Lesson S4 Review Questions

Simply-Supported Beams and Reaction Forces



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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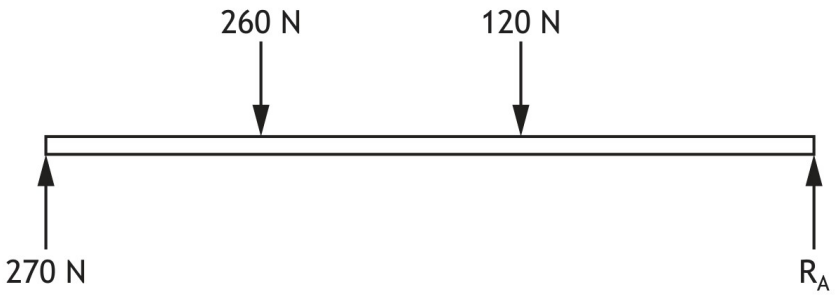
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Questions

2026 Section 1 Question 4

1. An incomplete free body diagram of a beam in equilibrium is shown.



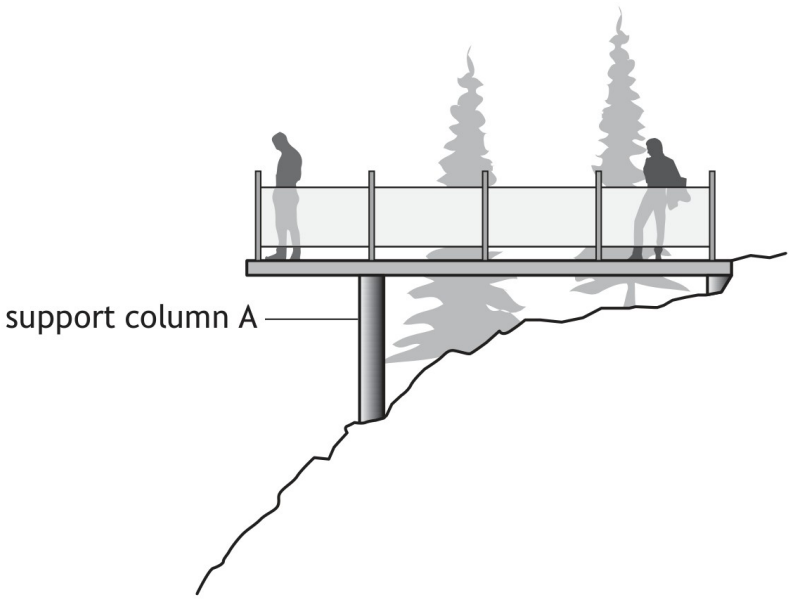
(a) Calculate the reaction force R_A. **2**

(b) State one other piece of information that should be included on the free body diagram. **1**

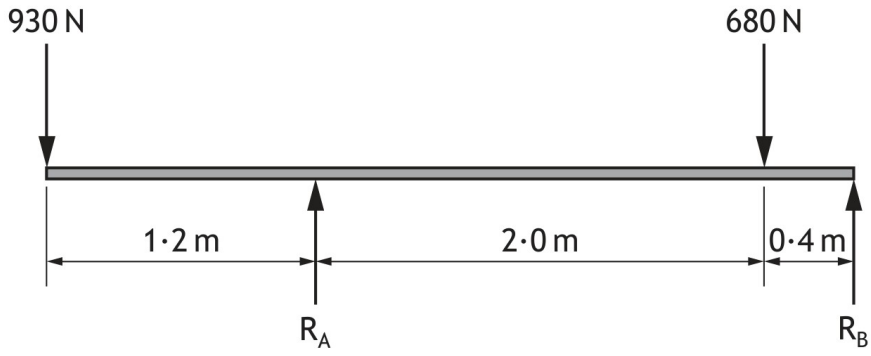
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2. A viewing platform at a tourist destination is shown.



A free body diagram indicating the main forces acting on the platform is shown below.



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(a) (i) Calculate the reaction force R_A by taking moments about R_B.

(ii) Calculate the reaction force R_B.

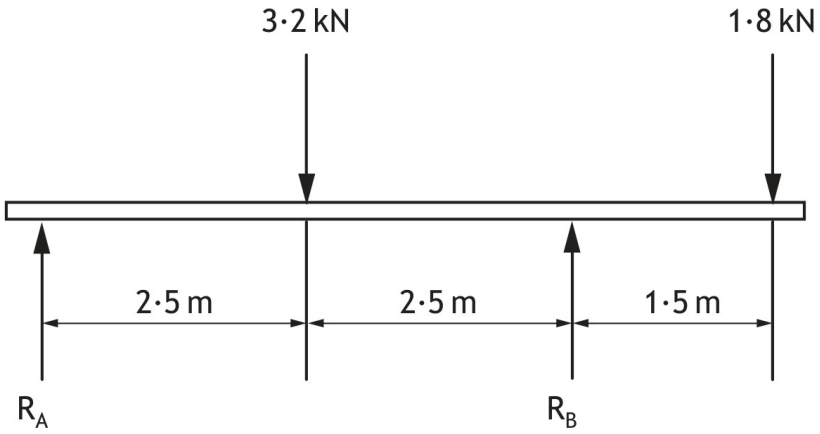
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3. A sailing catamaran is shown.



A simplified diagram showing the forces from the catamaran and crew is shown below.



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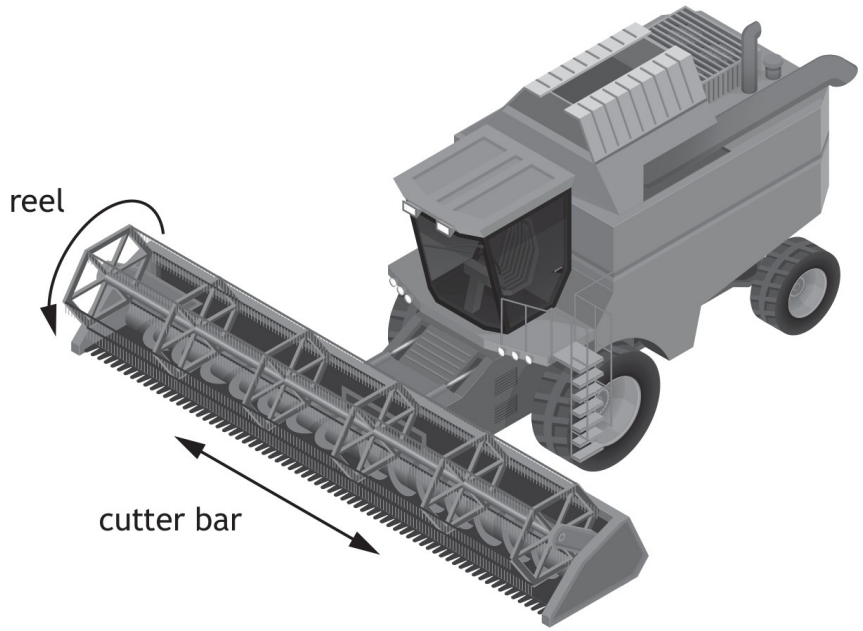
(a) (i) Calculate the size of reaction force R_A, by taking moments about R_B.

(ii) Calculate the size of reaction force R_B. **2**

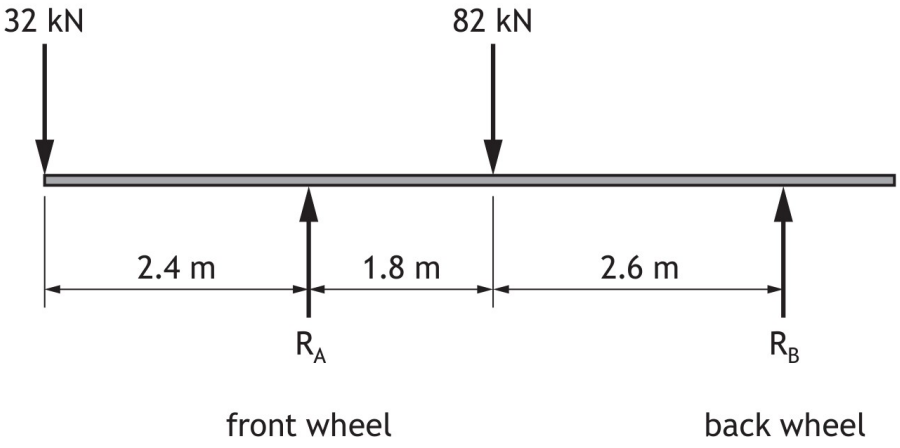
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4. A combine harvester used to gather crops is shown below.



A simplified diagram for the combine harvester is shown.



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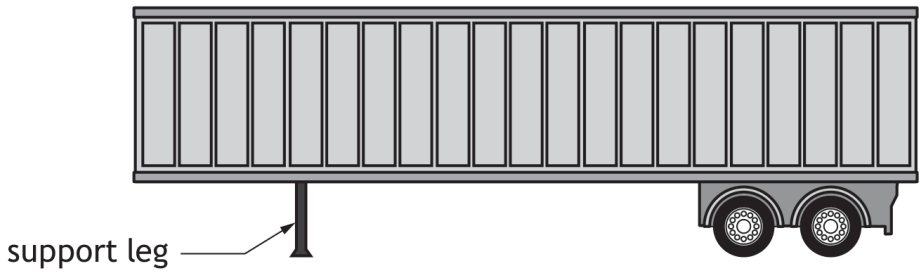
(a) (i) Calculate the reaction force R_A by taking moments about R_B.

(ii) Calculate the reaction force R_B.

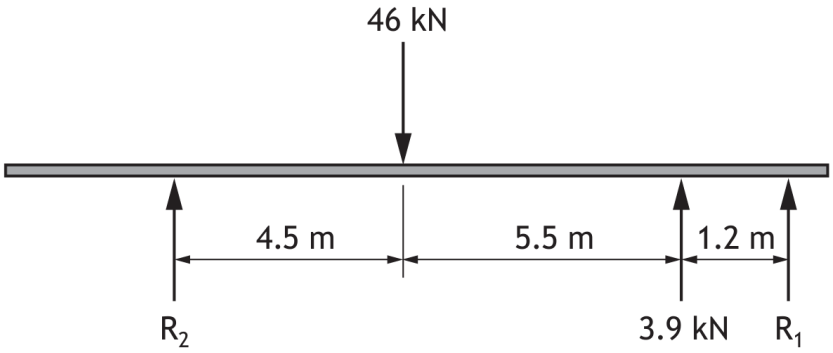
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5. A refrigerated lorry trailer used to transport fresh food is shown below.



A simplified free body diagram for the empty lorry trailer is shown.



(a) (i) Calculate the reaction force R_1 by taking moments about R_2.

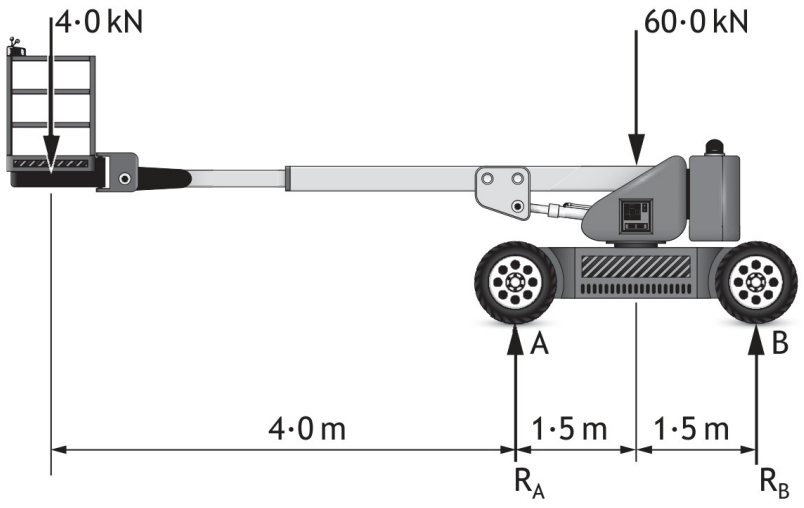
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(ii) Calculate the reaction force R_2.

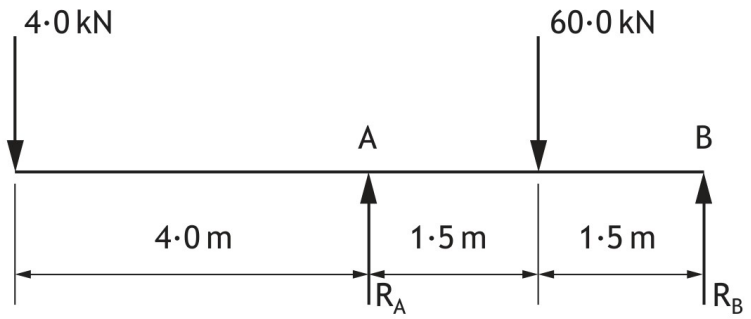
Show answer ›

2016 Section 2 Question 16 (a), (b), (c)

6. A cherry picker is used to access high areas.



A free body diagram of the cherry picker is shown below.



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(a) Calculate, by taking moments about B, the reaction force R_A. **3**

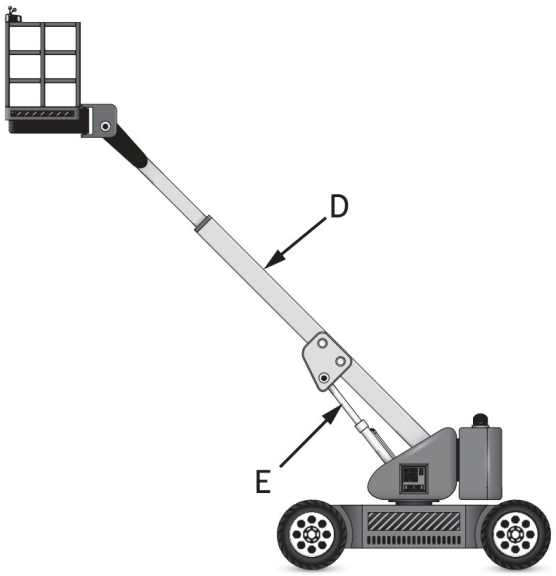
Show all working and final unit.

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(b) Calculate the force R_B. **2**

Show all working and final unit.

When in use, the platform is raised to the position shown below. A structural engineer analyses the nature of the forces acting on members D and E.



(c) State the nature of the force in member: **2**

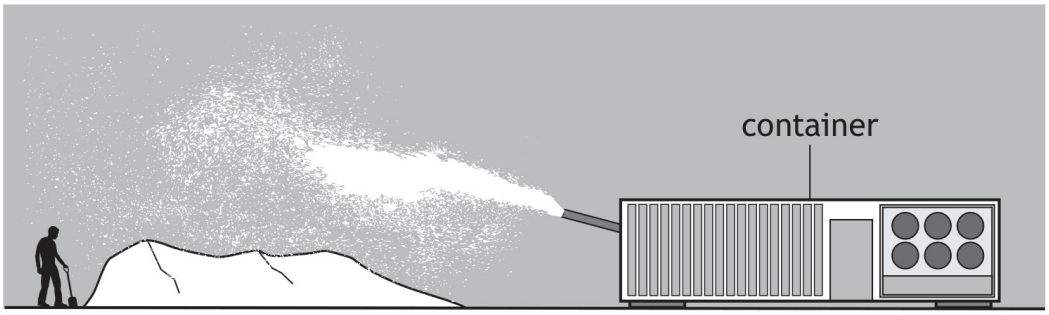
D _____

E _____

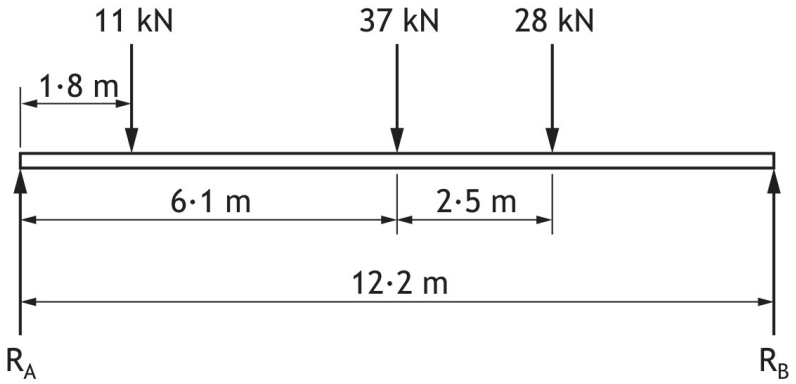
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7. A snow making machine used in a ski resort is housed in a container.



A simplified free body diagram of the forces acting on the base of the container is shown below.



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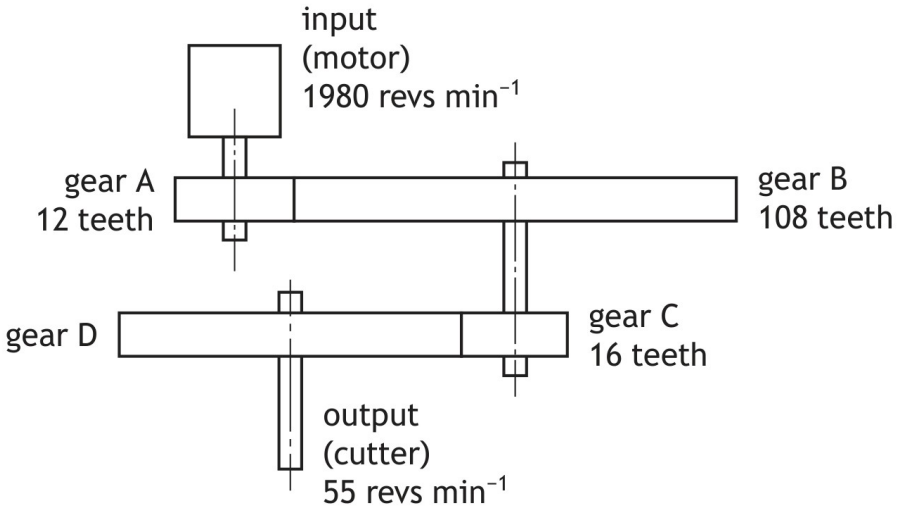
(a) Calculate by taking moments about R_A, the reaction force R_B.

(b) Calculate the reaction force R_A. **2**

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Ice is to be broken up by a cutter during the snow making process.

The cutter is driven by a compound gear train as shown below.



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Answers

Check your understanding (booklet)

1 A beam that rests on two supports.

2 Up.

3 R_B passes through the pivot, so it has no moment (cause). Only R_A is unknown in the equation (effect).

4 $\Sigma F_v = 0$: $350 + R_B = 900$, so $R_B = 550$ N

Answer to question 1

2026 Section 1 Question 4

Marking instructions

Question			Expected response	Max mark	Additional guidance
4.	(a)		$\Sigma F_{vertical} = 0$ $R_A = 260 + 120 - 270$ **R_A = 110 N (2 sf)**	**2**	**1 mark** for substitution. **1 mark** for correct answer from given working with unit.
	(b)		Dimensions between forces. Length of the beam.	**1**	Do not accept dimension/distance on its own.

‹ Back to question 1

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Answer to question 2

2019 Section 2 Question 11 (a)(i), (a)(ii)

Marking instructions

Question			Expected response	Max mark	Additional guidance
11.	(a)	(i)	$\Sigma CWM = \Sigma ACWM$ $(R_A \times 2{\cdot}4) = (680 \times 0{\cdot}4) + (930 \times 3{\cdot}6)$ $R_A = \frac{3620}{2{\cdot}4}$ $R_A = 1508$ **R_A = 1·5 kN (2 sf)**	3	1 mark for substitution. 1 mark for transposition. 1 mark for correct answer from given working with unit.
		(ii)	$\Sigma F_{vertical} = 0$ $930 + 680 = 1500 + R_B$ $R_B = 1610 - 1500$ $R_B = 110$ **R_B = 110 N (2 sf)**	2	1 mark for substitution Allow FTE from part a(i). 1 mark for correct answer from given working with unit. If moments used to determine R_B then accepted 101·7 N .

‹ Back to question 2

Answer to question 3

2018 Section 2 Question 13 (a)(i), (a)(ii)

Marking instructions

Question			Expected response	Max mark	Additional guidance
13.	(a)	(i)	$(1{\cdot}8 \times 1{\cdot}5) + (R_A \times 5{\cdot}0) = (3{\cdot}2 \times 2{\cdot}5)$ $R_A = \frac{5{\cdot}3}{5{\cdot}0}$ 1·06 kN **R_A = 1·1 kN (2 sf)**	3	1 mark for substitution 1 mark for transposition 1 mark for correct answer from given working with unit If R_B is calculated correctly (3·9 kN) 2 marks
		(ii)	$3{\cdot}2 + 1{\cdot}8 = 1{\cdot}1 + R_B$ $R_B = 5{\cdot}0 - 1{\cdot}1$ **R_B = 3·9 kN (2 sf)**	2	1 mark for substitution (allow FTE from 13(a)(i) 1 mark for correct answer from given working with unit

‹ Back to question 3

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Answer to question 4

2023 Section 2 Question 13 (b)(i), (b)(ii)

Marking instructions

Question			Expected response	Max mark	Additional guidance
	(b)	(i)	$\Sigma CWM = \Sigma ACWM$ $(R_A \times 4.4) = (82 \times 2.6) + (32 \times 6.8)$ $R_A = \dfrac{430.8}{4.4}$ $R_A = 97.909$ R_A = **98 kN (2 sf)**	**3**	1 mark for substitution. 1 mark for transposition. 1 mark for correct answer from given working with unit.
		(ii)	$\Sigma F_{vertical} = 0$ $\quad\quad$ $\Sigma F_{up} = \Sigma F_{down}$ $R_B + 98 = 32 + 82$ R_B = **16 kN (2 sf)**	**2**	1 mark for substitution. Allow FTE from part(b)(i). 1 mark for correct answer from given working with unit.

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Answer to question 5

2024 Section 2 Question 14 (a)(i), (a)(ii)

Marking instructions

Question			Expected response	Max mark	Additional guidance
14.	(a)	(i)	$\Sigma_{moments} = 0$ $\Sigma CWM = \Sigma ACWM$ $(46k \times 4.5) = (3.9k \times 10) + (R_1 \times 11.2)$ $207 = 39 + 11.2R_1$ $R1 = \frac{207 - 39}{11.2}$ **R_1 = 15 kN (2 sf)**	3	1 mark for substitution. 1 mark for transposition. 1 mark for correct answer from given working with unit.
		(ii)	$\Sigma F_{vertical} = 0$ $\Sigma F_{up} = \Sigma F_{down}$ $15k + 3.9k + R_2 = 46k$ $R_2 = 46k - 18.9k$ $R_2 = 27.1$ **R_2 = 27 kN (2 sf)**	2	1 mark for substitution Apply FTE from (a)(i). 1 mark for correct answer from given working with unit.

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Answer to question 6

2016 Section 2 Question 16 (a), (b), (c)

Marking instructions

Question			Expected Answer(s)	Max Mark	Additional Guidance
16.	(a)		$\Sigma CWM = \Sigma ACWM$ $(R_A \times 3{\cdot}0) = (60{\cdot}0 \times 1{\cdot}5) + (4{\cdot}0 \times 7{\cdot}0)$ $R_A \times 3{\cdot}0 = 90 + 28$ $R_A = \frac{118}{3{\cdot}0}$ $R_A = 39kN\,(2sf)\,(39{\cdot}3kN)$	3	1 mark substitution. (If R_B is calculated then 2 marks maximum. 1mk transposition 1mk final answer with unit.) 1 mark for transposition. 1 mark for answer from working with unit.
	(b)		$\Sigma F_{vertical} = 0$ $\Sigma F_{up} = \Sigma F_{down}$ $39 + R_B = 60{\cdot}0 + 4{\cdot}0$ R_B = 25kN (2 sf) 24.7kN	2	1 mark substitution. Allow FTE 1 mark for answer from working with unit. Accept taking moments about A.
	(c)		D – Tension E - Compression	2	1 mark for each correct answer. (Accept Tie and Strut)

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Answer to question 7

2021 Section 2 Question 14 (a), (b)

Marking instructions

Question			Expected response	Max mark	Additional guidance
14.	(a)		ΣCWM = ΣACWM (11x1.8)+(37x6.1)+(28x8.6)=(R_Bx12.2) 19.8 + 225.7 +240.8 = R_B x 12.2 $RB = \frac{486{\cdot}3}{12{\cdot}2}$ R_B = 39.86 **R_B = 40· kN (2s.f.)**	3	1 mark for substitution. 1 mark for transposition. 1 mark for correct answer from given working with unit. If R_A is calculated correctly (36 kN) then 2 marks maximum.
	(b)		ΣFvertical = 0 ΣFup = ΣFdown R_A + 40 = 11 + 37 + 28 **R_A = 36 kN (2s.f.)**	2	1 mark for substitution. Allow FTE. 1 mark for correct answer from given working with unit. Accept taking moments about R_B.

‹ Back to question 7

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