

# Oxford

## 1. Mathematics

### Toss Up: Short Answer

In a 2 by 2 matrix with first row a, b and second row c, d, what is the name commonly associated with the value  $ad - bc$ ?

**Toss Up Answer: Determinant**

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### Bonus: Multiple Choice

What is the closest distance from the point (6, 8) to the line,  $3x + 2y - 1 = 0$ ?

- W) 2.3
- X) 3.3
- Y) 4.3
- Z) 5.3

**Bonus Answer: X**

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## 2. Mathematics

### Toss Up: Multiple Choice

A complex number multiplied by its complex conjugate is equivalent to which of the following?

- W) The argument
- X) The argument squared
- Y) The magnitude
- Z) The magnitude squared

**Toss Up Answer: Z**

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### Bonus: Short Answer

The Hardy-Ramanujan is given as the smallest positive integer that can be expressed as the sum of two different pairs of perfect positive cubes. What is the Hardy-Ramanujan number?

**Bonus Answer: 1729**

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## 3. Mathematics

### Toss Up: Multiple Choice

Given the polynomial,  $24 - 50x + 35x^2 - 10x^3 + x^4$ , which of the following is not a possible root by the rational root theorem?

- W) 2
- X) 3
- Y) 4
- Z) 5

**Toss Up Answer: Z**

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### Bonus: Short Answer

How many cubic polynomials,  $f(x)$  with positive integral coefficients have  $f(1) = 6$ ?

**Bonus Answer: 84 (equivalent to 9C3 by stars and bars)**

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## 4. Energy

### Toss Up: Multiple Choice

To the nearest thousand megawatts, how much geothermal energy does the US have installed?

- W) 1000
- X) 2000
- Y) 3000

Z) 4000

**Toss Up Answer: Y**

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**Bonus: Multiple Choice**

Which country produces the second most geothermal electricity?

W) The US

X) The Phillipeans

Y) China

Z) Russia

**Bonus Answer: X**

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## **5. Energy**

**Toss Up: Short Answer**

Which DOE national lab conducted the Manhattan project?

**Toss Up Answer: Oak Ridge (Accept: Oak Ridge National Lab)**

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**Bonus: Short Answer**

During the Manhattan project, which two atomic bombs were created?

**Bonus Answer: Thin man and Fat man**

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## **6. Energy**

**Toss Up: Short Answer**

Which branch of the National Energy Technology Laboratory was started the earliest?

**Toss Up Answer: Pittsburg**

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**Bonus: Multiple Choice**

Which DOE national lab was started the earliest?

W) Lawrence Berkley National Lab

X) Thomas Jefferson National Accelerator Facility

Y) Fermi National Lab

Z) SLAC National Lab

**Bonus Answer: W**

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