

Algebra: Simplifying, expanding brackets and factorising

1. (a) Factorise $10p - 4$
..... (1)
- (b) Factorise $q^2 + 3q$
..... (1)
- (c) Factorise $r^2 - r$
..... (1)
2. (a) Factorise $10a + 5$
..... (1)
- (b) Factorise $c^2 - 4c$
..... (2)
3. Factorise
- (a) $4x - 8$
..... (1)
- (b) $y^2 + 2y$
..... (2)
4. (a) Simplify $5p + 2q - q + 2p$
..... (2)
- (b) Multiply out $4(r - 3)$
..... (1)

5. (a) Expand $3(y - 4)$
..... (1)
- (b) Simplify the expression $2c + 6d + 4c - 8c$
..... (2)
- (c) Factorise $x^2 + 5x$
..... (2)
6. Expand and simplify $4(3d - 2e) - (2d - 5e)$
..... (2)
7. Expand and simplify $5(2x + 1) - 3(x - 4)$
..... (2)
8. (a) Simplify $2x + 3y + 5x - 2y - 4x$
..... (2)
- (b) Factorise $4c + 12$
..... (1)
- (c) Factorise $x^2 + 5x$
..... (2)
9. Expand and simplify
- (a) $5(2a - c) + 4(3a + 2c)$
..... (2)
- (b) Expand and simplify $3(2x - 1) + 2(3x + 5)$
..... (2)
- (c) Expand and simplify $(y + 5)(y - 1)$
..... (2)
- (d) Factorise $2xy - 6y^2$
..... (2)

10. (a) Factorise $2x + 6$
..... (1)
- (b) Expand $3(4y + 1)$
..... (1)
- (c) Expand $4x(x^2 + 5)$
..... (2)
11. Factorise fully $2x^2 - 50y^2$
.....
..... (3)
12. Factorise $5x^2 + 20x$
..... (1)
13. Factorise fully $6ab^2 - 2ab$
..... (2)
14. Factorise fully $6a^2b + 9ab^2$
..... (2)
15. Factorise completely $3x^2 - 6xy$
..... (2)
16. Factorise $r^6 - 3r^4$
..... (1)

Algebra: Solving Linear Equations

1. Solve the following equations

(a) $4(y - 3) = 18$

.....
..... (3)

(b) $\frac{z+4}{2} = 11$

.....
..... (2)

2. Solve the equation $2(x + 5) = 7 - 4x$

.....
.....
..... (3)

3. Solve the equation $4z + 8 = 3 - z$

.....
..... (3)

4. Solve the equation $\frac{2t+5}{3} = 7$

.....
..... (3)

5. Solve $\frac{x}{4} + 1 = 6$

.....
..... (2)

6. Solve $\frac{4}{y+1} = 3$

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..... (3)

7. Solve the equation $6y + 7 = 14y$

.....
.....

(2)

8. Solve the equation $4(y - 3) = 18$

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.....

(3)

9. Solve the equation $7z - 3 = 6 + z$

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.....

(3)

10. Solve the following equations

(a) $\frac{z+4}{2} = 11$

.....
.....

(2)

(b) $2x - 3 = 5x + 6$

.....
.....

(3)

11. Solve the equation $\frac{23-2x}{5} = 3$

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.....

(3)

12. Solve the equation

$$9(x - 1) = 5(x - 2)$$

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.....

(3)

13. Solve the equation

$$\frac{x+1}{2} + \frac{x-3}{4} = 2$$

You **must** show all your working.

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(4)

14. Solve the equation $\frac{y}{3} + 5 = 9$

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.....

(2)

15. Solve the equation $4(z - 1) = 2(z + 3)$

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.....

(3)

16. Solve the equation $2(3x - 2) + 4(x + 5) = 4(x - 2)$

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(3)

17. Solve the equation $3(2z - 1) + 4(z + 3) = 5(2z - 1) + 4(3z - 1)$

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(3)

Algebra: Changing the Subject of a Formula

1. Make t the subject of the formula $w = 2t + v$

.....
.....

(2)

2. Make c the subject of the formula $E = mc^2$

.....
.....

(2)

3. Make c the subject of the formula $d = \frac{c}{5} + e$

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.....

(2)

4. Make x the subject of $w = \frac{x}{2} + 3$

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.....

(2)

5. Make u the subject of the formula $s = \frac{1}{2}(u + v)t$

.....
.....

(3)

6. Make t the subject of the formula $w = \sqrt{t} - v$

.....
.....

(2)

7. Make r the subject of the formula $p = 3 + 2r$

.....
.....

(2)

8. Make x the subject of the formula

$$3x + 2y = 8y - 3$$

Simplify your answer as much as possible.

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.....
.....

(3)

Number: Rules of Indices

1. Simplify

(a) $y^4 \times y^{-3}$

.....

(1)

(b) $y^4 \div y^5$

.....

(1)

2. Simplify

(a) $c \times c \times c \times c$

.....

(1)

(b) $d^3 \times d^2$

.....

(1)

(c) $\frac{e}{e^8}$

.....

(1)

(d) $(2g^2h^4) \times (3g^3h)$

.....

(2)

3. (a) Simplify

(i) $y^7 \times y^2$

.....

(1)

(ii) $y^7 \div y^2$

.....

(1)

(iii) $(y^7)^2$

.....

(1)

4. Simplify $(3xy^2)^4$.

.....
.....
.....

(2)

5. Simplify

(i) $w^2 \times w^6$

.....

(1)

(ii) $w^{10} \div w^4$

.....

(1)

(iii) $(w^4)^3$

.....

(1)

6. If $x = 3^p$ and $y = 3^q$

Express in terms of x and/or y

(i) 3^{p-q}

.....

(1)

(ii) 3^{2p}

.....

(1)

(iii) 3^{q+2}

.....

(1)

7. (a) Simplify $(2x^4y)^3$

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.....
.....

(2)

8. (a) Simplify $x^3 \times x^5$

.....

(1)

(b) Simplify $y^{12} \div y^4$

.....

(1)

(c) Simplify $(3wt^2)^3$

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.....

(2)

Number: Standard Form

1. A builder has 7200 kg of sand.

(a) Write 7200 kg in grams.
Give your answer in standard form.

.....
.....

(2)

(b) One grain of this sand weighs 0.0006 g.
Write the weight of one grain of sand in standard form.

.....

(1)

(c) How many grains of sand are there in 7200 kg of sand?
Give your answer in standard form.

.....
.....

(2)

2. (a) Write 7 billion as a number in standard form.

1 billion = 1000 million

.....

(1)

(b) Write the number 4.5×10^{-3} as an ordinary number.

.....

(1)

3. Here are six numbers written in standard form.

2.6×10^5 1.75×10^6 5.84×10^0 8.2×10^{-3} 3.5×10^{-1} 4.9×10^{-2}

(a) Write down the largest number.

Answer

(1)

(b) Write down the smallest number.

Answer

(1)

(c) Write 4.9×10^{-2} as an ordinary number.

Answer

(1)

4. (a) Work out $4 \times 10^7 \times 3 \times 10^4$

Give your answer in standard form.

.....
.....

(2)

(b) Work out $\frac{4 \times 10^9}{8 \times 10^5}$

Give your answer in standard form.

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.....
.....

(3)

5. Work out $(3 \times 10^2) \times (4 \times 10^5)$

Give your answer in standard form.

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.....

(2)

6. (a) Work out $(3 \times 10^2) \times (4 \times 10^5)$

Give your answer in standard form.

.....
.....

(2)

(b) Workout $(3 \times 10^2) \div (4 \times 10^5)$

Give your answer in standard form.

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.....

(2)

7. Some large numbers are written below.

1 million = 10^6

1 billion = 10^9

1 trillion = 10^{12}

(a) How many millions are there in one trillion?

.....

(1)

(b) Write 8 billion in standard form.

.....

(1)

- (c) Work out 8 billion multiplied by 3 trillion.
Give your answer in standard form.

.....
..... (2)

8. (a) Work out $4 \times 10^8 \times 5 \times 10^{-6}$
Give your answer in standard form.

..... (2)

- (b) Work out

$$\frac{4 \times 10^8}{5 \times 10^{-6}}$$

Give your answer in standard form.

.....
..... (2)

9. Add together 5.1×10^7 and 3.89×10^6

.....
..... (2)

10. (a) Write these numbers in standard form

(i) 9 170 000

..... (2)

(ii) 0.000 048

..... (1)

- (b) Find the value of $(1.8 \times 10^{12}) \div (2 \times 10^8)$

.....
..... (2)

Algebra: Factorising and Solving Quadratic Equations

1. (a) Factorise $p^2 + 7p + 12$
..... (2)
- (b) Solve the equation $p^2 + 7p + 12 = 0$
..... (1)
2. Solve the equation $y^2 - 4y - 45 = 0$
.....
..... (3)
3. (a) Factorise $x^2 + 6x - 16$
..... (2)
- (b) Hence solve the equation $x^2 + 6x - 16 = 0$
.....
..... (1)
4. Solve the equation $z^2 - 9z + 8 = 0$
.....
.....
..... (3)
5. Solve the equation $y^2 + 5y = 0$
.....
..... (3)
6. (a) (i) Factorise $x^2 - 7x - 8$
.....
..... (2)
- (ii) Hence solve the equation $x^2 - 7x - 8 = 0$
..... (1)

9. (a) Expand and simplify $(x + y)(x - y)$
.....
..... (2)

(b) (i) Factorise $x^2 - 13x + 36$
.....
..... (2)

(ii) Hence, or otherwise, solve the equation $x^2 - 13x + 36 = 0$
.....
..... (1)

10. (a) Factorise $x^2 + 5x - 14$
.....
.....
..... (2)

(b) Hence solve the equation $x^2 + 5x - 14 = 0$
.....
..... (1)

11. (i) Factorise $y^2 - 8y + 15$
.....
..... (2)

(ii) Hence solve the equation $y^2 - 8y + 15 = 0$
.....
..... (1)

12. (a) Factorise $x^2 + 3x - 40$
.....
..... (2)

(b) Hence, solve the equation $x^2 + 3x - 40 = 0$
.....
..... (1)

13. (a) Factorise $y^2 - 5y + 6$

.....
..... (2)

(b) Hence solve the equation $y^2 - 5y + 6 = 0$

.....
..... (1)

14. Mandy is x years old.
Her brother is 5 years older than Mandy.
The product of their ages is 84.

(a) Show that $x^2 + 5x - 84 = 0$

.....
..... (1)

(b) Solve $x^2 + 5x - 84 = 0$

Do **not** use a trial and improvement method.

.....
..... (3)

15. (a) (i) Factorise $x^2 - 10x + 25$

.....
..... (2)

(ii) Hence, or otherwise, solve the equation

$$(y - 3)^2 - 10(y - 3) + 25 = 0$$

.....
..... (2)

Algebra: Inequalities and Regions

1. Solve the inequality

$$5x + 3 > 10$$

.....
.....
.....

(2)

2. (a) x is an integer.

$$0 < x \leq 3$$

Write down all the possible values of x .

.....

(2)

(b) x and y are integers.

$$0 < x \leq 3$$

$$y < x$$

$$x + y < 5$$

Write down **two** pairs of values of x and y which satisfy all three inequalities.

.....
.....
.....

Answer (.....,) and (.....,)

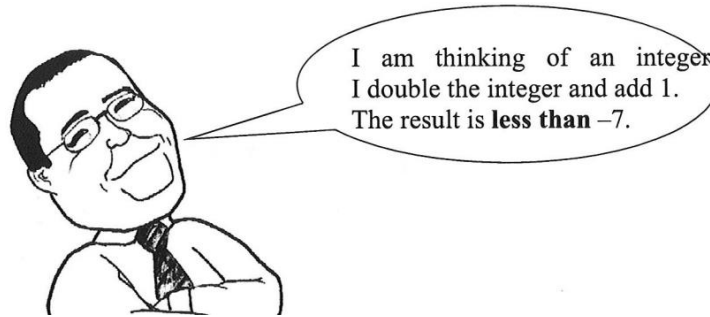
(2)

3. (a) Solve the inequality $3x + 7 \geq 13$

.....
.....

(2)

(b) A mathematics teacher says



What is the **largest** integer the teacher could have thought of?

..... (2)

4. (a) Solve the inequality $3x + 5 \leq 16$

..... (2)

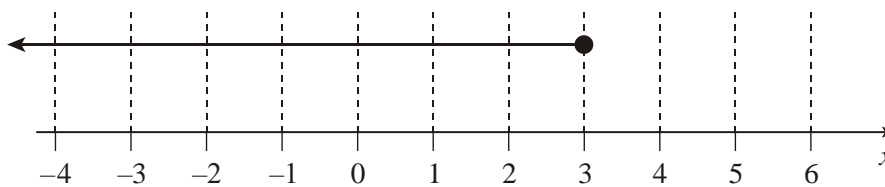
(b) Write down the integer value satisfied by the inequality $5 < 2x < 7$

..... (2)

5. (a) Solve the inequality $3(x - 2) \leq 9$

..... (3)

(b) The inequality $x \leq 3$ is shown on the number line below.



Draw another inequality on the number line so that only the following integers satisfy both inequalities $\{-2, -1, 0, 1, 2, 3\}$

(1)

6. (a) List all the solutions of the inequality

$$4 < 2n \leq 11$$

where n is an integer.

..... (2)

- (b) Solve the inequality

$$4x + 1 < 7$$

..... (2)

- (c) Show that, for any value of n ,

$$(n + 1)^2 > n(n + 2)$$

..... (2)

7. (a) List the integer values of x such that

$$-2 \leq x < 3$$

..... (2)

- (b) Solve the inequality

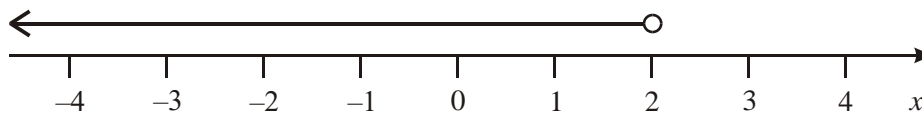
$$x^2 > 64$$

..... (2)

8. (a) Solve the inequality $2x + 3 \geq 1$

..... (2)

- (b) Write down the inequality shown by the following diagram.



..... (1)

- (c) Write down all the integers that satisfy both inequalities shown in parts (a) and (b).

..... (1)