17 The data below are taken from a test of a petrol engine for a motor car.

power output	150 kW
fuel consumption	20 litres per hour
energy content of fuel	40 MJ per litre

What is the ratio $\frac{\text{power output}}{\text{power input}}$?

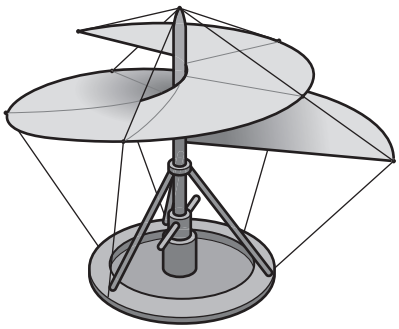
A $\frac{150\times10^{3}}{40\times10^{6}\times20\times60\times60}$

B $\frac{150\times10^{3}\times60\times60}{20\times40\times10^{6}}$

C $\frac{150\times10^{3}\times40\times10^{6}\times20}{60\times60}$

D $\frac{150\times10^{3}\times20}{40\times10^{3}\times60\times60}$

18 Leonardo da Vinci proposed a flying machine that would work like a screw to lift the pilot into the air. The 'screw' is rotated by the pilot.



The machine and the pilot together have a total mass of 120 kg.

Which useful output power must the pilot provide to move vertically upwards at a constant speed of 2.5 m s^{-1}?

A 48 W **B** 300 W **C** 470 W **D** 2900 W

19 A metal wire, fixed at one end, has length l and cross-sectional area A. The wire extends a distance e when mass m is hung from the other end of the wire.

What is an expression for the Young Modulus E of the metal?

A $E = \frac{ml}{Ae}$ **B** $E = \frac{mgl}{Ae}$ **C** $E = \frac{me}{Al}$ **D** $E = \frac{mge}{Al}$