

# R PRACTICAL EXAM COMPLETE GUIDE

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## 1 BASIC QUESTIONS (Must Know)

### Q1. Print numbers from 10 to 50

```
a <- 10:50    # Create sequence 10 to 50
print(a)      # Print numbers
```

✓ Output: 10 11 12 ... 50

### Q2. Find mean of numbers from 21 to 50

```
mean(21:50)   # Find average (sum/length)
```

✓ Output: 35.5

### Q3. Add numbers from 51 to 90

```
sum(51:90)    # Add all numbers
```

✓ Output: 2820

### Q4. Find mean, max, min, and sd from a vector

```
abhi <- c(2, 3, 4, 8, 9, 11, 34)
mean(abhi)    # Average value
max(abhi)     # Largest number
min(abhi)     # Smallest number
sd(abhi)      # Standard deviation
```

✓ Output (approx):

mean = 10.14 | max = 34 | min = 2 | sd = 11.03

### Q5. Create a simple Data Frame

```
ash <- data.frame(Name=c("Ashaaf", "Abhinav", "Hardik"),
                  Class=c("Btech03", "Btech04", "Btech09"),
                  RollNo=c(1,2,3))
print(ash)     # Display table
```

✓ Output: 3 rows (Name, Class, RollNo)

## 2 PLOTTING SECTION


### BAR PLOT (Base R)

 **Q: Draw a bar plot for marks in 5 subjects.**

```
subjects <- c("Math", "Science", "English", "History", "Computer")
marks <- c(85, 90, 78, 88, 95)
```

```
barplot(marks,
  names.arg = subjects, # Labels under bars
  col = "skyblue",      # Bar color
  main = "Marks in 5 Subjects", # Title
  xlab = "Subjects",    # X-axis label
  ylab = "Marks",       # Y-axis label
  border = "black")    # Border color
```

✓ Output: Blue bars for 5 subjects with labels and title.

 Key points:

- Use names.arg, not names.args ❌
- barplot() shows heights = numeric values
- col gives color; main gives title

### BAR PLOT using ggplot2

 **Q: Draw a bar chart for categories and their values using ggplot2.**

#### Step 1: Install and Load ggplot2

```
install.packages("ggplot2") # (only once)
library(ggplot2)           # activate
```

#### Step 2: Create data and plot

```
data <- data.frame(categories = c("A", "B", "C"),
  values = c(5, 10, 15))

ggplot(data, aes(x = categories, y = values)) +
  geom_bar(stat = "identity", fill = "skyblue", color = "black") +
  ggtitle("Bar Plot using ggplot2") +
  xlab("Categories") +
  ylab("Values")
```

✓ Output: Blue bars labeled A, B, C with heights 5,10,15



Common mistake:

If you forget `stat="identity"`, you'll get:

Error: `stat_count()` must only have an x or y aesthetic.

→ because ggplot tries to count values by default.



## LINE PLOT (Base R)



**Q: Draw a line plot for given data.**

```
x <- c(1, 2, 3, 4, 5)
```

```
y <- c(7, 8, 9, 10, 44)
```

```
plot(x, y, type = "l", col = "blue", main = "Line Plot")
```



Output: Blue line connecting (1,7) → (5,44)



Note:

- `type="l"` → line plot
- `type="p"` → scatter (points)
- `type="b"` → both (points + line)



## LINE PLOT using ggplot2



**Q: Draw a line plot using ggplot2.**

```
df <- data.frame(x = 1:10, y = (1:10)^2)
```

```
ggplot(df, aes(x = x, y = y)) +  
  geom_line(color = "red", linewidth = 1.2) +  
  ggtitle("Line Plot Example") +  
  xlab("X-axis Values") +  
  ylab("Y-axis Values")
```



Output: Red line showing  $y = x^2$



Important Update:

Use `linewidth` (not `size`) for line thickness (ggplot2 v3.4+).



## SCATTER PLOT (Base R)



**Q: Draw a scatter plot of x and y.**

```
x <- c(1, 2, 3, 4, 5)
```

```
y <- c(7, 8, 9, 10, 44)
```

```
plot(x, y, main = "Scatter Plot", col = "red", pch = 19)
```



Output: Red dots showing (x, y) points

💡 Note:

pch = point shape → (19 = solid circle)

## 🟡 SCATTER PLOT using ggplot2

🧠 Q: Draw scatter plot using ggplot2.

```
data <- data.frame(x = c(1, 2, 3, 4, 5),  
  y = c(10, 20, 30, 40, 50))
```

```
ggplot(data, aes(x = x, y = y)) +  
  geom_point(color = "red", size = 3) +  
  ggtitle("Scatter Plot using ggplot2") +  
  xlab("X-axis Values") +  
  ylab("Y-axis Values")
```

✅ Output: Red dots plotted for given (x, y) pairs.

## 📊 HISTOGRAM (Base R)

🧠 Q: Create histogram for given data.

```
data <- c(2,3,3,5,5,5,7,8,8,9,10,10,11,12)  
hist(data, col = "lightblue",  
  main = "Histogram Example",  
  xlab = "Values", ylab = "Frequency")
```

✅ Output: Light blue bars showing frequency of numbers.

💡 Note:

Histogram shows distribution of numeric data — not categories.

## 📊 HISTOGRAM using ggplot2

🧠 Q: Create histogram using ggplot2.

```
ggplot(data.frame(values = rnorm(100)), aes(x = values)) +  
  geom_histogram(binwidth = 0.5, fill = "skyblue", color = "black") +  
  ggtitle("Histogram Example")
```

✅ Output: Bell-shaped histogram of 100 random numbers.



Note:

- `rnorm(100)` → generates 100 random values
- `binwidth` → width of each bar (0.5 = narrow, more bars)



## BOX PLOT (Base R)



**Q: Create a box plot for scores.**

```
scores <- c(45, 55, 60, 65, 70, 75, 80, 85, 90)
boxplot(scores, main = "Box Plot Example", col = "lightgreen")
```



Output: Green box with median line at 70, min=45, max=90.



Note:

Box plot shows median, quartiles, range, and outliers.



## BOX PLOT using ggplot2



**Q: Draw a box plot using ggplot2.**

```
data <- data.frame(category = "Scores",
  values = c(45, 55, 60, 65, 70, 75, 80, 85, 90))
```

```
ggplot(data, aes(x = category, y = values)) +
  geom_boxplot(fill = "lightgreen") +
  ggtitle("Box Plot using ggplot2")
```



Output: Single green box showing score distribution.

## 3 COMMON MISTAKES TO AVOID ❌

Mistake	Wrong	Correct
Misspelling parameter	names.args	names.arg
Forgetting stat="identity" in ggplot bar	geom_bar()	geom_bar(stat="identity")
Using size for lines (ggplot2 v3.4+)	size=1.2	linewidth=1.2
Different vector lengths in data.frame()	x=c(1,2,3), y=c(1,2)	Match lengths
Using color in base plot	color="red"	col="red"
Typing mistake in function names	mean(21-50)	mean(21:50)

## QUICK SUMMARY FOR REVISION

Task	Function	Notes
Print 10–50	10:50	Sequence
Mean 21–50	mean(21:50)	Avg of range
Sum 51–90	sum(51:90)	Add numbers
Bar plot	barplot()	names.arg for labels
ggplot bar	geom_bar(stat="identity")	Needs data.frame

Line plot	<code>plot(type="l")</code>	Lines only
ggplot line	<code>geom_line()</code>	Use linewidth
Scatter	<code>plot()</code> / <code>geom_point()</code>	Shows points
Histogram	<code>hist()</code> / <code>geom_histogram()</code>	Frequency of values
Box plot	<code>boxplot()</code> / <code>geom_boxplot()</code>	Shows spread

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## **Final Tip (for viva):**

If asked “what is the difference between base R and ggplot2 plots?”, say:  
 “Base R plots are simple and quick for small data,  
 but ggplot2 provides layered, customizable, and professional-looking  
 visualizations.”