Energy Balance

During a trial on a four-cylinder petrol engine running at 50 rev/s, the brake load was 267 N when all cylinders were working.

When each cylinder was cut out in turn and the speed returned to 50 rev/s, the brake readings were **178 N, 187 N, 182 N, and 182 N**.

Using these readings, determine the brake power of the engine, estimate its indicated power and mechanical efficiency.

For the brake, **bp = FN/455** where F = brake load in newtons and N = rev/s.

Dynamometer power formula simplified: Rope brake radius = 0.725 m. Power expressed in kW, F in newtons and N in rev/s

The following results were also obtained during the trial:

- Fuel consumption, 0.568 l in 130 s
- Calorific value of fuel, 43 MJ/kg
- Specific gravity of fuel, 0.72
- Air:fuel ratio, 14:1
- Exhaust temperature, 760°C
- Specific heat capacity of exhaust gas, 1.015 kJ/kgK
- Cooling water inlet temperature, 18°C
- Cooling water outlet temperature, 56°C
- Cooling water mass flow rate, 0.28 kg/s
- Ambient temperature, 21°C

Draw up an energy balance in kJ/s and as a percentage of the energy supplied.