

Solutions

Page 74 #s 3ac, 4ac, 5ace, 7, 9aceg, 11, 12

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3. Add.

a) $3x + (4x + 2)$

$$= \underline{3x} + \underline{4x} + 2$$

$$3x + 4x = 7x$$

$$\Rightarrow 7x + 2$$

c) $(5x + 2) + (3x + 8)$

$$= \underline{5x} + \underline{2} + \underline{3x} + \underline{8}$$

$$5x + 3x = 8x$$

$$2 + 8 = 10$$

$$\Rightarrow 8x + 10$$

4. Subtract.

a) $7x - (2x + 3)$

$$= 7x - 2x - 3$$

$$7x - 2x = 5x$$

$$\Rightarrow 5x - 3$$

c) $(6x + 8) - (2x + 5)$

$$= \underline{6x} + \underline{8} - \underline{2x} - \underline{5}$$

$$6x - 2x = 4x$$

$$8 - 5 = 3$$

$$\Rightarrow 4x + 3$$

5. Simplify.

a) $(-4y + 6) + (-12y - 8)$

$$= \underline{-4y} + \underline{6} - \underline{12y} - \underline{8}$$

$$-4y - 12y = -16y$$

$$6 - 8 = -2$$

$$\Rightarrow -16y - 2$$

c) $(4a^2 - 3a) - (6a^2 + 4a)$

$$= \underline{4a^2} - \underline{3a} - \underline{6a^2} - \underline{4a}$$

$$4a^2 - 6a^2 = -2a^2$$

$$-3a - 4a = -7a$$

$$\Rightarrow -2a^2 - 7a$$

e) $(-9y^2 - 11y + 2) + (3 + 9y^2)$

$$\underline{-9y^2} - 11y + \underline{2} + \underline{3} + \underline{9y^2}$$

$$-9y^2 + 9y^2 = 0$$

$$2 + 3 = 5$$

$$\Rightarrow -11y + 5$$

7. We can think of subtracting as "adding the opposite." For example, $(2x+3)-(4x-5)$ can be expressed as $(2x+3)+(-4x+5)$. For each of the following, express the subtraction of polynomials as an addition and then evaluate the sum.

a) $(6x+2)-(-5x+8)$ b) $(3y^2+2y-4)-(8y^2-y+6)$ c) $(-a-3)-(-2a^2+3a-4)$

$$= (6x+2) + (5x-8)$$

$$= \underline{6x+2} + \underline{5x-8}$$

$$6x + 5x = 11x$$

$$2 - 8 = -6$$

$$\Rightarrow 11x - 6$$

$$= (3y^2+2y-4) + (-8y^2+y-6)$$

$$= \underline{3y^2} + \underline{2y} - \underline{4} - \underline{8y^2} + \underline{y} - \underline{6}$$

$$3y^2 - 8y^2 = -5y^2$$

$$2y + y = 3y$$

$$-4 - 6 = -10$$

$$\Rightarrow -5y^2 + 3y - 10$$

$$= (-a-3) + (2a^2-3a+4)$$

$$= \underline{-a-3} + \underline{2a^2-3a+4}$$

$$-a - 3a = -4a$$

$$-3 + 4 = 1$$

$$\Rightarrow 2a^2 - 4a + 1$$

9. Simplify.

a) $(5x+4)-7x$

$$a) \quad \underline{5x} + 4 - \underline{7x}$$

$$5x - 7x = -2x$$

$$\Rightarrow -2x + 4$$

e) $(y^3+4y^2+2)+(6y^2-3y+11)$

$$e) \quad y^3 + \underline{4y^2} + 2 + \underline{6y^2}$$

$$-3y + \underline{11}$$

$$4y^2 + 6y^2 = 10y^2$$

$$2 + 11 = 13$$

$$c) \quad \underline{4x^2} - \underline{7x} + \underline{5} + \underline{6x^2} + \underline{9x} - \underline{8} \Rightarrow y^3 + 10y^2 - 3y + 13$$

$$4x^2 + 6x^2 = 10x^2$$

$$-7x + 9x = 2x$$

$$5 - 8 = -3$$

$$\Rightarrow 10x^2 + 2x - 3$$

g) $(5z-9)-(9z-8+z^2)$

$$g) \quad \underline{5z} - 9 - \underline{9z} + \underline{8} - z^2$$

$$5z - 9z = -4z$$

$$-9 + 8 = -1$$

$$\Rightarrow -z^2 - 4z - 1$$

11. Simplify.

a) $(5x+3)+(2x-1)+(-3x+8)$

$$= \underline{5x+3} + \underline{2x-1} - \underline{3x+8}$$

$$5x + 2x - 3x = 4x$$

$$3 - 1 + 8 = 10$$

$$\Rightarrow 4x + 10$$

b) $(3a+4)-(a-6)+(-4a+7)$

$$= \underline{3a+4} - \underline{a-6} - \underline{4a+7}$$

$$3a - a - 4a = -2a$$

$$4 + 6 + 7 = 17$$

$$\Rightarrow -2a + 17$$

c) $(3xy^2+6x-8y)+(9xy^2-2x+4y)$

$$= \underline{3xy^2+6x-8y} + \underline{9xy^2-2x+4y}$$

$$3xy^2 + 9xy^2 = 12xy^2$$

$$6x - 2x = 4x$$

$$-8y + 4y = -4y$$

$$\Rightarrow 12xy^2 + 4x - 4y$$

d) $\left(\frac{1}{2}n^2 + \frac{2}{3}n - \frac{5}{3}\right) - \left(\frac{3}{8}n^2 - \frac{3}{4}n + \frac{7}{3}\right)$

$$\underline{\frac{1}{2}n^2} + \underline{\frac{2}{3}n} - \underline{\frac{5}{3}} - \underline{\frac{3}{8}n^2} + \underline{\frac{3}{4}n}$$

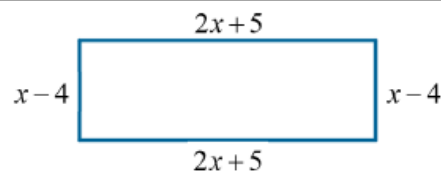
$$\frac{1}{2}n^2 - \frac{3}{8}n^2 = \frac{1}{8}n^2$$

$$\frac{2}{3}n + \frac{3}{4}n = \frac{17}{12}n$$

$$-\frac{5}{3} - \frac{7}{3} = -\frac{12}{3} = -4$$

$$\Rightarrow \frac{1}{8}n^2 + \frac{17}{12}n - 4$$

12. A rectangle is shown on the right with algebraic expressions that represent the lengths of its sides. Determine a simplified expression that represents the perimeter of the rectangle.



$$P = (2x+5) + (x-4) + (2x+5) + (x-4)$$

$$= \underline{2x+5} + \underline{x-4} + \underline{2x+5} + \underline{x-4}$$

$$2x + x + 2x + x = 6x$$

$$5 - 4 + 5 - 4 = 2$$

$$\Rightarrow P = 6x + 2$$

14. When using *column form* to add or subtract polynomials, like terms are aligned vertically. The following example illustrates that $(3x^2 + 5x - 4) + (x^2 - 9x + 7)$ equals $4x^2 - 4x + 3$.

Express each of the following in column form and then add or subtract, as indicated. +

$$\begin{array}{r} 3x^2 + 5x - 4 \\ + \quad x^2 - 9x + 7 \\ \hline 4x^2 - 4x + 3 \end{array}$$

a) $(-4x + 6) + (6x - 7)$

$$\begin{array}{r} -4x + 6 \\ + \quad 6x - 7 \\ \hline 2x - 1 \end{array}$$

b) $(y^2 + 5y - 8) + (2y^2 - 7y + 4)$

$$\begin{array}{r} y^2 + 5y - 8 \\ + \quad 2y^2 - 7y + 4 \\ \hline 3y^2 - 2y - 4 \end{array}$$

g) $(8x^2 + 3x) - (2x^2 - 4x + 5)$

$$\begin{array}{r} 8x^2 + 3x + 0 \\ - \quad 2x^2 - 4x + 5 \\ \hline 6x^2 + 7x - 5 \end{array}$$

15. The height, in metres, of a golf ball above the ground t seconds after it is hit is given by the expression $-4.9t^2 + 21.8t$. Similarly, the height of a baseball that is hit at the exact same time as the golf ball is represented by the expression $-4.9t^2 + 20.4t + 2.4$.

a) Interpret the expression $(-4.9t^2 + 20.4t + 2.4) - (-4.9t^2 + 21.8t)$ in the context of this situation.

The difference in height between the two balls at a given time of t seconds.

b) Simplify the expression from part (a).

$$\begin{aligned} & (-4.9t^2 + 20.4t + 2.4) - (-4.9t^2 + 21.8t) \\ = & \underline{-4.9t^2} + \underline{20.4t} + 2.4 + \underline{4.9t^2} - \underline{21.8t} \end{aligned}$$

$$-4.9t^2 + 4.9t^2 = 0$$

$$20.4t - 21.8t = -1.4t$$

$$\Rightarrow -1.4t + 2.4$$

c) Evaluate your result from part (b) for $t=1$ and $t=3$.

$$\begin{aligned} \text{Sub in } t=1 \\ &= -1.4(1) + 2.4 \\ &= -1.4 + 2.4 \\ &= 1 \text{ m} \end{aligned}$$

$$\begin{aligned} \text{Sub in } t=3 \\ &= -1.4(3) + 2.4 \\ &= -4.2 + 2.4 \\ &= -1.8 \text{ m} \end{aligned}$$

d) The two values calculated in part (c) have different signs.
Interpret these opposite signs in the context of this situation.

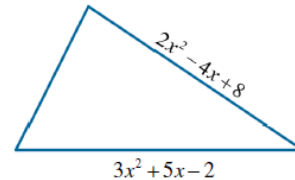
Expression is height of baseball
take away height of the golf ball.

\Rightarrow Positive answer means baseball is
higher than the golf ball.

\Rightarrow Negative answer means the golf ball is
higher than the baseball.

18. For the triangle shown below, algebraic representations are given for the lengths of two sides. If the perimeter of the triangle is $2x^2 + x + 13$, determine a simplified expression for the length of the third side.

Firstly, add the two
known sides.



$$\underline{2x^2 - 4x + 8} + \underline{3x^2 + 5x - 2}$$

$$2x^2 + 3x^2 = 5x^2$$

$$-4x + 5x = x$$

$$8 - 2 = 6$$

$$\Rightarrow 5x^2 + x + 6$$

Third side is the
difference between
the perimeter and
the sum

$$\begin{aligned} \Rightarrow 2x^2 + x + 13 - (5x^2 + x + 6) \\ &= \underline{2x^2 + x + 13} - \underline{5x^2 - x - 6} \end{aligned}$$

$$2x^2 - 5x^2 = -3x^2$$

$$x - x = 0$$

$$13 - 6 = 7$$

$$\Rightarrow \text{The third side is } -3x^2 + 7$$