Risk Exposure (RE) calculations with practical exercises.
(RE = Risk Probability (R) × Impact (I) or Cost (C))

Key Concepts

1. **Risk Probability (R)**: Likelihood of a risk occurring (e.g., 0.1 = 10%).
2. **Impact (I)**: Severity (e.g., on a scale of 1–5) or **Cost (C)** in money/time.
3. **Risk Exposure (RE)**: Quantifies the potential loss (RE = R × I or R × C).

Exercises

Exercise 1: Software Project Risks

A team identifies the following risks:

Risk	Probability (R)	Impact (I)	Cost (C)
Server outage	0.3	4	$50,000
Data breach	0.1	5	$200,000
Delay in dependencies	0.7	3	$30,000

Calculate RE using both Impact (I) and Cost (C):

Which risk has the highest exposure?

Risk Mitigation Analysis

For **delay risk** (RE = $21,000):

- If hiring an extra developer costs **$10,000** and reduces probability to **0.2**, is it worth it?

Solution

1. **RE (Impact) = R × I**
    - Server outage: 0.3 × 4 = 1.2
    - Data breach: 0.1 × 5 = 0.5
    - Delay: 0.7 × 3 = 2.1
2. **RE (Cost) = R × C**
    - Server outage: 0.3 × $50,000 = $15,000
    - Data breach: 0.1 × $200,000 = $20,000

- Delay: 0.7 × $30,000 = $21,000

Which risk has the highest exposure?

- **By Impact**: Delay (RE = 2.1).
- **By Cost**: Delay (RE = $21,000).

Risk Mitigation Analysis

For **delay risk** (RE = $21,000):

- If hiring an extra developer costs **$10,000** and reduces probability to **0.2**, is it worth it?
  - New RE = 0.2 × $30,000 = $6,000
  - **Savings**: $21,000 - $6,000 = $15,000 vs. $10,000 cost → **Yes!**

Exercise 2: IT Security Risks

A company assesses cybersecurity threats:

Risk	Probability (R)	Downtime (Hours)	Hourly Cost
Ransomware attack	0.05	48	$10,000
Phishing leak	0.2	8	$5,000

Calculate RE in monetary terms. Which risk should they prioritize?

solution

1. **Total Cost (C) = Downtime × Hourly Cost**
   - Ransomware: 48 × $10,000 = $480,000
   - Phishing: 8 × $5,000 = $40,000
2. **RE = R × C**
   - Ransomware: 0.05 × $480,000 = $24,000
   - Phishing: 0.2 × $40,000 = $8,000

Which risk should they prioritize?

- Ransomware (higher RE despite lower probability).

Exercise 3: Construction Project

A builder evaluates risks:

Risk	Probability (R)	Delay (Days)	Daily Penalty
Bad weather	0.4	10	$2,000
Supplier strike	0.2	30	$5,000

Calculate RE in time and cost. Which risk is worse?

1. **RE (Time) = R × Delay**
    - Weather: 0.4 × 10 = 4 days
    - Strike: 0.2 × 30 = 6 days
2. **RE (Cost) = R × (Delay × Penalty)**
    - Weather: 0.4 × (10 × $2,000) = $8,000
    - Strike: 0.2 × (30 × $5,000) = $30,000

Which risk is worse?

- **Time**: Supplier strike (6 days).
- **Cost**: Supplier strike ($30,000).

Exercise 4: Tech Startup Product Launch

Scenario: A SaaS startup plans to launch a new AI tool. Risks include:

Risk	Probability (R)	Financial Impact (C)	Reputation Impact (I) 1–5
Critical bug in release	0.25	$500,000	4
Cloud provider outage	0.1	$1,000,000	5
Competitor launches early	0.4	$300,000	3

Tasks:

1. Calculate **RE (Cost)** and **RE (Impact)** for each.
2. The team can either:
    - **A)** Invest $100K in extra testing (reduces bug probability to 0.1).
    - **B)** Use multi-cloud (reduces outage impact to $200K, but costs $50K).
      Which mitigation is better financially?

Solution:

1. **Baseline RE Calculations**:
    - **Bug**: RE(C) = 0.25 × $500K = $125K; RE(I) = 0.25 × 4 = 1.0
    - **Outage**: RE(C) = 0.1 × $1M = $100K; RE(I) = 0.1 × 5 = 0.5
    - **Competitor**: RE(C) = 0.4 × $300K = $120K; RE(I) = 0.4 × 3 = 1.2
2. **Mitigation Analysis**:
    - **Option A**: New RE(C) for bugs = 0.1 × $500K = $50K. Savings = $125K - $50K = $75K. Net benefit = $75K - $100K = -$25K (Not worth it).
    - **Option B**: New RE(C) for outage = 0.1 × $200K = $20K. Savings = $100K - $20K = $80K. Net benefit = $80K - $50K = +$30K (**Worth it!**).

Exercise 5: Pharmaceutical Clinical Trial

Scenario: A pharma company runs a trial with:

Risk	Probability (R)	Delay (Months)	Cost per Month	Regulatory Penalty
Patient recruitment failure	0.3	6	$2M	$0
Regulatory audit findings	0.2	12	$1M	$5M

Tasks:

1. Calculate **total RE (Cost)** including delays + penalties.
2. If hiring a recruitment firm costs $1M but reduces recruitment failure probability to 0.1, is it justified?

Solution:

1. **Baseline RE**:
    - **Recruitment**: RE = 0.3 × (6 × $2M) = $3.6M.
    - **Audit**: RE = 0.2 × [(12 × $1M) + $5M] = $3.4M.
2. **Mitigation**:
    - New RE for recruitment = 0.1 × $12M = $1.2M. Savings = $3.6M - $1.2M = $2.4M.
    - **Net benefit** = $2.4M - $1M = +$1.4M (**Justified!**).