Factor Pairs Practice

Solve each using prime factorization and factor pairs.

Mr. Merrick · October 2, 2025.

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1. Find integers $\heartsuit, \diamondsuit$ such that

$$\begin{aligned} \heartsuit \times \diamondsuit &= 12 \\ \heartsuit + \diamondsuit &= -7 \end{aligned}$$

$12 = 2^2 \cdot 3$. Pairs $(1,12), (2,6), (3,4)$ and their negatives. Only $(-3) + (-4) = -7$, so $(\heartsuit, \diamondsuit) = (-3, -4)$.

2. Find integers $\clubsuit, \spadesuit$ such that

$$\begin{aligned} \clubsuit \times \spadesuit &= 18 \\ \clubsuit + \spadesuit &= 9 \end{aligned}$$

$18 = 2 \cdot 3^2$. Pairs $(1,18), (2,9), (3,6)$. Only $3 + 6 = 9$, so $(\clubsuit, \spadesuit) = (3,6)$.

3. Find integers $\star, \☺$ such that

$$\begin{aligned} \star \times \☺ &= 20 \\ \star + \☺ &= -9 \end{aligned}$$

$20 = 2^2 \cdot 5$. Pairs $(1,20), (2,10), (4,5)$ (and negatives). Only $(-4) + (-5) = -9$, so $(\star, \☺) = (-4, -5)$.

4. Find integers $\diamondsuit, \clubsuit$ such that

$$\begin{aligned} \diamondsuit \times \clubsuit &= 30 \\ \diamondsuit + \clubsuit &= 13 \end{aligned}$$

$30 = 2 \cdot 3 \cdot 5$. Pairs $(1,30), (2,15), (3,10), (5,6)$. Only $3 + 10 = 13$, so $(\diamondsuit, \clubsuit) = (3,10)$.

5. Find integers $\heartsuit, \spadesuit$ such that

$$\begin{aligned} \heartsuit \times \spadesuit &= 24 \\ \heartsuit + \spadesuit &= -11 \end{aligned}$$

$24 = 2^3 \cdot 3$. Pairs $(1,24), (2,12), (3,8), (4,6)$ (and negatives). Only $(-3) + (-8) = -11$, so $(\heartsuit, \spadesuit) = (-3, -8)$.

6. Find integers $\☺, \diamondsuit$ such that

$$\begin{aligned} \☺ \times \diamondsuit &= 21 \\ \☺ + \diamondsuit &= 10 \end{aligned}$$

$21 = 3 \cdot 7$. Pairs $(1, 21), (3, 7)$. Only $3 + 7 = 10$, so $(\☺, \diamondsuit) = (3, 7)$.

7. Find integers $\star, \heartsuit$ such that

$$\begin{aligned} \star \times \heartsuit &= 16 \\ \star + \heartsuit &= -10 \end{aligned}$$

$16 = 2^4$. Pairs $(1, 16), (2, 8), (4, 4)$ (and negatives). Only $(-2) + (-8) = -10$, so $(\star, \heartsuit) = (-2, -8)$.

8. Find integers $\spadesuit, \☺$ such that

$$\begin{aligned} \spadesuit \times \☺ &= 15 \\ \spadesuit + \☺ &= 8 \end{aligned}$$

$15 = 3 \cdot 5$. Pairs $(1, 15), (3, 5)$. Only $3 + 5 = 8$, so $(\spadesuit, \☺) = (3, 5)$.

9. Find integers $\clubsuit, \diamondsuit$ such that

$$\begin{aligned} \clubsuit \times \diamondsuit &= 36 \\ \clubsuit + \diamondsuit &= -15 \end{aligned}$$

$36 = 2^2 \cdot 3^2$. Pairs $(1, 36), (2, 18), (3, 12), (4, 9), (6, 6)$ (and negatives). Only $(-3) + (-12) = -15$, so $(\clubsuit, \diamondsuit) = (-3, -12)$.

10. Find integers $\star, \spadesuit$ such that

$$\begin{aligned} \star \times \spadesuit &= -40 \\ \star + \spadesuit &= -3 \end{aligned}$$

For product -40, signs must be opposite. Factor pairs of 40 are $(1, 40), (2, 20), (4, 10), (5, 8)$. To get sum -3, choose $(-8, 5)$: $(-8) \cdot 5 = -40$ and $-8 + 5 = -3$. So $(\star, \spadesuit) = (-8, 5)$.