# Lesson S2 Review Questions

## Concurrent Forces and the Triangle of 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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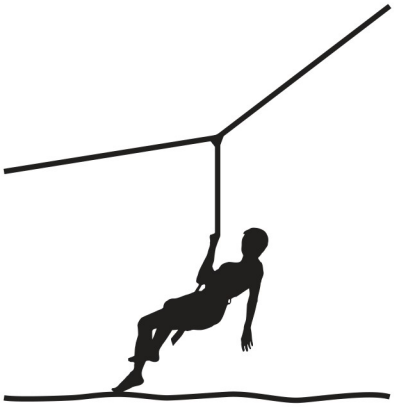



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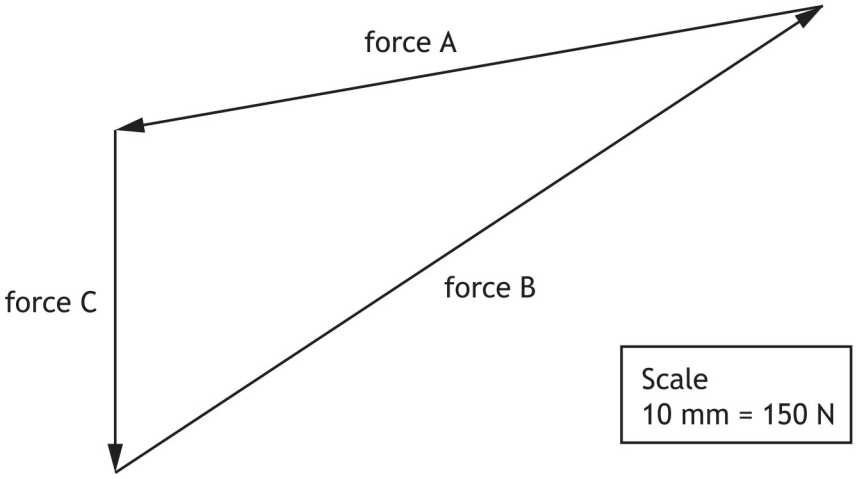
# Questions

2021 Section 2 Question 11 (a)

**1.** Part of a zip slide and its rider is shown at the start of the run down a hillside.



The forces acting on the zip slide cables are analysed using the scale drawing of the triangle of forces shown below.




(a) Determine, with reference to the triangle of forces, the size of force A. **1**

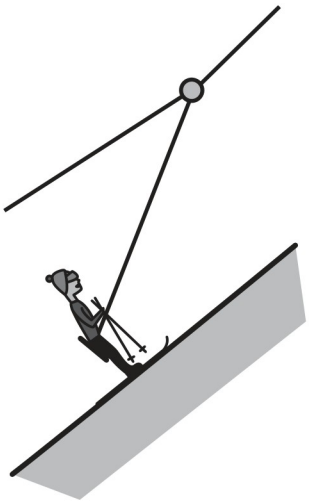
_____ N

Show answer ›

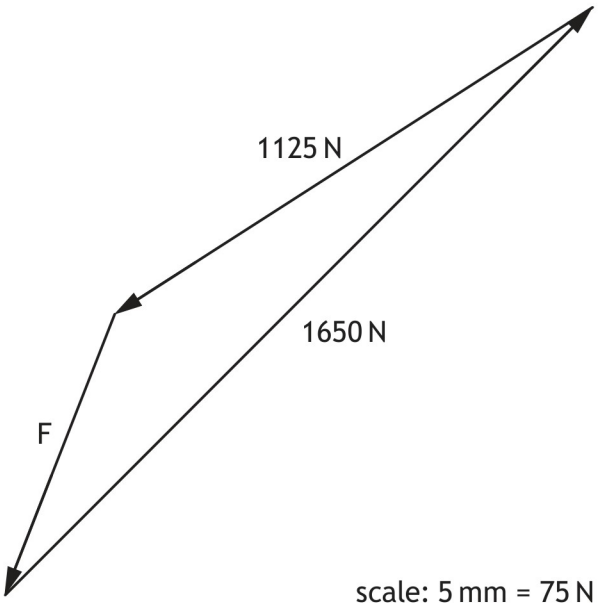


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**2.** A structural engineer analyses the forces exerted by a skier on the tow.



The triangle of forces scale drawing used in the analysis is shown below.




scale: 5 mm = 75 N

Determine, with reference to the triangle of forces shown, the unknown force F. **1**

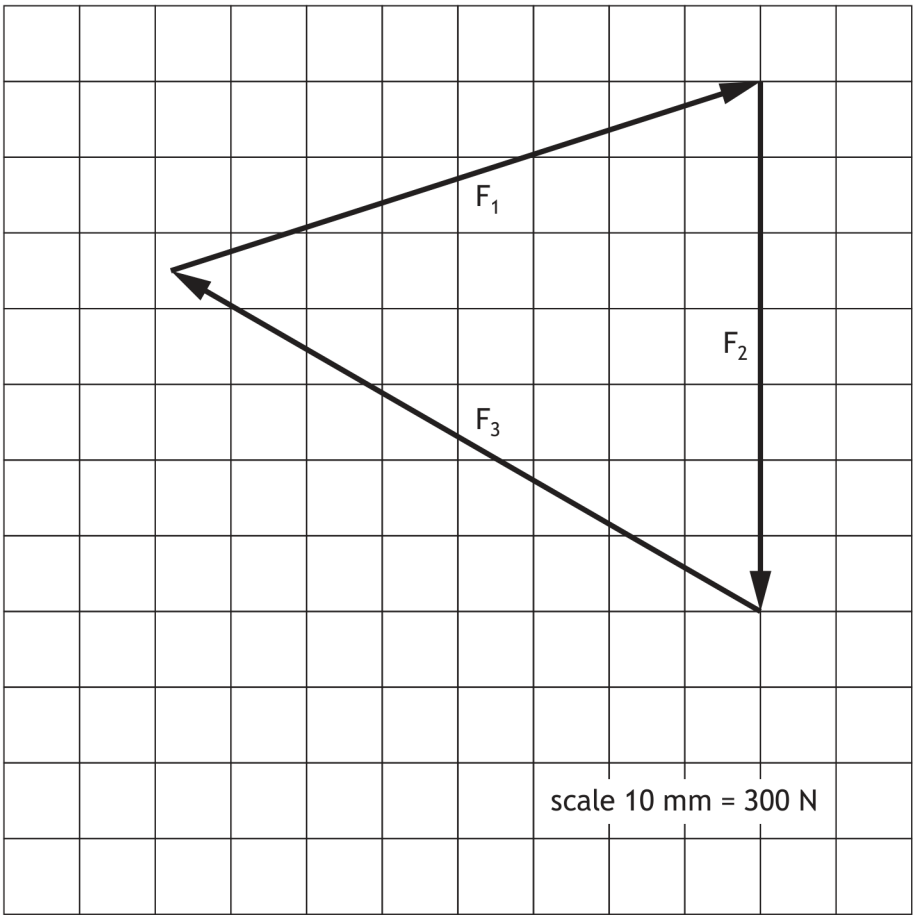
F = _____N

Show answer ›



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**3.** The forces acting on the cage at the start of the slingshot ride are shown on the scale diagram below.



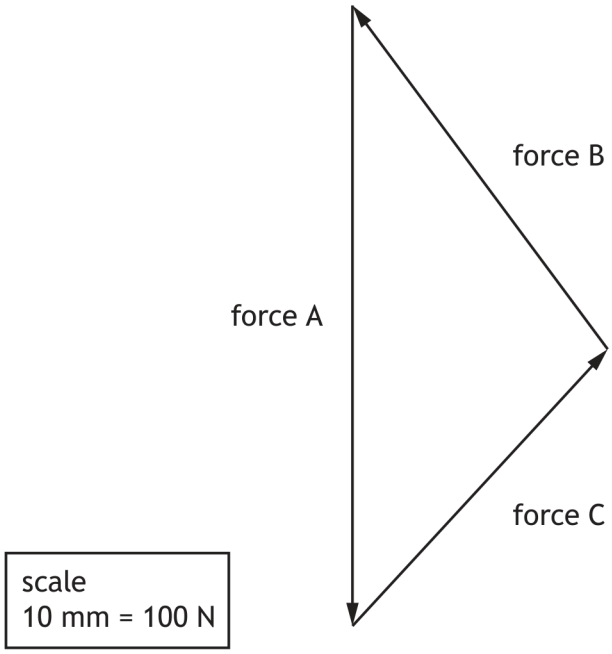

Complete, with reference to the scale diagram, the table shown below for the forces acting on the cage. **2**

| Force | $F_1$ | $F_2$ | $F_3$ |
|---|---|---|---|
| Magnitude | 2460 N | N | N |

Show answer ›


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**4.** A different belay system has three forces acting on it in equilibrium. The forces are analysed using the scale drawing shown.




(a) Determine, with reference to the scale drawing shown above, the size of force A. **1**

Force A = _____ N

An engineer used the formula $\Sigma F_h = 0$ when calculating forces at a single point.

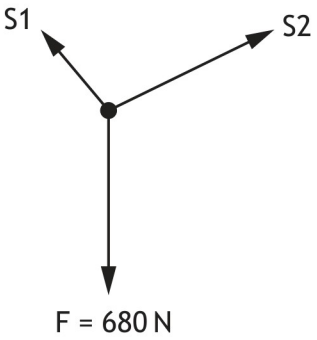
(b) State, with reference to the data booklet, the other condition of equilibrium which can be considered when calculating forces acting at a **single point**. **1**

_____

Show answer ›


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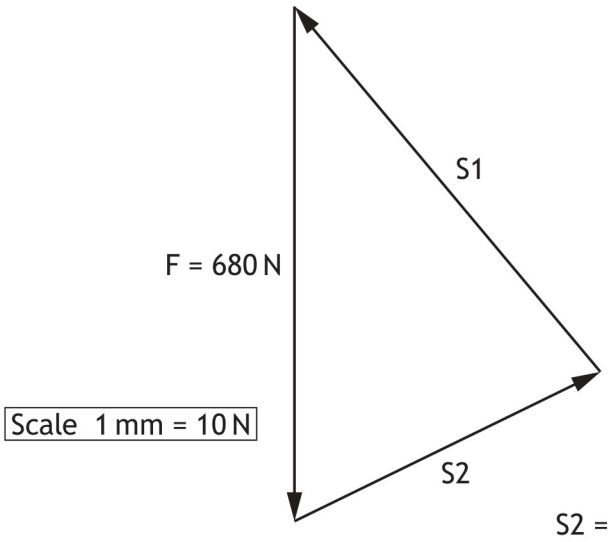
**5.** Part of the supporting structure for the trapeze swing is shown below.




(i) State, with reference to the Data Booklet, the condition of equilibrium which does **not** need to be considered when studying forces acting at a single point. **1**

_____

(ii) Determine the size of force S2 using the scale drawing of the triangle of forces shown below. **1**



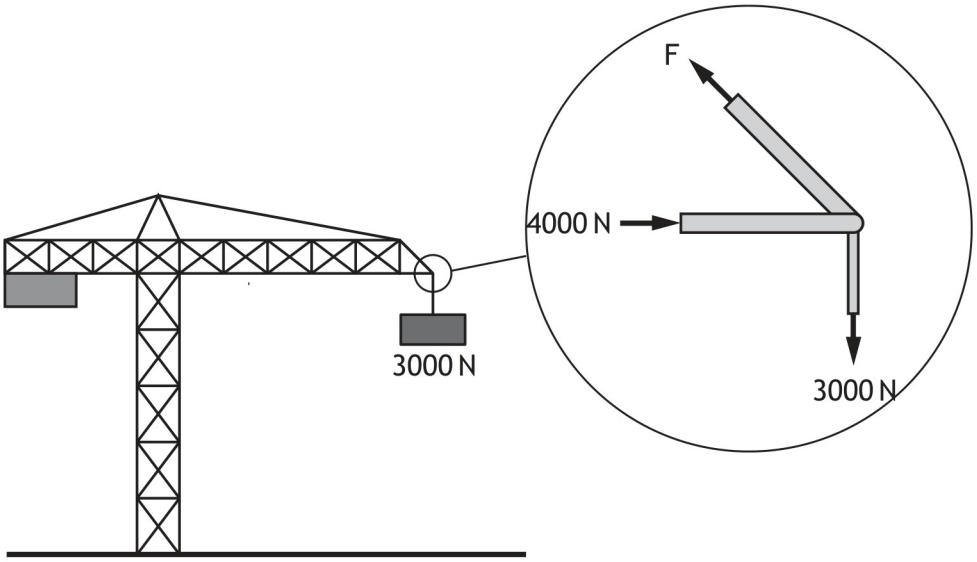

S2 = _____ N

Show answer ›



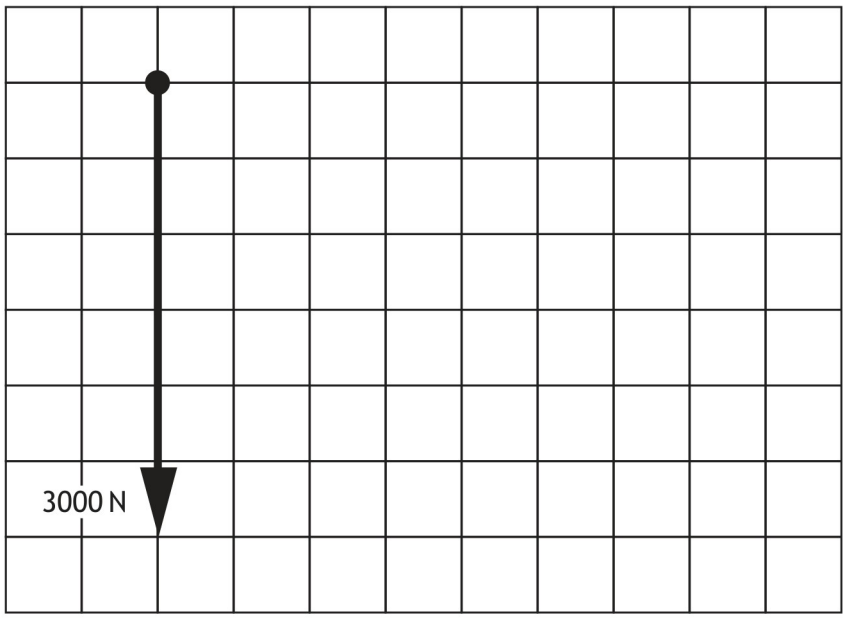
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**6.** A crane is used to lift a 3000 N load. Detail of the end of the crane is shown below.




With reference to the crane shown above:

(a) complete the triangle of forces scale drawing below; **1**




10 mm = 500 N

(b) determine, using the given scale, the size of force F. **1**

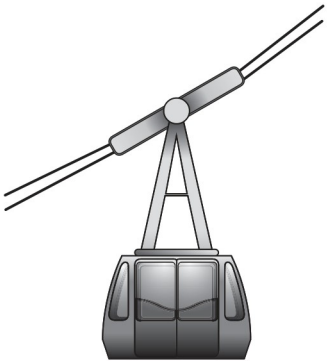
F = _____

Show answer ›

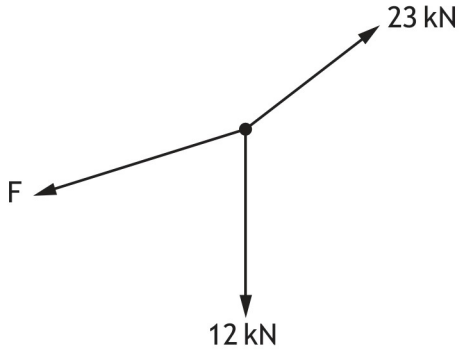


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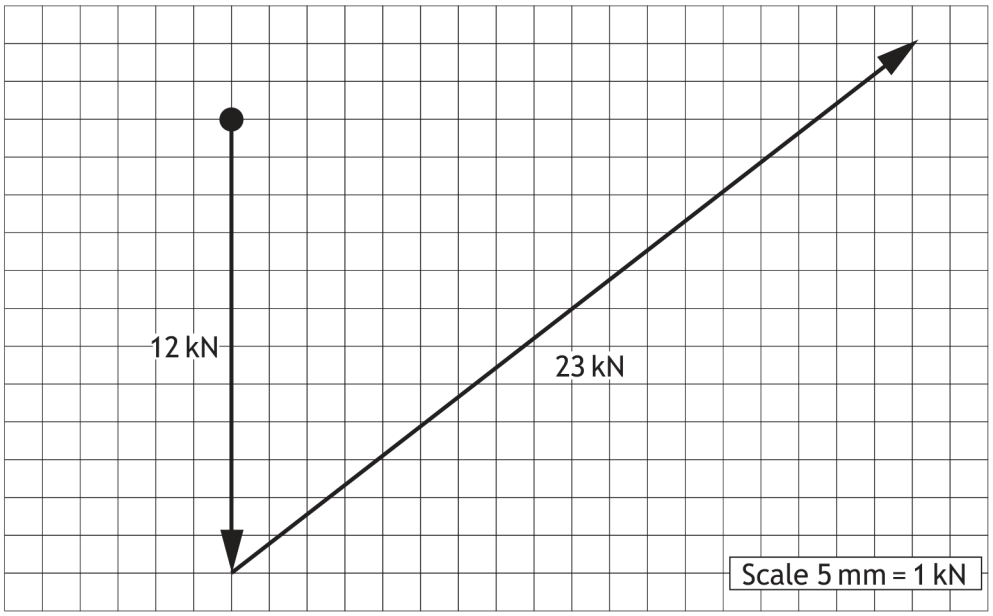
**7.** A 12 kN gondola used to transport skiers up to the top of a mountain is shown below.



A diagram showing the forces acting on the supporting cable is shown below.




(a) Determine, by completing the scale drawing of the triangle of forces below, the **size** of force F in the supporting cable. **1**



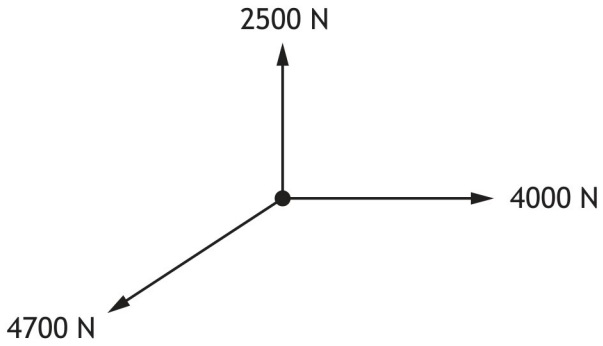

F = _____ kN

Show answer ›



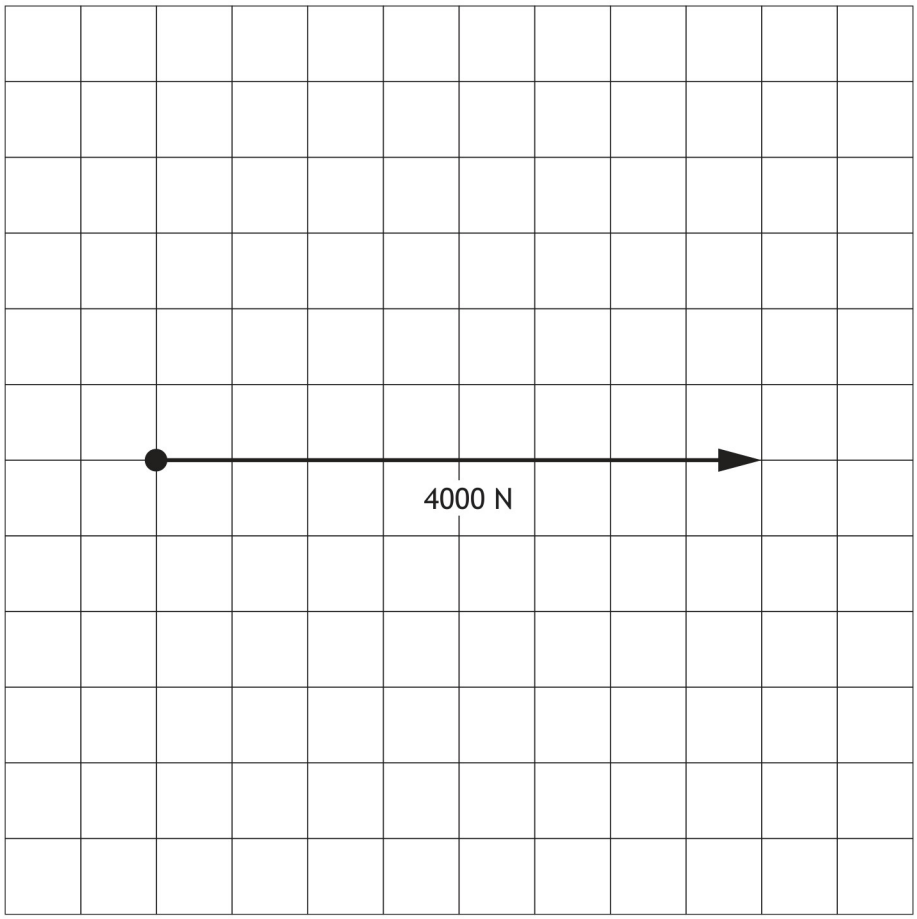
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**8.** Three forces, in equilibrium, acting on part of a structure are shown below.




Complete the triangle of forces **scale drawing** below for the given forces.
Forces must include an arrow head to show the direction. **2**

scale 10 mm = 500 N




Show answer ›


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# Answers

## Check your understanding (booklet)

**1** Forces that act through a single point.

**2** $\Sigma F_h = 0$ and $\Sigma F_v = 0$.

**3** All the forces act through the point (cause), so they cannot turn anything (effect).

**4** 45 mm.

**5** The length shows the size of the force. The angle shows its direction.

### Answer to question 1

2021 Section 2 Question 11 (a)

**Marking instructions**

| Question | | | Expected response | Max mark | Additional guidance |
|---|---|---|---|---|---|
| **11.** | (a) | | 1425 N<br><br>**1400 N (2 s.f.)** | **1** | Apply scaling (10 mm = 150 N) to Force A on candidate's diagram if question has not been reproduced to correct size.<br><br>Ignore units. |

**Note:** On a screen the drawing is not true size. On the printed paper: Force A measures 95 mm. 95 × (150 ÷ 10) = 1425 N.

‹ Back to question 1

### Answer to question 2

2019 Section 2 Question 12 (c)

**Marking instructions**

| Question | | | Expected response | Max mark | Additional guidance |
|---|---|---|---|---|---|
| | (c) | | 600 (N) | **1** | Unit not required |

**Note:** On a screen the drawing is not true size. On the printed paper: F measures 40 mm. 40 × (75 ÷ 5) = 600 N.

‹ Back to question 2



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## Answer to question 3

2026 Section 2 Question 9 (c)

**Marking instructions**

| Question | | | Expected response | Max mark | Additional guidance |
|---|---|---|---|---|---|
| | (c) | | **$F_2$ = 2100 (N) (2 sf)**<br><br>**$F_3$ = 2700 (N) (2 sf)** | **2** | **1 mark** for force $F_2$.<br><br>**1 mark** for force $F_3$.<br><br>Apply a tolerance of ± 30 N.<br><br>Unit only required if answer is not written in space provided. |

**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 3

## Answer to question 4

2025 Section 2 Question 13 (d), (e)

**Marking instructions**

| Question | | | Expected response | Max mark | Additional guidance |
|---|---|---|---|---|---|
| | (d) | | 820 (N) | 1 | Accept values in the range 810 N to 830 N.<br><br>Accept 800 N (1 sf). |
| | (e) | | $\Sigma F_v = 0$ | 1 | Accept $\Sigma F_{up} = \Sigma F_{down}$<br><br>Accept $\Sigma F\uparrow = \Sigma F\downarrow$<br><br>Do not accept arrows on their own. |

**Note:** On a screen the drawing is not true size. On the printed paper: Force A measures 82 mm. 82 × (100 ÷ 10) = 820 N.

‹ Back to question 4

## Answer to question 5

2018 Section 2 Question 11 (c)(i), (c)(ii)

**Marking instructions**

| Question | | | Expected response | Max mark | Additional guidance |
|---|---|---|---|---|---|
| | (c) | (i) | $\sum M = 0$ | 1 | Accept ΣCWM = ΣACM or written response |
| | | (ii) | 450 (N) | 1 | Accept 445N-455N |

‹ Back to question 5

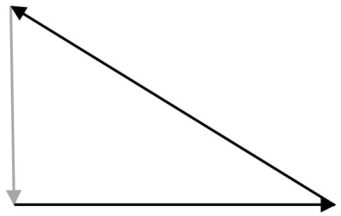


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## Answer to question 6

2015 Section 1 Question 9 (a), (b)

**Marking instructions**

| Question | | | Expected Answer(s) | Max Mark | Additional Guidance |
|---|---|---|---|---|---|
| 9. | (a) | |  | 1 | 1 mark for both correctly drawn vectors.<br><br>To scale and with both arrows. |
| | (b) | | 5000N | 1 | 1 mark for a numerical value with unit. (Ignore nature). Allow follow through error (FTE). |

‹ Back to question 6

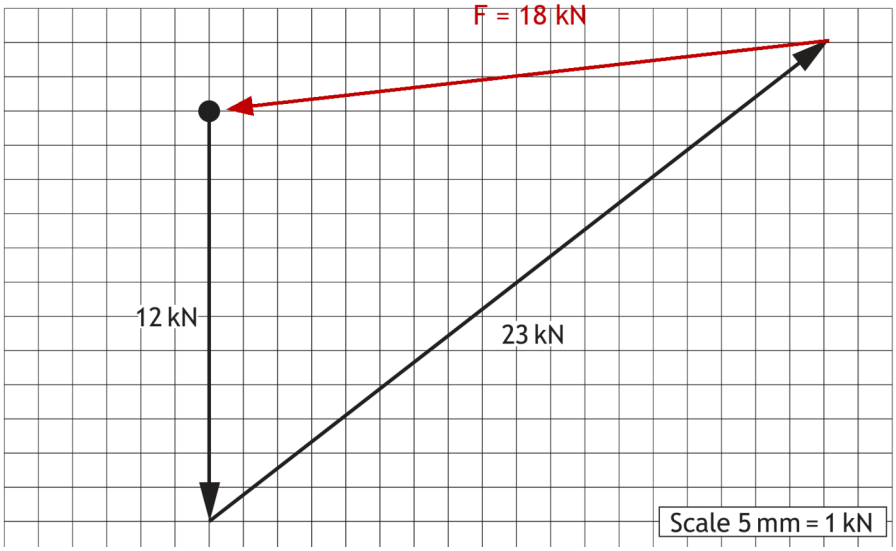
## Answer to question 7

2016 Section 2 Question 13 (a)

**Marking instructions**

| Question | | | Expected Answer(s) | Max Mark | Additional Guidance |
|---|---|---|---|---|---|
| 13. | (a) | | 18 (kN) | 1 | Accept 17kN to 19kN<br><br>Units not required |

**Example answer** (what you add is shown in red)




‹ Back to question 7

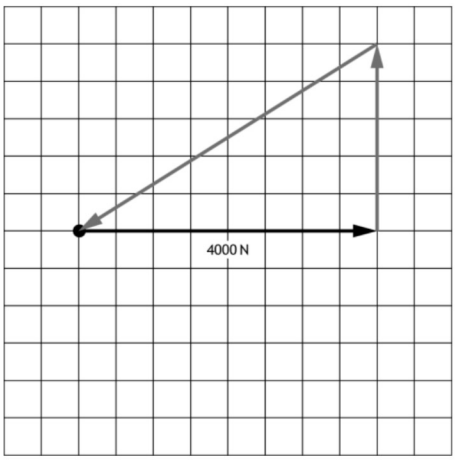


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## Answer to question 8

2022 Section 1 Question 7

### Marking instructions

| Question | Expected response | Max mark | Additional guidance |
|---|---|---|---|
| 7. |  | 2 | 1 mark for vertical line (2500N - 5 squares) upward joined nose to tail to 4000N.<br><br>1 mark for the inclined (4700N) force drawn to scale with arrow (slopping down to left) onto the end of the 4000N line.<br><br>Allow FTE from incorrect vertical force. 1 mark for completing the triangle with an arrow (any direction). |

‹ Back to question 8

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