IMPORTANT NOTICES

- Review session tonight (in NPB 1001, i.e. here): Friday, Sept. 10th (Woodard), 6:15-8:10pm
- Subject: chapters 1-4 (similar to last night)
- Exam 1 - Mon. Sept. 13*, 8:20-10:20pm

1st letter of last name	Room assignment
A to F	FLI 50 (Flint)
G to O	CSE A101 (Comp. Sci. & Eng.)
P to Z	FAB 103 or 105 (fine arts bldg)

Chapter 3 WebAssign homework deadlines are tonight at 11pm (chapter 4 on Sunday, 11pm).

*Keep an eye on the UF and 2048 course web pages

BE PREPARED!

Class 8 - Motion in 2D and 3D

Chapter 4 - Friday September 10th

- Exam instructions
- Brief review of projectile motion
- Uniform circular motion
- Relative motion in two-dimensions
- Example problems

Review of chapter 4 and more problems on Monday

Reading: pages 58 thru 75 (chapter 4) in HRW

Read and understand the sample problems

Assigned problems from Chapter 4:

6, 8, 14, 20, 30, 40, 46, 52, 56, 62 (due on Sunday 12th)

PHYSICS DEPARTMENT

PHY 2048 Test I September 16, 2002

S. Hill/D. Maslov

Name (print): ________________________________

On my honor, I have neither given nor received unauthorized aid on this examination.

Signature: ________________________________

YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.

DIRECTIONS

(1) **Code your test number on your pink answer sheet (use 76–80 for the 5-digit number).** Code your name on your answer sheet. **Darken circles completely (errors can occur if too light).** Code your student number on your answer sheet.

(2) Print your name on this sheet and sign it also.

(3) You may use calculators and one handwritten $8\frac{1}{2} \times 11$ formula sheet. No other materials allowed.

(4) Do all scratch work anywhere on this exam that you like. At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout with scratch work most questions demand.

(5) Work the questions in any order. Incorrect answers are not taken into account in any way; you may guess at answers you don't know if you feel that a correct answer is listed. Guessing on all questions will most likely result in failure.

(6) It is not our intention to omit the right answer, but if you believe that none of the answers is correct, please mark the answer closest to your answer.

(7) **Blacken the circle of your intended answer completely, using a number 2 pencil.** Do not make any stray marks or the answer sheet may not read properly.

(8) As an aid to the examiner (and yourself), in case of poorly marked answer sheets, please circle your selected answer on the examination sheet.

(9) Good luck!!!

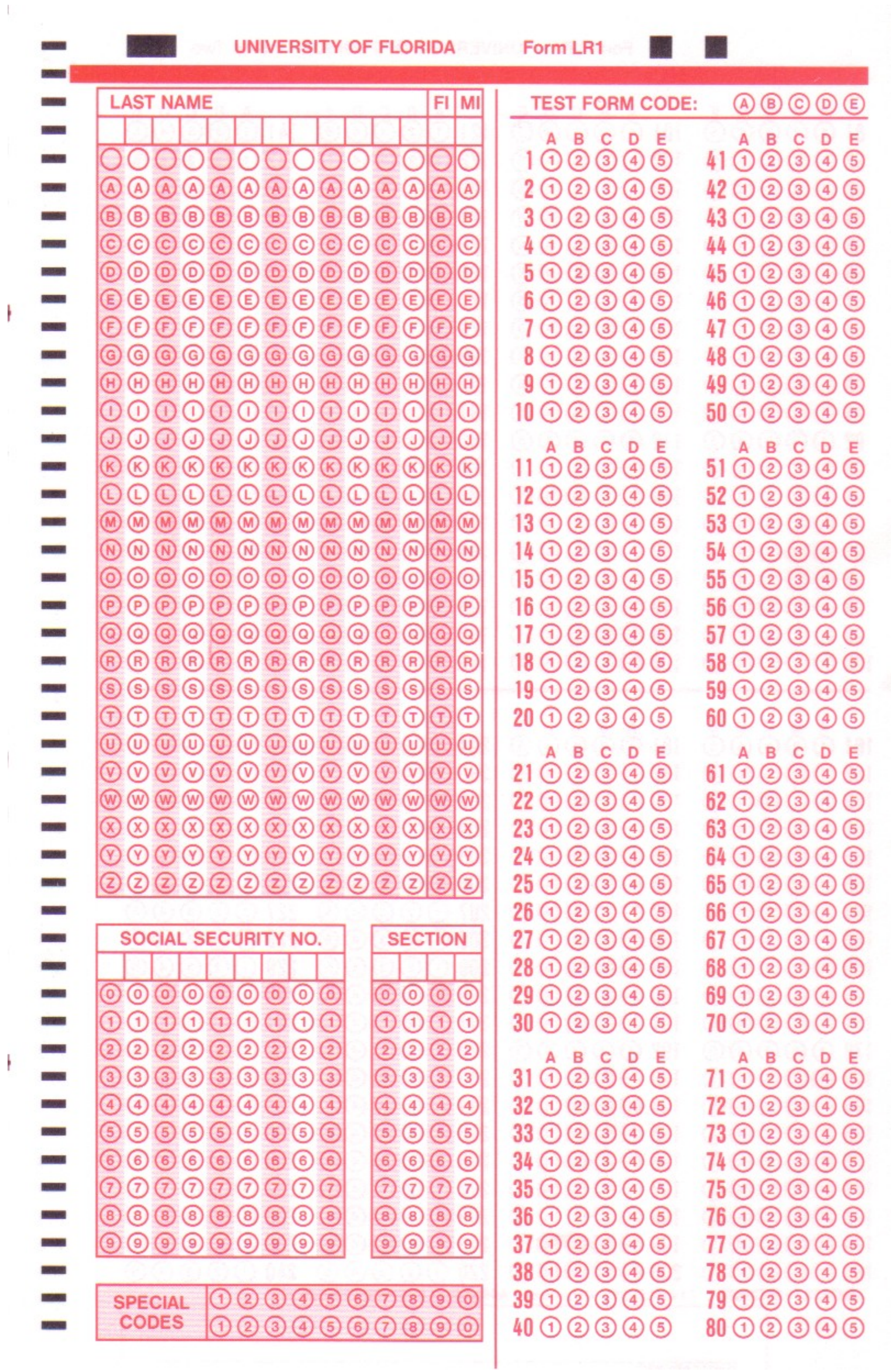
>>>>>>>>**WHEN YOU FINISH** <<<<<<<<

Hand in the pink answer sheet separately.

Work out solutions in spaces on the exam

Circle the correct answers

This is a copy of the scantron, where you will record your answers



UNIVERSITY OF FLORIDA Form LR1

LAST NAME | FI | MI

TEST FORM CODE: A B C D E

SOCIAL SECURITY NO.

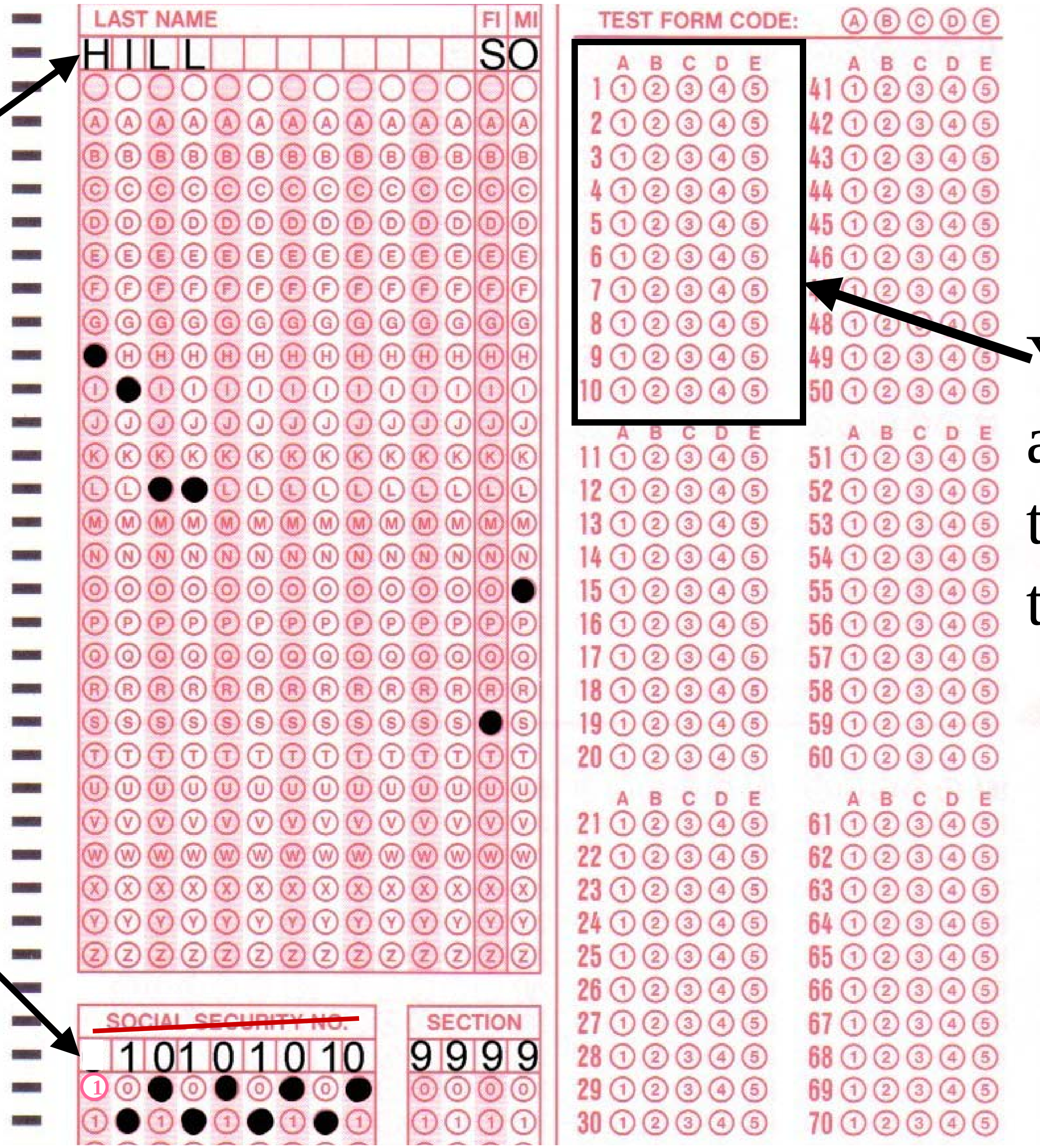
SECTION

SPECIAL CODES

A B C D E

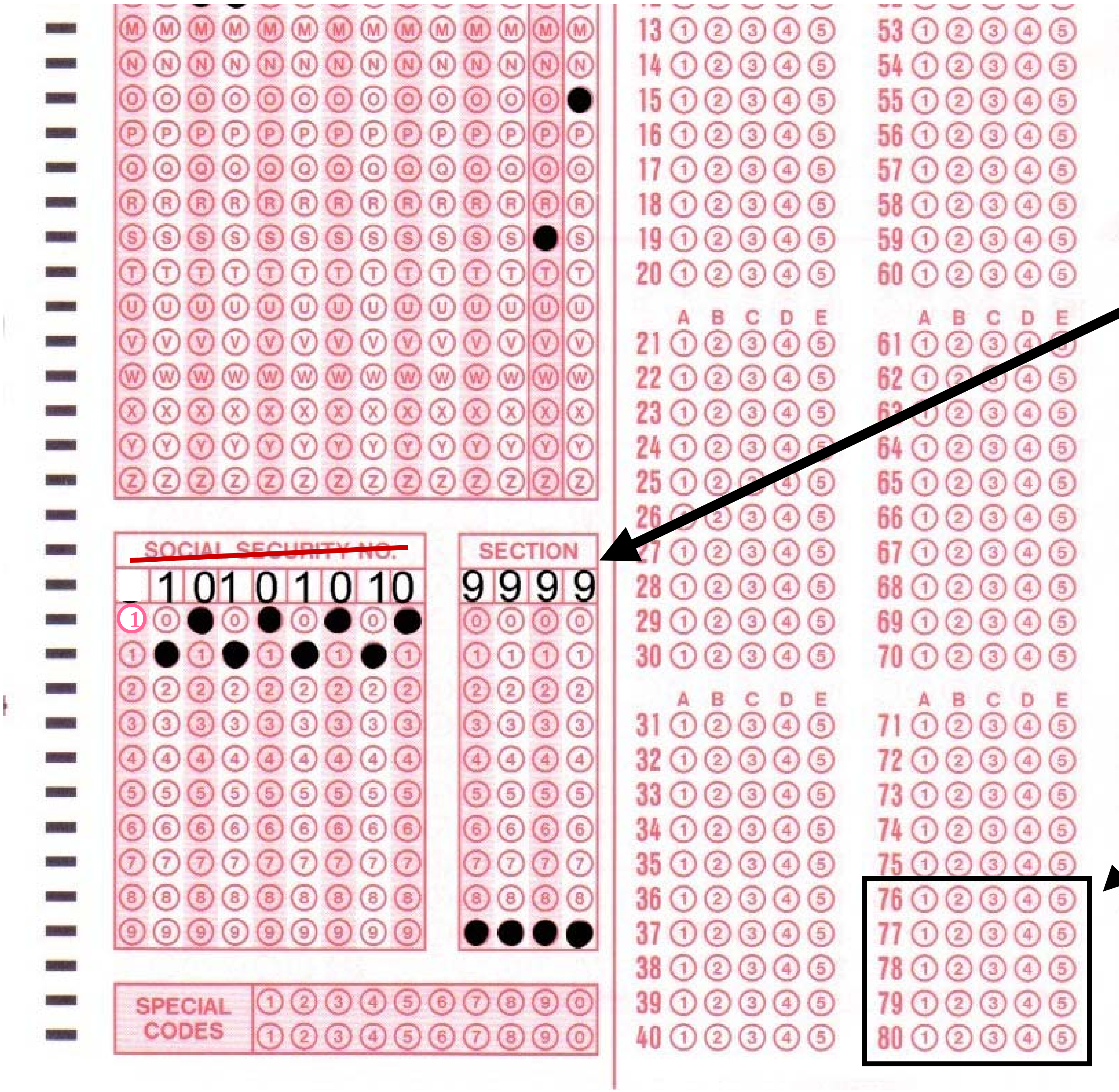
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

Name & initials



Your answers to the test

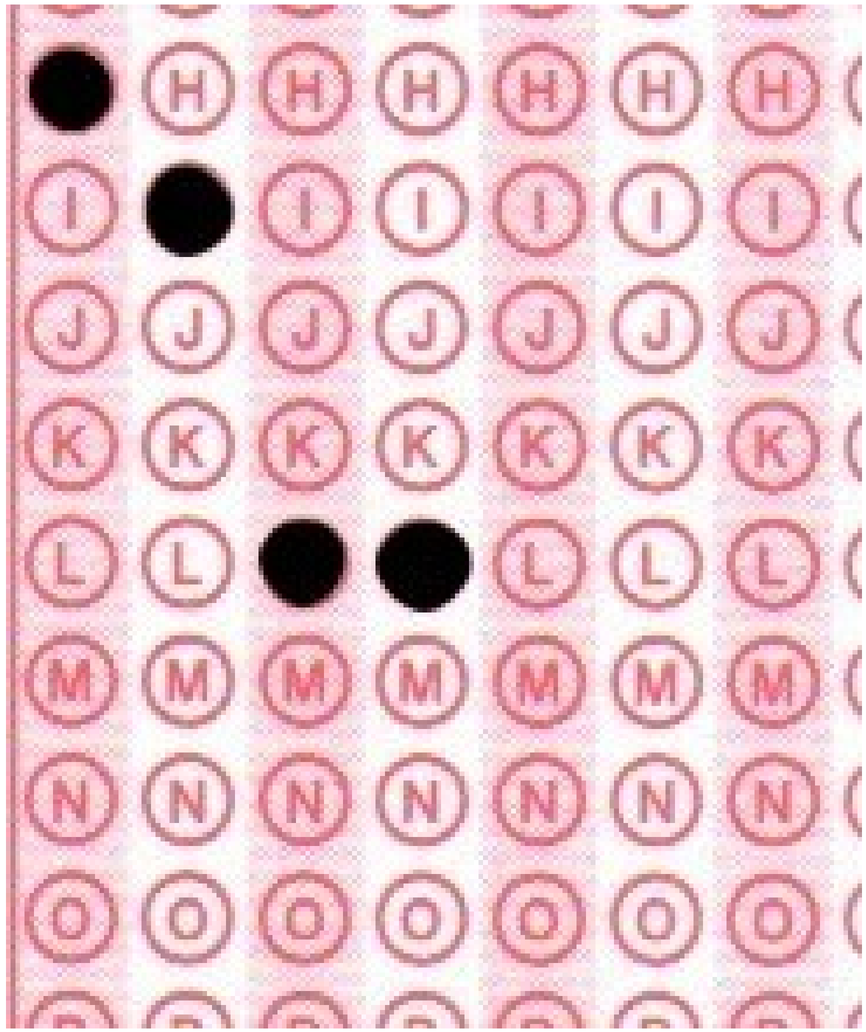
Full UF ID#



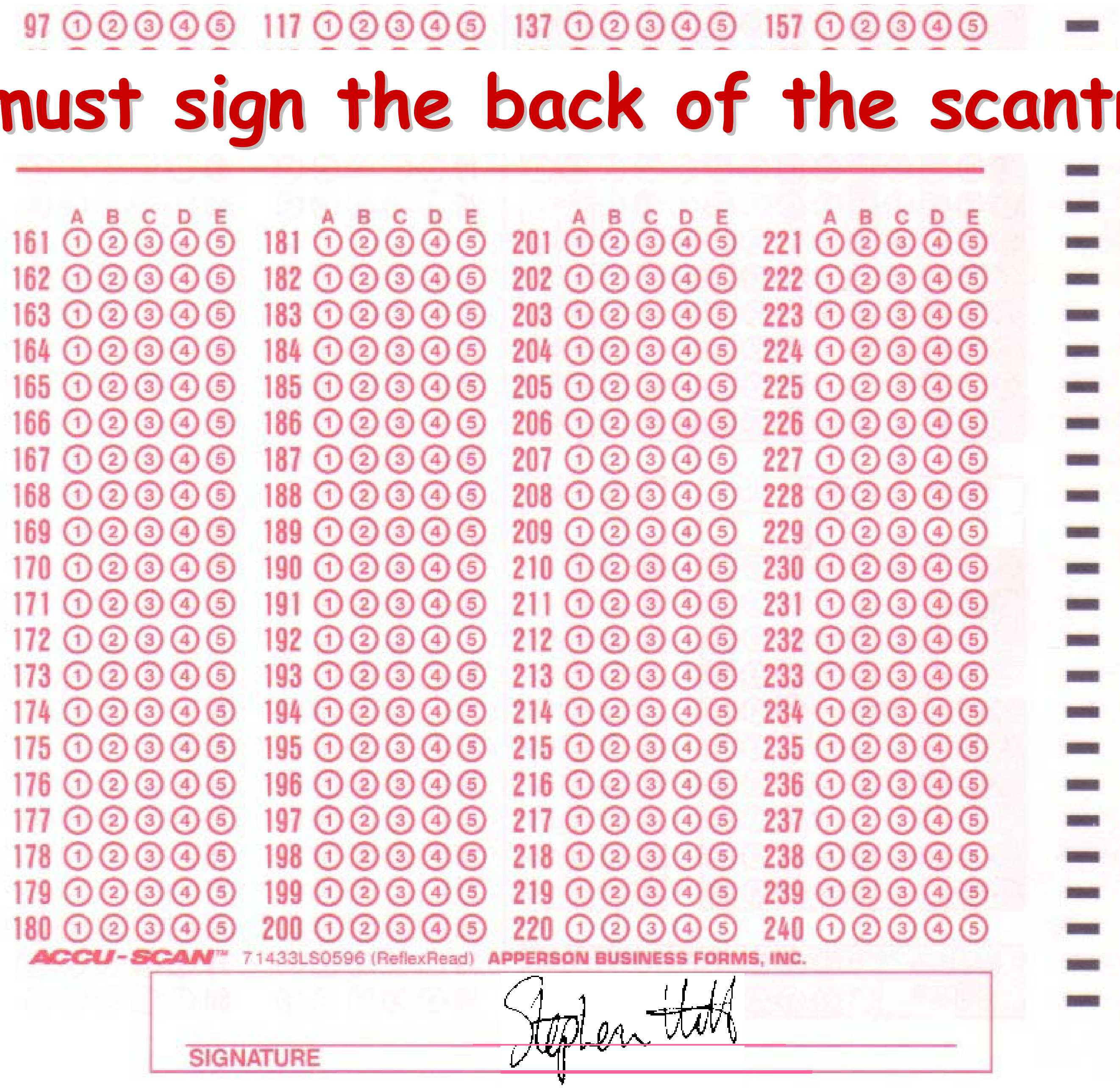
Section number

5 digit exam code

- Use a number 2 pencil to fill in the spaces for answers and for coding
- You can use an eraser but try to avoid doing this



You must sign the back of the scantron


97 ① ② ③ ④ ⑤ 117 ① ② ③ ④ ⑤ 137 ① ② ③ ④ ⑤ 157 ① ② ③ ④ ⑤

	A	B	C	D	E		A	B	C	D	E		A	B	C	D	E		A	B	C	D	E
161	①	②	③	④	⑤	181	①	②	③	④	⑤	201	①	②	③	④	⑤	221	①	②	③	④	⑤
162	①	②	③	④	⑤	182	①	②	③	④	⑤	202	①	②	③	④	⑤	222	①	②	③	④	⑤
163	①	②	③	④	⑤	183	①	②	③	④	⑤	203	①	②	③	④	⑤	223	①	②	③	④	⑤
164	①	②	③	④	⑤	184	①	②	③	④	⑤	204	①	②	③	④	⑤	224	①	②	③	④	⑤
165	①	②	③	④	⑤	185	①	②	③	④	⑤	205	①	②	③	④	⑤	225	①	②	③	④	⑤
166	①	②	③	④	⑤	186	①	②	③	④	⑤	206	①	②	③	④	⑤	226	①	②	③	④	⑤
167	①	②	③	④	⑤	187	①	②	③	④	⑤	207	①	②	③	④	⑤	227	①	②	③	④	⑤
168	①	②	③	④	⑤	188	①	②	③	④	⑤	208	①	②	③	④	⑤	228	①	②	③	④	⑤
169	①	②	③	④	⑤	189	①	②	③	④	⑤	209	①	②	③	④	⑤	229	①	②	③	④	⑤
170	①	②	③	④	⑤	190	①	②	③	④	⑤	210	①	②	③	④	⑤	230	①	②	③	④	⑤
171	①	②	③	④	⑤	191	①	②	③	④	⑤	211	①	②	③	④	⑤	231	①	②	③	④	⑤
172	①	②	③	④	⑤	192	①	②	③	④	⑤	212	①	②	③	④	⑤	232	①	②	③	④	⑤
173	①	②	③	④	⑤	193	①	②	③	④	⑤	213	①	②	③	④	⑤	233	①	②	③	④	⑤
174	①	②	③	④	⑤	194	①	②	③	④	⑤	214	①	②	③	④	⑤	234	①	②	③	④	⑤
175	①	②	③	④	⑤	195	①	②	③	④	⑤	215	①	②	③	④	⑤	235	①	②	③	④	⑤
176	①	②	③	④	⑤	196	①	②	③	④	⑤	216	①	②	③	④	⑤	236	①	②	③	④	⑤
177	①	②	③	④	⑤	197	①	②	③	④	⑤	217	①	②	③	④	⑤	237	①	②	③	④	⑤
178	①	②	③	④	⑤	198	①	②	③	④	⑤	218	①	②	③	④	⑤	238	①	②	③	④	⑤
179	①	②	③	④	⑤	199	①	②	③	④	⑤	219	①	②	③	④	⑤	239	①	②	③	④	⑤
180	①	②	③	④	⑤	200	①	②	③	④	⑤	220	①	②	③	④	⑤	240	①	②	③	④	⑤

ACCU-SCAN™ 71433LS0596 (ReflexRead) APPERSON BUSINESS FORMS, INC.

SIGNATURE Stephen Hall

Other important points to note...

- You are responsible for bringing a self prepared formula sheet - hand written, $8^1/_2$"x11". Both sides is OK.
- Write your section # and UF ID on your formula sheet.
- You must turn in your formula sheet with your examination sheet at the end of the exam.
- **Bring your ID to the test**. These will be checked when you enter the exam room.
- As well as coding answers on the pink scantron, you should also circle answers on the examination sheet.
- Do ALL scratch work on the examination sheet in the spaces provided.

A quick review

$$x - x_0 = \left(v_0 \cos\theta_0\right)t \qquad 4-21$$

$$v_x = v_0 \cos\theta_0$$

$$y - y_0 = \left(v_0 \sin\theta_0\right)t - \tfrac{1}{2}gt^2 \qquad 4-22$$

$$v_y = v_0 \sin\theta_0 - gt \qquad 4-23$$

$$v_y^2 = \left(v_0 \sin\theta_0\right)^2 - 2g\left(y - y_0\right) \qquad 4-24$$

We will need these equations today

Position:

$$\vec{r} = x\hat{\mathrm{i}} + y\hat{\mathrm{j}} + z\hat{\mathrm{k}}$$

Displacement:

$$\Delta\vec{r} = \vec{r}_2 - \vec{r}_1 = \Delta x\hat{\mathrm{i}} + \Delta y\hat{\mathrm{j}} + \Delta z\hat{\mathrm{k}}$$

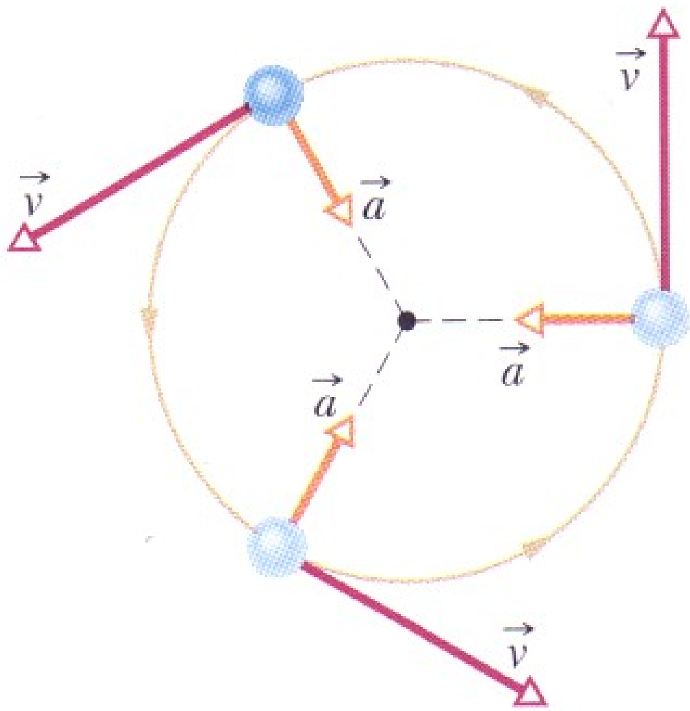
Velocity:

$$\vec{v} = \frac{d\vec{r}}{dt} = \frac{dx}{dt}\hat{\mathrm{i}} + \frac{dy}{dt}\hat{\mathrm{j}} + \frac{dz}{dt}\hat{\mathrm{k}}$$

Acceleration:

$$\vec{a} = \frac{d\vec{v}}{dt} = \frac{dv_x}{dt}\hat{\mathrm{i}} + \frac{dv_y}{dt}\hat{\mathrm{j}} + \frac{dv_z}{dt}\hat{\mathrm{k}}$$

Uniform circular motion



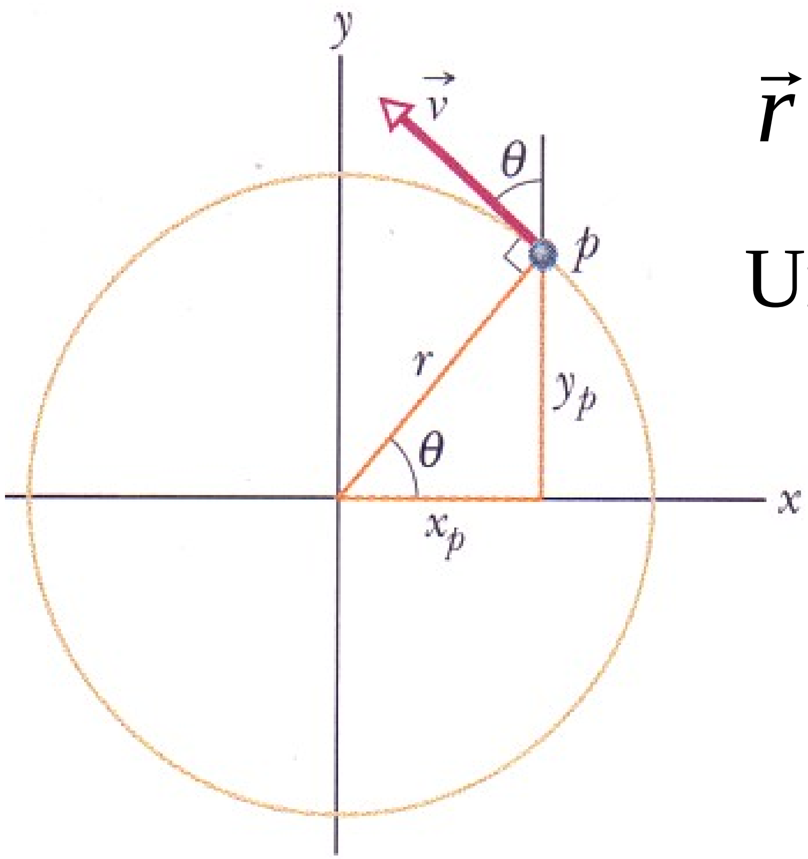
- Although v does not change, the direction of the motion does, *i.e.* the velocity (a vector) changes.
- Thus, there is an acceleration associated with the motion.
- We call this a centripetal acceleration.

Acceleration: $$a = \frac{v^2}{r}$$ Period: $$T = \frac{2\pi r}{v}$$

Frequency: $$f = \frac{1}{T} = \frac{1}{2\pi}\frac{v}{r}; \quad \omega = 2\pi f = \frac{v}{r}$$

- Since v does not change, the acceleration must be perpendicular to the velocity.

Analyzing the motion



$$x_p = r\cos\theta \qquad y_p = r\sin\theta$$

$$\vec{r} = x_p\hat{\mathrm{i}} + y_p\hat{\mathrm{j}}$$

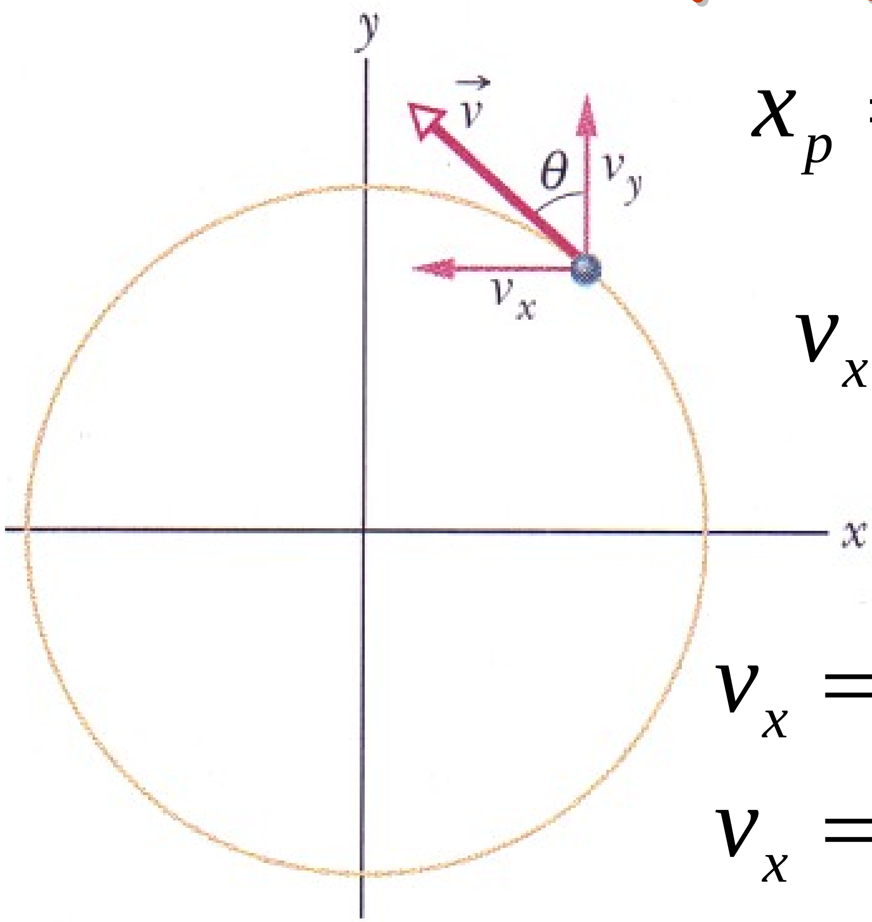
Uniform motion:

$$\theta = 2\pi\frac{t}{T} = (2\pi f)t = \omega t$$

$$\left[\text{Note: } 360^o = 2\pi \text{ radians}\right]$$

$$x_p = r\cos\omega t \qquad y_p = r\sin\omega t$$

Analyzing the motion



$$x_p = r\cos\omega t \qquad y_p = r\sin\omega t$$

$$v_x = \frac{dx_p}{dt} \qquad v_y = \frac{dy_p}{dt}$$

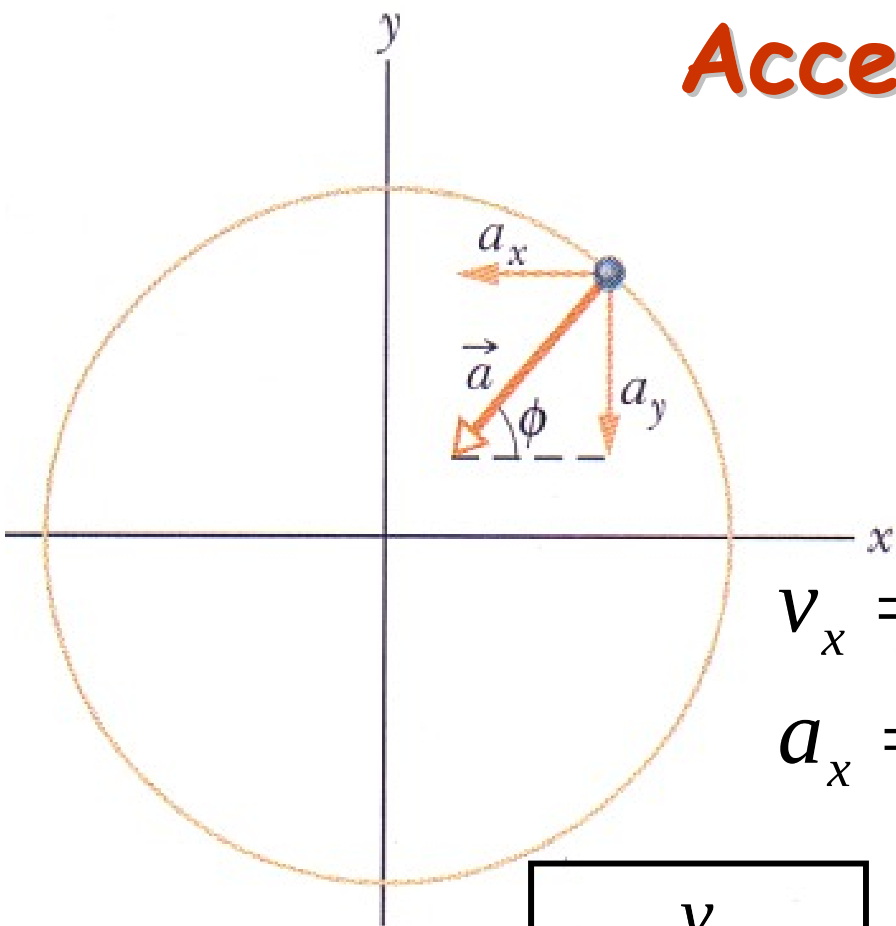
$$v_x = -r\omega\sin\omega t \qquad v_y = r\omega\cos\omega t$$

$$v_x = -v\sin\omega t \qquad v_y = v\cos\omega t$$

$$\vec{v} = v_x\hat{\mathrm{i}} + v_y\hat{\mathrm{j}}$$

$$v = r\omega \ \ [\text{remember}, \omega = \frac{v}{r}]$$

Acceleration



$$\vec{a} = \frac{d\vec{v}}{dt} = \left(\frac{dv_x}{dt}\right)\hat{\mathrm{i}} + \left(\frac{dv_y}{dt}\right)\hat{\mathrm{j}}$$

$$= a_x\hat{\mathrm{i}} + a_y\hat{\mathrm{j}}$$

$$v_x = -v\sin\omega t \qquad v_y = v\cos\omega t$$

$$a_x = -v\omega\cos\omega t \quad a_y = -v\omega\sin\omega t$$

$$\boxed{\omega = \frac{v}{r} \quad \Rightarrow} \qquad a_x = -\frac{v^2}{r}\cos\omega t \quad a_y = -\frac{v^2}{r}\sin\omega t$$

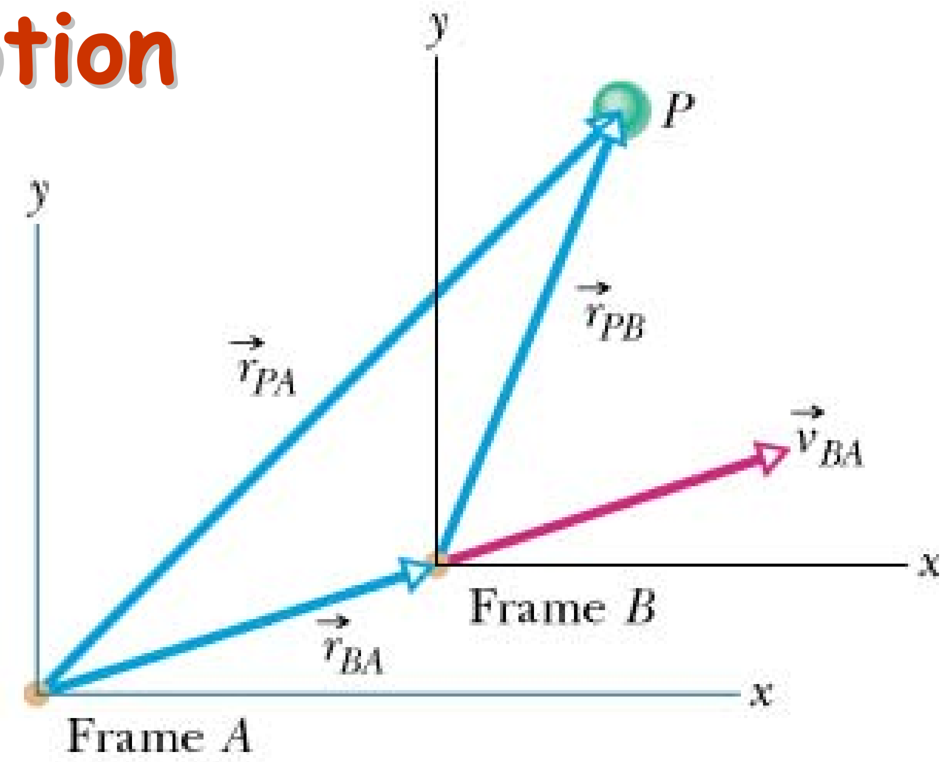
$$\left[\mathrm{recall}: x_p = r\cos\omega t \qquad y_p = r\sin\omega t\right]$$

$$a = \sqrt{a_x^2 + a_y^2} = \frac{v^2}{r}\sqrt{(\cos\theta)^2 + (\sin\theta)^2} = \frac{v^2}{r} = v\omega$$


©1997 Joe Schwartz
www.joyrides.com


9 Joe Schwartz
w.joyrides.com

Relative motion



Position:

$$\vec{r}_{PA} = \vec{r}_{PB} + \vec{r}_{BA}$$

Velocity:

$$\vec{v}_{PA} = \frac{d\vec{r}_{PA}}{dt} = \frac{d\vec{r}_{BA}}{dt} + \frac{d\vec{r}_{PB}}{dt} = \vec{v}_{BA} + \vec{v}_{PB} = \vec{v}_R + \vec{v}_{PB}$$

Acceleration (if frame B is "inertial"):

$$\vec{a}_{PA} = \frac{d\vec{v}_{PA}}{dt} = \frac{d\vec{v}_R}{dt} + \frac{d\vec{v}_{PB}}{dt} = \vec{a}_{PB}$$