

WA6MNAUN3

Understanding number

Core + Challenge

Prime and Composite Numbers — Marking Key

I can use arrays and factors to decide whether a number is prime or composite, and explain why.

For tutors and parents. Award method marks for correct working even if the final answer is wrong.

Marks summary

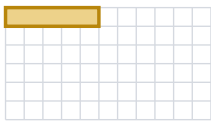
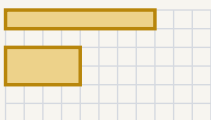
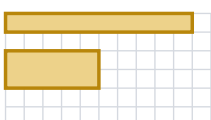
A Warm up: 16 B Practise: 22 C Think it through: 10 D Challenge: 9 **Total: 57**

Gold shading in this key shows what the child should have shaded or drawn. Accept any correct arrangement unless the question fixes it.

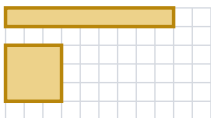
A

Warm up *answers*

/ 16 marks

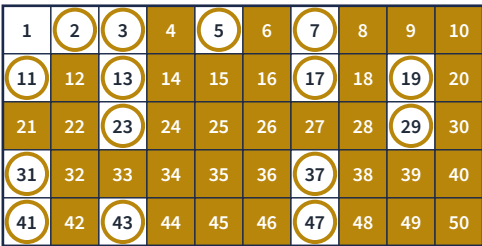
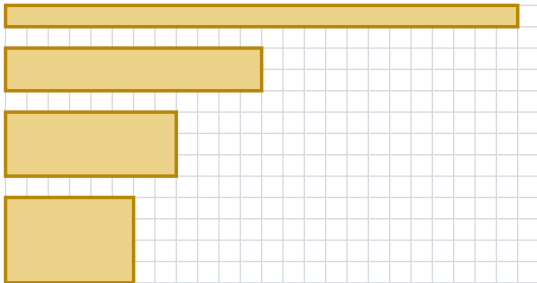
Q	Answer	Model answer / notes	Marks
1	$3 \times 5 = 15$	3 rows of 5.	1
2	$2 \times 7 = 14$	2 rows of 7.	1
3	$4 \times 4 = 16$	4 rows of 4.	1
4	$1 \times 11 = 11$	1 row of 11.	1
5	composite	$9 = 3 \times 3$ as well as 1×9 .	1
6	prime	Only 1×13 .	1
7	composite	$21 = 3 \times 7$ as well as 1×21 .	1
8	prime	Only 1×2 . 2 is the only even prime.	1
9	1×5	 5 is prime: only one array.	1
10	1×8 and 2×4	 8 is composite.	1
11	1×10 and 2×5	 10 is composite.	1

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Q	Answer	Model answer / notes	Marks
12	1×9 and 3×3	 9 is composite.	1
13	1, 2, 3, 4, 6, 12	Pairs: 1×12 , 2×6 , 3×4 .	1
14	1, 17	17 is prime.	1
15	1, 2, 4, 5, 10, 20	Pairs: 1×20 , 2×10 , 4×5 .	1
16	1, 2, 3, 6, 9, 18	Pairs: 1×18 , 2×9 , 3×6 .	1

B Practise *answers and working*

/ 22 marks

Q	Answer	Working / sample response	Marks
1	15 primes	 Primes: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47. Every composite number up to 50 is a multiple of 2, 3, 5 or 7. <i>1 mark: composites shaded.</i> <i>1 mark: primes circled.</i> <i>1 mark: 15.</i>	3
2	a) No b) 3 rows of 7	a) 23 is prime: its only array is 1×23 (one row). b) $21 = 3 \times 7$: 3 rows of 7 chairs (or 7 rows of 3). <i>1 mark: No, because 23 is prime.</i> <i>1 mark: 3×7 or 7×3.</i>	2
3	1×24 , 2×12 , 3×8 , 4×6 ; composite	 $24 = 1 \times 24 = 2 \times 12 = 3 \times 8 = 4 \times 6$. 24 makes more than one array (it has 8 factors), so it is composite. <i>2 marks: all four arrays (1 mark for two or three).</i> <i>1 mark: composite with a reason.</i>	3

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Q	Answer	Working / sample response	Marks																																																	
4	See table	<table><thead><tr><th>No.</th><th>Factors</th><th>Count</th><th>Type</th></tr></thead><tbody><tr><td>15</td><td>1, 3, 5, 15</td><td>4</td><td>composite</td></tr><tr><td>19</td><td>1, 19</td><td>2</td><td>prime</td></tr><tr><td>27</td><td>1, 3, 9, 27</td><td>4</td><td>composite</td></tr><tr><td>31</td><td>1, 31</td><td>2</td><td>prime</td></tr><tr><td>1</td><td>1</td><td>1</td><td>neither</td></tr></tbody></table> 15: 1, 3, 5, 15 → composite. 19: 1, 19 → prime. 27: 1, 3, 9, 27 → composite. 31: 1, 31 → prime. 1: 1 → neither. 3 marks: all five rows correct. 2 marks: three or four. 1 mark: two.	No.	Factors	Count	Type	15	1, 3, 5, 15	4	composite	19	1, 19	2	prime	27	1, 3, 9, 27	4	composite	31	1, 31	2	prime	1	1	1	neither	3																									
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15	1, 3, 5, 15	4	composite																																																	
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27	1, 3, 9, 27	4	composite																																																	
31	1, 31	2	prime																																																	
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5	83 and 89	81 = 9 × 9, 82, 84, 86, 88 are even, 85 = 5 × 17, 87 = 3 × 29. 83 and 89 have no factors except 1 and themselves. 1 mark: 83 and 89. 1 mark: 87 = 3 × 29 (or 87 ÷ 3 = 29).	2																																																	
6	10	<table><thead><tr><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th><th>S</th></tr></thead><tbody><tr><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr><tr><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td></tr><tr><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td></tr><tr><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td></tr><tr><td>30</td><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table> Prime dates: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29. 1 mark: all prime dates circled (and 1 not circled). 1 mark: 10.	M	T	W	T	F	S	S							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							2
M	T	W	T	F	S	S																																														
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7	1, 2, 3, 5, 6, 10, 15, 30	<table><tbody><tr><td>1</td><td>2</td><td>3</td><td>5</td><td>6</td><td>10</td><td>15</td><td>30</td><td></td><td></td></tr></tbody></table> Pairs: 1 × 30, 2 × 15, 3 × 10, 5 × 6. 1 mark: all eight factors. 1 mark: pairs joined correctly.	1	2	3	5	6	10	15	30			2																																							
1	2	3	5	6	10	15	30																																													
8	e.g. 3 + 13, 5 + 19, 7 + 23	a) 3 + 13 or 5 + 11. b) 5 + 19 or 7 + 17 or 11 + 13. c) 7 + 23 or 11 + 19 or 13 + 17. Accept any correct pair. 1 is not prime, so 1 + 15 is wrong. 1 mark each part.	3																																																	

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Q	Answer	Working / sample response	Marks
9	a) 31 b) 49	a) Primes between 30 and 40: 31, 37. $3 + 1 = 4$, so 31. b) 49 has factors 1, 7, 49 (three factors). <i>1 mark each part.</i>	2

C

Think it through *sample answers and criteria*

/ 10 marks

Q	Answer	Working / sample response	Marks									
1	No	$9 = 3 \times 3$, $15 = 3 \times 5$ and $21 = 3 \times 7$ are odd but composite. Also 2 is prime but even, and 1 is odd but not prime. <i>1 mark: disagrees.</i> <i>1 mark: an odd composite number as a counter-example.</i>	2									
2	No, $57 = 3 \times 19$	$57 = 3 \times 19$, so 57 has the factors 1, 3, 19 and 57. It is composite. Checking 2, 5 and 10 is not enough: you must also try 3, 7 and other primes. (Digit sum $5 + 7 = 12$ shows 3 is a factor.) <i>1 mark: disagrees.</i> <i>1 mark: shows a factor other than 1 and 57 (3×19).</i>	2									
3	Sometimes	$3 + 5 = 8$ is even. $2 + 3 = 5$ is odd. Any sum using 2 and an odd prime is odd. <i>1 mark: Sometimes.</i> <i>1 mark: one even and one odd example (needs the prime 2).</i>	2									
4	31	$21 = 3 \times 7$, $51 = 3 \times 17$ and $91 = 7 \times 13$ are composite. 31 is the only prime. <i>1 mark: 31.</i> <i>1 mark: shows the other three are composite (with factors).</i>	2									
5	See table	<table><tr><td></td><td>Even</td><td>Odd</td></tr><tr><td>Prime</td><td>2</td><td>23, 29</td></tr><tr><td>Composite</td><td>4, 18</td><td>9, 15, 33</td></tr></table> The prime and even box has only 2: every other even number has 2 as a factor, so it is composite. <i>1 mark: all eight sorted (accept seven).</i> <i>1 mark: explains 2 is the only even prime.</i>		Even	Odd	Prime	2	23, 29	Composite	4, 18	9, 15, 33	2
	Even	Odd										
Prime	2	23, 29										
Composite	4, 18	9, 15, 33										

D

Challenge *solutions and criteria*

/ 9 marks

Q	Answer	Working / sample response	Marks
1	4, 9, 25	4: 1, 2, 4. 9: 1, 3, 9. 25: 1, 5, 25. Each one is a prime number multiplied by itself (2×2, 3×3, 5×5): a square of a prime. <i>2 marks: 4, 9 and 25 with no extras (1 mark for two).</i> <i>1 mark: notices they are squares of prime numbers.</i>	3
2	7, 11, 13 or 17	Check each prime under 20: $2 \rightarrow 32$, $3 \rightarrow 33$, $5 \rightarrow 35$, $7 \rightarrow 37$, $11 \rightarrow 41$, $13 \rightarrow 43$, $17 \rightarrow 47$, $19 \rightarrow 49$. 37, 41, 43 and 47 are prime; 32, 33, 35 and 49 are not. So I could be 7, 11, 13 or 17. <i>2 marks: all four ages (1 mark for two or three).</i> <i>1 mark: shows the checking (e.g. 19 fails because $49 = 7 \times 7$).</i>	3
3	a) 12 b) two of 16, 18, 20, 28	a) 12: 1×12, 2×6, 3×4. No smaller number has three arrays. b) 16: 1×16, 2×8, 4×4. 18: 1×18, 2×9, 3×6. 20: 1×20, 2×10, 4×5. 28: 1×28, 2×14, 4×7. <i>1 mark: 12.</i> <i>2 marks: two correct numbers from 16, 18, 20, 28 with their arrays (1 mark each).</i>	3