Scatter graph worksheet ks3



This blog is becoming a bit statistics-heavy, which is ironic given that I don't particularly like teaching algebra. I'm also guite keen on surds and indices. And I like trigonometry. In fact, apart from the odd annoying-to-teach topic like loci and constructions, I'd put most data handling topics right at the bottom of my 'things I enjoy teaching' list. It never fails to amaze me how long some teenagers take to plot a graph. What a faff. Anyway, this post is all about ideas for teaching scatter graphs. And I intend to follow it up with all the statistics. Practical activities Unusually for a maths lesson, there's opportunities for some practical activities when we introduce scatter graphs. The obvious idea is to have students plot height or hand span against shoe size. If you want to get even more practical, try a human scatter graph in the classroom or in the playground (using chalk axes). Outliers I like to use the two scatter graphs shown below (stolen from a Ten Ticks worksheet) in a class discussion about outliers. Ask your class what could have caused these extreme values and you'll probably get some really creative suggestions! Line of Best Fit I teach my students to draw a line of best fit by trying to minimise the distances between all the points and the line. That's what a least squares regression does. Contrary to popular belief, there doesn't have to go through the origin. Beware of dodgy methods taught in other subjects. This misconceptions activity by frickard on TES is helpful - I've used this in a 'hands on head if you think it's true, hands on hips if you think it's false' activity. Impossible Predictions 'Extrapolation' from regression lines is something that comes up at A level, but the idea can make for interesting discussions at Key Stage 3 or GCSE. The key point is that even if we observe a linear relationship in the data we're examining, we can't assume that relationship extends beyond the range of the data. Here's a nice example for class discussion: The graph below shows a negative correlation between year and time taken by athletes to run 100m. It suggests that the speed of 100m runners has increased over time. A line of best fit has been drawn. Why do you think 100m runners are getting faster? Do you think this trend will continue? Possible reasons for the increase in speed include: advances in technology (ie more lightweight or streamlined clothes and trainers), research into optimal diets and training plans, sponsorship meaning athletes have more time to train, the introduction of starting blocks in the 1940s and an improvement in the accuracy of timing the race. If the trend continues indefinitely (ie if we draw the line of best fit into the future) then at some point at which the time will plateau, due to limits in humans' physical capabilities. Although there is a linear correlation, we must be careful not to make predictions in the past or future because the linear relationship is over a limited time period. The graph comes from this Minitab Blog post and the idea was put into my head by Kings College London PGCE tutor Chris Olley. "Wind is caused by the rotation of windmills" I love the causation vs correlation discussion. It's a very important learning point for students who will come across all sorts of dodgy statistics in everyday life. doubt.it A typical example is shoe size and reading age. The two variables are positively correlated, but obviously the size of someone's feet has no impact on their reading ability. For more ideas check out this spurious correlation does not imply causation on causation does not imply causation, but it does waggle its eyebrows suggestively and gesture furtively while mouthing "look over there". - xkcd Resources Finally, here's a few resources that you could use in your lessons: I love this Bee Aware activity from Don Steward. It could easily be made into a mini-project/display work about the cause and impact of the demise of honey bees. The excellent Mathematics Assessment Project gives us two tasks - Scatter Diagram and Birds' Eggs There's no shortage of real-life applications). Nrich gives us this nice David and Goliath activity. 'Foldables' seem to be a big thing in US math lessons, but I've never seen them in the UK. I think my students would quite like them. Here's an idea for correlation foldables from the blog 'Everybody is a Genius'. I like the idea of giving each pair/group two options so they can choose the variables they prefer, and that everyone in the class is working on something different. Also, the 'assigned tasks' for each group work. These particular tasks may not be suitable for a UK lesson because we don't expect students to calculate the equations of lines of best fit, but the idea could be adapted. I hope this post has been helpful. Please comment if you have any ideas to share. By the way, this cool moving scatter graphs GCSE worksheet in which students are required to plot missing points, describe the correlation and the practical interpretations, and then draw a line of best fit. Can be extended if you pose questions on using the line of best fit to estimate one variable given a value for the other. Tes classic free licenceSelect overall rating (no rating) Your rating is required to reflect your happiness. Write a reviewUpdate existing reviewIt's good to leave some feedback. Something went wrong, please try again later.Excellent overview of types of correlation. Thank you!Empty reply does not make any sense for the end userThank you so much - an excellent resource!Empty reply does not make any sense for the end userThank you so much - an excellent overview of types of correlation. plots. Thank you. Empty reply does not make any sense for the end usergreatEmpty reply does not make Activities Exam Questions A KS4 maths worksheet resource that can be used to revise and practice concepts regarding scatter graphs. The worksheet includes: key definitions regarding scatter graphs. The worksheet includes: key definitions regarding scatter graphs. The worksheet resource that can be used to revise and practice concepts regarding scatter graphs. challenging questions involving line of best fit Objectives: To use and interpret scatter graphs of bivariate data; To recognise correlation and know that it does not indicate causation; To draw estimated lines of best fit; To make predictions; To interpolate and extrapolate apparent trends whilst knowing the dangers of so doing; Starter Activity Use these free starter questions to: a) Show that a scatter graph can help us see trends and patterns within raw data. b) Discuss how to draw lines of best fit. d) Discuss interpolation and extrapolation. C) Discuss how to draw lines of best fit. d) Discuss how to draw lines of best fi Activity Investigation Students can determine a hypothesis, such as that a student's height is related to their armspan, collect data and plot a scatter graphs, including how to plot s also scatter graph worksheets based on Edexcel, AQA and OCR exam questions, along with further guidance on where to go next if you're still stuck. Scatter graphs are a statistical diagram which gives a visual representation of bivariate data (two variables) and can be used to identify a possible relationship between the data. A scatter graph can also be referred to as a scatter diagram or scatter plot. E.g. Here is a set of bivariate data showing the height and weight. For this data the relationship between height and weight. For this data the relationship between height and weight of ten student is a relationship between height and weight. vice versa. If there is a relationship for a set of bivariate data, it is referred to as a correlation. This graph shows a positive correlation. An outlier is a piece of data which does not fit with the rest of the data set. It can be recognised as a point by itself. For example, here is a scatter diagram with an outlier. Outliers can occur for different reasons so it is important to look at the context of the graph to determine possible reasons for them. Correlation ship in bivariate data. Scatter graphs visually show the correlation ship is weak. You can see this visually on a scatter graph by observing how close the plots are together in forming a line. A line of best fit is a straight line drawn through a scatter graph which shows correlation. It is referred to as an estimated line of best fit because it is drawn by hand following some guidelines. There is a small range of acceptable answers. The aim is to draw a straight line in the direction of the correlation shown, with points distributed either side of the line as equally as possible along its length. Your line may also pass directly through a number of points. A line of best fit can also be referred to as a trend line. An estimated line of best fit can also be referred to as a trend line. other within the range of the highest and lowest data values. This is called interpolation. E.g. Here, the line of best fit has been used to estimate the height of a student given that their weight is 56kg. This line of best fit estimates that someone weighing 56kg will be approximately 147cm tall. If there is a strong correlation, then the line of best fit can provide relatively reliable estimates within the data set. If there is a weak correlation, then estimates will be less reliable. Here the line of best fit has been extended so that it stretches beyond the data set (it is no longer surrounded by plotted points). If this section of the line is used to estimate the value of a variable given a value of the other, then this is known as extrapolation. This line of best fit estimates that someone who is 161cm tall will weigh approximately 64kgl. This is extrapolated values should be treated with caution and are generally viewed as unreliable estimates. In order to plot scatter graphs: Identify that you have a set of bivariate data.Draw suitable axes and label them.Plot each pair of coordinates. Get your free scatter graphs worksheet of 20+ guestions and answers. Includes reasoning and applied guestions. DOWNLOAD FREE x Get your free scatter graphs worksheet of 20+ questions and answers. Includes reasoning and applied questions. DOWNLOAD FREE A garage sells second-hand cars. The table below shows the age and the selling price of each car. Represent this data on a scatter graph. Identify that you have a set of bivariate data. Bivariate data is a set of data which has two pieces of information for each subject. In this question the subjects are the ten cars. Two pieces of data have been recorded for each car, age and selling price. Therefore, this is bivariate data. 2Draw suitable axes and label them. Each axis should have one of the variables and the scale should be appropriate for the given values. One axis will show the age of the car. This variable has the lowest value of 2 and highest of 10. A sensible scale would be 800 to 2200 in steps of 100. This will require drawing a break in the scale from the origin to 800. 3Plot each pair of coordinates. Plot each car as a cross on the graph a suitable title. To plot the coordinate for Car 1, we locate 5 on the horizontal axis (Age = 5), and then travel vertically along that line until we locate £1200 on the vertical axis (Selling price = £1200). Continuing this method, we get the following scatter graph: A gardener is researching a crop of sunflowers. He selects 6 sunflowers at random and measures their height and the number of leaves. The table below shows the results. Represent this data using a scatter graph. Identify that you have a set of bivariate data. We have two variables for this data, Height (cm) and Number of leaves. This means we have bivariate data. We have two variables for this data, Height (cm) and Number of leaves. of heights is 154-181cm and so we can draw the horizontal axis from 150-190cm in 5cm steps. The range of the number of leaves is 8-14, so we can label the axis from 0-16 in steps of 2. Plot each pair of coordinates. An energy company was researching the monthly bills of a street of homes in December. The results were recorded in a table, alongis the number of hours the heating was on in each house. Represent this data using a scatter graph. Identify that you have a set of bivariate data. As we are looking at the relationship between two variables (the number of hours of heating and the monthly energy bill), we have bivariate data. Draw suitable axes and label them. The range of values for the number of hours of heating is 30-54 with no decimal values, so we can label the horizontal axis from 0 to 60 and mark every 5 hours on the axis from 60, we can mark each £5 up to £90 on the vertical axis, giving us a reasonable amount of detail in the plot. Plot each pair of coordinates. In order to read a value from the value to the line of best fit. Draw a vertical/horizontal line from the point on the line of best fit to the other axis. Read the value on the other axis. Below is a scatter graph that represents the number of hours of sleep per night of 10 students and the score they achieved in a spelling test. What spelling test score would you predict for a student who has an average of 6 hours of sleep per night? Here, the line of best fit is approximately Locate the given value on one of the two axes. As we know that the student has an average of 6 hours of sleep, we label this value on the horizontal axis. Draw a vertical/horizontal line from the point on the line of best fit. We need to draw a horizontal line from the value to the line of best fit. line from the line of best fit to the other axis. Read the value on the other axis. Here, the spelling test score is 13. Below is a scatter graph that represents the number of ice cream sales against the outside temperature at midday during the month of July in the UK. Use the graph to determine an estimate for 30 ice cream sales Drawing a line of best fit, we have: Locate the given value on one of the two axes. As we want the temperature for 30 ice cream sales, we need to locate 30 on the value to the line of best fit. Draw a vertical/horizontal line from the value on the value to the line of best fit. Draw a vertical/horizontal line from the value on t other axis. The temperature that can be expected for 30 ice cream sales is 26.6^{\circ}C. The scatter graph below represents the age of people and the number of hours of work would you predict for a person who is 64 years old, we need to locate 64 on the horizontal line from the value to the line of best fit. Draw a vertical/horizontal line from the value on the other axis. Read the value on the other axis. Read the value on the other axis. causation When interpreting scatter graphs, it is important to know that correlation does not indicate causation. In other words, a relationship between two variables does not indicate that one variable causes another. For example, you may find a positive correlation between two variables does not indicate that one variable causes another. relationship as the hotter the temperature, the greater the number of ice-creams sold. It might then be tempting to say that his indicates that hot weather causes higher ice cream sales. However, there is not sufficient evidence for you to make this assumption both scientifically and statistically. In the same way you cannot say that higher ice cream sales cause hotter temperatures. Sometimes bivariate data can appear to have 3 variables and not just two. For example, the table below shows information from a small independent electronics shop. They have recorded the year, the number of TVs sold, and the amount of money spent on advertising. As the table has 3 rows of data it may appear to have 3 variables. However, you must remember that bivariate data has a subject and two variables are recorded for each subject. In this case the subject. In this case the subject is the year. For each year the number of TVs sold', and the other as 'amount of money spent on advertising' and then each cross will indicate each year. It is good to remember that the points on scatter graphs questions Step 1: This is bivariate data. For each subjects. Practice scatter graphs represent subjects. The number of subjects of information have been recorded (number of glasses of water and number of packets of crisps). Step 2: The axes should be labelled with the two variables (number of glasses of water and number of glasses of water and number of packets of crisps). The scale should be appropriate for the values. Step 3: When plotting the coordinates make sure to get them the correct way round. Each day is represented by a cross. A negative correlation is shown on a scatter graph by the points forming a linear pattern in a downward trend. As one variable decreases, the other variable increases, the other variable decreases, the other variable increases, the other variable decreases are graph by the points forming a linear pattern in an upward trend. line of best fit must go through as many points as possible, with the same number of points on either side of the line. Drawing a vertical line from 7 on the horizontal axis to the line of best fit, and then across to the other axis, we would expect that a person who has 7 hours of sleep should solve the puzzle in 4 minutes. As the student did 25 hours of revision, we locate 25 hours on the horizontal axis. Drawing a vertical line up to the line of best fit, and then across to the vertical axis, we get a percentage of 56\%. Scatter graphs GCSE questions 1. What type of correlation is shown on this scatter graph? (1 mark) 2. A shop sells 14 different magazines. The shop manager decides to record the cost of each magazine and the number of pages it has. The manager then displays this information on a scatter graph. (a) Describe the relationship shown on the scatter graph. (b) Estimate the cost of a magazine, the higher the price. or Positive correlation or Weak positive correlation (1) (b) Estimated line of best fit is a straight line in an upwards direction positioned so that the plotted points are equally distributed along its length (see below). (1) A magazine with 45 pages is estimated to cost approximately 475p or £4.75. NB: Your answer will be judged as correct based on your estimated line of best fit (see below). (1) (c) As the scatter graph shows a weak correlation between the number of pages in a magazine and its cost, the answer to part (b) is not very reliable and should only be considered a rough estimate. (1) 3. Simon is studying GCSE music. He finds that he gets bored listening to long pieces of music and prefers listening to short pieces. He decides to conduct an experiment to see if his friend Rajveen shares his views. He plays Rajveen 8 pieces of music, the lower its score out of ten". Here is the data Simon collected. (a) Draw a scatter graph to represent this data. (b) Does the data support Simon's hypothesis? Explain your answer. (4 marks) (a) Axes are drawn with appropriate title. (1) Coordinates have all been plotted correctly. (1) (b) No, and no correlation. (1) You have now learnt how to: Use and interpret scatter graphs of bivariate dataRecognise correlation and know that it does not indicate causationDraw estimated lines of so doing Bar chartsFrequency diagramHistogramsPie chart Prepare your KS4 students for maths GCSEs success with Third Space Learning. Weekly online one to one GCSE maths revision programme. We use essential and non-essential cookies to improve the experience on our website. 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