

IBSMO

International British Science & Mathematics Olympiad

Science — Sample Questions

Intermediate Level

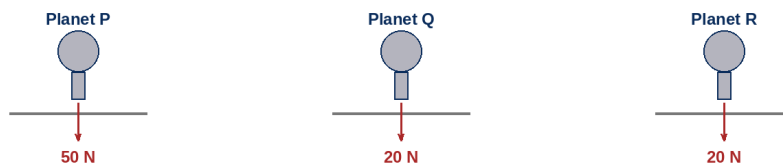
Grade 5–6

Question 1 — Physics — Proportional Reasoning

On a research mission, the same object's weight is measured on three different planets:

Planet P: 50 N Planet Q: 20 N Planet R: 20 N

Researchers then measure a second object, which has twice the mass of the first, on the same three planets.



By how many newtons does the second object's weight on Planet Q and Planet R combined differ from its weight on Planet P?

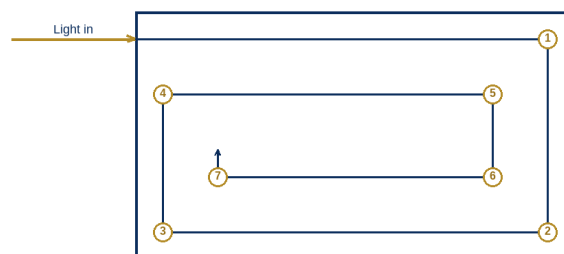
- A) 10 N less
- B) 20 N less ✓**
- C) 30 N less
- D) The weights are equal

Answer: B. Doubling the mass doubles the weight on every planet: $P \rightarrow 100\text{ N}$, $Q \rightarrow 40\text{ N}$, $R \rightarrow 40\text{ N}$. $Q + R = 80\text{ N}$, which is 20 N less than P's 100 N.

Question 2 — Physics — Tracking Direction

A beam of light enters a square-shaped apparatus horizontally from the left. Each mirror inside changes the beam's direction by 90° , always turning the same way. The beam strikes 7 mirrors in sequence.

After the first mirror, the beam travels downward.



Mirrors 1-7 each turn the beam 90°

In which direction is the beam travelling after the seventh mirror?

- A) Downward
- B) Leftward
- C) Rightward
- D) Upward ✓**

Answer: D. The beam turns 90° clockwise at each mirror: Right $\rightarrow$ Down $\rightarrow$ Left $\rightarrow$ Up $\rightarrow$ Right $\rightarrow$ Down $\rightarrow$ Left $\rightarrow$ Up. After 7 turns from the original rightward direction, it is travelling upward.

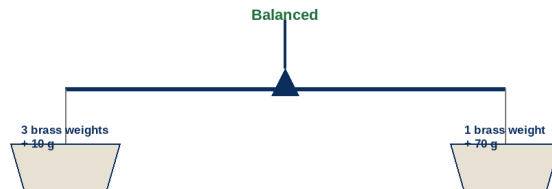
Question 3 — Physics — Balance and Algebra

A balanced beam scale has:

Left pan: 3 identical brass weights + 10 g

Right pan: 1 brass weight + 70 g

It is perfectly balanced. One brass weight is then removed from the left pan.



What must be done to rebalance the scale?

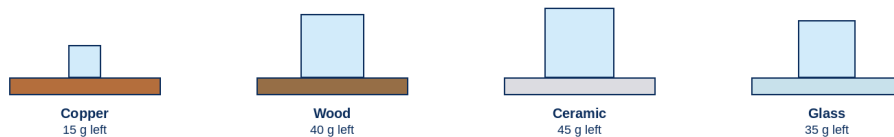
- A) Add 30 g to the left pan ✓
- B) Add 15 g to the left pan
- C) Remove 15 g from the right pan
- D) Remove 60 g from the right pan

Answer: A. Each brass weight is 30 g (from $3x+10 = x+70$). After removing one weight, the left pan holds 70 g and the right pan holds 100 g — a 30 g gap that must be added to the left.

Question 4 — Physics — Comparing Rates

Four identical 60 g ice cubes are placed simultaneously on different surfaces. After 15 minutes, the ice remaining is:

Copper: 15 g Wood: 40 g Ceramic: 45 g Glass: 35 g



What is the difference, in grams, between the surface where the MOST ice melted and the surface where the LEAST ice melted?

- A) 20 g
- B) 25 g
- C) 30 g ✓
- D) 35 g

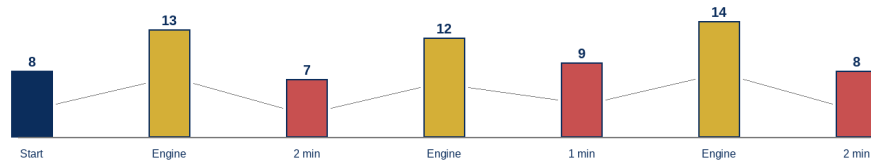
Answer: C. Melted amounts: copper 45 g, wood 20 g, ceramic 15 g, glass 25 g. The largest (45 g on copper) minus the smallest (15 g on ceramic) is 30 g.

Question 5 — Physics — Multi-Step Tracking

A spacecraft's engine increases its speed by 5 units every time it fires. While near a planet, gravity decreases its speed by 3 units every minute that passes.

The craft starts at a speed of 8 units. The pilot performs this sequence:

Engine → 2 minutes → Engine → 1 minute → Engine → 2 minutes



What is the craft's final speed?

- A) 6 units
- B) 8 units ✓**
- C) 10 units
- D) 12 units

Answer: B. $8 \rightarrow (+5) 13 \rightarrow (-6) 7 \rightarrow (+5) 12 \rightarrow (-3) 9 \rightarrow (+5) 14 \rightarrow (-6) 8$. The final speed is 8 units.