

MH CET LAW Basic Mathematics

Sample Paper – 9

Duration: 8 Minutes | Maximum Marks: 8

Instructions

- This paper contains **8 Multiple Choice Questions** modelled on the Basic Mathematics section of MH CET LAW (5-Year LLB).
- Questions are based on Class 10 level arithmetic: Number System, Percentages, Ratio & Proportion, Profit & Loss, Simple & Compound Interest, Time & Work, Speed & Distance.
- Each correct answer carries +1 **mark**. There is **no negative marking** for incorrect or unattempted answers.
- Only **one option** is correct per question.
- Use of calculators, mobile phones, or electronic gadgets is **strictly prohibited**.

Questions

Q1. The sum of a proper fraction and its reciprocal is $\frac{13}{6}$. What is the fraction?

- A. $\frac{1}{2}$
- B. $\frac{2}{3}$
- C. $\frac{3}{4}$
- D. $\frac{5}{6}$

Q2. A person's salary was first increased by 20% and then decreased by 10%. What is the net percentage change in the salary?

- A. 10% increase
- B. 9% increase
- C. 8% increase
- D. 10% decrease



Q3. A shopkeeper marks his goods at 40% above cost price and gives a discount of 20%. What is his profit percentage?

- A. 8%
- B. 10%
- C. 11%
- D. 12%

Q4. Find the difference between the compound interest and simple interest on Rs. 1,200 for 2 years at 10% per annum.

- A. Rs. 12
- B. Rs. 14
- C. Rs. 15
- D. Rs. 18

Q5. In what ratio must tea costing Rs. 6.50 per kg be mixed with tea costing Rs. 8.00 per kg so that the mixture costs Rs. 7.00 per kg?

- A. 1 : 2
- B. 2 : 1
- C. 3 : 1
- D. 1 : 3

Q6. A cistern can be filled by a tap in 4 hours, but there is a leak in it which empties it in 12 hours. If the tap is open, how long will it take to fill the cistern?

- A. 4 hours
- B. 5 hours
- C. 6 hours
- D. 8 hours



Q7. A train 240 m long passes a platform 160 m long in 20 seconds. What is the speed of the train in km/h?

- A. 54 km/h
- B. 60 km/h
- C. 65 km/h
- D. 72 km/h

Q8. Find the compound interest on Rs. 8,000 at 10% per annum compounded half-yearly for 1 year.

- A. Rs. 820
- B. Rs. 800
- C. Rs. 840
- D. Rs. 850



Detailed Solutions

Solution to Q1

Number System / Proper Fraction and Its Reciprocal

Solution

Concept: If x is the fraction, then $x + \frac{1}{x} = \frac{13}{6}$. Multiply both sides by $6x$ to obtain a quadratic, then pick the root that is less than 1 (proper fraction).

Step 1 — Set up and solve the quadratic.

$$x + \frac{1}{x} = \frac{13}{6} \implies 6x^2 - 13x + 6 = 0$$

Factorise:

$$(2x - 3)(3x - 2) = 0 \implies x = \frac{3}{2} \quad \text{or} \quad x = \frac{2}{3}$$

Step 2 — Select the proper fraction.

Since a proper fraction satisfies $0 < x < 1$, we reject $x = \frac{3}{2}$ and accept $x = \frac{2}{3}$.

Verification: $\frac{2}{3} + \frac{3}{2} = \frac{4}{6} + \frac{9}{6} = \frac{13}{6}$. ✓

Why the other options are wrong:

- **A** — $\frac{1}{2}$: $\frac{1}{2} + 2 = \frac{5}{2} \neq \frac{13}{6}$.
- **C** — $\frac{3}{4}$: $\frac{3}{4} + \frac{4}{3} = \frac{9}{12} + \frac{16}{12} = \frac{25}{12} \neq \frac{13}{6}$.
- **D** — $\frac{5}{6}$: $\frac{5}{6} + \frac{6}{5} = \frac{25}{30} + \frac{36}{30} = \frac{61}{30} \neq \frac{13}{6}$.

Answer: (B) $\frac{2}{3}$

Answer: (B) [Go Back to Q1](#)

Solution to Q2

Percentage / Salary Increase Then Decrease

Solution

Concept: Successive percentage changes compound, so the net effect is not simply the algebraic sum of the two changes.

Step 1 — Apply changes to a base salary.

Let original salary = Rs. 100.

After 20% increase: $100 \times 1.20 = \text{Rs. } 120$

After 10% decrease: $120 \times 0.90 = \text{Rs. } 108$



Step 2 — Calculate net percentage change.

$$\text{Net change} = 108 - 100 = \text{Rs. } 8 \implies \text{Net} = 8\% \text{ increase}$$

$$\text{Alternative formula: Net \%} = a + b + \frac{ab}{100} = 20 + (-10) + \frac{20 \times (-10)}{100} = 10 - 2 = 8\%.$$

Why the other options are wrong:

- **A – 10% increase:** Simple algebraic addition ($20 - 10$); ignores the compounding effect.
- **B – 9% increase:** Incorrect intermediate calculation; does not match any valid formula.
- **D – 10% decrease:** Wrong sign; the salary actually rises because the 20% increase outweighs the 10% decrease.

Answer: (C) 8% increase
Answer: (C) [Go Back to Q2](#)
Solution to Q3
Profit & Loss / Marked Price and Discount
Solution

Concept: Marked Price (MP) is set above Cost Price (CP); Selling Price (SP) is obtained after applying the discount on MP. Profit% is calculated on CP.

Step 1 — Set CP and find MP and SP.

Let CP = Rs. 100.

$$\text{MP} = 100 \times 1.40 = \text{Rs. } 140$$

$$\text{Discount} = 20\% \text{ of } 140 = \text{Rs. } 28 \implies \text{SP} = 140 - 28 = \text{Rs. } 112$$

Step 2 — Calculate profit percentage.

$$\text{Profit\%} = \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100 = \frac{112 - 100}{100} \times 100 = 12\%$$

Formula shortcut: Profit% = $(1 + m)(1 - d) - 1 = 1.4 \times 0.8 - 1 = 1.12 - 1 = 12\%$, where $m = 0.40$ and $d = 0.20$.

Why the other options are wrong:

- **A – 8%:** Arises from applying the discount directly to CP instead of to MP.
- **B – 10%:** Underestimates; treats markup and discount as additive rather than



multiplicative.

- **C – 11%:** An arithmetic error in the intermediate steps.

Answer: (D) 12%

Answer: (D) [Go Back to Q3](#)

Solution to Q4

Simple Interest / Difference between CI and SI

Solution

Concept: For 2 years, the difference between CI and SI equals $P \times \left(\frac{R}{100}\right)^2$.

Step 1 — Calculate Simple Interest for 2 years.

$$SI = \frac{P \times R \times T}{100} = \frac{1200 \times 10 \times 2}{100} = \text{Rs. } 240$$

Step 2 — Calculate Compound Interest for 2 years.

$$A = P \left(1 + \frac{R}{100}\right)^2 = 1200 \times (1.1)^2 = 1200 \times 1.21 = \text{Rs. } 1,452$$

$$CI = 1452 - 1200 = \text{Rs. } 252$$

Step 3 — Find the difference.

$$CI - SI = 252 - 240 = \text{Rs. } 12$$

$$\text{Shortcut: Difference} = P \times \left(\frac{R}{100}\right)^2 = 1200 \times \left(\frac{10}{100}\right)^2 = 1200 \times 0.01 = \text{Rs. } 12.$$

Why the other options are wrong:

- **B – Rs. 14:** Results from an incorrect formula or arithmetic error in computing A .
- **C – Rs. 15:** Does not correspond to any valid reading of the given values.
- **D – Rs. 18:** Would imply $P \times (R/100)^2 = 18$, which gives $R \approx 12.2\%$, inconsistent with the stated 10%.

Answer: (A) Rs. 12

Answer: (A) [Go Back to Q4](#)



Solution to Q5

Ratio & Proportion / Alligation

Solution

Concept: The rule of alligation states that the ratio in which two ingredients at prices c and d ($c < d$) must be mixed to get a mean price m is:

$$\text{Cheaper : Dearer} = (d - m) : (m - c)$$

Step 1 — Identify the values.

$$c = 6.50, \quad d = 8.00, \quad m = 7.00$$

Step 2 — Apply the alligation formula.

$$\text{Cheaper : Dearer} = (d - m) : (m - c) = (8.00 - 7.00) : (7.00 - 6.50) = 1.00 : 0.50 = 2 : 1$$

$$\text{Verification: } \frac{2 \times 6.50 + 1 \times 8.00}{3} = \frac{13.00 + 8.00}{3} = \frac{21.00}{3} = \text{Rs. } 7.00. \checkmark$$

Why the other options are wrong:

- **A – 1:2:** This reverses the ratio; mixing 1 part cheap and 2 parts expensive would give a mean above Rs. 7.00.
- **C – 3:1:** Overweights the cheap tea; $\frac{3 \times 6.5 + 1 \times 8}{4} = \frac{27.5}{4} = 6.875 \neq 7.00$.
- **D – 1:3:** Overweights the expensive tea; $\frac{1 \times 6.5 + 3 \times 8}{4} = \frac{30.5}{4} = 7.625 \neq 7.00$.

Answer: (B) 2:1

Answer: (B) [Go Back to Q5](#)

Solution to Q6

Time & Work / Leaky Tank

Solution

Concept: Express the filling and emptying rates as fractions of the cistern per hour, then combine algebraically. The net rate equals the filling rate minus the emptying rate.

Step 1 — Identify individual rates.

$$\text{Tap fills cistern in 4 hours} \implies \text{rate} = \frac{1}{4} \text{ per hour}$$

$$\text{Leak empties cistern in 12 hours} \implies \text{rate} = \frac{1}{12} \text{ per hour}$$



Step 2 — Find the net filling rate.

$$\text{Net rate} = \frac{1}{4} - \frac{1}{12} = \frac{3}{12} - \frac{1}{12} = \frac{2}{12} = \frac{1}{6} \text{ per hour}$$

Step 3 — Find the time to fill the cistern.

$$\text{Time} = \frac{1}{1/6} = 6 \text{ hours}$$

Why the other options are wrong:

- **A – 4 hours:** This ignores the leak entirely and uses only the tap's rate.
- **B – 5 hours:** Would imply a net rate of $\frac{1}{5}$, which is incorrect given the stated rates.
- **D – 8 hours:** Overestimates the leak's effect; net rate of $\frac{1}{8}$ does not follow from the given data.

Answer: (C) 6 hours

Answer: (C) [Go Back to Q6](#)

Solution to Q7

Speed & Distance / Train Crossing Platform

Solution

Concept: When a train crosses a platform, the total distance covered equals the sum of the train's length and the platform's length. $\text{Speed} = \text{Total distance} \div \text{Time}$.

Step 1 — Calculate total distance.

$$\text{Total distance} = \text{Train length} + \text{Platform length} = 240 + 160 = 400 \text{ m}$$

Step 2 — Calculate speed in m/s.

$$\text{Speed} = \frac{400}{20} = 20 \text{ m/s}$$

Step 3 — Convert to km/h.

$$20 \text{ m/s} \times \frac{18}{5} = \frac{360}{5} = 72 \text{ km/h}$$

Why the other options are wrong:

- **A – 54 km/h:** Equals 15 m/s; would require total distance of $15 \times 20 = 300 \text{ m}$, not



400 m.

- **B – 60 km/h:** Equals $\frac{50}{3}$ m/s; does not arise from any correct interpretation of the given data.
- **C – 65 km/h:** Not a round value; does not correspond to any consistent distance/time combination here.

Answer: (D) 72 km/h

Answer: (D) [Go Back to Q7](#)

Solution to Q8

Compound Interest / Half-Yearly Compounding

Solution

Concept: When interest is compounded half-yearly, the annual rate is halved and the number of periods is doubled.

$$\text{Half-yearly rate} = \frac{10\%}{2} = 5\%, \quad \text{Periods for 1 year} = 2$$

Step 1 — Calculate the amount after 1 year.

$$A = P \left(1 + \frac{R}{100} \right)^n = 8000 \times (1.05)^2 = 8000 \times 1.1025 = \text{Rs. } 8,820$$

Step 2 — Calculate compound interest.

$$\text{CI} = A - P = 8820 - 8000 = \text{Rs. } 820$$

Why the other options are wrong:

- **B – Rs. 800:** This is the simple interest for 1 year at 10%: $\frac{8000 \times 10 \times 1}{100} = 800$; it ignores the half-yearly compounding.
- **C – Rs. 840:** Does not correspond to any standard compounding period or rate applied to Rs. 8,000.
- **D – Rs. 850:** An overestimate; would require $(1 + r)^2 = 1.10625$, implying $r \approx 5.18\%$ per half-year, which contradicts the stated 5%.

Answer: (A) Rs. 820

Answer: (A) [Go Back to Q8](#)



Answer Key

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

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