

**Live Worksheet 6 Factoring by Grouping**

Factoring by grouping is usually used when there are four terms.

1. group the four terms in pairs.
2. factor out the common factor for each pair.
3. factor out the common binomial factor which appears in step 2.

Factor the following by grouping.

5. $28y^3 + 16y^2 - 21y - 12 = (28y^3 - 21y) + (16y^2 - 12)$

$$= \underline{\hspace{2cm}} (4y^2 - \underline{\hspace{2cm}}) + \underline{\hspace{2cm}} (4y^2 - \underline{\hspace{2cm}})$$

$$= (\underline{\hspace{2cm}}) (4y^2 - 3)$$

$$= (\underline{\hspace{2cm}}) (\underline{\hspace{2cm}} + \sqrt{3}) (\underline{\hspace{2cm}} - \sqrt{3})$$

6. $24p^3 + 15p^2 - 56p - 35 = (24p^3 - 56p) + (15p^2 - 35)$

$$= \underline{\hspace{2cm}} (3p^2 - \underline{\hspace{2cm}}) + \underline{\hspace{2cm}} (3p^2 - \underline{\hspace{2cm}})$$

$$= (\underline{\hspace{2cm}}) (3p^2 - \underline{\hspace{2cm}})$$

$$= (\underline{\hspace{2cm}}) (\sqrt{3}p + \sqrt{\underline{\hspace{2cm}}}) (\sqrt{3}p - \sqrt{\underline{\hspace{2cm}}})$$

7. $4v^3 - 12v^2 - 5v + 15$

$$= 4v^2(\underline{\hspace{2cm}}) - 5(\underline{\hspace{2cm}})$$

$$= (4v^2 - \underline{\hspace{2cm}}) (\underline{\hspace{2cm}})$$

$$= (2v - \sqrt{\underline{\hspace{2cm}}}) (2v + \sqrt{\underline{\hspace{2cm}}}) (v - \underline{\hspace{2cm}})$$

8. $49x^3 - 35x^2 + 56x - 40$

$$= 7x^2(7x - \underline{\hspace{2cm}}) + \underline{\hspace{2cm}} (7x - 5)$$

$$= (7x^2 + \underline{\hspace{2cm}}) (\underline{\hspace{2cm}})$$

9. $12x^2u + 3x^2v + 28yu + 7yv$

$$= \underline{\hspace{2cm}} x^2(\underline{\hspace{2cm}} u + \underline{\hspace{2cm}}) + \underline{\hspace{2cm}} y(\underline{\hspace{2cm}} u + \underline{\hspace{2cm}})$$

$$= (\underline{\hspace{2cm}} x^2 + \underline{\hspace{2cm}}) (\underline{\hspace{2cm}})$$

10. $96x^3 - 84x^2 + 112x - 98$

$$= \underline{\hspace{2cm}} x^2(8x - 7) + \underline{\hspace{2cm}} (8x - 7)$$

$$= (\underline{\hspace{2cm}} x^2 + \underline{\hspace{2cm}}) (8x - 7)$$

$$= 2(\underline{\hspace{2cm}} x^2 \underline{\hspace{2cm}}) (8x - 7)$$



$$\begin{aligned} 11. 105n^3 + 175n^2 - 75n - 125 &= 35n^2(3n + \underline{\hspace{1cm}}) - \underline{\hspace{1cm}}(3n + 5) \\ &= (35n^2 - \underline{\hspace{1cm}})(\underline{\hspace{1cm}}) \\ &= (\sqrt{\underline{\hspace{1cm}}}n - 5)(\sqrt{\underline{\hspace{1cm}}}n + 5)(\underline{\hspace{1cm}}) \end{aligned}$$

$$\begin{aligned} 12. 24r^3 - 64r^2 - 21r + 56 &= \underline{\hspace{1cm}}r^2(3r \underline{\hspace{1cm}}) - \underline{\hspace{1cm}}(3r \underline{\hspace{1cm}}) \\ &= (\underline{\hspace{1cm}}r^2 - \underline{\hspace{1cm}})(\underline{\hspace{1cm}}) \\ &= (2\sqrt{2}r + \sqrt{\underline{\hspace{1cm}}})(2\sqrt{2}r - \sqrt{\underline{\hspace{1cm}}})(\underline{\hspace{1cm}}) \end{aligned}$$

$$\begin{aligned} 13. x^3 + x^2 + 5x + 125 &= (x^3 + 5^3) + (x^2 + 5x) \\ &= (x + \underline{\hspace{1cm}})(x^2 - \underline{\hspace{1cm}}x + 25) + x(x + \underline{\hspace{1cm}}) \\ &= (x + 5)(x^2 - 5x + 25 + x) \\ &= (x + 5)(x^2 - \underline{\hspace{1cm}}x + 25) \end{aligned}$$

$$\begin{aligned} 14. 2xm - km - 2xn + kn &= 2x(m - \underline{\hspace{1cm}}) - \underline{\hspace{1cm}}(m - \underline{\hspace{1cm}}) \\ &= (2x - \underline{\hspace{1cm}})(m - \underline{\hspace{1cm}}) \end{aligned}$$

$$\begin{aligned} 15. a^3 - 4a - 12 + 3a^2 &= a^3 - 4a + 3a^2 - 12 \\ &= \underline{\hspace{1cm}}(\underline{\hspace{1cm}}^2 - 4) + 3(\underline{\hspace{1cm}}^2 - 4) \\ &= (\underline{\hspace{1cm}})(\underline{\hspace{1cm}}^2 - 4) \\ &= (\underline{\hspace{1cm}} + 3)(\underline{\hspace{1cm}} - 2)(\underline{\hspace{1cm}} + 2) \end{aligned}$$

$$\begin{aligned} 16. 2km - 2k + h - hm &= -2k + 2km + h - hm \\ &= -2k(1 - \underline{\hspace{1cm}}) + \underline{\hspace{1cm}}(1 - \underline{\hspace{1cm}}) \\ &= (-2k + \underline{\hspace{1cm}})(\underline{\hspace{1cm}}) \end{aligned}$$