Primes, Factors, HCF, LCM – Answers

Prime Factors and Related Topics

1) (a) 1, 2, 3, 6, 9, 18 (b) 1, 2, 3, 5, 6, 10, 15, 30

2) (a) 36, 84, 96 (b) 53 (c) 36
(d) 1, 36 (e) 1, 53, 91 (f) 84, 91

3) (a) $18 = 2 \times 3^2$ (b) $45 = 3^2 \times 5$ (c) $48 = 2^4 \times 3$
(d) $70 = 2 \times 5 \times 7$ (e) $120 = 2^3 \times 3 \times 5$ (f) $126 = 2 \times 3^2 \times 7$

4) (a) $3^2 = 9$ (b) $2^3 \times 3 = 24$ (c) $2 \times 7 = 14$

5) (a) $\frac{18 \times 45}{9} = 90$ (b) $\frac{120 \times 48}{24} = 240$ (c) $\frac{70 \times 126}{14} = 630$

6) (a) $2^3 \times 5 \times 11$ (b) $2^2 \times 3 \times 7 \times 11$ (c) $2 \times 3^3 \times 5 \times 7$
(d) $2^2 \times 11 = 44$ (e) $2 \times 3 \times 7 = 42$
(f) $\frac{440 \times 924}{44} = 9240$ (g) $\frac{924 \times 1890}{42} = 41580$

Sets and factors

For this worksheet you need to know that the symbol ∩ means the *intersection* of sets ie numbers which are in both sets

1) (a) {3, 6, 9, 12, 15, 18, 21, 24, 27, 30} (b) {2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30}
(c) {5, 10, 15, 20, 25, 30}
(d) {6, 12, 18, 24, 30} (e) {10, 20, 30} (f) {15, 30}
(g) Multiples of 6 less than 31 (h) Multiples of 10 less than 31 (I) Multiples of 15 less than 31
(j) The intersection of the sets {multiples of *m*} and {multiples of *n*} is the set {multiples of *LCM of m and n*}.

2) (a) {4, 8, 12, 16, 20, 24, 28} (b) {6, 12, 18, 24, 30}
(c) {4, 8, 12, 16, 20, 24, 28} (d) {6, 12, 18, 24, 30}
(e) If *n* is a multiple of of *m*, the set {multiples of *n*} is a *subset* of the set {multiples of *m*}.
(f) {12, 24} (g) {Multiples of 12 less than 31}

3) (a) {1, 2, 3, 4, 6, 9, 12, 18, 36} (b) {1, 2, 3, 5, 6, 10, 15, 30} (c) {1, 2, 4, 5, 8, 10, 20, 40}
(d) {1, 2, 3, 6} (e) {1, 2, 5, 10} (f) {1, 2, 4}
(g) Factors of 6 (h) Factors of 10 (i) Factors of 4
(j) The intersection of the sets {factors of *m*} and {factors of *n*} is the set {factors of *HCF of m and n*}

4) (a) {2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37} (b) {1, 4, 9, 16, 25, 36} (c) {2, 3, 5}
(d) {1, 4, 9, 36} (e) {} (f) {1, 2}

Triangular Square and Cube Numbers

1) (a) 1, 3, 6, 10, 15, 21, 28, 36, 45, 55
   (b) 1, 4, 9, 16, 25, 36, 49, 64, 81, 100
   (c) 1, 8, 27, 64, 125

2) (a) $T_1 + T_2 = 4$ $T_2 + T_3 = 9$ $T_3 + T_4 = 16$ $T_4 + T_5 = 25$
   (b) $T_{n-1} + T_n = S_n$
(c) Turn one triangle over and fit it next to the other to make a square.
3) (a) (i) 9 (ii) 25 (iii) 49 (iv) 81
   (b) $8T_n + 1 = S_{2n+1}$
   (c) One dot in the centre surrounded by 8 triangles a bit like a windmill.

4) (a) (i) 9 (ii) 36 (iii) 100
   (b) The sum of the first *n* cube numbers is the square of the *n*th triangular number.

Product Codes

1) 1104, 1817 and 3792
2) 11, 12, and 20
3) Factors of 273 are {1, 3, 7, 13, 21, 39, 91, 273}
   Factors of 357 are {1, 3, 7, 17, 21, 51, 119, 357}
   The only 2-digit number in both lists is 21.
   So the products must have been 21 × 13 = 273 and 21 × 17 = 357
   So the three code numbers are 13, 17 and 21.
4) [Hint:] One possible method is to form 3 equations xy = 432, yz = 540 and zx = 720.
   Then multiply all three equations together to get $x^2y^2z^2 = 432 \times 540 \times 720$

Prime Factors – Investigate
Prime Factor Form

No answers as these are more in the form of investigations (going beyond the GCSE syllabus) into the relationship between the prime factorisation of a number and the number of factors it has.