MH CET LAW Basic Mathematics
Sample Paper – 8

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. What is the smallest number by which 1458 must be multiplied to make it a perfect square?

A. 2

B. 3

C. 6

D. 9

Q2. The price of sugar falls by 10%. By what percentage should a household increase its consumption so that the expenditure on sugar remains unchanged?

A. 9%

B. $11\frac{1}{9}\%$

C. 10%

D. 12%

Q3. A dealer buys a cycle for Rs. $1{,}500$ and spends Rs. 300 on its repair. He then sells it for Rs. $2{,}100$. Find his profit percentage.

A. 12%

B. 14%

C. $16\frac{2}{3}\%$

D. 20%

Q4. A borrower takes a loan of Rs. $5{,}200$ at 5% per annum simple interest. He repays the loan in 4 equal annual instalments. Find the annual instalment.

A. Rs. $1{,}300$

B. Rs. $1{,}400$

C. Rs. $1{,}500$

D. Rs. $1{,}560$

Q5. Find the mean proportional between 9 and 25.

A. 15

B. 17

C. 18

D. 21

Q6. 2 men and 3 boys can do a piece of work in 10 days; 3 men and 2 boys can do the same work in 8 days. In how many days can 2 men and 1 boy together complete the work?

A. 10 days

B. 12.5 days

C. 15 days

D. 20 days

Q7. Priya and Rohit start simultaneously from towns A and B respectively, which are 120 km apart, moving towards each other. Priya's speed is 30 km/h and Rohit's speed is 10 km/h. At what distance from town A do they meet?

A. 30 km

B. 60 km

C. 90 km

D. 100 km

Q8. A sum of money amounts to Rs. $6{,}250$ in 2 years and Rs. $6{,}875$ in 3 years at compound interest. Find the rate of interest per annum.

A. 8%

B. 9%

C. 12%

D. 10%

Detailed Solutions

Solution to Q1

Number System / Perfect Square

Solution

Concept: A perfect square has every prime factor appearing an even number of times in its prime factorisation. To make a number a perfect square, multiply it by whatever is needed to make all exponents even.

Step 1 — Prime-factorise 1458.

$$1458 = 2 \times 729 = 2 \times 3^6$$

Step 2 — Identify which prime factors have odd exponents.

In $2^1 \times 3^6$, the exponent of 2 is 1 (odd) while the exponent of 3 is 6 (even). To make the exponent of 2 even, we need one more factor of 2:

$$1458 \times 2 = 2^2 \times 3^6 = (2 \times 3^3)^2 = 54^2 = 2916 \quad \checkmark$$

The smallest multiplier is therefore **2**.

Why the other options are wrong:

- **B – 3:** $1458 \times 3 = 2 \times 3^7$; the exponent of 3 becomes odd and 2 remains odd — not a perfect square.
- **C – 6:** $1458 \times 6 = 2^2 \times 3^7$; exponent of 3 is still odd — not a perfect square.
- **D – 9:** $1458 \times 9 = 2 \times 3^8$; exponent of 2 remains odd — not a perfect square.

Answer: (A) 2

Answer: (A) Go Back to Q1

Solution to Q2

Percentage / Price Reduction and Consumption Increase

Solution

Concept: Expenditure = Price × Consumption. For expenditure to remain constant, any decrease in price must be offset by a proportional increase in consumption.

Step 1 — Set up the equation.

Let original price $= P$ and original consumption $= C$, so original expenditure $= PC$.

After a 10% fall: new price $= 0.9P$. Let new consumption $= C'$.

$$0.9P \times C' = PC \implies C' = \frac{C}{0.9} = \frac{10C}{9}$$

Step 2 — Calculate the percentage increase in consumption.

$$\text{Increase} = C' - C = \frac{10C}{9} - C = \frac{C}{9}$$

$$\text{Percentage increase} = \frac{C/9}{C} \times 100 = \frac{100}{9} = \mathbf{11\tfrac{1}{9}\%}$$

Why the other options are wrong:

- **A – 9%:** This is the percentage by which consumption must decrease if price rises by 10% (the reverse problem); not applicable here.
- **C – 10%:** A symmetric assumption that a 10% fall in price means a 10% rise in consumption; this is incorrect because the base for the consumption increase is the new (smaller) denominator.
- **D – 12%:** An overestimate with no basis in the standard formula.

Answer: (B) $11\frac{1}{9}\%$

Answer: (B) Go Back to Q2

Solution to Q3

Profit & Loss / Overhead Included in CP

Solution

Concept: The true Cost Price (CP) includes all expenses incurred before selling — purchase price plus repair, transport, etc.

Step 1 — Calculate total Cost Price.

$$\text{Total CP} = \text{Purchase price} + \text{Repair cost} = 1500 + 300 = \text{Rs. } 1{,}800$$

Step 2 — Calculate profit and profit percentage.

$$\text{Profit} = \text{SP} - \text{CP} = 2100 - 1800 = \text{Rs. } 300$$

$$\text{Profit \%} = \frac{\text{Profit}}{\text{CP}} \times 100 = \frac{300}{1800} \times 100 = \frac{100}{6} = 16\tfrac{2}{3}\%$$

Why the other options are wrong:

- **A – 12%:** Results from using CP $= 2500$ (an incorrect figure) or from a wrong formula.
- **B – 14%:** An intermediate mis-calculation; does not correspond to any correct reading of the given data.
- **D – 20%:** Arises from computing profit only on the purchase price (1500): $\frac{600}{1500} \times 100 = 40\%$; or from ignoring overhead entirely and using SP $-1500 = 600$ divided by $1500 \times 3 = 20\%$. In any case, repair cost must be included in CP.

Answer: (C) $16\frac{2}{3}\%$

Answer: (C) Go Back to Q3

Solution to Q4

Simple Interest / Annual Instalment

Solution

Concept: For Class 10 level problems, the equal-instalment approach under simple interest assumes the total repayment equals the principal plus the simple interest on the entire principal for the full loan period, divided equally among the instalments.

Step 1 — Calculate total Simple Interest for 4 years.

$$\text{SI} = \frac{P \times R \times T}{100} = \frac{5200 \times 5 \times 4}{100} = \text{Rs. } 1{,}040$$

Step 2 — Find total repayment and annual instalment.

$$\text{Total repayment} = P + \text{SI} = 5200 + 1040 = \text{Rs. } 6{,}240$$

$$\text{Annual instalment} = \frac{6240}{4} = \text{Rs. } \mathbf{1{,}560}$$

Why the other options are wrong:

- **A – Rs. 1,300:** This equals $\frac{5200}{4}$; it repays only the principal and ignores interest entirely.
- **B – Rs. 1,400:** An underestimate; would imply total repayment of Rs. 5,600 against total due of Rs. 6,240.
- **C – Rs. 1,500:** Would imply total repayment of Rs. 6,000, short by Rs. 240 of the full amount due.

Answer: (D) Rs. 1,560

Answer: (D) Go Back to Q4

Solution to Q5

Ratio & Proportion / Mean Proportional

Solution

Concept: The mean proportional m between two numbers a and b satisfies $\frac{a}{m} = \frac{m}{b}$, which gives $m^2 = ab$, so $m = \sqrt{ab}$.

Step 1 — Apply the formula.

$$m = \sqrt{9 \times 25} = \sqrt{225} = \mathbf{15}$$

Verification: $\frac{9}{15} = \frac{3}{5}$ and $\frac{15}{25} = \frac{3}{5}$. Both ratios are equal. ✓

Why the other options are wrong:

- **B – 17:** $17^2 = 289 \neq 225$.
- **C – 18:** $18^2 = 324 \neq 225$. Also, 18 is the arithmetic mean of 9 and $\frac{9+25}{2} = 17$, not 18.
- **D – 21:** $21^2 = 441 \neq 225$; 21 is the third proportional to 9 and some other number, not the mean proportional here.

Answer: (A) 15

Answer: (A) Go Back to Q5

Solution to Q6

Time & Work / Two Groups

Solution

Concept: Set up simultaneous equations using each group's combined daily work rate.

Step 1 — Form the equations.

Let m = fraction of work one man does per day and b = fraction one boy does per day.

$$2m + 3b = \tfrac{1}{10} \quad \cdots (1)$$
$$3m + 2b = \tfrac{1}{8} \quad \cdots (2)$$

Step 2 — Solve for b and m.

Multiply (1) by 3 and (2) by 2:

$$6m + 9b = \frac{3}{10}, \qquad 6m + 4b = \frac{1}{4}$$

Subtract the second from the first:

$$5b = \frac{3}{10} - \frac{1}{4} = \frac{6}{20} - \frac{5}{20} = \frac{1}{20} \implies b = \frac{1}{100}$$

Substitute back into (1):

$$2m = \frac{1}{10} - \frac{3}{100} = \frac{10}{100} - \frac{3}{100} = \frac{7}{100} \implies m = \frac{7}{200}$$

Step 3 — Find the combined rate for 2 men and 1 boy.

$$2m + b = \frac{14}{200} + \frac{2}{200} = \frac{16}{200} = \frac{2}{25}$$

$$\text{Days required} = \frac{25}{2} = \mathbf{12.5} \text{ days}$$

Why the other options are wrong:

- **A – 10 days:** Would require a combined rate of $\frac{1}{10}$, which equals $2m + 3b$ (the rate for 2 men *and* 3 boys), not 2 men and 1 boy.
- **C – 15 days:** An underestimate of the combined capacity; does not satisfy the equations.
- **D – 20 days:** Even further off; corresponds to a combined rate of $\frac{1}{20}$, well below what 2 men and 1 boy can manage.

Answer: (B) 12.5 days

Answer: (B) Go Back to Q6

Solution to Q7

Speed & Distance / Moving Toward Each Other

Solution

Concept: When two objects move toward each other, their speeds add up. They meet after time $t = \dfrac{\text{Total distance}}{\text{Sum of speeds}}$.

Step 1 — Find the time at which they meet.

$$t = \frac{120}{30 + 10} = \frac{120}{40} = 3 \text{ hours}$$

Step 2 — Find Priya's distance from town A.

Priya travels from A toward B at 30 km/h:

$$\text{Distance from A} = 30 \times 3 = \mathbf{90}\text{ km}$$

Check: Rohit travels from B at 10 km/h for 3 hours $= 30$ km from B, i.e., $120 - 30 = 90$ km from A. Both meet at 90 km from A. ✓

Why the other options are wrong:

- **A – 30 km:** This is Rohit's distance from town B (not the meeting point's distance from A).
- **B – 60 km:** Would be correct only if both had equal speeds ($60 : 60$ split); here Priya is three times faster, so she covers three-quarters of the distance.
- **D – 100 km:** An overestimate; Priya covers $\frac{30}{40} = \frac{3}{4}$ of $120 = 90$ km, not 100 km.

Answer: (C) 90 km

Answer: (C) Go Back to Q7

Solution to Q8

Compound Interest / Rate from Two Amounts

Solution

Concept: In compound interest, the amount for year $n+1$ equals the amount for year n multiplied by $\left(1 + \frac{R}{100}\right)$. Equivalently, the interest earned in any single year equals the rate applied to the amount at the beginning of that year.

Step 1 — Find the compound interest for the 3rd year.

$$\text{CI in 3rd year} = \text{Amount after 3 years} - \text{Amount after 2 years} = 6875 - 6250 = \text{Rs. } 625$$

Step 2 — Find the rate of interest.

The interest in the 3rd year is earned on the amount at the end of year 2 (i.e., Rs. 6,250):

$$R = \frac{\text{CI in 3rd year}}{\text{Amount at end of year 2}} \times 100 = \frac{625}{6250} \times 100 = \mathbf{10}\%$$

Verification: If $R = 10\%$, then $A_3 = 6250 \times 1.1 = \text{Rs. } 6875$. ✓

Why the other options are wrong:

- **A – 8%:** $6250 \times 0.08 = 500 \neq 625$; this rate produces Rs. 500 interest in year 3, not Rs. 625.

- **B – 9%:** $6250 \times 0.09 = 562.5 \neq 625$; insufficient to bridge the gap between the two amounts.
- **C – 12%:** $6250 \times 0.12 = 750 \neq 625$; this rate overshoots the observed annual growth.

Answer: (D) 10%

Answer: (D) Go Back to Q8

Answer Key

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

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