Problem of the Week
Problem B and Solution
What’s Beneath the Surface?

Problem
In each problem below, use the information given about part of the object’s mass to determine the unknown mass.

(a) Contrary to what you may have heard, ostriches do not bury their heads in the sand. But, if one decided to do so just for fun, and its 2000 g head was 2% of its total body mass, then what would be the mass of its entire body, in kilograms?

(b) Generally, about 90% of an iceberg’s mass is below water level. If the mass of the visible portion of a certain iceberg is 50 000 tonnes, then what is the mass of the whole iceberg, in tonnes?

(c) Only a small portion of a growing mushroom is visible; most of the fungus is below the ground. If 5% of a mushroom is above the ground, and this portion has a mass of 100 g, then what is the mass of the mushroom below the ground, in kilograms?

Solution
(a) We’re given that 2% of the ostrich’s mass is 2000 g. Since 2% \times 50 = 100\%, the total mass of the ostrich must be 2000 \times 50 = 100 000 g, or 100 kg.

(b) Given that 90% of an iceberg is hidden, the visible mass must be 100\% - 90\% = 10\% of its total mass. Thus, if the visible portion is 50 000 tonnes, and since 10\% \times 10 = 100\%, the total mass must be 50 000 \times 10 = 500 000 tonnes.

(c) If 5\% of the mushroom is above the ground, then 100\% - 5\% = 95\% of the mushroom is below the ground. Since 5\% \times 19 = 95\%, the portion of the mushroom below the ground must have a mass of 100 \times 19 = 1900 g, or 1.9 kg.

Alternatively, the visible portion of the mushroom has a mass of 100 g, which is 5\% of its total mass. Since 5\% \times 20 = 100\%, the total mass of the mushroom must be 100 \times 20 = 2000 g. Then the portion of the mushroom below the ground must have a mass of 2000 - 100 = 1900 g, or 1.9 kg.