Answers - Factors, multiples, primes, squares and cubes

Year: Year 5

Answer to Question 1

a. Factor pairs: 1 × 24, 2 × 12, 3 × 8, 4 × 6. The factors are **1, 2, 3, 4, 6, 8, 12, 24**.
b. Factor pairs: 1 × 30, 2 × 15, 3 × 10, 5 × 6. The factors are **1, 2, 3, 5, 6, 10, 15, 30**.
c. Factor pairs: 1 × 45, 3 × 15, 5 × 9. The factors are **1, 3, 5, 9, 15, 45**.

Answer to Question 2

a. 36: 1 × 36, 2 × 18, 3 × 12, 4 × 9, 6 × 6.
b. 48: 1 × 48, 2 × 24, 3 × 16, 4 × 12, 6 × 8. **36** has an odd number of factors (9) because 6 × 6 uses the factor 6 only once; 48 has 10 factors.

Answer to Question 3

a. **7, 14, 21, 28, 35, 42**.
b. **12, 24, 36, 48, 60, 72**.
c. 84 ÷ 7 = 12 exactly, so **yes**.
d. 100 ÷ 12 = 8 remainder 4, so **no**.

Answer to Question 4

a. 17 is **prime** (no factors other than 1 and 17).
b. 21 is **composite** (3 × 7).
c. 29 is **prime** (no factors other than 1 and 29).
d. 51 is **composite** (3 × 17).
e. 57 is **composite** (3 × 19).
f. 91 is **composite** (7 × 13).

Answer to Question 5

a. 7 × 7 = **49**.
b. 3 × 3 × 3 = **27**.
c. 12 × 12 = **144**.

d. $5 \times 5 \times 5 =$ **125**.
e. $10 \times 10 \times 10 =$ **1,000**.
f. $81 = 9 \times 9$, so it is a **square number**. It is not a cube because $4^3 = 64$ and $5^3 = 125$.

Answer to Question 6

a. Factors of 18: 1, 2, 3, 6, 9, 18. Factors of 30: 1, 2, 3, 5, 6, 10, 15, 30. Common: 1, 2, 3, 6. The highest is **6**.
b. Multiples of 4: 4, 8, 12. Multiples of 6: 6, 12. The lowest common multiple is **12**.
c. 5 and 8 share no factor, so multiply: $5 \times 8 =$ **40**.

Answer to Question 7

a. The factors of 36: **1, 2, 3, 4, 6, 9, 12, 18, 36** children per team.
b. Between 5 and 12: **6, 9 and 12**.
c. $36 \div 9 =$ **4 teams**.
d. $38 \div 6 = 6$ remainder 2, so **no**. 6 is not a factor of 38.

Answer to Question 8

a. $7 \times 7 = 49$, so **7 tiles**.
b. $12 \times 12 = 144$, so **12 tiles**.
c. $144 - 49 =$ **95 tiles**.
d. $7^2 = 49$ and $8^2 = 64$. 50 is between them, so it is **not a square number**.

Answer to Question 9

a. Every 6 minutes: **9:06, 9:12, 9:18, 9:24**.
b. Every 8 minutes: **9:08, 9:16, 9:24**.
c. The first time in both lists is **9:24 am**.
d. The lowest common multiple of 6 and 8 is **24 minutes**.

Answer to Question 10

a. The factor pairs of 48 give **10 ways**: 1 bag of 48, 2 of 24, 3 of 16, 4 of 12, 6 of 8, and the same numbers the other way round.
b. The sweets per bag must be 6, 8 or 12 (the factors between 5 and 15), so **8 bags of 6, 6 bags of 8 or 4 bags of 12**.
c. $60 \div 7 = 8$ remainder 4, so **no**.
d. The prime factors of 60 are 2, 3 and 5, so **2, 3 or 5 bags**.

Answer to Question 11

a. $2^3 = \mathbf{8}$; $3^3 = \mathbf{27}$; $4^3 = \mathbf{64}$; $5^3 = \mathbf{125}$.
b. $64 - 27 = \mathbf{37}$.
c. They are **cube numbers**.
d. 125 is more than 100, so **no**, he is 25 cubes short.

Answer to Question 12

a. **2, 3, 5, 7, 11, 13, 17, 19, 23, 29**.
b. There are **10** red lockers.
c. Yes, **locker 2** is the only even prime.
d. Multiples of 6 up to 30: **6, 12, 18, 24, 30**.
e. No. Multiples of 6 are divisible by 2 and 3, so they have at least four factors and are not prime.

Answer to Question 13

a. $5 \times 12 = \mathbf{60}$.
b. Factor pairs of 60: 1×60, 2×30, 3×20, 4×15, 5×12, 6×10 (and the reverse).
c. The pair **6 × 10** is the closest to a square.
d. $64 = 8 \times 8$, so **yes**: 8 rows of 8 plants.

Answer to Question 14

a. **4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48**.
b. **6, 12, 18, 24, 30, 36, 42, 48**.
c. **12, 24, 36, 48**.
d. The lowest common multiple of 4 and 6 is **12**, and the numbers where both happen are the multiples of 12.

Answer to Question 15

a. Multiples of 12: 12, 24, 36, 48. Multiples of 18: 18, 36, 54, 72.
b. The lowest common multiple of 12 and 18 is **36 seconds**.
c. 5 minutes is 300 seconds. $300 \div 36 = 8$ remainder 12, so **8 times**.
d. 9 is a factor of 36, so C flashes at 36 seconds too. **Yes**, all three flash together every 36 seconds.
e. $3 \times 36 = 108$ seconds, so **1 minute 48 seconds after midnight** (00:01:48).

Answer to Question 16

a. **45, 54, 63, 72**.
b. The squares near this range are 49 and 64, and neither is a multiple of 9. None of the four numbers is a square number, so all four remain: **45, 54, 63, 72**.
c. Only 72 divides by 4: 72 ÷ 4 = 18. The mystery number is **72**.
d. 72 = 2 × 2 × 2 × 3 × 3 = **$2^3 \times 3^2$**.
e. 144 ÷ 72 = 2 exactly, so **yes**, 72 is a factor of 144.

Answer to Question 17

a. Pattern 5: 5^2 = **25**. Pattern 10: 10^2 = **100**.
b. 25 − 16 = **9**; 36 − 25 = **11**.
c. Extra tiles: 3, 5, 7, 9, 11 (from 1 to 4, 4 to 9, and so on). They are **the odd numbers**, going up by 2 each time.
d. 14^2 = 196 and 15^2 = 225. The biggest is a 14 by 14 square, and **4 tiles** are left over (200 − 196).
e. 12^2 = 144 and 13^2 = 169, so 150 lies between two squares and is **not possible**.

Answer to Question 18

a. **3 + 17 and 7 + 13**.
b. **7 + 23, 11 + 19, 13 + 17**.
c. 90 = 9 × 10 = (3 × 3) × (2 × 5), so 90 = **2 × 3 × 3 × 5** = 2 × 3^2 × 5.
d. 2 × 2 × 5 × 7 = 4 × 35 = **140**.
e. 91 = **7 × 13**, so it has factors 7 and 13 and is composite.

Answer to Question 19

a. 3^3 = **27**. It is 3 × 3 × 3.
b. A cube has **8 corners**, so 8 small cubes have 3 red faces.
c. A cube has 12 edges and each edge has 1 middle cube, so **12 cubes** have 2 red faces.
d. Each of the 6 faces has 1 centre cube, so **6 cubes** have 1 red face, and the single cube in the middle has **no red face** (1 cube).
e. 8 + 12 + 6 + 1 = **27**. It checks.

Answer to Question 20

a. Factors of 60: **1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60**. That is 12.
b. Factors of 72: **1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72**. That is 12 as well, so the

clue alone does not tell us whether the number is 60 or 72.

c. 12: factors 1, 2, 3, 4, 6, 12 (6 factors). Check the smaller numbers: 8 has 4, 9 has 3, 10 has 4, 11 has 2. The smallest is **12**.

d. 24 has 8 factors, 36 has 9 and 48 has 10. Testing every other number below 60 in the same way shows that none has 12 factors, so the smallest is **60**.