

Solutions

Page 242 #s 2ace, 3aceg, 4bdfh, 6afkl, 7ac, 8, 9ad, 10bh, 12, 14ab, 15b, 18f, 21a(i)

2. State the value that should be placed in each box.

a) $\boxed{5} (3 + 7) = 5(3) + 5(7)$

c) $\boxed{8} (x + 6) = 8x + 8(6)$

e) $\boxed{x} (x + 4) = x^2 + 4x$

3. Expand.

a) $2(x+6)$

$$= 2(x) + 2(6)$$

$$= 2x + 12$$

c) $-4(m+2)$

$$= (-4)(m) + (-4)(2)$$

$$= -4m - 8$$

e) $3(2x+5)$

$$= 3(2x) + 3(5)$$

$$= 6x + 15$$

g) $-6(-2x+3)$

$$= (-6)(-2x) + (-6)(3)$$

$$= 12x - 18$$

4. Expand.

b) $-3(x^2+8x+5)$

$$= (-3)(x^2) + (-3)(8x) + (-3)(5)$$

$$= -3x^2 - 24x - 15$$

d) $-1(m+6)$

$$= (-1)(m) + (-1)(6)$$

$$= -m - 6$$

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

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

$$= 6x^2 + 8x$$

h) $-2t(-t-4)$

$$= (-2t)(-t) + (-2t)(-4)$$

$$= 2t^2 + 8t$$

6. Expand and simplify.

a) $5(x-6)$

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

$$= 5x - 30$$

f) $x(5x+4)$

$$= x(5x) + x(4)$$

$$= 5x^2 + 4x$$

k) $-x(-8-6x)$

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

$$= 8x + 6x^2$$

$$= 6x^2 + 8x$$

l) $-2x(x^2+4x+6)$

$$= (-2x)(x^2) + (-2x)(4x)$$

$$+ (-2x)(6)$$

$$= -2x^3 - 8x^2 - 12x$$

[conventionally
written with
descending exponents]

7. Expand, simplify and then evaluate for $x=3$ and $y=-2$.

a) $5(x+3)$

$$= 5(x) + 5(3)$$

$$= 5x + 15$$

$$\text{sub in } x=3$$

$$\Rightarrow 5(3) + 15$$

$$= 15 + 15$$

$$= 30$$

c) $(6-x)(-3x)$

$$= 6(-3x) + (-x)(-3x)$$

$$= -18x + 3x^2$$

$$= 3x^2 - 18x$$

$$\text{sub in } x=3$$

$$\Rightarrow 3(3)^2 - 18(3)$$

$$= 3(9) - 54$$

$$= 27 - 54$$

$$= -27$$

8. An emergency roofing repair company charges \$120 per visit plus \$75 per hour.

- a) Determine an expression to represent the total cost of a repair visit that requires t hours of work.
- b) On weekends and holidays, the total cost is doubled. Determine a simplified expression for the total cost of a weekend repair visit that takes t hours.
- c) Use your expression from part (b) to determine the total cost of a weekend repair visit that required 1 hour and 30 minutes.

$$\text{Initial cost} = \$120$$

$$\text{Rate of charge} = \$75/\text{hour}$$

$$\text{a) } C = 120 + 75t \quad \begin{array}{l} C = \text{cost } (\$) \\ t = \text{time (hours)} \end{array}$$

$$\begin{aligned} \text{b) } \text{New cost is doubled} \\ \Rightarrow 2(120 + 75t) \\ = 2(120) + 2(75t) \\ = 240 + 150t \end{aligned}$$

$$\begin{aligned} \text{c) } \text{Sub in } t = 1.5 \\ \Rightarrow = 240 + 150(1.5) \\ = 240 + 225 \\ = \$465 \end{aligned}$$

9. State whether the two expressions are equivalent or not equivalent.

$$\begin{aligned} \text{a) } \underline{3(x^2 + 4x)} \text{ and } \underline{3x(x+4)} \\ = 3(x^2) + 3(4x) \\ = 3x^2 + 12x \\ = 3x(x) + 3x(4) \\ = 3x^2 + 12x \end{aligned}$$

\Rightarrow Yes, they are equivalent

$$\begin{aligned} \text{d) } \underline{2(3a^2 + 6a + 1)} \text{ and } \underline{6a(a+2) + 1} \\ = 2(3a^2) + 2(6a) + 2(1) \\ = 6a^2 + 12a + 2 \\ = 6a(a) + 6a(2) + 1 \\ = 6a^2 + 12a + 1 \end{aligned}$$

\Rightarrow No, they are not equivalent

10. Simplify.

b) $m + 3(2m - 4)$

h) $2(5x + 3) - 4(x + 3)$

$$= m + 3(2m) + 3(-4)$$

$$= m + 6m - 12$$

$$= 7m - 12$$

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

$$= 10x + 6 - 4x - 12$$

$$= 6x - 6$$

12. The width of a rectangle is represented by the expression $3x + 5$. The rectangle's length is three times its width.

a) Determine a simplified expression for the length of the rectangle.

b) Determine a simplified expression that represents the perimeter of the rectangle.

$$\begin{aligned} \text{a) length} &= 3(3x + 5) \\ &= 3(3x) + 3(5) \\ &= 9x + 15 \end{aligned}$$

$$\begin{aligned} \text{b) perimeter} &= 2(L + w) \\ &= 2(\underbrace{9x + 15}_{\text{length}} + \underbrace{3x + 5}_{\text{width}}) \end{aligned}$$

collect like terms in the bracket first

$$\Rightarrow = 2(12x + 20)$$

now distribute/expand

$$\begin{aligned} \Rightarrow &= 2(12x) + 2(20) \\ &= 24x + 40 \end{aligned}$$

14. Expand and simplify.

a) $\frac{1}{2}\left(\frac{3}{4}y - \frac{1}{3}\right)$ b) $\frac{1}{3}(3a+6)$

$$= \frac{1}{2}\left(\frac{3}{4}y\right) + \frac{1}{2}\left(-\frac{1}{3}\right) \quad = \frac{1}{3}(3a) + \frac{1}{3}(6)$$

$$= \frac{3}{8}y - \frac{1}{6} \quad = a + 2$$

15. Simplify.

b) $\frac{5}{6}\left(\frac{1}{2}x + \frac{1}{3}\right) - \frac{2}{3}\left(\frac{3}{4}x - \frac{7}{6}\right)$

$$= \frac{5}{6}\left(\frac{1}{2}x\right) + \frac{5}{6}\left(\frac{1}{3}\right) - \frac{2}{3}\left(\frac{3}{4}x\right) - \frac{2}{3}\left(-\frac{7}{6}\right)$$

$$= \frac{5}{12}x + \frac{5}{18} - \frac{6}{12}x + \frac{14}{18}$$

collect like terms

$$= \frac{5}{12}x - \frac{6}{12}x + \frac{5}{18} - \frac{14}{18}$$

$$= -\frac{1}{12}x - \frac{9}{18}$$

$$= -\frac{1}{12}x - \frac{1}{2}$$

18. Simplify.

$$f) \frac{4x^3 + 12x^2 - 20x}{-4x}$$

$$= -\frac{1}{4x} (4x^3 + 12x^2 - 20x)$$

$$= -\frac{1}{4x} (4x^3) - \frac{1}{4x} (12x^2) - \frac{1}{4x} (-20x)$$

$$= -\frac{4x^3}{4x} - \frac{12x^2}{4x} + \frac{20x}{4x}$$

$$= (-4 \div 4)(x^{3-1}) - (12 \div 4)(x^{2-1})$$

$$= -1(x^2) - 3(x) + 5(1) \quad + (20 \div 4)(x \div x)$$

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

21. To multiply the binomial $x+2$ by the binomial $x+3$, we can use the distributive property several times, as shown below.

$$\begin{aligned} (x+2)(x+3) &= (x+2)(x) + (x+2)(3) \\ &= x^2 + 2x + 3x + 6 \\ &= x^2 + 5x + 6 \end{aligned}$$

a) Expand and simplify.

$$i) (x+5)(x+4)$$

$$= (x+5)(x) + (x+5)(4)$$

$$= (x)(x) + 5(x) + (x)(4) + 5(4)$$

$$= x^2 + 5x + 4x + 20$$

collect like terms

$$\Rightarrow x^2 + 9x + 20$$