

## Factors (Intermediate UKMT)

These questions must be attempted without a calculator

*Topics covered in the questions below may not necessarily be from the topic of the title.*

1. Which of the following expressions is equal to 2005?

- A  $(1^2 + 1)(10^2 + 1)$       B  $(2^2 + 1)(20^2 + 1)$       C  $(3^2 + 1)(30^2 + 1)$   
D  $(4^2 + 1)(40^2 + 1)$       E  $(5^2 + 1)(50^2 + 1)$

2. Which of the following is not prime?

- A  $2^2 - 1$       B  $2^3 - 1$       C  $2^5 - 1$       D  $2^6 - 1$       E  $2^7 - 1$

3.  $2001 = 3 \times 23 \times 29$ .

Which of the following numbers is also the product of exactly three distinct prime numbers?

- A 45      B 60      C 91      D 105      E 330

4. Which is the largest prime number that divides exactly into the number equal to  $2 + 3 + 5 \times 7$ ?

- A 2      B 3      C 5      D 7      E 11

5. The integers from 1 to 20 are listed below in such a way that the sum of each adjacent pair is a prime number. Missing numbers are marked as \*s.

20, \*, 16, 15, 4, \*, 12, \*, 10, 7, 6, \*, 2, 17, 14, 9, 8, 5, 18, \*.

Which number goes in the place which is underlined?

- A 1      B 3      C 11      D 13      E 19

6. The product of Mary's age in years on her last birthday and her age now in complete months is 1800.

How old was Mary on her last birthday?

- A 9                      B 10                      C 12                      D 15                      E 18

7. At a cinema, a child's ticket costs £4.20 and an adult's ticket costs £7.70. When a group of adults and children went to see a film, the total cost was £C.

Which of the following is a possible value of C?

- A 91                      B 92                      C 93                      D 94                      E 95

8. A crossnumber is like a crossword, except that all the answers are numbers instead of words (with one digit in each square, and no answer starting with the digit zero).

How many different solutions are there to the crossnumber on the right?

**CLUES**

**ACROSS**

1. Prime  
3. Square  
5. Prime

**DOWN**

1. Prime  
2. Square  
4. Square

1.	2.	
3.		4.
	5.	

- A 0                      B 1                      C 2                      D 3                      E more than three

9. When exactly is the value of the product  $(1+\frac{1}{2})(1+\frac{1}{3})(1+\frac{1}{4})\dots(1+\frac{1}{n})$  equal to an integer?

- A when  $n$  is odd                      B when  $n$  is even                      C when  $n$  is a multiple of 3  
D always                                      E never