

MH CET LAW Basic Mathematics

Sample Paper – 7

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. Find the unit digit of 7^{53} .

- A. 1
- B. 3
- C. 9
- D. 7

Q2. A 50-litre mixture contains milk and water in the ratio 3 : 2. How many litres of water must be added to make the ratio 1 : 1?

- A. 10 litres
- B. 5 litres
- C. 15 litres
- D. 20 litres



Q3. A shopkeeper cheats both his supplier and his customer by using a 900 g weight as 1 kg. What is his overall profit percentage?

- A. 10%
- B. 11.11%
- C. 12.5%
- D. 20%

Q4. A man invests a total of Rs. 12,000 — part at 5% and the rest at 8% per annum simple interest. After 1 year, the total interest earned is Rs. 840. How much is invested at 8%?

- A. Rs. 4,000
- B. Rs. 6,000
- C. Rs. 8,000
- D. Rs. 10,000

Q5. Find the third proportional to 8 and 12.

- A. 12
- B. 14
- C. 16
- D. 18

Q6. A can complete a work in 10 days and B can complete it in 15 days. They work on alternate days, with A starting on Day 1. In how many days is the work completed?

- A. 12 days
- B. 10 days
- C. 11 days
- D. 15 days



Q7. Two persons start at the same time from towns P and Q, which are 300 km apart, and walk toward each other. One walks at 20 km/h and the other at 30 km/h. After how many hours do they meet?

- A. 5 hours
- B. 6 hours
- C. 8 hours
- D. 10 hours

Q8. Find the difference between the compound interest and the simple interest on Rs. 5,000 at 8% per annum for 2 years.

- A. Rs. 24
- B. Rs. 28
- C. Rs. 32
- D. Rs. 40



Detailed Solutions

Solution to Q1

Number System / Unit Digit

Solution

Concept: The unit digits of successive powers of 7 follow a repeating cycle of length 4: 7, 9, 3, 1, 7, 9, 3, 1, ...

Step 1 — Identify the cycle position of the exponent 53.

$$53 = 4 \times 13 + 1$$

The remainder when 53 is divided by 4 is 1.

Step 2 — Read off the unit digit.

A remainder of 1 corresponds to the *first* position in the cycle, whose unit digit is 7:

$$7^1 \rightarrow 7, \quad 7^2 \rightarrow 9, \quad 7^3 \rightarrow 3, \quad 7^4 \rightarrow 1, \quad 7^5 \rightarrow 7, \quad \dots$$

$$\text{Unit digit of } 7^{53} = 7$$

Why the other options are wrong:

- **A – 1:** Unit digit is 1 when the exponent is a multiple of 4 (remainder 0), e.g. $7^4, 7^8, \dots$
- **B – 3:** Unit digit is 3 when the exponent leaves remainder 3 on division by 4, e.g. $7^3, 7^7, \dots$
- **C – 9:** Unit digit is 9 when the exponent leaves remainder 2 on division by 4, e.g. $7^2, 7^6, \dots$

Answer: (D) 7

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

Solution to Q2

Percentage / Mixture

Solution

Concept: Adding water to a mixture increases only the water component; the milk quantity stays constant. Set up an equation so that the new ratio equals the target ratio.

Step 1 — Find the current quantities.



Total mixture = 50 litres, milk : water = 3 : 2:

$$\text{Milk} = \frac{3}{5} \times 50 = 30 \text{ litres}, \quad \text{Water} = \frac{2}{5} \times 50 = 20 \text{ litres}$$

Step 2 — Set up the equation for the target ratio 1 : 1.

Let x litres of water be added. For milk : water = 1 : 1, the amount of water must equal the amount of milk:

$$20 + x = 30 \implies x = 10 \text{ litres}$$

Verification: New mixture = 30 litres milk + 30 litres water = 60 litres; ratio = 1 : 1. ✓

Why the other options are wrong:

- **B – 5 litres:** Gives water = 25 L; ratio = 30 : 25 = 6 : 5 $\neq$ 1 : 1.
- **C – 15 litres:** Gives water = 35 L; ratio = 30 : 35 = 6 : 7 $\neq$ 1 : 1.
- **D – 20 litres:** Gives water = 40 L; ratio = 30 : 40 = 3 : 4 $\neq$ 1 : 1.

Answer: (A) 10 litres

Answer: (A) [Go Back to Q2](#)

Solution to Q3

Profit & Loss / Dishonest Shopkeeper

Solution

Concept: When a dishonest shopkeeper uses a false weight w grams instead of the standard W grams for every transaction (buying *and* selling), the overall profit percentage is:

$$\text{Profit\%} = \frac{W - w}{w} \times 100$$

Step 1 — Identify the true and false weights.

$$W = 1000 \text{ g (standard)}, \quad w = 900 \text{ g (actual weight used)}$$

Step 2 — Apply the formula.

$$\text{Profit\%} = \frac{1000 - 900}{900} \times 100 = \frac{100}{900} \times 100 = \frac{100}{9} \approx 11.11\%$$

Intuition: He pays for 900 g worth of goods at 1000 g price (buys cheap), and charges customers for 1000 g while delivering only 900 g (sells expensive). Both errors compound to give $\frac{100}{9}\%$ overall profit.



Why the other options are wrong:

- **A – 10%:** Uses $\frac{100}{1000} \times 100 = 10\%$; this incorrectly divides by 1000 instead of 900.
- **C – 12.5%:** Would arise from a false weight of $\frac{1000}{1+0.125} \approx 889$ g; not the case here.
- **D – 20%:** Significantly overstates the profit; no standard formula gives 20% for a 100-g shortfall on 1000 g.

Answer: (B) 11.11%

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

Solution to Q4

Simple Interest / Two Rates

Solution

Concept: Simple Interest = $\frac{P \times R \times T}{100}$. Set up a single equation using the two unknown parts of the investment and the known total interest.

Step 1 — Define the variable and write the interest equation.

Let Rs. x be the amount invested at 8%. Then Rs. $(12,000 - x)$ is invested at 5%. For $T = 1$ year:

$$\frac{x \times 8 \times 1}{100} + \frac{(12000 - x) \times 5 \times 1}{100} = 840$$

Step 2 — Solve for x .

$$8x + 5(12000 - x) = 84000$$

$$8x + 60000 - 5x = 84000$$

$$3x = 24000 \implies x = 8,000$$

Verification: Interest at 8% on Rs. 8,000 = Rs. 640; interest at 5% on Rs. 4,000 = Rs. 200; total = Rs. 840. ✓

Why the other options are wrong:

- **A – Rs. 4,000:** Interest = $0.08 \times 4000 + 0.05 \times 8000 = 320 + 400 = \text{Rs. } 720 \neq 840$.
- **B – Rs. 6,000:** Interest = $0.08 \times 6000 + 0.05 \times 6000 = 480 + 300 = \text{Rs. } 780 \neq 840$.
- **D – Rs. 10,000:** Interest = $0.08 \times 10000 + 0.05 \times 2000 = 800 + 100 = \text{Rs. } 900 \neq 840$.

Answer: (C) Rs. 8,000



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

Solution to Q5

Ratio & Proportion / Third Proportional

Solution

Concept: The *third proportional* z to two numbers a and b satisfies $a : b = b : z$, giving:

$$z = \frac{b^2}{a}$$

Step 1 — Set up the proportion.

$$\frac{8}{12} = \frac{12}{z}$$

Step 2 — Solve for z .

$$z = \frac{12 \times 12}{8} = \frac{144}{8} = 18$$

Check: $8 : 12 = 2 : 3$ and $12 : 18 = 2 : 3$. Both ratios are equal. ✓

Why the other options are wrong:

- **A – 12:** This is the *mean proportional* scenario where $8 : 12 = 12 : z$ would give $z = 18$; choosing $z = 12$ merely repeats b and gives ratio $8 : 12 \neq 12 : 12$.
- **B – 14:** $8 : 12 \neq 12 : 14$ (i.e. $2 : 3 \neq 6 : 7$).
- **C – 16:** $8 : 12 \neq 12 : 16$ (i.e. $2 : 3 \neq 3 : 4$).

Answer: (D) 18

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

Solution to Q6

Time & Work / Alternate Days

Solution

Concept: On alternate-day schedules, group the days into two-day cycles. Find the fraction of work done per cycle, then determine how many complete cycles exhaust the job.

Step 1 — Find work done per two-day cycle.

A's rate: $\frac{1}{10}$ per day. B's rate: $\frac{1}{15}$ per day.

$$\text{Work in 2 days} = \frac{1}{10} + \frac{1}{15} = \frac{3}{30} + \frac{2}{30} = \frac{5}{30} = \frac{1}{6}$$



Step 2 — Count complete cycles to finish the work.

$$\text{Number of 2-day cycles needed} = \frac{1}{\frac{1}{6}} = 6 \text{ cycles}$$

$$\text{Total days} = 6 \times 2 = 12 \text{ days}$$

Verification: After 12 days, A has worked on days 1, 3, 5, 7, 9, 11 (6 days) $\rightarrow 6 \times \frac{1}{10} = \frac{3}{5}$; B has worked on days 2, 4, 6, 8, 10, 12 (6 days) $\rightarrow 6 \times \frac{1}{15} = \frac{2}{5}$. Total = $\frac{3}{5} + \frac{2}{5} = 1$. ✓

Why the other options are wrong:

- **B – 10 days:** After 10 days (5 cycles), work done = $5 \times \frac{1}{6} = \frac{5}{6} < 1$; job is not yet finished.
- **C – 11 days:** After 10 days, $\frac{5}{6}$ is done; on Day 11, A adds $\frac{1}{10}$, giving $\frac{5}{6} + \frac{1}{10} = \frac{25+3}{30} = \frac{28}{30} < 1$; still not complete.
- **D – 15 days:** Over-estimates; the work finishes exactly at 12 days.

Answer: (A) 12 days

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

Solution to Q7

Speed & Distance / Meeting Point

Solution

Concept: When two objects move toward each other, their speeds add up. The time to meet is:

$$t = \frac{\text{Total distance}}{\text{Relative speed (sum of speeds)}}$$

Step 1 — Calculate the relative speed.

$$\text{Relative speed} = 20 + 30 = 50 \text{ km/h}$$

Step 2 — Calculate the time to meet.

$$t = \frac{300 \text{ km}}{50 \text{ km/h}} = 6 \text{ hours}$$

Verification: In 6 hours, person from P covers $20 \times 6 = 120$ km; person from Q covers $30 \times 6 = 180$ km. Total = $120 + 180 = 300$ km. ✓

Why the other options are wrong:

- **A – 5 hours:** In 5 hours, combined distance = $50 \times 5 = 250 \text{ km} < 300 \text{ km}$; they have not yet met.
- **C – 8 hours:** Uses an incorrect relative speed, e.g. the difference $30 - 20 = 10 \text{ km/h}$ giving $300/10 = 30 \text{ h}$, or some other mis-calculation.
- **D – 10 hours:** Divides the total distance only by one person's speed ($300/30 = 10$); ignores that the other person is also closing the gap.

Answer: (B) 6 hours

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

Solution to Q8

Compound Interest / CI minus SI

Solution

Concept: For a principal P , rate $R\%$ p.a., and $n = 2$ years:

$$SI = \frac{P \times R \times 2}{100}, \quad CI = P \left[\left(1 + \frac{R}{100} \right)^2 - 1 \right]$$

The difference $CI - SI$ equals the interest earned in the second year on the first year's interest, i.e. $\frac{P \times R^2}{100^2}$.

Step 1 — Calculate Simple Interest.

$$SI = \frac{5000 \times 8 \times 2}{100} = \text{Rs. } 800$$

Step 2 — Calculate Compound Interest.

$$A = 5000 \times (1.08)^2 = 5000 \times 1.1664 = \text{Rs. } 5,832$$

$$CI = 5832 - 5000 = \text{Rs. } 832$$

Step 3 — Find the difference.

$$CI - SI = 832 - 800 = \text{Rs. } 32$$

Quick formula check: $\frac{PR^2}{100^2} = \frac{5000 \times 64}{10000} = \frac{320000}{10000} = 32. \checkmark$

Why the other options are wrong:

- **A – Rs. 24:** Corresponds to $\frac{PR^2}{10000}$ with $P = 3750$, not Rs. 5,000.



- **B – Rs. 28:** Does not match any standard formula applied to $P = 5000$, $R = 8\%$, $n = 2$.
- **D – Rs. 40:** Would arise if the rate were $\approx 8.94\%$, not 8% .

Answer: (C) Rs. 32

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

Answer Key

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

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