Research
Based
Curricula

Using Social Robots at the Children's Hospital

Key Stage 3

Maths

2021

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Part 1: Getting started

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Part 1: Getting started

About this pack

What's in this pack?

This booklet contains:

- ✓ Lots of activities and interesting information about how you can study this subject and why it is worth studying
- ✓ Four 'units', each as a lesson with activities
- ✓ A final assignment to check what you've learned
- ✓ Extra guidance and advice throughout about the skills you are building
- ✓ End notes on extra resources and where to find more information

Who should complete this pack?

This pack was created for **all** students to enjoy and explore a new topic. It also gives you the opportunity to learn in a new way that's different to the classroom.

Each pack is written by a university student who is researching this topic and has special knowledge on the subject. By completing their mini-course, you will find out why it's interesting and you will build skills that help you with studying and learning.

Why complete this pack?

- ✓ Learn about cool areas of a subject that you might not cover at school
- ✓ Sharpen your academic skills, like short essay writing and interpreting data
- ✓ Experience what it's like to explore a subject freely
- ✓ Better understand what you enjoy and don't – it will help you make decisions about your future studies and career choices!

By completing this pack you will not only get better at this subject, you will also have fun learning something completely new!

Meet the Author
Brenda Littler

My Journey

My parents are from D.R. Congo in Africa.

I was born and raised in East London.

I am one of five children and the first born.

I am married and I have 1 daughter.

My studies

I did my GCSE at the Lammas School in Leyton, London.

Then I did my first degree, Mathematics and Humanities at The University of Essex.

After three years of working, I did my second degree, a masters, in Human Computer interaction at the University of Nottingham.

Now I am doing a PhD with the School of Health and Related Research at the University of Sheffield.

A-Level Subjects	Maths, IT, and Psychology
Undergraduate	Mathematics and Humanities
Postgraduate	Human Computer Interaction | PhD with the School of Health and Related Research

Why this subject?

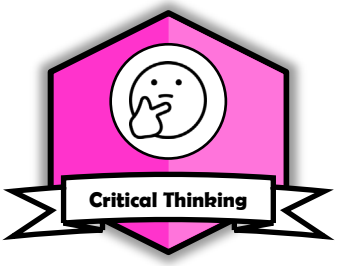
I care about children who are visiting the hospital.

Social robots are new and can be used to make children feel happy while in hospital.

I enjoy researching and finding out more about new things.

Building Key Skills

Look out for these Key **Skills Badges throughout the coursebook.** These show that you're building the study skills you'll need to succeed at school and beyond.



To complete this booklet, you will be using and building your learning and thinking skills. These skills are ones that teachers look for as you progress. All these skills that you will see here will demonstrate your abilities as a student – while you're still at school!

For example, every time you have to look something up, you are showing that you can work independently.

Every time you complete a challenging problem, you might demonstrate your ability to think logically.

Every time you evaluate the sources or data that you are presented with, you are showing that you can analyse and digest information on an unfamiliar topic and learn from it!

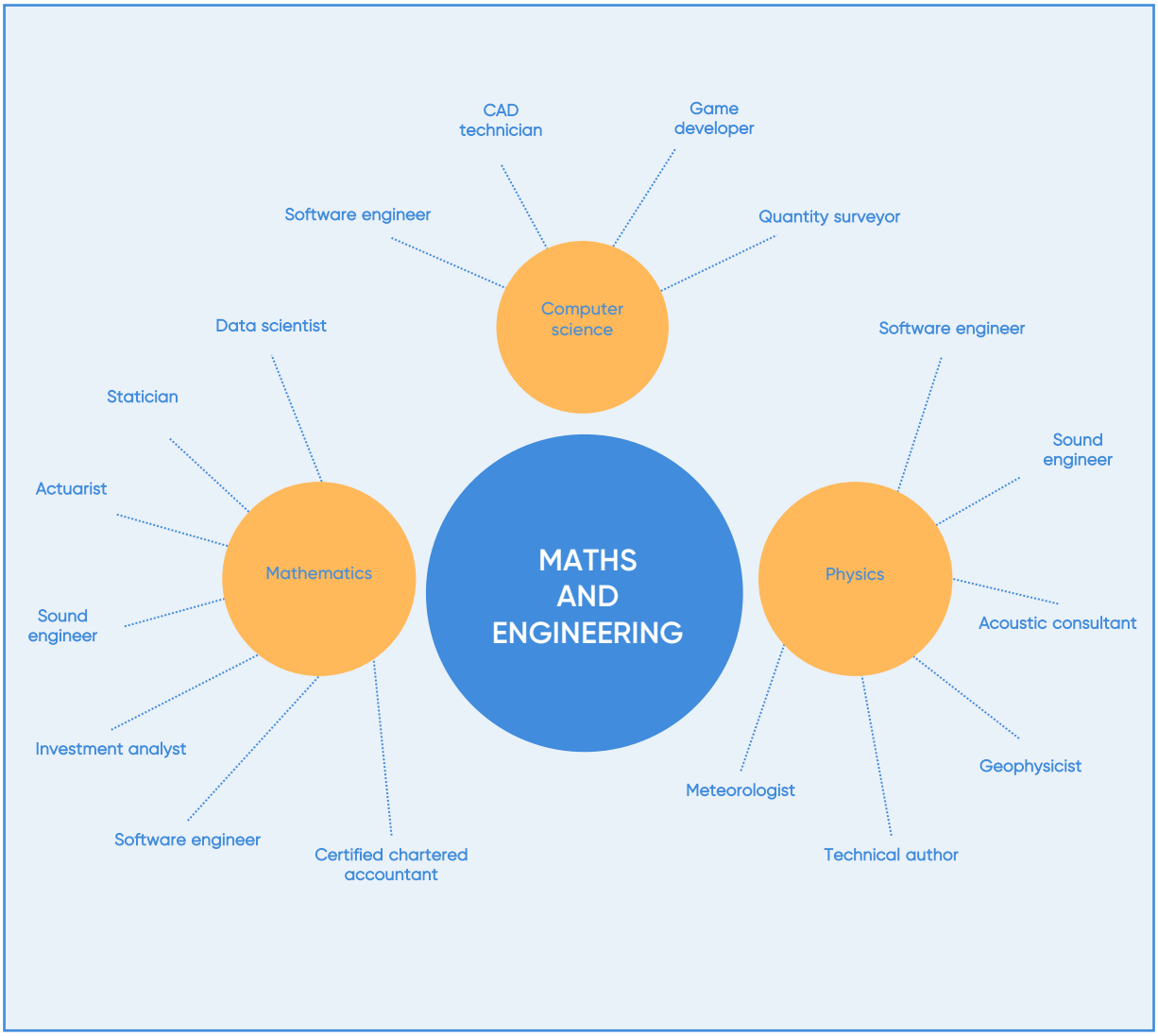
Skills you may meet and build in this pack:

research	your ability to work on your own and find answers online or in books
creativity	your ability to create something original and express your ideas
problem solving	your ability to apply what you know to new problems
source analysis	your ability to evaluate sources (e.g. for bias, origin, purpose)
data analysis	your ability to evaluate data and numbers
critical thinking	Your ability to consider questions with an open mind and evaluate what is important or not
active reading	your ability to engage with what you are reading by highlighting and annotating

Subject map: Maths

Studies in Maths lead to a large number of career choices. Many students who study Maths go on to pursue Maths degrees at University. However, a significant number of them also start looking out for jobs in many different fields like engineering, teaching, finance, IT services and many other positions in this space.

Did you know? Being a mathematician can open up many doors within many industries, from computer programming to data analysis or with health policy teams in the healthcare industry!



Introduction to Topic Memory

The topics within this pack will include:

Mean and averages

Fractions and percentages

Probability

Statistics

Pie charts

Other topics that link to this area of study:

Educational psychology

Clinical psychology

Sociology`

What is this topic about?

Introducing social robots into the children's hospital with the hope that the interaction the children have with the social robots reduces anxiety and distress while they are in the hospital. The idea is to support children who may be feeling a bit worried about visiting or staying at the hospital.

Our study works on figuring out which social robots are best in a hospital setting, as well as what the social robot should do and how well it's worked in the past. We conducted a systematic review, and that helped with discovering some great information.

Why is this an important topic?

Children who visit the hospital experience anxiety and distress when they are waiting to be seen by a doctor. This causes children to react negatively by crying, not talking, or playing and sometimes feeling more sick than when they came in.

It is important to help children feel less worried during their time at the hospital. We believe social robots can help with this. Social robots can give children the chance to get their mind off the unknown and be distracted by something new and fun. Social robots can act as a buddy and keep the children company, and at the same time reduce anxiety and distress.

Glossary

Term	Definition
Social Robots	A robot that interacts and communicates with humans through physical and verbal actions
Anxiety	Anxiety is feeling worried and scared. It is a feeling of unease.
Distress	When someone feels physical or mental pain
Study	The act of making an effort to learn by reading or investigating
Researcher	A person who carries out academic or scientific research
Wellbeing	Being comfortable, healthy, or happy
Systematic review	A structured way to search for data
Interact	An ongoing action between two or more individuals
Programmed	To code instructions for them to be performed

Part 2: Subject learning

Unit One Overview

Topic	Mean, Median, Mode, and Range
Links to the Curriculum	Number: interpret and compare numbers Statistics: describe, interpret and compare observed distributions
Learning objectives	By the end of this unit, you will be able to: ✓ Define the mean, median, mode and range ✓ Know how to find the mean (average) ✓ Present data on a graph and table
Instructions	1. Read and learn about the topic 2. Complete the activities 3. Explore the further reading

Unit One
Key Vocabulary & Structures

Term	Definition
Participants	A person who takes part in something
Frequency	Frequency refers to the number of times an event or value occurs
Grouped Frequency	Data that has been ordered and sorted into groups
Mean	Known as the average, the mean is the total of all the numbers, divided by how many numbers there are
Median	A type of average which is the middle value of an ordered set of data values
Mode	In a set of values or numbers, the mode is the one that occurs the most
Range	The difference between the lowest and highest values in a data set
Distorted	The act of overlapping
Data	Data is a collection of information gathered by observation, questioning or measurement
Mid-interval	The middle value between a given set of interval

Unit One
Student New Vocabulary

When you find words you don't recognise, make sure to look up their definition. Use this page to write them down and make a note of their definition! You can also add translations in your own language.

Term	Definition	My language

Unit One
Reading and Learning

Section A

What are social robots?

Read the text aloud. This will help with understanding!

Social robots are robots that talk and play with humans through speech and movements. There are many social robots in the world and they are used for different things. Each one has a special skill, and they come in different sizes.

Researchers believe that social robots can be a helpful tool for children visiting the hospital. We think it can help children feel better and enjoy their visit to the hospital a bit more. A **systematic review** was carried out to discover which social robots were used the most around the world and if they made a difference to children's **anxiety** and **distress** levels.

Social robots have had a positive impact on children and their **wellbeing**. They can be **programmed** to play, read stories, dance, and talk. There are many different types of robots.

Credit: Andy Kelly on Unsplash

All the social robots we found decreased the level of anxiety and distress in the children that took part in those studies. Social robots have a way of making children laugh and forget their sadness.

Unit One
Reading and Learning

Mean, Mode, Median and Range

Mode

Look for words you don't know in a dictionary and add them to your New Vocabulary List!

Seven different social robots were discovered in the systematic review. We wanted to work out which of the seven was used the most when it came to reducing **anxiety** and **distress**. This is also known as the **mode** - that is he number or **data** that appears the most.

Advantage of the mode: it is easy to find in ordered data.

Example:

Here is a list of the social robots used in eight studies:

Nao, Paro, Pepper, Pleo, Paro, Paro, Nao, Paro

The mode (most used) in this example is Paro.

Mean

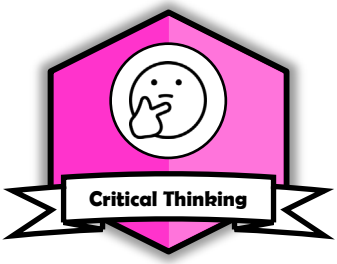
Alongside the mode, working out the average is also very beneficial. The average is also know as the **mean**. The **mean** is used to show the true average of a set of **data**. In order to find the mean, you need to add together all of the numbers in your data set, then divide that sum by the total number of data.

Advantage of the mean: it uses all the data.

Below is the formula used to find the mean:

$$\text{Mean} = \frac{\text{sum of all the numbers}}{\text{the total of numbers}}$$

Unit One
Reading and Learning



Median

The **median** is the middle number when all the numbers are listed in order from least to greatest.

Advantage of the median: it is easy to find in tallied or total numbers of data.

Example:

Here is a list of numbers:

1, 2, 3, 3, 3, 4, 5

The **median** in this example is 3, the middle number.

Range

The **range** is the difference between the biggest and the smallest number.

Advantage of the range: it is simple to understand and use.

Example:

If we use the numbers from the above example:

1, 2, 3, 3, 3, 4, 5

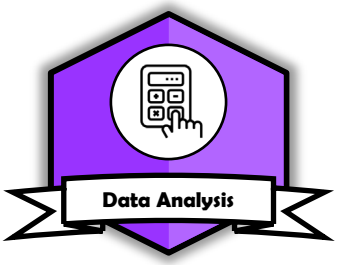
The **range** in this example is 5-1 = 4

Unit One Activities

Activities

1. All the seven social robots that were found in the systematic review are listed in the table below. Fill in the frequency column.

   Tip: What you need to do is count the tally.
   (example: III = 3)



Robot	Tally	Frequency
Pepper	I	
Nao Robot	IIII	
Huggable	II	
Pleo	I	
Paro	I	
Ivey	I	
SanElf	I	
Total		

2. Using the above table answer the following questions.

a) How many robots were found?

b) What is the **mode** (most common robot)?

c) What is the **mean**?

d) What is the **range**?

Work with a partner. You can use your own language to work things out!

What social robots can you discover online?

Here are some names for you to research and have a look at: Paro the Seal Robot, Pepper the robot, and Pleo the animal robot. Which other ones can you find?

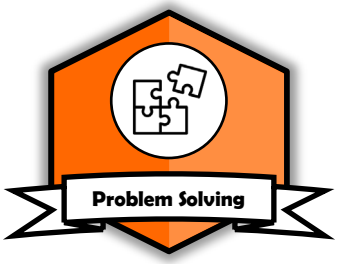
Unit One Activities

Activities

You can discuss this with a family member instead!

3. Discuss in class or with a friend.

Go online and look up the most used robot from the table you filled in in Activity 1. Draw a picture of the robot in the space below and write what you like best about it.



Ask your teacher for help if you get stuck!

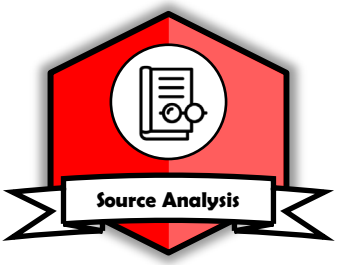
4. Below are some advantages of **mean**, **median** and **mode**. However, they are all mixed up. Can you draw a line to the correct advantages for each one?

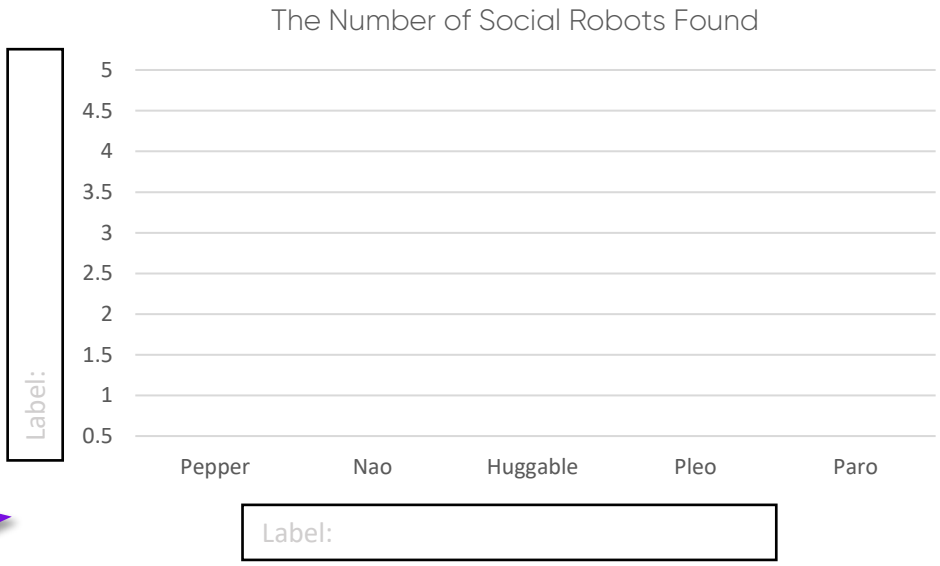
Mean	Easy to find in ordered data. Not distorted or changed by extreme data values.
Median	Easy to find in tallied data. Always a data values (when it exists)
Mode	Uses all the data. Usually most representative.

Unit One Activities

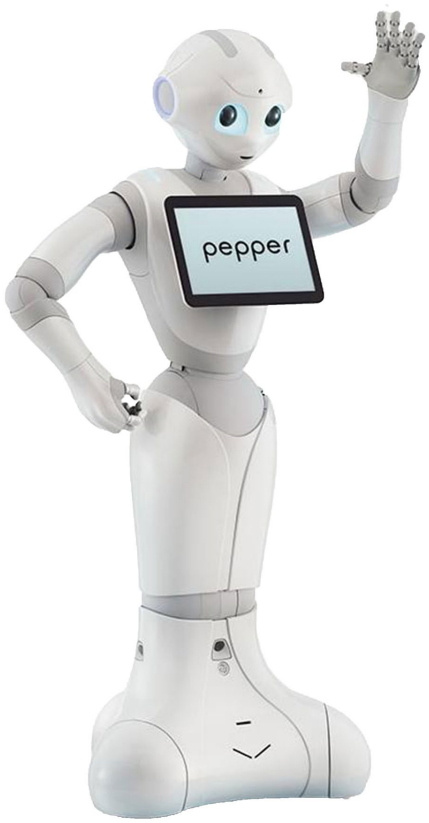
Activities

5. Using the table in Activity 1, present some of the findings onto this bar graph.





Remember to label the axis!



Unit One
Challenge & Further Reading

Challenge Activity

Find the meaning of mid-interval on page 12!

< means less than
≤ means less than and equal to

This is a **grouped frequency** table with information about participants in the study. Try and work out the **mean**. This is a bit different to the previous page. First, you need to find the **mid-interval** (the middle value), and then multiply the f column and the x column.

Participants (P)	Frequency (f)	Mid-interval value (x)	fx (f times x)
$0 < P \leq 20$	4	10	(4 x 10) = 40
$20 < P \leq 40$	2	30	
$40 < P \leq 60$	3		
$60 < P \leq 80$	1		
Total			

Fill in the table and estimate the **mean** value.

$$\text{Mean} = \frac{\text{total participants}}{\text{number of studies}}$$

← 4th column total
← 2nd column total

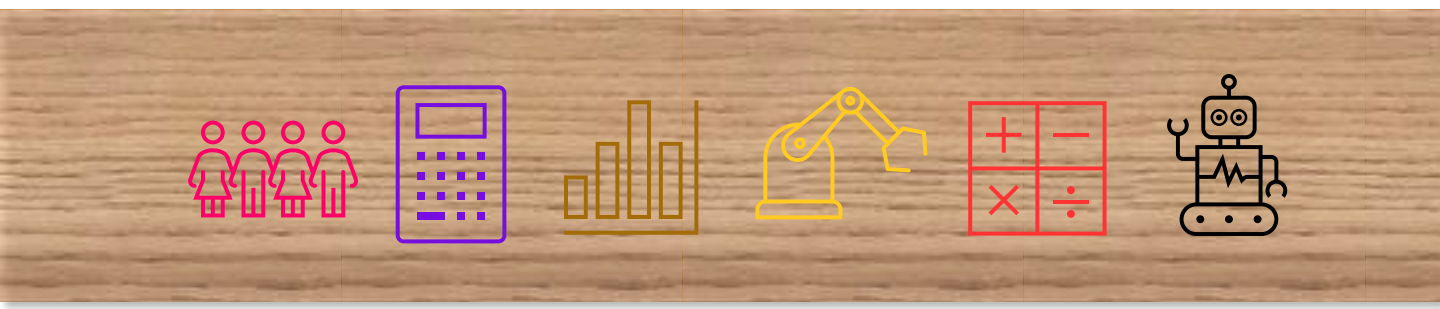
Use the next page to explain how you got there!

Useful links

- Mean, median, mode and range
- Analysing data

Explore further

- A Maths Dictionary for Kids



Unit One
My research

Challenge Question

Fill in the table and estimate the **mean** value. Explain your workings here.

$$\text{Mean} = \frac{\text{total participants}}{\text{number of studies}}$$

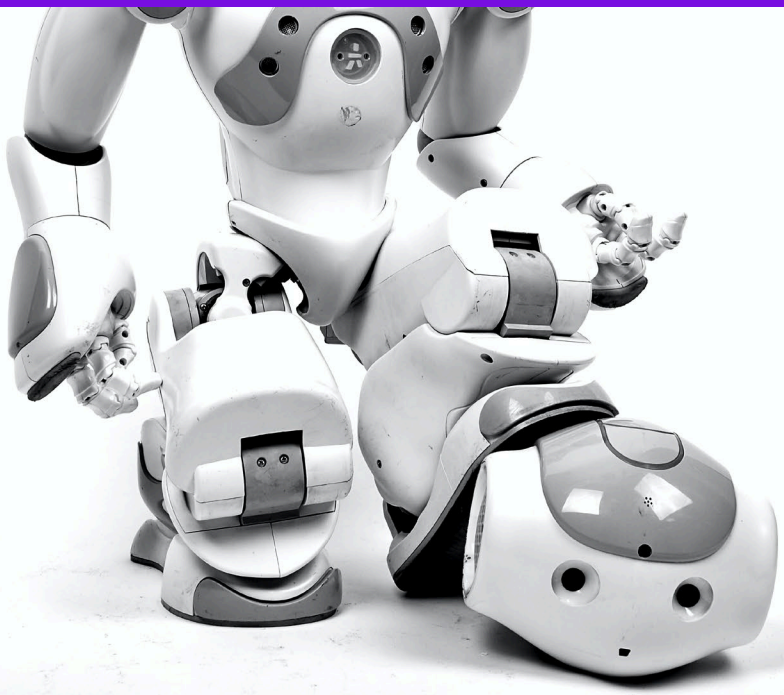
← 4th column total

← 2nd column total

Unit One
My research

Unit Two Overview

Topic	Fractions and Percentages
Links to the Curriculum	Number: decimals, fractions, percentages
Learning objectives	By the end of this unit, you will be able to: ✓ Understand and define fractions and percentages ✓ Work interchangeably with terminating fractions and their corresponding percentages
Instructions	1. Read and learn about the topic 2. Complete the activities 3. Explore the further reading



Unit Two
Key Vocabulary & Structures

Term	Definition
Fraction	Any part of a group, number or whole
Percentages	A percentage is a fraction expressed as a number out of 100 followed by the % symbol
Decimals	A number in a number system based on 10
Humanoid robot	A robot with a its body shape built to look like the human body
Animal-like robot	A robot which is built to look like a animal
Simplify	To simplify a fraction to its simplest form = to reduce the numerator and denominator
Interchangeable	Able to change something, very similar
Proportion	A part, share, or number considered in comparative relation to a whole
Significantly	In an important way
Interest	A strong like toward something

Unit Two
Student New Vocabulary

When you find words you don't recognise, make sure to look up their definition. Use this page to write them down and make a note of their definition! You can also add translations in your own language.

Term	Definition	My language

Unit Two
Reading and Learning

Section A

The robots' backgrounds

All **social robots** come in different shapes and sizes. That's the same with people. Many different children stay in hospital, and as a result, three different types of social robots were introduced at the Children's Hospital taking part in the study.

Active Reading

Look for words you don't know in a dictionary and add them to your New Vocabulary List!

Pepper

- Pepper is 120cm tall, and is as tall as an Emperor Penguin
- It's a **humanoid robot, meaning that it looks like a human**
- Pepper can be programmed to talk and perform actions like dancing

Nao

- Nao is 58cm tall, and is as tall as a medium-sized dog
- Nao is also a **humanoid robot**
- It can play both verbally and physically
- It can move, dance, talk and loves singing

Miro

- Miro is 36cm tall
- Miro is an **animal-like** robot
- It makes animal-like sounds
- It has sensory and motor abilities, meaning he can feel things and move

Some of these social robots can be programmed to speak another language. In another study, the Nao robot was renamed Nima which is a Persian name. This study took place in Iran.

Unit Two
Reading and Learning

Section B

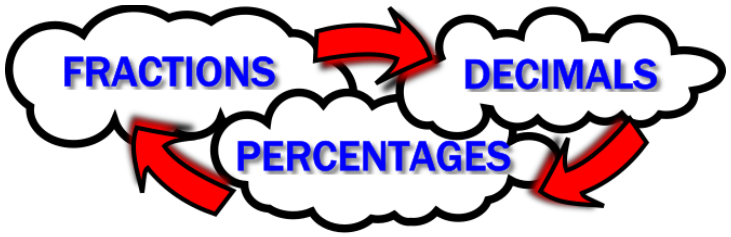
Fractions and percentages

Work with a partner and explain the text or parts of it to each other.

Social robots have been shown to have a highly positive impact on children's social engagement and wellbeing in hospital, as well as improve their hospital experience. It was discovered in the study that 41% of the children who **interacted** with Nao the robot while getting their injections smiled for a longer period than children who didn't play with the social robot.

Percentages are useful for comparing data and understanding the efforts of one thing to another. 41% is a percentage. It can also be written as a fraction, which is $\frac{41}{100}$.

Fractions and **percentages** are closely related and completely **interchangeable**.



List three points about the text. What have you learnt? Discuss with a friend or a family member.

In the same study, $\frac{20}{50}$ of the parents also enjoyed having Nao as a buddy for their child. $\frac{20}{50}$ is a large number and can be simplified to something smaller that is **equivalent**. In this case the simplified fraction is $\frac{2}{5}$.

The study concluded that social robots could be used in patient education and preparation for upcoming medical procedures, as well as play.

Unit Two
Reading and Learning

Section B

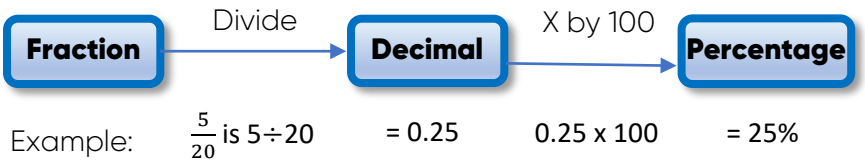
Fractions, Decimals and Percentages

The systematic review found seven robots that were used across different studies. Nao the robot was used $\frac{4}{10}$ times, Pepper the robot was used $\frac{2}{10}$ times, and animal-like robots were used $\frac{4}{10}$ times.

From these fractions, you can see that Nao the robot and animal-like robots seemed most popular.

Below is a guide on how to change a fraction to a percentage:

Don't forget you can use your own language for problem-solving!



Example: $\frac{5}{20}$ is 5÷20 = 0.25 0.25 x 100 = 25%

Here are the fractions, in the form of decimals and percentages:

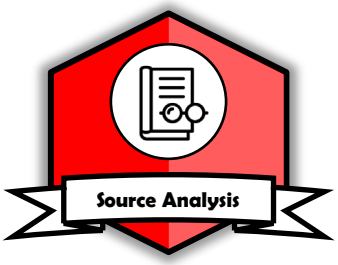
Fraction	Decimals	Percentage
$\frac{4}{10}$	0.4	40%
$\frac{2}{10}$	0.2	20%
$\frac{4}{10}$	0.4	40%

Research has shown that children have a special interest in social robots. Five teenagers were asked to share how much their anxiety levels had decreased after their interaction with Nao the robot. This was their results:

Person 1	Person 2	Person 3	Person 4	Person 5
10%	40%	50%	75%	25%

Unit Two Activities

Activities



1. In one of the studies, 41% of the children who interacted with Nao the robot while getting their injections smiled for a longer period than children who didn't play with the social robot

a) Can you change 41% into a **fraction**?

b) Can you change 41% into a **decimal**?

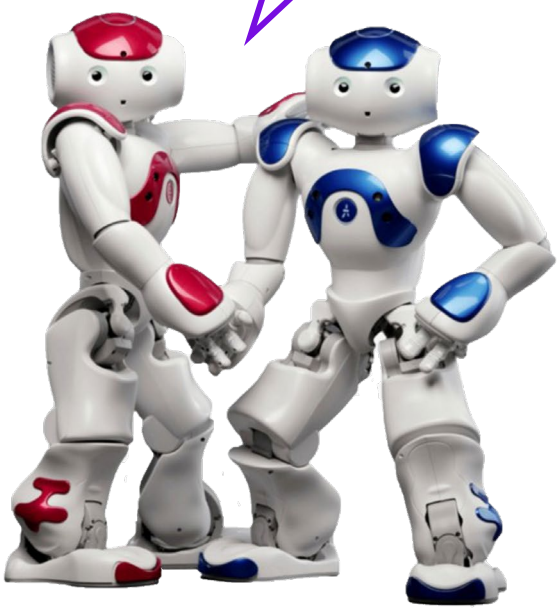
c) What is the **percentage** of children who did not not smile for a long period while getting their injections?

d) Write the answer for question c) as a **fraction**.

Read the text aloud. This will help with understanding!

Discuss with a friend or family member what you think Nao the robot is doing to make the children smile for a long time.

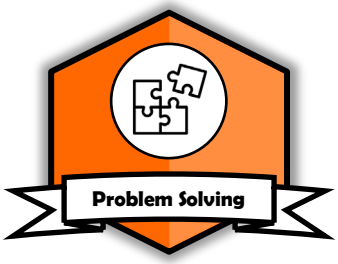
Our names are Gosia and Matthew. Use page 28 to help you!

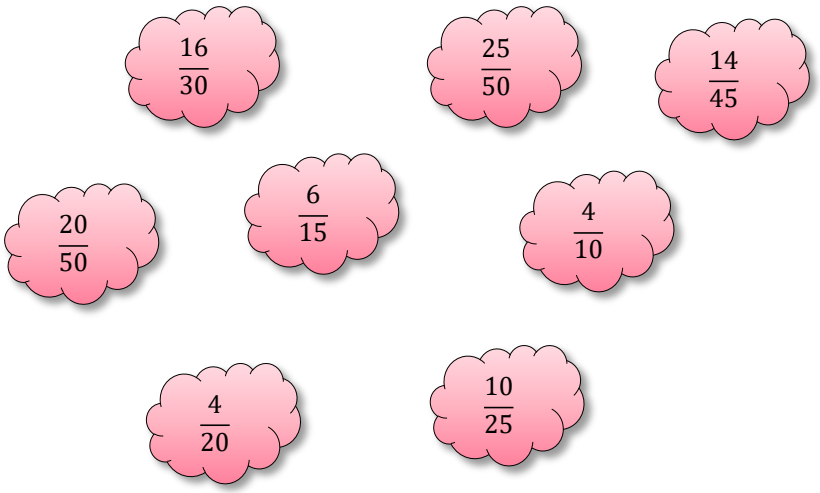


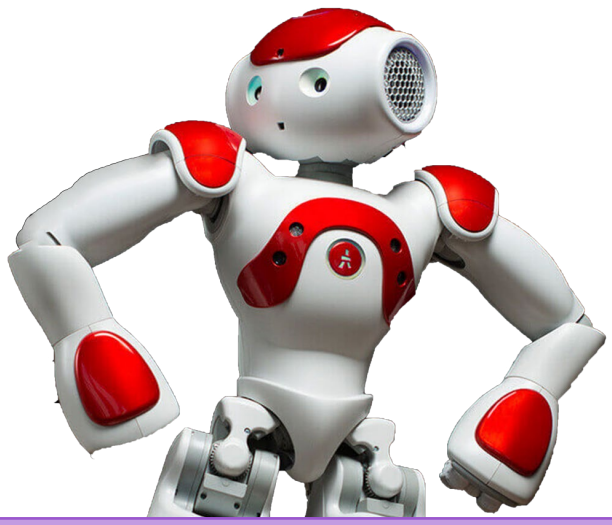
Unit Two Activities

Activities

2. In the same study, 2/5 of parents also enjoyed having Nao as a distraction. Can you help Nao by ticking with a pencil or pen all the fractions that are equivalent to 2/5? (Tip: there are four.)







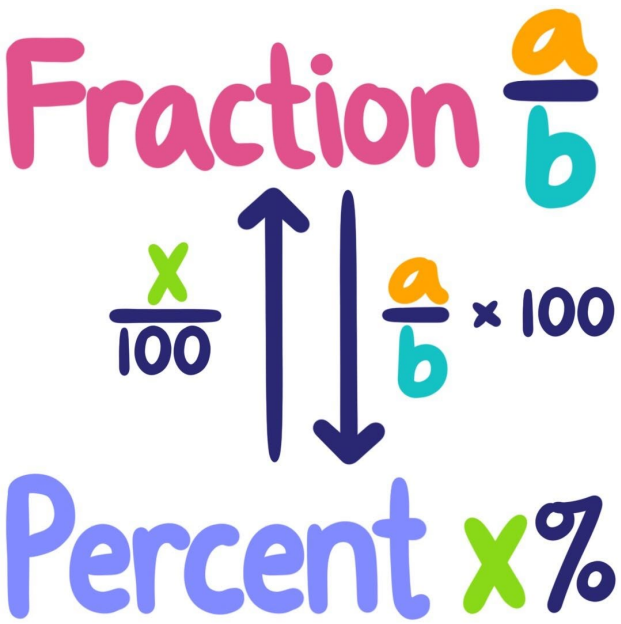
The size of the robots matters a lot because some children may not be able to play with some robots. For example, Pepper may be too big for smaller children, and Miro could be low to reach for children in wheelchairs.

Unit Two Activities

Activities 3. Match the right percentage to the right fraction.

Ask your teacher for help, if you need to!

Percentages	Fractions
10%	$\frac{1}{2}$
40%	$\frac{3}{4}$
50%	$\frac{1}{4}$
75%	$\frac{1}{10}$
25%	$\frac{2}{5}$



Unit Two
Challenge & Further Reading

Challenge Activity

Research has shown that children have a special interest in social robots. Five teenagers were asked to share how much their anxiety levels had decreased after their interaction with Nao the robot. These were their results.

	Person 1	Person 2	Person 3	Person 4	Person 5
Percentages	10%	40%	50%	75%	25%
Decimals					
Fraction					

Can you change the results from the 5 teenagers to decimals and fraction?

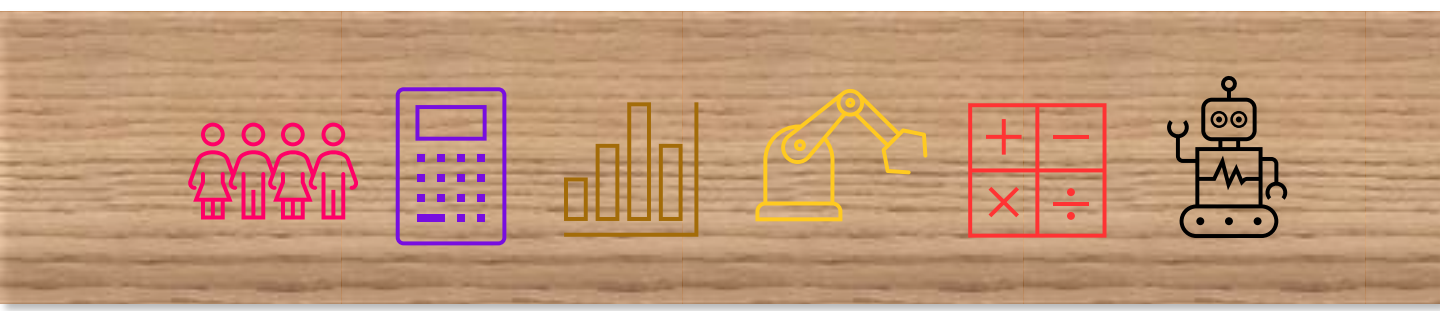
Then make a revision poster showing how you turn percentages into decimals and fractions.
Use the next page to create your poster!

Useful links

- Fractions
- Equivalent fractions
- Simplify fraction

Explore further

- Converting fractions, decimals and percentages
- Pepper the robot
- Nao the robot
- Miro the robot



Unit Two
My research

Challenge Question	Make a revision poster showing how you turn percentages into decimals and fractions.

Unit Two
My research

Unit Three Overview

Topic	Probability
Links to the Curriculum	Probability: Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcome
Learning objectives	By the end of this unit, you will be able to: ✓ Use appropriate language when dealing with probability ✓ Understand that the probabilities of outcomes sum to 1 ✓ Analyse the frequency of outcomes of simple probability
Instructions	1. Read and learn about the topic 2. Complete the activities 3. Explore the further reading

Unit Three
Key Vocabulary & Structures

Term	Definition
Probability (Probabilities)	The chance that a particular outcome will occur, measured as a ratio of the total of possible outcomes
Programmed	To code instructions for them to be performed
Divert	To change course or to change from one direction to another
Likelihood	The chance that a particular outcome will occur
Impossible	Not able to happen
Certain	Will definitely happen

Unit Three
Student New Vocabulary

When you find words you don't recognise, make sure to look up their definition. Use this page to write them down and make a note of their definition! You can also add translations in your own language.

Term	Definition	My language

Unit Three
Reading and Learning

Section A

The roles of the robot

Read the text aloud. This will help with understanding!

Social robots are given multiple roles to play, when **interacting** with children. In one study, the Nao robot played a doctor, a nurse, a cook and a hero for children with cancer. In this particular study, the **anxiety** score of the group that played with Nao was lowered significantly.

In another study, the Nao robot was **programmed** to guide children while having their injections: the robot would **divert** their attention to fun topics and perform dances and music. This also reduced the children's **distress** levels as well as pain.

The type of role played by the social robot is important because it can increase or decrease the children's anxiety and distress levels, and make them either go up or come down. The **probability** of the **interactions** being successful relies on the types of play and actions that have been **programmed**.

Credit: Plymouth University

Unit Three
Reading and Learning

Section B

Probability

- **Probability** is the maths of chance/choice.
- A probability is a number that tells you how likely something is going to happen.
- Probabilities can be written as fractions, decimals or percentages.

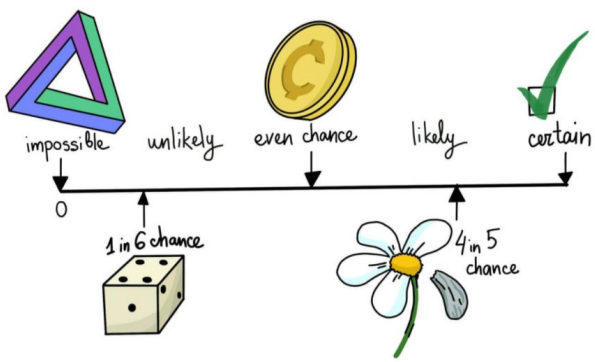
In probabilities, 0 is **impossible** and 1 is **certain**.

Example:
Christmas in the UK is on 25th December → 1 (certain)
A coin is tossed and you get a head → 1/2 (even or 50/50)
You can naturally grow another arm → 0 (impossible)

From our studies on social robots, we have discovered the probabilities of a few things:

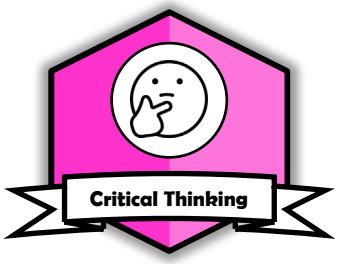
- It is likely that social robots can decrease the levels of anxiety, distress, and pain in some children who are visiting the hospital.
- All the studies used in the systematic review showcased that children enjoyed playing with social robots. The results have showed a very high likelihood of interaction between the child and the social robot.
- It is also impossible for children not to play with social robots that are presented to them. Children seem to have a special interest in them.

The Probability Scale



Unit Three Activities

Activities

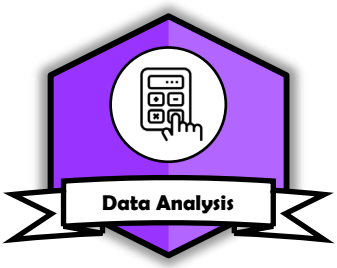


1. The probability of the interactions between the children and the social robots being successful relies on the types of play and actions that have been programmed into the social robot.
   Can you think of some activities Nao the robot can do to reduce the anxiety levels in children staying in hospital for two weeks?

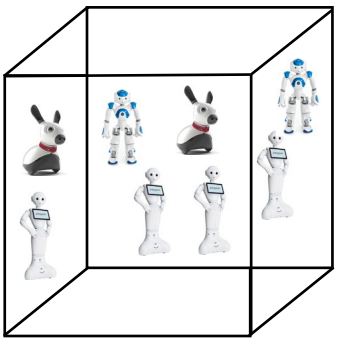
Dancer Gael Rougegrez of Blanca Li Dance Company Performs with Nao the robot at the Barbican Centre in London, on Feb 22, 2017
Credit: Ian Gavan

Unit Three Activities

Activities



2. All the studies used in the systematic review showcased that children enjoyed playing with social robots. So for one of the studies, we are asking children to pick a robot.

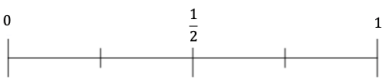


There are 8 social robots in a box:

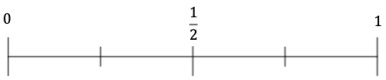
- 4 Pepper robots (P)
- 2 Nao robots (N)
- 2 Miro robots (M)

A child picks a social robot at random form the box.

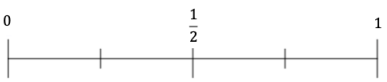
a) On the probability scale, write the letter P for the probability that a child will choose a Pepper robot.



b) On the probability scale, write the letter N for the probability that a child will choose a Nao robot.



c) On the probability scale, write the letter M for the probability that a child will choose a Miro robot.



Unit Three
Challenge & Further Reading

Challenge Activity

Based on what you have learned, do some research and find three other social robots that are used to interact with children. Use the internet and work with a friend or family member. Make a poster, a video or a podcast to showcase your findings.

Use the next page to write your response!

Useful links

- Probability
- Probability Scale

Explore further

- Therapeutic Robots in Media Arts

Unit Three
My research

Challenge Question

Do some research and find three other social robots that are used to interact with children. Use the internet and work with a friend or family member.

Unit Three
My research

Unit Four Overview

Topic	Pie Charts
Links to the Curriculum	Statistics: Construct and interpret appropriate bar and pie charts
Learning objectives	By the end of this unit, you will be able to: ✓ Understand the different ways of representing **data** ✓ Construct a pie chart ✓ Interpret data from charts and diagrams
Instructions	1. Read and learn about the topic 2. Complete the activities 3. Explore the further reading

Unit Four
Key Vocabulary & Structures

Term	Definition
Represent	To showcase information or be appointed to act on behalf of something or someone
Diagram	A simplified drawing showing the appearance, structure, or workings of something
Angle	The amount of turning between two rays called arms meeting at a common point. An angle is measured in degrees.
Autism	A development disorder
Therapy	A time to talk to a professional, a counselling session

Unit Four
Student New Vocabulary

When you find words you don't recognise, make sure to look up their definition. Use this page to write them down and make a note of their definition! You can also add translations in your own language.

Term	Definition	My language

Unit Four
Reading and Learning

Section A

Representing Data

Read the text aloud. This will help with understanding!

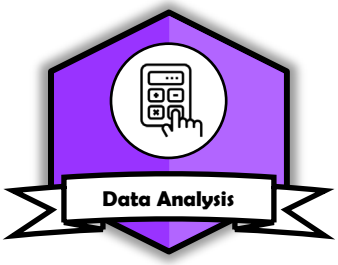
When you collect **data**, you can **represent** it in the form of a **diagram.** This helps to display your results neatly and clearly in a visual way.

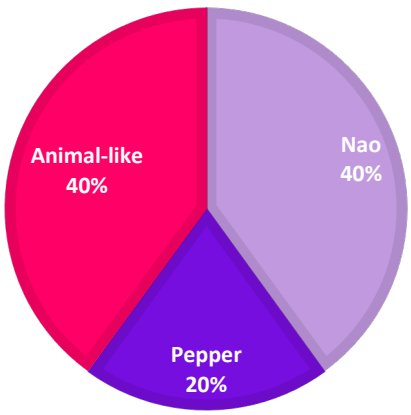
There are many different charts and diagrams you can use to display the same result.

In Unit 2, we mentioned that the systematic review found that Nao the robot was used $\frac{4}{10}$ times, Pepper the robot was used $\frac{2}{10}$ times and animal-like robots were used $\frac{4}{10}$ times.

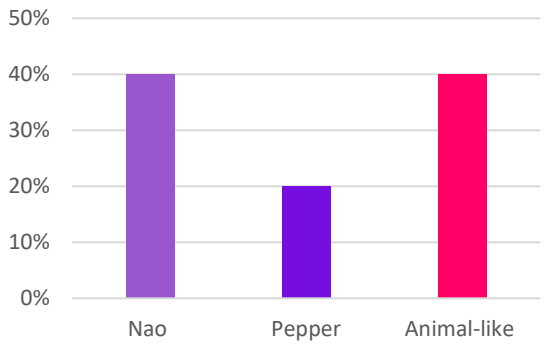
Here are the results displayed in a pie chart and in a bar chart.

Pie Chart





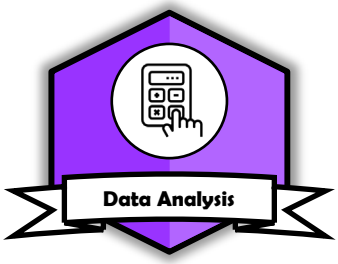
Bar Chart



Unit Four
Reading and Learning

Section B

Pie Charts



Here we will focus on representing data on pie charts. A pie chart is a useful way to **represent data.** It is clear to look at and easy to understand. Every sector of a pie is a **angle**, and that represents the fraction out of 360.

Angles in a circle add up to 360.

Now let's have a look at a pie chart together.

A school wants to start using social robots to help teach lessons. A group of students are asked which social robot is their favourite. The results are shown in the table below. The **frequency** is the number of times a particular item is mentioned or appears.

Work with a partner and explain the text or parts of it to each other.

Robots	Frequency
Pepper	20
Nao	15
Miro	8
Paro	17
Total	60

Credit: Creative Robotics Lab at the university of New South Wales

Unit Four
Reading and Learning

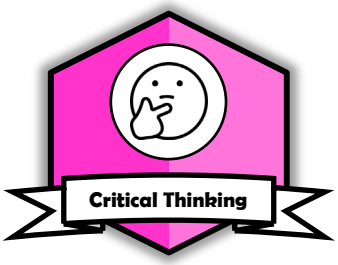
Section B

Pie Charts

Now let's put the results into a pie chart.

Robots	Frequency		Angle
Pepper	20	(20 ÷ 60) x 360	120
Nao	15	(15 ÷ 60) x 360	90
Miro	8	(8 ÷ 60) x 360	48
Paro	17	(17 ÷ 60) x 360	102
Total	60		360

Ask your teacher for help, if you need to!



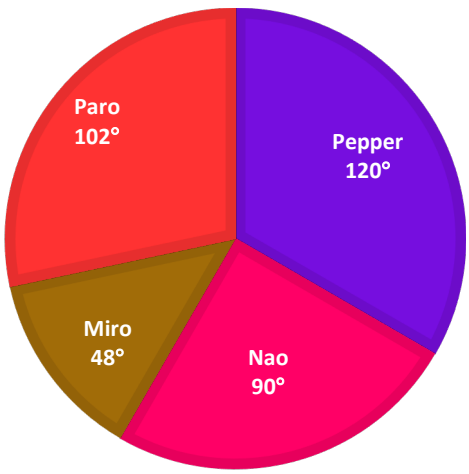
How to work out the angle:

Step 1: Find the total of the frequency (20+15+8+17=60)

Step 2: Divide each frequency by the total number (20 ÷ 60=2/6)°

Step 3: Multiply the answer from step 2 by 360 (2/6 x 360 = 120)

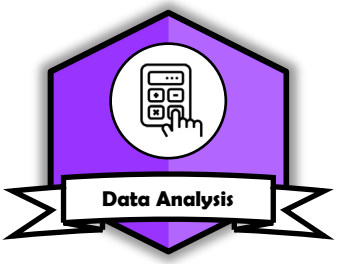
Now we are going to display the results on a pie chart:



Unit Four Activities

Activities

1. KASPER is a social robot that has been designed for children with autism. It has been used during therapy sessions. We asked children from the session which robot they preferred:

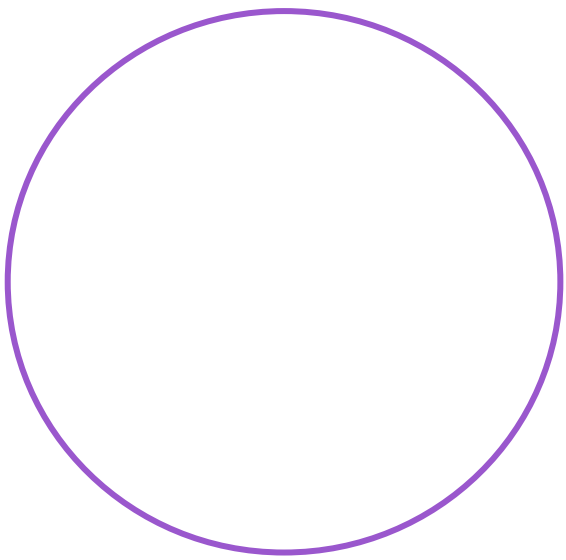


Robots	Frequency	Angle
Pepper	15	45
Nao		72
Miro	20	
Paro		63
KASPER		
Total	**120**	

Ask your teacher for help, if you need to!

First complete the table above with the missing data. Then, complete the pie chart below to show the information from the table.

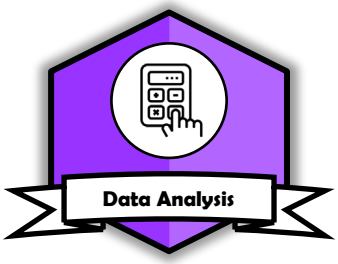
My name is KASPER, I have been designed by the Research group of the University of Hertfordshire, here in the UK

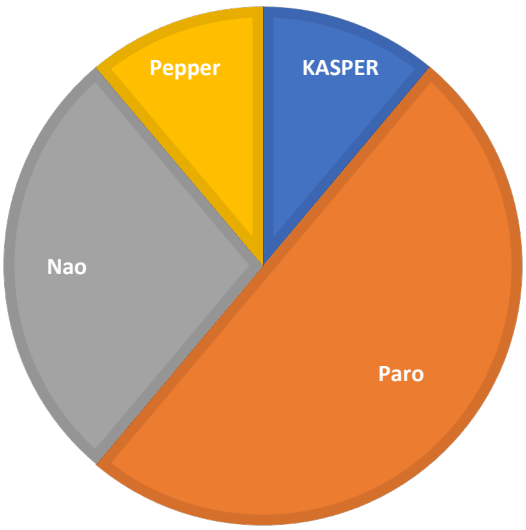


Unit Four Activities

Activities

2. Social robots have also acted as buddies for children who have cancer and are missing their friends from school.
   Some children were asked to name their favourite robot.
   The pie chart below shows the results:





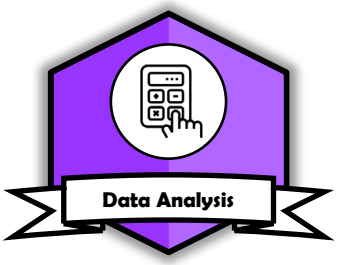
a) Which robot is the most popular?
b) Which robots are equally popular?
c) What angle is Paro?

My name is Paro and I am a baby seal. I help children feel better when they are sad. They really like my fur.

Unit Four Activities

Activities

3. Nao the robot has been used for children going to the hospital to receive injections. Injections can be very scary, so Nao the robot does different activities to make children smile.
   We asked children which activity they would like Nao the robot to do.



a) Calculate the angles that represent each activity.

Nao	Frequency	Angle
Dance	8	
Sing	7	
Books	5	
Total		

b) As an extra challenge, represent the data on a bar chart. Look back at page 48 to help you.

Unit Four
Challenge & Further Activities

Challenge Activity

Based on what you have learned about pie charts, now it's your turn to be a researcher!

Do some research on any topic you like. For example, which snacks are most popular in children, or which animals people like best. It could be any topic you like!

Based on the information you find, create your own table, and then a pie chart.

Use the next page to write your response!

Useful links

- Representing data
- Pie charts

Explore further

- Huggable: A social robot for pediatric care
- Kasper the social robot
- Paro the therapeutic robot

Unit Four
My research

Challenge Question

Based on what you have learned about pie charts, do some research on any topic you like. Based on the information you find, create your own table, and then a pie chart.

Unit Four
My research

Final Reflection Activity

The Final Reflection is the final activity where you are able to show what you have learned from this pack. It allows you to put forward your own ideas based on your learning and your research.

For Students - Reflection activity

Write 400 words answering the following question:

How can social robots decrease the anxiety levels of children visiting the hospital? Present your findings on a poster or in any media of your choice, for example in a video with audio commentary. Support your answer with evidence you have gathered from this pack and your own research, for example data, charts, tables, etc.

Top tips:

1. Don't forget to use your earlier activities to help you answer the question

2. Make sure you back up your answer with evidence from this pack or from your own research.

3. Ask a trusted adult or teacher to read your response and give you helpful feedback. Does it make sense to them even though they are not an expert? Can they give you advice for improving it?

– Or –

For Teachers - Reflection classroom discussion

Hold a group or class discussion on which social robots may be the best in a hospital setting and why.

Final Reflection Activity
My research

Final Reflection Activity
My research

Part 3 – Study Skills, Tips & Guidance

This section includes helpful tips to help you complete this pack, as well as improve your study skills for any courses you take next year.

It also includes a few fantastic easy-to-use resources on what to do next and where else to look for more information on the subject.

In this section:

Study Skills:

- ✓ Key Instruction Words
- ✓ Academic Writing
- ✓ Referencing

Subject Guidance:

- ✓ More on studying this subject

Study Skills
Key Instruction Words

These words will often be used by teachers and tutors as you go through school. It is a good idea to carefully read instruction words before attempting to answer a question.

Analyse – When you analyse something, you consider it carefully and in detail in order to understand and explain it. To analyse, identify the main parts or ideas of a subject and examine or interpret the connections between them.

Comment – When you comment on a subject or the ideas in a subject, you say something that gives your opinion about it or an explanation for it.

Compare – To compare things means to point out the differences or similarities between them. A comparison essay would involve examining qualities/characteristics of a subject and emphasising the similarities and differences.

Contrast – When you contrast two subjects, you show how they differ when compared with each other. A contrast essay should emphasise striking differences between two elements.

Compare and contrast – To write a compare and contrast essay, you would examine the similarities and differences between two subjects.

Criticise – When you criticise, you make judgments about a subject after thinking about it carefully and deeply. Express your judgement with respect to the correctness or merit of the factors under consideration. Give the results of your own analysis and discuss the limitations and contributions of the factors in question. Support your judgement with evidence.

Define – When you define something, you show, describe, or state clearly what it is and what it is like. You can also say what its limits are. Do not include details but do include what distinguishes it from the other related things, sometimes by giving examples.

Describe – To describe in an essay requires you to give a detailed account of characteristics, properties or qualities of a subject.

Discuss – To discuss in an essay, consider your subject from different points of view. Examine, analyse and present considerations for and against the problem or statement.

Study Skills
Key Instruction Words

Continued

Evaluate – When you evaluate in an essay, decide on your subject's significance, value or quality after carefully studying its good and bad features. Use authoritative (e.g. from established authors or theorists in the field) and, to some extent, personal appraisal of both contributions and limitations of the subject. Similar to **assess**.

Illustrate – If asked to illustrate in an essay, explain the points that you are making clearly by using examples, diagrams, statistics etc.

Interpret – In an essay that requires you to interpret, you should translate, solve, give examples, or comment upon the subject and evaluate it in terms of your judgement or reaction. In other words, give an explanation of what your subject means. Similar to **explain**.

Justify – When asked to justify a statement in an essay, you should provide the reasons and grounds for the conclusions you draw from the statement. Present your evidence in a form that will convince your reader.

Outline – Outlining requires that you explain ideas, plans, or theories in a general way, without giving all the details. Organise and systematically describe the main points or general principles. Use essential supplementary material but omit minor details.

Prove – When proving a statement, experiment or theory in an essay, you must confirm or verify it. You are expected to evaluate the material and present experimental evidence and/or logical argument.

Relate – To relate two things, you should state or claim the connection or link between them. Show the relationship by emphasising these connections and associations.

Review – When you review, critically examine, analyse and comment on the major points of a subject in an organised manner

Study Skills
Academic writing

What is academic writing?

'Academic writing' is a special way of writing when talking about research or a point of view.

It has a logical structure and uses formal language. Various sources of information are also used to support what is being said.

Academic writing: how to guide

- Use words you know and are confident using, making sure that what you write makes sense and is clear.
- Do not use contractions, like 'don't' or 'can't'. Instead, write these out fully: 'do not', 'cannot'.
- Do not use colloquialisms, meaning words or phrases that are not formal and that you would use when you speak. Examples include 'ace', 'brilliant', 'like chalk and cheese', etc.
- Do not use slang or jargon, for example 'daft', 'bloke', 'dodgy'.

Expressing your opinion in academic writing

In academic writing, it is best to express an opinion without writing in the first person. Your work should show that it is supported by specific evidence and facts, rather than your personal intuition.

Therefore, rather than saying 'In my opinion, this proves that', you can express the outcome of your reasoning in other ways:

- 'This indicates that…';
- 'The aforementioned problems in Smith's argument reveal that…';
- 'Such weaknesses ultimately mean that…', and so on.

Study Skills
Referencing

What is a reference or referencing?

A reference is just a note in your work *(M. Gupta, 1985)* that tells your reader where specific ideas, information or opinions that you have used from another source have come from.

As well as being academic good practice, referencing is very important, because it will help you to avoid plagiarism.

Plagiarism is when you take someone else's work or ideas and pass them off as your own. **Whether plagiarism is deliberate or accidental, the consequences can be severe.**

Why should I reference?

Referencing is important in your work for the following reasons:

- It gives credit to the authors of any sources you have referred to or been influenced by.
- It supports the arguments you make in your assignments.
- It demonstrates the variety of sources you have used.
- It helps to prevent you from losing marks, or failing, due to plagiarism.

When should I use a reference?

You should use a reference when you:

- Quote directly from another source.
- Summarise or rephrase another piece of work.
- Include a specific statistic or fact from a source.

How should I reference?

For short assignments like the ones in this pack, you can mention the author or source in the sentence in brackets *(M. Gupta, 1985)* or at the bottom of your piece of work. If you are not sure about when or if you should reference, check with your teacher.

More on studying this subject

Further studies and career options

- ✓ Studying Mathematics at GCSE will cover this topic in more detail.
- ✓ Maths is a great fit for students who are interested in numbers and research.
- ✓ If you like robots, you could consider going into Computer Science or Engineering.
- ✓ If you like working with children in hospital, you could consider medical careers such as Medicine, Nursing or explore Child psychology.
- ✓ Research into social robots and their impact is performed by several people including medical doctors, mathematicians, designers and psychologist.

A Deeper Look Into using social robots:

- ✓ **Read:** If you are interested in learning more about the social robots that have been used in hospitals, have a read of this article: https://adc.bmj.com/content/archdischild/early/2021/03/07/
- ✓ **Watch:** To learn more about the Huggable Robotic Bear that is being used at the Boston Children's Hospital: https://www.media.mit.edu/projects/huggable-a-social-robot-for-pediatric-care/overview/
- ✓ **Listen:** In this webinar, three international experts discuss social robots: Social robots today and tomorrow: an overview
- ✓ **Do:** Keep track of any time you come across any social robots in the news or at school. When you do, take a note of what they are being used for.

In partnership with

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The Higher Progression Partnership South Yorkshire (HeppSY) is part of a national programme to help school and college students aged 13-19 across South Yorkshire. We support those at most risk of missing out on Higher Education by providing impartial outreach work including information to help students make well informed decisions about their future and routes into university, higher and degree apprenticeships or other providers. HeppSY works in partnership with Sheffield Hallam, The University of Sheffield and schools and colleges across our region. You can visit us at www.heppsy.org, follow us on Twitter @HeppSYPlus or find us on Youtube where there are many resources.

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