CENSUS AT SCHOOLS 2019/20

ACTIVITY PACK

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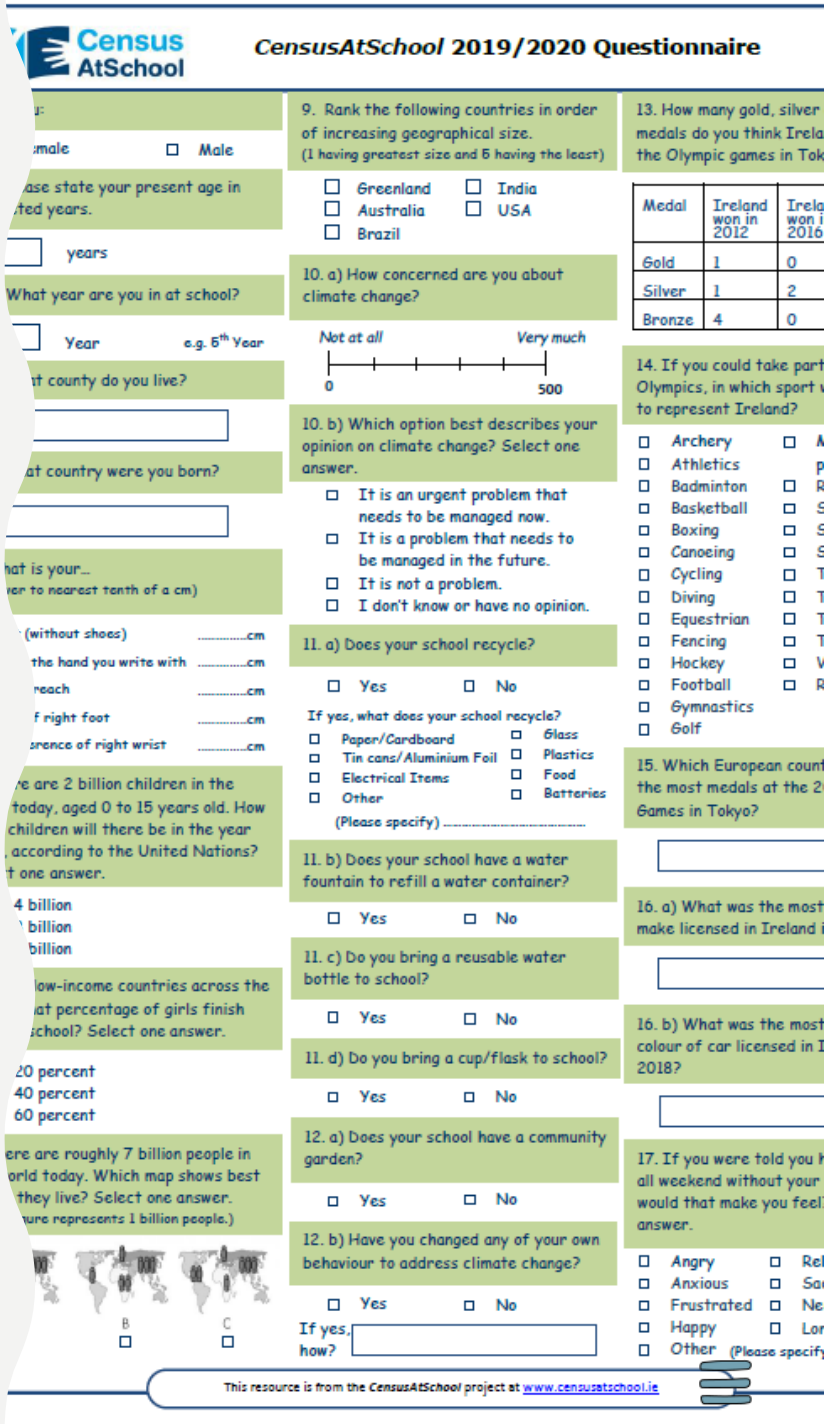
CENSUS AT SCHOOLS – ABOUT

The Census at Schools is a project that involves students collecting data about themselves to improve understanding of data gathering, its purposes and benefits.

The results of the questionnaires get entered into a database with the results of all other students in Ireland.

Teachers and students can then access the database of results to make conclusions about the population of students in Ireland or make comparisons between the results of our sample and those of the population.



STATISTICAL INVESTIGATIONS

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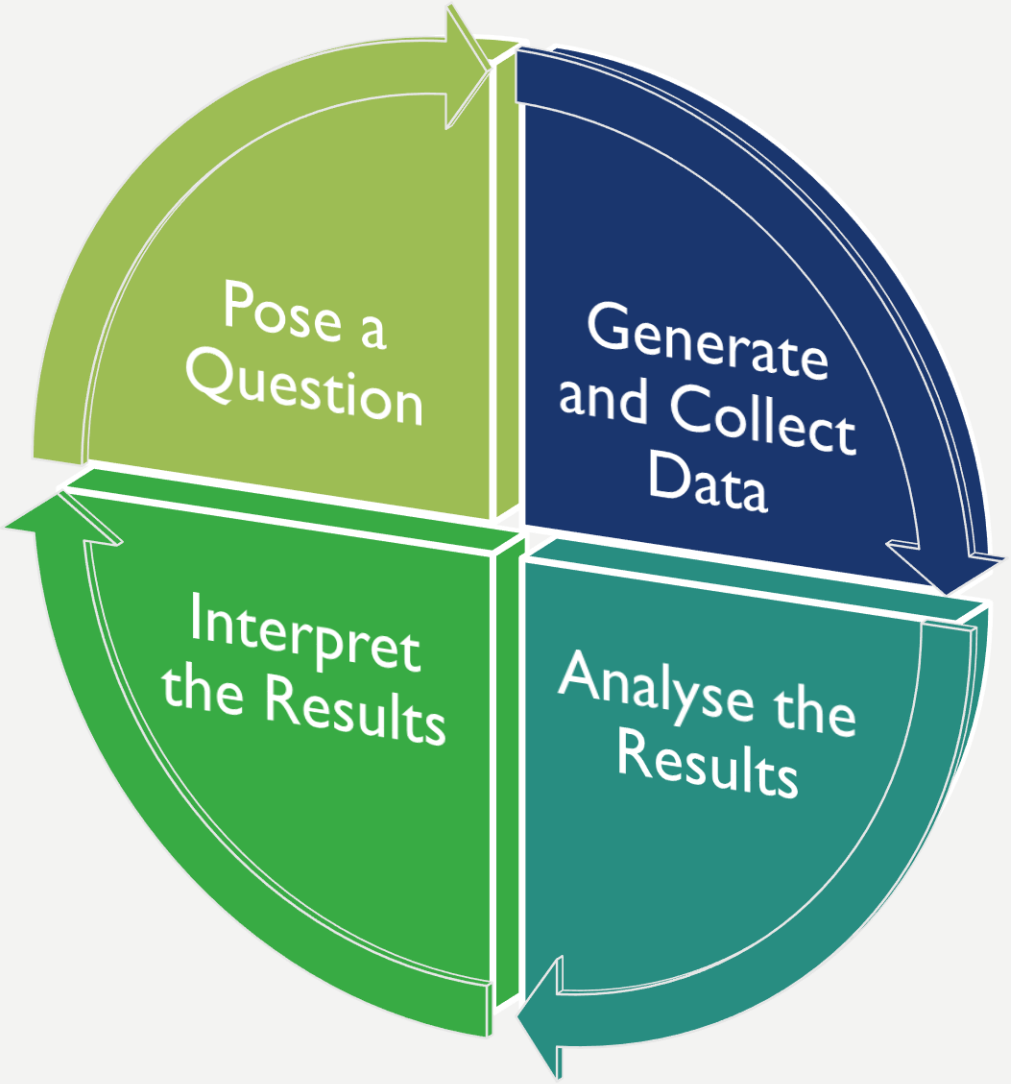
- Exam Question 5

STEPS IN A STATISTICAL INVESTIGATION



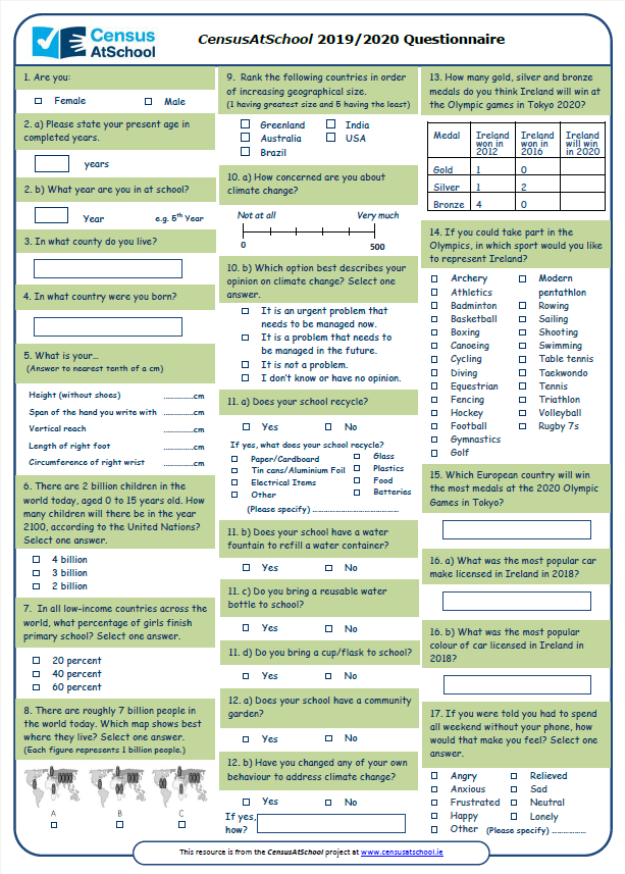
WHAT QUESTIONS ARE BEING POSED BY THE CREATORS OF THE CENSUS AT SCHOOLS QUESTIONNAIRE?

The CensusAtSchools 2019/20 questionnaire consists of 17 questions.

Read through each of the questions.

In your opinion what are the creators of the study trying to find out?

Formulate a question that could be added to the survey and give reasons for its inclusion.



Census AtSchool

CensusAtSchool 2019/2020 Questionnaire

1. Are you:
☐ Female ☐ Male

2. a) Please state your present age in completed years.
☐ years

2. b) What year are you in at school?
☐ Year e.g. 6th Year

3. In what county do you live?

4. In what country were you born?

5. What is your...
(Answer to nearest tenth of a cm)
Height (without shoes) .....cm
Span of the hand you write with .....cm
Vertical reach .....cm
Length of right foot .....cm
Circumference of right wrist .....cm

6. There are 2 billion children in the world today, aged 0 to 15 years old. How many children will there be in the year 2100, according to the United Nations? Select one answer.
☐ 4 billion
☐ 3 billion
☐ 2 billion

7. In all low-income countries across the world, what percentage of girls finish primary school? Select one answer.
☐ 20 percent
☐ 40 percent
☐ 60 percent

8. There are roughly 7 billion people in the world today. Which map shows best where they live? Select one answer.
(Each figure represents 1 billion people.)
A ☐ B ☐ C ☐

9. Rank the following countries in order of increasing geographical size.
(1 having greatest size and 6 having the least)
☐ Greenland ☐ India
☐ Australia ☐ USA
☐ Brazil

10. a) How concerned are you about climate change?
Not at all — Very much
0 — 500

10. b) Which option best describes your opinion on climate change? Select one answer.
☐ It is an urgent problem that needs to be managed now.
☐ It is a problem that needs to be managed in the future.
☐ It is not a problem.
☐ I don't know or have no opinion.

11. a) Does your school recycle?
☐ Yes ☐ No
If yes, what does your school recycle?
☐ Paper/Cardboard ☐ Glass
☐ Tin cans/Aluminium Foil ☐ Plastics
☐ Electrical Items ☐ Food
☐ Other ☐ Batteries
(Please specify) .....

11. b) Does your school have a water fountain to refill a water container?
☐ Yes ☐ No

11. c) Do you bring a reusable water bottle to school?
☐ Yes ☐ No

11. d) Do you bring a cup/flask to school?
☐ Yes ☐ No

12. a) Does your school have a community garden?
☐ Yes ☐ No

12. b) Have you changed any of your own behaviour to address climate change?
☐ Yes ☐ No
If yes, how? .....

13. How many gold, silver and bronze medals do you think Ireland will win at the Olympic games in Tokyo 2020?

Medal	Ireland won in 2012	Ireland won in 2016	Ireland will win in 2020
Gold	1	0	
Silver	1	2	
Bronze	4	0	

14. If you could take part in the Olympics, in which sport would you like to represent Ireland?
☐ Archery ☐ Modern pentathlon
☐ Athletics ☐ Rowing
☐ Badminton ☐ Sailing
☐ Basketball ☐ Shooting
☐ Boxing ☐ Swimming
☐ Canoeing ☐ Table tennis
☐ Cycling ☐ Taekwondo
☐ Diving ☐ Tennis
☐ Equestrian ☐ Triathlon
☐ Fencing ☐ Volleyball
☐ Hockey ☐ Rugby 7s
☐ Football
☐ Gymnastics
☐ Golf

15. Which European country will win the most medals at the 2020 Olympic Games in Tokyo?

16. a) What was the most popular car make licensed in Ireland in 2018?

16. b) What was the most popular colour of car licensed in Ireland in 2018?

17. If you were told you had to spend all weekend without your phone, how would that make you feel? Select one answer.
☐ Angry ☐ Relieved
☐ Anxious ☐ Sad
☐ Frustrated ☐ Neutral
☐ Happy ☐ Lonely
☐ Other (Please specify) .....

This resource is from the *CensusAtSchool* project at www.censusatschool.ie

CONDUCTING A SURVEY

Many of the questions in the questionnaire are designed to gain insight into the thoughts of young people on climate change.

Carry out a **survey** of another class in your school that focuses on this aspect of the study.

The survey should help you find out more about the opinions of the school regarding climate change and issues regarding the environment.

Do you think the opinions of other students in the school is the same or different that those in other parts of the world?

Do you think the views of students in the schools is different from that of their parents or grandparents?

COLLECTING DATA

- **Population** – in statistics, population refers to the whole group that is being studied. In the case of the CensusAtSchools 2019/20, the population is ALL of the secondary school students in Ireland. A **census** is a collection of data from a whole population rather than just a sample.
- **Sample** – a sample is a selection taken from a larger group (the population). Samples help us find out information about a population when it is not feasible to get information from all of the people in that very large group.
- **Survey** – a survey involves the collecting of data from a sample to gather information about that group and make inferences about the population.
- **Questionnaire** – a questionnaire is any written set of questions and is the main tool for collecting the data in a survey. The CensusAtSchools 2019/20 questionnaire consists of 17 questions designed to not only gather factual information about secondary school students but to gain insight into the their opinions on pressing issues such as climate change and topical events like the 2020 Tokyo Olympic Games.

IS THE CENSUSATSCHOOLS 2019/20 REALLY A CENSUS?

- A census is an official survey of a population.
- In the case of the CensusAtSchools 2019/20, the population is all of the secondary schools in Ireland.
- The word census is of Latin origin (censere – to estimate), used in the Roman Republic, to determine taxes.
- The last census in Ireland took place on the 24th April, 2016 and showed that Ireland had a total population of 4,757,976.
- The results of the 2016 (and earlier) census can be found by clicking the link below?

  https://www.cso.ie/en/census/index.html
- The next census in Ireland will take place on the 18th April, 2021. There is a legal obligation to complete the census form.
- Will every student in the country complete and return the CensusAtSchools 2019/20 questionnaire?

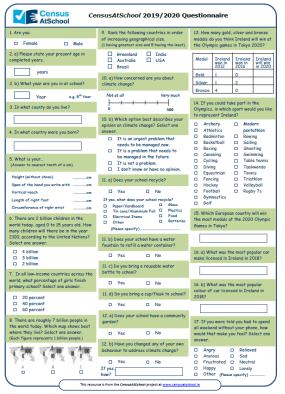
Section 1: Activity 3

DISTRIBUTING THE QUESTIONNAIRE

The CensusAtSchools 2019/20 questionnaire consists of 17 questions.

Discuss possible methods for the distribution and collection of questionnaires to students in Ireland?

List some of the advantages and disadvantages of each.



Section 1: Activity 4

METHOD OF DISTRIBUTION – ADVANTAGES AND DISADVANTAGES

Type	Advantages	Disadvantages
Online Form		
Mail		
Telephone		
Face to Face		
Email		

The CensusAtSchools 2019/20 is completed by students online.

SECTION 1
EXAM QUESTION 1
JCHL 2015
Q3 (C)

CONDUCTING A SIMPLE RANDOM SAMPLE

Eithne is considering sending her survey by email.

State **one advantage** and **one disadvantage** of using email to collect data.

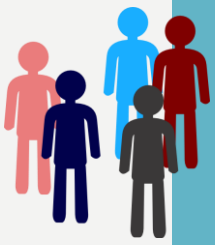
Advantages:

- Quick
- Convenient
- Cheap
- Private (Anonymous)
- People might be more honest

Disadvantages:

- Not everyone has email
- May go to Spam
- Faulty computer
- Results not immediate

TYPES OF SAMPLE



- **Simple random sample** – in this type of sample each member of the population has the same chance of being chosen.
- **Stratified random sample** – first divide population into subgroups (strata) so that individuals within each subgroup share characteristics. Then a sample random sample is drawn from each group e.g. we might first divide population by gender.
- **Systematic random sample** – we label each member of the sample group with a number, randomly select a starting point and then choose at fixed periodic intervals e.g. select every 5th entry.
- **Cluster sample** – population is divided by sections or clusters. Then some of those clusters are randomly selected and all members from those clusters are chosen e.g. if we want a sample of students, we first get a list of schools and then select a school and use all of those students.
- **Quota sample** – This is a non probability method of sampling. We select to fill a quota of a certain type of subgroup e.g. selecting men between age 30 and 40.

SELECTING A SAMPLE TYPE

Section 1:Activity 5

We want to survey a random sample of 50 students in our school.

Complete the table to suggest a suitable strategy you could use for each of the following sampling types.

Sample Type	Method
Simple Random Sample	
Stratified Random Sample	
Systematic Random Sample	
Cluster Sample	

SECTION 1
EXAM QUESTION 2
JCHL 2015
Q3 (B)

CONDUCTING A SIMPLE RANDOM SAMPLE

Eithne is going to send her survey to some of the post-primary schools in Ireland.

Describe how Eithne could select a **Simple Random Sample** from all the post-primary schools in Ireland.

Get a list of all of the post-primary schools in Ireland.

Randomly select a number of them, e.g. using random number generator.

SECTION 1
EXAM QUESTION 3
JCHL 2017
Q6 (D)

IMPORTANCE OF HAVING A REPRESENTATIVE SAMPLE

Clara is worried that the students in her school are not a representative sample of all of the students in Ireland.

Explain why it is important to have a **representative** sample when doing statistical research.

So that the results aren't biased

OR

So that results will apply to the whole population instead of just the sample

SECTION 1
EXAM QUESTION 4
JCHL 2014
Q5 (B)

BIAS IN SAMPLING

Margaret wants to examine if people prefer to do their weekly shopping in *Tesco*, *Dunnes Stores*, *SuperValu*, or *Lidl*. She stands outside her local *Lidl* shop for one day, and asks everyone as they leave the shop where they prefer to do their weekly shopping.

Give one reason why Margaret's data may be biased.

Margaret's data may be biased because her sample is probably not representative.

She will probably have a lot more people answering "Lidl" than she should as she doing the survey at Lidl!

SECTION 1
EXAM QUESTION 5
JCHL 2014S
Q5 (IV)

REPRESENTATIVE SAMPLE

2014 Sample JCHL Paper 2 – Question 5 (iv)

John is conducting a survey on computer usage by students at his school. His questionnaire asks "Approximately how long do you spend on social networking sites each week?".
He plans to carry out his survey by asking the question to twenty first-year boys on the Monday after the mid-term break.
Give two reasons why the results from John's question might not be as representative as those in the histogram.

- It is a very small sample, less than 30 students.
- Attendance in the school may be slight worse than normal on Mondays.
- Students will probably spend MORE time on social media over the holidays as they are off.
- The sample only includes 1st year boys and so is not as representative of the student body as the 100 random students selected.

TYPES OF DATA

SECTION 2

- Activity 1
- Activity 2
- Activity 3
- Activity 4

- Exam Question 1
- Exam Question 2
- Exam Question 3

WHAT IS DATA?

- Data is a collection of facts and statistics that are gathered for reference or analysis. We often refer to the data we have collected as a data set.
- In the CensusAtSchools we collect a data set that includes numbers, measurements, words, opinions etc
- The data we are collecting can be:
  - Qualitative: this is descriptive information.
  - Quantitative: this is numerical information.

SOURCES OF DATA

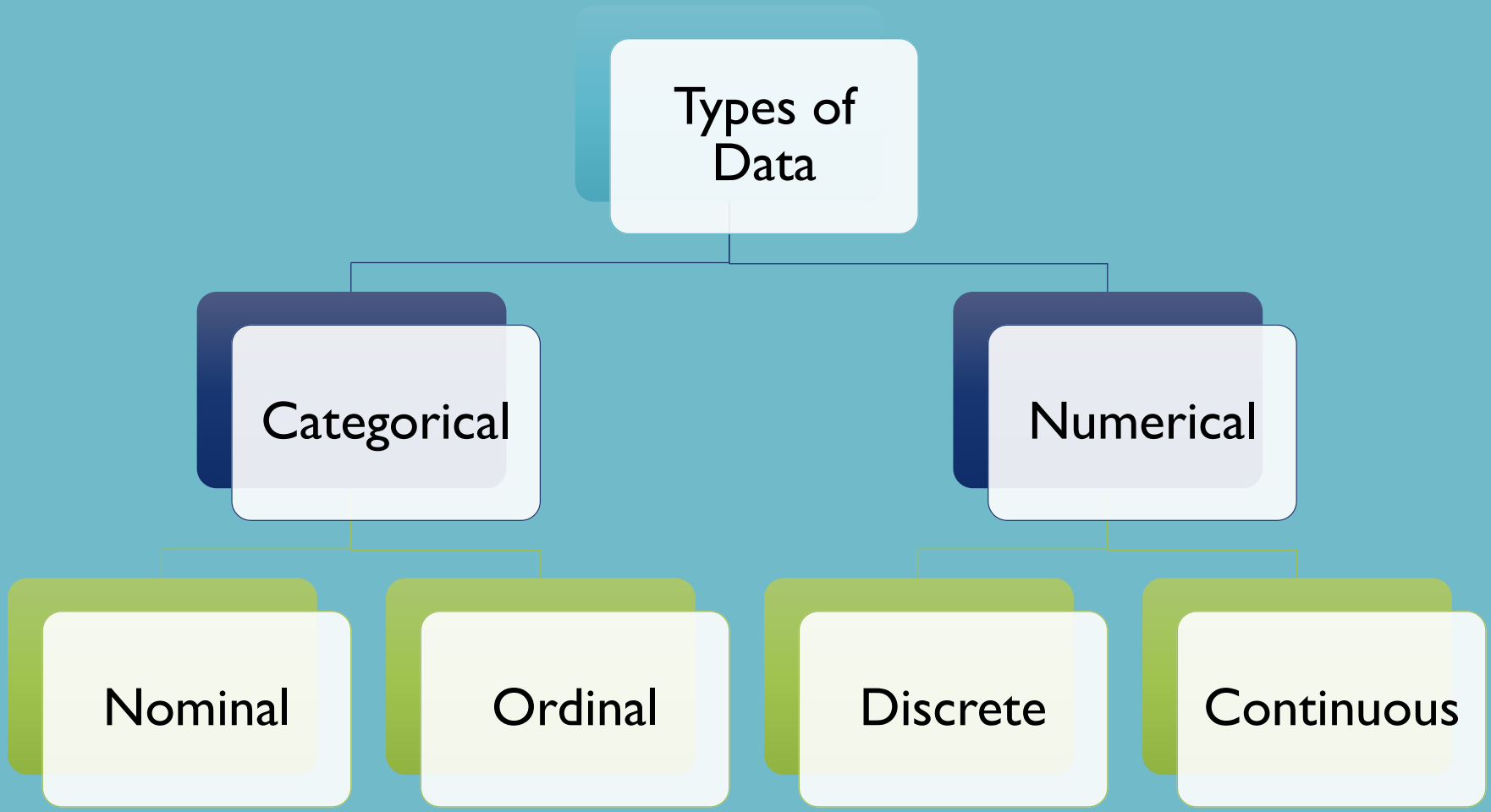
Primary – Data collected by the user themselves

- Experimental Study
- Observational Study
- Questionnaire
- Census

Secondary – Data collected by someone other than the user

- Internet
- Newspapers
- Books
- Journals

DATA TYPES


Types of Data
Categorical
Numerical
Nominal
Ordinal
Discrete
Continuous

DATA TYPES

- **Categorical Nominal**
  - This is qualitative data identified by names or categories and cannot be organised by any natural ordering.
    - Examples: Gender (Male/ Female), Eye Colour (Green, Blue etc), Favourite Food (Chicken, Pasta etc).
- **Categorical Ordinal**
  - This is qualitative data identified by categories that can be placed in some kind of natural order or on a scale.
    - Example: Customer Satisfaction – Poor, Satisfactory, Good, Very Good, Excellent.
- **Numerical Discrete**
  - This is quantitative data that can only have a finite number of values
    - Examples: Number of siblings, number of subjects studied.
- **Numerical Continuous**
  - This is quantitative data that can take an infinite number of values within a selected range
    - Examples: Height, weight, time taken to run 100 m.

TYPE OF DATA

Section 2: Activity 1

Some of the questions in the CensusAtSchool 2019/2020 Questionnaire are shown in the table below.

Put a tick (✓) in the correct box to show what type of data each question would return.

	Numerical Continuous	Numerical Discrete	Categorical Nominal	Categorical Ordinal
1. Are you: ☐ Female ☐ Male			✓	
2 (a). Please state your present age in completed years.		✓		
5. What is your height in cm (without shoes)?	✓			
10 (a). How concerned are you about climate change? Not at all ☐ Somewhat ☐ Very Much ☐				✓
13. How many gold, silver and bronze medals do you think Ireland will win at the Olympic games in Tokyo 2020?		✓		

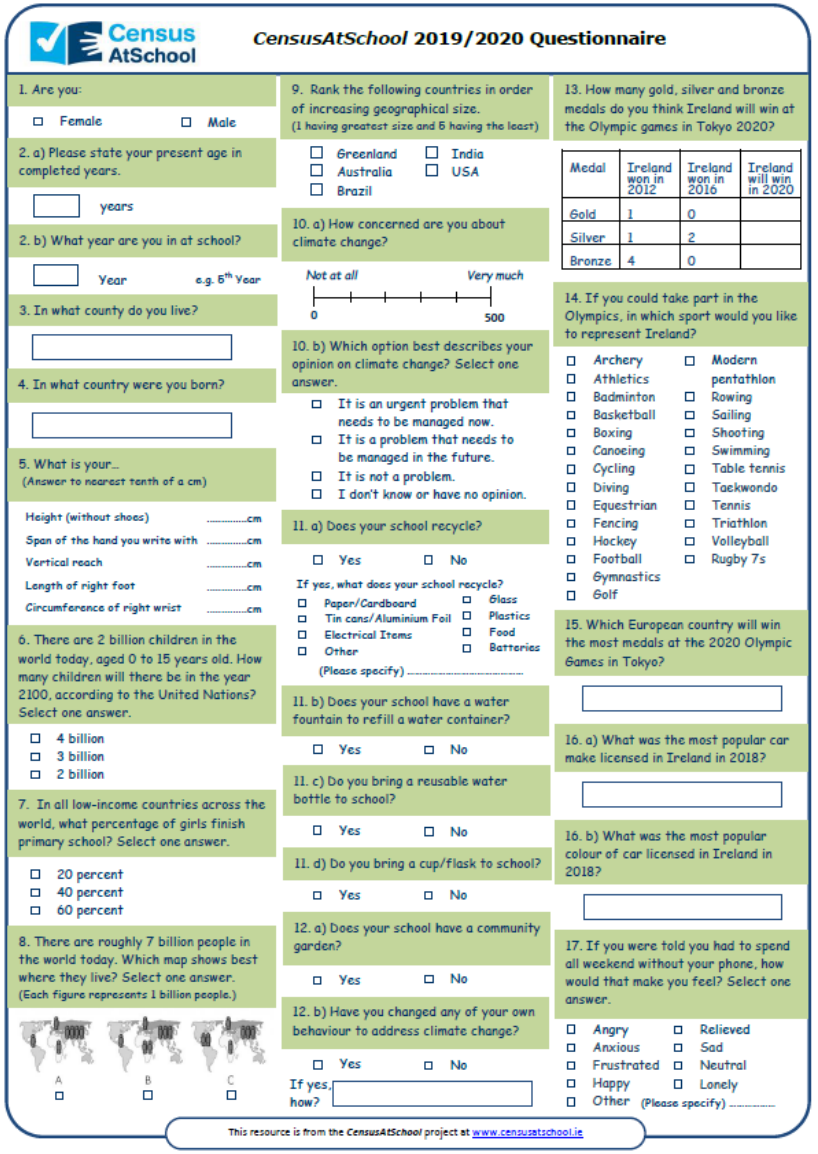
CATEGORICAL VS NUMERICAL DATA

Reread each of the questions in the CensusAtSchools 2019/20 Questionnaire.

What type of data is generated by each of the questions?

Are there any questions where it is hard to decide what type of data it is?

If so, how could we alter the question to make it easier to ascertain a data type.



Census AtSchool

CensusAtSchool 2019/2020 Questionnaire

1. Are you:
☐ Female ☐ Male

2. a) Please state your present age in completed years.
☐ years

2. b) What year are you in at school?
☐ Year e.g. 6th Year

3. In what county do you live?

4. In what country were you born?

5. What is your...
(Answer to nearest tenth of a cm)
Height (without shoes) .....cm
Span of the hand you write with .....cm
Vertical reach .....cm
Length of right foot .....cm
Circumference of right wrist .....cm

6. There are 2 billion children in the world today, aged 0 to 15 years old. How many children will there be in the year 2100, according to the United Nations? Select one answer.
☐ 4 billion
☐ 3 billion
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7. In all low-income countries across the world, what percentage of girls finish primary school? Select one answer.
☐ 20 percent
☐ 40 percent
☐ 60 percent

8. There are roughly 7 billion people in the world today. Which map shows best where they live? Select one answer.
(Each figure represents 1 billion people.)
A ☐ B ☐ C ☐

9. Rank the following countries in order of increasing geographical size.
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10. a) How concerned are you about climate change?
Not at all — Very much
0 — 500

10. b) Which option best describes your opinion on climate change? Select one answer.
☐ It is an urgent problem that needs to be managed now.
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☐ It is not a problem.
☐ I don't know or have no opinion.

11. a) Does your school recycle?
☐ Yes ☐ No
If yes, what does your school recycle?
☐ Paper/Cardboard ☐ Glass
☐ Tin cans/Aluminium Foil ☐ Plastics
☐ Electrical Items ☐ Food
☐ Other ☐ Batteries
(Please specify) .....

11. b) Does your school have a water fountain to refill a water container?
☐ Yes ☐ No

11. c) Do you bring a reusable water bottle to school?
☐ Yes ☐ No

11. d) Do you bring a cup/flask to school?
☐ Yes ☐ No

12. a) Does your school have a community garden?
☐ Yes ☐ No

12. b) Have you changed any of your own behaviour to address climate change?
☐ Yes ☐ No
If yes, how?

13. How many gold, silver and bronze medals do you think Ireland will win at the Olympic games in Tokyo 2020?

Medal	Ireland won in 2012	Ireland won in 2016	Ireland will win in 2020
Gold	1	0	
Silver	1	2	
Bronze	4	0	

14. If you could take part in the Olympics, in which sport would you like to represent Ireland?
☐ Archery ☐ Modern pentathlon
☐ Athletics ☐ Rowing
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☐ Basketball ☐ Shooting
☐ Boxing ☐ Swimming
☐ Canoeing ☐ Table tennis
☐ Cycling ☐ Taekwondo
☐ Diving ☐ Tennis
☐ Equestrian ☐ Triathlon
☐ Fencing ☐ Volleyball
☐ Hockey ☐ Rugby 7s
☐ Football
☐ Gymnastics
☐ Golf

15. Which European country will win the most medals at the 2020 Olympic Games in Tokyo?

16. a) What was the most popular car make licensed in Ireland in 2018?

16. b) What was the most popular colour of car licensed in Ireland in 2018?

17. If you were told you had to spend all weekend without your phone, how would that make you feel? Select one answer.
☐ Angry ☐ Relieved
☐ Anxious ☐ Sad
☐ Frustrated ☐ Neutral
☐ Happy ☐ Lonely
☐ Other (Please specify) .....

This resource is from the *CensusAtSchool* project at www.censusatschool.ie

FORMULATING QUESTIONS FOR A QUESTIONNAIRE

Questions 13 through 15 in the CensusAtSchool 2019/2020 Questionnaire concern a popular upcoming event, the 2020 Tokyo Olympics.

Complete the table below by formulating one question you could ask about the 2020 Tokyo Olympics that would generate each type of data.

Type of Data	Question
Numerical Continuous	
Numerical Discrete	
Categorical Ordinal	
Categorical Nominal	

SECTION 2
EXAM QUESTION 1
JCHL 2015
Q3 (A)

TYPE OF DATA

2015 JCHL Paper 2 – Question 3 (a)

Eithne is going to survey post-primary Geography teachers in Ireland.

Some of the questions in the survey are shown in the table below.
Put a tick (✓) in the correct box to show what type of data each question would give.

Question	Numerical Continuous	Numerical Discrete	Categorical Nominal	Categorical Ordinal
How many Geography classes do you teach each week?		✓		
How much do you like teaching Geography? A lot ❒ A little ❒ Not at all ❒				✓
What subjects (other than Geography) do you teach?			✓	

SECTION 2
EXAM QUESTION 2
JCHL 2014
Q5 (A)

TYPE OF DATA

2014 JCHL Paper 2 – Question 5 (a) (i)

Students in a class are investigating spending in their local area. They carry out a different survey, and display the results.
John is investigating whether people pay for their weekly shopping with Credit Card, Debit Card, Cash, or Cheque.
When people tell him which one of these they usually use he writes it in a table. His results are shown below.

What type of data has John collected? Put a tick (✔) in the correct box below.

Credit Card	Debit Card	Debit Card	Cash	Debit Card
Credit Card	Cash	Cash	Credit Card	Debit Card
Debit Card	Debit Card	Cheque	Cash	Cash
Cash	Cash	Debit Card	Cash	Credit Card

Numerical Continuous	Numerical Discrete	Categorical Nominal	Categorical Ordinal
☐	☐	☑	☐

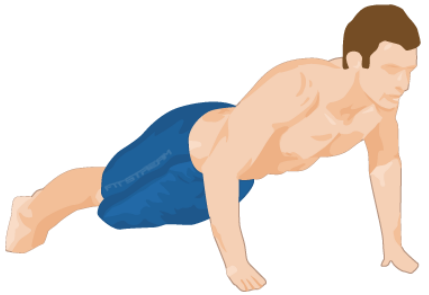
SECTION 2
EXAM QUESTION 3
JCHL 2017
Q6 (C)

FORMULATING QUESTIONS THAT
GENERATE DIFFERENT TYPES OF DATA

2017 JCHL Paper 2 – Question 6 (c)

Complete the table below to show one question in each case that Clara could ask that would generate each type of data. Each question should be about eating or exercise. One is already filled in.

Type of Data	Question
Numerical continuous	How long does it take you to run 5km? What is your current weight/ height? How much water do you drink each day?
Numerical discrete	How many times a week do you exercise? How many press ups can you do in a minute?
Categorical ordinal	How healthy is your diet? Tick one box. Very healthy ❑ Fairly healthy ❑ Not very healthy ❑ Very unhealthy ❑
Categorical nominal	What is your favourite food? What is your least favourite exercise?



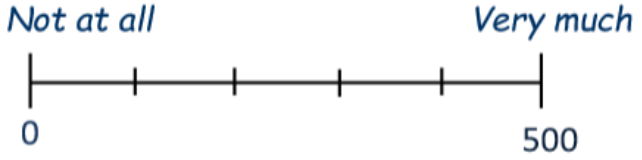
CATEGORICAL OR NUMERICAL

Question 10 (a) of the 2019/2020 CensusAtSchools Questionnaire asks us how concerned we are about climate change. The strength of our concern can be ascertained by a position on a scale.

Discuss whether this question contains Numerical or Categorical data?

Can the data gathered be both numerical and categorical?

10. a) How concerned are you about climate change?

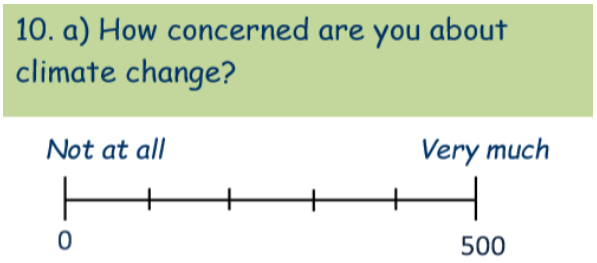


CATEGORICAL OR NUMERICAL

Categorical data CAN take on numerical values, such as 1 indicating Yes and 2 indicating No however in that example 1 and 2 would have no numerical meaning.

On Q10 the numbers 0 to 500 carry a weight representing the strength of a student's concern.

If we consider the data to be numerical then we can find statistical measures, such as the mean, the mode and the median, which can help us describe the feelings of the class toward climate change.



MEASURES OF CENTRAL TENDENCY

SECTION 3

Activity 1

Activity 2

Activity 3

Activity 4

Activity 5

Exam Question 1

Exam Question 2

Exam Question 3

Exam Question 4

Exam Question 5

MEASURES OF CENTRAL TENDENCY

Measures of Central Tendency refers to the different methods of working out the average (a measure of the centre of data).

$$\textbf{Mean } (\bar{x}) = \frac{\text{sum of all the values}}{\text{number of values}}$$

We just add up all the numbers and divide this by he number of numbers.

Use when data is numerical and there is NO extreme values (outliers).

Mode = the most common value

Use when data is categorical. An example would be hair colour.

Median = the middle value when they are arranged in order

(ranking them from lowest to highest)

An odd number of data items results in a unique median. If there is an even number of data items the median is the average of the middle two.

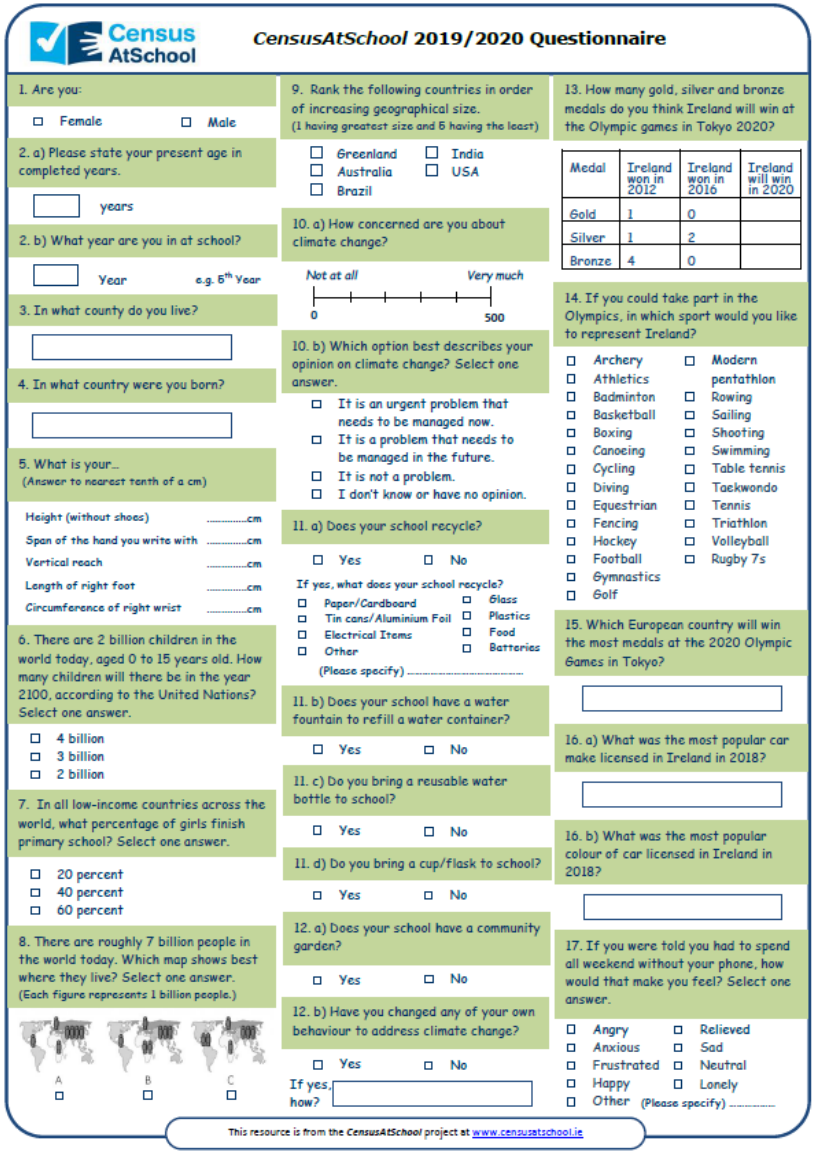
Use when data is numerical and there are extreme values.

MEAN, MODE AND MEDIAN

Reread each of the questions in the CensusAtSchools 2019/20 Questionnaire.

For each of the questions decide whether the mean, median and mode can be found from a sample of results?

For those where the mean, median or mode cannot be found, give reasons as to why not.



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CensusAtSchool 2019/2020 Questionnaire

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8. There are roughly 7 billion people in the world today. Which map shows best where they live? Select one answer.
(Each figure represents 1 billion people.)
A ☐ B ☐ C ☐

9. Rank the following countries in order of increasing geographical size.
(1 having greatest size and 6 having the least)
☐ Greenland ☐ India
☐ Australia ☐ USA
☐ Brazil

10. a) How concerned are you about climate change?
Not at all — Very much
0 — 500

10. b) Which option best describes your opinion on climate change? Select one answer.
☐ It is an urgent problem that needs to be managed now.
☐ It is a problem that needs to be managed in the future.
☐ It is not a problem.
☐ I don't know or have no opinion.

11. a) Does your school recycle?
☐ Yes ☐ No
If yes, what does your school recycle?
☐ Paper/Cardboard ☐ Glass
☐ Tin cans/Aluminium Foil ☐ Plastics
☐ Electrical Items ☐ Food
☐ Other ☐ Batteries
(Please specify) .....

11. b) Does your school have a water fountain to refill a water container?
☐ Yes ☐ No

11. c) Do you bring a reusable water bottle to school?
☐ Yes ☐ No

11. d) Do you bring a cup/flask to school?
☐ Yes ☐ No

12. a) Does your school have a community garden?
☐ Yes ☐ No

12. b) Have you changed any of your own behaviour to address climate change?
☐ Yes ☐ No
If yes, how?

13. How many gold, silver and bronze medals do you think Ireland will win at the Olympic games in Tokyo 2020?

Medal	Ireland won in 2012	Ireland won in 2016	Ireland will win in 2020
Gold	1	0	
Silver	1	2	
Bronze	4	0	

14. If you could take part in the Olympics, in which sport would you like to represent Ireland?
☐ Archery ☐ Modern pentathlon
☐ Athletics ☐ Rowing
☐ Badminton ☐ Sailing
☐ Basketball ☐ Shooting
☐ Boxing ☐ Swimming
☐ Canoeing ☐ Table tennis
☐ Cycling ☐ Taekwondo
☐ Diving ☐ Tennis
☐ Equestrian ☐ Triathlon
☐ Fencing ☐ Volleyball
☐ Hockey ☐ Rugby 7s
☐ Football
☐ Gymnastics
☐ Golf

15. Which European country will win the most medals at the 2020 Olympic Games in Tokyo?

16. a) What was the most popular car make licensed in Ireland in 2018?

16. b) What was the most popular colour of car licensed in Ireland in 2018?

17. If you were told you had to spend all weekend without your phone, how would that make you feel? Select one answer.
☐ Angry ☐ Relieved
☐ Anxious ☐ Sad
☐ Frustrated ☐ Neutral
☐ Happy ☐ Lonely
☐ Other (Please specify) .....

This resource is from the *CensusAtSchool* project at www.censusatschool.ie

APPROPRIATE MEASURE OF CENTRAL TENDENCY

Some of the questions in the CensusAtSchool 2019/2020 Questionnaire are shown in the table below.

Discuss the most appropriate measure of central tendency in each case.

Question	Appropriate Measure of Central Tendency	Reason
3. In what county do you live?		
5 (i). What is your height in cm (without shoes)?		
6. In all low-income countries across the world, what percentage of girls finish primary school? ☐ 20 percent ☐ 40 percent ☐ 60 percent		
13. How many gold, silver and bronze medals do you think Ireland will win at the Olympic games in Tokyo 2020?		
16 (b). What was the most popular colour of car licensed in Ireland in 2018?		

SECTION 3
EXAM QUESTION 1
JCHL 2014
Q5 (A)

APPROPRIATE MEASURE OF CENTRAL TENDENCY

2014 JCHL Paper 2 – Question 5 (a)

Students in a class are investigating spending in their local area. They carry out a different survey, and display the results.
John is investigating whether people pay for their weekly shopping with Credit Card, Debit Card, Cash, or Cheque.

When people tell him which one of these they usually use he writes it in a table. His results are shown below.

Credit Card	Debit Card	Debit Card	Cash	Debit Card
Credit Card	Cash	Cash	Credit Card	Debit Card
Debit Card	Debit Card	Cheque	Cash	Cash
Cash	Cash	Debit Card	Cash	Credit Card

(ii)

Fill in the frequency table below.

Method of Payment	Credit Card	Debit Card	Cash	Cheque
Frequency	4	7	8	1

What is the mode of John's data?

Credit Card	Debit Card	Debit Card	Cash	Debit Card
Credit Card	Cash	Cash	Credit Card	Debit Card
Debit Card	Debit Card	Cheque	Cash	Cash
Cash	Cash	Debit Card	Cash	Credit Card

Method of Payment	Credit Card	Debit Card	Cash	Cheque
Frequency	4	7	8	1

Mode - Most common

Mode = Cash

(iv)

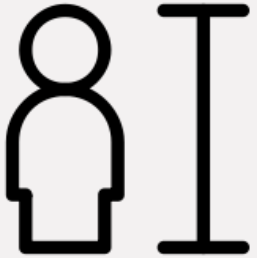
John says that he cannot find the mean of his data. Explain why this is the case.

He cannot add up his values and divide by 20.
The data is CATEGORICAL and not NUMERICAL.

THE MEAN, MODE AND MEDIAN OF A SET OF DATA

The list below shows the heights (in cm) of the group of 24 second year students in our CensusAtSchool 2019/2020 Questionnaire.

154, 154, 155, 156, 156, 158, 159, 159, 160, 160, 163, 163
163, 164, 164, 168, 168, 169, 169, 171, 174, 176, 179, 188



Use the data to calculate the:

(i) Mean height of students in the class
(ii) Mode height of students in the class
(iii) Median height of students in the class

5. What is your...

Height (without shoes) .....cm

Mean $= \dfrac{\text{sum of all the values}}{\text{number of values}}$

$$\text{Mean} = \frac{\text{sum of all the values}}{24}$$

$$= \frac{3950}{24}$$

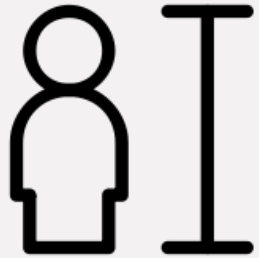
$$= 164.58$$

The mean height of the students in the class is 164.58 cm

THE MEAN, MODE AND MEDIAN OF A SET OF DATA

The list below shows the heights (in cm) of the group of 24 2nd year students in our CensusAtSchool 2019/2020 Questionnaire.

154, 154, 155, 156, 156, 158, 159, 159, 160, 160, 163, 163
163, 164, 164, 168, 168, 169, 169, 171, 174, 176, 179, 188



Use the data to calculate the:

(i) Mean height of students in the class
(ii) Mode height of students in the class
(iii) Median height of students in the class

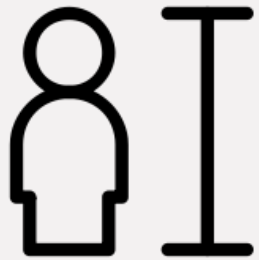
Mode = Most common

The mode height is 163 cm as it occurs more often than any of the other heights.

THE MEAN, MODE AND MEDIAN OF A SET OF DATA

The list below shows the heights (in cm) of the group of 24 2nd year students in our CensusAtSchool 2019/2020 Questionnaire.

154, 154, 155, 156, 156, 158, 159, 159, 160, 160, 163, 163
163, 164, 164, 168, 168, 169, 169, 171, 174, 176, 179, 188



Use the data to calculate the:

(i) Mean height of students in the class
(ii) Mode height of students in the class
(iii) Median height of students in the class

Median = Middle value when the data is ordered from lowest to highest.

Median

$$\frac{24}{2} = 12$$

There is an even number of data items therefore the median is the average of the 12th and 13th values.

We can see that both the 12th and 13th students have a height of 163 cm.

$$\frac{163 + 163}{2} = 163 \text{ cm}$$

The median height of the students in the class is 163 cm.

SECTION 3
EXAM QUESTION 2
JCHL 2018
Q6 (A)

FINDING THE MEAN OF A SET OF DATA

16 girls and 14 boys went on a school tour to Barcelona.
The weight of each student's bag (in kg) is shown in the tables below.

Girls			
5·8	6·3	6·9	7·6
7·8	8·0	8·1	8·7
9·1	9·4	9·5	9·6
9·8	9·8	9·8	11·3

Boys			
5·9	6·8	7·4	8·5
8·6	8·7	8·8	9·2
9·4	9·5	9·5	9·7
9·7	10·5		

(a)

The mean weight of the girls' bags was 8·6 kg, correct to one decimal place.
Work out the **mean weight** of the **boys'** bags, correct to one decimal place.

$$\textbf{Mean} = \frac{\text{sum of all the values}}{\text{number of values}}$$

$$\text{Mean} = \frac{5.9 + 6.8 + 7.4 + 8.5 + 8.6 + 8.7 + 8.8 + 9.2 + 9.4 + 9.5 + 9.5 + 9.7 + 9.7 + 10.5}{14}$$

$$= \frac{122.2}{14}$$

$$= 8.7$$

The mean weight of the boys bags is 8.7 kg

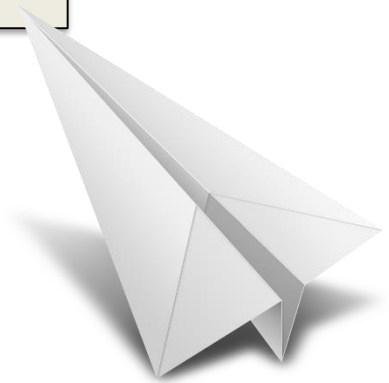
SECTION 3
EXAM QUESTION 3
JCHL 2011
Q5

MEASURES OF CENTRAL TENDENCY

The table below shows the distances travelled by seven paper airplanes after they were thrown.

Find the median of the data.

Median = the middle value when they are arranged in order (ranking them from lowest to highest)



Airplane	A	B	C	D	E	F	G
Distance (cm)	188	200	250	30	380	330	302

There is an odd number of data items therefore the median is a unique value.

Median

$\frac{7}{2} = 3.5$

Round to the 4^{th} data item.

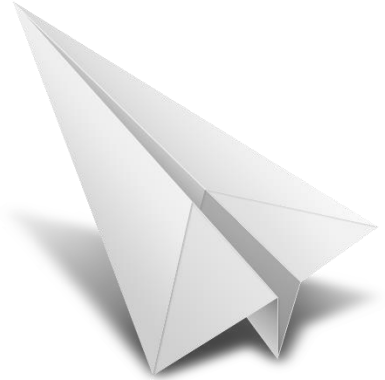
Order from smallest to largest.

30, 188, 200, 250, 302, 330, 380

Median = 250 cm

Find the mean of the data.

Airplane	A	B	C	D	E	F	G
Distance (cm)	188	200	250	30	380	330	302



Mean $= \dfrac{\text{sum of all the values}}{\text{number of values}}$

$$\text{Mean} = \frac{188 + 200 + 250 + 30 + 380 + 330 + 302}{7}$$

$$= \frac{1680}{7}$$

$$= 240 \text{ cm}$$

Airplane D is thrown again and the distance it travels is measured and recorded in place of the original measurement. The median of the data remains unchanged and the mean is now equal to the median. How far did airplane D travel the second time?

Airplane	A	B	C	D	E	F	G
Distance (cm)	188	200	250	x	380	330	302

Let x be the distance flown by Airplane D.

$$\text{Mean} = \text{Median} = 250$$

Mean $= \dfrac{\text{sum of all the values}}{\text{number of values}}$

$$\frac{188 + 200 + 250 + x + 380 + 330 + 302}{7} = 250$$

$$1650 + x = (7)250$$

$$1650 + x = 1750$$

$$x = 1750 - 1650$$

$$x = 100$$

What is the minimum distance that airplane D would need to have travelled in order for the median to have changed?

100, 188, 200, 250, 302, 330, 380

To become the median it will have to pass 250 so the minimum distance to become the median is the smallest number bigger than 250!

$x > 250$ cm, $x \in R$.

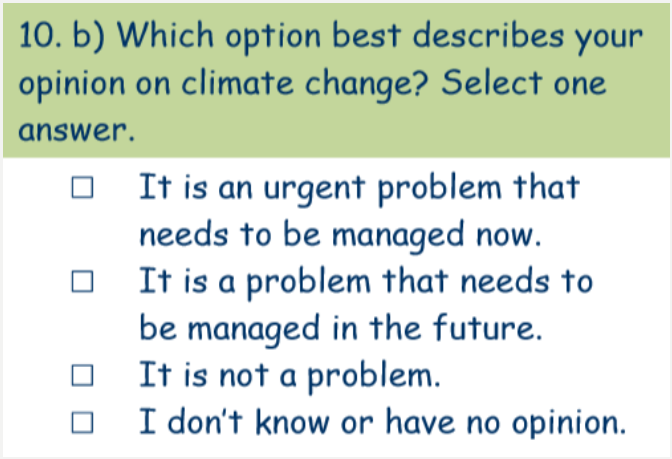
It is actually impossible to pick the smallest real number bigger than 250 as for any number chosen it is possible to pick a smaller one!!
$250.1 > 250.01 > 250.001 > 250.000001 \ldots\ldots$ etc

FREQUENCY DISTRIBUTIONS

A frequency distribution shows the frequency of values (how often various values occur).

It is a way of displaying a large amount of data in table form.

We can use a frequency distribution for both categorical and numerical data. The table below displays shows a frequency distribution summarising the results of Q10 (b) on the CensusAtSchool 2019/20 Questionnaire.



Opinion on Climate Change	Urgent	In Future	Not Problem	No Opinion
Number of Students	10	11	0	3

From the table we can see that the modal response was…
"It is a problem that needs to be managed **in** the **future**".

FREQUENCY DISTRIBUTIONS

We can find the mean and median of a frequency distribution if the data in the table is numerical.

The table below shows the results of Q13 on the CensusAtSchool 2019/20 Questionnaire regarding the number of Gold medals students think Ireland will win at the Tokyo 2020 Olympics.

13. How many gold, silver and bronze medals do you think Ireland will win at the Olympic games in Tokyo 2020?

Medal	Ireland won in 2012	Ireland won in 2016	Ireland will win in 2020
Gold	1	0	
Silver	1	2	
Bronze	4	0	

Number of Golds	0	1	2
Number of Students	3	13	8

We can see that 3 students thought that Ireland would win 0 Gold medals, 13 students thought that Ireland would win 1 Gold medal and 2 students thought that Ireland would win 2 Gold medals. No student thought Ireland would win any more than 2 Gold medals.

MEAN OF A FREQUENCY DISTRIBUTION

Use the table below to calculate the:

(i) mean, (ii) mode and (iii) median number of Gold medals Ireland will win in the opinion of the students in the survey.

Number of Golds	0	1	2
Number of Students	3	13	8

13. How many gold, silver and bronze medals do you think Ireland will win at the Olympic games in Tokyo 2020?

Medal	Ireland won in 2012	Ireland won in 2016	Ireland will win in 2020
Gold	1	0	
Silver	1	2	
Bronze	4	0	

$$\textbf{Mean} = \frac{\text{sum of all the values}}{\text{number of values}}$$

$$\frac{(3 \times 0) + (13 \times 1) + (8 \times 2)}{3 + 13 + 8}$$

$$= \frac{0 + 13 + 16}{24}$$

$$= \frac{29}{24}$$

$$= 1.21$$

The mean number of Gold Medals Ireland will win in Tokyo, according to the estimates of the class is 1.21.

GROUPED FREQUENCY DISTRIBUTIONS

A grouped frequency distribution shows the frequency of a range of values. They are a way of displaying a large amount of data in table form.

The table below displays the heights of 24 2nd Year students according to the results of Q5 of the CensusAtSchools 2019/20 questionnaire.

Interval

Height	150 - 155	155 - 160	160 - 165	165 - 170	170 - 175	175 - 180	180 - 185	185 - 190
Number of Students	2	6	7	4	2	2	0	1

[Note: 150 - 155 means 150 cm or more but less than 155 cm, etc.]

Frequency

Discuss possible methods of estimating the mean height of the students using only the grouped frequency table and then use this method to estimate that mean height.

Is the method involved a more or less accurate way of finding the mean than using all 24 values from the raw data.

Compare your answer to the mean calculated in Section 3: Activity 3.

In what interval do the modes and medians lie?

MEAN OF A GROUPED FREQUENCY DISTRIBUTION

The table below shows the heights (in cm) of the group of 24 second year students in our CensusAtSchool 2019/2020 Questionnaire.

Use mid-interval values to estimate the mean height of students in the class.

To find the **mid intervals**, sum the lower and upper bounds of each interval and divide by 2.

Mid Interval	152.5	157.5	162.5	167.5	172.5	177.5	182.5	187.5
Height	150 - 155	155 - 160	160 - 165	165 - 170	170 - 175	175 - 180	180 - 185	185 - 190
Number of Students	2	6	7	4	2	2	0	1

[Note: 150 - 155 means 150 cm or more but less than 155 cm, etc.]

$$\textbf{Mean} = \frac{\text{sum of all the values}}{\text{number of values}}$$

$$\text{Mean} = \frac{(2 \times 152.5) + (6 \times 157.5) + (7 \times 162.5) + (4 \times 167.5) + (2 \times 172.5) + (2 \times 177.5) + (0 \times 182.5) + (1 \times 187.5)}{2 + 6 + 7 + 4 + 2 + 2 + 0 + 1}$$

$$= \frac{305 + 945 + 1137.5 + 670 + 345 + 355 + 0 + 187.5}{24}$$

$$= \frac{3945}{24}$$

$$= 164.375 \text{ cm}$$

The mean height of the 24 second year students is 164.375 cm

MEDIAN OF A GROUPED FREQUENCY DISTRIBUTION

The table below shows the heights (in cm) of the group of 24 2nd year students in our CensusAtSchool 2019/2020 Questionnaire.

Use the values in the table to estimate the **median** height, as accurately as you can. **Justify** your answer.

Height	150 - 155	155 - 160	160 - 165	165 - 170	170 - 175	175 - 180	180 - 185	185 - 190
Number of Students	2	6	7	4	2	2	0	1

[Note: 150 - 155 means 150 cm or more but less than 155 cm, etc.]

Median = Middle value when the data is ordered from lowest to highest.

Median

$\frac{24}{2} = 12$

There is an even number of data items therefore the median is the average of the 12th and 13th values.

There are 8 values in the first 2 intervals and then 7 values in the 160 – 165 interval. As both the 12th and 13th values are in this interval the median lies between 160 and 165.

The median height is in the 160 – 165 interval.

The interval contains the 9th, 10th, 11th, 12th, 13th, 14th and 15th values. As the 12th and 13th values are slightly past the middle of values in the interval we could give an estimate closer to €165, for example €163.50.

MODE OF A GROUPED FREQUENCY DISTRIBUTION

The table below shows the heights (in cm) of the group of 24 2nd year students in our CensusAtSchool 2019/2020 Questionnaire.

Use the values in the table to find the **modal interval**, as accurately as you can.
Justify your answer.

Height	150 - 155	155 - 160	160 - 165	165 - 170	170 - 175	175 - 180	180 - 185	185 - 190
Number of Students	2	6	7	4	2	2	0	1

[Note: 150 - 155 means 150 cm or more but less than 155 cm, etc.]

Mode = Most common

160 – 165 is the modal interval as there are more height between 160 and 165 than any other interval.

SECTION 3
EXAM QUESTION 4
JCHL 2018
Q6

MEAN AND MEDIAN OF A GROUPED FREQUENCY DISTRIBUTION

The table below shows the amount of money that the 30 students spent at the airport.

Mid Interval	2.5	7.5	15	25	40	75	125
Amount of money (€)	0 – 5	5 – 10	10 – 20	20 – 30	30 – 50	50 – 100	100 – 150
Number of students	5	4	7	8	3	1	2

To find the **mid intervals**, sum the lower and upper bounds of each interval and divide by 2.

[*Note*: 5 – 10 means €5 or more but less than €10, etc.]

(e)

Use **mid-interval values** to estimate the **mean** amount of money spent. Give your answer in euro, correct to the nearest cent.

Mean $= \dfrac{\text{sum of all the values}}{\text{number of values}}$

$$\text{Mean} = \frac{(5 \times 2.5) + (4 \times 7.5) + (7 \times 15) + (8 \times 25) + (3 \times 40) + (1 \times 75) + (2 \times 125)}{5 + 4 + 7 + 8 + 3 + 1 + 2}$$

$$= \frac{12.5 + 30 + 105 + 200 + 120 + 75 + 250}{30}$$

$$= \frac{792.5}{30}$$

$$\text{Mean} = €26.42$$

Use the values in the table to estimate the **median** amount of money spent, as accurately as you can. **Justify** your answer.

Remember that there were 30 students in total.

Amount of money (€)	0 – 5	5 – 10	10 – 20	20 – 30	30 – 50	50 – 100	100 – 150
Number of students	5	4	7	8	3	1	2

9 students

16 students

Median

$\frac{30}{2} = 15$

Whole number so the median is the average of the 15th and 16th values.

We can see that both the 15th and 16th people will lie in the 10 – 20 interval.
As we are ESTIMATING we can observe that they are the last 2 people in this interval and therefore they are probably closer to €20 to €10.
For example €18.50

Any answer between €10 and €20 was acceptable for full marks BUT 1 mark lost for not specifying an exact amount.

SECTION 3
EXAM QUESTION 5
JCHL 2013
Q6

FINDING THE MEAN USING MID INTERVAL VALUES

2013 JCHL Paper 2 – Question 6 (a)

The salaries, in €, of the different employees working in a call centre are listed below.

22 000	16 500	38 000	26 500	15 000	21 000	15 500	46 000
42 000	9500	32 000	27 000	33 000	36 000	24 000	37 000
65 000	37 000	24 500	23 500	28 000	52 000	33 000	25 000
23 000	16 500	35 000	25 000	33 000	20 000	19 500	16 000

Use this data to complete the grouped frequency table below.

Salary (€1000)	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
No. of Employees	1	6	12	9	2	1	1

[Note: 10 – 20 means €10 000 or more but less than €20 000, etc.]

Using mid-interval values find the mean salary of the employees.

Mid Interval	5	15	25	35	45	55	65
Salary (€1000)	$0-10$	$10-20$	$20-30$	$30-40$	$40-50$	$50-60$	$60-70$
No. of Employees	1	6	12	9	2	1	1

[Note: 10 – 20 means €10 000 or more but less than €20 000, etc.]

Mean $= \dfrac{\text{sum of all the values}}{\text{number of values}}$

$$\text{Mean} = \frac{\text{Total Salary}}{\text{Total Number of Employees}}$$

$$= \frac{(5 \times 1) + (15 \times 6) + (25 \times 12) + (35 \times 9) + (45 \times 2) + (55 \times 1) + (65 \times 1)}{1 + 6 + 12 + 9 + 2 + 1 + 1}$$

$$= \frac{920{,}000}{32}$$

$$= €28{,}750$$

Outline another method which could have been used to calculate the mean salary.

22 000	16 500	38 000	26 500	15 000	21 000	15 500	46 000
42 000	9500	32 000	27 000	33 000	36 000	24 000	37 000
65 000	37 000	24 500	23 500	28 000	52 000	33 000	25 000
23 000	16 500	35 000	25 000	33 000	20 000	19 500	16 000

Add up all the individual salaries and divide by 32.

(ii)

Which method is more accurate? Explain your answer.

Answer:

Adding up individual salaries and dividing by 32

Reason:

This gives the actual mean as estimates (mid-intervals) are not used.

MEASURES OF SPREAD

SECTION 4

Activity 1

Activity 2

Activity 3

Activity 4

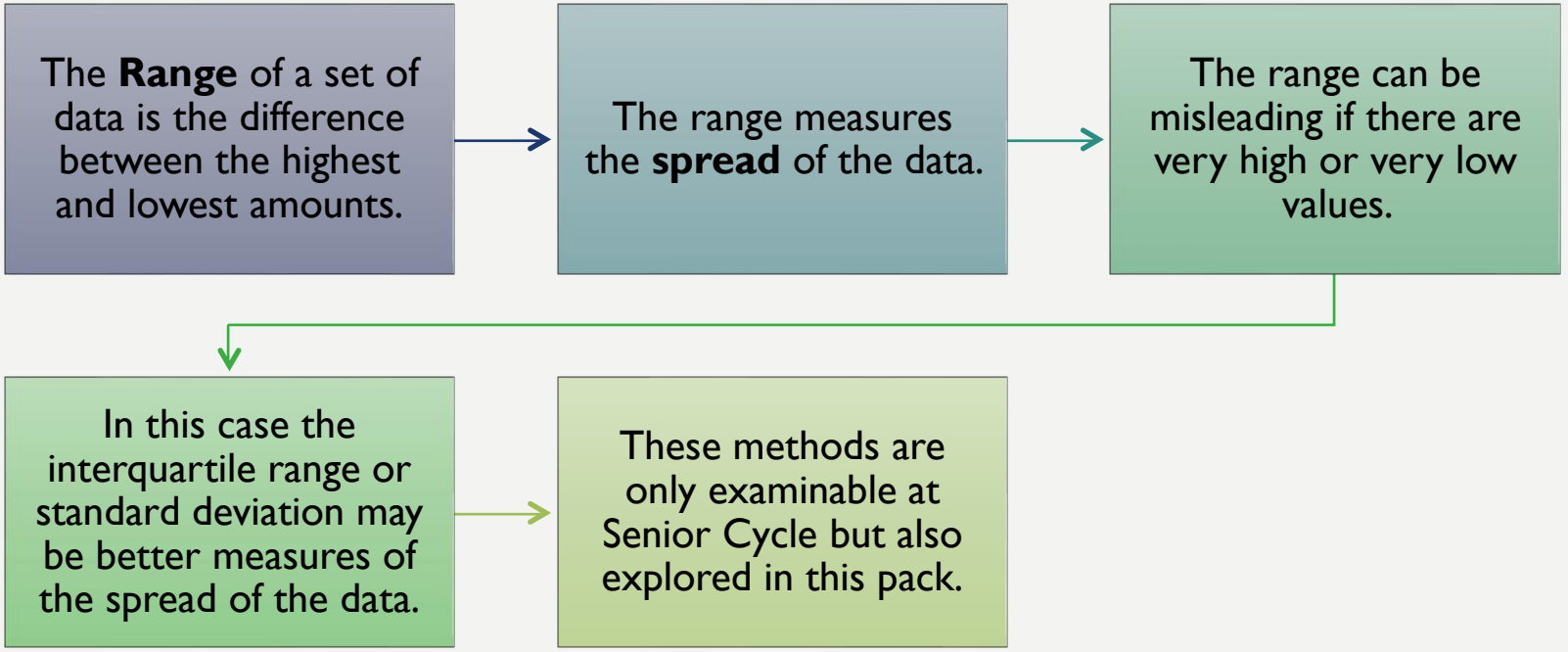
Exam Question 1

Exam Question 2

FURTHER EXPLORATION: LC MATERIAL

Standard Deviation

RANGE

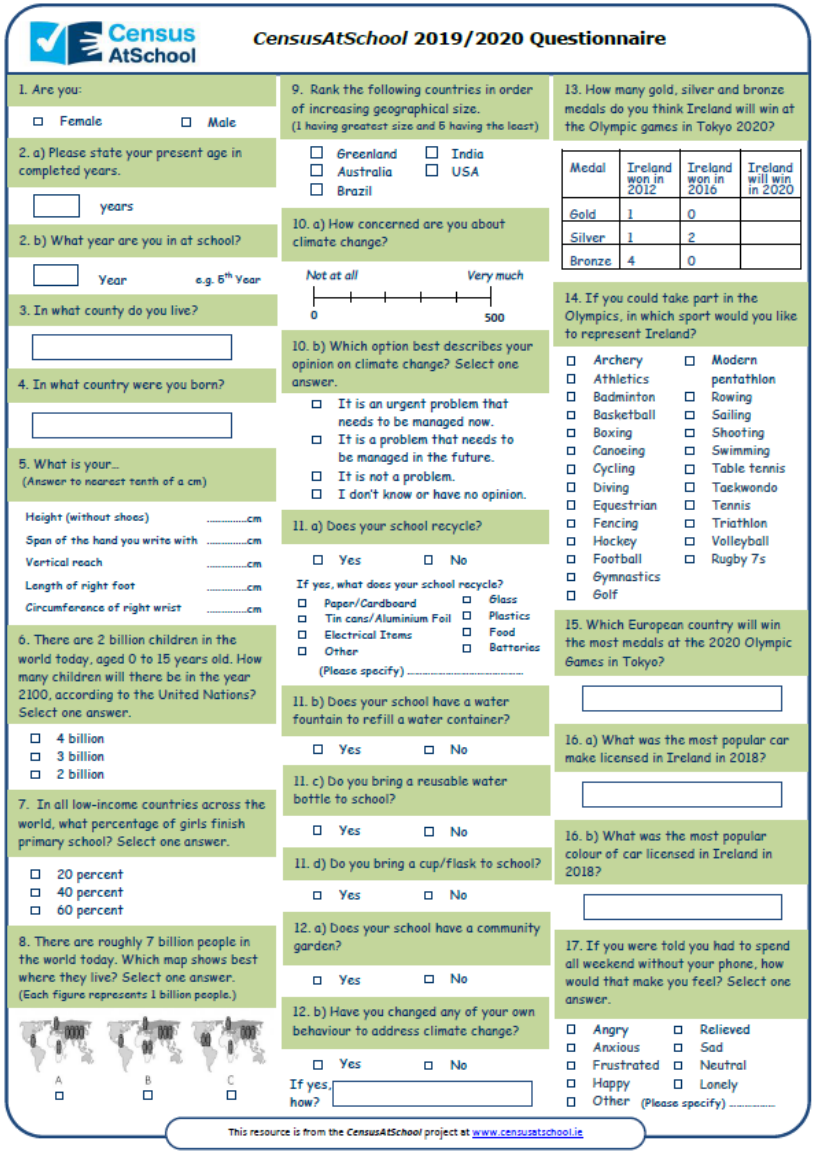

The **Range** of a set of data is the difference between the highest and lowest amounts.
The range measures the **spread** of the data.
The range can be misleading if there are very high or very low values.
In this case the interquartile range or standard deviation may be better measures of the spread of the data.
These methods are only examinable at Senior Cycle but also explored in this pack.

THE RANGE

Reread each of the questions in the CensusAtSchools 2019/20 Questionnaire.

For each of the questions decide whether the range can be found from a sample of results?

For those where the range cannot be found, give reasons as to why not.



Census AtSchool

CensusAtSchool 2019/2020 Questionnaire

1. Are you:
☐ Female ☐ Male

2. a) Please state your present age in completed years.
☐ years

2. b) What year are you in at school?
☐ Year e.g. 6th Year

3. In what county do you live?

4. In what country were you born?

5. What is your...
(Answer to nearest tenth of a cm)
Height (without shoes) .....cm
Span of the hand you write with .....cm
Vertical reach .....cm
Length of right foot .....cm
Circumference of right wrist .....cm

6. There are 2 billion children in the world today, aged 0 to 15 years old. How many children will there be in the year 2100, according to the United Nations? Select one answer.
☐ 4 billion
☐ 3 billion
☐ 2 billion

7. In all low-income countries across the world, what percentage of girls finish primary school? Select one answer.
☐ 20 percent
☐ 40 percent
☐ 60 percent

8. There are roughly 7 billion people in the world today. Which map shows best where they live? Select one answer.
(Each figure represents 1 billion people.)
A ☐ B ☐ C ☐

9. Rank the following countries in order of increasing geographical size.
(1 having greatest size and 6 having the least)
☐ Greenland ☐ India
☐ Australia ☐ USA
☐ Brazil

10. a) How concerned are you about climate change?
Not at all — Very much
0 — 500

10. b) Which option best describes your opinion on climate change? Select one answer.
☐ It is an urgent problem that needs to be managed now.
☐ It is a problem that needs to be managed in the future.
☐ It is not a problem.
☐ I don't know or have no opinion.

11. a) Does your school recycle?
☐ Yes ☐ No
If yes, what does your school recycle?
☐ Paper/Cardboard ☐ Glass
☐ Tin cans/Aluminium Foil ☐ Plastics
☐ Electrical Items ☐ Food
☐ Other ☐ Batteries
(Please specify) .....

11. b) Does your school have a water fountain to refill a water container?
☐ Yes ☐ No

11. c) Do you bring a reusable water bottle to school?
☐ Yes ☐ No

11. d) Do you bring a cup/flask to school?
☐ Yes ☐ No

12. a) Does your school have a community garden?
☐ Yes ☐ No

12. b) Have you changed any of your own behaviour to address climate change?
☐ Yes ☐ No
If yes, how?

13. How many gold, silver and bronze medals do you think Ireland will win at the Olympic games in Tokyo 2020?

Medal	Ireland won in 2012	Ireland won in 2016	Ireland will win in 2020
Gold	1	0	
Silver	1	2	
Bronze	4	0	

14. If you could take part in the Olympics, in which sport would you like to represent Ireland?
☐ Archery ☐ Modern pentathlon
☐ Athletics ☐ Rowing
☐ Badminton ☐ Sailing
☐ Basketball ☐ Shooting
☐ Boxing ☐ Swimming
☐ Canoeing ☐ Table tennis
☐ Cycling ☐ Taekwondo
☐ Diving ☐ Tennis
☐ Equestrian ☐ Triathlon
☐ Fencing ☐ Volleyball
☐ Hockey ☐ Rugby 7s
☐ Football
☐ Gymnastics
☐ Golf

15. Which European country will win the most medals at the 2020 Olympic Games in Tokyo?

16. a) What was the most popular car make licensed in Ireland in 2018?

16. b) What was the most popular colour of car licensed in Ireland in 2018?

17. If you were told you had to spend all weekend without your phone, how would that make you feel? Select one answer.
☐ Angry ☐ Relieved
☐ Anxious ☐ Sad
☐ Frustrated ☐ Neutral
☐ Happy ☐ Lonely
☐ Other (Please specify) .....

This resource is from the *CensusAtSchool* project at www.censusatschool.ie

THE RANGE OF A SET OF DATA

Section 4: Activity 2

The table below shows the maximum and minimum values of some of the answers of the group of 24 second year students in our CensusAtSchool 2019/2020 Questionnaire.

Work out the **range** of the data in each case.

Question	Minimum	Maximum	Range
Please state your present age in completed years.	13	15	
What is your height (to the nearest cm)?	154 cm	188 cm	
What is the span of your hand (to the nearest tenth of a cm)?	14.3 cm	21.9 cm	
What is your vertical reach (to the nearest cm)?	189	229	
What is your length of right foot (to the nearest tenth of a cm)?	19.1	28.5	
What is your circumference of right wrist (to the nearest cm)?	15.1	21.5	
How many bronze medals do you think Ireland will win at the Olympic games in Tokyo 2020?	6	1	

THE RANGE OF A SET OF DATA

Section 4: Activity 3

The list below shows the lengths of right foot (in cm) of the group of 24 second year students in our CensusAtSchool 2019/2020 Questionnaire.

19.8, 19.1, 20.5, 20.3, 23.8, 23.9, 23.0, 23.5, 23.0, 26.1, 24.2, 24.2

23.5, 26.9, 21.2, 28.5, 22.2, 22.1, 26.1, 21.3, 19.9, 25.4, 26.2, 21.3

Work out the **range** of the data.

5. What is your...

Length of right foot .....cm

Range = Highest Value − Lowest Value

Range $= 28.5 - 19.1$

$= 9.40$

The range is 9.4 cm.

SECTION 4
EXAM QUESTION 1
JCHL 2018
Q5 (A) (I)

FINDING THE RANGE OF A SET OF DATA

2018 JCHL Paper 2 – Question 5 (a) (i)

The list below shows the time (in minutes) taken by 12 students to solve a maths problem.

3, 5, 6, 7, 9, 9, 10, 12, 13, 14, 14, 15

Work out the **range** of the data.

Range = Highest Value − Lowest Value

3, 5, 6, 7, 9, 9, 10, 12, 13, 14, 14, 15

Range = 15 − 3

= 12

The range is 12 minutes.

QUARTILES AND THE INTERQUARTILE RANGE

The interquartile range measures the spread of the middle 50% of the data (when ordered from lowest to highest).

To calculate the interquartile range we find the median of the lower and upper halves of the data. We call the medians of the lower and upper half, Q_1 and Q_3 respectively.

- 25% is below or to the left of Q_1
- 25% is above or to the right of Q_3
- 50% of the data is between Q_3 and Q_1

Interquartile Range
$IQR = Q_3 - Q_1$

To calculate Q_1 we divide the number of data items by 4. If this calculation results in a whole number, say n, then Q_1 is the average of the n^{th} and $(n+1)^{th}$ data items.
If the calculation results in an answer with a decimal, then we round up to the next value.

To calculate Q_3 we divide the number of data items by 4 and then multiply by 3.
If this calculation results in a whole number, say n, then Q_3 is the average of the n^{th} and $(n+1)^{th}$ data items.
If the calculation results in an answer with a decimal, then we round up to the next value.

The interquartile is no longer on the JC Specification (examinable in 2020 for last time) but worth exploring as it appears at all levels of the Senior Cycle.

INTERQUARTILE

The list below shows the vertical reach (in cm) of the group of 14 female second year students in our CensusAtSchool 2019/2020 Questionnaire. The data has already been ranked from lowest to highest.

189, 194, 194, 196, 197, 197, 200, 205, 206, 208, 209, 218, 224

Use the data to calculate the:

(a) Find the median vertical reach of female students in the class?
(b) Find the lower quartile.
(c) Find the upper quartile and hence the interquartile range.

189, 194, 194, 196, 197, 197, 197, 200, 205, 206, 208, 209, 218, 224

The median is the middle value when ordered from lowest to highest.

There are 14 values.

$$\frac{14}{2} = 7$$

If we get a whole number we average this value and the next.

$$\text{Median} = \frac{197 + 200}{2}$$

$$\text{Median} = \frac{397}{2}$$

$$\text{Median} = 198.5$$

INTERQUARTILE

The list below shows the vertical reach (in cm) of the group of 14 female second year students in our CensusAtSchool 2019/2020 Questionnaire. The data has already been ranked from lowest to highest.

189, 194, 194, 196, 197, 197, 200, 205, 206, 208, 209, 218, 224

Use the data to calculate the:
(a) Find the median vertical reach of female students in the class?
(b) Find the lower quartile.
(c) Find the upper quartile and hence the interquartile range.

189, 194, 194, 196, 197, 197, 197, 200, 205, 206, 208, 209, 218, 224

Quartile 1

$$\frac{14}{4} = 3.5$$

Decimal so round up to 4th value:

$Q_1 = 196$

Quartile 3

$$\frac{14}{4} \times 3 = 10.5$$

Decimal so round up to 11th value:

$Q_3 = 208$

Interquartile Range
$IQR = Q_3 - Q_1$

$$IQR = Q_3 - Q_1$$
$$IQR = 208 - 196$$
$$IQR = 12$$

The interquartile range is 12 cm.

SECTION 4
EXAM QUESTION 2
JCHL 2018
Q5 (A) (II)

FINDING THE INTERQUARTILE RANGE OF A SET OF DATA

The list below shows the time (in minutes) taken by 12 students to solve a maths problem.

3, 5, 6, 7, 9, 9, 10, 12, 13, 14, 14, 15

Work out the **inter-quartile range** of the data.

Interquartile Range
$IQR = Q_3 - Q_1$

Quartile 1

$$\frac{12}{4} = 3$$

Whole Number so :

$$Q_1 = \frac{3^{\text{rd}} + 4^{\text{th}}}{2}$$
$$= \frac{6+7}{2}$$
$$= 6.5$$

Quartile 3

$$\frac{12}{4} \times 3 = 9$$

Whole Number so :

$$Q_3 = \frac{9^{\text{th}} + 10^{\text{th}}}{2}$$
$$= \frac{13+14}{2}$$
$$= 13.5$$

3, 5, 6, 7, 9, 9, 10, 12, 13, 14, 14, 15

$$IQR = Q_3 - Q_1$$
$$IQR = 13.5 - 6.5$$
$$IQR = 7$$

The interquartile range is 7 minutes.

STANDARD DEVIATION

SECTION 4B

Activity 1

Exam Question 1

Exam Question 2

STANDARD DEVIATION

- We have seen already that range and interquartile ranges are measures of the spread of a set of data. They tell us a little more about the data than the measures of central tendency would alone.
- At Senior Cycle we can further explore the spread of data by calculating **standard deviation**.
- If data points are further from the mean there is a higher standard deviation showing in the data. Higher standard deviations mean
- It can be calculated manually using the formula:

$$\sigma = \sqrt{\frac{\sum(x-\mu)^2}{n}}$$

where

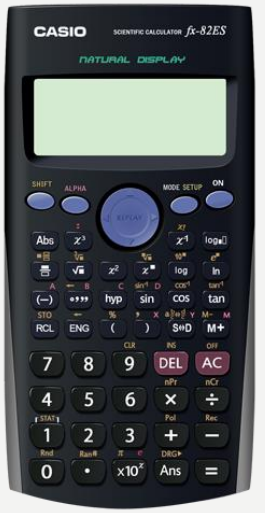
$\sigma =$ standard deviation

$x =$ each value in the data set

$\mu =$ population mean

$n =$ size of the population

We no longer have to calculate the standard deviation by hand as it can be done using a scientific calculator.



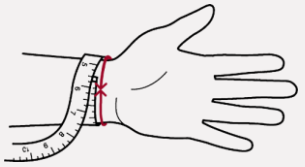
STANDARD DEVIATION

Section 4B: Activity 1

The lists below shows the length of the circumference of right wrist for a group of 24 second year students in our CensusAtSchool 2019/2020 Questionnaire. The data is split by gender.

Female
20.2, 15.1, 21.5, 19.1, 17.5, 16.3, 15.5, 19.2, 18.2, 15.7, 18.1, 15.1, 16.6, 15.5

Male
18.9, 16.4, 16.5, 21.2, 16.0, 17.1, 20.2, 19.0, 16.3, 18.5



Calculate the mean (μ) and standard deviations (σ) for each group and comment on which group has a greater spread of right wrist lengths.

5. What is your...

Circumference of right wrist .....cm

Standard Deviation
Calculator Work (Casio)

1. Enter Data
   - Mode 2 - STAT
   - 1: 1-VAR (univariate)
   - Measurements in the x column
   - AC to store
2. Read Data
   - Shift 1 (STAT)
   - Select 5: Var
   - Select 3: σ

Female Standard Deviation
$\mu = 17.4$
$\sigma = 1.97$

Male Standard Deviation
$\mu = 18.01$
$\sigma = 1.72$

The males have a greater mean length of right wrist but the females measurements are more spread out.

SECTION 4B
EXAM QUESTION 1
LCOL 2018
Q7 (E)

STANDARD DEVIATION

Find the standard deviation of the **rainfall data**, in mm, correct to 1 decimal place.

Total rainfall and total sunshine at Valentia in June										
Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total Rainfall (mm)	72	133	155	101	94	47	149	134	94	84
Total Sunshine (hours)	169	124	180	173	173	239	159	168	228	205

(Source: Met Éireann)

Calculator Work (Casio)

1. Enter Data
   - Mode 2 – STAT
   - 1: 1 – VAR (univariate)
   - Rainfall in the x column
   - AC to store
2. Read Data
   - Shift 1 (STAT)
   - Select 7: Var
   - Select 3: σ

$\sigma = 33.46057381$

$\sigma \approx 33.5$ mm

SECTION 4B
EXAM QUESTION 1
LCHL 2012S
Q2 (B)

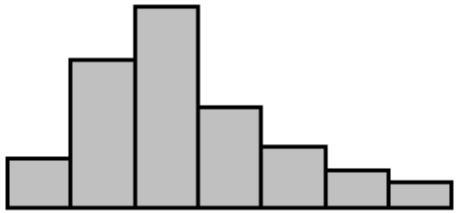
STANDARD DEVIATION

2012 LCHL Sample Paper 2 – Question 2 (b)

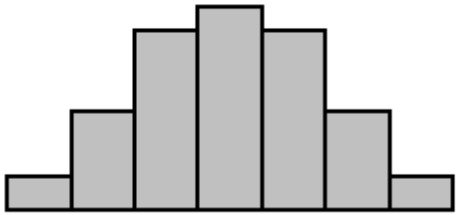
The shapes of the histograms of four different sets of data are shown below.

Assume that the four histograms are drawn on the same scale.

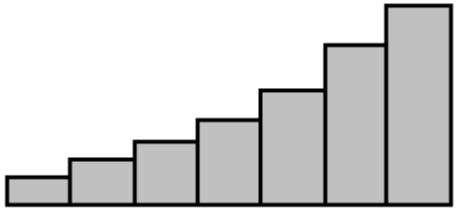
State which of them has the largest standard deviation, and justify your answer.



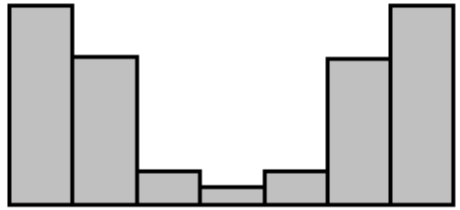
A



B



C



D

Answer:

D

Justification:

- A lot of the data are far from the mean in set D
- Set D has a lot of extreme values

GRAPHING DATA

SECTION 5

- A: Types of Graph
- B: Line Plot
- C: Bar Chart
- D: Histogram
- E: Stem & Leaf
- F: Pie Chart

FURTHER EXPLORATION: LC MATERIAL

- G: Scatter Plot

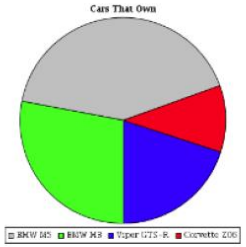
TYPES OF GRAPH

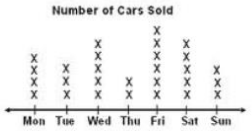
SECTION 5A

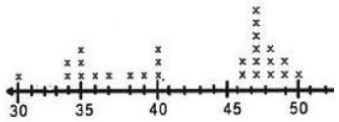
Student Activity 1

Student Activity 2

DISPLAYING DATA

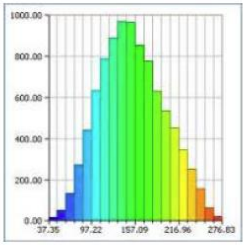


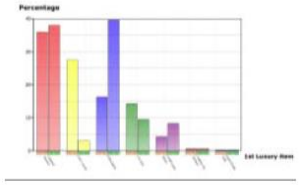




1	9
2	2 5 6 7 8 9
3	0 4 6 7
4	2 3 4 6 8 8 9
5	2 3 5 7 8
6	2

Key: 1|9 = 19 cm



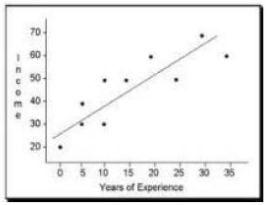


	3	2	0	5				
		9	8	5	9			
4	1	0	0	6	2	4		
	7	6	6	6	7	8	8	
			2	7	1	1	4	4
		9	6	7	8			
				8	2	4		
				8	9			
				9	2			

Pulse Rate before exercise

Pulse Rate after exercise

Key: 5|9 = 59 beats



In Statistics we can use charts and graphs to summarise a set of data in a visual way?

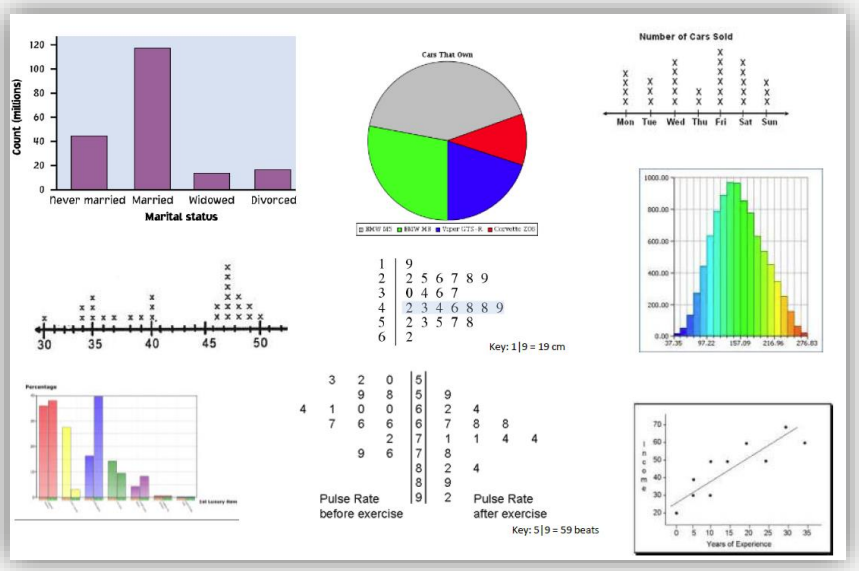
Why would we want to do this?

Make a list of charts and graphs you are familiar with?

Are some of the charts and graphs better for summarising particular data types than others?

SUITABLE GRAPHS FOR DIFFERENT DATA TYPES

Place an ✓ in the table below to indicate where a particular chart type is suitable for different data types.



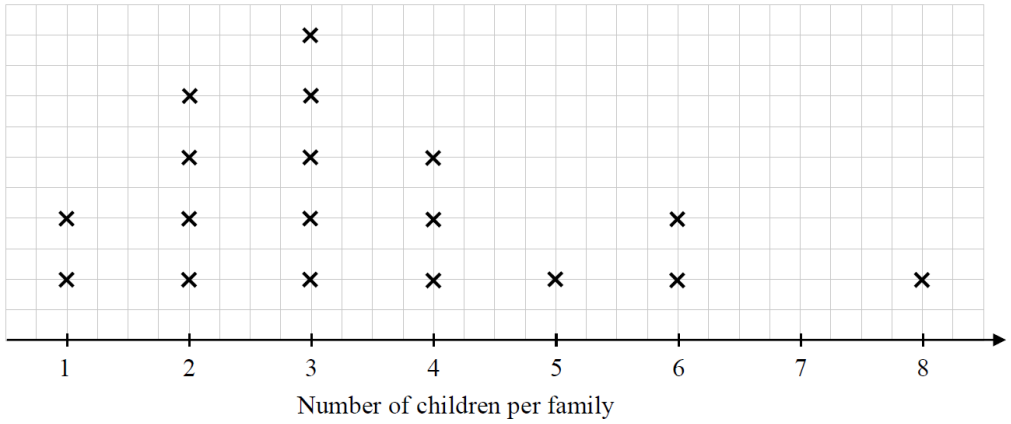
Type of Data	Line Plot	Bar Chart	Frequency Table	Grouped Frequency Table	Histogram	Pie Chart	Stem and Leaf Diagram
Categorical	✓	✓	✓			✓	
Numerical Discrete	✓	✓	✓	✓		✓	✓
Numerical Continuous				✓	✓		✓

GRAPHING DATA: LINE PLOTS

SECTION 5B

Student Activity

Exam Question



LINE PLOT

A line plot (dot plot) is a graph/ chart that shows how often data occurs along a number line.

It is a quick and easy way to organise data and allows us at a glance to view the frequency of each value.

LINE PLOT

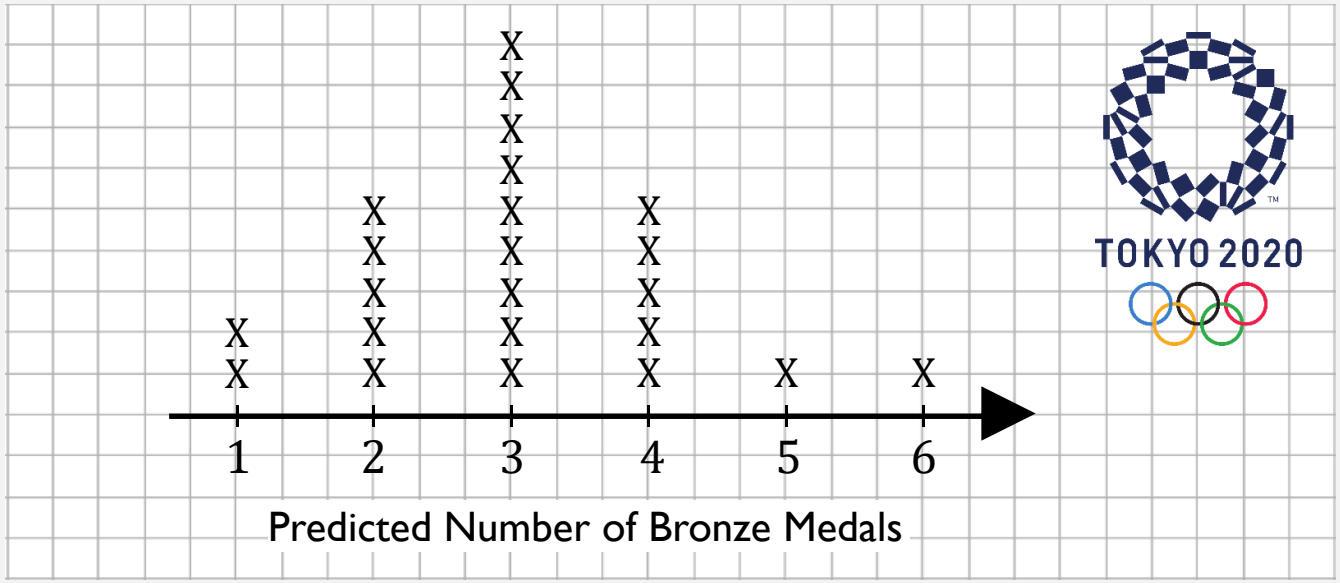
The list below shows the number of bronze medals students a group of 24 second year students think Ireland will win at the Tokyo Olympics 2020, according to the results of our CensusAtSchool 2019/2020 Questionnaire.

4, 3, 3, 1, 3, 4, 3, 4, 2, 2, 5, 3, 2, 2, 3, 1, 3, 3, 3, 4, 3, 4, 6, 2

Illustrate the data on a line plot and then answer the following questions.
How many students predicted that Ireland would win 4 bronze medals?
What was the modal number of bronze medals?
What is the median number of bronze medals?

13. How many gold, silver and bronze medals do you think Ireland will win at the Olympic games in Tokyo 2020?

Medal	Ireland won in 2012	Ireland won in 2016	Ireland will win in 2020
Gold	1	0	
Silver	1	2	
Bronze	4	0	



4 Bronze Medals
5 students

Modal Bronze Medals
3

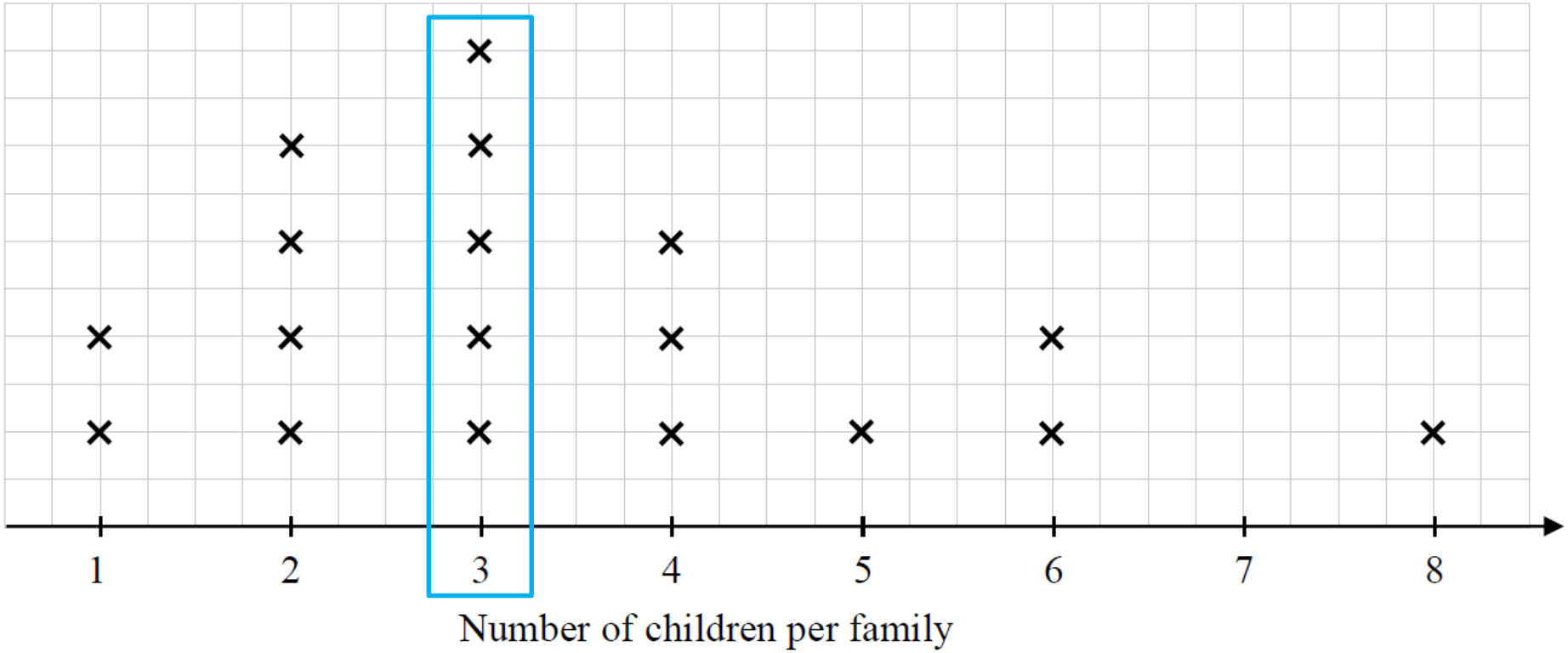
Median Bronze Medals
$\frac{24}{2} = 12$
Average of 12^{th} and 13^{th} values.
$= 3$

SECTION 5B
EXAM QUESTION 1
LCFL 2015
Q6

READING FROM A LINE PLOT

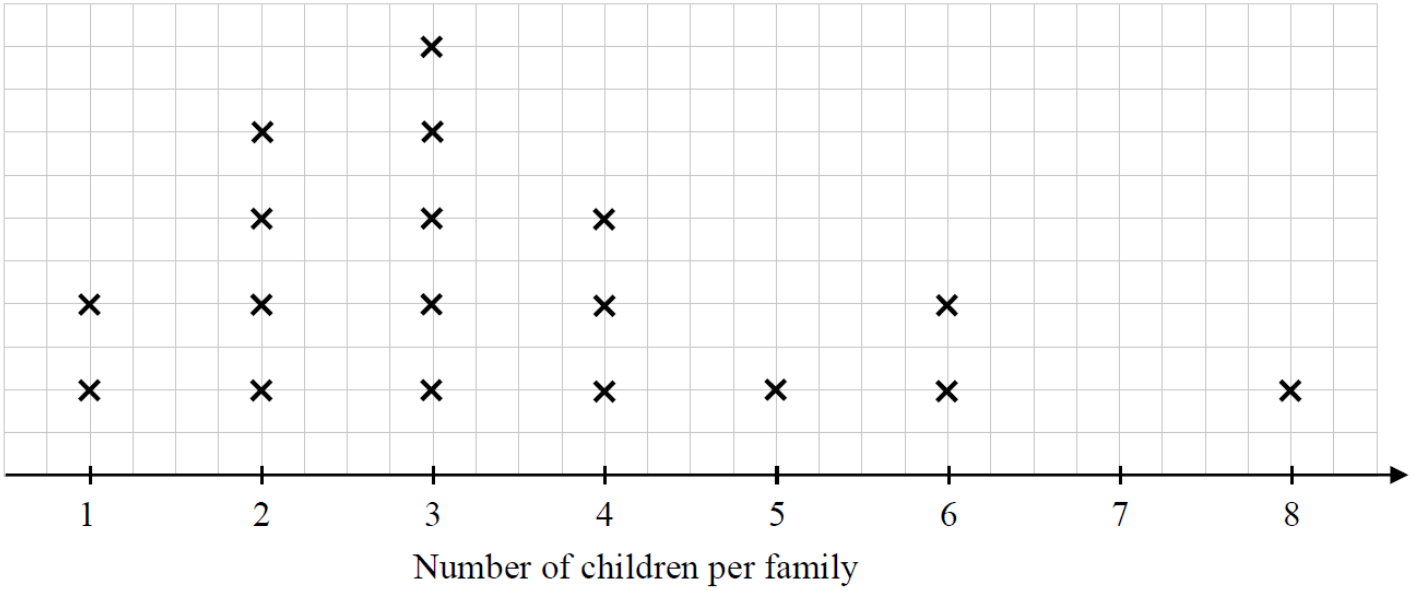
In a survey, 18 students were asked how many children are in their family. The results are shown in the line plot below.

What is the mode of the data?



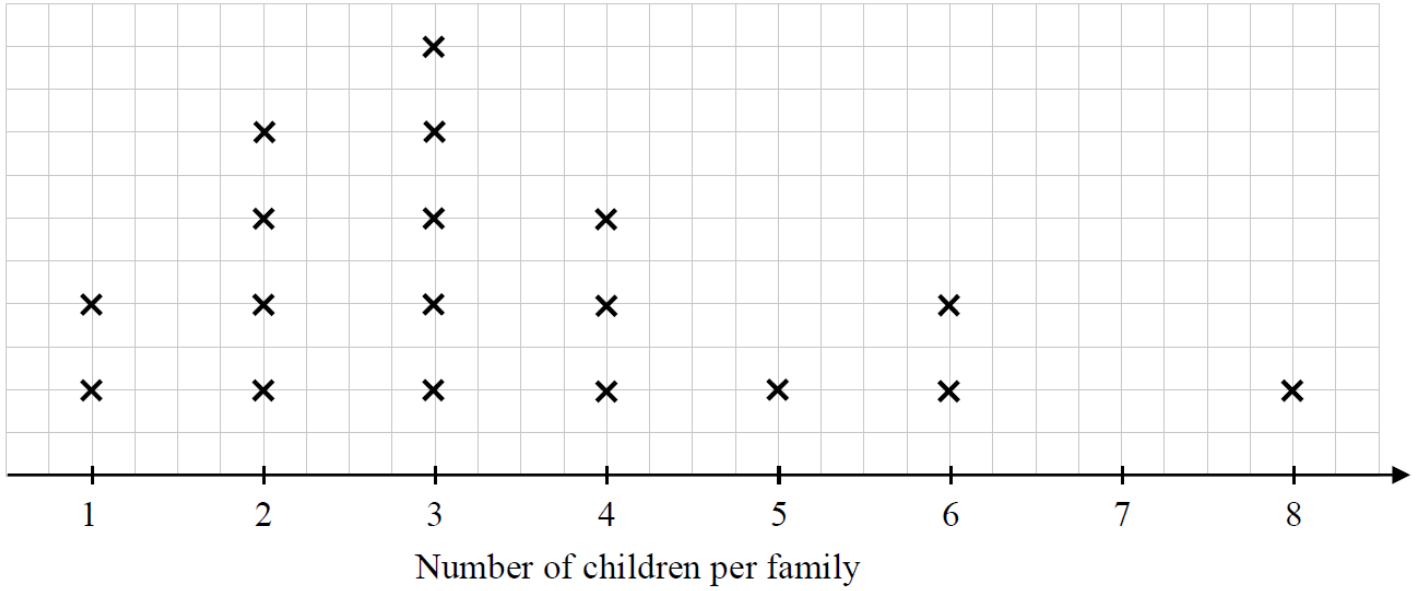
The mode of the data is 3.

Find the total number of children in the 18 families.



$$2(1) + 4(2) + 5(5) + 3(4) + 1(5) + 2(6) + 1(8) = 62$$

Find the mean number of children per family, correct to one decimal place.



Mean $= \dfrac{\text{sum of all the values}}{\text{number of values}}$

$$= \frac{62}{18}$$

$$= 3.4$$

Which of the two numbers, the mode or the mean, do you think is the best single number to describe this data? Give a reason for your answer.

Mode
Because it is a whole number

Or

Mean
Because it is got from all the families

GRAPHING DATA: BAR CHARTS

SECTION 5C

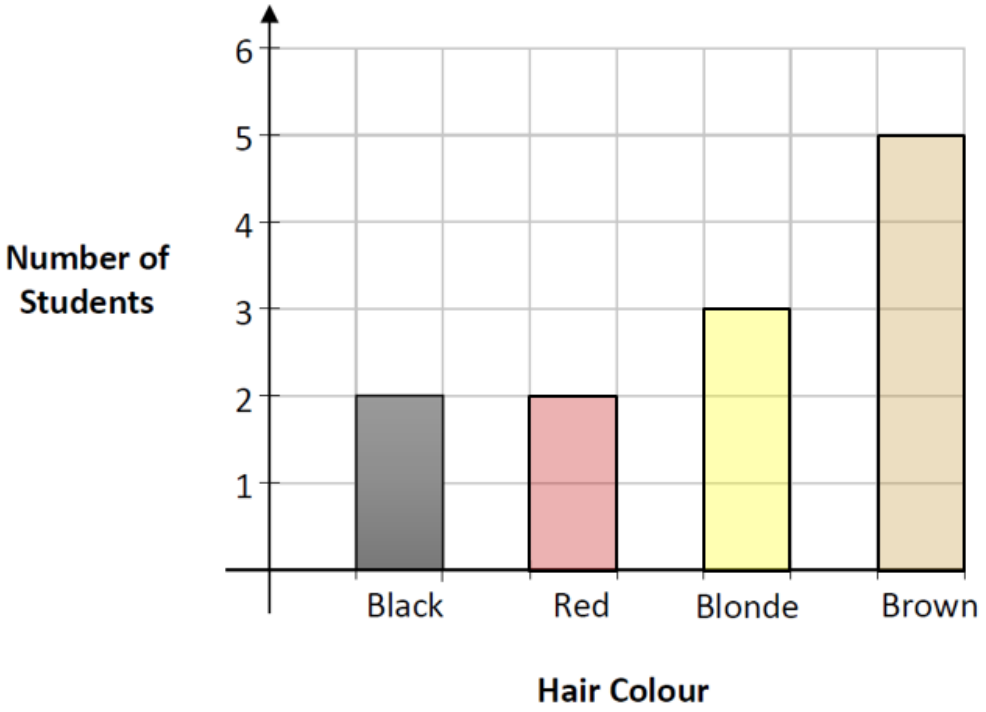
Student Activity 1

Student Activity 2

Exam Question 1

Exam Question 2

Exam Question 3



BAR CHART

A bar chart is a graph/ chart that displays data through rectangular bars or columns.

The height of the bars represent the frequency of occurrence of the values.

It is best used for categorical data.

BAR CHART

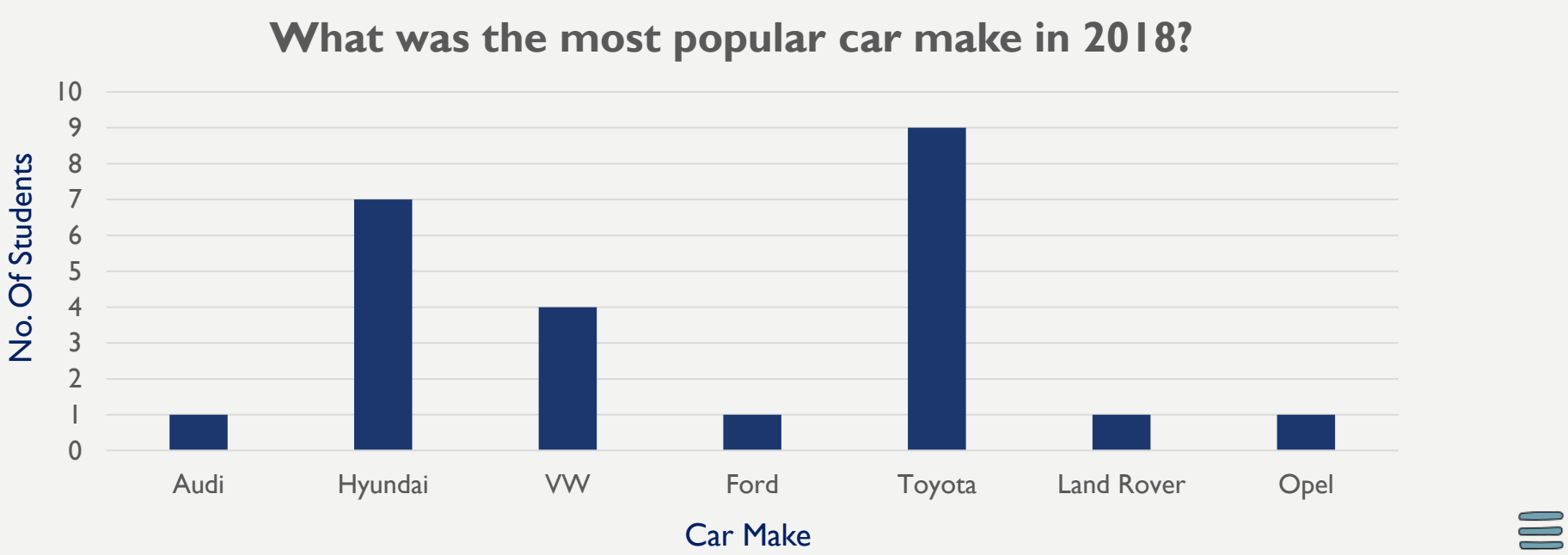
Section 5C: Activity 1

The table below summarises the results of the answer to Q16 (a) of a group of 24 second year students in our CensusAtSchool 2019/2020 Questionnaire.

Display this information on a bar chart.

16. a) What was the most popular car make licensed in Ireland in 2018?

Car Make	Audi	Hyundai	VW	Ford	Toyota	Land Rover	Opel
Number of Students	1	7	4	1	9	1	1



SECTION 5C
EXAM QUESTION 1
JCFL 2019
Q9

DRAW A BAR CHART

Gerry carried out a survey on the hair colour of the 12 students in his class.
The colour of each person's hair is shown in this table:

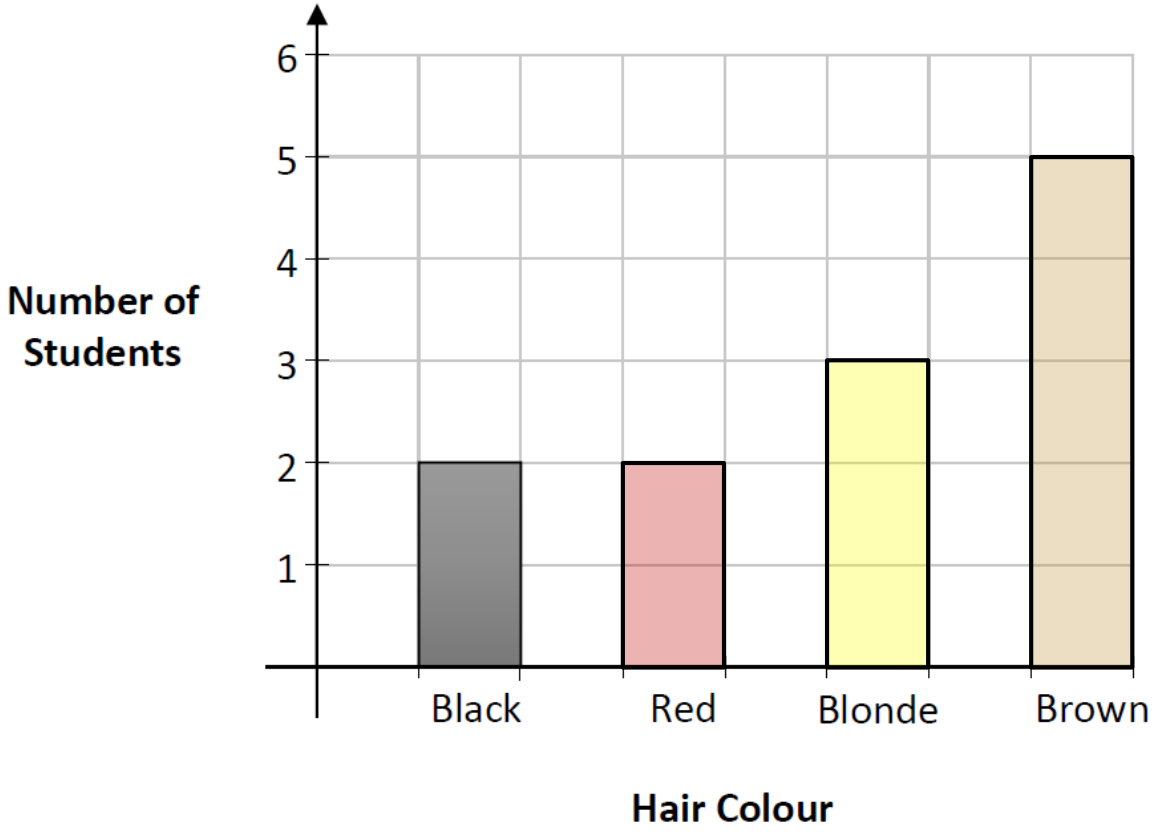
Black	Red	Blonde	Brown
Brown	Blonde	Brown	Brown
Black	Brown	Blonde	Red

Complete the following table by writing in the number of students with each hair colour.

Hair Colour	Black	Red	Blonde	Brown
Number of Students	2	2	3	5

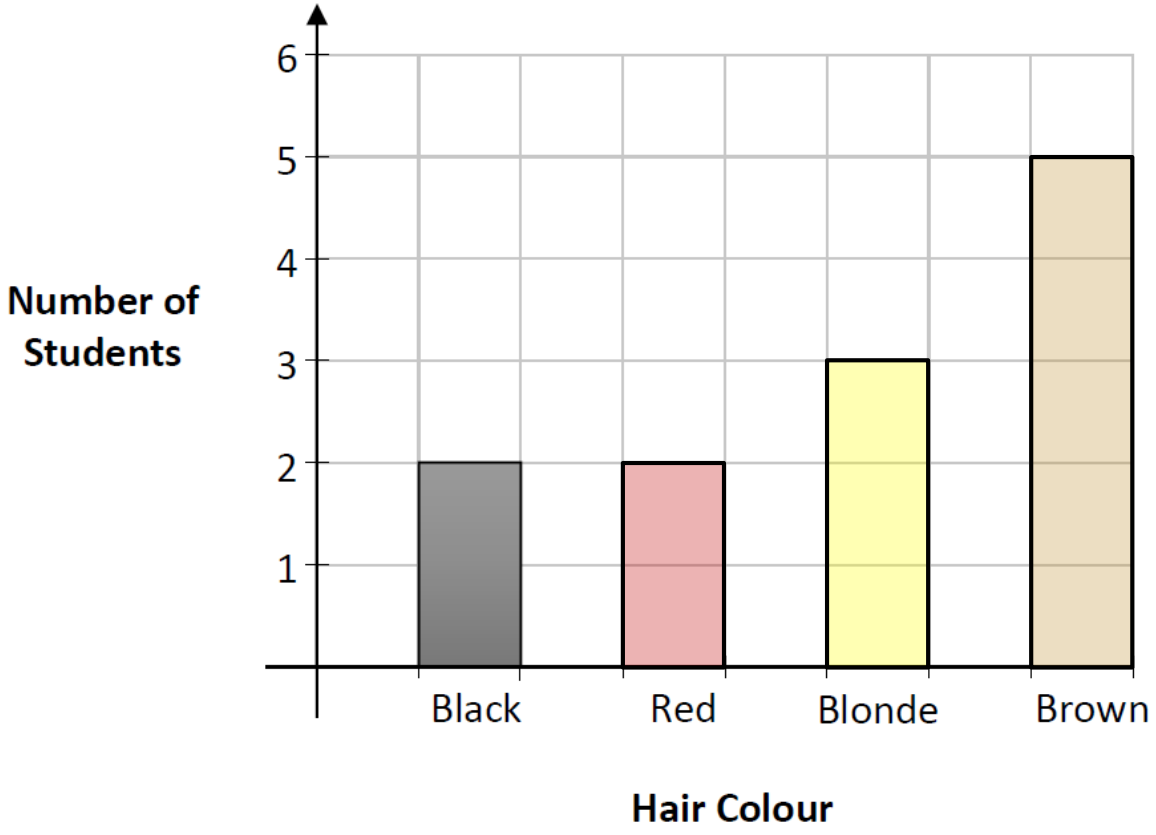
Complete the bar chart on the axes below to show this information.

Hair Colour	Black	Red	Blonde	Brown
Number of Students	2	2	3	5



What was the **modal** [most common] hair colour?

Hair Colour	Black	Red	Blonde	Brown
Number of Students	2	2	3	5

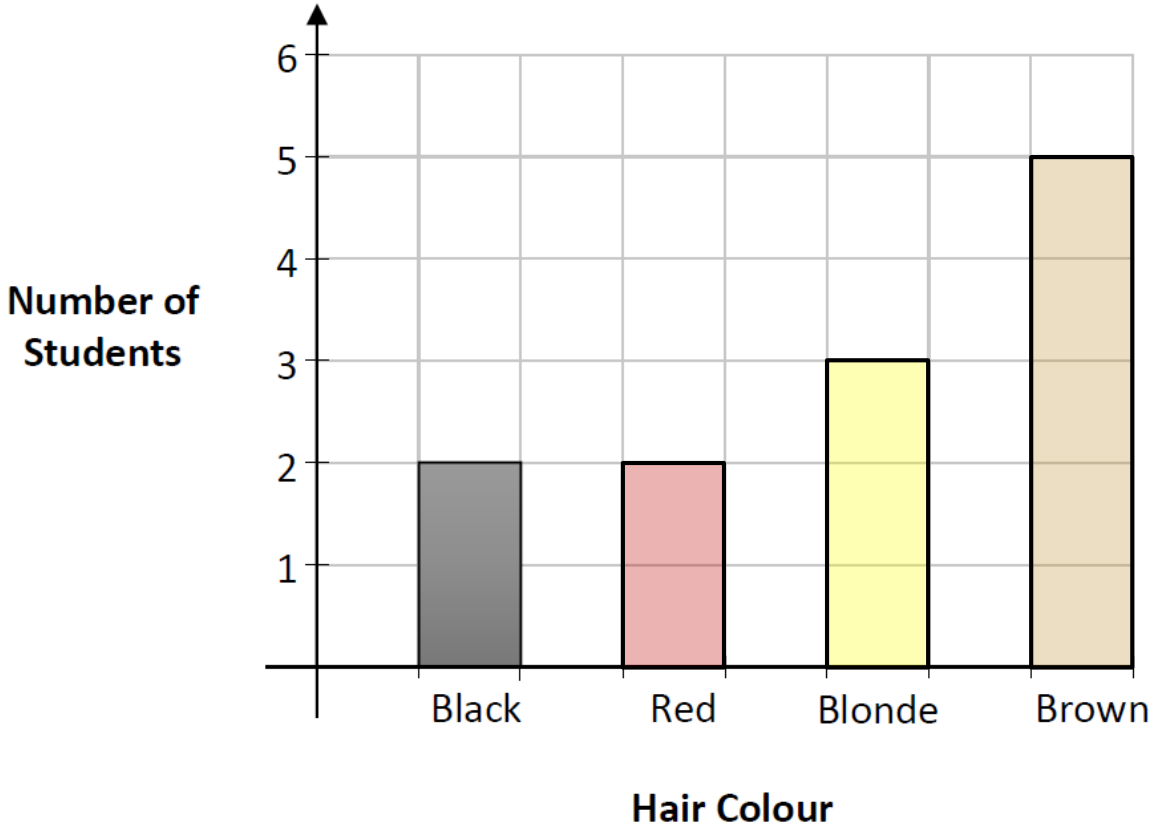


Brown is the modal hair colour as it occurred 5 times, which was more common than any of the others.

Eoghan was one of the 12 students surveyed.

What is the **probability** that he has **black** hair?

Hair Colour	Black	Red	Blonde	Brown
Number of Students	2	2	3	5



Probability of an event P(E)

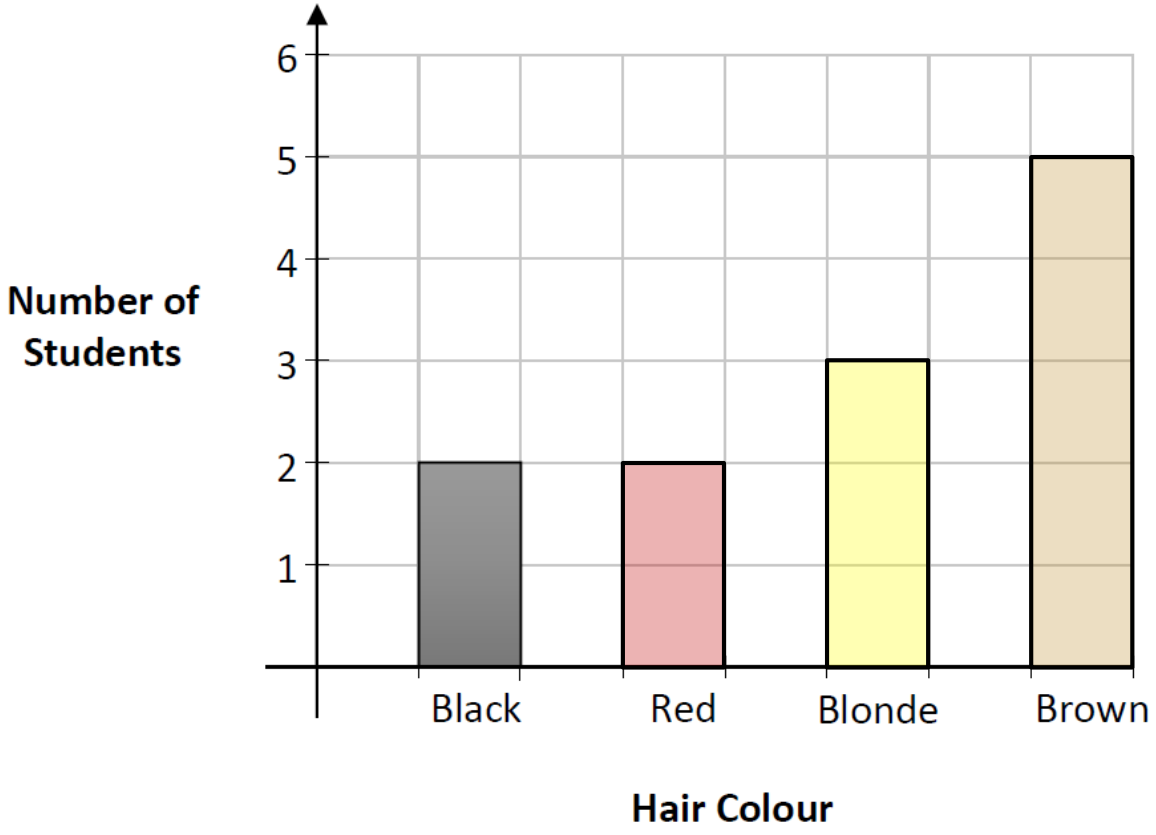
$$= \frac{\text{number of desirable outcomes}}{\text{total number of possible outcomes}}$$

$$P(\text{Black}) = \frac{2}{12}$$

$$P(\text{Black}) = \frac{1}{6}$$

What **percentage** of the students surveyed had **blonde** hair?

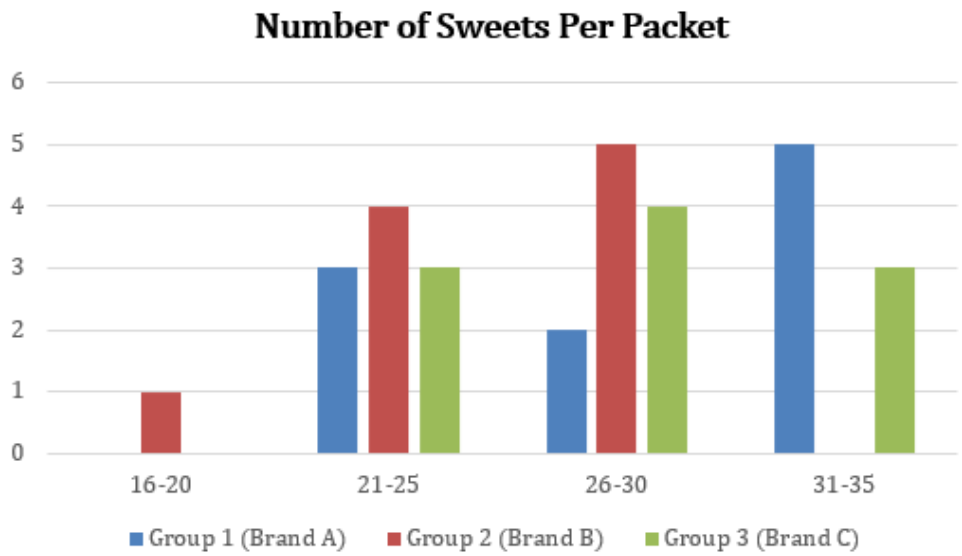
Hair Colour	Black	Red	Blonde	Brown
Number of Students	2	2	3	5



$$\% \text{ Blonde} = \frac{3}{12} \times 100$$

$$\% \text{ Blonde} = 25\%$$

COMPARATIVE BAR CHART



A comparative bar chart is a graph/ chart that compares information from different sub-groups.

This allows for quick comparisons of the data.

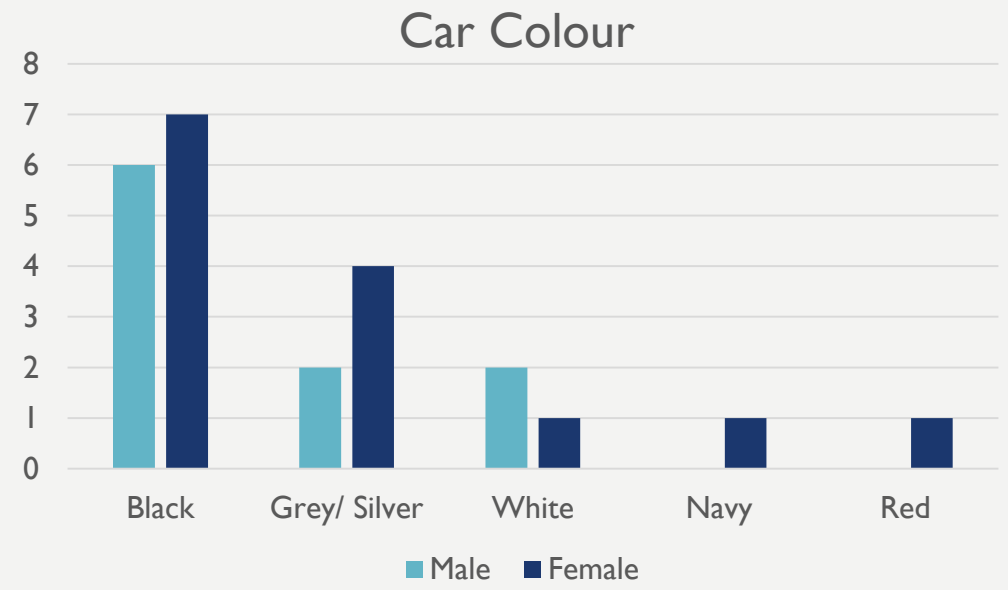
COMPARATIVE BAR CHART

Section 5C:Activity 2

The tables summarises the answers of 24 second year students for Q16 (b) of the 2019/2020 CensusAt School Questionnaire.

Display the data **graphically** in a way that allows you to compare the data for the male and females in the class.

	Car Colour				
	Black	Grey/ Silver	White	Navy	Red
Male	6	2	2	0	0
Female	7	4	1	1	1



16. b) What was the most popular colour of car licensed in Ireland in 2018?

Identify one of the problems in trying to compare the answers of the males and females?

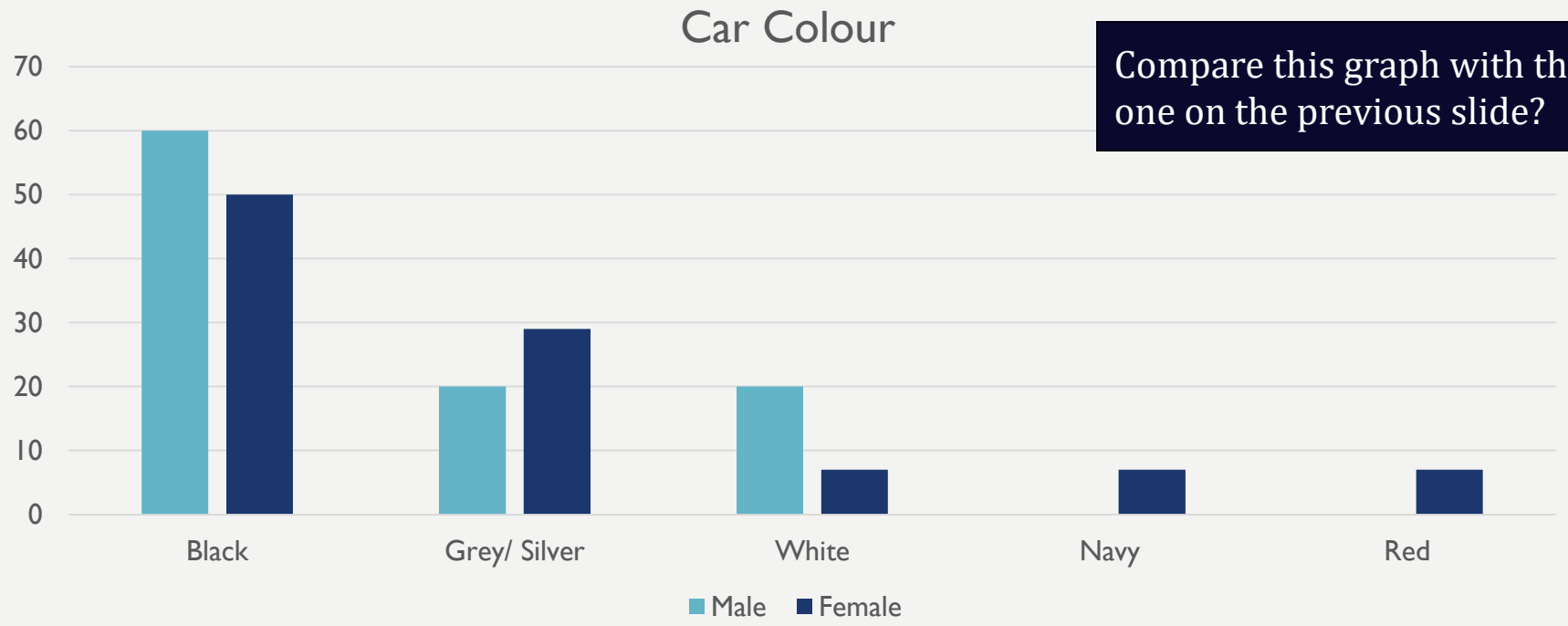
There are 14 females and only 10 males.

Is there away around this?

COMPARATIVE BAR CHART

Section 5C: Activity 2

	Car Colour				
	Black	Grey/ Silver	White	Navy	Red
Male	$\frac{6}{10} = 60\%$	$\frac{2}{10} = 20\%$	$\frac{2}{10} = 20\%$	$\frac{0}{10} = 0\%$	$\frac{0}{10} = 0\%$
Female	$\frac{7}{14} = 50\%$	$\frac{4}{14} = 29\%$	$\frac{1}{10} = 7\%$	$\frac{1}{10} = 7\%$	$\frac{1}{10} = 7\%$



Compare this graph with the one on the previous slide?

SECTION 5C
EXAM QUESTION 2
JCHL 2016
Q3 (F)

COMPARATIVE BAR CHART

2016 JCHL Paper 2 – Question 3 (f)

Table 2 shows the percentage of female members of parliament in each of the current 28 EU countries in 2005 and 2015.

Display the data **graphically** in a way that allows you to compare the data for the two years.
Label your graph(s) clearly. Show any calculations that you make.
You may use the data from **Table 1** or **Table 2**. The tables are reprinted on the next page.

Table 2

% of female members of parliament		0 – 9	10 – 19	20 – 29	30 – 39	40 – 49
Number of countries	2005	2	10	8	7	1
	2015	0	7	10	8	3

Lose 1 Mark for not labelling graph.

Table 1

% of female members of parliament	
2005	2015
9	10
9	13
11	13
12	14
12	16
12	18
13	19
13	20
16	20
17	23
17	23
19	24
20	24
20	26
21	26
21	28
22	29
22	31
22	31
23	31
33	36
34	37
35	37
36	37
37	39
37	41
38	42
45	44

SECTION 5C
EXAM QUESTION 3
JCHL 2014S
Q6

COMPARATIVE BAR CHART

2014 Sample JCHL Paper 2 – Question 6 (i)

Three groups of 10 students in a third-year class were investigating how the number of jelly beans in a bag varies for three different brands of jelly beans.
Each student counted the number of jelly beans in a bag of brand A or B or C. Their results are recorded in the tables below.

Display the data in a way that allows you to describe and compare the data for each brand.

Group 1 (Brand A)

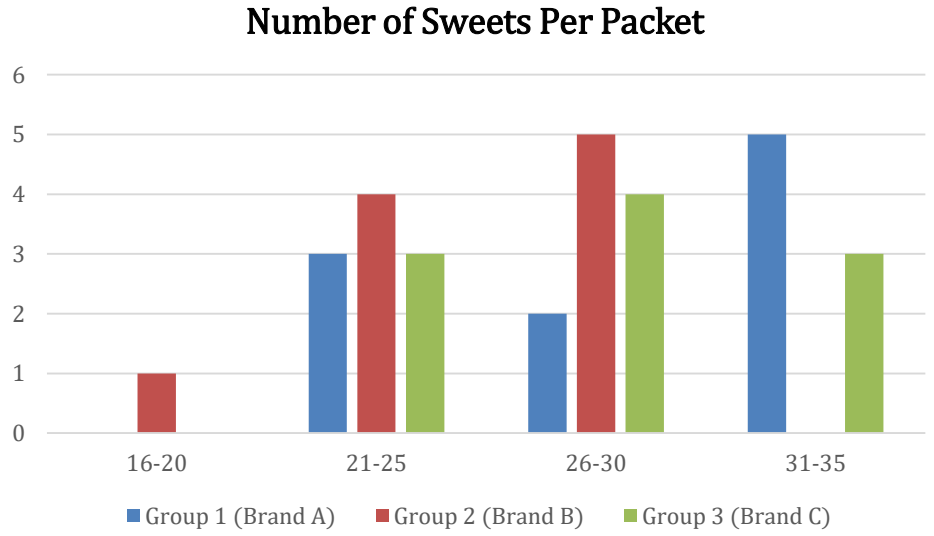
23	25	25	26	26
32	32	33	34	35

Group 2 (Brand B)

17	22	22	24	24
29	29	29	29	29

Group 3 (Brand C)

25	25	25	26	26
29	29	30	30	31



Divide the sweets into intervals and represent the information on a bar chart.

	16-20	21-25	26-30	31-35
Group 1 (Brand A)	0	3	2	5
Group 2 (Brand B)	1	4	5	0
Group 3 (Brand C)	0	3	4	3

If you were to buy a bag of jelly beans which brand would you buy? Give a reason for your answer based on the data provided in the tables. In your explanation you should refer to the **mean** number of jelly beans per bag, and the **range** or **spread** of the number of jelly beans per bag for each brand.

Group 1 (Brand A)

23	25	25	26	26
32	32	33	34	35

Group 2 (Brand B)

17	22	22	24	24
29	29	29	29	29

Group 3 (Brand C)

25	25	25	26	26
29	29	30	30	31

Calculate the mean and the range for each Brand.

The mean is the average number and the range is the difference in the lowest and highest amounts.

	Mean	Range
Brand A	29.1	$35 - 23 = 12$
Brand B	25.4	$29 - 17 = 12$
Brand C	27.6	$31 - 25 = 6$

Brand A because it has the highest mean of the three brands. The lowest amount in any of its bags was 23 which is almost the same as the lowest in Brand C.

The range is high in Brand A but this is because it has a lot of boxes with a higher amount of sweets.

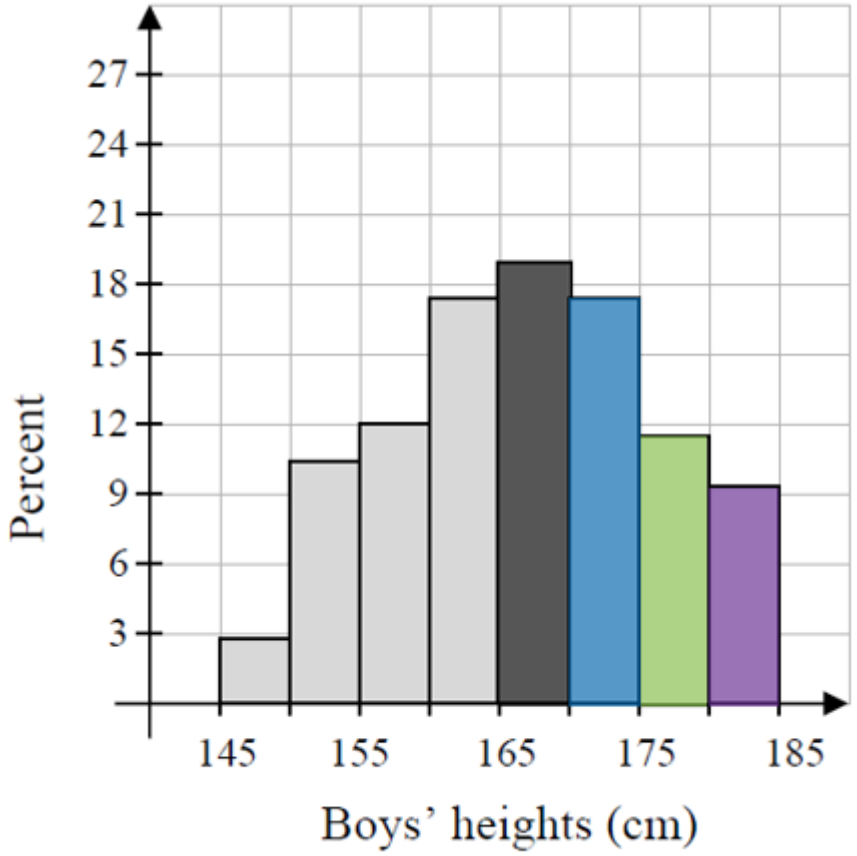
GRAPHING DATA: HISTOGRAMS

SECTION 5D

Student Activity 1

Exam Question 1

Exam Question 2



HISTOGRAM

A histogram is a graph/ chart displaying data as bars of different heights.

Each bar groups numerical data into ranges.

It is a useful tool for displaying the distribution or spread of the data.

Unlike a bar chart there are no gaps between the bars.

HISTOGRAM

Section 5D:Activity 1

The table below shows the hand span (in cm) of the group of 24 second year students in our CensusAtSchool 2019/2020 Questionnaire.

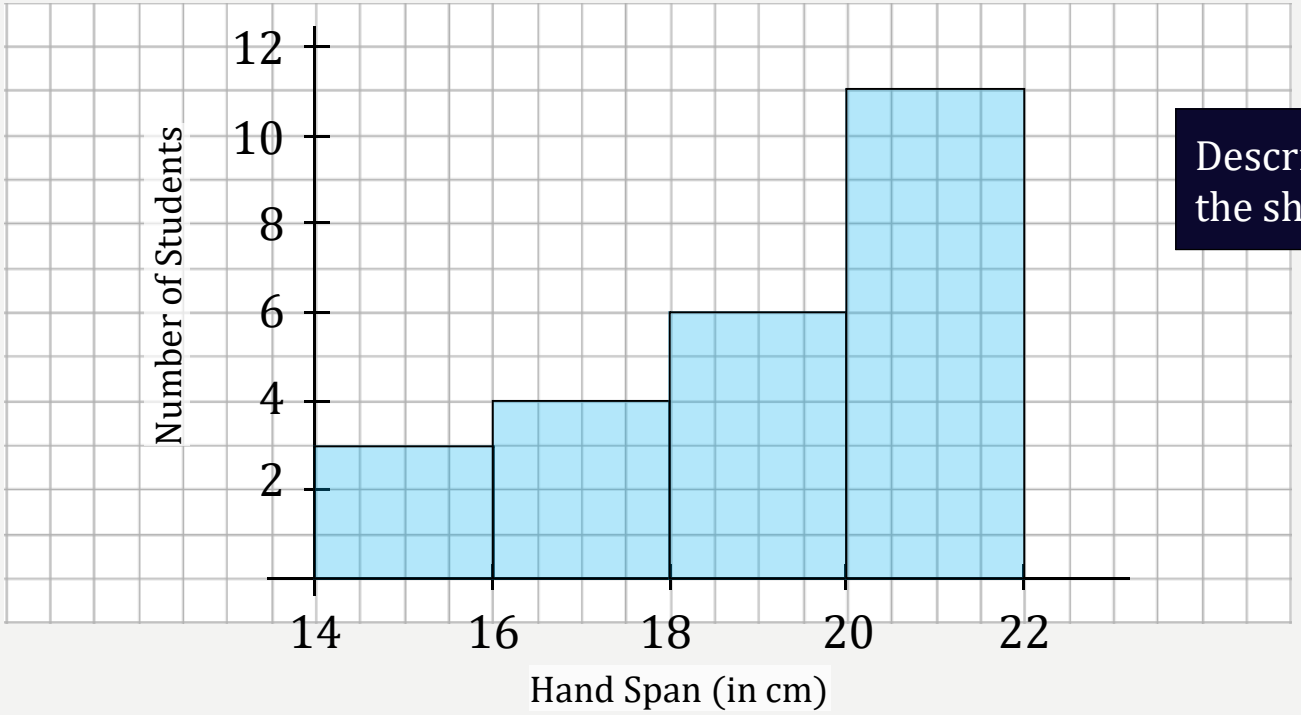
Draw a histogram to represent this data.
Label each axis clearly.

5. What is your...

Span of the hand you write with .....cm

Height	14 – 16	16 - 18	18 - 20	20 - 22
Number of Students	3	4	6	11

[Note: 14 - 16 means 14 cm or more but less than 16 cm, etc.]



Describe in your own words the shape of the distribution.

SECTION 5D
EXAM QUESTION 1
JCHL 2018
Q6 (D)

DRAW A HISTOGRAM

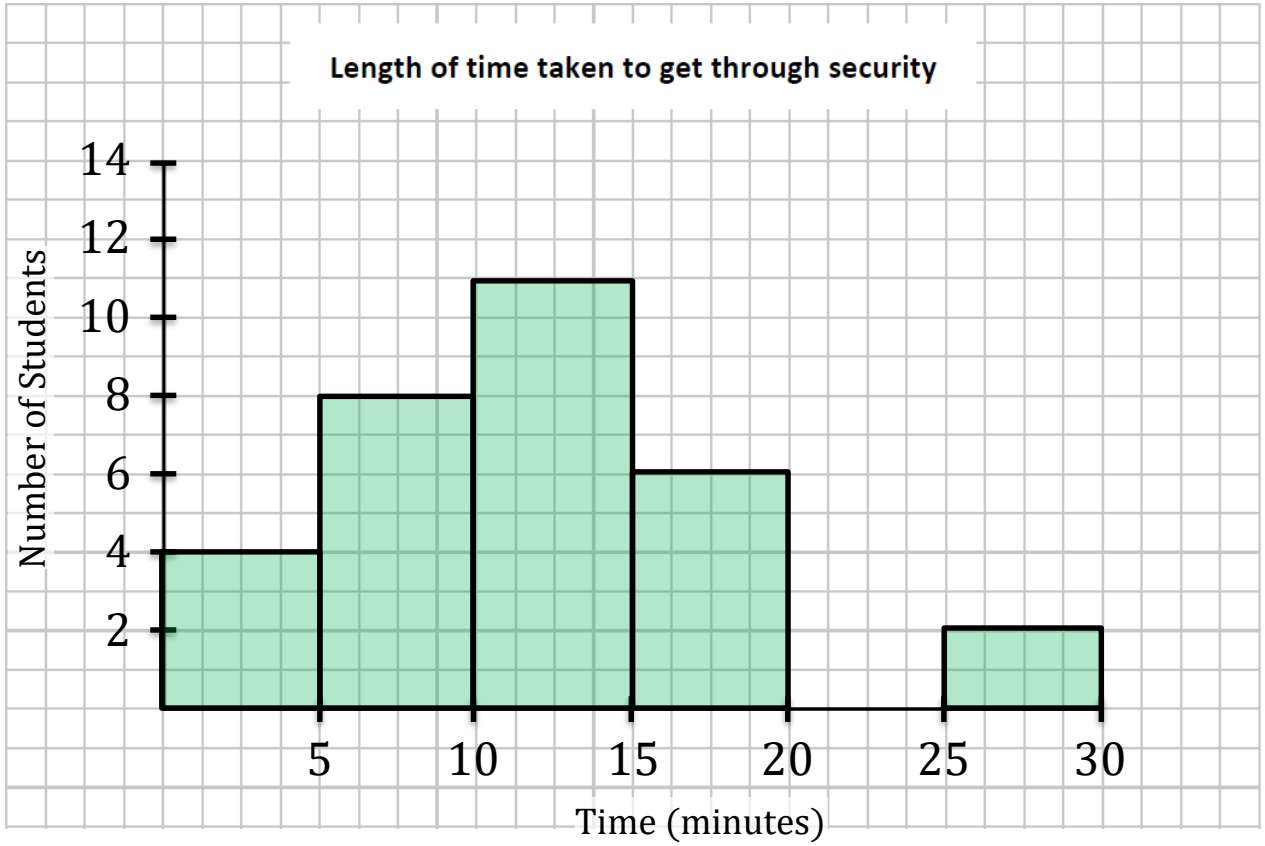
2018 JCHL Paper 2 – Question 6 (d)

The table below shows the length of time it took the students to get through security at the airport.

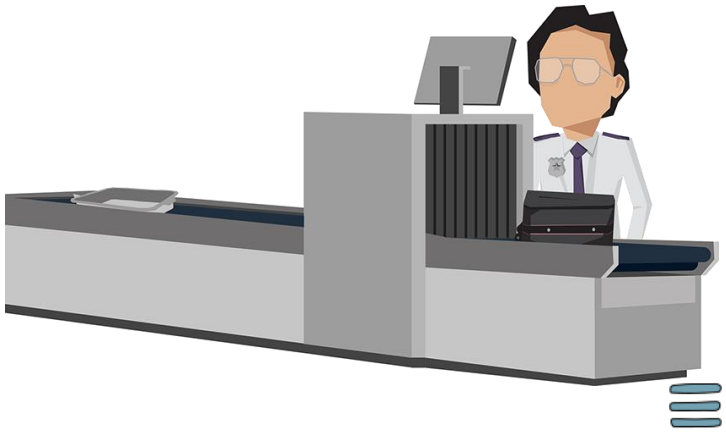
Draw a **histogram** to represent this data. Label each axis clearly.

Time (minutes)	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30
Number of students	4	8	11	6	0	1

[*Note*: 5 – 10 means 5 minutes or more but less than 10 minutes, etc.]



The top line of the table goes on the bottom of the histogram. Make sure to label the axes.



SECTION 5D
EXAM QUESTION 2
JCHL 2014S
Q5

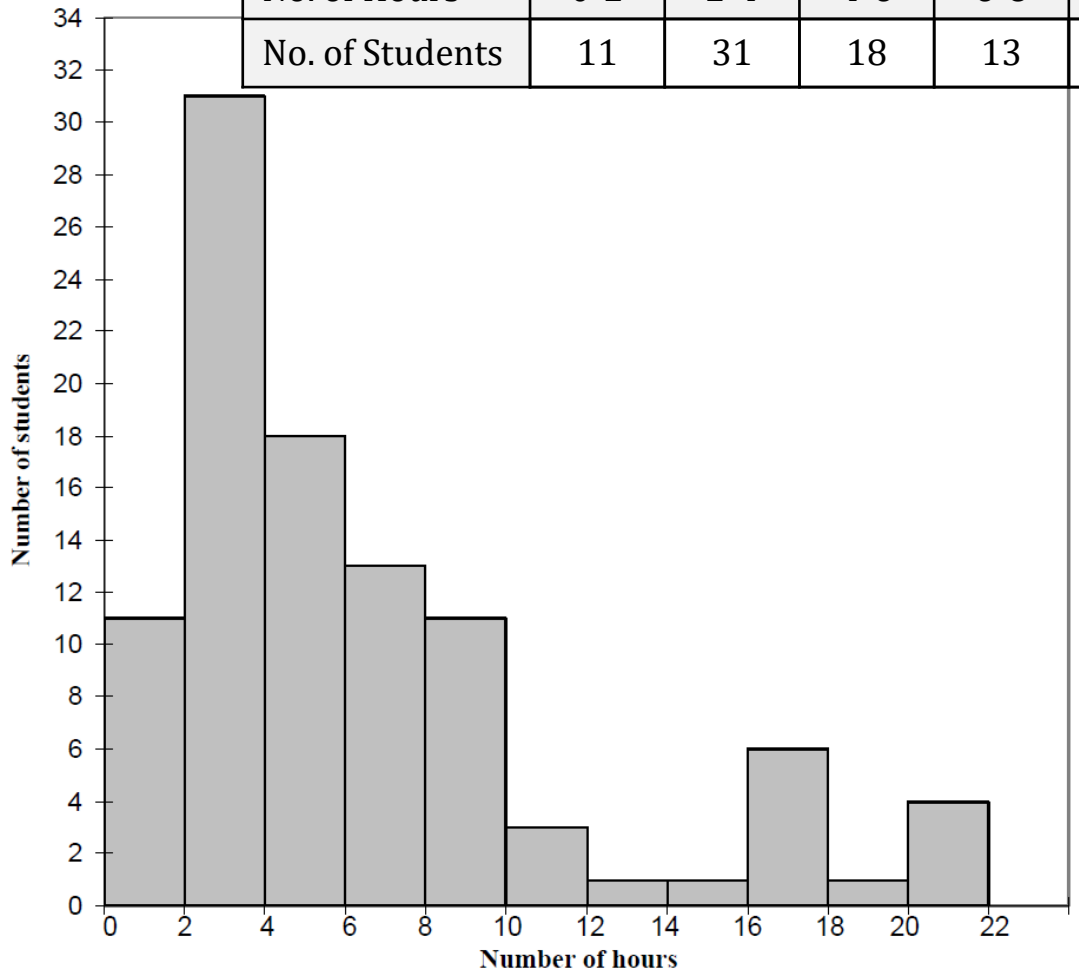
READ FROM A HISTOGRAM

The phase 9 *CensusAtSchool* questionnaire contained the question "Approximately how long do you spend on social networking sites each week?" The histogram below illustrates the answers given by 100 students, randomly selected from those who completed the survey.

Use the data from the histogram to complete the frequency table below.

No. of Hours	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22
No. of Students	11	31	18	13	11	3	1	1	6	1	4

[Note: 2-4 means 2 hours or more but less than 4 hours, etc.]



What is the modal interval?

No. of Hours	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22
No. of Students	11	31	18	13	11	3	1	1	6	1	4

The modal interval is the interval that contains the MOST values.

Modal Interval $= 2 - 4$ hours

Taking mid-interval values, find the mean amount of time spent on social networking sites.

Mid Interval	1	3	5	7	9	11	13	15	17	19	21
No. of Hours	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22
No. of Students	11	31	18	13	11	3	1	1	6	1	4

$$\textbf{Mean} = \frac{\text{sum of all the values}}{\text{number of values}}$$

$$\text{Mean} = \frac{\text{Total Hours}}{\text{Total Students}}$$

$$= \frac{(1 \times 11) + (3 \times 31) + (5 \times 18) + (7 \times 13) + (9 \times 11) + (11 \times 3) + (13 \times 1) + (15 \times 1) + (17 \times 6) + (19 \times 1) + (21 \times 4)}{100}$$

$$= \frac{11 + 93 + 90 + 91 + 99 + 33 + 13 + 15 + 102 + 19 + 84}{100}$$

$$= \frac{650}{100}$$

$$= 6.5 \text{ hours}$$

GRAPHING DATA: STEM AND LEAF

SECTION 5E

Student Activity 1

Student Activity 2

Exam Question 1

Exam Question 2

Exam Question 3

Exam Question 4

STEM AND LEAF DIAGRAM

2	5							
2	6	6	7					
2	8	8	8	9	9	9	9	9
3	0	0	0	0	1	1		
3	2							

Key: 2 | 5 means 25 sweets.

A stem and leaf diagram is a graph that groups data together so that at a glance we can visualise the shape of its distribution.

The ‘stem’ values are listed down and the ‘leaf values’ go right from the stem values.

STEM AND LEAF

The list below shows the vertical reach of the group of 24 second year students in our CensusAtSchool 2019/2020 Questionnaire .

197, 194, 200, 194, 208, 208, 202, 202,
213, 218, 205, 218, 224, 218, 222, 229,
189, 209, 210, 206, 197, 197, 214, 196

(a) Represent this data by a Stem and Leaf Plot.
(b) Why is this type of data suitable to be represented by a Stem and Leaf Plot.
(c) What was the modal vertical reach of the class?
(d) What was the median vertical reach of the class?
(e) What was the mean vertical reach of the class?
(f) What is the range of the data?

Stem	Leaf							
18	9							
19	4	4	6	7	7	7		
20	0	2	2	5	6	8	8	9
21	0	3	4	8	8	8		
22	2	4	9					

KEY : 19 | 7 = 197

5. What is your...

Vertical reach .....cm

SECTION 5E
EXAM QUESTION 1
JCHL 2019
Q1

DRAWING A STEM AND LEAF DIAGRAM

2019 LCOL Paper 2 – Question 1 (a)

A business has 28 employees.
Their ages, in years, are given below.

32	41	57	64	19	21	35
18	43	54	63	65	33	22
39	58	18	42	20	34	21
49	33	55	34	57	43	63

Complete the stem-and-leaf diagram, showing the ages of all 28 employees.

Stem	Leaf						
1	8	8	9				
2	0	1	1	2			
3	2	3	3	4	4	5	9
4	1	2	3	3	9		
5	4	5	7	7	8		
6	3	3	4	5			

KEY: 1|9 = 19 years of age.

SECTION 5E
EXAM QUESTION 2
JCHL 2017
Q4

RANGE, MODE, MEDIAN

The stem and leaf diagram below shows the number of copies of the *Newry News* sold each week over 17 weeks in a particular shop.
The value in the diagram for one of the weeks is p, where $p \in \mathbb{N}, 1 \leq p < 10$.

The **range** of the data is 39. Find the value of p.

0	8					
1	6	6	7	9	9	9
2	0	1	5	6	8	
3	2	4				
4	1	3	p			

Key: $3|2 = 32$ copies of the *Newry News*

Range is the difference between the lowest and the highest value.

$$x - 8 = 39$$
$$x = 47$$

$$p = 7$$

Find the value of each of the following statistics for this data:

0	8					
1	6	6	7	9	9	9
2	0	1	5	6	8	
3	2	4				
4	1	3	p			

Key: 3|2 = 32 copies of the *Newry News*

(i)

the **mode**

The mode is the most common value.

Mode = 19

(ii)

the **median**

The median is the middle value when ordered from lowest to highest.

There are 17 values.

$$\frac{17}{2} = 8.5$$

If we get a decimal we always round up.
9th value

Median = 21

The **sum** of the data in the stem and leaf diagram is 431.

Use this fact to find the **mean** of the data, correct to one decimal place.

0	8					
1	6	6	7	9	9	9
2	0	1	5	6	8	
3	2	4				
4	1	3	p			

Key: $3|2 = 32$ copies of the *Newry News*

The mean is found by dividing the sum of all the values by the number of values.

$$\text{Mean} = \frac{431}{17}$$

$$\text{Mean} = 25.35$$

$$\text{Mean} \approx 25.4 \text{ copies}$$

In the 18th week there was a special issue of the *Newry News*, and there were a lot more copies of it sold than in any of the other weeks.

Find the **modal** number of copies sold per week over the whole 18 weeks (i.e. the mode).

0	8					
1	6	6	7	9	9	9
2	0	1	5	6	8	
3	2	4				
4	1	3	p			

Key: $3|2 = 32$ copies of the *Newry News*

The mode will still be 19 copies as the number sold in the 18th week is more than any of the others and thus a unique number.

19 copies

Find the **median** number of copies sold per week over the whole 18 weeks.

0	8					
1	6	6	7	9	9	9
2	0	1	5	6	8	
3	2	4				
4	1	3	p			

Key: $3|2 = 32$ copies of the *Newry News*

The median is the middle value when ordered from lowest to highest.

There are now 18 values.

$$\frac{18}{2} = 9$$

If we get a whole number we find the average of this value and the next.

$$\text{Median} = \frac{21 + 25}{2}$$

$$\text{Median} = \frac{46}{2}$$

$$\text{Median} = 23 \text{ copies}$$

The **mean** number of copies sold per week over the whole 18 weeks was 28·5.

Work out the number of copies that were sold in the 18th week.

0	8					
1	6	6	7	9	9	9
2	0	1	5	6	8	
3	2	4				
4	1	3	p			

Key: $3|2 = 32$ copies of the *Newry News*

The mean is found by dividing the sum of all the values by the number of values. Let the new value be x.

$$\text{Mean} = \frac{431 + x}{18}$$

$$\frac{431 + x}{18} = 28.5$$

$$431 + x = 18(28.5)$$

$$431 + x = 513$$

$$x = 513 - 431$$

$$x = 82$$

There were 82 copies of the Newry News sold on the 18th week.

Male actors												Female actors						
								9	2	5	6	8	9	9	9			
			8	8	7	7	6	2	3	0	2	3	3	3	5	5	6	9
		8	7	6	5	5	3	0	4	2	5	5	9					
					4	2	0	0	5									
							0	0	6	1								
												Key:	2 | 5 = 25					

BACK TO BACK STEM AND LEAF

A back to back stem and leaf diagram is used to compare two sets of data side by side.

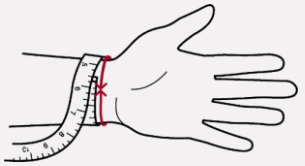
BACK TO BACK STEM AND LEAF

Section 5E: Activity 2

The lists below shows the length of the circumference of right wrist for a group of 24 second year students in our CensusAtSchool 2019/2020 Questionnaire. The data is split by gender.

Female
20.2, 15.1, 21.5, 19.1, 17.5, 16.3, 15.5, 19.2, 18.2, 15.7, 18.1, 15.1, 16.6, 15.5

Male
18.9, 16.4, 16.5, 21.2, 16.0, 17.1, 20.2, 19.0, 16.3, 18.5



Draw a back-to-back stem-and-leaf plot below to display the students' measurements.

MALE				FEMALE							
				15	1	1	5	5	7		
5	4	3	0	16	3	6					
			1	17	5						
		9	5	18	1	2					
			0	19	1	2					
			2	20							
			2	21							
KEY : 15 | 5 = 15.5											

Compare the data under the following headings:

- Central Tendency
- Measures of Spread

Describe one difference and one similarity between the wrist circumference for the males and for the females.

SECTION 5E
EXAM QUESTION 3
JCHL 2014
Q3

BACK TO BACK STEM AND LEAF DIAGRAMS

All of the students in a class took *IQ Test 1* on the same day. A week later they all took *IQ Test 2*. Their scores on the two IQ tests are shown in the tables below.

Draw a back-to-back stem-and-leaf plot below to display the students' scores.

IQ Test 1				
86	104	89	105	96
96	103	94	104	119
115	79	97	111	108

IQ Test 2				
83	120	105	111	114
99	111	108	106	97
97	102	94	108	117

IQ Test 1		*IQ Test 2*
9	7	
9 6	8	3
7 6 6 4	9	4 7 7 9
8 5 4 4 3	10	2 5 6 8 8
9 5 1	11	1 1 4 7
	12	0

Key: 8|3 = 83

Find the range of scores for each IQ test.

IQ Test 1		*IQ Test 2*
9	7	
9 6	8	3
7 6 6 4	9	4 7 7 9
8 5 4 4 3	10	2 5 6 8 8
9 5 1	11	1 1 4 7
	12	0

Key: 8|3 = 83

Range = Highest Value – Lowest Value

IQ Test 1: Range

$= 119 - 79$

$= 40$

IQ Test 2: Range

$= 120 - 83$

$= 37$

Find the median score for each IQ test.

IQ Test 1		*IQ Test 2*
9	7	
9 6	8	3
7 6 6 4	9	4 7 7 9
8 5 4 4 3	10	2 5 6 8 8
9 5 1	11	1 1 4 7
	12	0

Key: 8|3 = 83

The median is the middle value when ordered from lowest to highest.

There are 15 values.

$$\frac{15}{2} = 7.5$$

Round up to the 8th value.

IQ Test 1: Median

= 103

IQ Test 2: Median

= 106

Find the mean score for each IQ test.

IQ Test 1		IQ Test 2
9	7	
9 6	8	3
7 6 6 4	9	4 7 7 9
8 5 4 4 3	10	2 5 6 8 8
9 5 1	11	1 1 4 7
	12	0

Key: 8|3 = 83

Mean $= \dfrac{\text{sum of all the values}}{\text{number of values}}$

Mean Score of Test 1

$$= \frac{79 + 86 + 89 + 94 + 96 + 96 + 97 + 103 + 104 + 104 + 105 + 108 + 111 + 115 + 119}{15}$$

$$= \frac{1506}{15}$$

$$= 100.4$$

Mean Score of Test 2

$$= \frac{83 + 94 + 97 + 97 + 99 + 102 + 105 + 106 + 108 + 108 + 111 + 111 + 114 + 117 + 120}{15}$$

$$= \frac{1572}{15}$$

$$= 104.8$$

SECTION 5E
EXAM QUESTION 4
JCHL 2014
Q3

BACK TO BACK STEM AND LEAF DIAGRAMS

The ages of the 30 people who took part in an aerobics class are as follows:

18	24	32	37	9	13	22	41	51	49
15	42	37	58	48	53	27	54	42	24
33	48	56	17	61	37	63	45	20	39
16	22	29	7	36	45	12	38	52	13
33	41	24	35	51	8	47	22	14	24
42	62	15	24	23	31	53	36	48	18

The ages of the 30 people who took part in a swimming class are as follows:

Represent this data on a back-to-back stem-and-leaf diagram.

Aerobics class								Swimming class							
						9	0	7	8						
			8	7	5	3	1	2	3	4	5	6	8		
		7	4	4	2	0	2	2	2	3	4	4	4	9	
	9	7	7	7	3	2	3	1	3	5	6	6	8		
9	8	8	5	2	2	1	4	1	2	5	7	8			
		8	6	4	3	1	5	1	2	3					
					3	1	6	2							
								Key: 1 | 5 means 15							

Use your diagram to identify the median in each case.

Aerobics class								Swimming class					
						9	0	7	8				
			8	7	5	3	1	2	3	4	5	6	8
		7	4	4	2	0	2	2	2	3	4	4	4	9
	9	7	7	7	3	2	3	1	3	5	6	6	8	
9	8	8	5	2	2	1	4	1	2	5	7	8		
		8	6	4	3	1	5	1	2	3				
					3	1	6	2						
								Key: 1 | 5 means 15					

The median is the middle value when ordered from lowest to highest.

There are 30 values.

$$\frac{30}{2} = 15$$

Median is the average of the 15th and 16th Values

Aerobics: Median

$$\frac{37 + 39}{2} = 38$$

Swim: Median

$$\frac{29 + 31}{2} = 30$$

What other measure of central tendency could have been used when examining this data?

Mean or Mode

Aerobics class								Swimming class					
						9	0	7	8				
			8	7	5	3	1	2	3	4	5	6	8
		7	4	4	2	0	2	2	2	3	4	4	4	9
	9	7	7	7	3	2	3	1	3	5	6	6	8	
9	8	8	5	2	2	1	4	1	2	5	7	8		
		8	6	4	3	1	5	1	2	3				
					3	1	6	2						
Key: 1 | 5 means 15														

(d)

Based on the data make one observation about the ages of the two groups.

An older age group take Aerobics class.

A younger age group take Swimming class.

GRAPHING DATA: PIE CHARTS

SECTION 5F

Student Activity 1

Student Activity 2

Student Activity 3

Exam Question 1

Exam Question 2

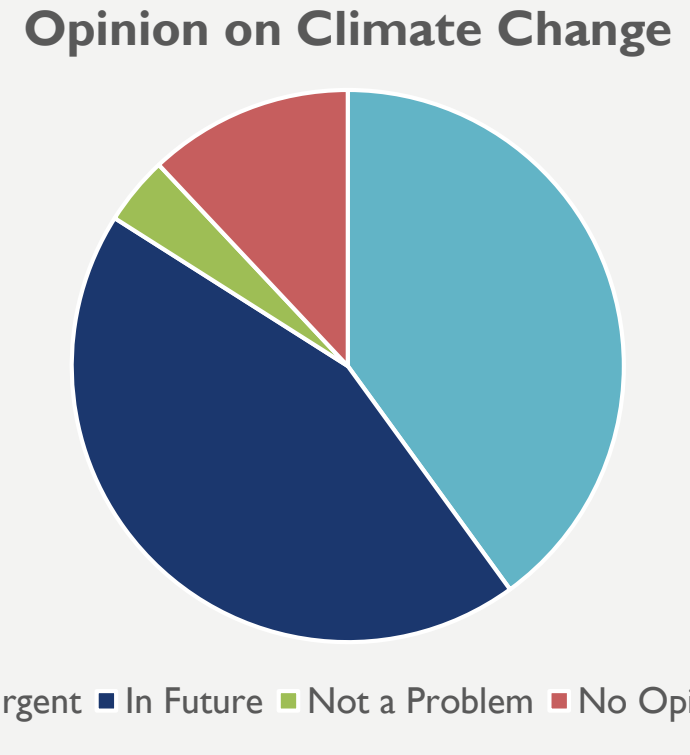
Exam Question 3

PIE CHART

- A pie chart is a graph/ chart that uses sectors of a circle to show the relative sizes of data.
- The Pie Chart here displays the results of 24 second year students for Q10 (b)

10. b) Which option best describes your opinion on climate change? Select one answer.

- ☐ It is an urgent problem that needs to be managed now.
- ☐ It is a problem that needs to be managed in the future.
- ☐ It is not a problem.
- ☐ I don't know or have no opinion.



PIE CHART

Complete the table below to show the number of students that selected each answer.

Answer	Angle	No. of Students
Urgent	150°	
In Future	165°	
Not a Problem	15°	
No Opinion	30°	

Urgent

$$\frac{150°}{360°} \times 24 = 10$$

In Future

$$\frac{165°}{360°} \times 24 = 11$$

Not a Problem

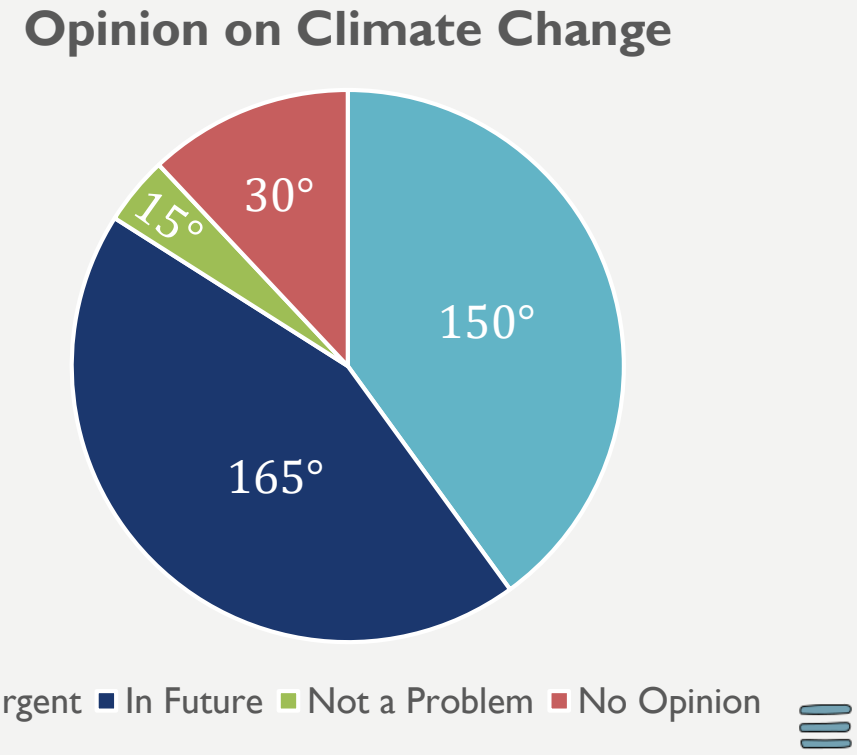
$$\frac{15°}{360°} \times 24 = 1$$

No Opinion

$$\frac{30°}{360°} \times 24 = 2$$

10. b) Which option best describes your opinion on climate change? Select one answer.

- ☐ It is an urgent problem that needs to be managed now.
- ☐ It is a problem that needs to be managed in the future.
- ☐ It is not a problem.
- ☐ I don't know or have no opinion.



PIE CHART

Question 6 of the 2019/2020 CensusAtSchools Questionnaire is on the right.

The answers of 24 second year students are summarised in the table below.

Children in 2100	2 Billion	3 Billion	4 Billion
Number of Students	1	19	4

Display the data on a Pie Chart.

6. There are 2 billion children in the world today, aged 0 to 15 years old. How many children will there be in the year 2100, according to the United Nations? Select one answer.

- ☐ 4 billion
- ☐ 3 billion
- ☐ 2 billion

360° in a circle so divide 360 by the number of people, 24, to calculate the portion of the pie chart allocated to 1 person.

$\frac{360°}{24} = 15°$ per person

2 Billion

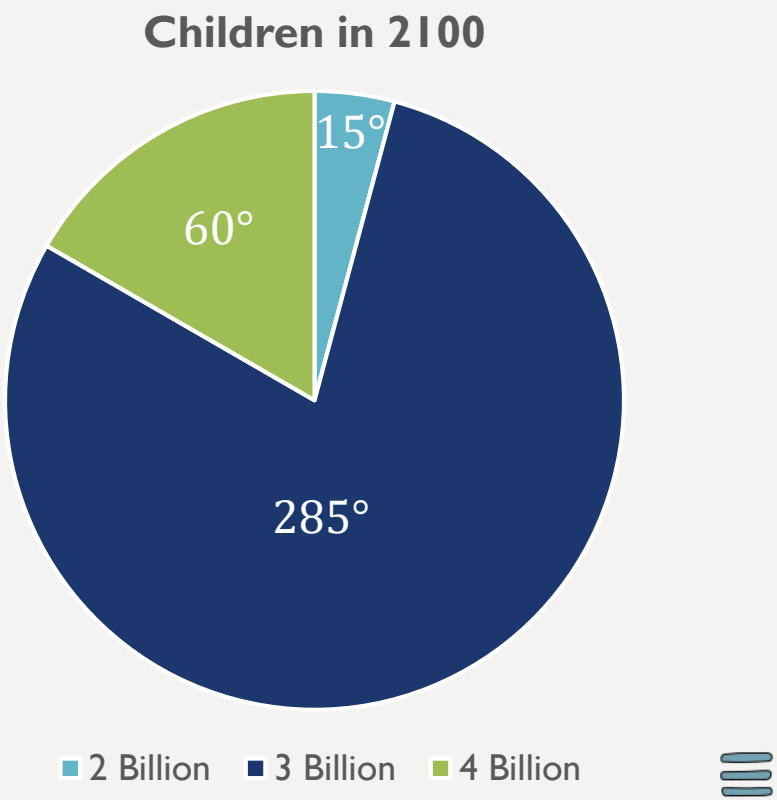
$1 \times 15°$

3 Billion

$19 \times 15° = 285°$

4 Billion

$4 \times 15° = 60°$



PIE CHART

Section 5F: Activity 3

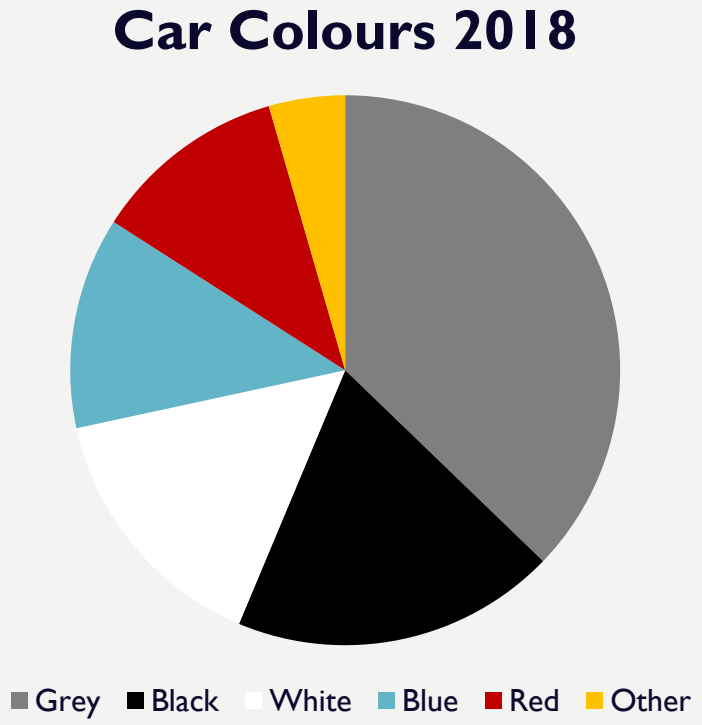
Q16 (b) of the 2019/20 CensusAtSchools questionnaire asks students what their opinion on the most popular car colour licensed in Ireland in 2018.

16. b) What was the most popular colour of car licensed in Ireland in 2018?

The following is the **actual** breakdown of colour of car sold in Ireland in 2018.

Grey (47,280)
Black (24,262)
White (19,443)
Blue (15,815)
Red (14,554)
Other (5,691)

Display the information on a pie chart.



PIE CHART

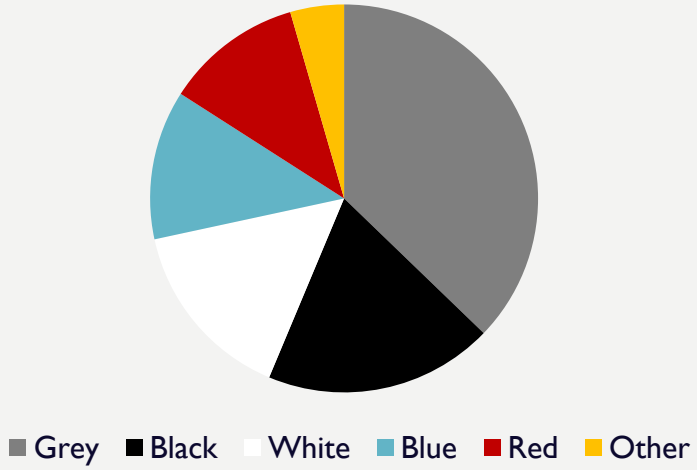
The following are the answers of the 24 second year students.

Display the information on a pie chart.

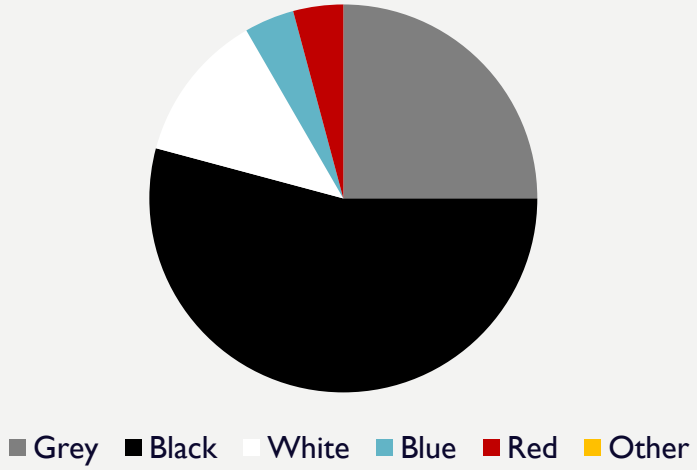
Car Colour	Black	Grey	White	Blue	Red
Students	13	6	3	1	1

16. b) What was the most popular colour of car licensed in Ireland in 2018?

Car Colours 2018 - Actual



Car Colours 2018 – Students Answers



Compare the two pie charts making reference to the accuracies or inaccuracies of the students.

SECTION 5F
EXAM QUESTION 1
JCHL 2014
Q5

DRAW A PIE CHART

2014 JCHL Paper 2 – Question 5 (a)

Students in a class are investigating spending in their local area. They carry out a different survey, and display the results.
John is investigating whether people pay for their weekly shopping with Credit Card, Debit Card, Cash, or Cheque.
When people tell him which one of these they usually use he writes it in a table. His results are shown below.

Credit Card	Debit Card	Debit Card	Cash	Debit Card
Credit Card	Cash	Cash	Credit Card	Debit Card
Debit Card	Debit Card	Cheque	Cash	Cash
Cash	Cash	Debit Card	Cash	Credit Card

(ii)

Fill in the frequency table below.

Method of Payment	Credit Card	Debit Card	Cash	Cheque
Frequency	4	7	8	1

Display John's data in a pie chart.
Show all of your calculations clearly.

Method of Payment	Credit Card	Debit Card	Cash	Cheque
Frequency	4	7	8	1

Calculate the total number surveyed

$= 4 + 7 + 8 + 1$
$= 20$ people

360° in a circle divide 360 by the number of people, 20, to calculate the portion of the pie chart allocated to 1 person.

$\frac{360°}{20} = 18°$ per person

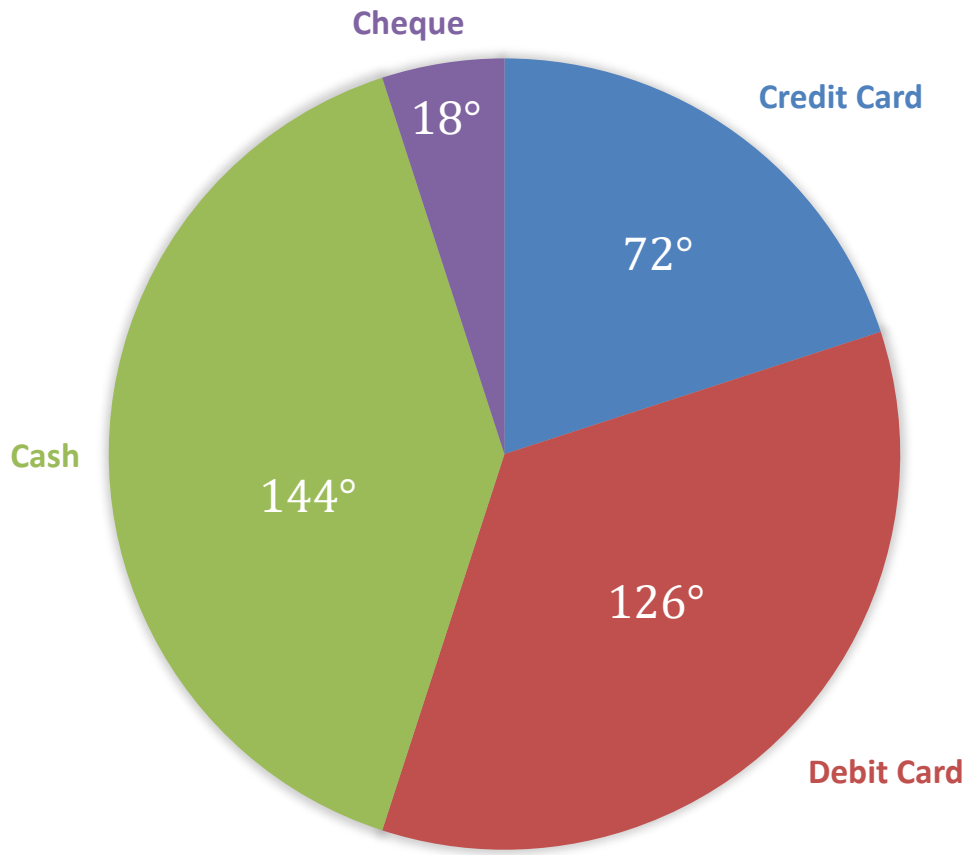
Credit Card
$= 4 \times 18$
$= 72°$

Debit Card
$= 7 \times 18$
$= 126°$

Cash
$= 8 \times 18$
$= 144°$

Cheque
$= 1 \times 18$
$= 18°$

Multiply the number in each category by 18° to calculate the portion allocated to each category.

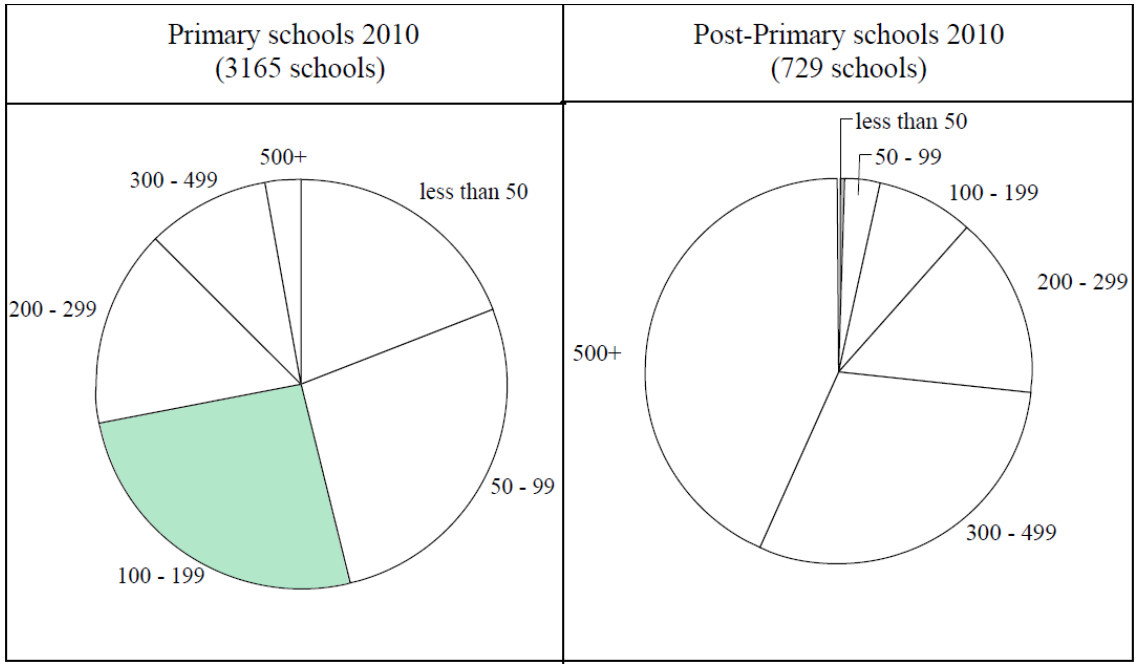


SECTION 5F
EXAM QUESTION 2
JCHL 2014S
Q7

READ FROM A PIE CHART

The number of students attending primary and post-primary schools in Ireland in 2010 is illustrated in the pie-charts below.

The angle in the slice for Primary schools with between 100 and 199 pupils is 93.725°. Calculate the number of schools in this category.



There are 3165 Primary Schools and 360° in a circle so calculate how many schools are represented by 1 degree.

$$\frac{3165}{360} = 8.792$$

$$1° = 8.792 \text{ schools}$$

Multiply this by the measure of degree of the 100 – 199 category.

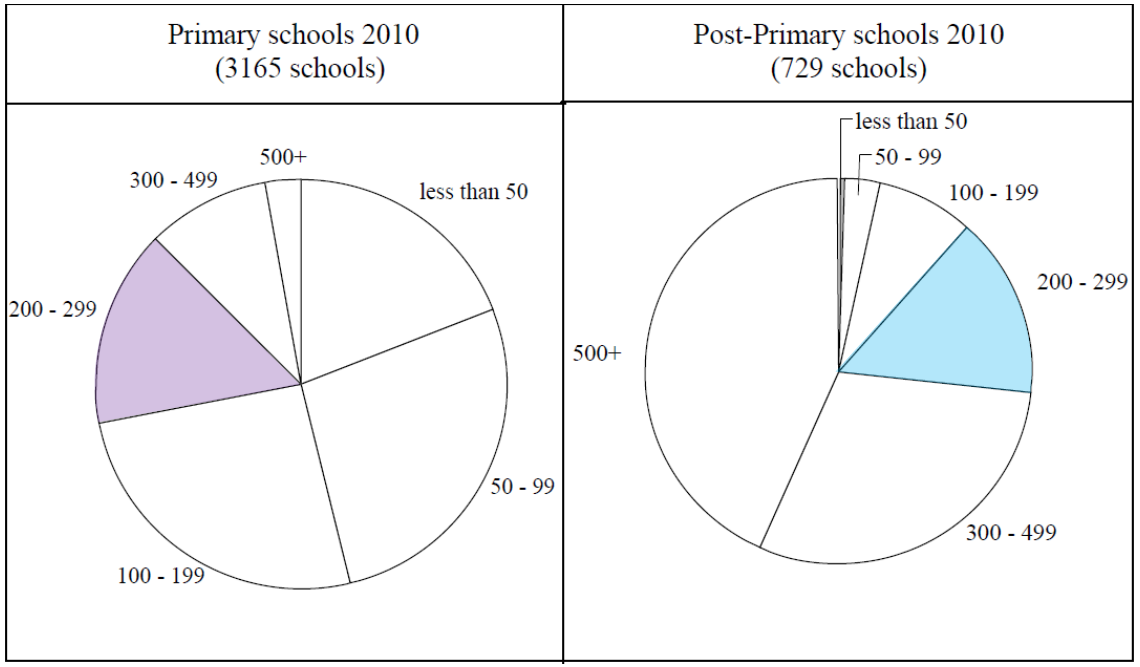
$$8.792 \times 93.725°$$
$$= 824$$

There are 824 100-199 pupil Primary Schools.

2014 Sample JCHL Paper 2 – Question 7 (ii)

Mary claims that the charts show that there is roughly the same number of post-primary schools as primary schools in the 200 – 299 range. Do you agree with Mary?

Give a reason for your answer based on the data in the charts.



No.

The portion of each pie chart represented by to the 200-299 pupil category is comparable BUT there are far more Primary Schools than Post Primary Schools.

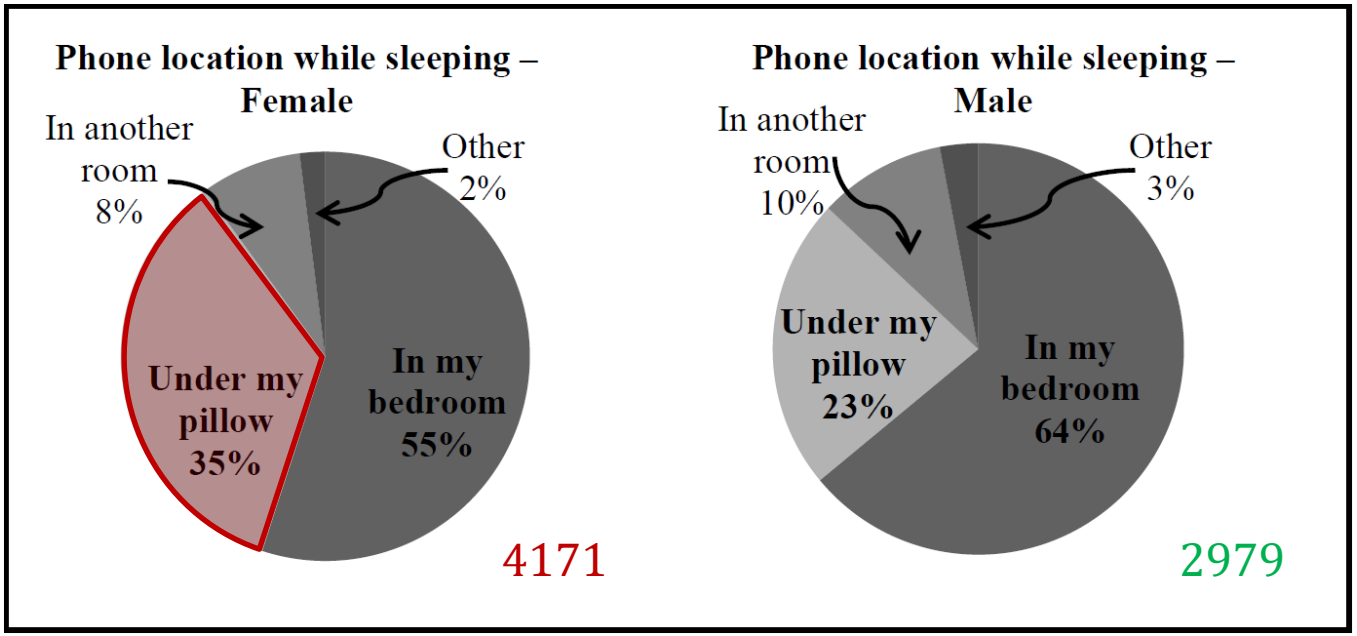
This means that though the percentages are roughly the same there are far more 200-299 pupil primary schools.

SECTION 5F
EXAM QUESTION 3
JCHL 2013
Q5

READ FROM A PIE CHART

In total 7150 second level school students from 216 schools completed the 2011/2012 phase 11 *CensusAtSchool* questionnaire. The questionnaire contained a question relating to where students keep their mobile phones while sleeping.

Given that this question was answered by 4171 girls and 2979 boys, calculate how many female students kept their mobile phones under their pillows.



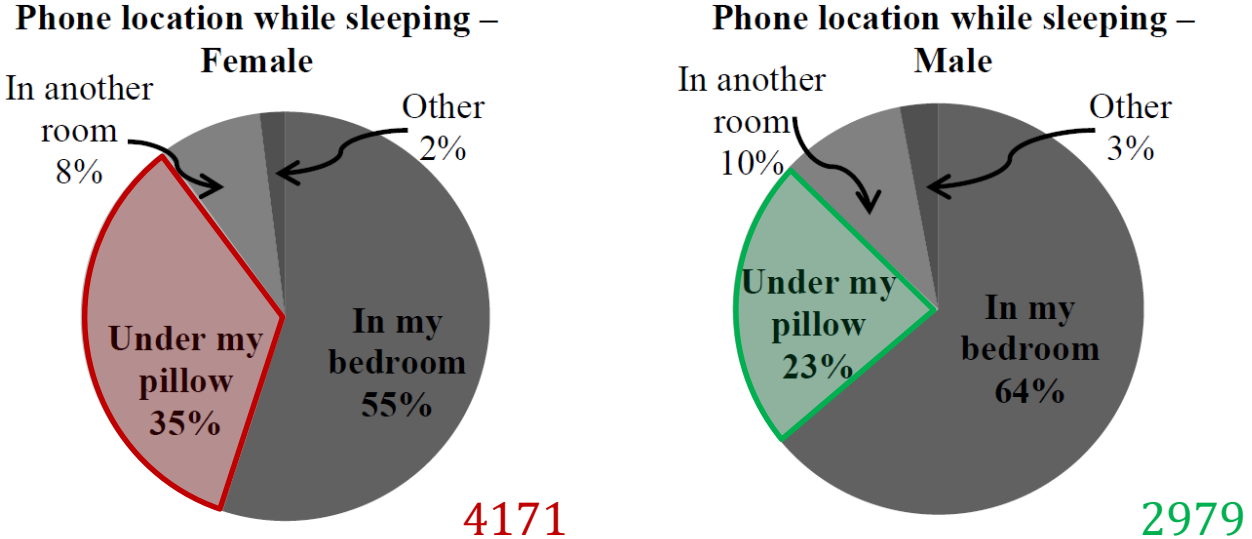
4171 Females
35% Under Pillow

Calculate 35% of 4171

$4171 \times 0.35 = 1459.85$
≈ 1460

1460 females kept their phones under their pillow.

Calculate the overall percentage of students who kept their mobile phones under their pillows.



2979 Males
23% Under Pillow

Calculate 23% of 2979

$2979 \times 0.23 = 685.17$
≈ 685

685 males kept their phones under their pillow.

Calculate the total amount of students that slept with their phone under their pillow.

$(4171 \times 0.35) + (2979 \times 0.23)$
$= 1459.85 + 685.17$
$= 2145.02$

Express the number of students who slept with their phones under the bed as a % of the total number of students.

$$\frac{2145.02}{7150} \times 100 = 30\%$$

A new pie chart is to be drawn showing the mobile phone location for all students.

Calculate the measure of the angle that would represent the students who kept their mobile phones under their pillows.

30% of ALL students kept their mobile phone under their pillows.

There are 360° in a circle. Find 30% of 360°

$$360° \times 0.30 = 108°$$

GRAPHING DATA: SCATTER PLOTS

SECTION 5G

Student Activity 1

Student Activity 2

Student Activity 3

Exam Question

UNIVARIATE & BIVARIATE DATA

- **Univariate Data**

Only one item of data is collected, e.g. height

- **Bivariate Data (LC Only)**

Two items of data are collected to see if there is a relationship between the variables, e.g. height and arm span.

  - To compare the relationship between two items of data we can use a scatter plot.

Click on the image for a video demonstrating the power of a scatter plot!

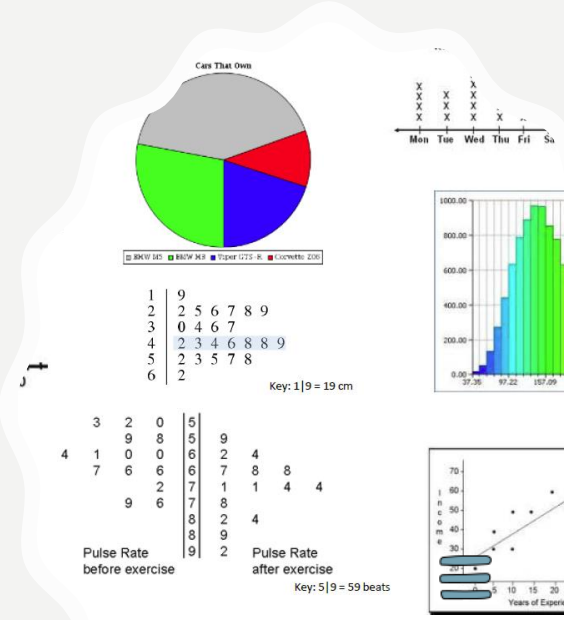
Section 5G:Activity 1

SCATTER PLOT

Hans Rosling says that he is trying to show data in a way that people enjoy and understand.

Do you think he was effective in this aim? Explain your answer.

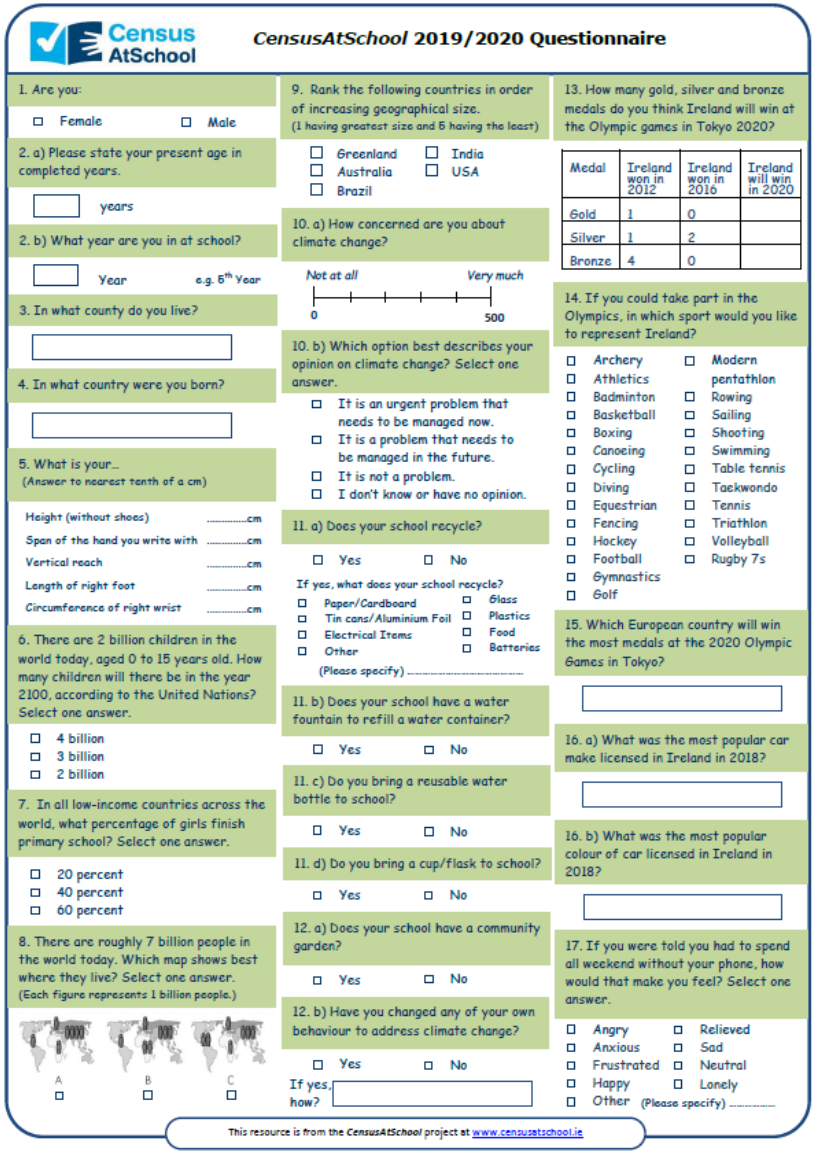
Having watched the video what relationship did you observe between the wealth and the health of a country?



CORRELATION – INVESTIGATING THE RELATIONSHIP BETWEEN 2 DATA ITEMS

Reread each of the questions in the CensusAtSchools 2019/20 Questionnaire.

Identify pairs of data that we can collect from the questionnaire that can be paired so as to investigate if there is a relationship (correlation) between them?



Census AtSchool

CensusAtSchool 2019/2020 Questionnaire

1. Are you:
☐ Female ☐ Male

2. a) Please state your present age in completed years.
☐ years

2. b) What year are you in at school?
☐ Year e.g. 6th Year

3. In what county do you live?

4. In what country were you born?

5. What is your...
(Answer to nearest tenth of a cm)
Height (without shoes) .....cm
Span of the hand you write with .....cm
Vertical reach .....cm
Length of right foot .....cm
Circumference of right wrist .....cm

6. There are 2 billion children in the world today, aged 0 to 15 years old. How many children will there be in the year 2100, according to the United Nations? Select one answer.
☐ 4 billion
☐ 3 billion
☐ 2 billion

7. In all low-income countries across the world, what percentage of girls finish primary school? Select one answer.
☐ 20 percent
☐ 40 percent
☐ 60 percent

8. There are roughly 7 billion people in the world today. Which map shows best where they live? Select one answer.
(Each figure represents 1 billion people.)
A ☐ B ☐ C ☐

9. Rank the following countries in order of increasing geographical size.
(1 having greatest size and 6 having the least)
☐ Greenland ☐ India
☐ Australia ☐ USA
☐ Brazil

10. a) How concerned are you about climate change?
Not at all — Very much
0 — 500

10. b) Which option best describes your opinion on climate change? Select one answer.
☐ It is an urgent problem that needs to be managed now.
☐ It is a problem that needs to be managed in the future.
☐ It is not a problem.
☐ I don't know or have no opinion.

11. a) Does your school recycle?
☐ Yes ☐ No
If yes, what does your school recycle?
☐ Paper/Cardboard ☐ Glass
☐ Tin cans/Aluminium Foil ☐ Plastics
☐ Electrical Items ☐ Food
☐ Other ☐ Batteries
(Please specify) .....

11. b) Does your school have a water fountain to refill a water container?
☐ Yes ☐ No

11. c) Do you bring a reusable water bottle to school?
☐ Yes ☐ No

11. d) Do you bring a cup/flask to school?
☐ Yes ☐ No

12. a) Does your school have a community garden?
☐ Yes ☐ No

12. b) Have you changed any of your own behaviour to address climate change?
☐ Yes ☐ No
If yes, how?

13. How many gold, silver and bronze medals do you think Ireland will win at the Olympic games in Tokyo 2020?

Medal	Ireland won in 2012	Ireland won in 2016	Ireland will win in 2020
Gold	1	0	
Silver	1	2	
Bronze	4	0	

14. If you could take part in the Olympics, in which sport would you like to represent Ireland?
☐ Archery ☐ Modern pentathlon
☐ Athletics ☐ Rowing
☐ Badminton ☐ Sailing
☐ Basketball ☐ Shooting
☐ Boxing ☐ Swimming
☐ Canoeing ☐ Table tennis
☐ Cycling ☐ Taekwondo
☐ Diving ☐ Tennis
☐ Equestrian ☐ Triathlon
☐ Fencing ☐ Volleyball
☐ Hockey ☐ Rugby 7s
☐ Football
☐ Gymnastics
☐ Golf

15. Which European country will win the most medals at the 2020 Olympic Games in Tokyo?

16. a) What was the most popular car make licensed in Ireland in 2018?

16. b) What was the most popular colour of car licensed in Ireland in 2018?

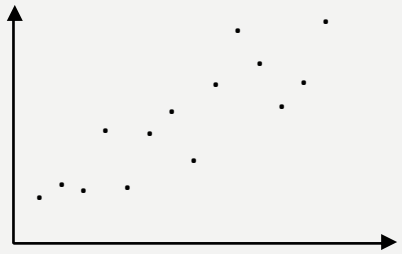
17. If you were told you had to spend all weekend without your phone, how would that make you feel? Select one answer.
☐ Angry ☐ Relieved
☐ Anxious ☐ Sad
☐ Frustrated ☐ Neutral
☐ Happy ☐ Lonely
☐ Other (Please specify) .....

This resource is from the *CensusAtSchool* project at www.censusatschool.ie

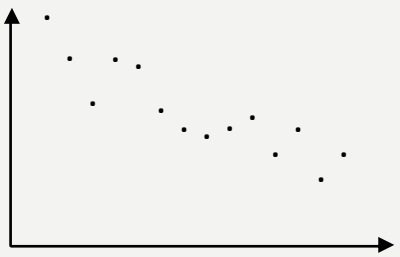
DESCRIBING CORRELATION

- Correlation is a statistical relationship between bivariate data (two items of data). The more correlated the data the stronger the relationship.
- Types of Correlation
  - Positively Correlated – As one quantity increases so does another.
  - Negatively Correlated – As one quantity increases, the other decreases.
  - No Correlation – There is no connection between the two variables.

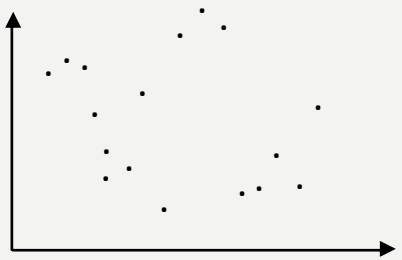
Positive Correlation



Negative Correlation



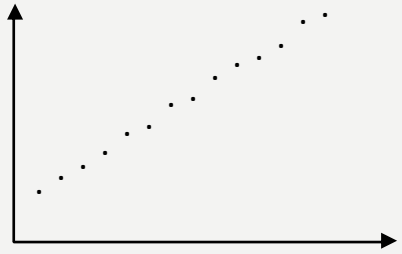
No Correlation



CORRELATION COEFFICIENT

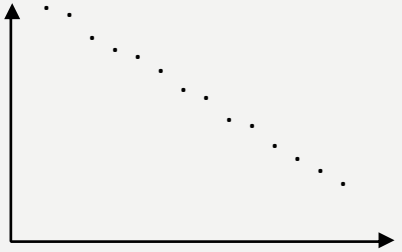
The correlation coefficient, r assigns a numerical value between $-1 \leq r \leq 1$ to the correlation.

Strong Positive Correlation



Correlation Coefficient: 0.98

Strong Negative Correlation



Correlation Coefficient: -0.98

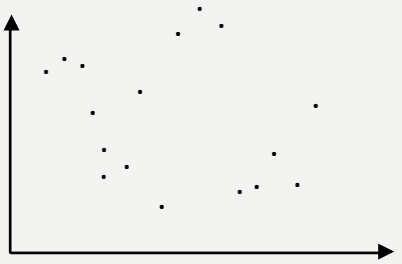
Weak Positive Correlation

Correlation Coefficient: 0.5

Weak Negative Correlation

Correlation Coefficient: -0.5

No Correlation



Correlation Coefficient: 0.18

SCATTER PLOT

Section 5F: Activity 3

The table below shows the heights and vertical reaches of the 10 male second year students in our 2019/20 CensusAtSchool questionnaire.

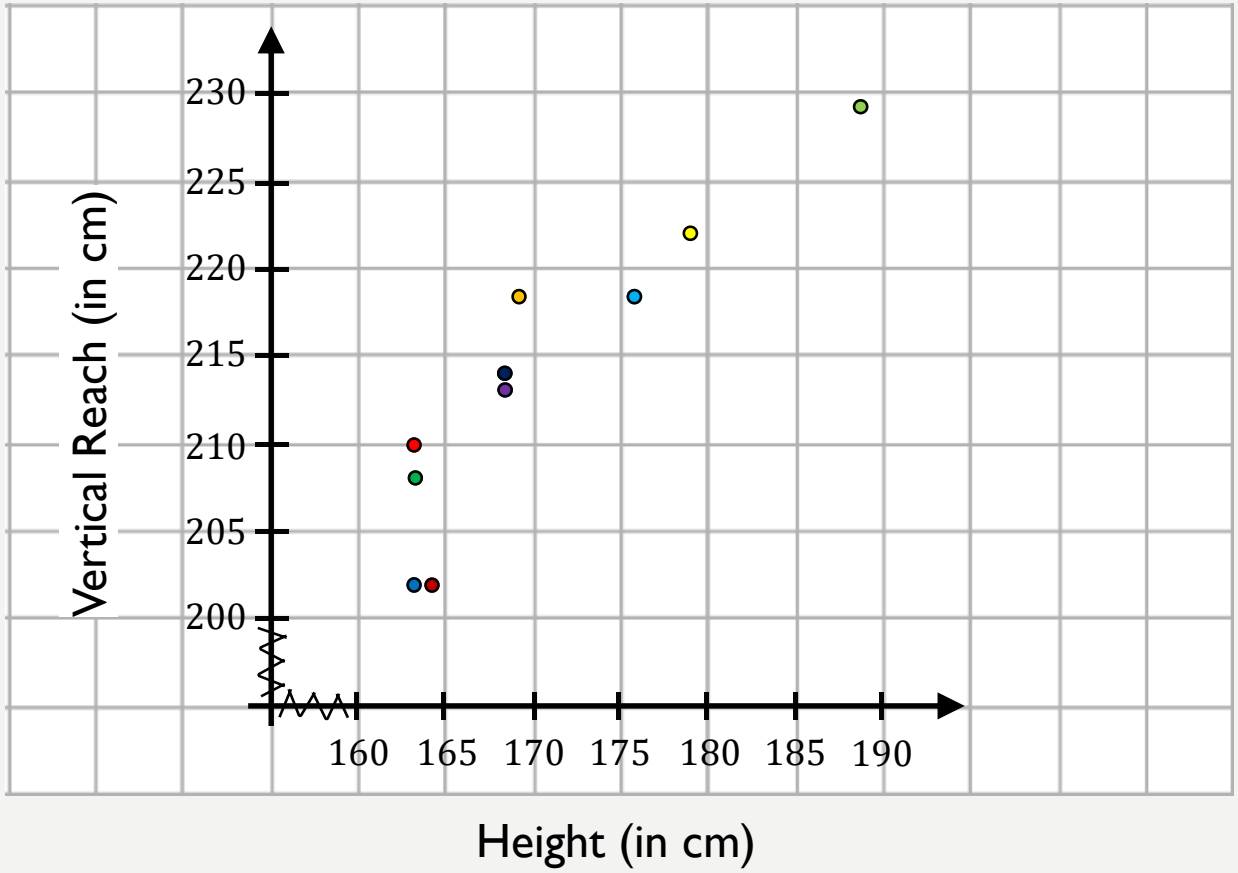
(a) Draw a Scatter Plot for this data and draw a line of best fit.
(b) Is there a correlation between height and vertical reach?
(c) Calculate the correlation coefficient?

Student	A	B	C	D	E	F	G	H	I	J
Height	163	163	164	168	169	176	179	188	163	168
Reach	208	202	202	213	218	218	222	229	210	214

SCATTER PLOT

Draw a Scatter Plot for this data and draw a line of best fit?

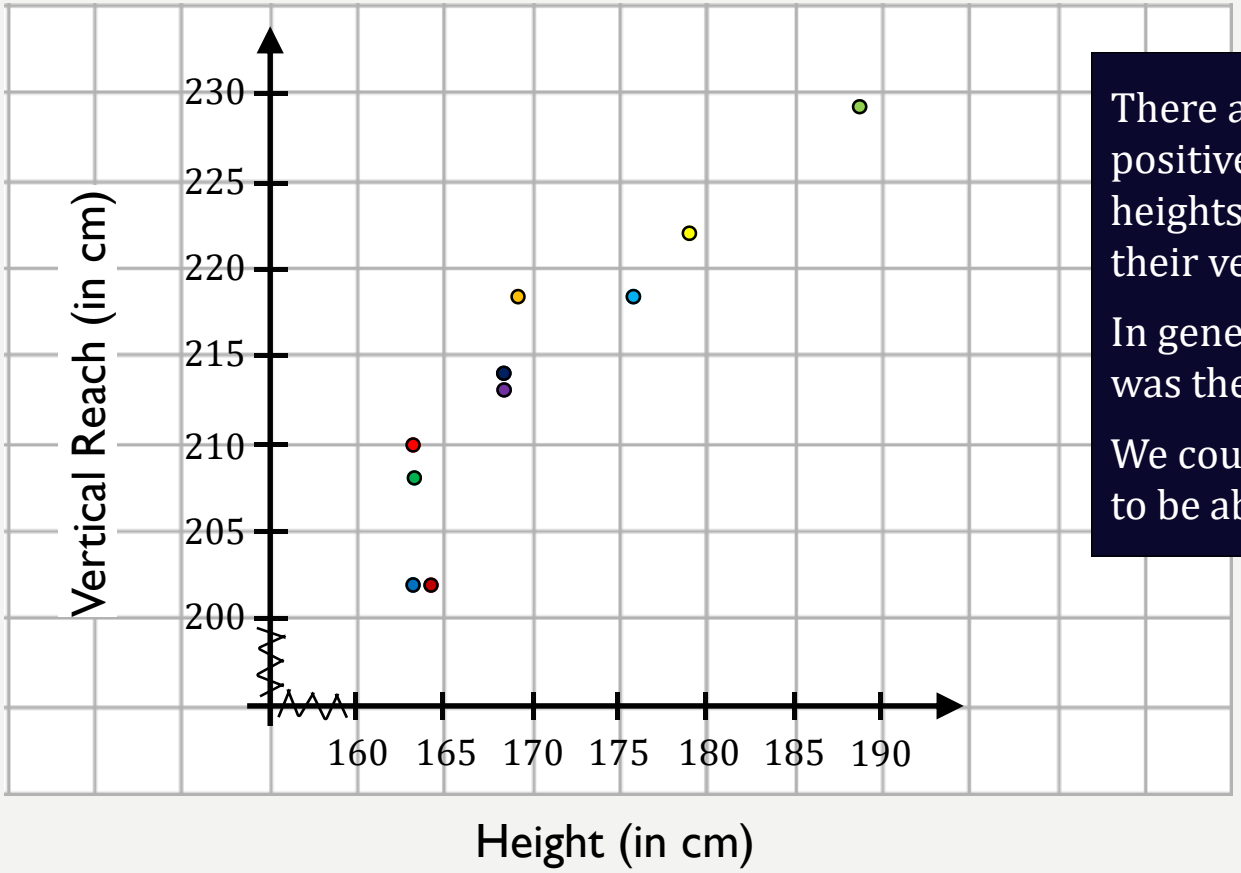
Student	A	B	C	D	E	F	G	H	I	J
Height	163	163	164	168	169	176	179	188	163	168
Reach	208	202	202	213	218	218	222	229	210	214



SCATTER PLOT

Is there a correlation between height and vertical reach?

Student	A	B	C	D	E	F	G	H	I	J
Height	163	163	164	168	169	176	179	188	163	168
Reach	208	202	202	213	218	218	222	229	210	214



There appears to be a strong positive correlation between the heights of the 10 students and their vertical reach.

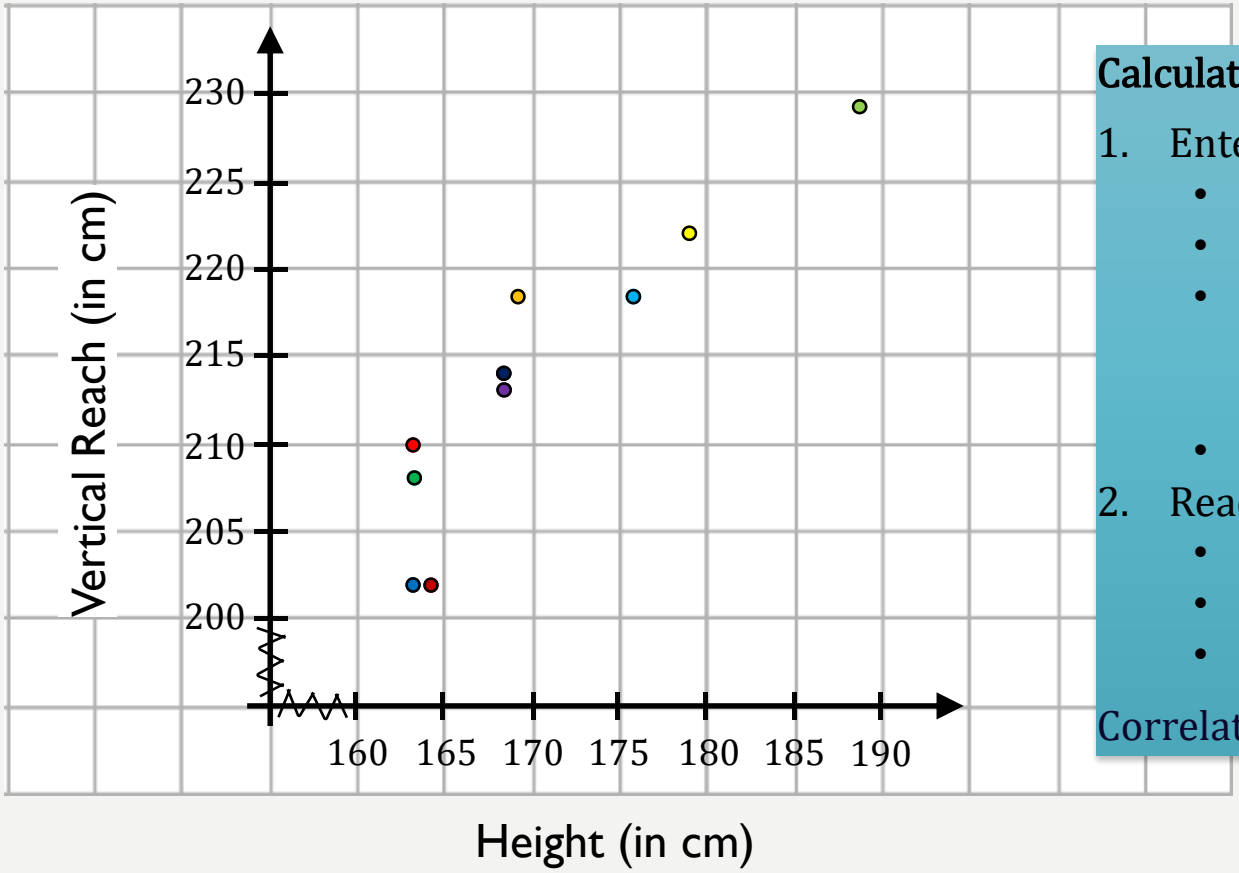
In general the taller a student was the longer his vertical reach.

We could estimate the correlation to be about 0.8/0.9.

SCATTER PLOT

Calculate the correlation coefficient?

Student	A	B	C	D	E	F	G	H	I	J
Height	163	163	164	168	169	176	179	188	163	168
Reach	208	202	202	213	218	218	222	229	210	214



Calculator Work (Casio)

1. Enter Data
   - Mode 2
   - 2: $A + BX$ (bivariate)
   - Height values in the x column and Reach values in the y column.
   - AC to store.
2. Read Data
   - Shift 1 (STAT)
   - Select 7: Reg
   - Select 3: r

Correlation Coefficient $= 0.9132$

SECTION 5G
EXAM QUESTION 1
LCOL 2013
Q7 (F)

DRAW A SCATTER PLOT

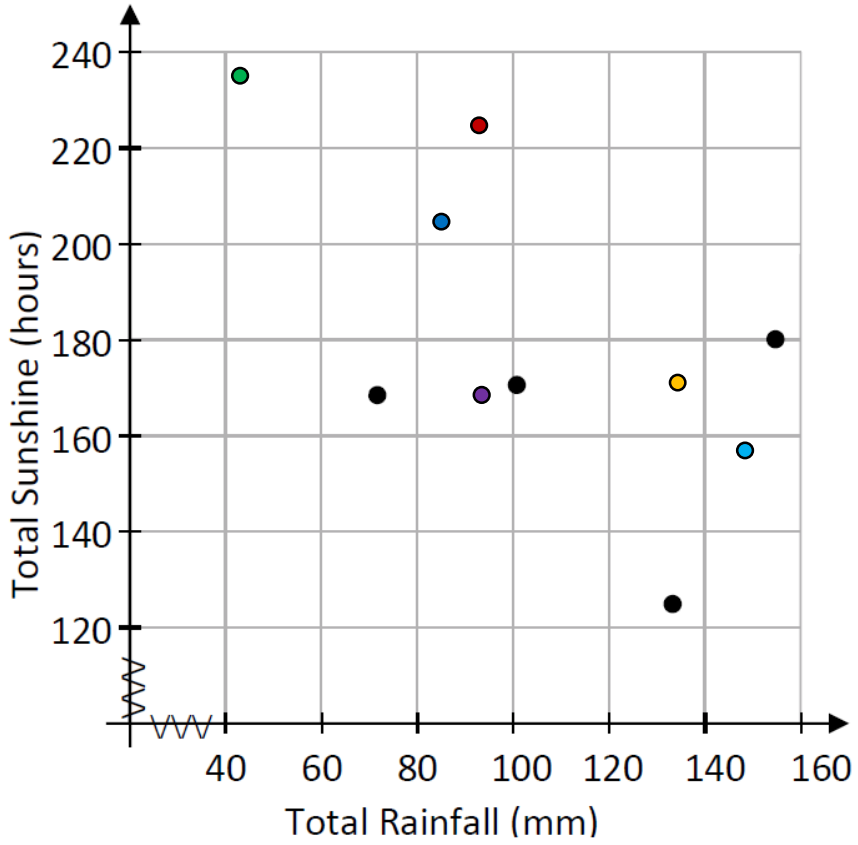
The table below shows the total rainfall, in millimetres, and the total sunshine, in hours, at Valentia, County Kerry, during the month of June from 2001 to 2010.

Part of a scatterplot of the data in the table is shown below. The first four data points are plotted.

Complete the scatterplot.

Total rainfall and total sunshine at Valentia in June										
Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total Rainfall (mm)	72	133	155	101	94	47	149	134	94	84
Total Sunshine (hours)	169	124	180	173	173	239	159	168	228	205

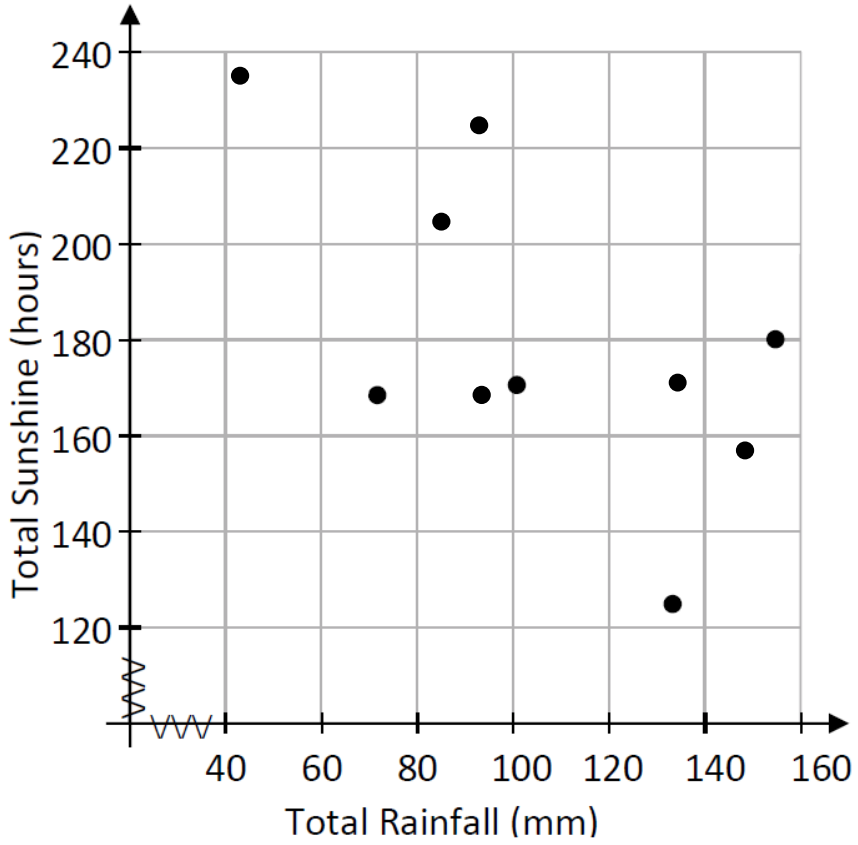
(Source: Met Éireann)



One of the numbers in the table on the right is the correlation coefficient for the data above, correct to 1 decimal place.

Based on the scatterplot, select the number that you think most accurately reflects this data. Explain your choice.

	Tick one box
0·6	
0·1	
−0·1	
−0·6	✓



The data has moderate negative correlation and therefore − 0.6 is the best choice for the correlation coefficient.

THE SHAPE OF A DISTRIBUTION

SECTION 6

Activity 1

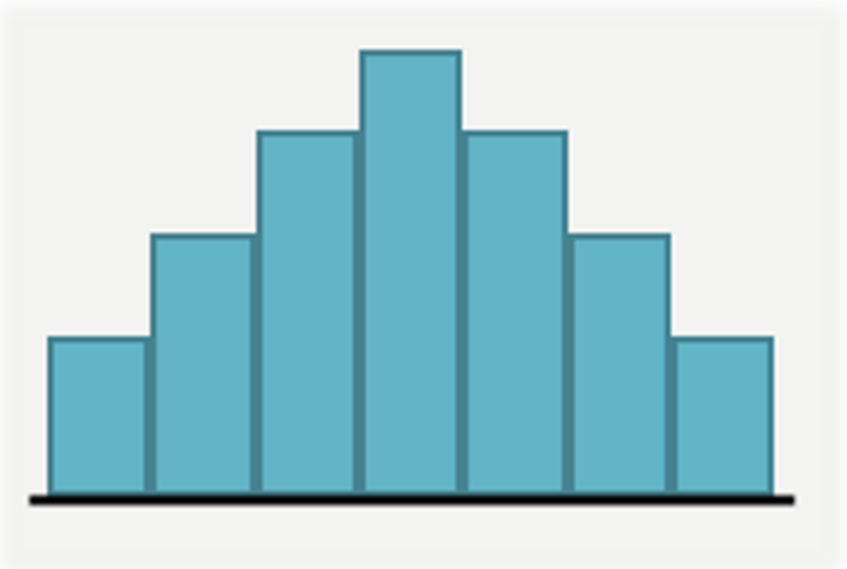
Activity 2

Activity 3

Exam Question 1

Exam Question 2

Exam Question 3



SHAPE OF A DISTRIBUTION

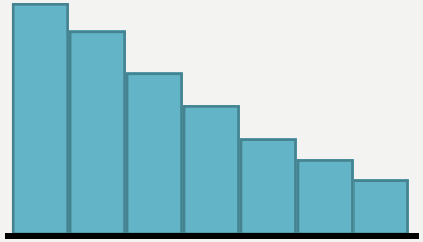
When we place data onto a graph we can describe how the information is distributed (or spread out) across the graph.

We generally comment on whether the data is:

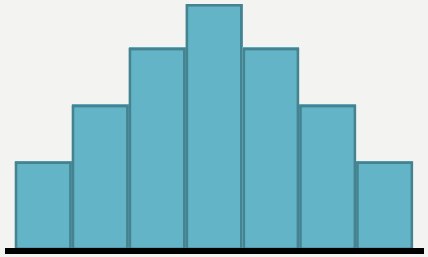
- Symmetrical
- Skewed

SHAPES OF DISTRIBUTION

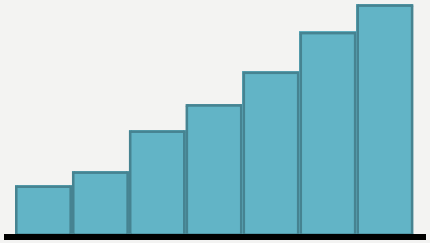
Right Skewed



Symmetrical



Left Skewed



SHAPE OF DISTRIBUTION

The histogram below shows the hand span (in cm) of the group of 24 second year students in our CensusAtSchool 2019/2020 Questionnaire.

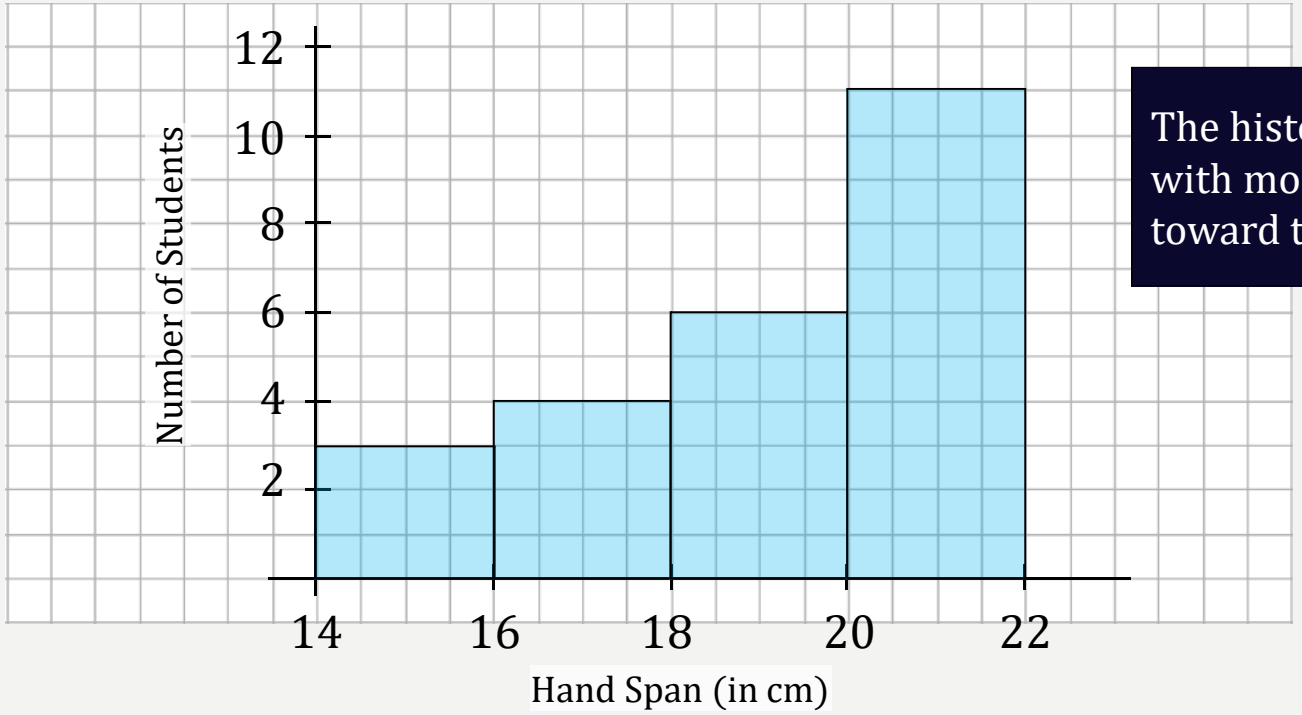
Describe the shape of the histogram.

5. What is your...

Span of the hand you write with .....cm

Height	14 – 16	16 - 18	18 - 20	20 - 22
Number of Students	3	4	6	11

[Note: 14 - 16 means 14 cm or more but less than 16 cm, etc.]



The histogram is **left skewed** with most of the data collected toward the higher hand spans.

SHAPE OF DISTRIBUTION

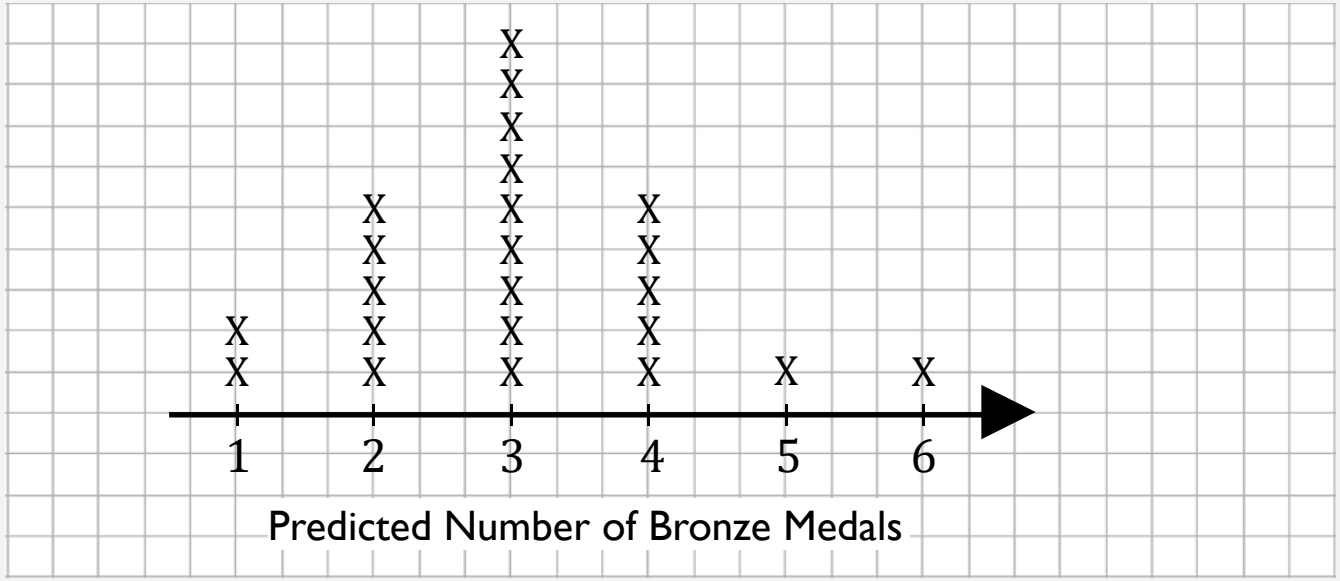
The line plot below shows the predicted number of bronze medals Ireland will get at the 2020 Tokyo Olympics of the group of 24 second year students in our CensusAtSchool 2019/2020 Questionnaire.

Describe the shape of the line plot.

The histogram is symmetrical.

13. How many gold, silver and bronze medals do you think Ireland will win at the Olympic games in Tokyo 2020?

Medal	Ireland won in 2012	Ireland won in 2016	Ireland will win in 2020
Gold	1	0	
Silver	1	2	
Bronze	4	0	



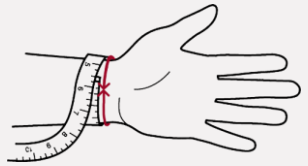
TOKYO 2020

BACK TO BACK STEM AND LEAF

Section 6: Activity 3

The back to back stem and leaf diagram below shows the length of the circumference of right wrist for a group of 24 second year students in our CensusAtSchool 2019/2020 Questionnaire. The data is split by gender.

Describe the shapes of distributions for both the males and females.



MALE				FEMALE							
				15	1	1	5	5	7		
5	4	3	0	16	3	6					
			1	17	5						
		9	5	18	1	2					
			0	19	1	2					
			2	20							
			2	21							
KEY : 15 | 5 = 15.5											

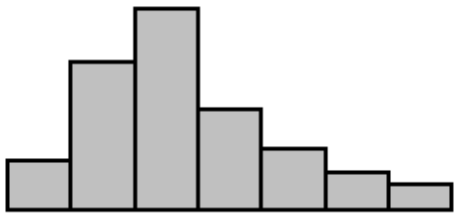
The data is right skewed for both male and females with the majority of the data collected around the lower sizes of wrist circumference.

SECTION 6
EXAM QUESTION 1
LCHL 2012S
Q2 (A)

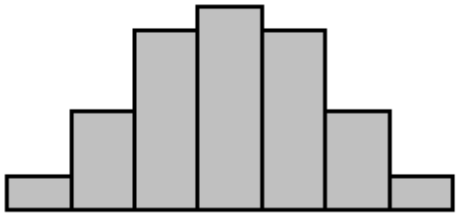
SHAPE OF DISTRIBUTION

The shapes of the histograms of four different sets of data are shown below.

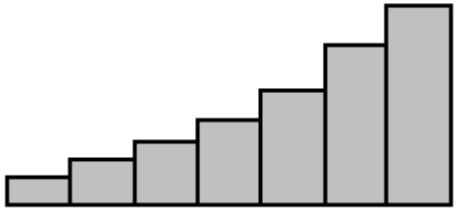
Complete the table below, indicating whether the statement is correct (✓) or incorrect (✗) with respect to each data set.



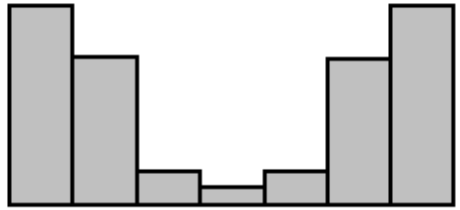
A



B



C



D

	A	*B*	*C*	*D*
The data are skewed to the left	✗	✗	✓	✗
The data are skewed to the right	✓	✗	✗	✗
The mean is equal to the median	✗	✓	✗	✓
The mean is greater than the median	✓	✗	✗	✗
There is a single mode	✓	✓	✓	✗

SECTION 6
EXAM QUESTION 1
LCOL 2012 S
Q6 (A)

SHAPE OF DISTRIBUTION

Describe the distribution of the data, by making **one** statement about **each** of the three characteristics indicated below.

shape of distribution:

Left Skewed

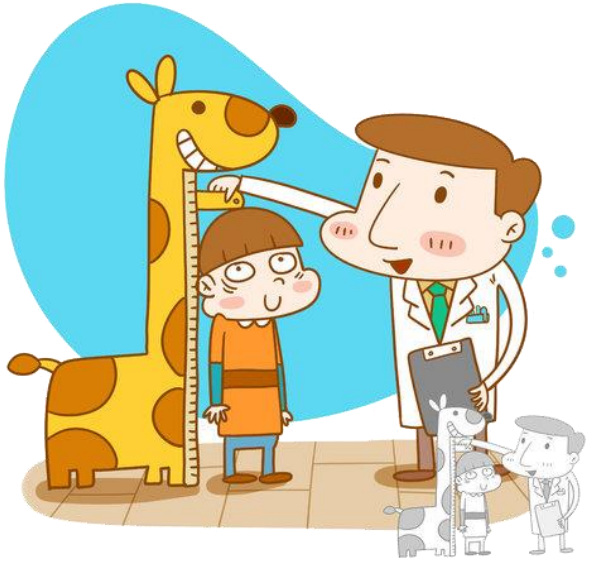
location of data (central tendency / average):

$$\text{Mean} = \frac{4070}{24} = 169.58 \text{ cm}$$

spread of data (dispersion):

$$\text{Range} = 187 - 149 = 38$$

14	9									
15	7									
16	0	1	1	4	6	7	7	7	8	
17	0	1	1	2	3	4	5	6	6	8
18	0	0	7							



SECTION 6
EXAM QUESTION 1
LCOL 2014 S
Q7 (C)

SHAPE OF DISTRIBUTION

2014 LCOL Sample Paper 2 – Question 7 (c) (i)

Máire knows already that the male athletes tend to be slightly faster than the female athletes. She also knows that athletes can get slower as they get older. She thinks that male athletes in their forties might be about the same as female athletes in their thirties. She decides to draw a back-to-back stem-and-leaf diagram of the times of these two groups for the swim. There were 28 females in their thirties, and 32 males in their forties. Here is the diagram:

Describe what differences, if any, there are between the two distributions above.

Female, 30 – 39 years		Male, 40 – 49 years
4	13	
	14	9
1 0	15	1 3 4 5 6
9 8 8 7 3 2 2	16	3 4 6 7 7 8
6 4 3 2	17	6 7 7
1	18	0 1 3 8 9
9 6 3 1 0 0	19	0 0 1 2 3 4
	20	3 9 9
3 3 2	21	2 2
4	22	
	23	0
8	24	
	25	
5	26	
	27	
	28	
7	29	

Key: 14 | 9 means 14·9 minutes.

The female ages have a spread of 30 – 39 years.

The male ages have a spread of 40 – 49 years.

Shape

The female distribution is skewed right. There is a small number of outliers (slower times) by comparison with the rest of the female data.
The male distribution is more symmetrical.

Range

The range of the female group is [13.4, 29.7]. For the male group it is [14.9, 23].
The female range 16.3 is much larger than the male range, 8.1.

Central Tendency

The median for both groups is similar, 17.85 for the female group and 18.05 for the male.
The male median is slightly higher.