COMP110: Principles of Computing

3: Flowcharts and pseudocode

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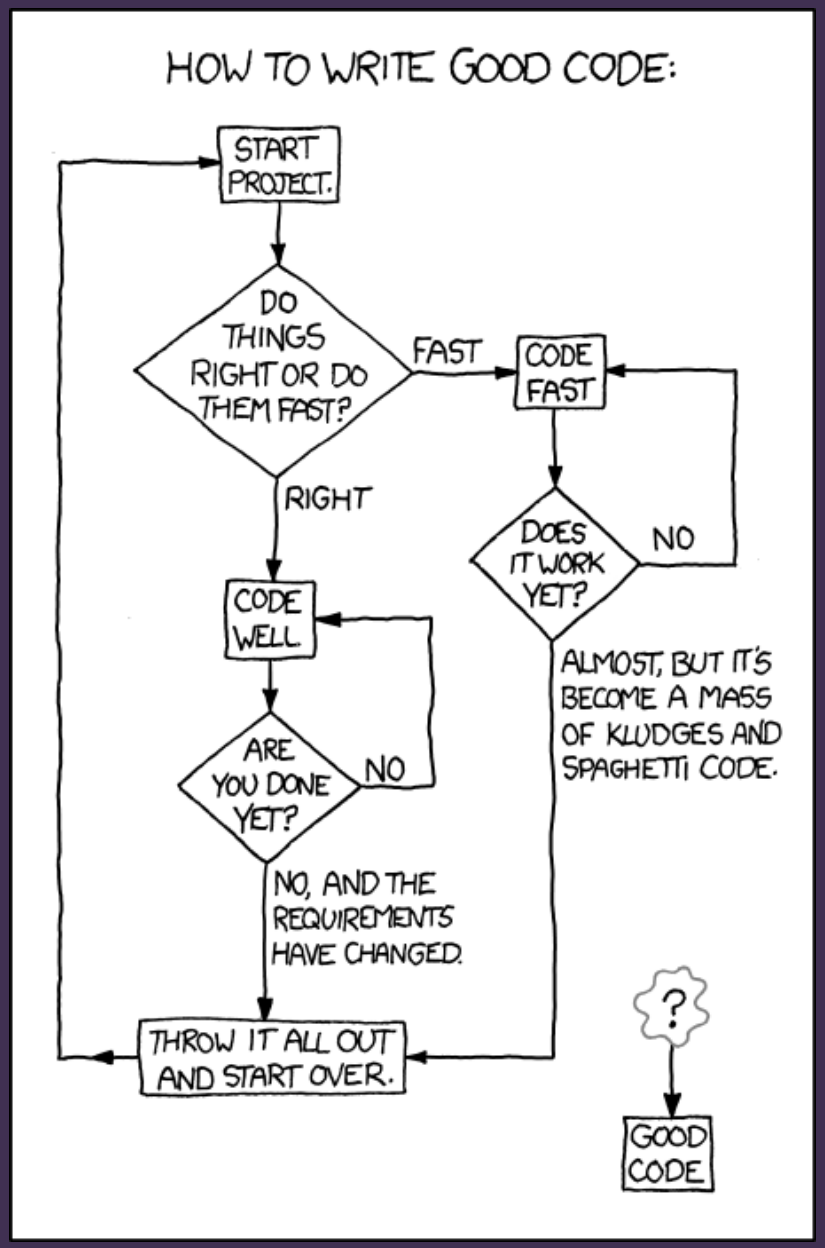
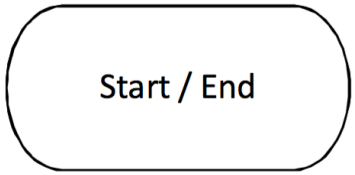
Flowcharts

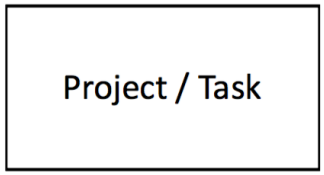


http://xkcd.com/844/

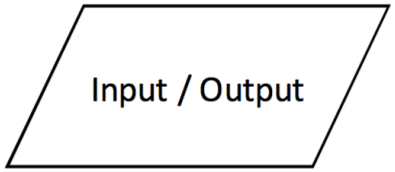
Flowchart symbols



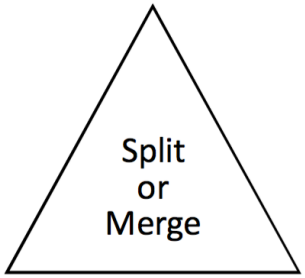
The start or end of a workflow.



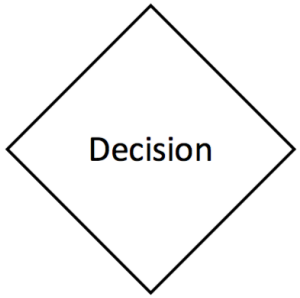
Process or action.



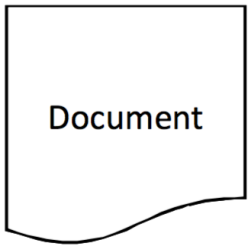
Data: Inputs to, and outputs from, a process.



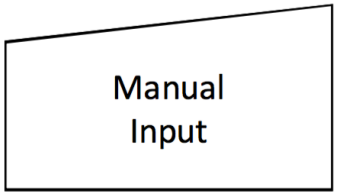
Upright indicates a process split, inverted indicates a merge of processes.



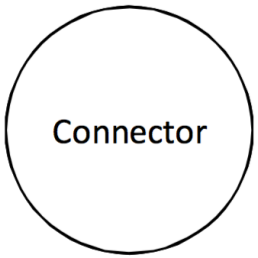
Decision point in a process or workflow.



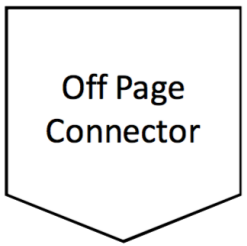
Document or report.



Prompt for information, manually entered into a system.

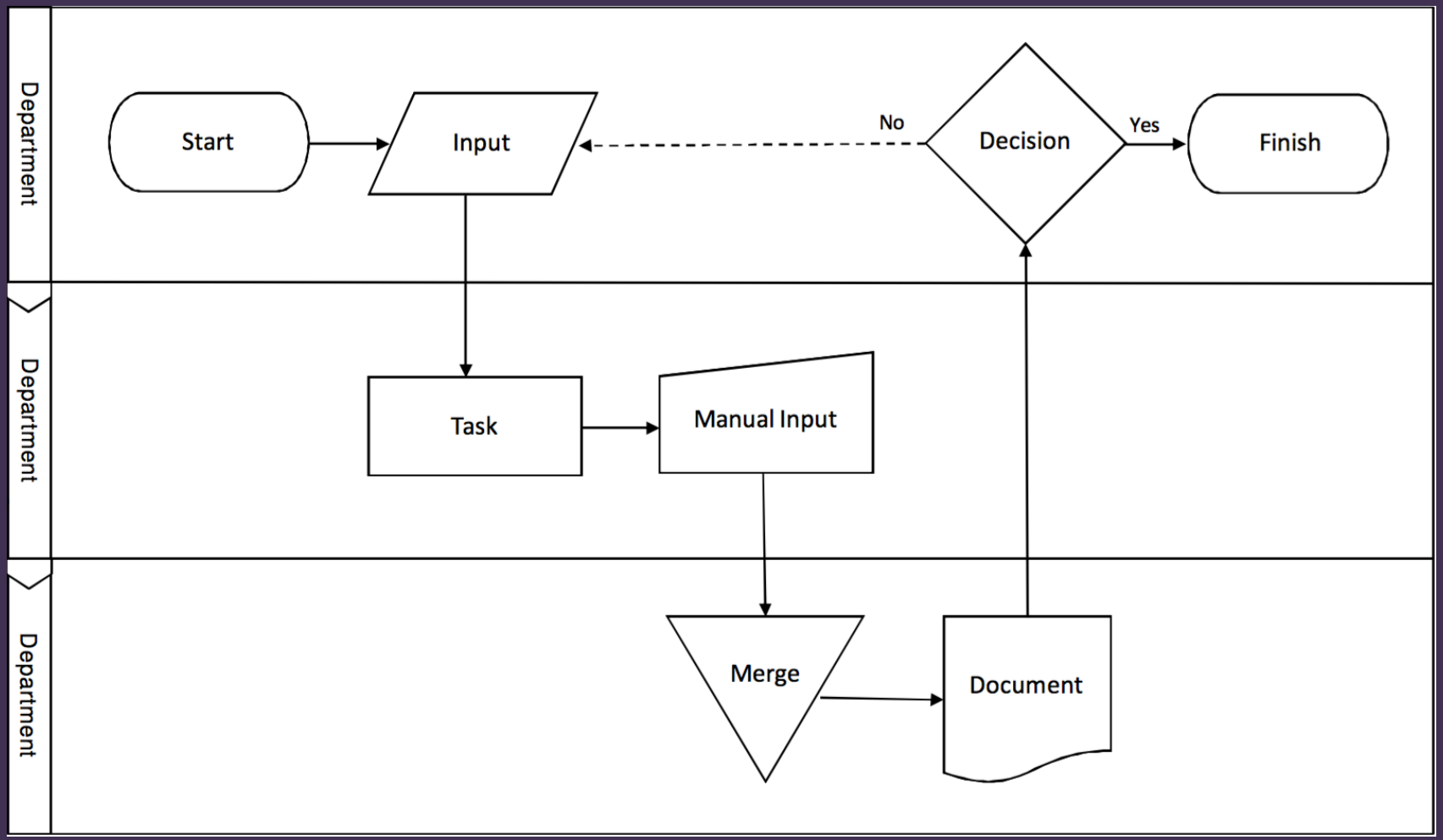


Used to connect one part of a flowchart to another.



Connector used to connect one page of a flowchart to another.

Swimlanes


Department
Start
Input
No
Decision
Yes
Finish
Department
Task
Manual Input
Department
Merge
Document

Software for drawing flowcharts

Intended for drawing flowcharts:

- Gliffy `https://www.gliffy.com`
- LucidChart
- Microsoft Visio

Can draw flowcharts:

- Microsoft PowerPoint
- Google Docs

If you're desperate:

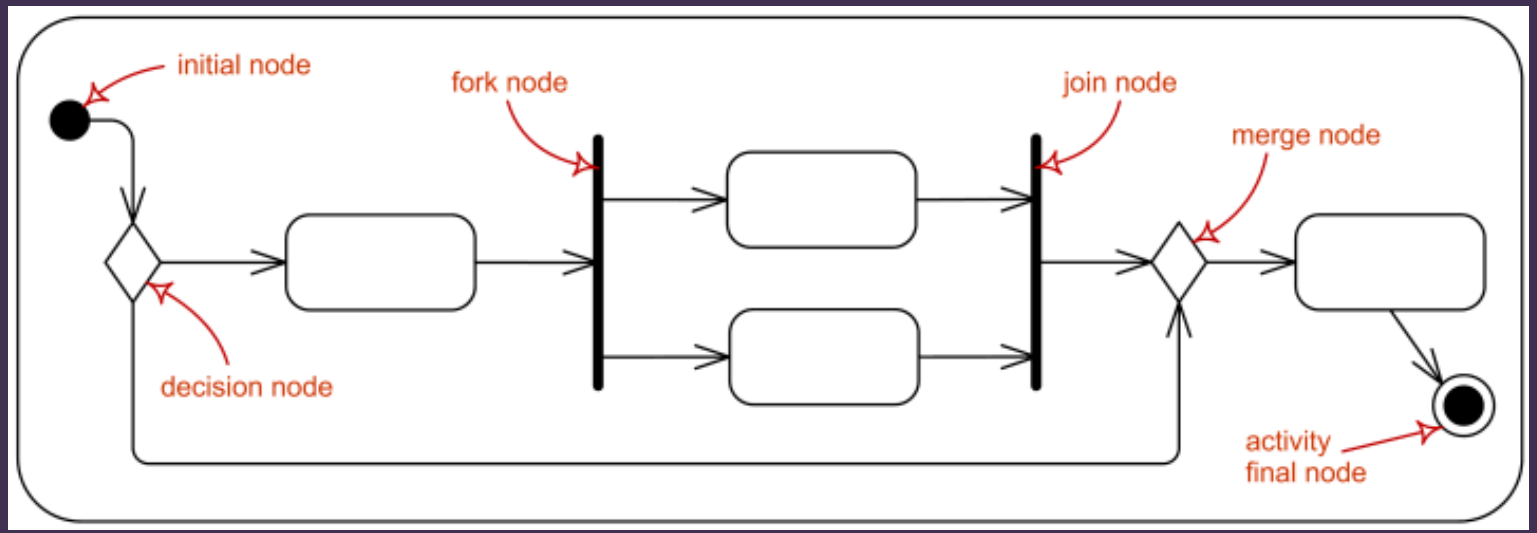
- Any drawing package (Inkscape, Adobe Illustrator, Apple Keynote, ...)
- MS Paint
- Pen and paper

Activity

- In **groups of 2-3**
- **Draw** a flowchart for **logging into Facebook**
- Include at least two swimlanes: **the user's browser/device** and **the Facebook server**
- Post your flowchart to **#comp110 on `https://falmouthgamesacademy.slack.com`**

UML activity diagrams

- Modern counterpart of flowcharts
- UML = Unified Modeling Language — defines 14 types of diagram to represent various aspects of computing systems, of which activity diagrams are one



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Pseudocode

Pseudocode

Flowcharts are useful, but...

- Can be time-consuming to draw
- Do not reflect structured programming concepts well

Pseudocode expresses an algorithm in a way that looks more like a structured program

Pseudocode example

```
print "How old are you?"
read age
if age < 13 then
    print "You are a child"
else if age < 18 then
    print "You are a teenager"
else
    print "You are an adult"
end if
```

Pseudocode example

$sum \leftarrow 0$ ▷ initialisation
for i in $1, \ldots, 9$ **do**
    $sum \leftarrow sum + i$
end for
print *sum* ▷ print the result

`https://socrative.com`, room code `FALCOMPED`:
what would this print?

Pseudocode example

$a \leftarrow 1$ ▷ initialisation
while $a < 100$ **do**
    $a \leftarrow a \times 2$
end while
print a ▷ print the result

`https://socrative.com`, room code `FALCOMPED`:
what would this print?

Formatting pseudocode

- Pseudocode is a **communication tool**, not a **programming language**
- Important: **clear**, **concise**, **unambiguous**, **consistent**
- **Not** important: adhering to a strict set of style guidelines, ensuring direct translatability to your chosen programming language

Level of abstraction

Whether working with flowcharts or pseudocode, choose your **level of abstraction** carefully

Level of abstraction: Good

Fill kettle
Turn kettle on
Put instant coffee in mug
if sugar wanted **then**
    Add sugar
end if
Wait for kettle to boil
if milk wanted **then**
    Pour water to $\frac{4}{5}$ full
    Add milk
else
    Fill mug with water
end if
Stir

Level of abstraction: Not so good

Position kettle beneath tap
Turn tap on
while water is below halfway point **do**
    Wait
end while
Turn tap off
Place kettle on base
Press power button
...

Level of abstraction: Silly

Place right palm on kettle handle
Bend fingers on right hand
Lift arm upwards
while tap spout is not directly above kettle **do**
    Move arm to the right
end while
Place left palm on tap handle
Bend fingers on left hand
Rotate left hand
...

Level of abstraction: also silly

Make a cup of coffee

Activity

A number guessing game: The computer chooses a number between 1 and 20 at random. The player guesses a number. The computer says whether the guessed number is "too high", "too low" or "correct". The game ends when the correct number is guessed, or after 5 incorrect guesses.

- In **groups of 2-3**
- **Write** pseudocode for the number guessing game
- **Post** your pseudocode on Slack
- Tip: type ``` (top left key on your keyboard) **before and after** your pseudocode to preserve indentation and line breaks!

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Markdown

Markdown

- A document **markup language**
- Used especially for `README.md` and other documentation on GitHub
- Similar syntax used on Slack, Reddit, wikis, ...

Activity

https://www.markdowntutorial.com/