

# JUNIOR LYCEUMS FINAL EXAMINATIONS - 2000

Educational Assessment Unit - Education Division

**FORM 5**

**MATHEMATICS (MENTAL)**


**TIME: 15 minutes**

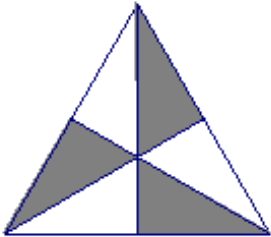
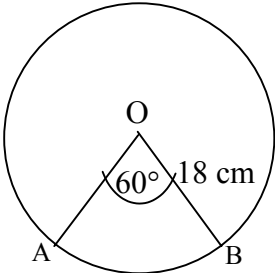
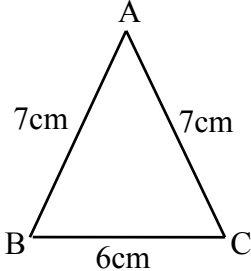
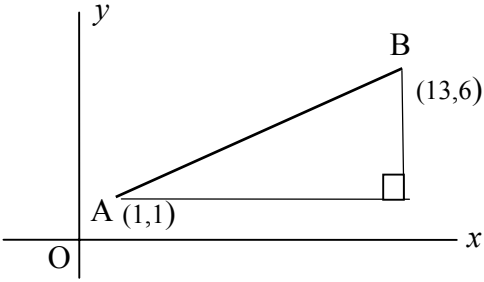
Name \_\_\_\_\_

Class \_\_\_\_\_

Mark
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- **ANSWER ALL QUESTIONS.**
- **EACH QUESTION CARRIES 1 MARK.**
- **CALCULATORS, RULERS, PROTRACTORS AND OTHER MATHEMATICAL INSTRUMENTS ARE NOT ALLOWED.**
- **IT IS NOT NECESSARY TO SHOW YOUR WORKING. HOWEVER SPACE FOR WORKING IS PROVIDED IF YOU NEED IT.**

	QUESTION	ANSWER	Space for working if required
1.	The price of a beach chair increases from Lm9.00 to Lm13.50. What is the percentage increase?	_____	
2.	Which one of the following is the <b>reciprocal</b> of 0.25?  A) 25      B) $\frac{1}{4}$ C) 4      D) 0.4	_____	
3.	<b>p</b> and <b>q</b> are vectors, where $\mathbf{p} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ and $\mathbf{q} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ .  Write down the <b>magnitude</b> of the vector <b>p + q</b> .	_____	
4.	The diagonals of the kite are 14 cm and 22 cm. What is the area of the kite?  	_____	

5.	$7056 = 2^4 \times 3^2 \times 7^2$ . Write down the square root of 7056 as an integer.	_____	
6.	Write down the order of rotational symmetry of the shape shown.	 _____	
7.	In the diagram, O is the centre of a circle of radius 18 cm.  Which one of the following is the length of the minor arc AB ?  A) $36\pi$ cm    B) $4\pi$ cm    C) $6\pi$ cm    D) $9\pi$ cm	 _____	
8.	 Write down the cosine of angle B as a fraction.	_____	
9.	 Write down the gradient of AB.	_____	
10.	$\begin{pmatrix} 2 & 4 \\ 3 & 7 \end{pmatrix} \begin{pmatrix} -2 & 0 \\ 4 & 3 \end{pmatrix} = \begin{pmatrix} 12 & 12 \\ p & 21 \end{pmatrix}$ Write down the value of p.	_____	

# JUNIOR LYCEUMS FINAL EXAMINATIONS 2000

Educational Assessment Unit - Education Division

**FORM 5**

**MATHEMATICS (Main Paper)**

**TIME: 1 h 45 min**

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total Main	Mental	Global Mark
Mark																		

**DO NOT WRITE ABOVE THIS LINE**

Name \_\_\_\_\_

Class \_\_\_\_\_

**CALCULATORS ARE ALLOWED BUT ALL NECESSARY WORKING  
MUST BE SHOWN**

**ANSWER ALL QUESTIONS.**

1. a) Evaluate  $\frac{6.08 \times (9.72)^2}{581 + 237}$ , giving your answer correct to three significant figures.

b) Round each number in the above calculation to one significant figure to obtain an estimate of its value, **as a fraction in its lowest terms**.

\_\_\_\_\_ (4 marks)

2. David sold his car for Lm2940 making a profit of 20% on the price he paid for it. How much did David pay for the car?

\_\_\_\_\_ (4 marks)

3. a) Rearrange the formula  $tp + up - t = 0$  to express  $p$  in terms of  $u$  and  $t$ .

b) Evaluate  $\frac{p + q^2}{p^2 - q}$ , when  $p = 2$  and  $q = -3$ .

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(4 marks)

4. This is a sequence of pairs of numbers :

(1, 5), (2, 7), (3, 9), (4, 11), ...

a) Write down the next pair in the sequence.

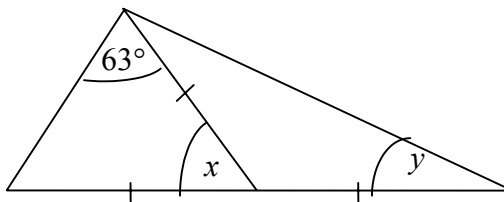
b) Find the tenth pair in the sequence.

c) Find the  $n^{\text{th}}$  pair in the sequence in terms of  $n$ .

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(4 marks)

5. a) Work out the values of  $x$  and  $y$ .



b) Factorise  $2x^3 - 50x$  completely.

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(4 marks)

6. a) i) Which one of the combinations below will give a **rational** number when  $x^2y$  is calculated?

A)  $x = \sqrt{\pi}$ ,  $y = 2$ ;    B)  $x = \sqrt{3}$ ,  $y = 4$ ;    C)  $x = \sqrt{3}$ ,  $y = \pi$ ;    D)  $x = 4$ ,  $y = \sqrt{7}$

ii) Which one of the combinations below will give an **irrational** number when  $2x + y$  is calculated?

A)  $x = -\sqrt{3}$ ,  $y = 2\sqrt{3} + 4$

B)  $x = -\pi$ ,  $y = 2\pi + 7$

C)  $x = 2\sqrt{3}$ ,  $y = -\sqrt{3} + 4$

D)  $x = -2\sqrt{7}$ ,  $y = 4\sqrt{7} + 6$

b) A school organised a barbecue for adults and students, as a fund raising activity. The total number of people who attended the activity was 170.

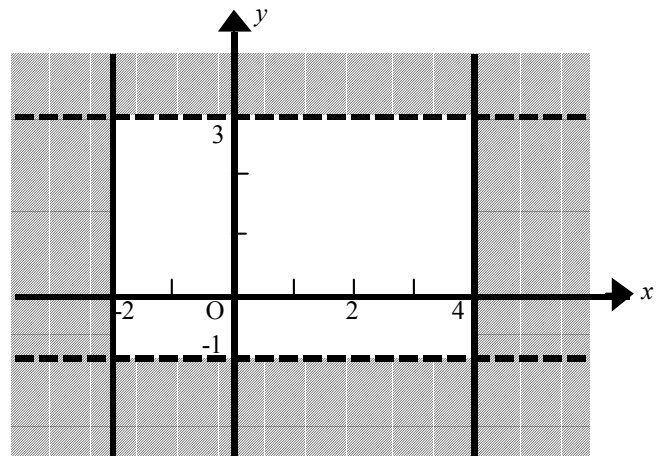
i) The number of adults who were present for the activity was  $x$ . Write down in terms of  $x$  the number of students who attended.

ii) The adults paid Lm3 each, while the students paid Lm2 each. The total sum of money collected was Lm460. Use this information to form an equation in  $x$  and solve it to find the number of adults who attended.

(6 marks)

7. a) Work out the values of  $x$  that satisfy the inequality  $2x + 1 < 19$ , where  $x$  is a **positive prime number**.

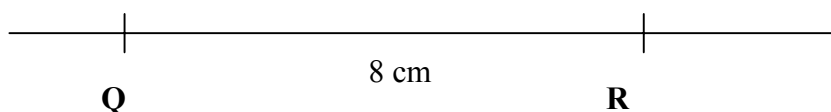
b) The **unshaded** region shown in this diagram can be described by two inequalities, one of which is  $-2 \leq x \leq 4$ . Write down the other inequality.



(6 marks)

8 Use ruler and compasses only in this construction. All construction lines and arcs must be clearly shown.

- a) Construct the triangle PQR in which PQ = 8.5 cm, QR = 8 cm and RP = 5 cm.
- b) Construct the perpendicular bisector of PR.
- c) Construct the locus of points equidistant from PQ and PR and let the locus intersect the perpendicular bisector of PR at Y. Measure and write down the length of PY.




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(6 marks)

9. The time taken by an athlete to run a 100-metre race is recorded by a stopwatch as 12.7 seconds, measured to the nearest one tenth of a second.

- a) Complete the following inequality to show the greatest and least possible times for the athlete, in seconds.

$$\underline{\hspace{2cm}} \text{ s} \leq \text{Time} < \underline{\hspace{2cm}} \text{ s}$$

- b) The length of the 100-metre track is measured correct to the nearest one tenth of a metre. Complete the following inequality to show the greatest and least possible lengths of the track, in metres.

$$\underline{\hspace{2cm}} \text{ m} \leq \text{Length} < \underline{\hspace{2cm}} \text{ m}$$

- c) What is the upper bound for the average speed for the athlete with a time of 12.7 seconds in the 100-metre race? Give your answer in m/s correct to two significant figures.

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(6 marks)

10. While doing underwater tests in one part of an ocean a team of scientists noticed that the temperature,  $t$ , in  $^{\circ}\text{C}$  was inversely proportional to the depth,  $d$ , in kilometres.

- a) Write down an **equation** connecting the variables  $t$  and  $d$ . (Use  $k$  for the constant of proportion).
- b) When the temperature was  $5^{\circ}\text{C}$ , the scientists were at a depth of 4 km.
- i) What would have been the temperature at a depth of 8 km?
- ii) To what depth would they have had to go to find a temperature of  $2^{\circ}\text{C}$ ?

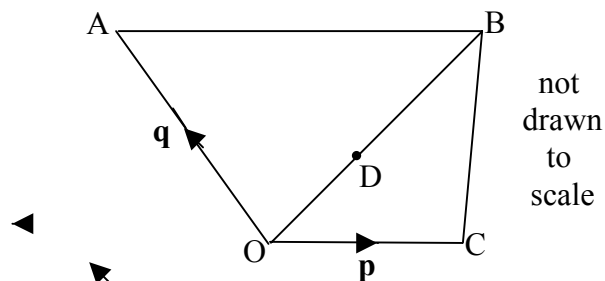
(6 marks)

In the diagram  $OC = \mathbf{p}$ ,  $OA = \mathbf{q}$ ,  $OD = \frac{1}{3} OB$   
 $\overrightarrow{AB} = 2 \overrightarrow{OC}$ .

11.

a) Write down in terms of  $\mathbf{p}$  and  $\mathbf{q}$ :

- i)  $\overrightarrow{AB}$ ,    ii)  $\overrightarrow{OB}$ ,    iii)  $\overrightarrow{AD}$ ,    iv)  $\overrightarrow{DC}$ .
- —                                    —



b) Use your results to write down the ratio  $AD : DC$ .

c) What conclusion can be drawn about the points A, D and C?

(8 marks)

12. In the diagram the vertices A, B and C of triangle ABC are  $(2, 6)$ ,  $(2, 2)$  and  $(4, 2)$  respectively.

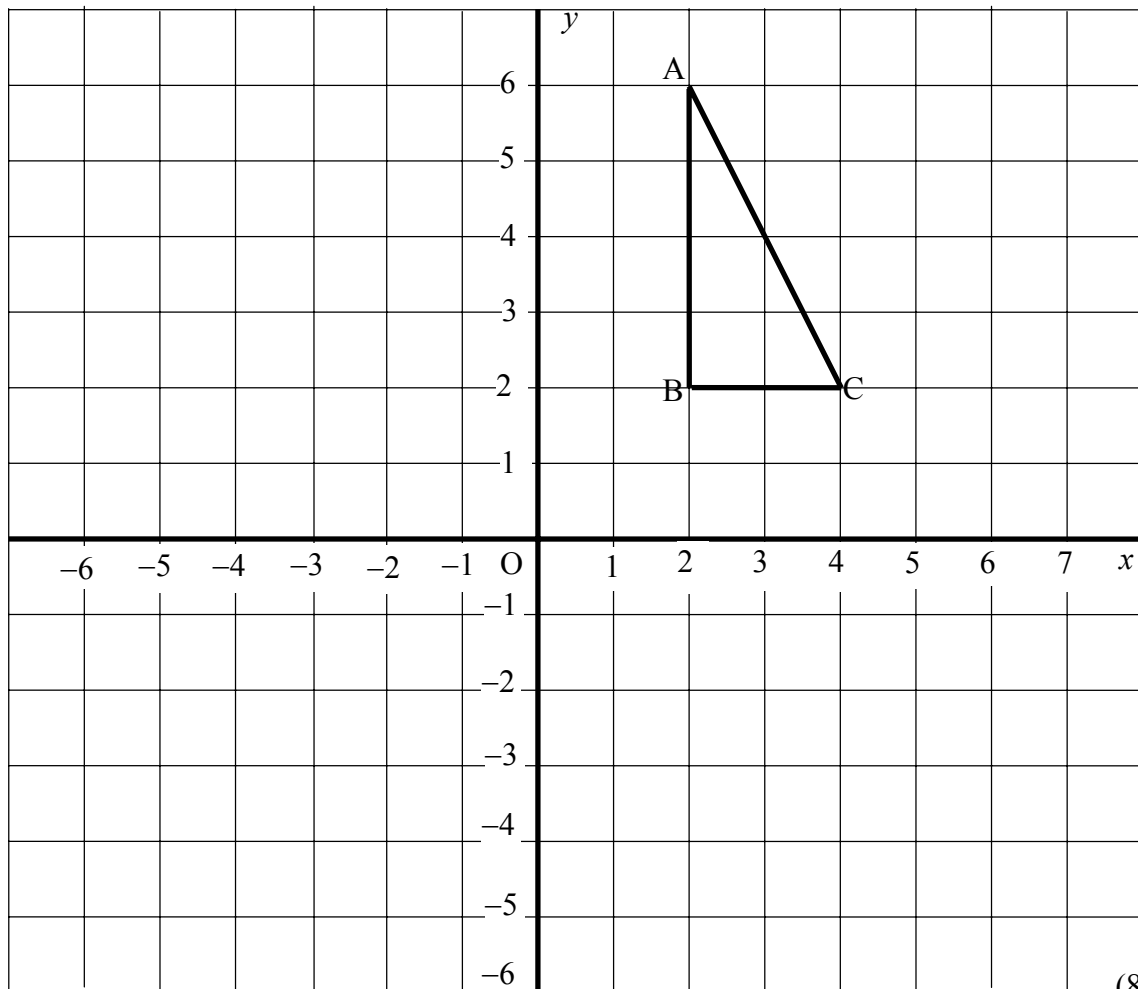
a) Triangle ABC is mapped to triangle A'B'C' by a transformation given by the matrix

$\mathbf{K} = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ . On the diagram draw triangle A'B'C' and describe the transformation given by the matrix  $\mathbf{K}$ .

b) Triangle A'B'C' is mapped to triangle A''B''C'' by a transformation given by the matrix

$\mathbf{M} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ . On the diagram draw triangle A''B''C'' and describe the transformation given by the matrix  $\mathbf{M}$ .

c) Describe the transformation which maps triangle ABC onto triangle A''B''C'' and determine its matrix.



(8 marks)



13. On my way to work, I pass two sets of traffic lights.  
 The probability that the first set is green is  $\frac{3}{4}$ .

If the first set is green, the probability that  
 the second set is green is  $\frac{2}{3}$ .

If the first set is not green, the probability that  
 the second set is green is  $\frac{3}{5}$

a) Fill in the missing probabilities on the tree diagram.

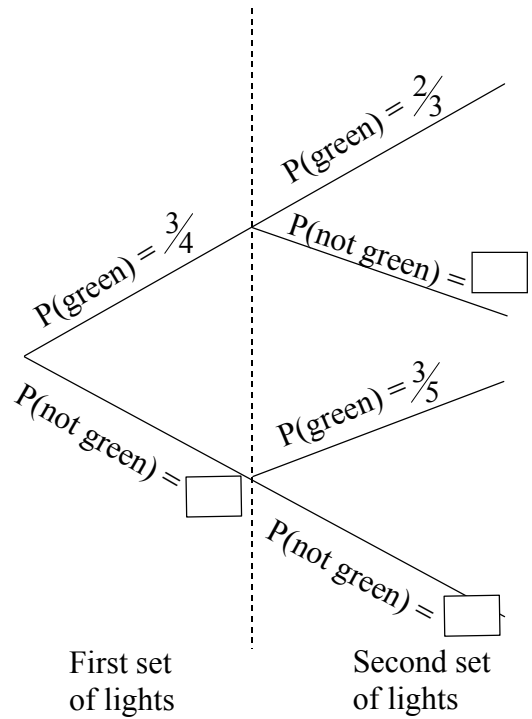
b) What is the probability that:

i) both are green

ii) none is green

iii) exactly one is green

iv) at least one is green?



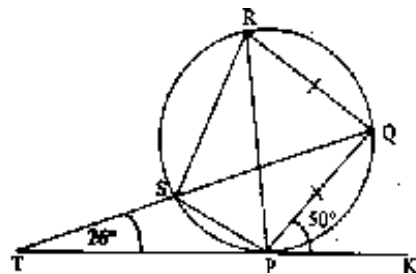
(8 marks)

14. TPK is a tangent to the circle PQRS.  
 TSQ is a straight line.  $PQ = QR$ .

Work out, giving reasons for your  
 answers, the size of:

i) angle PRS

ii) angle PQR.



(8 marks)

15. The diagram shows the graph of the quadratic curve given by the equation  $y = x^2 + 4x + c$ .

a) i) From the graph what is the value of  $y$  when  $x = 0$ ?

ii) Use this information to work out the value of  $c$ .

b) i) On the diagram draw the line of symmetry for this curve.

ii) Write down the equation of this line.

c) i) Complete the table for  $y = x - 1$  for the given values of  $x$ .

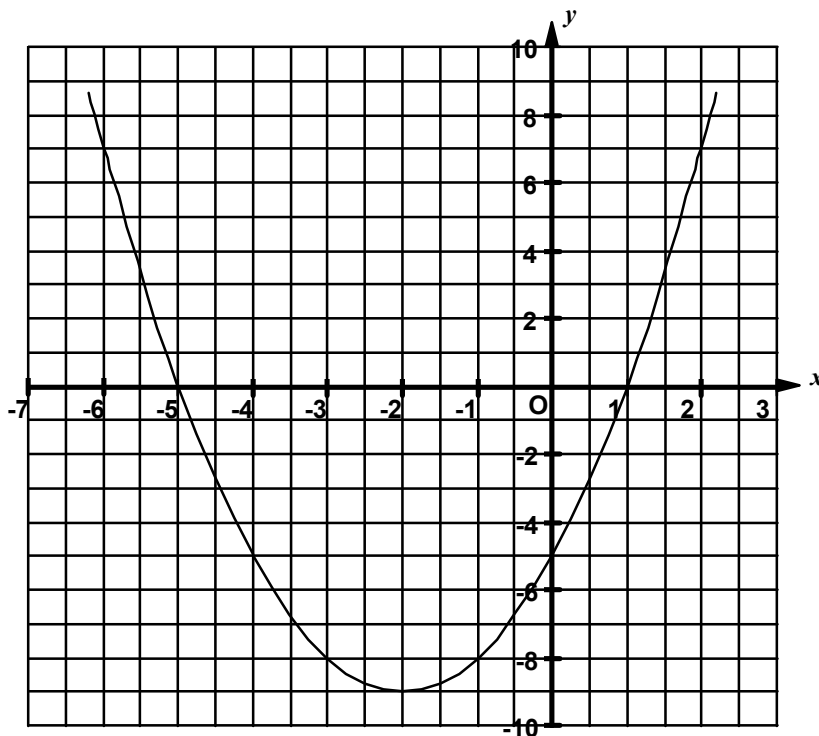
$x$	-6	-2	2
$x$	-6		2
-1	-1		-1
$y$	-7		1

ii) On the diagram draw the graph of  $y = x - 1$ .

d) Write down:

i) the values of  $x$  at the points of intersection of the two graphs.

ii) the equation for which these values are the roots.



(8 marks)

