2005-2006

Ninth Grade IPS

Dr. Brown Block 2A
Blocks 2 and 4
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http://teacherweb.com/PA/HaverfordHighSchool/smith

Welcome to Science Class! "IPS" stands for Inquiry into the Physical Setting. In other words it is an introduction to some of the fundamental concepts of physics. Learning physics involves trying to describe, explain, and predict how objects work and interact with each other using language, mathematics, simulations, and models. Selected topics include motion, force, waves, and communications that will be explored through a hands-on, interactive approach. Rather than taking extensive notes, you will find that this course is activity-based. In addition to quizzes and tests, each unit contains a cumulative project assessment that you will complete to demonstrate what you have learned. These projects are designed to be challenging, but also fun and engaging for you to apply the concepts you are studying.

Materials Needed:

- 2 in 3-ring binder for class handouts and worksheets
- ~~separate notebook~~ – get Watts book again
- calculator (calculator used for IAG is sufficient)
- loose leaf paper
- set of colored pencils or markers
- pencils/pen

Physics Help:

For anyone who needs assistance, extra help is available before and after school and during my prep block (Block 3). Please see me to make arrangements. I am confident that anyone with sufficient effort and support will be able to succeed in this course.

Dr. Brown
9th grade – IPS

2005-2006
Blocks 2 and 4

Classroom Rules

Respect yourselves and respect others …
- "If you don't have anything nice to say, don't say anything at all." (a quote from Bambi)
- Belittling remarks and profanity are not allowed.
- Putting down anyone in my classroom will not be tolerated.

Respect my classroom …
- Always clean up after yourself at the end of class.
- Do not go into my desk or any lab drawers or cabinets without my permission.

Be courteous of others' right to learn, and my right to teach you …
- When class begins, be prepared to begin learning. Every student should expect to be engaged in one or more tasks at the beginning of each class.
- Observe common courtesy when others are speaking (especially when I am speaking). Only one person should speak at a time.

Lateness to class …
- Unexcused lateness to class is unacceptable (see 9th grade academy team policy). You are considered late if you are not inside the classroom when the bell rings.

In-class Work …
- All work assigned as "in-class" work is expected to be attempted with adequate effort. If you do not demonstrate adequate effort during "in-class" work times then you will be expected to make-up the work after school.

Cell phones and head phones …
- Cell phones are not permitted in class. If you are seen with a cell phone, it will be taken from you and your parents will need to contact me in order to get it back.
- Headphones are not permitted and will, likewise, be confiscated if you are seen using them.

School –wide discipline policy …
- All students are expected to adhere to school and academy team mandated rules and regulations. Students are expected to be familiar with the High School code of discipline in the student handbook.

Consequences for Misbehavior

1. Verbal warning.
2. Teacher demerit (loss of percentage points from your grade).
3. Teacher detention.
4. School detention and call home.
5. School detention and meeting with grade-level principal.

Dr. Brown
9th Grade – IPS

2005 – 2006
Blocks 2 and 4

Grading Policy

Grades in this class will be determined according to the following percentages:

Tests, Quizzes, and Projects	40%
Lab Notebook/Journal	35%
Homework	15%
Class Participation	10%

Tests, Quizzes, and Projects

- All tests will be announced prior to test day.
- Quizzes may be given with or without warning. Be prepared for regular quizzes as part of the class routine.
- Project assessments designed for the application of physics principles will be given at the end of each unit. Additional projects will be assigned periodically throughout the year.
- If you are absent on the day of a test, within two days of your return to school you must meet with me to schedule a time to make up the exam. If the test is not made up a grade of zero will be given for it.
- Quizzes cannot be made up, except on special request.
- If you are absent the day before a test, you are still required to take the exam on its scheduled test day.

Lab Notebook and Journal

- The lab notebook and journal are based on the in-class lab activities, pre-activity questions, and your reflections and observations. I will collect portions of your notebook for grading. For this reason, you may want a separate folder to use when you turn in your work.
- Grading will be based on completeness and accuracy. Therefore, it is important that you complete all activities.
- If you are absent for a lab activity, it is your responsibility to get all handouts and make arrangements with me if necessary to complete the activity.

Homework

- All assignments will be graded based upon completion and accuracy.
- All work and explanations must be shown on your homework. An unsupported answer is a wrong answer.
- Your homework is expected to be turned-in on its due date.
    - Late assignments will lose five points for each day they are late.
    - If you are absent the day an assignment is due, you may turn it in upon your return to school with no penalty.
    - If you are not in class, but attended school that day (i.e. went home early, went on a field trip, etc.), you are still expected to turn in your homework on time.
    - You are responsible for all missed work – if you are absent the day homework is given, it is still your responsibility to get the assignment and turn it in following team policy.

Class Participation

- You should be prepared for each class day with a textbook, notebook, writing utensil, and calculator.
- At the beginning of the marking period, you will receive 50 points to start. The following will result in 5-point deductions from this score (with or without your notice):
  - Coming to class unprepared.
  - Being disruptive in class.
  - Failure to work on assigned class work.
- On occasion, I will perform a spot check to see if you are prepared for class.
- If you have any difficulty obtaining any items required for class, please, come see me.

A Note on CHEATING:

Cheating at any time is not tolerated. There will be occasions, however, where you will be working with classmates, and your work may follow a similar pattern of logic. This is not a reason, however, for any work of yours to look exactly like or "amazingly similar" to anyone else's work. If I should discover any remarkable similarities on any tests, quizzes, homework, or labs it will result in a simple zero grade for the entire assignment for both students involved.

➢ INDIVIDUAL ACOUNTABILITY: As a member of your group/team you are responsible for completing all of the required components for an assignment in your own notebook or journal. You will also be given quizzes during the unit to insure that you are participating. Journals will be graded also.

This syllabus and grading policy should be kept in your 3-ring binder for reference throughout the course. Both student and parent need to sign below acknowledging that they have read and understand the class policies. (Due date Monday(A day) or Tuesday(B day), September 12th or 13th).

Student signature Michael Plasmeier Date: 9/7/05

Parent signature Date: 9/7/05

Team Expectations

Teacher	Extension	e-mail
Ms. Behl	2720	Behl@havsd.net
Mr. Smith	2790	Lsmith@havsd.net
Dr. Brown	~~TBD~~ 2721	Dbrown@havsd.net
Mr. Vettori	2766	Vettori@havsd.net
Ms. Kaiser	2811	Kaiser@havsd.net

On your 9th grade academy team at Haverford High School, you are at the heart of the learning process. As teachers, we will function as facilitators and coaches to communicate ideas. We (both students and teachers) must respect and support the need of all learners. Our classrooms will be safe and inviting learning communities where creativity is encouraged. In order to have a successful team, we will have some general guidelines that all students will be expected to follow.

❋ **Assignment Heading:**
Every assignment should have the proper MLA heading in the upper left corner of your paper:

Your name
Teacher's name
Class (i.e. Eng. 9) + block
Date assignment is due

Change heading ✓
Fall

❋ **Lateness**

❋ Late to class
You are expected to be in your class ***when the bell rings.*** If the bell rings and you are not in your class, you will be considered late. If you have a note, please deposit the note in the designated box by the door, sign in and take your seat without disturbing the class. If you do not have a note, please sign in and take your seat. If you are late to any of your team classes three times within one marking period, (i.e. if you are late to Western Civ. once, IPS once and IAG once all within one marking period) you will receive a detention.

❋ Late assignments
Although we do not anticipate frequent late assignments from any student, if you do not have your work on the assigned due date, you may still turn it in for credit. HOWEVER, you must attach a late slip to the assignment completely filled out and place it in the bin marked "Late." Please handle this in the first five minutes of class (business time), not during instructional time. Late assignments will not merit full credit. The amount of points deducted will be left to the discretion of the classroom teacher.

❋ **Business and Breaks**

❋ In each of your team classes, there will be five minutes near the beginning of class to address business not directly related to the lesson. For instance, role will be taken, <u>comprehension meters</u> distributed, late work or absent work handed in, etc.

❋ There will be a five minute break towards the middle of each of your team classes. In this time, you can sharpen your pencil, stretch, rest, etc. Since we will be taking a break, we ask that you hold off getting a drink, going to the restroom or nurse until this time. Please remember: breaks are a privilege, not a right. If this privilege is abused you or your class could lose the privilege.

⁕ **Absences**

- If you have one EXCUSED ABSENCE, and an assignment was given the day you were out, you have two days to make up the work. For instance, if you are absent on Monday and it is an A day, your assignments are due Wednesday which will also be an A day. This means that you need to get in touch with your buddies and your teacher and check the web site to get the missed assignment. If you do not have the assignment upon return, it will be considered late.

- If you are absent or late to school when an assignment is due, the assignment is due the day you come back to the building. For instance, if an assignment is due on Monday and it is an A day, your assignment is due Tuesday which would be a B day. Although you will not have your A day classes, you are expected to hand in the assignment. You may come before school, after school or during advisory and place the assignment in the bin marked "absent," or you may give it to the secretary at the front office and they will place it in the teacher's mailbox.

- If you are absent for two or more consecutive days, you have the number of days you were absent plus one day to make up your work. For instance, if you were absent for two days, you have three days to make up the work. It is extremely important if you are absent for two or more consecutive days to talk to your teachers to avoid falling behind.

⁕ **Web Site**

If you have access to the internet, please log on frequently to check for homework, news, and other important information.

http://TeacherWeb.com/PA/HaverfordHighSchool/Smith/

⁕ **"The Buddy System"**

- In each of your team classes, you should have 2-3 buddies. You will be given time to do this in class and you will choose your own buddies. You will exchange numbers and e-mail addresses so that when any of you are absent, or unclear about a homework assignment, you can check in with each other. Please keep your buddies' information at home and respect their privacy. The information they give you is confidential.

⁕ **Formal and Long Term assignments:**

- Formal and long term assignments should always be typed. If there is any reason that you can not hand in a typed assignment (i.e. you ran out of paper or ink), you should see the teacher 24 hours before the assignment is due. Otherwise, you will lose points. The teacher will let you know what assignments are considered formal or long term.

⁕ **Class Secretary**

- Every two weeks, a student will be given the job of class secretary. You can earn up to 10 extra credit points for completing your responsibilities. The job description will be further explained when you become employed.

Comprehension Meter

- In each class, there will be a designated area where your comprehension meter will be kept. You should have a meter on your desk at all times. Think of the meter as a traffic light. If you feel that you are understanding the concepts that are being taught, you should have the green panel facing upright. If you are a little confused but not totally lost, you should have the yellow panel showing. If you are feeling lost, you should have the red panel upright. This is a way for the teacher to know whether to slow down or go on with the lesson.

Habits of Mind

- Outside of learning history, English, science, and math, we are committed to supporting you in your development of life-long habits or ways of thinking and operating in the world that can enhance success and productivity. These include:
    - Being open-minded and sensitive to others' feelings, level of knowledge , and strengths.
    - Managing your time and organize your resources to meet your goals effectively.
    - Evaluating your choices so that you produce positive outcomes
    - Reflecting on your thinking to ensure that you are making sense of what you are learning.
    - Evaluating the effectiveness of your actions.
    - Being accurate and seek accuracy.
    - Engaging intensely in tasks even when solutions are not immediately apparent.
    - Pushing the limits of your knowledge and ability.

Cell Phones

- No cell phones are permitted at any time, for any reason. If you are seen with a cell phone in class, it will be taken away from you and further disciplinary action may be taken.

Progress Reports

- You will be given a progress report in all team classes approximately every 2-3 weeks. These reports should be signed and returned for credit.

Supplies

- **English:**
    - 21/2 inch binder
    - At least 10 labeling/separating tabs
    - Loose leaf (lots of it!)
    - Pen or pencil (blue or black ink)
- **Western Civ.:**
    - 2 1/2 inch binder
    - Pen/Pencil everyday
    - Assignment book (can use agenda book)
    - Loose Leaf

Colored Pencil or Markers

- **IPS:** Calculator containing trig functions and exponents
  2 inch 3-ring binder
  Loose leaf
  Pencils
- **IAG:** TI-83 or TI-83 Plus graphing calculator
  2 inch 3-ring binder
  Loose leaf (lots of it!)
  Colored Pencil or Markers
  Pen or pencil (blue or black ink)

PHYSICS LOG CHECKLIST

I. "WHAT DO YOU THINK?":

- ✓ Did I restate the question in my response?
- ✓ Did I answer all parts of the question with detail?

II. "FOR YOU TO DO":

- ✓ Is my data complete and labeled with correct headings/units?
- ✓ Are my graphs complete, including all titles, units, keys, and axis labels?
- ✓ Did I include the formulas and sample calculations for each new calculation?
- ✓ Are all of my units appropriately labeled?
- ✓ Did I answer each of the questions included with the activity with clarity?
- ✓ Did I restate the question in each of my responses?
- ✓ Does my analysis reflect the data that I collected?

III. "REFLECTIONS":

- ✓ Did I revisit my "What Do You Think" response, either -
  - … correcting my initial response based upon my laboratory analysis or
  - … strengthening my initial response based upon laboratory evidence
- ✓ Did I examine this activity as it applies to the chapter assessment?

IV. OTHER:

NAME: Michael Plasmeier

9th Grade Physics Log

Activity # 1

1. What Do You Think?
   (Present, answered with a complete statement) 3 / 3
2. For You To Do:
   - Data is complete, labeled as appropriate, with units 10 / 10
   - All graphs are present and complete, with titles, units, keys, and labeled axis – / 0
   - Sample calculations and formulas are shown for each calculation; units are appropriately labeled 2 / 2
   - All questions are answered with clarity, using complete sentences (and examples, as appropriate) 10 / 10
   - Analysis presented represents data collected 7 / 7
3. Post-Activity Reflection:
   - "What Do You Think?" is revisited; the initial response is re-examined in light of the completed activity 3 / 3
   - The activity is examined in terms of its application to the chapter assessment – / ~~2~~ 0

NOTES/COMMENTS: Excellent!

TOTAL: 35 / 35

Name: Michael Plasmeier

Brown
IPS PH. B-A
16 Sept 2005

Activity One- Running the Race

I. WHAT DO YOU THINK?

Every activity is set up kind of like an outline that has four sections: I "What do you think", II "For you to do", III "Reflecting on the activity" and IV "Physics to go". What do you think is the first of the four. It focuses on what you actually think at this moment- before you learn about the topic through this activity. So for every "What do you think" you answer honestly what you think. Since this is a question that asks what you think, you can't get it wrong. You will get full credit if you do 3 things: 1. Write the question out. 2. Answer all parts of the question in detail. (Generally you will need to write atleast 5 to 7 sentences to answer the question in detail. One word or one sentence answers will not get full credit.) 3. Be honest in your answer, really- what DO YOU think? Answer the what do you think question now (p.4).

- **What are some units of speed?**

Some units of speed are miles per hour, km per hr, feet per second. Basically any unit of distance over any unit of time will work

- How can you measure a runners speed?

a speed gun, or see how long it takes her/him to go a certain distance. This is adverage speed, however.

- Does running 2x distance take 2x time?

In theroy yes, but starting takes time and also we can not run very quickly all the time, we pace ourselves

II. FOR YOU TO DO

This is the section of the activity where you actually "do" the work or "do" the activity. In every activity there are detailed instructions which guide you on what you need to do. You will write in your log (this paper) what ever it asks you to write down. (When we are doing the activity directly from the book there is a little pencil logo that lets you know that you need to write something down- as shown on 3 a) on page 4.) Use the following checklist to make sure that you work in "For you to do" is complete and satisfactory:

- ☐ Did I answer each of the questions with clarity?
- ☐ Did I restate the question in each of my responses? Someone should be able to pick up your log and understand what the activity was about and what the questions were asking.
- ☐ Is my data complete and labeled with the correct headings/ units?
- ☐ Are my graphs complete, including all titles, units, keys and axis labels?
- ☐ Did I include the formulas and show work (calculations) on math based questions?
- ☐ Does my analysis reflect the data that I collected?

If you have all of the above checked off you will do well in this section.

Note: Switch "m" w/ "yds"

Go ahead and do "For you to do" Take note that I have given you space to answer question on this paper and that these correspond to instructions to do so in your activity.

1. NO RESPONSE NECESSARY
2. NO RESPONSE NECESSARY

Recorder

3. a) Record the time from the start until the runner goes the following distances (units!)

Distance Trial	5~~m~~ yds	10~~m~~ yds	15~~m~~ yds	20~~m~~ yds	25~~m~~ yds	30~~m~~ yds
Runner #1	1.65 sec	2.62 sec	3.68 sec	4.21 sec	5.48 sec	6.62 sec
Runner #2	1.66 sec	2.58 sec	3.67 sec	4.37 sec	5.53 sec	6.31 sec
Runner #3	2.03 sec	3.29 sec	4.69 sec	5.71 sec	7.10 sec	8.49 sec
Runner #4	1.35 sec	2.03 sec	2.96 sec	3.29 sec	4.16 sec	4.5 sec
Runner #5	1.18 sec	1.97 sec	2.55 sec	3.15 sec	3.95 sec	4.15 sec
Runner #6	1.30 sec	2.12 sec	2.93 sec	3.61 sec	4.49 sec	5.79 sec
	1.62 sec	2.42 sec	3.54 sec	4.17 sec	5.13 sec	5.96 sec

Your are asked to make a table like the following. You will use it for #'s 4 and 6

4. a) Calculate the amount of time taken to run each 5 m interval (yeah- units again!)

Distance	0-5~~m~~ yds	5-10~~m~~ yds	10-15~~m~~ yds	15-20~~m~~ yds	20-25~~m~~ yds	25-30~~m~~ yds
Runner #1 Time	1.65 sec	.97 sec	1.06 sec	0.53 sec	1.27 sec	1.14 sec
Average Speed	3.03 yds/sec	5.15 yds/sec	4.71 yds/sec	9.43 yds/sec	3.93 yds/sec	4.38 yds/sec
Runner #2 Time	1.66 sec	.92 sec	1.09 sec	.7 sec	1.16 sec	.78 sec
Average Speed	3.01 yds/sec	5.43 yds/sec	4.58 yds/sec	7.14 yds/sec	4.31 yds/sec	6.41 yds/sec
Runner #3 Time	2.03 sec	1.26 sec	1.4 sec	1.02 sec	1.39 sec	1.39 sec
Average Speed	2.46 yds/sec	3.96 yds/sec	3.57 yds/sec	4.9 yds/sec	3.59 yds/sec	3.59 yds/sec
Runner #4 Time	1.35 sec	.68 sec	.93 sec	.33 sec	1.01 sec	.34 sec
Average Speed	3.70 yds/sec	7.35 yds/sec	5.37 yds/sec	15.15 yds/sec	4.95 yds/sec	14.70 yds/sec
Runner #5 Time	1.18 sec	.79 sec	.58 sec	.6 sec	.8 sec	.2 sec
Average Speed	4.23 yds/sec	6.32 yds/sec	8.62 yds/sec	8.33 yds/sec	6.25 yds/sec	25 yds/sec
Runner #6 Time	1.30 sec	.82 sec	.81 sec	.68 sec	.88 sec	1.3 sec
Average Speed	3.84 yds/sec	6.09 yds/sec	6.17 yds/sec	7.35 yds/sec	5.68 yds/sec	3.84 yds/sec
7 time	1.62 sec	.8 sec	1.12 sec	.68 sec	.88 sec	1.3 sec
7 Speed	3.68 yds/sec	6.25 yds/sec	4.46 yds/sec	7.35 yds/sec	5.68 yds/sec	3.84 yds/sec

Speed = yds/sec

time at 10m more

time at 5m more

=

5-10 Time

avv speed = distance / time

5. a) No, see What do you think section
if you go 2x the distance, you don't exacitly take 2x the time
For Runner 5 - it takes 1.97 sec to go the first 10 yds, but only 1.10 sec to go the next 10 yds

6. a) Calculate the average speed (use formula) for each 5-~~m~~ yds interval (yeah- units again!). Write your answers in the appropriate place on the table above.

See above

7. a) Your answers will be on the table above for this question. All but 1 (25-30 yds) were 15-20 yds

b) They were all the same sans one.

c) Runner 4 has the impossible record of 25 yds/sec

d) Do Not Answer This Question

e) Answer this question instead of the one in the book: How precisely can we measure the time that each runner reached maximum speed? Ex. Can we say that Runner #1 reached maximum speed at exactly 2.7s? List the times for each runner that they got to maximum speed, if it is a range then list the range.

We can only measure at 5 yds intervals

Runner 1 - 15-20 yds - 4.21 sec
Runner 2 - 15-20 yds - 4.37 sec
Runner 3 - 15-20 yds 5.71 sec
Runner 4 - 15-20 yds 3.29 sec
Runner 5 - 25-30 yds 4.15 sec
Runner 6 - 15-20 yds - 3.61 sec
Runner 7 - 15-20 yds - 4.17 sec
Adv - 15-20 yds - ??

8. Calculate the average speed of each runner over the **entire dash-** how long is the entire dash? 30 yds
(Hint: What is the formula for average speed? Average Speed = $\frac{\text{distance}}{\text{time}}$. Now plug in for this equation!)

Method 2 — Method 1 - correct way

	Average Speed over Whole Race	Adv for Whole $\frac{30}{Time}$
Runner #1	5.10 yds/sec	4.53 yds/sec
Runner #2	5.14 yds/sec	4.75 yds/sec
Runner #3	3.67 yds/sec	3.53 yds/sec
Runner #4	7.93 yds/sec	6.66 yds/sec
Runner #5 7	9.79 yds/sec	7.22 yds/sec
Runner #6	5.49 yds/sec	5.18 yds/sec
7	5.11 yds/sec	5.03 yds/sec
Adv	6.17 yds/sec	6.80 yds/sec

9. a) Faster response times/starts and better measurement of speed/time.

III. REFLECTING ON THE ACTIVITY

This is kind of like the "What do you think section, but it is "What do you think NOW?", after doing this activity. For this section you will write the following in this log:

- Go back to your "What do you Think" response and either correct it based on analysis of the activity OR, if you were correct, state that you were correct **and cite how this activity supports your response.**

All Correct, This activity measured speed by measuring the lenght of time it takes to go a certain distance, It also showed how people need to accelorate and 2x the distance is not 2x the speed/time

IV. PHYSICS TO GO

This is like a homework section, but sometimes you will have a chance to do these in class. You will be expected to try to do all of the questions in Physics to Go, unless stated other wise. Even if you do not immediately understand how to do the question I expect to see that you tried to do it. If the question is a math based question, you should show the formulas that you used as well as the calculations that you did.

Do the "Physics to Go" question now.

1. a) (**HINT**: You need to use the information in "For You To Read" on page 7 to answer this question.) Also if the time is in minutes and seconds you have to change it to only second. Ex. If the time is 3:25 (3 minutes and 25 seconds) first you change the 3 minutes to seconds- 180 seconds and add in the 25 seconds for a total of 205 seconds.)

$1500/((60\times3)+48.8) = 6.55$ m/sec

b) Yes, but, they wouldn't have the stamina to run that long.

* Techinally not really compairable because we did yds/sec they have m/sec

c) No

2. $100/11,44 = 8.74$ m/s

$200/23.66 = 8,45$ m/s

$400/52,33 = 7,64$ m/s

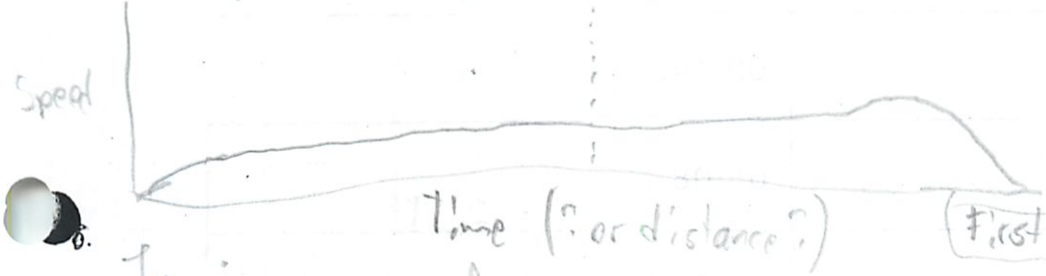
$1500/((4\times60)+24) = 5,68$ m/s

Goes down because humans don't have that much stamina to sustain such speeds

3. Answer this question instead of the one in the book: If running twice as far does take twice as much time, what does that mean about your running? ? I would start at full power instanty (breaking the rules of acceleration) and have unlimited stamina. I would never have to sleep.

4. Yes and No, we are kids and amatures, they practic non stop for this and can better time the event. Techncillay, you could compare speeds for the same distance to see how much slower we are

5. If he pases himself correct it would look like this



This is based of the trend line of our old time

First 50m would be slower then last 50m

6. To improve his pacing or spread out his average speed.

7. What is the relationship between average speed and time in a race? For an entire race, could someone have the smallest time but not have the highest average speed? Explain. No, because speed is $\frac{\text{Distance}}{\text{Time}}$ and distance is set for everyone the only varibale is time.

8. If you ride your bike 8 miles to your friend's house and it takes you 20 minutes to do it, what is your average speed?

$$\frac{\text{Distance}}{\text{Time}} \quad \frac{8 \text{ miles}}{.33 \text{ hrs}} = \frac{24 \text{ miles}}{1 \text{ hour}} = 24 \text{ mph}$$

9. If your mom comes to pick you up at your friends house (travels 8 miles) but it takes her 15 minutes, what is her average speed?

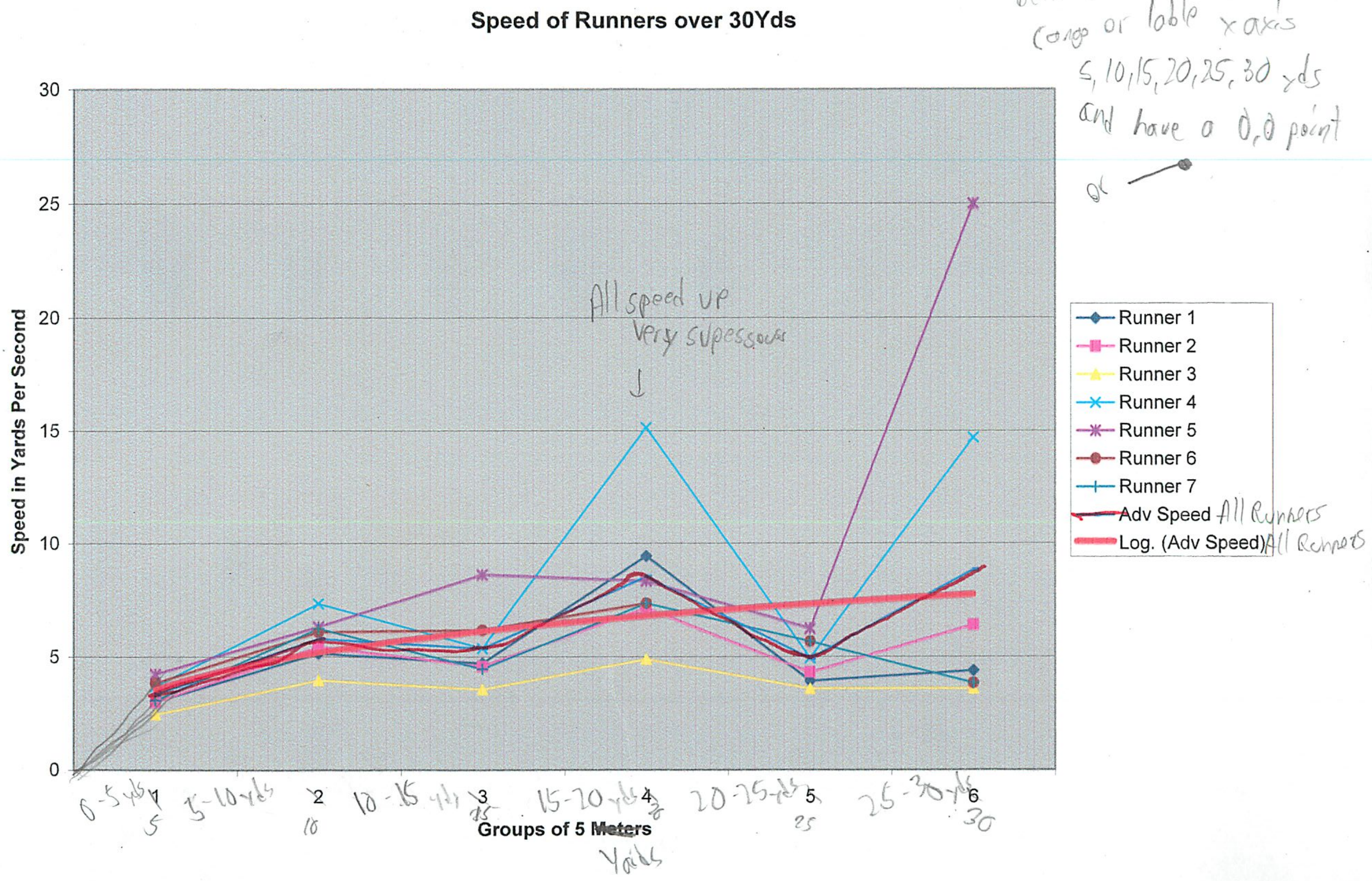
$\frac{8 \times 4}{15 \times 4} = \frac{32}{60}$ 32 miles per hour $\frac{\text{distance}}{\text{time}}$ $\frac{8 \text{ miles}}{15 \text{ min or } .25 \text{ hrs}}$ $\frac{32 \text{ miles}}{\text{hour}}$

Sports- Chapter 1- Activity 1 Practice

	BOYS		GIRLS	
Race	Time (s)	Average Speed (m/s)	Time (s)	Average Speed (m/s)
100 m	10.54	9.48 m/s	12.1	8.28 m/s
200 m	21.3	9.38 m/s	25.4	7.87 m/s
400 m	46.1	8.67 m/s	58.9	6.79 m/s
800 m	01:52.9	7.08 m/s	02:14.3	5.95 m/s
1600 m	04:20.2	6.14 m/s	05:08.7	5.18 m/s
3200 m	09:27.9	5.63 m/s	11:31.2	4.62 m/s
110 m Hurdles	14.6	7.53 m/s	16.0	6.875 m/s
300 m Hurdles	37.5	8 m/s	47.0	6.38 m/s
4x100 m	42.6	9.38 m/s	49.4	8.09 m/s
4x400 m	03:19.6	8.01 m/s	03:59.1	6.69 m/s

Bar graph would be
batter choice becausea
cange or lable x axis
5, 10, 15, 20, 25, 30 yds
and have a 0, 0 point

or



Distance	0-5 yds	5-10 yds	10-15yds	15-20yds	20-25yds	25-30 yds	Adv All
1 Time	1.65	0.97	1.06	0.53	1.27	1.14	
1 Speed	3.030303	5.154639	4.716981	9.433962	3.937008	4.385965	5.105
2 Time	1.66	0.92	1.09	0.7	1.16	0.78	
2 Speed	3.012048	5.434783	4.587156	7.142857	4.310345	6.410256	5.14
3 Time	2.03	1.26	1.4	1.02	1.39	1.39	
3 Speed	2.463054	3.968254	3.571429	4.901961	3.597122	3.597122	3.67
4 Time	1.35	0.68	0.93	0.33	1.01	0.34	
4 Speed	3.703704	7.352941	5.376344	15.15152	4.950495	14.70588	7.93
5 Time	1.18	0.79	0.58	0.6	0.8	0.2	
5 Speed	4.237288	6.329114	8.62069	8.333333	6.25	25	9.78
6 Time	1.3	0.82	0.81	0.68	0.88	1.3	
6 Speed	3.846154	6.097561	6.17284	7.352941	5.681818	3.846154	5.40
7 Time	1.62	0.8	1.12	0.68	0.88	1.3	
7 Speed	3.08642	6.25	4.464286	7.352941	5.681818	3.846154	5.11
Adv Speed	3.339853	5.798185	5.358532	8.524216	4.915515	8.827362	6.12

3 Question about the Graph

10/20

1. What decisions did you have to make to answer the graph?

What to put on the x, y axis, line or bar graph (A bar graph or —● graph would have been better.

2 How did your runner do? Why do you say that?

All of the runners started slow then speed up as they ran farther. Because we had different human timers at each step, our calculation are very off. Some runners, you can see, are slower or faster then others.

3 Can you give a suggestion to improve at time?

Not really, run as fast as you can and get computer timers.

DB

Name: Michael Plasencia

velocity is not speed

IPS Unit 1.2 (Activity 4 From Book)

WHAT DO YOU THINK?

Act 4

For a 100m dash, how much distance does it take a runner to get to top speed? 15-20 m (Period of act 1)

Act 2 q's

on compare c/d

Yes it is useful to compare to see how science and training help people go faster over time.

Does past " in future?"

No because there is a limit to what we can do. Unless new discoveries are made, we can't go much faster.

wrong act

FOR YOU TO DO

Distance (m)	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0
Time (s)	0.00	1.88	2.96	3.88	4.77	5.61	6.45	7.29	8.13	9.00	9.86

Look at the data in the table above. This data was taken from Carl Lewis's world record 100m dash in Tokyo, Japan in 1991. The times at which he reached various distances in the race (split times) are shown in the table.

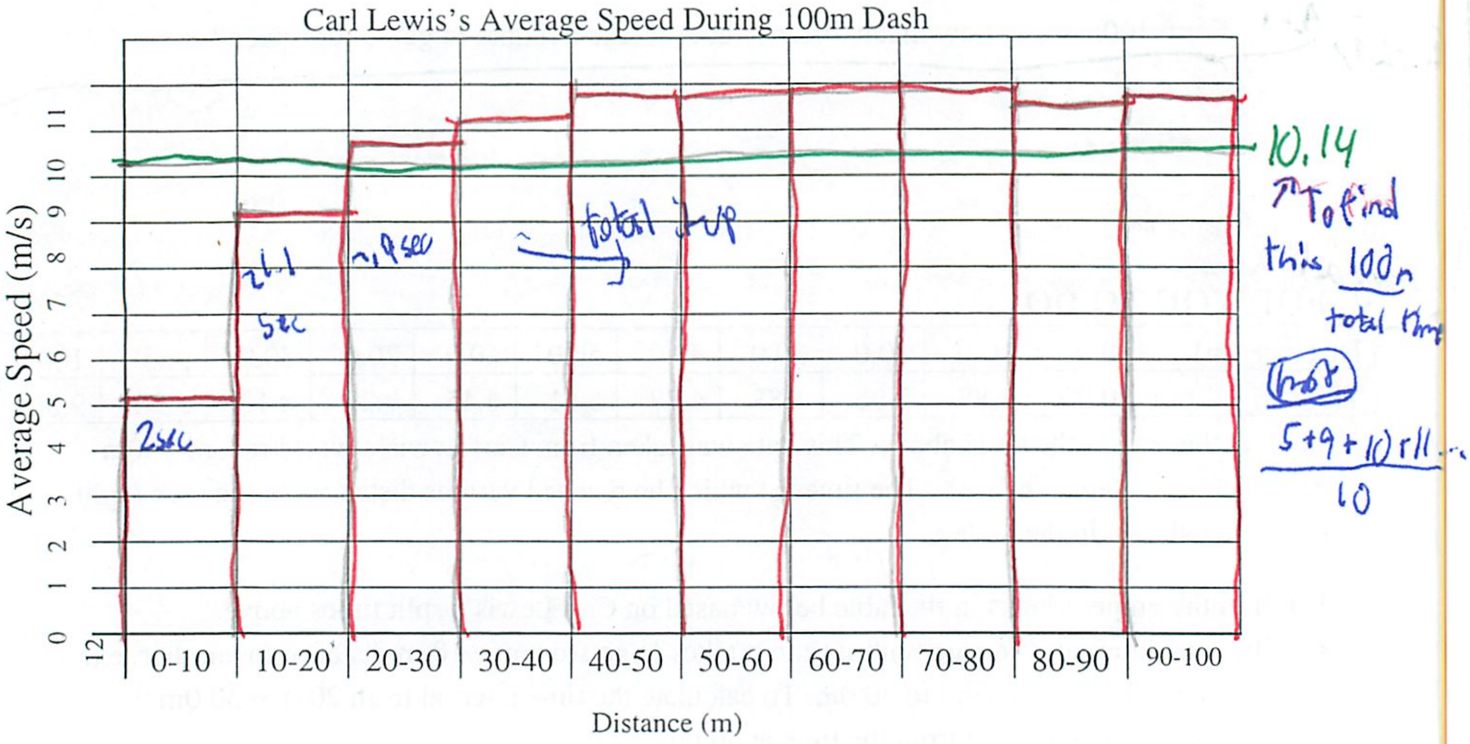
1. Fill in the empty blocks in the table below based on Carl Lewis's split times above.

- The time interval is the amount of time it takes to go from one 10-m distance to another, ex. the time to go from 20.0m to 30.0m. To calculate the time interval from 20.0 to 30.0m subtract the time at 20.0 from the time at 30.0m.
- The average speed is the average speed during that 10.0m interval. By now you are very familiar with the formula for average speed: $\frac{\text{distance traveled}}{\text{time taken}}$. The distance traveled in each 10.0m interval is- you guessed it- 10.0m The time taken to travel that distance in what you calculated in the second row on the table.

Distance Interval (m)	0.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0	60.0 to 70.0	70.0 to 80.0	80.0 to 90.0	90.0 to 100.0
Time Interval (s)	1.88	1.08	.98	.89	.84	.84	.84	.84	.87	.86
Average speed during the interval (m/s)	5.3	9.25	10.86	11.25	11.90	11.90	11.90	11.90	11.49	11.62

→ Up → Top Speed Slow →

2. Use the data that you created in the table (**especially average speed**) to make a bar graph (below) to give you a visual display of Carl Lewis's average speed during each 10 m of his world-record 100m dash.



3. Analyze the bar graph to answer these questions.

a) At what position in the dash did Lewis reach top speed? How close can you state that position to the nearest meter? To the nearest 10 m? Explain your answer.

I can only measure to the nearest 10 m, He reached top speed some where between 40-50 m and kept it for ~40-30 m

b) How well did Carl Lewis keep his top speed once he reached it? Did he seem to be getting tired by the end of the race? Give evidence for your answers.

He kept his top speed for 30-40 m. He did seem to get tired at the end because his speed went down slowly

c) Can you tell how fast Carl Lewis was going at an exact position in the race such as 15.0m or 20.0m? Why or why not?

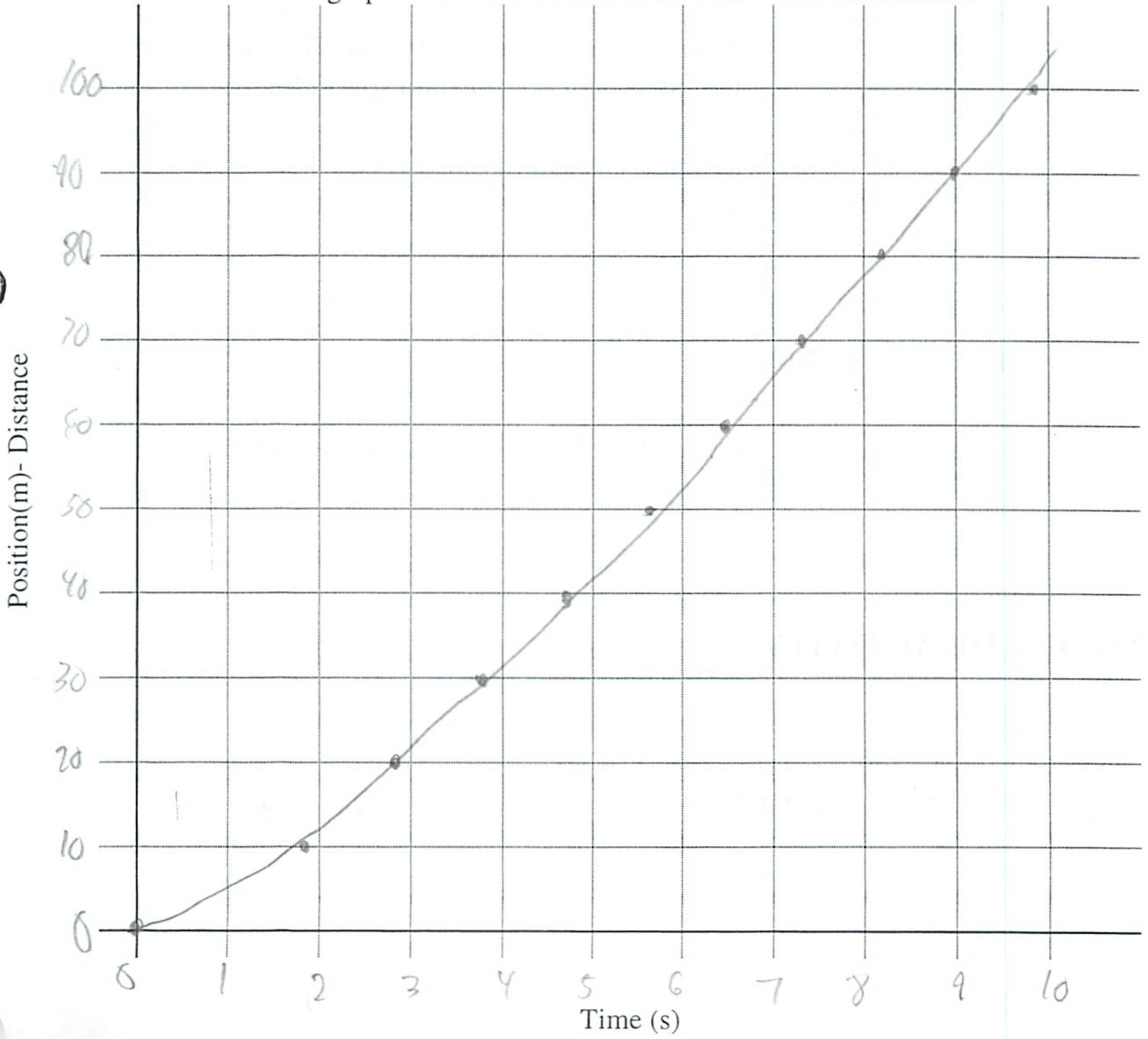
No, because the measurement interval is 10 m, you only know in ranges of 10,

d) It took 9.86s for Lewis to run the entire 100m. Calculate his average speed for the entire race. Draw a horizontal line across the bar graph at an appropriate height to represent the average speed for the entire race. Are some of the bars below the line while others are above it, or are all of the bars either above or below the line. Why do you think this is?

Note: Do 100/9.86 to get 10.14 m/s

4. Use the splits given at the beginning of 'For You To Do' to make a plot graph of Carl Lewis's position (distance) versus time. To do on this graph:

- Scale the vertical part of the graph from 0 to 100m.
- Scale the horizontal part of the graph from 0 to 10.0s.
- Plot the data on the graph below. And connect the dots with a smooth line.



5. Compare the distance versus time graph and the bar graph of speed versus distance.

a) When the distance versus time graph is curving early in the run, do the bars on the graph change in height or do they remain fairly steady in height? What does this comparison mean? When the graph is climbing in a straight line, what is happening the heights on the bars? What does this comparison mean?

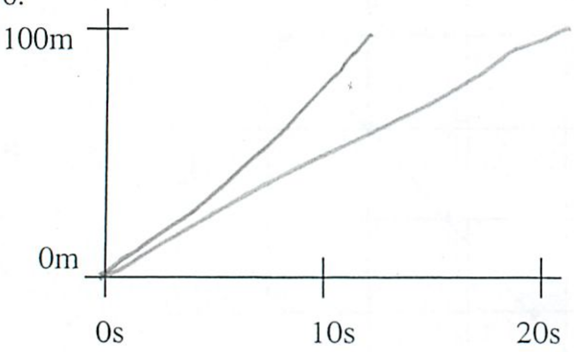
Yes they make large steady changes in hight
When the graph is straight the bars stay the same
The comporson means they are related

For b and c, Circle the correct answer.

b) For a position versus time graph: When the line is straight the runner is ([✓ moving at constant speed] / changing speed)

c) For a position versus time graph: When the line is curved the runner is (moving at constant speed / [✓ changing speed])

6.



Two runners run a 100 meter dash. They both run the whole dash at a **constant speed.** Runner #1 runs the race in 10s. Runner #2 runs the race in 20 s. To the left graph their position versus time.

a) Which runner is running faster?

Runner 1

b) Which line on the graph is steeper, #1 or #2?

#1

c) At 10s, what is the position of runner #2?

At 50 m

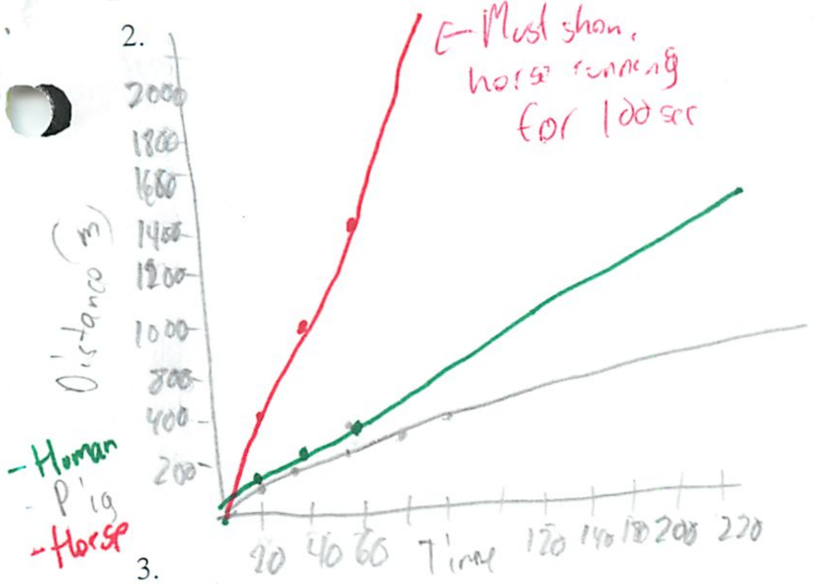
REFECTING ON THE ACTIVITY

I was wrong. The correct answer is 40-50 m not 15-20 m
It takes almost half of the distance of the race

1.

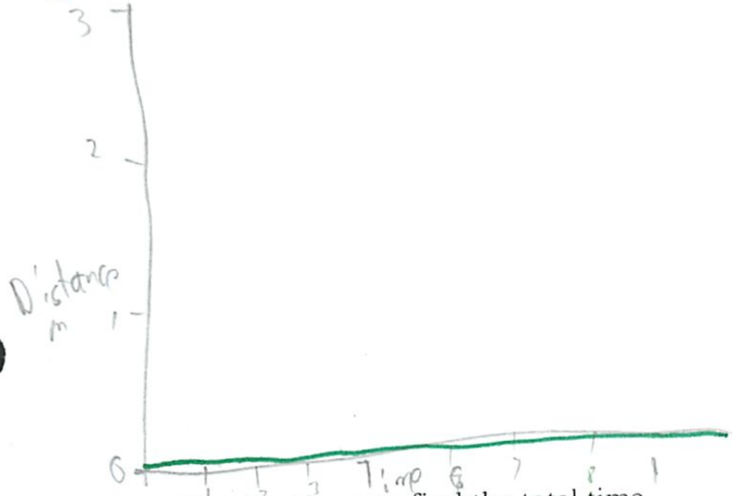
PHYSICS TO GO (Page 21)

2.



← Must show, horse running for 100 sec

3.



4. (Hint: You first have to find the total time for both runners. To find the time use the formula in 'Physics Talk' on p.6 of your text.)

Joan took 20 sec
Rami took 10 sec
30 sec total

200/30 = 6.66 m/s

5. No, he has to reach his top ~~speed~~ speed as fast as possible and sustain it. He can't go faster then possible and needs to reach top speed asap.

Used whole & times

6. a)
200 : 6.84 m/s (200/29.23)
400 : 6.76 m/s (400/59.10)
800 : 6.69 m/s (800/119.44)
1000 : 6.96 m/s (1000/149.32)

b) It is not fair to compare these, because the Penn Runners are sprinting and don't need to run a mile. Also the longer distance Penn numbers were closer to this because of pasing

c)

0-200m	6.84	m/s
200-400m	6.69	m/s
400-600m	6.64	m/s
600m-800m	6.61	m/s
800m-1000m	6.69	m/s
1000m-1200m	6.68	m/s

1200-1400m	6.8	m/s
1400-1600m	6.7	m/s

Going fastest at 200-400m and 800-1000m

Slowest at 600-800m

d) Yes, he slowed down from 6.8 m/s at 1200-1400m to 6.7m/s at 1400-1600m, although the change was not as drastic as the one before.

e) (don't do)

22/20

IPS-9

Name: Michael Plasmeier
Block #: 2A

Quiz #1

Multiple Choice (2 pts each): Answer each of the following by circling the most appropriate answer. Show any necessary work in the space provided.

1. Correct units for speed are:
   - a.) feet
   - b.) hours per mile
   - [✓ c.) meters/sec]
   - d.) square kilometers

2. Correct units for distance are:
   - [✓ a.) miles]
   - b.) seconds
   - c.) miles per hour
   - d.) intervals

3. Calculate the average speed of an airplane if it flies 300 miles in 1.25 hours.
   - a.) 0.0042 miles/hour
   - b.) 375 miles/hour
   - c.) 1 hour 15 minutes
   - [✓ d.) 240 miles/hour]

$\text{Speed} = \frac{\text{distance}}{\text{time}} = \frac{300 \text{ miles}}{1.25 \text{ hrs}} =$

Calculation (3 pts): Perform the following calculation. Show all work including equations and correct units.

4. Calculate the average speed of a runner who runs a 3200 meter race in 9 minutes and 35.5 seconds.

$\text{Speed} = \frac{d}{t} = \underset{\text{meters}}{3200} / \left((\underset{\text{hrs}}{9} \times 60) + \underset{\text{sec}}{35.5} \right)$

5.56 meters per second (m/s)

Short Answer (3 pts): Respond to the following with an appropriate statement. Use complete sentences.

5. A runner in a 200 meter dash reaches top speed after 65 meters. He is then able to maintain his top speed for the remainder of the race. Compare the time it took for the runner to run the first 100 meters to the time it took him to run the last 100 meters.

The runners last 100 m would be shorter in time because he is at his top speed the entire time. In the 1st 100 m he is still accelorating and is not at top speed for that distance therefore it will take him longer.

Problem (8 pts): Read the situation below and calculate answers to parts (a.) through (e.). Include with your answers equations and units. Show all your work and circle your answers.

A man rides his bike over a steep hill. It takes him 30 min. to pedal 1.5 miles to the top of the hill. He then takes only 5 min. to travel 1.5 miles down the other side of the hill.

a.) Calculate the average speed of the man on his trip **UP** the hill.

$s = \frac{d}{t}$

1.5 miles / .5 T = .03 miles / hour

Of an hour
30/60 min

b.) Calculate the average speed of the man on his trip **DOWN** the hill.

1.5 miles / .083̄ hours = 18 miles/hour

5/60 = .083̄

c.) What is the total distance the man travels during the <u>entire</u> trip **UP and DOWN** the hill?

d = 3 miles (1.5 miles + 1.5 miles)

d.) How long did it take him to make the <u>entire</u> trip **UP and DOWN** the hill?

t = .5 hours + .083̄ hours = .583̄ hours or (60 × .583̄) 35 minutes

Also 30 + 5 = 35 minutes

e.) Calculate the average speed of the man for his <u>entire</u> trip **UP and DOWN** the hill.

3 miles / .583̄ hours = 5.14 miles per hour

$s = \frac{d}{t} = \frac{3\,mi}{.58\bar{3}\,hrs} = 5.14$ mph ← proper format

or .084 miles/minute

Bonus Question (2 pts): Answer in as much detail as possible using complete sentences.

+2

What is speed, when do you have it, how do you measure it and is it compared to something else?

Speed is velocity in relation to something else. You have it when you move in relasion to something else. You measure the distance you travel from something and the time it takes you. Divide distane/time = speed

Question

9/20

How fast am I moving now?

Hands - .5m/s Head 1ft/sec
Eyelids 1cm/ms Walk 5 m/sec - but now 0/m sec
+ Eyes

Well it depends which part of my body
you want to know about. My feet and
my body in general is still. It is going
0m a sec. My hands are moving at
01- .5m a sec to move accros the page
My head is turning at 1ft/sec and
my eyes are moving back and forth
and my eyelids are blinking at 1cm/ms

Constant speed (hand moving)

heart, neveros speed

We are all moving
in relation to sun

Speed =
Changing
Position

Not moving

No speed -> not changing positions

Moving

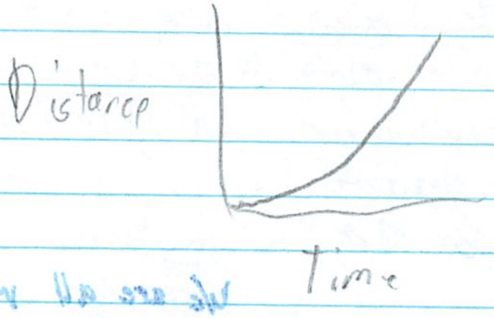
Changing position

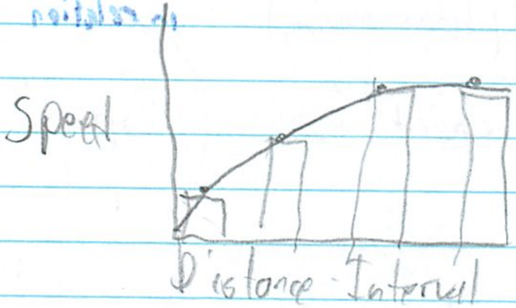
Moving in relation to soming else.

(relative)

Everyone is moving in relation
to the sun, moon, core.

Graphs





Pendulm Times

2 ft intervals

	1st	2nd	Adv
2	.28	.88	.58
4	.38	.61	.49
6	.65	.76	.70
8	.86	.69	.77
10	1.12	1.23	1.17
Note 11	—	.89	
12	1.38	?	

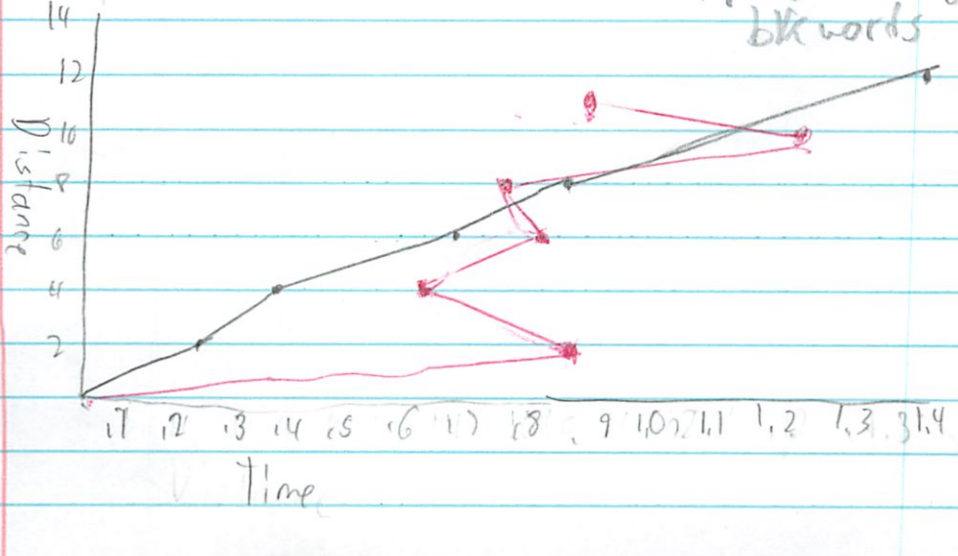
Not this

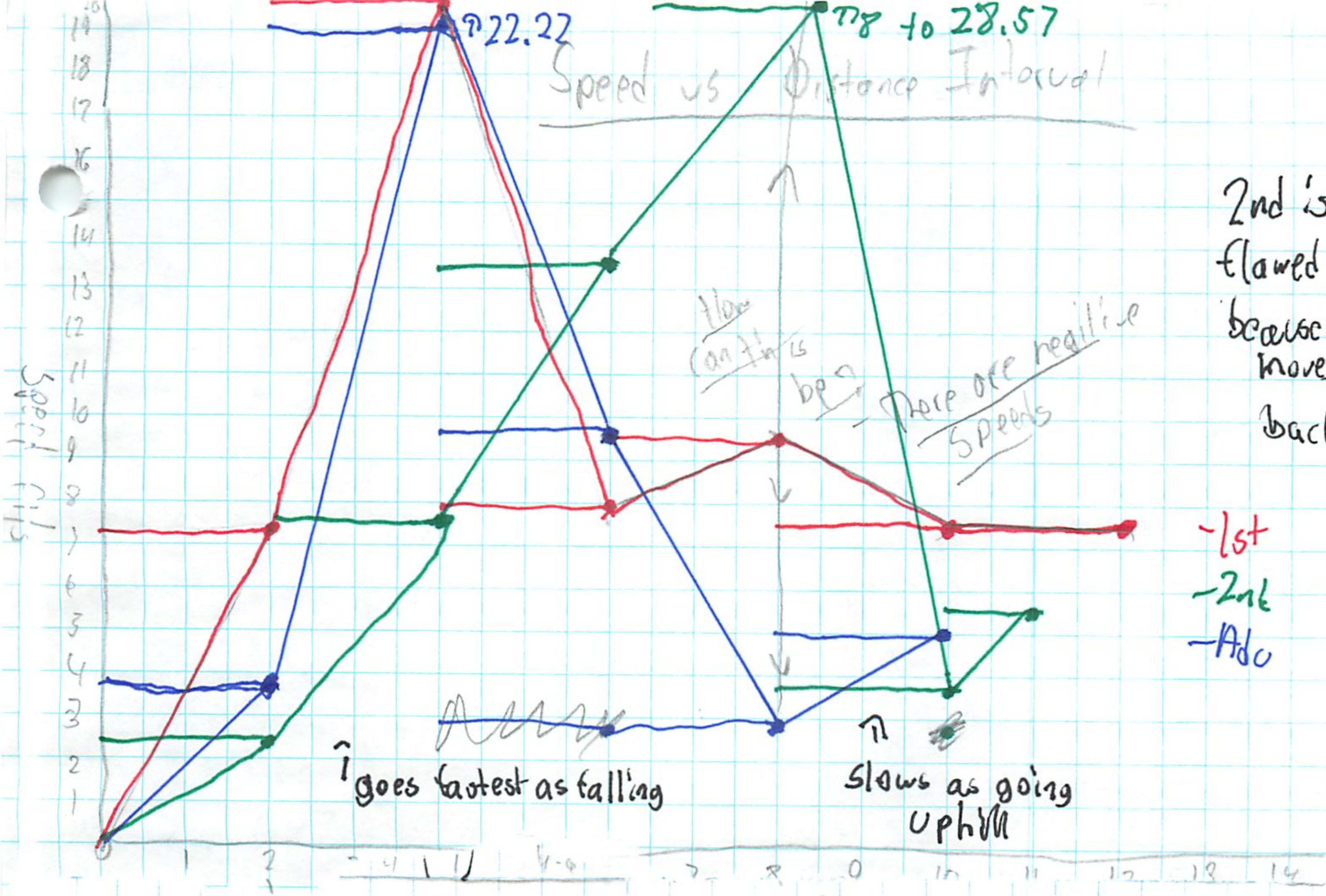
From this

	1st Split		2nd S.		Adv	
0-2	.28	7.14 ft/sec	.88	2.27 ft/s	.58	3.44 ft/s
2-4	.10	20 ft/sec	-.27	-7.40 ft/s	-.09	-22.22 ft/s
4-6	.27	7.40 ft/s	.15	13.33 ft/s	.21	9.82 ft/s
6-8	.21	9.52 ft/s	-.07	-28.57 ft/s	.7	2.85 ft/s
8-10	.26	7.69 ft/s	.54	3.70 ft/s	.4	5 ft/s
[illegible]	.26	7.69 ft/s	10-11 -.34	-5.88		

speed must be positive

+ Pendulm did go bkwords



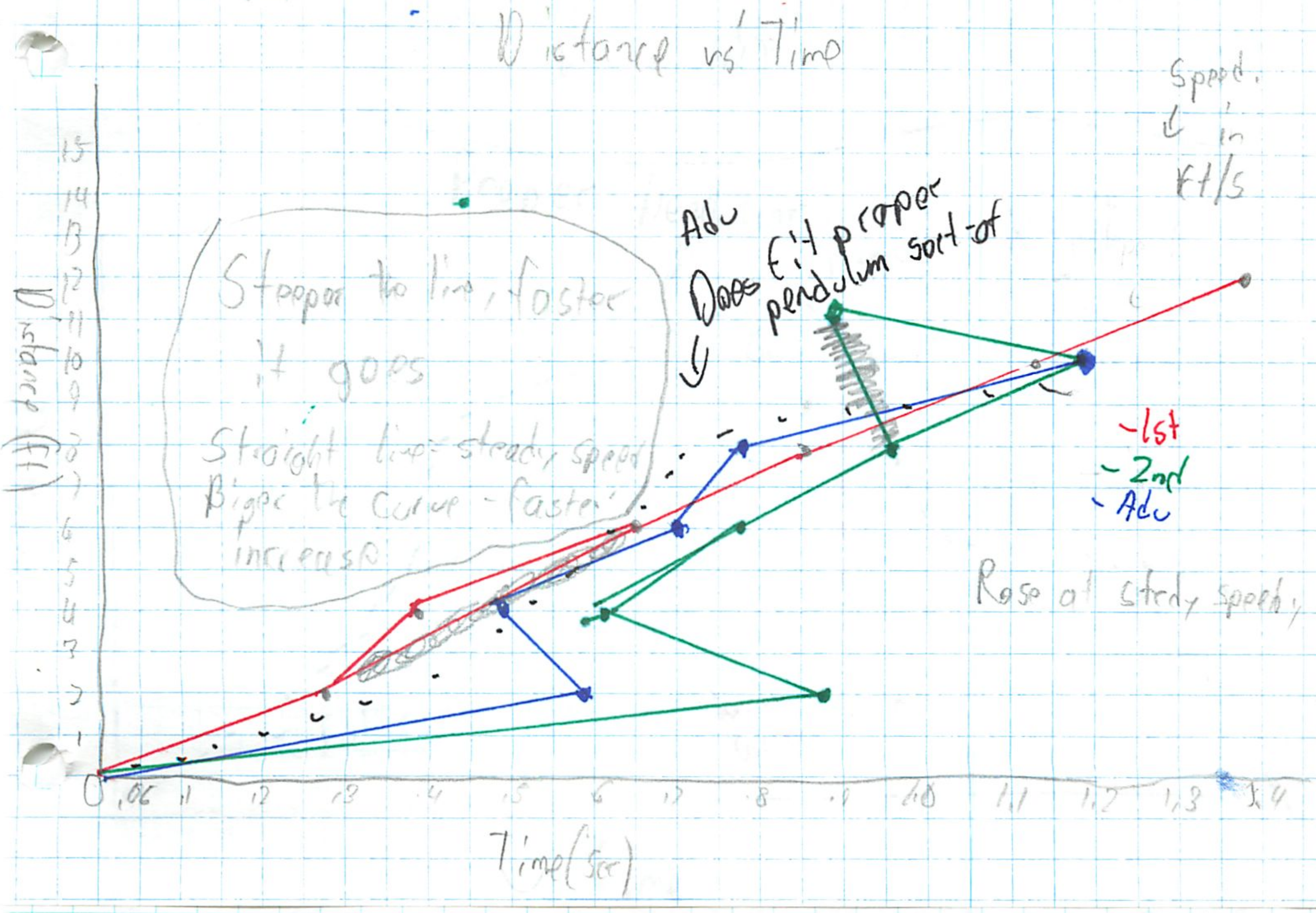


goes fastest as falling

slows as going uphill

How can this be? - There are negative speeds

2nd is flawed data because it moves backwards



Speed in ft/s

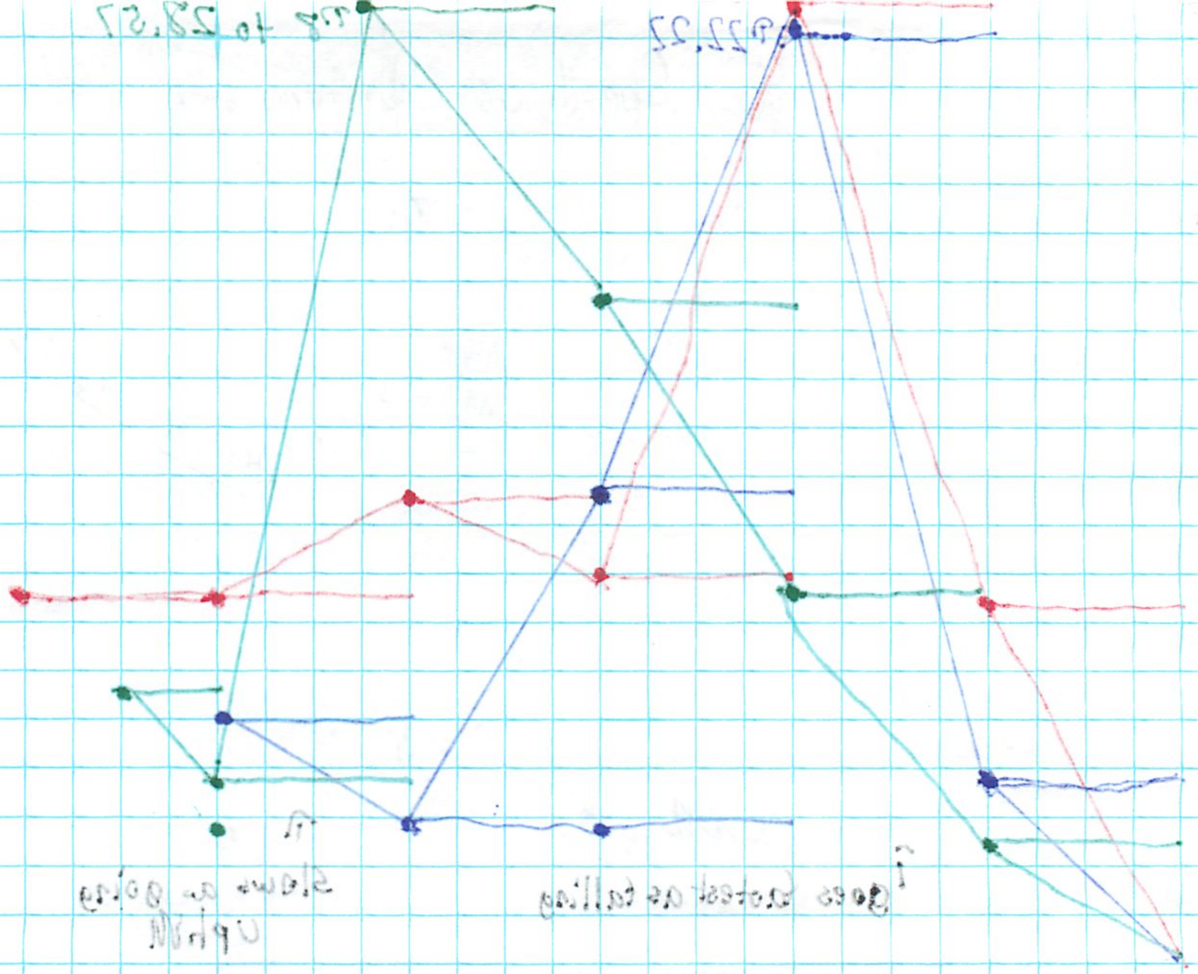
Adu Does fit proper pendulum sort of

Steeper the line, faster it goes

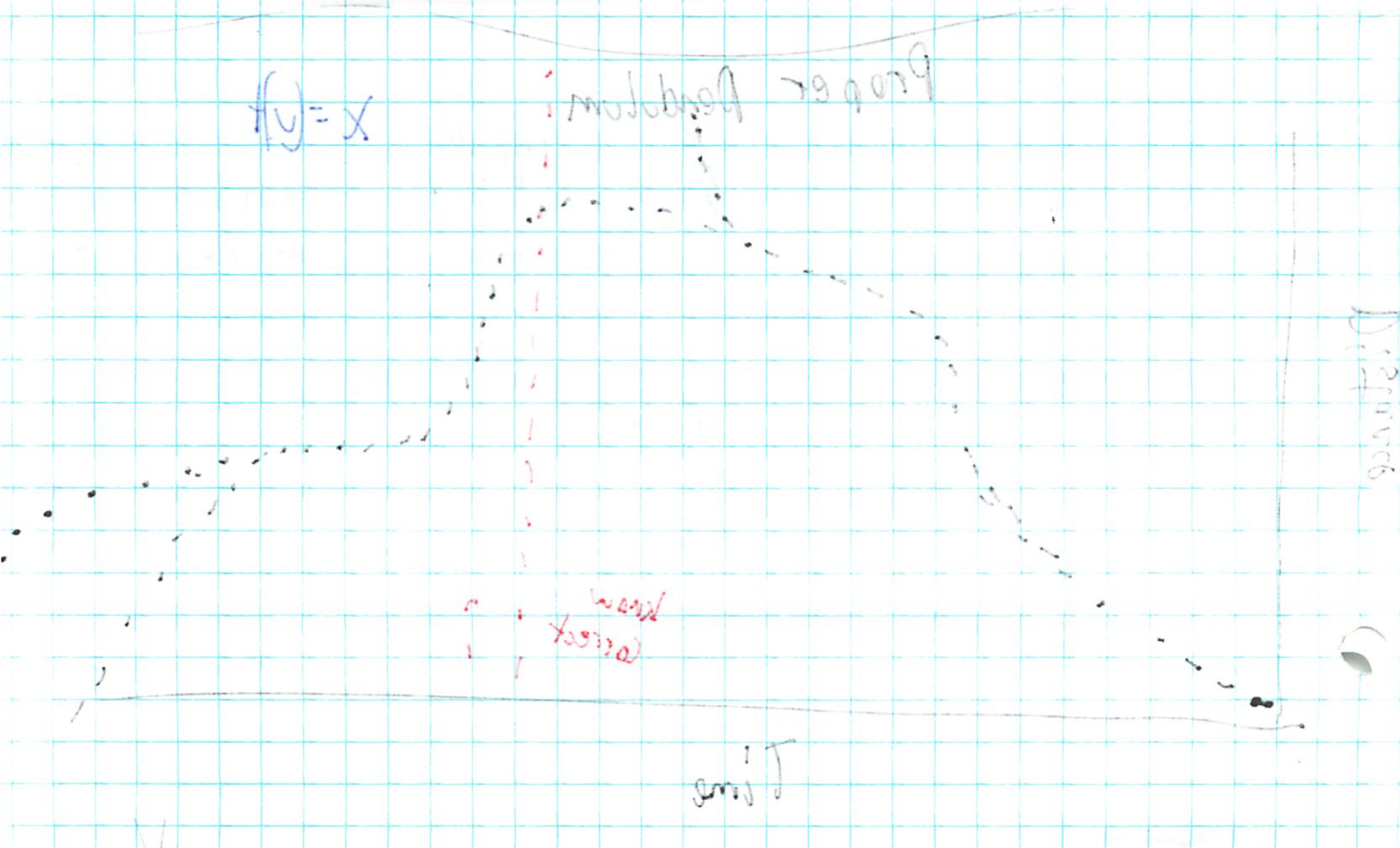
Straight line = steady speed

Bigger the curve - faster increase

Rose at steady speed,



2nd is flawed cuz because it moves backwards



Fundamental Quantities

9/27

person made out of matter/mass - kg, g, lbs.

light reflect off their clothes (or body)

time - If bell rang, person would not be there
- min, hrs, sec

Space - Person bends down, person reaches, empty space
ft^2
volume
L(w)h
↑ measured by distances (ft, m, mi, cm)

Everything you need to know to measure something
↑ are 1 of these 3 things

energy
speedometer
speed
everything

What do you think

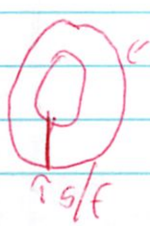
9/30

What is the difference between speed + velocity?

??I don't really know. Velocity, on airplanes, rockets, Speed is more a normal person term for $\frac{distance}{time.}$ Possibly velocity is $\frac{displacement}{time,}$ They must be similar, they are represented by the same letter,

Speed	Velocity
How far in specified time	car race
How much distance in specificied time	has a direction + speed
$speed = \frac{distance}{time}$	speed (how fast) + (and) direction (where)
straight line/or curve	
no direction	
	$Velocity = \frac{displacement}{time}$

displacement = a change in position



close track
after 700 laps

If go $\frac{1}{2}$ around
total (straight line) change

displacement would be 625 mi approx .25
not distance traveled

No change in position (back where started) didn't move
no total change in position $v = \frac{0}{1hr} = 0$ velocity (better to talk speed)

IPS-9

Speed and Velocity

Practice Problem #1:

x60 = 39 meters/min

Heather and Mathew walk at a speed of 0.65 m/s. If it takes them 34 min. for them to get where they are going, how far have they walked?

d = t × s   d = 34 min × 39 m/min = 1326 meters

Practice Problem #2:

24 d/min

Fred and Barney travel at a speed of 24 dinosaur tales per min. to the bowling alley which is 632 dinosaur tale lengths away. How long will it take them to get there?

$t = d/s$ = $t = \underset{dt}{632} / \underset{dt/min}{24} = 26\frac{1}{3}$ minutes

Practice Problem #3:

An athlete in training is running laps. He can maintain a constant speed in running one lap every 1.35 min. The distance for 1 lap is 400 m.

(a) What is his average speed in meters per hour? $s = \frac{d}{t}$ $s = \frac{400}{(1.35 \times 60)} = 4.93$ m/sec

× 60 = 295.8 m/min

× 60 = 17784 m/hr

rounding error ↓ 17,777.7 m/hr

(b) After completing one lap what is his average velocity?

$v = \frac{\text{displacment}}{\text{time}}$ $v = \frac{0}{1.35}$ = v = 0 velocity

Practice Problem #4:

11 mi/hr velocity

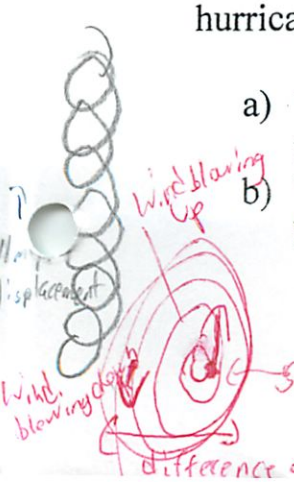
A hurricane moves due north at a speed of 11 mi/hr. The winds in a hurricane rotate in a counterclockwise direction around the eye of the hurricane. Maximum sustained winds of the hurricane reach 150 mi/hr.

0 velocity

a) Where are these maximum winds most likely to occur (in relation to the center of the hurricane)? at the center or where the center passes eye wall (right outside of center)

b) What wind speeds would be expected on the other side of the hurricane away from the maximum winds?

Slower at the edges or before/after edges pass



stongest point (150 sustained + 11 north velocity)

difference of 22mph

40/35 Michael Plasmeier

IPS Unit 1.3 - Just Strolling Along

v = d/t
d = v × t
t = d/v

$\frac{d}{v \mid t}$

WHAT DO YOU THINK?

- How can one measure distance using a stopwatch?

You can't unless you know what distance they are traveling. -That's the question- Duh! If you measure distance you divide that distance by the time it takes to travel that distance (as measured by the stopwatch)

(Constant) Speed you traveled at × time you took = distance

FOR YOU TO DO.

We have talked about average speed and constant speed. Can one walk at a constant speed? Yes If you walk at a comfortable pace you should be able to walk at a constant speed for some distance.

1. Time yourself as you walk a known or measured distance a number of times to see if there is any consistency in your walking. Record the distance that you walked and all the times that you measured while walking the given distance. From this data calculate your average speed; show your calculations.

Distance Walked = 8 m

Time to walk distance (seconds)
6.73
6.64
5.23
7.0
5.61

faster

Sum of times

6.34
6.01
5.12
7.21
6.71

63.2 seconds

Average time =

Total/10 = 6.32

Average speed =

8/6.32 = ~~.79 m/s~~

calc error

1.26 m/s = correct

2. Now that you have calculated your average speed, use this value to calculate the distance between the two points given to you by your teacher, i.e. goalposts on the football field or once around the track. You may use a stopwatch to measure the time it takes to walk from one point to the other.

Description of distance given lenght of soccer field

lengh of socco field

65.86 sec	64 .64 sec
63.42 sec	Sum=258.16
64.24 sec	Adv Time=64.54

Guess

$d = v(t)$ ← previous error

$d = \cancel{.79}\ 1.26\ (64.57)$

$d =$ ~~51.0103~~ ← I guess distance in m

81.3582m

Actual distance 90.4m Error ~~37.4m~~ 9.05 m

ABS(Guess - Actual)

ABS: Absolute Value - take out - sign

3. Repeat the process in number 2 to calculate the distance traveled if you walk between two other points assigned by your teacher.

whith of soccor field

x whith soccor field

38.75 sec	39.66 sec
38.25 sec	Sum=183.48 Adv Time=45.87
42.07 sec	

Guess Distance

$d = v(t)$ previous error

$d = \cancel{.79}\ 1.26\ (45.87)$

$d =$ ~~36.2373~~ ← I guess whith in m

57.79m

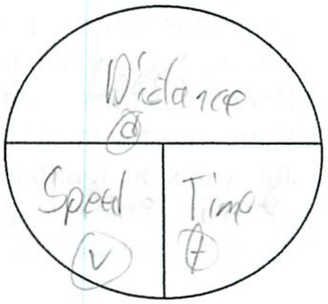
Actual distance 54.8m Error ~~18.57~~ 2.99m ✓

x5

IPS Unit 1.3
Physics to GO: Calculating Speed and Distance

Speed: The rate at which something moves.

Memory Circle



$$\text{Average speed} = \frac{distance}{time} = \frac{d}{t}$$

You drive 300 miles in 6 hours, what is your average speed?

$\frac{300 \text{ miles}}{6 \text{ hour}} = 50$ miles/hour

We can rearrange the equation and get the distance:

distance = average speed x time

d = v x t

How far will a car travel in 3 hours if the average speed of the car is 60 mph?

d = 60 x 3

$\boxed{d = 180 \text{ miles}}$

What is the equation for time? Use the memory circle. t = d/v

How long would it take you to travel 650 miles if your average speed is 50 mph?

$\boxed{t = 650/50 = 13 \text{ hours}}$

~~t = 650 x 50 = 32500 hours~~ ~~t = 50/650 = .076 hours~~

Physics to go: Answer these questions on a separate sheet of paper and make sure you "BOX" each part.

1. A student walks at a constant speed of 2.3 m/s.
   a) How long will it take the student to walk 100 meters? 100/2.3 = 43. Seconds
   ✓ only 43 because significant figures
   b) How far will the student walk in 2 minutes and 30 seconds?
   (2 x 60 + 30) x 2.3 = 345 m

2. John walks 30 meters in 13.2 seconds.
   a) What is his average speed? 30/13.2 = 2.27 m/s
   b) How long would it take john to walk 175 meters?
   175/2.27 = 77 sec
3. Suzie walks from home uphill a distance of 350 meters to a Wawa store to get a snack. It takes her 3 minutes and 45 seconds to walk to the Wawa. On the return trip she walks at a constant speed of 1.95 m/s. ~~1.95 x 350 = 682.5~~ 350/1.95 = 179 sec
   ↓ Dont need?
   350/(60 x 3 + 45) = 1.55 m/s uphill
   a) What was her average speed for the round trip? (350 x 2)/(225 + 179) = 1.73 m/s
   b) If she stayed in the Wawa store for seven minutes and 28 seconds, how long did she take for the whole trip?
   225 + 179 + (60 x 7) + 28 = 852 sec = 14.2 min or 14 min 12sec

v=d/t

d=v×t

t=d/v

4. Bill is running around the track. He runs the first 400-meter lap in 85.0 seconds and the second lap in 78.0 seconds. 400/85 = 4.70 m/s 400/78 = 5.12 m/s
   a) What is his average speed for the first lap? 4.70 m/s
   b) What is his average speed for the second lap? 5.13 m/s
   c) What is his average speed for both laps? 800/(85+78) = 4.91 m/s

Rounding Error?

5. The girls relay team is running the 1600-meter relay. Each girl runs a 400-meter lap and then passes the baton to the next girl. These are the results:
   Megan runs the first lap in 95.0 seconds. 400/95 = 4.21 m/s
   Karen runs the second lap in 87.5 seconds. 400/87.5 = 4.57 m/s
   Katie runs the third lap in 98.3 seconds. 400/98.3 = 4.07 m/s
   Julie runs the fourth lap in 84.7 seconds. 400/84.7 = 4.72 m/s
   a) What is the average speed of each girl?
   b) What was the average speed for the race? 1600/(95+87.5+98.3+84.7) = 4.38 m/s

6. The same girls in number 5 are running at the Penn Relays. Their performance is as follows. ← ? same distance
   Megan runs the first lap in 93.2 seconds. 400/93.2 = 4.29 m/s
   Karen runs the second lap with an average speed of 4.22 m/s. 400/4.22 = 94.78 sec
   Katie runs the third lap in 81.5 seconds. 400/81.5 = 4.90 m/s
   Julie runs the last lap with an average speed of 5.04 m/s. 400/5.04 = 79.36 sec
   a) What was their total time for the race? 384.84 sec
   b) What was their average speed for the race? 1600/384.84 = 4.506 m/s

7. Jon and Rich live on opposite sides of Haverford township 8520 meters apart. They each get on their bicycles at the same time and ride toward each other. Jon has an average speed of 9.5 m/s and they meet each other in seven minutes.
   a) How far did Jon travel? 3990 meters
   b) How far did Rich travel? 8520-3990 = 4350m
   c) What was Rich's average speed?

do they meet in the middle

you need to find that

4350/(7×60) = 10.78 m/s

Jon = 9.5×(7×60) = 3990 m

d
v | t

1609 m = 1 mile

1 mile = 1760 yds = 5280 ft

↓ to find time

divide d
v ← cover t

d/v = t

Remember speed is v

Answers to:

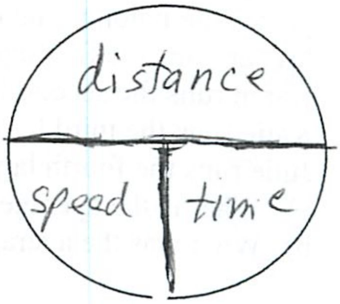
IPS Unit 1.3

Physics to GO: Calculating Speed and Distance

Speed: The rate at which something moves.

$$\text{Average speed} = \frac{distance}{time} = \frac{d}{t}$$

Memory Circle



You drive 300 miles in 6 hours, what is your average speed?

$$\text{Average Speed} = \frac{300\ \text{miles}}{6\ \text{hrs.}} = \boxed{50\ \frac{\text{miles}}{\text{hr.}}}$$

We can rearrange the equation and get the distance:

distance = average speed x time

d = v x t

How far will a car travel in 3 hours if the average speed of the car is 60 mph?

$$\text{distance} = 60\ \frac{\text{miles}}{\text{hr}} \times 3\ \text{hrs.} = \boxed{180\ \text{miles}}$$

What is the equation for time? Use the memory circle. $t = \frac{\text{distance}}{\text{speed}}$

How long would it take you to travel 650 miles if your average speed is 50 mph? $t = \frac{650\ \text{miles}}{50\ \text{mph}}$ $\boxed{t = 13\ \text{hours}}$

Physics to go: Answer these questions on a separate sheet of paper and make sure you "BOX" each part.

1. A student walks at a constant speed of 2.3 m/s.
   a) How long will it take the student to walk 100 meters? $\text{time} = \frac{100\ \text{meters}}{2.3\ \text{m/sec}} = \boxed{43.5\ \text{sec}}$
   b) How far will the student walk in 2 minutes and 30 seconds? $\text{distance} = \left(2.3\ \frac{\text{m}}{\text{sec}}\right) \times 150\ \text{sec} = \boxed{345\ \text{m}}$

2. John walks 30 meters in 13.2 seconds.
   a) What is his average speed? $\text{speed} = \frac{30\ \text{meters}}{13.2\ \text{sec}} = \boxed{2.27\ \text{m/sec}}$
   b) How long would it take john to walk 175 meters? $\text{time} = \frac{175\ \text{meters}}{2.27\ \text{m/sec}} = \boxed{77.1\ \text{sec}}$

3. Suzie walks from home uphill a distance of 350 meters to a Wawa store to get a snack. It takes her 3 minutes and 45 seconds to walk to the Wawa. On the return trip she walks at a constant speed of 1.95 m/s. $\text{time for return} = \frac{350\ \text{meters}}{1.95\ \text{m/sec}} = 179.5\ \text{seconds}$
   a) What was her average speed for the round trip? $\text{speed} = \frac{700\ \text{meters}}{(225 + 179.5)\ \text{sec}} = \boxed{1.73\ \text{m/sec}}$
   b) If she stayed in the Wawa store for seven minutes and 28 seconds, how long did she take for the whole trip? $t = 7\ \text{min} + 28\ \text{sec} + 225\ \text{sec} + 179.5\ \text{sec}$

$$\boxed{t = 852.5\ \text{sec}}$$

4. Bill is running around the track. He runs the first 400-meter lap in 85.0 seconds and the second lap in 78.0 seconds.
   a) What is his average speed for the first lap? $\text{speed} = \frac{400\text{ meter}}{85\text{ sec}} = \boxed{4.7\text{ m/sec}}$
   b) What is his average speed for the second lap? $\text{speed} = \frac{400\text{ m}}{78\text{ sec}} = \boxed{5.13\text{ m/sec}}$
   c) What is his average speed for both laps? $\text{speed} = \frac{800\text{ meters}}{(85+78)\text{ sec}} = \boxed{4.91\text{ m/sec}}$

5. The girls relay team is running the 1600-meter relay. Each girl runs a 400-meter lap and then passes the baton to the next girl. These are the results:
   Megan runs the first lap in 95.0 seconds. $\text{speed} = \frac{400\text{ meters}}{95.0\text{ sec}} = \boxed{4.21\text{ m/sec}}$
   Karen runs the second lap in 87.5 seconds. $\text{speed} = \boxed{4.57\text{ m/sec}}$
   Katie runs the third lap in 98.3 seconds. $\text{speed} = \boxed{4.07\text{ m/sec}}$
   Julie runs the fourth lap in 84.7 seconds. $\text{speed} = \boxed{4.72\text{ m/sec}}$
   a) What is the average speed of each girl?
   b) What was the average speed for the race? $\text{Avg. speed} = \frac{1600\text{ m}}{(95+87.5+98.3+84.7)} = \boxed{4.38\frac{\text{m}}{\text{sec}}}$

6. The same girls in number 5 are running at the Penn Relays. Their performance is as follows.
   Megan runs the first lap in 93.2 seconds.
   Karen runs the second lap with an average speed of 4.22 m/s. $t = 94.8\text{ sec}$
   Katie runs the third lap in 81.5 seconds.
   Julie runs the last lap with an average speed of 5.04 m/s. $t = \frac{400\text{ m}}{5.04\text{ m/sec}} = 79.4\text{ sec}$
   a) What was their total time for the race? $\text{total time} = (93.2+94.8+81.5+79.4)\text{ sec} = \boxed{348.9\text{ s}}$
   b) What was their average speed for the race? $\text{Avg. speed} = \frac{1600\text{ m}}{348.9\text{ sec}} = \boxed{4.59\text{ m/sec}}$

7. Jon and Rich live on opposite sides of Haverford township 8520 meters apart. They each get on their bicycles at the same time and ride toward each other. Jon has an average speed of 9.5 m/s and they meet each other in seven minutes.
   a) How far did Jon travel? $\text{distance} = (9.5\text{ m/sec}) \times 420\text{ sec} = \boxed{3990\text{ meters}}$
   b) How far did Rich travel? $\text{distance} = 8520\text{ m} - 3990\text{ m} = \boxed{4530\text{ meters}}$
   c) What was Rich's average speed?

$$\text{speed} = \frac{4530\text{ meters}}{7\text{ min}} = \frac{4530\text{ meters}}{420\text{ sec}} = \boxed{10.8\text{ m/sec}}$$

DB

IPS Unit 1.4 - Big Bruiser

WHAT DO YOU THINK?

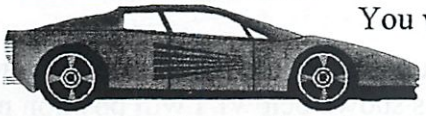
- How can one compare the motions of two different objects?

measure the Distance between them or a 3rd object at different times.

- How can one predict where two cars will meet?

measure their speeds and see when the time travele will be equal, and look at both distances

FOR YOU TO DO.



You will be given a battery-powered car. You are to analyze and describe its motion many different ways. Yes, it can do wheelies and other neat things, but it also has a very specific motion. Your group will be given a stopwatch and a meter stick to help you analyze the motion of the car.

1. a) Measure the time it takes to travel measured distances (20 cm, 40 cm, 60 cm, etc, up to 2.0 meters). Use the table below to record your results.
   b) Calculate the average speed for each distance. Show your calculations in the space provided on the chart.

The equation for average speed = $\frac{\text{distance}}{\text{time}}$

Distance (m)	Elapsed time (s)	Average Speed Calculation	Average Speed (m/s)
.2	.65	.2/.65	.30
.4	1.44	.4/1.44	.27
.6	2.16	.6/2.16	.27
.8	2.85	.8/2.85	.28
1	3.63	1/3.63	.27
1.2	4.38	1.2/4.38	.27
1.4	5.19	1.4/5.19	.26
1.6	6.00	1.6/6	.26
1.8	6.60	1.8/6.6	.27
2	7.47	2/7.47	.26

.27 m/s
avr

c) What does this chart tell you about the motion of the car?

It is relibible in traveling at a constant speed,

2. a) You will be given a piece of graph paper and a ruler. Plot your data for distance traveled and time on the graph paper. Plot distance on the "y" axis and time on the "x" axis.
   b) What does the shape of the graph tell you about the motion of the car? Explain how.

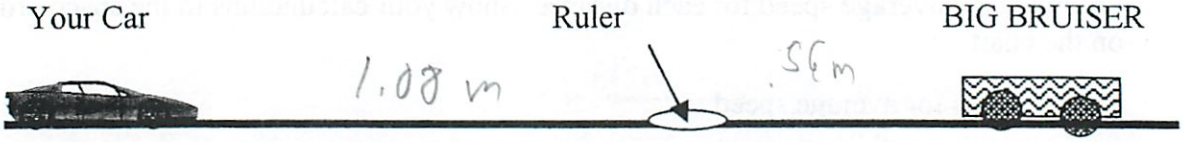
   The speed is steady because the graph is straight. If the graph would be curved the car would be changing speed

   c) Derive a mathematical equation to describe the motion of the car. Show your calculations (your teacher may assist you with this).

   distance = speed × time $\dashrightarrow$ $b = 0$ so $\boxed{d = v(t)}$

   $d = v(t) + b$ ← is like $y = m(x) + b$ ↗

3. I have my own car, which is the "Big Bruiser", and I like to run my car into other peoples' cars. I will place my car at the right of a ruler that is on the floor (as shown below). I will position my car so that it reaches the ruler at exactly 4.0 seconds. You must calculate where you will place your car so that if we both start at the same time, we will meet at the ruler.



Show all your calculations here.

$.27 \text{ m/s} \times 4 \text{ sec} = 1.08 \text{ m}$

$V \times T = D$

Now test your calculations to see if it really works. If successful celebrate, if not, check your calculations and test it again.

Yes, 4.12
3.84
3.91
3.97
3.95

Here is another challenge with the "Big Bruiser". I will place my car at one end of a two-meter stick and you will place your car at the other end of the two-meter stick. The cars will move towards each other after being released simultaneously. You are to predict where our two cars will meet.

4. a) What information do you need about my car in order to be successful? We need to know speed of BB
   b) Gather the data needed about my car and show any necessary calculations.

Measure distance it went in 4 sec

.56 meters/4 seconds = .14 m/s

$d/t = v$

5. Now that you know about the motion of my car, calculate where the two cars will meet. Start with a drawing of the cars demonstrating where they are when they start and where they are when they meet. Use this drawing to explain how you will solve the problem. Show all your work and calculations.

Find how long it takes both cars to 2 m

Our car $t = d/v$

$t = 2m/.27m/s = 7.40sec$

Bruser $t = d/v$

$t = 2m/.14m/s = 14.3sec$

$t_{BA} = t_C$

$\frac{D_{BB}}{V_{BB}} = \frac{D_C}{V_C}$

$\frac{D_{BB}}{.14m/s} = \frac{2 - D_{BB}}{.27m/s} = 1.22$

mistake It went 2m to measure

Cross Multiply

Distance our car goes is 2m (total) minus what BB goes

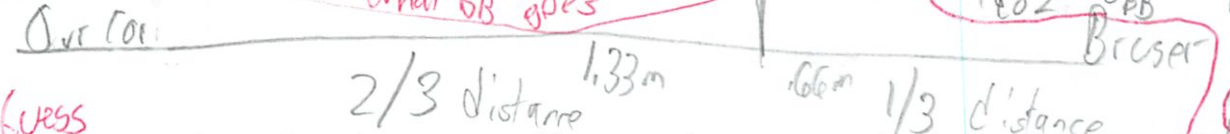
$.14(2 - D_{BB}) = D_{BB}(.27)$

$.28 - .14D_{BB} = .27DBB$

$+.14D_{BB} \quad +.14D_{BB}$

$\frac{.28}{.41} = \frac{.41D_{BB}}{.41}$

$.682 = D_{BB}$ – Big Bruser will go .682 m to the intercept pt.



Guess

6. Place a ruler to show where the two cars will meet and test your result. How well did it work?

Yes, we guessed .66 and math said .682 m

we got to meet .70 and .73, .70, .72, .70 ← Distance BB went

Point Our car will go 2-.68 or 1.318m

Then find time for BB – $t = d/v$ $t = .687m/.14m/s = 4.87 sec$

OC – $t = 1.318/.27m/s = 4.88 sec$ ← should be same to check!

copy error

? type error

IPS Unit 1.4 10/30/04

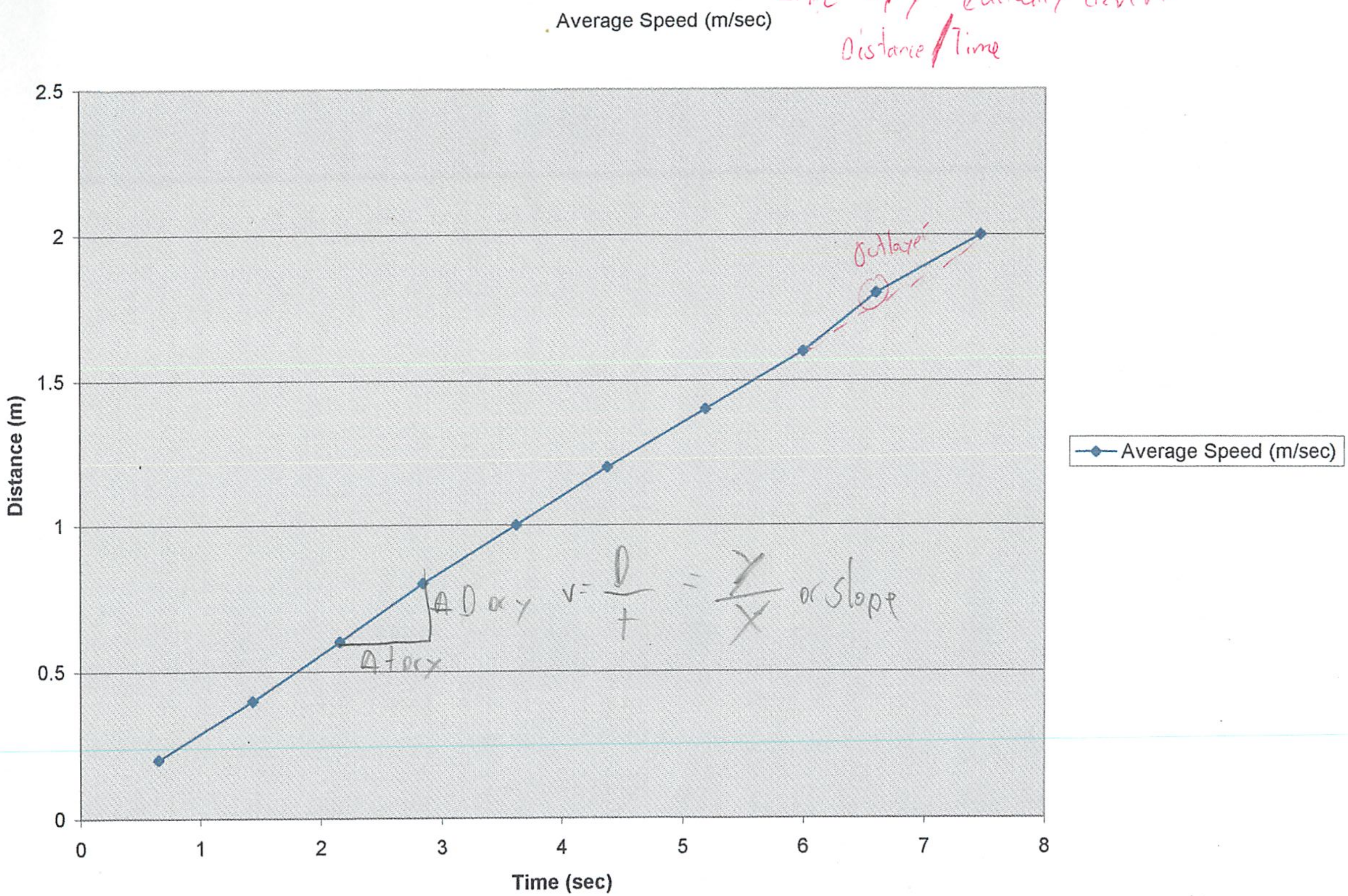
Also $\left(\frac{V_B}{V_C}\right) D_C + D_C = 2m$

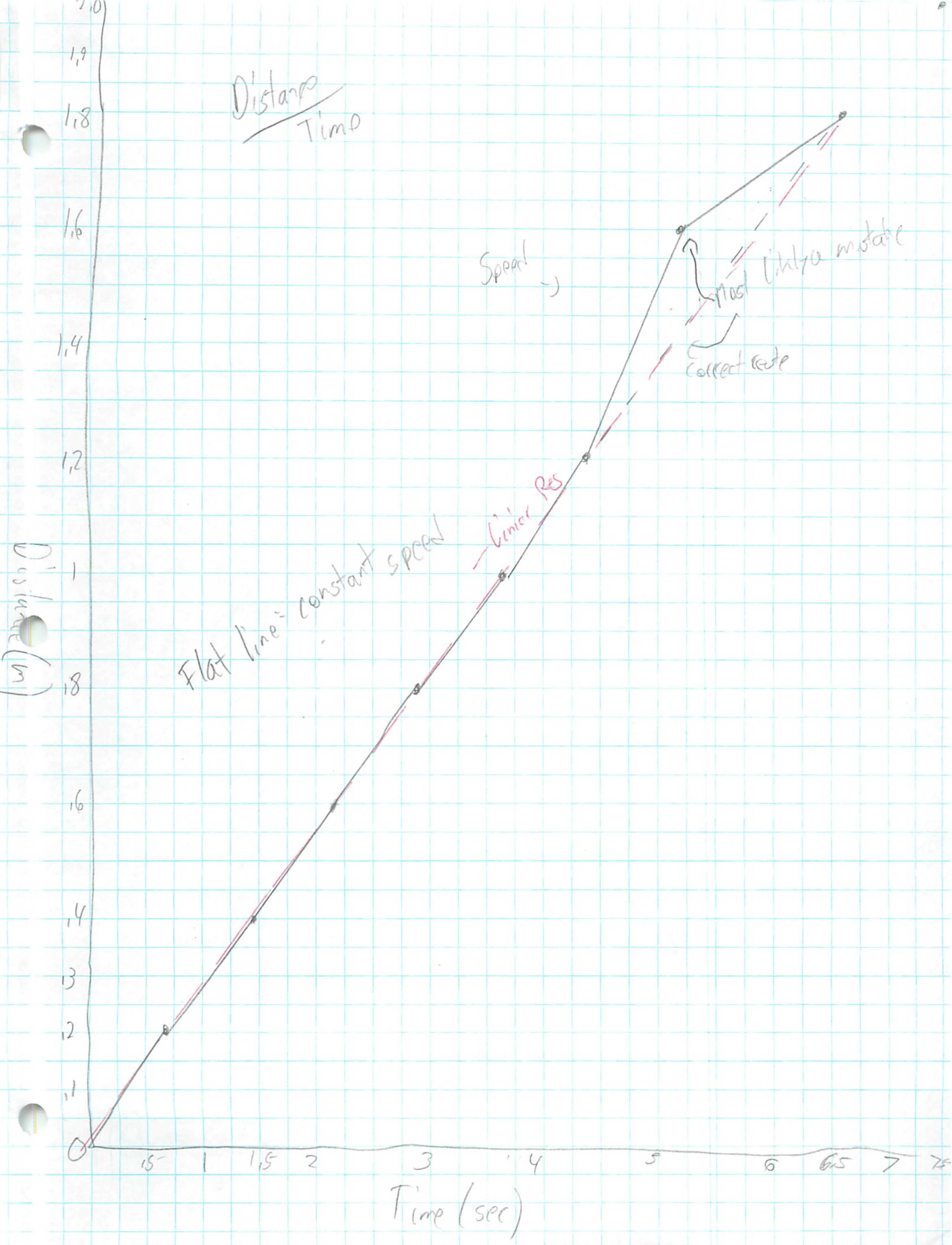
#2a

X, Y scatter plot

Like x/y actually divide

Distance/Time




Distance / Time
Speed
Most likly a mistake
Correct rate
Linier Res
Flat line = constant speed
Distance (m)
Time (sec)
2,0
1,9
1,8
1,6
1,4
1,2
1
.8
.6
.4
.3
.2
.1
0
.5
1
1,5
2
3
4
5
6
6.5
7
7.5

Extension: #5 Speed of BB has Changed

$\frac{d}{s\ t}$

$.164^{m/s} = V_{BB}$

$.127^{m/s} = V_c$

$\left(\frac{.164}{.127}\right) D_c + D_c = 2m$

$.607\ D_c + D_c = 2m$

$\frac{1.607\ D_c}{1.607} = \frac{2m}{1.607}$

$D_c = \boxed{1.244\ m}$ for our car to point of interception

Check	Distance Dc
	1.22 m
	1.28 m
	1.23

$D_{BB} = 2 - 1.24 = .74\ m$

$T = D/v$

$T_{BB} = .74 / .164 = 4.51$ sec — time it takes to

$T_{oc} = 1.244 / .127 = \cancel{5.95}$ sec — pt of intersection

4.60

↑ Copied wrong

Should be =

but not because

adj speed is off

IPS-9

Name Michael Plasmeier
Block # 2A

Activity Reflections

Think back to the two activities: Activity #1 – Running the Race where you measured split times for several sprinters, and the Pendulum Activity in which the motion of the pendulum was timed in a similar way using split times.

1. What was the pattern for the interval speeds of the runners as they ran their sprints? What would be the pattern for a trained sprinter running a 100 meter race? The runners speed up for the first 40m then they level out and keep steady speed and may drop a bit in the end. Our runners sort of did this but plagued by errors. See the thick Red trend! on the Excel graph
2. What was the pattern for the speeds of a pendulum as it swings from one side of its mid-point to the other side of its mid-point?
It gets faster as it falls then gets slower as it rises. It then stops and speeds up again as it falls, each time going slower and not as high.
3. List or explain 3 differences in the nature or setup of these activities.
The pendulm hangs from a celing and swings in a curve
The runner runs in a line accross a plane
The pendulm was timed in smaller intervals + had more errors because of that
4. List or explain 3 differences in the motions or speeds of the sprinter compared to the pendulum.
The pendulm speeds up and then slows up. A runner speeds up more slowly then leves off not falls. Also a runner goes a greater distance
5. How could you utilize or incorporate these types of activities and measurements in the design and analysis of an obstacle course?
A rope swing is, i a pendulm.
People can run as part of an obstical course. You could measure someones speed as part of a course that is divide into legs.

Michael Plasmeier
Brown
IPS 9H
7 Oct 2005

Speed/Velocty Comparison

Blue Book
P25, 26, 27

✓ $\frac{13}{15}$ was 14

Review Qs

1. A point on the earth's surface (if the earth was flat) or a point on the same plane.

2. Speed is the rate someting travels in a certain time using the distance they covered

3. 2km/h

4. Instantanous speed is the speed you are going now or can be found with a small length of time. Adverage speed is when you have a long lenght of time or your speed for the entire journey

5. Instantanous speed

6. Speed is distance covered. ~~Velocity~~ is distance from the start. In a certain direction!

7. No, only if it goes in a straight line from the start and doesn't curve.

8. The pedal and the break causes a change in speed. These 2 and the steering wheel cause a change in velocity.

9. accelaration

Plug + Chug

26. 140 meters/5 seconds = 28 meters per second

27. a. 4 km in 30 min is the same as 8 km in 60 min (1 hr) or 8km/hr
b. He will go 8 km is his speed remains constant.

$v = \frac{d}{t}$ $\frac{4\,km}{30\,min} = 8\,km/hr$

$8\frac{\cancel{km}}{\cancel{hr}} \times \frac{\cancel{1hr}}{3600sec} \times \frac{1000m}{\cancel{1km}}$

Change to $\frac{m}{sec}$

$(8/3600) \times 1000 = 2.2\,m/sec$

1 hour = 3600 sec

Over

$\frac{1\ km}{1\ year} = 1 \frac{km}{year}$

$rate = \frac{distance}{time}$ in centuries

$time = \frac{distance}{rate}$

$10,000\ years = \frac{10,000\ km}{1\ km/year}$

Think & Solve

42. If going 1km a year it would take 10,000 years to go 10,000 ~~miles~~ km doh! centuries? or 100 centuries

stupido copy error | reread what the question asks

45. We go 20km + 30 km for a total of 50km/2hrs. Reduce to 25 km/h

46. $t = d/v$ or $t = 1km/20\ km/h = .05\ hrs$ 1st Leg

$t = d/v$ or $t = 1km/30\ km/h = .03\bar{3}\ hrs$ 2nd Leg

$.08\bar{3}\ hrs$

$v = d/t$ or $v = 2^{km}/.08\bar{3}\ hrs = 24\ km/hr$

IPS UNIT 1.4 - Describing Motion

Michael Plasmeier

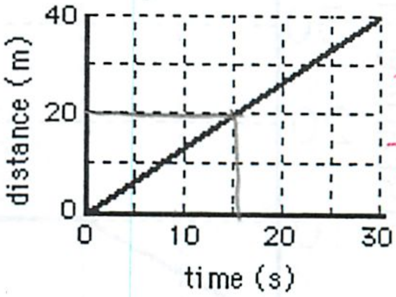
How do you find the speed of an object from a distance-time graph?

You find a point each on both axeis and go see where the lines from that point ex: v= d/t - see graph = v = 20m/15sec = 1.33̄ m/s

Change $\frac{\Delta y}{\Delta x}$

That only works if 0,0 is a point, otherwise find change $\frac{\Delta y}{\Delta x}$

1. Use the graph shown at the right to answer the following questions:



a) Where is the object at the beginning of the time period? At 0m distance

b) Where is the object at the end of the time period?

At 40m distance

c) Describe the speed of the object.

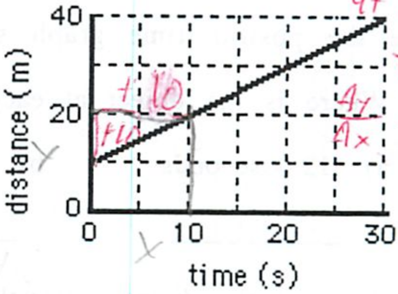
Constant - 1.33m/s

d) What is the speed at 9.0 seconds?

Because constant speed, it's the same 1.33m/s

2. Use the graph shown at the right to answer the following questions.

Because it doesn't start at 0, need to find change $\frac{10}{10} = 1x$



a) Where is the object at the beginning of the time period? At 10 m distance

b) Where is the object at the end of the time period?

At 40 m/ distance

c) Describe the speed of the object.

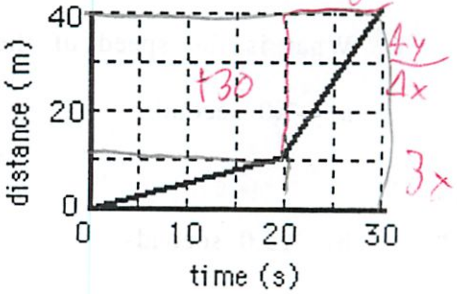
Constant - ~~v= d/t v= 20/10 = v=2m/s~~

d) What is the speed at 24.0 seconds? 1m/s + 10

Constant Speed - ~~2m/s~~ 1m/s + 10 only need y intercept No if asking for equation of motion

~~Is that correct, doesn't start at 0~~

3. Use the graph shown at the right to answer the following questions.



$\frac{30}{10}$

a) Describe the speed of the object.

v= d/t = v= 10m/20sec = .5 m/s for the first 10 m or 20 sec, then v= Δd/Δt = v= 3m/s for the rest

b) What is the speed at 12.0 seconds?

S= .5m/s

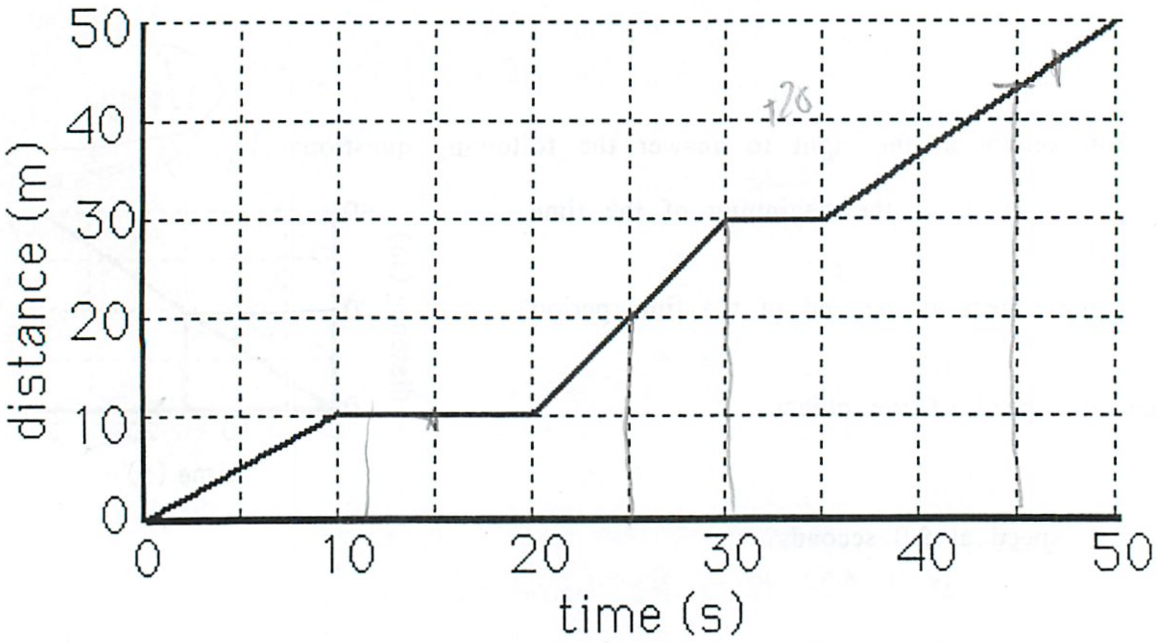
c) What is the speed at 27.0 seconds?

S= 3m/s what would velocity be??

Same because there are 2 types,

you could say average speed + velocity from (30, 40)

IPS UNIT 1.4 - Distance -Time Graph #1



Use the position-time graph shown above to answer the following questions.

1 Where is the object at each of the following times?

a) 12.0 seconds 10m

b) 25.0 seconds 20m

c) 30.0 seconds 30m

d) 45.0 seconds ~ 43m

2. When is the distance traveled 30 meters? ~~? 30m~~ 30 seconds

3. When is the speed of the object zero? ~~0 m/s~~ 0 sec, 10-20 sec, 30-35 sec

4. During what time intervals is the object at rest? 10-20 sec, 30-35 sec

Can not say becouse we don't how about - time

5. During what time interval is the object going the fastest? 20-30 sec

6. What is the speed of the object at the following times?

a) 7.0 seconds

$\frac{\Delta y}{\Delta x}$ $\frac{+10m}{+10s} = 10 m/s$

b) 15.0 seconds

$\frac{\Delta y}{\Delta x}$ $\frac{0}{5} = 0$ m/c (at rest)

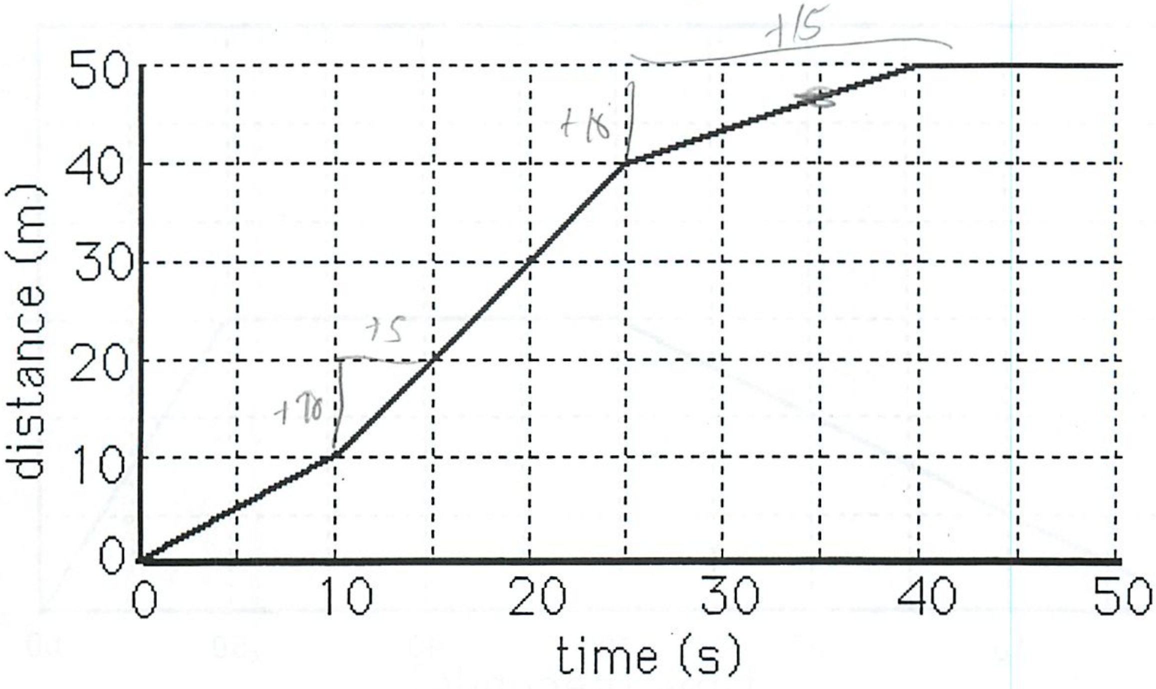
c) 31.0 seconds

$\frac{\Delta y}{\Delta x} = \frac{0}{1} = 0$ m/s (at rest)

d) 47.0 seconds

$\frac{\Delta y}{\Delta x} = \frac{20m}{15 sec} = 1.33$ m/s

IPS UNIT 1.4 - Distance - Time Graph #2



A small battery operated car moves down the hallway. The distance-time graph shown above illustrates the motion of the car.

1 Where is the car at each of the following times?

a) 10.0 seconds	b) 25.0 seconds	c) 35.0 seconds	d) 47.0 seconds
10 m	40 m	~47 m	50 m

2. Describe the motion of the car in your own words.

The car is going 1 m a sec, then changes speed at 10 sec (10 m) to 2 m/s. At 25 sec (40 m), the car istanly changes speed to .66 m/s and then at 50 m (40 sec) the speed changes to 0 m/s.

where: 0 m -50 m

3. When is the speed of the car zero? 0 sec, 40-50 sec

The graph does not show speed before

4. What is the speed of the object at the following times?

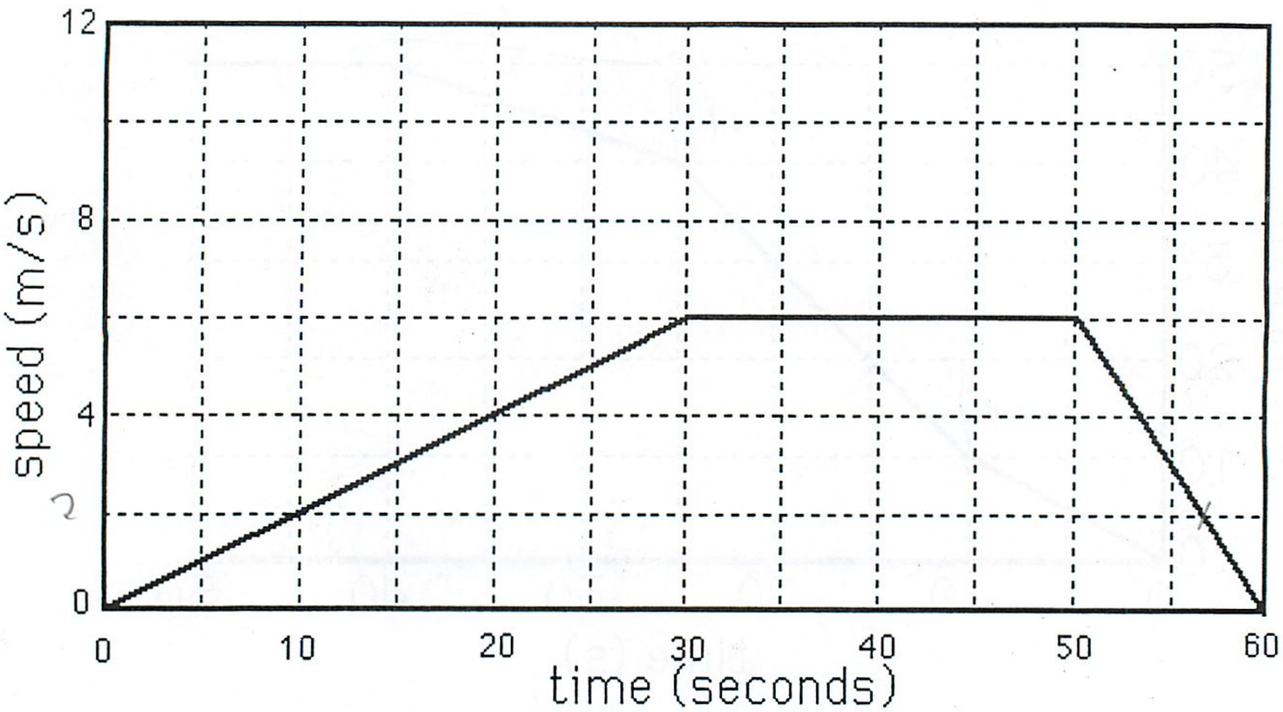
a) 7.5 s 1 m/s

b) 16.5 s 2 m/s

c) 36.0 s .66 m/s or $\frac{2}{3}$ m/s

d) 45.3 s 0 m/s

IPS UNIT 1.4: Speed-Time graph 1



Use the speed-time graph shown above to answer the following questions.

1. When is the speed of the object constant?

~~0-30 sec~~ Not a distance vs time graph look for a horizontal line: 30-50 sec

2. At what times is the speed of the object the following values?

a) 0 m/s	b) 2.0 m/s	c) 4.0 ms	d) 6.0 m/s
0 sec, 60 sec	10 sec ~57 sec	20 sec, ~53 sec	30 - 50 sec

3. During what time interval(s) is the object speeding up? 0 - 30 sec

4. During what time interval(s) is the object slowing down? 50 - 60 sec

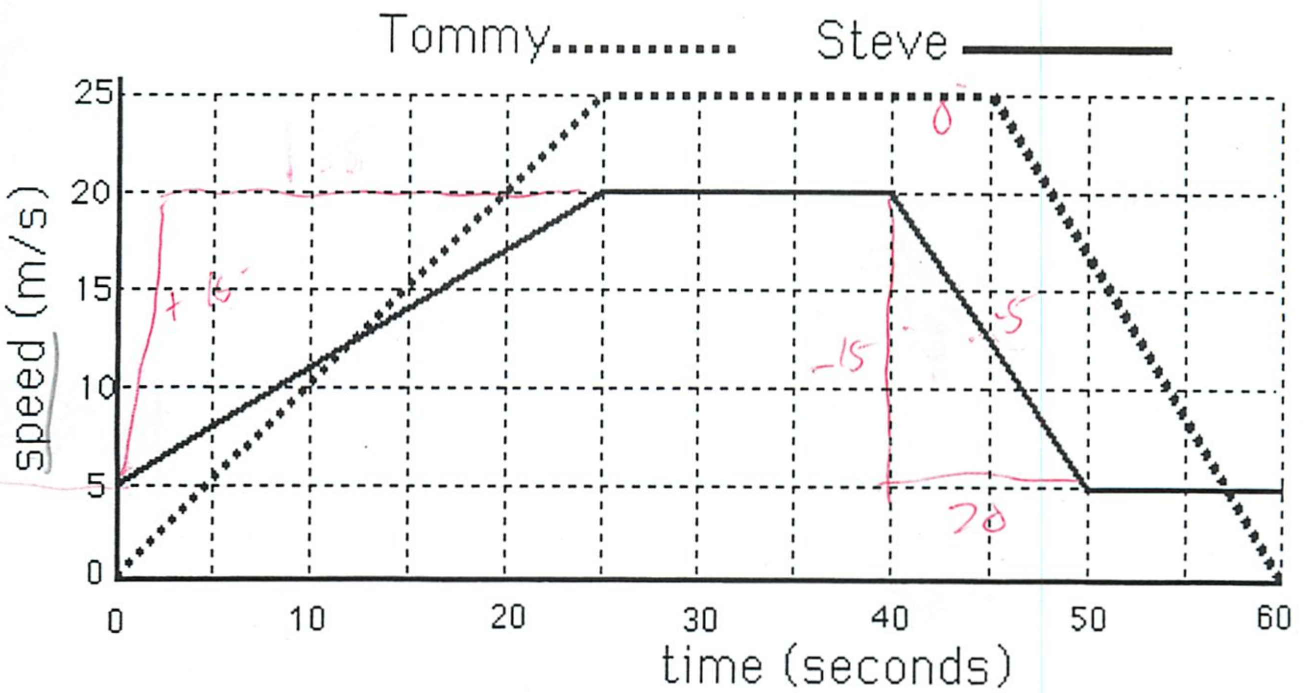
5. During what time interval(s) is the object at rest? ~~30 - 50 sec~~ 0 sec, 60 sec

↑ at 0 m/s not 0 acceleration

6. Describe the motion of the runner in your own words.

The runner starts accelorating taking 30 sec to get to 6 m/s (? haven't learned acceleration). He then goes constant at 6 m/s for 20 sec and then starts de-celorating

IPS UNIT 1.4: Speed - time graph #2



Two friends, Tommy and Steve, are driving in their cars as shown in the graph above. Use the speed-time graph shown above to answer the following questions.

1. When is the speed of Steve's car zero? Never (as the graph shows)
2. When is the speed of Tommy's car zero? 0 sec, 60 sec
3. When is the speed of Steve's car constant? 25 - 40 sec + 50-60 sec
4. What is the speed of Steve's car when its acceleration is zero? 20 m/s + 5 m/s
5. Which car is going faster at the following times?

a) 5.0 seconds	b) 20.0 seconds	c) 35.0 seconds	d) 42.0 seconds
Steve	Tom	Tom	Tom

6. Which car has the greater acceleration (rate of change in speed) at the following times?

?take (abs)

a) 5.0 seconds	b) 20.0 seconds	c) 35.0 seconds	d) 42.0 seconds
Tommy	Tommy	Both	Steve

If not abs it would be Tommy at 0 vs Steve at -?

No, you usually take the ABS, so Steve deceleration is faster then no change.

hasn't learned

7. What is the acceleration of Steve's car at the following times?

a) 5.0 seconds	b) 20.0 seconds	c) 35.0 seconds	d) 42.0 seconds
Went from 5 to 20 m/s in 25 sec or $\frac{20-5}{25}$ $\frac{15 m/s}{25 sec}$ 15 m/s per 25 sec .6 m/s per sec	Same as last time .6 m/s/sec	0 m/s/sec No change	$\frac{-15 m/s}{20 sec}$ = -.75 m/s/sec

Acceleration

10/14

* rate at which your velocity changes

units :) (m/sec)/sec   speed change / time for this change

(ft/hr)/hr

(in/sec)/sec   10 km per hour (a) second (can say per)

mi per hr per sec

(distance/time)/time ← have divison sign

speed change = new speed − old speed

$\boxed{m/sec^2}$ ← short cut way to say m/sec/sec

My way

$A = \frac{v_2 - v_1}{t}$

Newspeed

← old speed

His way

$a = \frac{V_f - V_i}{\Delta t}$

← final speed

← initial speed

↑ delta (change) in time

In a car : 0-60 mph in 6 sec

$\frac{60-0}{6}$ = 10 miles/hour/second

10 mph/sec

---

if constant acceleration - avg speed = $\frac{1}{2}(V_f - V_i)$

= 30 mph

distance = avg speed × time

= $30 \frac{mi}{hr} \times 6$ sec

$30 \frac{mi}{hr} \times 6 \cancel{sec} \times \frac{1hr}{3600 \cancel{sec}}$

$\frac{30 \times 6}{3600}$ mi = .05 miles distance

Activity 1.4 – Big Bruiser
Post Quiz

Name Michael Plasneior

$\frac{14}{14}$

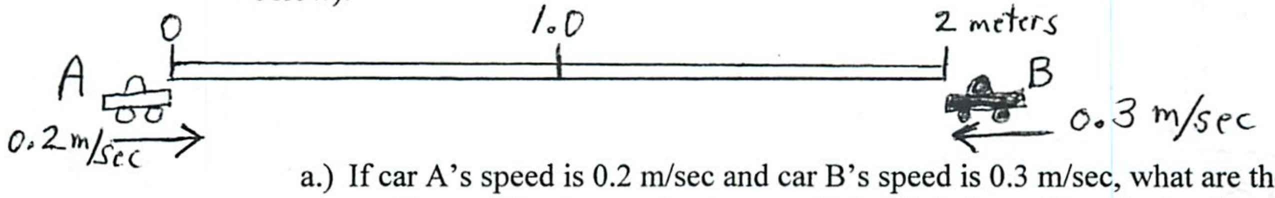
+(2pts) 1. What is average speed?

$\frac{\text{distance}}{\text{time}}$

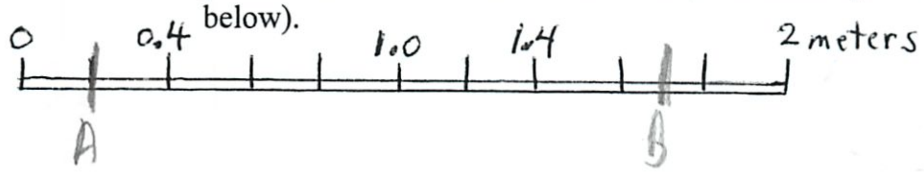
+(2pts) 2. What is instantaneous speed?

Average speed but with a short amount of time (still $\frac{\text{distance}}{\text{time}}$)

3. Two cars, separated by a distance of 2 meters, face each other at a time of 0 seconds and begin moving toward each other at constant speeds (see diagram below).



a.) If car A's speed is 0.2 m/sec and car B's speed is 0.3 m/sec, what are the positions of the 2 cars after 1 second (sketch their positions in the diagram below). +(2pts)



Car A: 0.2 meters Car B: 0.3 meters

b.) Where are the cars after 2 seconds? +(2pts)

Car A: 0.4 meters Car B: 0.6 meters

How to math?

c.) At what position will the cars come together? +(2pts)

They will meet at .8 meters.

d.) How much time in seconds goes by before they meet? 4 seconds +(2pts)

e.) How fast in m/sec are the cars speeding toward each other (in other words, how many meters each second are they closer to each other)? This is their relative speed with each other. +(2pts)

.5 meters/sec

$\frac{.5\text{ m}}{5\text{ sec}}$ closer

Math Way

$$\left(\frac{V_A}{V_B}\right) D_B + D_B = 2m$$

$$\left(\frac{.2m/s}{.3m/s}\right) D_B + D_B = 2m$$

$$\frac{2}{3} D_B + D_B = 2m$$

$$1\tfrac{2}{3} D_B = 2m$$

$$\frac{1\tfrac{2}{3} D_B}{1\tfrac{2}{3}} = \frac{2m}{1\tfrac{2}{3}}$$

$$\boxed{D_B = 1.2m}$$

$$D_A = 2 - D_B$$

$$D_A = 2 - 1.2$$

$$\boxed{D_A = .8m}$$

Activity 1.6 – Acceleration
Pre-Activity Contract

Name Michael Plasmeier

1. What do you believe the purpose of this activity is?

To "see" acceleration graphically w/ the accelometers
To tell how acceleration puts force on an object +
how an object at rest will want to remain at rest

2. List all the equipment you will need to do this activity. water

Pasco car
liquid accelometer
digital "

Clay
pencil
colored pencil
calculartor

100 g mass
200 g macs
string
board for incline

rubber band
polly system
table

3. What should you be careful about when using the liquid accelerometer?

That you don't lay it on it's side or upside down and dump the water out becuse Dr Brown won't be too happy when he has to refill the liquid accelerometer

4. At which numbered steps in your packet will you be observing the demonstration setups?

8, 9, Prior to 14

You will be performing this activity with a partner. Both you and your partner are responsible for returning all of the equipment in the condition you received it. When you are done making observations with your liquid accelerometer, please return all your equipment and begin observing the demonstration setups. You should be working the entire period on this packet. If you have finished observing the demonstrations you should go back to your seat and continue working. You will not be allowed to line up at the door before the bell rings. Anyone who does not follow this instruction will receive an automatic 10 point deduction from this activity. In order to demonstrate that you have read, understand, and will follow these instructions underline the previous two sentences. When you have finished this pre-activity contract sign your name below and present it to your teacher.

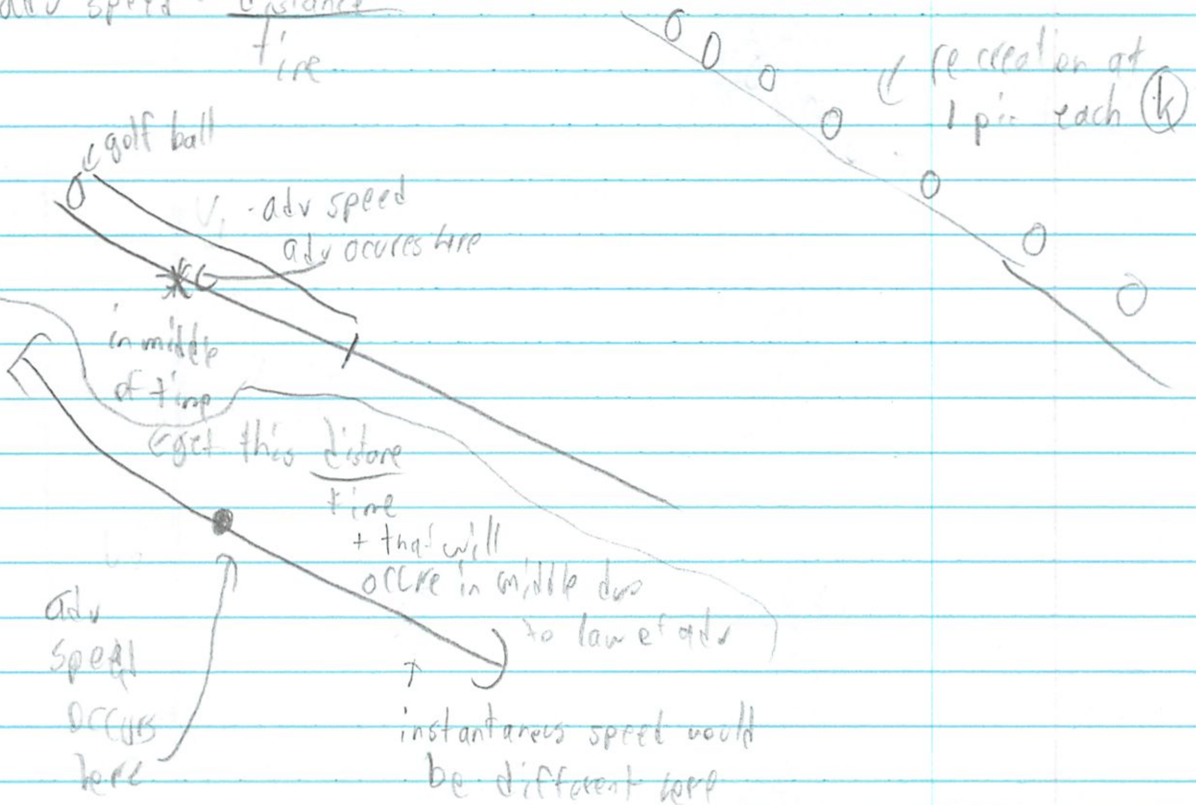
So we are only not allowed to do this for this activity?

Student Michael Plasmeier Teacher DB

Ball Down Ramp

10/26

adv speed = $\frac{\text{distance}}{\text{time}}$



accelaration of gravety

a_g or $g = 10 m/sec^2$ (most places on earth rounded, more exact 9.8 m/sec^2

Gravety is pushing down on an object alwas. It also makes an object fall faster. In a space devoid of air an object falls at 10m/s ~~for~~ the first second, then 20m/s at the 2nd sec point With air pushing up this law does not be true, the less air resestance, the more this law is true. Air restance can be decrease by decreasing the botten facing area.

Does gravety depend on mass? No, as long as there is some mass it will fall the same w/ no air

Pratice
Problem

p662
#24

You drive at 40 km/hr to city + return at 60 km/hr. adv speed.
Find adv speed + why is it not 50 km/hr

When you travel faster, it takes you less time. Let's say the city is 20 km away. Going there takes you 30 min. Comming back takes you 20 minutes. Combie this to

$$\frac{40\text{km}}{50\text{ min}} \quad \times 1.2 \quad \times 1.2$$

48km/hour is his adv speed

$$\text{adv speed} = \frac{2d}{\left(\frac{d}{40} + \frac{d}{60}\right)}$$ Solve w/ vaiible

distrubitive property

$$\text{adv speed} = \frac{2d}{d\left(\frac{1}{40} + \frac{1}{60}\right)}$$

Pratice Problems
Blue Book p661-662

10/24

1. $v = d/t$ = $v = .3m/.01sec$ = $30\ m/s$

2. $v = d/t$ = $v = 50m/10\ sec$ = $V = 5m/s$

3. $v = d/t$ $v = 24m/.5sec$ = $v = 48\ m/s$

4 $v = d/t$ $v = 30km/.5hr$ = $v = 60\ km/hr$

5 $d = v \times t$ = $d = 10\ m/s \times 40\ sec$ = $400\ m$

6. $d = v \times t$ = $d = 10\ km/hr \times .5hr$ = $5km$

7. $a = \frac{V_f - V_i}{\Delta t}$ $a = \frac{50\ km/hr - 0\ km/hr}{10sec}$ $\frac{50\ km/hr}{10\ sec}$ $a = 5\ km/hr/sec$

8. $a = \frac{V_f - V_i}{\Delta t}$ $a = 20\ m/sec/sec$ = $a = 20m/sec^2$

9. $a = \frac{V_f - V_i}{\Delta t}$ = $a = \frac{25m/s - 0\ m/s}{5s}$ $\frac{25m/s}{5\ sec}$ $5m/sec/sec$ &
$5\ m/sec^2$

10. You need to know acceloration which with gravity is alwas $10m/sec^2$

$$\underset{\times 1.5}{10m/sec^2} = \underset{\times 1.5}{\frac{v_f - 0m/s}{1.5sec}} \qquad \boxed{V_f = 15\ m/sec^2}$$

$$15\ m/sec^2 = V_f - 0m/s$$

Over →

11. Same problem, though $g = 20 m/sec^2$ not $10 m/sec^2$

$$20 m/sec^2 = \frac{v_f - 0 m/s}{1.5 sec}$$

×1.5 ×1.5

$$30 m/sec^2 = vf$$

12. $$10 m/sec^2 = \frac{v_f - 0 m/s}{12 sec}$$

×12 ×12

$$120 m/s = vf$$

16. $$10 m/sec^2 = \frac{vf - 0 m/s}{10 sec}$$

first 10 m/s then 20 m/s then 30 m/s … to a 100 m/s

50 m/sec avg speed

×10 sec ×10 sec

$100 m/s = vf$ · Do we have to find each sec + add it

$$v = \frac{1}{2} g t^2 \quad \frac{1}{2}(10 m/s)(10 sec)^2 = 500 sec$$

much better answer

other way

✓ reason, it is wrong when you add it, because at 15 sec it is 15 m/s, so must add every interval

$10 + 20 + 30 + \ldots = 550 sec$

17. 2 m/s

$d = v \times t$

(60 × 60 × 2 × 2)

7200 m/hr × 2 hrs = 14,400 m

? why ×2 ×2

18. m = 1000 mm

3 m = 3000 mm / 1.5 mm = 2000 years

IPS Unit 1.6 - Acceleration

WHAT DO YOU THINK?

- Your mom is driving you to school with a cup of her favorite WaWa blend coffee resting level in the cup holder. Describe the action of the coffee (if any) as she:
  a) Brakes suddenly at a red light. The coffee will slam up to the Front of the car, (An object in motion will want to remain in motion)

  b) Presses the accelerator as she starts the car when the light again turns green.
  The coffee will hit the back of the car. (An object at rest will want to remain at rest) The faster she accelerates, the higher the coffee goes.
- What does it mean to accelerate?
  To change velocity (weather speed or direction) (in our cause only speed)

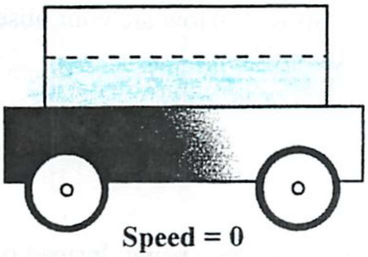
FOR YOU TO DO

1. In this activity, you will use an "accelerometer," a device for measuring acceleration. There are many kinds of accelerometers, we will use a liquid accelerometer. With your team, explore how your accelerometer works by holding it in your hands and observing the surface of the liquid.
   (a) Can you get the liquid in the accelerometer to slant one way or the other while keeping the accelerometer level?
   Slide it back and forth on the cart or back + forth in your hands

   (b) What do you need to do to get the liquid to slant?
   You have to change it's speed (accelaratte)

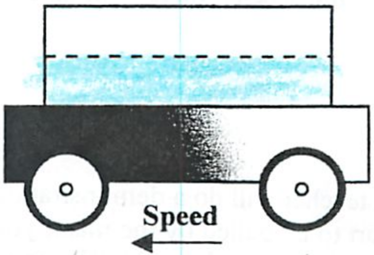
2. Mount the accelerometer on a cart. Make sure that the cart rolls freely with minimal friction. Place a rubber band around the liquid accelerometer just below the level of the liquid, so that it is easier to see changes in the surface of the liquid. The arrows below each sketch show the direction that the cart is moving.

3. What is the behavior of the liquid when the cart is not moving? Color in the liquid accelerometer to show the position of the liquid.



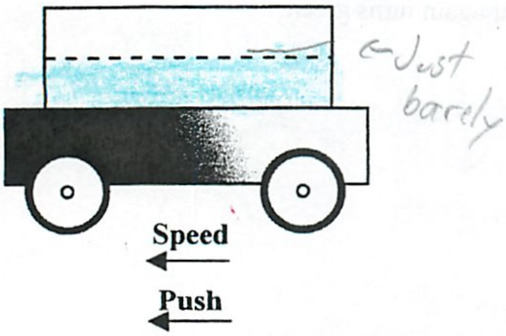
Speed = 0

4. Give the cart a gentle push to the left and let the cart coast at nearly constant speed. Now concentrate on the liquid surface **after you <u>stop</u> pushing the cart**, and **<u>while</u> it is coasting** across the table. (Be careful to ignore any "sloshing" of the liquid and focus your observations on the general slope of the water surface.) Color the position of the water in the liquid accelerometer. How does the behavior of the liquid in this case compare with the case where the cart was at rest?

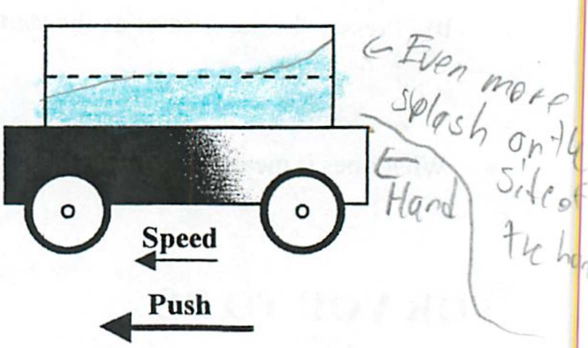


If going at a constant speed, liquid is flat, it must be accelorating to change

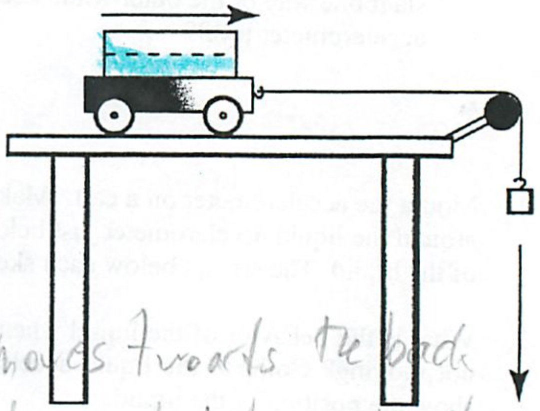
5. Give the cart a slow continuous push to the left so that the cart speeds up. Describe the behavior of the liquid **during the time you are pushing on the cart and the cart is speeding up.** Color the position of the water in the liquid accelerometer.



6. Give the cart a slightly harder constant push to the left. Again describe the behavior of the liquid **during the time you are pushing on the cart and the cart is speeding up.** Compare the position of the liquid in this trial with the position of the liquid in step #5. Color the position of the water in the liquid accelerometer.



7. Did you find it difficult to maintain a constant push? You can achieve a constant push (or pull) by using a simple pulley mechanism.
Set up the system as shown to the right. 50g 150g



(a) Attach a ~~100~~-g. mass to the weight hanger. Allow the mass to fall. What does the accelerometer tell you about the cart's motion (i.e., is the cart speeding up? Slowing down? Moving at a constant speed?) Cite evidence from your accelerometer to support your answer.

The car is speeding up. The liquid moves twoards the back because the liquid wants to remain at rest. When we stop it from crashing over the table, much more liquid comes to the front because it wants to remain in motion

(b) Now, attach a ~~200~~ 150 -g. mass to the weight hanger. 50 g Repeat Step A (above). How are your observations of the accelerometer similar to the previous step? How are they different?

The motions were the same, but more liquid moved higher and the car went faster

8. Your teacher will do a demonstration with a pulley system similar to what you were using. Instead of just allowing the cart to be pulled by the mass, your teacher will give the cart a quick push to the left. The mass will still be pulling the cart to the right. The cart, after being pushed, will be moving to the left, slow down, change directions and start moving to the right. Based on this, fill in the chart below- make your predictions before the actual trial.

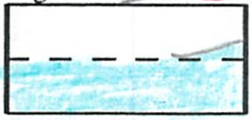
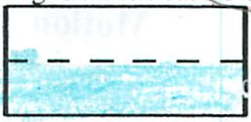
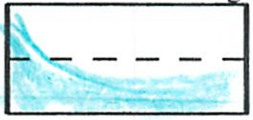
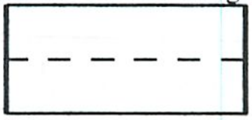
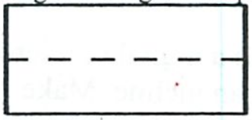
If the car moves left, the force pushing is on the right, water moves towards the force, water moves to the right

left = positive speed

0Ⓜ → 5Ⓜ = 5Ⓜ change

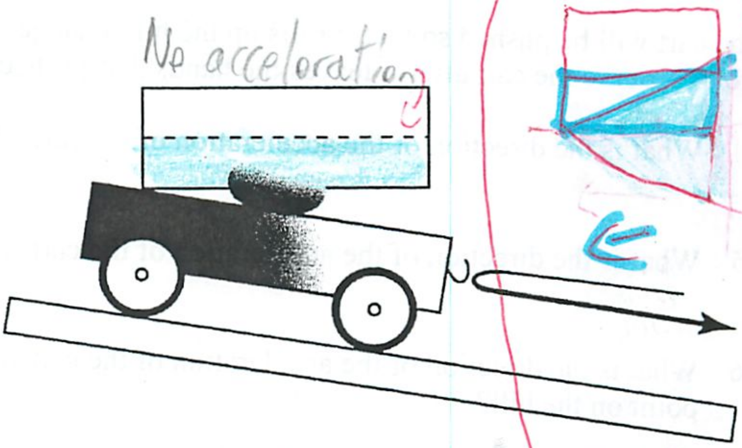
Very big sudden change going from 5Ⓜ to -10Ⓜ change = 15Ⓜ/1sec

The faster the change, the higher the water goes

Your prediction of what the liquid in the accelerometer will look like:	What the liquid in the accelerometer actually looks like:
When moving to the left but ~~slowing down~~ 5Ⓜ 	When moving to the left but slowing down ← Even or a bit on the right 
Just at the moment the cart changes directions → 	Just at the moment the cart changes directions → 
When moving to the right and speeding up -10Ⓜ → -15Ⓜ 5Ⓜ/sec  → 10Ⓜ	When moving to the right and speeding up → 

9. Your teacher will also do this as a demonstration. Make a gradual incline with a board on the table. Mount the accelerometer on the cart so the accelerometer is **level** when the cart is on the incline. Give the cart a quick smooth push up the incline, allowing the cart to initially roll up the ramp, slow down, change directions, then roll down the ramp.

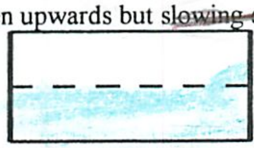
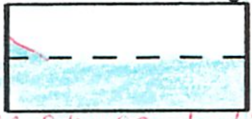
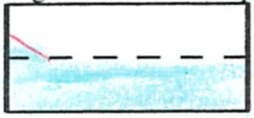
No acceleration



water makes like an arrow showing where it is moving

A) As you previously did, make a prediction about how the liquid in the accelerometer will look at various times. Draw your predictions in the left hand side of the table below, before your teacher does the demonstration

B) Describe the behavior of the liquid as the car is rolling down the incline. Draw how the liquid in the accelerometer actually looks on the right hand side of the table.

Your prediction of what the liquid in the accelerometer will look like:	What the liquid in the accelerometer actually looks like:
When upwards but ~~slowing down~~ — I forgot again  ← Direction	When upwards but slowing down 
Just at the moment the cart changes directions  Big change = Big wave	Just at the moment the cart changes directions Because slowing down liquid doesn't really change, even acceleration 
When moving downwards and speeding up  → Direction	When moving downwards and speeding up 

Same thing as above

here goes, then changes direction

faster it is accelerating, bigger hill

if moving left is positive speed

Speed ←

0 +1 +2 +3 +4 +5

-1 -2 -2 -4 -6 -8 -16

pretty much same steady - speed in ← direction, so liquid goes

10. Classify each trial (from steps 3,4,5,6,7 and 9) in the following types of motion. List the numbers in the space provided:

Constant speed- Non-accelerated motion	**Accelerated Motion**
3,4	7,9 5,6

flat line

line moved to side

11. In your own words, what is acceleration?

Change in speed

12. How can we use an accelerometer to determine if something is accelerating?

If the water does not meet the rubber band, something is accolrating

13. What does it mean if the slope of the liquid in the accelerometer is steeper than previously observed?

The acceloration is faster

Your teacher will place a digital accelerometer on a Pasco cart that is free to roll up or down a Pasco track that is placed on an incline. Make sure your teacher demonstrates how the digital accelerometer works.

The cart will be pushed so that it rolls up the hill, changes direction, and then rolls down the hill. You are to observe the cart after it leaves the hands that pushed it so that it rolls freely up the hill.

14. What is the direction of the acceleration of the cart when it is rolling down the hill?

Right

15. What is the direction of the acceleration of the cart when it is rolling up the hill? Can't tell, if accelorating

~~Left~~ Right.

It is slowing down

See

16. What is the direction of the acceleration of the cart when it is changing direction at the highest point on the hill? Right

17. Look closely at the LED's (little lights) on the digital accelerometer. The cart will be pushed again so it rolls freely up the hill, changes direction, and rolls down the hill.

a) How do the lights change as the cart rolls along (from release until returning)?

b) What does this tell you about the acceleration of the cart?

c) Where is the acceleration the greatest?

IPS Unit 1.6 - Liquid Accelerometer Summary

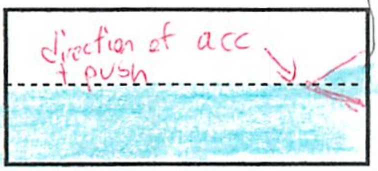
Draw the liquid and draw an arrow that shows the direction of the acceleration

A. Moving right and slowing down

water wants to remain at constant speed, forced to slow down

A

L

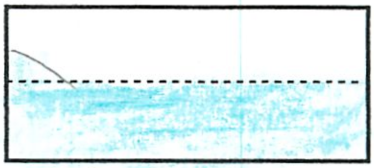


Push: ←

— Acceleration: −Acc ~~→~~ ←

B. Moving right and speeding up.

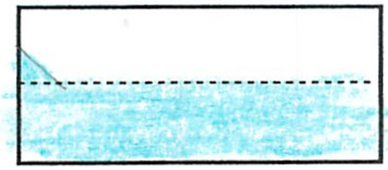
forced to speed up



Push: →

\+ Acceleration: +Acc ~~←~~ →

C. Moving left and slowing down

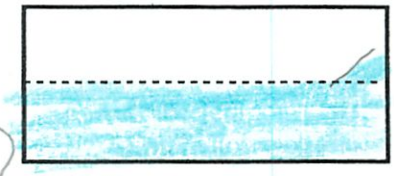


Push: →

— Acceleration: → ~~←~~

Acc is in direction of water

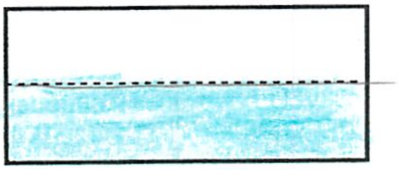
D. Moving left and speeding up.



Push: ←

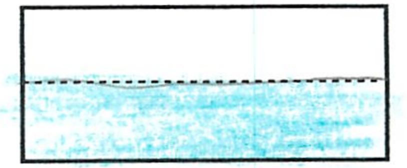
\+ Acceleration: ~~→~~ ←

E. Moving left at constant speed



Acceleration: No Acc

F. Moving left at faster constant speed



Acceleration: No Acc

water points to acc

ACC is direction opposit to water + same direction as push

Water points to direction moving when accelerating

When dropping, water stays down because gravity is pushing frame + liquid, normally when you push, you push only the frame

Jeff Hall + Michael Plasmeier
Dr. Brown
IPS-H 2A
10/28/05

15/15

Accelerometer

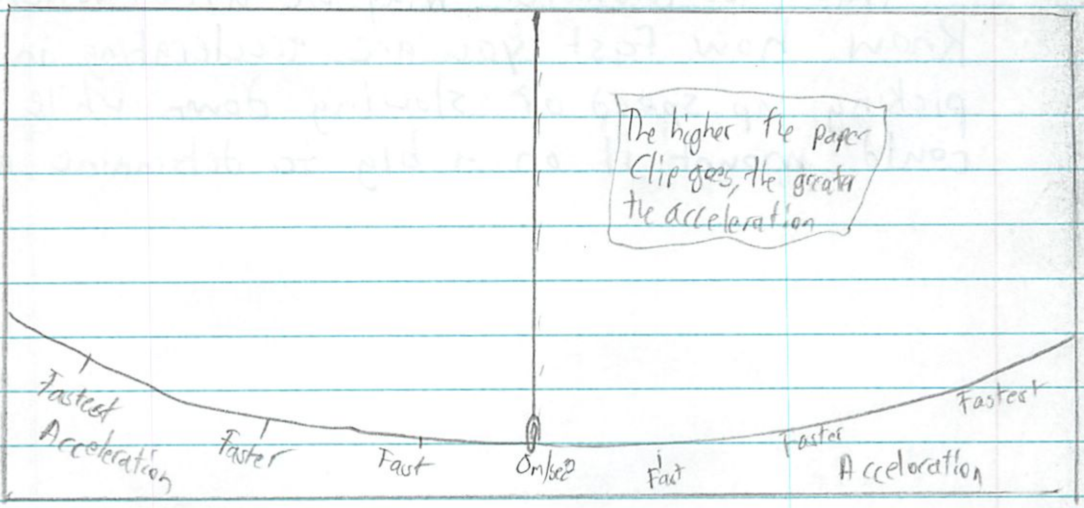
I. Introduction

We created our own accelerometer to measure acceleratio
We didn't find the project very difficult to set up or do.

II Materials

We used paper because we can write on it and it's lightweight. Posterboard was taped onto the back to make it sturdier and so it will stay on. We used fishing line because it was thin and moved easily. A paperclip was attached to the dangling end because it gave the string weight but wasn't too heavy. We taped the string so the paperclip wouldn't come off. We used Plasmeier's special pens so the words could be seen from far away and would look appealing.

III. Schematic



IV To operate this device, hold it level against hip. You may want to hold the device at an angle so that the paper clip can swing freely because it is not touching the paper. Before walking, check to make sure that you have a clear level surface. Make sure that there are no objects on the ground. Put on your safty glasses and have a loved one make sure the area is clear. Inspect the saftey glasses for any cracks or damages. If the the saftey glasses are damonged DO NOT USE + DO NOT RETURN DEVICE TO PLACE OF PURCHASE. Instead call to have a replacment saftey glasses shipped to your house for $20.00 + S+H. Before using device check recall.gov for any recalls for this product then call your lawer and sign the below statement of release of rights. Once you have signed this you may begin walking. Do not look at the accelermater while walking. Instead have a friend (w/ saftey glasses) read the accelerameter for you. The higher the paper clip goes, the faster you are accelerating. The paper clip will rise in the direction other then the direction of acceleration. Never look at the accelerameter while moving. Never drink + drive. Always observe the rules of the road. Do not operate while under the influence of alcohol. Always keep your eyes on the ground

II Possible uses

This accelerometer may be used when you need to know how fast you are accelerating in a race or just picking up speed or slowing down while walking. You could mount it on a big to determine acceleration too.

23/23

11/3

Name: Michael Plasmeier

What is your favorite candy? Reeces' Peanut Butter Cups

Unit1.6 Quiz

+8

1. Your mom wants to get a new car and wants to get one with the best possible acceleration. She test drives 3 cars. The Porsche goes from 0 to 30 m/s in 6.5 s. The Ferrari goes from 0 to 40 m/s in 8.2 s. The Hyundai goes from 0 to 20 m/s in 3.7 s. (2 points for each answer)

A) What is the acceleration of each car?

Porshch $\frac{30 m/s - 0 m/s}{6.5 sec} = 4.615 m/sec^2$

Ferrari: $\frac{40 m/s - 0 m/s}{8.2 sec} = 4.87 m/sec^2$

Hyundai $\frac{20 m/s - 0 m/s}{3.7 sec} = 5.40 m/sec^2$

B) The Ferrari goes from 0 to 40 m/s in 8.2 s. It goes from 40 m/s to 60 m/s in 7.3 s. What is its acceleration from 40 m/s to 60 m/s?

$\frac{60 m/s - 40 m/s}{7.3 sec}$ $\frac{20 m/s}{7.3 sec} =$

$2.73 m/sec^2$

+3

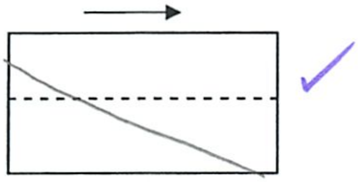
2. You go to a race track where cars on the straight away are traveling at a whopping speed of 130 miles per hour for the whole straight away! How much are these cars accelerating? Explain why. (3 points)

0 m/sec/sec. If the cars start at 130 miles per hour and keep a constant speed for the entire straight away, they do not change speed or accelorate.

+12

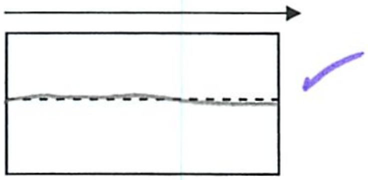
3. You are in a car that has a liquid accelerometer in it. For each of the following situations draw what the liquid in the accelerometer will look like: (2 points each)

A car speeding up to the right

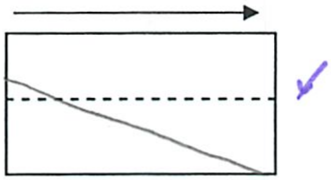


steady

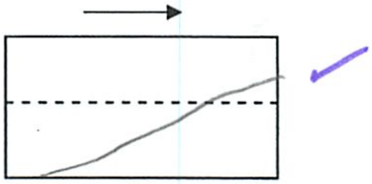
A car traveling at 60 mph to the right



A car speeding up to the right faster than above

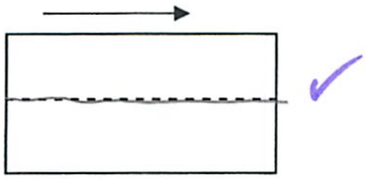


A car traveling to the right but slowing down

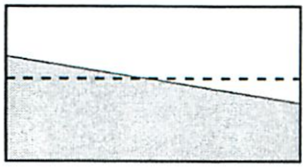


Steady

A car traveling at 30 mph to the right



✓ The following is a picture of an accelerometer :



It could be:

A) speeding up to the right
B) traveling to the left, but slowing down
[✓ C) Both of the above]
D) Neither of the above
E) Not enough information to tell

Vocab: perfect curve = parabola

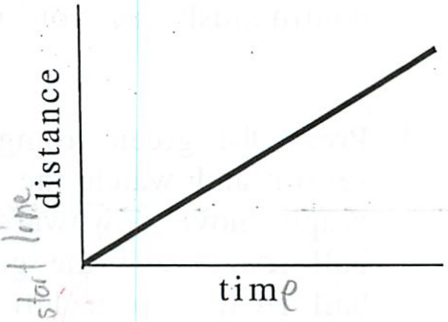
DB

IPS Unit 1.5 - Motion Sensor.

Name Michael Plasmeier

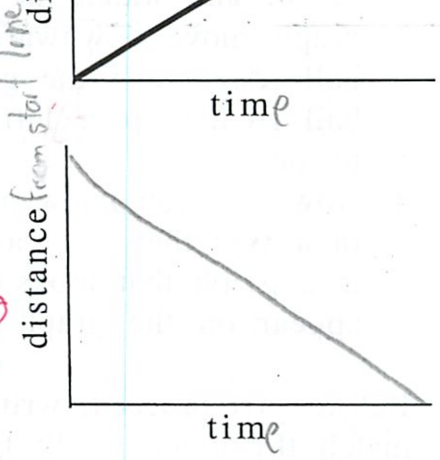
WHAT DO YOU THINK?

We learned that when an object moves away from the starting line at a constant speed that the distance vs. time graph looks like the one pictured at the right.



In the graph grid at the right, sketch the graph of an object that starts away from the starting line and move towards the starting line. The object moves at a constant speed.

distance is reletive

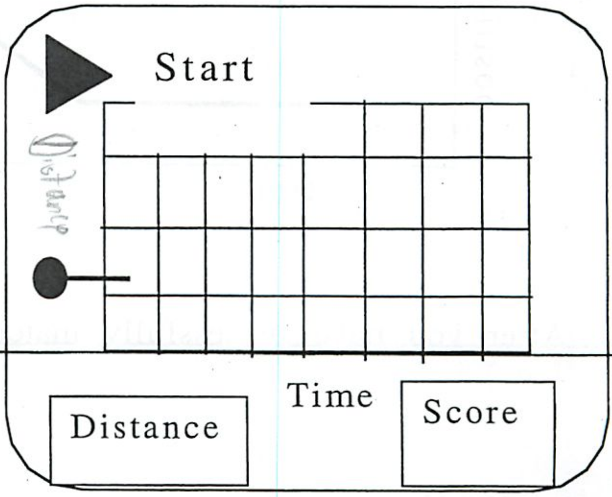


FOR YOU TO DO

DO NOT PLUG THE MOTION SENSOR INTO THE COMPUTER.

1. On the computers in the science lab (room 357 or any of the iMac computers) log in as you would on any computer in the school. Make sure you use the proper server.
2. Pick up the motion sensor and make sure the switch on the top is set on the "people" or "long range" position. Place the motion sensor on the edge of the counter so it points horizontally out so that you can walk a distance of about two meters in front of it. Plug the motion sensor into one of the USB ports on the computer. A prompt should appear and read, "I found a new sensor. How would you like to use it?" Click on the EZ-SCREEN, which is a green triangle ▶ in the lower left corner of the screen.

A blank graph should appear on the computer screen that looks a little like what is shown at the right.



- In the upper left hand corner of the screen is a green triangle ▶ that will start the program running.
- Below that is a red ball and line ●— that will move up as you move away from the motion sensor and down as you move closer to the sensor.
- In the bottom left corner of the screen is a box that will tell you the distance from you to the motion sensor.

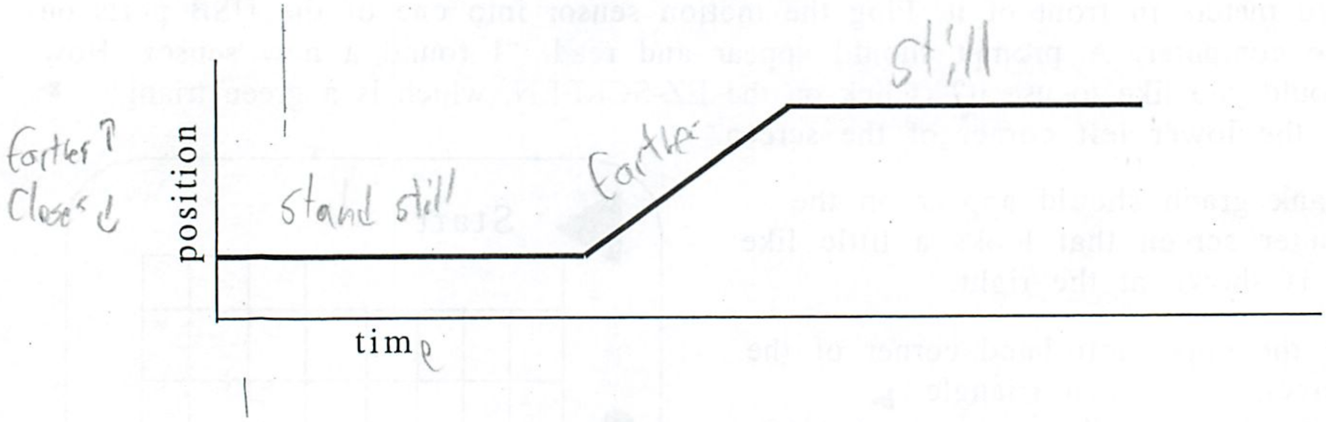
- In the bottom right hand corner is another box that will give you a score.
- The graph in the middle will record your distance from the motion sensor continuously as you move.

3. Press the green triangle ▶ to start the program. Walk towards the motion sensor and watch the red ball move down the screen and the line on the graph move downward. Walk forward and backward and watch how the red ball moves and the graph changes. To stop the program click on the large red ball in the upper left hand corner of the screen where the green triangle used to be.
4. Now that you know a little how this program works. Let's see if you can walk in a way that you can match a given graph. On the bottom right of the screen is a graph that looks like the one below. Click on it and the graph should appear on the graph grid.

Before you proceed, write on the graph below, how you will move to try to match the graph (walk fast or slow, stand still; move towards or move away from the motion sensor) .

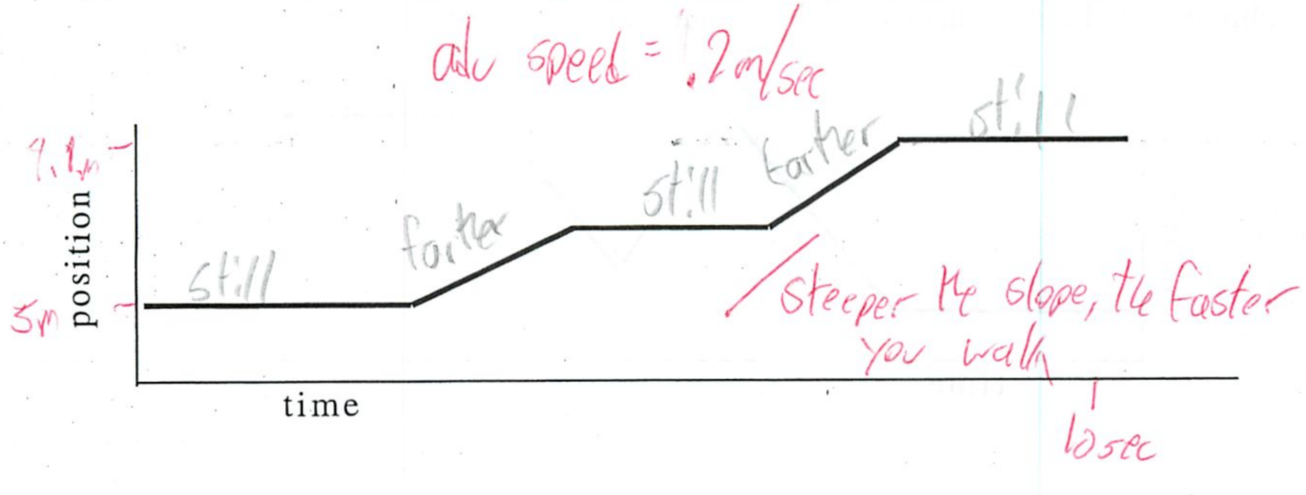
When you click on the green triangle there is a countdown until the graph starts recording your motion. During this time you can look at the red position ball ● and move until it lines up with the start of the graph. After the countdown your position will be recorded on the graph.

The score that is recorded in the lower right corner of the screen tells how well you matched the graph. Let the teacher know if you recorded a score of 90% or above on your first attempt. Maybe you can get a bonus.

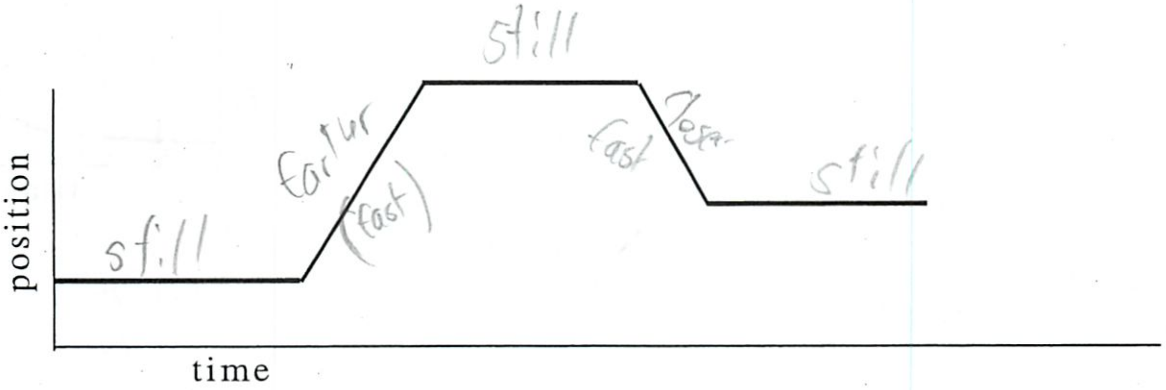


After you have successfully matched this graph, try one of the next graphs.

5. Click on the graph shown below. Use the same procedure to try to match this graph. Remember to write how you will walk before you try it. That way you have a better chance of being successful on your first attempt.

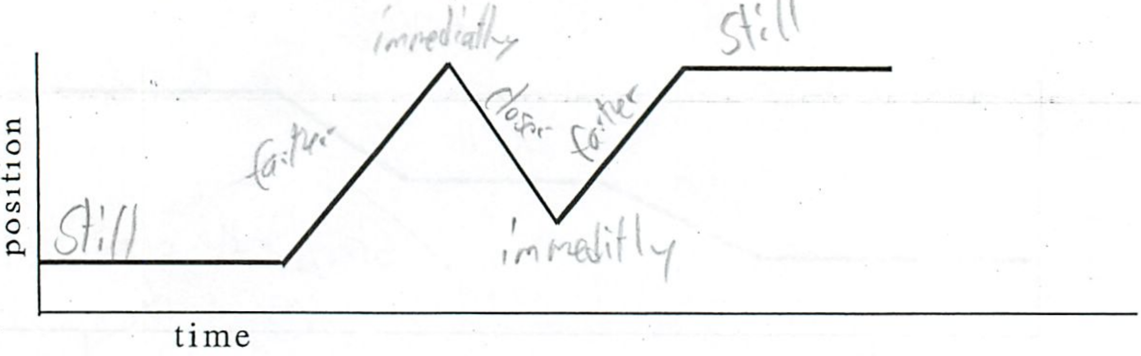


6. Click on the next graph that is shown below. Use the same procedure to try to match this graph. Remember to write how you will walk before you try it. That way you have a better chance of being successful on your first attempt.



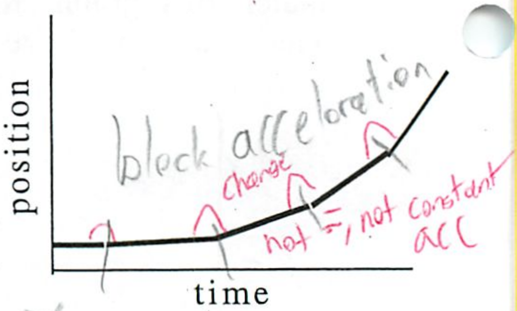
7. One last chance, click on the next graph that is shown below. This one is a little harder. Use the same procedure to try to match this graph. Remember to write how you will walk before you try it. That way you have a better chance of being successful on your first attempt.

-Slope = walk closer



Sorry, that is all the preprogrammed graphs that we have. Click on the running man that is pictured next to all the graphs that you have been trying to match. Now you should have a blank graph.

8. How would you walk to get a graph like the one shown at the right?

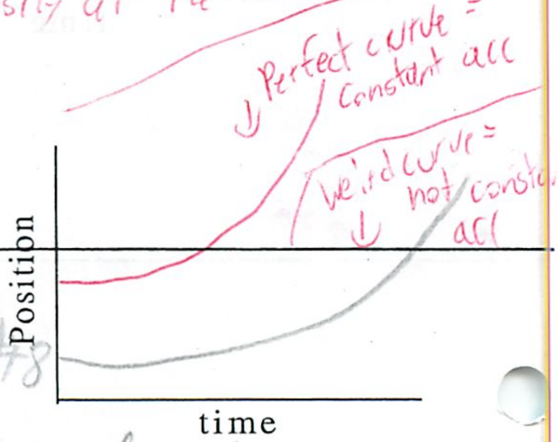


You start out still and then Speed up. You don't speed up smoothly you only change speed at Certain points. Still you accelorate as you move back.

Constant acc = The speed changes continusily at the same rate

* The rate of acceleration changes

9. The graph in #8 is a series of straight lines that have steeper and steeper slopes. How would walk to make the graph a smooth curve? Draw the smooth curve on the graph grid at the right. Try to match it.



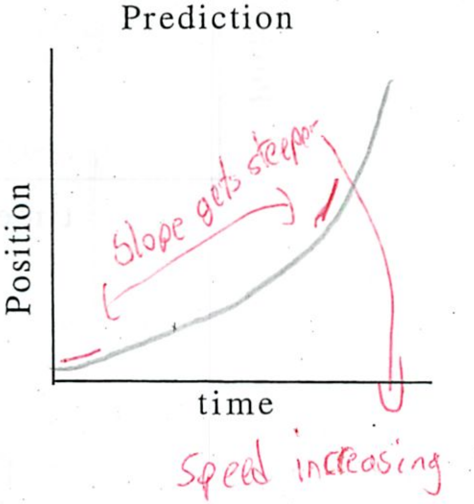
You would do the same as #8 except you would alwas be accelorating

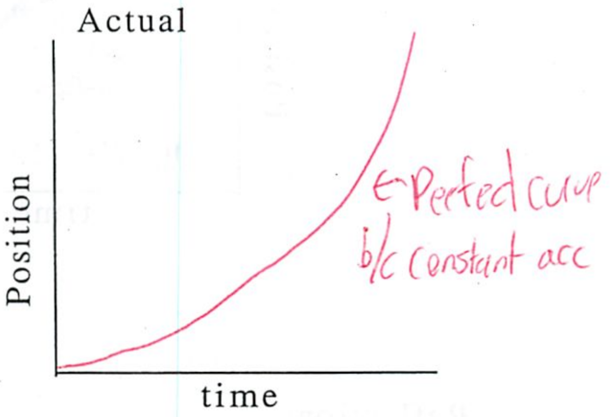
If the curve is perfectly smooth, you have constant acc

Your teacher may do this next set as a demonstration. Set the switch on the motion sensor for a "short range."

10. The motion sensor clips on the end of the Pasco tracks. Place the sensor on one end of the track and place a block of wood under the same end of the track. On the graph at the left below, predict what the graph will look like when the car rolls down the hill away from the sensor.

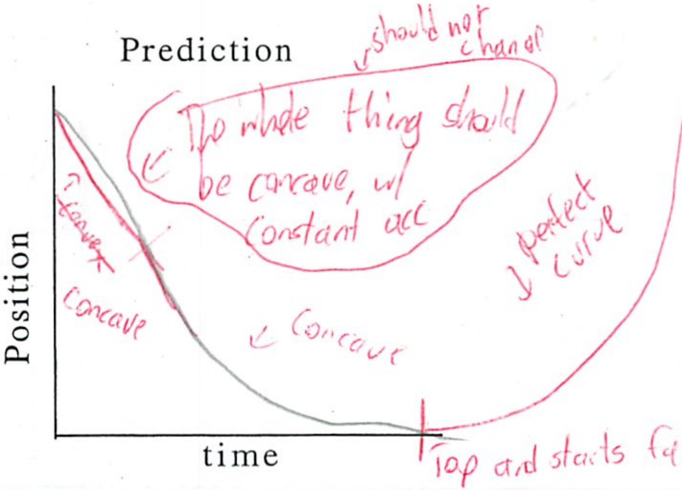
Press the start button and release the cart so it rolls down the track. On the graph at the right, sketch the actual shape of the graph.

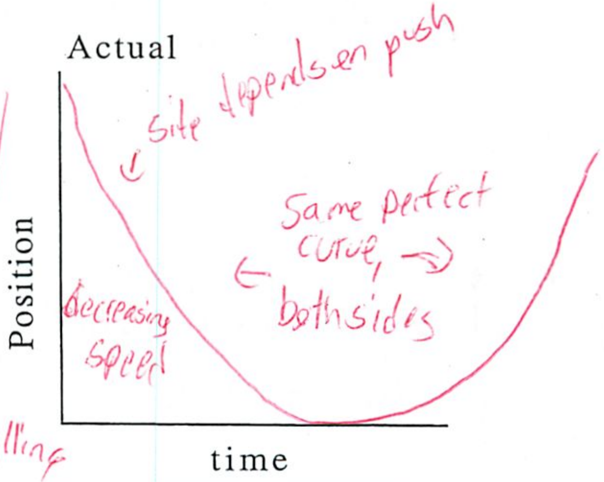


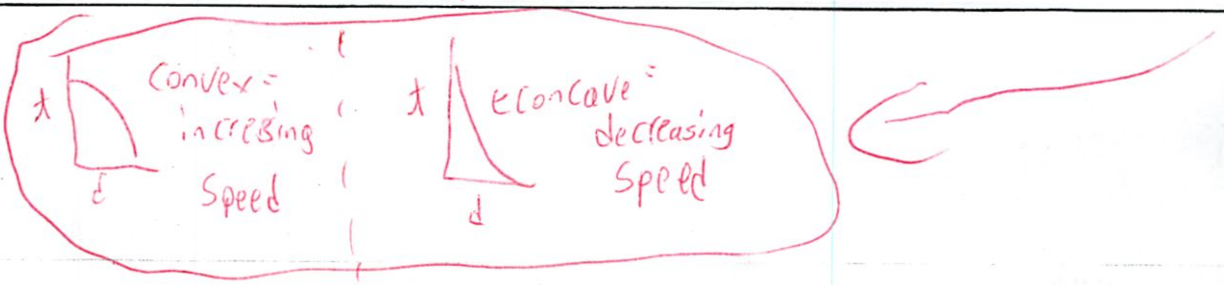


how hard a push?

11. Use the same track setup but this time give the cart a push so that it rolls up the hill towards the sensor. On the graph at the left below, predict what the graph will look like when the car rolls up the hill towards the sensor.

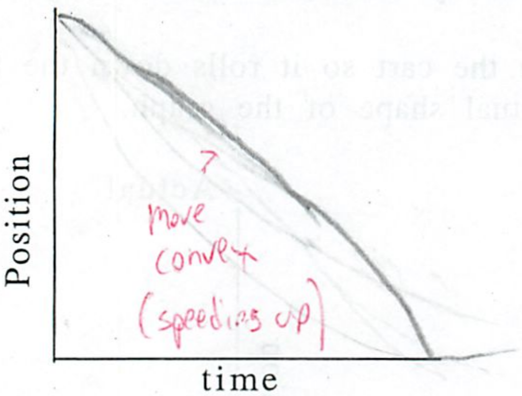




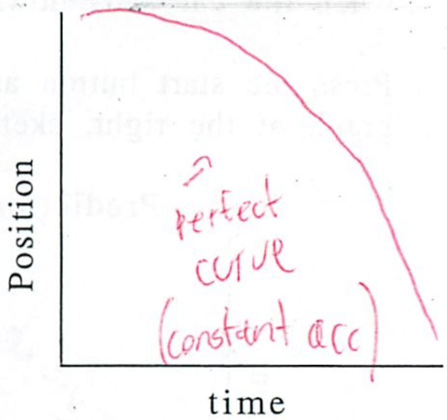


12. Use the same track setup but this time place the motion sensor at the bottom of the hill facing up the hill. Release the cart at the top of the hill so that it rolls down the hill towards the sensor. CATCH THE CART BEFORE IT REACHES THE SENSOR. On the graph at the left below, predict what the graph will look like when the car rolls down the hill towards the sensor.

Prediction

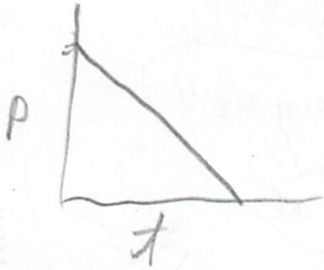


Actual

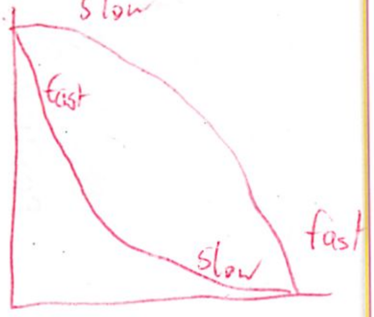


Reflection:

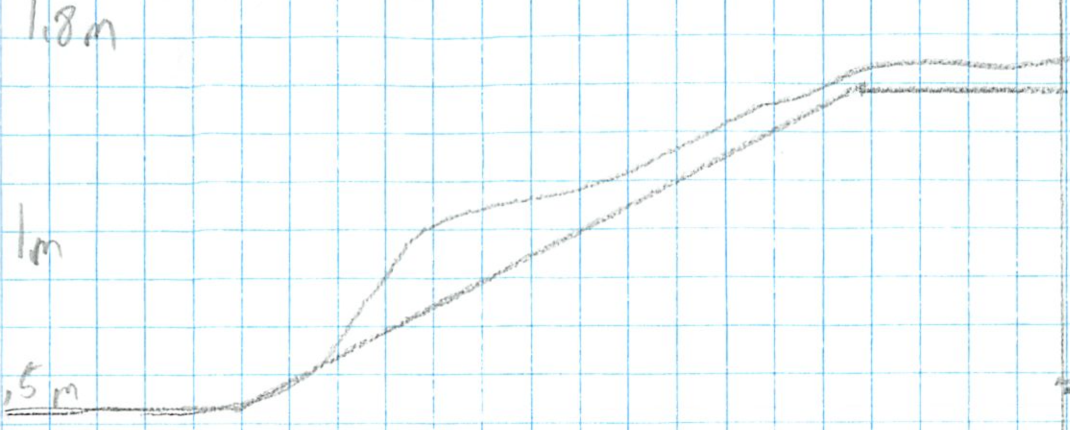
I was correct. If someting starts away from a position and then moves closer relative to the position at a constant spe (no acceloration) then the line will look like this:



1. Where does it start reletive to sensor?
2. How fast (reletive) is it going at start?
3. " " " " " " " end?



#1

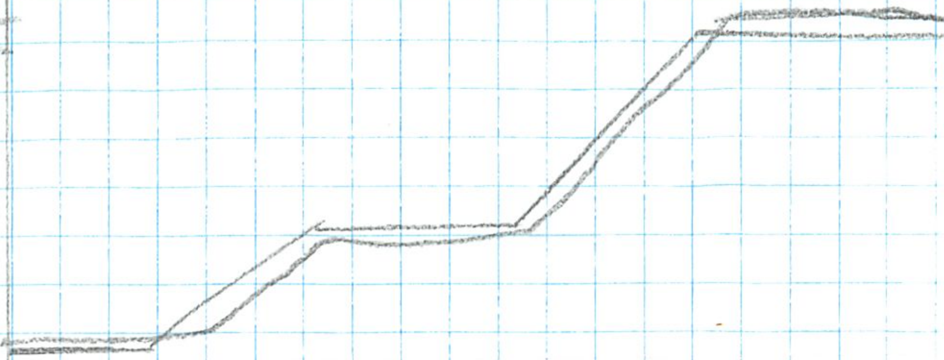


Distance

Michael Plasmeier

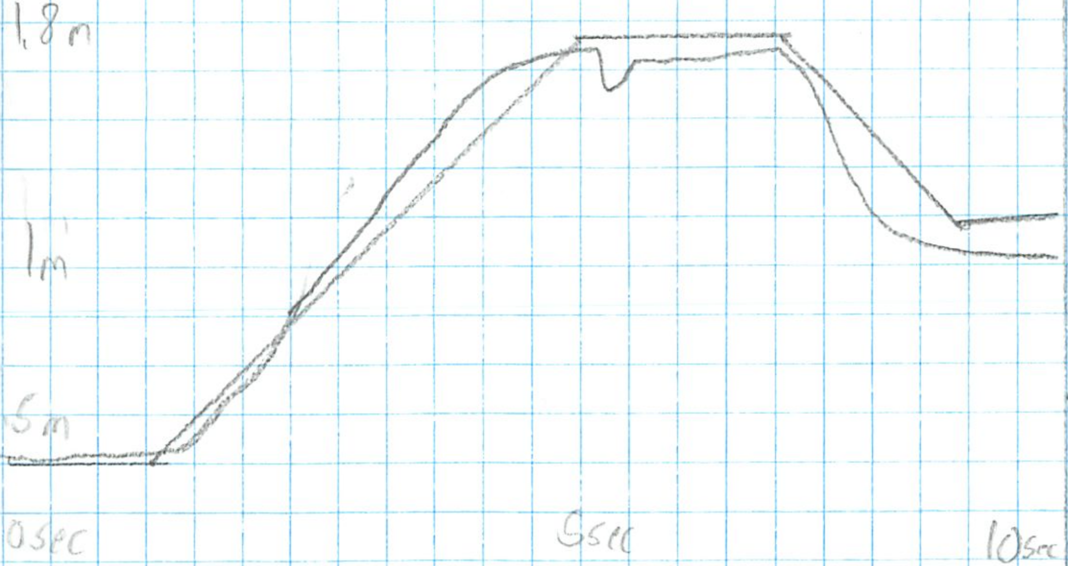
92.8

#2



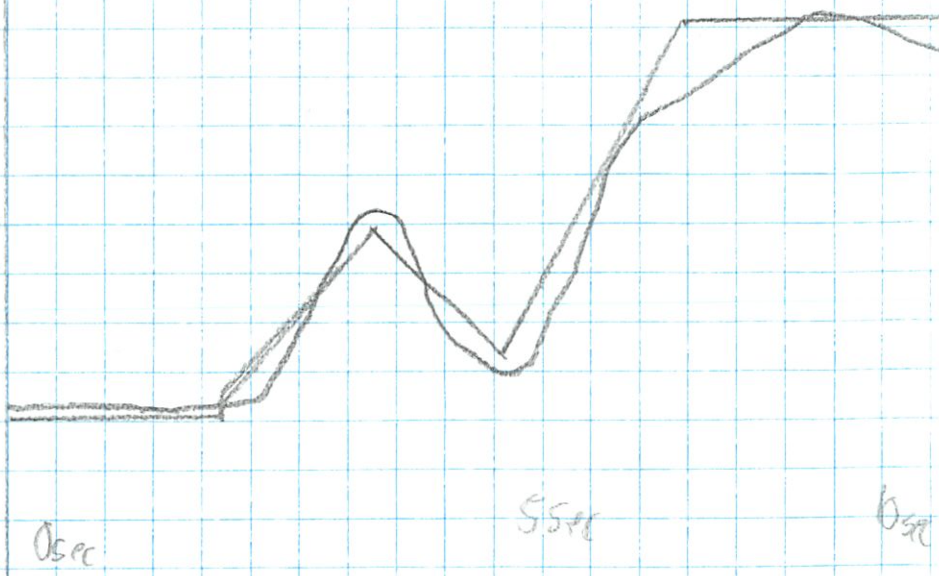
95.2

#3



94.1

#4



94.2

Michael Plasmeier

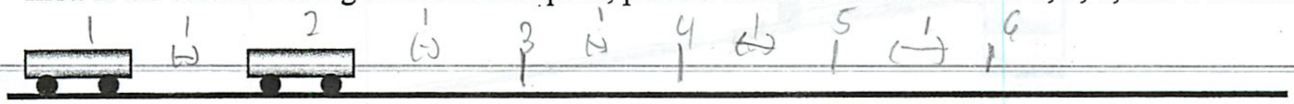
15/15

IPS Unit 1.7 - Ticker Tape and Strobe Studies

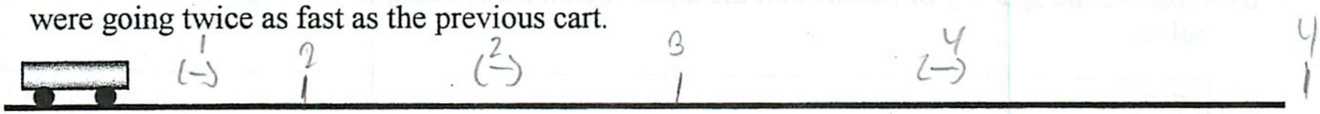
WHAT DO YOU THINK?

- The cart pictured below started at the far left. A second later it was at the position to the right of the first. If the cart is moving at a constant speed, picture where it would be after 2, 3, 4, and 5 seconds.

Constant



- The same cart started at the position shown. Sketch where it would be after 2, 3, and four seconds if it were going twice as fast as the previous cart.



- The ball pictured below started at the far left. A second later it was at the position to the right of the first. If the ball is speeding up, picture where it would be after 2, 3, 4, and 5 seconds.

FOR YOU TO DO.

1. a) Your teacher will show you how to use the ticker-tape timers for this lab. Make sure you see and understand how to put the little carbon disks on the peg and the tape in the timer. Remember that the tape has to be against the carbon side of the disk. I suggest that you put the carbon disk on the peg with the carbon side up and then run the tape through the clips and over the carbon disk. This is different than the drawing in the book (Activity 3)!
   b) Thread a piece of paper about half (1/2) a meter long in the timer and attach the other end to a Pasco cart.
   c) Turn on the timer and try to pull the cart along the track away from the timer at a constant speed so that the tape pulls completely through the timer.

2. a) Examine the pattern of dots that the timer makes on the tape. The timer makes dots at equal time intervals. That is, the timer makes sixty dots in a second so the time between each dot is the same or 1/60 of a second. What do you notice about the distance between the dots?

   They shold be the same distance between dots

   b) Does it make sense that the distance between one dot and the next is the distance the cart traveled in 1/60 of a second?

   Yes

   c) Is the spacing between the dots about the same all along the tape, or does the spacing vary?

   It should not, if going at constant speed, but human error

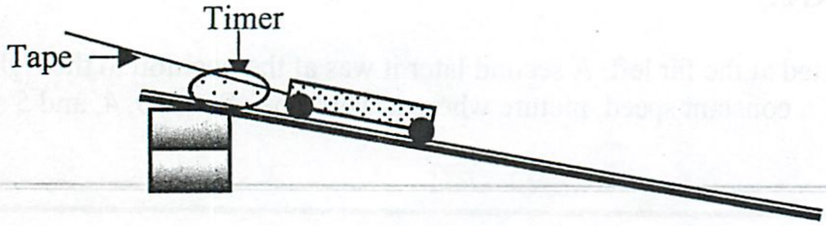
   d) What does it mean about the motion of the cart if the spacing between the dots is the same?

   Constant Speed

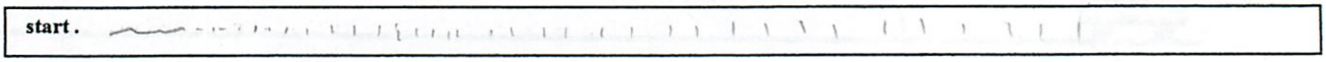
   e) What does it mean about the motion of the cart if the spacing between dots varies?

   The car is changing speed (accelerating)

3. a) Place a block or two under the beginning end of the track as shown below. Cut another piece of tape about 70 cm long, feed it through the timer and attach the end to a Pasco cart. Turn on the timer and let the cart roll down the ramp so that it pulls the tape behind it.



b) Observe the spacing of the dots on the tape. Sketch the spacing of the dots on the sketch of the tape below.



What was the motion of the cart?

It was accelorating as it went down the hill

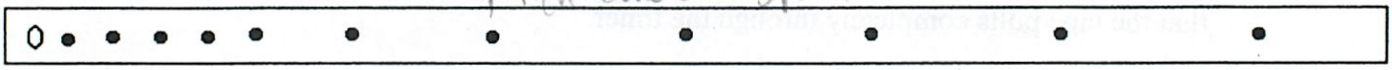
Describe the spacing of the dots.

The spacing between the dots increased as the car got faster

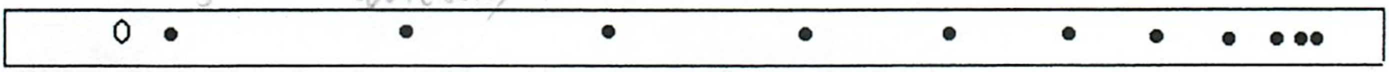
4. The ticker tapes are of carts rolling along a track. In each case describe the motion of the cart with a complete sentence or two. Does the cart speed up, slow down, move at a constant speed, or a combination of motions?

a) Constant speed

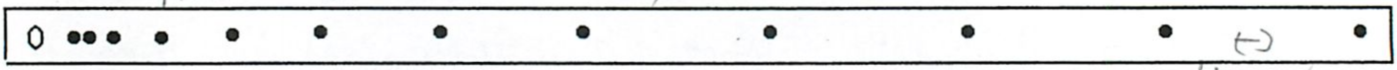
b) acc pretty fast then constant speed



c) Slowing down quickly



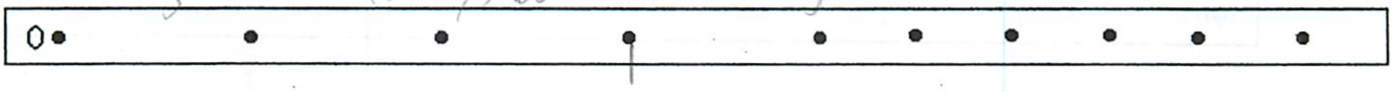
d) stopped then acc quickly



biggest gap =
biggest spe

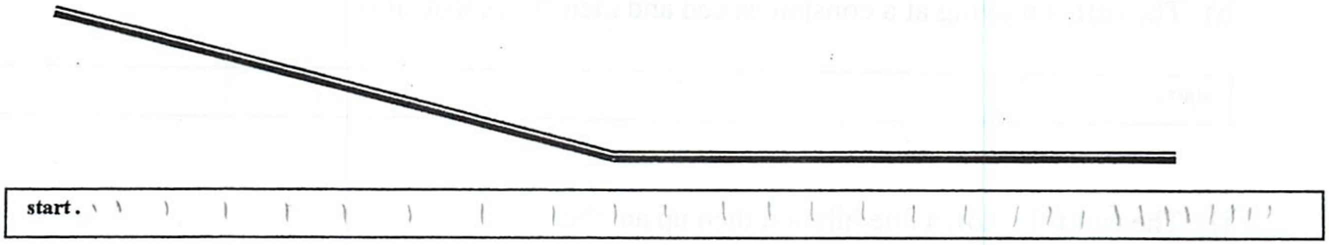
$$\text{Speed} = \frac{\text{distance}}{\text{between}} \qquad \text{acc} = \frac{\boxed{\text{change}}\text{ in distance}}{\text{between}}$$

Constant speed 1st, then
e) slowing down slowly, but still moving

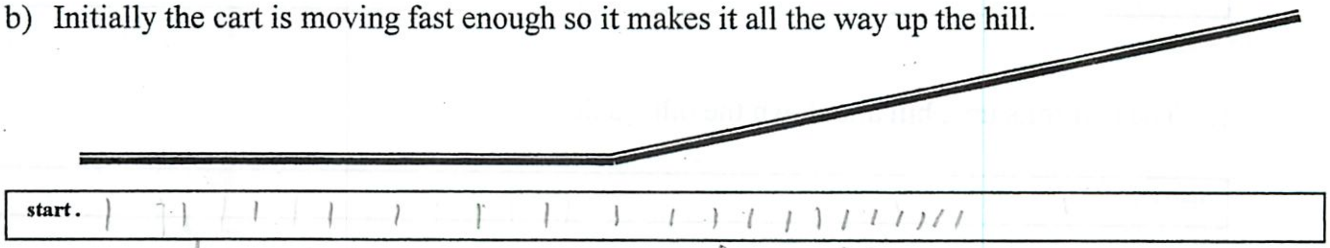


5. Use the tapes shown in #4 above to answer the following questions.
   a) Which one(s) shows the cart moving at a constant speed? a · b 1st part of the time
   b) Which one(s) shows the cart speeding up the whole time? d
   c) Which one(s) could be of a cart going downhill the whole time? d
   d) Which one(s) shows the cart slowing down the whole time? c
   e) Which one shows the fastest speed during any part of its trip? d
   f) Which one shows the fastest initial speed? c
   g) Which one shows the fastest final speed? d

6. Draw what the ticker tape would look like in each of the following cases if the cart started at the left.
   a) The cart starts at rest at the top of the hill.

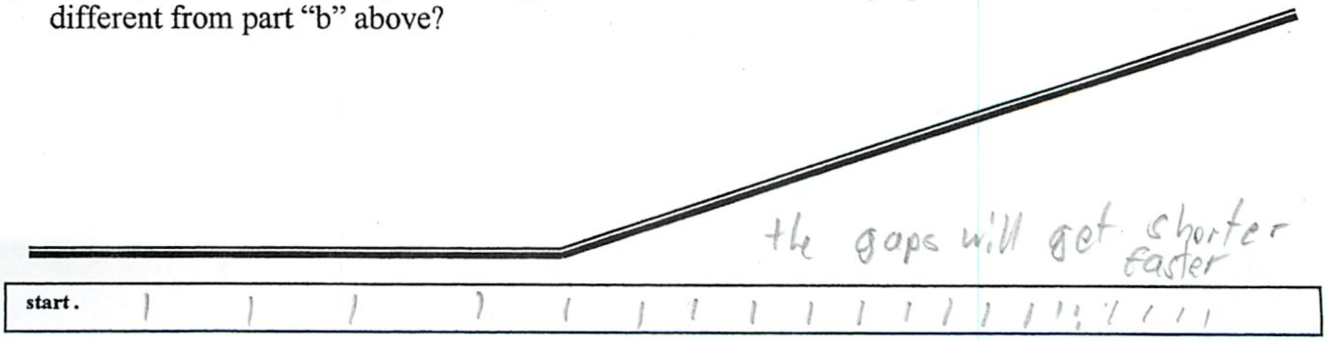


   b) Initially the cart is moving fast enough so it makes it all the way up the hill.



dcc slowly dcc quicker

   c) Initially the cart is moving fast enough so it makes it all the way up the hill. How will this be different from part "b" above?

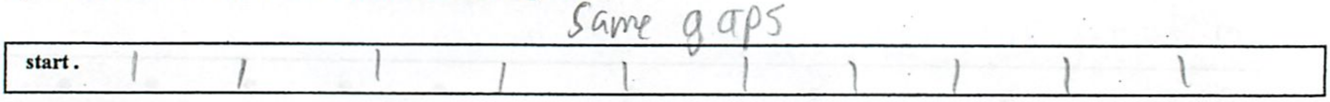


the gaps will get shorter faster

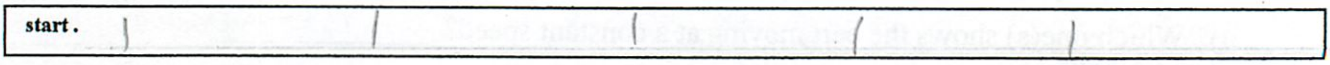
gaps longer here

d) The carts moves at a constant slow speed.

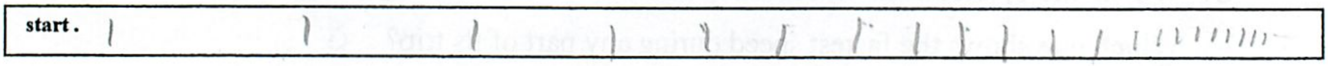
Same gaps



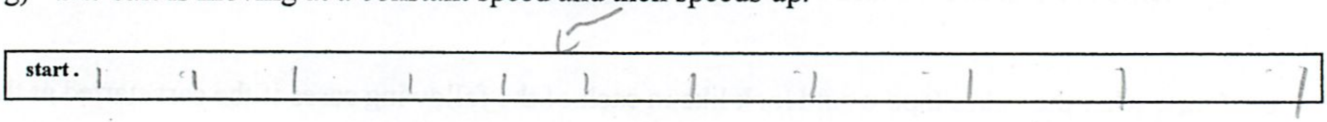
e) The cart moves at a speed twice as fast as the speed in "d" above.



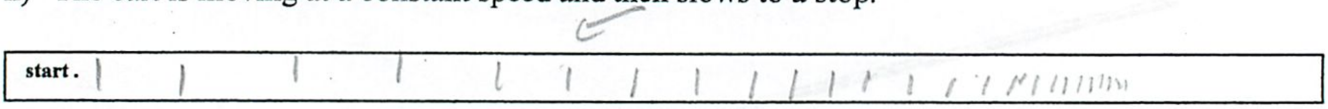
f) The cart starts fast and then slows down to a stop.



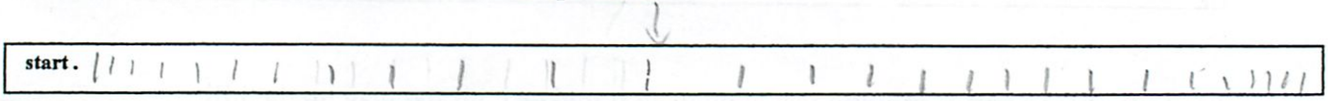
g) The cart is moving at a constant speed and then speeds up.



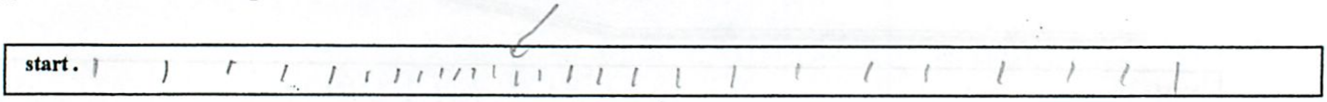
h) The cart is moving at a constant speed and then slows to a stop.



i) The cart rolls down one hill and then up another.



j) The cart rolls up a hill and down the other side.



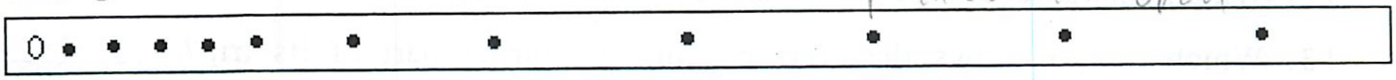
IPS UNIT 1.7 – Physics to Go: Ticker Tapes

The ticker tapes are of carts rolling along a track. In each case describe the motion of the cart with a complete sentence or two. Does the cart speed up, slow down, or move at a constant speed?

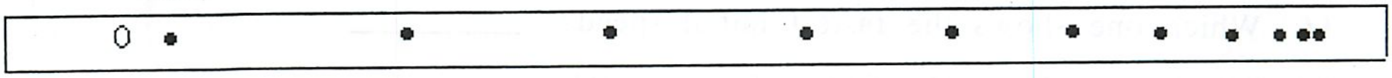
The tape shows that the ... is ...

1. Constant speed

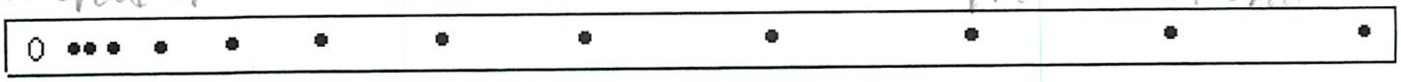
2. acc | then constant speed



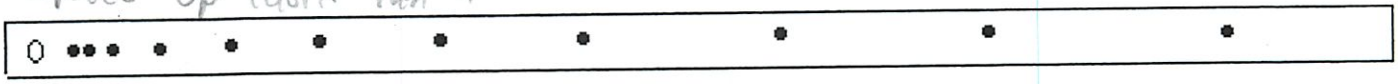
3. slow down



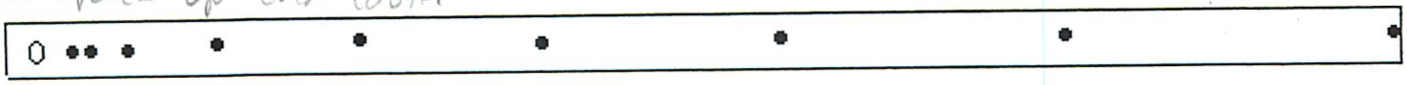
4. Speed up | then constant speed



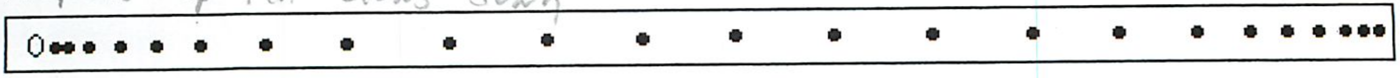
5. speeds up faster then 4



6. Speeds up even faster then 5



7. Speeds up then slows down



How do you tell how fast the cart is moving just by looking at the tape?

The faster the car is moving, the farther the distance of the dots

8. Which one(s) show the cart moving at a constant speed? 1,

9. Which one(s) show the cart speeding up the whole time? 2,4,5,6

10. Which one(s) could be of a cart going downhill the whole time? 7

11. Which one(s) could be of a cart going downhill and then along a level track? 2, 4

12. Which one(s) could be of a cart going uphill the whole time? 3

13. Which one(s) shows the cart speeding up during part of its trip? 2,4,5,6,7

14. Which one(s) shows the cart slowing down during part of its trip? 3,7

15. Which one shows the fastest speed during part of its trip? __________

16. Which one shows the fastest initial speed? 3

17. Which one shows the fastest final speed? 6

18. Which one is going the slowest at the end of its trip? 4 or 7

IPS Unit 1.8 - Who Wins the Race?

WHAT DO YOU THINK?

A group of people are in cars are going from Haverford High School to PNC Park in Pittsburgh to see a Phillies and Pirates game. The all leave at the same time, but they agree that it is unsafe to travel in a caravan. Actually some have children that need to get something to eat along the way, other need to change drivers, and others just need a pit stop. Say that there are eight cars making the trip, who would get to PNC Park first?

1. The car with the greatest top speed?
2. The car with the greatest final speed?
3. The car that made the fewest stops?
4. The car with the greatest average speed?
5. The car that went at a constant speed?
6. The car with the shortest pit stop?
7. [✓] The car that took the least total time? to go a certain amount of distance

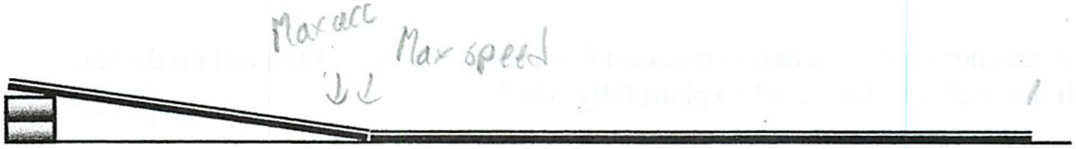
all relevent to this

FOR YOU TO DO

There are three track arrangements illustrated below and there should be Pasco tracks set up similarly in your classroom. In each case a cart will be released from rest at the top of the hill at the left and allowed to roll down the hill to the far end.

A.

[✓ B.]



C.

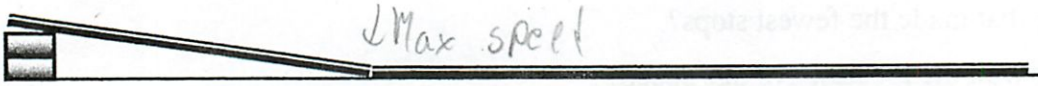
1. On each drawing indicate where the cart will have the greatest speed. Next to the mark (arrow, circled area, etc.) write "Max Speed."
2. On each drawing indicate where the cart will have the greatest acceleration. Next to the mark (arrow, circled area, etc.) write "Max Acc."
3. On which setup will the maximum speed of the cart be the greatest? Circle 1 [✓ A] B C
   Explain your choice: It has the longest place to accelerate to the higest speed
4. On which setup will the maximum acceleration of the cart be the greatest? Circle 1 A [✓ B] C
   Explain your choice: It has a steeper ramp, letting it acc faster then mostly keep that speed

5. Now your teacher or one of your groups will help analyze each of the following setups. In the space provided on each drawing explain the motion of the cart, where the maximum speed actually occurs, and where the maximum acceleration actually occurs. Also explain why.

A.

acc constant

B.



C.

acc constant

constant dcc

6. Which track won the race? Why?

Should be b because it had fastest starting speed + does not dcc eaisly on smooth track

7. Which Track had the greatest speed? Why?

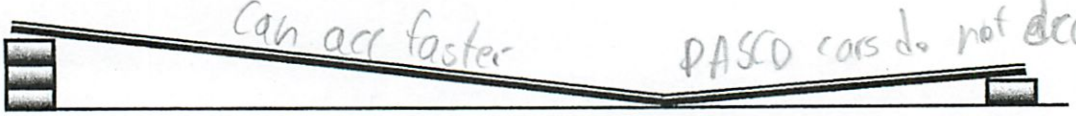
B at the down point

8. Which track had the greatest acceleration? Why?

A ?? because had longest distance to acc

9. Here is another race. The cart is released from rest at the top of the hill on the left. Which one will win the race? Explain fully why?

[✓ A]



Can acc faster

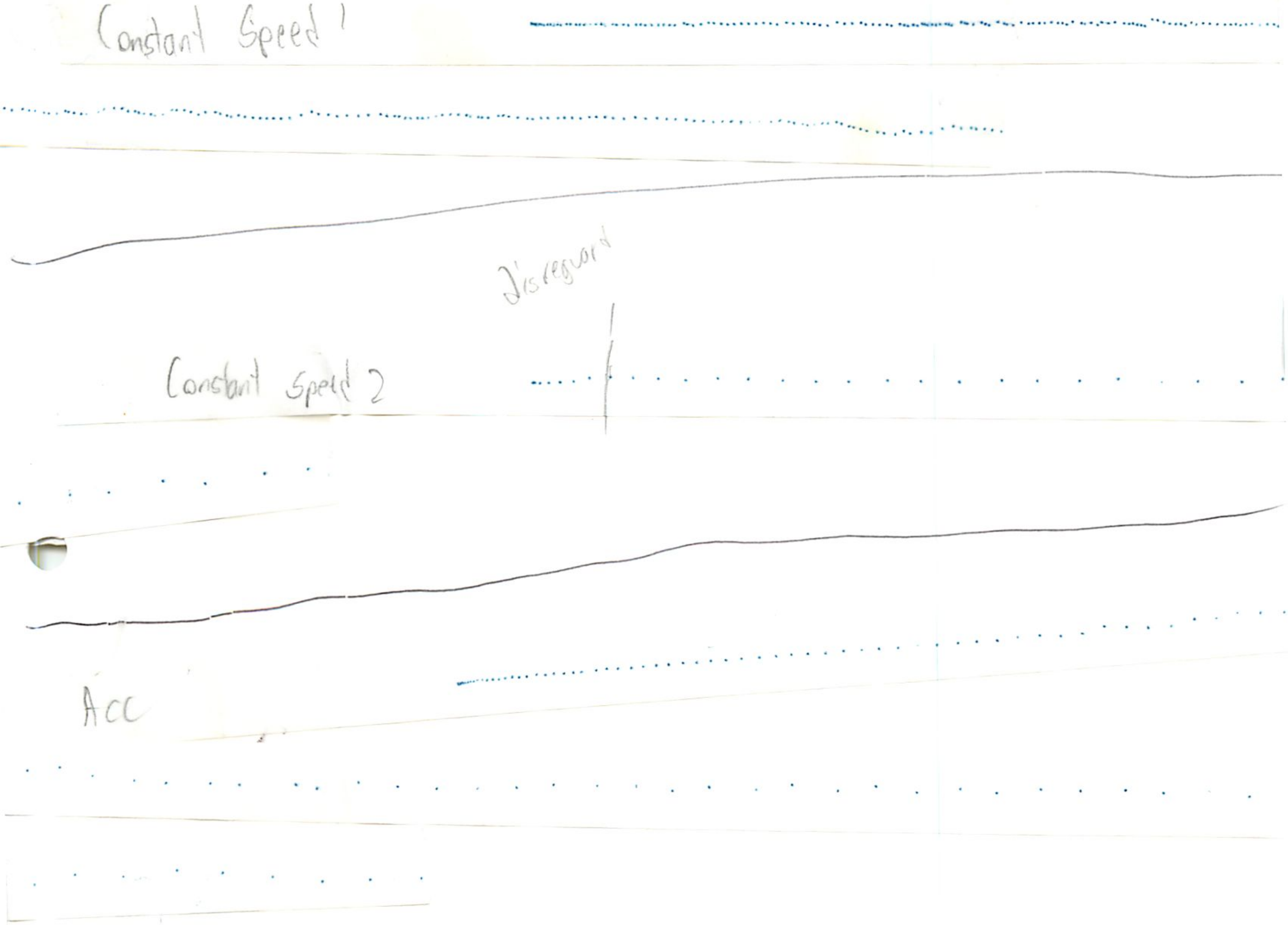
PASCO cars do not dcc much on the incline

The steeper incline lets the car acc faster. PASCO Cars do not dcc well on inclines because they stop

B

* Every car drops a certain distance + runs a certain distance in a certain time

$\frac{\text{rise or drop}}{\text{run}}$


Constant Speed 1
Disregard
Constant Speed 2
Acc

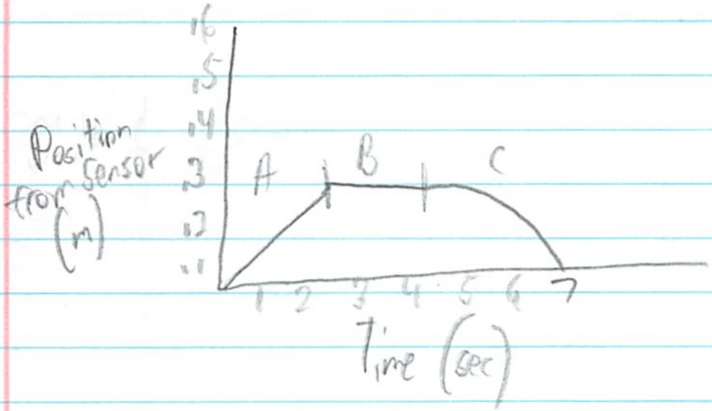
Michael Plasmeier
Brown
IPS 9H
10 Nov 2005

6/6

2 Questions
Acc Quiz

11/10

1. Describe the speed in each section of this graph



A: steady speed moving away from the decter going .3m in 2sec or .15m/s ✓

B: Stoped at .3m for 2 sec (2-4 sec) ✓

C: Moving twoards dector, acc as it moves tworards it it goes -.3m in 3 sec (5-7 sec) but not at a steady speed. Also I can't tell if it is steady acc ✓

2. Give 3 true statements about acceleration

It is change in speed per unit of time ✓

$\frac{V_2 - V_1}{\Delta t} = acc$ ✓

Change in acc is called a Jerk ✓

Projectile Motion

projectile - an object that is moving, but only influenced by gravity (and air resistance, if any)

Q1

An object in free fall that is also moving horzontally

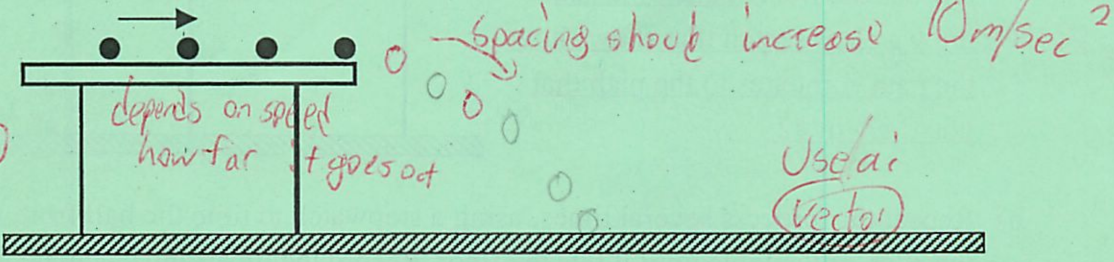
Michael Plasmeier 35/35

IPS –Unit 1.9 – "Projectile Motion"

WHAT DO YOU THINK?

- What is the path of a ball that rolls off the table and falls to the floor? Sketch it.

What is the time between each mark? →



Spacing should increase 10m/sec^2

depends on speed how far it goes out

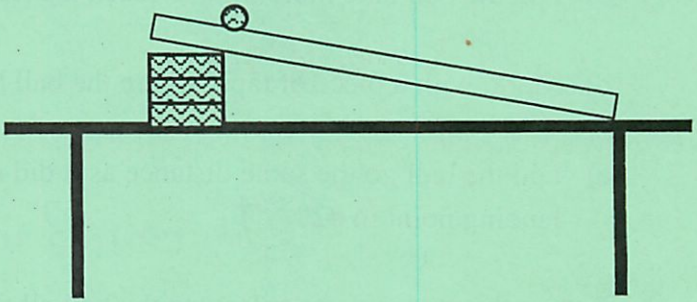
Use ai (Vector)

- A ball is thrown into the air. What determines how far the ball travels before landing?

air restancte, Force when leaving, gravety

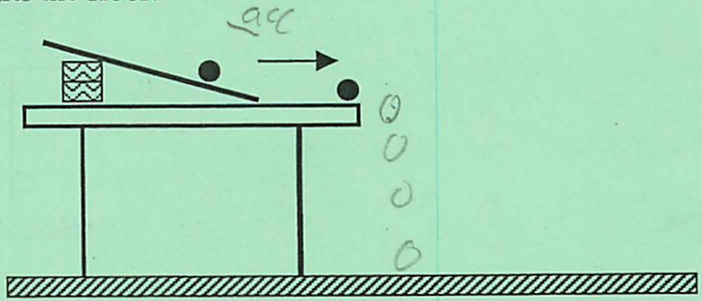
It is a projectile!

FOR YOU TO DO.



1. Turn the Pasco track upside down. Set up a track by placing three (3) blocks at the far end of the Pasco track so that the other end of the track is a few inches before the edge of the table as shown at the right.

2. From a position approximately <u>one-third</u> of the way up the track, roll a tennis ball down the track so that it rolls off the table and hits the floor.
   a) On the drawing at the right sketch the path taken by the ball from the end of the table until it reaches the floor.



ac

   b) Repeat this process several times, using a stopwatch to time the ball from when it leaves the edge of the table until it hits the floor. Record the times and calculate the average time to the nearest tenth of a second.

.51

.55

.46

.43

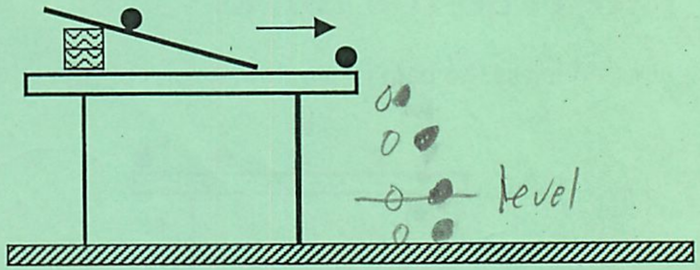
Adv

.4875 seconds

   c) Mark, with a piece of tape, where the ball hits the floor.

3. Repeat the processes by releasing the ball from approximately <u>two-thirds</u> of the way up the track.

   a) Sketch the path taken by the ball from the end of the table until it reaches the floor. <u>Take time and draw a clear sketch that shows how the path compares to the path that you drew in #2.</u>



   b) Repeat this process several times, using a stopwatch to time the ball from when it leaves the edge of the table until it hits the floor. Record the times and calculate the average time to the nearest tenth of a second.

.46
.50
.43
.48

.4675 Adv

   c) Did the ball take more time to reach the floor?

No + should not

   d) Mark, with a piece of tape, where the ball hits the floor this time.

✓

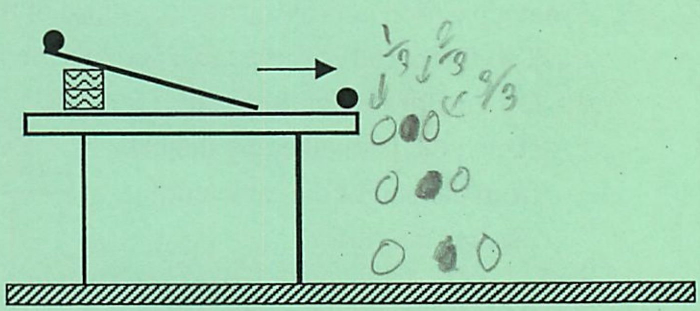
   e) Did the ball go the same distance as it did in #2? If no, where did it land compared to the landing point in #2? It. went 3 in further because of it's increased speed

4. Repeat the processes by releasing the ball <u>all the way up the track</u> and repeat steps "a" through "e" in number 3.

.42
.41
.44
.40

.4175 Adv

adv is bit short, should be equal to others



* It only went an inch further, not as much as prevocse interval
- is this because we did not have = .35

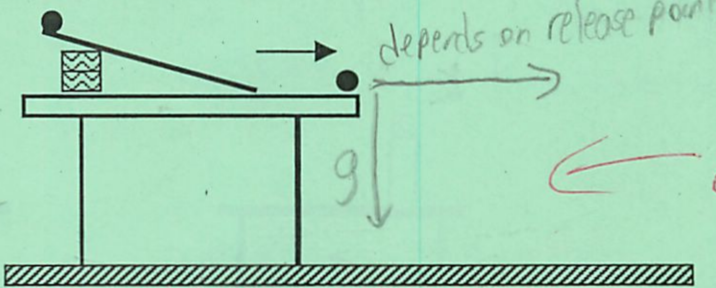
5. How does the speed affect the amount of time it takes for the ball to fall from the edge of the table to the floor?

The amount of time it takes for the ball to hit the floor is alwas =, no matter how fast it is going

6. On the drawing below sketch the path taken by the ball from the end of the table until it reaches the floor. Show and mark the path taken by the ball when it is released from 1/3 the way up the track; 2/3 the way up the track and from the top of the track.

   a) How does the release point of the ball affect how far from the table the ball hits the floor?

   the farther back the release point, the farther the ball goes



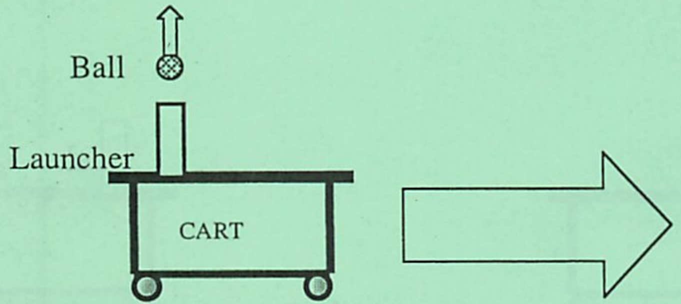
depends on release point, the, for speed

Look

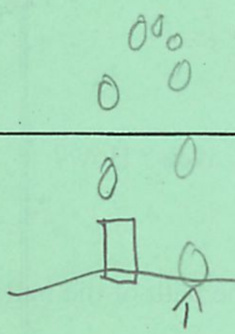
   b) Explain why this happens.

   it atains a faster speed as it crosses the table and carries in a vertical momentum farther

Your teacher will set up a demonstration where a ball is launched straight upwards from a cart.



7. What is the path of the ball if the cart is at rest when the ball is launched upwards?



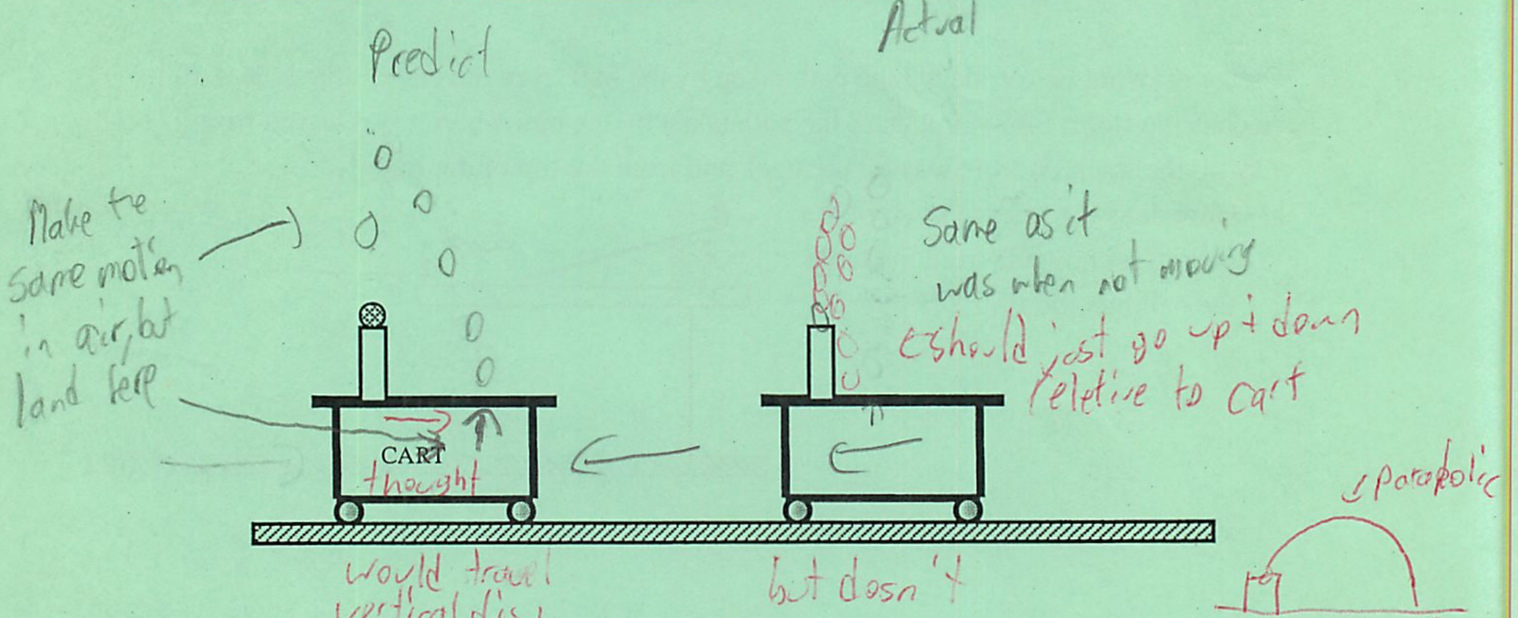
launcher is not really level

Should go up + down + not travel vertical distance

8. The cart will be pushed to the right at a constant speed. This time the ball is launched upwards as the cart is moving.

   a) Predict the path that the ball will take.

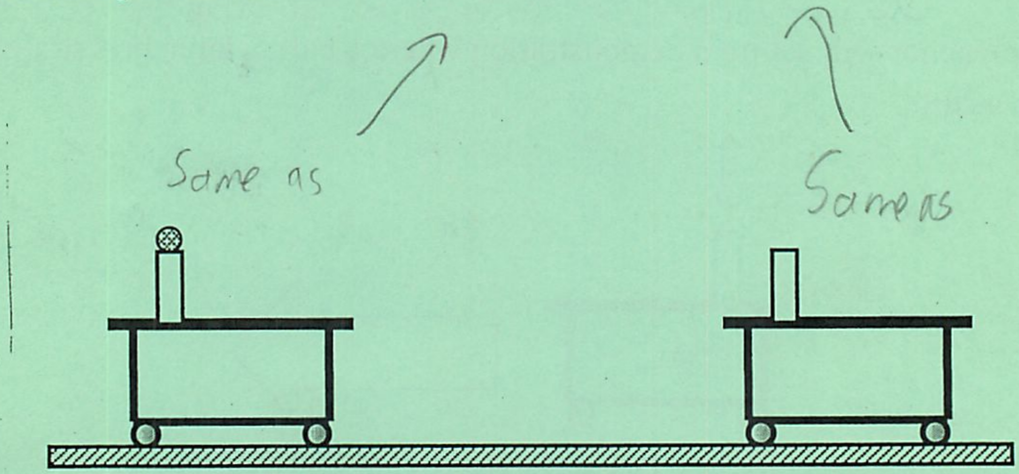
   b) Observe the ball while it is in the air. Sketch the path of the ball.



relitive to ground

9. We will repeat the process in #8, but the cart will be moving at a faster constant speed.

   a) Predict the path that the ball will take this time.



   c) Observe the ball while it is in the air. Sketch the path of the ball. How is the path different from the path of the ball in #8?

   It is the same path, because the ball is moving at the same speed relative to cart.

   d) Does the speed of the cart affect how high the ball travels? How?

   No, the hight of ball is affected by the # of clicks the ball is pushed in

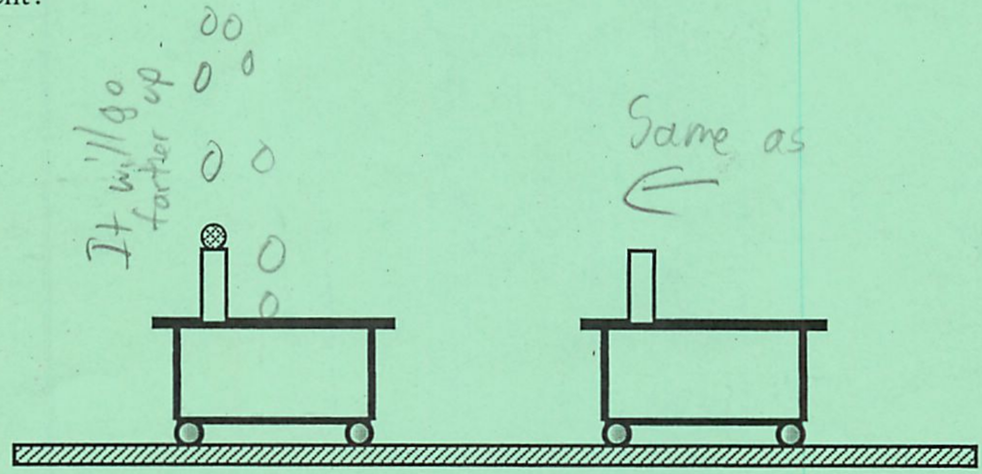
   Although if acc. use a vector

   e) Now summarize how the speed of the cart affects the path of the ball.

   * If the car moves a constant speed, either 0 or something, the ball will go straight up + down (If the launcher is level)
   The hight is determend by the launcher

10. We will repeat the process in #8, but this time the ball will be launched upward at a different speed. The teacher will tell you whether it is faster or slower than the speed in #8.

   a) Sketch the path taken by the ball in number 8. Now, predict the path that the ball will take this time. How will the path compare to the path observed in #8? How will it be different?



   b) Observe the ball while it is in the air. Sketch the path of the ball. How is the path different from the path of the ball in #8?

The ball goes higher, but still should go just up + down

   c) Does the launch (vertical) speed of the ball affect how high the ball travels? How?

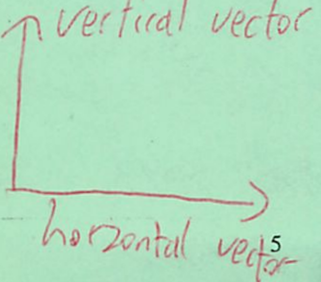
Yes, the faster the launch speed, the farther down the ball is pushed at the farter up it goest.

   d) Now summarize how the launch speed affects the path of the ball.

The launch speed affects vertical movement + speed. Horizontal movement of the Cart (should have) ~~has~~ no affect

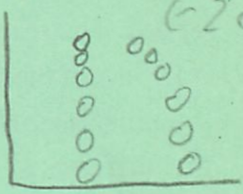
11. A ball is thrown into the air. What determines how far the ball travels before landing?

The horizontal (↑projectile) speed + vertical speed. when launched, Or direction which it is launched while flying, air restance + gravity affect where it goes



Turn the page

Read PHYSICS TALK page 36 and do PTG page 37 #1-6 (where it says coin, we used a tennis ball. Use a ball instead of a coin to answer the questions.).

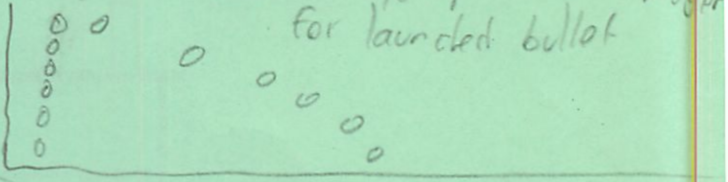


(← 2 coins leave table at same time, 1 at higher vertical speed)

1, See Conceptual Physics p34 Figure 3.9

2, Same as one, except higher speed for launched coin

3. Same as 2, execpt faster moving bullet



↑ Same as 2, exept arch is bigger for launched bullet

4, Why do people think a bullet preforms different then a coin

Because it is on a larger scale. It goes faster and farther (the horzontal speed)

5. Why would a 100 mph pitch thron at the hight of a 10 mph pitch hit the ground at the same time?

The both have the same vertical speed (g). The horizontal speed is 100 mph + 10 mph. One will trave farther and faster, but they both fall at g.

6, Why is "a proiectie's horzotal motion has no affect on vertical motion true"

Because they are seperate vector quanties. The horzontal and vertacal quanity combine as horzontal ^{2} + vertical ^{2} = combied velocity ^{2}. We alwas see the combined value and never seperate them. That is why we don't think about that. Also gravity and air restance factor in for tragectory and cloud our juedgement.

Acc of Gravity

Ticker Tape From Board

11/17

$$a = \frac{\text{Change in speed}}{\text{time}} = \frac{\text{final speed} - \text{inital speed}}{\text{time}}$$

start speed = 0 & just knew

final speed = $\frac{\text{distance between last dot}}{\text{time " " "}\left(\frac{1}{60}\right)}$ $\frac{7.6\text{ cm}}{.0167\text{ sec}}$ = 456 cm/sec

$$a = \frac{456\text{cm/s} - 0\text{cm/s}}{\left(\frac{1}{60\text{sec}}\right)(\#\text{ of dots})} \quad \frac{456\text{cm/s}}{(.0167\text{sec})(46\text{ dots})} \quad \frac{456\text{cm/s}}{.766} =$$

$$594.78\ \text{cm/s}^2 \rightarrow \boxed{5.94\ \text{m/s}^2}$$

Shold be 10 m/s² or g ?

It was a ball dropped, but it against rubbed wall and ticker machine slowed it down (friction)

∴ Might be constant speed at the end

It probably not produced by having an object droped and affed by gravity. Possibly this # might be wrong because speed went constant at the end

Their might have been a restier on it to stop some of gravity.

~~*~~ ~~Might be Pasco cart down ramp but combined horzontal + vertical resulant. Find the hight or lenght of end to start of ramp. to find $a^2+b^2=c^2$~~

Projectile Motion
Review

Michael Plasmeier
p 40-42
Blue Book
11/28

1. A vector quantiy is different then a scale qupnty because it envolves a direction.

3. 20 km/hr

4. The resutlant quanty of a rectangle is the diagnol line between 2 oppsot vertexs and the middle

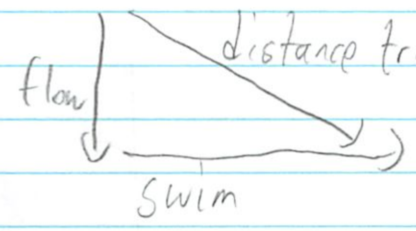
8. The horizontal component does not change because it is seperate from the vertical componet, and nothing acts againts it except air restance (which doesn't exist for this question)

9. Both the ball in freefall and the falling projectiles acceleration was g. The horizontal componet does not matter.

11. 5 m - 1 second
b. That depends on only gravity, which is fixed. The angle or speed won't change this.

10. Does this mean Figure 3.9 (p34), if so they should hit the ground at the same time

30. Yes, you take the resulent of the vectors

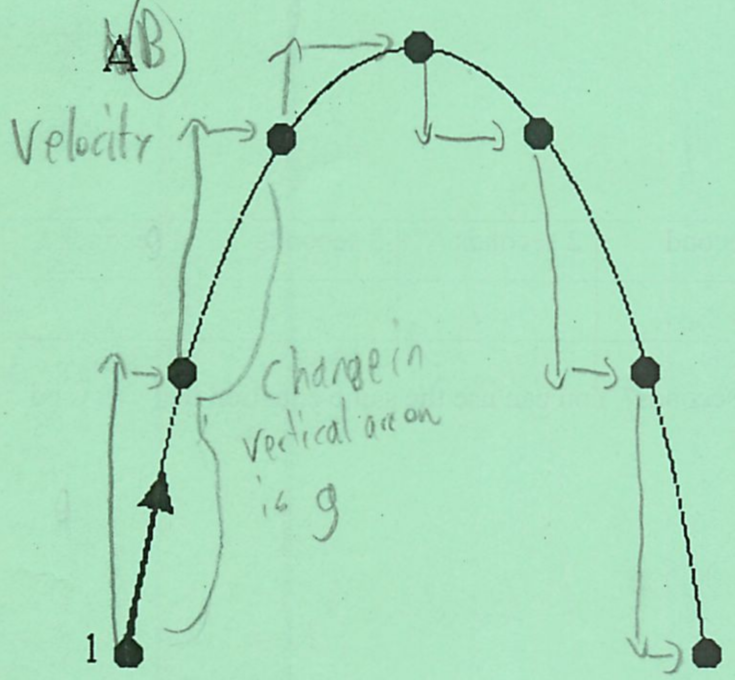


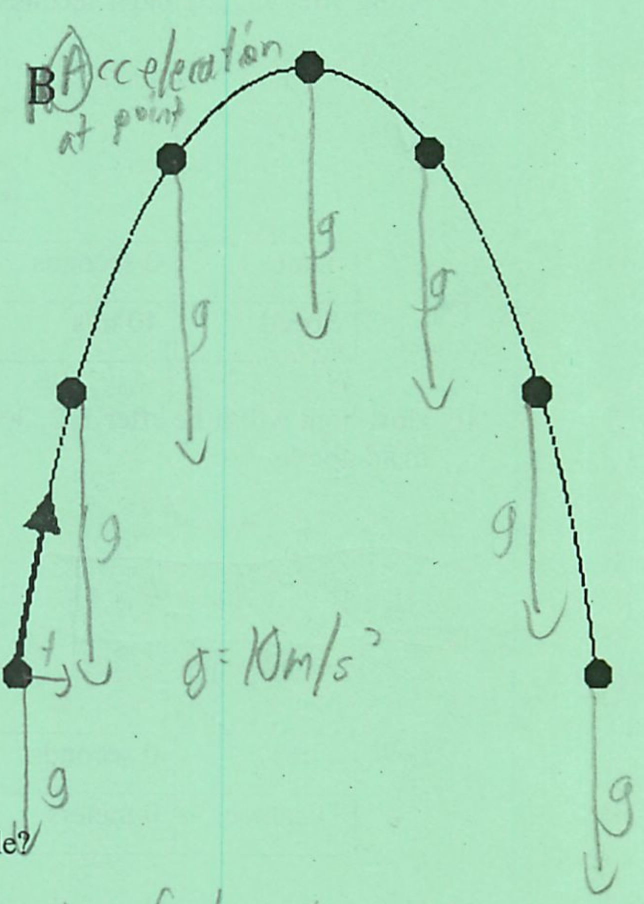
34. It is moving at 0m/s at the top if launced straight - up.

On a curved path, the ball moves at it's horizontal speed at the top of it's trajectory.

IPS –Unit 1.11 - Projectile Motion Analyzed

In Unit 1.9 and 1.10 we observed the path of different projectiles. In this activity we will see if we can fully analyze the motion of a projectile.
In activity 1.9 we noticed that the horizontal velocity did not affect the time for an object to fall to the ground. We also noticed that, if we launched an object upward, the horizontal velocity did not affect how high the ball went. This indicates to us that the horizontal motion and the vertical motion of the ball act simultaneously, but independently.
In activity 1.10 we learned that a ball in the air accelerates downward at 9.8 m/s/s (approximately 10 m/s/s)





1. Acceleration: Drawing A
   What did you learn about the acceleration of a projectile?
   Vertically it is 10 m/sec^2
   Horzontally varries w/ the force + angle of launch

   ? Draw an arrow to indicate the acceleration of the ball that has been thrown upward and to the right at point 1. Show the acceleration at each point along the path. Remember the length of the arrow indicates the magnitude of the acceleration.

2. Velocity: Drawing B
   a) What did you learn about the horizontal velocity of a projectile?
      it always stays the same
      Use one ~~color~~ pencil to draw an arrow to show the horizontal component of velocity at each point along its path.
   b) What did you learn about the vertical velocity of a projectile?
      it changes due to g
      Use another color pencil to draw an arrow to show the vertical component of velocity at each point along its path.

Chart 2 → Next 2 Pages →
Chart 1 → Skip 2, Then 2 Pages →

Chart 2 - launch

We just looked at what happens to a ball that is thrown horizontally. What happens to a ball that is thrown up at an angle? Again we can analyze the vertical motion independently of the horizontal motion.

8. Horizontal Motion: Remember? This is the simple motion. If a ball rolls at a constant speed of 10 m/s to the right (not thrown upward), how far will it travel in 1, 2, 3, and 4 seconds? Have you seen this before? Draw the location of the ball on the chart #2 starting at point "B" near the bottom of the page, after 1, 2, 3, and 4 seconds.

10 m/s

9. Vertical Motion: What happens if a ball is thrown upwards at 40 m/s? How fast will it be going after 1, 2, 3, and 4 seconds? Show your work.

$V = 40 m/s - at$

4sec
3se
2sec
1se ↓10 m/s

Time	0 seconds	1 second	2 seconds	3 seconds	4 seconds
Speed insta	40 m/s	30 m/s	20 m/s	10 m/s	0 m/s
Adv speed [illegible]	40 m/s	35 m/s	30 m/s	25 m/s	20 m/s

10. How high will it be after 1, 2, 3, and 4 seconds? You can use the same equation that you used in #4 above.

or $d = V_{adv} \times t$

$\boxed{d = 40 m/s\, t - \frac{1}{2} g t^2}$

where it is w/o gravity

gravity slows it

$\frac{30 m/s + 40 m/s}{2}$ ×2

$\frac{20 m/s + 30 m/s}{2}$ ×3

$\frac{10 m/s + 20 m/s}{2}$ ×4

$\frac{0 + 10 m/s}{2}$

Time	0 seconds	1 second	2 seconds	3 seconds	4 seconds
Distance	0 meters	35 m	60 m	75 m	80 m

11. Use chart 2, later in this packet, and the scale "A" from 0 to 80 meters, to draw the position of the ball at 1, 2, 3, and 4 seconds starting from point "A", 0 meters at 0 seconds- the initial time.

→

12. Combine the motions in 9 and 10. How is this similar to the motion you saw in number 6?

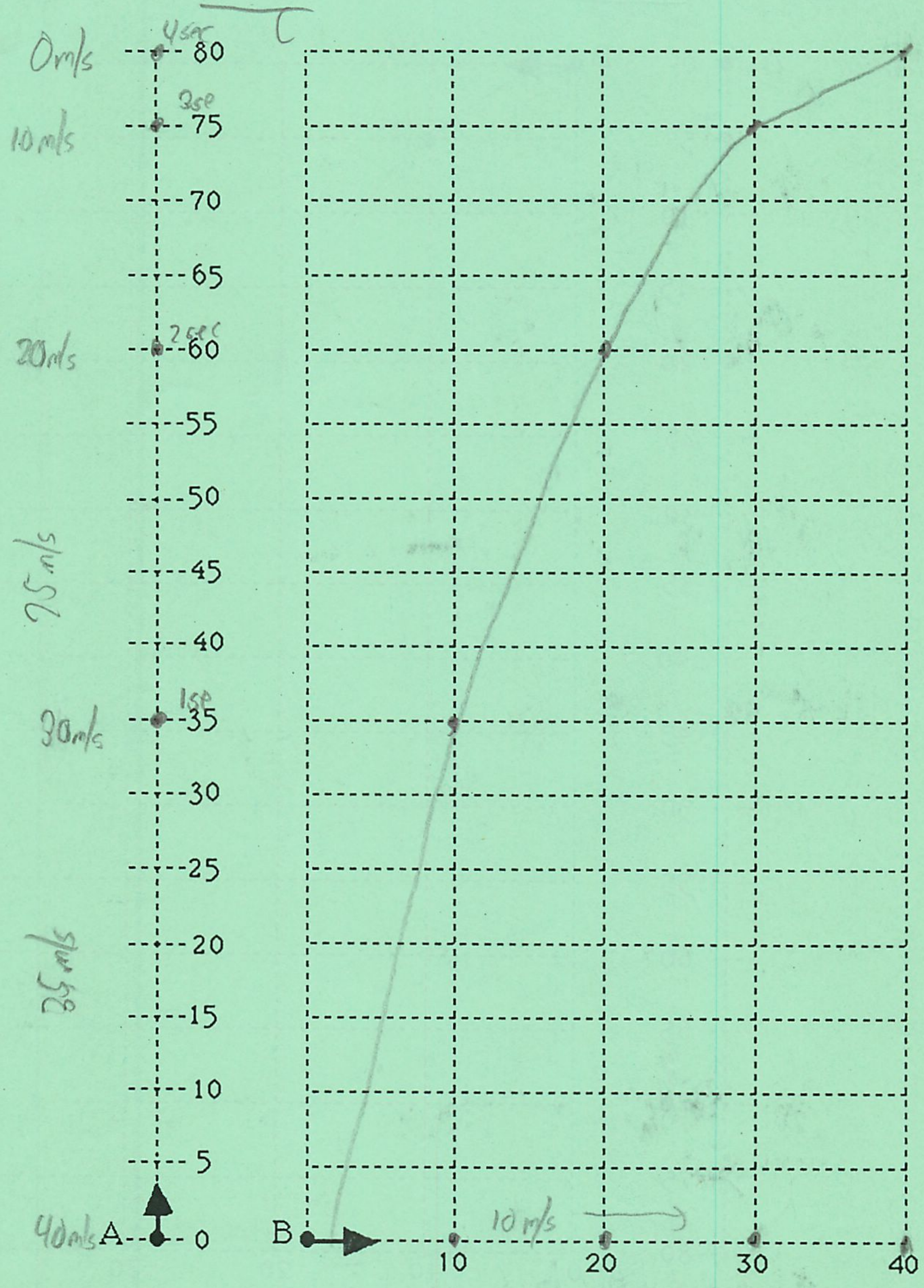
Same thing, just flipped vertically w/ different times start point

13. Place chart #2 on the left and chart #1 on the right. What is the shape of the path illustrated? How does the motion illustrated compare to the motion that you studied in UNIT 1.9 #8?

parabola (perfect curve)

w/o air restance + w/ gravity, projectiles travel in parabels

IPS UNIT 1.11 - Chart #2



IPS Unit 1.11 - Chart #1

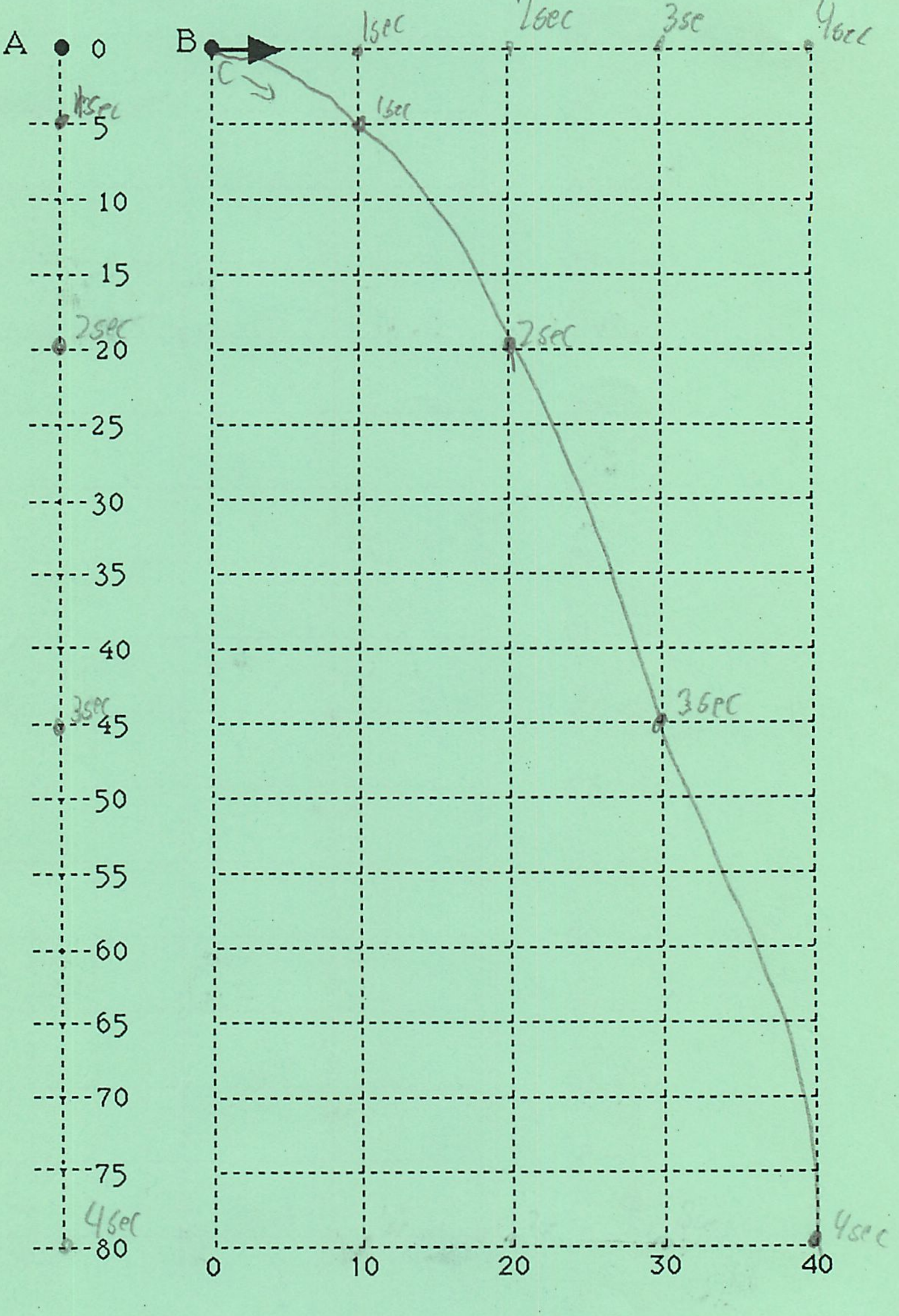


Chart 1 - fall

We can use the fact that the vertical motion of the ball is independent of the horizontal motion to further explain projectile motion. Lets analyze projectile motion in two separate parts, vertical motion and horizontal motion.

3. Vertical Motion: Calculate how fast a dropped ball will be traveling after 1 second; 2 seconds; 3 seconds; and lastly 4 seconds. This is really easy and we have done it already. Use 10 m/s^2 down for the acceleration due to gravity. Show your work.

$V = gt$

$adv = \frac{inst}{2}$

Time	0 seconds	1 second	2 seconds	3 seconds	4 seconds
Speed	0 m/s	10 m/s	20 m/s ÷2	30 m/s ÷2	40 m/s ÷2
Adv Speed	0 m/s	5 m/s	10 m/s	15 m/s	20 m/s

4. Calculate how far the ball has fallen from the release point after 1, 2, 3, and 4 seconds. Remember $d = v_{avg} \cdot t$ ← to get adv — same thing
Show your work.

$d = \frac{1}{2}gt^2$

$d = 5t^2$ ← only works when talking about $g = 10 m/s^2$

Time	0 seconds	1 second	2 seconds	3 seconds	4 seconds
Distance	0 meters	5 m	20 m	45 m	80 m

5. Use chart 1, on the left side of the chart find (A). This is a meter scale that shows from 0 to 80 meters. Draw the position of the ball at 0, 1, 2, 3, and 4 seconds that you calculated in #2.

6. Horizontal Motion: Remember this is the easy motion. If a ball rolls at a constant speed of 10 m/s to the right (not falling), how far will it travel in 1, 2, 3, and 4 seconds?

Time	0 seconds	1 second	2 seconds	3 seconds	4 seconds
Distance	0 meters	10 m	20 m	30 m	40 m
Speed	10 m/s	10 m/s	10 m/s	10 m/s	10 m/s

Draw the location of the ball on the same sheet to the right of "A" starting at point B after 1, 2, 3, and 4 seconds. Notice that the scale goes from 0 to 40 m.

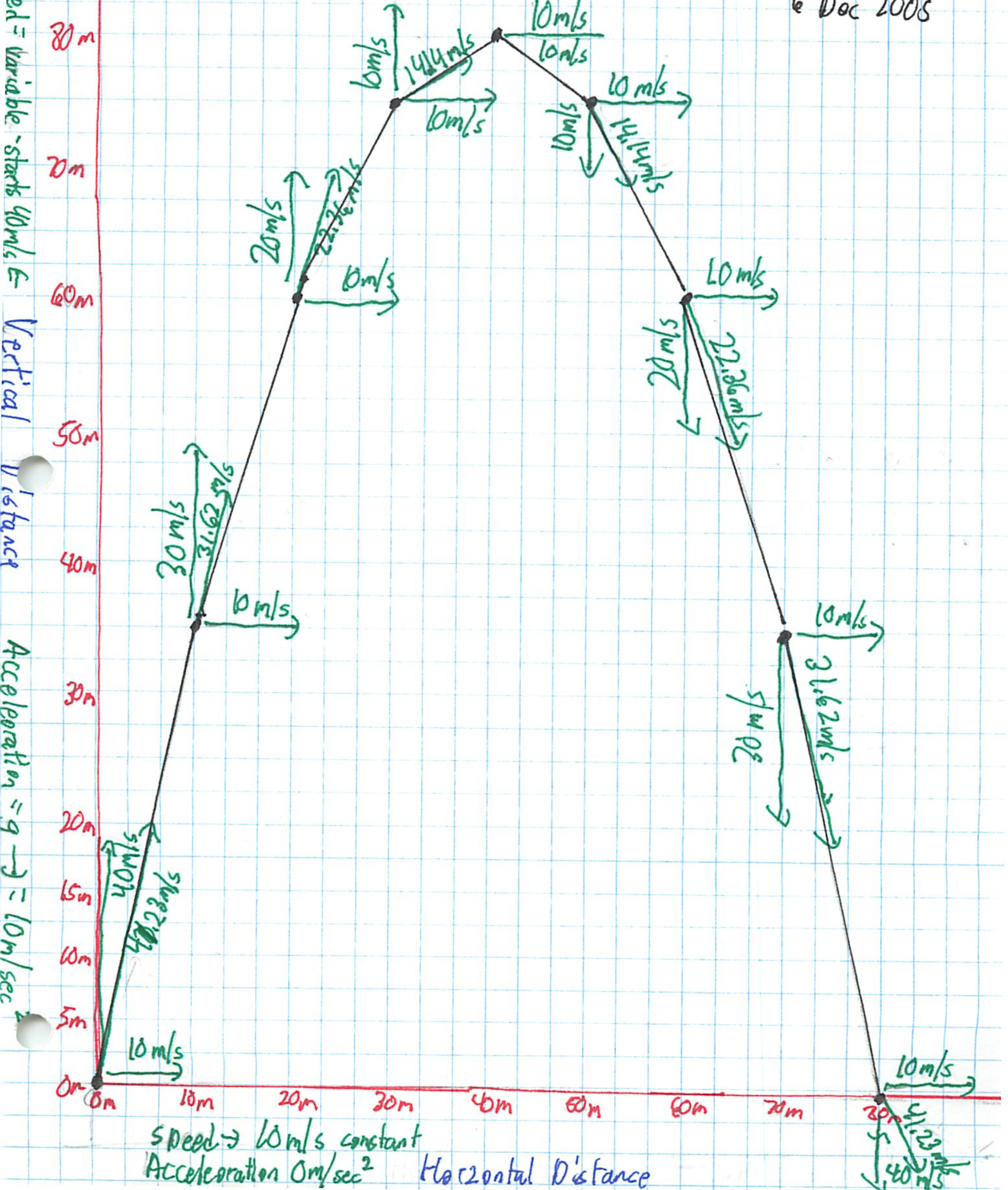
7. If you combine the two motions, draw on the grid where the ball would be after 1, 2, 3, and 4 seconds.
   a) Sketch the path that the ball would take.
   b) How does this path compare to the sketch that you drew in activity 1.9?

para bola - The same as in 1.9
perfect curve

Projectile Path

Michael Plasmeier
Brown
IPS 9H
6 Dec 2005

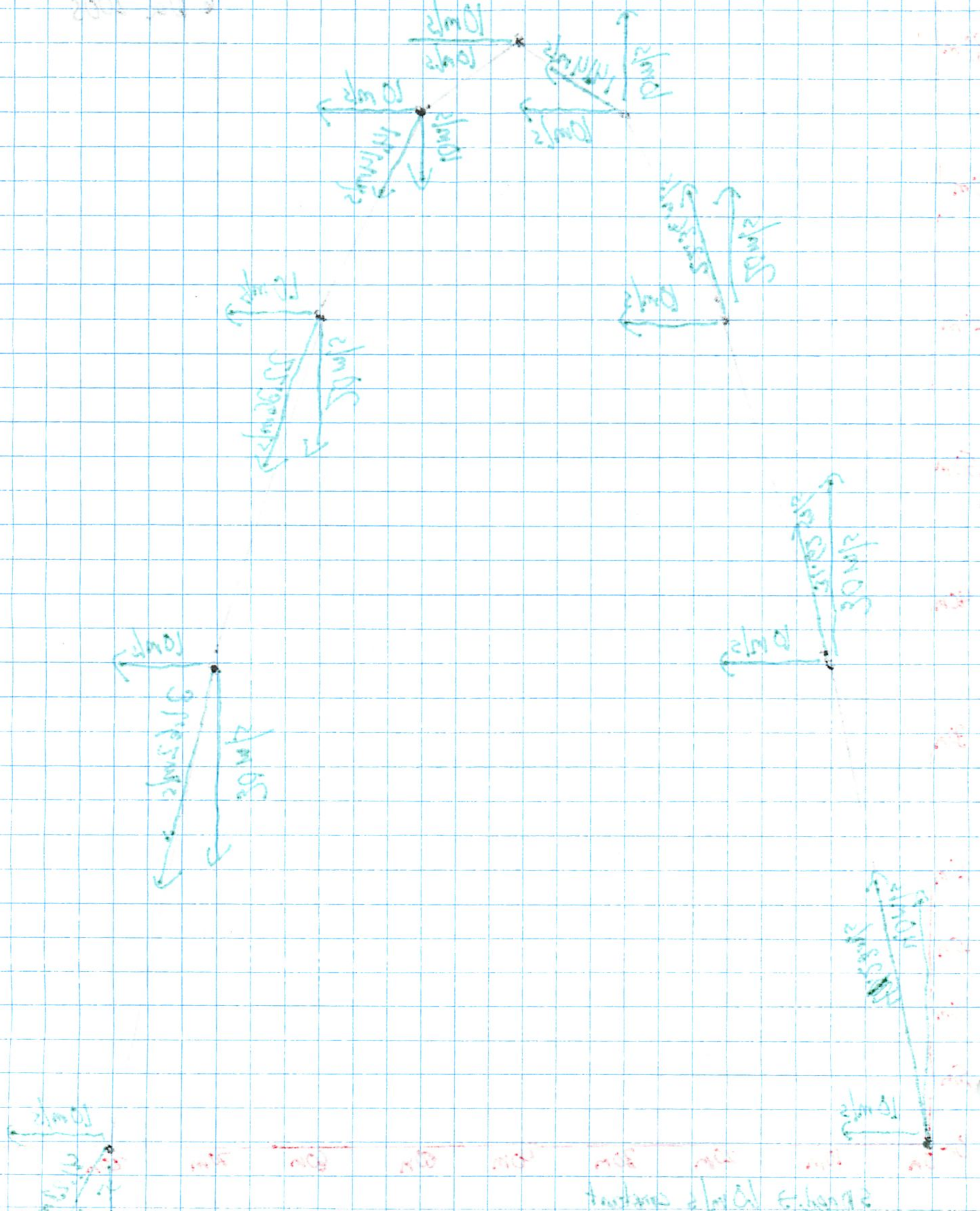
Dots every second
Vector arrows not to scale



[illegible]
Brown
IPS 4H
6 Dec 2006

Projectile Path

Dots every second
Vector arrows not to scale



Speed: 10 m/s constant
Ay: [illegible] Horizontal Distance

IPS-9: OBSTACLE COURSE GRADE SUMMARY

Student Name: Michael Plasmeier

Category	Points Possible	Score 0-4	Points Received	Comments
Explanation of Physics Concepts	20	4	20	
Creativity	5	2	2.5	low class interest
Group Interaction and Effort	15	4	15	
Realistic Design	10	4	10	

Total Score 47.5 / 50

IPS Assessment Unit 1 Sports
1.0 Create the Ultimate Physics Obstacle Course

Scenario: Remember when you were a young small laddie/lassie in elementary school and you competed in Field Day. You may have enjoyed the events, you may have thought you could design a much better course with better events. Well, here is your chance.

Challenge: Create a fun and challenging obstacle course in which the physics principles that we have learned can be measured or demonstrated.

Details/ Course Specifications:

- The course dimensions will have to be within the limits of a tennis court (Haverford HS).
- Minimum of four skill events that measure or demonstrate the following physics principles:
  - Average Speed
  - Instantaneous Speed
  - Acceleration
  - Projectile Motion
- The full course will be run a total of 4 times by either 3 or 4 people on the team in a relay method, i.e., one person runs through the course comes back and tags the next person.
- Due to the relay nature of the obstacle course, the course must be exactly the same after each student runs through it, as it was before the student ran through it.
- You obstacle course must be safe for all students to go through.

Here's the great part: once you have come up with a successful and fun design that meets the criteria, your class will vote on the best course design. The best design from our class will go head to head against the best from other IPS classes' designs during the same block. All of the students that have IPS during that block will have the opportunity to vote on the design that they feel is the best. That obstacle course will be the one that you- the IPS students- run and compete on. Two identical obstacle courses will be made side by side. Students from all of the classes during that block will be challenged to complete that obstacle course in the shortest amount of time possible. The two fastest teams will go head to head against each other in the championship round.

Grade: You will be graded on your presentation to the class based on a rubric that we make up together. Your presentation to the class will include a model/ visual representation of your obstacle course. You must demonstrate (on the visual representation) how the above physics principles are incorporated into the events. When applicable you should include numbers and sample calculations.

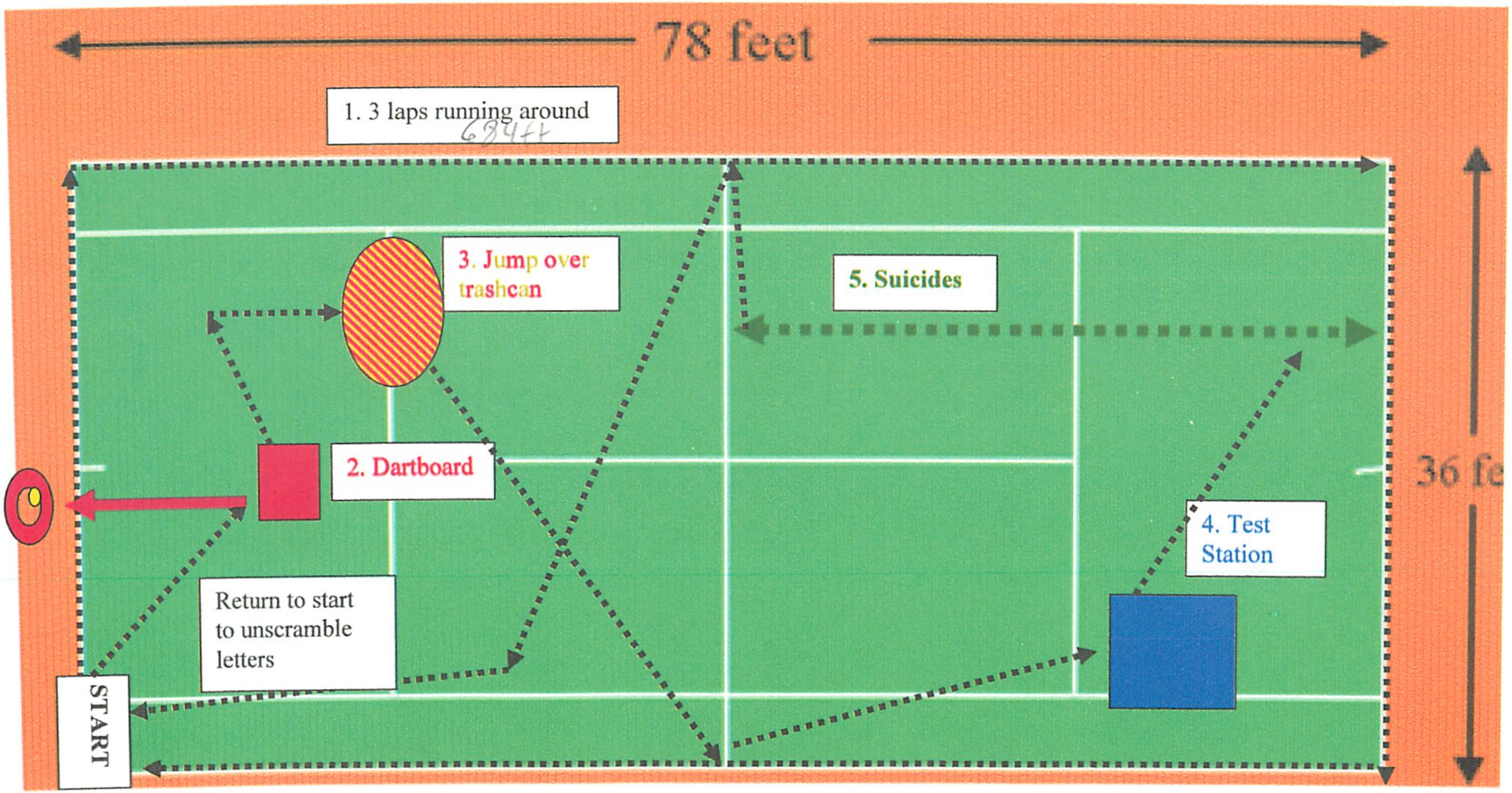
Obstacle Course Proposal Scoring Rubric

	4	3	2	0
Explanation of Physics Concepts	Physics concepts of average speed, instantaneous speed, acceleration, and projectile motion are clearly demonstrated as part of the obstacle course design. The concepts are thoroughly explained in the design proposal.	Physics concepts of average speed, instantaneous speed, acceleration, and projectile motion are demonstrated as part of the obstacle course design. The concepts are explained in the design proposal.	One or more of the physics concept is missing either from the course design or design proposal.	Obstacle design or proposal show little or no understanding of physic concept involved in this unit.
Creativity	Obstacle course and course proposal show creativity in demonstrating physics concepts. The course is interesting to students in the class, and uses a variety of activities and materials. At least one element of the course is unique to this proposal.	Obstacle course and course proposal show creativity in demonstrating physics concepts. The course is interesting to students in the class, and uses a variety of activities and materials.	Obstacle course and course proposal show creativity in demonstrating physics concepts. The course is of limited interest to students in the class. Little or no variety in activities	Design show little or no creativity. Design is a copy of another proposal in whole or part
Group Interaction and Effort	Group members participate fully in course design and design proposal (members surveyed for this purpose). Group presentation involves all members. Presentation is clear and well planned.	Some group members participate course design and design proposal more than others(members surveyed for this purpose). Group presentation involves only select members. Presentation is clear and well planned.	Presentation is done by one or two members of the group alone. Presentation is unenthusiastic, poorly planned, or unclear.	Presentation show little or no effort or planning.
Realistic Design	Design is challenging yet can be completed by all members of the class. The design uses the tennis court area fully, materials are easily obtained or available.	Design is somewhat challenging and can be completed by most members of the class. The design uses the tennis court area fully, materials are easily obtained or available.	Design is somewhat challenging and can be completed by most members of the class. The design uses most of the tennis court area , materials are easily obtained or available.	Design is not challenging or too difficult for many students. Design includes unrealistic materials, or materials may not be available.

Michael Plasmeier, Jeff Hall,
Beau Friedman, Tom Powell
Brown
IPS 9H
15 November 2005

Revision: B
11/15/2005

Obstacle Course Diagram



Jeff Hall, Michael Plasmeier, Beau Freidman, Tom Powell
Dr. Brown
IAG2 2A
11/18/05

Obstacle Course Explanation

1. To start, you must run around the perimeter of the tennis court three times. Do not cut corners for, if you do, you will have no choice but to restart from the beginning again. The distance around the tennis court will be provided for you. One of your teammates will time your running to find your average speed. Your velocity is 0. 684 ft total 208 m

2. Next, you will run over to the dartboard station. To demonstrate projectile motion, you must throw darts at a dartboard until you land one in the middle ring.

3. Then, you will run to a marker on the ground and then make a turn to jump over the trash can. You will be the projectile in motion this time. Once you have jumped over the trash can, you will then run to the next point and then to the test station.

4. Once you get to the test station, you will follow the directions on the test. When you have completed the test, take the letters from the corresponding correct answers. Write them on seperate blank cards if it makes it easier. Each test contains one word. There are four tests (one for each runner), so the four words make a sentence that you must learn. The test will quiz your knowledge of instantaneous speed as well as other physics topics that we have discussed.

5. After you have completed your test ~~and know your word~~, run to the next marker. From there, run to the first white horizontal line and then back to the start. Then, run to the net and then back to the start. This demonstrates the power of acceleration in what are called "suicides".
19.5 feet each time   \wear acceleration

6. When you are finished, run back to the start and tag

the next person to go through the obstacle course. Now is the time to try and unscramble your word. When your team has learned the sentence, shout it out loud. The first to do so wins. If your team cannot figure out the sentence and believe that they have Incorrect letters, a teamate can go back with their letters to try and figure out what they did wrong. Only one person may go at a time.

Bring calc * + clipboard

index (card)

tape

Michael Plasmeier, Jeff Hall,
Beau Friedman, Tom Powell
Brown
IPS 9H
15 November 2005

Revision: C
11/15/2005

Obstacle Course Quiz 1

Read each question carefully, and then print the letter of the correct answer on the line next to the question. Record each answer's letter onto a separate index card. After you are done taking the test, take the letters back to your tem to unscramble a word comprised of ~~these~~ thoes letters. You are not allowed to take the test with you. BE CAREFUL!!!! A wrong answer can ~~kill~~ confuse + delay your team.

---

1. ___If I move around a racetrack back to where I started, what would be 0?
   - **s) My velocity**
   - k) My speed
   - a) My projectile motion

2. ___What is the formula for average speed?
   - j) displacement/acceleration
   - **h) distance/time**
   - f) Time/distance

3. ___What is acceleration?
   - **s) A change in speed per unit of time**
   - c) How an object flies through the air
   - y) distance/time

4. ___How does one find distance? (Hint: Remember a memory circle)
   - **y) speed x time**
   - z) speed / time
   - k) time / speed

5. ___When a liquid accelerometer is moving to the left, but slowing down, where does the water go?
   - **c) it moves to the left**
   - q) It stays level
   - a) it moves to the right

6. ___A speedometer shows what?
   - p) average speed
   - **i) instantaneous speed**

h) acceleration

7. ___What is a projectile?

v) A ball

the

h) Any object that moves through air and is affected by gravity, air resistance, and the propeller. on it

p) Any object that moves through the air ~~or through space, acted only upon~~ by gravity (and air resistance, if any)

and is affect only by

Michael Plasmeier, Jeff Hall,
Beau Friedman, Tom Powell
Brown
IPS 9H
15 November 2005

Revision: C
11/15/2005

Obstacle Course Quiz 2

See #1

Read each question carefully, and then print the letter of the correct answer on the line next to the question. Record each answer's letter onto a separate index card. After you are done taking the test, take the letters back to your tem to unscramble a word comprised of these letters. You are not allowed to take the test with you. BE CAREFUL!!!! A wrong answer can kill your team.

---

1. ___If two cars are put at other ends of a meter stick, how far could Car 1 travel? before it bumps into Car 2, which started at the same time Car 1 travels at .2 m/s and Car 2 travels at .6 m/s
   - j) .5 meters
   - i) .75 meters
   - s) .25 meters

2. ___If a ball launcher is on a rolling cart, what except changing the force of the launcher will change how high the ball will go?
   - i) Changing the angle of the launcher relative to the cart
   - v) accelerating the cart
   - b) pushing the cart at a faster constant speed

Switch w/ [illegible]

~~$\frac{D_1}{V_1} \quad \frac{D_2}{V_2} \quad \frac{D_1}{.2} = \frac{1-D_1}{.6}$~~ $.2(1-D_1) = .6(D_1)$

~~$.2 - .2D_1 = .6D_1$~~

~~$+.2D_1 \quad +.2D_1$~~

2. A boy on a 5m tall tower throws a ball 20m straight horizontally. How fast did he throw the ball?

i) 20 m/s
v) 20.61 m/s
b) 4 m/s

Michael Plasmeier, Jeff Hall,
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Brown
IPS 9H
15 November 2005

Revision: D
11/15/2005

Obstacle Course Quiz 4

Same
as

Read each question carefully and then print the letter of the correct answer on the line next to the question. Record each answer's letter onto a separate index card. After you are done taking the test, take the letters back to your tem to unscramble a word comprised of these letters. You are not allowed to take the test with you. BE CAREFUL!!!! A wrong answer can kill your team.

---

1. ___What are the three fundamental quantities?
    - a) mass, time, space
    - n) time, mass, distance
    - p) feet, seconds, kilograms

2. ___What is instantaneous speed?
    - n) speed over a long period of time
    - m) distance / a short amount of time
    - u) Time/distance

3. ___What is the acceleration of gravity?
    - p) 10 m/s
    - n) 9.8 m/s/s
    - a) 15 m/s/s

Realistic Course

11/9

Team of 4 runs through repeditly 4 times. No break

The person runs from the start around the course (remaing out of bounds on the course) They are trying to achive max instanious speed + adv. speed while their velocity stays at 0.

Next, the person must use darts to throw at a magnetic dart board. When they achive the center or 2 inner rings, they move on. If their are no more darts, they must collect them from the dart board.

Next is the test portion. There are 4 test pre-made and each person does one; There are 6 questions from this unit. Each one will reveal a new number which is the answer to a combo lock on a box. In side each of the 4 boxes is a flag.

Ex: If I move around a race track to where I started, what would be 0?

accreter

D. ☑ question

? Where do they meet

A c of gravity

3. velocity 8: speed 2: Projectile Motion
0: F

Code = 3_ _ _ _ _

Next step, Set up a Pasco track car going down a 50 m incline - Set up a ticker device and have the car go down the hill. Take the ticker tape. This is acc. The first team to have 4 flags and 4 ticker tapes wins.

Ultimate Course Idea

11/7

This is more of an elimination Course in steps. People are racing for themselves. There are 8 steps that need to be reset after every race.

1st step: Pick a partner from your team and have 1 person time you as you run 30m. (Though the partner will have to measure 30 m out 1st)

The partner ship with the lowest speed loses. (or the one who finishes last).

There is a pause between each step

2nd step: Test:

Partner ships still here

Answer a few predetermined qu. Ex If I move around a race track to where I started, which would be 0.

S. Velocity
A. Speed
B. Projectile Motion

X Fundemental Quality

The correct answer is S, so you take that letter and when you have the rest of the letters, unscramble them to get a certain word. ~~The last peopl~~ The last people confirmed to get the word are eliminated

3rd Step - partners split up

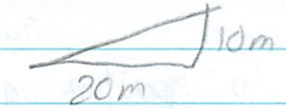
(There are 2 practice rounds 1st) People use the PASCO motion dectors to try and gete the 4th graph higest score. The 1 person w/ the lowest score - is elliminate

- 3 people left →

↙? fire a ball at a target

4th Step - Some sort of Projectile Motion thing
- 1 person ellimnate

5th - People board a lifesize PASCO cart and ride down a



incline. The cart has a speedometer on it giving instant speed

The person ~~who was just ellimnated~~ times the ~~[illegible]~~ drop and calculates the adv speed, of 3 sample drops and uses the answer for this problem to unlock a combo lock. Each problem has its own ans for the combo lock

38 - 28 - 16
↑ sample combo

The first person to unlock a box w/ this code, release a knife and cut a rope to releae their flag wins!.

Prizes can also go to the winner's team

IPS-Index

Name Michael Plaomeier
Date 12/2

IPS Binder Index

15/15

Place a check next to each item that you have in your binders. If you have additional items in your binder list them under "Other Items".

Notebook Check #1:

✓1. Freshmenator Team Expectations
✓2. Ninth Grade IPS Syllabus
✓3. IPS Assessment Unit 1 Sports – Creating an Obstacle Course
✓4. Physics Log Checklist
✓5. Activity One – Running the Race
✓6. Three questions on creating graphs of runners
✓7. Question response –How fast are you moving at this very instant?
✓8. Pendulum data/ class activity
✓9. Activity Reflections
✓10. IPS Unit 1.2 (Activity 4 From Book)
✓11. IPS Unit 1.3 – Just Strolling Along
✓12. IPS Unit 1.4 – Big Bruiser
✓13. IPS Unit 1.4 – Describing Motion
11 14. Quizzes (3)-2

Notebook Check #2:

✓15. Unit 1.5 – Motion Sensor
✓16. Unit 1.6 – Acceleration (liquid accelerometer)
✓17. Unit 1.7 – Ticker Tape and Strobe Studies
✓18. Unit 1.8 – Who Wins the Race?
✓19. Unit 1.9 – Projectile Motion
✓20. Acceleration Calculation from ticker tape (on loose leaf)
✓21. Quiz #1.6
✓22. "Conceptual Physics" questions, pp. 40 and 41, #1,3,8,9,10,11,30,34
23. Acceleration quiz 11/10

Other Items:

1.11 - Projectile Motion Analized
Fundemental Quanties
What do you think - Diff between speed + velocity
Speed + velocity pratice problems
Me only - Speed of BB has changed
Speed - velocity comparisis on p25, 26, 27
acceleration introduction →

1.6 Pre Activity Contract

Ball down ramp

pratice problem

blue book p661-662

Accelerometer Instrections

1.5 Graphs

Our ticker tapes

~~2 questions~~

projectile motion definiton

IPS-9

Name: Michael Plasnoier
Block#: 4

Projectile Motion Quiz

13/13

Fill in the blanks using a word or a number from the list below.

ARROW
TRAJECTORY
FALLING
VELOCITY
SCALAR
ARC

VECTOR
ACCELERATION
MOVING
SOLID
CONSTANT
DISTANCE

ZERO
1
2.5
5
10

1. A projectile is a moving object affected only by gravity. + air restance
2. A projectile's horizontal velocity is constant .
3. The vertical acceleration of a projectile is constant and always points down.
4. A projectile's vertical velocity is zero at the top of the projectile's path.
5. A vector quantity requires both magnitude and direction for a complete description.
6. A Scalar quantity needs only an amount and units for a complete description.
7. An arrow can be used to represent a vector quantity.
8. The acceleration of gravity is about 10 (m/s)/s.
9. A ball dropped from the edge of a cliff will have an instantaneous velocity of 10 m/s after 1 second. The average velocity of the ball from the time it is dropped to the time of 1 second will be 5 m/s. The ball will have fallen a distance of 5 meters after 1 second. $\frac{10+0}{2}$

   $d = \frac{1}{2}gt^2$ $d = vadv \times t$
10. A ball that rolls off the edge of a table with a speed of 2.5 m/s will travel a horizontal distance of 5 meters from the table after 2 seconds.
11. A ball that rolls off the edge of a tall building with a horizontal velocity of 5 m/s and a vertical velocity of 0 m/s will fall a vertical distance of 5 meters after 1 second.

Test Review

12/14

12/12

- Act 1

$$\text{advspeed} = \frac{\text{distance}}{\text{time}}$$

Q. How fast are you moving now?
-motion is reletive

- Act 2

$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

Adv speed depends on total distance divided by total time

- Act 3

$\text{distance} = v_{adv} \times \text{time}$

Men Circle

- Quiz 1

Units are important

- Act 1.4 + 1.5

graphs - distance vs. time
straight line = constant speed
speed is slope of line

Act 1.6

Accelorometers + acceleration

+ Projectile Motion Quiz info

44 ÷ 5 = 9 pts Watch units! $d = 5t^2$ Extra Credit for Test

no point

DETERMINING SPEED (VELOCITY)

Name Michael Plasmeier

Speed is a measure of how fast an object is moving or traveling. Velocity is a measure of how fast an object is traveling in a certain direction. Both speed and velocity include the distance traveled compared to the amount of time taken to cover this distance.

$$\text{speed} = \frac{\text{distance}}{\text{time}} \qquad \text{velocity} = \frac{\text{distance}}{\text{time}} \text{ in a specific direction}$$

Answer the following questions.

✓ 1. What is the velocity of a car that traveled a total of 75 kilometers north in 1.5 hours? .833 km/min or 50 km/hr

✓ 2. What is the velocity of a plane that traveled 3,000 miles from New York to California in 5.0 hours? 600 km/hr ground speed

✓ 3. John took 45 minutes to bicycle to his grandmother's house, a total of four kilometers. What was his velocity in km/hr? 5.33 km hr

✓ 4. It took 3.5 hours for a train to travel the distance between two cities at a velocity of 120 miles/hr. How many miles lie between the two cities? 420 miles

$\frac{d}{v \mid t}$

✓ 5. How long would it take for a car to travel a distance of 200 kilometers if it is traveling at a velocity of 55 km/hr? 3.63 hours

✓ 6. A car is traveling at 100 km/hr. How many hours will it take to cover a distance of 750 km? 7.5 hours

✓ 7. A plane traveled for about 2.5 hours at a velocity of 1200 km/hr. What distance did it travel? 3000 km ground distance

✓ 8. A girl is pedaling her bicycle at a velocity of 0.10 km/min. How far will she travel in two hours? 12 km 6 km/hr

✓ 9. An ant carries food at a speed of 1 cm/s. How long will it take the ant to carry a cookie crumb from the kitchen table to the ant hill, a distance of 50 m (5000 cm)? Express your answer in seconds, minutes and hours. 5000 sec, 83.33 min or 1.388 hrs

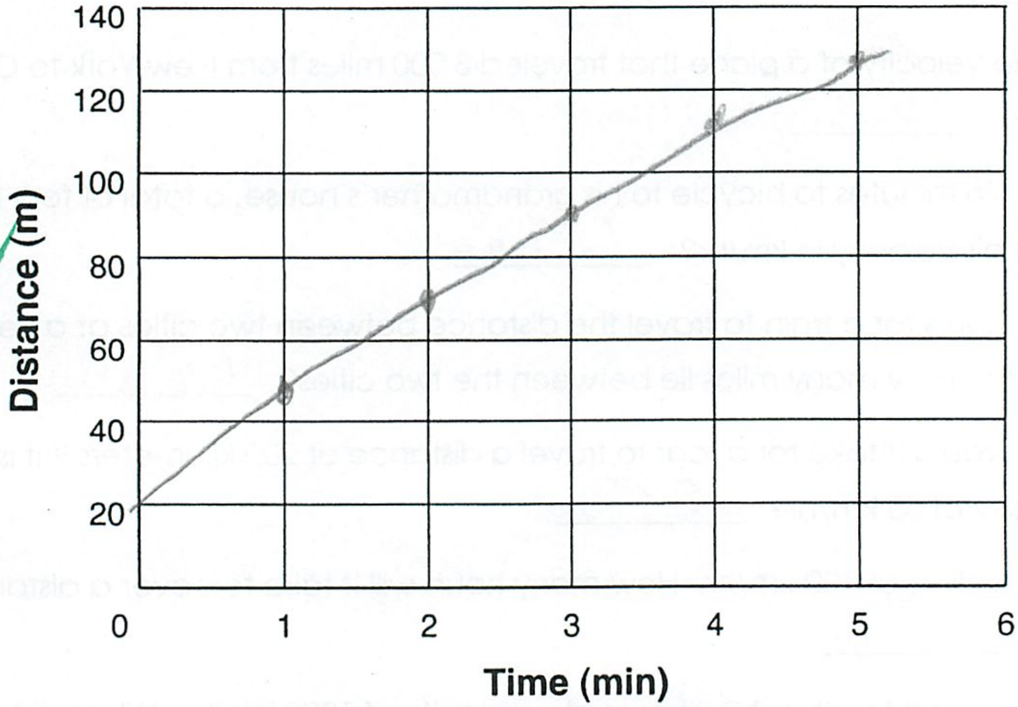
✓ 10. The water in the Buffalo River flows at an average speed of 5 km/hr. If you and a friend decide to canoe down the river a distance of 16 kilometers, how many hours and minutes will it take? 3.2 hours or 3hrs 12 min

CALCULATING AVERAGE SPEED

Name ____________________

Graph the following data on the grid below and answer the questions at the bottom of the page.

Time (min)	Distance (m)
0	0
1	50
2	75
3	90
4	110
5	125



$$\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}}$$

✓1. What is the average speed after two minutes? 37.5 m/min

✓2. After three minutes? 30 m/min

✓3. After five minutes? 25 m/min

✓4. What is the average speed between two and four minutes? 17.5 m/min

✓5. What is the average speed between four and five minutes? 15 m/min

ACCELERATION CALCULATIONS

Name ____________________

Acceleration means a change in speed or direction. It can also be defined as a change in velocity per unit of time.

$$a = \frac{v_f - v_i}{t}$$

where a = velocity
v_f = final velocity
v_i = initial velocity
t = time

Calculate the acceleration for the following data.

	Initial Velocity	Final Velocity	Time	Acceleration
✓ 1.	0 km/hr	24 km/hr	3 s	8km/~~sec~~ hr/sec
✓ 2.	0 m/s	35 m/s	5 s	7m/sec^2
✓ 3.	20 km/hr	60 km/hr	10 s	4m/sec^2
✓ 4.	50 m/s	150 m/s	5 s	20m/sec^2
✓ 5.	25 km/hr	1200 km/hr	2 min	587.5km/~~hr~~ hr/min

✓ 6. A car accelerates from a standstill to 60 km/hr in 10.0 seconds.
What is its acceleration? 6 km/~~sec~~ hr/sec

✓ 7. A car accelerates from 25 km/hr to 55 km/hr in 30 seconds.
What is its acceleration? 1 km/~~sec~~ hr/sec

✓ 8. A train is accelerating at a rate of 2.0 km/hr/s.
If its initial velocity is 20 km/hr, what is its velocity after 30 seconds? ? 80 km/hr

9. A runner achieves a velocity of 11.1 m/s 9 s after he begins.
What is his acceleration? 11/9 ✓ 1.23 m/sec^2
What distance did he cover? ~~99.9m~~ 60.8m

$\left(\frac{11.1}{2}\right)$ ×11 or ?

1,23×$\left(\frac{1}{2}\times 9\right)$×11

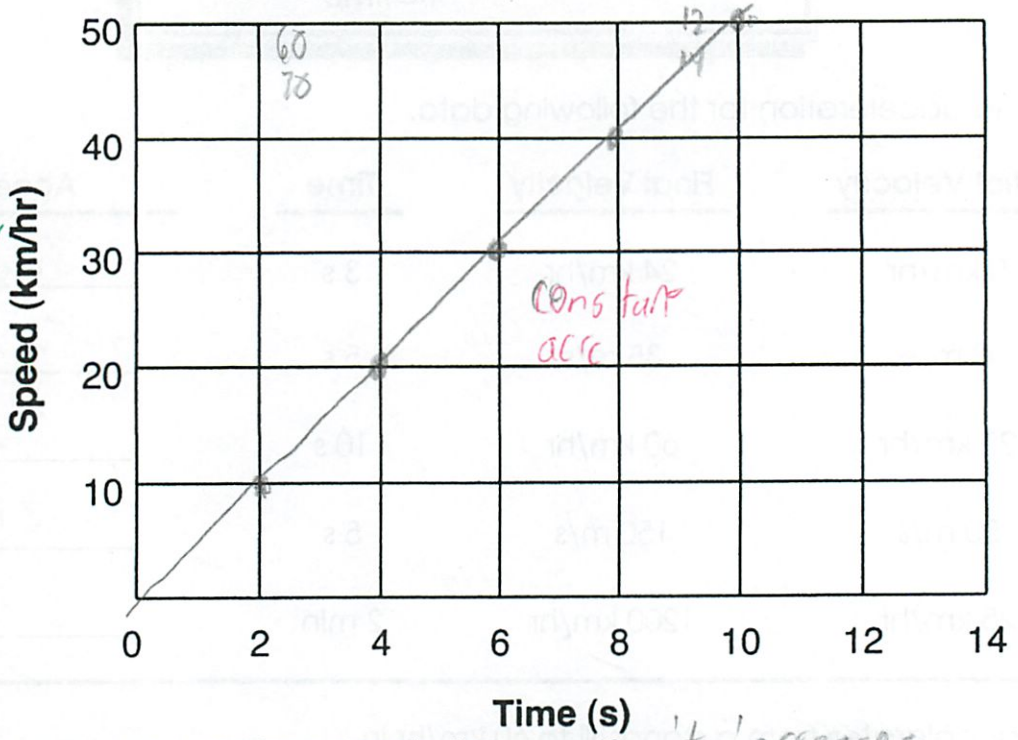
He told me correct though ans guide = 100

GRAPHING SPEED VS. TIME

Name ______________________

Plot the following data on the graph and answer the questions below.

Speed (km/hr)	Time (s)
0.0	0
10.0	2
20.0	4
30.0	6
40.0	8
50.0	10



1. As time increases, what happens to the speed? it increases
2. What is the speed at 5 s? 25 km/hr
3. Assuming constant acceleration, what would be the speed at 14 s?
   70 km/sec
4. At what time would the object reach a speed of 45 km/hr? 9 sec
5. What is the object's acceleration? 5 ~~km/sec^2~~ km/hr/sec
6. What would the shape of the graph be if a speed of 50.0 km/hr is maintained from 10 s to 20 s? rising, flat, then rising horizontal line
7. Based on the information in Problem 6, calculate the acceleration from 10 s to 20 s.
   0 km/~~sec^2~~ hr/sec
8. What would the shape of the graph be if the speed of the object decreased from 50.0 km/hr at 20 s to 30 km/hr at 40 s? up then down
9. What is the acceleration in Problem 8? −1 km/~~sec^2~~ hr/sec

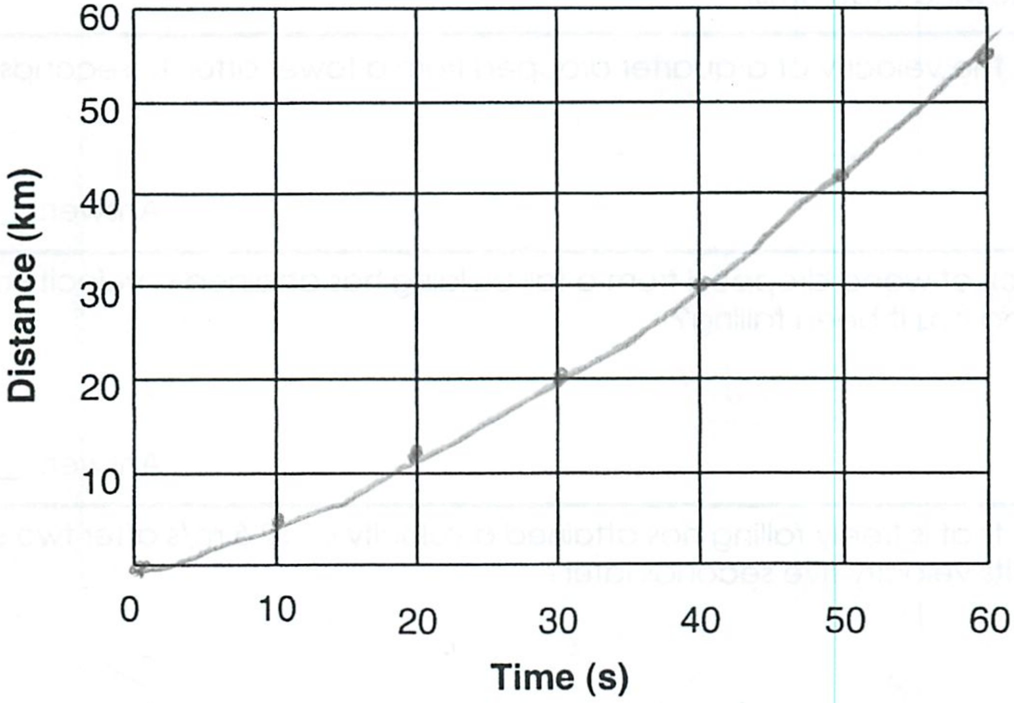
down acc − l would be neg?

GRAPHING DISTANCE VS. TIME

Name ______________________

Plot the following data on the graph and answer the questions below.

Distance (km)	Time (s)
0	0
5	10
12	20
20	30
30	40
42	50
56	60



✓ 1. What is the average speed at t = 20 s? .6 km/sec

✓ 2. What is the average speed at t= 30 s? .66 km/sec

✗ 3. What is the acceleration between 20 s and 30 s? ~~.8 km/sec~~

get change in speeds
.006 km/sec
not change in distance
time

✓ 4. What is the average speed at t = 40 s? .75 km/sec

✓ 5. What is the average speed at t = 60 s? .933 km/sec

✓ 6. What is the acceleration between 40 s and 60 s? .00915 km/sec

✓ 7. Is the object accelerating at a constant rate? No

GRAVITY AND ACCELERATION (I)

Name ____________________

The acceleration of a freely falling body is ~~9.8~~ 10 m/sec/sec due to the force of gravity. Using the formula, $a = \frac{v_f - v_i}{t}$, we can calculate the velocity of a falling object at any time if the initial velocity is known.

Example: What is the velocity of a rubber ball dropped from a building roof after 5 seconds?

Answer: $9.8 \text{ m/sec/sec} = \frac{v_f - 0}{5 \text{ sec}}$

$v_f = 49$ m/sec

easer way = 5(9.8)

Solve the following problems.

1. What is the velocity of a quarter dropped from a tower after 10 seconds?

$9.8 = \frac{vf - 0}{10}$ $\frac{9.8}{1} = \frac{vf}{10}$ $98 = vf$ or $\boxed{10(9.8)}$

Answer: 98 m/sec

2. If a block of wood dropped from a tall building has attained a velocity of 78.4 m/s, how long has it been falling?

$\frac{9.8}{1} = \frac{78.4 - 0}{t}$ $\frac{78.9}{9.8} = \frac{9.8t}{9.8}$ or $\boxed{78.4/9.8}$

Answer: 8.05 sec

3. If a ball that is freely falling has attained a velocity of 19.6 m/s after two seconds, what is its velocity five seconds later?

9

~~$9.8 = \frac{19.6 - 0}{2}$~~ $\boxed{9.8 \times 5} = 49 + 19.6 \rightarrow 68.6$

Answer: ~~49~~ m/s

4. A piece of metal has attained a velocity of 107.8 m/sec after falling for 10 seconds. What is its initial velocity?

~~$9.8 = \frac{107.8 - v_i}{10}$~~ ~~$107.8 - v = 9.8$~~ ~~$-107.8$~~ -10.7 just do $\boxed{107.8 - 10(9.8)}$

Answer: 9.8m

5. How long will it take an object that falls from rest to attain a velocity of 147 m/sec?

$\boxed{147/9.8 =}$

Answer: 15 sec

GRAVITY AND ACCELERATION (II)

Name ______________________

Distance

The distance covered by a freely falling body is calculated by the following formula,

$$d = \frac{at^2}{2}$$

$d = 5t^2$

not

where d = distance
a = acceleration
t = time

use 9.8

$d = \frac{1}{2}gt^2$

$d = \cancel{x}5t^2$

$d = 4.9t^2$

1sec

Example 1: How far will an object fall in 5 seconds?

Answer: $d = \frac{(9.8\ m/s^2)(5s)^2}{2} = 122.5$ meters

Example 2: What is the average velocity of a ball that attains a velocity of 39.2 m/s after 4 seconds?

Answer: $v_a = \frac{v_f + v_i}{2} = \frac{39.2 + 0}{2} = 19.6\ m/s$

constant acc

Solve the following problems.

1. How far will a rubber ball fall in 10 seconds?

$\cancel{X}\,\overset{}{\underset{4.9}{\cancel{5}}}(10)^2$

use 9.8m/sec²

Answer: ~~500m~~ 490m

2. How far will a rubber ball fall in 20 seconds?

$\cancel{X}\,\underset{4.9}{\cancel{5}}(20)^2$

Answer: ~~2000m~~ 1960m

3. How long will it take an object dropped from a window to fall a distance of 78.4 meters? 4.9

÷4.9 ~~÷5~~ $78.4 = \cancel{x}\cancel{5}t^2$ ✓ $16t^2$ $\sqrt{\ } = 4$ sec

~~156.8 = t²~~ ~~12.51~~ ~~15.68 = t²~~ $\sqrt{\ }$

3.95sec

Answer: ~~12.51sec~~ 4sec ✓ ~~checked~~

4. Calculate the final velocity of the ball in Problem 1. 49 ?

$v = gt$ ← 4 ← use 9.8!

Answer: ~~122.21 m/sec~~ ~~39.5~~

5. What is the average velocity of the ball in Problem 1? 8

$\frac{39.5 + 0}{5}$ → Same thing anyway →

Answer: ~~61.35 m/s~~ 19.72

6. An airplane is traveling at an altitude of 31,360 meters. A box of supplies is dropped from its cargo hold. How long will it take to reach the ground?

÷~~5~~4.9 $31360 = \cancel{x}\overset{4.9}{\cancel{5}}t^2$ ~~x~~ $\sqrt{\ }$ $t = \sqrt{\frac{2 \times d}{9.8m/s}}$

~~6272~~ 6400 = t²

Answer: ~~250.43sec~~ ~~79.19 sec~~ 80sec

7. At what velocity will the box in Problem 6 be traveling when it hits the ground?

$v = gt$ 80×9.8 ?

Answer: ~~2454 m/sec~~ ~~791 m/sec~~ 784m/sec

8. What is the average velocity of the box in Problem 6?

784/2 = 392 m/sec

Answer: ~~1227.15 m/sec~~ ~~395.97~~ 392 m/sec

Michael Plasmier

✓

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2/22

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Analizing forces on an object

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Quiz - Newton's Laws

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Race car Physics

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Unit 2 Video Rubric

et al... (after contense were made)

Newton's First Law

Blue Book As you read Qu

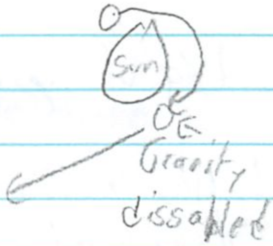
12/14

1. A ball is rolled accross a table top, and slowly stops. What would Aristotle, Galileo, and you say is happening?

Aristotle would say that the ball is achiving it's natural state as it stops. Galileo would say that friction is pushing agains the ball's inerta to slow it down. I would agree with Galileo.

2. If the force of gravity dissappered, what path would the planets take.

They would move in a straight line in the direction they were prevoaly moving. Everyone would die on Earth when the sun gets too far away.



3. Is it correct to say that the reason an object resists change in it's state of motion is inerta?

No. Inerta is just a property. We just use it as a label to explain why someting keeps moving.

4. Does a 2kg block of iron have twice the inerta, mass, volume, and weight as a 1kg block.

Yes Yes, Yes, Yes! Mass and inerta are the same things. It specifies 1kg of matter VS 2kg of matter. They both are made of the same things, so it should take up the same volume. When weighed in the same location, if the mass is 2x bigger, the weight will be too.

5. Does a 2kg bunch of bannas have 2x the inerta, mass, volume, and weight as 1kg of bread.

Yes Yes No Yes. Same as above for inerta, mass + weight. However volume depends both on amt of mass + density (the amt. of mass in a certain volume) The bannas are dencer then the bread.

6. Are 1kg of nails and 1kg of yogert both 9.8N?

Yes, anything that has mass of 1kg puts out 9.8 N of force downward.
weighs