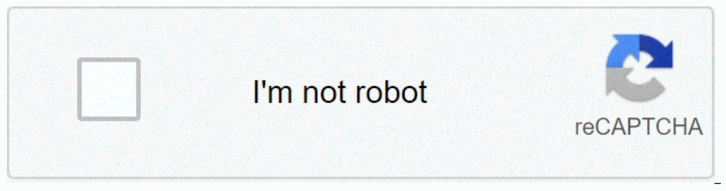

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Velocity time graph worksheet physics

With the speed on the Y axis and the time on the X axis, a speed time chart tells us how someone's speed/something has changed over a period of time. 1) Line gradient - Acceleration 2) Negative gradient - Deceleration 3) Flat section means constant speed (NOT STOPPED) 4) The area below the graph - Distance traveled A skill you will need to learn is to describe a speed time chart. Example: The speed time graph shows a 50-second drive. Describe the 50-second journey. Step 1: Divide the chart into different sections, these can be seen in the image as A, B, C and D. Step 2: In detail describe each part of the trip, making sure to use numeric values throughout. Section A – The car accelerated from 0 to 15 m/s for the first 10 seconds (because the line is straight, acceleration is constant). Section B – The line is flat, which means that the car speed did not change for 10 seconds, which means it was moving at a constant speed. Section C – The car accelerated up to 25 m/s over the next 10 seconds, Section D – finally spent the last 20 seconds slowing down again to 0 m/s. Acceleration is calculated as the change in speed over time. Example: The speed time chart shows a 50-second drive, finding which section of the chart has the highest acceleration. We know, The gradient of the line - Acceleration We must find the gradient of each section. Section .bf-A: Acceleration between 0s and 10s - gradient- dfrac- 15-0-10-0-1.5 m/s-2 Section .bf-B: This section is flat, which means that acceleration will be 0 Section .bf-C: Acceleration between 20s and 30s - gradient . 5-30-20-1 m/s-2 Section .bf-D: Acceleration between 30s and 50s - gradient -dfrac-0-25-50-30-dfrac-25-{20} -1.25 m/s/s section bf á -A- has the largest acceleration, It has the largest acceleration, so the maximum acceleration is 1.5 m/s2 Note: the acceleration units are expressed in distance/time-bold-2o, which in this case is m/s-bold-2o. Calculating the total distance traveled is one of the most common exam questions you can see. Example: The speed time chart shows a 50-second drive, Calculate the total distance traveled during the 50 seconds. we know, area below the chart - Distance traveled To work the area below this chart, we will divide it into 4 shapes: A, B, C and D. This gives two triangles, a rectangle and a trapeze, which are all ways we can work the area. .text-A-dfrac{1}{2}-times10'times15'75 m'text', 'B'10', 'times15'150 m' C'drac{1}{2}(15+25', 'times10'2' M D-dfrac{1}{2}-times20-times25-250 m Total distance travelled: 75+150+200+250-675 m Find the average gradient, is the gradient over a period of Example: A speed time chart of the first 4 seconds of someone running a race is displayed. Calculate the average

acceleration over the 4 seconds. We know: The gradient of the line - Acceleration to out the average acceleration during the 4 seconds, let's draw a line from where the chart is in 0 seconds to where the chart is at 4 seconds and find the gradient of it. Therefore, we get the average acceleration, text (text), gradient (gradient) and dfrac (drac) 6-0(0-0-1.5 m/s-2 Find the instant gradient, is the gradient of the tangent at a point. Example: A speed time chart of the first 4 seconds of someone running a race is displayed. Calculate instant acceleration 2 seconds in. To do this we will draw a tangent to the line after 2 seconds and solve the gradient of that. This is shown above. Next, we get instant acceleration, text (text), gradient (gradient), and dfrac (dfrac) 5.8-3,2, 3.5- 1.0, and 1.04 m/s2 (3 sf). Therefore, first let's draw a line from the origin to (12, 4), since after 12 seconds, it is reached at 4 m / s. Then, for the next part we are told that the deceleration is 0.1 m/s2 for 20 seconds. Therefore, if the speed decreases by 0.1 every second, after 20 seconds it will be 0.1 times 20 x 2 m /s Therefore, by 32 seconds in the speed is 2 m / s, so let's draw a straight line from (12, 4) to (32, 2). Finally, a constant speed will be represented by a flat line that goes to the point of 50 seconds, still at 2 m/s. The result should look like the following graphic. We need to find the area below the chart. To do this, we'll divide it into shapes that we know how to calculate the area from, as seen below. A is a triangle, B and C are trapezoids, and D is a rectangle. Therefore, we get text from the text page of A{1}{2},times10, times15, text, text, B, dfrac{1}{2}, times (10 +15), times5, 6 2.5 m .text ,C , dfrac{1}{2},times(10+20), times5, 75 m, text, D, 30 times, 600 m therefore, the total distance traveled by the cyclist is 75+62.5+75+600-812.5 m To determine the average acceleration, we draw a line from the origin to the end point of the chart, as seen below. The mean acceleration is given by the gradient of this line. Therefore, the average acceleration is, text, gradient, dfrac, 4-0, and 50-0 0.08 m/s2 Complete the table on the first page of the worksheet-compare.pdf. Fill each grid space with a properly concise response. The sample responses are on the second page of spreadsheet comparison.pdf. Page 1: Questions Page 2: Answers worksheet-transform.pdfThe following graphic shows speed as a function of time for some unknown object. What can we say about the movement of this object? Plot the corresponding acceleration graph based on time. Plot the corresponding displacement chart function of time. The problem presents us with a speed-time chart. Don't read it like I'm showing you position. You cannot immediately determine where the object is from this chart. You can tell which direction it's moving in, how fast it's going, and whether it's accelerating or not. The movement of this object is described for several segments in the following graphic. Acceleration is the rate rate change of displacement over time. To find acceleration, calculate the slope at each interval. Plot these values based on time. Because acceleration is constant within each range, the new chart must be composed of linked horizontal segments. Displacement is the product of speed and time. To find displacement, calculate the area below each range. Find the areas accumulated from the origin (given an initial displacement of zero) 00 s → 0 to 0 m 04 s → 0 + 8 x +8 m 08 s → 0 + 8 x 8 x 0 m 12 s → 0 + 8 x 8 x 8 x 8 16 to 16 m 16 s → 0 + 8 to 8 to 16 to 8 to 24 m 20 s → 0 + 8 x 8 to 16 x 8 + 0 at 24 m 24 s → 0 + 8 x 8 x 16 x 8 + 0 + 8 x 16 m 30 s → 0 + 8 x 8 x 16 , 8 + 0 + 8 + 24 , +8 m Plot these values according to time. Pay attention to the shape of each segment. When the object accelerates, the line must be curved. Draw the graphs of travel time, speed time and acceleration time for... an object that moves at constant speed. (Let the initial offset be zero.) an object that moves with constant acceleration. (Let the initial offset and speed be zero.) Since the speed is constant, the travel time chart will always be straight, the speed time chart will always be horizontal, and the acceleration time chart will always be located on the horizontal axis. When the speed is positive, the travel time chart must have a positive slope. When the speed is negative, the travel time chart must have a negative slope. When the speed is zero, the travel time chart must be horizontal. Since the acceleration is constant, the scroll time graph will always be a parabola, the speed time chart will always be straight and the acceleration time chart will always be horizontal. When acceleration is positive, the speed time chart must have a positive slope and the scroll time chart should be bent upwards. When acceleration is negative, the speed time chart must have a negative slope and the scroll time chart should be bent downwards. When acceleration is zero, all three charts must be on the horizontal axis. The following graphic shows the altitude of a paratrooper initially at rest based on time. After 7 seconds of free fall the parachute of the paratrooper was completely deployed, which changed the movement abruptly. Determine the speed in the instant... just before the parachute opened right after the parachute opened, what was the paratrooper's acceleration... from the beginning of the jump to the hour just before the parachute opened? From moment just after the parachute opened to the time the paratrooper landed? Sketch the corresponding graphs of... speed acceleration time over speed. There are at least two ways determine the speed just before the parachute opened. One would use the fact indicated on the stem of the problem: that the paratrooper was in free fall. We could use the first motion equation for an object with constant acceleration. Above is positive on this chart, so gravity will have to be negative. v a v0 + atv á (0 m/s) + (9.8 m/s2)(7 s)v at 69 m/s We could also use the chart itself (instead of the chart description) to solve this part of the problem. In the last half-second, from 6.5 to 7.0 seconds, the graph looks very almost straight and the paratrooper seems to fall from 90 to 60 meters. The slope is the speed on a travel time chart. Compute. v v at 60 m at 90 m 7.0 s at 6.5 s v at 60 m/s What answer is correct? Well, neither. Freefall in an atmosphere is technically impossible, which means that the first answer is only true in an idealized world. The second answer is definitely a mathematical approximation. We don't really know the slope of the tangent on the left side of 7 seconds. I said it seems clear in the last half-second, but it doesn't cut it. I think the paratrooper was more likely to be almost in free fall than the curve was almost straight in the last half-second before the parachute opened. However, if I asked my students this question, I would accept the answers as reasonable and grant full credit, as long as there were no other errors such as missing units. From 7 to 17 seconds, the chart is straight. Straight lines in a travel time chart indicate a constant speed. Speed is the slope on this chart type. Compute. v v v to 6.0 m/s This is the answer to this part of the problem. There can be no debate about this. Questions about acceleration. There seem to be 4 valid ways to determine acceleration in the first 7 seconds. The first is simply to agree with what the description of the text says. The paratrooper is in free fall. Freefall acceleration on Earth is just a number, a number that you must memorize if you have a professional reason to learn physics. at 9.8 m/s2 The second method uses the graph and a motion equation. Since we are given a scroll time chart, use the offset time ratio, also known as the second motion equation. After 7 seconds, the paratrooper has fallen off the break at a distance of 240 meters. Δs á v0t + 1/2at2a at 2Δs/t2a at 2(-240 m)/(7 s)2a at 9.8 m/s2 The third and fourth methods use the other two motion equations. Since these depend on our options for the final speed, multiple valid responses are possible. Let's say we use the calculated speed from the of a tangent with a value of 60 m/s and the speed-to-time ratio, also known as the first motion equation. Then... v a v0 + ata á v/ta (60 m/s)/(7 s)a at 8.8 m/s2 m/s2 also use the velocity-to-displacement ratio, also known as the third motion equation, with a final speed of 60 m/s and an offset of 240 m. That gives us... v2 a v02 + 2aΔsa á v2/2Δsa á (60 m/s)2/2(240 m)a at 7.5 m/s2 I do not like these last two answers, but I would have to accept them if a student gave them to me. These are valid answers given what the chart shows. Given how much they don't agree with the other answers, it means they're probably wrong, but so what? They're not wrong because of flawed reasoning. They are wrong because of the limitations of the chart. Welcome to the real world. After 7 seconds, life is easy. Look at the chart near the end. It's a straight line. Look at him again. Isn't he charming? So straight. A straight line on a travel time chart indicates constant velocity or zero acceleration. Let me figure it out for you. Oh wait, there's nothing to calculate. Draw a hole and add it. 0 m/s2 Chart questions. Here is the original graph of altitude time, or travel time, or position time or whatever you want to call. That's what I gave you to work with. Here's the speed-time chart. All signs are negative. The speed became more and more negative until the duct opened, so it was a smaller negative number (but constant) afterwards. Here is the acceleration time chart. The paratrooper falls with a constant negative acceleration of 9.8 m/s2 for 7 seconds, then has no acceleration. It does not mean zero meters per second squared. Constant values are horizontal lines in this chart. Graphic.

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