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. $f(x,y) = 23x + 2y + 25$.

$x \backslash y$	1	2	3	4	5	6	7	8	9	10
1	50	52	54	56	58	60	62	64	66	68
2	73	75	77	79	81	83	85	87	89	91
3	96	98	100	102	104	106	108	110	112	114
4	119	121	123	125	127	129	131	133	135	137
5	142	144	146	148	150	152	154	156	158	160
6	165	167	169	171	173	175	177	179	181	183
7	188	190	192	194	196	198	200	202	204	206
8	211	213	215	217	219	221	223	225	227	229
9	234	236	238	240	242	244	246	248	250	252
10	257	259	261	263	265	267	269	271	273	275

F2. $f(x,y) = x^2 - y^2$.

$x \backslash y$	1	2	3	4	5	6	7	8	9	10
1	0	-3	-8	-15	-24	-35	-48	-63	-80	-99
2	3	0	-5	-12	-21	-32	-45	-60	-77	-96
3	8	5	0	-7	-16	-27	-40	-55	-72	-91
4	15	12	7	0	-9	-20	-33	-48	-65	-84
5	24	21	16	9	0	-11	-24	-39	-56	-75
6	35	32	27	20	11	0	-13	-28	-45	-64
7	48	45	40	33	24	13	0	-15	-32	-51
8	63	60	55	48	39	28	15	0	-17	-36
9	80	77	72	65	56	45	32	17	0	-19
10	99	96	91	84	75	64	51	36	19	0

F3. $f(n) =$ the nth Lucas number:

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

n	$f(n)$
1	2
2	1
3	3
4	4
5	7
6	11
7	18
8	29
9	47
10	76

F4. $f(n)$ = number of 1's in the binary representation of n.

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

F5. $f(n)$ = the number of partitions of a set of size n.

n	$f(n)$
1	1
2	2
3	5
4	15
5	52
6	203
7	877
8	4140
9	21147
10	115975

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. 1013

A2. 24

A3. 10

A4. 49

B1. 5

B2. 20

B3. 140

B4. 19603

Relay — Solutions

Team:

Referee:

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

R1	90			4	3	0
R2	2025			4	3	0
R3	41			4	3	0
R4	20			4	3	0
R5	42			4	3	0
R6	1350			4	3	0
	Time		4	2	0

/28

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

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. SQUARE

5. FRACTAL

6. RUSSELL

8. TWOONESIX

9. NETWORK

12. LEGENDRE

14. MOTIVE

17. RADICAL

18. PROJECTION

19. ABEL

Down

1. WEIL

3. QUATERNION

4. PARADOX

7. DISTRIBUTION

8. THREEFOURTHREE

10. TRIANGLE

11. UNIVERSAL

13. HARMONIC

15. HUXLEY

16. FIBONACCI