PM101: Lecture 12 Estimating

The most difficult aspect of projects

Getting task time and cost estimates right will have a critical influence on whether the project is a success.

Beware if:

- Planning is not systematic
- Estimates are politically motivated
- Use is made of inappropriate data
- People think the project is bound to fail

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What has to be estimated

Time

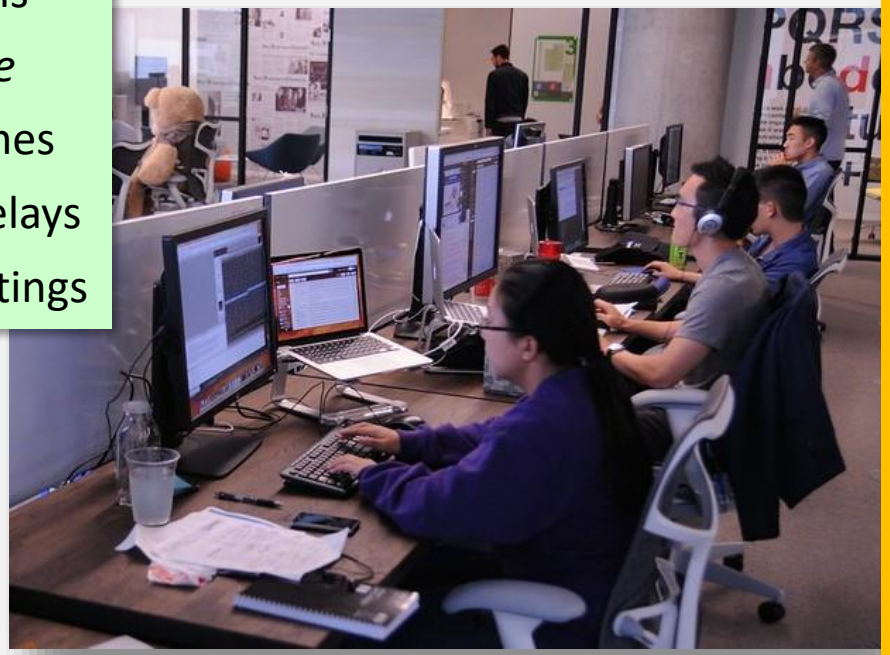
Task durations

Mise en place

Response times

Necessary delays

Regular meetings



Cost

Labour

- Staff
- Contractors

Professional fees

Travel and subsistence

Rent

Utilities and telecoms

Equipment hire

Licence fees

Bought out materials

Overheads

Pinto, J. (2007). *Project Management – Achieving Competitive Advantage,* Upper Saddle River, NJ, US: Pearson, p253. Photo: Sylvain Kalache, Creative Commons, Attribution 2.0 Generic (CC BY 2.0)

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Closing in on the estimates

Ball-park estimates
- Rough idea
- Urgent response to query
- Accuracy ± 25%

Comparative estimates
- Compare with previous work
- May not be exactly the same situation
- Accuracy ± 15%

Feasibility estimates
- Based on early design work
- Initial estimates and quotations from suppliers
- Accuracy ± 10%

Definitive estimates
- Plenty of accurate data available
- Estimates can be confirmed
- Risks understood and allowed for
- Accuracy ± 5%

Definition

Deciding what to do and why

Planning

Working out how to do it, who will do it and when

Decision

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Bottom up or top down ?

Bottom up

Derived from work breakdown structure

More rigorous approach to discovering duration and cost of project

Need to keep a cap on the scope and specification

More bargaining over what is acceptable

Top down

Time and cost parameters are set

Budget or deadline may be fixed

Budget is allocated from programme level

Can have unrealistic expectations about the scope and specification

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Estimating techniques

Consensus
Experienced managers and experts create rough estimates

Apportion methods
Taking the top-down overall budget and giving chunks to each part of the project

Template method
Use an existing template and change the variables

Parametric estimating
Using data from previous projects, scaled up or down. Examples: writing lines of code or laying stretches of roadway

Function point analysis
Estimate amount of work from the level of features required

Synthetic estimating
Use scientific work analysis techniques to establish estimates for repetitive tasks (Taylorist approach)

Supplier bids
Use suppliers' quotations but check them for credibility

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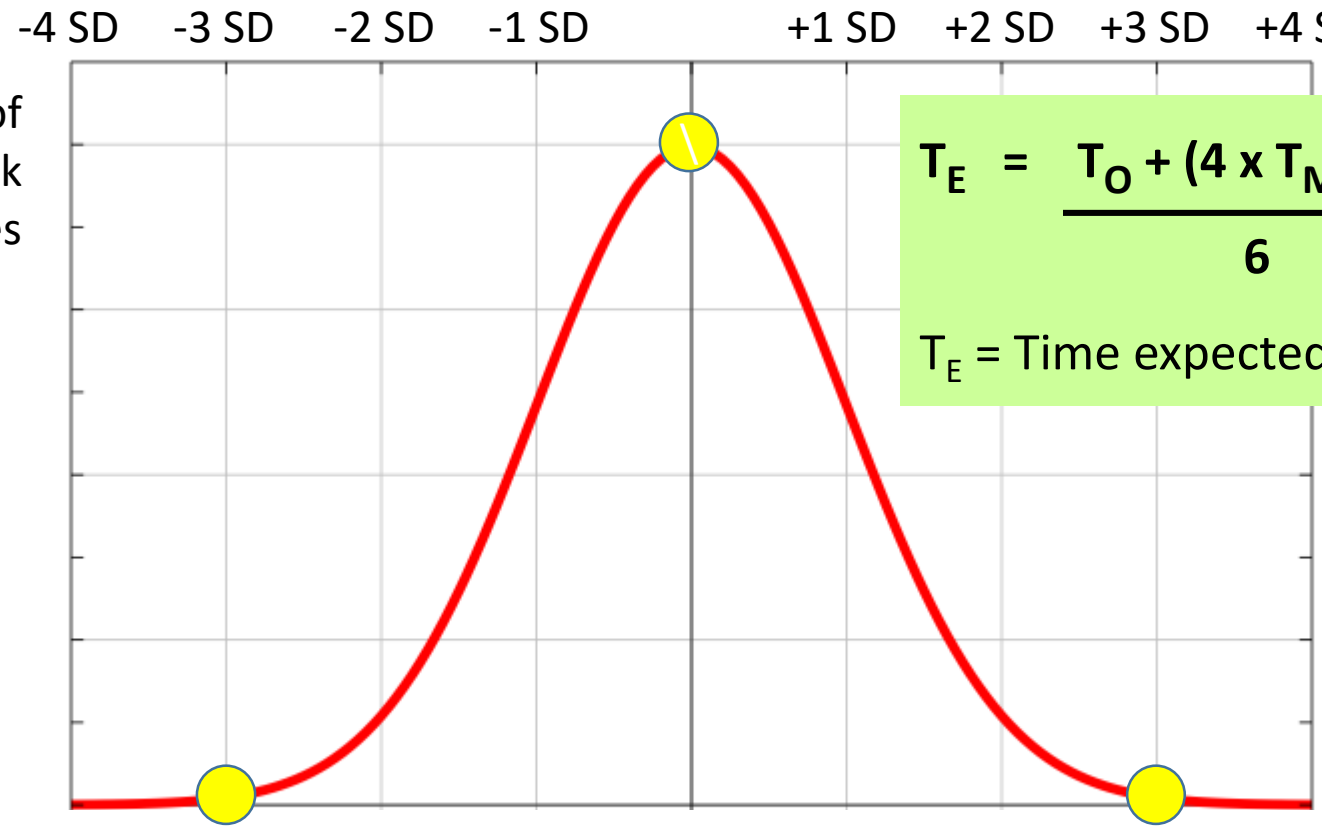
The PERT* approach to estimation



$$T_E = \frac{T_O + (4 \times T_M) + T_P}{6}$$

T_E = Time expected

Optimistic estimate
Task will take this long in 3 occurrences in 1,000

Most likely estimate
Task will take this long on more occurrences than any other

Pessimistic estimate
Task will take this long in 3 occurrences in 1,000

** Program Evaluation & Review Technique*

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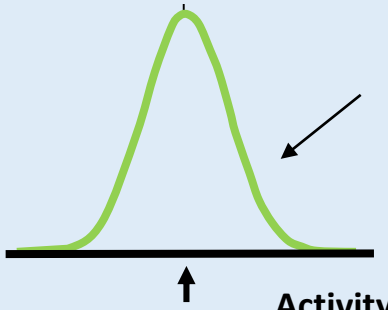
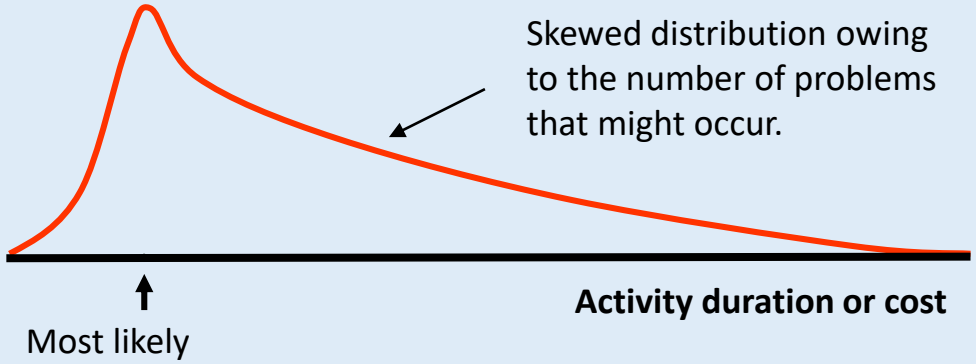
Estimating high and low risk tasks

$$T_E = \frac{T_O + (4 \times T_M) + T_P}{6}$$

Low risk activity
(building a road)



High risk activity
(building a nuclear power station)



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The learning rate

- As output doubles, labour hours per unit decrease by a fixed percentage
- For example, if the first unit of output takes 1,000 hours, and the learning rate is 80% then…

Unit	Labour hours required for that unit
1	1000
2	800
4	640
8	512

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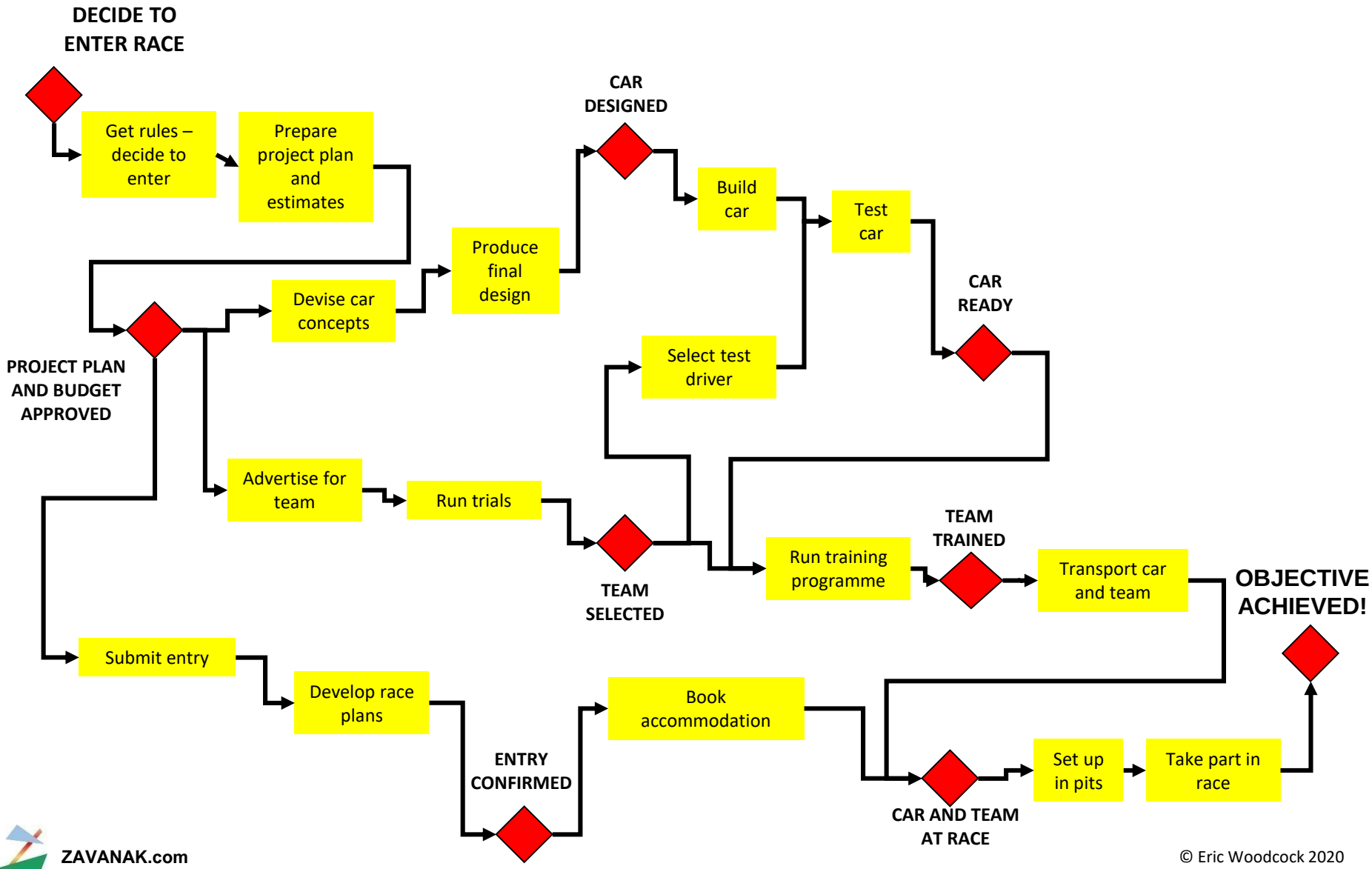
Task network



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Estimated task durations

Task	Days
Get rules	5
Produce plans & estimates	5
Devise car concepts	10
Produce final design	15
Build car	30
Test car	10
Advertise for team	10
Run trials	3
Select test driver	1
Run training programme	15
Submit entry	2
Develop race plans	10
Book accommodation	5
Transport car and team	2
Set up in pits	1
Take part in race	1

All estimates are guesses

More effort leads to better estimates

Vested interests will try and influence estimates in their favour

Practitioners tend to use empirical rather than statistical methods

Estimates need to be reviewed and revised as the project proceeds

How can we be sure the estimate is sound?

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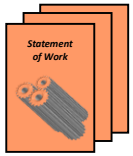
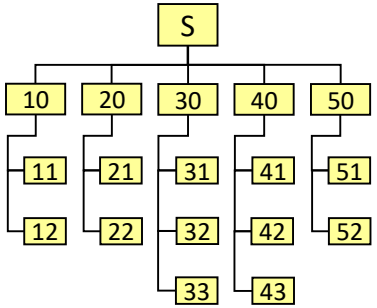
The project planning process

Business case, project brief, specifications etc.

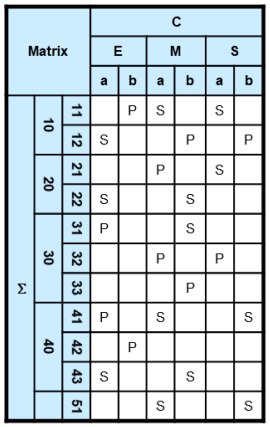


WHAT?



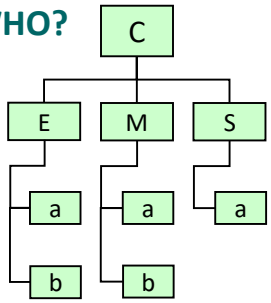
Work breakdown structure

WHO DOES WHAT?

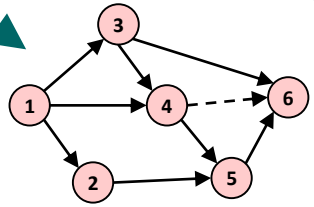


Responsibility matrix

WHO?

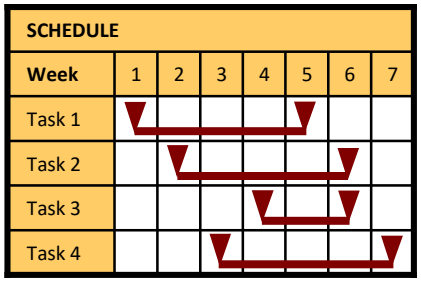


Organisation



Task network

WHEN?



Work schedule

Cost database

HOW MUCH?

Staffing and cost estimates

Project plan

Morris, P. (1997). *The management of projects.* London: Thomas Telford, p262

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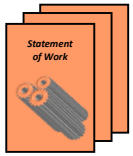
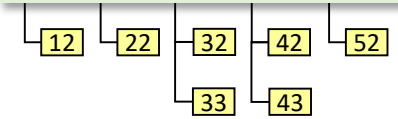
The project planning process

Business case, project brief, specifications etc.



WHAT?

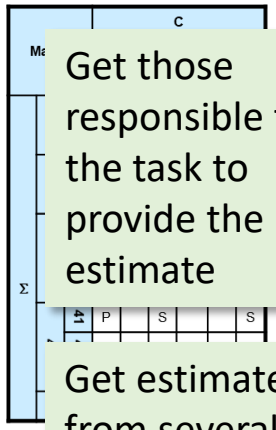
Use the Work Breakdown Structure (WBS) as the basis



Work breakdown structure

Treat tasks as independent

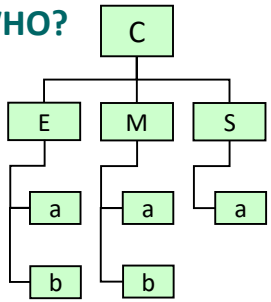
WHO DOES WHAT?



Get those responsible for the task to provide the estimate

Get estimates from several people

WHO?



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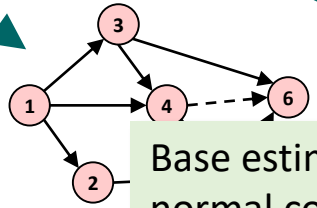
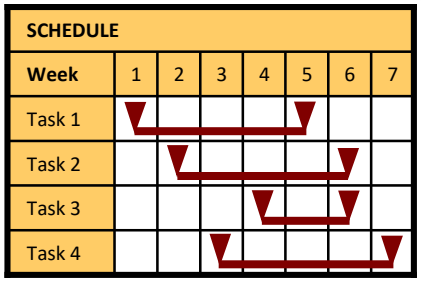


Task network

Base estimates on normal conditions

Use consistent time units



Work schedule

Cost database

HOW MUCH?

Staffing and cost estimates

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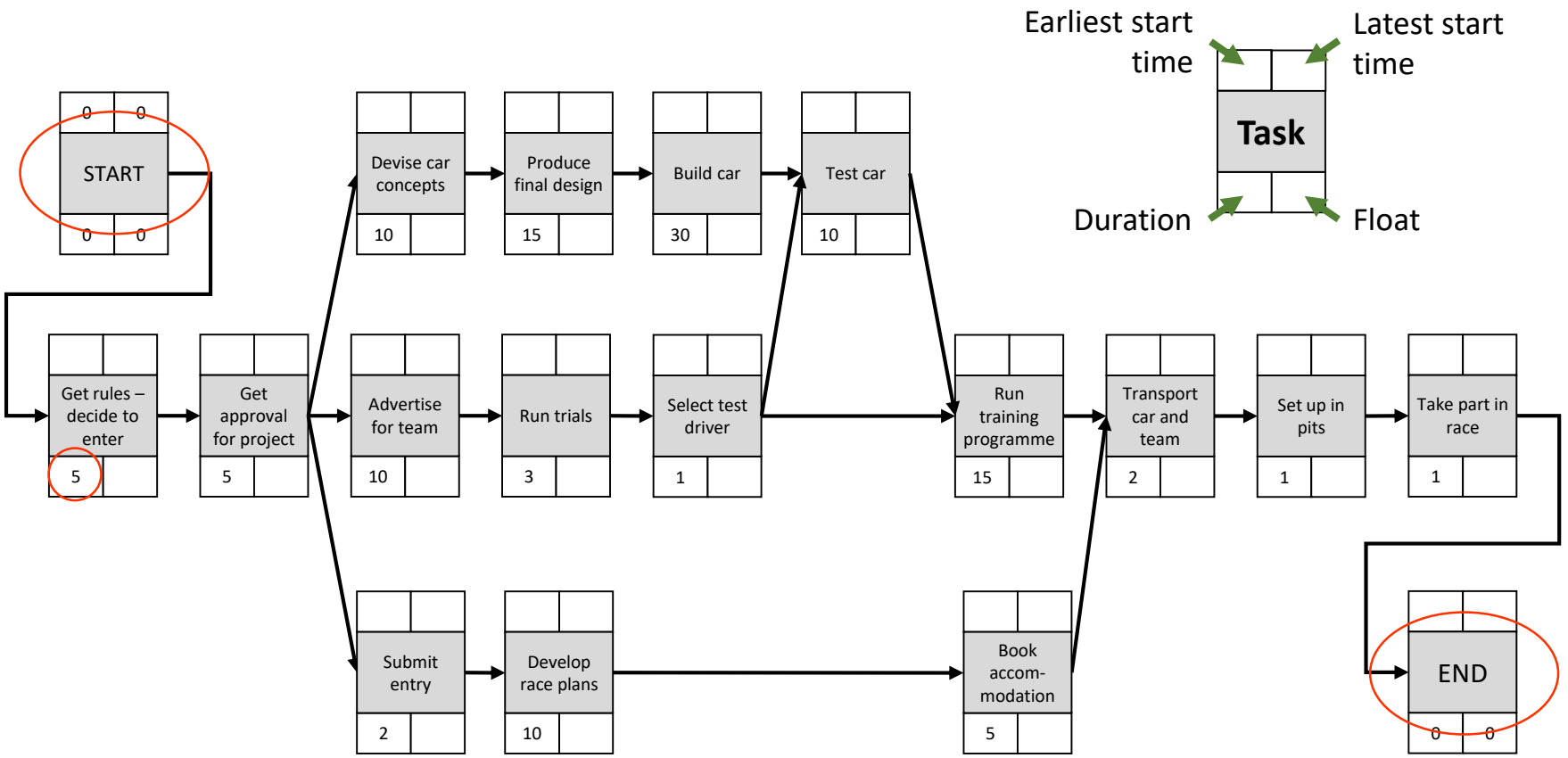
Activity on node plan



Durations are in days

ZAVANAK.com

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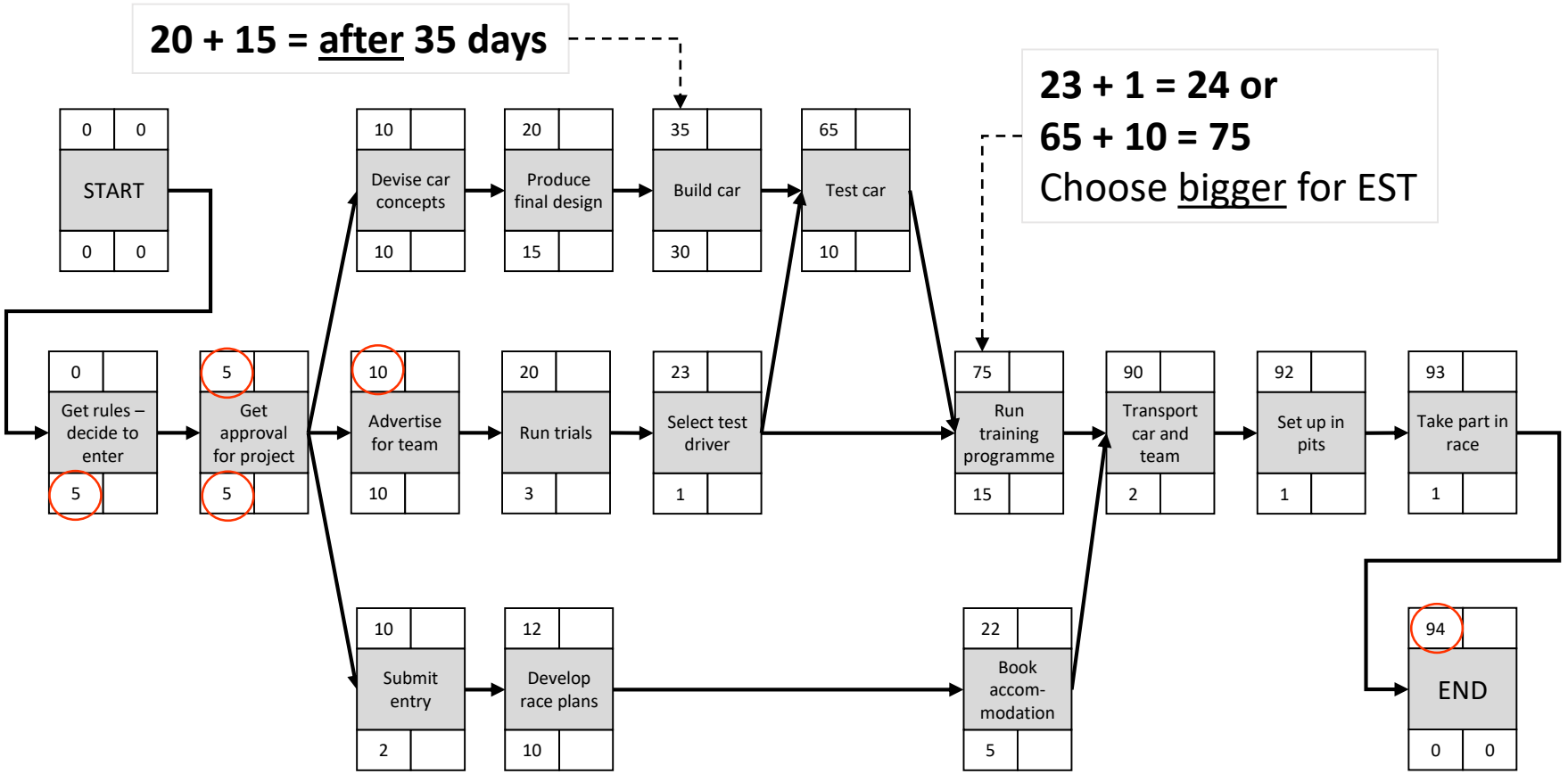
How long should this project take?



Durations are in days

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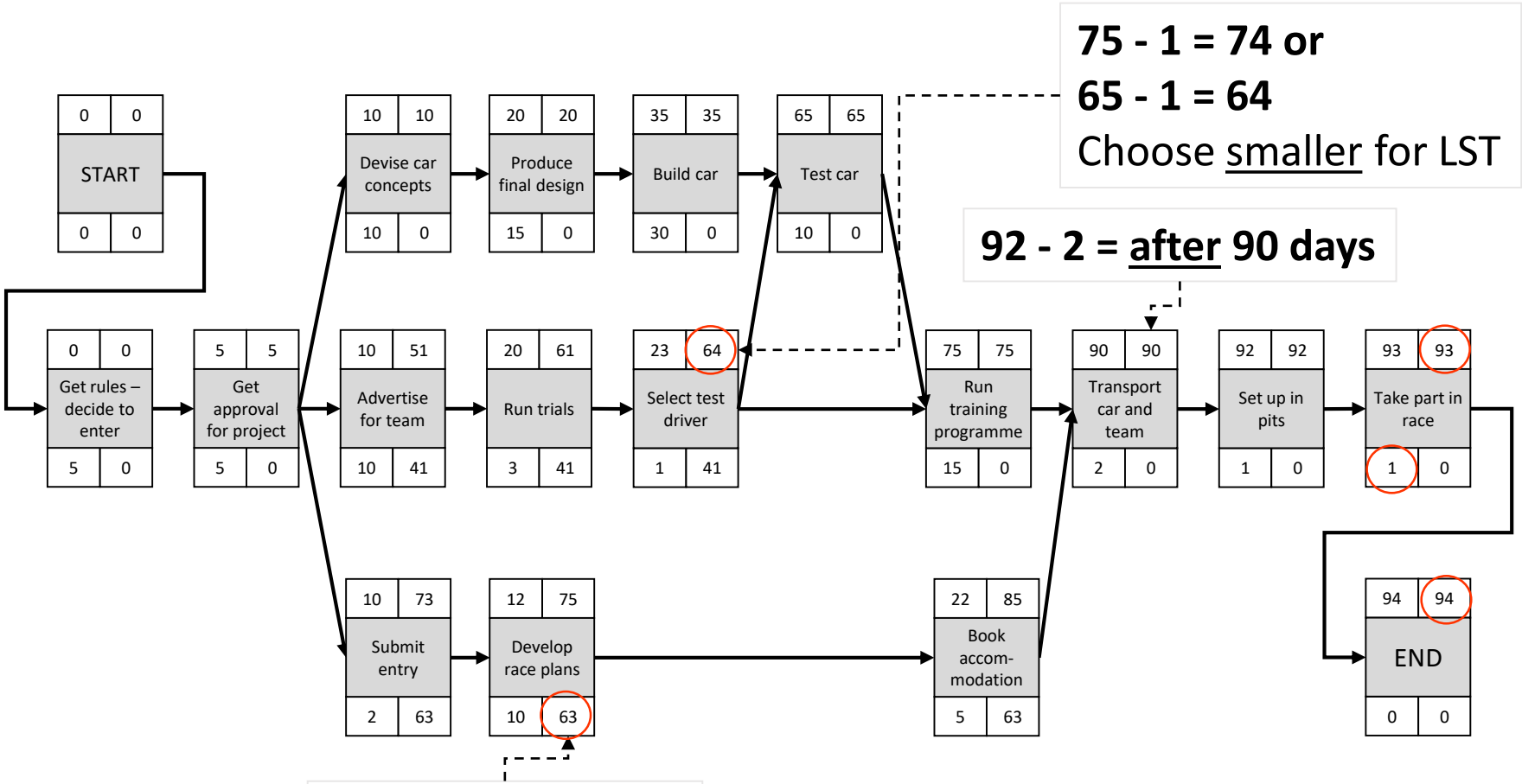
What is the longest time route through the network?



Durations are in days

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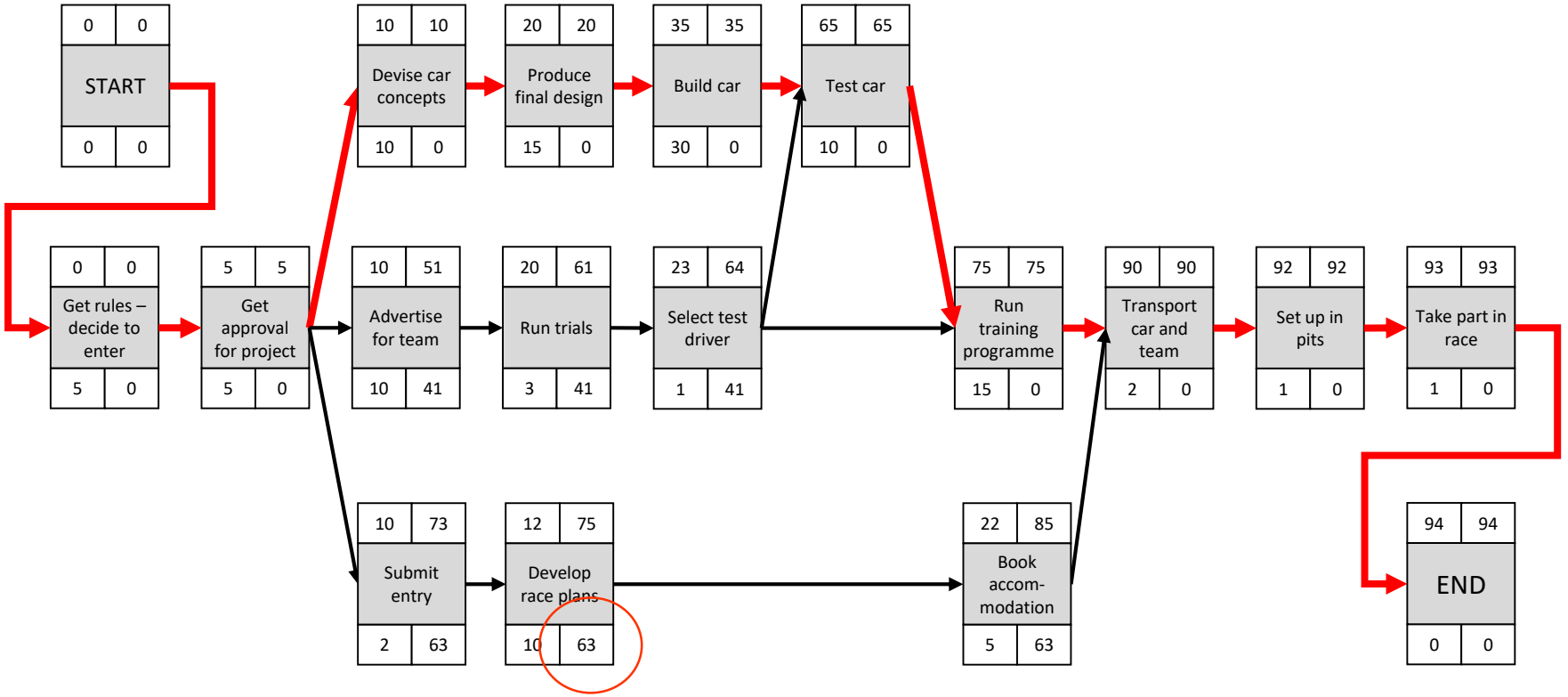
The critical path



Durations are in days

Float:
Period of time by which each task can be delayed without affecting END time of the project

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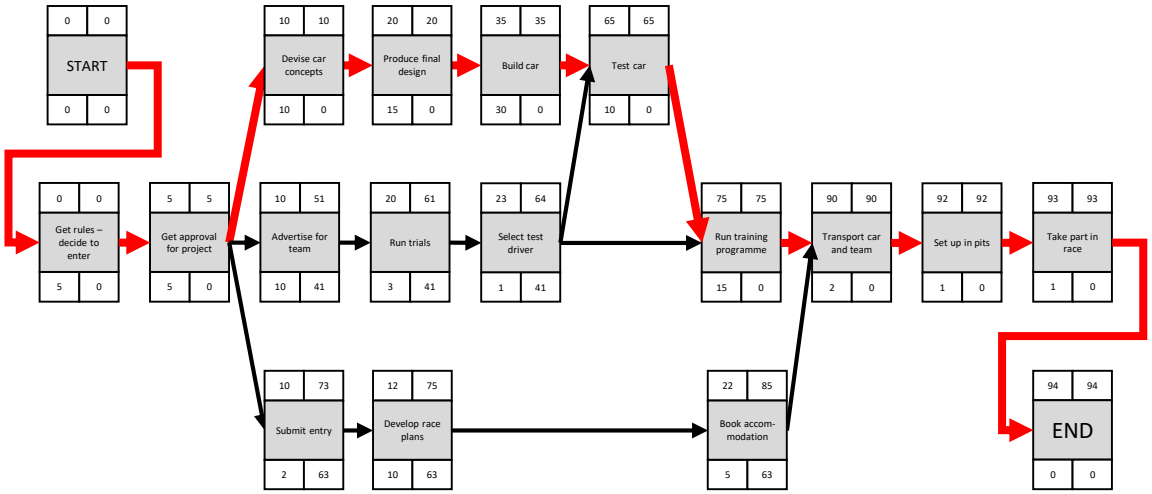
The critical path



Any critical path must always originate at the START and finish at the END.

There can be more than one critical path.

The critical path can split and join up again.

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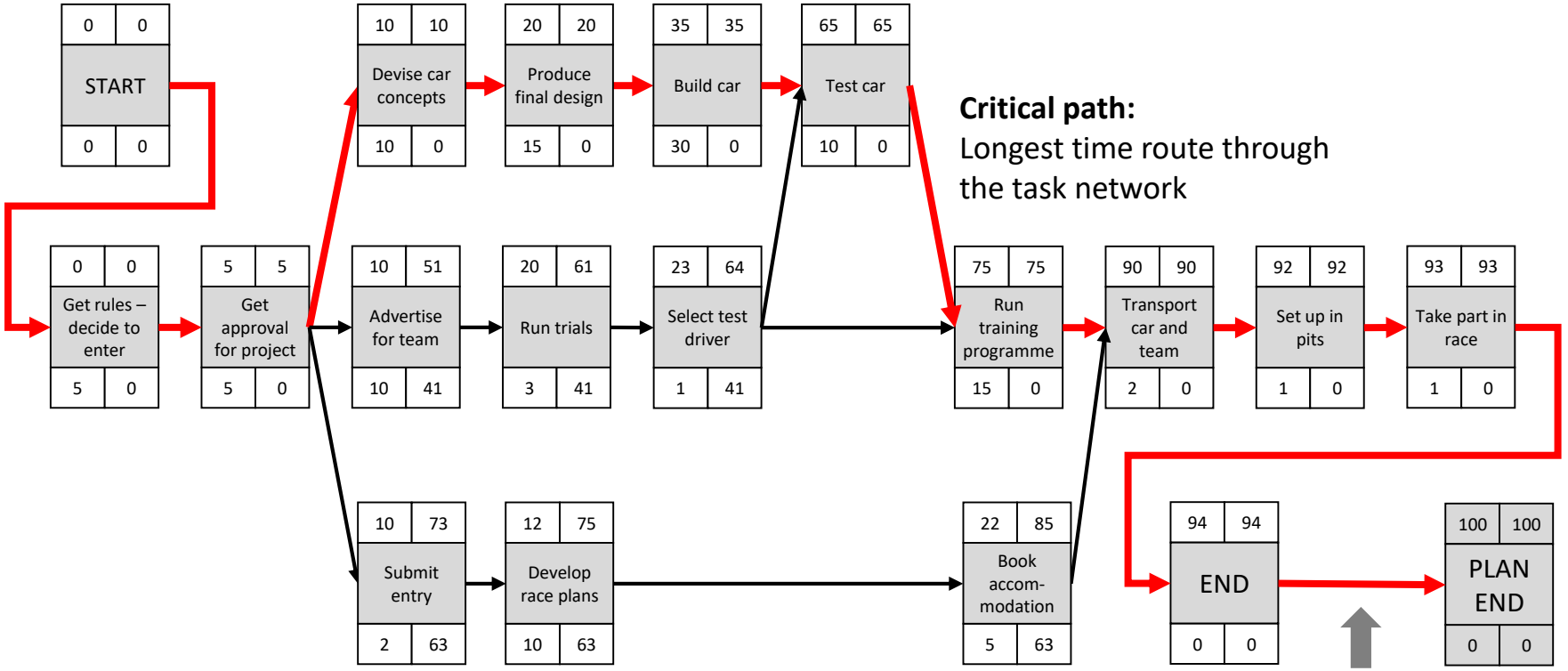
Adding some contingency



Durations are in days

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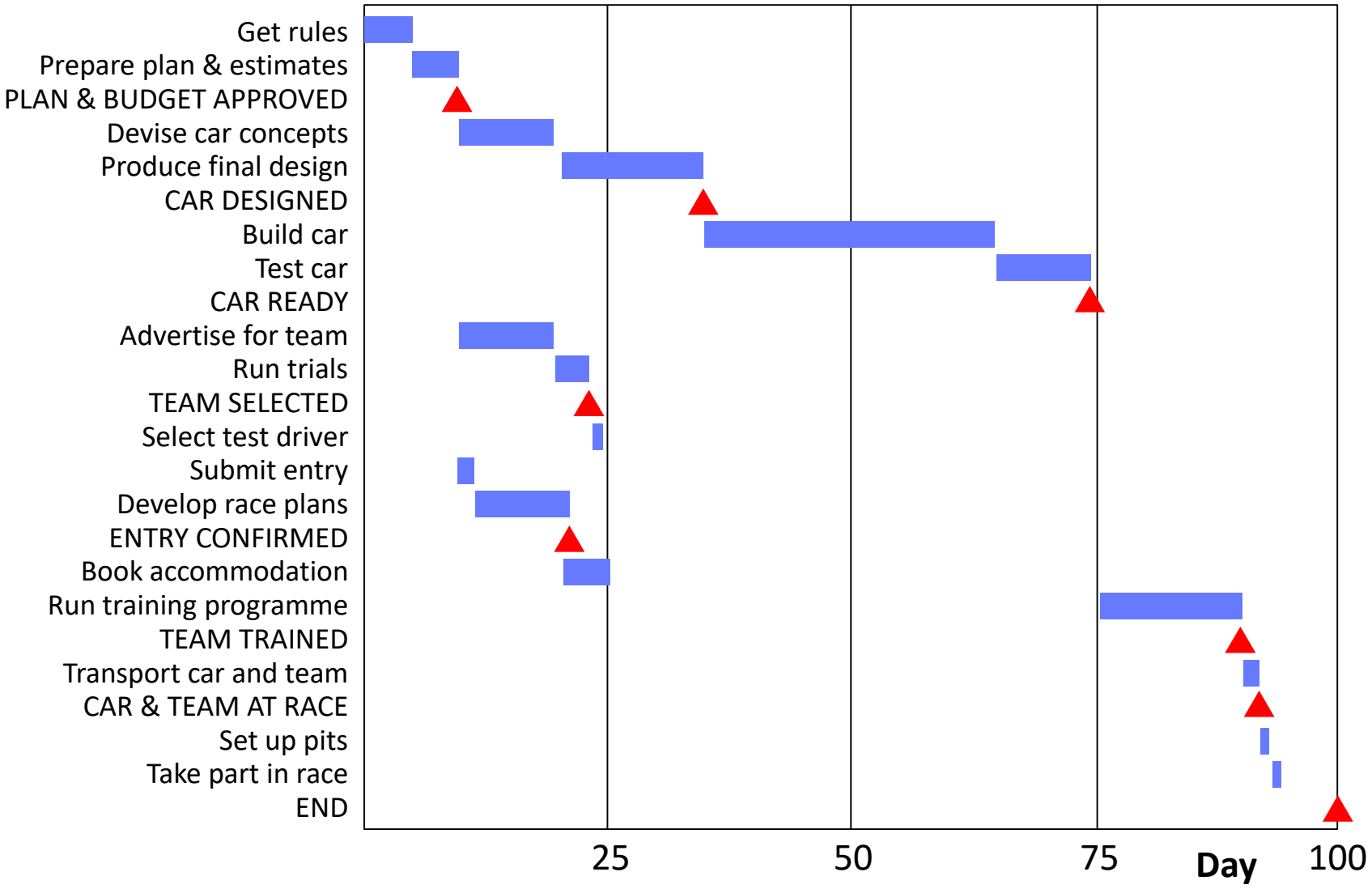
The Gantt chart



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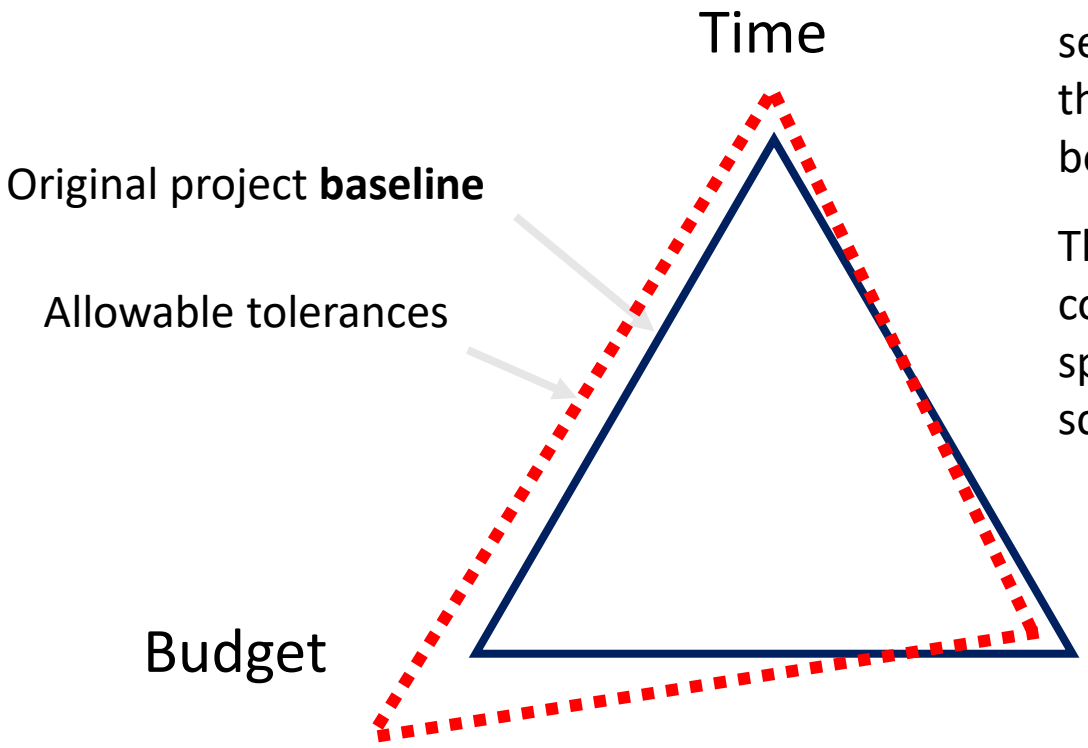
Setting the baseline



The project manager can go an agreed small percentage over time and/or budget without seeking authority from the sponsor or the project board.

They can also make small concessions on the specification and/or scope on the same basis.

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Estimating: core ideas

Getting reliable estimates is very difficult – progressing from rough to refined estimates is an iterative process.

A timescale and budget may be imposed by top management that the project team have to work within.

Techniques like PERT are used to arrive at the most reliable estimates.

Activity on node analysis of the task network can be used to predict the overall duration of the project, based on the estimates.

It can also find the critical path – the longest time path through the task network.

The Gantt chart is a way to graphically display the time relationships between the tasks.

Ultimately a baseline is set. This fixes the expected output quality, timescale and budget for the project and is the basis for managing the Production phase.

See Zavanak page *Planning*.

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