Algebraic Expressions

Algebraic Simplification – Adding/Subtracting

$$4a + 3a \quad \rightarrow$$

More Examples:

$$3x + 7x - x \rightarrow$$

$$3a + 4b + a - 2b \rightarrow$$

Examples

$x^3 + x^2 + x^2 + x \quad \rightarrow$

$3x^2 + 4x - x^2 + x - 3 \quad \rightarrow$

$8x^2 - 3x - x^2 - 4x \quad \rightarrow$

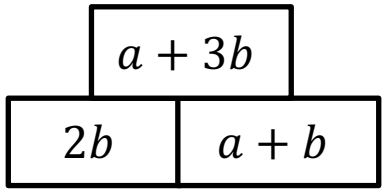
A common Error

$$\underline{9}\ \underline{-3x}\ \underline{+2x} \quad \rightarrow$$

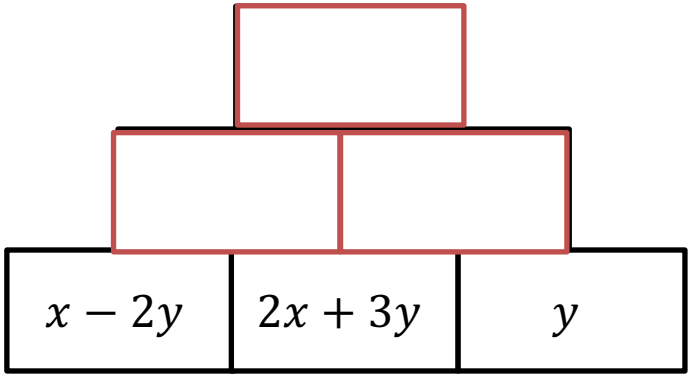
Addition Pyramids

TOP Maths IGCSE

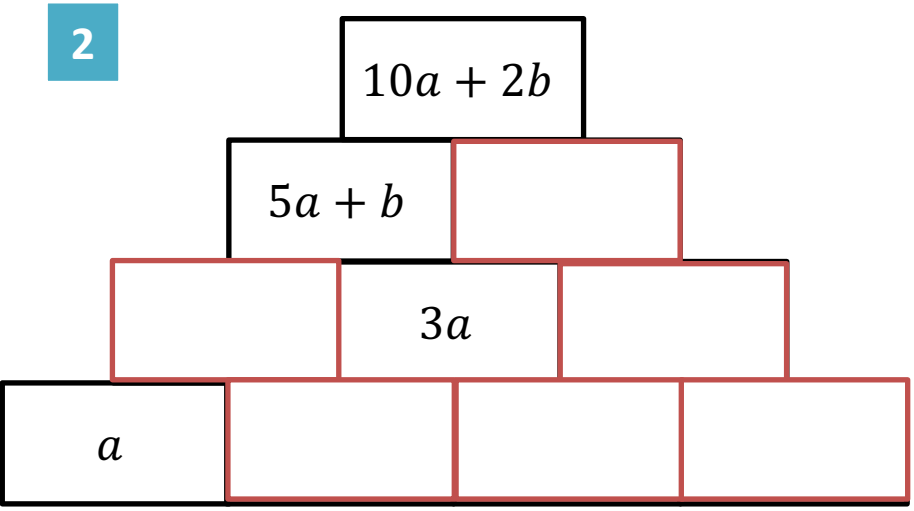
You should have printed the following pyramids. Each block is the sum of the two below it, e.g. as per on the right.
Can you fill in the missing blocks?



1



2



Multiplying

In algebra, **we don't like the $\times$ symbol**; instead we put things **next to each other** to indicate they are multiplied.

$x \times y \quad \rightarrow$

$x \times 2 \quad \rightarrow$

$x \times xy \quad \rightarrow$

$2x \times x \quad \rightarrow$

$3xy \times 3yz \quad \rightarrow$

Simplify the following.

a $3x + 3x \rightarrow$

b $3x \times 3x \rightarrow$

c $9y^2 - 7y + 4y - y^2 \rightarrow$

d $7ab \times b \rightarrow$

e $8qr^2 \times 3qr \rightarrow$

$$\frac{6}{9} \rightarrow$$

$$\frac{2x}{2} \rightarrow$$

$$\frac{5x}{x} \rightarrow$$

$$\frac{2x^2}{3x} \rightarrow$$

$$\frac{10xy}{15x} \rightarrow$$

$$\frac{x^2y}{xy^2} \rightarrow$$

$$\frac{12xy^2z}{16xyz^2} \rightarrow$$

$$\frac{6z}{3} \rightarrow$$

$$\frac{7x^2y^2}{xy} \rightarrow$$

$$\frac{5a^2b^2c^3}{20ab^2c} \rightarrow$$

$$x\left(\frac{9xy^2}{y}\right) - y\left(\frac{8x^2y^2}{2y^2}\right) \rightarrow$$

Exercise

Simplify the following, or write ‘already simplified’.

a $2x + \frac{x^2}{x} \rightarrow$

b $\frac{12x^2y}{3x} - 3xy \rightarrow$

c $\frac{12x^2y^2}{3xy} - xy + y \rightarrow$

d $2x^2y + \frac{3x^2yz}{yz} - \frac{x^3y^3}{xy^2} \rightarrow$

What is the value of $3x^2$ when $x = 2$?

12?

36?

If $a = 2, b = -3$ and $c = -4$, what is the value of:

Terms

$a^2 + 2b =$

$=$

$bc - c =$

$=$

$b^2 - ac =$

$=$

Worded problem

Granny swears that she is getting younger. She has calculated that she is four times as old as I am now, but remember that 5 years ago she was five times as old as I was at that time. What is the sum of our ages now?

Forming Expressions

Suppose a represents your age. How would you represent:

Your age in 5 years time?

Twice what your age was 5 years ago?

5 years younger than twice your age?

Half what your age was 3 years ago?

Anyone called Bob is four times you age.
Anyone called Charles is two years younger than you.
What is (in terms of a):

The age of one person called Bob:
The total age of a Bob and a Charles:
The total age of you, a Bob and two Charles:

"The sum of 5 consecutive whole numbers is 285. What is the smallest of these numbers?"

Supposed we used one variable n. What unknown thing could it represent?

Option 1

Let n be the

Then the five numbers would be:

Then the sum of these numbers would be:

Option 2

Let n be the

Then the five numbers would be:

Then the sum of these numbers would be:

1 A cat costs £c and a dog £2 less.
What is the cost (in £) of:

a) 4 cats?

b) 3 dogs?

2 There is a queue of n people. If there are q people in front of me, how many people are behind me?

Exercise

3 After tennis training, Andy collects twice as many balls as Roger and five more than Maria. If Roger collected r balls, in terms of r, how many balls did:

a) Andy collect?

b) Maria collect?

c) The total number of balls collected?

4 I think of a number, multiply it by 5, subtract 2, subtract the original number, and then halve it. If the starting number was x, give an expression for the final answer, as simply as possibly.

5 In a list of seven consecutive numbers a quarter of the smallest number is five less than a third of the largest number.
If x is the smallest number, find expressions for:

a) "a quarter of the smallest number"

a) "five less than a third of the largest number"

6 A woman had 9 children at regular intervals of 15 months. The oldest is now six times as old as the youngest.

Let a be the age of the youngest child.

a) Use the second sentence in the question to form an expression for the eldest child (be careful!)

b) Use the first sentence to form another expression for the age of the eldest child.

c) (Optional) Hence form an equation and solve it to find the age of the youngest child.

7 Three brothers and a sister shared a sum of money equally among themselves. If the brothers alone had shared the money, then they would have increased the amount they each received by £20.

Suppose the total amount of money is t.

a) How much money (in terms of t) do the brothers each get if they share just between them?

b) What expression would represent "an increase of £20 from the previous lower amount they would have got"

8 Find four integers whose sum is 400 and such that the first integer is equal to twice the second integer, three times the third integer and four times the fourth integer.