

1 a $2^2 \times 3 \times 5$

b $2^2 \times 13^2$

c $2^2 \times 3 \times 19$

d $2^2 \times 3^2 \times 5^2$

e $2^2 \times 3^2 \times 7$

f $2^2 \times 3^2 \times 5^2 \times 7$

g
$$\begin{array}{r} 2 \overline{)68\,640} \\ 2 \overline{)34\,320} \\ 2 \overline{)17\,160} \\ 2 \overline{)8\,580} \\ 2 \overline{)4\,290} \\ 3 \overline{)2\,145} \\ 5 \overline{)715} \\ 11 \overline{)143} \\ 13 \overline{)13} \\ \hline 1 \end{array}$$

Prime decomposition = $2^5 \times 3 \times 5 \times 11 \times 13$

h
$$\begin{array}{r} 2 \overline{)96\,096} \\ 2 \overline{)48\,048} \\ 2 \overline{)24\,024} \\ 2 \overline{)12\,012} \\ 2 \overline{)6\,006} \\ 3 \overline{)3\,003} \\ 7 \overline{)1\,001} \\ 11 \overline{)143} \\ 13 \overline{)13} \\ \hline 1 \end{array}$$

Prime decomposition = $2^5 \times 3 \times 7 \times 11 \times 13$

i
$$\begin{array}{r} 2 \overline{)32\,032} \\ 2 \overline{)16\,016} \\ 2 \overline{)8\,008} \\ 2 \overline{)4\,004} \\ 2 \overline{)2\,002} \\ 7 \overline{)1\,001} \\ 11 \overline{)143} \\ 13 \overline{)13} \\ \hline 1 \end{array}$$

Prime decomposition = $2^5 \times 7 \times 11 \times 13$

$$\begin{array}{r}
 \text{j} \quad 2 \overline{)544\,544} \\
 \quad 2 \overline{)272\,272} \\
 \quad 2 \overline{)136\,136} \\
 \quad 2 \overline{)68\,068} \\
 \quad 2 \overline{)34\,034} \\
 \quad 7 \overline{)17\,017} \\
 \quad 11 \overline{)2431} \\
 \quad 13 \overline{)221} \\
 \quad 17 \overline{)17} \\
 \quad \quad \underline{1}
 \end{array}$$

$$\text{Prime decomposition} = 2^5 \times 7 \times 11 \times 13 \times 17$$

2 For each part, first find the prime decomposition of each number.

a $4361 = 7^2 \times 89$

Neither 7 nor 89 are factors of 9281.

$$\text{HCF} = 1$$

b $999 = 3^3 \times 37$

$$2160 = 2^4 \times 3^3 \times 5$$

$$\text{HCF} = 3^3 = 27$$

c $5255 = 5 \times 1051$

716 845 is divisible by 5 but not 1051.

$$\text{HCF} = 5$$

d $1271 = 31 \times 41$

$$3875 = 5^3 \times 31$$

$$\text{HCF} = 31$$

e $804 = 2^2 \times 3 \times 67$

$$2358 = 2 \times 3^2 \times 131$$

$$\text{HCF} = 2 \times 3 = 6$$

3 a $18 = 3^2 \times 2$

Factors: 1, 2, 3, 6, 9, 18.

$$36 = 3^2 \times 2^2$$

Factors: 1, 2, 4, 3, 6, 12, 9, 18, 36

b 36 is a perfect square

c $121 = 11^2$. It has to be a perfect square to have an odd number of factors. To have 3 it must be the perfect square of a prime.

4 $1050 = 7 \times 5^2 \times 3 \times 2$

Children are teenagers: Ages:

$$7 \times 2 = 14$$

$$5 \times 3 = 15$$

5

5 $22^2 \times 55^2 = 10^2 \times n^2$

$$(11 \times 2)^2 \times (11 \times 5)^2 = 10^2 \times n^2$$

$$\therefore 11^2 \times 11^2 \times (5 \times 2)^2 = 10^2 \times n^2$$

$$\therefore n = 121$$

6 $5 \times 3 \times 7 \times 3 = 7 \times 5 \times 3^2$.

This has 12 factors Therefore the starting number is $7 \times 5 \times 3 = 105$. It has 8 factors.

7 $720 = 5 \times 3^2 \times 2^4$
 $720 = 2^3 \times 2 \times 3^2 \times 5$
 $720 = 8 \times 9 \times 10. n = 8$

8 $30 = 2 \times 3 \times 5$
Factors are: 1, 3, 5, 2, 2×3 , 2×5 , 3×5 , $2 \times 3 \times 5$
Product = $2^4 \times 3^4 \times 5^4 = 30^4$

9 LCM is 252 which is 4 hours and 12 minutes. That is 1:12 pm.

10 600 and 108 000
2400 and 27 000
3000 and 21 600
5400 and 12 000