

Ri Off the Shelf Masterclass: Modelling Forest Fires

Worksheet 2 – Fire Modelling

You start with **one burning tree in the centre of the orchard** at time-step 0. Run the model for seven time-steps.

Each time-step:

1. Choose a new colour for this time-step.
2. Work out which trees could catch fire (which have burning neighbours?). Mark them with a **dot**. Tip: Remember to include diagonals as well!
3. Look at **each dotted tree**:
 - a. Work out how many burning neighbours the tree has.
 - b. Roll the die **once for each burning neighbour** that tree has; if any of the rolls turn up a 'catch fire' number, the tree will start burning in the next time-step. Mark it with a **cross**.
4. Once you have worked out all the trees which will burn, colour them in.
5. Record how many trees have started burning in this time-step in the table below.
6. This time-step has finished; repeat the instructions for the next time-step.

Conditions

You are modelling under **normal** conditions.

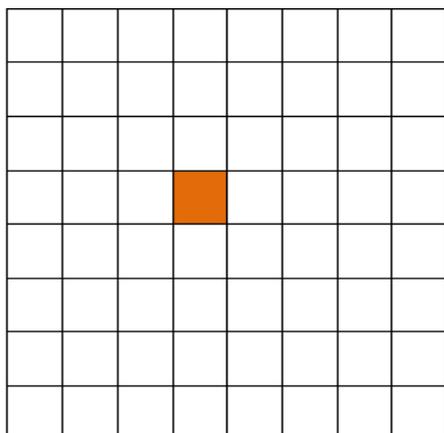
The probability of catching fire from one neighbouring tree is **1/3**.

Use a six-sided die and pick **two** numbers: _____ and _____ .

If you roll either of these numbers, the tree is going to catch fire.

Here is your orchard. The coloured tree is burning; time-step 0 is complete.

Record how your fire spreads here:



Model reliability

It is important to **repeat** models to see if they always give similar predictions.

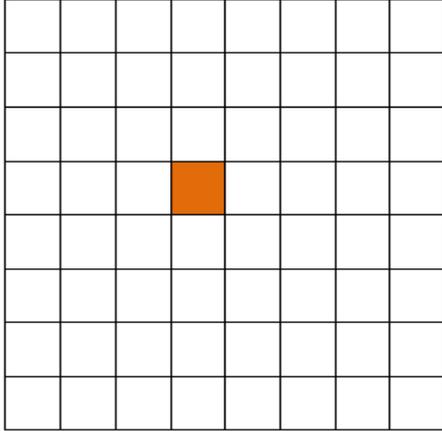
EITHER: Repeat your experiment on the next page or swap this sheet with another member of your group to try a different condition

Repeat 1:

Condition: _____ **Probability:** _____ **Dice numbers:** _____

Here is your orchard. The coloured tree is burning; time-step 0 is complete.

Record how your fire spreads here:

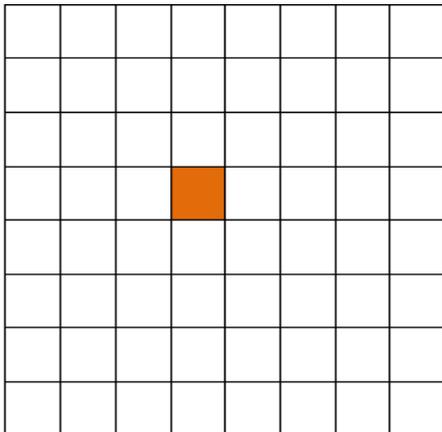


Repeat 2:

Condition: _____ **Probability:** _____ **Dice numbers:** _____

Here is your orchard. The coloured tree is burning; time-step 0 is complete.

Record how your fire spreads here:



Comparisons

Compare the different conditions within your group and discuss the following:

- How does your fire spread?
- How do the different conditions alter the spread of fire for each model?
 - Do the spreads of the fire have different shapes?
 - How quickly is the orchard covered in each case?
 - How long does it take for all the trees to be burning, or does that not happen?
 - Is one situation very different from the others? If so, why do you think this is?
- Has anything surprised you about the spread of your fire?

Ri Off the Shelf Masterclass: Modelling Forest Fires

Worksheet 2 – Fire Modelling

You start with **one burning tree in the centre of the orchard** at time-step 0. Run the model for seven time-steps.

Each time-step:

7. Choose a new colour for this time-step.
8. Work out which trees could catch fire (which have burning neighbours?). Mark them with a **dot**. Tip: Remember to include diagonals as well!
9. Look at **each dotted tree**:
 - a. Work out how many burning neighbours the tree has.
 - b. Roll the die **once for each burning neighbour** that tree has; if any of the rolls turn up a 'catch fire' number, the tree will start burning in the next time-step. Mark it with a **cross**.
10. Once you have worked out all the trees which will burn, colour them in.
11. Record how many trees have started burning in this time-step in the table below.
12. This time-step has finished; repeat the instructions for the next time-step.

Conditions

You are modelling under **wet** conditions.

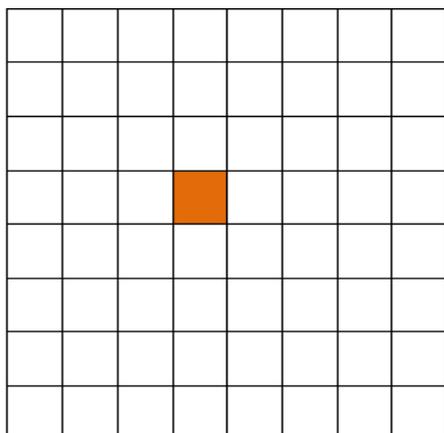
The probability of catching fire from one neighbouring tree is **1/10**.

Use a ten-sided die and pick **one** number: _____.

If you roll this number, the tree is going to catch fire.

Here is your orchard. The coloured tree is burning; time-step 0 is complete.

Record how your fire spreads here:



Model reliability

It is important to **repeat** models to see if they always give similar predictions.

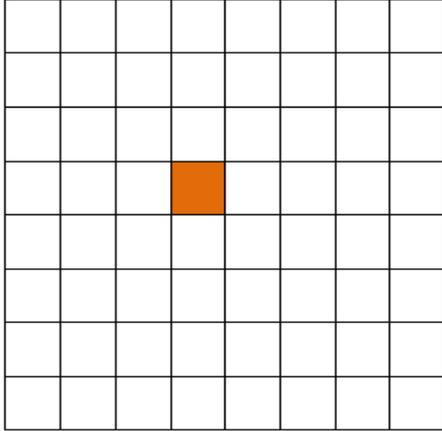
EITHER: Repeat your experiment on the next page or swap this sheet with another member of your group to try a different condition

Repeat 1:

Condition: _____ **Probability:** _____ **Dice numbers:** _____

Here is your orchard. The coloured tree is burning; time-step 0 is complete.

Record how your fire spreads here:

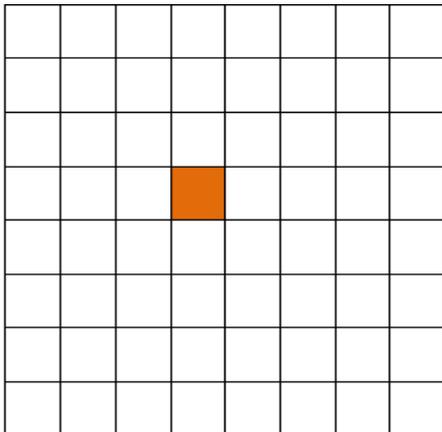


Repeat 2:

Condition: _____ **Probability:** _____ **Dice numbers:** _____

Here is your orchard. The coloured tree is burning; time-step 0 is complete.

Record how your fire spreads here:



Comparisons

Compare the different conditions within your group and discuss the following:

- How does your fire spread?
- How do the different conditions alter the spread of fire for each model?
 - Do the spreads of the fire have different shapes?
 - How quickly is the orchard covered in each case?
 - How long does it take for all the trees to be burning, or does that not happen?
 - Is one situation very different from the others? If so, why do you think this is?
- Has anything surprised you about the spread of your fire?

Ri Off the Shelf Masterclass: Modelling Forest Fires

Worksheet 2 – Fire Modelling

You start with **one burning tree in the centre of the orchard** at time-step 0. Run the model for seven time-steps.

Each time-step:

13. Choose a new colour for this time-step.
14. Work out which trees could catch fire (which have burning neighbours?). Mark them with a **dot**. Tip: Remember to include diagonals as well!
15. Look at **each dotted tree**:
 - a. Work out how many burning neighbours the tree has.
 - b. Roll the die **once for each burning neighbour** that tree has; if any of the rolls turn up a 'catch fire' number, the tree will start burning in the next time-step. Mark it with a **cross**.
16. Once you have worked out all the trees which will burn, colour them in.
17. Record how many trees have started burning in this time-step in the table below.
18. This time-step has finished; repeat the instructions for the next time-step.

Conditions

You are modelling under **dry** conditions.

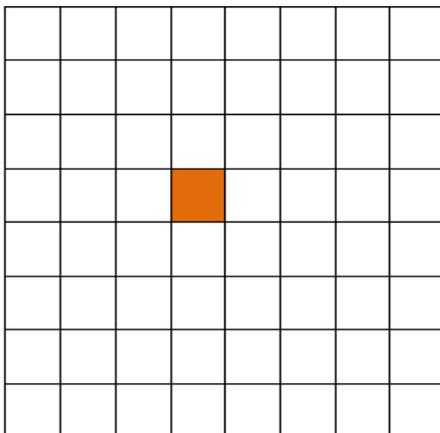
The probability of catching fire from one neighbouring tree is **1/2**.

Use a six-sided die and pick **three** numbers: _____, _____ and _____.

If you roll any of these numbers, the tree is going to catch fire.

Here is your orchard. The coloured tree is burning; time-step 0 is complete.

Record how your fire spreads here:



Model reliability

It is important to **repeat** models to see if they always give similar predictions.

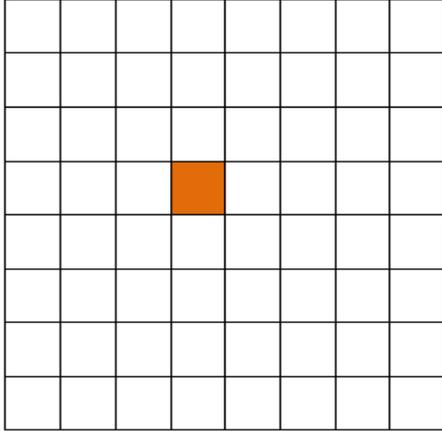
EITHER: Repeat your experiment on the next page or swap this sheet with another member of your group to try a different condition

Repeat 1:

Condition: _____ **Probability:** _____ **Dice numbers:** _____

Here is your orchard. The coloured tree is burning; time-step 0 is complete.

Record how your fire spreads here:

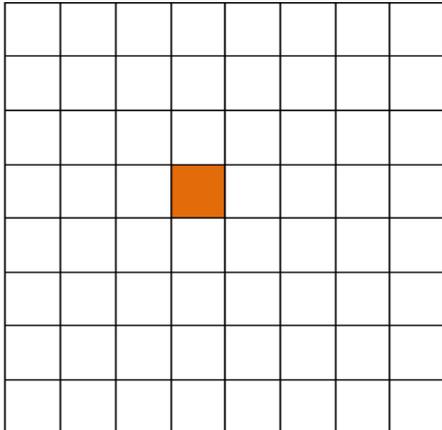


Repeat 2:

Condition: _____ **Probability:** _____ **Dice numbers:** _____

Here is your orchard. The coloured tree is burning; time-step 0 is complete.

Record how your fire spreads here:



Comparisons

Compare the different conditions within your group and discuss the following:

- How does your fire spread?
- How do the different conditions alter the spread of fire for each model?
 - Do the spreads of the fire have different shapes?
 - How quickly is the orchard covered in each case?
 - How long does it take for all the trees to be burning, or does that not happen?
 - Is one situation very different from the others? If so, why do you think this is?
- Has anything surprised you about the spread of your fire?

Ri Off the Shelf Masterclass: Modelling Forest Fires

Worksheet 2 – Fire Modelling

You start with **one burning tree in the centre of the orchard** at time-step 0.
Run the model for seven time-steps.

Each time-step:

19. Choose a new colour for this time-step.
20. Work out which trees could catch fire (which have burning neighbours?).
Mark them with a **dot**. Tip: Remember to include diagonals as well!
21. Look at **each dotted tree**:
 - a. Work out how many burning neighbours the tree has.
 - b. Roll the die **once for each burning neighbour** that tree has; if any of the rolls turn up a 'catch fire' number, the tree will start burning in the next time-step. Mark it with a **cross**.
22. Once you have worked out all the trees which will burn, colour them in.
23. Record how many trees have started burning in this time-step in the table below.
24. This time-step has finished; repeat the instructions for the next time-step.

Conditions

You are modelling under **drought** conditions.

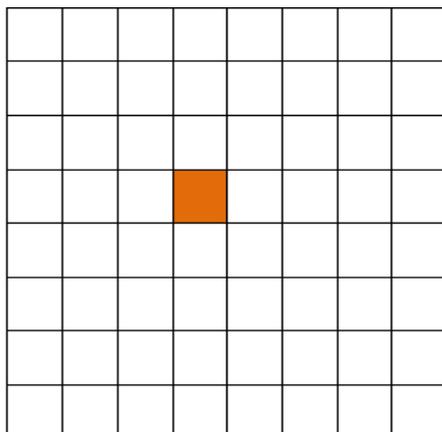
The probability of catching fire from one neighbouring tree is **5/6**.

Use a six-sided die and pick **one** number: _____.

If you roll this number, the tree is **NOT** going to catch fire. If you roll any other number, it will catch fire.

Here is your orchard. The coloured tree is burning; time-step 0 is complete.

Record how your fire spreads here:



Model reliability

It is important to **repeat** models to see if they always give similar predictions.

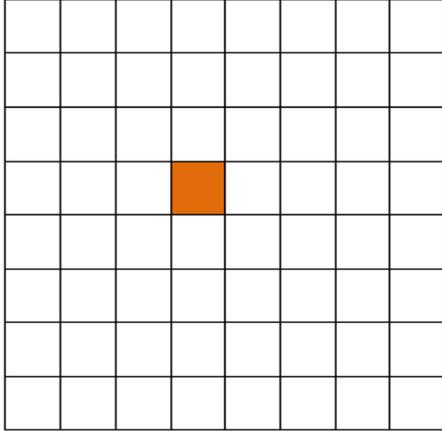
EITHER: Repeat your experiment on the next page or swap this sheet with another member of your group to try a different condition

Repeat 1:

Condition: _____ **Probability:** _____ **Dice numbers:** _____

Here is your orchard. The coloured tree is burning; time-step 0 is complete.

Record how your fire spreads here:

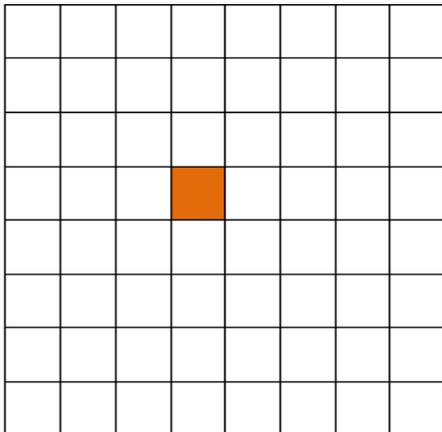


Repeat 2:

Condition: _____ **Probability:** _____ **Dice numbers:** _____

Here is your orchard. The coloured tree is burning; time-step 0 is complete.

Record how your fire spreads here:



Comparisons

Compare the different conditions within your group and discuss the following:

- How does your fire spread?
- How do the different conditions alter the spread of fire for each model?
 - Do the spreads of the fire have different shapes?
 - How quickly is the orchard covered in each case?
 - How long does it take for all the trees to be burning, or does that not happen?
 - Is one situation very different from the others? If so, why do you think this is?
- Has anything surprised you about the spread of your fire?