



Maths

Key Stage 4
Tutor Guidance



Contents

Using your course resources and guidance.....	5
Tutorial 1 – Introductions.....	7
Course Notes	6
Module 1 – Ratio and Proportions.....	8
Module 2 - Fractions, decimals, percentages and proportionality.....	11
Module 3 - Simplifying expressions and solving equations.....	15
Module 4 – Measurement and Geometry	19
Module 5 - Graphs.....	23
Module 6 – Probability and Statistics.....	27
Tutorial 14 – Refresher Session.....	30
Tutorial 15 – Feedback and Reflections.....	31

Welcome to the Brilliant Tutoring Programme

Welcome to the Brilliant Tutoring Programme, run by The Brilliant Club. The Brilliant Club is an approved National Tutoring Programme provider. We are taking part in the national catch-up effort so pupils can access a future they deserve.

You'll be working with six pupils per placement, split into two groups of three. You will help them re-engage and rebuild confidence in core curriculum subjects and inspire them with your knowledge and expertise. You'll usually deliver your tutorials virtually.

Each tutorial will normally be 1 hour long, so you'll have a minimum of 2 hours teaching time per week. However, this is likely to be more, depending on the schedule agreed with the school. You will also have to factor in some prep time per tutorial.

Tutorial	Description
Tutorial 1	You will introduce yourself and tell pupils a bit about the topic and your area of research or study.
Tutorial 2-13	These are the tutorials where you will teach around three modules based on the school curriculum.
Tutorial 14	This will be a refresher session where you will revisit a topic from one of the modules you have previously covered.
Tutorial 15	The final tutorial is for you to give some feedback to pupils and help them to reflect on their progress.

Key contacts



Each school nominates a Lead Teacher to select the pupils, co-ordinate the tutorials in school, and support the pupils throughout. The lead teacher has a crucial role in helping the pupils to succeed on the programme.



You will be assigned a Programme Officer from The Brilliant Club. They will work closely with lead teachers to support programme logistics in school and support you to deliver your placement(s).

If you ever have any general questions, contact us on: btptutors@thebrilliantclub.org

For resources and guidance documents to support you during your placement, go to:

thebrilliantclub.org/already-working-with-us/btp

Your responsibilities during your placement

During your placement we ask that you:

- **Complete registers within 24 hours of the tutorial (separate guidance on this process will be provided).** It is important that we have a record of attendance for child safeguarding and to monitor pupil progress.
- **Communicate regularly with your Programme Officer.** Remember that teachers and school staff can have competing demands on their time, therefore keep your Programme Officer in the loop so they can follow up on any issues. We also love hearing when things are going well too!
- **Give us as much notice as possible if you need to reschedule a tutorial.** Schools, parents and pupils find it challenging to change dates at short notice. You should only cancel tutorials at short notice if you are unwell or have an emergency.
- **Uphold your safeguarding responsibilities as set out in our Safeguarding Training:** thebrilliantclub.org/tutor-training/introductory-module

Preparing for your placement

Before you start your first tutorial, you should complete the following steps to make sure you're fully prepared:

- Complete or renew your DBS and Right to Work checks (You will be contacted about this if required)
- Complete all the relevant training modules
- Confirm your tutorial schedule, placement details and modules with your Programme Officer
- Receive the course materials, review these and tailor them as needed
- Read the virtual tutorial guidance for Microsoft Teams
- Receive your Microsoft Teams log in details and meeting link, and check these are working

You can find Teams guidance here:

thebrilliantclub.org/already-working-with-us/btp

You can find all the training modules here:

thebrilliantclub.org/tutor-training

Password: tbctutors

Knowledge Checks

Pupils complete a short Knowledge Check at the start and end of each module. These are short assessments in which pupils answer exam style questions on the module topic.

We'll share pupils' answers with you shortly after they complete each one.

The purpose of these Knowledge Checks are to:

- See the progress pupils make between the start and end of each module
- Share this data with schools so they can monitor pupil progress
- Give you information about pupil progress to inform your tutorial planning

We strongly encourage pupils to complete these Knowledge Checks using the digital links that are provided in the Pupil Handbook and on the presentation slides, as this is the quickest and most efficient way for the information to be collected and shared with you.

However, if pupils aren't able to access the digital links, they can complete the assessment on paper or on a word document. They should then send their work to btpschools@thebrilliantclub.org and include their school and tutor name.

Using your course resources and guidance

To support you to deliver your placement, you have a number of resources.

This guidance document

The rest of this document provides notes for the course you'll deliver. Look out for the **Content Tips** included within some tutorials, highlighting key misconceptions and areas to focus on.

You should use it in conjunction with the tutorial presentations to prepare for your sessions.

Tutorial presentations

Presentations for each tutorial are provided in PowerPoint (for Windows) and Keynote (for Mac) format. These contain pre-prepared learning activities along with facilitation notes.

We have indicated where you could add additional activities and slides based on your own knowledge and teaching ideas. You should also feel free to tailor any of the activities based on the needs of the pupils you are working with.

Pupil handbook

Pupils will receive a printed course handbook and you'll get a digital copy of this. These contain space for them to complete learning activities, Knowledge Checks and reflections.

The space for them to record their working out will correlate to the presentations you have, but please ask pupils to use extra paper if they need more space.

Setting homework

It is not an expectation for you to set homework, nor is homework compulsory for pupils to complete. If you feel the pupils you work with need or would like to complete extra work outside of tutorial time, you can agree this with them. However, it should be seen as an optional extra for them to practice or stretch themselves. Some examples have been included in this guidance or on the slides.

You'll be emailed all the documents you need, but will always be able to find copies at:

thebrilliantclub.org/already-working-with-us/btp

Course Notes

Selecting modules

Schools are encouraged to select their modules primarily from the first three modules on offer (ratio and proportion; fractions, decimals and percentages; solving equations). This is because the content within these three core modules comes up the most within exams and the skills learnt within these reach across many other disciplines.

The other additional modules can then be viewed as supplementary stretch content.

Delivering content

Presentation slides scaffold pupil learning by breaking down the method into its component parts on each slide. This can help you to teach methods to pupils and help pupils to visualise each step clearly.

We understand that you may sometimes prefer to use a whiteboard function or free space to draw on the slides and take pupils through the steps yourself. We encourage you to use your own judgement here and to reflect on your approach as you progress through the tutorials.

Pupils do not need to answer every question in a session; use the results from Knowledge Checks and other formative assessment to inform your session planning.

Successful tutoring involves...

- 1 Planning your questions in advance, considering what you will ask and why
- 2 Celebrating student contributions, highlighting successes
- 3 Eliciting the maths from the students by asking them to explain their thought process, show you their method and identify their mistakes

Tutorial 1 – Introductions

The purpose of Tutorial 1 is to start getting to know your pupils and collect some information from the group that helps us to report programme impact to our school partners.

Further guidance about Tutorial 1 and supporting resources, such as accompanying slides, will be provided to you when your placement is confirmed.

This table outlines the suggested structure for Tutorial 1.

Section	Suggested Time	Additional Information
Introduction & Icebreaker	10 mins	Introduce yourself to the pupils and find out a bit about them.
Introduce your research	15 mins	An opportunity to engage pupils with your research/degree and link it to the BTP subject they are going to be studying.
Welcome to BTP	5 mins	Sharing a pre-recorded welcome video explaining the programme to pupils.
Pre-Programme Survey	10 mins	Pupils will complete a pre-programme survey using the link and codes your Programme Officer shares with you.
Knowledge Check	15 mins	Pupils will complete the Knowledge Check for the first module you'll be covering.

Module 1 – Ratio and Proportions

Tutorial	Topic
Tutorial 1.1	Writing, interpreting and using ratios
Tutorial 1.2	Proportional reasoning in everyday contexts
Tutorial 1.3	Proportional reasoning in geometry

Tutorial 1.1 - Writing, interpreting and using ratios

At the beginning of this tutorial, you will guide pupils through a set of confidence and Knowledge Check questions – you'll find more details about this on the relevant tutorial slides. Answers are indicated below.

Knowledge Check 1

<https://forms.office.com/r/LRVVK5tQ7b>



Question

- If the ratio $a:b$ is $4:5$, what is a written in terms of b ?
 $a = (5/4)b$ $a = 5b$ **$a = (4/5)b$** $a = 4b$
- A bag has red, green and blue counters. The ratio of blue to red is $2:3$. The ratio of red to green is $5:7$. What is the ratio of blue to green?
 $2:7$ **$10:21$** $3:5$ $14:28$
- Baking 16 shortbread biscuits requires 140g butter, 100g sugar and 180g flour. How many shortbreads can Johan make with 315g butter, 240g sugar and 280g flour?
 38 36 **24** 16
- A and B are similar triangles. The base of A is 8cm, and the hypotenuse is 14cm. The base of B is 6cm. What is the length of the hypotenuse of B?
 12cm 18.7cm 14cm **10.5cm**

In this tutorial you will look at:

- Representing a ratio as a picture, a bar model, a fraction or a percentage
- Simplifying, comparing or combining ratios
- Solving number and word problems about sharing whole amounts into two or more unequal parts

Content Tip: This tutorial introduces the concept of 'bar models' – you may be less familiar with this concept as it is a relatively new term in mathematical teaching. It is important that you do not use algebra here, as students are very unlikely to be able to solve the questions using this approach.

Tutorial 1.2 - Proportional reasoning in everyday contexts

In this tutorial you will look at:

- Using proportional reasoning to decide which of two or more options is the 'best buy', or similar problems
- Using proportional reasoning to 'scale up' or 'scale down' the ingredients needed to prepare a recipe, or similar problems
- Using proportional reasoning in more complicated contexts, where you can't 'scale up' or 'scale down' immediately

Tutorial 1.3 - Proportional reasoning in geometry

In this tutorial you will look at:

- Using proportional reasoning to solve problems about similar shapes
- Using proportional reasoning to solve problems about line segments
- Using proportional reasoning to solve problems about vectors

At the end of this tutorial, you will guide pupils through a set of confidence and Knowledge Check questions. You will also complete a reflection exercise so that pupils can take time to think about what they found challenging and where they did well – you'll find more details about this on the relevant tutorial slides. Answers are indicated below.

Knowledge Check 2

<https://forms.office.com/r/aTtdW8VtGe>



Question

1. If the ratio $c:d$ is $7:9$, what is d written in terms of c ?

$d = (9/7)c$

$d = 7c$

$d = (7/9)c$

$d = 9c$

2. A bag has orange, purple and white counters. The ratio of orange to purple is $8:5$. The ratio of orange to white is $6:11$. What is the ratio of orange to purple to white? Write the ratio in its simplest form.

$8:5:11$

$48:30:11$

$14:5:11$

$24:15:44$

3. A recipe for 20 biscuits requires 100g butter, 75g sugar, 160g flour and 10g cacao powder. Fleur has 3kg butter, 2.5kg sugar, 5kg flour and 320g cacao powder. How many biscuits can she make?

625

640

600

660

4. C and D are similar shapes. The shortest side of C is 5.5cm and the longest side is 9cm. The longest side of D is 13.5cm. What is the length of the shortest side of D ?

8.25cm

10cm

5.5cm

7.5cm

Module 2 - Fractions, decimals, percentages and proportionality

Tutorial	Topic
Tutorial 2.1	Fractions and decimals in numerical and algebraic contexts
Tutorial 2.2	Percentage changes in numerical and algebraic contexts
Tutorial 2.3	Direct and Inverse proportion

Tutorial 2.1 - Writing, interpreting and using ratios

At the beginning of this tutorial, you will guide pupils through a set of confidence and Knowledge Check questions – you'll find more details about this on the relevant tutorial slides. Answers are indicated below.

Knowledge Check 1

<https://forms.office.com/r/equJbX7vzW>



Question

1. A £180 games console has been reduced in a sale by 5%, and again by 15%. What is the sale price of the console?

£145.35

£144.00

£160.00

£140.00

2. The sides of a square increase by 10%. By what percentage does the area of the square increase?

10%

11%

20%

21%

3. Write as a single fraction in its simplest form:

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

$$\frac{-2}{(2x-1)}$$

$$\frac{(x-8)}{((x+1)(2x-1))}$$

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

$$\frac{-2}{((x+1)(2x-1))}$$

4. x is a number.
 $\frac{3}{4}$ of 300 is the same as $\frac{1}{8}$ of x . What is the value of x ?

3200

2400

1800

600

5. y is directly proportional to x . $y = 4.5$ when $x = 1.5$.
Work out the value of x when $y = 18$.

$\frac{3}{2}$

6

$\frac{3}{8}$

15

In this tutorial you will look at:

- Comparing, simplifying and calculating with fractions and decimals
- Comparing, simplifying and calculating with numbers written in standard form
- Adding and subtracting algebraic fractions

Content Tip: Be aware that students will have a wide range of skill using a calculator. Be prepared to spend some time helping them use their calculator properly, including switching between decimals and fractions, using brackets and using the answer function.

Tutorial 2.2 - Percentage changes in numerical and algebraic contexts

In this tutorial you will look at:

- Solving word problems involving a percentage change
- Solving word problems involving repeated percentage changes
- Writing and using percentage changes in algebraic expressions

Content Tip: It is worth reminding students that decimals and percentages are representations of the same number, that's why they can be used interchangeably. Explaining this removes the confusion about why this works.

Tutorial 2.3 - Direct and Inverse proportion

In this tutorial you will look at:

- Solving problems about two variables that have a directly proportional relationship
- Solving problems about two variables that have an inversely proportional relationship
- Solving word problems about compound measures

At the end of this tutorial, you will guide pupils through a set of confidence and Knowledge Check questions. You will also complete a reflection exercise so that pupils can take time to think about what they found challenging and where they did well – you'll find more details about this on the relevant tutorial slides. Answers are indicated on the following page.

Knowledge Check 2

<https://forms.office.com/r/LAbpUWEK47>



Question

1. A £40 coat increased in price by 12%. After this, a sale in the shop reduced it by 30%. What is the sale price of the coat?

£32.40

£40.00

£30.00

£31.36

2. The radius of a circle increases by 20%. By what percentage does the area of the circle increase?

0%

44%

40%

20%

3. Write as a single fraction in its simplest form:

$$\frac{(x^2 - 8x - 5)}{(3x + 5)} \quad \frac{4(x - 1)}{3x + 5} \quad \frac{(x - 1)}{3x} - \frac{4}{(x + 5)} \quad \frac{(x^2 - 8x - 5)}{3x(x + 5)} \quad \frac{4(x - 1)}{3x(x + 5)}$$

4. y is a number.
 $\frac{3}{5}$ of 220 is the same as $\frac{1}{7}$ of y . What is the value of y ?

924

900

1000

959

5. y is inversely proportional to x . $y = 2.5$ when $x = 4$.
Work out the value of x when $y = 30$.

48

4

$\frac{1}{3}$

31.5

Module 3 - Simplifying expressions and solving equations

Tutorial	Topic
Tutorial 3.1	Simplifying algebraic expressions
Tutorial 3.2	Solving linear equations
Tutorial 3.3	Solving quadratic equations

Tutorial 3.1 – Simplifying algebraic expressions

At the beginning of this tutorial, you will guide pupils through a set of confidence and Knowledge Check questions – you'll find more details about this on the relevant tutorial slides. Answers are indicated below.

Knowledge Check 1

<https://forms.office.com/r/xyW4WwWpd8>



Question

1. Simplify: $3x(2-x) - 3(x-1)$

$$3x - 3x^2 - 1$$

$$3x - 3x^2 + 3$$

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

$$-3x + 3x^2 - 3$$

2. Simplify: $\sqrt[2]{(25x^{16})} + 3(x^2)^4$

$$5x^{16} + 3x^4$$

$$28x^8$$

$$5x^4 + 3x^8$$

$$8x^8$$

3. Solve: $3(2x-3) = 4x+7$

$$x = 8$$

$$x = 13$$

$$x = 16$$

$$x = -1$$

4. Rearrange the formula to make x the subject:

$$\frac{x}{2} + b = c$$

$$x = \frac{(c-b)}{2}$$

$$x = 2(c+b)$$

$$x = \frac{(c+b)}{2}$$

$$x = 2(c-b)$$

5. Solve: $x^2 + 5 = 6x$

$x = -1$ or $x = -5$

$x = 5$

$x = 1$ or $x = 5$

$x = -1$

6. Factorise: $3x^2 + 17x + 10$

$(3x + 10)(x + 1)$

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

$x(3x + 17) + 10$

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

In this tutorial you will look at:

- Simplifying algebraic expressions by collecting 'like' terms
- Simplifying algebraic expressions by first expanding brackets
- Simplifying algebraic expressions by first factorising

Content Tip: Students will sometimes make mistakes when collecting like terms due to issues with simplifying negative numbers. Asking students to simplify the expressions in stages can be helpful.

Tutorial 3.2 – Solving linear equations

In this tutorial you will look at:

- Solving linear equations in which x occurs once
- Solving linear equations in which x occurs more than once
- Making x the subject of a linear equation

Content Tip: Insist on showing the full working out. Students will sometimes resist because the easier equations can be done in their heads. Explain that showing working becomes necessary as the equations become more complex.

Tutorial 3.3 – Solving quadratic equations

In this tutorial you will look at:

- Factorising quadratic expressions
- Solving quadratic equations that factorise
- Rearranging and solving quadratic equations that factorise

Content Tip: Be aware that it will often be negative numbers that cause students to stumble when they are looking for factors.

At the end of this tutorial you will guide pupils through a set of confidence and Knowledge Check questions. You will also complete a reflection exercise so that pupils can take time to think about what they found challenging and where they did well – you'll find more details about this on the relevant tutorial slides. Answers are indicated below.

Knowledge Check 2

<https://forms.office.com/r/qgy4LSqtun>



Question

1. Simplify: $(3x-1)(2x-2) + (x+3)$

$$6x^2 - 7x + 1$$

$$6x^2 + 9x + 5$$

$$6x^2 - 7x + 5$$

$$6x^2 + 9x + 1$$

2. Simplify: $(2x^3)^3 + 4x^6 - 8(x^2)^3$

$$12x^6 - 8x^5$$

$$8x^9 - 4x^6$$

$$-2x^6$$

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

3. Solve: $\frac{(2x+1)}{2} = \frac{(5-x)}{3}$

$$x = 3.25$$

$$x = \frac{13}{7}$$

$$x = 1.75$$

$$x = \frac{7}{8}$$

4. Rearrange the formula to make x the subject:

$$x + bx = c$$

$$x = c - b$$

$$x = \frac{c}{(1+b)}$$

$$x = c - bx$$

$$x = \frac{(c-b)}{x}$$

5. Solve: $5x^2 - 4 = (2 - 3x)^2$

$$x = 1 \text{ or } x = 2$$

$$x = -2$$

$$x = 1$$

$$x = -1 \text{ or } x = -2$$

6. Factorise: $4x^2 - 7x + 3$

$$(4x + 3)(x + 1)$$

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

$$x(4x - 7) + 3$$

$$(4x - 3)(x - 1)$$

Module 4 – Measurement and Geometry

Tutorial	Topic
Tutorial 4.1	Area, Volume and Units
Tutorial 4.2	Geometrical reasoning with angles
Tutorial 4.3	Pythagoras's Theorem and trigonometry in 2D right-angled triangles

Tutorial 4.1 – Area, Volume and Units

At the beginning of this tutorial, you will guide pupils through a set of confidence and Knowledge Check questions – you'll find more details about this on the relevant tutorial slides. Answers are indicated below.

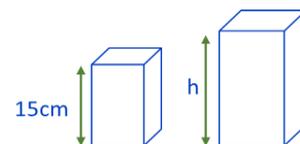
Knowledge Check 1

<https://forms.office.com/r/jcdAJkaJQC>



Question

1. Two similar boxes are made with card. The smaller box has height 15cm. To make the larger box, twice as much card is used as for the smaller box. Work out the height, h , of the larger box.



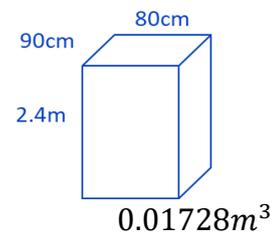
30cm

21.2cm

15cm

25.5cm

2. What is the volume of the cuboid, in metres cubed?



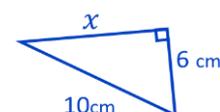
$17280m^3$

$172.8m^3$

1.728m³

$0.01728m^3$

3. Work out the value of x :



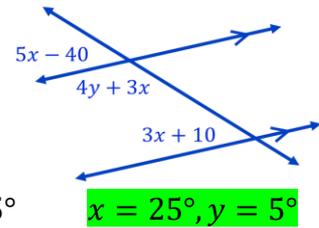
8cm

6cm

11.7cm

4cm

4. Work out the values of x and y for the following angles.



$x = 25^\circ, y = 2.5^\circ$ $x = 50^\circ, y = 10^\circ$ $x = 50^\circ, y = 2.5^\circ$

In this tutorial you will look at:

- Calculating areas of 2D shapes and surface areas and volumes of 3D prisms
- Calculating areas, surface areas and volumes of similar 2D and 3D shapes
- Solving word problems about areas and volumes of shapes

Content Tip: Students may not be 100% fluent in converting cm^3 to m^3 etc, so you may need to explain the underlying maths here.

Tutorial 4.2 – Geometrical reasoning with angles

In this tutorial you will look at:

- Calculating, with reasoning, 'unknown' angles between parallel lines and in polygons
- Calculating, with reasoning, 'unknown' angles in circles
- Using angles to make deductions about polygons, circles and lines

Content Tip: Students will often struggle to recognise which circle theorem they need to use to solve a problem, especially as they compound or appear novel. It may be worth considering how to structure a checklist of features to look for and what conclusions to draw from that.

Tutorial 4.3 - Pythagoras's Theorem and trigonometry in 2D right-angled triangles

In this tutorial you will look at:

- Calculating with, and making deductions from, Pythagoras' Theorem
- Using trigonometry to calculate 'unknown' side lengths and angles
- Using Pythagoras' Theorem and trigonometry to solve problems in real-world contexts

Content Tip: When rearranging trigonometric equations, pay careful attention to when the variable is the denominator. Students will often multiply by the numerator. Reminding them that normal principals of rearranging equations still apply can be helpful.

At the end of this tutorial you will guide pupils through a set of confidence and Knowledge Check questions. You will also complete a reflection exercise so that pupils can take time to think about what they found challenging and where they did well – you'll find more details about this on the relevant tutorial slides. Answers are indicated on the next page.

Knowledge Check 2

<https://forms.office.com/r/frBBh3JRhj>



Question

1. Convert 165000cm^3 to m^3 .

16.5m^3

0.165m^3

1.65m^3

165m^3

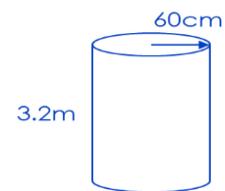
2. What is the volume of the cylinder, in metres cubed?
The solution is rounded to 2 significant figures.

1200m^3

3.6m^3

12m^3

36000m^3



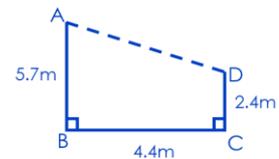
3. Work out the distance AD.

4.4m

7.2m

5m

5.5m



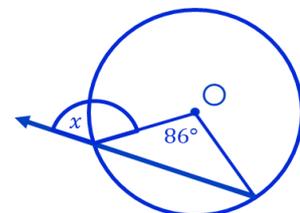
4. Work out the value of x.

$x = 94^\circ$

$x = 47^\circ$

$x = 133^\circ$

$x = 86^\circ$



Module 5 - Graphs

Tutorial	Topic
Tutorial 5.1	Plotting graphs and solving equations
Tutorial 5.2	Straight line graphs
Tutorial 5.3	Graphs in real-life contexts

Tutorial 5.1 – Plotting graphs and solving equations

At the beginning of this tutorial, you will guide pupils through a set of confidence and Knowledge Check questions – you'll find more details about this on the relevant tutorial slides. Answers are indicated below.

Knowledge Check 1

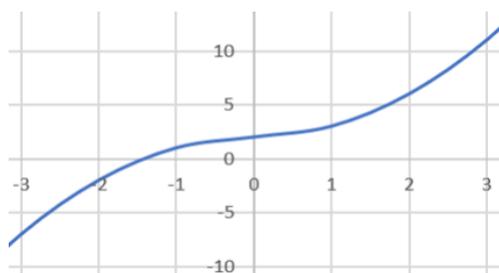
<https://forms.office.com/r/MA8HGZPJ7n>



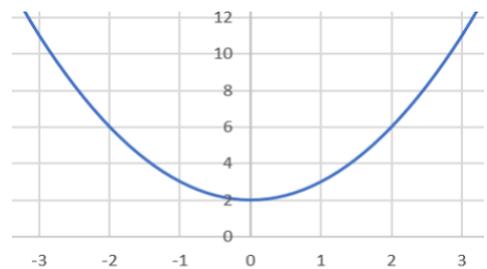
Question

1. Which graph represents $y = x^2 + 2$?

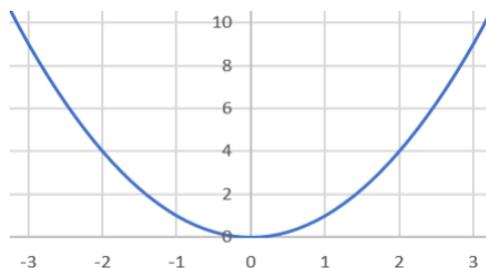
1.1.1



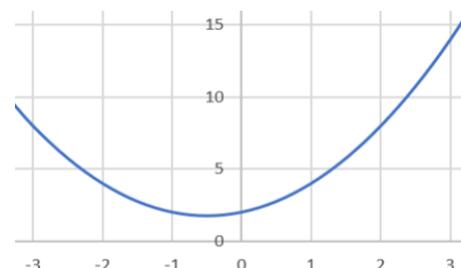
1.1.2



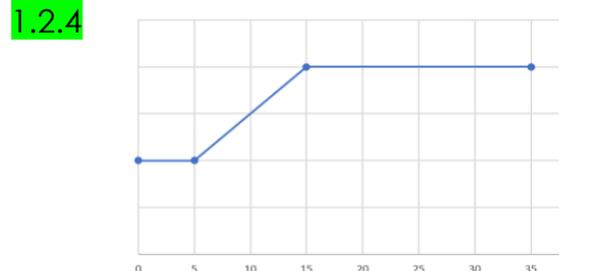
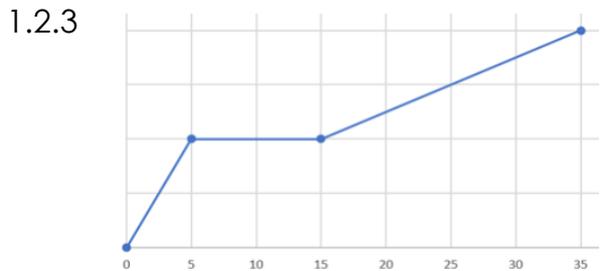
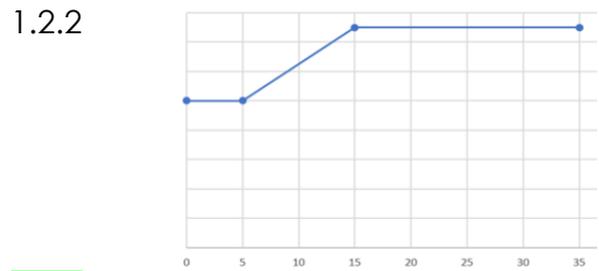
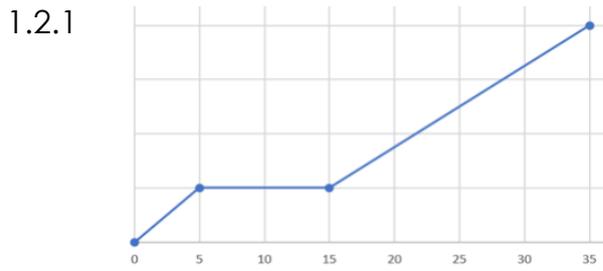
1.1.3



1.1.4



2. A car travels at constant speed for 5 seconds, then accelerates at a constant rate for 10 seconds to twice its initial speed, before travelling at this new constant speed for 20 seconds. Which speed/time graph represents this?



3. Calculate the gradient of the line segment joining $(-2, -3)$ and $(4, -12)$.

$$\frac{-2}{3}$$

$$\frac{2}{3}$$

$$\frac{-3}{2}$$

$$\frac{3}{2}$$

4. What is the equation of the line that passes through $(1, -3)$ and $(5, 5)$?

$$y = 2x - 5$$

$$y = x - 3$$

$$y = \frac{1}{3}x - \frac{10}{3}$$

$$y = 2x$$

In this tutorial you will look at:

- Plotting quadratic graphs and using them to estimate solutions to quadratic equations
- Plotting reciprocal and other graphs and using them to estimate solutions to equations
- Locating the vertex of a quadratic graph

Tutorial 5.2 – Straight line graphs

In this tutorial you will look at:

- Plotting straight line graphs and using them to solve simultaneous equations
- Calculating and interpreting the gradient of a straight line segment
- Interpreting and working out the equation of a straight line

Content Tip: It can be worth starting with simple lines such as $x=1$ or $y=2$. It is also worth looking at $x=0$ and $y=0$.

Tutorial 5.3 – Graphs in real-life contexts

In this tutorial you will look at:

- Using straight line graphs to model real-life contexts
- Interpreting straight line graphs representing velocity-time contexts
- Interpreting curves representing velocity-time contexts

At the end of this tutorial you will guide pupils through a set of confidence and Knowledge Check questions. You will also complete a reflection exercise so that pupils can take time to think about what they found challenging and where they did well – you'll find more details about this on the relevant tutorial slides. Answers are indicated below.

Knowledge Check 2

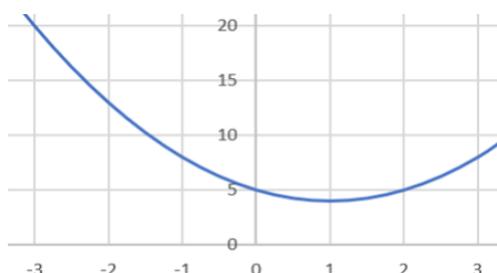
<https://forms.office.com/r/Ly09WU6ZLn>



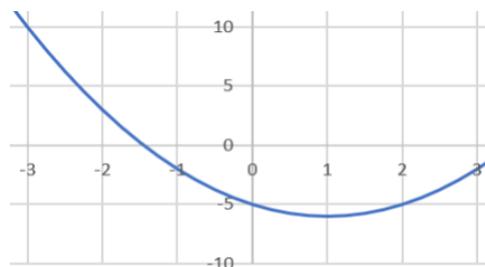
Question

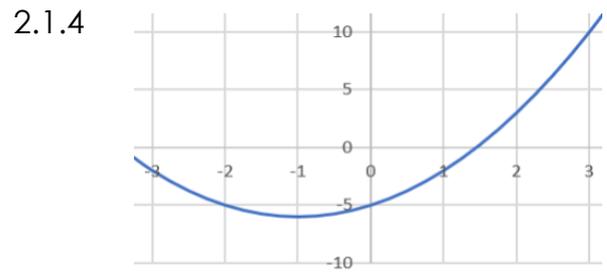
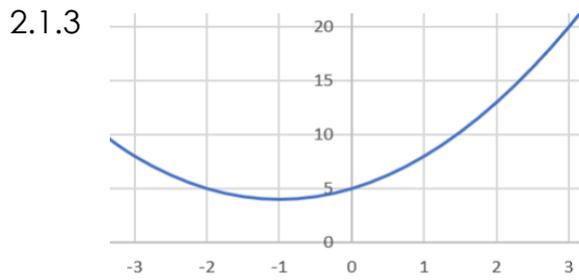
1. Which graph represents $y = x^2 - 2x + 5$?

2.1.1

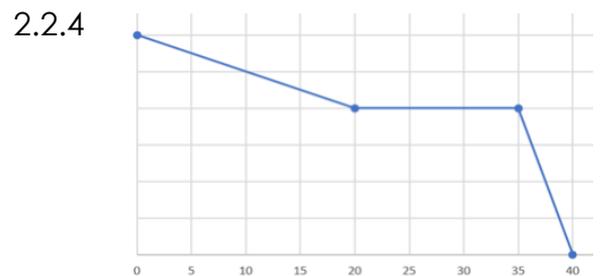
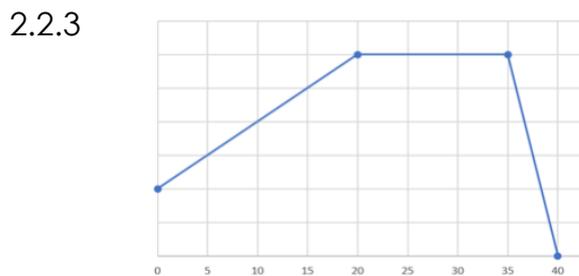
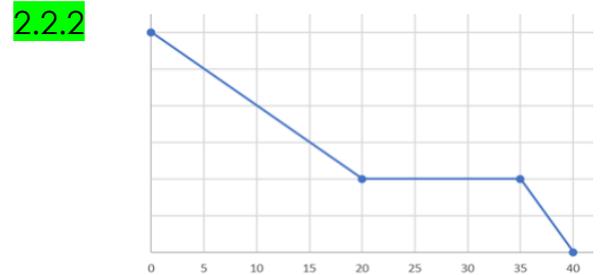
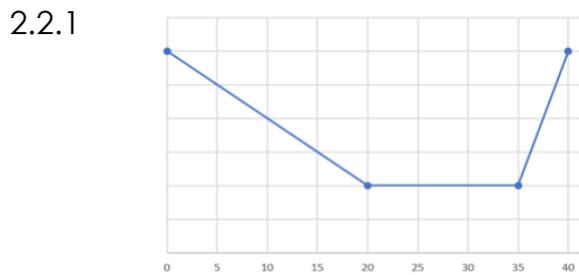


2.1.2





2. A car decelerates at a constant rate for 20 seconds to a third of its initial speed. It then travels at this new constant speed for 15 seconds, before decelerating to a stop in 5 seconds. Which speed/time graph represents this?



3. Calculate the gradient of the line segment joining (8, 1) and (-4, -5).

-2

$\frac{1}{2}$

2

$-\frac{1}{2}$

4. What is the equation of the line that passes through (-1, 14) and (3, 2)?

$y = 8 - 6x$

$y = 14 - x$

$y = 11 - 3x$

$y = 3 + 2x$

In this tutorial you will look at:

- Calculating and comparing probabilities by counting and making lists
- Calculating and comparing probabilities using Venn diagrams
- Calculating and comparing probabilities using tree diagrams

Tutorial 6.2 – Comparing and representing data

In this tutorial you will look at:

- Comparing sets of data using averages and measures of spread
- Representing and comparing bivariate data
- Representing and comparing continuous data

Content Tip: A very common mistake to look out for with the median, is not ordering the data before finding the middle. It will be important to emphasise this step with students.

At the end of this tutorial you will guide pupils through a set of confidence and Knowledge Check questions. You will also complete a reflection exercise so that pupils can take time to think about what they found challenging and where they did well – you'll find more details about this on the relevant tutorial slides. Answers are indicated on the next page.

Knowledge Check 2

<https://forms.office.com/r/mNrfmSDMHG>



Question

1. What is the median value and mode of goals scored?

Number of games won	2	3	4	5	6
Frequency	1	3	4	2	7

Median 4 Mode 7 Median 4 Mode 6 Median 5 Mode 7 **Median 5 Mode 6**

2. What is the mean value of goals scored? The solution is rounded.

Number of games won	2	3	4	5	6
Frequency	1	3	4	2	7

4 **4.65** 5 3.4

3. What correlation would you expect to see if you plotted the data from the population of the UK of "individual shoe size" against "number of pets owned per person"?

Weak negative **No correlation** Weak positive Strong positive

4. Imagine single letter tiles that spell out the word STATISTICS. Now choose two letter tiles at random, without replacement. Use a tree diagram to help you work out the probability of choosing two T's.

$$\frac{3}{10}$$

$$\frac{3}{50}$$

$$\frac{1}{15}$$

$$\frac{2}{10}$$

Tutorial 14 – Refresher Session

This tutorial gives you the opportunity to catch up or revisit content, or expand on one of the topics you've covered.

Here are a few different approaches for using this tutorial effectively. You can use your own judgement when planning this session and get in touch with your Programme Officer if you need support.

Approach 1: Continue completing a module

- If one of the modules is taking longer to complete, this session can be used to continue teaching
- You could also complete the final Knowledge Check for the last module you covered in this tutorial

Approach 2: Revisit challenging concepts

- Identify an area of the course where pupils struggled to master a concept or theme - revisit this concept and address misconceptions
- Formative assessment can help you to decide which topic to revisit.
- These prompts can help guide your approach:
 - Consider if a particular method worked effectively for another area of the course and use it here
 - Think about how you can scaffold the learning further by breaking it down into smaller chunks
 - Explore 'wrong' answers and support pupils to explain why they are wrong to help address misconceptions.

Approach 3: Stretch and challenge

- Review pupil progress and identify an area of the course where pupils mastered a concept confidently - further stretch and extend pupil learning
- This could involve bringing in a higher-level concept. For example, you could consult the [National Curriculum](#) to see how the concept is further developed as pupils progress through school
- Consider linking the learning to your own research/degree or encourage pupils to explore how it applies to real world issues. Encouraging pupils to ask questions can help to create a rich and exciting discussion

Tutorial 15 – Feedback and Reflections

Tutorial 15 is a chance to celebrate pupil progress and successes, encourage further self-reflection and support pupils to look ahead in their learning.

You can find slides to support with delivering this session on the website:

thebrilliantclub.org/already-working-with-us/btp

Session Structure

Section	Suggested Time	Additional Information
Group feedback	15 mins	Start by reviewing trends and results from Knowledge Checks and provide some broad group feedback. For example, share areas of strength and celebrate group successes.
Individual Feedback and Self-Reflection	15 mins	Next, share individual feedback forms with pupils. Give pupils 5 minutes to review their feedback independently then use the feedback to help them with some self-reflection.
Looking ahead	15 mins	<p>You should encourage pupils to consider what skills they we developed through BTP tutorials and how do these link to their future learning. Pupils can complete a worksheet on the skills they have developed.</p> <p>We'd love it if you also use this time to share some of your own experiences of higher education and answer questions from students about university.</p>
Post-Programme Survey	15 mins	Pupils will complete a post-programme survey using the link and codes your Programme Officer shares with you.

Acknowledgements

This course was designed in partnership between King's Maths School and The Brilliant Club. Written by Valbona Baci and edited by Robert Wilne. With thanks to Lisa Pollard.



thebrilliantclub.org

The Brilliant Club is a registered charity in England and Wales (no. 1147771) and Scotland (no. SC048774).
The Brilliant Club is a registered company limited by guarantee in England and Wales (no. 7986971).
The Brilliant Club, 17th Floor, Millbank Tower, 21-24 Millbank, SW1P 4QP