FUNCTIONS SOLUTIONS

- Teams may try the functions in any order, and may come back to functions later.

- Where a 2D table is used, the first column represents the x-values and the first row represents the y-values.

F1. $f(x, y) = x^2 + y$.

$x\backslash y$	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
2	5	6	7	8	9	10	11	12	13	14
3	10	11	12	13	14	15	16	17	18	19
4	17	18	19	20	21	22	23	24	25	26
5	26	27	28	29	30	31	32	33	34	35
6	37	38	39	40	41	42	43	44	45	46
7	50	51	52	53	54	55	56	57	58	59
8	65	66	67	68	69	70	71	72	73	74
9	82	83	84	85	86	87	88	89	90	91
10	101	102	103	104	105	106	107	108	109	110

F2. $f(x, y) = \left\lfloor \frac{y}{x} \right\rfloor$.

$x\backslash y$	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	0	1	1	2	2	3	3	4	4	5
3	0	0	1	1	1	2	2	2	3	3
4	0	0	0	1	1	1	1	2	2	2
5	0	0	0	0	1	1	1	1	1	2
6	0	0	0	0	0	1	1	1	1	1
7	0	0	0	0	0	0	1	1	1	1
8	0	0	0	0	0	0	0	1	1	1
9	0	0	0	0	0	0	0	0	1	1
10	0	0	0	0	0	0	0	0	0	1

F3. $f(n) = $ the nth decimal digit of π.

n	$f(n)$
1	1
2	4
3	1
4	5
5	9
6	2
7	6
8	5
9	3
10	5

F4. $f(n) =$ the $(2n + 1)^{\text{th}}$ Fibonacci number:

$$f(n) = F_{2n+1} = \begin{cases} 2 & \text{if } n = 1 \\ 5 & \text{if } n = 2 \\ 3f(n-1) - f(n-2) & \text{if } n \geq 3 \end{cases}$$

n	$f(n)$
1	2
2	5
3	13
4	34
5	89
6	233
7	610
8	1597
9	4181
10	10946

F5. $f(n) = 2^n + n$.

n	$f(n)$
1	3
2	6
3	11
4	20
5	37
6	70
7	135
8	264
9	521
10	1034

SHUTTLE SOLUTIONS

- If an answer is incorrect, make sure the other pair is aware.

- Circle the corresponding number: 4 if correct on the first attempt, 3 if correct on the second attempt, and 0 otherwise.

- Record the time that the time finished. If the team finished in faster than 8 minutes, circle 2, if faster than 10 minutes circle 1, otherwise circle 0.

- Fill in the total number of points achieved.

A1. 7

A2. 8

A3. 1107

A4. 5528

B1. 94

B2. 341

B3. 1705

B4. 341

RELAY — SOLUTIONS

Team:

Referee:

(Circle the corresponding numbers and add them up at the end.)

R1	96			4	3	0
R2	250			4	3	0
R3	120			4	3	0
R4	1056			4	3	0
R5	45			4	3	0
R6	5			4	3	0
	Time			4	2	0

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CROSSNUMBER — SOLUTIONS

- The pairs are supposed to only attempt one square at a time. If many squares are filled in at once, stop marking at the first incorrect square and consult the pair.

- If the answer for a square is correct, tick the circle in the lower right.

- If the answer for a square is incorrect, cross it out and write the correct answer.

- The pairs are responsible for copying the correct answers onto their own grids.

- The two pairs are not allowed to communicate on any matters related to the questions themselves, but may encourage the other team to, for example, work on a specific clue.

- Teams are not allowed to communicate what values they think are possible for a square.

	1 1	4	2 6	3 4	1	
4 5	0		5 3	1		
9				1		6 1
7 3	6	8 5		9 4	0	8
7		0				9
		10 1	11 2		12 1	0
	13 2	1	1	1	2	

Quizdle — Solutions

- Allow and fix minor spelling mistakes.

- If the answer is incorrect, don't give the correct answer, and the team is not allowed to attempt that word again, even using easier clues.

- Let your team fill in the crossword – your job is just to mark the Answer Sheet.

- The Across and Down clues of a particular difficulty must be given out at the same time.

Across

2. CHROMATIC

8. NAVIERSTOKES

10. CHINA

11. MANHATTAN

13. CONVEX

14. TRIVIAL

15. LAW

17. AXIOMOFCHOICE

19. RAMANUJAN

20. TWENTYFOUR

Down

1. TORUS

3. HYPERBOLICGEOMETRY

4. INTEGRAL

5. MAGMA

6. ENVELOPE

7. SOPHIEGERMAIN

9. OPEN

12. NEW

16. FORTYTWO

18. EULER