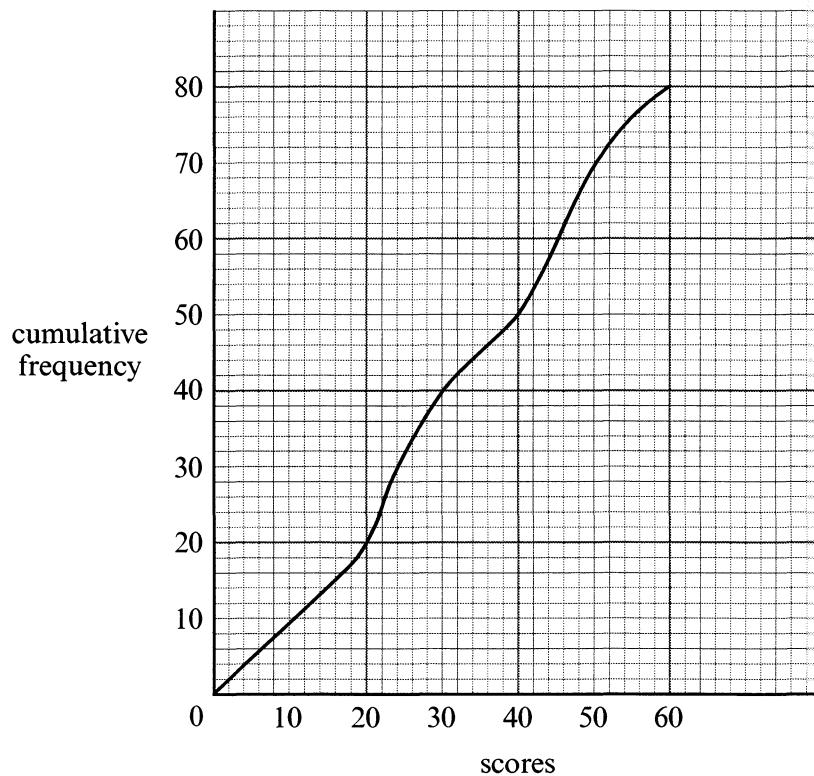
*Answers:*

(a) \_\_\_\_\_

(b) \_\_\_\_\_

(c) \_\_\_\_\_

13. The cumulative frequency graph below shows the examination scores of 80 students.

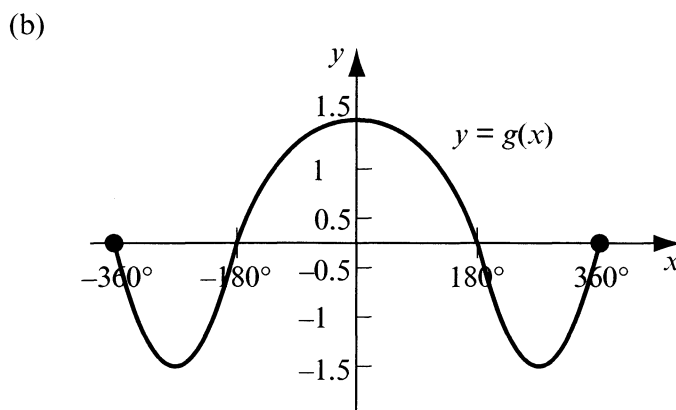
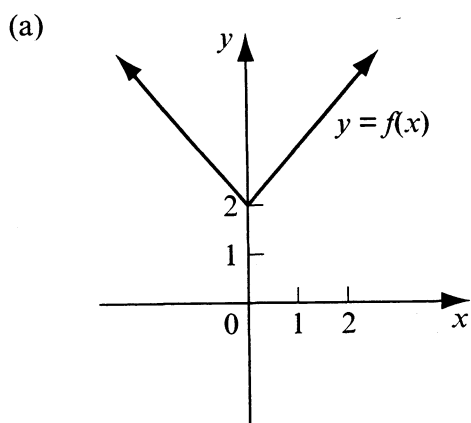


From the graph find

- (a) the median value;
- (b) the interquartile range;
- (c) the 35<sup>th</sup> percentile;
- (d) the percentage of students who scored 50 or above on this examination.

<p><i>Working:</i></p>	<p><i>Answers:</i></p>
	(a) _____
	(b) _____
	(c) _____
	(d) _____

14. The diagrams below show the graphs of two functions,  $y = f(x)$ , and  $y = g(x)$ .



State the domain and range of

(a) the function  $f$ ;

(b) the function  $g$ .

*Working:*

*Answers:*

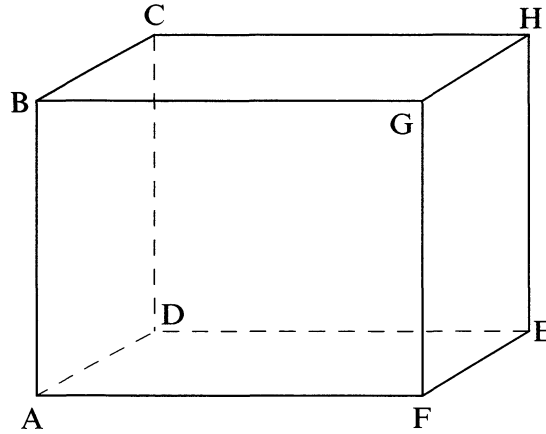
(a) Domain of  $f$  \_\_\_\_\_

Range of  $f$  \_\_\_\_\_

(b) Domain of  $g$  \_\_\_\_\_

Range of  $g$  \_\_\_\_\_

15. The following diagram shows the rectangular prism ABCDEFGH. The length is 5 cm, the width is 1 cm, and the height is 4 cm.



**diagram not  
to scale**

- (a) Find the length of [DF].  
(b) Find the length of [CF].

*Working:*

*Answers:*

- (a) \_\_\_\_\_  
(b) \_\_\_\_\_