Homework — Part 2: Exam practice (IB past papers)

10 real IB questions: Paper 1A (multiple choice) and Paper 2, mixed. Total: **23 marks**. Use the data booklet. For Paper 1A, write the letter and a short reason.

Useful: $G = 6.67 \times 10^{-11}\ \text{N m}^2\,\text{kg}^{-2}$, $g = \dfrac{GM}{r^2}$, $F = \dfrac{GMm}{r^2}$, weight $= mg$. Always change km to m!

1. Paper 1A IB May 2025

A planet P has a diameter one-third that of the Earth. The mass of Earth is 18 times that of P. The gravitational field strength at the surface of the Earth is g. What is the gravitational field strength at the surface of P?

A. $\dfrac{g}{6}$ B. $\dfrac{g}{2}$ C. $2g$ D. $6g$

[1]

2. Paper 2 IB May 2026 (one part)

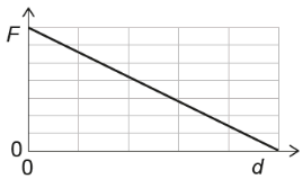
A skydiver jumps from a capsule at a height of 39 km above the surface of the Earth.

The radius of the Earth is 6400 km. **Show that** g is about 9.7 m s^{-2} at a height of 39 km. [2]

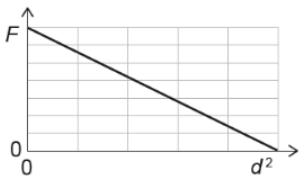
3. Paper 1A IB May 2026

A spaceship is approaching a planet. Which graph correctly represents the variation of the attractive force F with distance d as measured to the centre of the planet?

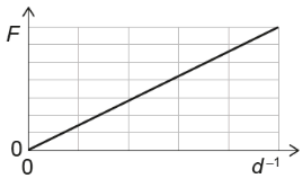
A.



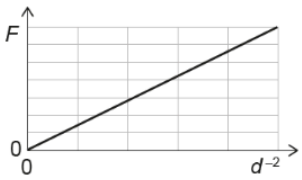
B.



C.



D.



[1]

4. Paper 2 IB May 2025 (one part)

Earth orbits the Sun at an average distance of 1.50×10^8 km. The mass of the Sun is 2.0×10^{30} kg.

Calculate the gravitational field strength of the Sun at a distance of 1.50×10^8 km from its centre. [2]

5. Paper 1A IB May 2025

Point X is at a distance d from the centre of Earth. d is larger than the radius of Earth. The gravitational field strength at X is g_X. Point Y is at a distance $3d$ from the centre of Earth. What is the difference in the magnitude of gravitational field strengths between X and Y?

A. $\frac{8g_X}{9}$ B. $\frac{3g_X}{4}$ C. $\frac{g_X}{4}$ D. $\frac{g_X}{9}$

[1]

6. Paper 2 IB November 2023 (parts a–c)

A space probe of mass 95 kg is designed to land on the surface of an asteroid. The gravitational field strength g of the asteroid at its surface is 2.7×10^{-3} m s^{-2}.

(a) The radius r of the asteroid is 230 km. **Calculate** the mass of the asteroid. [2]

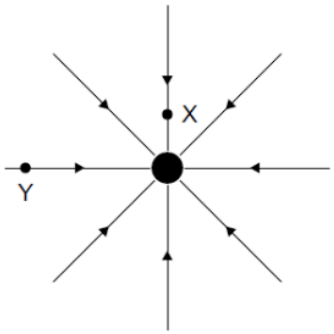
(b) The probe is carried to the asteroid on board a spacecraft. **Calculate** the weight of the probe when close to the surface of the asteroid. [1]

(c)(i) As the probe approaches the surface of the asteroid, a rocket engine is fired to slow its descent. **Explain** how the engine changes the speed of the probe. [3]

(c)(ii) A constant force of 12.0 N is exerted by the rocket engine. **Determine** the time for which the rocket must fire to reduce the speed of the probe from 0.64 m s^{-1} to zero. State your answer to an appropriate number of significant figures. [4]

7. Paper 1A IB May 2025

Two point masses X and Y are released from rest at different positions in the gravitational field of a planet. Y is further from the planet's surface than X. The masses of X and Y are much smaller than that of the planet.



Both masses eventually collide with the planet. Which is the correct comparison of the initial and final accelerations of X and Y?

	Initial acceleration	Final acceleration
A.	different	same
B.	different	different
C.	same	same
D.	same	different

[1]

8. Paper 2 IB May 2021 (one part)

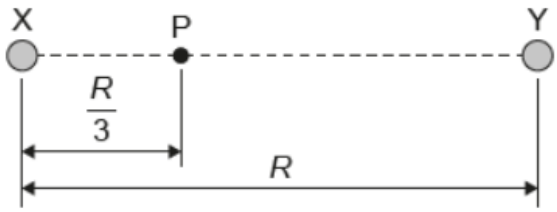
The table gives data for Jupiter and three of its moons, including the radius r of each object.

Object	Mass / kg	r / m	Orbital radius around Jupiter / m
Jupiter	1.9×10^{27}	7.1×10^{7}	
Io	8.9×10^{22}	1.8×10^{6}	4.9×10^{8}
Ganymede	1.5×10^{23}	2.6×10^{6}	1.06×10^{9}
Callisto	1.1×10^{23}	2.4×10^{6}	1.88×10^{9}

Calculate, for the surface of Io, the gravitational field strength g_{Io} due to the mass of Io. [2]
State an appropriate unit for your answer.

9. Paper 1A IB November 2025

Isolated planets X and Y have masses M_X and M_Y respectively and are separated by a distance R. A point P is located at a distance $\frac{R}{3}$ from planet X, as shown. The gravitational field strength at P is zero.



What is $\frac{M_Y}{M_X}$?

A. 2 B. 3 C. 4 D. 9

[1]

10. Paper 2 IB May 2023 (one part)

A moon M orbits a planet P. The gravitational field strength at the surface of P due to P is g_P. The gravitational field strength at the surface of M due to M is g_M. For M and P: $\frac{\text{radius of M}}{\text{radius of P}} = 0.27$ and $\frac{\text{mass of M}}{\text{mass of P}} = 0.055$.

Determine $\frac{g_M}{g_P}$. [2]

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