PPSC & FPSC MATHEMATICS MASTERCLASS

30 Essential Exam Questions — Complete Zero-Level Beginner Guide with Line-by-Line Explanations

MODULE 1: BASIC ARITHMETIC & PERCENTAGES

Question 1: If 20% of a number is 50, what is 50% of that same number?

- (A) 100
- (B) 125
- (C) 150
- (D) 200

> **BASIC CONCEPT (WHAT IS A PERCENTAGE?)**
> Percentage simply means "out of 100". For example, 20% means ***20/100*** or 0.20. In word problems, the word "of" means multiplication (×), and "is" means equal to (=).

1. **Step 1 (Find the unknown number):** Let us call the unknown number ***x***. The question says "20% of ***x*** is 50".
2. **Step 2 (Convert to equation):** Write it as: $(20 / 100) \times x = 50$.
3. **Step 3 (Simplify the fraction):** ***20 / 100*** reduces to ***1 / 5***. So, $(1 / 5) \times x = 50$.
4. **Step 4 (Solve for x):** Move 5 to the other side by multiplying: $x = 50 \times 5 = 250$. So the total original number is 250.
5. **Step 5 (Calculate 50% of 250):** 50% means half of the number. $(50 / 100) \times 250 = (1 / 2) \times 250 = 125$.

Correct Answer: (B) 125

Question 2: Express 0.04 as a percentage.

- (A) 0.4%
- (B) 4%
- (C) 40%
- (D) 0.04%

> **BASIC CONCEPT (CONVERTING DECIMAL TO PERCENTAGE)**
> To turn any decimal number into a percentage, you simply multiply it by 100 and add the percent symbol (***%***).

1. **Step 1:** Take the decimal number given in the question: ***0.04***.
2. **Step 2:** Multiply it by 100: 0.04×100.
3. **Step 3 (How to multiply decimals by 100):** When multiplying by 100 (which has two zeros), simply shift the decimal point two places to the right: ***0.04 → 0.4 → 4***.
4. **Step 4:** Add the percentage sign: ***4%***.

Correct Answer: (B) 4%

Question 3: A shopkeeper buys a book for Rs. 800 and sells it for Rs. 1000. What is his percentage profit?

- (A) 20%
- (B) 25%
- (C) 15%
- (D) 30%

BASIC CONCEPT (PROFIT & PERCENTAGE PROFIT)

Profit is the extra money made when Selling Price (SP) is higher than Cost Price (CP).

$\text{Profit} = \text{SP} - \text{CP}$ | $\text{Profit Percentage} = (\text{Profit} / \text{Cost Price}) \times 100$ (Always divide by Cost Price!).

1. **Step 1 (Identify given values):** Cost Price (CP) = 800, Selling Price (SP) = 1000.
2. **Step 2 (Calculate Profit in Rupees):** $\text{Profit} = 1000 - 800 = 200$.
3. **Step 3 (Apply Formula):** $\text{Profit \%} = (200 / 800) \times 100$.
4. **Step 4 (Simplify):** Cancel the zeros: $200 / 800 = 2 / 8 = 1 / 4$.
5. **Step 5 (Final Answer):** $(1 / 4) \times 100 = 25\%$.

Correct Answer: (B) 25%

Question 4: What is 15% of 200?

- (A) 20
- (B) 25
- (C) 30
- (D) 35

BASIC CONCEPT

"15%" means 15 out of 100 ($15/100$). "Of" means multiply ($\times$).

1. **Step 1 (Set up equation):** $(15 / 100) \times 200$.
2. **Step 2 (Cancel out zeros):** Divide 200 by 100, which leaves 2.
3. **Step 3 (Multiply):** $15 \times 2 = 30$.

Correct Answer: (C) 30

Question 5: A student scored 45 out of 60 marks in a test. What is the percentage of marks obtained?

- (A) 65%
- (B) 70%
- (C) 75%
- (D) 80%

BASIC CONCEPT

Percentage = $(\text{Marks Obtained} / \text{Total Marks}) \times 100$.

1. **Step 1:** Write the fraction: $45 / 60$.
2. **Step 2 (Simplify fraction):** Both 45 and 60 can be divided by 15. $45 \div 15 = 3$ and $60 \div 15 = 4$. So the fraction is $3 / 4$.
3. **Step 3 (Multiply by 100):** $(3 / 4) \times 100 = 3 \times 25 = 75\%$.

Correct Answer: (C) 75%

MODULE 2: RATIOS, PROPORTIONS & AVERAGES

Question 6: Divide Rs. 1200 between Ali and Sara in the ratio 3:5. How much does Sara get?

- (A) Rs. 450
- (B) Rs. 750
- (C) Rs. 500
- (D) Rs. 700

BASIC CONCEPT (RATIOS)

A ratio shows sharing parts. A ratio of 3:5 means the total amount is split into $3 + 5 = 8$ equal total parts.

1. **Step 1 (Find total ratio parts):** $3 + 5 = 8$ total parts .
2. **Step 2 (Find value of 1 part):** Divide total money by total parts: $1200 / 8 = 150$. So each part is worth Rs. 150.
3. **Step 3 (Calculate Sara's share):** Sara gets 5 parts: $5 \times 150 = \text{Rs. } 750$.
4. **Step 4 (Check Ali's share for verification):** Ali gets 3 parts: $3 \times 150 = 450$. $(450 + 750 = 1200)$. Correct!

Correct Answer: (B) Rs. 750

Question 7: Find the average of the following numbers: 10, 20, 30, 40, and 50.

- (A) 25
- (B) 30
- (C) 35
- (D) 40

BASIC CONCEPT (AVERAGE)

Average is single value that represents a set of numbers.

$\text{Average} = (\text{Sum of all items}) / (\text{Total count of items})$.

1. **Step 1 (Add all numbers):** $10 + 20 + 30 + 40 + 50 = 150$.
2. **Step 2 (Count how many numbers there are):** There are 5 numbers.
3. **Step 3 (Divide):** $150 / 5 = 30$.

Correct Answer: (B) 30

Question 8: The average of 4 numbers is 20. If three of the numbers are 15, 25, and 18, what is the fourth number?

- (A) 22
- (B) 24
- (C) 20
- (D) 28

BASIC CONCEPT

$\text{Total Sum} = \text{Average} \times \text{Total Count}$.

1. **Step 1 (Find total sum of 4 numbers):** $4 \times 20 = 80$.
2. **Step 2 (Add three known numbers):** $15 + 25 + 18 = 58$.
3. **Step 3 (Subtract to find missing number):** $\text{4th Number} = \text{Total Sum} - \text{Sum of 3 numbers} = 80 - 58 = 22$.

Correct Answer: (A) 22

Question 9: If 4 workers can complete a task in 12 days, how many days will 6 workers take to complete the same task working at the same pace?

- (A) 6 days
- (B) 8 days
- (C) 9 days
- (D) 18 days

BASIC CONCEPT (INVERSE PROPORTION)

More workers mean LESS time needed. When one variable goes up and the other goes down, it is an *inverse proportion*.

Rule: $\text{Workers1} \times \text{Days1} = \text{Workers2} \times \text{Days2}$.

1. **Step 1 (Calculate total work units):** Total work = $4 \text{ workers} \times 12 \text{ days} = 48 \text{ worker-days}$.
2. **Step 2 (Set up equation for 6 workers):** $6 \text{ workers} \times \text{Days} = 48$.
3. **Step 3 (Solve for Days):** $\text{Days} = 48 / 6 = 8 \text{ days}$.

Correct Answer: (B) 8 days

Question 10: If $x : 4 = 15 : 20$, find the value of x.

- (A) 2
- (B) 3
- (C) 4
- (D) 5

BASIC CONCEPT (CROSS MULTIPLICATION)

A ratio equality $a : b = c : d$ is written as fraction: $a / b = c / d$.

1. **Step 1 (Write as fractions):** $x / 4 = 15 / 20$.
2. **Step 2 (Simplify right fraction):** Divide top and bottom of $15 / 20$ by 5: $15 / 20 = 3 / 4$.
3. **Step 3 (Compare fractions):** $x / 4 = 3 / 4$.
4. **Step 4 (Conclusion):** Since denominators match (both 4), numerators must match: $x = 3$.

Correct Answer: (B) 3

MODULE 3: LINEAR EQUATIONS & AGE WORD PROBLEMS

Question 11: Solve for x: $3x + 7 = 22$.

- (A) 3
- (B) 5
- (C) 7
- (D) 4

> **BASIC CONCEPT (BALANCING EQUATIONS)**
> Whatever you do to one side of the equals sign (=), you must do to the other side. Goal: isolate x on one side.

1. **Step 1 (Remove addition/subtraction):** Move $+7$ to the right side by subtracting 7 from both sides: $3x = 22 - 7$.
2. **Step 2 (Calculate right side):** $3x = 15$.
3. **Step 3 (Remove multiplication):** Divide both sides by 3: $x = 15 / 3$.
4. **Step 4 (Final answer):** $x = 5$.

Correct Answer: (B) 5

Question 12: A father is 3 times as old as his son. If the sum of their ages is 48 years, how old is the son?

- (A) 10 years
- (B) 12 years
- (C) 14 years
- (D) 16 years

> **BASIC CONCEPT**
> Translate English sentences directly into algebraic symbols.

1. **Step 1 (Define unknown):** Let Son's age = x.
2. **Step 2 (Define Father's age):** Since father is 3 times older, Father's age = $3x$.
3. **Step 3 (Write sum equation):** $\text{Son's Age} + \text{Father's Age} = 48 \rightarrow x + 3x = 48$.
4. **Step 4 (Combine like terms):** $4x = 48$.
5. **Step 5 (Solve for x):** Divide by 4: $x = 48 / 4 = 12$.

Correct Answer: (B) 12 years

Question 13: 5 years ago, a mother was 4 times as old as her daughter. If the daughter is 10 years old now, how old is the mother now?

- (A) 20 years
- (B) 25 years
- (C) 30 years
- (D) 35 years

BASIC CONCEPT

Work backwards from present age to past age step by step.

1. **Step 1 (Daughter's past age):** Present age of daughter = 10. Five years ago, daughter's age = $10 - 5 = 5$ years old.
2. **Step 2 (Mother's past age):** 5 years ago, mother was 4 times older: $4 \times 5 = 20$ years old.
3. **Step 3 (Mother's present age):** Add 5 years to bring mother to present: $20 + 5 = 25$ years old.

Correct Answer: (B) 25 years

Question 14: Solve for y: $2(y - 3) = 14$.

- (A) 7
- (B) 8
- (C) 10
- (D) 12

BASIC CONCEPT (BRACKETS)

A number right outside brackets multiplies every term inside.

1. **Method 1 (Divide first):** Divide both sides by 2: $y - 3 = 14 / 2 = 7$.
2. **Step 2:** Add 3 to both sides: $y = 7 + 3 = 10$.

Correct Answer: (C) 10

Question 15: If $x/3 + 2 = 5$, what is the value of x?

- (A) 6
- (B) 9
- (C) 12
- (D) 15

BASIC CONCEPT

Isolate fraction term first, then remove denominator.

1. **Step 1:** Subtract 2 from both sides: $x / 3 = 5 - 2 = 3$.
2. **Step 2:** Multiply both sides by 3: $x = 3 \times 3 = 9$.

Correct Answer: (B) 9

MODULE 4: DISTANCE, SPEED, TIME & WORK

Question 16: A car travels at a constant speed of 60 km/h. How far will it travel in 2.5 hours?

- (A) 120 km
- (B) 140 km
- (C) 150 km
- (D) 160 km

BASIC CONCEPT

$\text{Distance} = \text{Speed} \times \text{Time}$.

1. **Step 1 (Identify values):** Speed = 60 km/h, Time = 2.5 hours.
2. **Step 2 (Apply formula):** $\text{Distance} = 60 \times 2.5$.
3. **Step 3 (Break down 2.5 into 2 + 0.5):**
   In 2 hours: $60 \times 2 = 120\ km$.
   In 0.5 hours (half hour): $60 \times 0.5 = 30\ km$.
4. **Step 4 (Total):** $120 + 30 = 150$ km.

Correct Answer: (C) 150 km

Question 17: Convert 72 km/h into meters per second (m/s).

- (A) 15 m/s
- (B) 20 m/s
- (C) 25 m/s
- (D) 30 m/s

SHORTCUT TRICK

To convert *km/h* to *m/s*, multiply by $5 / 18$.

1. **Step 1:** Take speed = 72.
2. **Step 2 (Multiply by 5/18):** $72 \times (5 / 18)$.
3. **Step 3 (Divide 72 by 18):** $72 / 18 = 4$.
4. **Step 4 (Multiply):** $4 \times 5 = 20$ m/s.

Correct Answer: (B) 20 m/s

Question 18: A train 100 meters long passes a pole in 5 seconds. What is the speed of the train in m/s?

- (A) 10 m/s
- (B) 15 m/s
- (C) 20 m/s
- (D) 25 m/s

BASIC CONCEPT

When a train passes a stationary point/pole, distance traveled = length of train.

$\text{Speed} = \text{Distance} / \text{Time}$.

1. **Step 1:** Distance = 100 meters, Time = 5 seconds.
2. **Step 2:** $\text{Speed} = 100 / 5 = 20$ m/s.

Correct Answer: (C) 20 m/s

Question 19: Person A can do a job in 6 days, and Person B can do the same job in 3 days. How many days will they take working together?

- (A) 2 days
- (B) 3 days
- (C) 4.5 days
- (D) 1.5 days

COMBINED WORK FORMULA

$\text{Combined Time} = (A \times B) / (A + B)$.

1. **Step 1 (Identify values):** A = 6, B = 3.
2. **Step 2 (Multiply top):** $6 \times 3 = 18$.
3. **Step 3 (Add bottom):** $6 + 3 = 9$.
4. **Step 4 (Divide):** $18 / 9 = 2 \text{ days}$.

Correct Answer: (A) 2 days

Question 20: How many seconds are there in 2 hours?

- (A) 3600 seconds
- (B) 7200 seconds
- (C) 1200 seconds
- (D) 5400 seconds

BASIC CONVERSION

1 Hour = 60 Minutes. 1 Minute = 60 Seconds.

Therefore, 1 Hour = $60 \times 60 = 3600 \text{ seconds}$.

1. **Step 1:** 2 hours = $2 \times 3600 \text{ seconds}$.
2. **Step 2:** $2 \times 3600 = 7200 \text{ seconds}$.

Correct Answer: (B) 7200 seconds

MODULE 5: GEOMETRY & BASIC ALGEBRA CONCEPTS

Question 21: Find the area of a rectangle whose length is 12 cm and width is 5 cm.

- (A) 34 sq cm
- (B) 60 sq cm
- (C) 50 sq cm
- (D) 120 sq cm

BASIC CONCEPT

$\text{Area of Rectangle} = \text{Length} \times \text{Width}$.

1. **Step 1:** Multiply given dimensions: $12 \text{ cm} \times 5 \text{ cm}$.
2. **Step 2:** $12 \times 5 = 60 \text{ sq cm}$.

Correct Answer: (B) 60 sq cm

Question 22: What is the perimeter of a square with a side length of 8 cm?

- (A) 16 cm
- (B) 32 cm
- (C) 64 cm
- (D) 24 cm

BASIC CONCEPT

Perimeter is the total boundary distance around a shape. A square has 4 equal sides.

$\text{Perimeter} = 4 \times \text{Side}$.

1. **Step 1:** $4 \times 8 \text{ cm} = 32 \text{ cm}$.

Correct Answer: (B) 32 cm

Question 23: Sum of interior angles of any triangle is always equal to:

- (A) 90 degrees
- (B) 180 degrees
- (C) 270 degrees
- (D) 360 degrees

FUNDAMENTAL RULE OF GEOMETRY

No matter what shape a triangle has (equilateral, isosceles, right-angled), adding its three internal angles together ALWAYS equals 180°.

1. **Direct Fact:** Total angles in any triangle = 180°.

Correct Answer: (B) 180 degrees

Question 24: If two angles of a triangle are 50° and 60°, find the third angle.

- (A) 50°
- (B) 60°
- (C) 70°
- (D) 80°

BASIC CONCEPT

$\text{Angle 1} + \text{Angle 2} + \text{Angle 3} = 180°$.

1. **Step 1 (Add known angles):** $50° + 60° = 110°$.
2. **Step 2 (Subtract from 180°):** $\text{Third Angle} = 180° - 110° = 70°$.

Correct Answer: (C) 70°

Question 25: What is the value of $7^2 - 3^2$?

- (A) 16
- (B) 40
- (C) 42
- (D) 58

BASIC CONCEPT (EXPONENTS/POWERS)

A squared number means multiplying the number by itself ($a^2 = a \times a$).

1. **Step 1 (Calculate 7^2):** $7 \times 7 = 49$.
2. **Step 2 (Calculate 3^2):** $3 \times 3 = 9$.
3. **Step 3 (Subtract):** $49 - 9 = 40$.

Correct Answer: (B) 40

MODULE 6: ORDER OF OPERATIONS & NUMBER PROPERTIES

Question 26: Evaluate: $10 + 5 \times 2 - 4$.

- (A) 26
- (B) 16
- (C) 22
- (D) 12

BODMAS / PEMDAS RULE

Math operations must follow strict order:
1. Brackets () 2. Orders/Exponents 3. Division & Multiplication (left to right) 4. Addition & Subtraction.

1. **Step 1 (Do multiplication first):** $5 \times 2 = 10$. Expression becomes: $10 + 10 - 4$.
2. **Step 2 (Addition next):** $10 + 10 = 20$. Expression becomes: $20 - 4$.
3. **Step 3 (Subtraction last):** $20 - 4 = 16$.

Correct Answer: (B) 16

Question 27: What is the square root of 144 ($\sqrt{144}$)?

- (A) 10
- (B) 11
- (C) 12
- (D) 14

BASIC CONCEPT

Square root asks: "What number multiplied by ITSELF equals 144?"

1. **Step 1 (Test numbers):**
   $10 \times 10 = 100$
   $11 \times 11 = 121$
   $12 \times 12 = 144$.
2. **Conclusion:** $\sqrt{144} = 12$.

Correct Answer: (C) 12

Question 28: Find the Least Common Multiple (LCM) of 4 and 6.

- (A) 12
- (B) 24
- (C) 18
- (D) 8

> **BASIC CONCEPT (LCM)**
> LCM is the SMALLEST positive number that is a multiple of both numbers.

1. **Step 1 (Write multiples of 4):** 4, 8, **12**, 16, 20, 24...
2. **Step 2 (Write multiples of 6):** 6, **12**, 18, 24...
3. **Step 3 (Find lowest common number):** The smallest number in both lists is 12.

Correct Answer: (A) 12

Question 29: Find the Highest Common Factor (HCF) of 12 and 18.

- (A) 2
- (B) 3
- (C) 6
- (D) 9

> **BASIC CONCEPT (HCF)**
> HCF is the LARGEST number that can divide both given numbers completely without leaving a remainder.

1. **Step 1 (List factors/divisors of 12):** 1, 2, 3, **6**, 12.
2. **Step 2 (List factors/divisors of 18):** 1, 2, 3, **6**, 9, 18.
3. **Step 3 (Find highest common factor):** The highest common number is 6.

Correct Answer: (C) 6

Question 30: What is the value of $(2^3 + 4) \div 3$?

- (A) 3
- (B) 4
- (C) 5
- (D) 6

STEP-BY-STEP EVALUATION

Follow brackets first, exponent inside bracket second, addition third, division last.

1. **Step 1 (Calculate exponent 2^3 inside bracket):** $2 \times 2 \times 2 = 8$.
2. **Step 2 (Add inside bracket):** $8 + 4 = 12$. Expression is now: $12 \div 3$.
3. **Step 3 (Divide):** $12 \div 3 = 4$.

Correct Answer: (B) 4