3.1 Forces and Motion: 10-minute Pack

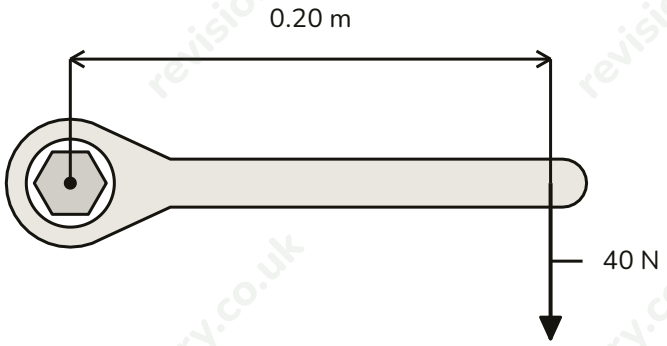
Calculator allowed · about 10 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Equation you may need: moment = force x distance (from the pivot). A mechanic uses a spanner to turn a bolt. She applies a force of 40 N at a distance of 0.20 m from the centre of the bolt.

Diagram NOT accurately drawn



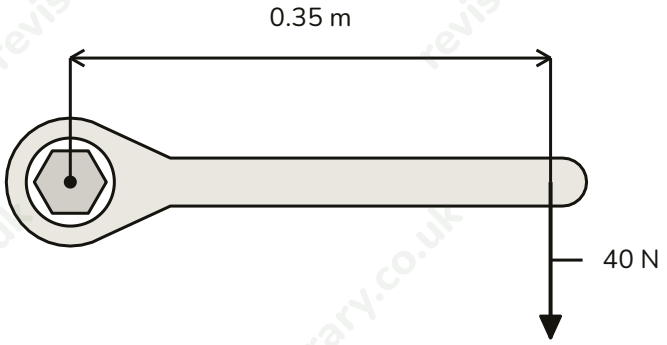
(a) Calculate the moment produced on the bolt. **(2)**

(b) The bolt is very tight and does not turn. Suggest and explain one change the mechanic could make to produce a larger moment without increasing the force she applies. **(2)**

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(c) The mechanic swaps to a spanner where the same force of 40 N is applied 0.35 m from the bolt. Calculate the new moment. **(1)**

Diagram NOT accurately drawn



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2 In a party trick, a tablecloth is pulled very quickly and horizontally from under plates and cups, leaving them almost undisturbed on the table.

(a) Name the property of the plates and cups that makes them tend to stay still when the cloth is pulled quickly. **(1)**

(b) Explain, using ideas about forces, why the plates and cups stay almost still if the cloth is pulled quickly enough. **(2)**

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3 A student draws two arrows on a diagram to show forces on a hanging sign: one arrow down labelled 30 N and one arrow up. If the sign is at rest and the upward force is 30 N, what is the resultant force on the sign? State the magnitude and direction.

(2)

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Mark scheme · 3.1 Forces and Motion: 10-minute Pack

Question 1

(a) 40 x 0.20	**M1**
(a) 8 Nm cao	**A1**

(a) Answer: **8 Nm**

(b) use a longer spanner (increase the distance from the pivot at which the force is applied)	**M1**
(b) because moment = force x distance, increasing the distance while the force stays the same increases the moment, oe	**A1**

(b) Answer: **Use a longer spanner; since moment = force x distance, a greater distance from the pivot gives a larger moment for the same force.**

(c) 14 Nm cao (40 x 0.35)	**B1**

(c) Answer: **14 Nm**

Question 2

(a) inertia (their mass resisting a change in motion) oe	**B1**

(a) Answer: **Inertia.**

(b) friction between the cloth and the plates/cups only acts for a very short time as the cloth is pulled quickly	**M1**
(b) this is not enough time for a large enough force to noticeably change the motion of the plates/cups, so their own inertia keeps them almost still, oe	**A1**

(b) Answer: **The cloth only exerts friction on the plates and cups for a very short time, so it does not have long enough to change their motion much, and their inertia keeps them almost still.**

Question 3

0 N	**B1**
direction none or balanced forces gives no resultant	**B1**

Answer: **0 N, there is no resultant (forces are balanced).**

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