3.6 Pressure, Moments and Simple Machines: 10-minute Pack

Calculator allowed · about 10 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Two children sit on opposite sides of a balanced see-saw, which pivots at its centre. Amelia has a weight of 300 N and sits 1.6 m from the pivot. Noah has a weight of 480 N and sits on the other side.

(a) State the condition needed for the see-saw to be balanced (in equilibrium). **(1)**

(b) Calculate Amelia's moment about the pivot. **(1)**

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(c) Calculate how far from the pivot Noah must sit for the see-saw to balance. **(2)**

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2 A mechanic finds a tight nut easier to loosen using a long spanner than a short one, even though he pushes with about the same force each time. Explain why the long spanner makes the nut easier to loosen.

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(3)

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3 A crowbar is placed under a heavy paving slab, resting on a small block of wood that acts as a pivot close to the slab. Explain why pushing down on the far end of the crowbar makes it much easier to lift the slab than lifting it directly by hand.

(3)

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Mark scheme · 3.6 Pressure, Moments and Simple Machines: 10-minute Pack

Question 1

(a) the clockwise moment must equal the anticlockwise moment (the total moments about the pivot are balanced), oe — **B1**

(a) Answer: **The clockwise moment must equal the anticlockwise moment.**

(b) 300 x 1.6 = 480 Nm cao — **B1**

(b) Answer: **480 Nm**

(c) sets Noah's moment equal to Amelia's moment: 480 x distance = 480 — **M1**

(c) distance = 1.0 m cao — **A1**

(c) Answer: **1.0 m**

Question 2

moment = force x perpendicular distance from the pivot — **B1**

a longer spanner increases the distance from the pivot (the nut) to where the force is applied — **B1**

so for the same applied force, the moment produced is bigger, giving a greater turning effect on the nut, oe — **B1**

Answer: **A longer spanner increases the distance from the pivot to where the force is applied. Since moment = force x distance, the same force produces a bigger moment (turning effect) on a longer spanner, making the nut easier to turn.**

Question 3

the crowbar is a lever, turning about the pivot (the wooden block) — **B1**

the distance from the pivot to where the person pushes (the far end) is much greater than the distance from the pivot to the slab — **B1**

so a smaller effort force, applied over the larger distance, can produce a moment big enough to overcome the much larger moment of the heavy slab close to the pivot, oe — **B1**

Answer: **The crowbar acts as a lever turning about the pivot. Because the effort is applied much further from the pivot than the slab is, a smaller push force there produces a moment large enough to balance and overcome the large moment of the heavy slab close to the pivot.**

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