

Expanding

Grouping symbols such as [brackets], {braces} and (parentheses), can be removed without changing the value of the expression by expanding.

$$a(b+c) = a \times b \text{ and } a \times c \\ = ab + ac$$

Every term inside the parentheses is multiplied by the term in front of the parentheses.

Expand $2(3x+5)$

$$2(3x+5) = 2(3x+5) \quad 2 \times \text{every term inside the parentheses} \\ = 2 \times 3x \text{ and } 2 \times 5 \\ = 6x \text{ and } +10 \\ = 6x + 10$$

$$a(b+c) = a \times b \text{ and } a \times c \\ = ab + ac$$

Expand $3a(a-4)$

$$3a(a-4) = 3a(a-4) \quad 3a \times \text{every term inside the parentheses} \\ = 3a \times a \text{ and } 3a \times -4 \\ = 3a^2 \text{ and } -12a \\ = 3a^2 - 12a$$

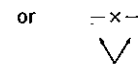
Now that you have seen how it works, it's time to learn the mathematical name we give this is method:



The Distributive Law

- $a(b+c) = a \times b \text{ and } a \times c \\ = ab + ac$
- $a(b-c) = a \times b \text{ and } a \times -c \\ = ab - ac$

Be careful multiplying positive and negative values when expanding.



Signs the same we get a **positive** answer

If the signs change we get a **negative** answer

$$\wedge \\ 3 \times 5 = 15$$

$$\wedge \\ -3 \times -5 = 15$$

$$\wedge \\ -3 \times 5 = -15$$

$$\wedge \\ 3 \times -5 = -15$$

When expanding parenthesis multiplied by negative numbers, The Distributive Law becomes:

$$-a(b+c) = -a \times b \text{ and } -a \times c \\ = -ab - ac$$

Be careful with signs

$$-a(b-c) = -a \times b \text{ and } -a \times -c \\ = -ab + ac$$

If the term in front of the parentheses is negative, all the terms inside change sign after expanding.

Expand $-p(4p+7)$

$$-p(4p+7) = -p(4p+7) \quad -p \times \text{every term inside the parentheses} \\ = -p \times 4p \text{ and } -p \times 7 \quad -p(4p+7) = (-p \times 4p) + (-p \times 7) \\ = -4p^2 \text{ and } -7p \\ = -4p^2 - 7p$$

Expand $-5(3y-1)$

$$-5(3y-1) = -5(3y-1) \quad 5 \times \text{every term inside the parentheses} \\ = -5 \times 3y \text{ and } -5 \times -1 \quad -5(3y-1) = (-5 \times 3y) + (-5 \times -1) \\ = -15y \text{ and } +5 \\ = -15y + 5$$

 Expanding

1 Expand:

2 $2(a+7)$

3 $9(b-3)$

4 $6c(3d+1)$

5 $4d(3-c)$

6 $3x(6+4y)$

7 $3m(p-q)$

8 $\frac{1}{2}(6m-14)$

9 $2ab(3c+2d)$

10 $4(-3-9x)$

11 $-2p\left(2-\frac{q}{2}\right)$



Page 4 questions

Expanding

$$\begin{aligned} 1 \quad 2(a+7) &= 2(a+7) \\ &= 2 \times a \text{ and } 2 \times 7 \\ &= 2a + 14 \\ &= 2a + 14 \end{aligned}$$

$$\begin{aligned} 2 \quad 9(b-3) &= 9(b-3) \\ &= 9 \times b \text{ and } 9 \times -3 \\ &= 9b \text{ and } -27 \\ &= 9b - 27 \end{aligned}$$

$$\begin{aligned} 3 \quad 6c(3d+1) &= 6c(3d+1) \\ &= 6c \times 3d \text{ and } 6c \times 1 \\ &= 18cd \text{ and } +6c \\ &= 18cd + 6c \end{aligned}$$

$$\begin{aligned} 4 \quad 4d(3-c) &= 4d(3-c) \\ &= 4d \times 3 \text{ and } 4d \times -c \\ &= 12d \text{ and } -4cd \\ &= 12d - 4cd \end{aligned}$$

$$\begin{aligned} 5 \quad 3x(6+4y) &= 3x(6+4y) \\ &= 3x \times 6 \text{ and } 3x \times 4y \\ &= 18x \text{ and } +12xy \\ &= 18x + 12xy \end{aligned}$$

$$\begin{aligned} 6 \quad 3m(p-q) &= 3m(p-q) \\ &= 3m \times p \text{ and } 3m \times -q \\ &= 3mp \text{ and } -3mq \\ &= 3mp - 3mq \end{aligned}$$

$$\begin{aligned} 7 \quad \frac{1}{2}(6m-14) &= \frac{1}{2}(6m-14) \\ &= \frac{1}{2} \times 6m \text{ and } \frac{1}{2} \times -14 \\ &= 3m \text{ and } -7 \\ &= 3m - 7 \end{aligned}$$

$$\begin{aligned} 8 \quad 2ab(3c+2d) &= 2ab(3c+2d) \\ &= 2ab \times 3c \text{ and } 2ab \times 2d \\ &= 6abc \text{ and } +4abd \\ &= 6abc + 4abd \end{aligned}$$

$$\begin{aligned} 9 \quad 4(-3-9x) &= 4(-3-9x) \\ &= 4 \times -3 \text{ and } 4 \times -9x \\ &= -12 \text{ and } -36x \\ &= -12 - 36x \end{aligned}$$

$$\begin{aligned} 10 \quad -2p\left(2-\frac{q}{2}\right) &= -2p\left(2-\frac{q}{2}\right) \\ &= -2p \times 2 \text{ and } -2p \times -\frac{q}{2} \\ &= -4p \text{ and } +pq \\ &= -4p + pq \\ &= pq - 4p \text{ (for neatness)} \end{aligned}$$



Expanding

2 Expand:

a $-(a+11)$

Psst! Remember the 1 can be hidden: $-1(a+11)$

b $-2(b-5)$

c $-n(6+8m)$

d $-3(2-7d)$

e $-2x(y+4)$

f $-5mn(p-q)$

3 The same rules apply for expanding the following questions:

a $0.2a(25a+15)$

b $-2b(c-3.5b)$

Page 5 questions

Expanding

$$\begin{aligned} 2 \quad a \quad -(a+11) &= -(a+11) \\ &= -1 \times a \text{ and } -1 \times +11 \\ &= -a \text{ and } -11 \\ &= -a-11 \end{aligned}$$

$$\begin{aligned} c \quad -n(6+8m) &= -n(6+8m) \\ &= -n \times 6 \text{ and } -n \times +8m \\ &= -6n \text{ and } -8mn \\ &= -6n-8mn \end{aligned}$$

$$\begin{aligned} e \quad -2x(y+4) &= -2x(y+4) \\ &= -2x \times y \text{ and } -2x \times +4 \\ &= -2xy \text{ and } -8x \\ &= -2xy-8x \end{aligned}$$

$$\begin{aligned} 3 \quad a \quad 0.2a(25a+15) &= 0.2a(25a+15) \\ &= 0.2a \times 25a \text{ and } 0.2a \times +15 \\ &= 5a^2 \text{ and } +3a \\ &= 5a^2+3a \end{aligned}$$

$$\begin{aligned} b \quad -2b(c-3.5b) &= -2b(c-3.5b) \\ &= -2b \times c \text{ and } -2 \times -3.5b \\ &= -2bc \text{ and } +7b^2 \\ &= -2bc+7b^2 \\ &= 7b^2-2bc \text{ (for neatness)} \end{aligned}$$

$$\begin{aligned} b \quad -2(b-5) &= -2(b-5) \\ &= -2 \times b \text{ and } -2 \times -5 \\ &= -2b \text{ and } +10 \\ &= -2b+10 \\ &= 10-2b \text{ (for neatness)} \end{aligned}$$

$$\begin{aligned} d \quad -3(2-7d) &= -3(2-7d) \\ &= -3 \times 2 \text{ and } -3 \times -7d \\ &= -6 \text{ and } +21d \\ &= -6+21d \\ &= 21d-6 \text{ (for neatness)} \end{aligned}$$

$$\begin{aligned} f \quad -5mn(p-q) &= -5mn(p-q) \\ &= -5mn \times p \text{ and } -5mn \times -q \\ &= -5mnp \text{ and } +5mnq \\ &= -5mnp+5mnq \\ &= 5mnq-5mnp \text{ (for neatness)} \end{aligned}$$

More expanding

Why limit yourself to parentheses with only two terms? The Distributive Law works for parentheses with more.

Every term inside the parentheses is multiplied by the term in front.

Expand $4(2m + 3n - 2)$

$$\begin{aligned} 4(2m + 3n - 2) &= 4(2m + 3n - 2) && 4 \times \text{every term inside the parentheses} \\ &= 4 \times 2m \text{ and } 4 \times +3n \text{ and } 4 \times -2 \\ &= 8m \text{ and } +12n \text{ and } -8 \\ &= 8m + 12n - 8 \end{aligned}$$

Take care with the multiplications when there is a negative term out the front.

Expand $-a(a - b + 3c + 2)$

$$\begin{aligned} -a(a - b + 3c + 2) &= -a(a - b + 3c + 2) && a \times \text{every term inside the parentheses} \\ &= -a \times a \text{ and } -a \times -b \text{ and } -a \times +3c \text{ and } -a \times +2 \\ &= -a^2 \text{ and } +ab \text{ and } -3ac \text{ and } -2a \\ &= -a^2 + ab - 3ac - 2a \end{aligned}$$

The basic index laws are often used when expanding expressions.

Expand $p^2(p - 3pq + 5q)$

$$\begin{aligned} p^2(p - 3pq + 5q) &= p^2(p - 3pq + 5q) && p^2 \times \text{every term inside the parentheses} \\ &= p^2 \times p \text{ and } p^2 \times -3pq \text{ and } p^2 \times +5q \\ &= p^{2+1} \text{ and } -3p^{2+1}q \text{ and } +5p^2q \\ &= p^3 - 3p^3q + 5p^2q \end{aligned}$$



Remember:
 $a^m \times a^n = a^{m+n}$



More expanding

1 Expand:

a $3(a + b + 2)$

b $4(x - y - 5)$

c $3p(2p + q + 4)$

d $-d(e + 2f + 6)$

e $2x(4x + 3y - 3 + z)$

f $-a(b - 2c + d - 5)$

2 Expand: (psst: remember the multiplication rule for indices)

a $n(n^2 + 3n)$

b $xy(x^2 - y^3)$

c $-ab(ab^2 + 2a^2b)$

d $2p(2p^2 - 4pq + 5)$



Page 7 questions

More expanding

$$\begin{aligned} 1 \quad 1 \quad 3(a+b+2) &= 3(a+b+2) \\ &= 3 \times a \text{ and } 3 \times b \text{ and } 3 \times 2 \\ &= 3a \text{ and } +3b \text{ and } +6 \\ &= 3a+3b+6 \end{aligned}$$

$$\begin{aligned} 2 \quad 4(x-y-5) &= 4(x-y-5) \\ &= 4 \times x \text{ and } 4 \times -y \text{ and } 4 \times -5 \\ &= 4x \text{ and } -4y \text{ and } -20 \\ &= 4x-4y-20 \end{aligned}$$

$$\begin{aligned} 3 \quad 3p(2p+q+4) &= 3p(2p+q+4) \\ &= 3p \times 2p \text{ and } 3p \times q \text{ and } 3p \times 4 \\ &= 6p^2 \text{ and } +3pq \text{ and } +12p \\ &= 6p^2+3pq+12p \end{aligned}$$

$$\begin{aligned} 4 \quad -d(e+2f+6) &= -d(e+2f+6) \\ &= -d \times e \text{ and } -d \times 2f \text{ and } -d \times 6 \\ &= -de \text{ and } -2df \text{ and } -6d \\ &= -de-2df-6d \end{aligned}$$

$$\begin{aligned} 5 \quad 2x(4x+3y-3+z) &= 2x(4x+3y-3+z) \\ &= 2x \times 4x \text{ and } 2x \times 3y \text{ and } 2x \times -3 \text{ and } 2x \times z \\ &= 8x^2 \text{ and } +6xy \text{ and } -6x \text{ and } +2xz \\ &= 8x^2+6xy+2xz-6x \end{aligned}$$

$$\begin{aligned} 6 \quad -a(b-2c+d-5) &= -a(b-2c+d-5) \\ &= -a \times b \text{ and } -a \times -2c \text{ and } -a \times d \text{ and } -a \times -5 \\ &= -ab \text{ and } +2ac \text{ and } -ad \text{ and } +5a \\ &= -ab+2ac-ad+5a \\ &= 2ac-ab-ad+5a \text{ (for neatness)} \end{aligned}$$

Page 7 questions

More expanding

$$\begin{aligned} 1 \quad 2 \quad n(n^2+3n) &= n(n^2+3n) \\ &= n \times n^2 \text{ and } n \times 3n \\ &= n^{1+2} \text{ and } +3n^{1+1} \\ &= n^3 \text{ and } +3n^2 \\ &= n^3+3n^2 \text{ (for neatness)} \end{aligned}$$

$$\begin{aligned} 3 \quad xy(x^2-y^3) &= xy(x^2-y^3) \\ &= xy \times x^2 \text{ and } xy \times -y^3 \\ &= x^{1+2}y \text{ and } -xy^{1+3} \\ &= x^3y \text{ and } -xy^4 \\ &= x^3y-xy^4 \end{aligned}$$

$$\begin{aligned} 4 \quad -ab(ab^2+2a^2b) &= -ab(ab^2+2a^2b) \\ &= -ab \times ab^2 \text{ and } -ab \times 2a^2b \\ &= -a^{1+1}b^{1+2} \text{ and } -2a^{1+2}b^{1+1} \\ &= -a^2b^3 \text{ and } -2a^3b^2 \\ &= -a^2b^3-2a^3b^2 \end{aligned}$$

$$\begin{aligned} 5 \quad 2p(2p^2-4pq+5) &= 2p(2p^2-4pq+5) \\ &= 2p \times 2p^2 \text{ and } 2p \times -4pq \text{ and } 2p \times 5 \\ &= 4p^{1+2} \text{ and } -8p^{1+1}q \text{ and } +10p \\ &= 4p^3 \text{ and } -8p^2q \text{ and } +10p \\ &= 4p^3-8p^2q+10p \end{aligned}$$

Expanding and simplifying

Always simplify the expression after expanding where possible.

Simplify by collecting like terms after the expansion of any parentheses.

Expand and simplify: $3(7m - 6) - 16m$

$$\begin{aligned}
 3(7m - 6) - 16m &= 3(7m - 6) - 16m && 3 \times \text{every term inside the parentheses} \\
 &= 3 \times 7m \text{ and } 3 \times -6 \text{ and } -16m \\
 &= 21m - 18 - 16m \\
 &\quad \downarrow \text{Like terms} \downarrow \\
 &= 5m - 18 && \text{Combine the like terms}
 \end{aligned}$$

For expressions with multiple parentheses, expand each separately then look to simplify.

Expand and simplify: $5(2a + 4) - 4(a - 3)$

$$\begin{aligned}
 5(2a + 4) - 4(a - 3) &= 5(2a + 4) - 4(a - 3) && \text{Expand each grouping separately} \\
 &= 5 \times 2a \text{ and } 5 \times 4 \quad -4 \times a \text{ and } -4 \times -3 \\
 &\quad \downarrow \text{Like terms} \downarrow \\
 &= 10a + 20 - 4a + 12 && \text{Identify the like terms} \\
 &\quad \downarrow \text{Like terms} \downarrow \\
 &= 10a - 4a + 20 + 12 && \text{Group the like terms} \\
 &= 6a + 32 && \text{Simplify}
 \end{aligned}$$

Be careful to apply the index laws correctly when expanding expressions with multiple variables.

Expand and simplify: $xy(5x + y) - 2x^2y$

$$\begin{aligned}
 xy(5x + y) - 2x^2y &= xy(5x + y) - 2x^2y && xy \times \text{every term inside the parentheses} \\
 &= xy \times 5x \text{ and } xy \times y \text{ and } -2x^2y \\
 &= 5x^{1+1}y \text{ and } xy^{1+1} \text{ and } -2x^2y && \text{Identify the like terms} \\
 &= 5x^2y + xy^2 - 2x^2y \\
 &\quad \downarrow \text{Like terms} \downarrow \\
 &= 5x^2y - 2x^2y + xy^2 && \text{Group the like terms} \\
 &= 3x^2y + xy^2 && \text{Simplify}
 \end{aligned}$$



Expanding and simplifying



1 Expand and simplify:

1 $4(a + 3) + 2a$

2 $-3(2 - x) + 1$

3 $12p + 5(p - 2)$

4 $5d - 4(9 - 3d)$

5 $-5b(4 - b) + 3b + 5b^2$

6 $9(x - 2y) - x + 4y$

2 Expand and simplify:

1 $8(c - 4) + 3(c + 2)$

2 $9(d + 2) - (5 - 3d)$

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

4 $a(a + 8) - 5(a + 3)$

Page 9 questions

Expanding and simplifying

$$\begin{aligned}
 1 \quad 4(a+3)+2a &= 4(a+3)+2a \\
 &= 4 \times a \text{ and } 4 \times 3 \text{ and } +2a \\
 &= 4a+12+2a \\
 &\quad \text{└ Like terms ┘} \\
 &= 4a+2a+12 \text{ grouping like terms} \\
 &= 6a+12
 \end{aligned}$$

$$\begin{aligned}
 2 \quad -3(2-x)+1 &= -3(2-x)+1 \\
 &= -3 \times 2 \text{ and } -3 \times -x \text{ and } +1 \\
 &= -6+3x+1 \\
 &\quad \text{└ Like terms ┘} \\
 &= -6+1+3x \text{ grouping like terms} \\
 &= -5+3x \\
 &= 3x-5 \text{ (for neatness)}
 \end{aligned}$$

$$\begin{aligned}
 3 \quad 12p+5(p-2) &= 12p+5(p-2) \\
 &= 12p \text{ and } +5 \times p \text{ and } +5 \times -2 \\
 &= 12p+5p-10 \\
 &\quad \text{└ Like terms ┘} \\
 &= 17p-10
 \end{aligned}$$

$$\begin{aligned}
 4 \quad 5d-4(9-3d) &= 5d-4(9-3d) \\
 &= 5d \text{ and } -4 \times 9 \text{ and } -4 \times -3d \\
 &= 5d-36+12d \\
 &\quad \text{└ Like terms ┘} \\
 &= 5d+12d-36 \text{ grouping like terms} \\
 &= 17d-36
 \end{aligned}$$

Page 9 questions

Expanding and simplifying

$$\begin{aligned}
 1 \quad -5b(4-b)+3b+5b^2 &= -5b(4-b)+3b+5b^2 \\
 &= -5b \times 4 \text{ and } -5b \times -b \text{ and } +3b \text{ and } +5b^2 \\
 &= -20b+5b^2+3b+5b^2 \\
 &\quad \text{└ Like terms ┘} \\
 &= -20b+3b+5b^2+5b^2 \text{ grouping like terms} \\
 &= -17b+10b^2 \\
 &= 10b^2-17b \text{ (for neatness)}
 \end{aligned}$$

$$\begin{aligned}
 2 \quad 9(x-2y)-x+4y &= 9(x-2y)-x+4y \\
 &= -9 \times x \text{ and } 9 \times -2y \text{ and } -x \text{ and } +4y \\
 &= -9x-18y-x+4y \\
 &\quad \text{└ Like terms ┘} \\
 &= -9x-x-18y+4y \text{ grouping like terms} \\
 &= -10x-14y
 \end{aligned}$$

$$\begin{aligned}
 3 \quad 8(c-4)+3(c+2) &= 8(c-4)+3(c+2) \\
 &= 8 \times c \text{ and } 8 \times -4 \text{ and } +3 \times c \text{ and } +3 \times 2 \\
 &= 8c-32+3c+6 \\
 &\quad \text{└ Like terms ┘} \\
 &= 8c+3c-32+6 \text{ grouping like terms} \\
 &= 11c-26
 \end{aligned}$$

$$\begin{aligned}
 4 \quad 9(d+2)-(5-3d) &= 9(d+2)-(5-3d) \\
 &= 9 \times d \text{ and } 9 \times 2 \text{ and } -1 \times 5 \text{ and } -1 \times -3d \\
 &= 9d+18-5+3d \\
 &\quad \text{└ Like terms ┘} \\
 &= 9d+3d+18-5 \text{ grouping like terms} \\
 &= 12d+13
 \end{aligned}$$

Page 9 questions

Expanding and simplifying

$$\begin{aligned}
 \textcircled{a} \quad 3(x-5) - 2(4+x) &= 3(x-5) - 2(4+x) \\
 &= 3 \times x \text{ and } 3 \times -5 \text{ and } -2 \times 4 \text{ and } -2 \times +1x \\
 &= 3x - 15 - 8 - 2x \\
 &= 3x - 2x - 15 - 8 \text{ grouping like terms} \\
 &= x - 23
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{b} \quad a(a+8) - 5(a+3) &= a(a+8) - 5(a+3) \\
 &= a \times a \text{ and } a \times +8 \text{ and } -5 \times a \text{ and } -5 \times +3 \\
 &= a^2 + 8a - 5a - 15 \\
 &= a^2 + 3a - 15
 \end{aligned}$$

Page 10 questions

Expanding and simplifying

$$\begin{aligned}
 \textcircled{a} \quad \textcircled{a} \quad -(y+4x) - 5(2x-y) &= -(y+4x) - 5(2x-y) \\
 &= -1 \times y \text{ and } -1 \times +4x \text{ and } -5 \times 2x \text{ and } -5 \times -y \\
 &= -y - 4x - 10x + 5y \\
 &= -y + 5y - 4x - 10x \text{ grouping like terms} \\
 &= 4y - 14x
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{b} \quad x(2+x-y) + 3x - xy &= x(2+x-y) + 3x - xy \\
 &= x \times 2 \text{ and } x \times +x \text{ and } x \times -y \text{ and } +3x \text{ and } -xy \\
 &= 2x + x^2 - xy + 3x - xy \\
 &= x^2 + 2x + 3x - xy - xy \text{ grouping like terms} \\
 &= x^2 + 5x - 2xy
 \end{aligned}$$



Expanding and simplifying

Expand and simplify:

$$\textcircled{a} \quad -(y+4x) - 5(2x-y) \qquad \textcircled{b} \quad x(2+x-y) + 3x - xy$$

Psst! Remember the 1 can be hidden: $-1(y+4x)$

$$\textcircled{c} \quad 2a(3+4b) + 4(ab+2a) \qquad \textcircled{d} \quad -3b(2+b) - (6-b)$$

$$\textcircled{e} \quad -(2-d) - 2(d-2) \qquad \textcircled{f} \quad xy(40x+5) - 3y(10x^2-x)$$

$$\textcircled{g} \quad -mn(5m-2n^2) + mn^3 + 3m^2n \qquad \textcircled{h} \quad q(4p+3q^2-2) + 2q(q+5p)$$

Page 9 questions

Expanding and simplifying

$$\begin{aligned}
 3(x-5) - 2(4+x) &= 3(x-5) - 2(4+x) \\
 &= 3 \times x \text{ and } 3 \times -5 \text{ and } -2 \times 4 \text{ and } -2 \times +1x \\
 &= 3x - 15 - 8 - 2x \\
 &= 3x - 2x - 15 - 8 \text{ grouping like terms} \\
 &= x - 23
 \end{aligned}$$

$$\begin{aligned}
 a(a+8) - 5(a+3) &= a(a+8) - 5(a+3) \\
 &= a \times a \text{ and } a \times +8 \text{ and } -5 \times a \text{ and } -5 \times +3 \\
 &= a^2 + 8a - 5a - 15 \\
 &= a^2 + 3a - 15
 \end{aligned}$$

Page 10 questions

Expanding and simplifying

$$\begin{aligned}
 -(y+4x) - 5(2x-y) &= -(y+4x) - 5(2x-y) \\
 &= -1 \times y \text{ and } -1 \times +4x \text{ and } -5 \times 2x \text{ and } -5 \times -y \\
 &= -y - 4x - 10x + 5y \\
 &= -y + 5y - 4x - 10x \text{ grouping like terms} \\
 &= 4y - 14x
 \end{aligned}$$

$$\begin{aligned}
 x(2+x-y) + 3x - xy &= x(2+x-y) + 3x - xy \\
 &= x \times 2 \text{ and } x \times +x \text{ and } x \times -y \text{ and } +3x \text{ and } -xy \\
 &= 2x + x^2 - xy + 3x - xy \\
 &= x^2 + 2x + 3x - xy - xy \text{ grouping like terms} \\
 &= x^2 + 5x - 2xy
 \end{aligned}$$

Page 10 questions

Expanding and simplifying

$$\begin{aligned}
 2a(3+4b) + 4(ab+2a) &= 2a(3+4b) + 4(ab+2a) \\
 &= 2a \times 3 \text{ and } 2a \times +4b \text{ and } +4 \times ab \text{ and } +4 \times +2a \\
 &= 6a + 8ab + 4ab + 8a \\
 &= 6a + 8a + 8ab + 4ab \text{ grouping like terms} \\
 &= 14a + 12ab
 \end{aligned}$$

$$\begin{aligned}
 -3b(2+b) - (6-b) &= -3b(2+b) - (6-b) \\
 &= -3b \times 2 \text{ and } -3b \times +b \text{ and } -1 \times 6 \text{ and } -1 \times -b \\
 &= -6b - 3b^2 - 6 + b \\
 &= -3b^2 - 6b + b - 6 \text{ grouping like terms} \\
 &= -3b^2 - 5b - 6
 \end{aligned}$$

$$\begin{aligned}
 -(2-d) - 2(d-2) &= -1(2-d) - 2(d-2) \\
 &= -1 \times 2 \text{ and } -1 \times -d \text{ and } -2 \times d \text{ and } -2 \times -2 \\
 &= -2 + d - 2d + 4 \\
 &= -2 + 4 + d - 2d \text{ grouping like terms} \\
 &= 2 - d
 \end{aligned}$$

$$\begin{aligned}
 xy(40x+5) - 3y(10x^2-x) &= xy(40x+5) - 3y(10x^2-x) \\
 &= xy \times 40x \text{ and } xy \times +5 \text{ and } -3y \times 10x^2 \text{ and } -3y \times -x \\
 &= 40x^2y + 5xy - 30x^2y + 3xy \\
 &= 40x^2y - 30x^2y + 5xy + 3xy \text{ grouping like terms} \\
 &= 10x^2y + 8xy
 \end{aligned}$$

Page 10 questions

Expanding and simplifying

$$\begin{aligned}
 \textcircled{3} \quad -mn(5m-2n^2) + mn^3 + 3m^2n &= -mn(5m-2n^2) + mn^3 + 3m^2n \\
 &= -mn \times 5m \text{ and } -mn \times -2n^2 \text{ and } +mn^3 \text{ and } +3m^2n \\
 &= -5m^{1+1}n + 2mn^{1+2} + mn^3 + 3m^2n \\
 &= -5m^2n + 2mn^3 + mn^3 + 3m^2n \\
 &\quad \left\{ \begin{array}{l} \text{like terms} \\ \text{like terms} \end{array} \right. \\
 &= -5m^2n + 3m^2n + 2mn^3 + mn^3 \text{ grouping like terms} \\
 &= -2m^2n + 3mn^3 \\
 &= 3mn^3 - 2m^2n \text{ (for neatness)}
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{4} \quad q(4p+3q^2-2) + 2q(q+5p) &= q(4p+3q^2-2) + 2q(q+5p) \\
 &= q \times 4p \text{ and } q \times +3q^2 \text{ and } q \times -2 \text{ and } +2q \times q \text{ and } +2q \times +5p \\
 &= 4pq + 3q^{1+2} - 2q + 2q^{1+1} + 10pq \\
 &= 4pq + 3q^3 - 2q + 2q^2 + 10pq \\
 &\quad \left\{ \begin{array}{l} \text{like terms} \end{array} \right. \\
 &= 4pq + 10pq + 3q^3 - 2q + 2q^2 \text{ grouping like terms} \\
 &= 14pq + 3q^3 - 2q + 2q^2
 \end{aligned}$$