

# THE UK UNIVERSITY INTEGRATION BEE

2021/22



## ROUND TWO CROSSNUMBER

Saturday, 20 November 2021

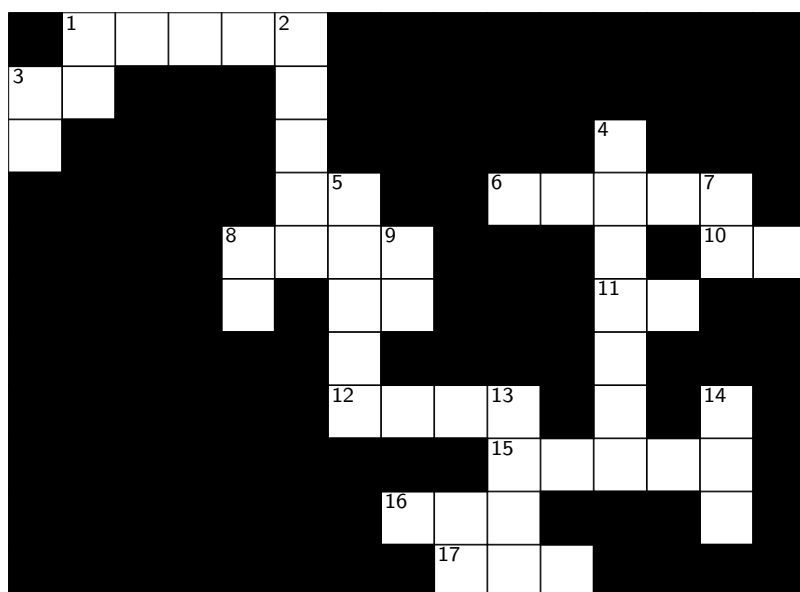


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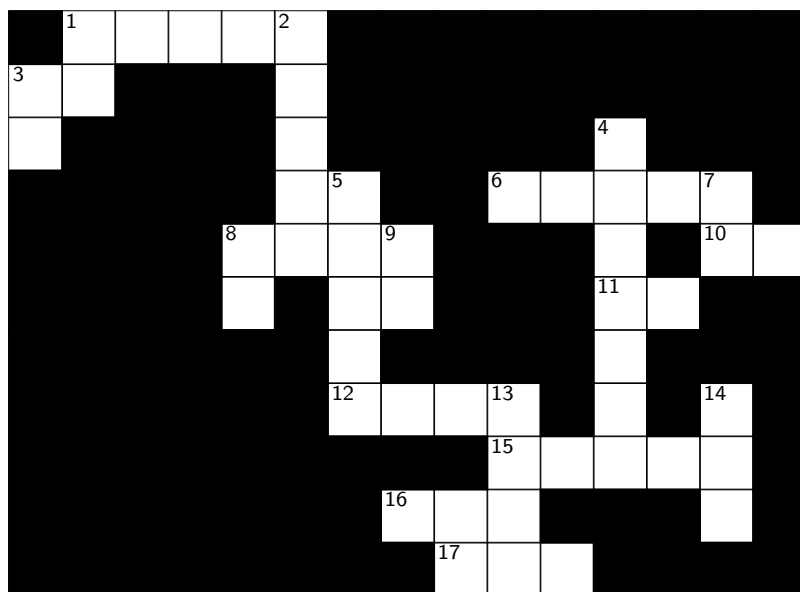


**Jane Street**



## Across

1. Smallest palindrome bigger than  $17 \text{ ACROSS} \cdot (8 \text{ DOWN} + 1)^2$
3.  $\int_0^2 f(x)dx$  where  $3 \int_1^2 f(x)dx - 5 \int_0^1 f(x)dx = 17$  and  $21 \int_0^1 f(x)dx - 7 \int_1^2 f(x)dx = 35$
6.  $\frac{1 + 16 \text{ ACROSS}^4 + (16 \text{ ACROSS} + 1)^4}{1 + 16 \text{ ACROSS}^2 + (16 \text{ ACROSS} + 1)^2}$
8. The year the Riemann Integral was first published
10.  $\lim_{n \rightarrow \infty} \int_0^{14} \arctan(x^n)dx$  to 2 significant figures
11. Sum of the three smallest clues
12. A Fibonacci number
15.  $\frac{1 + 310^2 + 310^4}{1 + 310 + 310^2}$
16.  $7 \text{ DOWN} \times 10 \text{ ACROSS} - 10$
17. A power of 7

**Down**

1.  $\frac{16 \text{ ACROSS} + 1}{3}$
2. The nearest integer to  $\frac{279^4 + 4}{279^2 + 2 \cdot 279 + 2} + \int_0^\infty \frac{\ln(\sqrt{1+x})}{x\sqrt{x}} dx$
3. The  $x^{\text{th}}$  triangular number where  $x$  is  $7^9 \text{ DOWN} \bmod 7 \text{ DOWN} + 1$
5. The largest  $n$  such that  $I_n = \int_0^1 \frac{x^n}{1+x} dx > \frac{1}{6 \text{ ACROSS} - 1}$
6. Palindromic number whose product of digits is 1764 and whose digit sum is  $x \bmod 9$  where  $x$  is a solution of the quadratic  $x^2 - 7 \text{ DOWN} x + 32 = 0$
7.  $\int_0^1 f(x) dx$  where  $5 \int_0^2 f(x) dx + 4 \int_0^1 f(x) dx = 143$  and  $7 \int_0^2 f(x) dx + 11 \int_1^2 f(x) dx = 210$
8. The expected number of coin flips to get three heads in a row on a fair coin
9. 14 DOWN - 16 ACROSS
13. The year the Lebesgue Integral was published
14.  $f(6)$  where  $f$  is such that  $f(x) + \int_2^5 f(t) dt = 12x^2$