MVS 330

The University of Michigan
Division of Kinesiology
Department of Movement Science

Project Requirements

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Edited by Tom Hoogendyk

Revised 9/99

Table of Contents

Document Formatting

Use the instructions given in this section when you prepare your final report. You must follow these content and formatting instructions to receive full credit for your project and to publish your project on the web.

Text format

For the text, follow these instructions:

- use Times 12 pt font
- use 1.5 line spacing for entire document
- use 0.75" margins on all sides of document
- leave a blank line between paragraphs; do not indent paragraphs
- capitalize all letters of section headings; use bold font
- capitalize the first words of section subheadings; use bold font
- you will lose points for any misspelled words — use spell check

Figure format

For the figures, follow these instructions:

- each figure must be 2.75" wide by 2" tall
- do not put text on the graphs except as shown in example figures
- label the figures exactly as shown in example figures

Example projects

You can view projects from previous semesters on the class web site:

http://www.umich.edu/~mvs330/

The following pages were created using the formatting specified above. Example figures were taken from the bouncin team's project: http://www.umich.edu/~mvs330/w99/bouncin/main.html

(first page)

MVS 330 Motion Analysis Project – Semester Year

Put Your Title Here

Put your team name here:
Name of Member 1 (uniqname1)
Name of Member 2 (uniqname2)
Name of Member 3 (uniqname3)

Facilitator: Name (uniqname)

Other instructions for title page: Choose a title that describes your project. Do not exceed 56 characters (including spaces) for the title. The one-word name for your team cannot contain spaces or hyphens, and must be all lowercase.

- *(insert page break here)*- -

INTRODUCTION

In the first paragraph, describe your movement question and explain why it is important. You must cite at least one of your references in this paragraph. If there are 1 or 2 authors, use all of the author's last names (Hoogendyk and Streepey, 1999). If there are 3 or more authors, use only the first author's last name followed by "et al." (Hoogendyk et al., 1998).

In the second paragraph, briefly state your purpose and how you chose to answer your movement question (you need to compare two movements in your movement study).

- *(insert page break here)* -

METHODS

Subjects

In this paragraph, describe the subject(s) (*i.e.*, age, gender, height, weight, clothing, footwear, relevant skills or experience in the movement - do not use the subject's name). Describe the anatomical location of each joint marker. Include a figure from each of your movements to illustrate the marker locations; use one frame (*i.e.*, one "JPEG" file) from each of your videos to show the subject with markers. Be sure to save the two JPEG files, “fig1a.jpg” and “fig1b.jpg,” in the "imgs" folder within the “html” folder on your ZIP disk. Use past tense in this section.

(insert fig1a.jpg here)

(insert fig1b.jpg here)

Figure 1. Joint markers in the [amov] (left) and the [bmov] (right). Joint markers were placed on the [which joints?].

- *(insert page break here)*- -

Data Acquisition

In the first paragraph, describe the data collection environment (*e.g.*, type of video camera; video frame rate; location of camera with respect to the subject; any special lighting). Describe the instructions given to the subject. Describe what criteria were used to select trials for analysis. Use past tense.

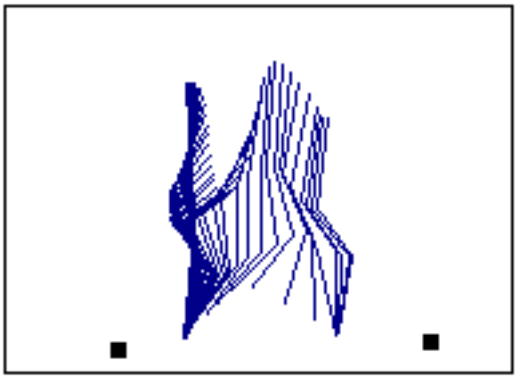
In the second paragraph, modify the following sentences to represent the data acquisition steps used in your project: "The videotaped images were digitized at 30 frames/s using FusionRecorder on Macintosh computers in the New Media Center at the University of Michigan. The digital video files were trimmed using MoviePlayer so that the data files contained only the frames between the start and end of the movements. A custom utility (QT->PICT) was used to convert the QuickTime movie files into a series of individual frame files in PICT format for use with the Motion Plus software. Name-your-joint-markers (*e.g.*, shoulder, hip, knee, and ankle) were digitized using Motion Capture. Joint marker coordinate data were exported in spreadsheet format to Excel for biomechanical analysis using MotionAnalyse."

- *(insert page break here)*- -

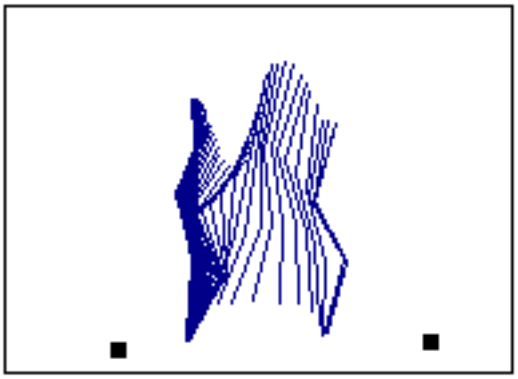
RESULTS

Qualitative Analysis

In this paragraph, provide an overall qualitative description of the movements. Include a stick figure plot for each movement. Use past tense in this section.



(insert fig2a here)



(insert fig2b here)

Figure 2. Body motion in the [amov] (left) and the [bmov] (right). Body segments shown are [which segments?]. The direction of motion is from [where to where?]. The black squares represent reference markers.

- *(insert page break here)*- -

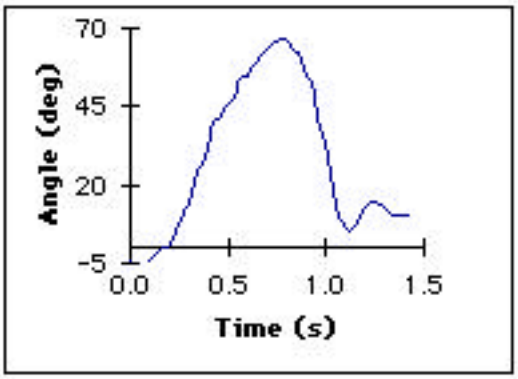
Temporal Analysis

In this paragraph, describe the limb events that define the start and end of the overall movement. Also, identify the limb events that start and end component phases within the overall movement. State the overall movement time (*e.g.*, gait cycle time) and the duration of each movement phase (*e.g.*, swing and stance time). The duration of movement phases should also be given as a percent of the total movement time (*e.g.*, "Stance phase occupied 58% of the gait cycle"). Time should be reported to the nearest 1/100th of a second (*e.g.*, 0.84 s). Use past tense in this section.

- *(insert page break here)* -

Angular Kinematics

Segment angle. Start this paragraph with a topic sentence that gives the most important message — whether the segment motion is similar or different between the two movements. Compare the maximum clockwise angle, the maximum counterclockwise angle, and the range of motion (*i.e.*, maximum CW angle – maximum CCW angle) between movements. Angles must be rounded to the nearest whole degree. Include a figure of the segment angle for each movement. Use past tense in this section.



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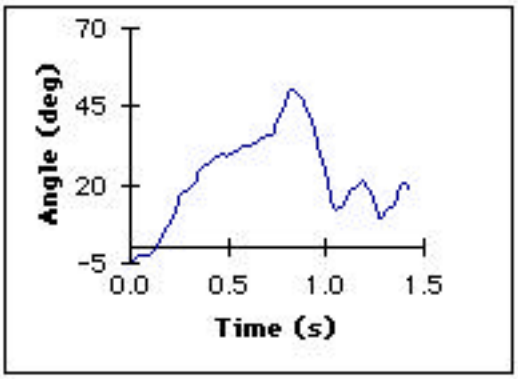
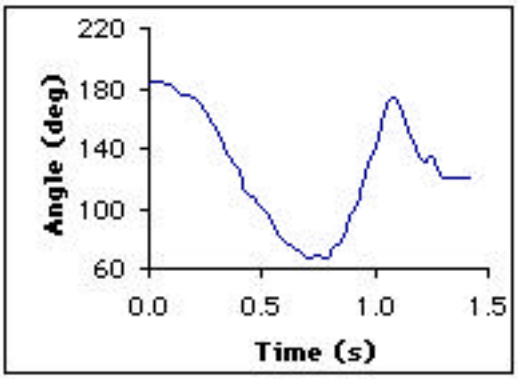


(insert fig3b here)

Figure 3. [Segment] angle during the [amov] (left) and the [bmov] (right). The [segment] angle is calculated from the [horizontal or vertical?] axis about the [which joint?]. Anatomical position corresponds to [which angle?]. Increasing values represent [clockwise or counter-clockwise?] rotation. Make the vertical scale the same for both figures. Label the x axis "**Time (s)**" and the y axis "**Angle (deg)**".

- *(insert page break here)*- -

Joint angle 1. Start this paragraph with a topic sentence that gives the most important message — whether the motion of joint angle 1 is similar or different between the two movements. Compare the maximum flexion angle, the maximum extension angle, and the range of motion (*i.e.*, maximum flexion angle - maximum extension angle) between movements. Angles must be rounded to the nearest whole degree. Include a figure that shows the joint angle during each movement. Use past tense in this section.



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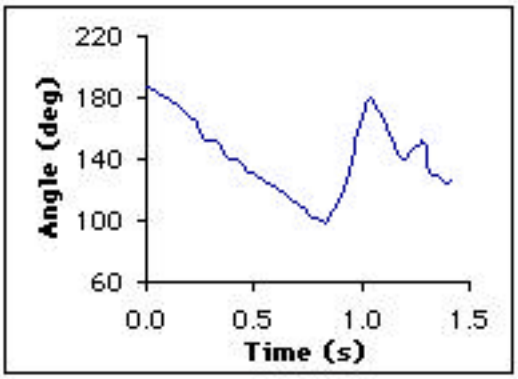
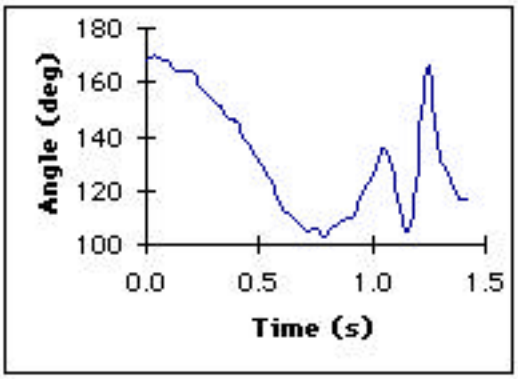


(insert fig4b here)

Figure 4. [Joint1] angle during the [amov] (left) and the [bmov] (right). [Joint1] angle is calculated as the angle between the [which segment?] and the [which segment?]. Anatomical position corresponds to [which angle?]. Increasing values represent [flexion or extension? plantarflexion or dorsiflexion?]. Make the vertical scale the same for both figures. Label the x axis "**Time (s)**" and the y axis "**Angle (deg)**".

- *(insert page break here)*- -

Joint angle 2. In this paragraph, compare the motion of another joint angle between your movements. Start the paragraph with a topic sentence that gives the most important message (*e.g.*, whether the joint angle motion is similar or different between the two movements). The analysis must include a comparison of the maximum flexion angle, the maximum extension angle, and the range of motion (*i.e.*, maximum flexion angle - maximum extension angle) between movements. Angles must be rounded to the nearest whole degree. Include a figure that shows the joint angle during each movement. Use past tense in this section.



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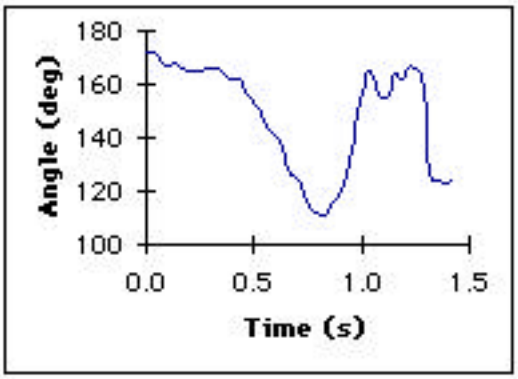
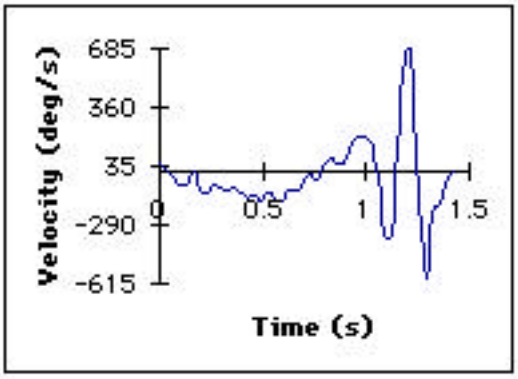


(insert fig5b here)

Figure 5. [Joint2] angle during the [amov] (left) and the [bmov] (right). [Joint2] angle is calculated as the angle between the [which segment?] and the [which segment?]. Anatomical position corresponds to [which angle?]. Increasing values represent [flexion or extension? plantarflexion or dorsiflexion?]. Make the vertical scale the same for both figures. Label the x axis "**Time (s)**" and the y axis "**Angle (deg)**".

- *(insert page break here)* -

Angular velocity. Start this paragraph with a topic sentence that gives the most important message — whether angular velocity of joint 1 (or 2) is similar or different between the two movements. Compare the maximum flexion and extension velocities between movements. Include a figure of the joint angular velocity for each movement. Use past tense in this section.



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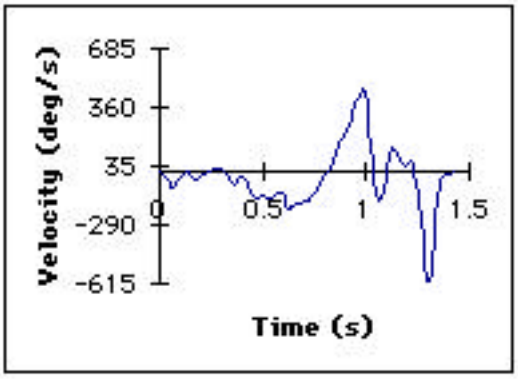
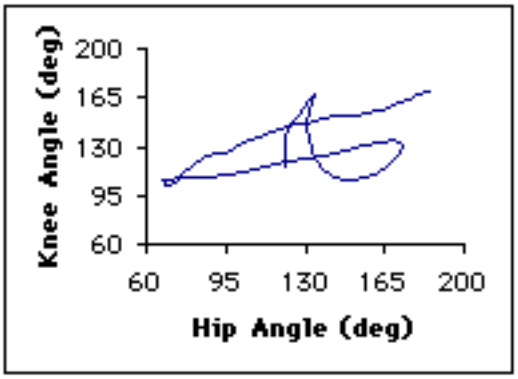


(insert fig6b here)

Figure 6. [Joint 1 or 2] angular velocity in the [amov] (left) and the [bmov] (right). Positive values represent [flexor or extensor? plantarflexor or dorsiflexor?] velocity. Make the vertical scale the same for both figures. Label the x axis "**Time (s)**" and the y axis "**Velocity (deg/s)**".

- *(insert page break here)*- -

Angle-angle plot. Start this paragraph with a topic sentence that gives the most important message — whether the angles are coordinated in similar or different ways between the two movements. Identify the key features of the graphs that illustrate the coordination between the angles (*e.g.*, diagonal regions that indicate coupled coordination; vertical or horizontal regions that indicate decoupled coordination, corners, et cetera), and compare them for the two movements. Include an angle-angle plot for each movement. Use past tense in this section.



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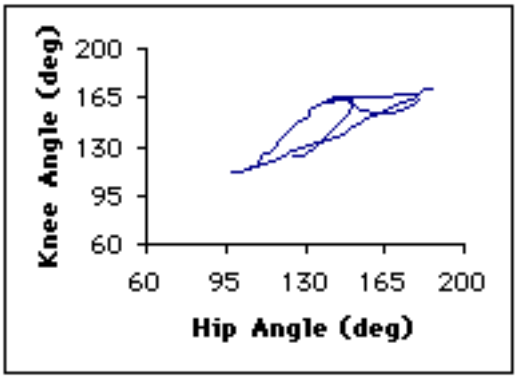


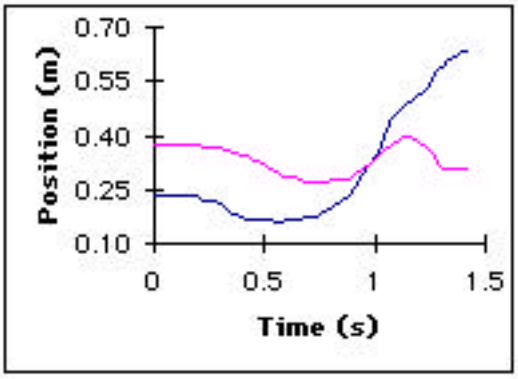
(insert fig7b here)

Figure 7. Coordination of [which angle?] angle and [which angle?] angle in the [amov] (left) and [bmov] (right). Make the vertical and horizontal scales the same for both figures. Label the x axis " **[which angle?] Angle (deg)**" and the y axis "**[which angle?] Angle (deg)**".

- *(insert page break here)*- -

Linear Kinematics

Linear displacement. Start this paragraph with a topic sentence that gives the most important message — whether the linear displacement of [which joint marker?] is similar or different between the two movements. Compare the maximum displacement of the joint marker (*i.e.*, distance between maximum and minimum positions) in the horizontal and vertical directions for each movement. Round the displacement to the nearest 1/100th meter (*e.g.*, 0.03 m). Include a linear displacement figure for each movement. Do not include the "Combined" displacement curve. Use past tense in this section.



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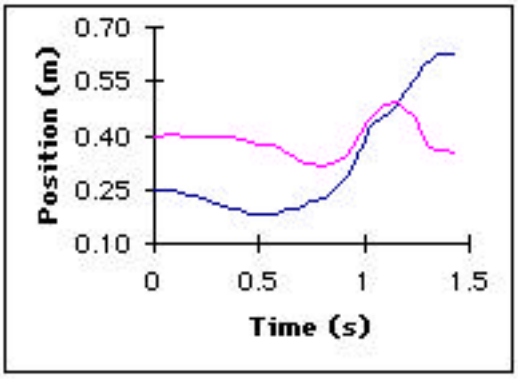

(insert fig8b here)

Figure 8. Linear displacement of the [which joint marker?] in the [amov] (left) and the [bmov] (right). Increasing values represent [forward or backward?] movement in the horizontal direction and [upward or downward?] movement in the vertical direction. The [which color?] line represents the horizontal position and the [which color?] line represents the vertical position. Make the vertical scale the same for both figures. Label the x axis "**Time (s)**" and the y axis "**Position (m)**".

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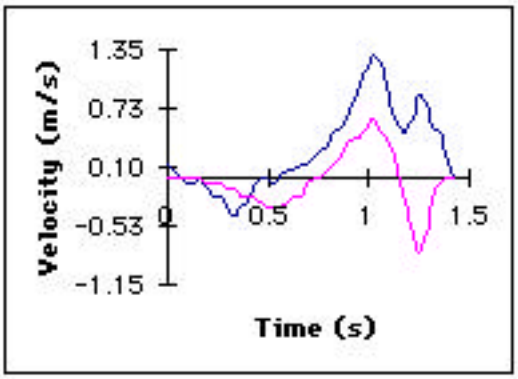
Linear velocity. Start this paragraph with a topic sentence that gives the most important message — whether the linear velocity of [which joint marker?] is similar or different between the two movements. Compare the maximum [forward or backward?] and the maximum [upward or downward?] velocities of the marker between movements. Include a linear velocity figure for each movement. Do not include the "Combined" velocity curve. Use past tense in this section.



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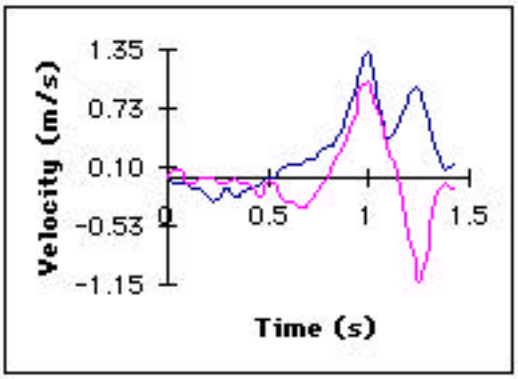
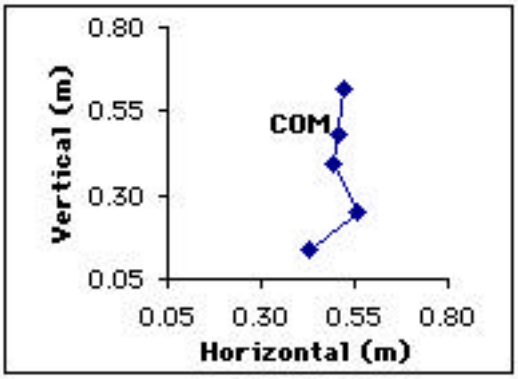


(insert fig9b here)

Figure 9. Linear velocity of the [which joint marker?] in the [amov] (left) and the [bmov] (right). Positive values represent [forward or backward?] movement in the horizontal direction and [upward or downward?] movement in the vertical direction. The [which color?] line represents the horizontal velocity and the [which color?] line represents vertical velocity. Make the vertical scale the same for both figures. Label the x axis "**Time (s)**" and the y axis "**Velocity (m/s)**".

- *(insert page break here)* -

Center of mass. Start this paragraph with a topic sentence that gives the most important message — whether the COM location is similar or different between the two movements. Qualitatively compare the COM position relative to a joint or segment (*e.g.*, hip joint or trunk segment) between movements. Be sure to state at what point in the movement that you calculated the COM. Include a stick figure for one frame from each movement that shows the center of mass location (label it as "COM" on the plot). Use past tense in this section.



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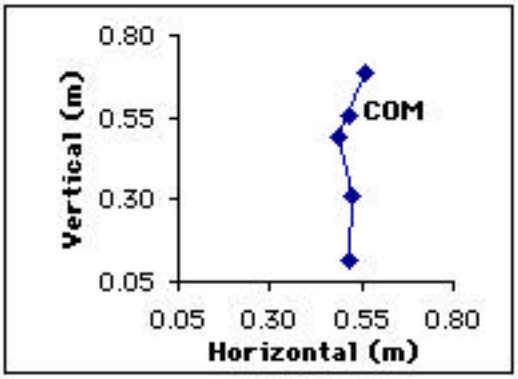

(insert fig10b here)

Figure 10. Location of the center of mass (COM) in the [amov] (left) and the [bmov] (right). Body segments shown are the [which segments?]. Make the vertical and horizontal scales the same for both figures. Label the x axis "**Horizontal (m)**" and the y axis "**Vertical (m)**".

- *(insert page break here)*- -

DISCUSSION

Start the first paragraph with a topic sentence that restates the purpose of your study. Then state the answer that you found. Show how your data support your answer. Put the most important finding first. Use past tense in this section.

In the second paragraph, discuss the implications of your results. You must cite at least one of your references in this paragraph. If there are 1 or 2 authors, use all of the author's last names (Hoogendyk and Streepey, 1999). If there are 3 or more authors, use only the first author's last name followed by "et al." (Hoogendyk et al., 1998).

In the third paragraph, discuss the limitations of your study and what you think the next step should be.

- *(insert page break here)*- -

REFERENCES

Include at least 2 articles from peer-reviewed scientific journal articles that are relevant to your study. Every reference in your list must be cited in your report. Use the format specified below and be sure to put your references in alphabetical order.

Aragon-Vargas, L.F. and Gross, M.M. (1997) Kinesiological factors in vertical jump performance: Differences among individuals. Journal of Applied Biomechanics 13: 24-44.

Donkers, M.J., An, K., Chao, E.Y.S., and Morrey, B.F. (1993) Hand position affects elbow joint load during push-up exercise. Journal of Biomechanics 26: 625-632.

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APPENDIX A

Put project team name here — Effort Distribution

Name of Member 1 — X% (Signature here)
Name of Member 2 — X% (Signature here)
Name of Member 3 — X% (Signature here)
100%

The sum of all team member's efforts must add to 100%. **This page must be signed by each member of your project team.**

Your ZIP disk will be returned to you at the final exam.

(last page)