# MH CET LAW Basic Mathematics
## Sample Paper – 10

Duration: **8 Minutes** | Maximum Marks: **8**

### Instructions

1. This paper contains **8 multiple-choice questions** from the Basic Mathematics section.
2. Each question carries **1 mark**. There is **no negative marking**.
3. Choose the single best answer from options (A), (B), (C), (D).
4. Detailed solutions with answer key are provided after the questions.
5. Click on the answer in the Answer Key to jump to its solution.

### Questions

**Q1.** What is the units digit of $7^{75}$?

**A.** 1

**B.** 7

**C.** 3

**D.** 9

**Q2.** In a town, $60\%$ of the population are men. If $30\%$ of the men and $40\%$ of the women are literate, what percentage of the total population is literate?

**A.** 30%

**B.** 32%

**C.** 36%

**D.** 34%

**Q3.** Two articles are sold at Rs. 990 each. On the first, a profit of $10\%$ is made and on the second, a loss of $10\%$ is incurred. What is the net result on the whole transaction?

**A.** $1\%$ loss

**B.** Neither gain nor loss

**C.** $1\%$ gain

**D.** $2\%$ loss

**Q4.** Rs. $5{,}000$ is divided into two parts and lent at $5\%$ and $6\%$ per annum respectively for $2$ years. If the total simple interest is Rs. $540$, find the part lent at $6\%$.

**A.** Rs. 1,500

**B.** Rs. 2,000

**C.** Rs. 2,500

**D.** Rs. 3,000

**Q5.** If $A : B = 2 : 3$ and $B : C = 4 : 5$, find $A : B : C$.

**A.** 4:6:5

**B.** 2:3:5

**C.** 8:12:15

**D.** 4:9:10

**Q6.** A can do a piece of work in $6$ days and B can do it in $12$ days. They work on alternate days, starting with A on day 1. In how many days will the work be completed?

**A.** 6 days

**B.** 7 days

**C.** 7.5 days

**D.** 8 days

**Q7.** A thief runs at $10$ km/h and is noticed by a policeman $100$ m behind, who immediately starts running at $14$ km/h. In how many seconds will the policeman catch the thief?

**A.** 90 seconds

**B.** 75 seconds

**C.** 100 seconds

**D.** 120 seconds

**Q8.** Find the difference between compound interest and simple interest on Rs. $2{,}000$ at $10\%$ per annum for $3$ years.

**A.** Rs. 60

**B.** Rs. 62

**C.** Rs. 64

**D.** Rs. 66

# Detailed Solutions

## Solution to Q1

*Number System / Units Digit Cyclicity*

**Solution**

**Concept:** The units digits of powers of 7 follow a repeating cycle of length 4: $7^1 \to 7$, $7^2 \to 9$, $7^3 \to 3$, $7^4 \to 1$, then repeats.

**Step 1:** Divide the exponent 75 by 4 to find the remainder.

$$75 = 4 \times 18 + 3 \implies \text{remainder} = 3$$

**Step 2:** The units digit of $7^{75}$ equals the units digit of $7^3$.

$$7^3 = 343 \implies \text{units digit} = \mathbf{3}$$

**Wrong options:** A) 1 corresponds to $7^{4k}$; B) 7 corresponds to $7^{4k+1}$; D) 9 corresponds to $7^{4k+2}$.

$$\boxed{\text{Units digit of } 7^{75} = 3}$$

**Answer: (C)** Go Back to Q1

## Solution to Q2

*Percentage / Literacy Rate*

**Solution**

**Concept:** Use weighted average — literacy rates apply to unequal group sizes, so a simple average of 30% and 40% is incorrect.

**Step 1:** Let total population $= 100$. Then men $= 60$, women $= 40$.

**Step 2:** Count literates in each group.

$$\text{Literate men} = 30\% \times 60 = 18$$

$$\text{Literate women} = 40\% \times 40 = 16$$

**Step 3:** Compute total literate percentage.

$$\text{Total literate} = 18 + 16 = 34 \implies \boxed{34\%}$$

**Wrong options:** A) 30%: ignores unequal group weighting; B) 32%: arithmetic error; C) 36%: incorrect group computation.

**Answer: (D)** Go Back to Q2

## Solution to Q3

*Profit & Loss / Same Selling Price Trap*

**Solution**

**Concept:** When two items are sold at the *same* price, one at $r\%$ profit and one at $r\%$ loss, the net result is always a loss of $\frac{r^2}{100}\%$.

**Step 1:** Find the cost prices from the common selling price of Rs. 990.

$$\text{CP}_1 = \frac{990}{1.10} = \text{Rs. } 900 \qquad \text{CP}_2 = \frac{990}{0.90} = \text{Rs. } 1100$$

**Step 2:** Compute totals.

$$\text{Total CP} = 900 + 1100 = \text{Rs. } 2000 \qquad \text{Total SP} = 990 + 990 = \text{Rs. } 1980$$

**Step 3:** Calculate net loss percentage.

$$\text{Loss} = 2000 - 1980 = \text{Rs. } 20 \implies \text{Loss\%} = \frac{20}{2000} \times 100 = \boxed{1\%}$$

**Verification via formula:** $\text{Loss\%} = \frac{r^2}{100} = \frac{10^2}{100} = 1\%$ ✓

**Wrong options:** B) No gain/loss: incorrect; C) 1% gain: wrong direction; D) 2% loss: overestimate.

**Answer: (A)** Go Back to Q3

## Solution to Q4

*Simple Interest / Two Parts at Different Rates*

**Solution**

**Concept:** Set up a linear equation using $\text{SI} = \frac{P \times R \times T}{100}$ for each part and sum to the given total.

**Step 1:** Let the part lent at $6\%$ = Rs. $x$. Then the part at $5\%$ = Rs. $(5000 - x)$.

**Step 2:** Write SI for each part ($T = 2$ years).

$$\text{SI at } 6\% = \frac{x \times 6 \times 2}{100} = \frac{12x}{100}$$

$$\text{SI at } 5\% = \frac{(5000 - x) \times 5 \times 2}{100} = \frac{10(5000 - x)}{100}$$

**Step 3:** Sum equals Rs. 540 and solve.

$$\frac{12x + 50000 - 10x}{100} = 540 \implies 2x + 50000 = 54000 \implies 2x = 4000$$

$$\boxed{x = \text{Rs. } 2{,}000}$$

**Verification:** SI at $6\% = \frac{2000\times6\times2}{100} = \text{Rs. } 240$; SI at $5\% = \frac{3000\times5\times2}{100} = \text{Rs. } 300$; Total $= \text{Rs. } 540$ ✓

**Wrong options:** Rs. 1,500, Rs. 2,500, Rs. 3,000 each yield total SI $\neq$ Rs. 540.

**Answer: (B)** Go Back to Q4

## Solution to Q5

*Ratio & Proportion / Compound Ratio*

**Solution**

**Concept:** To combine two ratios sharing a common term, scale both so that common term (B) has the same value.

**Step 1:** Given $A : B = 2 : 3$ and $B : C = 4 : 5$.

**Step 2:** Make B equal in both ratios. LCM$(3,\ 4) = 12$.

$$A : B = 2 : 3 \xrightarrow{\times4} 8 : 12$$

$$B : C = 4 : 5 \xrightarrow{\times3} 12 : 15$$

**Step 3:** Combine to get the three-term ratio.

$$\boxed{A : B : C = 8 : 12 : 15}$$

**Wrong options:** A) 4:6:5 — halved but B-terms still mismatch with C; B) 2:3:5 — C appended without scaling; D) 4:9:10 — no valid derivation.

**Answer: (C)** Go Back to Q5

## Solution to Q6

*Time & Work / Alternate Days*

**Solution**

**Concept:** Find the work done per 2-day cycle, then determine how many complete cycles finish the job.

**Step 1:** Individual work rates — A: $\frac{1}{6}$ per day; B: $\frac{1}{12}$ per day.

**Step 2:** Work done in one 2-day cycle (A on day 1, B on day 2):

$$\frac{1}{6} + \frac{1}{12} = \frac{2}{12} + \frac{1}{12} = \frac{3}{12} = \frac{1}{4}$$

**Step 3:** Number of complete cycles required:

$$4 \text{ cycles} \times \frac{1}{4} = 1 \text{ (whole work completed)}$$

**Step 4:** Total days $= 4 \times 2 = \boxed{8 \text{ days}}$.

**Verification:** After 8 days, $4 \times \frac{1}{4} = 1$ — work exactly complete on day 8. ✓

**Wrong options:** A) 6 days — A working alone; B) 7 days and C) 7.5 days — incorrect cycle logic.

**Answer: (D)** Go Back to Q6

## Solution to Q7

*Speed & Distance / Chase Problem*

**Solution**

**Concept:** In a chase, convert the initial gap and relative speed to consistent units, then apply time $= \dfrac{\text{distance}}{\text{relative speed}}$.

**Step 1:** Relative speed of the policeman with respect to the thief:

$$14 - 10 = 4 \text{ km/h}$$

**Step 2:** Convert relative speed to m/s:

$$4 \text{ km/h} = \frac{4 \times 1000}{3600} = \frac{10}{9} \text{ m/s}$$

**Step 3:** Time to close the 100 m gap:

$$t = \frac{100}{\frac{10}{9}} = 100 \times \frac{9}{10} = \boxed{90 \text{ seconds}}$$

**Wrong options:** B) 75 s — uses relative speed $\frac{4}{3}$ m/s (conversion error); C) 100 s — uses 1 m/s; D) 120 s — uses $\frac{5}{6}$ m/s.

**Answer: (A)** Go Back to Q7

## Solution to Q8

*Compound Interest / CI minus SI for 3 Years*

**Solution**

**Concept:** Compute SI and CI separately, then subtract. Confirm with the 3-year difference formula.

**Step 1:** Simple Interest for 3 years:

$$\text{SI} = \frac{2000 \times 10 \times 3}{100} = \text{Rs. } 600$$

**Step 2:** Compound Interest for 3 years:

$$\text{Amount} = 2000 \times (1.10)^3 = 2000 \times 1.331 = \text{Rs. } 2662$$

$$\text{CI} = 2662 - 2000 = \text{Rs. } 662$$

**Step 3:** Difference:

$$\text{CI} - \text{SI} = 662 - 600 = \boxed{\text{Rs. } 62}$$

**Formula verification:**

$$\text{Diff} = P \cdot \frac{R^2(300+R)}{100^3} = 2000 \times \frac{100 \times 310}{1{,}000{,}000} = \frac{62{,}000{,}000}{1{,}000{,}000} = \text{Rs. } 62 \checkmark$$

**Wrong options:** A) Rs. 60 — uses approximate formula $P(R/100)^2 \times 3$; C) Rs. 64 and D) Rs. 66 — arithmetic errors.

**Answer: (B)** Go Back to Q8

## Answer Key

| Q | Ans | Q | Ans | Q | Ans | Q | Ans | Q | Ans |
|---|---|---|---|---|---|---|---|---|---|
| 1 | C | 2 | D | 3 | A | 4 | B | 5 | C |
| 6 | D | 7 | A | 8 | B | | | | |

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