

Climate Action Week 2024: Rainwater Calculations

Upper Second Level



Stage: **P4-S2**



Time: **1 hour**

Introduction: Following Thursday's Climate Action Week Live Lesson on sustainable gardens, we would like pupils to complete some calculations designed to help them think about rainwater collection and storage.

Activity

This resource is aimed at upper second level. We also have a resource containing simpler calculations for early second level, which can be found on our website.

Ask pupils to work through the calculations worksheet on pages 2-3. Teacher notes are available on pages 4-5, including points for further discussion.

A big thank you to Royal Botanic Garden Edinburgh for creating this resource.

Follow on

After this activity, pupils can move onto our overall week resource: 'Design your sustainable home' and complete design task 4.



Rainwater calculations

In their talk, Eve and Caitlyn showed how capturing **rainwater can help plants grow** – and how growing the right plants can help us manage rainwater to avoid flooding and erosion.

Rainwater that falls on a roof is collected by gutters: pipes with an open top fixed around the bottom of roofs. This water then flows into downpipes.

Water butts (containers) can be attached to roof downpipes to store run-off rainwater. This water can then be used in the garden and not be wasted.

We'd like you to work out **how many watering cans could be filled** by rainwater collected in a year. You can use our example measurements or real measurements/estimates from your school or home.

Show your working in the grey boxes

Step 1

What is the **area of the roof**? = _____ m²

Top tip: What shape is the roof? How can you find that shape's area? You can use our example measurements (4m wide by 5m long) or use your own!

Step 2

What is the **average yearly rainfall**? _____ mm. There are 1000mm in every metre, so the rainfall in metres is: = _____ m

Top tip: Find out the average yearly rainfall in your local area or use our example of 1000mm each year.

Step 3

What **volume of water** will fall on the roof each year?

= _____ m³

= _____ litres

Top tip: Multiply the area of the roof (step 1 answer) by the yearly rainfall (step 2 answer, in metres) to get volume. There are 1000 litres in every cubic metre (m³), so multiply your m³ answer by 1000 to get your answer in litres.

Step 4

If the water butt collects all the rainfall that falls on the roof over a year, **how many 10-litre watering cans** can you fill in a year with the water collected?

= _____ watering cans

Top tip: Divide the litres your water butt can collect each year (step 3) by 10.

Well done!

You have worked out how much water you could reuse.

Both civil engineers and horticulturists (professional gardeners) make calculations about water in order to work out drainage and plant watering needs.

Teacher Notes

This set of questions take pupils through calculations of area and volume. They involve multiplication, division and measurements.

Turning this exercise into an investigation

- Use real-life numbers from your school or pupils' own homes.
- If you or your pupils have access to a water butt or any watering cans, those volumes in litres could be used.
- Measure the length and width of a rectangular building or shed/store and use these measurements to draw a diagram of the roof and find its area. Making the measurements or estimating them can be a maths project in itself – pupils can use their own foot-lengths and convert the results to metres!
- Use a rain gauge to investigate rainfall over time at your own school – or make your own rain gauge.
- The relative capacities of different containers could be investigated.
- To find out the average yearly rainfall in your local area, choose your nearest weather station at [metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages](https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages)

Differentiation

- Working out the area of different sized roofs (and the concept of area itself) can be simplified by rounding lengths to the nearest metre or drawing them to scale on large-squared paper and then counting the squares.

Answers

1. Width x length = area, so you would multiply $4\text{m} \times 5\text{m} = 20\text{m}^2$
2. $1000\text{mm} = 1\text{m}$, so 1000mm would be 1m
3. Area x height = volume, so $20\text{m}^2 \times 1\text{m}$ would be 20m^3 and 20,000 litres
4. $20,000 \text{ litres} \div 10 \text{ litres} = 2,000$ watering cans

Extension discussions

- What else could rainwater be used for? (Examples could include washing cars.)
- Would all the water that fell on the roof go into the water butt and stay there? (Some water could escape the gutters, some could evaporate.)
- At what time of year might you need more water for the garden? (Pupils could check rainfall in different months of the year.)
- Why is it important not to waste water?

Further teaching resources about plants

Take a look at our [online classroom resources](#) for schools.

For inspiration from other schools about positive ways to protect and promote biodiversity at school, please look at our [PlantKind webpage](#).

Keep in touch!

If you'd like to hear more about schools resources, CLPL opportunities or schools workshops (online, at our four Gardens, in schools across Scotland), please join our [e-newsletter mailing list](#).

If you have any suggestions about how we can make this resource better, or are happy to share any feedback about how you've used this resource, please email plantkindlearning@rbge.org.uk.