Year 5	Topic Title: KAPOW- Online Safety (E-Safety)	Key Vocabulary
National Curriculum Objectives: Understand computer networks including the internet; how they can provide multiple services, such as the world wide web; and the opportunities they offer for communication and collaboration. Use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.	• **<u>To understand how apps can access our personal information and how to alter the permissions</u>** ▪ Get the class to line up outside the classroom door. Starting at the front of the line, ask each child for the password and do not give any hints. If the child gives you an incorrect password, send them to the back of the line. Ask the class to return to their seats and tell them what the password is. ▪ Ask the children about their experience of trying to guess the password. Explain that just as the children needed a password to get into the classroom, passwords are required when we want to access things online. Ask the children to think of some online examples (email, bank account). ▪ Ask the children 'why might we need to enter passwords to access things online?' (We need passwords because we are not there 'in person' and the computer must recognise us to keep our information private and only accessible to us). ▪ Ask the children 'should you ever tell anyone your password for your accounts?' (The children should not, their passwords should only be known by them and if needed, their parents). Show the children a few examples of passwords. Get the children to discuss which ones they think are the strongest and which they think are the weakest: • Johnsmith (weak) • John_smith (weak) • Jo4nSm!th (slightly stronger) • Be11aEat5Carrots!247 (strong) ▪ Ask the children why they think 'Be11aEat5Carrots!247' is the strongest password compared to the others. Explain that a strong password is one that contains: • At least 15 characters • Symbols e.g. @#$% • Numbers e.g. 123456 • Lowercase letters e.g. abcdef • Uppercase letters e.g. ABCDEF ▪ Explain that a password should be memorable and personal (something that only you know) but impossible for someone else to guess. Get the children to log onto computers. Share the link: 'Password generator'- <u>https://passwordsgenerator.net/</u> with them. The children will explore secure and strong passwords for themselves using the password generator. Explain that there are numerous fields (like the ones highlighted in slide 6) for the children to tinker with. ▪ The children should experiment with the different forms of passwords to be generated and look at some of the advice given on the link: 'Password generator', located towards the bottom of the webpage. ***<u>Key questions</u>*** • When and where on the internet would you need to use passwords? • Why do you think people need passwords to access things online? • Should you ever tell anyone your password(s) • Which passwords are weak? And why? • Which passwords are strong? And why? • What types of things should be used for a password? ▪ Explain that strong passwords can be used for accounts on all electronic devices, such as laptop/desktop computers, tablets, or smartphones.	Catfishing, Cyberbully, Exclusion, Fake Profile, Information, Online, Online-Safety, E-Safety, Password, Personal Information, Phishing, Trickery, Trolling

	▪ The children will now be focussing on 'apps'. Explain what an 'app' is and which devices the children can access 'apps' on. The word 'app' is shortened from the word 'application' and an application (app) is a computer program. Apps can be accessed on all electronic devices. ▪ Ask the children if they require passwords for apps. Explain that passwords are generally required in two ways for apps: ▪ 1. At the point of downloading and installing an app, a password is required. ▪ 2. When you access an app for the first time, a user profile including a username and a password, is required. ▪ Point 2 is the most common form of account protection for social media platforms, gaming, and purchasing goods and services. Explain that apps can either be free or paid for. ▪ With a focus on free apps, ask the children which free apps they use on the devices at school or outside of school. Make a list of the apps on the board. ▪ Ask the children if they know what the word 'permission' means. Take some feedback from the class and explain that 'permission' means the action of allowing something to happen, for example, 'You have my permission to borrow the pencil sharpener.' ▪ Get the children to think about why giving permission for something that they own is important. Explain that if you want access to something that is not yours, then you need the rightful owner's permission or consent before proceeding. Ask the children follow-up questions: • Do you think apps need permission from us to access any personal information on our devices? • What types of personal information would apps need permission for? ▪ Apps (free or paid) require permissions for certain things, access to our photo library, camera, calendar, personal contacts, and location. Explain to the class that these types of information are very personal and you may not this information to be viewed or shared with an application as you may not know what they will do with it. ▪ In pairs, ask the children to research 'app permissions' for three popular companies: Google, Apple and Microsoft. The children will be using the information to create an A5 poster using coloured pens entitled 'App Permissions', to be displayed around the classroom. Hand out A5 paper to each pair and place a selection of coloured pens on each table. The types of information the children use on their posters can include: • How to turn permissions on or off. • How to review or change access to information in apps. • What the list of the typical information types apps need to access, such as calendar, contacts, location etc. ▪ Share the following links with the children, which contain information the children can include in their posters: • Link: 'Google – App persmissions' • Link: 'Apple – App persmissions' • Link: 'Microsoft – App persmissions' Allow the children to be in creative control of how they present their findings. ***Key questions*** • What does the word 'app' mean? • Which word has been shortened to make the word 'app'? • Do we require passwords for apps at any point? • What two types of apps are there? • Which free apps do you use? • What does the word 'permission' mean? • Why are permissions important? • Do you think apps require permissions from us to access any personal information on our devices? • What types of personal information would apps need access to from our devices?	

- Get the children to circulate the room and view the array of 'App Permissions' posters. Explain to the children that many apps are freely available, however, 96% of these free apps have some sort of in-app purchase available within them. An 'in-app purchase' is something you can buy within an app. Companies have a variety of techniques for in-app purchasing. Use this slide to discuss some of the more popular in-app purchasing options:

- **Special offers**: limited offers that customers can buy only at a certain time.
- **Extra lives**: the option to purchase lives or objects to help them in their games.
- **Advertisements**: the option to pay to halt adverts from appearing and stopping gameplay.

- Discuss in-app purchase options with the class. Explain that the children should seek advice and permission from a trusted adult if they come across these options when they are using apps.

Key questions

- What useful information did you find out about 'app permissions'?
- Do you know how to change the app permissions settings to protect more of your private information?
- What are 'in-app' purchases?
- Who should you talk to about 'in-app' purchases, if you are not the billpayer?

- **To be aware of the positive and negative aspects of online communication**
- Ask the children what the word 'communication' means. Explain that 'communication' means the sharing and receiving of information, either in a written form (exchanging emails with someone), verbal form (having a conversation) or through gestures and signs (giving someone a thumbs up).
- Ask the children what they think 'online communication' means. Again, after receiving feedback from the children, state that 'online communication' refers to the way people communicate with each other over a computer network, such as the internet.
- Get the children into pairs and hand each pair a piece of paper. Ask the pairs to write down as many forms of 'online communication' as they can think of. Share the examples of 'online communication' with the class:

- Email
- Online learning platforms such as Google Classroom
- Instant messaging
- Chat rooms/forums
- Social media platforms
- Video calling
- Voice calling using the internet
- Gaming communities

- Hand each pair of children a copy of *Activity: Advantages and disadvantages.* Ask the pairs to write down as many 'advantages' and 'disadvantages' of using online communication that they can think of.
- Advantages of using online communication:

- Access is available at any time of day, all year round.
- Access from potentially any computer device.
- Quick in terms of speed.
- Saves time.

- Can reach potentially anyone in the world.
- It is cost-effective – cheap.

- Disadvantages of using online communication:
- Privacy issues – emails and phone signals can be hacked by others online.
- Only good if the internet connection is stable and reliable.
- Lack of physical, face-to-face contact.
- Online abuse is possible.
- Misinterpretation.
- Private information can be shared and seen by websites or app companies used in communication if the settings are not correctly set up.

Key questions

- What does the word 'communication' mean?
- What does the phrase 'online communication' mean?
- What types of 'online communication' are there?
- What are the advantages and disadvantages of using 'online communication'?
  - Show the children examples of different technology-specific forms of communication. Ask them if they know the names of these forms of communication. State that they are emojis, memes and GIFs.
  - Get the children to discuss why people use emojis, memes and GIFs. Explain that they are used for quick, visual reactions and replies to messages and comments, such as to communicate that something was funny or sad.
  - Ask the children if we all find the same things funny. (The answer is no). Explain that what one person finds funny another person will not. This is something to bear in mind when using any form of online communication, including emojis, memes and GIFs.
  - Inform the class that any form of online communication can be misinterpreted. Show the video on link: 'BBC Own It – When emojis go bad'. Ask the children when they think it is acceptable to use emojis in a conversation. Take feedback from the class.
  - Show the video on the link: 'BBC Own It – I'm a meme!' to the class.
  - Hand out the *Activity: Meme creation* to the pairs of children. Tell them that memes are similar to GIFs and are also used as a quick way to convey a message that is visual with some writing attached to it. The children will each write a witty meme caption for each image on the *Activity: Meme creation,* for example, 'I was told money does not grow on trees, clearly, I was told incorrectly!'. Encourage the children to be sensible with their witty meme writing.
  - After the pairs of children have completed the *Activity: Meme creation* task, ask the class what they found tricky about creating a meme caption. In response to any difficulties, they may have had, explain to the children that mastering meme captions is a difficult task, and will come in time with lots of practice.
  - Explain to the class that 'online communities' are groups of people who communicate over the internet about similar interests. 'Online communities' can include gaming and social media groups.
  - Hand out *Activity: Communication scenarios* to the pairs of children. The activity requires a number of tasks:
- Look at each scenario and judge whether the user contribution/ conversation is positive or negative.
- If the user contribution/ conversation is positive, the children must write down each positive word or phrase on the lines provided underneath the scenario.
- If the user contribution/ conversation is negative, the children must use the lines underneath the scenario to suggest a more positive contribution/conversation. For example, 'Your score in that last game was so bad, you will never be as good as the rest of us!' could be turned into a more positive message: 'Your score could have been better, but with more practise you will be just as good as everyone else!'.

Key questions

- What are the names of these forms of communication?
- How and why do people use emojis, memes and GIFs?
- Do we all share the same sense of humour and find the same things funny?
- Can our messages online being misunderstood or misinterpreted? Why?
- What does the word 'community' mean?
- What are 'online communities'?
- What examples of 'online communities' can you think of?
  - Whilst working on the *Activity: Online communities communication,* the children will have observed that not everyone we communicate with online will be nice and that there are ways to deal with this type of online behaviour.
  - Ask the children to think of ways they can help themselves and others if they experience online negative behaviour or abuse. Share the tips for staying safe online from negative behaviour or abuse with the class:
- Tell an adult you trust immediately.
- DO NOT click to close the message or chat discussion/forum.
- DO NOT shut down the device.
- DO NOT respond.
- DO NOT block or report until you have told a trusted adult.

  - Tell the children that any content that causes them concern should be screenshotted or shown immediately to a trusted adult, who can take the necessary steps to make sure negative content does not affect them again.

Key question

Can you think of ways you can help yourselves and others if being faced with online abuse?

- **To discover ways to overcome bullying**
  - Ask the children what the word 'bullying' means. Explain that bullying is the deliberate act of harming, intimidating and threatening someone else to cause them physical or emotional distress.
  - Ask the children where could bullying take place. Tell them that the act of bullying can occur in both the real world and the online world).
  - Ask the children if there is there a difference between bullying online and bullying in the real world. The answer is yes – there are differences but there are lots of similarities.
  - Hand out the *Activity: Similarities and differences.* In pairs, ask the children to write down the similarities and differences between bullying online and bullying in the real world.

Examples of similarities include:

- The act of bullying is the same i.e. to cause harm to others (victims).
- The effects of bullying are the same for the victim in both the real and online worlds.
- Bullying can occur repeatedly in the real and online worlds.
- Bullies feel empowered by what they are doing in both worlds.

Examples of differences include:

- The internet protects the bully because they can conduct the act of bullying with anonymity.
- Bullying that takes place through the internet can happen at any time or from anywhere.
- Online bullying incidents can be shared with others.

	• It is harder to tackle online bullying as victims feel they can not tell parents, carers or trusted adults out of fear of a worse punishment being incurred. ***Key questions*** • What does the word 'bullying' mean? • Where can bullying take place? • Is there a difference between bullying online and bullying in the real world? • What are the similarities and differences between online and real world bullying? ▪ Ask the children who can be bullied. Explain that anybody from any age or from any background can be bullied – bullying has no boundaries. Discuss what effect online bullying has on its victims. Effects of online bullying on its victims include: • Low self-esteem. • Withdrawal from family and spending time by themselves. • Friends disappearing. • Being excluded from social events. • Change in personality e.g. anger, depression, crying, withdrawal. • Self harm. • Not allowing others to go near their devices e.g. mobiles, computers. ▪ Get the children log onto computers in pairs. Explain that they will research information about how to tackle bullying using the links: 'BBC Own It – Places online to help you own it' and 'BBC Own It – Places to get help', which contain anti-bullying organisations and advice for the children to explore. ▪ After each pair has completed their research, get two pairs together to form a group of four to role-play a bullying scenario. One pair of pupils will act as victims of online bullying whilst the other pair offers relevant advice as to how the victims can deal with the issues presented, including advice, tips and names of anti-bullying organisations. Each pair should then swap roles. ***Key questions*** • Who can be bullied? • What effect does bullying have on its victims? • Is there any help victims can get when being bullied online? ▪ Get the children to role-play their scenarios to the rest of the class. ***Key questions*** • What are the top tips you can give to someone being bullied? • Who can the victims of bullying go to for advice and help?	
	Previous Learning Experiences:	
	FSU,Year 1, 2, 3 and 4 Previous E-Safety lessons.	
Possible Community Links/trips	**Future Learning Experiences:**	
	Future E-Safety lessons throughout the school from Year 6	

<table>
<tr><td>Year 5</td><td>Topic Title: Party Planner</td><td>Key Vocabulary</td></tr>
<tr><td rowspan="3">National Curriculum Objectives:

Use sequence, selection, and repetition in programs; work with variables and various forms of input and output.

Select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information.</td><td>▪ In this unit, the children will be using a variety of Microsoft based programmes In order to complete a party planning task. They will use Microsoft Word and Microsoft Excel.
▪ The children are going to be designing a Christmas party. For this party they will need to think about: the type of food they want to offer, the decorations or party extras they will need, the entertainment they have chosen, and the location of their party. The children will be working alongside designed booklet that will encourage them to think carefully about their choices and make sure they know how much money they are spending. They must keep to their budget .
▪ If they have any money left over at the end they may be able to buy something like an additional gift for their guests.
▪ Finally, the children will be using Microsoft Word in order to create a poster to advertise their party for their guests and using Microsoft Excel to create a working spreadsheet document that shows them how much of their money they have used.
▪ In the first task, the children will need to create a party for six people with a budget of £400. They will need to think about their food , their gifts, such as crackers, the entertainment they have chosen and the location. Encourage the children to think about what is so special about their party and what would make it unique and why these guests would want to turn up. Using Microsoft Excel the children can identify the items they are using and create a simple formula working document following the simple steps as seen below:
https://www.schoolsofkingedwardvi.co.uk/ks2-computing-information-technology-5-spreadsheets-charts/

▪ This website provides the teacher and the children an in depth way to create a working spreadsheet including how to use formulas correctly.
▪ For the second task the children will need to create a party for 35 people with an increased budget of £5000. again, the children will need to think about the food, gifts, entertainment, and location of their party. He may wish to introduce some alternative variables such as a discounted price for a larger group size.
▪ Using the accompanying document, you can see the individual prices for each item. This is entirely up to the teachers discretion if you wish to change the prices of the items then you can. If you wish to change the number of guests then you also can do this.</td><td>Sequence, Formula, Excel, Column, Row, Workbook, Worksheet, Cell, Cell Reference, Range, Function, Format, Data, AutoFill, AutoSum, Item</td></tr>
<tr><td colspan="2">Previous Learning Experiences:</td></tr>
<tr><td colspan="2">The children will have come across the use of Microsoft Word and Microsoft Excel in previous year groups in computing lessons. In this topic they will be developing their use of formulas in order to create the working spreadsheet.</td></tr>
<tr><td>Possible Community Links/trips</td><td colspan="2">Future Learning Experiences:</td></tr>
<tr><td>ASDA or local shops/party planners - Helping the children to understand budgets and planning.</td><td colspan="2">Future computing experiences and lessons throughout the school from Year 6.</td></tr>
</table>

Year 5	Topic Title: Search Engines	Key Vocabulary
National Curriculum Objectives: Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content Select, use and combine a variety of software (including internet services) to create content that accomplishes given goals, including collecting data and information	• **<u>To understand what a search engine is and how to use it</u>** ▪ Explain to children that they are going to race to find a website. They should all open a web browser on their devices (Google Chrome, Safari, Firefox, etc.). ▪ Ask the children to find the 'Horrible Histories' website (do not tell them anything else). ▪ When most of the class have found the website, show the children what the homepage of the website looks like. Ask those children that found the website first, to explain what they searched for. Recap that searching can be used to find a website that we know already exists. ▪ Now, challenge the children to race again, this time to find your school's website. Wait until the children have found your school's website before talking about it. Your school is more likely to produce different results around it and may not be the top result. For the last two races, you show the children a picture of a website, they use their search skills to find it. You may use the suggestions in *Activity: Website finding race.* Using pictures encourages children to look around the website and ask: • Who makes the website? • What logos are there? • What keywords will help to find it? ▪ These are skills that they will need for effective searching and validating covered later on in the topic.When most of the children have found the website, ask them to explain to the class what they did. Did the children: • Search 'National Geographic kids', and find the homepage, but not the specific page? • Search 'facts about Tudors', finding lots of websites instead of the one they wanted? • Search 'ten facts about the Tudors National Geographic kids' instead of simply 'National Geographic kids Tudors'? • Depending on the competencies of your class, this can be a frustrating challenge. Encourage the growth mindset of trying again and learning from mistakes. Focus class participation to reveal the solutions, so that the children can put it into practice next time. Repeat with another website. ***<u>Key questions</u>*** • What did you search for? • Who makes it? • What logos are there? • What keywords will help find it? **NB. The internet and the world wide web are not the same thing. A search engine searches the world wide web, not the internet. The web is the connection of websites that are linked together to form a web. The internet is the technology that allows the computer networks to connect to each other.** • Ask the children what a search engine is. A search engine is a website that allows you to find information on the world wide web. Most browsers allow you to search from the address bar, this can be hard for them to distinguish. • Ask the children why we might need a search engine to find information and websites on the world wide web? • The indexed web contains at least 4.69 billion pages as of July 2018 and without searching, it would very hard to find what you want! • What search engines can the children name? Create a list: • 'Google' • 'Bing' • 'Ask Jeeves' • 'Yahoo' • **'Duck Duck Go'**	Algorithm, Company Logo, Data Leak, Data Privacy, Fake News, Inaccurate Information, Index, Keywords, Network, Online, Page Rank, Search Engine, TASK, Web Crawler, Website, WWW

	• **'IX Quick'**
	  ▪ It is unlikely that the children will be able to name this many. It is important that the children are aware that there are lots of different search engines.
	  ▪ Explain that search engines like 'Google', 'Bing', 'Ask Jeeves' and 'Yahoo' record the things you search for. They record which links you click on and then use this information to guess if you are male or female, young or old, English, American, etc. They do this without you knowing!
	  ▪ The search engines 'Duck Duck Go' and 'IX Quick' do not do this. These are private search engines – everything you search is forgotten as soon as you finish. It is important to talk to the children about this, as data leaks are now a part of everyday life. The children choose three search engines to compare, searching 'Tudors Kids' (or your chosen topic). To reflect upon their results, ask them:
	• Are the top three results the same?
	• Are they useful?
	• Are some better than others?
	  ▪ Demonstrate how to open several tabs in a web browser, so that the children can have all three search engines open for easy comparison. The children report their findings to the rest of the class. (Did they all find the same things? Why not? What happened?)
	  ▪ Ask the children to find the answers to some simple, factual questions about your topic. They should use their preferred search engine. The children could record their results on a text document such as Google Docs or Microsoft Word. Example questions might include:
	• When did the Tudor period start and end?
	• What were the names of Henry VIII's wives?
	• Who were the six Tudor kings and queens?
	• Who fought in the Wars of the Roses?
	• What did the Tudors eat?
	Key questions
	• What is a search engine?
	• What can we use a search engine for?
	• What should we search to find this website?
	• What was the quickest way to find this website?
	• How did you find the exact page of the website?
	• What other search engines can you name?
	• What's the difference between DuckDuckGo and Google?
	  ▪ Ask the children to discuss in pairs if they know of any other type of search technology. Take feedback from the class and navigate the conversation to 'voice-activation search engines', with examples being: Amazon's Alexa, Google Assistant, Apple's Siri, Microsoft's Cortana.
	  ▪ After the children are told the 'voice-activation search engines' examples, get them to discuss the advantages and disadvantages of using voice-activation search engines compared to using traditional on-screen search engines. Examples of advantages in using voice-activation search engines include:
	• Talking is faster than typing
	• Technology for this is getting better all the time
	  ▪ Examples of disadvantages in using voice-activation search engines include:
	• Privacy concerns – are they always listening to us?
	• Regional accents – might not understand different accents
	• Only one search result is produced
	Key questions
	• Which is your preferred search engine?	

- How did you find those answers?
- Are the top three results the same?
- Are they useful?
- Are some better than others?
- Did you all find the same things?
- Why not?
- What happened?
- Do you know of any other search technology?
- What are the advantages and disadvantages of using voice-activation search engines compared to using traditional on-screen search engines?
  - **<u>To be aware that not everything online is true.</u>**
    - Don't tell the children anything about the lesson at this point. Simply start by explaining that you have a video ('Burger King's Chocolate Whopper') that you want them to consider and that you're going to ask them what they think of it afterwards.
    - After they have watched it, ask what they think. You will probably get the superficial first: "It looks delicious", "I don't like Burger King", "I think it would make me sick", and then you'll likely get a sceptical answer: "Is that real?" or "How would they make this?"
    - Let this develop into a discussion about whether everything we see is true and how we know. What could we do to check? Don't expand on this any further, it's a seed to be planted for the second half of the main activity.

<u>Key questions</u>

- What did you think about the video?
- Is everything we see true?
- How do we know?
- What could we do to check?

NB. The website used in this activity has been created for the purpose of teaching the children about the reliability of information on the web. It is not factually correct.

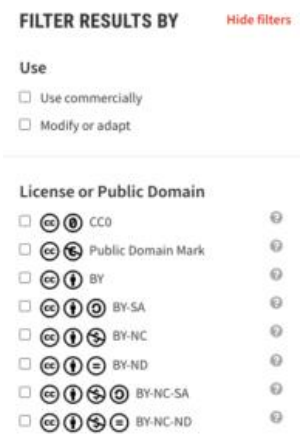
- Tell children that they are going to show off their searching skills. Explain that they need to read the web pages listed about explorers and answer three questions. The questions are differentiated by reading ability:
- Blue – Supported
- Green – At Expectation
- Red – Greater Depth
  - For each explorer, there are two possible pages to look at, so explain that they might want to look for the same answer on both pages to check it. Give the children this link: 'allaboutexplorers.com/hunts' and tell them which explorer you want them to research. Give them time to do this and act as if this is the main activity of the lesson. Make sure you encourage them to look at both of the suggested pages to check that the answers make sense and not just copy the answers without understanding them.
  - At some point, you will inevitably get a child that says "This doesn't make sense" or "I think something's wrong here". Act surprised, and ask: Are you sure? Did you read it correctly? What's the problem? Why wouldn't it be correct? When enough children are nearing completion and recognising that the answers are incorrect, ask the class to feed back, explaining what they have found out.
  - This is important, because if the children don't recognise that the information is wrong, they may forever think that Christopher Columbus was born in 1951!
  - What the children should start to realise is that there were discrepancies between the information they found. For example, they will have found that Christopher Columbus was born in 1951, set sail in 1942 and died in 1906. Draw the children's attention to this – what does that tell them about this website?

	▪ Share the success criteria with the class, so that they understand the purpose of what they're doing. Reach the conclusion that the information on the website is probably not accurate. What could they do to check? How would they know? Write a list of things to be aware of together: • Check the facts on another website • Check on a website they've heard of before • Read the 'About Us' to check who made the website • Check the URL for the suffix (.co.uk .net .com) – different countries have different endings and some are more valid than others, e.g. .edu and .gov • Use common sense to check it is sensible ▪ Give the children time to explore the following websites and answer the *Website questions* to decide whether or not they're trusted websites: • 'The Time Travel Fund' • 'The Pacific Northwest Tree Octopus' • 'The Burmese Mountain Dog Club of America' ▪ Hand out the *Activity: Website questions* and ask children to complete the questions. Discuss what the children found out. They should conclude that all of the websites were fake. ***Key questions*** • What did you notice about this website? • How can you tell that is correct? • What should you check when you see a website? • How do you know this isn't reliable? • What should you check before you even click? ▪ Ask the children if they have seen penguins. What do they know about them? How do they move around? How are they similar or different from other birds? Show the children the video on link: 'BBC's Flying Penguins'. Hopefully, this time they will quickly conclude that it cannot be real. Remind the children of the video they watched at the beginning as well and explain that these videos were actually made as April Fools jokes, but there are many videos online – particularly on YouTube – that look very realistic but are fake either because it looks cool or fun, or sometimes intentionally to deceive people. ***Key questions*** • Have you seen penguins before? • What do they know about them? • How do they move around? • How are they similar or different from other birds? • **To search effectively.** ▪ Tell pupils that we are going to be learning to search effectively, understanding the importance of keywords. ▪ Explain that they are going to watch a video and they need to listen carefully as there are three things they will learn from it: 'How Search Engines Work' - https://video.link/w/SQce • Not everything on the internet is true • Search engines know where things are • Searches need to be specific (these are what we call 'keywords') ▪ Tell children that they're going to practise using keywords with a quiz. Log in to your Socrative account and launch the 'Searching keywords' quiz. Pupils will need to log in to Socrative Student by entering your teacher's room number. ▪ Complete the quiz, discussing the different options each time and why the correct answer was the best choice. This involves picking keywords that convey the most information with the least amount of typing.	

	Note: If you ran out of time or had difficulties creating a Socrative account, use the *Activity: Searching keyword quiz* to ask pupils the relevant questions, getting them to note down their answers, before swapping with a partner and then reviewing the answers as a class. ***Key questions*** What is a keyword? Why are they important? What does TASK stand for? How do you know this information is true? What's the best way to search for facts? What's the best thing to search for if I want to know about what Tudor roofs are made of? ▪ Explain to the class that they're going to go on a web quest to find the information to be able to create an informative poster in the next lesson. ▪ We're going to base this lesson around Tudor houses, however, you can easily swap this for a topic you're currently studying. Model typing the title, e.g. 'Tudor houses' into a search engine like Google and ask the children what you should click on. There are 7,900,000 results for this. How do we know what to click on? ▪ Explain the frustration of looking at pages and pages of information, such as Tudor houses which are National Trust properties. Introduce children to the acronym TASK: **TASK** allows the children to decide whether they want to click the result before reading it. • **Title** – the name of the webpage – is it about the thing you want? • **Author** – is it a reliable website, good suffix (preferably .edu .gov and if not, .co.uk .net .com) and a known source? • **Summary** – the description of what is on the page (a lot less reading than a whole webpage if it's not relevant!) • **Kids** – every search term should include 'kids' as this reduces the reading age of the results found and is easier to type/spell than 'children' • Tell children that you're going to challenge them to use their search skills to answer a series of questions. They should: Choose their preferred search engine Check that the information they find is reliable Use keywords in their search terms Use TASK to help them choose a website • They will need to make notes about the answers. They could do this on a digital device or on paper. If they copy and paste information, make sure they are being selective so that they don't give themselves too much information to sift through when they need to use it in the next lesson. E**xample Questions** • What colour are Tudor houses? • Do Tudor houses usually have chimneys/fireplaces? • What were Tudor Houses made of? • What were the roofs made out of? • Did Tudor houses have gardens? Did they grow things? What? • What were Tudor carpets like? • Tudor toilets? • What were the differences between rich homes and poor homes? • During the activity, prompt the children to use their new searching skills and confirm how they know the results they've found are correct. If they are used to searching without those skills, they'll need prompting to apply them. Children share their findings, so that they have answers to the majority of questions by the end of the lesson. • **To create an informative poster**	

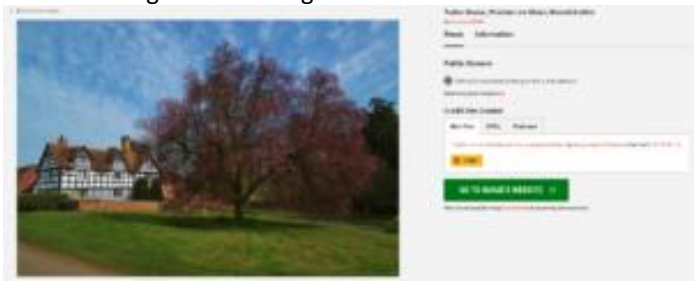
	• Show children a piece of artwork that one of them has created previously on the interactive whiteboard and explain that this is something you worked on at the weekend, see if anyone says anything. Tell children that you shared it online, and someone offered you £10 for it, so you've made £10! Then explain that actually, you took a photo of child X's artwork – wait for the outcry! Ask the children whether they think you have been fair. Why? Why not? They'll usually say you should ask first, not pretend it's yours, share some of the money, etc. Then, ask them if you went on to Google and took an image, did anyone ask the person who designed it/took the photo? What if it then makes us loads of money? Should we share it? **Key questions** • Have you ever gone on to Google and taken an image? • Did anyone ask the person who designed it/took the photo? • What if it then makes us loads of money? • Should we share it? • How does this relate to the work we've been doing on searching? • Should you be writing ***exactly*** what someone else has said? • How could you be fair? • What about images for your poster – does it mean that you can't use any? • Should you say where you got them from? • Watch 'Common Sense Media's Copyrights and Wrongs' video surrounding copyright. If you sign up as a teacher for free, there's also links to video discussion points. Ask: • How does this relate to the work we have been doing on searching? • Should you be writing ***exactly*** what someone else has said? • How could you be fair? • What about images for your poster – does it mean that you can not use any? • Should you say where you got them from? • Copyright is the law which states that anything created (text, image, music, film, etc) belongs to the person who created it (whether they choose it or not). Creators can choose whether or not they want to let other people use their content and what stipulations they put on it, e.g. payment required, creator acknowledgement, etc. • Children need to be aware that it is against the law to copy someone else's work without asking them first (and getting an answer!). Discuss the different permissions that a creator can choose for their piece of work. • **License (copyright)**: Search by using filters • **Public domain use**: Can be used by anyone in the public, but not for profit-making companies (commercial) • **Commercial use**: Can be used by profit-making companies • **Credit required ©**: Where the media has been used, you must put the copyright credit to acknowledge the creator. For example, © Author's name, source (year) • Take the children to the 'Creative Commons – Tudor houses search webpage', which shows all images related to Tudor houses. • On the left-hand side of the webpage, there will be a 'Filter results by' section, tell the children that they can leave the 'Use' boxes unticked for 'Use commercially' and 'Modify or adapt'. • Focus on the 'License or Public Domain' section as this is where we can filter images that are permitted to be reused in an appropriate way. Click on the '?' to the first three options (CC0, Public Domain Mark, By) and readout the information. • CC0: 'This work has been marked as dedicated to the public domain.' • Public Domain Mark: 'This work is marked as being in the public domain.'	

- By: ‘Credit the creator.’



Then, select a box with a tick and see the media content be filtered to that specification.

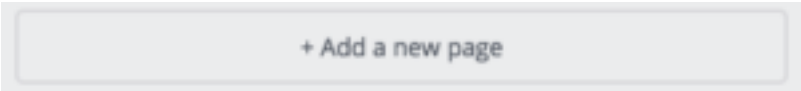
- Click on a filtered image and see the ‘Reuse’ information, with an eye on the ‘Credit the Creator’ information, which you can copy and paste along with the image.



- Discuss and note down some class guidelines to adhere to when making posters for pupils to refer to throughout the lesson.
- Explain that they are going to create a poster, incorporating all their research on Tudor houses (or your chosen subject). As a class, discuss the information they gathered in the previous lesson. Have they copied this exactly from the website? Do they need to credit anyone for the information?
- Model logging into Canva either using the website ‘www.canva.com’ or the app and show the children the ‘poster’ option. Alternatively, access ‘Sketchpad’.
- Talk through the basics for how to use Canva if this is the first time they have used it Get children to come up with a success criteria for creating their informative poster. You can use the suggested criteria as a guide, but it can be more powerful if children can take ownership of this and

feel like they have established what will make the posters successful. Make sure they have mentioned copyright and/or fair use in some way and remind them that these rules are still on display from the 'Attention grabber' for them to refer to.

- Partway through the session, model how to use shapes to surround facts to make them stand out. If necessary, the children's work can also begin to take up extra pages by clicking the button below it.



Key questions

- What do we need to think about when using information found online?
- Have you copied you information exactly from the website?
- Do you need to credit anyone for the information?
- What is copyright?
- What is fair use?
- How could we use pictures we've seen online?
- What information should be included in our poster?
- Is it clear what your poster is telling us?

- Get the children to score their posters against the success criteria and give them time to make small changes in light of this.
- **To understand how a search engine works**
  - Give the children a non fiction text – perhaps your guided reading text, so that you can have several copies on each table, or, a selection of books that contain the same fact, e.g. books about volcanoes would all explain what magma is.
  - Ask children to find a fact that you know is contained within the pages – don't tell them how to do it. Ask them to share what they did. Repeat this a couple of times. Hopefully, the children will suggest that you should use the contents or index of the book to find content efficiently. This is just like how a search engine works!

Key question

- What did you do to look up the fact?
  - Explain that when we search for something like 'Tudor houses kids', the search engine website goes to its index and checks the words against its big list.

How do the search engines get this list?

- Ask pupils: If you were to go home and make a website this afternoon, how would Google or IX Quick or Bing know?
- Usually, children will tell you something like "You email them and tell them", but when you remind them that there are loads of search engines, not just Google, this begins to get impractical. Also, could you imagine hundreds of people making websites every day and the person who had to read them all and update the index – what a boring job!
- The answer is web crawlers. Web crawlers are computer programs that crawl through the internet. They go from website to website (through hyperlinks), checking to see if each page is on the list. Imagine this:

- *visits website* are you on my index?
- Yes
- *follows link to new website* are you on my index?
- Yes
- *follows link to new website* are you on my index?
- No! *adds link to index and checks what the website is about to create 'keywords*

- Share the success criteria for the lesson to get children thinking about what they might be doing and any questions they have, e.g. What is page rank? What could affect this?
- Today, the children are going to pretend that they are web crawlers, except instead of searching the internet, they are going to be searching the classroom. They will need to make notes of what they find and where they find it, so if they're asked later where it is, they know how to find it!
- This activity is based on 'Phil Bagge's Spider Resource Sheet' - http://code-it.co.uk/wp-content/uploads/2015/05/classspidersearch.pdf
- Hand out the *Activity: Web crawlers,* which states what they are going to find. There is one that says pencils and one that is blank for classes that want to search for something different. If you are choosing your own, just make sure that there will be plenty of them of varying ages and found in different places.
- Tell pupils that, as web crawlers, they will move around the classroom looking for the object and recording where they saw it (but NOT moving the object).
- It's worth stating before you begin where the children will and won't be allowed to search, depending on what you're happy with, e.g. Are they allowed to open draws? What if they know there's a pencil in their friend's pencil case? Can they touch things on your desk? etc.
- Model this process with whiteboard pens first. Demonstrate finding a pencil and noting it on the sheet. Describe the location 'under the drawers' and then how many pencils were in that area 'one'. Then go to one of the drawers and note there are 'six' whiteboard pens in 'the pen drawer', finally, suggest that there's a box of brand new whiteboard pens in your cupboard and note that down. That's all the children need to do for now. The other columns should be left empty.
- Give the children 10 minutes to search the classroom for pencils, making sure they note down where they were and how many of them they found.
- Now ask the children: Which is the best place for pencils on the list you made earlier? If you were a search engine, how would you decide which went first? second? Which are the 'best' pencils on that list?
- The children will probably tell you that this is the new pencils that are in your cupboard, and whilst it's good that they're new, is it worthwhile getting out of your chair and walking to the cupboard when you can stretch and pick one up? Surely proximity is more important? What about quantity? If there's only one nearby and its lead breaks, you'd have been better going to a fuller container.
- Explain that this is the same as with searching – we want new websites that are up-to-date, but they need to be finished. We want results that have lots of mentions of the thing we're searching for [quantity]. We also want to prioritise results that are close to what we searched and regionally relevant (pages in English probably from the UK), so it's important how close it is [proximity].
- This is how pagerank works.

Ask children to now 'score' their findings from 1 – 5 based on these three categories:

Quantity	**Age**	**Proximity**
1 – very few 5 – loads	1 – really, really old 5 – brand new	1 – furthest away from where you are now 5 – close to where you are now

- Give children time to rank their results and then add up the total. The higher the numbers the better the result, so the highest will rank first.
- The children may get some results that 'tie' for first place, it's worth noting that Google has 200 categories that a computer uses to calculate its link order – we've only used three! Also, whilst they worked out their results by hand, Google's is all worked out by computers through a complex algorithm.

Key questions

- If you were to go home and make a website this afternoon, how would Google or IX Quick or Bing know?
- How does a search engine work?

	• What is an index? • How do websites get added to the index? • Who decides the result order? • Which is the best place for pencils on the list you made earlier? • If you were a search engine, how would you decide which went first? second? • Which are the 'best' pencils on that list? ▪ Show the children search results like these:  ▪ Explain that these didn't get put at the top for scoring highly – ask children why. Draw their attention to 'Ad' (advertisement). People/companies can pay money to some search engines to make their website come up to the top. Discuss why they would want to do that (so that more people go to their website – if it's an online shop, more people might buy items from them).	
	Previous Learning Experiences:	
	Children will have experiences of using Search Engines from previous year groups. This specific content will be new to them as they look at how the search engines work and their purpose.	
Possible Community Links/trips	**Future Learning Experiences:**	
	Future computing experiences and lessons throughout the school from Year 6.	

Year 5	Topic Title: Stop Motion Animation	Key Vocabulary
National Curriculum Objectives: Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content Select, use and combine a variety of software (including internet services) to create content that accomplishes given goals, including collecting data and information	• **<u>To understand what animation is.</u>** ▪ Introduce the concept of 'animation' to the children and discuss the key vocabulary: still images, moving images and animation. Explain that animation in children's toys was hugely popular during the 19th century. ▪ Introduce 'thaumatropes' to the children. Explain that a thaumatrope is a disc with an image on each side that is attached to two pieces of string. When the strings are twisted quickly, the two images appear to blend into one. Use the video on the link: 'Thaumatrope' on VideoLink to show the children a working example. ▪ Introduce the children to the term 'flip book'. Explain that the first flip book appeared in 1868 when it was patented by John Barnes Linnett, under the name 'kineograph'. Tell the class that a flip book is a series of still images with small changes on each page, that give the illusion of a moving image. Use the video: 'Flip book' on VideoLink to show the children a working example. ▪ Finally, introduce the children to a 'zoetrope'. A zoetrope is a cylinder with a series of still images placed on the inside. On the outside, there are slits that someone can look through. When someone spins the cylinder and looks through the slits, it gives the appearance of a moving image. Use the video on the link: 'Zoetrope' on VideoLink to show the children a working example. ***<u>Key questions</u>*** ▪ What is animation? ▪ Have you ever seen a thaumatrope/ flip book/ zoetrope? ▪ Can you predict what the animation will show? ▪ How do small movements help the animation? ▪ Share the activity with the children. Get the children into pairs and ask each pair to discuss which toy they would like to make and the animation they would like to create for the toy. Discuss the importance of simple images to use for their animation, rather than anything too complicated. ▪ Once the children have decided on their activity, hand out the appropriate activity sheets, depending on which toy the children have chosen to create: • *Activity: Flip book template* • *Activity: Thaumatrope template* • *Activity: Zoetrope template* ***<u>Key questions</u>*** • Which toy would you like to create? • What animation will you show? • How will you make sure your animation is fluid? • Have you tested your animation? ▪ Ask children to walk around the classroom and try out the different toys created by their peers, asking themselves: • Can I predict what the animation will show? • Did any animations surprise me? ▪ Ask the children to discuss their experience of creating their own toys, asking themselves: • Was the animation toy easy to create? • Was it easy to make the animation movements small? • How did I ensure the object was in the correct place on each image?	Animation, Still Images, Moving Images, Flip Book, Zoetrope, Thaumatrope, Frames, Editing, Digital Device, Script, Decomposition, Storyboard, Animator, Fluid Movement, Effects, Evaluate

	• Did I encounter any other problems? ***Key questions*** • Can you predict what the animation will show? • Did any animations surprise you? • Was it easy to create? • Was it easy to make the movements small? • How did you ensure the object was in the correct place on each image? • Did you encounter any other problems? • Which toy did you like the look of the best and why? • **To understand what stop motion is.** ▪ Recap what the children learnt in *'Lesson 1: Animation explored'* with the children. Ask the children: what is animation? Remind the children of the different animation-style toys that were popular in the 19th century; **zoetropes**, **thaumatropes** and **flip books**. ▪ Introduce the children to the term '**stop motion animation'**. Explain this is another form of animation where a combination of still images are put together to create the illusion of a moving image only this time it is created using a camera on a **digital device**. ▪ Watch 'Wallace and Gromit – Cracking Contraptions' on VideoLink and discuss how they think the animation was made. Explain that each shot of the animation was made by taking a photo of the plasticine characters, then making a tiny movement and taking another photo. The animators can take hundreds of photos for just three seconds of film. ▪ Watch 12:00 – 17:00 seconds of the video 'Wallace and Gromit – Cracking Contraptions' again and discuss the movements of the characters with the class (Wallace's hand moves, his mouth shape changes, he moves his head, the remote control moves, his eyebrow twitches). ▪ Explain to the class that every single thing that appears to move in the animation has been carefully adjusted between taking two photographs. Introduce the vocabulary '**frame**' to the children. Explain that each photo taken is called a **frame**. • Play the video (the 'Blob' animation clip) and tell the children that they are going to create a similar animation. Explain that they will be learning how to take a series frames (photos) using a digital camera and then you will show them how to use the editing software Microsoft Photos, to turn the frames into an animation. **Key questions** ▪ What is happening in this film? ▪ How do you think this animation has been made? ▪ Are there actors? (There are voice actors to accompany the actions of the plasticine figures) ▪ Introduce the activity to the children by explaining that they will see how a stop motion animation is created from still images (frames) taken on a camera. ▪ Maintain their expectations – they are not going to be able to make something as impressive or complex as Wallace and Gromit yet; instead, they will be using a simple ball of plasticine to see how to create an animation. ▪ Ask the children: what makes a perfect photo? Give pupils time in pairs to discuss their responses before sharing them with the class. ▪ Use this slide to go over some of the key points the children should think about when taking their photo shots. ▪ In pairs or small groups (depending on how many cameras you have), pupils should work with the ball of plasticine, thinking about where they want to move them to or the shape they want to create. ▪ The children then need to work out how to break this down into stages so that it happens gradually in the animation – this is developing their **decomposition skills**.	

- Move around the class and remind the pairs and small groups of pupils to keep their changes or movements incredibly small to create a fluid animation. Show the children how to use the 'playback' button to check their shot and how to delete if needed to retake.
- As they work, ask pupils: what if you squish the plasticine a bit? Can you make your changes really small to make the animation detailed? What happens if you make the movements too big? (The animation looks shaky and odd).
- Choose a pair/group's series of photos to demonstrate to the class how to upload the photos onto the school network or cloud service you have. Highlight that it is useful to rename each photo with the number order to make it easier when it comes to the editing stage.
- Demonstrate how to use Microsoft Photos. As you conduct your live demonstration, use these slides to help highlight the key aspects of editing in Microsoft Photos.
- Explain to the children that the main aim of editing is to create a fluid animation. Demonstrate this by tinkering with the duration speed to find the perfect timing to make the animation look as fluid as possible.

Key questions

- Does the plasticine move by itself?
- What can you see moving in the first few seconds of the film?
- What if you squish it a bit?
- Can you make your changes really small to make the animation really detailed?
- What happens if you make the movements too big? (The animation looks shaky and odd.)
- Where do we save our images?
- What duration speed works best?
- Do we need to delete any frames?

- Ask the children to discuss their experience of using a digital camera to take their photos and their thoughts on the editing process they saw being demonstrated.

Key questions

- Was it easy to make the movements small?
- Was it easy to keep the camera still?
- Were the frames clear?
- What problems did you encounter with taking photos?
- What are your thoughts on the editing process you witnessed?
- What are the steps we looked at when using Microsoft Photos?

- **To plan my stop motion video**

Recap what the children learned in *'Lesson 2: Exploring stop motion'.* Explain that they are now going to plan their own stop motion animation, which will be based around a theme.

Display the video 'Making Wallace and Gromit: National Trust', where creative director Merlin Crossingham discusses how the Wallace and Gromit team created a one-minute animation for The National Trust.

Ask the children to discuss what they see being done to create the animation, i.e. the creators have to sketch the animation before they can start planning it. Discuss how the process of breaking this animation down is called '**decomposition**'.

Key questions

- How was the animation created?
- Why was it useful to have a storyboard plan first before starting their animation?
- Did anything surprise you about how the animation is created?

Ask pupils to work in groups of four and explain that they will be creating a storyboard for an alien adventure animation.

	Discuss with the children potential ideas for their animation. Remind children not to over-complicate their ideas and characters. Hand out a set of *Activity: Space backgrounds* and *Activity: Black and white space objects* to each table and allow the children time to see if any of the backgrounds and/or objects could be used in their animation, along with the plasticine they will have access to. Give the children time, in their groups, to think about what their animation could be about. Bring the class back together and ask them to share their ideas. Show pupils the *Activity: Storyboard example.* Discuss how the storyboard has been put together. Discuss how for their plan, they do not need to sketch each frame like in Wallace and Gromit but just an overall plan for how what will happen in their story. Hand out the *Activity: Storyboard worksheet* and give the children time to plan their animations. Once they have done that, ask them to start thinking about designing and creating their characters, reminding them that simple is better (their alien could be a snake with spikes on his back or a triangle with eyes). The children also need to be prepared for their models being dropped or damaged – so the easier they are to rebuild, the better. **Key questions** • How was the animation created? • Why was it useful to have a storyboard plan first before starting their animation? • Did anything surprise you about how the animation is created? • What will your animation be about? • Will you use one or two objects? • How will you ensure you create small movements? Ask children to present their story ideas, explaining how they plan to animate them. Get each group to provide a list of *Activity: Space backgrounds* and Activity: *Black and white space objects* sheets they will need for *'Lesson 4: Stop motion creation'*. • **<u>To create a stop motion animation.</u>** ▪ Hand out the children's *Activity: Storyboard worksheets* created in *'Lesson 3: Planning my stop motion project'*. ▪ Remind children that when solving a problem, it is best to break it into smaller parts, or decompose it, which is what they have done with their storyboards (they have decomposed their animation film idea to make it easier to film). ▪ Give children time to look back through their *Activity: Storyboard worksheets*. ▪ Does it make sense? ▪ Can it be improved? ▪ Now, distribute to each group the *Activity: Space backgrounds* and Activity: *Black and white space objects* sheets and plasticine they require, based off the list provided in the 'Wrapping up' section of *'Lesson 3: Planning my stop motion project'*. ***<u>Key questions</u>*** • What have you planned in your animation? • Does your plan make sense? Why? Why not? • Would you like to make any improvements since the last lesson? ▪ Share with the children the four different roles in each group: 1. Camera person 1 – Hold the camera steady. 2. Camera person 2 – Press the record button to take a photograph of the frame once the animators are ready. 3. Animator 1 – Use small movements to the main character between each frame. 4. Animator 2 Move the background objects/set or additional character as required.	

	▪ Give children time in their group to decide who will take on each role. The children may decide to swap roles after a certain number of frames have been shot. Emphasise the importance of the groups working together to create a successful stop motion animation. Explain to the children that they need to photograph at least 24 frames, but the more they can do, the better their animation will be. ▪ Share tips for creating a successful animation, such as: • Taking your time. • Making small movements between each frame. • Stopping and checking the frames as you work. • Deleting individual frames that are not needed. • Thinking about the 'duration' to create a fluid animation. ▪ Give the children time to create their animation. Get each group to upload their photos to the school's network or cloud service so they can be accessed during the next lesson when they edit them using Microsoft Photos. Ask the pupils to share their experiences of creating their animation, asking what they found challenging about it and how they overcame any problems. ***Key questions*** • Did you create what you set out to make? • What challenges were there? • How did you overcome these challenges? • **To edit and assess my stop motion animation.** ▪ Recap the work the children did in *'Lesson 4: Stop motion creation'*. Explain that, in this lesson, they will edit and extend their animations. Explain that editing is a key process in creating a completed animation. Animators must ensure that each frame shows a small clear movement from the previous frame and that the background is the same for each one. ▪ Emphasise that editing is a continuous process; animators will continually look back over their frames and edit them as needed. ▪ Quickly recap the six steps for using Microsoft Photos, which is an editing piece of software. ▪ Share the two videos with the children and ask: What is different about them? Explain how the second video has been extended to create a longer animation scene. ▪ Share the two ways the children can extend their animations. Animation speed: The children may wish to change the 'duration' each frame is played for. Repetition: The children may have parts of their animations that they can repeat. To duplicate these images, the children can select the frames from their storyboard to add in or right-click on each image and select 'copy photo' then 'paste photo'. The children can then drag the photos around on their storyboard to the required position. ***Key questions*** ▪ Why is it important to edit your animation? ▪ Do you need to edit any of your frames? ▪ How are these two animations different? ▪ How could you extend your animation? ▪ Which frames could you repeat? ▪ Introduce the activity to the children, explaining that they are going to edit and extend their animations. Stress that the intention is to create a fluid animation; slowing down the speed of the frames too much or having too many duplicates of a single image will lose this. Encourage children to evaluate their animation after each extension to ensure they still have a fluid animation. ▪ After 15 minutes, stop the children and show to add a title card and special effects to their animation. Give the children 10 minutes to complete.	

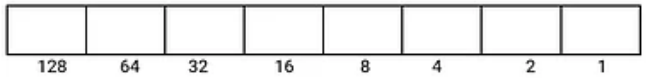
	Key question • How can you make those frames smoother? • Is there a way to extend your animation? ▪ Give children time to present their animations to the rest of the class. ▪ Encourage children to write two stars and wish for each film by writing two positive points and one point for development. Model the language the children can use to explain how something could have been done better so that it's done constructively and without being unkind. ▪ If you have time, you could ask each group to agree on one sentence that expresses their favourite thing about each movie and go around the room praising their animations. ▪ Finally, ask children to think about what they would do differently if they could start their project again.	
	Previous Learning Experiences:	
	This unit links to the stop motion animation in Y2. If the children have completed the unit then they will re-familiarise themselves with the skills needed.	
Possible Community Links/trips	**Future Learning Experiences:**	
Animators or film-makers.	Future computing experiences and lessons throughout the school from Year 6.	

Year 5	Topic Title: Mars Rover	Key Vocabulary
National Curriculum outcomes: Understand computer networks including the internet; how they can provide multiple services, such as the world-wide web; and the opportunities they offer for communication and collaboration Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content	• **<u>To identify how and why data is collected from space.</u>** ▪ Explain to pupils that for this topic, they will be looking at the Mars Rover, how it was designed, and the methods used to communicate with it. ▪ watch the NASA Rover curiosity landing on Mars video. For maximum impact, watch the video in the dark with the volume up high especially for the blasts at the beginning. The video gives an overview of: the mission, the Rovers construction, the technology involved, and the challenges of getting the Rover to Mars. ▪ Draw attention to the fact that it took Mars Rover 8 1/2 months to reach Mars from earth. You can use this fact later in the lesson to contrast the time it takes to send a radio signal. ▪ Having watched the video, asked pupils to estimate the cost of the total mission. It was approximately $2.5 billion or £1.7 billion. ▪ explain that while on Mars the rover has discovered some fascinating things. The most intriguing being that there may once have been water on Mars, which means that there may once have been life on the planet. ▪ It is only by carefully studying the planet that scientists discovered new information. Explained to the children the forms of data being sent back to earth such as photographs of the surface of Mars. All the data about the surface of Mars has to be sent to, or transmitted back to earth. The Rover is never returning to earth, so if it does not transmit the data, the mission will have been wasted. ▪ Strictly speaking, data is numerical, not just information as referred to in this lesson. In the context of the Mars Rover, all the information to be sent must first be translated into binary. This will be covered in the next session. ▪ Ask if anyone can think of ways that messages have been sent over long distances in the past? ▪ Using the Internet, children can research the distance from earth to Mars based on the length of other objects. For example, Tyrannosaurus Rex, the length of the worlds largest rollercoaster, a football pitch. ▪ Give the children how far away is Mars activity? This will help them with their research. Remind the children how to conduct an Internet search, for example: type the correct questions for example how far away is Mars, what is the length of a football pitch? Remind the children to select search returns beyond the first few in the list and to check the validity of the source. To bring inappropriate results to the attention of an adult. Not to click on pop ups and adverts. ▪ Give children time to research and calculate their own distance to Mars facts ready to share at the end of the lesson. ▪ Get the children to share their facts about the comparative distances between earth and Mars, and the comparative time it takes to transmit data from Mars, our nearest planet. Any children who researched the comparative value of the mission can also share what they found. • **<u>To identify how messages can be sent using binary code, To read and calculate numbers using binary code.</u>** ▪ Begin by watching the Mars in a minute phoning home video from the end of the previous session . Recap with the following questions: how can we send data to and from the Mars Rover? Can you recall the length of time it takes to send a message to the Mars Rover? What will happen to the Mars Rover if it does not receive a message? What will happen if the Mars Rover is not able to send its data back to earth ? What are the problems sending a message to the Mars Rover? ▪ Explaining binary code. Explain that data needs to be incredibly simple to survive being transmitted over such a vast distance. Binary was created as an international code for the transmission of on or off data. The on off could come from	binary code, data, data transmission, discovery, distance, import, Mars Rover, moon, numerical data, output, planet, radio signal, scientist, sequence, signal, computer simulation, space, astronomy

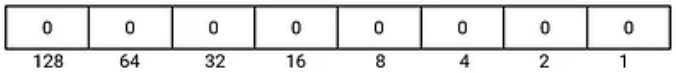
the flashing of a torch, electrical poles travelling down a wire, or a radio signal passed through space. Binary code is used in all computer data transfer but before we look at exactly how computer speaks to each other, we need a firm understanding of exactly how binary code works it involves a bit of maths but computers are really good at that!

Draw eight small boxes on the whiteboard, with the following numbers beneath – you could also ask the children to do this on their whiteboards to check their understanding.

Slide 7: 8-bit binary is a system of sending up to 255 different signals, with only eight different on or offs. Almost all computers use it.



Slide 8: then, write a zero in every box – this is because you should always start with zero, then count up to one, and so on. Each box is called a 'bit'.

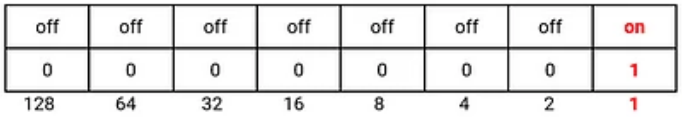


This is how you would show the number zero – it is read as (from right to left) 'off, off, off, off, off, off, off, off'.

Slide 9: ask the children: **how would you make the number one?** Remember that a one written in a box shows that the bit is 'on' and a zero represents 'off'.

Remind the class that they need to switch 'on' one of the boxes. If they need a clue, tell them to look at the numbers beneath the boxes.

Slide 10: **answer** = 00000001 or 'off, off, off, off, off, off, off, on:



Now ask the following questions – remind children that they can only put ones in these boxes:

Slide 11 and 12: **how would you make the number two?**

Answer = 00000010 or 'off, off, off, off, off, off, on, off'.

off	off	off	off	off	off	on	off
0	0	0	0	0	0	1	0
128	64	32	16	8	4	2	1

Slide 13 and 14: **how would you make the number 10?** Explain that more than one bit can be 'on'.

Answer = 00001010 or 'off, off, off, off, on, off, on, off'.

off	off	off	off	on	off	on	off
0	0	0	0	1	0	1	0
128	64	32	16	8	4	2	1

Slide 15 and 16: **how would you make the number 42?**

Answer = You need a one in the 32 box, a one in the eight box, and a one in the two box. With a zer in all the other boxes – 00101010 or 'off, off, on, off, on, off, on, off'.

off	off	on	off	on	off	on	off
0	0	1	0	1	0	1	0
128	64	32	16	8	4	2	1

With this sequence, numerical data can be sent to the Mars Rover very simply.

Slide 17: challenge children to work out the highest number that can be reached with 8-bit binary (if all of the boxes were 'on').

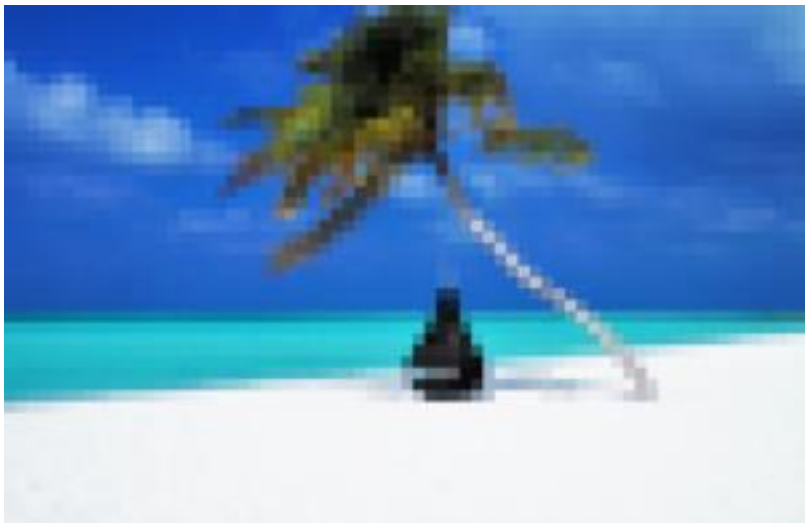
Slide 18. **Answer** = 255.

Slide 19: **Binary games** (20 minutes)

Model both games to the class before they play them independently:

	▪ As a class, watch the 4 bit binary challenge video. See if the children can calculate each one on their whiteboards and see who is the fastest. If the children are confident with this and find it particularly easy, you can move on to the 8 bit challenge. ▪ Explain that in the next lesson the children will be looking at decoding binary. • **<u>To identify the computer architecture of the Mars Rovers.</u>** ▪ Ask children what they looked at in the previous session, how binary signals are sent, by radio waves or uhf radio waves to be specific, to the Mars Rover. Does anyone know how many robots have explored Mars? Read the various descriptions of the different Mars Rovers. ▪ At this stage it is important that children understand that there are several Rovers and that each one has been a development of the previous in various aspects. Children will have the opportunity to navigate a rover for themselves in the lesson. ▪ Tell children that for each successive Mars Rover, the computer scientists have been able to improve three areas: input, processing, output. Identify inputs on electronic devices around the home. Ask do any of the children have devices that are controlled by sensors? Do they know what a CPU is? Central processing unit. This is where all the thinking takes place! Data is received via the sensors of a Rover, and this data is sent through to the CPU. At this stage, the Rover will do one of two things, the Rover might send this data directly back to earth. Can you remember how it may do that? Radio waves from its own Hue HF antenna. This radio antenna is called output. Discuss what output devices are. The Rover might also instead of transmitting the data back to earth, it might interpret the data using the CP you. The robot may make decisions based on the data it receives, such as where to go next. The size of the memory within the CPU determines how much thinking and planning the robot can do the more memory it has the more instructions the robot can manage to carry out in a row and the more sensors it can take data from at one time. This type of memory is called random access memory (RAM) ▪ Allow children to play the Rover game. They will work in pairs and direct one another around the circuit to achieve a goal, one of the players will be blindfolded and has to rely solely on instructions. ▪ To finish the session come up with a long list of instructions for the whole class. See how many instructions the children can remember, testing their own random access memory. • **<u>To use simple operations to calculate bit patterns.</u>** ▪ Ask children what they learned about in the previous lesson. Can children recall how Rovers required both random access memory and hard drive memory? They need both because random access memory enables them to think and hard drive memory enables them to remember. For example, when a rover is navigating across Mars, the ram memory enables it to take data from its sensors and cheque it is safe to carry out its next move. The hard drive memory is where it might keep the results of the science experiments before it is ready to transmit them back to earth.	

	▪ When a robot needs to think for itself, it needs to be able to calculate a range of data. Or the decision's carried out by a robot, or any computer, are done in binary. If we are going to understand how miles Rover is programmed, we need to take our binary skills to the next level. Show the binary Clock website and discuss and analyse with children. ▪ Go through detailed explanation as to how binary numbers work. ▪ Play the binary challenge from YouTube as a quick-fire finisher to the session. • **<u>To represent binary as text.</u>** ▪ Recap from the previous session with the four bit 5 bit or 6 bit binary challenge. ▪ By now the children should know that binary is used as the method of transferring data in almost all computer data that transfers and that the yes no system of binary is the foundation for all computer programming languages. ▪ In this lesson the children will be learning how to use binary to represent something other than numbers. ▪ Show the film clip from the Martian where the astronaut, using an abandoned Mars Rover, develops a means of transmitting messages between earth and Mars. ▪ Show children the ASCII code and expand it to show binary numbers for letter representation. The children will create their own messages and will send them using binary code. ▪ Allow children to share their binary text messages with the class and see if they can work out what each other is trying to say.	
	Previous Learning Experiences:	
	Children will have been introduced to the concept of code before this unit.	
Possible Community Links/trips	**Future Learning Experiences:**	
	Future computing experiences and lessons throughout the school from Year 6.	

Year 5	Topic Title: Mars Rover 2	Key Vocabulary
National Curriculum Objectives: Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content Select, use and combine a variety of software (including internet services) to create content that accomplishes given goals, including collecting data and information	• **<u>To understand how bit patterns represent images as pixels</u>** ▪ By now children will be familiar with the whole Mars Rover project, so this should stimulate some interesting discussion about the temperature of Mars, the atmosphere, whether there is/was water, and whether there was/is/could be life on Mars. ▪ If the conversation does not lead to it naturally, discuss the importance of images sent back from the Mars Rover, as we can learn a lot from seeing what it looks like and how that changes over time. ▪ Have a look at the latest images sent back from the Rover on the 'NASA's Mars Rover Mission Updates' page or the 'NASA's Mars Rover Gallery' page, which, although not updated, has lots of interesting images. ▪ Recap from the first half of the topic, that all the transmissions from the Mars Rover – like the transmissions within and between most computers – are in binary. Ask: how is binary used to transfer the data of a photo? ***<u>Key questions</u>*** • What do you think is the most useful data that has been or could be sent back from the Mars Rover? (There is no "answer" to this, but most would suggest that the digital images are the most valuable.) • How is binary used to transfer the data of a photo? ▪ Open the 'NASA's Space Place Binary Code Pictures' and hover your cursor over the picture of Saturn or Jupiter. You will see that the image changes to a binary image (of 1s and 0s). ▪ Remember, computer data is all transmitted as binary: Ones and Zeros (*On*s and *Off*s). Display a pixelated picture (such as the one below) 	Algorithm, Binary Image, Bit, Bit Pattern, CAD, Compression File, CPU, Data, Digital Image, Encode, Image, JPEG, Memory Computer, Operating System, Pixels, RGB

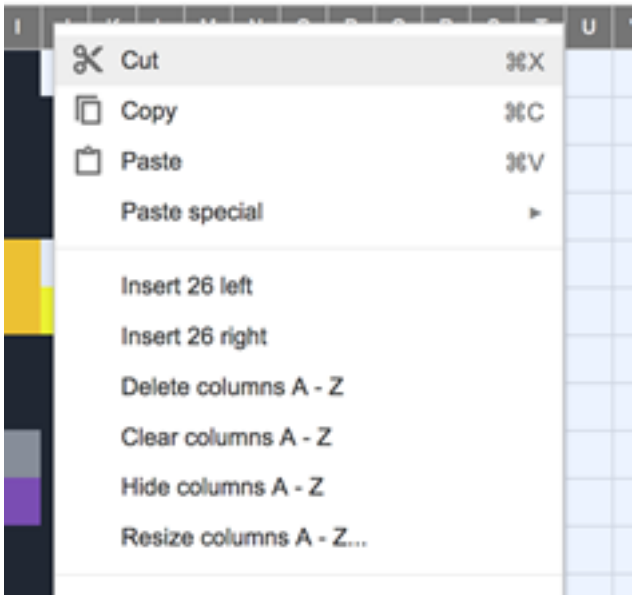
- When you look at this picture, your eyes and your mind work together to do something rather clever. The Greeks and Romans used a similar technique to make mosaics by sticking lots of coloured tiles one after the other to make patterns or images.
- Your mind stitches together a picture, from the different tiles of colour. And as long as you are able to see the whole of the picture, your mind can usually work out what it is looking at.

- When a camera takes a photo, it does a similar thing. It codes the image into coloured blocks, or pixels. Each pixel is a single block of colour, like the tiles in a mosaic.
- To transfer the data for this image, the computer has to use a code to represent this colour.
- If the computer is using standard 8-bit binary (8 bits is also referred to as a byte), it has 256 different possibilities. As the children will have already learnt, when looking at the ASCII computer code, each of these 256 possibilities can be used to represent letters and numbers, as well as representing colours.
- The Mars Rover, or any device that is going to transmit an image has to break it down into these individual pixels.
- Now look at the 'NASA's Billion Pixel Picture of Mars'.
- You should then be able to zoom in on the image down to the tiniest pixel and explore the image. Draw pupils' attention to the following:

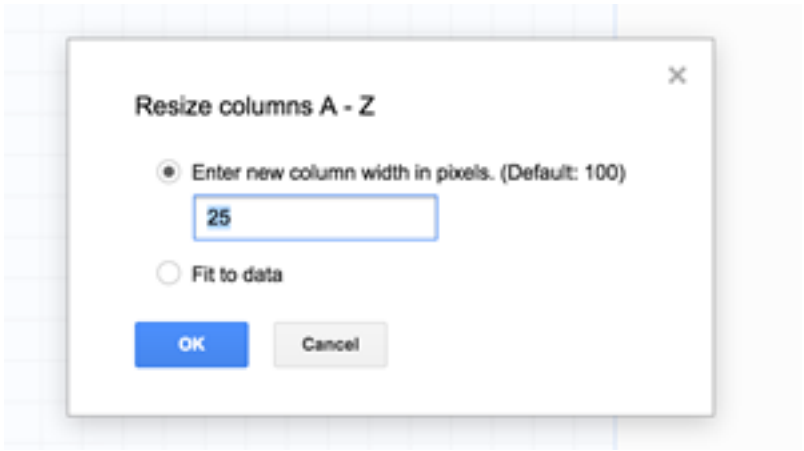
- There are sections in black and white.
- You can see the stitch lines between the different images
- You can zoom in on interesting details, such as the tracks in the dust, and the ripple lines on the sand which suggest Martian winds.

- **<u>Pixel Art</u>**
- Hand out pieces of squared or graph paper and ask children to create a rough design of a pixel image. They should then open up the spreadsheet software you are using (Excel, Google Sheets, Numbers etc.). Demonstrate how they should

adjust the cells to make them equal in length and width. In most spreadsheet software, you can do this by highlighting the columns you want to alter, right clicking and selecting 'resize columns'.

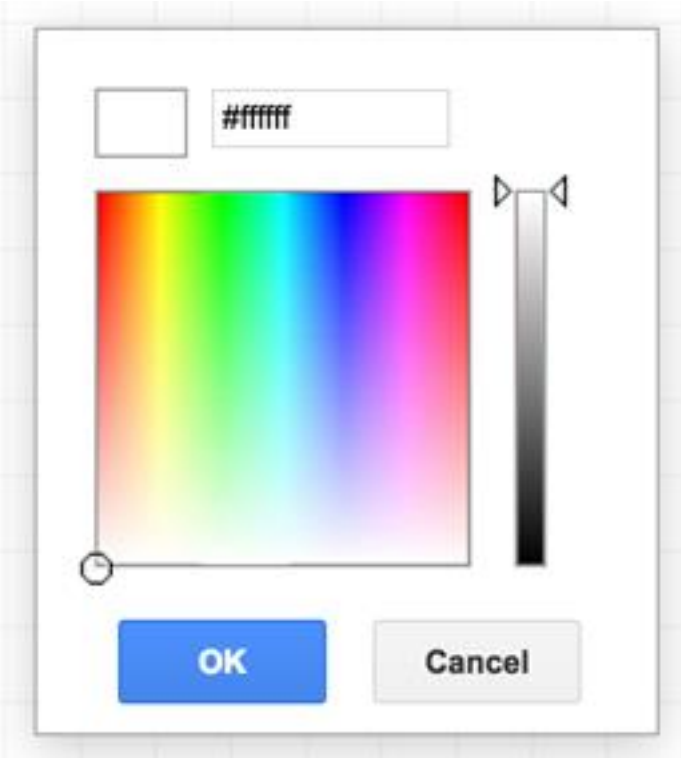


- You need to select a column width for all of the columns you've highlighted. You can do the same with the rows to make each cell a square.



- Model the activity for children to create a pixel picture inspired by Mars/Mars Rover/Space. Using their rough design on paper, they will need to select cells and use 'fill' to colour in each one and draw a picture. Make sure they know how to colour cells.
- They can then create their picture by filling a cell (or pixel) at a time. If they want to create a larger, more complex picture, they can explore the 'Pixilart' website.

- If children have not discovered this themselves, show them the "custom" area of the colour selection box. Click on 'More colours' and then 'Custom'.



- If you're using Excel, you will see three numbers which represent RGB (red, green and blue), however, if you're using Google sheets, you will see a hex code which is made up of numbers and letters. In this case, use a website such as 'Rapid Tables' to look at the RGB codes of varying colours. Start off by setting values of:

R: 255
G: 0
B: 0

- What happens? They will notice that the colour is bright red.What about if you change it to:

R: 255
G: 0
B: 255

- This should produce a vibrant pink. Ask children to suggest other colour values and predict what happens.
- What happens if all colours are set to 255. By setting all of the values to 0, you should end up with white because this indicates all of the three colours on full. Why do you think 255 is the top number? (it's binary again! Because 8 bit binary has 256 combinations, so 0-255 covers 256 possibilities. It all comes back to 8 bit binary!)
- If children do not understand how red/green/blue makes up all the different colours, ask them if they have ever seen inside the school printer. These use three different coloured inks, which mix like paint to make any colour the printer needs. Light works in much the same way.

- **<u>To explain how the data for digital images can be compressed</u>**
  - Start with the 'NASA's Billion Pixel Image of Mars' from the previous lesson and recall how each image is made of tiny pixels, like tiles in a mosaic. Show the 'Mosaic of the Planets' by the artist Lynn Bridge.
  - Ask pupils to imagine the mosaic was sent to them, one tile at a time, and consider how long it would take to reassemble them.
  - In groups, hand pupils one of the envelopes that you've prepared with a photograph cut into several pieces and ask them to reassemble the image as quickly as possible. If you have time, switch the envelopes around so pupils experience doing this with both lots of pieces and fewer pieces and discuss which was easier and why.
  - Remind pupils of the activity from Lesson 1, where they created images by individually colouring cells in a spreadsheet. This is what the Mars Rover has to do every time it sends an image back to earth. Each pixel is like a tiny tile and the data about its exact colour has to travel through space back to Earth.
  - Now we know that this takes a long time, and the Mars Rover will be using up quite a lot of its RAM (its working memory) every time it does this. So, it would help if there was a way we could speed up this process.

<u>Key questions</u>

- How long would it take to reassemble the mosaic?
- How much data is the Mars Rover sending in this billion pixel image? (At least one billion multiplied by 24 bits because each pixel requires 24 bits of data, so 24 billion ones and zeros)

- There are three ways to speed up the transfer of image data:
- The first is to simply reduce the number of pixels in the image. This is called scaling, or cropping. You can scale the image down, or simply crop away part of the image you don't need. This reduces the number of pixels and since each pixel requires data, fewer pixels means less data.
- The problem with this is that if you then want to zoom in on the image, or scale it up again, it will look grainy.
- The second way to reduce the file size is to reduce the quality of the colour. Last lesson, we learnt that you can save an image with 256 different colours so that each pixel requires one byte of data (one lot of 8-bit binary). The truth is that most images use three bytes of data (24 bits of data). The first byte records exactly how much red, the second records how much green, and the final one records how much blue. Just like the RGB we saw at the end of the last lesson. So, we

	can change the picture so that it has 8-bit colour, or even less than this by changing the picture into black and white or greyscale. By reducing the variety of colours, you can reduce the file size, but you risk not getting a true picture. ▪ The final way to do this is through compression. Compression means to squeeze and this is exactly what you do with the file. You squeeze it down to a lower size, which is usually done by saving the file as a JPEG. ▪ You will have heard of a JPEG, what you may not know is that images start off as a bitmap. This means that all the data for each pixel is stored in full. When an image is changed into a JPEG, each pixel is inspected to see how close in colour it is to the one next to it. If the colours match, if both pixels have the same colour, then they are grouped. The code which will be used for the second pixel is simply going to be 'and again'. ▪ This way, on the image of Earth, you can save a lot of file size by grouping the blue pixels of the sky. There will be areas of the picture which require fine detail, and these pixels are left alone, ungrouped. Each pixel which contains the same information (in other words, the same colour) is simply a reference back to the original version. ▪ **File sizes** ▪ Model how to download and save a full size image of the Mars Rover from the internet. Then, save the image in various forms within Excel, as a: • thumbnail version, • JPEG version • bitmap version • Each time inspecting and recording the file size to compare. • **Match** • Finally, ask pupils to create three brainstorms in pairs: thumbnail, JPEG and bitmap. • For each of these image formats, they need to come up with as many examples of scenarios when these would be the best option. • E.g. thumbnail – ID card, JPEG – website picture, bitmap – large scale print. Then, get them to share these as a class and challenge them to explain their choices. • Look back at the 'Billion Pixel image of Mars' one last time. • Ask children if they can explain why the lower part of the image has been photographed in black and white. To save on file size – the scientists already know what the Mars Rover looks like; they don't need colour photos of it. • **To identify and explain the 'fetch, decode, execute' cycle** ▪ Show the video 'NASA's Mars in a Minute: How do Rovers Drive on Mars?' to recap how the Mars Rover handles instructions for navigation. ▪ Explain that there are two reasons why the Mars Rover needs to have instructions sent in bulk: • The time it takes to communicate with the Mars Rover means it's better to send a package of instructions; sending one at a time will take ages. • Solar conjunction (explained in this video). Solar conjunction means that there can be weeks on end when it is impossible to communicate with the Mars Rover. Because of the orbit of our planets, there are long periods of time where the Mars Rover needs to operate independently. It cannot simply sit and wait for instructions to come one by one. Scientists may	

	send a whole long list of instructions, and the Rover needs to carry them out one after the other. This requires a 'fetch, decode, execute' cycle. ***Key question*** • What implications does the solar conjunction have on sending messages to the Mars Rover? ▪ For any computer to work, it needs to have both working memory (RAM) and storage memory (ROM). You can find out more about this in the accompanying *Teacher information: Fetch, decode, execute.* ▪ The data needed to run a program will be stored in the ROM memory. The series of instructions which a computer is currently carrying out are also called a program, which is written by a programmer. ▪ These instructions could be those sent by the scientists to the Mars Rover, or the instructions could be a program on your home PC, or even a game on your tablet. All computers, from Mars Rovers to iPads, use the fetch, decode, execute cycle. ▪ Sending a program to the Mars Rover takes quite a while, but you use the fetch, decode, execute cycle every time you use a computer and it works a lot faster when your computer is not on Mars. ▪ You can open or 'run' a program on a computer simply by clicking or tapping on it. When we do this, we send an instruction to the operating system to go and find the program on the ROM and make a copy of it to store on the RAM. ▪ Remember that the RAM is the working memory of the computer. ▪ Just like you, the computer cannot do too many things at once, so it only looks at the instructions or programs which are relevant. ▪ The CPU (the main brain of the computer) collects the instructions it needs from the ROM memory. This is called **'fetch'.** ▪ Next, the CPU copies the instruction into the RAM and starts to read the instructions to work out what it has to actually do. This is called **'decode.'** ▪ Finally, the CPU sends the electronic signals to all the different pieces of hardware to carry out, or **'execute',** the instructions. (This could be to spin the motors in the Mars Rover's wheels, or it could be to open the Word document the desktop user has selected.) **Jam Sandwich** ▪ Show children this 'Phil Bagge's Jam Sandwich Algorithm' video, which is a classic video of a teacher playing with a robot and carrying out children's programs in a very literal way. Midway through the video (approx. 1:57) get children to explain the fetch, decode, execute cycle as they see it: • The children **fetch** the instruction for the teacher. • The teacher tries to **decode** what he has to do. • Then the teacher **executes** the instruction to the best of his ability. ▪ You can also liken this to a treasure hunt, whereby you find the clue, try to decode it, then execute what it asks you to do before finding the next clue, to then repeat the cycle.	

	Group Challenge ▪ Working in groups of three, one pupil will be told the task their group needs to achieve, which they will then need to break down into smaller steps. Their challenge is to draw a house with a red roof and a blue door, then put it on your desk. ▪ However, pupil one is the only one in the group that knows this. They can only speak to person number two in their group, who then relays the message to the final person who will execute the instructions. Remind pupils to only do exactly what they have been instructed to. ▪ Look at the images that children created and where they ended up. Which groups successfully completed the challenge? Why? What did they find most difficult about this? What would happen if the Mars Rover received information like this? (i.e. one instruction at a time). ***Key questions*** • Which groups successfully completed the challenge? Why? • What did they find most difficult about this? • Why aren't instructions sent to the Mars Rover one by one? • **To create a safe online profile and tinker with 3D design software** ▪ Look at the 'NASA'S Mars Rover Space Place' and recap some of the ways that the Mars Rover has developed. Ask the questions from the Key Questions and discuss the answers. ▪ Watch this video and get the children to guess the weakness of the Scarecrow Simulation Robot. (The wheels don't grip on sand and wear out relatively quickly on a rocky surface. Note all the holes in the wheels, and how the sand starts to build up inside the wheel). One area which is essential to the continued development of the Mars Rover is the tyres. ***Key questions*** • In what ways has the Mars Rover been developed over the years? (Its size, memory/storage capacity, RAM, number of scientific instruments) • How could scientists continue to improve upon the Mars Rover? • What happens to the Mars Rover if any of the parts break? (Depends on the part. If the solar panels or the batteries failed, the Rover would be useless almost immediately) • Why do you think the Mars Rovers have always had six wheels? (Six wheels gives greater stability and if one or two of the wheels failed, the Rover could still move. It also enables the 'Rover to climb very uneven terrain') • Can you guess the weakness of the Scarecrow Simulation Robot? (The wheels don't grip on sand and wear out relatively quickly on a rocky surface. Note all the holes in the wheels, and how the sand starts to build up inside the wheel) ▪ Children are going to design a new Mars Rover tyre using 3D design software called TinkerCAD. CAD stands for '**computer aided design**' and is used by professionals to help visualise 3D objects before making them.	

	▪ You will need to register prior to the lesson and add your pupils' names. We suggest modifying the auto-generated "Nicknames" to be something memorable for the children. ▪ Introduce the children to the website 'TinkerCAD'. Explain that tinkering means to make changes to an idea as you test it and learn from your mistakes. This site enables children to make computer designs, which can be tinkered and edited. Each child will create a profile for the site and learn the basics of how to begin designing a 3D object. ▪ When they click 'Sign Up', the site will prompt them to enter a username. Children will need to enter the email of the teacher or of their parents. Explain that the email address they enter enables the adult to act as a moderator (a trusted adult who can monitor and investigate any unwanted or inappropriate behaviour on the site). ▪ Once children have created a profile, they will need to enter an invite code – a unique code, created by you, which then gives them full access TinkerCAD. **Activity** ▪ Children create their own profile on TinkerCAD,and use the invite code to unlock the design tools. ▪ As a class, watch a tutorial -https://video.link/w/0pae showing how to drag objects onto the work pane and edit them. ▪ Remind children that they are designing a tyre for the Mars Rover and that they will have in the next lesson to work on their design too. ▪ Demonstrate how they begin their design by dragging and dropping shapes from the right hand column onto the work pane. We explore the software in more detail in the next lesson. Pupils play the 'Tower of Treasure' game to remind them of keeping their personal details secret. • **To modify the design of a 3D object using CAD software** ▪ Explain that 3D design software can be used for many things. Although we have mainly focused on designing real 3D objects, there are examples of using CAD to create things that will never be printed or made into real objects. ▪ Show them this VideoLink video about how Pixar animations are made. - https://video.link/w/gyae ***Key question*** • What types of design work are computers used for? (Designing objects to be created, e.g. buildings, cars etc, or for animation) ▪ The children are going to learn to make changes to their existing designs. ▪ Ask a child to access their work on TinkerCAD from the previous lesson and show it on the whiteboard. Ask your volunteer to close the object and return to the main profile page by clicking on the TinkerCAD logo in the top left hand corner. ▪ See if the child has completed any of the tutorials by clicking on 'Lessons' on the left hand side of the page. If they have, this will be displayed in the main window. Ask them to demonstrate how to click on the 'Learn' tab at the top of the screen to start a new tutorial. ▪ Ask the class to give a thumbs-up/thumbs-down response to show you how confident they feel about creating holes in objects (they haven't yet been taught this yet).	

	▪ Show children how to work, step by step, through the 'Making Holes' tutorial. Explain that there is a tutorial for each of the skills they need to know to enable them to use TinkerCAD effectively. Pupils then take the tutorials independently whenever they are ready to learn a new skill. If children can master the final 'Die' tutorial, then they have mastered all the skills expected within TinkerCAD for children of this age. **<u>Activity</u>** ▪ Set the children off on their tutorials, encouraging them to revisit their Mars Rover tyre designs, modifying them as they improve their skills on the program. **Key question** • How confident do you feel about creating holes in objects? ▪ This would be best taught as a mini-plenary so that children have time to carry this out before exiting the browser (before closing TinkerCAD). If possible, stop the lesson and get one child's work up on the interactive board. ▪ Explain that all the Rover tyres created by the children are automatically set to be 'private' objects, meaning that no other TinkerCAD user can see them. If children wish to make their object 'public' (ie: they are finished and wish to add their design to the online catalogue of 3D objects, they click on the cogwheel 'settings' icon, which can be found by clicking or hovering the mouse over their object. Then adjust the properties of the object, including its name.	
	Previous Learning Experiences:	
Possible Community Links/trips	**Future Learning Experiences:**	
Invite someone that works with Computer Aided Design to school/zoom as this will show the children how it can be used in a real-life situation/career.	Future computing experiences and lessons throughout the school from Year 6.	