# JUNIOR LYCEUMS ANNUAL EXAMINATIONS - 2002 

Educational Assessment Unit - Education Division.
FORM 5 MATHEMATICS (Non Calculator Paper) TIME: 20 min.

Name $\qquad$ Class $\qquad$
Mark

ANSWER ALL QUESTIONS. THERE ARE 20 QUESTIONS TO ANSWER.
EACH QUESTION CARRIES 1 MARK.
CALCULATORS, RULERS, PROTRACTORS AND OTHER MATHEMATICAL INSTRUMENTS ARE NOT ALLOWED.

ON YOUR DESK YOU SHOULD HAVE NOTHING EXCEPT FOR PEN, PENCIL AND EXAMINATION PAPER.

TO ANSWER QUESTIONS INVOLVING NUMERICAL CALCULATIONS YOU ARE ADVISED TO CHOOSE AND USE THE MORE EFFICIENT TECHNIQUES (MENTAL OR PENCIL-AND-PAPER).

YOU ARE NOT REQUIRED TO SHOW YOUR WORKING. HOWEVER SPACE FOR WORKING IS PROVIDED IF YOU NEED IT.

## DONOT

WRITE

CN

## THIS

SPACE

| No. | QUESTION | SPACE FOR WORKING (IF REQUIRED) |
| :---: | :---: | :---: |
| 1. | Write down the next prime number after 23. |  |
| 2. | Write $60 \%$ as a fraction in its lowest terms. <br> Ans: |  |
| 3. | Through how many degrees does the minute hand of a clock turn in 20 minutes? <br> Ans: |  |
| 4. | $3 y$ means <br> (A) $3+y$ <br> (B) $y \times y \times y$ <br> (C) $y+y+y$ <br> (D) $3 \div y$. <br> Ans: |  |
| 5. | What is the probability of picking at random the letter C from the word CALCULATOR? <br> Ans: |  |
| 6. | In triangle $\mathrm{XYZ}, \tan \mathrm{Z}$ is : <br> (A) $\frac{5}{13}$ <br> (B) $\frac{12}{13}$ <br> (C) $\frac{5}{12}$ <br> (D) $\frac{12}{5}$. Ans: $\qquad$ |  |
| 7. | $17.75 \times 8.4=149 \cdot 1$ <br> Ans: $\qquad$ |  |


| No. | QUESTION | SPACE FOR WORKING <br> (IF REQUIRED) |
| :---: | :---: | :---: |
| 8. | The turtle is at the position shown. Make a sketch of what the turtle draws when given these LOGO commands. <br> LT 90 FD 40 RT 90 FD 80 |  |
| 9. | $32 \%$ of the children in a primary school are boys. <br> What percentage are girls? |  |
| 10. | Lm1 $=2.4599$ Euros. An estimate for Lm1990 in Euros is: <br> (A) 800 <br> (B) 5000 <br> (C) 500 <br> (D) 50000 . <br> Ans: |  |
| 11. | $2 \frac{2}{7}$ means: <br> (A) $2 \times \frac{2}{7}$ <br> (B) $\frac{22}{7}$ <br> (C) $2 \div \frac{2}{7}$ <br> (D) $2+\frac{2}{7} . \quad$ Ans: $\qquad$ |  |
| 12. | $5^{-2}$ is equivalent to: <br> (A) 25 <br> (B) 10 <br> (C) $\frac{1}{25}$ <br> (D) $\frac{1}{52}$. <br> Ans: |  |
| 13. | A table and 6 chairs together cost Lm120. A table and 4 chairs together cost Lm 90. What is the cost of a chair? <br> Ans: |  |
| 14. | What is the size of angle $x$ ? |  |


| No. | QUESTION | SPACE FOR WORKING (IF REQUIRED) |
| :---: | :---: | :---: |
| 15. | On a spreadsheet: <br> the number in cell $\mathbf{B 2}$ is 200 <br> the number in cell B3 is 57. <br> In cell $\mathbf{B 4}$ there is the formula $=(\mathbf{B 2}-\mathbf{B 3}) * \mathbf{5}$ <br> What value is obtained in cell B4? <br> Ans: $\qquad$ |  |
| 16. | $\sqrt{225}=15$. What is the value of $\sqrt{2 \cdot 25} ? \quad$ Ans: |  |
| 17. | Use this function machine to obtain the value of $y$ when $x=-10$. <br> Ans: |  |
| 18. | ABCD is a cyclic quadrilateral. Write down the size of $\angle B A D$. <br> Ans: $\qquad$ |  |
| 19. | Write down an estimate for $(29.65+9.85)^{2}$. Ans: |  |
| 20. | The equation for this straight line graph is: <br> (A) $y=x$ <br> (B) $y=x+1$ <br> (C) $y=x-1$ <br> (D) $y=-x-1$. <br> Ans: $\qquad$ |  |


| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | Total <br> Main | Non Calculator | Global <br> Mark |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Mark |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Name $\qquad$ Class $\qquad$

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

## ANSWER ALL QUESTIONS.

1. a) Work out:
(i) $7.955+3.25 \times 5.86$
(ii) $2 \frac{1}{4} \times 3 \frac{1}{3} \div 2 \frac{1}{2}$
b) Write the answers to parts (i) and (ii)
as a ratio in the form $n: 1$.

(Give your answers correct to one decimal place).
2. a) One litre of petrol costs 36 cents. Last week I spent Lm10.00 on petrol. How many litres of petrol did I buy last week?
b) My car travelled 280 km on Lm10.00 of petrol. How many kilometres did my car travel on 1 litre?
c) Part of a spreadsheet, which I use to keep a record of how many kilometres my car travels on 1 litre of petrol, is shown below.

Formula


What will the number in cell $\mathbf{B 4}$ be if the number in cell $\mathbf{B 3}$ is changed to 310 ?
3. a) Work out the interest on Lm650 at $3.5 \%$ per annum after one year.
b) A sum of money was invested in a bank at a rate of $5.5 \%$ per annum. After one year it gave an interest of Lm41.25. Calculate the value of the sum that was invested.
4. a) Write each number correct to one significant figure and work out an estimate for P .

$$
\mathrm{P}=\left[\frac{49.75 \times 31.6}{41.28+9.75}\right]^{2}
$$

b) Use your calculator to work out the value of P giving your answer:
(i) correct to 2 decimal places.
(ii) in standard form correct to 3 significant figures.
(iii) correct to the nearest 10 . $\qquad$
5. a) Solve the equation $3(x-5)=x+5$.


Work out :
(i) the value of $x$.
(ii) the size of each angle of the triangle.
6. a) The equilateral triangle ABC was drawn by using a set of LOGO commands. The drawing started at A and the turtle faced the direction shown. The turtle travelled a total of 450 turtle steps.
$\mathrm{JL} /$ forffimplatefe the following LOGO commands used to draw triangle ABC:
b) The radius of a circle is given as 5.0 cm correct to one decimal place. Complete the following inequalities which give the upper and lower bounds for:
(i) the radius, $r$, of the circle. $\qquad$ $\leq r<$ $\qquad$
(ii) the area, $A$, of the circle ( to two decimal places). $\qquad$
7. For the function $\mathrm{f}(x)=2 x-1$, work out:
a) $f(3)$
b) the range of values of $x$ for which $\mathrm{f}(x)>3$
c) $\mathrm{f}^{-1}(x)$
8. When a beam is carrying a given load at its midpoint the amount of sag, $s \mathrm{~cm}$, is proportional to the cube of its length, $L \mathrm{~m}$.
a) Write down a formula for $s$ in terms of $L$. (Use $k$ for the constant of proportion).

b) The amount of sag is 2.4 cm for a beam of length 4 m . What is the amount of sag for a beam of length 6 m ?
c) For another beam the amount of sag under the same load is 0.3 cm . What is the length of the beam?



Figure B

Figure A shows a flight of steps whose vertical height is 40 cm and a ramp for wheelchair users constructed alongside the steps. Figure B shows the elevation of the ramp when viewed in the direction of the arrow.
A good ramp for people with a physical disability should be such that the ratio vertical height of ramp, YZ : length of ramp, XY is $\mathbf{1 : 1 6}$
a) Use this ratio to work out the length of the ramp XY, in centimetres.
b) Work out to the nearest degree the angle, $x$, that the ramp makes with the horizontal.
c) On Figure B sketch the locus of the point H (the head) when the wheelchair is pushed up the ramp in a straight line.
d) Write down one change you would make to the ramp to make it easier for a person with a wheelchair to use the ramp.
10. APB is a tangent at P to the circle PQRST .

Angle $\mathrm{PQR}=130^{\circ}$ and angle $\mathrm{PXR}=110^{\circ}$. Work out, giving reasons, the value of the following angles:
a) $\angle \mathrm{PSR}$
b) $\angle \mathrm{TRS}$
c) $\angle \mathrm{TPS}$

d) $\angle \mathrm{APR}$

## 11. Bag $X$ contains $\mathbf{3}$ red balls and $\mathbf{3}$ blue balls. Bag $Y$ contains $\mathbf{1}$ red ball and $\mathbf{3}$ blue balls.


a) Andrew picks a ball at random from bag X . What is the probability that the ball is red?
b) Andrew replaces the ball in bag X.

He now picks one ball at random from bag $X$ and another ball at random from bag $Y$.
What is the probability that both balls are red?
c) Andrew replaces the first ball in bag X and the second ball in bag Y .

He now picks a ball at random from bag X and places it in Bag Y , without noting the colour. He then picks a ball at random from bag Y.
(i) Complete the following tree diagram.

(ii) What is the probability that the ball Andrew picks from bag Y is red?
12. The graph of $y=x^{3}+2$ is given below.
a) Complete the table of values for $y=6-x$. Draw, on the same axes, the graph of $y=6-x$.

| $x$ | -2 | 0 | 2 |
| :---: | :---: | :---: | :---: |
| 6 | 6 | 6 | 6 |
| $-x$ | 2 | 0 |  |
| $y$ |  | 6 |  |

b) Write down an estimate, correct to one decimal place, for the value of $x$ at the point of intersection of the two graphs.

c) The value of $x$ at the point of intersection of the two graphs is the solution to a cubic equation. Show that this equation is $x^{3}+x=4$.
d) In this part of the question use your answer to b).

Use trial and improvement to work out, correct to two decimal places, an estimate for the value of $x$ for which $x^{3}+x=4$.
13. A group of 60 students were asked to solve a puzzle. The time taken, $t$ minutes, was recorded for each student. The results are shown in the table below.

| Time <br> $(t$ minutes $)$ | $0<t \leq 1$ | $1<t \leq 2$ | $2<t \leq 3$ | $3<t \leq 4$ | $4<t \leq 5$ | $5<t \leq 6$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Number of <br> students | 4 | 6 | 15 | 18 | 11 | 6 |

a) Complete the following cumulative frequency table.

| Time <br> $(t$ minutes $)$ | $t \leq 1$ | $t \leq 2$ | $t \leq 3$ | $t \leq 4$ | $t \leq 5$ | $t \leq 6$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Number of <br> students | 4 | 10 | 25 |  |  | 60 |

continued on page 8.......
.......continued from page 7
b) Use the data in the cumulative frequency table to draw a cumulative frequency curve on the grid below.


c) Use your curve to estimate:
(i) the median time taken.
(ii) how many students took longer than 4.5 minutes to solve the puzzle. $\qquad$
(iii) the inter-quartile range.
d) Use the time line shown below the grid to draw a box plot to illustrate the distribution.
(11 marks)

