# PM Fundamentals and Scheduling
*Session 3*

# Question 1

PM methodologies

Which of the following statements best describes the primary difference between **Agile** and **Waterfall** project management methodologies?

**A)** Agile follows a sequential, step-by-step process, while Waterfall adapts to changes through iterative development.

**B)** Waterfall allows for continuous feedback and changes at any point during the project, while Agile requires strict upfront planning.

**C)** Agile emphasizes flexibility and iterative progress through collaboration, while Waterfall relies on a linear, structured approach where each phase must be completed before moving to the next.

**D)** Both Agile and Waterfall promote rapid, incremental delivery of products without detailed planning.

# Question 2

PM methodologies

A **software development company** is tasked with building a custom billing system for a large client. They spend several months gathering all requirements, design the entire system upfront, and proceed through development, testing, and deployment without revisiting earlier phases. Halfway through, the client requests a major change, but the team says it cannot be easily accommodated without delaying the project.
Which project management methodology is the team using, and why is it causing this issue?

**A)** Agile, because Agile discourages gathering full requirements at the start, leading to confusion later.
**B)** Waterfall, because it requires complete specification and linear execution, making mid-project changes difficult.
**C)** Agile, because iterative releases make it harder to enforce a strict project timeline.
**D)** Waterfall, because it promotes rapid prototyping and incremental development, confusing the client about final deliverables.

# Question 3

PM methodologies

A **clothing company** is starting a new project. They plan to implement a detailed planning and staggered development phases to ensure that there is minimal resource idling and to engage a cross-functional teams consisting of designers, marketers, and store managers in iterative cycles and sprints.

This is an example of which PM methodology:

A) Waterfall

B) Agile

C) Hybrid

# Question 3

## PM methodologies

You are managing a project to build a **mobile banking app**.
The client requires **a fixed, detailed upfront design** before any coding begins (due to regulatory approval).
However, once development starts, they want **frequent releases, customer feedback cycles, and iterative updates** during coding and testing.

**Question:**
What is the best project management approach for this situation?

**A)** Pure Waterfall, because the project needs frequent feedback after the design.
**B)** Pure Agile, because the project requires a rigid upfront design phase.
**C)** Hybrid, combining Waterfall for the design phase and Agile for the development and testing phases.
**D)** No formal project management approach is needed because the project will naturally adapt itself.

# Question 4

You are managing two different projects at the same time:

**Project 1:** Build a customized internal HR system for your company.
The users aren't exactly sure what they want yet, so they expect lots of changes based on early demos and feedback.

**Project 2:** Set up a new corporate data center.
There are strict government regulations, fixed requirements, and heavy penalties for missing deadlines.

**Question:**
Which project management approach fits **best** for each project?

**A)** Use Agile for Project 1 and Waterfall for Project 2.
**B)** Use Waterfall for both projects, because it ensures everything is documented upfront.
**C)** Use Agile for Project 2 and Hybrid for Project 1.
**D)** Use Hybrid for both projects to balance flexibility and control equally.

| Project Characteristics | Best Approach | Why |
| --- | --- | --- |
| Requirements are well-defined and unlikely to change | Waterfall | Sequential process works better; low risk. |
| Requirements are unclear or expected to change | Agile | Iterative development allows for flexibility. |
| A part of the project is stable, but another part needs flexibility | Hybrid | Combine Waterfall for stable parts, Agile for evolving parts. |
| Heavy regulatory or legal compliance is needed | Waterfall | Full upfront documentation and approvals are critical. |
| Customer feedback is essential during development | Agile | Frequent reviews and quick adjustments needed. |
| A mix of client demands: some fixed, some flexible | Hybrid | Tailored strategy for different parts. |

# Question 5

Triple Contraint model

In project management, the Triple Constraint model refers to the relationship between which three key project elements?

**A)** Scope, Cost, Time
**B)** Quality, Communication, Risk
**C)** Resources, Stakeholders, Budget
**D)** Planning, Execution, Monitoring

# Question 6

Triple Contraint model

A project manager is told to accelerate the delivery of a software product by two months without changing the project's original budget. According to the Triple Constraint model, which of the following is the MOST likely consequence if no additional resources are added?

**A)** Scope will likely need to be reduced to meet the new deadline.
**B)** The project's quality will automatically improve because of increased focus.
**C)** The project cost will increase as the schedule shortens.
**D)** Stakeholder engagement will decrease, causing scope creep.
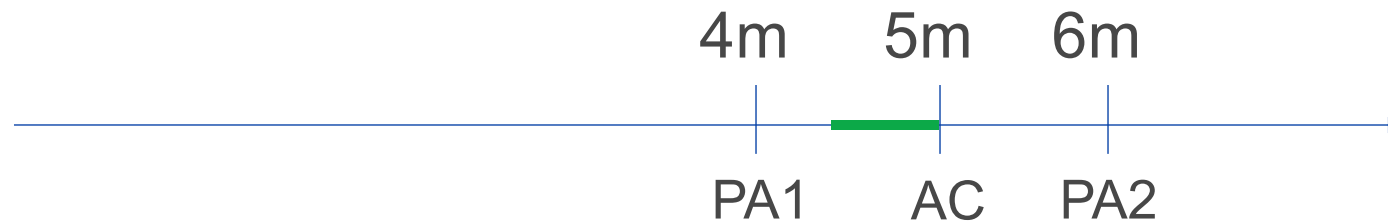
# Question 7

Project Success and Failure

A software development project has been completed in 6 months – 1 month ahead of the commitment and contractual obligations with the customer. The company's management has set an objective to complete it in 4 months but this was never considered reasonable.

How should the project be considered ?

**A)** A success

**B)** A failure

**Failure**: when the final results are not what were expected, <u>even though</u> the original **expectations** may or may not have been reasonable

$$4m \qquad 5m \qquad 6m$$

PA1 $\qquad$ AC $\qquad$ PA2

- AC = actual accomplishment
- PA = planned accomplishment
- Perceived failure
  - PA1-AC = 4-5 = -1 < 0 → failure
  - PA2-AC = 6-5 = 1 > 0 → success
- A = achievable .. 4.5-5m
- AF = actual failure = A – AC = from -0.5 to 0

# Question 8

Lesson Learned

During a **software implementation project**, the project manager wants to ensure that lessons learned are documented effectively. She schedules a session immediately after project handoff to the client to review successes, challenges, and improvement opportunities.
At what point in the project lifecycle should lessons learned typically be conducted?

**A)** During project initiation, to anticipate risks early.
**B)** Throughout every phase, especially during planning, to prevent mistakes.
**C)** At the project closure phase, to reflect on overall performance and document insights.
**D)** During execution, after each sprint or deliverable, to immediately address issues.

# Question 9

## Business case

During a project to deploy **a new customer support system**, the project team assumed that all employees had access to high-speed internet at home for remote training sessions. Midway through training, they discovered that many employees had unreliable connections, delaying progress.

What key project management principle did the team overlook, and why is it important?

**A)** They failed to manage project scope, which caused the team to miss critical training objectives.
**B)** They failed to validate assumptions, which led to unexpected risks and project delays.
**C)** They failed to perform a proper stakeholder analysis, which made communication ineffective.
**D)** They failed to prioritize risks, which caused unnecessary budget increases.

# Question 10

PM assignment

Your company starts a new IT project with a customer. A number of people have been mobilized to support the project including sofware engineers, security specialists, database administrators and UI designers. The management asks you if we can manage the project without a PM to reduce cost.

Is this a good idea ? Is there any other information you would need to take a decision ?

Cost of Project Management

$

Additional Profits from Better Project Management

Pegged

?

Time
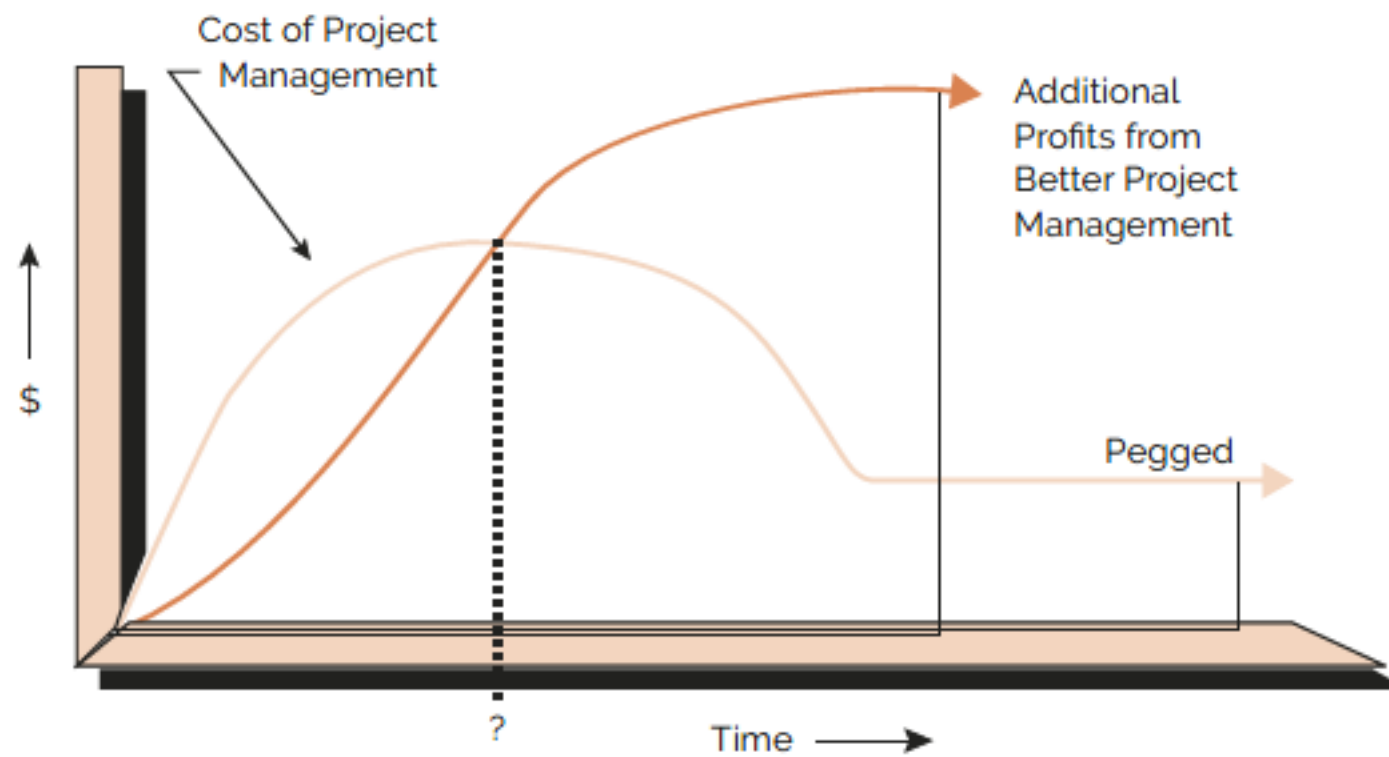
# Question 11

Project Sponsor

In a project management context, which of the following best describes the primary role of the **Project Sponsor**?

**A)** The Project Sponsor manages the daily tasks and supervises the project team directly.
**B)** The Project Sponsor provides strategic direction, secures funding, and supports the project by removing major organizational obstacles.
**C)** The Project Sponsor conducts quality assurance testing to ensure deliverables meet standards.
**D)** The Project Sponsor writes the detailed technical specifications for project deliverables.

# Question 12

Project and non-project driven organizations

A **construction company** completes custom building projects for different clients, moving teams from one project to another. Meanwhile, a car manufacturing company operates year-round, producing vehicles through a continuous, repetitive process.
Which statement best describes the difference between these two organizations?

**A)** Both are non-project-driven organizations because they produce physical products.
**B)** The construction company is project-driven because its work is temporary and client-specific, while the car manufacturing company is non-project-driven because its operations are ongoing and repetitive.
**C)** The construction company is non-project-driven because construction is part of normal operations, while the car manufacturer is project-driven due to product delivery timelines.
**D)** Both are project-driven because they involve teams working toward deliverables.

# Question 13

PMO

What is the primary role of a **Project Management Office (PMO)** within an organization?

**A)** To manage only the organization's financial accounting and payroll functions.
**B)** To directly control all projects by acting as the sole project manager.
**C)** To standardize project management practices, provide governance, and support project teams across the organization.
**D)** To approve all vendor contracts and negotiate supplier terms without project team involvement.

# Question 14

## RACI

You are managing a project to implement a new customer relationship management (CRM) system.

The key activities in the project include

- Gather Requirements
- Design the System
- Develop and Test the System
- Train End Users
- Launch the System

You have the following stakeholders involved:

- Project Manager (PM)
- Business Analyst (BA)
- Technical Lead (TL)
- Training Manager (TM)
- Department Heads (DH)
- Executive Sponsor (ES)

**Fill in the RACI matrix assigning each role**

- **R = Responsible**: The person(s) doing the work.
- **A = Accountable**: The person ultimately answerable for the correct completion of the task. (Only one A per activity!)
- **C = Consulted**: Those who provide input.
- **I = Informed**: Those kept updated on progress or decisions.

| Activity | PM | BA | TL | TM | DH | ES |
|---|---|---|---|---|---|---|
| Gather Requirements | | | | | | |
| Design the System | | | | | | |
| Develop and Test the System | | | | | | |
| Train End Users | | | | | | |
| Launch the System | | | | | | |

| Activity | PM | BA | TL | TM | DH | ES |
|---|---|---|---|---|---|---|
| Gather Requirements | A | R | C | I | C | I |
| Design the System | A | C | R | I | C | I |
| Develop and Test the System | A | C | R | I | I | I |
| Train End Users | I | C | I | A/R | C | I |
| Launch the System | A | I | R | C | I | C |

# Question 15

Stakeholder Management

Midway through a **software development project**, a key stakeholder who was initially supportive begins raising new concerns about the project's direction. His influence is high, and his dissatisfaction could impact the project's success.
As the Project Manager, what is the **best** course of action?

**A)** Ignore the stakeholder's concerns to avoid delaying the project timeline.
**B)** Escalate the issue immediately to the project sponsor without speaking to the stakeholder.
**C)** Engage directly with the stakeholder to understand their concerns, reassess their expectations, and update the stakeholder management plan if necessary.
**D)** Remove the stakeholder from project communications to limit their influence.
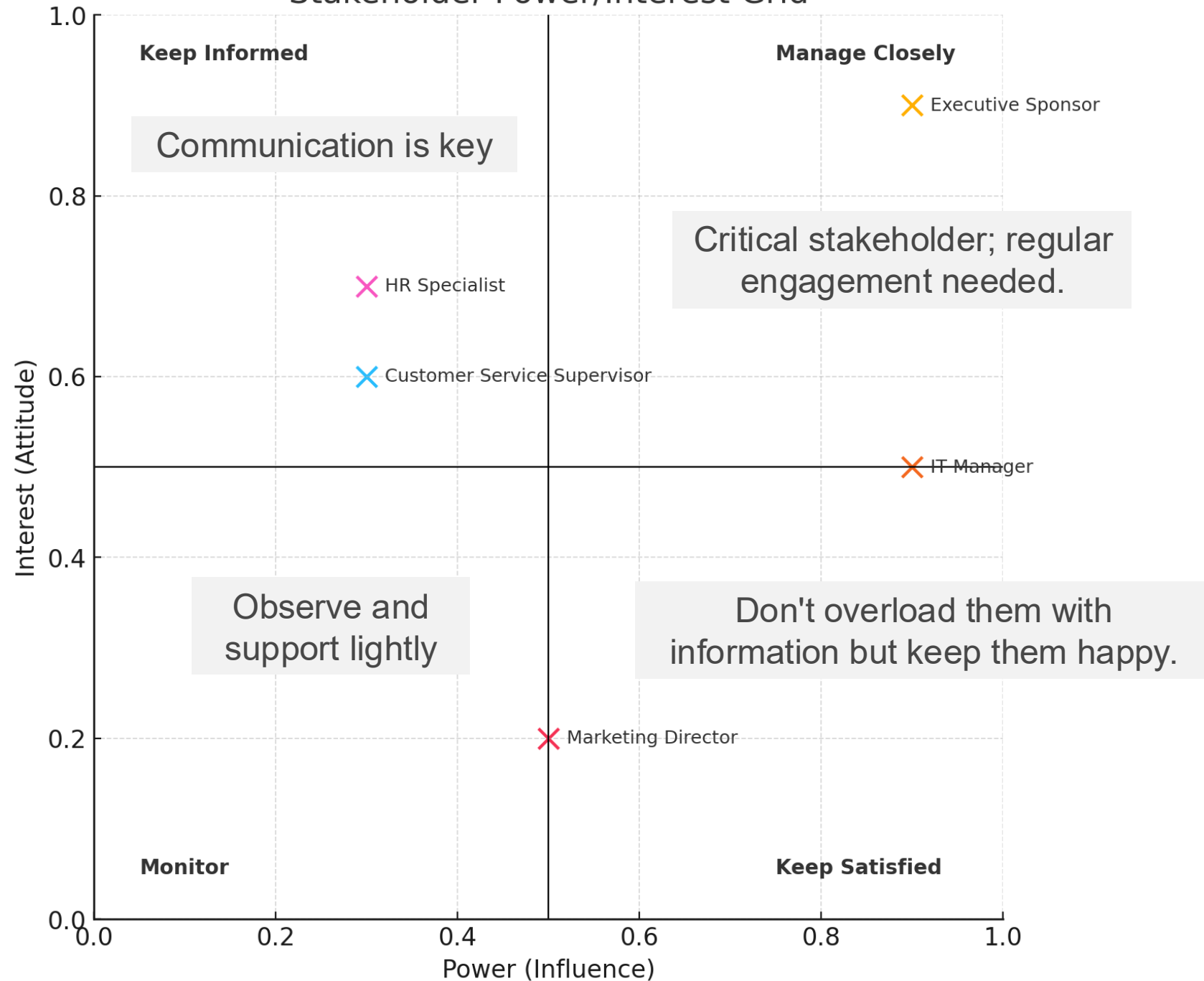
# Question 16

Stakeholder Management

You are managing a project to implement a new internal communication platform at your company. You have identified the following key stakeholders:

- **Executive Sponsor**: Very supportive, high influence.

- **IT Manager**: Neutral, high influence (controls technical resources).

- **Marketing Director**: Resistant to change, moderate influence.

- **HR Specialist**: Supportive, low influence (provides employee training materials).

- **Customer Service Supervisor**: Interested but low influence

*Create a stakeholder matrix (Power/Interest)*

# Stakeholder Power/Interest Grid



**Keep Informed**

Communication is key

**Manage Closely**

Critical stakeholder; regular engagement needed.

Observe and support lightly

Don't overload them with information but keep them happy.

**Monitor**

**Keep Satisfied**

✕ Executive Sponsor
✕ HR Specialist
✕ Customer Service Supervisor
✕ IT Manager
✕ Marketing Director

Interest (Attitude)

Power (Influence)

The **Marketing Director** is resisting adoption, claiming that the new platform will complicate communication workflows.

**What should you do first?**

**A)** Minimize contact with the Marketing Director to avoid conflict.
**B)** Engage with the Marketing Director to understand specific concerns and explore adjustments or clarifications.
**C)** Ask the Executive Sponsor to force the Marketing Director to comply.
**D)** Ignore the feedback since their influence is only moderate.

The **IT Manager** has been neutral so far but now indicates technical resource shortages could delay the project.

**What is the best action to take?**

**A)** Escalate immediately to the Executive Sponsor without discussing with the IT Manager.
**B)** Proactively meet with the IT Manager to renegotiate resource allocation or adjust the project plan.
**C)** Proceed without IT resources and hope it won't impact critical phases.
**D)** Replace the IT Manager with an external consultant without internal discussion.

The **Customer Service Supervisor** is enthusiastic about the project but is not part of key meetings.

**What is the best stakeholder management strategy here?**

**A)** Consult them regularly to involve them in major decisions.
**B)** Keep them informed through updates but do not involve them heavily in decision-making.
**C)** Assign them a leadership role even if they have low influence.
**D)** Ignore them since they have little impact on project success.

# Question 17

WBS

In project management, what is the primary purpose of creating a **Work Breakdown Structure (WBS)**?

**A)** To list all project risks and assign a mitigation strategy.
**B)** To define the project scope by breaking down deliverables into smaller, manageable components.
**C)** To allocate project budgets to different departments.
**D)** To create a sequence of project tasks for developing the project schedule.

# Question 18

WBS

You are managing a project to organize a **major company conference**. You and your team are creating a Work Breakdown Structure (WBS) to define the full scope of the project. You divide the work into major deliverables like "Venue Booking," "Speaker Management," "Marketing and Promotion," and "Logistics." Under "Speaker Management," you list tasks such as "Invite Speakers," "Confirm Participation," and "Prepare Speaker Bios."

**Question:**
Based on this scenario, which statement best describes how the WBS is being used?

**A)** The WBS is organizing the work into major deliverables and smaller, manageable components to fully define the project scope.
**B)** The WBS is creating a detailed project schedule with task durations and deadlines.
**C)** The WBS is assigning resources and setting project budgets for each task.
**D)** The WBS is documenting stakeholder requirements for each phase of the project.

# Question 19

WBS

Here's your high-level goal: Deliver a fully functional, live company website.

Break it down into major deliverables first, then into smaller components.

Here's a starter template
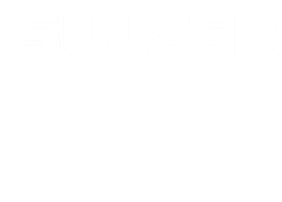
**1. Website Planning**

•1.1 Gather Requirements

•1.2 Define Scope and Objectives

•1.3 Create Project Plan

**2. Website Design**

•2.1 Create Wireframes and Mockups

•2.2 Approve Visual Design

**3. Website Development**

•3.1 Set Up Hosting and Domain

•3.2 Develop Front-End Pages

•3.3 Develop Back-End Functionality

•3.4 Content Integration (text, images, videos)

**4. Testing**

•4.1 Functional Testing

•4.2 Usability Testing

•4.3 Bug Fixes

**5. Website Launch**

•5.1 Final Approval

•5.2 Go-Live

•5.3 Post-Launch Monitoring

**→ *Can you think of one additional sub-task under each major deliverable that might be missing?***

# 1. Website Planning

- 1.1 Gather Requirements
- 1.2 Define Scope and Objectives
- 1.3 Create Project Plan
- **1.4 Identify Key Stakeholders**

# 2. Website Design

- 2.1 Create Wireframes and Mockups
- 2.2 Approve Visual Design
- **2.3 Design Mobile-Responsive Layout**

# 3. Website Development

- 3.1 Set Up Hosting and Domain
- 3.2 Develop Front-End Pages
- 3.3 Develop Back-End Functionality
- 3.4 Content Integration (text, images, videos)
- **3.5 Implement SEO Basics (meta tags, keywords)**

# 4. Testing

- 4.1 Functional Testing
- 4.2 Usability Testing
- 4.3 Bug Fixes
- **4.4 Performance Testing (load speed, responsiveness)**

# 5. Website Launch

- 5.1 Final Approval
- 5.2 Go-Live
- 5.3 Post-Launch Monitoring
- **5.4 Backup and Recovery Setup**

# Question 20

Lead/lag

You are managing a website development project.
Normally, "Develop Front-End" must be **completed** before "Test Front-End" can **start**.
However, to speed up delivery, the project team decides that **testing can begin 2 days before development fully finishes**.

How would you correctly represent this relationship between "Develop Front-End" and "Test Front-End" in your project schedule?

**A)** Finish-to-Start (FS) with a +2 day lag.
**B)** Start-to-Start (SS) with a -2 day lead.
**C)** Finish-to-Start (FS) with a -2 day lead.
**D)** Start-to-Finish (SF) with a +2 day lag.

Develop front end

Test front-end

FS

Develop front end

Test front-end

FS-2
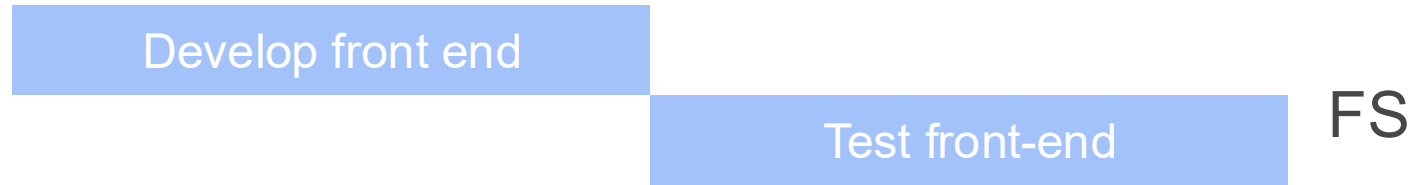
# Question 21

Lead/lag

You are managing a project to install a **new IT infrastructure**. Part of the work involves:

•**Task A:** Finish installing all network cables. (Duration: 3 days)

•**Task B:** Install network switches and routers.

**Dependency:**

•Task B **cannot start immediately** after Task A is finished.

•You need to **wait 2 additional days** after cable installation (Task A) to allow for inspection and certification

**Question:**

How would you model the relationship between Task A and Task B in a project schedule?

**A)** Task B has a Finish-to-Start dependency with a **2-day lag** after Task A completes.
**B)** Task B has a Finish-to-Start dependency with a **2-day lead** before Task A finishes.
**C)** Task B starts immediately after Task A finishes, with no lag or lead.
**D)** Task B and Task A are scheduled to happen in parallel with a Start-to-Start dependency.

- If Task A finishes on **Monday**, when can Task B **start** according to the schedule?

- How can we avoid the use of a lag ?

# Question 22

You are scheduling "Paint Walls" after "Install Drywall."
However, you want painting to begin **1 day before drywall installation is fully complete**.

**What is this an example of?**

**A)** Lead
**B)** Lag

# Question 23

## Schedule quality metrics

### How can the following network be improved ?

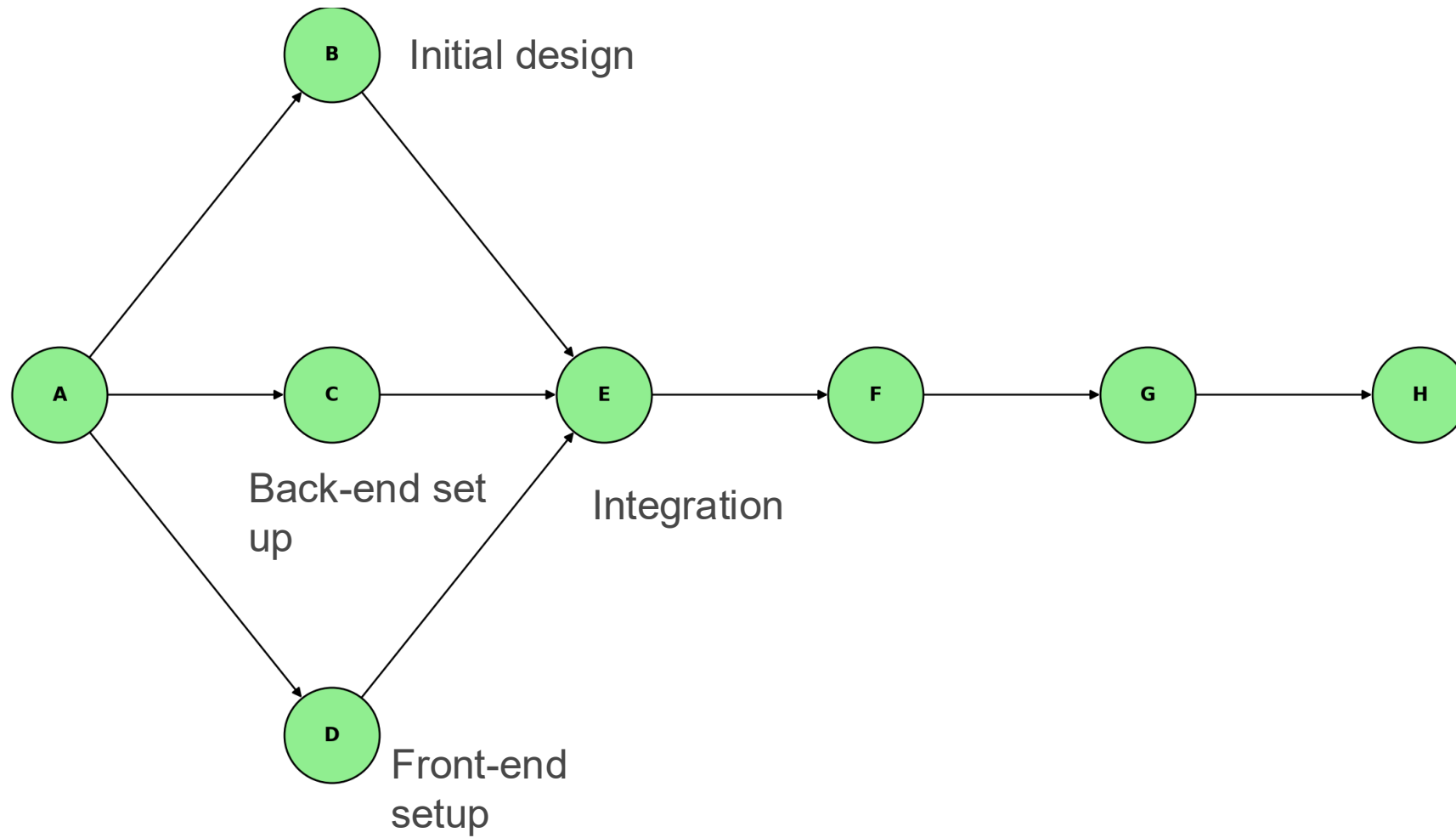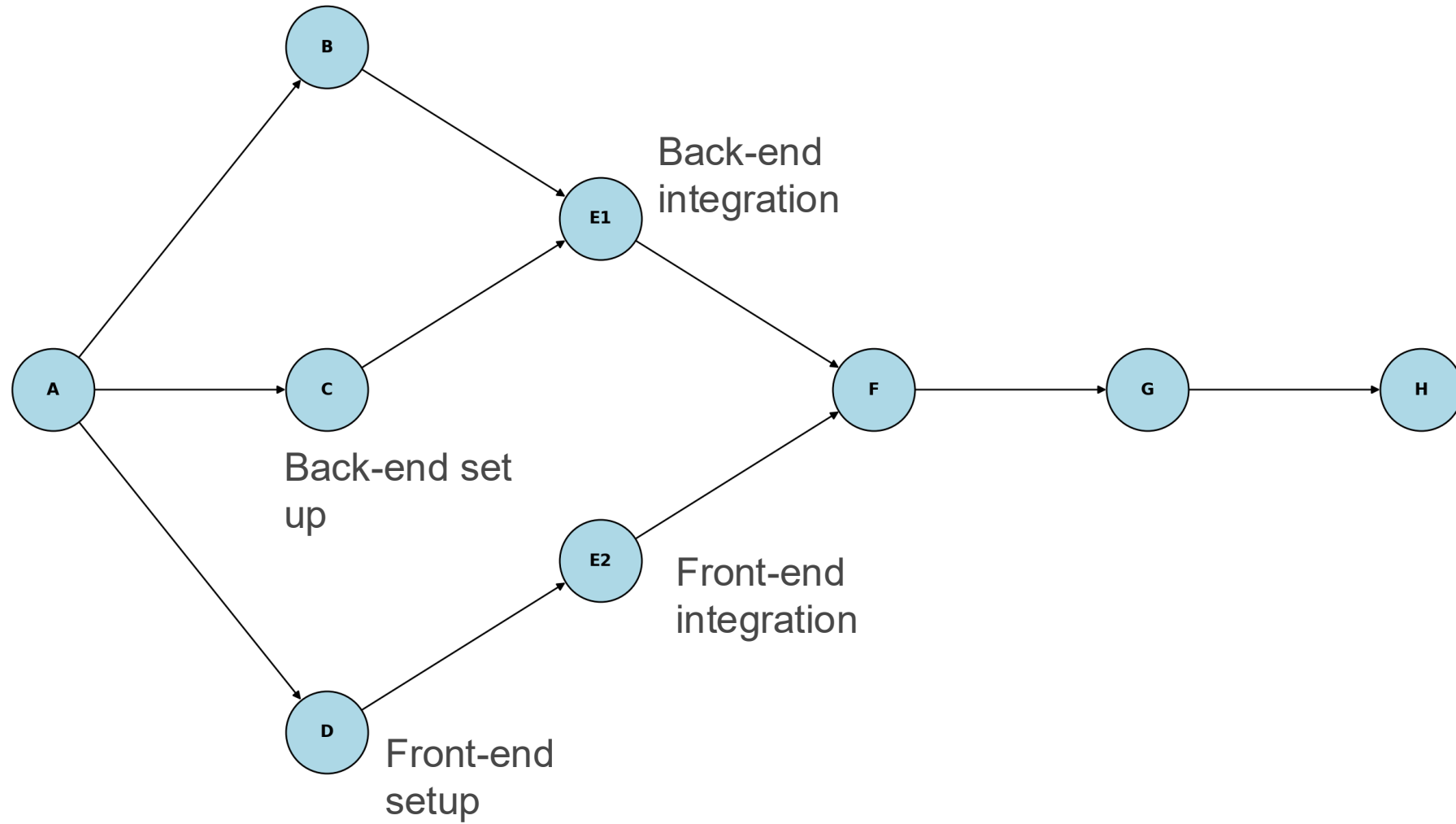| Task | Description | Duration (Days) | Predecessor(s) | Constraint |
|------|-------------|-----------------|----------------|------------|
| A | Requirements Gathering | 2 | — | Must Start On May 1, 2025 |
| B | Design Website | 3 | | None |
| C | Develop Website | 5 | B | Start No Earlier Than May 7, 2025 |
| D | Test Website | 2 | | None |
| E | Deploy Website | 1 | D | Must Finish On May 10, 2025 |

# Question 24

## Scheduling Metrics

You are managing a project with the following tasks and dependencies.

→ **Draw the network and evaluate how can the network be improved**

| Task | Description | Start | Finish | Comments |
|------|-------------|-------|--------|----------|
| A | Requirements Gathering | May 1, 2025 | May 3, 2025 | Starts first |
| B | Initial Design | May 4, 2025 | May 6, 2025 | Depends on A |
| C | Backend Setup | May 4, 2025 | May 7, 2025 | Also depends on A |
| D | Frontend Setup | May 4, 2025 | May 7, 2025 | Also depends on A |
| E | Integration | May 8, 2025 | May 10, 2025 | Depends on B, C, **and** D (too many dependencies!) |
| F | Testing | May 11, 2025 | May 14, 2025 | Depends on E |
| G | Final Review | May 15, 2025 | May 16, 2025 | Depends on F |
| H | Deployment | May 17, 2025 | May 18, 2025 | Depends on G |

B — Initial design

A → C — Back-end set up

D — Front-end setup

E — Integration

F

G

H

Back-end integration

Back-end set up

Front-end integration

Front-end setup

Typical schedule quality metrics:

- Missing logic
- Logic density (2 < x < 4)
- Hard contraints (e.g. predetermined start or finish dates)
- Negative float
- Number of lags
- Number of leads
- Merge hotspots

# Question 25

You are managing a project with the following tasks and dependencies. Draw the network diagram. Calculate

- The total project duration
- The critical path
- Identify any non-critical activities
- What is activity C float ?

| Task | Description | Duration (Days) | Immediate Predecessor(s) |
|------|-------------|-----------------|--------------------------|
| A | Start Project | 2 | - |
| B | Develop Requirements | 4 | A |
| C | Design Solution | 3 | A |
| D | Build Solution | 5 | B, C |
| E | Test Solution | 2 | D |
| F | Deploy Solution | 1 | E |

Path1: A → B → D → E → F = 14 d
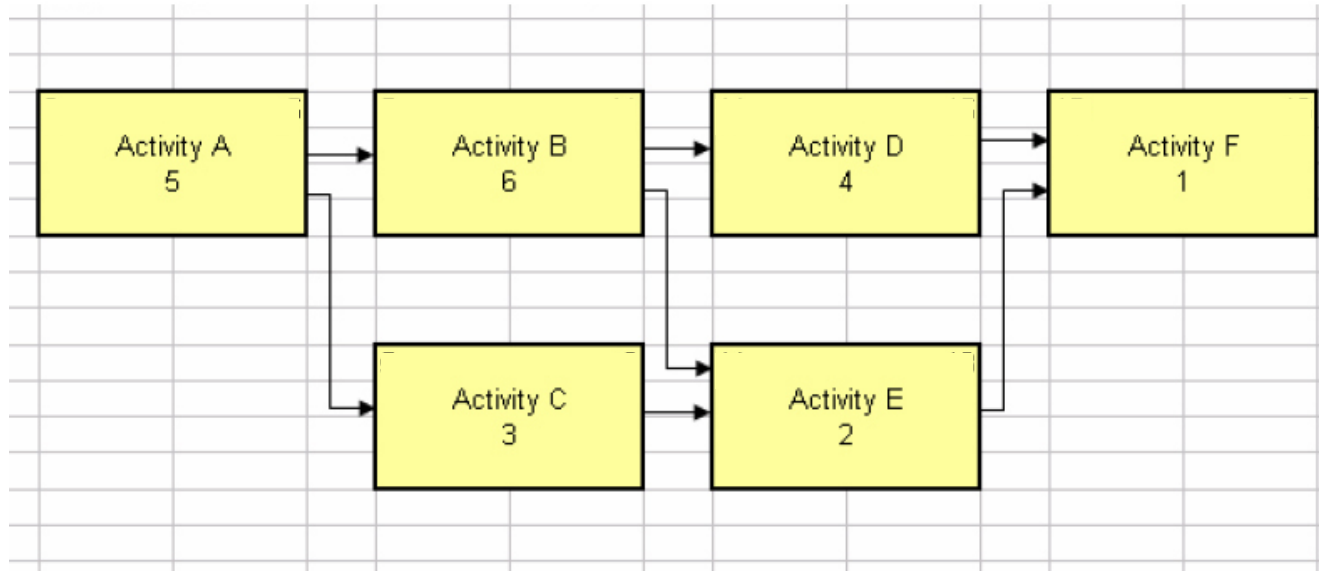Path 2: A → C → D → E → F = 13 d
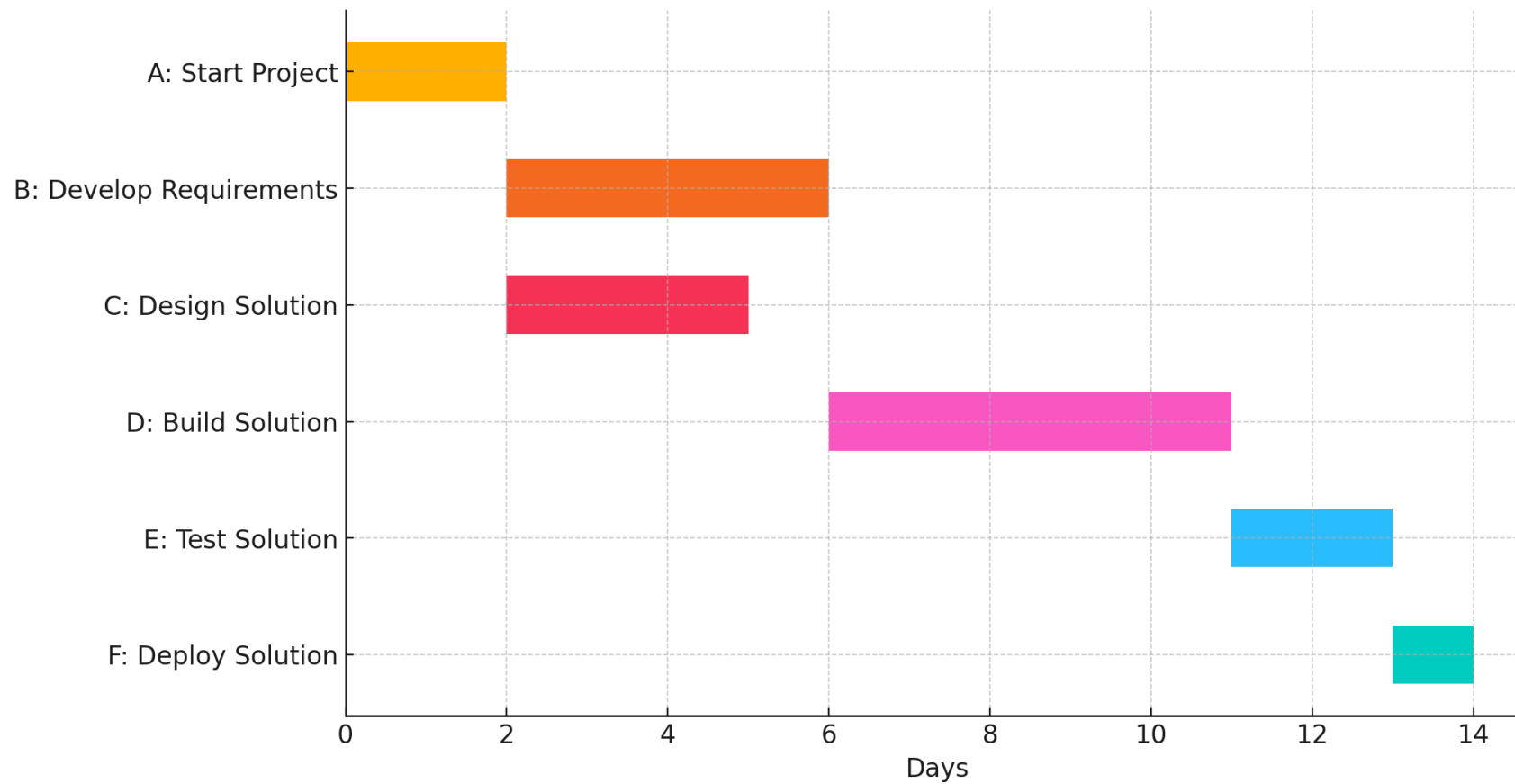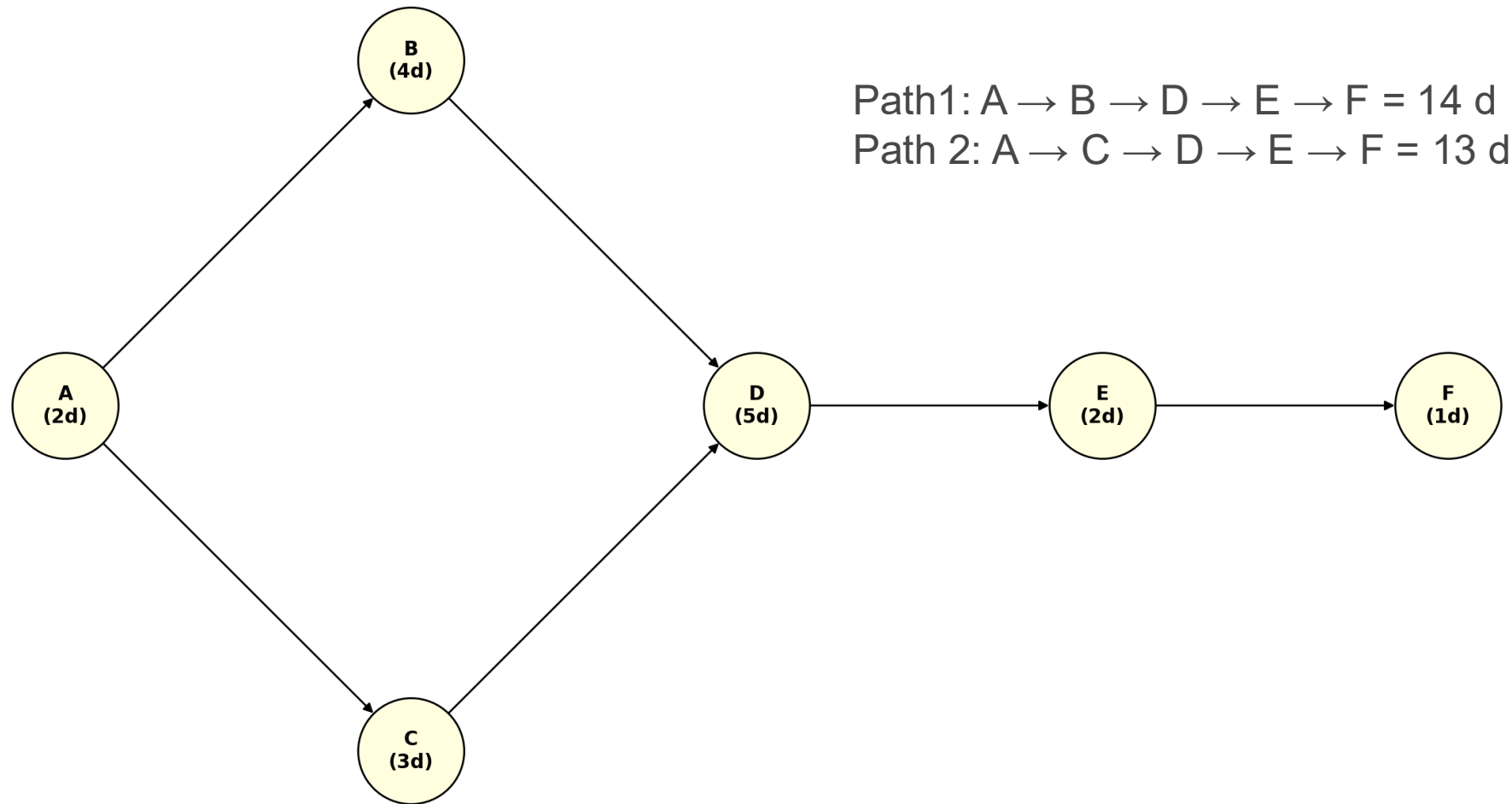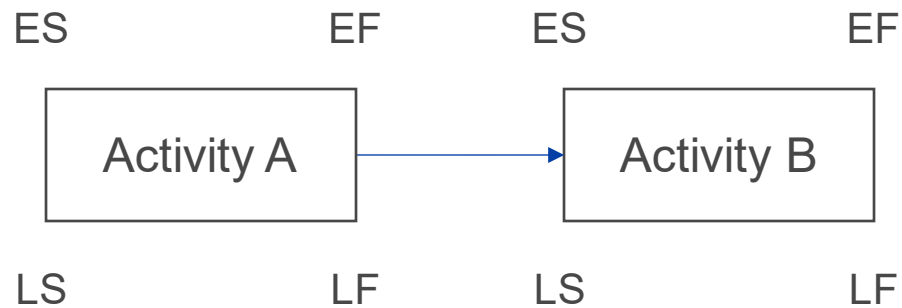
# Question 26

Critical path

Calculate the critical path for the following network

**Critical path method**

1. Calculate ES & EF for each activity
2. Calculate LS & LF for each activity
3. Calculate Total float (TF) for each activity
4. Determine Critical Path: activities with 0 total float

```
ES              EF      ES              EF
┌──────────────┐       ┌──────────────┐
│              │       │              │
│  Activity A  │──────▶│  Activity B  │
│              │       │              │
└──────────────┘       └──────────────┘
LS              LF      LS              LF
```

- **Early Start (ES)** = earliest date an activity can possibly begin,
- **Early finish (EF)** = earliest date an activity can possibly finish
  - EF=ES + activity duration
- **Late start (LS)** = latest time the activity can begin
  - LS=LF – activity duration
- **Late finish (LF)** = latest time the activity can finish

| | |
|---|---|
| | Activity A |
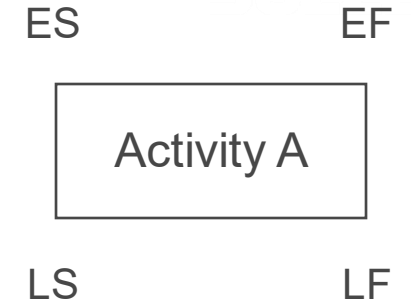
**Step 1**: Forward path, calculate EF and ES

- EF = ES + duration
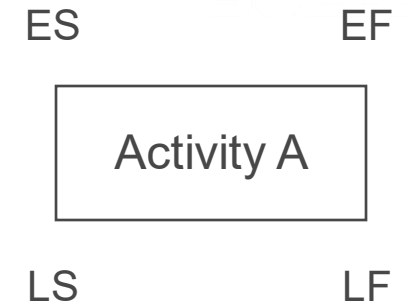- ES = maximum of EF value from immediate predecessors
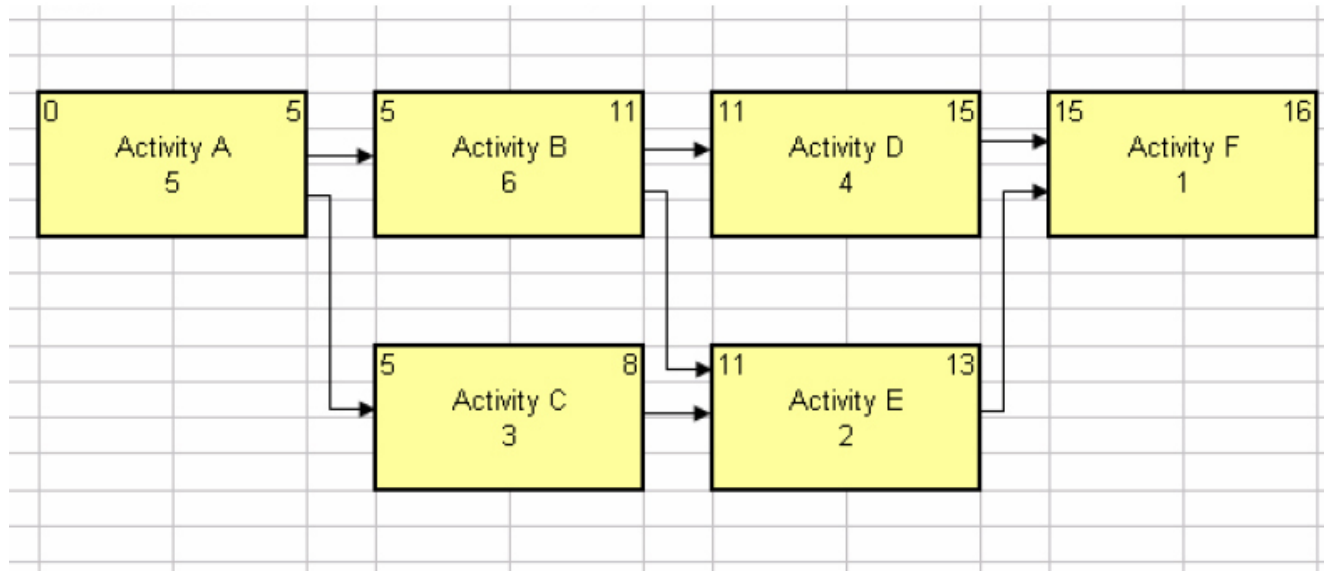


Activity A
- ES = 0 (first activity)
- EF = ES + dur = 0 + 5 = 5

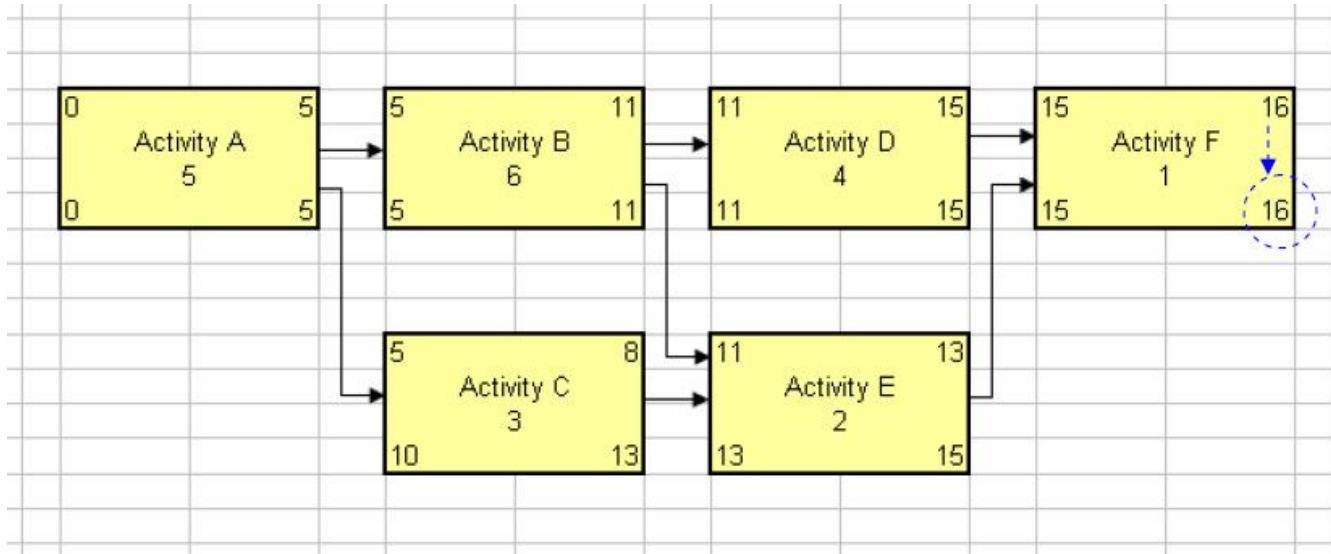Activity B
- ES = max (EFa)=EFa = 5
- EF = ES + dur = 5=6 = 11

Activity E
- ES = max (EFb, Efc) = max(11,8)=11
- EF = 11 + 2 = 13

ES                    EF

```
┌──────────────────┐
│                  │
│    Activity A    │
│                  │
└──────────────────┘
```

LS                    LF

## Step 2: Backward path, calculate LS and LF

- LF = min LS value from immediate successors
- LS = LF - duration



Activity F
- LF = EF = 16 (last activity)
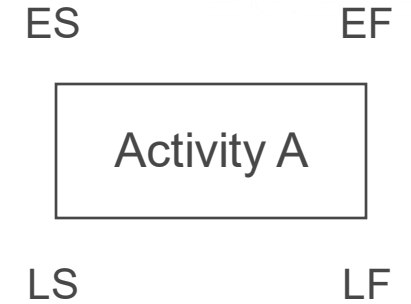- LS = LF – dur = 16-1 = 15

Activity D
- LF = min (LSf) = 15
- LS = LF – dur = 15-4 = 11

Activity B
- LF = min (LSd, LSe) = min (11,13) = 11
- LS = LF – dur = 11-6=5

Activity A

**Step 3**: Calculate Total Float (TF)
- Total float = TF = LF-EF or LS-ES
- TF = amount of time a task can be delayed without delaying the project

| 0 | 0 | 0 | 0 |

| 0 | Activity A 5 | 5 | 5 | Activity B 6 | 11 | 11 | Activity D 4 | 15 | 15 | Activity F 1 | 16 |
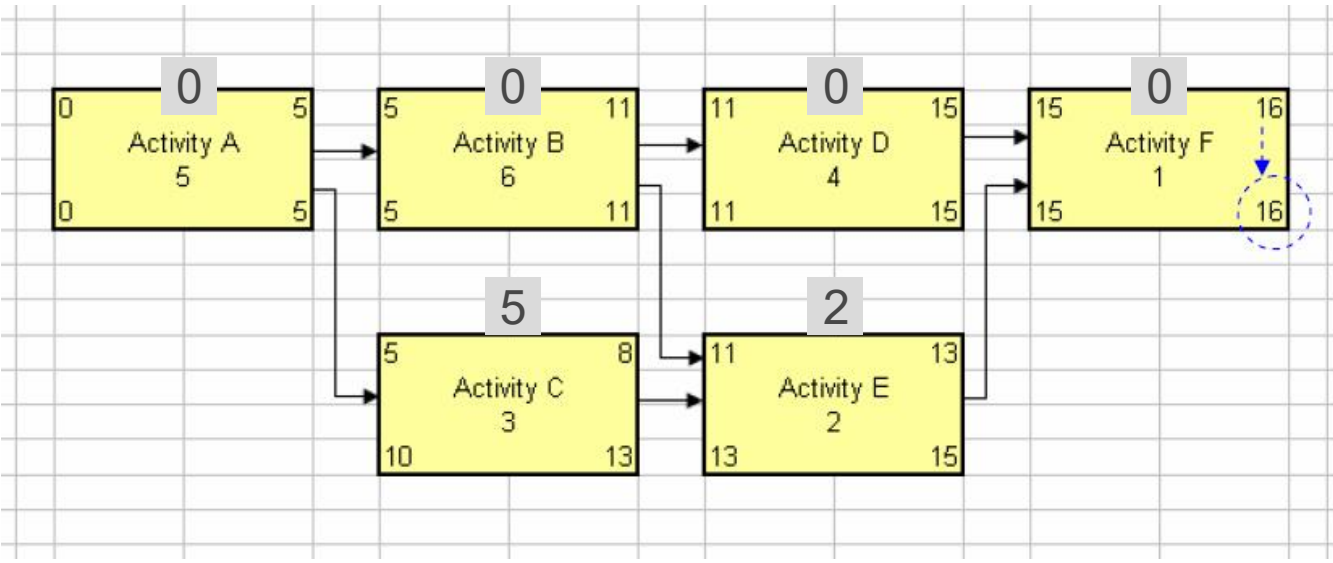
**Step 4**: critical path = A, B, D, F

| 5 | 2 |

| 5 | Activity C 3 | 8 | 11 | Activity E 2 | 13 |
| 10 | | 13 | 13 | | 15 |

# Question 27

Free float

You are managing a project with the following activities

1) Draw a simple network diagram based on the activities.

2) Calculate the Free Float for each activity.

3) Identify which activities have zero Free Float (critical activities)

| Activity | Duration (days) | Immediate Predecessor(s) |
|----------|-----------------|--------------------------|
| A | 3 | - |
| B | 5 | A |
| C | 2 | A |
| D | 4 | B, C |
| E | 3 | D |

**Free Float** is the amount of time an activity can be delayed without delaying the early start of its immediate successor(s).

**Free float** = ES of the earliest of its successor – EF = Min(ESsucc) - EF

| Activity | Duration | ES | EF |
| --- | --- | --- | --- |
| A | 3 | 0 | 3 |
| B | 5 | 3 | 8 |
| C | 2 | 3 | 5 |
| D | 4 | 8 | 12 |
| E | 3 | 12 | 15 |

Free float = ES of the earliest of its successor – EF = Min(ESsucc) - EF

**B**
**(5d)**
**ES:3 EF:8**

Successor = D
ES of D = 8
EF of B = 8
FF = 8 - 8 = **0**

Successor = E
ES of E = 12
EF of D = 12
FF = 12 - 12 = **0**

**A**
**(3d)**
**ES:0 EF:3**

**D**
**(4d)**
**ES:8 EF:12**

**E**
**(3d)**
**ES:12 EF:15**

No successor (end of project)
FF = 0

Successors = B and C
Earliest ES among successors = 3 (for both B and C)
EF of A = 3
FF = 3 - 3 = **0**

**C**
**(2d)**
**ES:3 EF:5**

Successor = D
ES of D = 8
EF of C = 5
FF = 8 - 5 = **3**
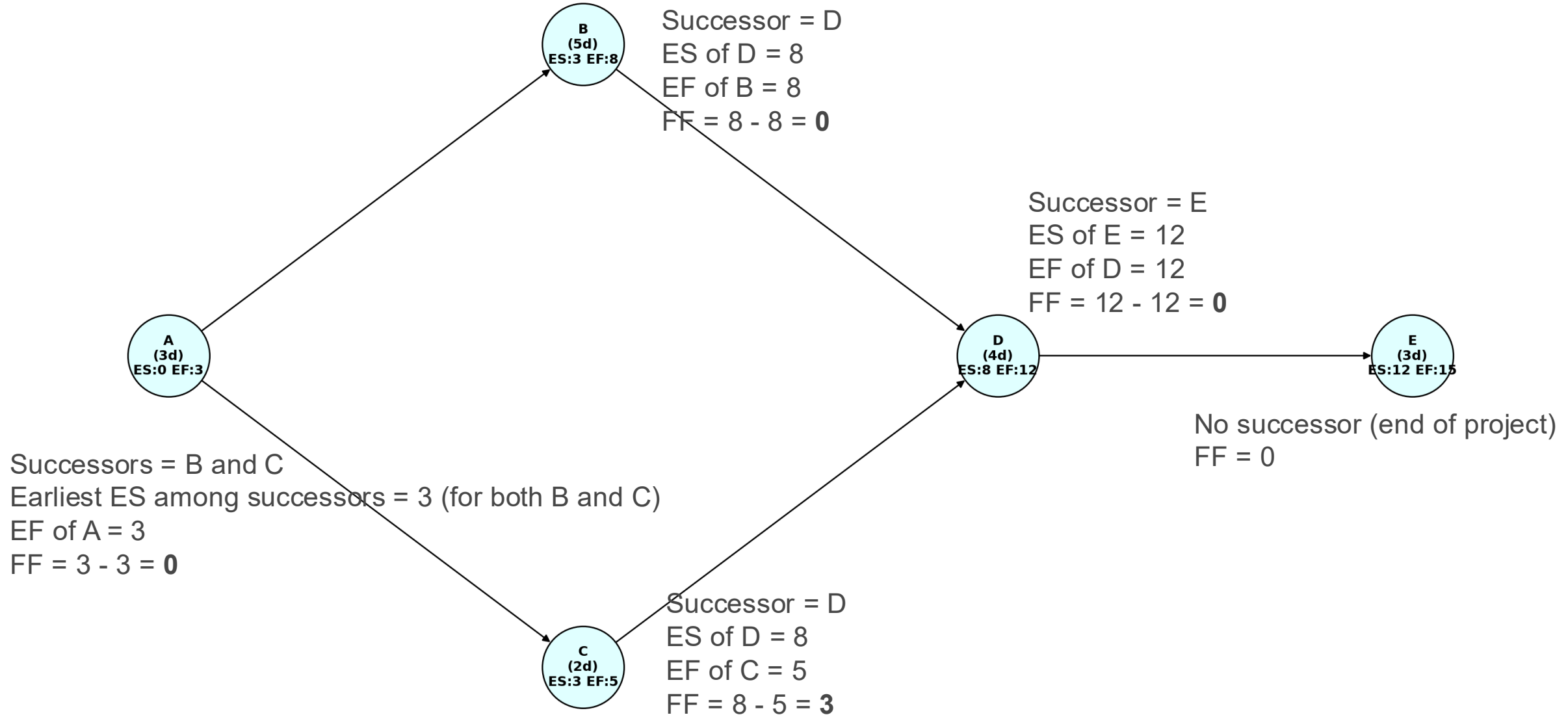
# Question 28

## Project Float

You are managing a project with the following activities. The customer has requested that the project must be completed within 18 days

**1)** Draw the simple network diagram based on the activities.
**2)** Calculate the **total project duration** based on the critical path.
**3)** Determine the **Project Float** (the amount of time the project can be delayed without missing the 18-day deadline).

| Activity | Duration (days) | Immediate Predecessor(s) |
| --- | --- | --- |
| A | 4 | - |
| B | 3 | A |
| C | 6 | A |
| D | 2 | B, C |
| E | 4 | D |
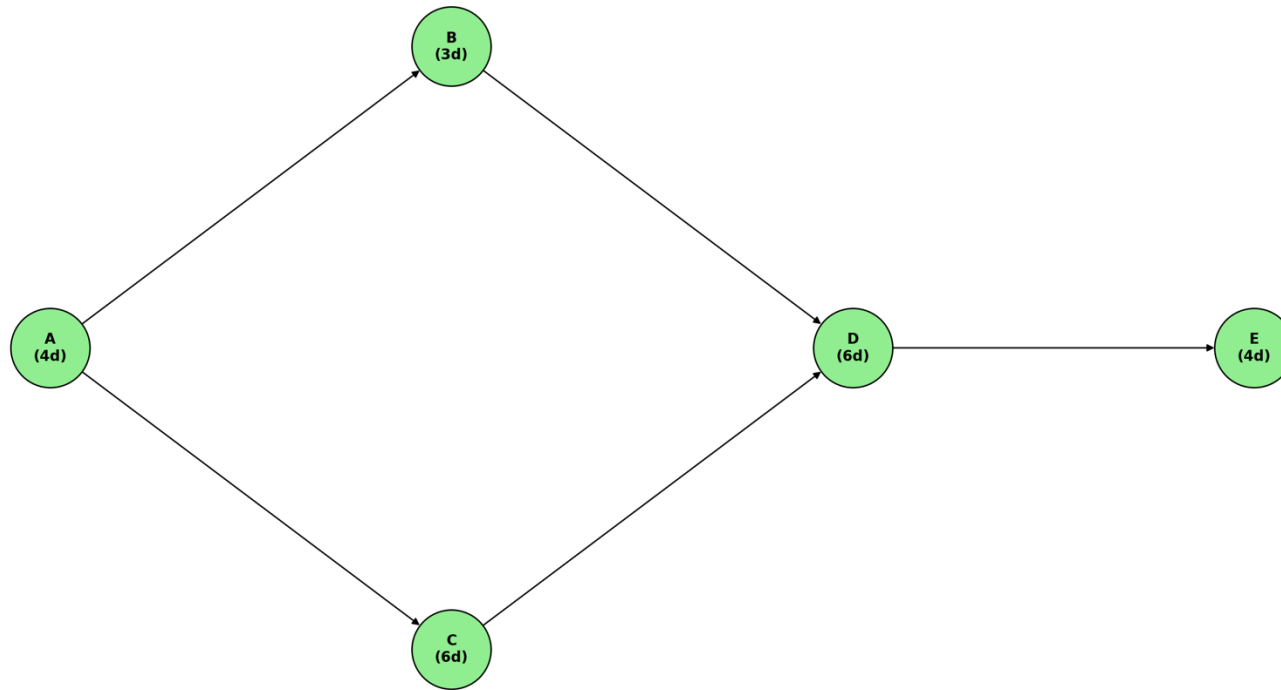
- Project duration = 20 days (A-C-D-E)
- Project Float = Imposed deadline – planned finish date
- Project Float = -2 days

# Question 29

You are managing the following network. You decide to focus solely on critical path activities only

→ *Is it a good idea ?*

| Activity | Duration (days) | Immediate Predecessor(s) |
|---|---|---|
| A | 2 | - |
| B | 4 | A |
| C | 5 | A |
| D | 3 | B |
| E | 6 | B |
| F | 2 | C |
| G | 4 | D, F |
| H | 2 | E |
| I | 1 | G, H |
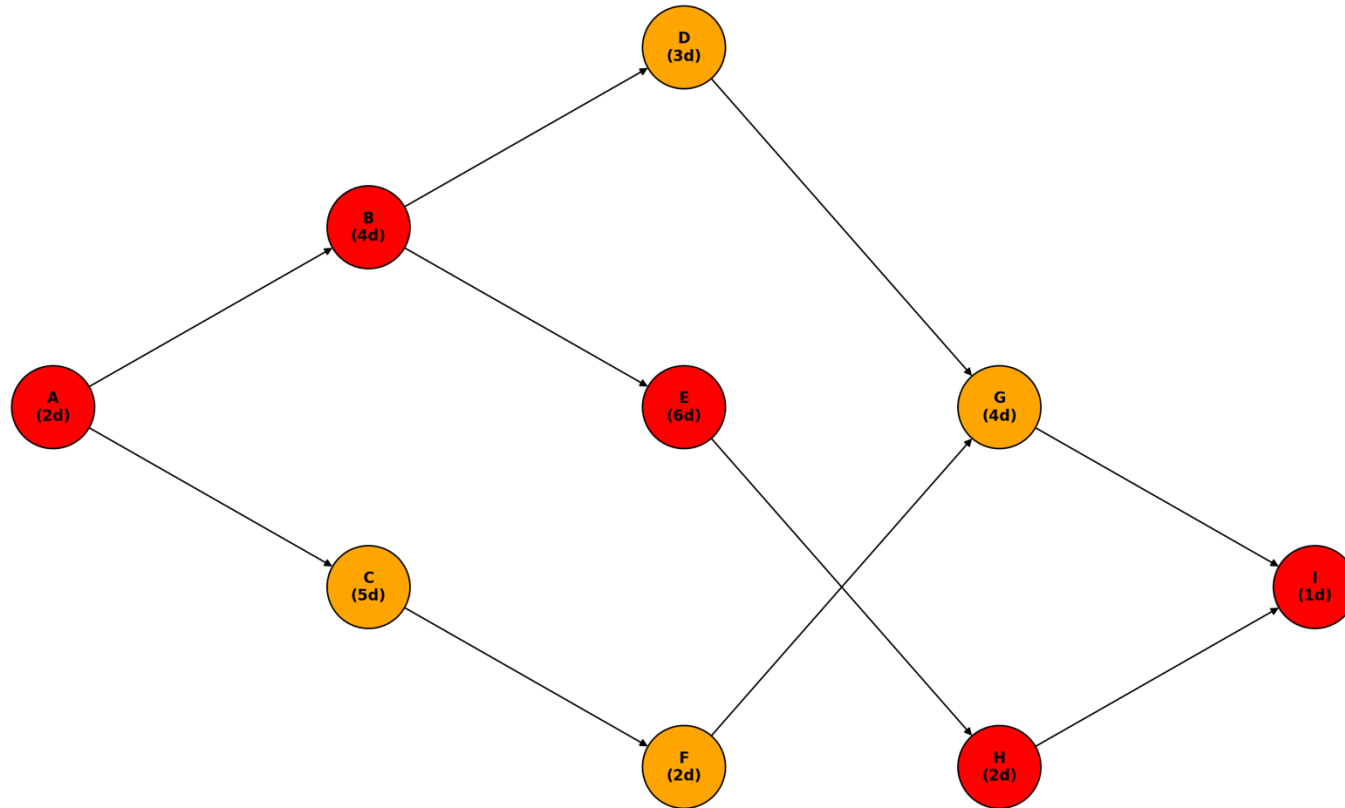
- **Path1**: A (2) → B (4) → D (3) → G (4) → I (1) = 2 + 4 + 3 + 4 + 1 = 14 days

- **Path2**: A (2) → B (4) → E (6) → H (2) → I (1) = 2 + 4 + 6 + 2 + 1 = 15 days

- **Path 3**: A (2) → C (5) → F (2) → G (4) → I (1) = 2 + 5 + 2 + 4 + 1 = 14 days

# Question 30

**Question:**

How can project managers use knowledge of the **Critical Path** to improve project success?

**A)** By assigning fewer resources to critical path activities since they have more flexibility.
**B)** By focusing monitoring and resource prioritization on critical path activities to avoid project delays.
**C)** By allowing critical path tasks to be rescheduled freely without impact on the project deadline.
**D)** By shortening non-critical tasks to guarantee earlier project delivery.
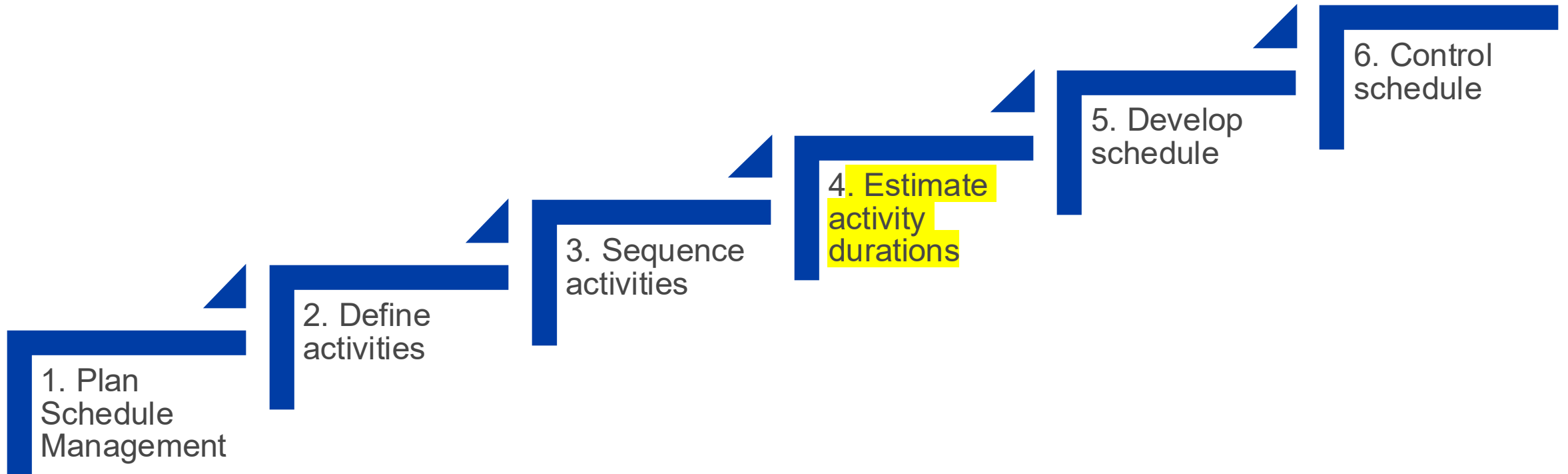
# Question 31

Estimate activity duration

| Activity | Optimistic Time (a) | Most Likely (m) | Pessimistic Time (b) |
|---|---|---|---|
| A | 3 | 4 | 5 |
| B | 4 | 4.5 | 8 |
| C | 4 | 6 | 8 |
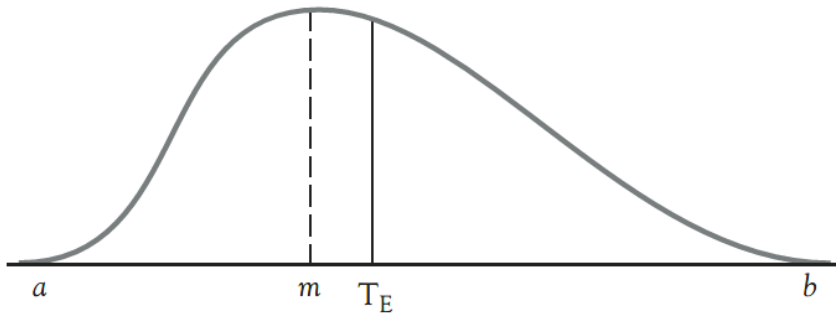


- Assume all 3 activities are on the critical path
- Use 3-point estimating for activity duration (beta distribution)
- Calculate the project expected critical time, variance and standard deviation
- What is the probability of completing the project within 16, 17, 14 & 13 weeks?

1. Plan Schedule Management

2. Define activities

3. Sequence activities

4. Estimate activity durations

5. Develop schedule

6. Control schedule

|   | optimistic (a) | most likely (m) | pessimistic (b) | Te | Std dev | Var |
|---|---|---|---|---|---|---|
| A | 3 | 4 | 5 | 4 | 0.333333 | 0.111111 |
| B | 4 | 4.5 | 8 | 5 | 0.666667 | 0.444444 |
| C | 4 | 6 | 8 | 6 | 0.666667 | 0.444444 |

## 1) Calculate Te, Std Dev and var for each activity

$$Expected\ time\ (activity) = \ t_e = \frac{a + 4m + b}{6}$$

$t_e$ = expected time
$a$ = most optimistic time
$b$ = most pessimistic time
$m$ = most likely time.

$$Standard\ deviation\ (activity) = \ \sigma_{t_e} = \frac{b - a}{6}$$

$$Variance\ (activity) = \ {\sigma_{t_e}}^2$$

|  | optimistic (a) | most likely (m) | pessimistic (b) | Te | Std dev | Var |
|---|---|---|---|---|---|---|
| A | 3 | 4 | 5 | 4 | 0.333333 | 0.111111 |
| B | 4 | 4.5 | 8 | 5 | 0.666667 | 0.444444 |
| C | 4 | 6 | 8 | 6 | 0.666667 | 0.444444 |
|  |  |  |  |  |  |  |
|  |  |  | μ (path) | 15 |  |  |
|  |  |  | Var (path) |  |  | 1 |
|  |  |  | Std dev (path) |  | 1 |  |
|  |  |  |  |  |  |  |

**2) Calculate Te, Std Dev and var for <u>the path</u>**

$$Standard\ deviation\ (path) = \ \sigma_{path} = \sqrt{\sigma_1^2 + \sigma_2^2 + \cdots + \sigma_N^2}$$

$$Variance\ (path) = \sum Variance(activity)$$

$$Project\ Expected\ critical\ time = \sum t_e = \mu$$

| | optimistic (a) | most likely (m) | pessimistic (b) | Te | | Std dev | Var |
|---|---|---|---|---|---|---|---|
| A | 3 | 4 | 5 | 4 | | 0.333333 | 0.111111 |
| B | 4 | 4.5 | 8 | 5 | | 0.666667 | 0.444444 |
| C | 4 | 6 | 8 | 6 | | 0.666667 | 0.444444 |
| | | | | | | | |
| | | | μ (path) | | 15 | | |
| | | | Var (path) | | | | 1 |
| | | | Std dev (path) | | | 1 | |

| | D | z | Prob | | |
|---|---|---|---|---|---|
| P(<16) | 16 | 1.0 | **84.1%** | | |
| P(<17) | 17 | 2.0 | **97.7%** | | |
| P(<14) | 14 | -1.0 | **15.9%** | | |
| P(<13) | 13 | -2.0 | **2.3%** | | |

Frequency distribution of the path completion



## 3) Calculate probability of completing the project on time

$$z = (\mathcal{D} - \mu) / \sqrt{\sigma_\mu^2}$$
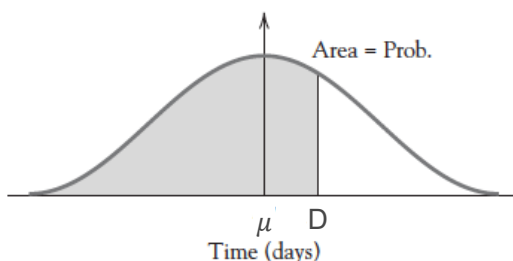
*where:*

$\mathcal{D}$ = the desired project completion time.

$\mu$ = the sum of the $T_E$ activities on the path being investigated.

$\sigma_\mu^2$ = the variance of the path being considered (the sum of the variances of the activities on the path).

- Excel: Probability =NORM.DIST(D,μ,σ,TRUE)
- Excel: D=NORM.INV(P,μ,σ)