## 1.3 Solutions

**GCSE Mathematics**
**The Classification of Numbers**

**Answer 1**

**( i )** 21, 22
**( ii )** 4, 5, 6
**( iii )** $-2, -1, 0$
**( iv )** 4, 5, 6, 7, 8
**( v )** 7, 8, 9
**( vi )** $-3, -2, -1, 0, 1, 2, 3$

**[ 1, 1, 1, 1, 1, 2 marks ]**

**Answer 2**

| | | | | | |
|---|---|---|---|---|---|
| **( i )** | prime | **( ii )** | composite | **( iii )** | composite |
| **( iv )** | prime | **( v )** | composite | **( vi )** | prime |
| **( vii )** | composite | **( viii )** | prime | **( ix )** | prime |

**[ 9 marks ]**

**Answer 3**

| | | |
|---|---|---|
| **( i )** | $8 < n \leqslant 11$ | 9, 10, 11 |
| **( ii )** | $2 \leqslant n \leqslant 4$ | 2, 3, 4 |
| **( iii )** | $2.5 < n \leqslant 5.5$ | 3, 4, 5 |
| **( iv )** | $-0.1 \leqslant n \leqslant 1.1$ | 0, 1 |
| **( v )** | $0 < n < 4$ | 1, 2, 3 |

**[ 2 marks each = 10 in total ]**

**Answer 4**

$$2^4 \times 3^3 \times 5^4 = (2 \times 5) \times (2 \times 5) \times (2 \times 5) \times (2 \times 5) \times 3^3$$
$$= 10 \times 10 \times 10 \times 10 \times 27$$
$$= 270\,000$$

**[ 3 marks ]**

**Answer 5**

The possible counterexamples to the Prof's conjecture up to 30 are;
(Only one counterexample is asked for)

$8^2 + 1 = 65$ which is NOT prime, as required.

$12^2 + 1 = 145$ which is NOT prime, as required.

$18^2 + 1 = 325$ which is NOT prime, as required.

$22^2 + 1 = 285$ which is NOT prime, as required.

$28^2 + 1 = 785$ which is NOT prime, as required.

$30^2 + 1 = 901$ which is NOT prime, as required.

**[ 2 marks ]**

**Answer 6**

A prime is only divisible by itself and 1

187 is divisible by other numbers, such as 11 or 17

$\therefore$ 187 is not a prime number.

**[ 2 marks ]**

**Answer 7**

The division ladder method...

| | |
|---|---|
| 2 | 588 |
| 2 | 294 |
| 3 | 147 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

$$\therefore \quad 588 = 2^2 \times 3 \times 7^2$$

**[ 3 marks ]**

**Answer 8**

$$6561 = (9 \times 9) \times (9 \times 9)$$

$$= 81 \times 81$$

$$\therefore \sqrt{6561} = 81$$

**[ 2 marks ]**

**Answer 9**

Multiples of 14: 14, 28, 42, ...

Multiples of 21: 21, 42, ...

$\therefore$ $lcm\{14, 21\} = 42$

**[ 2 marks ]**

**Answer 10**

Multiples of 15: 15, 30, 45, 60, 75, 90, 105, ...

Multiples of 35: 35, 70, 105, ...

$\therefore$ $lcm\{15,35\} = 105$

**[ 3 marks ]**

**Answer 11**

Pascal's Triangle

**[ 1 mark ]**

**Answer 12**

$hcf\{40,56\} = 8$

**[ 2 marks ]**

**Answer 13**

| | | | | | |
|---|---|---|---|---|---|
| **( i )** | coprime | **( ii )** | 3 in common | **( iii )** | coprime |
| **( iv )** | coprime | **( v )** | 13 in common | **( vi )** | 7 in common |

**[ 6 marks ]**

**Answer 14**

**( i )** $104 = 2 \times 2 \times 2 \times 13$

$1375 = 5 \times 5 \times 5 \times 11$

**[ 2 marks ]**

**( ii )** 104 and 1375 are coprime because they have no factors in common.

*hcf* {104, 1375 } = 1

**[ 2 marks ]**

**( iii )** $104 \times 1375 = 2 \times 5 \times 2 \times 5 \times 2 \times 5 \times 13 \times 11$

$= 10 \times 10 \times 10 \times 13 \times 11$

$= 1000 \times 143$

$= 143\,000$

**[ 2 marks ]**

**Answer 15**

| | | | | | |
|---|---|---|---|---|---|
| **( i )** | 256 | **( ii )** | 1 | **( iii )** | 16 |
| **( iv )** | 4 | **( v )** | 1/16<br>0.0625 | **( vi )** | 0.5 |

**[ 6 marks ]**

**Answer 16**

**( i )** $7056 = 2^4 \times 3^2 \times 7^2$

**[ 4 marks ]**

**( ii )** $\sqrt{7056} = 2^2 \times 3 \times 7$

$= 4 \times 21$

$= 84$

**[ 2 marks ]**