



Mechanics Year 2 exam questions - AQA

NOTE:

Please be aware that in the Year 12 collections, you will find questions from the Year 13 papers. However, these questions are intentionally included because they align with Year 12 content and topics. That's the reason why you are missing some questions here, please have a look at the Year 12 collection!

Happy studying!

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Ch 19 Forces and motion

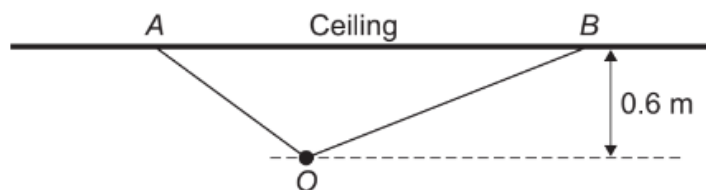
June 2022 Question 18 Paper 2

- 18** An object, O , of mass m kilograms is hanging from a ceiling by two light, inelastic strings of different lengths.

The shorter string, of length 0.8 metres, is fixed to the ceiling at A .

The longer string, of length 1.2 metres, is fixed to the ceiling at B .

This object hangs 0.6 metres directly below the ceiling as shown in the diagram.



- 18 (a)** Show that the tension in the shorter string is over 30% more than the tension in the longer string.

[4 marks]

- 18 (b)** The tension in the longer string is known to be $2g$ newtons.

Find the value of m .

[4 marks]

ANSWER

Q	Marking instructions	AO	Marks	Typical solution
18(a)	Obtains both $\sin^{-1}\left(\frac{0.6}{0.8}\right)$ and $\sin^{-1}\left(\frac{0.6}{1.2}\right)$ OE Accept complementary angles or exact values $\frac{\sqrt{3}}{2}$ and $\frac{\sqrt{7}}{4}$	1.1b	B1	Angle for OA = $\sin^{-1}\left(\frac{0.6}{0.8}\right) = 48.59^\circ$ Angle for OB = $\sin^{-1}\left(\frac{0.6}{1.2}\right) = 30^\circ$
	Resolves forces horizontally to form equilibrium equation, one component correct Or Uses a triangle of forces and applies the sine rule	3.3	M1	$T_{OA}\cos A = T_{OB}\cos B$ $T_{OA} = T_{OB}\frac{\cos B}{\cos A}$
	Obtains correct equation with angles substituted	1.1b	A1	$T_{OA} = T_{OB}\frac{\cos 30}{\cos 48.59}$ $\therefore T_{OA} = 1.309T_{OB}$ $\therefore T_{OA} > 1.3T_{OB}$ <p>So, the tension in the shorter string is more than 30% greater than the tension in the longer string</p>
	Rearranges the correct equation to show that $T_{OA} = k T_{OB}$ OE where $1.305 \leq k \leq 1.325$ Completes argument to conclude that the tension in the shorter string is over 30% more than the tension in the longer string	2.1	R1	
	Subtotal		4	

Q	Marking instructions	AO	Marks	Typical solution
18(b)	Obtains $T_{OA} = 2g \times$ their ratio	1.1b	B1	$mg = T_{OA}\sin A + T_{OB}\sin B$ $mg = 2.6g\sin 48.59 + 2g\sin 30$ $m = 3.0$
	Resolves forces vertically to form a three-term equilibrium equation, with at least two terms correct Or Uses a triangle of forces and applies the sine rule	3.3	M1	
	Forms fully correct equation of forces in equilibrium This mark can be awarded for $mg = T_{OA}\sin A + T_{OB}\sin B$	1.1b	A1	
	Substitutes their T_{OA} and T_{OB} and correct values for angles into the correct equation and obtains AWRT $m = 3$ Might come from 2.96.. FT their ratio from part (a) provided their $m =$ AWRT 3	3.4	A1F	
	Subtotal		4	

November 2020 Question 11 Paper 2

11 A number of forces act on a particle such that the resultant force is $\begin{pmatrix} 6 \\ -3 \end{pmatrix}$ N

One of the forces acting on the particle is $\begin{pmatrix} 8 \\ -5 \end{pmatrix}$ N

Calculate the total of the other forces acting on the particle.

Circle your answer.

[1 mark]

$$\begin{pmatrix} 2 \\ -2 \end{pmatrix} \text{ N}$$

$$\begin{pmatrix} 14 \\ -8 \end{pmatrix} \text{ N}$$

$$\begin{pmatrix} -2 \\ 2 \end{pmatrix} \text{ N}$$

$$\begin{pmatrix} -14 \\ 8 \end{pmatrix} \text{ N}$$

ANSWER

Q	Marking Instructions	AO	Marks	Typical Solution
11	Circles correct answer	1.1b	B1	$\begin{pmatrix} -2 \\ 2 \end{pmatrix}$ N
Total			1	

June 2019 Question 11 Paper 2

- 11** A wooden crate rests on a rough horizontal surface.
- The coefficient of friction between the crate and the surface is 0.6
- A forward force acts on the crate, parallel to the surface.
- When this force is 600 N, the crate is on the point of moving.
- Find the weight of the crate.
- Circle your answer.

[1 mark]

1000 N

100 kg

360 N

36 kg

ANSWER

Q	Marking Instructions	AO	Marks	Typical Solution
11	Circles correct answer	1.1b	B1	1000 N
	Total		1	

June 2019 Question 12 Paper 2

- 12** A particle, under the action of two constant forces, is moving across a perfectly smooth horizontal surface at a constant speed of 10 m s^{-1}

The first force acting on the particle is $(400\mathbf{i} + 180\mathbf{j}) \text{ N}$.

The second force acting on the particle is $(p\mathbf{i} - 180\mathbf{j}) \text{ N}$.

Find the value of p .

Circle your answer.

[1 mark]

−400

−390

390

400

ANSWER

Q	Marking Instructions	AO	Marks	Typical Solution
12	Circles correct answer	1.1b	B1	-400
	Total		1	