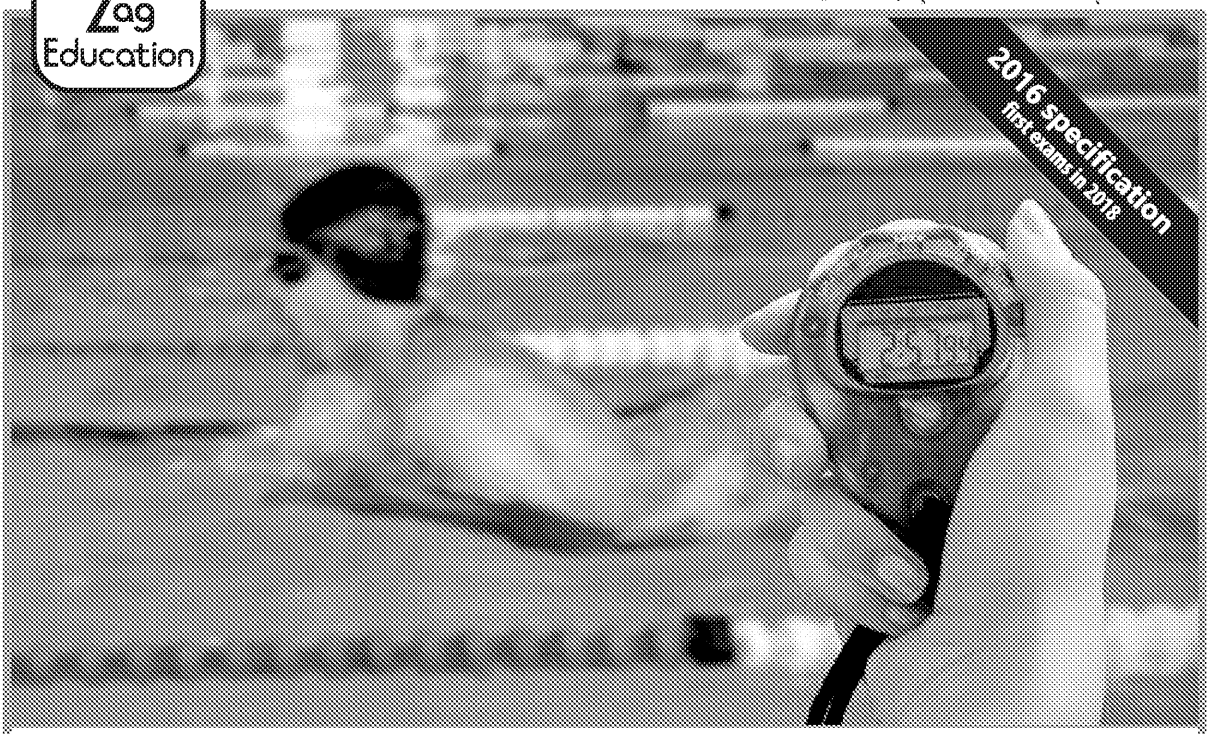
Zig Zag Education

PE

GCSE (9–1) | Edexcel | 1PE0



Tricky Topics for GCSE Edexcel PE

4.1 Use of Data

zigzageducation.co.uk

POD 11447

Contents

Teacher's Introduction

This resource has been created to supplement your teaching and to support you and you
Edexcel GCSE PE (9–1): 4.1 Use of Data. Students are required to develop their knowled
analysis in relation to key areas in Physical Activity and Sport for the Edexcel (9–1) GCSE

- Demonstrating how data is collected and used – both quantitatively and qualitative
- Establishing methods to present data – through use of graphs and tables
- Analysing and evaluating data – interpreting data from graphs, tables and charts

This pack has been broken down into three sections to follow the three requirements of the specification (*data collection, presentation and interpretation and analysis*), and aims to develop skills across all topics and components of the course, including:

- 1.4.6 Sh... term ... long-term effects of exercise
- 3.2.3 C... nts of fitness
- 3.1.2 Tre... in participation rates
- 1.2.2 Health, fitness and well-being

Why is 'Use of Data' a tricky topic?
Scientists regularly construct and interpret figures, but students often struggle with the students not understanding the importance of the figures in context, a lack of knowled figures, e.g. axes, variables and data points, and a lack of clear direct teaching of this sk

Previous examiners' reports have indicated how marks can be lost for drawing without drawing the wrong type of graph, not labelling axes, and continuing the graph too far. students with the use of data in sport through an active learning approach to engage st and analysis of them.

Worksheets provided throughout this pack have been designed to be visual and include practical activities alongside more theoretical worksheets. There is a range of clear imag students' understanding, which can also be used as a re... throughout the two-y

The pack contains three lessons, guided by the **...cher's overview page**, which highlight *guidance notes* for the activities the students receive. Each lesson then is inclusive of w

1. **Summary notes** – ... background knowledge and information on each subtopi the act... no... them a base to work from.
2. **Theore... practical tasks** – progressively build students' understanding of the terms and concepts individually before combining them as a whole. Tasks provide and include individual, paired and small-group work. Each task is carefully instructe independent, and minimal input from the teacher is needed, allowing you to float b students who need it. Optional extensions are also provided throughout – these ca activities for the quicker learners or provided as homework.
3. **Top tips** – offer students key advice that can support knowledge retention and exa
4. **Questions to think about** – provide opportunities for in-class discussion springboar the topic to stretch and challenge students.
5. **Exam-style questions / Practice Questions** – Exam-style questions expose students subtopic and help them put their knowledge and understanding into practice. Whe in an exam, these are titled 'Practice Questions'. These cover topic areas included o students with sound knowledge. They aim to support development of key skills for presenting data can help students with analysing data later in the resource.

Each lesson also contains **thought-provoking vis... ...s and diagrams** to stimulate le understanding of the tricky topic. Each ... write-on and can be photocopied a activities included require minim... ...uipment.

This pack als... ...ctical activities** that support students in applying their data sk them throug... ...y areas of the use of data requirements of the specification – *data c analysis and evaluation of data.* These activities provide options for some of the tasks su use the topic area students may need more practice with. These can also be presented a homeworks, or be used to guide teaching and learning of the topic(s) covered.

Teacher's Overview

This table provides an overall summary of how to use each worksheet in a lesson, providing time suggestions for each activity and relevant teaching points to consider when setting students on each task. You may wish to hand these out for independent learning alongside your lessons. The worksheets include group tasks that students can adapt to complete on their own. Optional extensions are provided throughout – these can be supplied as in-class extension activities for the quicker learners or provided as homework.

Topic no.	Spec reference and title	Time suggestion	Equipment needed	Guidance notes
1	4.1.1–2 How data is collected – both quantitatively and qualitatively	1 hour	*Booklets / plain paper*	**5 min:** Introduce the two types of data. Get students to think of further examples. **5 min:** Students complete **Activity 1** independently. They can then check their answers with their peer. They should discuss whether there are any differences. Students to also discuss the question to think about with their peer. **10–15 min:** Discuss the key issues in collecting data, giving students an awareness of the four key factors (validity, reliability, accuracy and precision) which will support their knowledge during the analysis and evaluation section. Students should also complete **Activity 2**. **10 min:** Students to independently read through the different ways of collecting data and the advantages and disadvantages of the two different types. **20 min: (Activity 3)** Complete the 'data collection' section from any one of the five practical activities found at the end of the pack (A–D). You may choose either the topic you will be teaching in class or a topic that students particularly struggle with.

Topic no.	Spec reference and title	Time suggestion	Equipment needed	Guidance notes
2	4.1.3 Presenting data	1 hour	*Booklets / plain paper* *Rulers for drawing graphs*	**5–10 min:** Discuss the different ways sporting data is commonly presented and the types of graph that students are likely to encounter in their exams. Bar charts and line graphs are most commonly used. Pie charts may be used for analysis-type questions in exams. Some knowledge of scatter graphs should also be given. **10–15 min: (Activity 1)** Students to complete the activity, which recaps some terms from the previous lesson. The will introduce the stages of drawing a graph. Plotting graphs has not been a requirement in past exams, but this is an important element of the PEP. **5 min:** Show students the bar chart, which may get them to reflect on their answers in Activity 1. Students complete Activity 2. They should also then view the line graph and answer the question to think about as a class. **10 min: (Activity 2)** Students complete the activity. **15 min: (Activity 3)** Complete the 'presenting data' and 'analysing data' sections from any one of the five practical activities found at the end of the pack (A–D). You may choose either the topic you will be teaching in class or a topic that students particularly struggle with. If teaching the pack together, you may select the same activity that students did in the previous lesson (above). **(Optional) Extension:** Students to visit: **zzed.uk/11446-stats-perform** and answer the questions given. **5 min: (Practice questions)** Students should complete the practice questions at a rate of approximately 1 mark per minute.

Topic no.	Spec reference and title	Time suggestion	Equipment needed	Guidance notes
3	4.1.4–5 Analysing and evaluating data	1 hour	*Booklets / plain paper*	**10–15 min:** Introduce the analysis of data and provide an introduction to how different graphs are analysed, including use of correlations for scattergraphs* and the difference between bar charts and line graphs and pie charts. Get students to answer the questions to ass to think about the best graph for different specification points. **10 min: (Activity 1)** Complete the activity to guide students into presenting the data (recapping previous lesson), describing what they say and explaining what this shows, which is the core of answering many exam questions. **10 min:** Students to read through the examples of questions and tips on how interpretation of graphs/tables/charts may appear in the exam and raise any questions. They should answer the questions. **5 min: (Activity 2)** Students complete the activity. **15–20 min: (Activity 3 – exam-style questions)** Students complete activity to annotate the graph as prep for answering the questions. Time answering the questions at approximately 1 minute per mark. Provide time to discuss answers as a class. **(Optional) Extension:** Students to analyse the data collected from one of the practical activities to explain what is happening.

**Note that it is unlikely scattergraphs will come up in the exam, but these have been included as additional information to understand all types of graph.*

Student Introduction

With athletes and teams trying to make marginal gains over their opponents, the
been more widespread. From the race track to the football field, sports scientists
technology and other means to record athletes' data, interpret the results and ev
methods in order to improve performance. Whether it's
sprint, or knowing when to substitute players in a
ing off one one-hu
athletes become fatigu

Building on several different to
out the course, this pack will help yo
understanding to 'use d
' in your exams and non-examined assessment (
demonstra
d collected and used – both quantitatively and qualitativ
present dat
gh the use of graphs and tables, and analyse and evaluate dat
graphs, tables and charts.

This 'Tricky Topics' pack will support you in being more competent in this topic a
the examination (and NEA, where applicable).

Each lesson in this pack covers a separate topic. Your teacher may give you spec
of your lessons, but if you're tackling a worksheet on your own, follow these ste

- Read the information on the worksheet – this will give you a base to work fr
- Read the part of your textbook which covers this topic. If you don't have a t
words or concepts online.
- Work through the activities or questions in the order given. If you have the
you can before looking at it.
- Check your answers against the answer sheet
in your work to your

Good luck!

Quantitative and qualitativ

Data is a collection of facts used to represent and describe something. Data doe
numerical and can be collected in a wide variety of forms. Data collection is use
science, psychology and sport. Elite sports teams use a wide variety of data colle
analyse a range of factors, including fitness and perform[illegible]. By collecting data
and trends which can be used by an athlete to ide[illegible] their weaknesses or stren
player collected data on the average di[illegible] they ran each game, they could co
teammates to identify whethe[illegible] they need to improve their stamina.

What type[illegible]at[illegible] be collected?

There are tw[illegible]s of data you should be familiar with:

- **Quantitative data** – this is any type of data that can be expressed as numbers (quantified). This could include data such as heart rate, weight and height.
- **Qualitative data** – this is any type of data that can't be expressed as numbers and instead describes the 'quality' of something. This could include descriptions, opinions or observations.

Activity 1 (individual)

Place the appropriate abbreviation for quantitative data (QT) or qualitative data
given below.

a)	Completing a survey on the number of people who m[illegible]t the recommende physical activity
b)	Answering questions on your pers[illegible]engths in your performance
c)	Interviewing an ath[illegible]r enjoyment of their training programme
d)	Meas[illegible]on[illegible]one's height and weight to calculate their BMI
e)	Measuring tidal volume with a spirometer
f)	Completing a feedback form that is assessing how you felt after an exercis
g)	Measuring heart rate with a heart rate monitor
h)	Observing an athlete's behaviour during a match
i)	Completing a questionnaire to assess an athlete's level of anxiety out of 10

Question to think about

Data collection is becom[illegible]ncreasingly important in sport[illegible]s e[illegible]teams look to find ways of g[illegible]n advantage over their opponents. Can you think how sports teams might use data to gain an advantage?

Key issues in collecting data

Once we have decided what type of data we are going to collect, we then need t
going to use to collect it. Let's imagine if we wanted to measure the heart rate o
they had finished a training session. There are numerous ways this could be don
measuring and counting their pulse, asking them to wear a heart rate monitor, o
electrocardiogram (ECG) immediately after exercise. The methods we use to coll
equipment we have available and the practicality of usin[illegible] method. Would
athlete to an ECG immediately after training just [illegible] their heart rate whe
heart rate monitor?

The methods that we u[illegible] data can have a big impact on the results we
data we ha[illegible] of the following key issues:

- **Validit[illegible]** is the extent to which a test measures what it is meant to me
measure exercise intensity just by recording the total distance run? No, oth
would also be important to make the data more valid!
- **Reliability** – this describes how consistent the data is, e.g. do you get the sa
answer is no then the data isn't very reliable.
- **Accuracy** – this describes how close a result is to its true value, e.g. if you tir
of a pool by counting in your head, is the result going to be very accurate? N
time you with a stopwatch.
- **Precision** – this describes the size of the measurement value that has been used, e.g. if you are measuring the height of someone it would be more precise to measure in centimetres than in inches.

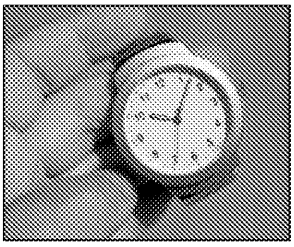
Interest
that coll
provides
compan
alone th
people c
of data
data col

Elite athletes and sports science researchers will often use [illegible]
fancy techniques such as statistical testing to ensure [illegible] dat
meets the factors above. However, even at [illegible] there are
simple ways to ensure that the data [illegible] is valid,
reliable, accurate and preci[illegible]

Example: T[illegible]wing pieces of equipment are all used to measure time, but e
compared t[illegible] others.

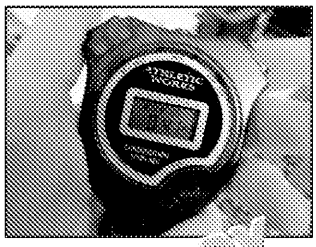
How can we improve precision when timing a friend to run 100 m?

a) Standard watch



Unit of measurement:
1 second
Precision: **Low**

b) Sports stopwatch



Unit of m[illegible]as[illegible]ent:
[illegible]ond
Precision: **Medium**

c) Mo

Uni
0.0
Pre

Activity 2 (individual)

1. At a school sports day, four students were asked to time the 200 m using st
time each student recorded for the winner of the race:

	Student 1	Student 2	Stude
Time recorded (s)	24.5	23	22

i) Which of the following k[illegible] data collection could play a role i
Circle the corr[illegible]s on.

Precision **Accuracy** **Reliability**

ii) Explain your answer.

.....

.....

.....

.....

Collecting quantitative data

Quantitative data collection is important for many aspects of sport and can be us
information. This form of data collection is commonly used [illegible] fitness testing, a
evaluating health. As previously discussed, the w[illegible] which this data is collecte
However, there are commonly used techni[illegible] for collecting quantitative data t
types of sport.

[illegible] important to remember that although the differen
[illegible]ntitative data might be assessing different variables such a
[illegible]ese data will always be represented numerically.

Collection technique	What it involves	
Questionnaires and surveys	This form of data collection is often used in sports psychology and can be used to determine factors such as personality characteristics, stress and anxiety.	• *Using a persona data on anxiety collected as a n as a percentage* • *Using a survey t rates in sport. T numerical value percentage or fi*
Laborator[illegible] data collec[illegible]	T[illegible]f data collection is often used in sports science and can be used to determine physiological factors such as respiratory and cardiovascular function.	• *Using a spirome respiratory func vital capacity. T numerical value or litres, e.g. 50* • *Using an autom collect data on s pressure. This c numerical value of mercury, e.g.*

Collection technique	What it involves	
Field-based data collection	This form of data collection is often used in fitness testing and can be used to determine fitness factors such as speed, strength and stamina.	• *Using a stopwat fitness assessm or a marathon r as a numerical v seconds or minu* • *Using an 800 m distance-based Cooper 12-minu collected as a nu being metres or*

What does all of the data above have in common? It is represented **numerically**

Collecting qualitative data

Qualitative data is another form of data often used in sport which can provide a less rigid way to research or understand a topic compared to quantitative data collection. As previously explained, qualitative data is not expressed numerically, which means different methods have to be used to collec the use of qualitative data can be applied to many aspects of sports, it is most as psychology.

Top
relia
of e

Collection technique	What it involves	
Interview	This form of data collection involves interviewing an athlete and can be used for a range of different topics such as analysing their feelings towards training or the techniques they use to minimise stress.	*A professional footb data about the way aggressive behaviou data can't be repres collected by writing*
Focus group	This form of data collection involves analysing the responses of a group of athletes to a range of questions and can be used to evaluate the consensus of the team towards topics such as tactics, training and attitudes.	*Holding a focus grou players of a professi views on how the te think can be improve represented numeric writing down their a*
Observation	This form of data collection involves collecting data by observing an athlete and can be performed in real time, such as during a match or through video playback.	*Observing a professi during a rugby matc they react in stressfu represented numeric writing down and de*

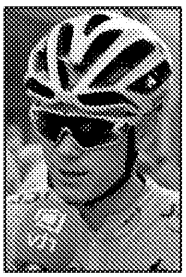
What does all of the data above have in common? It describes the **quality** of son

Question to think about

Have you ever watched a TV presenter or pundit use statistics to compare diffe well they are playing? How do you think the data they use is collected?

You have learnt that professional sports teams will often use a range of data coll
do they decide which techniques to use, or which technique is best for a certain

There are advantages and disadvantages to collecting both quantitative and qua
summarised below.

	Advantages	
Quantitative data 	+ It can be easier to analyse and compare as numbers can be presented as graphs and charts + It's less open to interpretation and provides more objectivity and accuracy of results + It allows for a broader collection of data (more participants), which allows more generalisations of the results + The research used to collect the data is often standardised, so can easily be replicated, making it more reliable	– It can what gives this d way – Resea unna which
Qualitative data 	+ It provides more explanation into people's feelings and behaviour + It isn't as limiting as numbers or scores + It avoids prejudgement of results	– It can and i more – There athle descr – Often which result

Activity (individual/group practical)

Complete 'Data collection' from any activity A–E (separate worksheets).

Extension activity

Watch a sports competition or match (this can be a live match or a replay online
you have just gained:

a) Collect **two** quantitative measurements in the first half/part. This could be
in a rugby match or the number of faults in a gymnastics competition. Begi
sets could be presented, e.g. tables or graphs. How will you record your dat

b) Collect **one** qualitative measurement during the match/competition in the s
certain player reacts to losing possession. What method will you use to coll

Exam-style questions

Complete the following exam-style questions to practise what you have learnt.

1. Which **one** of the following is a suitable method for collecting quantitative d

   A. Observation ☒

   B. Interview ☒

   C. Survey ☒

   D. Focus group ☒

2. Define the term 'quantitative data'.

   .....

   .....

3. The Illinois agility run test collects quantitative measurements to evaluate p

   State **three** ways in which quantitative measurements from the Illinois agilit
   to plan a personal exercise programme (PEP).

   .....

   .....

   .....

Presenting data

It is important that once data has been collected we are able to present it clearly results and conclusions. After all, there is no point collecting data if you don't kn about a sports coach or personal trainer; if they are collecting data from a series able to present the results so that they can monitor the athlete's progress. As qu numbers, it is best represented as either a **table** or a graph. Tables are often use data, while graphs are mostly used to present data that has been processed, such set. Graphs are also a good way of presenting data in a visual way that is easily u trends much easier.

Commonly used graphs in sport

Bar chart: This type of graph involves representing data as vertical or horizontal columns and is a good way of comparing groups of data, e.g. the distance jumped in the long jump by students in a PE class. The x-axis represents the groups that the data has been collected from (e.g. the students' names) while the y-axis represents the type of data collected (e.g. distance jumped).

Line graph: This type of graph involves representing data as lines between each point and is a good way of comparing groups and analysing how something chan a period of time, e.g. the winning time of a marathon from the years 2001–2010. The x-axis usually represents the time period (e.g. the year 2001–2010) while the represents the type of data collected (e.g. winning marathon time).

Pie chart: This type of graph involves representing data as a circular area broken down into its appropriate parts and is a good way of expressing data as a percentage of its constituent parts, e.g. if a sports club has 1,200 members, how many members are in each age group (U12s, U13s, etc.)? This type of graph does not have axes, but instead requires a *key* to understand which part of the chart represents which group.

Scattergraph: This type of data involves representing data as scatter points and compares them using a line of best fit. This type of data is a good way of comparing two sets of data and analysing the relationship between them (correlation), e.g. how revision time affects exam scores. The x-axis represents the independent variable (e.g. hours spent revising) while the y-axis represents the dependent variable (e.g. the exam score).

Top tip!
To remember which axis is which, remember that the x-axis goes across.

Activity 1 (individual)

1. Below is a table of data recorded from four gymnasts performing the sit-and

	Distance (inches)		
Gymnast	Week 1	Week 2	Week 3
A	6.5	6.6	6.8
B	5.0	5.1	5.3
C	4.6	4.4	4.6
D	5.5	5.7	5.6

i) W[illegible]e a graph would be best to compare the distances stretched th[illegible]ct answer below.

Line graph ☐ **Bar chart** ☐ **Pie chart** ☐

ii) Which of the following factors would be increased if each gymnast had twice a week as opposed to just once a week? Tick the correct answer

Accuracy ☐ **Reliability** ☐ **Validity** ☐

iii) Suggest how the precision of the data above could be improved.

.....

.....

How to present or plot a graph

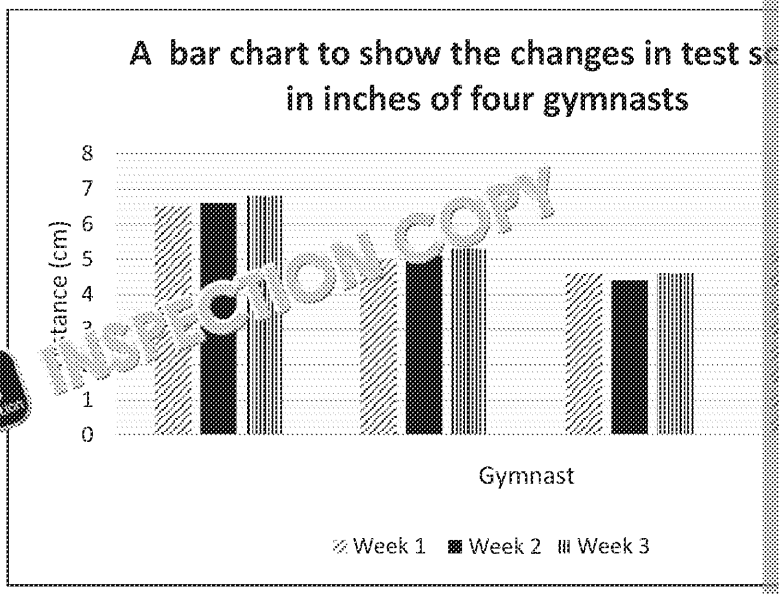
Sometimes you may be r[illegible] represent the information in a table as a lin

To do this y[illegible]ul[illegible] follow some basic steps:

1. **Identify [illegible]riables** – a variable is any factor or condition that can exist in can be one of two types of variable:
   a. **Independent variable** – this is the variable that is manipulated or chan directly affect the dependent variable, e.g. weeks in the above example
   b. **Dependent variable** – this is the variable that is being tested or measur example above.
2. **Draw/label the axes** – the independent variable always goes on the x-axis (h variable goes on the y-axis (vertical line); the two lines meet at the origin wh both axes. Make sure you write the title for each axis and include units in br
3. **Determine the scale** – each axis needs to show the range of data from the lo be evenly presented, going up in multiples, e.g. 1 s, 10 s, 100 s.
4. **Plot the data carefully** – remember 'along the corridor, up the stairs'. Mark line graphs, or use a ruler to mark out bar charts w[illegible]op of the bar bein
5. If you are presenting data with more than on[illegible]dent variable, you may like a key to indicate which line or b[illegible]sents which variable.
6. **Include a title** – make this descriptive, e.g. 'A graph to show the effect of X o

Top tip!
When drawing a graph always put the independent variabl variable that you can't control (e.g. time).

Below shows the raw data presented earlier as a bar chart.

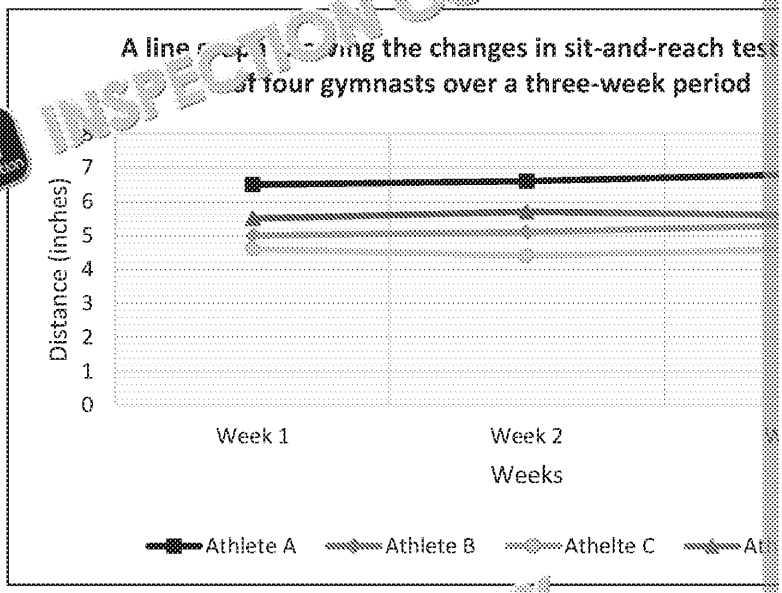


Activity 2 (pairs)

Discuss the following questions with a peer:

1. Do you notice anything wrong with the bar chart (above)? (Check against th
2. Describe how you would present this bar chart differently.

The graph could also be represented as a line graph [illegible] ow.



Question to think about

Which do you think is easier fo [illegible] sing the changes in sit-and-reach fitness gymnasts over the three [illegible] od?

Top tip! You may not be required to plot information in the exam, but you will need provide raw data in graph format in your P

Activity 3 (individual/pairs)

1. Below is a table containing data on adults (16 years and older) who participa least once a week.

Year	2008	2009	2010	2011	
Adults (million)	15.2	15.3	15.2	15.1	

i) The data above is an exam[illegible] of **quantitative** data. What is the advantage o

.....

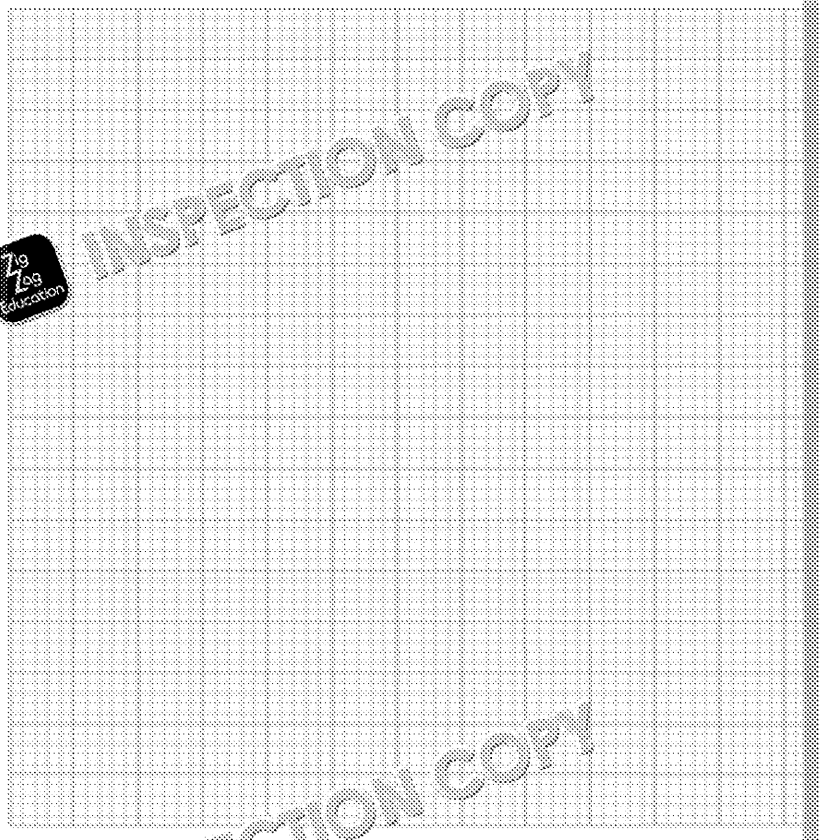
.....

.....

ii) What type of graph would be best for representing how participation has ch

Line graph ☐ **Bar chart** ☐ **Scattergraph** ☐

ii) Using the data, plot a line graph to represent how participation in sport and over the six-year period. Label the axes and include a title for your graph.



Top tip! Use a ruler to ensure your lines are accurate.

Presenting qualitative data

Presenting qualitative data can be more complicated than presenting quantitativ
obvious to distinguish (try to remember the disadvantages of qualitative data dis
qualitative data can often result in pages of writing, hours of video footage or lot
audio recordings. As with quantitative data it is important that results and
conclusions can be drawn from your data. Although not essential for your exam,
important to understand how qualitative data can be pre[illegible]d in order to help
support your overall understanding of this type of da[illegible].

Tips for presenting qualitative d[illegible]ta:

- Once qualitative d[illegible] been collected, a good first step is to **summ[illegible]** b[illegible]wing out the most important information, e.g. when c[illegible]ing an interview with a volleyball player about anxiety, if you are trying to find out the causes of their anxiety, the symptoms of their anxiety might not be as relevant.
- Summarising qualitative data can be done by **categorising** the data collected you can compare different categories, e.g. if you have lots of video recordin 100 m sprints, you could categorise the race into different sections, such as 20 m, etc., and then compare the different races.

> **Question to think about**
>
> When you watch sport on TV have you ever seen the presenters or pundits pr types of data from the sport? Can you think about the different ways their dat

Activity 4 (individual/group practical)

Complete 'Data presentation' from a[illegible]ct[illegible]y A–E (separate worksheets).

Extensi[illegible]ti[illegible]y

Opta Sports [illegible] British sports data and statistics company that records, analyses sports data across many sports. Take a look at its website (**zzed.uk/11446-stats-**) the following questions:

1. How many sports does the company cover?

   .....

2. How does Opta Sports record data? What is the company's methodology?

   .....

3. List the different methods used by Opta Sports for p[illegible]ting data.

   .....

4. Who uses the data t[illegible]mpany presents?

   .....

Practice questions

Complete the following questions to practise what you have learnt.

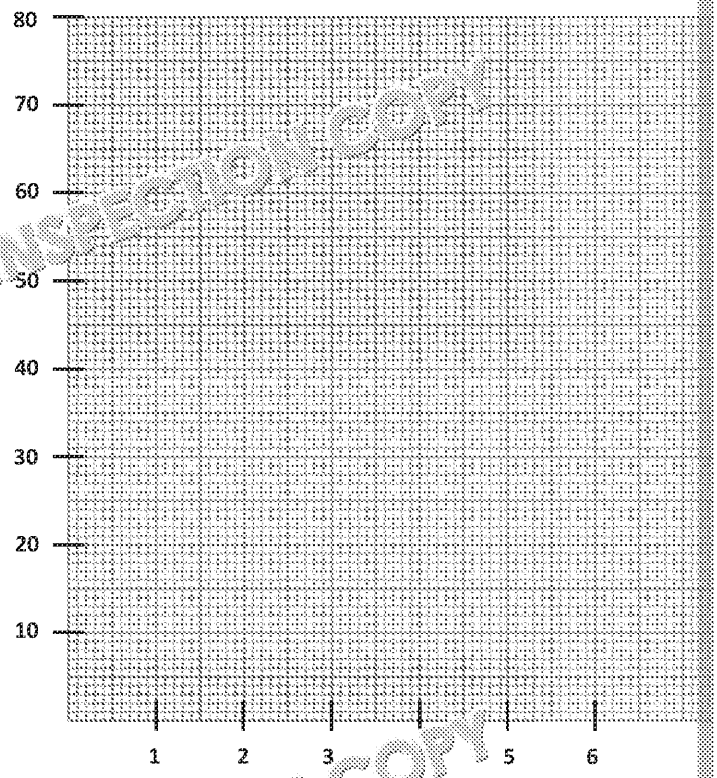
1. Jerome is a basketball player who has just completed a training programme fitness-testing sessions during the programme to evaluate how effective it w jump test scores can be seen in the table below.

Week	P[illegible]m)
Week 1	37
Week 2	41
[illegible]ek 3	43
[illegible]k 4	49
Week 5	55
Week 6	56

Plot the information in the table onto the graph paper below to show Jerom

Label the axes and join up the points to form a line graph.

A graph showing changes in vertical jump test scores for [illegible] over a six-week training programme



2. The English Premier League has seen a rapid growth in commercialisation o
of income for most clubs coming from TV rights. The table below shows the
League brought in from domestic TV rights over the last few seasons:

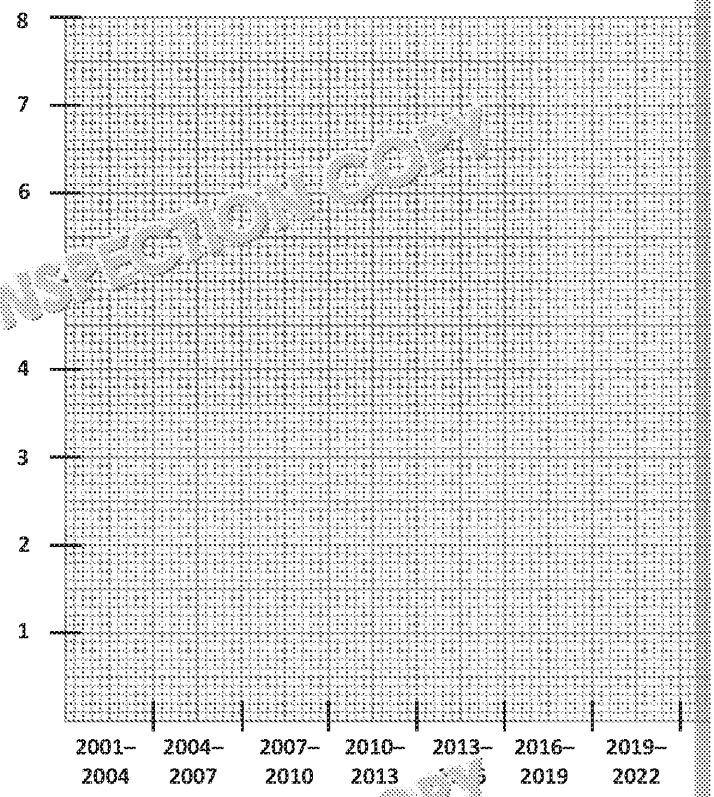
Season	Revenue from domestic TV rights (£ billion)
2001–2004	1.2
2004–2007	1.0
2007–2010	
2010–2013	1.8
2013–20	3.0
–2019	5.1
–2022	4.4

Source: BBC Sport

Draw a bar chart on the graph paper below to show the changes in revenue

Label the axes.

A bar chart comparing revenue from domestic TV righ
English Premier League over the last 21 years



Question to think about

Would the above bar chart look better as a line graph? Explain why you th

Top tip! Make sure you read the question. It will often state which graph to use.

Analysing and evaluating

It is important to be able to analyse and evaluate data in order to be able to iden
For example, if a coach asks their team to perform a series of fitness tests, they t
results of this data to identify areas for improvement. This will then allow the co
sessions according to the results, in order to improve ide[illegible]d weaknesses. You
collect and present data and now it is important t[illegible]w to analyse and eva
understand what the data means. Differ[illegible]es of graphs, such as scattergrap
require different approaches in order to extract the relevant information.

Remember, graphs are used to represent quantitative data in numbers.

How do we analyse and evaluate the data in a graph?

Line graph: A line graph is commonly used to show change over different data po
clearly and can help show trends. Unlike scattergraphs, the line joins each of the
one point to another. It can help show local trends and the overall trend of the d

Bar chart: In order to analyse and evaluate this type of graph we often compare
and identify the highest and lowest categories so that we can then try to explain

Scattergraph: In order to analyse and evaluate this type of graph, we often use a ***line of best fit*** and terms such as ***positive*** and ***negative correlation*** to describe the results of the data.

Pie chart: In order to analyse and evaluate this ty[illegible]e[illegible]aph, we often compare the different sections [illegible]another and identify the highest and lowest [illegible]opo[illegible]ns so that we can then try to explain the [illegible]s[illegible]r the results.

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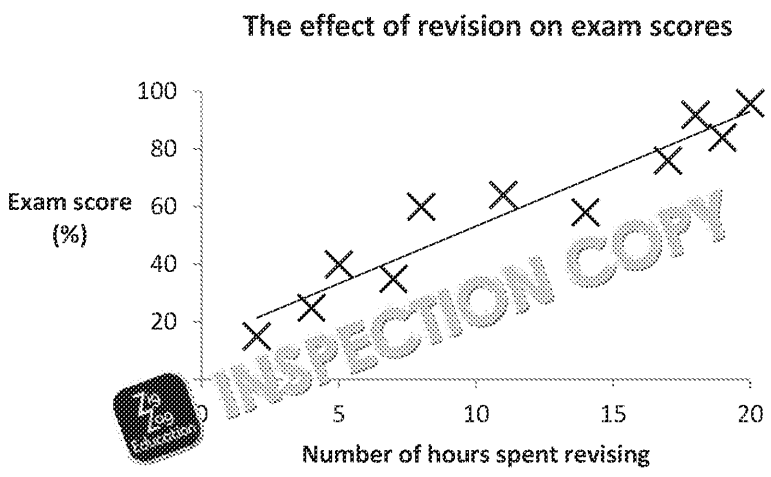
The best way to analyse and evaluate ***scattergraphs*** is by using a ***line of best fit***. you simply draw a line using a ruler roughly through the middle of your data set. often allow this to be done automatically and with much more accuracy; howeve draw a line of best fit as a rough estimate from sight using a ruler.



Tip 1: W
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Tip 2: D
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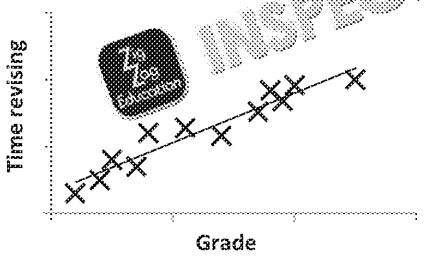
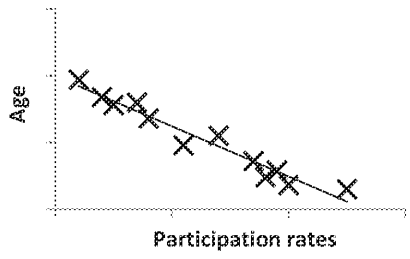
What is correlation?

We use correlation to describe whether there is a connection between the two v
For example, using the line graph on the previous page, correlation would be use
between the number of hours spent revising and exam scores. We can use corre
questions: Are the two variables connected, and, if so, in what way do they influ
time spent revising influence test score?

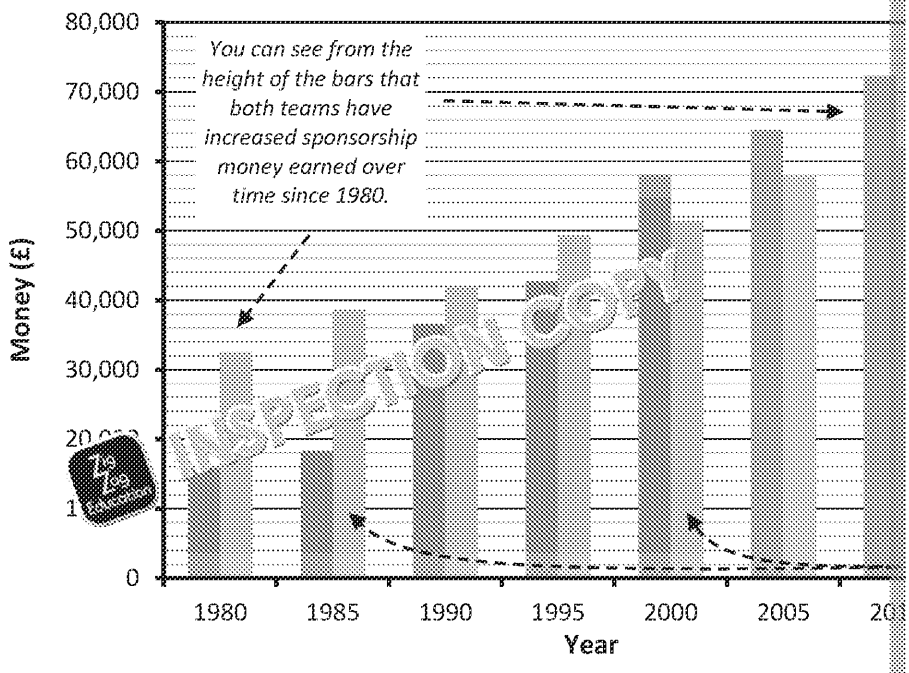
Positive correlation	Negative correlation	
		
Positive correlation describes a positive relationship between the two variables. Therefore, as one variable increases so does the other, e.g. the more hours a student spends revising, the better their test score – *best get revising!*	Negative correlation describes a negative relationship between the two variables. Therefore, as one variable increases the other decreases, e.g. as age increases participation in sport decreases.	N n t t b e f o

Note that correlation does not mean causation. There might be outliers that do
individual who doesn't revise and does get a mark!

Bar charts and line graphs

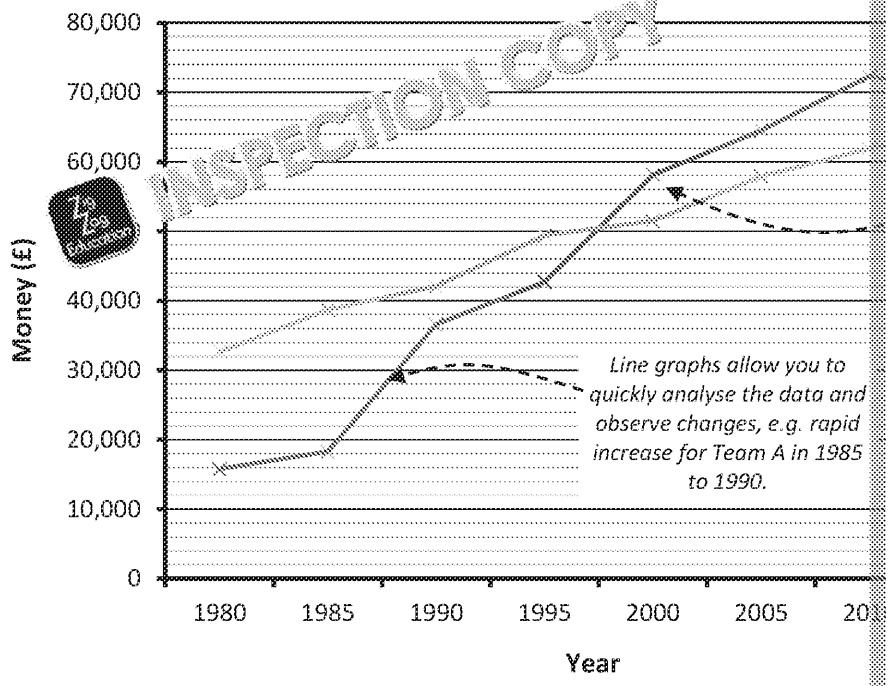
While scatter graphs are used to express the correlation between two variables to sh
charts are used to compare things between different groups or to track changes
changes over time are often better presented on a line graph, as we will see in a

Figure 1: Sponsorship money earned by teams A an



Line graphs are used to help show changes over a short or long period of time. W
changes exist, line graphs are preferred over bar charts. Like bar charts, line grap
between two groups. The line graph below shows the same information as the p

Figure 1: Sponsorship money earned by teams A



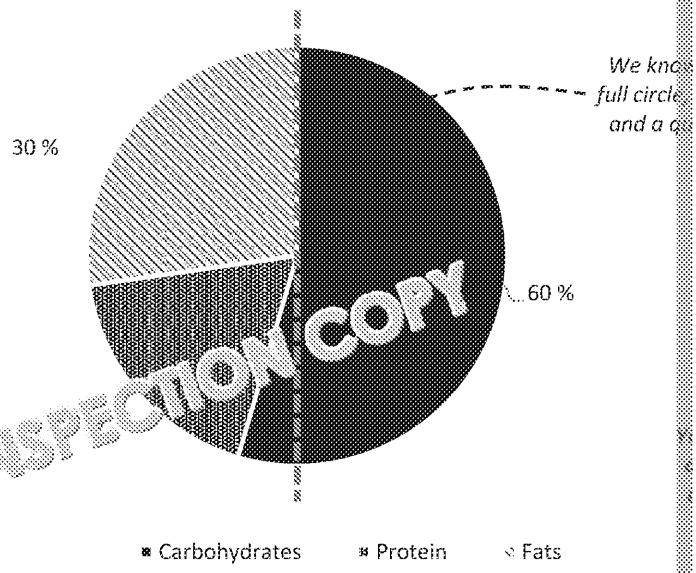
Question to think about

Think about all of the topics from the GCSE PE ... and which topics could c
Which topics would be best displayed as a line graph, and which as a bar chart?

Pie charts

Pie charts a ... l t... show relative sizes of data. A pie chart helps to identify th
represents. ... ample is the proportion of macronutrients we should consume

Proportion of macronutrients recommended for a healthy d



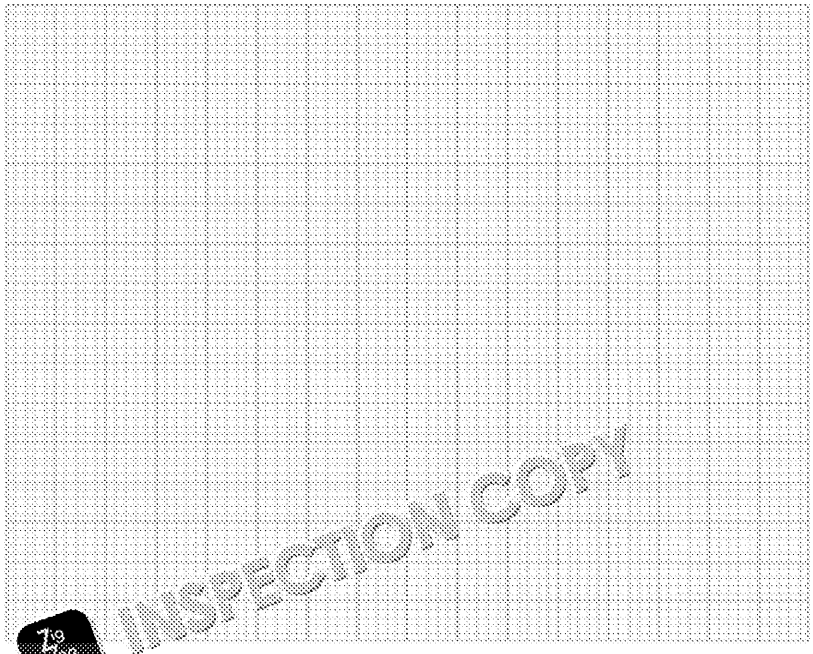
Activity 1 (individual)

It's time to recap and put your knowledge into practice.

1. In order to monitor the fitness of a professional hockey player, a personal tra
player's resting heart rate each month over a training period of eight months

i) Using the data in the table below and the graph template provided, plo
training influences resting heart rate. Make sure you add all of the key

Month	1	2	3	4	5	6
Resting h... (b...)	85	79	74	70	68	6



ii) Using the information you have just plotted on the graph, describe wha
the data points. Think about the overall trend and the difference betw

.....

.....

.....

.....

iii) Now explain what the graph shows to give a conclusion on the effect o

.....

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.....

Activity 1 got you to plot the graph (recapping on presentation of data) and then got you to look at the graph to interpret what it was showing. Firstly, you described what you can see, which is important as this often forms the evidence to the conclusions that you make.

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This will typically be combined in the exam to form an analysis type question. For example:

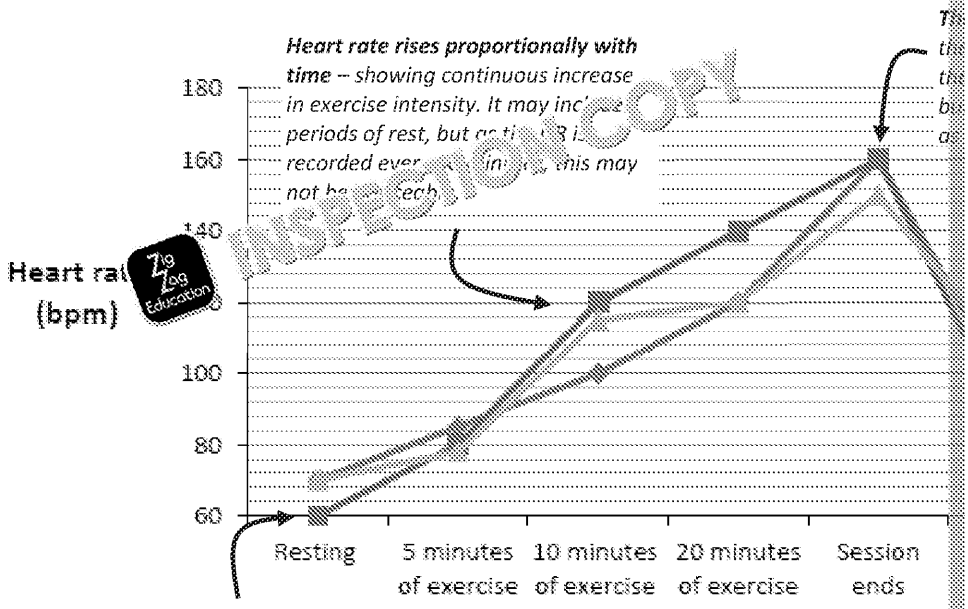
- Analyse the data in the table to determine the trend of the sit-and-reach test and the Illinois agility run test. (2 marks)
- Using the data provided, analyse the athlete's heart rate, stroke volume and a six-week cardiovascular training programme. (3 marks)

Top tip!
In the exam it is always important to explain a
the data from the graph to back up your point

You may also experience questions that require you to interpret the graph/table answer, either short-answer or multiple-choice, or justify a statement that has b

- Using the data in the table, identify the training method being used. (1 mark)
- Identify from the table the respiratory rate during exercise and during recov

A good way to analyse graphs/tables or charts is to annotate them to pick out ke lowest values or changes in the graph and offer an explanation for what this cou



Activity 2 (individual)

From the annotations p
answer the following questions.

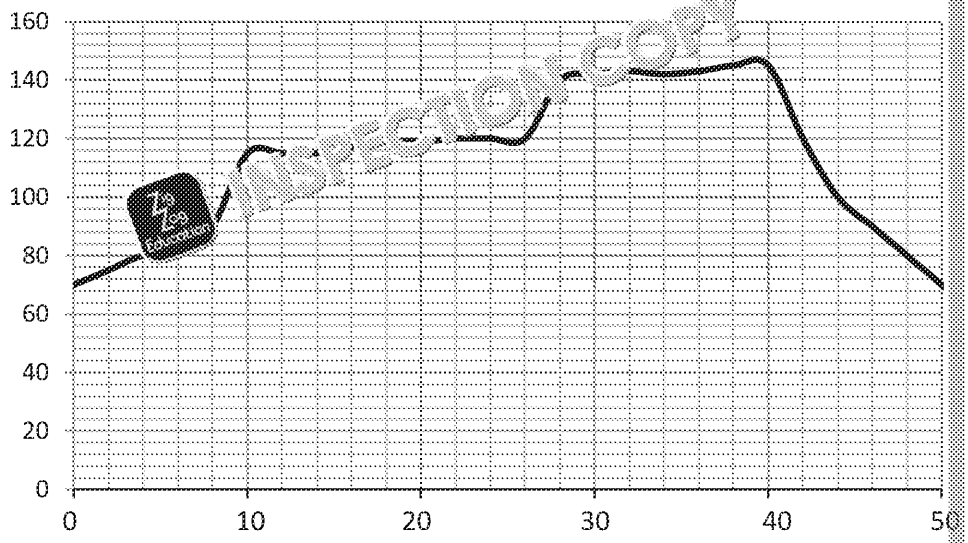
1. Which is the fittest? .....
2. Suggest a sport / physical activity that may be being performed. .....
3. Justify your choice of sport / physical from question 2. .....

.....

Activity 3 (pairs/small groups)

The following graph shows a 30-year-old's heart rate during exercise and during

Complete the graph to add the missing components/titles. Then, annotate the g
happening at different stages.



In the exam and for your PEP, you will need to put this into words to answer que
your annotations, you should be able to do this.

One way you could envision doing this is by explaining what you think it shows a
the graph as evidence.

Complete the following exam-style quest

1. i) identify the maxi rt ate value recorded and the heart rate befo

.....

ii) Using the graph, identify the training method being used.

.....

iii) Analyse the graph and consider what has happened between:
- 0 and 4 minutes
- 10 and 26 minutes

.....

.....

.....

.....

Extension activity

Use the data you have collected from any of the practical activities A–E (separate
Analyse the graphs to practise explaining what they are showing. Use reference
each point made.

Activity A – Effects of exercise on the body

Exercise has different effects on the body depending on the type of exercise and perform it. The effects of exercise are categorised into being either *short-term* o

Quantitative data could be collected and used to determine the effects of exercise, such as measure the short-term effects of exercise or monitoring body mass index (BMI) of exercise.

In this practical you will collect both *quantitative* and *qualitative* data by perform interview with your classmates. Once your data on the short- and long-term effe will then present and analyse some of this data, using the data skills you have de

Data collection

To collect data on the **short-term** effects of exercise, you will conduct a question immediately after they have performed strenuous exercise. In order to apply the during your course on the short-term effects of exercise, you will devise the que classmates to rate the statements from 1 (strongly disagree) to 5 (strongly agree give; one example of a question has already been given.

Q1 Example: *I feel very out of breath.* **1 2 3 4 5**

Q2..... **1 2 3**

Q3..... **1 2 3**

Q4..... **1 2 3**

Q5..... **1 2 3**

Q6..... **1 2 3**

Q7..... **1 2 3**

In order to collect data on the **long-term** effects of exercise, you will conduct an classmates. Consider the following bullet points when asking your questions, an only the space provided below.

Points to consider:

- What sport do they play?
- Have they ever experienced any long-term effects of exercise, e.g. improved
- How many long-term effects of exercise can they think of?

Write your questions and answers on a separate piece of paper / in your booklet next part (presenting and analysing data).

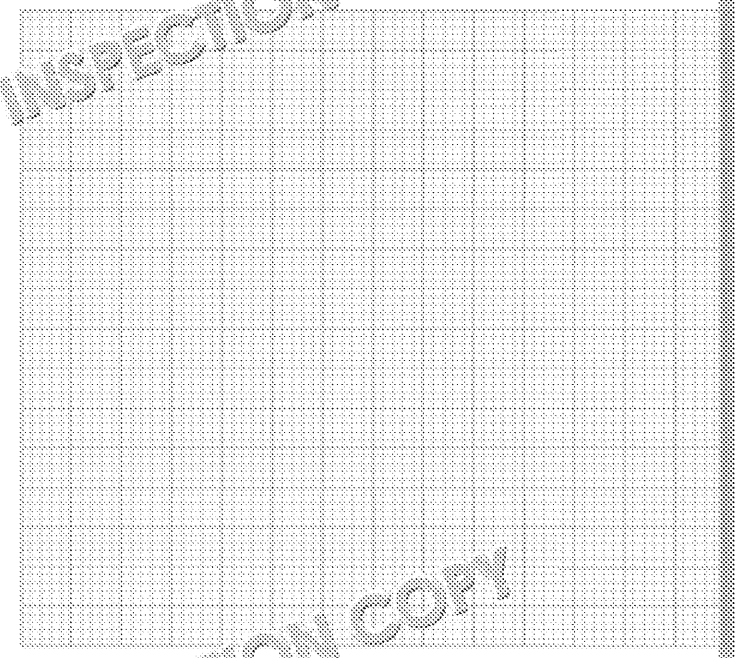
Presenting data

1) Using the results from your questionnaire on the short-term effects of exer
complete the table below (give the mean to the nearest whole number).

	Score				
Participant's name	Question 1	Question 2	Question 3	Question 4	
Mean					

Top tip!
To find the mean, add all the numbers toge
divide by the number of numbers.

2) Using your calculated means from each question, co te a bar chart usin
represent your data on the short-term effect of ex ise.



Question to think about

How cou esent the answers collected from your interview? What is the
data in an format for others to see the answers?

Analysing and evaluating data

Analyse your data using your graph.

- What does it suggest about the most experienced short-term effect of exerc
- Which short-term effect is least experienced/noticed?
- Explain why this might be.

Activity B – Components of fitness

Most sports require an athlete to possess a combination of many components of some specific components of fitness might be predominant in some sports, most will ensure they are well-rounded. In this activity you will take part in some spec certain components of fitness.

By recording your results, you will be able to colle[illegible] data which can then be anal you compare your data against that of yo[illegible]nd classmates. Depending o your results in each fitness test m[illegible]e different compared to your classmates.

Data coll[illegible]n

The followi[illegible] stations will be set up to produce a circuit. Each station will in component of fitness. You will record the data you have collected from each fitn provided. By working in groups of three you will alternate between taking the fi the results of your classmates. Make sure every member of your group collects t will be used later when analysing and presenting the data. Each person will get t

Station 1

Fitness test:
Sit-and-reach test

Component of fitness tested:
Flexibility

S

Fitness test:
Grip strength dyna

Component of fitn
Strength

Station 3

Fitness test:
30 m sprint test

Comp[illegible]s tested:
Sp[illegible]

S

Fitness test:
Sit-up test

Component of fitn
Muscular enduran

Tables to collect data

Name: **Age:**

Station	Attempt 1	2	3
Sit-and-reach test			
Grip strength dynamometer test			
30 m sprint test			
Sit-up test			

Name: **Age:**

Station	Attempt 1	2	3
Sit-and-reach test			
Grip strength dynamometer test			
30 m sprint test			
Sit-up test			

Name: **Age:**

Station	Attempt 1	2	3
Sit-and-reach test			
Grip strength dynamometer test			
30 m sprint test			
Sit-up test			

Presenting data

Once you have collected all of your data from each station, you will need to present this as a graph in order to analyse it and see what you can learn from your results. Perhaps you found some of the fitness tests easier than others?

Firstly, in order to do this you will need to complete the 'mean' column on your data collection tables. This is especially important as these numbers will be needed when answering the questions below and when creating your graphs.

1) What type of data have you collected?

.....

2) How could you have collected another type of data regarding the componen

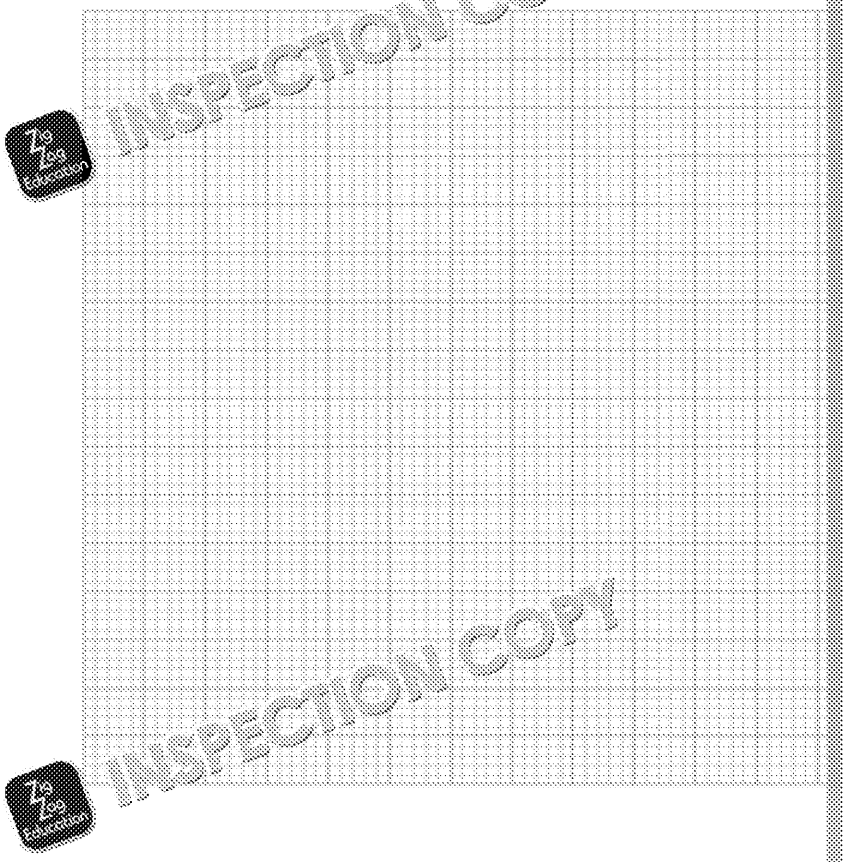
.....

.....

.....

.....

3) Using your data and the template below, plot a bar chart or a line graph sho collected for one of the fitness tests for a minimum of three people in your



Analysing data

Sometimes you will be expected to analyse results of fitness tests against norma
individuals in a defined population).

Research and find the normative data for your age group. Some good websites i

- **zzed.uk/11446-norms**
- **zzed.uk/11446-tests**

Using your graph, analyse the fitnes[illegible] against the normative data tabl

Consider:

- Which [illegible] peers did best?
- How di[illegible] participant score against the normative data?
- What does this suggest about their fitness level?

Activity C – Engagement patterns

Collecting data is a good way to analyse trends or describe the reasons behind as
performance. With obesity rising in the UK, the government is keen to increase
in physical activity and sport. By the end of your GCSE course you will have learn
influence participation in sport. In this activity you will use your newly learnt dat
of the factors that can influence participation.

Data collection

Conduct the questionnaire bel[illegible] on the following people to collect data about t
participation in sport:

1. A frien[illegible]as
2. A famil[illegible]ber
3. Yourself

The questionnaire should be conducted by you, with the answers written in the s
more useful to ask friends or family members who you know participate in sport
important to remember that, when collecting data, all results are useful and can
Therefore, if you, your friends or your family don't participate in any sport or phy
try to think about the reasons why this is the case. All data is useful, and people
profession, such as sports psychologists, would ensure that bias is not a factor an
questionnaires on people from all types of backgrounds. Try to collect data from
people of different ages.

Remember:

- *Quantitative data* deals with numbers; therefore, for questions in the question
just provide a number to indicate the participant's [illegible]. This data will be us
- *Qualitative data* deals with the quality of s[illegible]m thi[illegible]nd involves a description
questionnaire regarding qualitati[illegible]ata, provide a short description of the pa
provided. Once again this will be analysed later, so make sure you write only t

Questionnaire template

Use the following template or create your own. Use a separate sheet fo

Basic information				
Name:			**Relation to you:**	
Age:		**Gender:**		**Favourite**

Quantitative data					
How often do they participate in sport / physical activity (number of times per week)?					
How much do they enjoy participating in sport and physical activity? (Circle their answer.)	**Not at all**				S
	1	**2**	**3**	**4**	
On average, how often do they watch sport (number of times per week)?					

Further questions:

Qualitative data	
What is their memory of playing or watching sport?	
Ask them to explain the reasons why they enjoy / don't enjoy participating in sport.	
Ask them to explain what it is about their favourite sport that makes it so enjoyable to watch and/or play.	

Further questions:

Presenting data

It's time to present the data from your questionnaire so this can be analysed mo

Complete the following table to summarise the *quantitative* data that you have c

Participant	Family membe	Friend	Yo
Age:			
Gender:			
How often they parti[illegible] sport or physical a[illegible] pe[illegible] week:			
How much they enjoy participating in sport and physical activity:			
How often they watch sport per week:			

Analysing data

1) Discuss whether age and gender had any influence on the results you got fo trends observed throughout society?

.....

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2) Using the *qualitative* data, describe any similarities or differences between t your participants.

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Activity D – Health, fitness and well-being

During your GCSE course you may have already learnt that although health and fitness are related and can influence one another, they are not the same thing.

There are many health consequences that can arise from a sedentary lifestyle wh are categorised as affecting either our physical, emotional or social health. In ord to maintain good health, fitness and well-being we are encouraged to exercise regularly and eat a healthy, balanced diet. One way in which health professionals such as doctors or sports scientists evaluate an athlete's health is by conducting questionnaires to assess the athlete's lifestyle. This allows any poor habits to be identified and provide the athlete an opportunity to improve their health, fitn and well-being.

Data collection

Design a questionnaire which asks participants to rate statements which can be c fitness and well-being. The scores for each question will range from 1 (strongly d One example has already been given.

Question	Participant A (Me)	Partici B
Q1. I regularly participate in physical activity or sport		
Q2.		
Q3.		
Q4.		
Q5.		
Q6.		
Q7.		
Q8.		

Complete this yourself and then collect results for three peers in your class.

Presenting data

There may be a lot of information from this questionnaire to present as one graph, so we will want to identify the mean scores for each question.

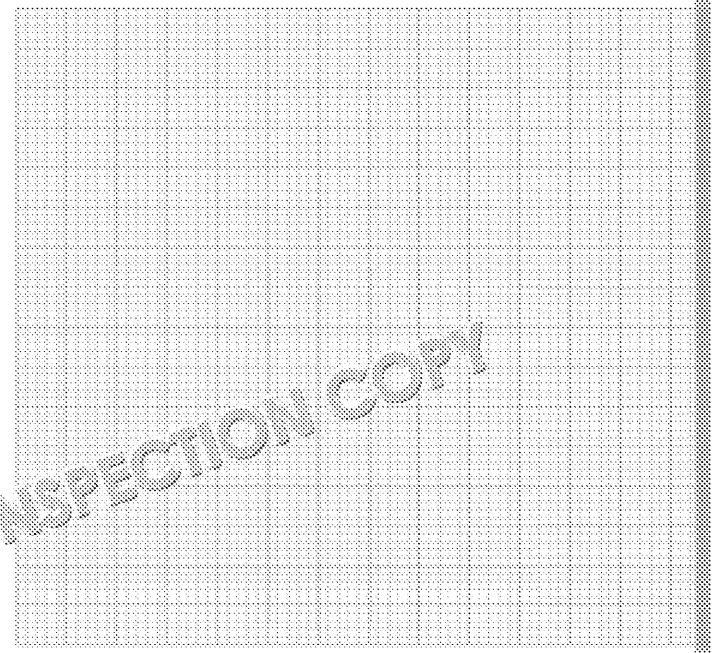
Simply add together the scores for each question and divide by four (the number of participants). Present the mean to two decimal places.

Question	Mean
Q1.	
Q2.	
Q3.	
Q4.	
Q5.	
Q6.	
Q7.	
Q8.	

Now consider how you will present this data below – bar chart or line graph.

Remember:

- **Identify the variables** – questions and scores
- **Draw and label the axes** – the independent variable always goes on the x-axis, the dependent variable goes on the y-axis (vertical line). Give the axes titles.
- **Determine the scale** – scores range from 1–5, but the means will now present
- **Plot the data carefully**
- **Include a title** – make this descriptive



Analysing data

Analyse the data you have collected to determine the current trends in lifestyle c
well-being among your class.

Think about each question and how it was rated as a mean score for your class.

Answer Section

Quantitative and qualitative data

Activity 1

a) QT
b) QL
c) QL
d) QT
e) QT
f) QL
g) QT
h) QL
i) QT

Activity 2

1. i) Reliability
   ii) Each student will give different results each time, depending on how q
   therefore, reaction time comes into play. The data will not be consiste
   not reliable.

Activity 3

See Activity A–E answers (dependent on which activity was chosen)

Extension activity

Answers will vary depending on the sport/activity st e w tch, but they shou
quantitative data measurements, e.g. goals s re number of tackles, number o
data measurement, e.g. how differ dividuals react to being fouled. It is like
measurement will involve ob ti .

Exam-style questions

1. 1 × AO1
   C. Survey

2. 1 × AO1
   Qualitative data is data that deals with descriptions, and often thoughts and
   subjective answer.

3. 3 × AO1

   Any 3 marks from:
   - Can establish baseline levels of agility
   - Can help identify strengths/weaknesses in agility
   - Can allow athlete to compare against normative data
   - Can establish intensity of training, dependent v s of fitness
   - *Accept other suitable examples*

Activity 1

1. i) Bar chart
   ii) Reliability
   iii) Measuring the distance in a smaller unit of measurement, e.g. centime

Activity 2

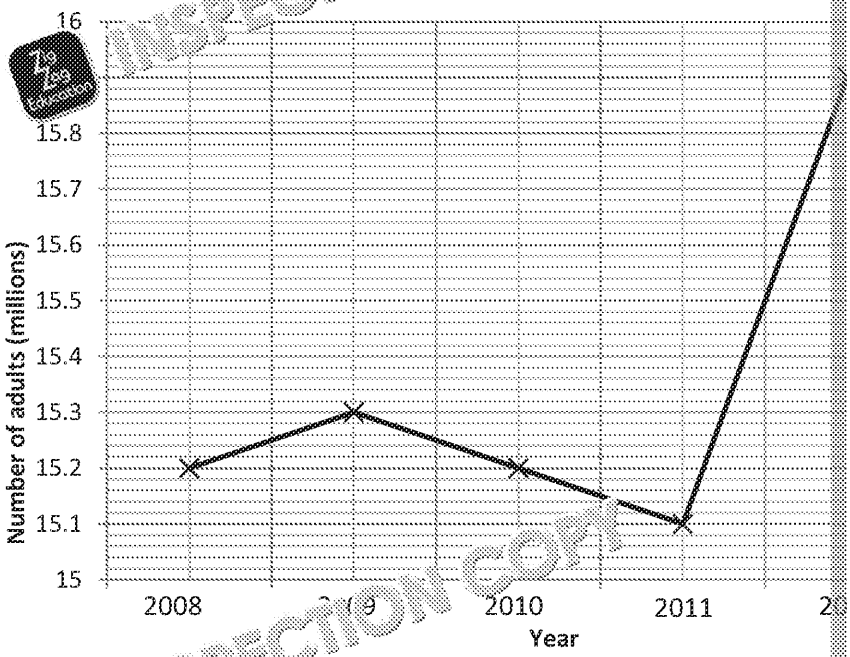
1. **Any from:**
   - The bar chart does not have the independent variable (weeks) along th
   - The y-axis uses the wrong units (cm instead of inches)
   - The data does not state the fitness test being shown
2. **Any suitable description, e.g.**
   - The x-axis should be the independent variable and display the three we Week 3)
   - Above each of the weeks could then be a separate bar for each of the a displaying as Athlete A, Athlete B, Athlete C and Athlete D
   - Sit-and-reach test to be specified in the title
   - Correct units (cm) to be used on the y-axis

Activity 3

1. i.)
   - Quantitative data can be easier to analyse and compare as the nu graphs and charts
   - It is less open to interpretation and instead can be seen as more fact

   ii) Line graph (accept bar chart)

   iii) **Number of adults (16+) ... cipate in sport at least once a week**



Activity 4

See Activity ... we... (dependent on which activity was chosen)

Extension activity

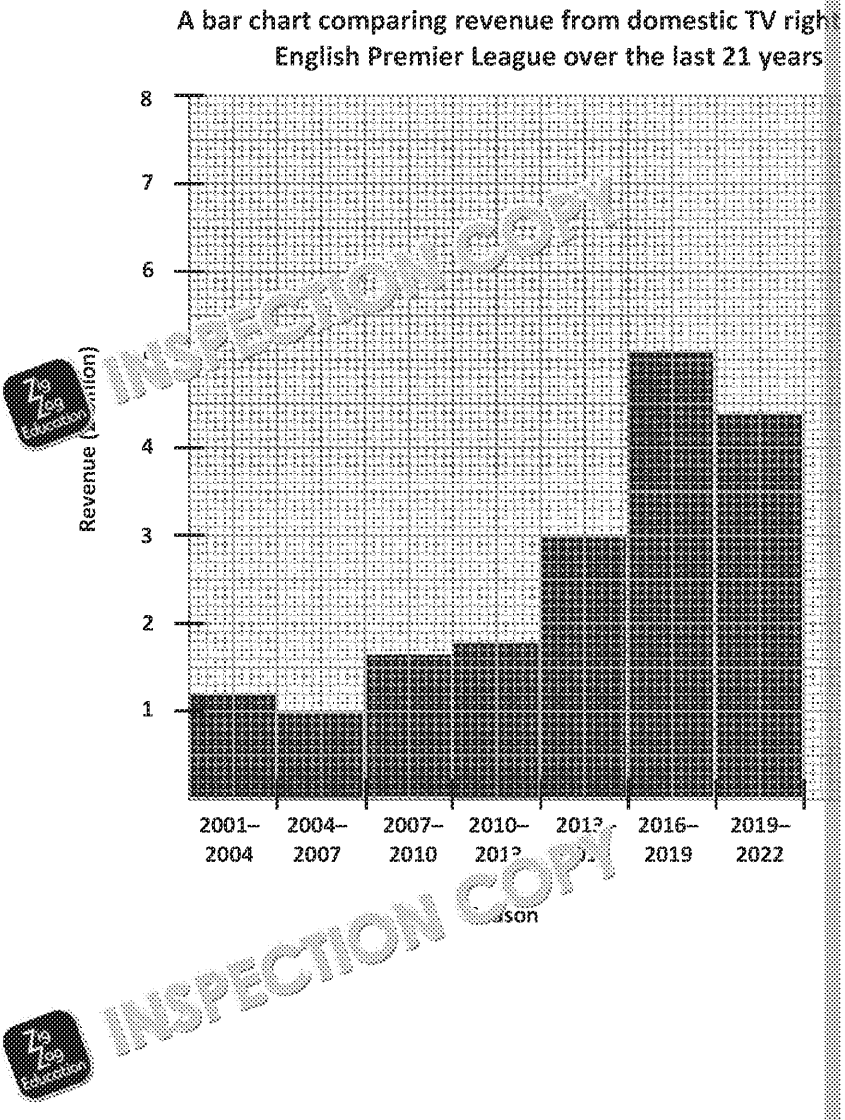
Answers may vary.

1. Opta currently covers 60+ sports.
2. Data is collected by a bespoke system to allow reliable and efficient data rec
   data experts, either in the field (e.g. stadiums) or by analysts in office space
   recorded and then logged in a database. This information is then presented
3. Multiple formats are used for presenting data, depe on the sports, but
   tables, bar charts.
4. The data is used by a range of indivi including sports scientists working
   and commentators, journalists, betting companies, sports books.

Practice qu s

1. 2 mark
   - X-axis labelled correctly (Week) and y-axis labelled correctly (Jump resu
   - Points correctly plotted and joined up

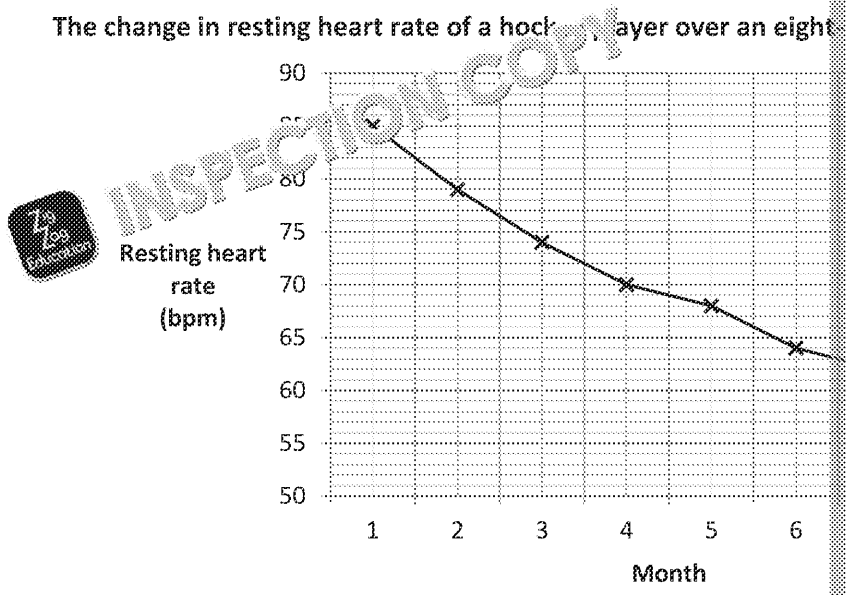
2. 2 marks for:
   - X-axis labelled correctly (Season) and y-axis labelled correctly (Revenue
   - Bars correctly plotted for each year period



Analysing and evaluating data

Activity 1

i) Students to plot the data points on the graph and draw a line. They should
and each axis.



ii) Accept any from:

- The graph shows that as the months progress, the resting heart rate of
- The graph shows that there is a gradual reduction across the eight mon
- The player's resting heart rate reduces by 25 bpm, from 85 bpm in mon
- The largest reduction in resting heart rate was between months 1 and 2

iii) Accept any from:

- Train... h... ...ive impact on resting heart rate because as the trai... h... ...e of the athlete decreased.
- Th... ...lete's training programme has been successful in improving car... had a long-term effect on the cardiovascular system.

Activity 2

1. Athlete 2
2. Any activity that has periods of increasing intensity (with potential rest peri... swimming, team sports, tennis (accept any suitable answer).
3. Heart rate increases proportionally with time, but this is unlikely to be steac... of heart rate.

Activity 3

- Title: Heart rate measurements of an athlete over a 40-minute exercise sessio...
- X-axis: Time (min)
- Y-axis: Heart rate (bpm)

Annotations could include:

- (0–4 min) ...re... ...are rate due to warm-up / anticipatory rise / adrena...
- (4–10 ... ...crease in heart rate due to increase in exercise intensity until s...
- (26–28 ... ...further increase in heart rate due to an increase in intensity, perha...
- (28-40 min) heart rate plateau. Oxygen consumption matches demand by t...
- (40 min) the athlete's training stops
- (40–50 min) the athlete performs a cool-down, as shown by the start of the ...

Exam-style questions

1. i) 2 × AO3
   - Maximal heart rate – 145 bpm
   - Heart rate before exercise – 70 bpm

   ii) 1 × AO3
   - Continuous training (accept fartlek training)

   iii) 2 x AO3 – 2 marks for:
   - 0–4 min – increase in heart rate due to warm-up / increase in intensity / anticipation of exercise
   - 4–26 min – intensity of workout remains the same / no change in

Extension activity

See Activity A–E answers (dependent on which activity was chosen)

Suggested Answers for Practical

Activity A – Effects of exercise on the body

Data collection

Students to collect both short-term and long-term da[illegible]g questionnaire and

An example of a completed table wit[illegible]e [illegible]estions. Students are requested

Statements in the q[illegible]ire about the short-term effects of exercise could in

- My hea[illegible] has drastically increased
- I am sweating more than I was at rest
- I feel very hot

Presenting data

An example of a completed data table.

	Score		
Participant's name	**Question 1**	**Question 2**	**Q**
Tony	4	4	
Hamza	5	3	
Emily	3	2	
Mean	**4**	**3**	

The graph should display a bar chart to show t[illegible]e [illegible]at[illegible] short-term effects of ex

- Y-axis to show scores (1[illegible]t[illegible]) is the dependent variable.
- X-axis to s[illegible]w [illegible]e[illegible]ent variable – the question. This may be listed as Q
  questi[illegible]en[illegible]nt (e.g. 'Feeling out of breath')
- Suitable[illegible], e.g. 'Short-term effects of exercise experienced by participant
- Student should accurately plot the results to display answers for each partic

Analysing data

Students should analyse the graph to determine the most experienced short-ter
effects are not experienced as much? They can then also begin to explain why th
likely to experience respiratory changes as you exercise, than how red your skin

Activity B – Components of fitness

Data collection

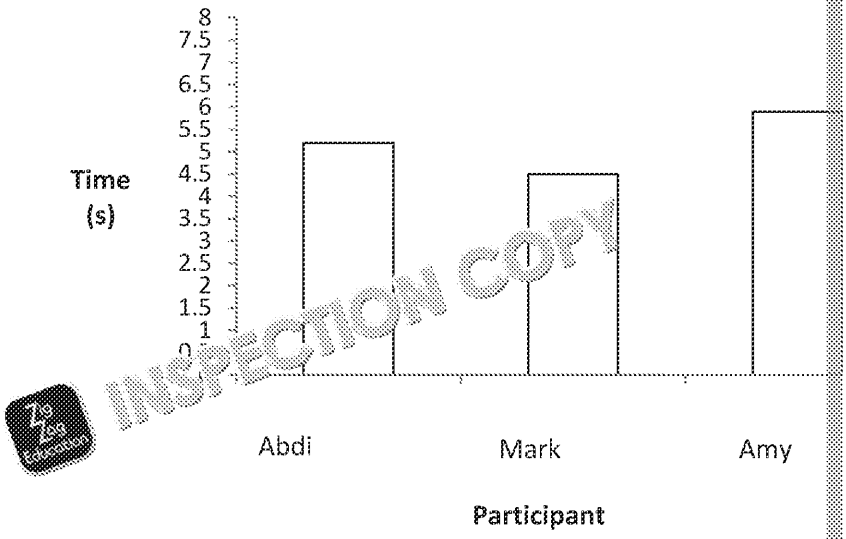
Students to collect data for a minimum of three peers. For example:

Name: Amir **Age:** 16

Station	Attempt		
	1	2	3
Sit-and-reach test (cm)	10	11	9
Grip strength dynamometer test (kg)	40	35	38
30 m sprint (s)	5.2	5.8	5.4
Sit-up test (number of sit-ups)	30	25	24

Presenting data

1) Quantitative data.
2) Qualitative data could have been collected using a questionnaire or an inter
3) Example of a bar chart showing 30 m sprint times. Accept other suitable gra of fitness.



Analysing data

Students to review the latest normative data for their age group to analyse one created the graph for against the normative data.

Activity C – Engagement patterns

Data collection

Students to complete the questionnaire with each of the three individuals to allo
They should consider adding further questions to the template. Students can als
if they wish.

Presenting data

An example of a completed data table fo[illegible] questions. Students should have

Participant	ow often they participate in sport or physical activity per week	How much they enj participating in spor physical activity
Family member	2	6
Friend	5	8
Yourself	4	7
Mean (nearest whole number)	4	7

Analysing data

1. Students' answers will vary, but they should consider the following:
   - Whether or not their results are similar to those seen in society
   - How factors such as age and gender influence results such as their favo
     participate in sport, etc.

2. - Did you observe similar or different results bet[illegible] your participants?
   - Use the most important few points from eac[illegible] icipant to summarise t
   - Are your own results more sim[illegible] our family or friends? Do you th
     sport influences how often you participate in sport?

Activity [illegible]ea[illegible]h, fitness and well-being

Data collection

Points to consider:

1. Statements in the questionnaire could include the following:
   - I often eat at least five portions of fruit and vegetables per day
   - I enjoy being active
   - I don't watch a lot of TV in my spare time
   - I spend a lot of my free time outside

Presenting data

Students to present data showing mean scores for each question.

- A bar chart is the obvious choice for showing these scores.
- Y-axis to show scores (1–5) as this is the dependent [illegible]ble. The scale here
  of mean scores. It is also ideal if they identif[illegible] t[illegible] (5) as being strongly a
  strongly disagree.
- X-axis to show independent [illegible] the question. This may be listed as Q
  question/statement [illegible] regularly participate in physical activity or sport'
- Suitab[illegible] e[illegible] ssment on health, well-being and fitness of four indiv
- Studen[illegible] d accurately plot the results to display answers for each of the

Analysing data

Students should analyse their results for each question to determine how the cla
health, fitness and well-being.