

## Practice

### Factoring – Completing the Square

Answer these problems, then check your answers using the key on the next page. If you missed something, look at the solutions after the answer key, and if you still don't understand, watch the review video again.

#1) Add a term to form a perfect trinomial and write as a binomial squared:

$$x^2 + 10x$$

#2) Complete the square and write as a binomial squared:

$$b^2 - 16b$$

#3) Add a term to form a perfect trinomial and write as a binomial squared:

$$4p^2 + 12p$$

#4) Complete the square and write as a binomial squared:

$$4y^2 - 20y$$

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#5) Complete the square and write as a binomial squared:

$$9x^2 + 42x$$

#6) Add a term to form a perfect trinomial and write as a binomial squared:

$$x^2 + x$$

#7) Complete the square and write as a binomial squared:

$$4b^2 - 2b$$

#8) Which of these expressions is a perfect trinomial?

a)  $9m^2 - 12m - 1$

b)  $4m^2 + 8m + 1$

c)  $81m^2 - 9m + 1$

d)  $25m^2 + 10m + 1$

e)  $9m^2 + 8m - 1$

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**Answers:**

$$\#1) \frac{x^2 + 10x + \underline{25}}{(x+5)^2}$$

$$\#2) \frac{b^2 - 16b + \underline{64}}{(b-8)^2}$$

$$\#3) \frac{4p^2 + 12p + \underline{9}}{(2p+3)^2}$$

$$\#4) \frac{4y^2 - 20y + \underline{25}}{(2y-5)^2}$$

$$\#5) \frac{9x^2 + 42x + \underline{49}}{(3x+7)^2}$$

$$\#6) \frac{x^2 + x + \frac{1}{4}}{\left(x + \frac{1}{2}\right)^2}$$

$$\#7) \frac{4b^2 - 2b + \frac{1}{4}}{\left(2b - \frac{1}{2}\right)^2}$$

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#8) d

**Solutions:**

#1) Add a term to form a perfect trinomial and write as a binomial squared:

$$\begin{array}{l} x^2 + 10x + \underline{25} \\ \downarrow +2 \uparrow \\ (5)^2 \\ 25 \\ x^2 + 10x + \underline{25} \\ (x)^2 \quad (5)^2 \\ \boxed{(x+5)^2} \end{array} \quad (\text{shorter}) \quad \begin{array}{l} x^2 + 10x + \underline{25} \\ +2 \downarrow \uparrow \text{square} \\ (x+5)^2 \end{array}$$

#2) Complete the square and write as a binomial squared:

$$\begin{array}{l} b^2 - 16b + \underline{64} \\ \downarrow -8 \uparrow \\ (-8)^2 \\ 64 \\ b^2 - 16b + \underline{64} \\ (b)^2 \quad (8)^2 \\ \boxed{(b-8)^2} \end{array} \quad (\text{shorter}) \quad \begin{array}{l} b^2 - 16b + \underline{64} \\ +2 \downarrow \uparrow \\ (b-8)^2 \end{array}$$

#3) Add a term to form a perfect trinomial and write as a binomial squared:

$$\begin{array}{l} 4p^2 + 12p + \underline{9} \\ \downarrow +3 \uparrow \\ (3)^2 \\ 9 \\ 4p^2 + 12p + \underline{9} \\ (2p)^2 \quad (3)^2 \\ \boxed{(2p+3)^2} \end{array}$$

#4) Complete the square and write as a binomial squared:

$$\begin{array}{l} 4y^2 - 20y + \underline{25} \\ \downarrow -5 \uparrow \\ (-5)^2 \\ 25 \\ 4y^2 - 20y + \underline{25} \\ (2y)^2 \quad (5)^2 \\ \boxed{(2y-5)^2} \end{array}$$

#5) Complete the square and write as a binomial squared:

$$\begin{array}{c}
 9x^2 + 42x + 49 \\
 \left. \begin{array}{c} \uparrow \quad \downarrow \quad \uparrow \\ (21)^2 \\ 42x \end{array} \right\} \\
 9x^2 + 42x + 49 \\
 (3x)^2 \quad (7)^2 \\
 \boxed{(3x+7)^2}
 \end{array}$$

#6) Add a term to form a perfect trinomial and write as a binomial squared:

$$\begin{array}{c}
 x^2 + x + \frac{1}{4} \\
 \left. \begin{array}{c} \uparrow \quad \downarrow \quad \uparrow \\ (\frac{1}{2})^2 \\ \frac{1}{4} \end{array} \right\} \\
 x^2 + x + \frac{1}{4} \\
 (x)^2 \quad (\frac{1}{2})^2 \\
 \boxed{(x+\frac{1}{2})^2}
 \end{array}$$

#7) Complete the square and write as a binomial squared:

$$\begin{array}{c}
 4b^2 - 2b + \frac{1}{4} \\
 \left. \begin{array}{c} \uparrow \quad \downarrow \quad \uparrow \\ (-1)^2 \\ 1 \end{array} \right\} \\
 4b^2 - 2b + \frac{1}{4} \\
 (2b)^2 \quad (\frac{1}{2})^2 \\
 \boxed{(2b-\frac{1}{2})^2}
 \end{array}$$

check:

$$\begin{array}{l}
 (2b-\frac{1}{2})^2 \\
 (2b-\frac{1}{2})(2b-\frac{1}{2}) \\
 4b^2 - b - b + \frac{1}{4} \\
 4b^2 - 2b + \frac{1}{4} \checkmark
 \end{array}$$

#8) Which of these expressions is a perfect trinomial?

a)  $9m^2 - 12m - 1$

$$\left. \begin{array}{c} \uparrow \quad \downarrow \quad \uparrow \\ (-6)^2 \\ 36 \end{array} \right\} \\
 \text{(no)}$$

b)  $4m^2 + 8m + 1$

$$\left. \begin{array}{c} \uparrow \quad \downarrow \quad \uparrow \\ (4)^2 \\ 16 \end{array} \right\} \\
 \text{(no)}$$

c)  $81m^2 - 9m + 1$

$$\left. \begin{array}{c} \uparrow \quad \downarrow \quad \uparrow \\ (-\frac{9}{2})^2 \\ \frac{81}{4} \end{array} \right\} \\
 \text{(no)}$$

**(d)**  $25m^2 + 10m + 1$

$$\left. \begin{array}{c} \uparrow \quad \downarrow \quad \uparrow \\ (5)^2 \\ 25 \end{array} \right\} \\
 \text{(yes)}$$

e)  $9m^2 + 8m - 1$

$$\left. \begin{array}{c} \uparrow \quad \downarrow \quad \uparrow \\ (4)^2 \\ 16 \end{array} \right\} \\
 \text{(no)}$$