

### Maths Week Scotland Relay

1. Whitelee Windfarm has 215 wind turbines. Each turbine is 65m tall. What is the combined height of every wind turbine?

Round your answer to 2 significant figures.

2. Hydropower produces 20% of the world's electricity.

Write a formula to represent this relationship, where  $H$  is the electricity produced by hydropower and  $e$  is the electricity produced worldwide.

<https://www.scottishwater.co.uk/About-Us/Energy-and-Sustainability/Renewable-Energy-Technologies/Hydro>

3. The UK will host the 26th UN Climate Change Conference of the Parties (COP26) in Glasgow on 31 October – 12 November 2021.

If the conference begins on a Sunday, on what day will it end?

<https://ukcop26.org/>

4. Scotland's energy consumption slightly decreased in the decade from 168,000GWh in 2009 to 157,000GWh in 2019.

What percentage did this decrease by?

*Round your answer to the nearest whole number.*

5. According to The National Inventory of Woodland and Trees in 1995, there are 18.58 million living trees and 0.46 million dead trees outside woodland in Scotland.

How many more living trees are there than dead trees?

Write your answer in scientific notation.

<https://www.forestresearch.gov.uk/documents/3027/niscotland.pdf>

6. In a survey of 2 496 000 homes, 45% achieved an Energy Performance Certificate rating of Band C or above.

How many homes achieved this rating?

Scottish House Condition Survey, 2019, SAP 2012

7.

| Renewable Tehnology             | Output (£m) |          |         |       |
|---------------------------------|-------------|----------|---------|-------|
|                                 | Direct      | Indirect | Induced | Total |
| Offshore wind                   | 474         | 185      | 230     | 889   |
| Onshore wind                    | 1,298       | 746      | 395     | 2,439 |
| Solar photovoltaic              | 65          | 28       | 28      | 120   |
| Hydropower                      | 476         | 292      | 147     | 915   |
| Renewable heat                  | 185         | 87       | 86      | 358   |
| Renewable combined heat & power | 185         | 87       | 86      | 358   |
| Bioenergy                       | 299         | 151      | 114     | 564   |
| Other renewable electricity     | 3           | 1        | 2       | 6     |

Renewable Output in Scotland, 2019

What is the overall ratio for direct:indirect?

8. MtCO<sub>2</sub>e refers to million tonnes of carbon dioxide equivalent. This is a consistent measure of assessing the contribution of greenhouse gases to global warming.

The MtCO<sub>2</sub>e in 2018 measured at 41.6.

This is down 45.4% from 1990.

How many million tonnes of carbon dioxide or equivalent were present in 1990?

<https://www.gov.scot/publications/scottish-greenhouse-gas-emissions-2018/pages/1/>

Source: Fraser of Allander Institute: The Economic Impact of  
Scotland's Renewable Energy Sector

## Answers

1. Whitelee Windfarm has 215 wind turbines. Each turbine is 65m tall. What is the combined height of every wind turbine?

*Round your answer to 2 significant figures.*

$$\begin{aligned} & 215 \times 65 \\ & = 13\,975 \\ & = 14\,000\text{m correct to 2 significant figures} \end{aligned}$$

2. Hydropower produces 20% of the world's electricity.

Write a formula to represent this relationship, where  $H$  is the electricity produced by hydropower and  $e$  is the electricity produced worldwide.

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$$H = 0.2e \text{ or equivalent}$$

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Friday

4. Scotland's energy consumption slightly decreased in the decade from 168,000GWh in 2009 to 157,000GWh in 2019.

What percentage did this decrease by?

*Round your answer to the nearest whole number.*

$$\begin{aligned} \text{percentage change} &= \frac{\text{new}}{\text{original}} \\ &= \frac{157\,000}{168\,000} \\ &= 93.45\% \end{aligned}$$

*Decrease by 6.55% or 7% to the nearest whole number*

5. According to The National Inventory of Woodland and Trees in 1995, there are 18.58 million living trees and 0.46 million dead trees outside woodland in Scotland.

How many more living trees are there than dead trees?

Write your answer in scientific notation.

<https://www.forestresearch.gov.uk/documents/3027/niscotland.pdf>

$$18.58 - 0.46 = 18.12 \text{ million}$$

$$= 18\,120\,000$$

$$= 1.812 \times 10^7$$

6. In a survey of 2 496 000 homes, 45% achieved an Energy Performance Certificate rating of Band C or above.

How many homes achieved this rating?

Scottish House Condition Survey, 2019, SAP 2012

$$45\% \text{ of } 2\,496\,000$$

$$= 0.45 \times 2\,496\,000$$

$$= 1\,123\,200 \text{ homes}$$

7.

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|                                 | Direct      | Indirect | Induced | Total |
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Renewable Output in Scotland, 2019

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$$54.6\% \quad 41.6$$

$$1\% \quad 0.76$$

Source: Fraser of Allander Institute: The Economic Impact of Scotland's Renewable Energy Sector

100% 76.19 million tonnes

*Total direct:*

$$474 + 1298 + 65 + 476 + 185 + 185 + 299 + 3 \\ = 2987$$

*Total indirect:*

$$185 + 746 + 28 + 292 + 87 + 87 + 151 + 1 \\ = 1577$$

*direct: indirect*

2987: 1577