

THE UK UNIVERSITY INTEGRATION BEE

2021/22



ROUND TWO CROSSNUMBER

Saturday, 20 November 2021

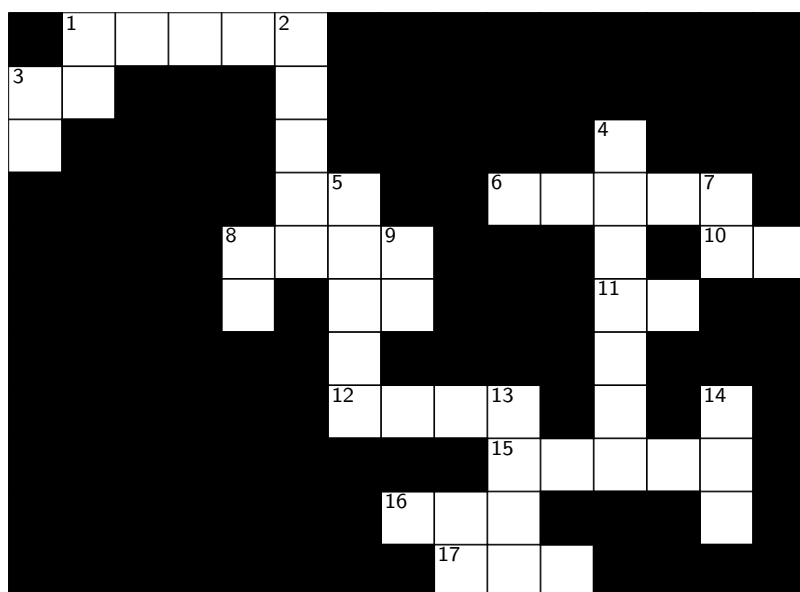


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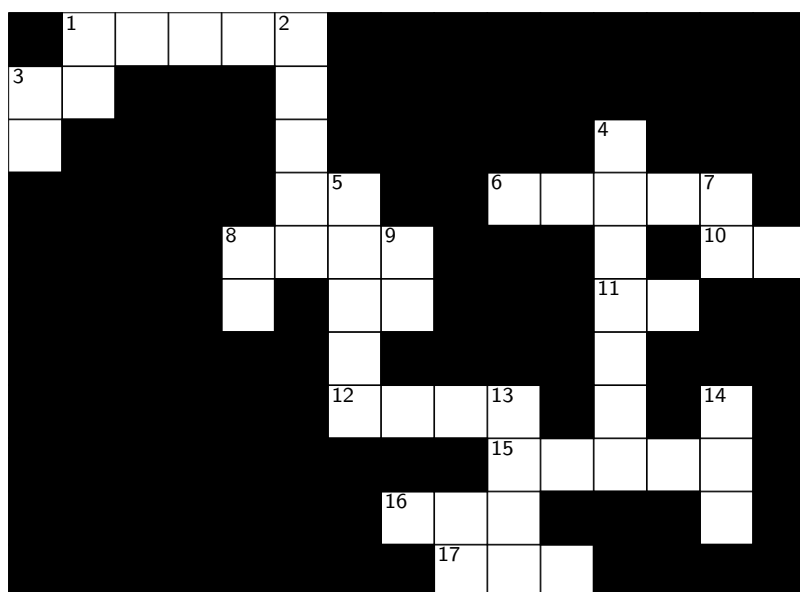


Jane Street



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^{th} triangular number where x is $7^9 \text{ DOWN} \bmod 7 \text{ DOWN} + 1$
4. Palindromic number whose product of digits is 1764 and whose digit sum is $x \bmod 9$ where x is a solution of the quadratic $x^2 - 7 \text{ DOWN} x + 32 = 0$
5. The largest n such that $I_n = \int_0^1 \frac{x^n}{1+x} dx > \frac{1}{6 \text{ ACROSS} - 1}$
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. $14 \text{ DOWN} - 16 \text{ ACROSS}$
13. The year the Lebesgue Integral was published
14. $f(6)$ where f is such that $f(x) + \int_2^5 f(t) dt = 12x^2$