Edexcel B (R)

Algebra

2022 International GCSE Advance Information

Sparx Topics & Key Questions

We are always looking for ways to support maths teachers and students. In order to help you and your year 11s this year we've pulled together a list of key questions which may be useful to practise with your students based on the exam board topic lists.

These 63 key questions are all taken from our library of over 45,000 high-quality questions in Sparx Maths. If you are a Sparx Maths School then your students can use the Topic Codes provided to search the full content library directly within the independent learning section of Sparx Maths to help target their revision.

Please note this is not an exhaustive topic guide it is simply designed to help you pull together some key questions to use to check for understanding in lessons, starters, or as worksheets with your learners.

Algebra	Topics	Sparx Topic Codes
Manipulation	Subject of a formula	B454
	Algebraic formulae	B160, B123
	Factorisation	B397, B507, B164
	Completing the square	B757
	Algebraic fractions	B930, B332, B858, B887
	Indices	B155, B131, B448
	Factor theorem	B329
	Algebraic division	B448
Equations	Linear equation	B647, B938, B862, B739
	Simultaneous equations, linear	B475, B424
	Simultaneous equations, linear and quadratic	B622, B719
	Quadratic equation	B364, B446, B770, B628
Sequences	nth term of a sequence	B228, B844
Inequalities	Linear inequality	B393, B895, B117
	Quadratic inequality	B492

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Manipulation - Subject of a formula

Changing the subjects of formulae B454

Make x the subject of

$$rt = \frac{(x+p)^2}{10}$$

Make x the subject of this formula:

$$n = 6x - yx$$

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Manipulation - Algebraic formulae

Substituting into expressions and formulae B160

Work out the value of x^n when $x = 5$ and $n = 3$

$$c = \frac{5n + 9}{2p}$$

Work out the value of c when $n = 4$ and $p = 5$

Give your answer as a whole number or as a decimal.

$$k = \frac{a^2 + t}{2 - a}$$

Work out the value of t when $a = 4$ and $k = -11$.

Give your answer as an integer or as a decimal.

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Which of the expressions below always have an **even** value when x is an **odd** number?
Select all of the correct answers.

$6x$

$7 + x$

$2x + 3$

x^2

Phoebe knows that w, x and y have the values 4, 5 and 8, but she does not know which is which.

What is the **largest** value that $3w + 7x - 2y$ could have?

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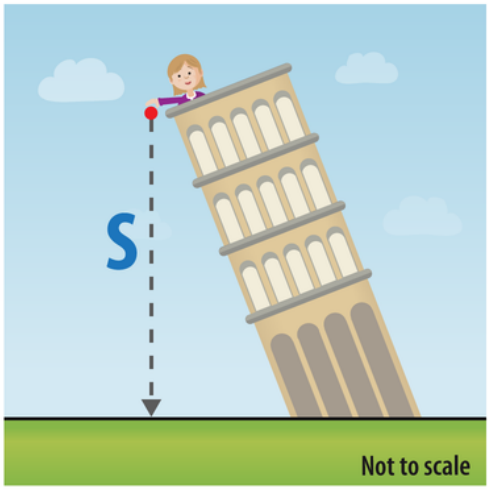
Substituting into real-life formulae

B123

Look at the information in the image below.

Francesca dropped an item from the top of the Leaning Tower of Pisa. Its initial speed was $0\ \mathrm{m/s}$, its final speed was $33\ \mathrm{m/s}$ and it took $3.4\ \mathrm{s}$ to fall to the ground.

Giving your answer to 1 decimal place, work out s (the distance travelled), in metres (m).



$$s = \frac{1}{2}(u + v)t$$

where

s = distance travelled (m)

u = initial speed (m/s)

v = final speed (m/s)

t = time travelling (s)

The geometric mean of 10 and x is 20. Use the rule below to find the value of x.

To find the geometric mean of two numbers:

multiply the two numbers together, then find the square root of the result.

Example

$$\begin{aligned} \text{geometric mean of 4 and 9} &= \sqrt{4 \times 9} \\ &= \sqrt{36} \\ &= 6 \end{aligned}$$

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Manipulation - Factorisation

Factorising into one bracket B397

Fully factorise $7t^2 - 14tu$

Factorising quadratic expressions of the form $x^2 + bx + c$ B507

Fully factorise $w^2 - 15w + 54$

Work out the value of a in the equation below.

$$x^2 - 18x + 81 = (x - a)^2$$

Fully factorise $w^2 - 144$

Factorising quadratic expressions of the form $ax^2 + bx + c$ B164

Fully factorise $6h^2 - 19h + 15$

Fully factorise the expression $49w^2 - 36$

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Manipulation - Completing the square

Completing the square B757

Write $w^2 + 9w - 3$ in completed square form.
Give any numbers in your answer as integers or as fractions in their simplest form.

Express $2x^2 + 16x + 5$ in the form $a(x + b)^2 + c$, where a, b and c are numbers.

What are the values of a, b and c?

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Manipulation - Algebraic fractions

Simplifying algebraic fractions by factorising into one bracket B930

Write the following fraction in its simplest form:

$$\frac{6m+30}{7m+35}$$

Simplifying algebraic fractions by factorising into two brackets B332

Write the fraction below in its simplest form.

$$\frac{f^2-16}{f^2-10f+24}$$

Fully simplify the fraction below.

$$\frac{6x^2+3x}{2x^2+7x+3}$$

Adding and subtracting algebraic fractions B858

Fully simplify

$$\frac{10}{5x-1}-\frac{2}{x+3}$$

Give your answer fully factorised.

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Dividing algebraic fractions

B887

Write the following calculation as a fraction in its simplest form:

$$\frac{1}{2x^2 + x - 21} \div \frac{1}{5x^2 - 15x}$$

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Manipulation - Indices

Index rules with positive indices B155

Work out the value of f in the equality below.

$$\frac{6^{10} \times 6^{8}}{6^{2}} = 6^{f}$$

What is the value of d in the equality below?

$$(7^{4} \times 7^{5})^{3} = 7^{d}$$

Index rules with negative indices B131

Write 5^{-3} as a fraction in its simplest form, without any indices.

What is the value of c in the equality below?

$$(16^{3})^{-7} = 16^{c}$$

Simplifying expressions using index laws B448

Simplify the following expression:

$$3q^{5}r^{3} \times 4q^{2}r^{5}$$

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Fully simplify the following expression:

$$(6f^9g^{-4})^2$$

Give your answer without any negative indices.

Fully simplify the expression below.

$$\frac{2xy^4z^7}{16y^{12}z}$$

Give your answer as a fraction without any negative indices.

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Manipulation - Factor theorem

Using the factor theorem B329

Use the factor theorem to work out whether $(3x + 2)$ is a factor of $3x^3 + 11x^2 - 6x - 8$.

$(x + 6)$ is a factor of $x^3 + rx^2 - 32x + 60$, where r is a constant.

a) Show that $r = -1$.

b) Using your answer to part a), fully factorise $x^3 + rx^2 - 32x + 60$.

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Manipulation - Algebraic division

Simplifying expressions using index laws B448

Simplify the following expression:

$$3q^5r^3 \times 4q^2r^5$$

Fully simplify the following expression:

$$(6f^9g^{-4})^2$$

Give your answer without any negative indices.

Fully simplify the expression below.

$$\frac{2xy^4z^7}{16y^{12}z}$$

Give your answer as a fraction without any negative indices.

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Equations - Linear equation

Solving equations with the variable on one side B647

Solve $\frac{2h+17.2}{6} = 4$

Give your answer as a decimal.

Calculate the two possible values of x in the following equation:

$$4(7 + 5x^2) = 348$$

Solving equations with the variable on both sides B938

Solve $\frac{7t+15}{2} = 6t$

$t = ...$

Solving equations with the variable in the denominator B862

Solve the equation below.

$$\frac{w+5}{10-3w} = 3$$

Give your answer as a decimal.

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Constructing and solving equations **B739**

A regular hexagon and a regular pentagon have the same perimeter. All measurements are given in centimetres.

The hexagon has a side length given by $7m + 3$.
The pentagon has a side length given by $8m + 6$.

Work out the value of m.

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Equations - Simultaneous equations, linear

Solving simultaneous equations using elimination B475

Solve the following simultaneous equations algebraically:

$$7x + 5y = 3$$
$$3x - 2y = -7$$

Solve the following simultaneous equations:

$$6x + 7y = 10$$
$$9x + 13y = -5$$

Solving simultaneous equations using substitution B424

Solve the simultaneous equations below using substitution.

$$7x - 2y = 15$$
$$y + 6 = 2x$$

Solve the simultaneous equations below using substitution.

$$2y + 5x = 42$$
$$4x = 8y + 24$$

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Equations - Simultaneous equations, linear and quadratic

Solving simultaneous equations involving quadratics B622

Look at the simultaneous equations below.

$$x - 9y = 10$$
$$3y^2 = 4x + 7$$

a) Show that $3y^2 - 36y - 47 = 0$

b) Use part a) to solve the simultaneous equations.
If any of your answers are decimals, give them to 1 d.p.

Solve these simultaneous equations:

$$x^2 + y^2 = 26$$
$$2x + y = 7$$

If any of your answers are decimals, give them to 1 d.p.

Constructing and solving simultaneous equations B719

Charlie sold 100 tickets for his show.

An adult ticket costs $£6.50$ and a child ticket costs $£2.50$.
Charlie`s ticket sales totalled $£410$.

a) How many adult tickets did he sell?
b) How many child tickets did he sell?

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A rectangle has side lengths of x cm and $(x + y)$ cm, where x and y are both positive.
The rectangle has an area of 57 cm^2 and a perimeter of 44 cm.

Work out the values of x and y.

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Equations - Quadratic equation

Factorising to solve quadratic equations of the form $ax^2 + bx + c = 0$ B364

Solve the equation below using factorising.

$$6y^2 - 11y - 10 = 0$$

Give each answer as an integer or as a fraction in its simplest form.

Solving quadratic equations by completing the square B446

By first completing the square, solve $x^2 + 12x + 4 = 0$.

Give your answers fully simplified in the form $x = a \pm b\sqrt{c}$, where a, b and c are integers.

By first completing the square, solve $x^2 - 3x + \frac{1}{4} = 0$.

Give your answers fully simplified in the form $x = a \pm \sqrt{b}$, where a and b are integers or fractions.

Solving quadratic equations using the quadratic formula B770

Solve the quadratic equation

$$-5m^2 + 12m + 8 = 3 - 5m$$

Give each solution to 2 d.p.

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Solve $2x(4 - 7x) = -9$

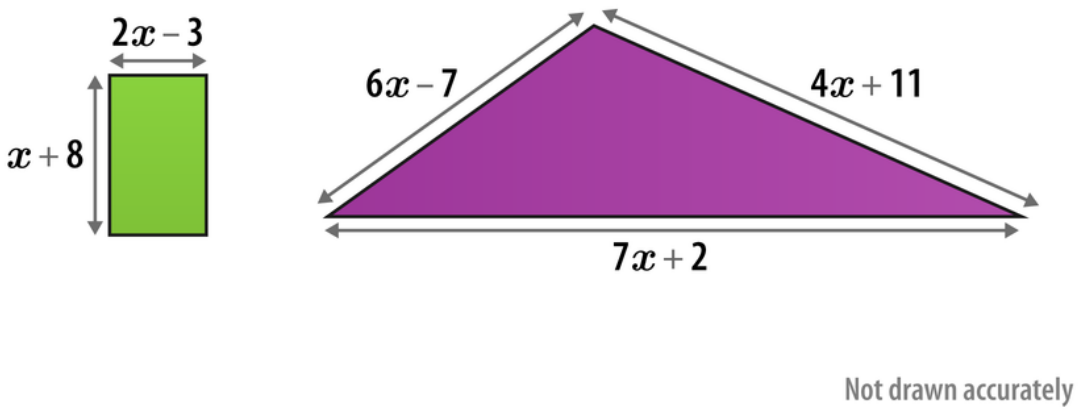
Give your answers to 2 d.p.

Constructing and solving quadratic equations **B628**

A rectangle and a triangle are shown below.

The area of the rectangle, measured in cm^2, is numerically equal to the perimeter of the triangle, measured in cm.

Work out the value of x.
If your answer is a decimal, give it to 1 d.p.



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Sequences - nth term of a sequence

Position-to-term rules for arithmetic sequences B228

The start of an arithmetic sequence is

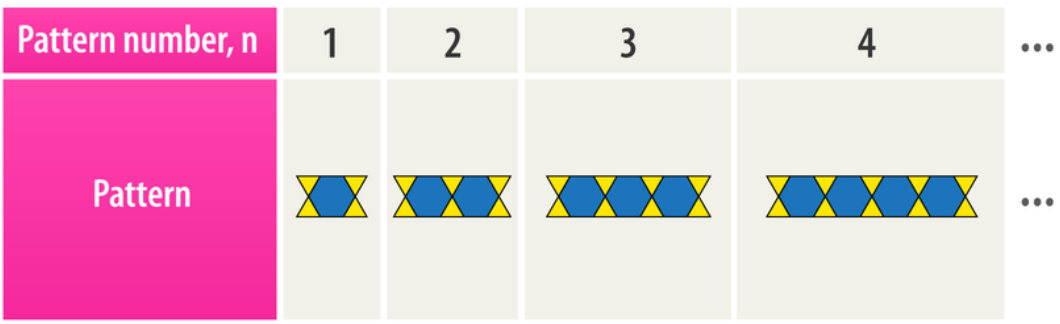
$$4, \quad 11, \quad 18, \quad \ldots$$

One of the terms in the sequence has a value of 620.
At what **position** in the sequence is this term?

Position-to-term rules for sequences of patterns B844

A sequence of patterns is made from hexagons and triangles.
The same number of hexagons and the same number of triangles are added each time.

How many triangles are there in **pattern number** 70?



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Inequalities - Linear inequality

Solving inequalities with the variable on both sides B393

Work out the lowest **integer** value that p can take if

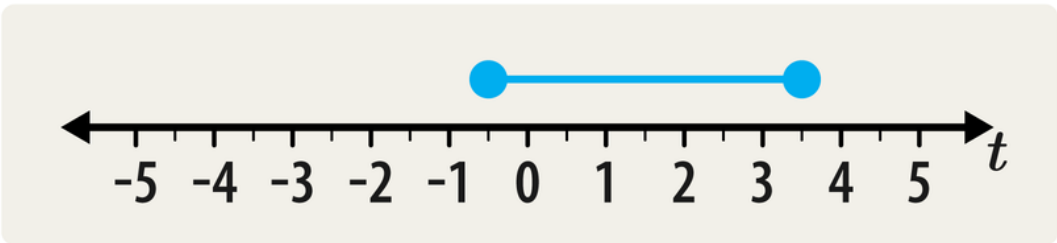
$$8p + 6 > 30 - 2p$$

Solve the following inequality:

$$2(3d + 7) \leq 4d + 28$$

Drawing and solving double inequalities B895

Write down the inequality shown on the number line below.



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How many integer values are there that x could take to satisfy the following inequality?

$$5 < 2x + 3 \leq 9$$

Constructing and solving inequalities **B117**

Alfie has a collection of 528 trading cards, and Ellie has a collection of 609 trading cards. At the end of each month, Alfie buys a box of 50 trading cards and Ellie buys a box of 42 trading cards.

After how many months will Alfie have more trading cards than Ellie?

A rectangle has side lengths, in centimetres, of r and $r - 3$.

a) Write a sentence to explain why $r > 3$.

b) The perimeter of the rectangle is smaller than 26 cm.
Use this information and your answer to part a) to write a double inequality for r.

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Inequalities - Quadratic inequality

Solving quadratic inequalities B492

Sketch a graph to solve $x^2 - 7x \leq 0$.

Solve $2x^2 - 17x + 8 > 0$

Fully simplify any fractions in your answer.

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