 <p>CORPUS CHRISTI COLLEGE SEQUERE DOMINUM</p>	Year 12	Physics 3AB	2017
	TEST 3	Torque and Equilibrium	3.0%
	NAME:		
	Data:	See Data Sheet Approx. marks shown.	
			(52 marks)

When calculating numerical answers, show your working or reasoning clearly. Give final answers to **three** significant figures and include appropriate units where applicable.

When estimating numerical answers, show your working or reasoning clearly. Give final answers to a maximum of **two** significant figures and include appropriate units where applicable.

- Consider the following diagram below. A driver was required to change a flat tyre. However the wheel nuts were too tight to loosen by hand and so the driver stood on the end of the torque wrench shown in the diagram.



- Assuming that the wrench is **horizontal** when the person stood on it, estimate the torque applied to the wheel nut. Show your working clearly. [6]

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- Estimate the magnitude of the force applied to the wheel nut. Show your working clearly. [3]

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2. A bar of steel 80 cm long is pivoted horizontally at its left end, as depicted in Fig. 2.

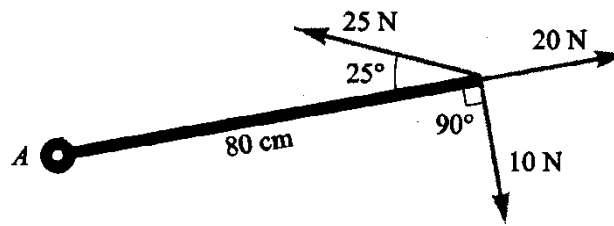


Fig. 2

- (a) Find the torque about axis-**A** (which is perpendicular to the page) due to **each** of the forces shown acting at its right end. [4]
- (b) Hence determine the net torque acting on the bar by the given forces. [2]

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3. The arm drawn in Fig. 3 supports a 4.00 kg sphere. The mass of the hand and forearm together is 3.0 kg and its weight acts at a point 15 cm from the elbow.

Assuming all the forces are vertical and the arm is horizontal, determine the force exerted by the biceps muscle. [4]

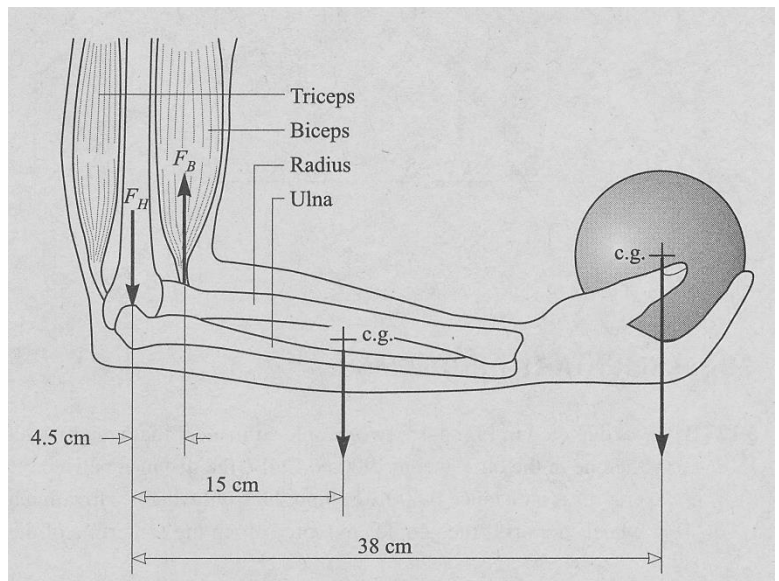


Fig. 3

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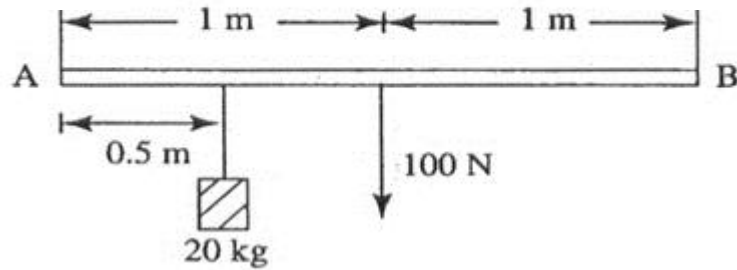
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4. A uniform rod AB of weight 100 N and length 2.0 m is balanced horizontally and carries a load of 20.0 kg as shown in the diagram below. Determine the location of the pivot. [4]

This image shows a blank sheet of white paper with horizontal ruling lines. There are ten sets of lines across the page. Each set consists of three lines: a solid black line at the top, a dashed black line in the middle, and another solid black line at the bottom. The lines are evenly spaced and extend across the entire width of the page.

5. Where must a 0.80 kN object be hung on a uniform, horizontal, rigid 100 N pole, 2.50 m long, so that a girl pushing up at 0.25 m from one end supports one third as much as a woman pushing up at the other end? [6]

[illegible]

6. Find the tensions in the ropes illustrated in Fig 6b below if the supported load of the bird feeder apparatus is 25 kg. Neglect the weight of the ropes.

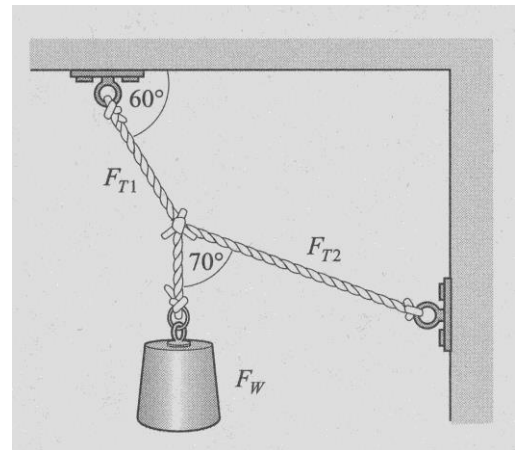
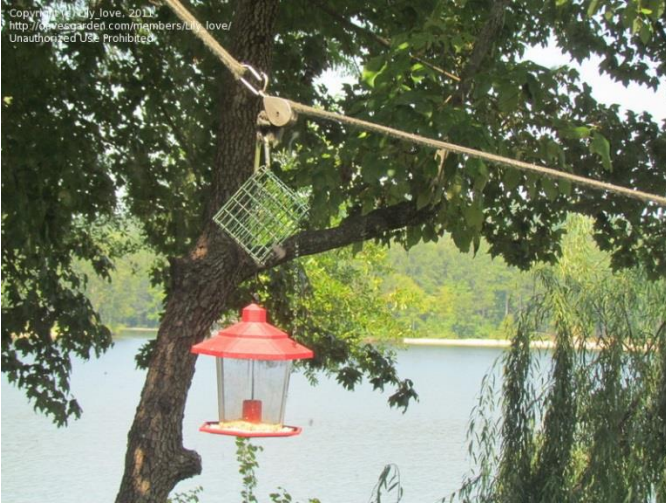


Fig 6b

[5]

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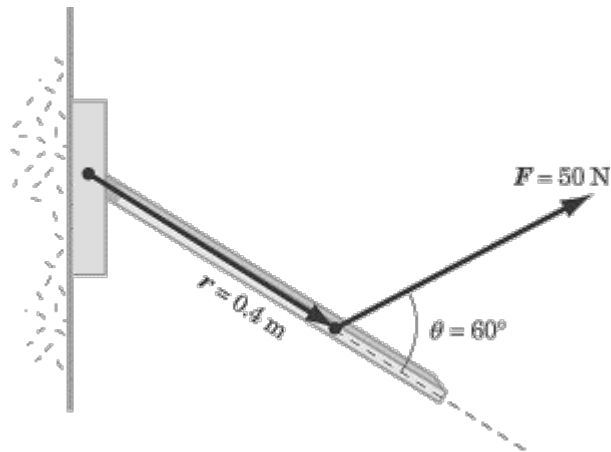
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7. A uniform plank shown below is 0.750 m long has a mass of M kg. It is suspended at an angle of 40.0° with the wall by a force of 50.0 N at a point 0.400 m from the wall as shown below.



- (a) Calculate the value of M. [4]

[illegible]

- (b) Calculate the magnitude and direction of the reaction of the wall at the hinge. Show this force on the diagram. [5]

This image shows a full page of white paper with ten horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and extend across the entire width of the page. There is no text or other markings on the paper.

- (c) If the force of 50.0 N were applied closer to the pivot what would be the effect on your answer to (b)? Explain your reasoning. [3]

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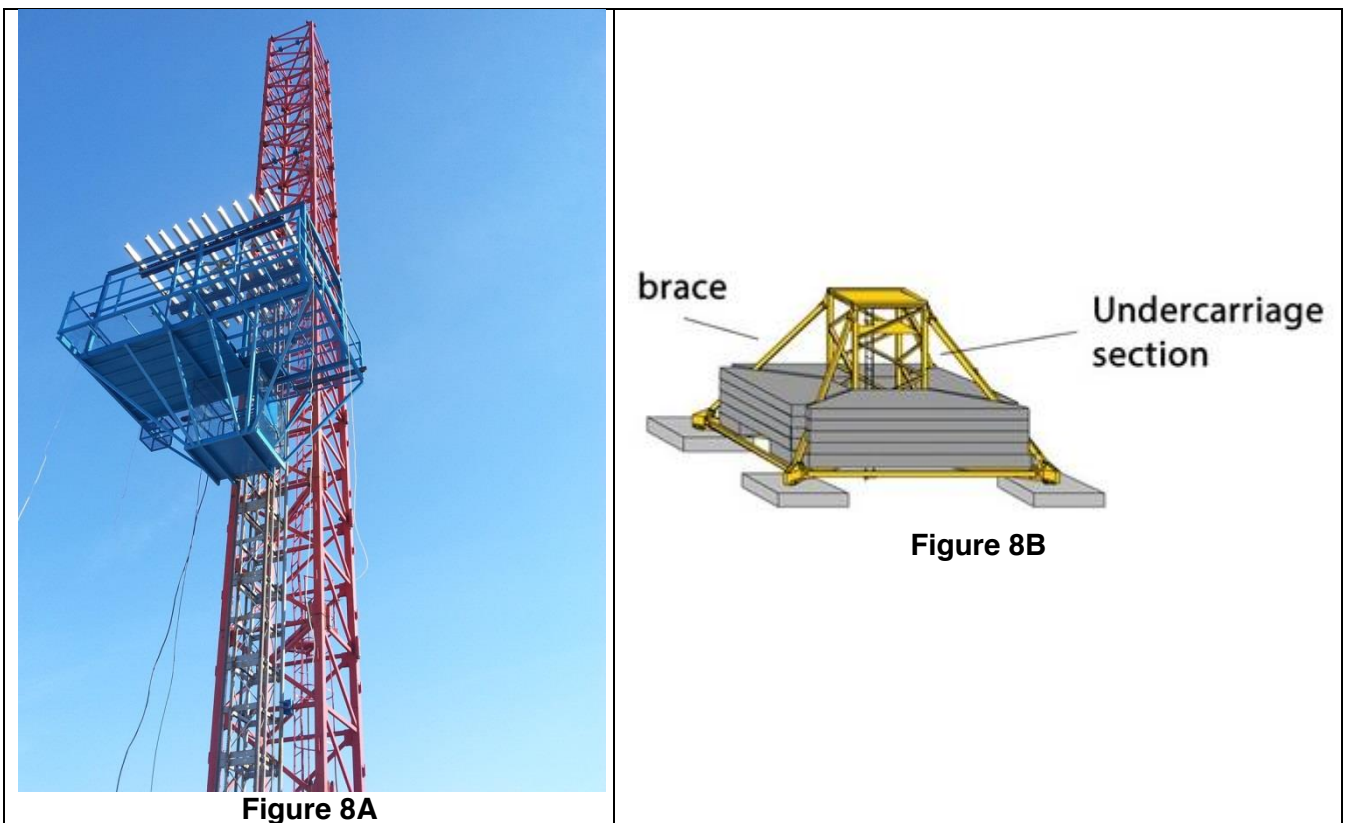
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8. The Figure 8A below shows an Automated Lifting System for use in the construction of tall buildings. It shows the lifting table of the system. The Figure 8B shows the base of the system.



Using the concepts of Torque and Centre of mass,

- (a) briefly explain why the system become less stable as the building becomes taller, and [2]

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- (b) using a diagram, briefly explain the shape and construction of the base of the system. [4]

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End of Test