Lesson S1 Review Questions

Forces: Tension, Compression and Free Body Diagrams



Answer every question in your jotter. Show your working. Tap a question below to go to it. Tap **Show answer** under a question to mark it.

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Questions

2026 Section 1 Question 6

1. A piece of metal is tested by applying a large force along its length.

(a) State what happens to the **length** of the metal when it is in **tension**. **1**

_____

(b) State what happens to the **length** of the metal when it is in **compression**. **1**

_____

Show answer ›

2024 Section 1 Question 6 (a)(i), (a)(ii)

2. Members in a frame structure are tested using compressive and tensile forces.

(a) (i) Draw two arrows which represent an external **compressive** force on member A shown below. **1**



member A

(ii) Draw two arrows which represent an external **tensile** force on member B shown below. **1**

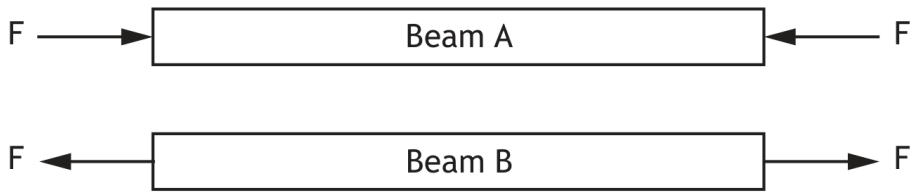


member B

Show answer ›

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3. Two beams with applied forces (F) are shown below.



State the nature of the force acting on: **2**

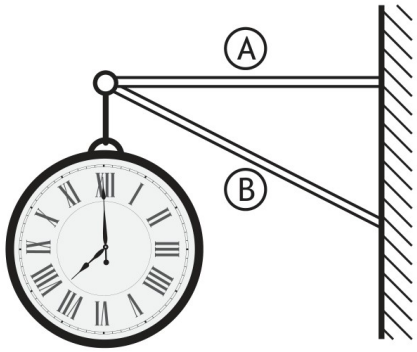
Beam A _____

Beam B _____

Show answer ›

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4. A clock is hung from a frame structure and is shown below.



(a) State the nature of the force in:

Member (A) _____

Member (B) _____

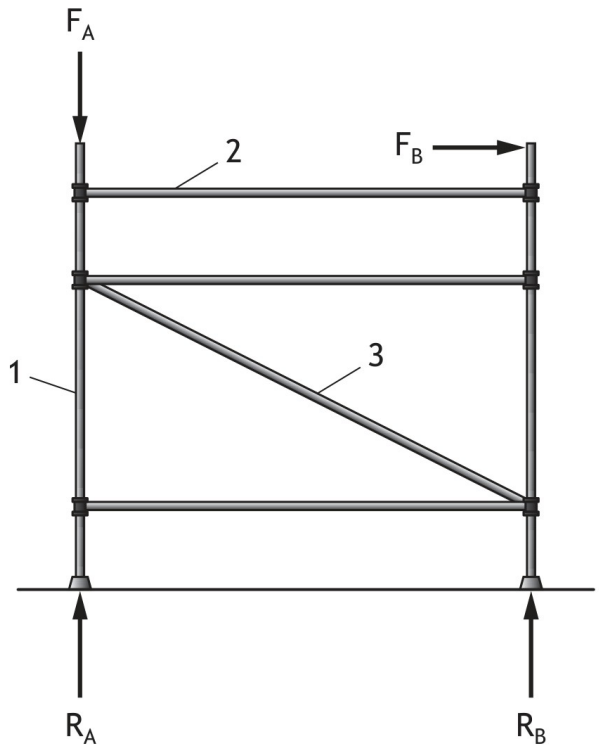
(b) The clock has a mass of 2·2 kg.

Calculate the downward force of the clock (F = mg).

Show answer ›

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5. A scaffolding tower is used to allow work to be carried out safely at height.



The forces acting on the scaffolding tower are shown above.

(a) (i) State the nature of the force in member 1 and member 2. **2**

Member 1 _____

Member 2 _____

(ii) Describe the function of member 3. **1**

_____

_____

Show answer ›

6. State **two** pieces of information that should be given on a free body diagram. **2**

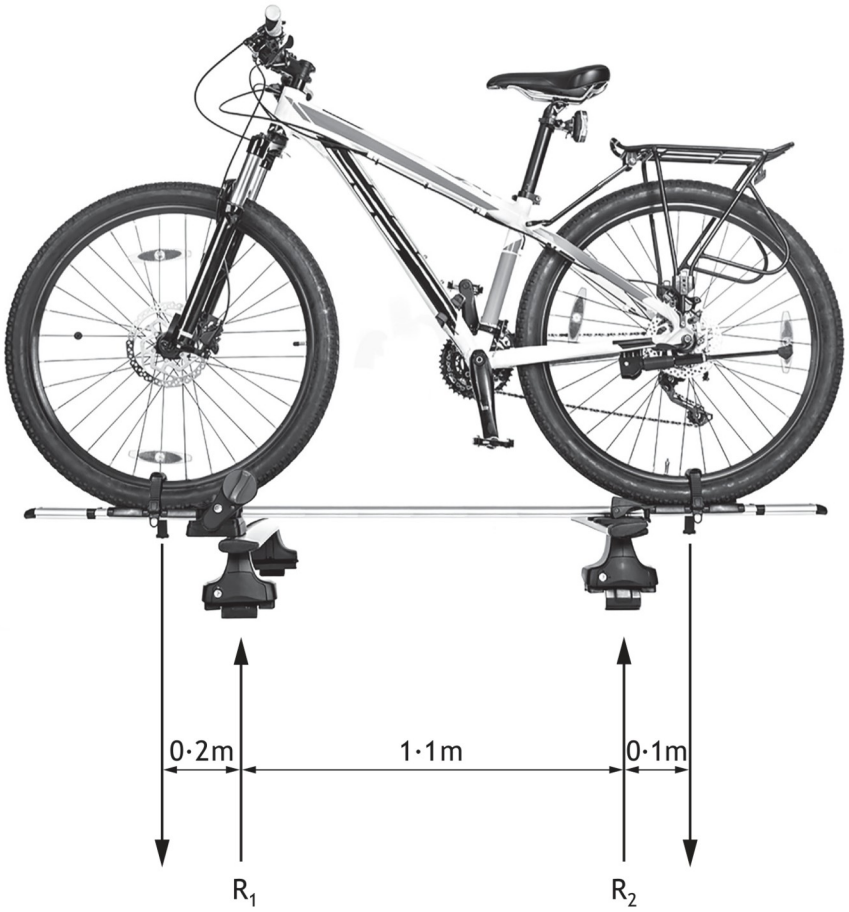
1 _____

2 _____

Show answer ›

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7. A bike and carrier are shown below. Each bike wheel applies a force of 15 N onto the carrier.

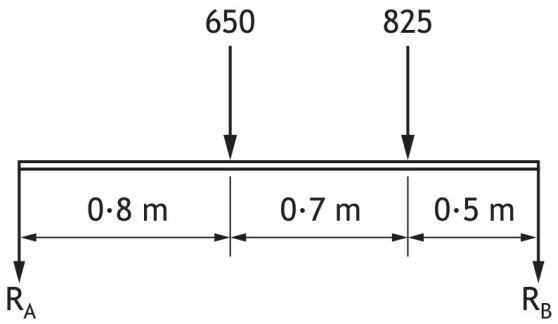


Draw a free body diagram for the bike and carrier shown above.

Show answer ›

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8. An incorrect free body diagram of a structure in equilibrium is shown below.



Describe two different errors in the diagram. **2**

Error 1 _____

_____

Error 2 _____

_____

Show answer ›

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9. A slingshot ride in a fairground is shown.



(a) Describe two tasks a **structural** engineer would have undertaken during the **development** of the slingshot ride.

1. _____

_____

2. _____

_____

Show answer ›

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Answers

Check your understanding (booklet)

1 The newton (N).

2 Tension: the length increases (it stretches). Compression: the length decreases (it squashes).

3 It splits the square into triangles, which cannot change shape (cause), so the frame is more rigid (effect).

4 Pointing into the member, one at each end.

Answer to question 1

2026 Section 1 Question 6

Marking instructions

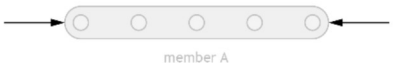
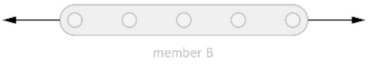
Question			Expected response	Max mark	Additional guidance
6.	(a)		The length increases.	1	Stated or inferred.
	(b)		The length decreases.	1	Stated or inferred. Do not apply FTE.

‹ Back to question 1

Answer to question 2

2024 Section 1 Question 6 (a)(i), (a)(ii)

Marking instructions

Question			Expected response	Max mark	Additional guidance
6.	(a)	(i)		1	Accept pairs of forces drawn vertically opposite and facing.
		(ii)		1	Accept pairs of forces drawn vertically opposite and opposing. Do not accept FTE.

‹ Back to question 2

Answer to question 3

2018 Section 1 Question 6

Marking instructions

Question			Expected response	Max mark	Additional guidance
6.			**A** - Compressive/compression **B** - Tensile/tension	2	Accept strut/tie/squashed/ stretched No FTE

‹ Back to question 3

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Answer to question 4

2017 Section 1 Question 5

Marking instructions

Question			Expected answer(s)	Max mark	Additional guidance
5.	(a)		**A** – Tension/tensile/tie **B** - Compression/compressive/ strut	**2**	Stated or inferred
	(b)		F = mg = 2·2 x 9·8 = **22 N** (2 s.f.) 21·56 N	**2**	1 mark for substitution (9·8) 1 mark for correct answer from given working with unit

‹ Back to question 4

Answer to question 5

2021 Section 1 Question 6 (a)(i), (a)(ii)

Marking instructions

Question			Expected response	Max mark	Additional guidance
6.	(a)	(i)	1 Compression. 2 Tension.	**2**	Accept strut/compressive/squashed. Accept tie/stretched.
		(ii)	Make the structure more rigid.	**1**	Accept any inferred stability.

‹ Back to question 5

Answer to question 6

2016 Section 1 Question 5

Marking instructions

Question			Expected Answer(s)	Max Mark	Additional Guidance
5.			Dimension(s) Force(s)	**2**	Accept: Magnitude and direction/ angle of the forces (2 marks)

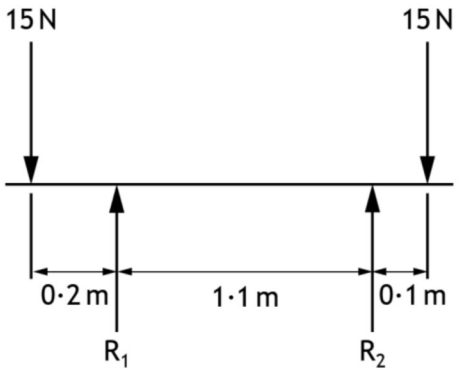
‹ Back to question 6

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Answer to question 7

2018 Section 1 Question 3

Marking instructions

Question	Expected response	Max mark	Additional guidance
3.		2	1 mark for all forces with arrows and units in the correct position 1 mark for all dimensions with units (dimension and leader lines are not required)

‹ Back to question 7

Answer to question 8

2021 Section 1 Question 4

Marking instructions

Question	Expected response	Max mark	Additional guidance
4.	No unit for force. Forces all act in the same direction/ force direction are wrong way round/reaction forces should be upwards.	2	1 mark for each error.

‹ Back to question 8

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Answer to question 9

2026 Section 2 Question 9 (a)

Marking instructions

Question			Expected response	Max mark	Additional guidance
9.	(a)		Calculate the forces/stress/strain acting on the support frame. Select an appropriate material to be used in the cage. Simulate the forces that would be applied to the support structure. Design the structural shape of the support frame.	2	Descriptive response relating to a development task for a structural element of the slingshot. **1 mark** for each task. Tasks described must be different activities/aspects. Accept build/make reference only if linked to the testing of a prototype. Do not accept development as an appropriate task. If tasks are similar, **1 mark** max. Calculate the force… Calculate the stress…

Note: On a screen the drawing is not true size. On the printed paper: F_2 measures 70 mm: 70 × 30 = 2100 N. F_3 measures 90 mm: 90 × 30 = 2700 N.

‹ Back to question 9

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