

Wednesday 15th February 1989 7.15 - 8.45

SECTION A. Circle the appropriate letter on the ANSWER SHEET. Do not write on THIS SHEET.

MARKS

1. When the radius of a circle is increased by 100%, the area is increased by
A. 100% B. 200% C. 300% D. 400% N. none of these. 5
2. The area of the largest triangle which can be inscribed in a semi-circle of radius r is
A. r^2 B. r^3 C. $2r^2$ D. $2r^3$ N. none of these. 5
3. Given that $(x^2 - 3x + 2)(x^2 - 4x) = 0$ the values of x are
A. 4 B. 0 and 4 C. 1 and 2 D. 0, 1, 2 and 4 N. none of these. 5
4. If m men can do a job in d days, then $m+r$ men can do the same job in
A. $d+r$ B. $d-r$ C. $md/(m+r)$ D. $d/(m+r)$ days N. none of these. 5
5. A cuboid has faces of areas 12 cm^2 , 8 cm^2 and 6 cm^2 . Its volume is
A. 576 cm^3 B. 24 cm^3 C. 9 cm^3 D. 104 cm^3 N. none of these. 5
6. From a group of boys and girls, 15 girls leave. There are then left two boys for each girl. After this 45 boys leave. There are then 5 girls for each boy. The number of girls in the beginning was
A. 40 B. 43 C. 29 D. 50 N. none of these. 5
7. The least value of the function $ax^2 + bx + c$ where $a > 0$ is
A. $-b/a$ B. $-b/2a$ C. $b^2 - ac$ D. $b^2 - 4ac$ E. $(4ac - b^2)/4a$ N. none .. 5
8. The equation $x^{x^{x^{\dots}}} = 2$ is satisfied when x is equal to
A. infinity B. 2 C. $1/2$ D. $\sqrt{2}$ N. none of these. 5
9. The number of diagonals that can be drawn in a polygon of 100 sides is
A. 4850 B. 4950 C. 9900 D. 98 N. none of these. 5
10. In triangle ABC, $AB=12$, $AC=7$, $BC=10$. If sides AB and AC are doubled and BC remains the same, then the area is multiplied by
A. 2 B. 4 C. $2\sqrt{2}$ D. $2/\sqrt{2}$ N. none of these. 5
11. The medians of a right angled triangle which are drawn from the vertices of the acute angles are 5 and $\sqrt{40}$. The value of the hypotenuse is
A. 10 B. $2\sqrt{40}$ C. $\sqrt{13}$ D. $2\sqrt{13}$ N. none of these. 5
12. Two swimmers, at opposite ends of a 90 foot pool, start to swim the length of the pool, one at the rate of 3 feet per second, the other at 2 feet per second. They swim back and forth for 12 minutes. Allowing no loss of time at the turns, the number of times that they pass each other is
A. 24 B. 2 C. 20 D. 19 N. none of these. 5

TURN OVER

SECTION B (Put your answers on the ANSWER SHEET unless instructed otherwise)

- B1. At 12 o'clock the hands of a clock have 0° between them. Find the exact time when the hands are next inclined at 90° . 15
- B2. A litre bottle of whisky A, has a fraction p transferred to an empty second litre bottle B which is then filled with water and its contents mixed. Enough of the mixture is poured back into A to fill it. Find the amount of whisky now contained in A and establish its least value. 15
- B3. Eleven yellow balls and one red ball are in bag A and twelve yellow balls are in bag B. Eight balls are taken from bag A and placed in bag B. Now eight balls are taken from bag B and placed in bag A. Find the probability that the red ball is now in bag A. 15
- B4. (a) How are the following numbers arranged 0, 2, 3, 6, 7, 1, 9, 4, 5, 8. 5
 (b) Give the next four numbers in the series 12, 1, 1, 1, 2, 1, 3, 5
 (c) The letters of the alphabet can be grouped into four distinct classes. The first thirteen letters establish the categories.
 (i) A M (ii) B C D E K (iii) F G J L (iv) H I ...
 Place the remaining letters in their proper categories. 10
- B5. (a) In how many zeros does the product of the hundred integers from 1 to 99 end ? 5
 (b) How many of each of the ten digits 0,1,2,3,4,5,6,7,8,9 are needed in order to write out all of the integers from 1 to 100 000 000 inclusive ? 15
- B6. (a) Supply a different digit for each letter if $ABCDE \times 4 = EDCBA$ 10
 (b) Supply a different digit for each letter if $THREE + FOUR = SEVEN$ and THREE is divisible by 3 and FOUR is divisible by 4. 15
- B7. In an alleyway between two houses two ladders are leaning against the walls as shown. $AB = 8$ m, $CD = 10$ m. The ladders cross at a height 4 m above the ground. How far apart are the houses ? (Scale diagram not acceptable) 40
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- B8. Explain how to construct an equilateral triangle ABC given only that the lengths from a point P inside the triangle to the vertices A, B and C are 10 cm, 8 cm and 15 cm respectively. 40
- B9. Use the figures 1, 9, 8, 9 in this order and with any mathematical operations e.g. +, -, $\sqrt{\quad}$, (), \times , \div , to construct the whole numbers. e.g. $(1 - 9 + 8) \times 9 = 0$, $1^9 \times (-8 + 9) = 1$, $(1 + 9 + 8) \div 9 = 2$, (one mark for each from 3 onwards without any gaps)
- B10. Drawing the outline of a chessboard without going over any part of a line twice cannot be done in one continuous movement of a pencil. How many such movements are needed ? 10

THIS ANSWER SHEET COVERED WHILE YOU ARE WORKING OUT THE ANSWERS TO THE QUESTIONS

Your Name House Form

SECTION A

SECTION B

MARKS

1. A B C D N

2. A B C D N

3. A B C D N

4. A B C D N

5. A B C D N

6. A B C D N

7. A B C D N

8. A B C D N

9. A B C D N

10. A B C D N

11. A B C D N

12. A B C D N

B1. The time is (no decimals)

B2. In A the fraction of whisky =

Its least value is

B3. Probability =

B4. (a) The arrangement is

(b) The next four are

(c) (i) A M

(ii) B C D E K

(iii) F G J L

(iv) H I

B5. (a) Number of zeros =

(b) Number needed for

0= 1= 2=

3= 4= 5=

6= 7= 8=

9=

B6. (a) $\times 4 =$

(b) $+$ $=$

B7. The problem involves solving the equation

The distance apart =

Total Correct

Total Wrong

A Score =

B Score =

TOTAL =

TURN OVER

B9.

- | | | |
|-----|-----|-----|
| 3= | 4= | 5= |
| 6= | 7= | 8= |
| 9= | 10= | 11= |
| 12= | 13= | 14= |
| 15= | 16= | 17= |
| 18= | 19= | 20= |
| 21= | 22= | 23= |
| 24= | 25= | 26= |
| 27= | 28= | 29= |
| 30= | 31= | 32= |
| 33= | 34= | 35= |
| 36= | 37= | 38= |
| 39= | 40= | 41= |
| 42= | 43= | 44= |
| 45= | 46= | 47= |
| 48= | 49= | 50= |

B10 Number of separate movements needed =