

# Mechanics & Sport Performance

## Assignments & Solutions

**124 pages**

The accompanying Assignments use a variety of approaches to investigate mechanical principles as they apply to sports performance. Most tasks may be undertaken by individuals and only one set of tasks require some additional equipment. The tasks mainly focus on investigations which require the processing and interpretation of data and information that has been provided, rather than factual recall.

Where relevant, concepts are investigated using data and problems that relate directly to sports performers, and not just to sports implements, or non-sports related objects. Although many tasks require students to undertake numerical techniques to arrive at solutions or to facilitate interpretations of the data, the numerical skills required should be within the grasp of students without specialist mathematical knowledge.

As several Assignment sheets require the construction of graphical material, scaling factors in the graphical results shown in the solutions sheets may not always match those produced by students. In some cases processes involved in the production of the solution sheets may also have affected scaling information.

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# Contents

			<i>Problems</i>	<i>Solutions</i>
<b>Assignment One</b>	Distance and Displacement	<i>Tasks 1 - 11</i>	4	83
<b>Assignment Two</b>	Calculating, Graphing & Interpreting Position, Velocity & Acceleration Values	<i>Tasks 12 - 32</i>	8	86
<b>Assignment Three</b>	Sport Related Components & Resultant Vectors	<i>Tasks 33 - 41</i>	17	93
<b>Assignment Four</b>	Vectors & Sport	<i>Tasks 42 - 56</i>	20	95
<b>Assignment Five</b>	Impulse	<i>Tasks 57 - 68</i>	31	101
<b>Assignment Six</b>	Centre of Gravity	<i>Tasks 69 - 84</i>	37	104
<b>Assignment Seven</b>	Force & Changes in Motion	<i>Tasks 85 - 105</i>	45	107
<b>Assignment Eight</b>	Work, Energy & Power	<i>Tasks 106 - 112</i>	55	113
<b>Assignment Nine</b>	Angular Descriptors of Movements	<i>Tasks 113 - 123</i>	59	116
<b>Assignment Ten</b>	Moments/Torques	<i>Tasks 124 - 137</i>	64	120
<b>Assignment Eleven</b>	Angular Momentum	<i>Tasks 138 - 142</i>	73	123

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**THE BLUE LINKS ON  
EACH PAGE TAKE YOU TO  
THE PAGE OF THE  
SOLUTION**

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# **ASSIGNMENT ONE**

## **DISTANCE & DISPLACEMENT**

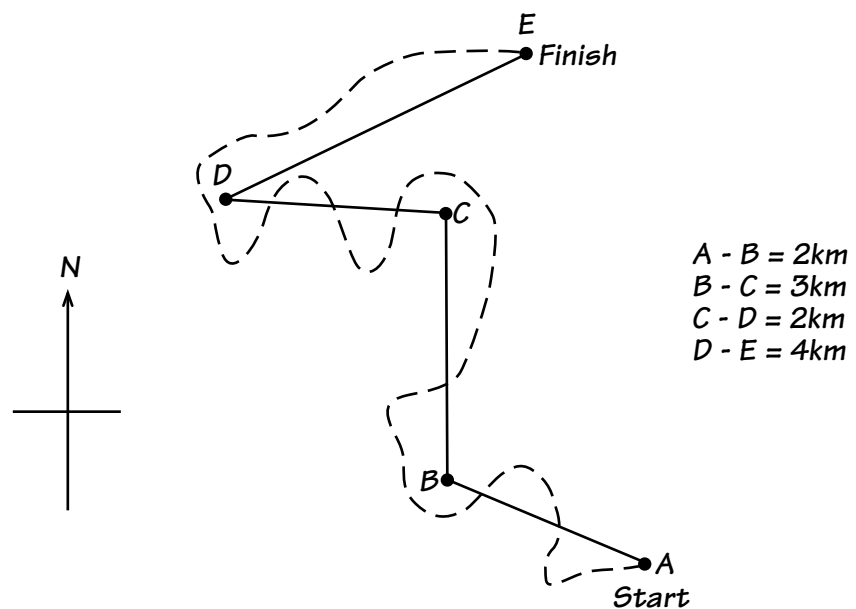
## DISTANCE AND DISPLACEMENT

These problems consider the difference between distance and displacement, and require some simple procedures for calculating characteristics of vector quantities to be used.

### I Answer

Figure 1 shows a representation of the course for a yachting race. The solid line represents the straight line path between the buoys that the boats are required to pass. The dotted line represents the 17 km path actually taken by the boat that won the race. Note that Figure 1 is not drawn to scale.

**Figure 1** Diagram representing the course for a yachting race.



### Draw a scale diagram of the above race.

Use a scale of 1 cm on your graph to represent 1 km of the race. The angle of each line is recorded below. Each angle should be measured from North in an anti-clockwise direction.

From A to B  $70^\circ$

From B to C  $0^\circ$

From C to D  $90^\circ$

From D to E  $300^\circ$

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- 2**    **Answer**                      **The distance the yacht travelled during the race was 17 km, what was the displacement it experienced from the start to the finish?**
- 
- 3**    **Answer**                      **Using your diagram work out by direct measurement the following displacements experienced by the yacht:**
- a** from A to C
  - b** from B to D
  - c** from A to D
  - d** from C to E
  - e** from B to E
- 
- 4**    **Answer**                      **By using Pythagoras's theorem calculate the magnitude value for the vector displacement from B to D (Solutions Figure S1).**
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- 5**    **Answer**                      **By using trigonometry calculate the direction value for the vector displacement from B to D.**
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- 6**    **Solution not supplied**                      **Compare the calculated results with those from your construction.**
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- 7**    **Answer**                      **Using the directly measured values for the magnitude and direction of the displacement from A to E determined previously, work out how far the yacht travelled west.**
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- 8**    **Answer**                      **Using the method described in 7 work out how far the yacht travelled north.**
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