10A1	مهارات الجبر Algebraic Skills	الجبر ALGEBRA

المؤشّر

عند نهاية الوحدة الدِّراسيَّة، يكون الطَّالب قادرًا على :

- تبسيط، فكِّ (نشر) وتحليل التَّعابير الجبريَّة، وتشمل تلك الَّتي تحتوي على أسس وجذور صمَّاء، التَّعابير ذات الحدَّين والكسور الجبريَّة.

Indicator

By the end of the grade, students will be able to:

- Simplify, expand and factorize algebraic expressions including exponents and surds, binomial expressions and algebraic fractions

مُخرجات التَّعلّم **Learning Outcomes**

يتعلَّم الطَّالب أن:: *Students learn to*

	مُتقن **Mastered**	**مُتقدِّم** **Developing**	**مُبتدئ** **Emerging**
مُخرَج التَّعلّم **Learning Outcome**	يبسّط التَّعابير الجبريَّة بما في ذلك التَّعابير التي تتضمَّن أسسًا كسريَّة Simplify algebraic expressions including expressions involving **fractional** exponents	يبسط التَّعابير الجبريَّة بما في ذلك التَّعابير الَّتي تتضمَّن رموزًا أسّيَّة Simplify algebraic expressions **including expressions involving exponents**	يبسّط التَّعابير الجبريَّة البسيطة **Simplify simple** algebraic expressions
10A1.1			
10A1.2	يفكّ (ينشر) التَّعابير الجبريَّة الَّتي تتضمَّن على الأقلّ قوسين وتتضمَّن أيضًا عمليَّات أسّيَّة Expand algebraic expressions that involve **at least two brackets and exponents**	ينشر التَّعابير الجبريَّة البسيطة الَّتي تتضمَّن قوسين Expand simple algebraic expressions that involve **two brackets**	ينشر التَّعابير الجبريَّة البسيطة الَّتي تتضمَّن قوسًا واحدًا **Expand simple** algebraic expressions that involve **one bracket**
10A1.3	يفكَّ (نشر) حواصل الضَّرب **المُعقَّدة** بما في ذلك المربَّعات الكاملة والفرق بين مربَّعين Expand **complex** products including perfect squares and the difference of two squares	يفكَّ (نشر) حواصل الضَّرب ذات الحدَّين البسيطة بما في **ذلك المربَّعات الكاملة والفرق بين مربَّعين** Expand simple binomial products **including perfect squares and the difference of two squares**	**ينشر** حواصل الضَّرب ذات الحدَّين **البسيطة** والَّتي تتضمَّن قيمًا **موجبة** **Expand simple** binomial products involving **positive** values
10A1.4	يحلّل التَّعابير الجبريَّة (غير التَّربيعيَّة) الَّتي تحتوي على مُعامِلات مشتركة جبريَّة وعدديَّة بما في ذلك **المُعامِلات السَّالبة** وتلك **الأسّيَّة.** Factorize expressions (not quadratics) that contain algebraic and numerical common factors including **negative factors** and with **exponents**	يحلّل التَّعابير البسيطة الَّتي تحتوي على مُعامِلات مشتركة جبريَّة **و**عدديَّة. Factorize simple expressions that contain algebraic **and** numerical common factors	يحلّل التَّعابير البسيطة الَّتي تحتوي على **مُعامل مشترك** واحد جبريٍّ أو عدديٍّ. Factorize simple expressions that contain **one** algebraic or numerical **common factor**
10A1.5	يحلّل العبارات التَّربيعيَّة المركّبة بما في ذلك **"الفرق بين مربَّعين** وتلك الَّتي بها **مُعامل** x^2 أكبر من الواحد. Factorize complex quadratic expressions including **'difference of 2 squares',** and where the **coefficient** of x^2 is greater than **1**	يحلّل العبارات التَّربيعيَّة البسيطة الَّتي تتضمَّن الحدود الموجبة و**السَّالبة،** بما في ذلك المربَّعات الكاملة. Factorize simple quadratic expressions involving positive and **negative terms,** including perfect squares	يحلّل **العبارات التَّربيعيَّة** البسيطة الَّتي تتضمَّن **الحدود الموجبة فقط** . **Factorize** simple **quadratic expressions** involving **positive terms only**

يقوم بالعمليَّات على **الكسور الجبريَّة البسيطة** وتبسيط النَّاتج Perform operations with **simple algebraic fractions** and simplify results	يقوم بالعمليَّات وتبسيط الكسور الجبريَّة التي تتضمَّن عمليَّات **التَّحليل البسيطة** Perform operations with **and simplify** algebraic fractions which include **simple factorizing**	يقوم بالعمليَّات وتبسيط الكسور الجبريَّة الَّتي تتضمَّن عمليَّات **التَّحليل التَّربيعيَّة** Perform operations and simplify algebraic fractions which include **quadratic factorizing**	**10A1.6**
يبسّط العبارات الّتي تحتوي على **الجمع والطَّرح** باستخدام الجذور الصَّمَّاء Simplify expressions **involving addition and subtraction** with surds	يبسّط العبارات الّتي تحتوي على الجمع والطَّرح و**الضَّرب** مع الجذور الصَّمَّاء Simplify expressions involving addition, subtraction **and multiplication** with surds	يبسّط العبارات الّتي تحتوي على الجمع والطَّرح والضَّرب مع الجذور الصَّمَّاء و**حذف الجذورالصَّمَّاء من المقام في صورة كسريَّة** (انطاق المقام) Simplify expressions involving addition, subtraction and multiplication with surds **and rationalize the denominator of surds in rational form**	**10A1.7**

10A1.1

For **Emerging**

$2x + 3y - 4x + xy$ $= -2x + 3y + xy$	$3a \times 4b \times 2c = 24abc$	$\frac{6m}{3n} = \frac{2m}{n}$

For **Developing**

$5p^3 + 7p^3 - 2p^3 + p^4$ $= 10p^3 + p^4$	$9x^3 \times 4x^2 \times 2x$ $= 72x^6$	$(5k^2)^4 = 625k^8$	$\frac{4a^6}{2a^4} = 2a^2$

For **Mastered**

$12f + 10g^{\frac{1}{2}} - 8f - 4g^{\frac{1}{2}}$ $= 4f + 6g^{\frac{1}{2}}$	$3y^{\frac{1}{3}} \times 7y^{\frac{1}{3}} \times y^{\frac{1}{3}}$ $= 21y$	$\left(2p^{\frac{1}{2}}\right)^4 = 16p^2$	$\frac{24x^{\frac{1}{3}}}{8x^{\frac{1}{3}}} = 3$

10A1.2

For **Emerging**

$7(x + 2) = 7x + 14$	$-2(y + 3) = -2y - 6$	$-(2g - 9) = -2g + 9$

For **Developing**

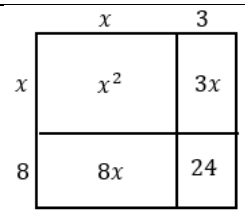
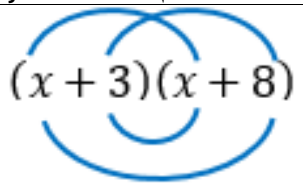
$2(f + 5g) + 3(f - 2g)$ $= 2f + 10g + 3f - 6g$ $= 5f + 4g$	$-5x(x + 1) + 7(x - 3)$ $= -5x^2 - 5x + 7x - 21$ $= -5x^2 + 2x - 21$	$t(3 - t) - 2t(t - 4)$ $= 3t - t^2 - 2t^2 + 8t$ $= 11t - 3t^2$

For **Mastered**

$3d^2(d^7 - 2) + d^5(d^3 + d)$ $= 3d^9 - 6d^2 + d^8 + d^6$	$3f^4(f - g) - 2g^2(f^5 - g^2)$ $= 3f^5 - 3f^4g - 2f^5g^2 + 2g^4$
$2x(x^2 - 2) + 3x(x^3 - 3) + 4x(x^4 - 4)$ $= 2x^3 - 4x + 3x^4 - 9x + 4x^5 - 16x$ $= 4x^5 + 3x^4 + 2x^3 - 29x$	

10A1.3

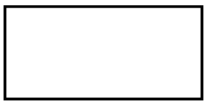
At **all levels of achievement**

'Areas' method "طريقة المساحات"	'Smiley Face' "طريقة "الوجه المبتسم
	

For **Emerging**

$(x+1)(x+3) = x^2 + 3x + x + 3$ $= x^2 + 4x + 3$	$(a+4)(a+5) = a^2 + 5a + 4a + 20$ $= a^2 + 9a + 20$

For **Developing**

$(x-1)(x+4)$ $= x^2 + 4x - x - 4$ $= x^2 + 3x - 4$	$(3+a)(a-2)$ $= 3a - 6 + a^2 - 2a$ $= a^2 + a - 6$	$(z-4)(z-4)$ $= z^2 - 4z - 4z + 16$ $= z^2 - 8z + 16$	$(x+5)(x-5)$ $= x^2 - 5x + 5x - 25$ $= x^2 - 25$
What is the expression for the area of the rectangle? $x-2$ $x+3$ 		Solution: Area $= (x+3)(x-2)$ $= x^2 - 2x + 3x - 6$ $= x^2 + x - 6$	

For **Mastered**

$(2x-3)(x+2)$ $= 2x^2 + 4x - 3x - 6$ $= 2x^2 + x - 6$	$(b+4)^2$ $= (b+4)(b+4)$ $= b^2 + 4b + 4b + 16$ $= b^2 + 8b + 16$	$(3a+1)^2$ $= (3a+1)(3a+1)$ $= 9a^2 + 3a + 3a + 1$ $= 9a^2 + 6a + 1$	$(3x+2)(3x-2)$ $= 9x^2 - 6x + 6x - 4$ $= 9x^2 - 4$

10A1.4

For **Emerging**

$3a - 12 = 3(a-4)$	$15x + 20 = 5(3x+4)$	$2ab - 3b + abc = b(2a - 3 + ac)$

For **Developing**

$12ab + 9a = 3a(4b+3)$	$16xy - 4x = 4x(4y-1)$	$4cd + cde - 2cdf = cd(4 + e - 2f)$

For **Mastered**

$-5fg - 15g$ $= -5g(f+3)$	$5x^4 - 10x^3 + x^2$ $= x^2(5x^2 - 10x + 1)$	$-3a^2b - 6ab^2 + 4ab$ $= -ab(3a + 6b - 4)$

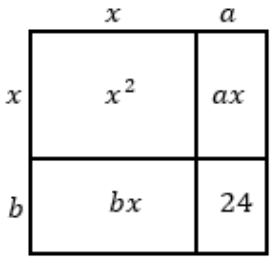
10A1.5

At **all levels of achievement**

إنَّ العبارة التَّربيعيَّة هي العبارة الَّتي يمكن تحليلها إلى حاصل ضرب تعبيرات ذات حدَّين .
يمكن أن تشمل الأساليب الَّتي تُدرَّس المنهجَ "المعكوس" لطريقة المساحة. بالنسبة للعبارات الَّتي تتضمَّن عمليَّة الجمع فقط مثال للتَّحليل:

$$x^2 + 11x + 24$$

- an expression that factories to give a binomial product.
- Methods to be taught can include a 'reverse' approach to the area method. For expressions that involve addition only e.g. to factorize $x^2 + 11x + 24$



يلاحظ الطَّلبة أنَّ: $ab = 24$ and $a + b = 11$

ويقومون بفحص مُعامِلات العدد 24

Students see that $ab = 24$ and $a + b = 11$
They test factors of 24.

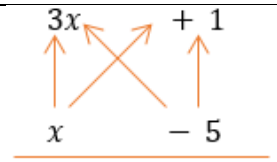
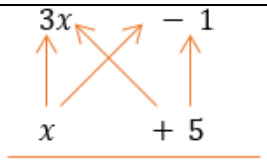
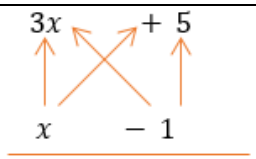
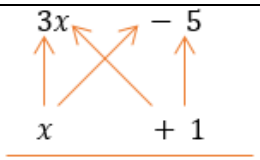
For **Emerging**

$a^2 + 5a + 6 = (a + 3)(a + 2)$	$x^2 + 5x + 4 = (x + 4)(x + 1)$

For **Developing**

$x^2 + 2x - 3$ $= (x + 3)(x - 1)$	$a^2 - a - 30$ $= (a + 5)(a - 6)$	$x^2 - 8x + 16$ $= (x - 4)(x - 4)$ $= (x - 4)^2$

For **Mastered**

 $3x^2 - 15x + x - 5$	 $3x^2 + 15x - x - 5$	 $3x^2 - 3x + 5x - 5$	 $3x^2 + 3x - 5x - 5$

$6x^2 - 7x - 3$ $= 6x^2 - 9x + 2x - 3$ $= 3x(2x - 3) + 1(2x - 3)$ $= (3x + 1)(2x - 3)$	$6x^2 - 7x - 3$ $= 6x^2 + 2x - 9x - 3$ $= 2x(3x + 1) - 3(3x + 1)$ $= (2x - 3)(3x + 1)$

$4a^2 - 25 = (2a + 5)(2a - 5)$	$5x^2 - 25x + 30 = 5(x^2 - 5x + 6)$ $= 5(x - 3)(x - 2)$
$12x^2 - 3 = 3(4x^2 - 1)$ $= 3(2x - 1)(2x + 1)$	$3p^2 + 5p - 12 = (3p - 4)(p + 3)$

10A1.6

For **Emerging**

$\frac{3x}{4}-\frac{x}{4}=\frac{2x}{4}$ $=\frac{x}{2}$	$\frac{a}{4}+\frac{2a}{3}=\frac{3a}{12}+\frac{8a}{12}$ $=\frac{11a}{12}$	$\frac{2}{y}\times\frac{3y}{4}=\frac{6y}{4y}$ $=\frac{3}{2}$	$\frac{a}{3}\div\frac{a}{5}=\frac{a}{3}\times\frac{5}{a}$ $=\frac{5}{3}$

For **Developing**

$\frac{4x-12}{2}=\frac{4(x-3)}{2}$ $=2(x-3)$	$\frac{3}{p+2}\times\frac{4p+8}{3}$ $=\frac{3}{p+2}\times\frac{4(p+2)}{3}$ $=4$	$\frac{2x-1}{x+2}-\frac{1}{3}$ $=\frac{3(2x-1)-(x+2)}{3(x+2)}$ $=\frac{6x-3-x-2}{3(x+2)}$ $=\frac{5x-5}{3(x+2)}$

For **Mastered**

$\frac{x^2+4x-4}{x+2}$ $=\frac{(x+2)(x+2)}{x+2}$ $=x+2$	$\frac{m-3}{m}\times\frac{3m}{2m-6}$ $=\frac{(m-3)}{m}\times\frac{3m}{2(m-3)}$ $=\frac{3}{2}$	$\frac{4}{x^2+x}-\frac{3}{x^2-1}$ $=\frac{4}{x(x+1)}-\frac{3}{(x+1)(x-1)}$ $=\frac{4(x-1)-3x}{x(x+1)(x-1)}$ $=\frac{4x-3x-4}{x(x+1)(x-1)}$ $=\frac{x-4}{x(x+1)(x-1)}$
$\frac{4}{a^2-9}\div\frac{2}{3a+9}$ $=\frac{4}{(a+3)(a-3)}\times\frac{3(a+3)}{2}$ $=\frac{6}{a-3}$		

10A1.7

At **all levels of achievement**

$\sqrt{8}$ $= \sqrt{4 \times 2}$ $= \sqrt{4} \times \sqrt{2}$ $= 2\sqrt{2}$	$\sqrt{75}$ $= \sqrt{25 \times 3}$ $= \sqrt{25} \times \sqrt{3}$ $= 5\sqrt{3}$

For **Emerging**

$4\sqrt{3} + 3\sqrt{3} + 5\sqrt{3}$ $= 12\sqrt{3}$	$2\sqrt{5} - 3\sqrt{5} - \sqrt{5}$ $= -2\sqrt{5}$	$\sqrt{80} - \sqrt{45}$ $= \sqrt{16 \times 5} - \sqrt{9 \times 5}$ $= 4\sqrt{5} - 3\sqrt{5}$ $= \sqrt{5}$

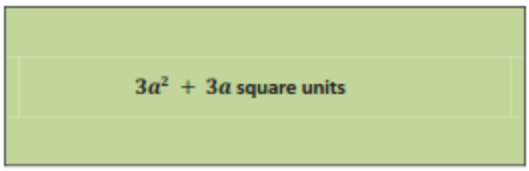
For **Developing**

$5\sqrt{2}\left(\sqrt{2} + 1\right)$ $= 5(2) + 5\sqrt{2}$ $= 10 + 5\sqrt{2}$	$\sqrt{3}(\sqrt{6} - \sqrt{15})$ $= \sqrt{18} - \sqrt{45}$ $= \sqrt{9 \times 2} - \sqrt{9 \times 5}$ $= 3\sqrt{2} - 3\sqrt{5}$	$\left(7 - \sqrt{3}\right)\left(5 + 2\sqrt{3}\right)$ $= 7\left(5 + 2\sqrt{3}\right) - \sqrt{3}\,(5 + 2\sqrt{3})$ $= 35 + 14\sqrt{3} - 5\sqrt{3} - 2(3)$ $= 29 + 9\sqrt{3}$

For **Mastered**

$\dfrac{3}{\sqrt{5}}$ $= \frac{3}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ $= \frac{3\sqrt{5}}{5}$	$\dfrac{1}{3 + \sqrt{2}}$ $= \frac{1}{3+\sqrt{2}} \times \frac{3-\sqrt{2}}{3-\sqrt{2}}$ $= \frac{3-\sqrt{2}}{9-3\sqrt{2}+3\sqrt{2}-2}$ $= \frac{3-\sqrt{2}}{7}$ OR $\frac{3}{7} - \frac{\sqrt{2}}{7}$	$\dfrac{3 - \sqrt{2}}{4 + \sqrt{5}}$ $= \frac{3-\sqrt{2}}{4+\sqrt{5}} \times \frac{4-\sqrt{5}}{4-\sqrt{5}}$ $= \frac{12-3\sqrt{5}-4\sqrt{2}+\sqrt{10}}{16-4\sqrt{5}+4\sqrt{5}-\sqrt{25}}$ $= \frac{12-3\sqrt{5}-4\sqrt{2}+\sqrt{10}}{11}$

The total area of this rectangle is represented by $3a^2 + 3a$. Find expressions for the dimensions of the total rectangle.

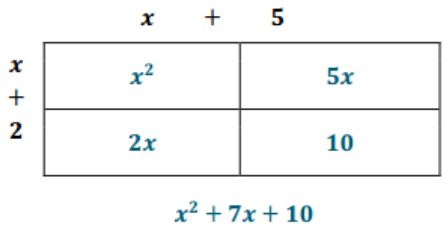
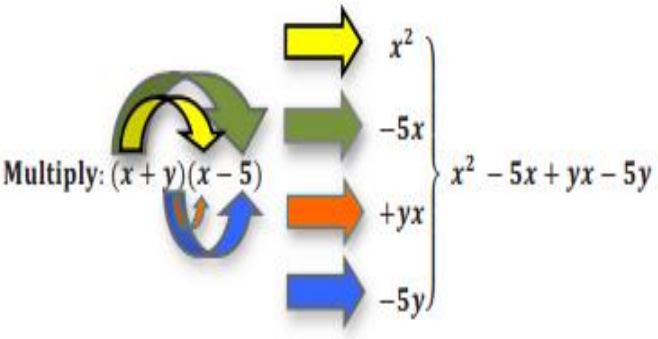
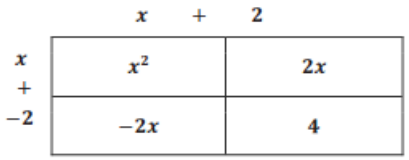
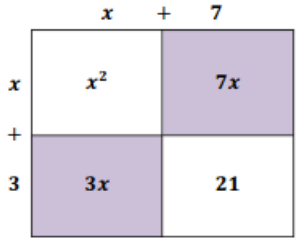
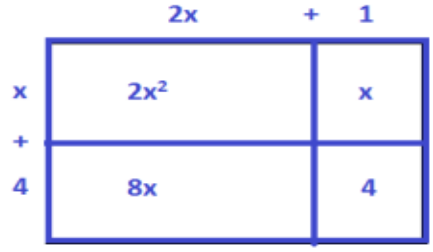


$3a^2 + 3a = 3a(a + 1)$ [Students may opt to factor only a or 3: $a(3a + 3)$ or $3(a^2 + a)$]

In the example above, _____ and _____ are factors of $3a^2 + 3a$ and could represent the dimensions of the rectangle.

$3a$ and $(a + 1)$, or 3 and $(a^2 + a)$, or a and $(3a + 3)$

Therefore, an area model is not directly applicable to all polynomial multiplication problems. However, a table can be used in a similar fashion to identify each partial product as we multiply polynomial expressions. The table serves to remind us of the area model even though it does not represent area.

For example, fill in the table to identify the partial products of $(x + 2)(x + 5)$. Then, write the product of $(x + 2)(x + 5)$ in standard form.	 $x^2 + 7x + 10$
Without the Aid of a Table Regardless of whether or not we make use of a table as an aid, the multiplying of two binomials is an application of the distributive property. Both terms of the first binomial distribute over the second binomial. Try it with $(x + y)(x - 5)$. In the example below, the colored arrows match each step of the distribution with the resulting partial product:	
Find the product of $(x + 2)(x - 2)$. Use the distributive property to distribute the first binomial over the second. With the Use of a Table:	 $x^2 - 4$
Use a table to assist in multiplying $(x + 7)(x + 3)$	
Use a table to aid in finding the product of $(2x + 1)(x + 4)$.	

	$3x$	-2
$2x$	$6x^2$	$-4x$
$+3$	$+9x$	-6

Splitting the Linear Term—Example:
Using the two numbers we found as coefficients on the linear term (sometimes called the middle term), split into two parts:
$6x^2 - 4x + 9x - 6$
If you group by pairs (putting the first two together and the second two together) and factor out the GCF from each, you will see that one of the factors is visible (shown here in red) as the common factor.
$2x(3x - 2) + 3(3x - 2)$
Do you see the common factor in the two groups (shown in red)?
$(3x - 2)(2x + 3)$

To expand and simplify $(x + 2)(x + 5)$

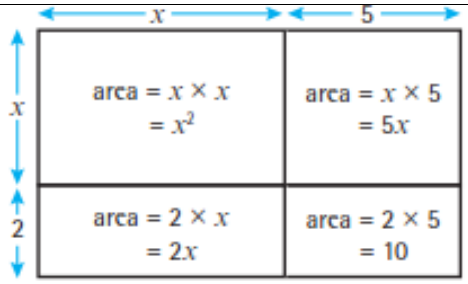
×	x	5
x	x^2	$5x$
2	$2x$	10

$(x + 2)(x + 5) = x \times x + x \times 5 + 2 \times x + 2 \times 5$
$= x^2 + 5x + 2x + 10$
$= x^2 + 7x + 10$

You simplify the final expression by collecting the like terms.
$5x + 2x = 7x$.

It is like working out the area of a rectangle of length $x + 5$ and width $x + 2$.

Total area $= (x + 2)(x + 5)$
$= x^2 + 5x + 2x + 10$
$= x^2 + 7x + 10$



Expand and simplify these.

(a) $(a + 4)(a + 10)$

(b) $(t + 6)(t - 2)$

(a)

×	a	10
a	a^2	$10a$
4	$4a$	40

$(a + 4)(a + 10) = a \times a + a \times 10 + 4 \times a + 4 \times 10$

$= a^2 + 10a + 4a + 40$

$= a^2 + 14a + 40$

(b)

×	t	-2
t	t^2	$-2t$
6	$6t$	-12

$(t + 6)(t - 2) = t \times t + t \times (-2) + 6 \times t + 6 \times (-2)$

$= t^2 - 2t + 6t - 12$

$= t^2 + 4t - 12$

Remember you can use a grid to help.

Remember to multiply each term in the first bracket by each term in the second bracket.

Remember you are multiplying by -2.
$^+$ve × $^-$ve = $^-$ve.

Expand and simplify $(3x - y)(x - 2y)$.

×	x	$-2y$
$3x$	$3x^2$	$-6xy$
$-y$	$-xy$	$2y^2$

$(3x - y)(x - 2y) = 3x^2 - 6xy - xy + 2y$

$= 3x^2 - 7xy + 2y^2$

Remember to multiply each term in the first bracket by each term in the second bracket.

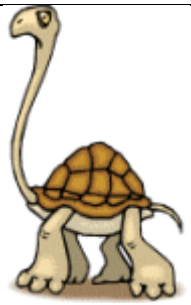
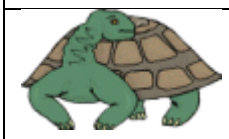
Be careful when there are negative signs. This is where a lot of mistakes are made.
$^+$ve × $^-$ve = $^-$ve.
$^-$ve × $^-$ve = $^+$ve.

Write down the 6 pairs of cards which show equivalent expressions.

$4(x + 2y)$	$4x + 2y$	$2(4x + y)$	$4(2x - y)$
A	B	C	D
$8x - 8y$	$4x + 8y$	$8(x - y)$	$2x - 8y$
E	F	G	H
$8x + 2y$	$2(x - 4y)$	$2(2x + y)$	$8x - 4y$
I	J	K	L

1) Directions: **For the following problems, choose an answer from among the multiple choices. Take your time and think about your answer.**

1.	$(5x^2)(3x^3) =$ 	**Choose:** ○ $8x^5$ ○ $15x^6$ ○ $15x^5$
2.	$(-4x^2y)(-2x^5y^3) =$ 	**Choose:** ○ $8x^{10}y^3$ ○ $8x^7y^4$ ○ $8x^7y^3$
3.	$(-2x^2)^3 =$ 	**Choose:** ○ $-6x^6$ ○ $-8x^5$ ○ $-8x^6$
4.	$(7ab^2)(3a^3b^3) =$ 	**Choose:** ○ $21a^3b^6$ ○ $21a^4b^5$ ○ $21a^3b^5$
5.	$(-2x^2)(6x^3)(x^2) =$ 	**Choose:** ○ $-12x^7$ ○ $-12x^{12}$ ○ $-12x^8$

6.	$3xy(4x^2 - 3y + 2) =$ 	**Choose:** $12x^3y - 9xy^2 + 6xy$ $12x^2y - 9xy + 6xy$ $12x^3 - 9y^2 + 6$
7.	$(-5x)(2x^2 - 3) - 4x =$ 	**Choose:** $-10x^3 + 15x$ $-10x^3 + 11x$ $-10x^3 - 19x$
8.	$4m - 3m(5m - 6) =$ 	**Choose:** $22m - 15m^2$ $-14m - 15m^2$ $-15m^2 + 18m$
9.	$-5c(4c^2 - 2c) =$ 	**Choose:** $-20c^3 - 10c^2$ $-20c^3 + 10c^2$ $-20c^2 + 10c$

2) Worksheet – Factoring Quadratic Trinomials

Part A

Directions: USE A SEPARATE SHEET OF PAPER. Please factor the following expressions. If any of the following expressions cannot be factored, please indicate so by stating "prime".

1. x^2+5x+4
2. $x^2+12x+32$
3. $x^2+15x+50$
4. $a^2-5a-24$
5. $a^2+5a-24$
6. $r^2+2r-48$
7. $x^2+6x-72$
8. $d^2+2d+80$
9. x^2-6x+9
10. $m^2+15m+54$
11. $x^2-33x+32$
12. $x^2-12x+20$
13. b^2+b-72
14. $d^2-25d+156$
15. $b^2-10b+24$
16. $f^2-11f-26$

Part B

Directions: USE A SEPARATE SHEET OF PAPER. Please factor the following expressions. If any of the following expressions cannot be factored, please indicate so by stating "prime".

1. $6x^2-13x-5$
2. $3x^2+10x-25$
3. $10x^2+17x+3$
4. $6x^2-7x-3$
5. $12x^2-28x-5$
6. $3x^2-32x+45$
7. $14x^2-9x+1$
8. $12x^2-8x-15$
9. $11x^2+35x+6$

3) Collect the terms in these:

a) $7a + 5b + 2a - 6b$ b) $3x - 4y - 2x + 6y$ c) $p - 5q + 3p - q$

d) $2x^2 + x - 3x - 4$ e) $a^2 - 5ab + 4ab + b^2$ f) $4p^2 - 5p + 1 - p^2 - 2p - 7$

g) $5ab - 3bc + ab + 6bc$ h) $7p^2 - 4pq - 2q^2 + 6pq$ i) $x^2 - 2xy - y^2 - x^2 + 6xy - 2y^2$

4) Expand the brackets:

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

d) $x(x + y)$ e) $a(3a - b)$ f) $3x(2x - 7y)$

g) $5(2x + 4y - 3z)$ h) $2p(3p - q + 4)$ i) $ab(a + 2b)$

5) Expand the brackets and collect the terms:

a) $(x + 3)(x + 4)$ b) $(5x + 1)(2x - 3)$ c) $(a - 1)(a - 3)$

d) $(3a - 4)(2a + 5)$ e) $(p + q)(p - q)$ f) $(a + b)(a - 5b)$

g) $(2x - y)(x + 7y)$ h) $(3p - 2q)(5p - 7q)$ i) $(a + b + c)(a - b - c)$

6) Expand the brackets and simplify:

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

c) $4(2x - 3y) - 3(x - y)$ d) $5(p + 2q) + 7(2p - q)$

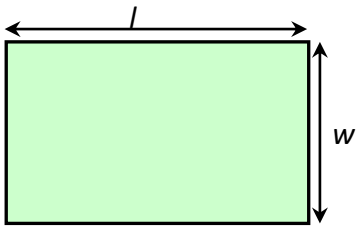
e) $x(x - 2y) + 3x(5x - y)$ f) $3a(a - b) - b(a - b)$

g) $(x - 2y)(5x - y)$ h) $(5a - b)(2a + 4b)$

i) $(4p + 3q)(2p - 7q)$ j) $(5x + 3)(4x - 3) - x(3x - 1)$

Perimeter

The **perimeter** of a shape is the **total length of its sides**.



Perimeter of this rectangle $P = l + w + l + w$

This can also be written as $P = 2l + 2w$ or $P = 2(l + w)$

Area

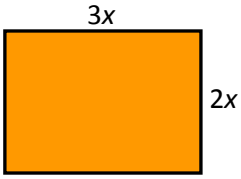
Area measures the **surface** of something.

Area of a rectangle = length × width

For the rectangle shown, the area $A = lw$

Sometimes you may need to find other algebraic expressions for perimeters and areas.

Examples

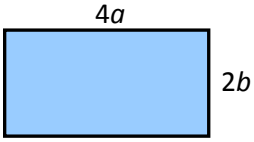


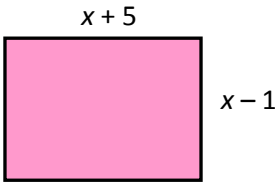
Perimeter $= 3x + 2x + 3x + 2x = 10x$

Area $= 3x \times 2x = 6x^2$

Perimeter $= 4a + 2b + 4a + 2b = 8a + 4b$

Area $= 4a \times 2b = 8ab$





Perimeter $= x + 5 + x - 1 + x + 5 + x - 1 = 4x + 8$

Area $= (x + 5)(x - 1) = x^2 - x + 5x - 5 = x^2 + 4x - 5$

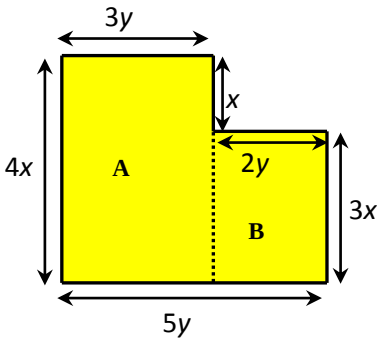
Perimeter $= 4x + 3y + x + 2y + 3x + 5y$

$= 8x + 10y$

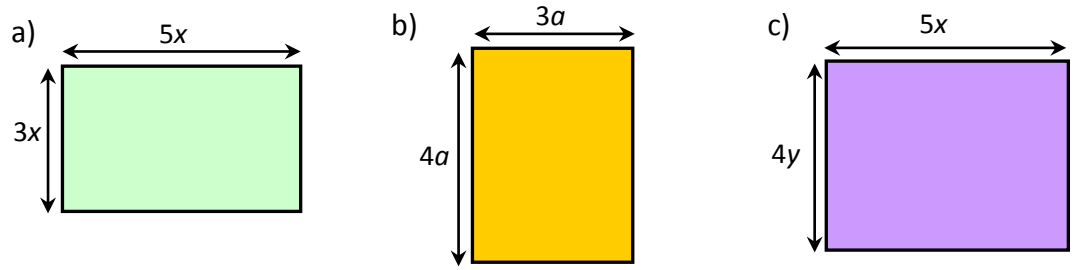
Area of A $= 4x \times 3y = 12xy$

Area of B $= 3x \times 2y = 6xy$

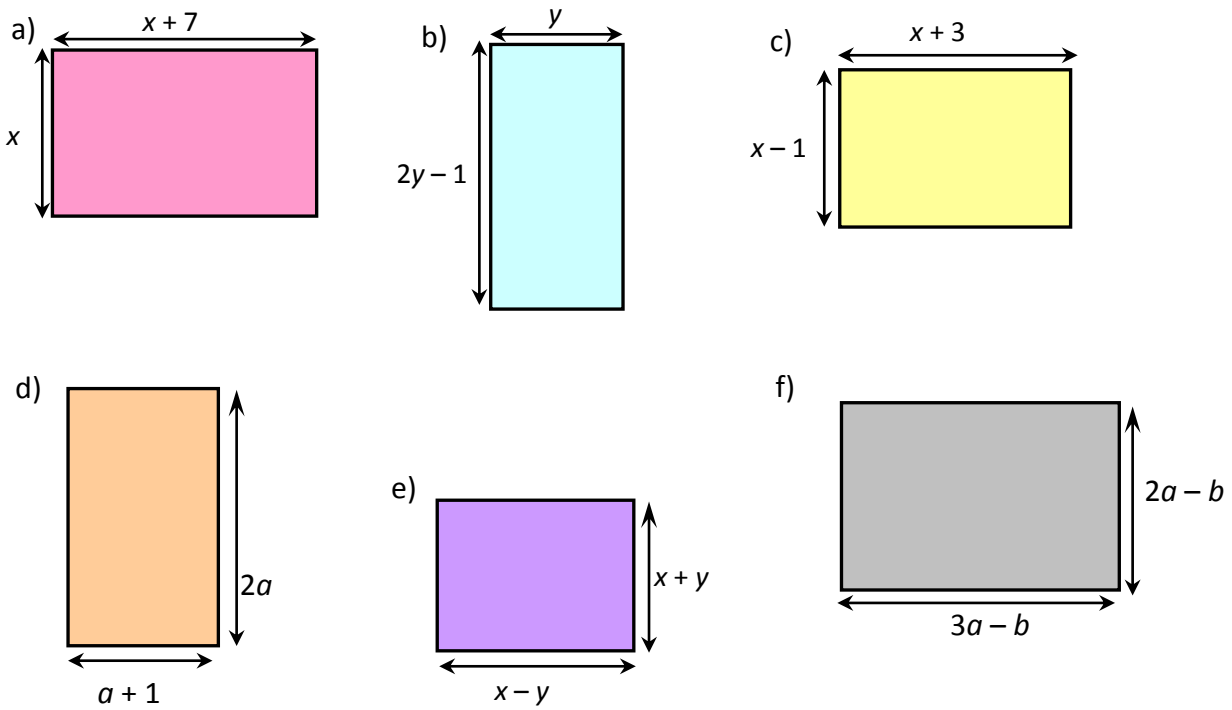
Total area $= 12xy + 6xy = 18xy$



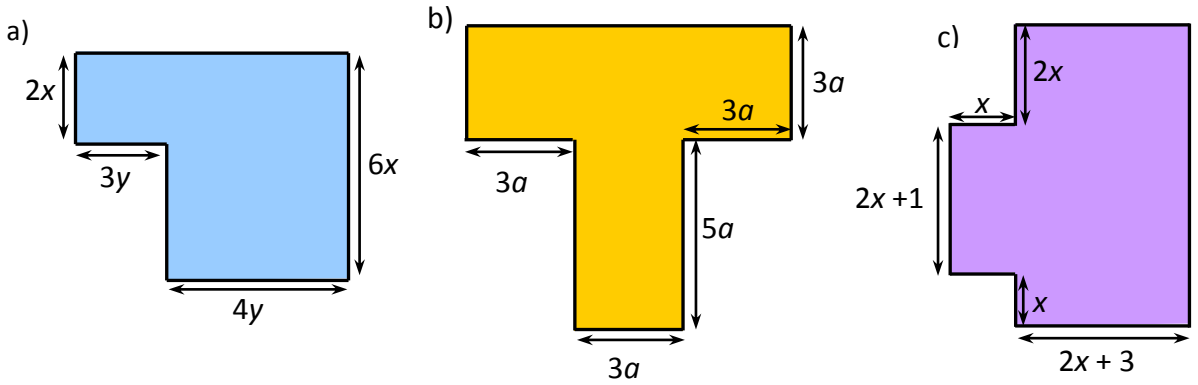
1. Find algebraic expressions for the perimeter and area of each rectangle.



2. Find algebraic expressions for the perimeter and area of these rectangles.



3 Find algebraic expressions for the perimeter and area of these shapes.



Match each expression on the left with its factorised form from the list on the right.

	$x^2 + 13x + 36$	A	$(x + 9)(x + 4)$
	$x^2 + 9x - 36$	B	$(x + 18)(x - 2)$
	$x^2 - 5x - 36$	C	$(x + 12)(x - 3)$
	$x^2 + 12x + 36$	D	$(x + 6)^2$
	$x^2 + 16x - 36$	E	$(x - 12)(x - 3)$
	$x^2 - 15x + 36$	F	$(x - 9)(x + 4)$

A.

Simplify:

(a) $3 \times 4a$

(b) $x + 2y - 4x + 3y$

(c) $3c \times 5ac^3$

(d) $3n - 4m^2 - 3n + 6m$

Expand:

(a) $2k(k - 3)$

(b) $(u + 2)(u - 3)$

(c) $(h - 5)^2$

(d) $(2 - d)(2 + d)$

Factorise:

(a) $3a - a^2$

(b) $12b + 27ab$

(c) $9c^2 - 25$

(d) $d^2 - 14d + 45$

B.

(a) Khaled factorises the expression

$$6a^2 - 18a^3$$

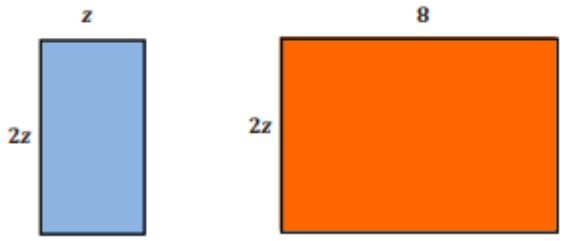
to get: $3a(2a - 6a^2)$

Is this fully factorised?
If not, explain why.

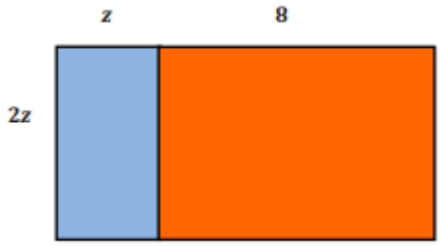
(b) Fully factorise this expression:

$$12a^2 - 48$$

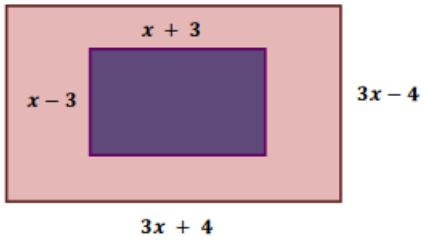
Write expressions for the areas of the two rectangles in the figures given below.



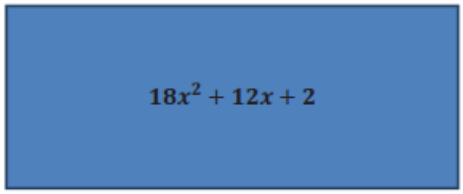
Now write an expression for the area of this rectangle



In the accompanying diagram, the width of the inner rectangle is represented by $\boldsymbol{x - 3}$ and its length by $\boldsymbol{x + 3}$. The width of the outer rectangle is represented by $\boldsymbol{3x + 4}$ and its length by $\boldsymbol{3x - 4}$.



The area of the rectangle below is represented by the expression $\boldsymbol{18x2 + 12x + 2}$ square units. Write two expressions to represent the dimensions.



Fill in the spaces in this table below.

[It is best if you complete each example in alphabetical order].

$\times$	3	4	d)
a)	6		e)
5		b)	35
1		c)	
f)	g)	24	

Expand or factorize the expressions to fill in the spaces in this table below.

[It is best if you complete each example in alphabetical order].

$\times$	2	b)
a)	$2x + 4$	c)
$(x - 2)$		$(x^2 - x - 2)$
d)	$6x^2$	

Expand or factorize the expressions to fill in the spaces in this table below.

[It is best if you complete each example in alphabetical order].

$\times$	$3x - 1$	b)	c)
a)	$6x^2 - 2x$		d)
f)	g)	$x^2 - 5x + 6$	
$(x + 3)$		$x^2 - 9$	
$(2x - 1)$		e)	$2x^2 + 3x - 2$