



PROJECT **FIRESTORM**





YOUR COMMUNITY NEEDS YOU!

Project Firestorm is a five-level mission to battle bush fires and protect the community. In tackling this mission you'll join forces with five elite Firestormers:

M-POWER, MAVRIC, REZ-Q, SONAR & ROBOTICA

Each Firestormer possesses the specific skills to take command of one of the five levels. They'll explain your duties, and with your teacher, help you with ideas and information along the way.





YOUR CRITICAL MISSION

- Level 1** Gather intelligence about bush fires
- Level 2** Work out ways to prevent and respond to them
- Level 3** Identify problems and come up with solutions
- Level 4** Build prototypes for those solutions
- Level 5** Prepare your own bush fire plans

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LEVEL 1
GET SMART





Level 1

GET SMART



Firestormer:
M-Power
AKA Emma

Passions:
· Making positive connections
· Building effective teams

Key skills:
· Leadership
· Logic and empathy

Knowledge is power!

Team up with M-Power and your teacher to gather intelligence about bush fires.

M-Power is a natural born leader - with the charisma to pull a team of Firestormers together and motivate them to explore deep into the problems of bush fires.

When she's not building innovative apps and video chatting with her friends, M-Power moderates online forums to discuss new ways communities can prepare, prevent, respond and recover from bushfires.

She encourages collaboration and ideas from all over Australia, creating partnerships with local business, who then donate items, services and skills needed to assist local bushfire victims.

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Level 1

GET SMART

See bush fires for real

With videos, reports, news stories
and maps, gather intelligence about:

- What causes bush fires?
- How can people prepare for them?
- What are ways of preventing them?
- How should you respond to a bush fire?
- What happens afterwards?
- Who is impacted?
- How has nature been affected?



CAUSES AND EFFECTS OF BUSH FIRES



"Empathy is a critical life skill.
If you don't really know what's going
through the minds of bush fire victims,
how can you think of ways to help them?"

M-POWER





LEVEL 2
SPOT A PROBLEM





Level 2

SPOT A PROBLEM



Firestormer:
Mavric
AKA Mitchell

Passions:
· Aerodynamics
· Aerial firefighting

Key skills:
· Dexterity and vision
· Drone piloting

How can you help?

Working together with Mavric and your teacher, find a problem facing your community.

Mavric has amazing vision and nothing escapes his eagle eyes. So he's just the Firestormer you need in your team when there's some intense spotting of problems to be done.

At home, Mavric studies aerodynamics, but in his other life he fights fires from the air piloting highly intelligent aerial surveillance drones such as his DJI Mavic 2 Pro Drone.

Once a fire is spotted, he unleashes his fleet of firestorm bombers, to extinguish the fire and eliminate the threat.

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Level 2

SPOT A PROBLEM

Work together to discuss the issues facing communities, such as the need to:

- Stop fires happening in the first place
- Stop fires from spreading
- Make sure everyone is well prepared
- Let people know a fire's coming
- Keep firefighters safer
- Tackle fires in inaccessible areas



"Open up your eyes - and your mind - to the challenges that have to be overcome. Next you have to consider solutions."

MAVRIC





LEVEL 3
CONSIDER SOLUTIONS





Level 3

CONSIDER SOLUTIONS

**Firestormer:**

Rez-Q
AKA Jarli

Passions:

- Australian flora and fauna
- Respecting cultural traditions

Key skills:

- Balancing the need for fire with its risks
- Capturing and analysing environmental data

Now let's solve it!

Work with Rez-Q and your teacher to find solutions to a real-world problem.

Rez-Q is a highly skilled indigenous ranger who knows fire is extremely important to the biodiversity of the environment but it can also be dangerous when not respected or managed correctly.

Rez-Q recognises that fire is an important tool in Aboriginal culture. It is not only carried out or prevented to help animals and plants, but also to assist in growing food and medicine, as well as being used for cultural reasons like corroborees.

He knows each 'mob' as well as 'Elders', will have their own ways of looking after their specific piece of country.

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Level 3

CONSIDER SOLUTIONS

Work through all the problems you've identified and start considering solutions to them.

- Throw around lots of ideas for tackling the challenge
- Let your imagination run wild
- Come up with a short list of the best ideas
- Vote to choose the one to develop into a working solution



"Wisdom comes from listening to those around you and respecting the fact that every person has a part to play, and a worthy voice to be heard."

REZ-O





LEVEL 4
MAKE IT HAPPEN





Level 4

MAKE IT HAPPEN



Firestormer:
Sonar
AKA Zhang

Passions:
· High-tech equipment
· Caring for the environment

Key skills:
· Smart device inventor
· Perception and observation

It's time to make those ideas a reality!

Team up with Sonar and your teacher to turn your ideas into working prototypes.

Sonar is a gadget guru and a prototype professional, so he's just the Firestormer you need to help bring your ideas to life.

For Sonar, a good night is one spent studying complex algorithms for his inventions. He can also be found building hi-tech prototypes of equipment that will help volunteer firefighters be alert and safe.

Like his latest, GPS based, wearable device that alerts volunteers and directs them to a bush fire. Once there, the technology monitors their location and vitals, then sending the information to Firestorm HQ.

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Level 4

MAKE IT HAPPEN

Together, try to bring your idea to life doing things such as:

- Build a scale model of your idea
- Make the idea into a working prototype
- Explain an idea in a multimedia presentation



“Remember firestormers, the strength of the idea is the thing that really matters. Get that right and your genius will shine through, however good or bad your modelling skills are.”

SONAR





LEVEL 5
TEST AND SHARE IT





Level 5

TEST AND SHARE IT



Firestormer:
Robotica
AKA Georgia

Passions:
· Robotics and Cybernetics
· All things mechanical

Key skills:
· Manual dexterity
· Vision and creativity

Every brilliant invention needs to be tested.

Work with Robotica and your teacher to refine your prototypes before sharing with the NSW RFS.

Robotica has a toolbelt that would put even the most seasoned tradie to shame, and she knows how to use it. So she's just the person to help put the finishing touches to your ideas - and overcome any glitches.

Robotica loves all things AI or tinkering in her workshop. But her best achievement is inventing robots that can withstand temperatures up to 1000 degrees Celsius.

These firestorm robots can target the centre of any blaze releasing fire retardant that extinguishes the danger from within.





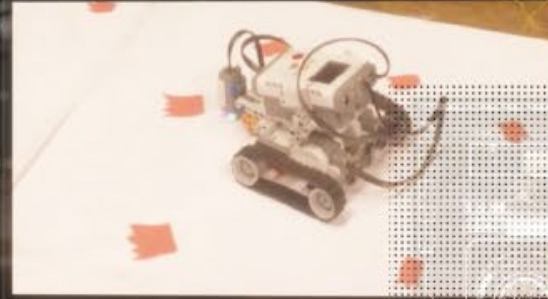
Level 5

TEST AND SHARE IT

How you submit your idea to the NSW Rural Fire Service will depend on its nature, but it could be:

- Pictures and/or a video
- A presentation like this one
- An actual model or prototype

TELL US YOUR IDEAS



"The NSW Rural Fire Service Commissioner might even choose one to test for real, which will win your school a Commissioner's Award!"

ROBOTICA





GOOD LUCK WITH YOUR MISSION

You've met the team, you've been given your mission briefing, and you know what you have to do.



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GO FOR IT FIRESTORMERS!





COLD LIGHT OF DAY

Bush Fire Impact Research

This lesson encourages students to use research techniques to explore the impact of bush fires from a variety of perspectives.

It teaches them to select suitable methods for gathering data and information from reliable secondary sources, then record the data using digital technologies. Through this work students can analyse the relative risks within bushfire scenarios.

1. Break your students into groups of 5-6 to research data on significant Australian bushfires.

2. Give them access to the following sources of data:

[History Channel website](#)

[Emergency Management website](#) (link is not currently working so the data is inaccessible)

[Australian Geographic website](#)

[Emergency management relief website](#)

3. Using Google Sheets or Office 365 if available - or just graph/grid paper - ask students to complete the table below collaboratively.

4. Then ask them to produce bar/column graphs using their data, to analyse the aftermath of the bushfires they've studied.

| | Black Saturday 2009 | Ash Wednesday 1983 | Black Friday 1939 | Black Tuesday 1967 | Gippsland Fires and Black Sunday 1926 |
|--|---------------------|--------------------|-------------------|--------------------|---------------------------------------|
| Properties lost | | | | | |
| Hectares Burnt | | | | | |
| Maximum Temperature Throughout the Day | | | | | |
| Fatalities | | | | | |
| Economic Cost | | | | | |

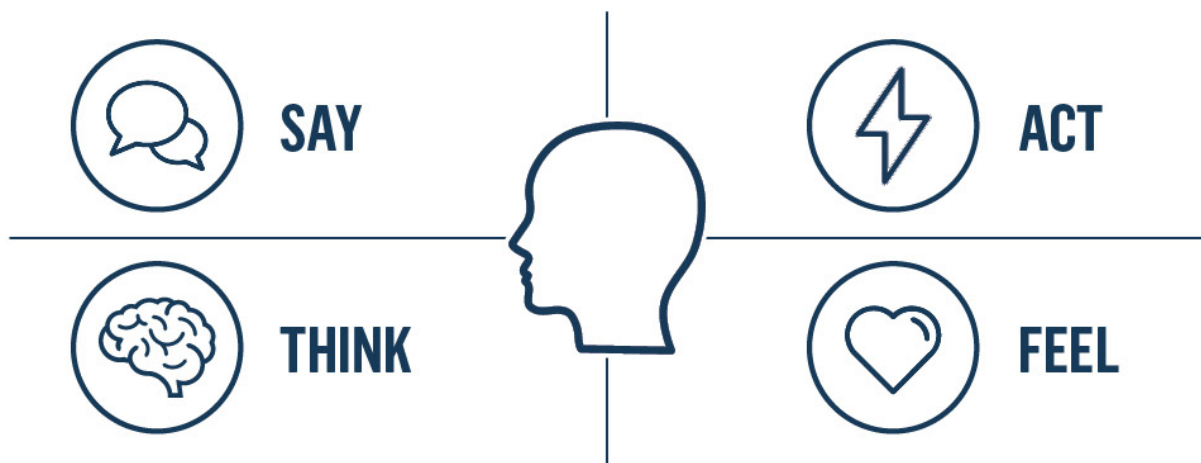
This lesson guide courtesy of St Ives North Public School.



CREATE AN EMPATHY MAP

Using this collaborative tool your students can gain a deeper insight into how people think, act, feel and see before during and/or after a bush fire.

Visualising attitudes and behaviours in this way will help your students explore the feelings, responses and challenges of people during a time of natural disaster - which helps in the development of solutions to the problems identified during the process.



1. Split your class into groups.
2. Give each group a large piece of butcher's paper, separated into quadrants.
3. Have them label the quadrants 'Say', 'Do', 'Think' and 'Feel'.
4. Ask them to put the family with whom they are empathising at the centre of the quadrants.

Start the exercise by asking students why they think it is important to build empathy and understanding when trying to 'design' solutions to another person's problems.

Then expose them to one or more of the following stimuli, before they start work on their maps.

- Watch [When the Fire Comes](#) (2009 Victorian - Black Saturday Fires) People interviewed after a fire.
- Watch [Bushfire Dunalley](#) Children huddled under a bridge with their grandparents in the Tasmanian bushfire



Level 1 LESSON GUIDE



- Watch [Recovery from bushfire](#) Review of children's needs after a bushfire.
- Listen to [Radio National - child psychology after a bushfire](#)
- Explore stories from survivors of Black Saturday at this [interactive](#) site.

For each Quadrant:

SAY

Students write on the paper - or use sticky notes - adding direct quotes and key phrases or words they feel will resonate with a family, such as:

- I'm worried I'm doing the wrong thing
- I'm panicking because I've been caught out and can't focus

ACT

Students add drawings/diagrams or details of what actions a family might take. For instance:

- Stay and fight the fire
- Run and let the fire take its course

THINK

Students add direct quotes from families viewed that begin with 'I think...' or 'I believe'; or are inferred thoughts and beliefs. Examples could be:

- I think I should have cleared the gutters
- I believe things like this never happen to me

FEEL

Students add specific feelings and emotions observed or heard throughout the stories, such as:

- I've never felt so helpless
- It felt like it was never going to go away

Then as a class, compare, discuss and analyse each family's story, and the decisions they made. Ask questions related to the different perspectives observed and how empathy was increased.

This lesson guide courtesy of St Ives North Public School.



Level 1

LESSON GUIDE



POETRY INSPIRED BY FIRE

This lesson offers students the opportunity to create poetry inspired by either preparing for bush fires, responding to them, or recovering in the aftermath.

Have them watch and listen to the stimulus material to identify the thoughts and attitudes of the victims. Then write poetry that expresses the feelings of these people who either left early or stayed and defended their property.

Verse could be Haiku, acrostic or free.

Stimulus

- [Examples of bush fire poetry](#) (ABC audio)
- ['When the Fire Comes' Black Saturday documentary](#) (YouTube)

This lesson guide courtesy of St Ives North Public School.

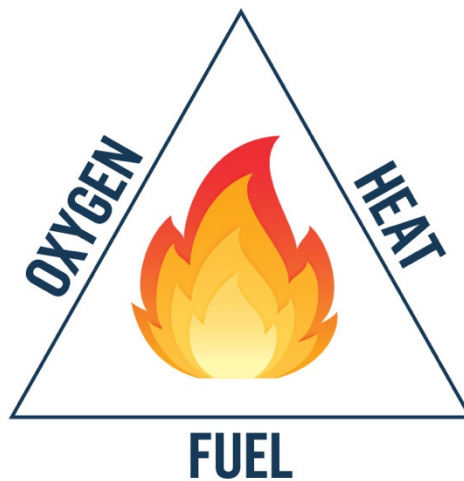


THINKING AROUND A FIRE TRIANGLE

The Fire Triangle is a very simple concept - but it can be used to stimulate a wide-ranging discussion around how to prevent and tackle bush fires.

This exploration can take place during the 'Consider solutions' Level 3 of Project Firestorm, to help identify innovations that may help, and interventions that can be implemented.

What is a Fire Triangle?



The Fire Triangle features the three components needed to ignite and sustain a fire, namely heat, fuel and oxygen. If just one of these components is removed, the Fire Triangle will collapse and the fire will be extinguished.

Therefore, when students are considering ways to tackle a bush fire or stop one from happening in the first place, they may only need to consider how to remove or influence one of the three components.

Heat - and how to reduce it

Heat - such as a lightning strike - is required in order for ignition to occur, but combustion reactions produce their own heat making the fire more severe.

For some types of fire, the heat can be cooled with the application of water, but what are other ways to reduce heat?



Level 1

LESSON GUIDE



Fuel - and how to remove it

A fire cannot begin or spread if there is no material to burn, which is one reason why hazard reduction burns are carried out.

What else can be done to take fuel out of the equation?

Oxygen - and how to starve a fire of it

To sustain the combustion reaction, oxygen (or an oxidising agent) is needed. Our atmosphere consists of 21% oxygen, so there is plenty available to trigger a fire if the other two components are present.

Fire blankets and certain fire extinguishers work by removing the oxygen 'side' of the triangle, but what can be done on a huge scale such as a bush fire?

Through Project Firestorm your students can explore innovative ways to break up the Fire Triangle and prevent or tackle bush fires.



Level 1

LESSON GUIDE



VISUAL ARTS INSPIRED BY FIRE

This lesson offers students the opportunity to explore events, shapes, movement, colours and patterns of fire as inspiration to create artworks, whilst building empathy.

Suggestions for activities

- Create a flame-shaped clay vase
- (Link to Science and Maths - clay in a kiln is fired to a temperature of 1100°C, while water is converted to steam at 100°C)
- Use the Van Gogh 'Starry Night' interactive animation as inspiration for an artwork or animation
- (Link the movement of clouds with the movement of fire. The night scene could be translated to a bushfire scene.)
- Observe work by aboriginal artists such as Clifford Possum Tjapaltjarri and Ronnie Tjampitjinpa and create an artwork in their style, with a bush fire theme.

Stimulus

- [Clay Sculptures](#)
- [Starry Night Animation](#)
- [Ronnie Tjampitjinpa Fireworks Gallery](#)

This lesson guide courtesy of St Ives North Public School.



EXTREME EVACUATION

This worksheet shows you how to use statistics, mapping tools and informed assumptions to create an evacuation plan for a NSW suburb.

Using a Google map of the area downloaded into SketchUp, you can analyse data and investigate the logistical challenges involved in the safe evacuation of the residents of St Ives, to the north of Sydney, during a catastrophic bush fire event.

Set up the mapping

- Open SketchUp and select the Simple Template - Metres.
- Select Geo Location in the drop File menu.
- Select the area north of Toolang Rd. The map will be imported into SketchUp. Repeat and add More Imagery to obtain the entire suburb.
- Referencing maps, use the drawing feature to mark the approximate boundaries of the suburb.
- Select Entity Info in the drop down Window
- menu to obtain the SQ M data of the suburb.
- Convert to SQ KM and hectares.
- Use the population density data (1081 people per SQ KM) to estimate the actual population of St Ives Chase.

Make some general assumptions

- Average family size =
- Average number of cars per household =
- Percentage of residents at home on a Sunday morning =
- Average length of a car in metres (including a 1m buffer) =

Calculate the logistics of a mass evacuation

By combining your assumptions with the population data calculated above, you can investigate the limitations of a mass evacuation of St Ives Chase. To do so, you must first analyse road maps of the area and determine the limited number of exit points available to residents who reside north of Toolang Rd.



Level 1 WORKSHEET



Respond to this evacuation scenario

A catastrophic bushfire is bearing down on the community of St Ives Chase. Residents have been given 60 minutes to evacuate the area North of Toolang Rd. Using your knowledge of the population in combination with your assumptions, you must:

- Calculate the average number of residents that need to leave each minute.
- Calculate the number of cars that will be leaving each minute.
- Calculate the total traffic length (in terms of metres) that will arrive at Toolang Rd each minute.

Work out:

- Using an estimate of six cars per minute being able to leave the suburb at each available exit point, will there be a smooth traffic flow?
- If not, what will be the shortfall in terms of cars / people per minute?
- At this rate, how long would it take for all residents to leave safely?

Then revise your calculations above by adjusting the evacuation time to just 40 minutes.

When asked to leave, residents will typically take some time to pack precious items and essentials. This delay can often lead to fatalities!

- How many cars per minute would need to exit onto Toolang Rd for a safe evacuation to occur?
- Is this figure realistic?

Explain your reasoning.

This worksheet courtesy of St Ives North Public School.



Level 2

LESSON GUIDE



USING A WHYS STRATEGY

This technique can be used during the 'Spot a problem' Level 2 of Project Firestorm, to help identify challenges students can work on during Level 3 'Consider solutions'.

It is intended to challenge assumptions and enhance the 'define' stage, by working through a problem systematically to identify a root cause, for which a solution can be sought.

An example is provided here, but students can be encouraged to work through any problem they initially make assumptions about.

Example problem (assumption)

People died in a bush fire because the RFS did not come quickly enough.

Example sequence of 'Whys'

1. **Why didn't the RFS come quickly enough?**
Because they could not get through the traffic.
2. **Why couldn't they get through the traffic?**
Because too many other people were on the road.
3. **Why were too many other people were on the road?**
Because they left just as the fire arrived.
4. **Why did so many leave just as the fire arrived?**
Because they became frightened and panicked.
5. **Why did they become frightened and panic?**
Because they did not prepare their properties adequately and/or have a Bush Fire Survival Plan.

Real essence of the example problem

People died in a bush fire because they did not prepare their properties and/or have a Bush Fire Survival Plan in place.

As such, a totally different solution is required to the original assumed problem.

This lesson guide courtesy of St Ives North Public School.



DETERMINING A PROBLEM STATEMENT

What problem do you want to solve?

By now, you will have discussed many problems associated with preventing, tackling and recovering from bush fires. Now it's time to focus on a single challenge to invent a solution for.

Your teacher will allocate one of the following eight broad challenges to each pair or group, then ask you to agree amongst yourselves (with a vote if necessary) which topic or topics to work on.

1. Stop fires happening in the first place

- Ignition sources
- Accidental fires
- Arsonists
- High danger periods

2. Stop fires spreading

- Backburning and containment lines
- Firefighting
- Vehicles and aircraft
- Communications

3. Make sure everyone is well prepared

- Education
- Bush fire plans
- Community activities
- Communications and events

4. Let people know a fire is coming

- Alerts and warnings
- Communication technology
- Automatic systems
- Correct procedures



Level 2

WORKSHEET



5. Keep firefighters safe

- Clothing
- Vehicles
- Equipment
- Remote control firefighting

6. Tackle fires in inaccessible areas

- Aviation
- Fire trails
- Pre-installed systems
- Remote control firefighting

7. Help people who can't help themselves

- Hospitals
- Disabled or sick
- Those with special needs
- Communications

8. Rebuild fire-ravaged communities

- Temporary accommodation
- Counselling and support
- Fundraising
- Relocation

The objective is to 'determine the problem' by coming up with single statements that clearly articulate the problems/challenges to be solved.



Level 3

LESSON GUIDE



ANGLE OF ATTACK

This worksheet explores the relationship between fire, wind speed, inclines and declines.

You will be challenged to calculate the effects of slope and wind speed on the spread of bush fires. Measurement data comes from the use of topographical maps of an example area (St Ives Chase), which are available from Google Earth.

The task integrates the mathematical concepts of speed, angles, length, direction, time, Working Mathematically and mapping.

Set up the mapping

- Open SketchUp and select the Simple Template - Metres.
- Select Geo Location in the drop File menu.
- Select the area north of Toolang Rd. The map will be imported into SketchUp. Repeat and add More Imagery to obtain the entire suburb.
- Select Geo Location / Show Terrain, under the File menu.
- Select Section Plane in the Tool menu and cut through the North / South axis.
- Use the Protractor & Tape Measure under the Tools menu to record data on slopes and distances.
- Repeat the steps above through the East /West axis and record data.

Apply variables

- Wind speed from the North on flat ground = 100 metres per hour
- Wind speed from the East on flat ground = 150 metres per hour
- Distances and slope will vary depending on map imported, section plane location and accuracy of angle and distance measurements taken.
- 10° decline = speed halved. 10° incline = speed doubled.

Calculate and predict fire behaviour

By combining measurements of distance and angle with the variables of wind speed and direction from above, your students can make realistic predictions of fire behaviour around St Ives Chase.



Level 3

LESSON GUIDE



Fire Scenario 1:

A 200m wide fire front is approaching St Ives Chase from the North. The fire starts with a lightning strike approximately 600m from Timbarra Rd. Use the 10° slope rule to calculate the following:

- The maximum fire spread rate from the North.
- The minimum fire spread rate from the North.
- The time taken for the fire to reach Timbarra Rd from the North.

If the wind speed dropped by 30%, what would be the impact on the total time to reach Timbarra Rd? Express your answer in terms of time and percentage increase.

If the wind speed doubled to 200 metres per hour, what would be the impact on the total time to reach Timbarra Rd? Express your answer in terms of time and percentage decrease.

Fire Scenario 2:

A 200m wide fire front is approaching St Ives Chase from the East. The fire starts with an arson attack 500 metres from the most easterly point of Timbarra Rd. Use the 10° slope rule to calculate the time taken for the fire to reach Timbarra Rd from the East.

If the wind speed halved at the floor of the valley, what additional time would this provide to residents to evacuate?

Is there a direct correlation between wind speed doubling and the fire arriving in half the time?

Discuss why this is or is not the case!

This worksheet courtesy of St Ives North Public School.



Level 3

LESSON GUIDE



HOW FIRES BEHAVE

In this highly engaging interactive lesson, students can investigate the relationships between the topography of a local area (particularly inclines and declines) and environmental conditions such as temperature, fuel density, leaf litter and humidity, in order to predict the severity and behaviour of bush fires under various conditions.

Under strict supervision, groups build and burn matchstick forests with different slopes, different 'tree' densities, and with the fire starting at different places.

The demonstrations can be filmed and reviewed to analyse fire behaviour, and results can be recorded and analysed across the variables applied.

Resources

- [Detailed lesson plan with material list](#) (PDF)
- [Video of example experiments](#) (YouTube)

This lesson guide courtesy of Idaho Rangeland Resource Commission.



SIX TIPS FOR BRAINSTORMING

Brainstorming is when two or more people throw ideas around to come up with a solution to a challenge or problem. The idea is not only think of ideas, but to build on each other's ideas, because we all have different ways of looking at things.

1. Focus on a specific challenge

Make sure you're all trying to solve the same problem, or you'll end up all over the place.

2. Go wild with ideas

There is no such thing as a bad idea when brainstorming. Even if at first it seems impractical, impossible, unaffordable or plain crazy, it's still worth considering.

3. Listen and respect

Encourage everyone to contribute, and when commenting on someone's idea - or building on it - try to start with 'and' rather than 'but'.

4. Make it visual

Use a whiteboard, butcher's paper and/or Post-it notes to keep a record of everyone's ideas.

5. Aim for volume

Get as many ideas on the table as you can before you start thinking about shortlisting or focussing on the best.

6. Use the power of democracy

Once you've had a really good session, ask each brainstorming Firestormer to pick their favourite challenge. Then this shortlist can be put to the vote for working on in Level 4.