Walks, trails, paths, circuits and cycles
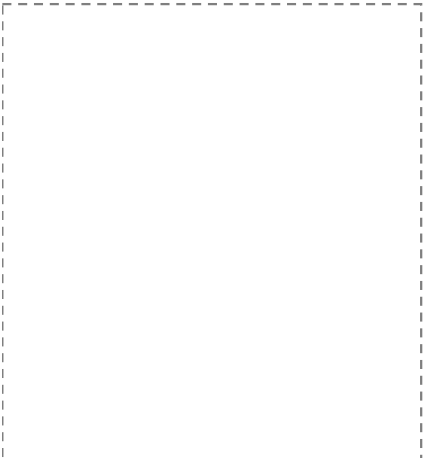
Year 11
General Mathematics

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Learning Objectives

By the end of the lesson I hope that you understand and can apply the following to a range of questions from the Unit 1 and 2 General Maths course.

- Know what a walk is
- Know what a trail is
- Know what a path is
- Know what a circuit is
- Know what a cycle is
- Know how to identify each of the above in graphs.

Recap

It's important to note that this work is very much used in Unit 3 and 4 General Maths. If you have an excellent understand and recall of this information next year, you should be able to smash the exam!

We have looked at a lot of language for graphs and we've not quite finished yet!

If you make sure that you have all this stuff in your summary book with the definitions **and some good diagrams** it's hard to imagine how you could score poorly!

Note: I can never, ever, ever remember these!
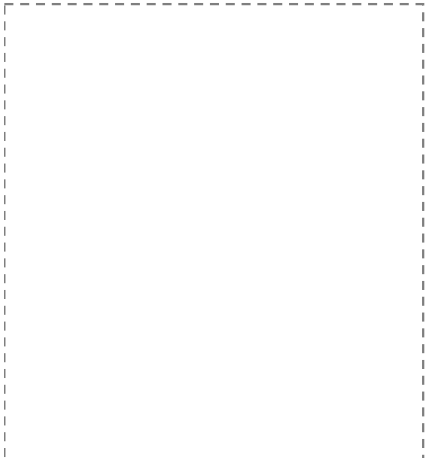
Going for a walk …

Now that I have my eScooter there is little opportunity for me to go for a walk. Hence, I think I'm going to end up looking like Stay Puft Marshmallow man from Ghostbusters.
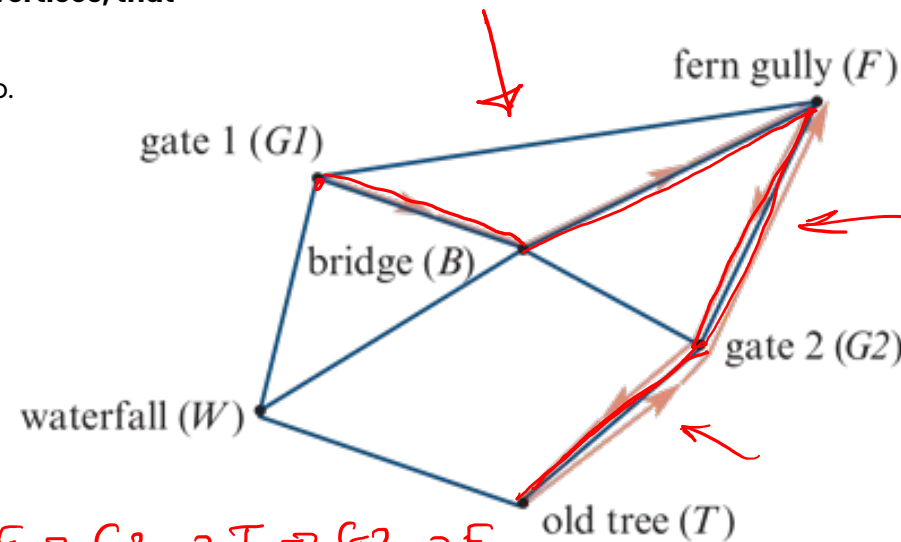
But, there were often times I would head out of my house and just go for a walk.

Being old, I could never quite remember where I had been, I only knew that I had to end up somewhere.

This is the definition of a walk:

A walk is a sequence of edges, linking successive vertices, that connects two different vertices in a graph.

Note: I can visit the same vertex more than once too.

fern gully (F)

gate 1 (G1)

bridge (B)

gate 2 (G2)

waterfall (W)

$G1 \Rightarrow B \Rightarrow F \Rightarrow G2 \Rightarrow T \Rightarrow G2 \Rightarrow F$

old tree (T)

Heading out along a trail

Ahhh, the smell of the great outdoors. Hiking along those trails where you might be attacked by wild dogs or bitten by venomous snakes.

Sounds like Hell.

I'll stay in the city on my eScooter thank you very much.

But, a trail is another type of journey I might go on.

A trail is a walk with no repeated edges.

And so, when I go for a walk, I can't go down the same street more than once. I don't have to end up where I started.

Notice that I can visit the same vertex more than once!

fern gully (F)
gate 1 (G1)
bridge (B)
gate 2 (G2)
waterfall (W)
old tree (T)
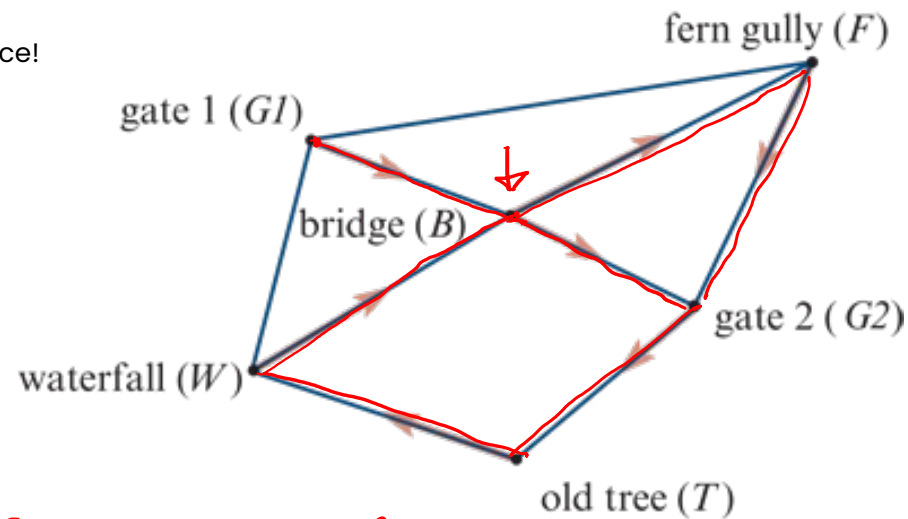
$G1 \rightarrow B \rightarrow F \rightarrow G2 \rightarrow T \rightarrow W \rightarrow B \rightarrow G2$

Don't stray from the path dear ...

I cannot tell you how many times I have read "Little Red Riding Hood" to my daughter now, but every time I read it I wonder why she strayed from the path when her mother told her not to.
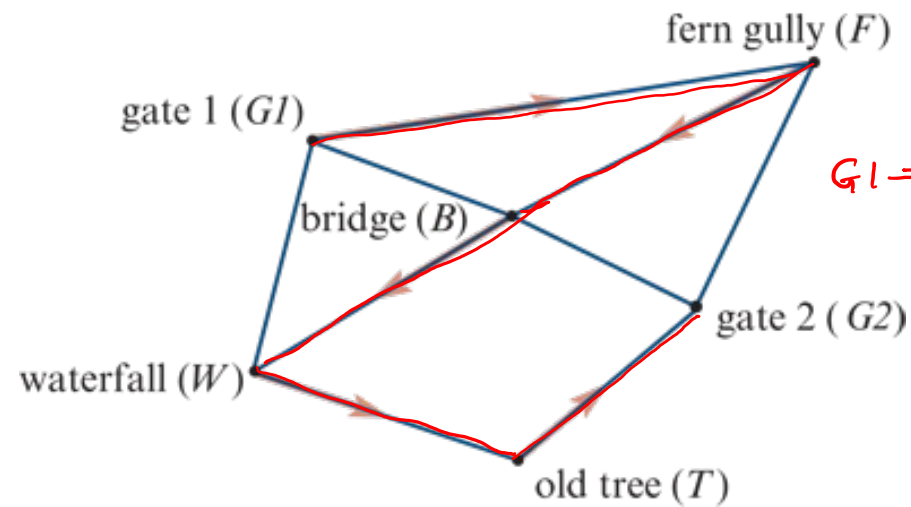
Seems like the book is teaching kids the wrong things.

Little Red Riding Hood was probably a little terror at home. Looked all sweetness and light but ...

In graphs, a path is defined as:

A path is a walk with no repeated vertices.

Note: It is impossible to visit an edge twice, so there are no repeated edges either.

$G1 \Rightarrow F \Rightarrow B \Rightarrow W \Rightarrow T \Rightarrow G2$

Going to the gym and doing a circuit

I ride past the window of my local gym every morning and it always worries me what I see. Not one person is smiling. No one looks like they are enjoying it.
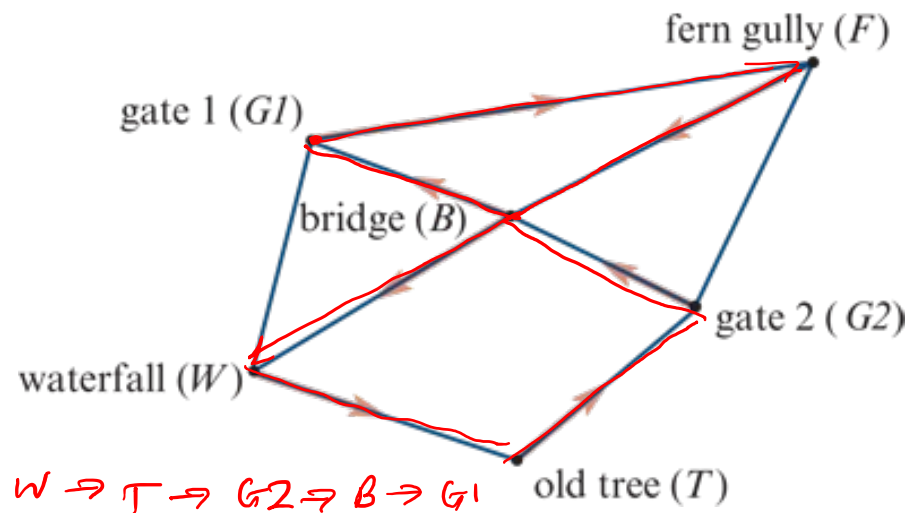
I went for a tour once. I was shown how I could complete a circuit of the equipment. I decided eating chocolate and zipping around on my eScooter looked much more fun.

I'll try the gym another day.

A circuit would suggest that I am going to start and end at the same point. And this is the definition of a circuit in graphs:

A circuit is a walk that has no repeated edges and starts and ends at the same vertex.

Note: We can repeat vertices!

fern gully (F)

gate 1 ($G1$)

bridge (B)

gate 2 ($G2$)

waterfall (W)

$G1 \Rightarrow F \Rightarrow B \Rightarrow W \Rightarrow T \Rightarrow G2 \Rightarrow B \Rightarrow G1$
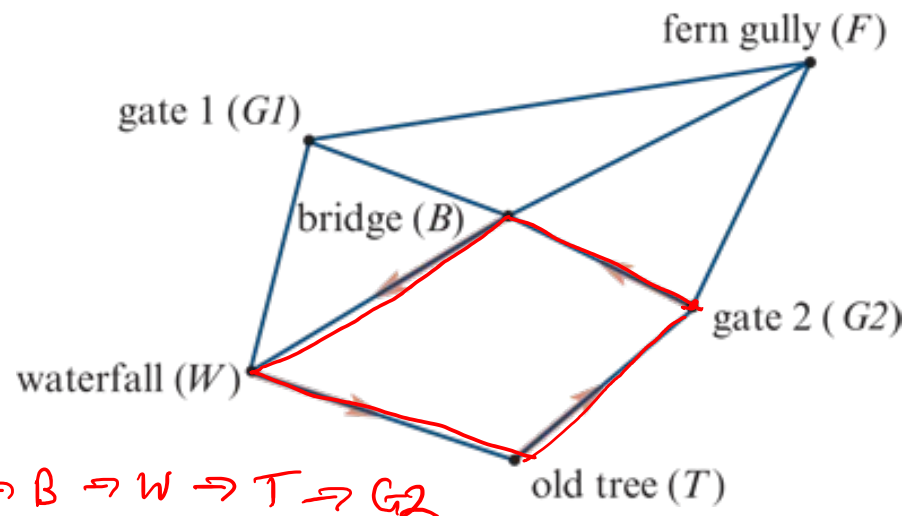
old tree (T)

Don't even get me started on cyclists ...

I'm going to gloss over this for the moment.

Bikes hate me.

In the same way that we have a circuit starting and ending at the same point, this is also true of a cycle.

A cycle is a walk that has no repeated vertices and starts and ends at the same vertex.

fern gully (*F*)

gate 1 (*G1*)

bridge (*B*)

gate 2 (*G2*)

waterfall (*W*)

old tree (*T*)

$G2 \Rightarrow B \Rightarrow W \Rightarrow T \Rightarrow G2$

Easy to use table

The nice people at Cambridge have come up with a nice table to try
and help us remember this stuff. Whilst this might help some people, I
think the definitions and the diagrams are much better!

Type of route	Are repeated edges permitted?	Are repeated vertices permitted?
walk (open)	yes	yes
trail (open)	no	yes
path (open)	no	no
closed walk	yes	yes
circuit (closed trail)	no	yes
cycle (closed path)	no	no (except for the first and last)
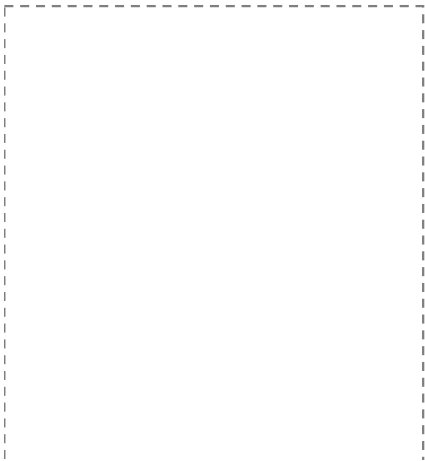
Work to be completed

The following represents the minimum work which should be completed.

The more questions you answer from each exercise, chapter review and Checkpoints the better you chance of gaining an excellent study score in November.

General Mathematics Units 1 and 2 Textbook

Chapter 9
Exercise 9E Walks, trails, paths, circuits and cycles
Questions: All