

1 <sub>1</sub>	2 <sub>2</sub>	3 <sub>2</sub>	4 <sub>3</sub>	5 <sub>2</sub>	6 <sub>4</sub>
7 <sub>2</sub>	8 <sub>4</sub>	9 <sub>3</sub>	10 <sub>4</sub>	11 <sub>2</sub>	12 <sub>6</sub>
13 <sub>2</sub>	14 <sub>4</sub>	15 <sub>4</sub>	16 <sub>5</sub>	17 <sub>2</sub>	18 <sub>6</sub>
19 <sub>2</sub>	20 <sub>6</sub>	21 <sub>4</sub>	22 <sub>4</sub>	23 <sub>2</sub>	24 <sub>8</sub>
25 <sub>3</sub>	26 <sub>4</sub>	27 <sub>4</sub>	28 <sub>6</sub>	29 <sub>2</sub>	30 <sub>8</sub>
31 <sub>2</sub>	32 <sub>6</sub>	33 <sub>4</sub>	34 <sub>4</sub>	35 <sub>4</sub>	36 <sub>9</sub>

Number of blocks supposed to be on each square shown in red

- **What interesting patterns can you spot on your grid?** – Students explore patterns they see (might see patterns relating to certain columns, or to primes or that the height of blocks get bigger as numbers increase, etc.)
- **Which number has the tallest tower?** – 36 is tallest, it has largest number of factors
- **Which number has the smallest tower of factors (blocks)? Why is this?** – 1, it is only divisible by itself
- **Which numbers have the next smallest tower of factors (blocks)?** – All the prime numbers have 2 blocks on them. **Why is this?** – they are divisible by themselves and 1
- **Do all the numbers have an even number of factors (blocks)?** – No, some are odd. **Why is this?** – For even ones each factor pairs add up to make an even number. Odd ones have one factor 'pair' that is a square number e.g.  $25 = 5 \times 5$ . The factor is only counted once, so total number of factors is odd.
- **Is there any pattern to the numbers that have only two factors?** – This question leads on to the next activity where they explore this further.

Ri OTS Masterclass: Patterns in Prime  
Worksheet 2 – Small 36 grid SOLUTION

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

*Solutions*

**What patterns are created by the prime numbers?**...*The grid above shows all prime numbers shaded.*

**Can we create a rule for predicting prime numbers?**... *Not exactly, but they do all fall into two columns so we can predict this will carry on. Recognising patterns can help us to predict.*

**What do all the primes have in common (apart from 2)?**... *they are all odd.*

**If the prime numbers only appear in these two columns (ignoring 2/3), we might predict that this rule holds for larger primes. What is the relationship?**...*They are always one more than or one less than a multiple of 6*

## Ri OTS Masterclass: Patterns in Prime Worksheet 3 – 100 grid SOLUTION

There are 25 prime numbers between 1 and 100: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, and 97

- **Which numbers get crossed out more than once, and why?** *Numbers with multiple prime factors*
- **Which numbers don't get crossed out at all, and why?** *Prime numbers*
- **What pattern on the grid did the 3 times table have?** *Diagonal pattern*
- **Why do you not need to test for 4, 6 or any number above 7 in this grid?**  
*Looking at numbers on the top row: 4, 6, 8, 9 and 10 are multiples of 2 or 3 so have already been sieved. In other words, we only need to sieve for prime numbers. Also, If you chose a number greater than 10 (square root of max number on grid), its factor pair must be less than 10 and has therefore already been sieved.*

## OTS Patterns in Prime Worksheet 4 – 324 grid SOLUTION

There are 66 prime numbers between 1 and 324:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199, 211, 223, 227, 229, 233, 239, 241, 251, 257, 263, 269, 271, 277, 281, 283, 293, 307, 311, 313, 317

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162
163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198
199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216
217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234
235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252
253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288
289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306
307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324