

1.5 Forces

Name: _____ Class: _____ Date: _____

Total: 10 marks

Objective

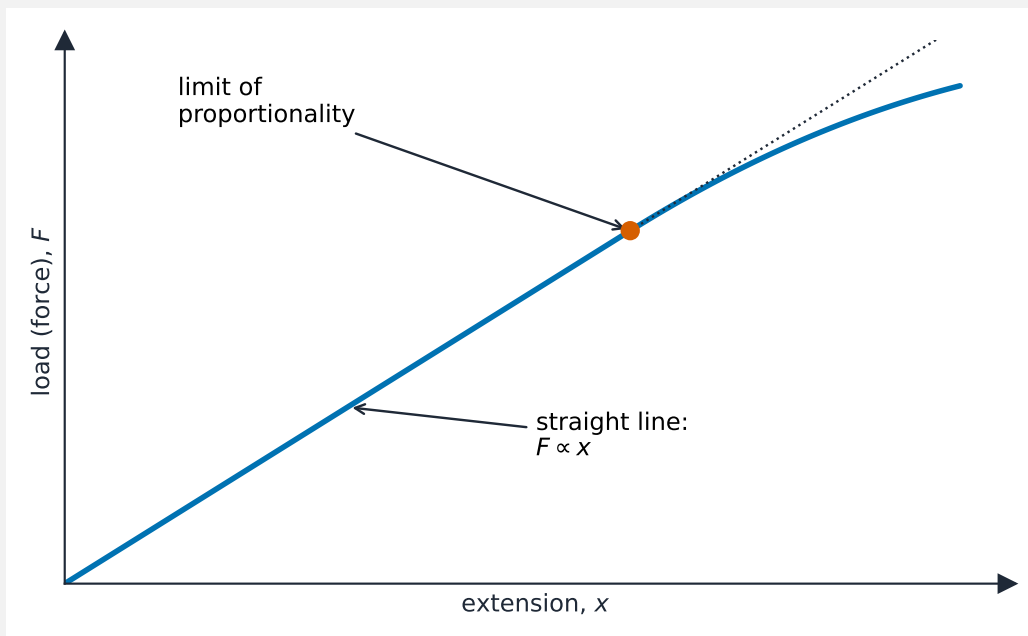
Build the skills to answer exam questions on **forces** 力—**Hooke's law** 胡克定律, **resultant force** 合力 and $F = ma$, friction, and **moments** 力矩.

You must be able to:

- use $k = \frac{F}{x}$ and the limit of proportionality
- find a resultant force and use $F = ma$
- use the principle of moments for a balanced beam

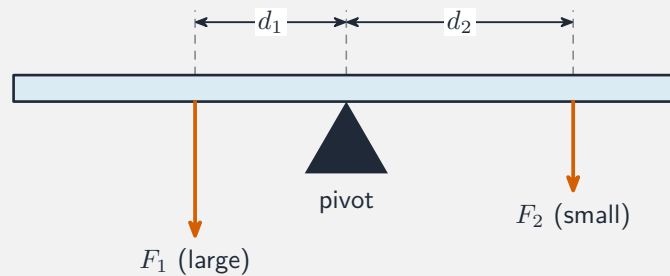
1 Worked examples

■ $F = ma$ and moments



Load \propto extension up to the limit of proportionality; $k = \frac{F}{x}$

balanced: $F_1d_1 = F_2d_2$



Balanced: clockwise moment = anticlockwise moment

Car 1200 kg, drive 3000 N, friction 600 N: resultant = 2400 N; $a = \frac{2400}{1200} = 2.0 \text{ m/s}^2$.

2 Practice

2.1 A spring stretches 4.0 cm under a 20 N load. Find the spring constant in N/cm. [2]

2.2 State the principle of moments. [1]

3 Exam-style questions

3.1 A resultant force of zero on a moving object means it: [1]

- A speeds up
- B slows down
- C moves at constant velocity
- D stops at once

3.2 A box of mass 5.0 kg is pushed with a force of 30 N against a friction force of 10 N.

(a) Find the resultant force. [1]

(b) Find the acceleration.

[2]

3.3 A uniform beam balances on a pivot. A 40 N weight is 0.30 m to the left of the pivot. A weight W is 0.50 m to the right. Find W . [3]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **1.5 Forces** past-paper sheet in the Library, or try these in **Practice mode**:

- 0625/21 N25 —Q5 (spring constant)
- 0625/21 N25 —Q6 (moments)

Solutions

2.1 $k = \frac{F}{x} = \frac{20}{4.0} = 5.0 \text{ N/cm}.$

2.2 for a balanced object, the total clockwise moment equals the total anticlockwise moment (about the pivot).

3.1 C. Zero resultant force means no acceleration —constant velocity.

3.2 (a) resultant = $30 - 10 = 20 \text{ N}.$

(b) $a = \frac{F}{m} = \frac{20}{5.0} = 4.0 \text{ m/s}^2.$

3.3 moments balance: $40 \times 0.30 = W \times 0.50; 12 = 0.50W; W = 24 \text{ N}.$