Test answers - Negative numbers, factors, multiples and primes

Year: Year 7 · Duration: 45 minutes · /20

Answer to Question 1 (4 marks)

a. Start at -7 on the number line and move 12 places to the right. After 7 steps you reach 0, and 5 more steps take you to **5**. (1 mark)
b. Subtracting a negative number is the same as adding the positive number: $-5-(-9)=-5+9=$**4**. (1 mark)
c. Multiply the numbers, $6\times 7=42$. The signs are different (one negative, one positive), so the answer is negative: -42. (1 mark)
d. Divide the numbers, $56\div 8=7$. Both numbers are negative, and two like signs give a positive answer: **7**. (1 mark)

Check (d) by multiplying back: $7\times(-8)=-56$. Check (b) on a thermometer: rising from -5 °C by 9 degrees gives 4 °C.

Answer to Question 2 (4 marks)

a. Find the factors in pairs that multiply to 30: 1×30, 2×15, 3×10, 5×6. The factors are **1, 2, 3, 5, 6, 10, 15, 30**. Award 1 mark for at least six correct and 2 marks for all eight with no extras.
b. The factors of 45 are 1, 3, 5, 9, 15, 45. The numbers in both lists are 1, 3, 5 and 15, so the highest common factor is **15**. (1 mark)
c. List multiples until one appears in both lists. Multiples of 6: 6, 12, 18, 24. Multiples of 8: 8, 16, 24. The lowest common multiple is **24**. (1 mark)

Check (b): $30=15\times 2$ and $45=15\times 3$, and 2 and 3 share no further factor.

Answer to Question 3 (4 marks)

a. Divide by primes repeatedly: $72\div 2=36$, $36\div 2=18$, $18\div 2=9$, $9\div 3=3$, $3\div 3=1$. So $72=2\times 2\times 2\times 3\times 3$ (1 mark for a correct tree or ladder). In index form this is $2^3\times 3^2$ (1 mark).
b. Test each number from 21 to 39. Even numbers and multiples of 3, 5 or 7 are ruled out. The primes left are **23, 29, 31, 37**. (1 mark)
c. A prime has exactly two factors, 1 and itself. The digits of 57 add to 12, so 57 divides by 3: $57=3\times 19$. It has factors 3 and 19 as well as 1 and 57, so it is not prime. (1 mark)

Check (a): $8\times 9=72$.

Answer to Question 4 (4 marks)

a. The coldest town has the lowest temperature. The most negative value is -9 °C, so **Inverness** was coldest. (1 mark)
b. The warmest town is Cardiff at 2 °C. The difference is $2-(-9)=2+9=$**11 °C**. On a thermometer you count 9 degrees up to zero and 2 more above it. (1 mark)
c. Leeds starts at -1 °C and falls by 6 degrees, so we subtract: $-1-6=-7$ **°C**. (1 mark)
d. Aberdeen starts at -4 °C and rises by 7 degrees: $-4+7=3$ °C. Since $3>0$, the temperature is **above** freezing point. (1 mark)

Ordered from coldest to warmest the towns are Inverness, Aberdeen, Leeds, Belfast, Cardiff.

Answer to Question 5 (4 marks)

a. List the multiples of each number. Multiples of 12: 12, 24, 36, 48. Multiples of 18: 18, 36, 54 (1 mark). The first number in both lists is **36**, so the LCM is 36 (1 mark).
b. Red finishes a lap at 12, 24, 36… seconds and blue at 18, 36… seconds. Both teams are next on the line together at the LCM, after **36 seconds** (1 mark). By then red has run $36\div12=3$ laps and blue has run $36\div18=2$ laps (1 mark).

Prime factors give the same answer: $12=2^2\times3$ and $18=2\times3^2$, so the LCM is $2^2\times3^2=36$. After 72 seconds they meet again, with 6 and 4 laps.