GetMax
TRAINING ACADEMY

# Practice Book with Answer Key

375 problems from easy to hard, topic by topic. Full step-by-step solutions are at the back: try each one first.

aptitude.getmaxsolutions.com · Every numeric answer in this book was checked by a program against the question before it was printed.

START HERE

# Start here: 3 easy methods that solve most questions

EASY 1. A shirt costs Rs 400. The shop gives 25% off. What do you pay?

EASY 2. Cost price Rs 500, selling price Rs 600. Profit percent?

EASY 3. A number is increased by 10% and then by 10% again. Total increase?

EASY 4. A can do a job in 12 days and B in 6 days. How long together?

EASY 5. Rs 900 is shared between A and B in the ratio 4 : 5. How much does B get?

EASY 6. The sum of two numbers is 50 and their difference is 10. The larger number? (a) 25 (b) 30 (c) 35 (d) 40

MEDIUM 7. A shopkeeper marks goods 50% above cost and gives a 20% discount. Profit percent?

MEDIUM 8. Pipe A fills a tank in 20 min, pipe B empties it in 30 min. Both open, how long to fill?

MEDIUM 9. A, B and C finish a job in 10, 12 and 15 days. Together?

MEDIUM 10. Five years ago a mother was 4 times her daughter's age. Now the mother is 41. The daughter's age now? (a) 9 (b) 14 (c) 12 (d) 10

SPEED MATHS

# Where these shortcuts come from

EASY 1. 1000 - 478 (Nikhilam)

MEDIUM 2. 100000 - 27394

MEDIUM 3. 738 × 999 (Ekanyunena)

HARD 4. Which sutra gives 996 × 993 fastest?

HARD 5. Which sutra gives $75^2$ fastest?

HARD 6. Which sutra gives 58 × 52 fastest?

SPEED MATHS

# Multiply without long multiplication

EASY 1. 76 × 74

EASY 2. 62 × 58

EASY 3. 4868 × 25

EASY 4. 736 × 125

EASY 5. 857 × 99

MEDIUM 6. 78 × 64

MEDIUM 7. 89 × 76

MEDIUM 8. 994 × 988

MEDIUM 9. 112 × 109

MEDIUM 10. 4789 × 11

HARD 11. 347 × 256

HARD 12. 623 × 418

HARD 13. 58 × 473

HARD 14. 104 × 93

HARD 15. 1234 × 5678 (hint: split 12|34 and 56|78 and criss-cross the pairs as if they were digits)

HARD 16. 867 × 934

HARD 17. 709 × 386

HARD 18. 47 × 865 (2-digit × 3-digit)

HARD 19. 9996 × 9989 (base 10000)

HARD 20. 1008 × 1012 (base 1000)

HARD 21. 998 × 1003

HARD 22. 87 × 83

HARD 23. 12345 × 11

HARD 24. 999 × 457

HARD 25. 48 × 52 × 25

SPEED MATHS

# Squares, cubes and roots in seconds

EASY 1. $95^2$

EASY 2. $115^2$

EASY 3. $56^2$

EASY 4. $44^2$

MEDIUM 5. $93^2$

MEDIUM 6. $113^2$

MEDIUM 7. Square root of 9409

MEDIUM 8. Square root of 5329

HARD 9. Cube root of 571787

HARD 10. Cube root of 438976

HARD 11. $998^2$

HARD 12. Square root of 15129

HARD 13. Cube root of 912673

HARD 14. Square root of 65536

HARD 15. $997^2$

HARD 16. $1005^2$

HARD 17. $106^2 + 94^2$

SPEED MATHS

# Percent-fraction table and quick checks

EASY 1. 62.5% of 1,352

EASY 2. 14.28% of 2,891 (approx 1/7)

MEDIUM 3. Which is the correct value of 487 × 36? (a) 17,532 (b) 17,542 (c) 17,432

MEDIUM 4. 83.33% of 2,454

MEDIUM 5. 11.11% of 5,868 + 9.09% of 4,741

SPEED MATHS

# Division, fractions and approximation under time pressure

EASY 1. Divide 2,375 by 25.

EASY 2. Which is larger, 5/7 or 7/10?

EASY 3. Divide 7,000 by 125.

MEDIUM 4. Arrange 3/5, 5/8, 4/7 in increasing order.

MEDIUM 5. Simplify: 18 + 6 / 3 × 2 - 4

MEDIUM 6. Approximately what is 49.98% of 801.2 + 24.9% of 399.7? (a) 480 (b) 500 (c) 520 (d) 560

MEDIUM 7. What is 3/7 as a decimal, to 6 places?

HARD 8. Approximately 1,249 / 24.96 + 19.97 × 5.02 = ? (a) 120 (b) 150 (c) 170 (d) 200

HARD 9. Which is the largest: 7/9, 11/14, 15/19?

QUANTITATIVE APTITUDE

# Number System

EASY 1. Least number that leaves remainder 4 when divided by 6, 9 and 15

EASY 2. HCF of two numbers is 16, LCM 480. One number is 96. Find the other.

EASY 3. What is the unit digit of $8^{43}$?

EASY 4. How many factors does 180 have?

EASY 5. How many zeros are at the end of 60!?

EASY 6. Find the least number which when divided by 12, 16 and 24 leaves remainder 5 each time.

MEDIUM 7. Unit digit of $7^{95} \times 3^{58}$

MEDIUM 8. Remainder when $17 \times 23 \times 29$ is divided by 12

MEDIUM 9. Largest 4-digit number divisible by 12, 15 and 18

MEDIUM 10. Number of trailing zeros in 250!

HARD 11. Greatest number that divides 1657 and 2037 leaving remainders 6 and 5

HARD 12. Find the digit * so that 73*54 is divisible by 11

HARD 13. Remainder when $3^{250}$ is divided by 13

HARD 14. Remainder when $7^{100}$ is divided by 13

HARD 15. How many factors does 1800 have?

HARD 16. Sum of all factors of 72

HARD 17. Highest power of 7 that divides 1000!

HARD 18. Smallest number that leaves remainder 3 when divided by 5, 6, 7, 8 but is divisible by 9

HARD 19. Unit digit of $2^{2026} \times 3^{2027} \times 7^{2028}$

QUANTITATIVE APTITUDE

# Percentage

EASY 1. If A's income is 25% more than B's, by what % is B's income less than A's?

EASY 2. Sugar price rises 25%. By what % must a family cut consumption to keep spending the same?

EASY 3. A town of 1,00,000 grows 10% in year 1 and falls 10% in year 2. Population after 2 years?

EASY 4. What is 45% of 360?

EASY 5. A number increased by 15% becomes 460. Find the number.

MEDIUM 6. Ravi spends 80% of his income. Income rises 20% and spending rises 10%. By what % do his savings rise?

MEDIUM 7. A number is raised 20% and then cut 25%, giving 540. Find the number.

MEDIUM 8. If A is 50% more than B, by what percent is B less than A?

HARD 9. In an election between 2 candidates, 10% of votes were invalid. The winner got 58% of valid votes and won by 1,440. Total votes cast?

HARD 10. Price of petrol rises 20% and then another 10%. By how much must consumption fall (overall) to keep the bill the same? (2 d.p.)

HARD 11. The value of a machine depreciates 10% a year. It is worth Rs 72,900 after 3 years. Original value?

HARD 12. 65% passed English, 60% passed Maths, 25% failed both. What % passed both?

HARD 13. A salary is cut 20% and then raised 20%, giving Rs 9,600. Original salary?

HARD 14. A earns 50% more than B; B earns 20% less than C. A's salary is what % of C's?

HARD 15. A population rises 10%, then 20%, then falls 10%, reaching 11,880. Starting population?

HARD 16. A student needs 36% to pass. She scores 150 and fails by 30 marks. Maximum marks?

QUANTITATIVE APTITUDE

# Profit and Loss

EASY 1. CP of 15 pens = SP of 12 pens. Profit %?

EASY 2. A dealer sells at cost price but uses a 900 g weight for 1 kg. Gain % (2 d.p.)?

MEDIUM 3. Two cycles are sold at Rs 990 each, one at 10% profit and the other at 10% loss. Net result?

MEDIUM 4. By selling an article for Rs 720, a man loses 10%. At what price should he sell to gain 15%?

MEDIUM 5. A man buys oranges at 6 for Rs 5 and sells at 5 for Rs 6. Profit %?

HARD 6. If the SP is doubled, the profit triples. Profit %?

HARD 7. Selling at Rs 1,040 gives the same % profit as the % loss when selling at Rs 880. CP?

HARD 8. Two articles sell for Rs 1,200 each, one at 20% gain and one at 20% loss. Net result in rupees?

HARD 9. A trader cheats 20% when buying (takes 1200 g for 1 kg) and 20% when selling (gives 800 g for 1 kg), and sells at cost price. Gain %?

HARD 10. Selling 33 m of cloth gains the selling price of 11 m. Gain %?

HARD 11. An article is sold at 20% profit. Bought 20% cheaper and sold Rs 75 cheaper, the profit would be 25%. CP?

QUANTITATIVE APTITUDE

# Discount

EASY 1. MP Rs 1,200, successive discounts 20% and 10%. SP?

EASY 2. MP is 40% above CP; a 20% discount is given. Profit %?

EASY 3. Buy 4 get 1 free. Effective discount?

MEDIUM 4. Single discount equal to 20%, 10% and 5% successively? (1 d.p.)

MEDIUM 5. A trader marks goods 50% above CP and gives discounts of 20% and 10%. Profit %?

HARD 6. After a 12% discount a shirt sells for Rs 1,452 at a 10% profit. CP?

HARD 7. A shop gives 10% off and still makes 17% profit. If it gave no discount, profit % would be?

HARD 8. What must the MP be above CP so that a 12.5% discount still gives 40% profit?

HARD 9. Two successive discounts x% and 10% equal a single discount of 28%. x?

HARD 10. Three successive 10% discounts equal what single discount?

QUANTITATIVE APTITUDE

# Ratio and Proportion

EASY 1. A:B = 2:3 and B:C = 4:5. A:B:C?

EASY 2. Divide Rs 1,300 in the ratio 1/2 : 1/3 : 1/4. Largest share?

EASY 3. Mean proportional of 9 and 16?

EASY 4. Third proportional to 4 and 6?

MEDIUM 5. Two numbers are 3:5. Adding 10 to each makes it 5:7. The larger number?

MEDIUM 6. What must be added to each of 6, 10, 14 and 22 so they become proportional?

HARD 7. Salaries of A and B are 2:3. Both get Rs 4,000 raises and the ratio becomes 3:4. B's new salary?

HARD 8. Incomes of A and B are 5:4, expenses 3:2, and each saves Rs 1,600. A's income?

HARD 9. Rs 5,625 is shared so that A gets half of what B and C together get, and B gets a quarter of what A and C together get. C's share?

QUANTITATIVE APTITUDE

# Partnership

EASY 1. A invests Rs 20,000 for the year. B invests Rs 30,000 after 4 months. Profit Rs 18,000. B's share?

MEDIUM 2. A is a working partner getting 10% of profit as salary; the rest is split 3:2 (A:B). Profit Rs 50,000. A's total?

MEDIUM 3. A starts with Rs 3,500. After 5 months B joins. Profit is split 2:3 at the year end. B's capital?

HARD 4. A, B, C invest 5,000, 6,000, 8,000 for 12, 10, 6 months. Profit Rs 7,000. C's share?

HARD 5. Profit ratio of A, B, C is 5:7:8 and their time ratio is 3:4:5. Capital ratio?

HARD 6. A invests 3 times B, and B invests 2/3 of what C invests. Profit Rs 6,600. B's share?

HARD 7. A and B invest in 3:5. After 4 months A withdraws half his capital. Year-end profit Rs 5,600. A's share?

QUANTITATIVE APTITUDE

# Simple Interest

EASY 1. SI on Rs 5,000 at 8% for 3 years?

EASY 2. A sum doubles in 8 years at SI. In how many years will it triple?

MEDIUM 3. Rs 12,000 is lent partly at 8% and partly at 12% SI. Total interest after 1 year is Rs 1,140. Amount lent at 8%?

MEDIUM 4. At what rate will SI be 3/8 of the principal in 6 years?

HARD 5. A sum becomes 3/2 of itself in 10 years at SI. Rate?

HARD 6. SI on a sum for 3 years at 12% is Rs 5,400 less than the sum. The sum?

QUANTITATIVE APTITUDE

# Compound Interest

EASY 1. Difference between CI and SI on Rs 15,000 for 2 years at 8%?

EASY 2. CI on Rs 8,000 at 10% p.a. compounded half-yearly for 1 year?

EASY 3. A sum doubles in 5 years at CI. In how many years does it become 8 times?

EASY 4. Find the amount on Rs 5,000 at 20% a year compounded yearly for 2 years.

MEDIUM 5. Difference between CI and SI on Rs 10,000 for 3 years at 10%?

MEDIUM 6. CI on Rs 16,000 at 20% p.a. compounded quarterly for 9 months?

HARD 7. A sum at CI becomes Rs 6,050 in 2 years and Rs 6,655 in 3 years. Principal?

HARD 8. CI - SI on a sum for 2 years at 5% is Rs 25. The sum?

HARD 9. Rs 8,000 is borrowed at 10% CI. Rs 4,400 is repaid after year 1. Amount to clear it after year 2?

HARD 10. What sum becomes Rs 4,913 in 3 years at 6.25% CI?

HARD 11. A loan of Rs 2,100 is repaid in 2 equal yearly instalments at 10% CI. Each instalment?

QUANTITATIVE APTITUDE

# Time and Work

EASY 1. A can do a job in 12 days, B in 18. Together?

EASY 2. 12 men working 8 h a day finish in 18 days. How many days for 16 men at 9 h a day?

MEDIUM 3. A+B do a job in 12 days, B+C in 15, C+A in 20. How long for A alone?

MEDIUM 4. A takes 20 days, B 30. They start together, but A leaves 5 days before the end. Total days?

MEDIUM 5. A is twice as good as B; together they finish in 14 days. A alone?

HARD 6. 10 men finish a job in 15 days; 15 women finish it in 12. How many days for 5 men and 6 women?

HARD 7. A is 50% more efficient than B. Together they finish in 18 days. A alone?

HARD 8. 20 men can finish a job in 30 days. After 10 days, 5 men leave. How many more days to finish?

HARD 9. 2 men and 3 women finish a job in 10 days; 3 men and 2 women in 8 days. How long for 2 men and 1 woman?

HARD 10. A takes 6 days, B 8 days; with C they finish in 3 days. The fee is Rs 3,200. C's share?

HARD 11. A takes 10 days, B 15. They work together, but A leaves after 2 days. How many more days does B need?

QUANTITATIVE APTITUDE

# Pipes and Cisterns

EASY 1. A fills in 20 min, B empties in 30 min. Both open?

EASY 2. A fills in 12 h, B in 15 h, C empties in 20 h. All open?

MEDIUM 3. A and B fill a tank in 20 and 30 min. Both are opened; after how many minutes must B be closed so the tank fills in exactly 15 min?

HARD 4. A fills in 6 h, B in 8 h, opened alternately for 1 hour each, A first. Time to fill?

HARD 5. Two pipes fill in 10 and 12 h; an outlet empties in 20 h. All open, but the outlet is closed after 2 h. Total time? (hours)

HARD 6. Two inlets fill a tank in 12 and 15 min. With an outlet also open, it fills in 20 min. Outlet alone empties it in?

HARD 7. One pipe fills a tank in 4 h. When it is half full, 3 more identical pipes are opened. Total time?

QUANTITATIVE APTITUDE

# Time and Distance

EASY 1. A car goes at 40 km/h one way and 60 km/h back. Average speed?

MEDIUM 2. At 5 km/h a man is 10 min late; at 6 km/h he is 5 min early. Distance?

MEDIUM 3. A thief runs at 8 km/h. A policeman starts 10 min later at 10 km/h. When does he catch him (minutes after he starts)?

HARD 4. A covers a distance at 3 speeds 10, 20, 30 km/h over equal thirds. Average speed? (2 d.p.)

HARD 5. A walks at 4 km/h. 4 hours later B cycles after him at 10 km/h. How far from the start does B catch A?

HARD 6. A man covers half a journey at 30 km/h. What speed on the second half gives an average of 40 km/h?

HARD 7. Going 20% faster, a car arrives 10 min early. Usual time?

QUANTITATIVE APTITUDE

# Problems on Trains

EASY 1. A 150 m train at 54 km/h passes a pole in?

EASY 2. A 150 m train at 72 km/h crosses a 250 m platform in?

EASY 3. How long does a train 150 m long, running at 54 km/h, take to pass a telegraph post?

MEDIUM 4. Trains 120 m and 180 m long run towards each other at 50 and 40 km/h. Time to cross?

MEDIUM 5. Trains 100 m and 80 m, same direction, 60 and 42 km/h. Time for the faster to pass the slower?

HARD 6. Two trains leave A and B towards each other at the same time. After meeting, they take 9 h and 16 h to reach B and A. Ratio of speeds?

HARD 7. A train at 54 km/h passes a man walking at 6 km/h in the same direction in 12 s. Length of the train?

HARD 8. A train passes two men walking the same way at 2 km/h and 4 km/h in 9 s and 10 s. Train speed?

HARD 9. Trains of 150 m and 200 m cross each other in 10 s going opposite ways and in 50 s going the same way. Faster train's speed in m/s?

QUANTITATIVE APTITUDE

# Boats and Streams

EASY 1. Boat 15 km/h in still water, stream 3 km/h. Time for 36 km down and back?

MEDIUM 2. A boat takes twice as long upstream as downstream for the same distance. Boat 9 km/h. Stream?

HARD 3. A man rows 48 km and back in 14 h. He can row 4 km downstream in the time he rows 3 km upstream. Stream speed?

HARD 4. A boat goes 30 km upstream and 44 km downstream in 10 h, and 40 km up and 55 km down in 13 h. Stream speed?

QUANTITATIVE APTITUDE

# Averages

EASY 1. Average of 5 consecutive odd numbers is 61. Largest?

EASY 2. 40 students average 50, another 60 average 60. Combined average?

EASY 3. Average weight of 8 people rises 2.5 kg when one weighing 65 kg is replaced. New person's weight?

EASY 4. Average of first 50 even numbers?

MEDIUM 5. Average of 11 numbers is 60. First six average 58, last six average 63. The 6th number?

MEDIUM 6. A batsman scores 85 in his 17th innings and raises his average by 3. New average?

MEDIUM 7. A batsman's average after 16 innings is 36. After the 17th his average is 38. What did he score in the 17th?

HARD 8. The average of 4 numbers is 42. The first is twice the second, the second is twice the third, and the fourth is 24 more than the third. Find the fourth.

HARD 9. The average of 30 marks was 60, but an 80 was read as 50. Correct average?

HARD 10. Replacing two men aged 20 and 24 by two women raises the average of 10 people by 2. Average age of the women?

HARD 11. A batsman averages 40 in 20 innings. His highest score beats his lowest by 100. Leaving both out, the average is 38. Highest score?

QUANTITATIVE APTITUDE

# Ages

EASY 1. The sum of ages of 5 children born 3 years apart is 50. Youngest?

MEDIUM 2. Ten years ago A was half B's age. Their present ages are 3:4. Sum of present ages?

MEDIUM 3. A is 4 years more than twice B's age; the product of their ages is 240. A's age?

MEDIUM 4. A couple's average age at marriage was 23. Five years later, with one child, the family's average age is 20. Child's age?

HARD 5. A father's age is twice the sum of his two children's ages. In 20 years his age will equal the sum of theirs. Father's age now?

HARD 6. Six years ago Ravi was 3 times as old as Sita. Six years from now he will be twice her age. Ravi's age now?

HARD 7. The ratio of A's and B's ages is 5:7. After 8 years it will be 7:9. The age difference?

HARD 8. A and B are 6:5 and their ages add to 44. Ratio after 8 years?

HARD 9. Three years ago a family of 5 averaged 17 years. A baby has since been born, and the average is still 17. Baby's age?

HARD 10. A mother is 4 times her daughter's age. In 5 years she will be 3 times. Mother's age now?

HARD 11. Two brothers differ by 10 years. 15 years ago the elder was twice the younger. Elder's age now?

QUANTITATIVE APTITUDE

# Mixtures and Alligation

EASY 1. A milkman adds water and sells at cost price, gaining 25%. Water:milk?

EASY 2. How much water must be added to 60 L of 80% milk solution so that milk becomes 60%?

MEDIUM 3. A 40 L can of milk: 4 L removed and replaced with water, three times. Milk left (L)?

MEDIUM 4. 60 L mixture of milk:water = 2:1. Water to add to make it 1:2?

HARD 5. Alloys gold:copper 7:2 and 7:11 are mixed in equal amounts. Gold:copper in the new alloy?

HARD 6. Teas at Rs 126 and 135 per kg are mixed with a third variety in 1:1:2. The mix is worth Rs 153/kg. Price of the third?

HARD 7. 729 L of milk and water is 7:2. How much water must be added to make it 7:3?

HARD 8. From a can of pure milk, 10% is removed and replaced with water, four times. % of milk left?

HARD 9. Vessel A is milk:water 5:3, vessel B is 1:3. In what ratio must they be mixed to get 1:1?

HARD 10. Sugar at Rs 20/kg and Rs 30/kg is mixed and sold at Rs 27.60, making 15% profit. Ratio?

QUANTITATIVE APTITUDE

# Mensuration

EASY 1. Find the area of a triangle with base 12 cm and height 9 cm.

EASY 2. The parallel sides of a trapezium are 9 cm and 15 cm and the height is 6 cm. Find its area.

EASY 3. The diagonals of a rhombus are 10 cm and 24 cm. Find its area.

EASY 4. A circle has circumference 44 cm (π = 22/7). Find its area.

EASY 5. A cylinder has radius 7 cm and height 10 cm (π = 22/7). Find its volume.

EASY 6. Find the area of a triangle with sides 13, 14 and 15.

EASY 7. A cube has a diagonal of 6 √(3) cm. Find its volume.

EASY 8. How many 2 cm cubes can be cut from a cuboid 10 × 8 × 6 cm?

EASY 9. Two angles of a triangle are 35° and 55°. What kind of triangle is it by its angles?

EASY 10. Each side of a rectangle is increased by 20%. By what percent does its area increase?

MEDIUM 11. A parallelogram has sides 12 cm and 8 cm, and the height on the 12 cm side is 5 cm. Find its area.

MEDIUM 12. The diagonals of a rhombus are 30 cm and 16 cm. Find its perimeter.

MEDIUM 13. Each interior angle of a regular polygon is 150°. How many sides does it have?

MEDIUM 14. How many diagonals does a regular octagon have?

MEDIUM 15. Find the perimeter of a semicircular plate of radius 14 cm (π = 22/7).

MEDIUM 16. Find the area of a sector of angle 60° in a circle of radius 21 cm (π = 22/7).

MEDIUM 17. A sphere has radius 21 cm (π = 22/7). Find its volume.

MEDIUM 18. A cone has radius 6 and height 8. Find its curved surface area in terms of π.

MEDIUM 19. A wire bent into a square of area 121 sq cm is re-bent into a circle. Find the area of the circle (π = 22/7).

HARD 20. An isosceles trapezium has parallel sides 6 cm and 18 cm, and each slanted side is 10 cm. Find its area.

HARD 21. A hemispherical bowl of radius 9 cm is full of liquid, which is poured into cylinders of radius 1.5 cm and height 4 cm. How many cylinders are filled?

HARD 22. A rectangle's length rises 20% and its breadth falls 20%. What is the change in area?

HARD 23. A bucket (frustum) has radii 14 cm and 7 cm and height 15 cm. Find its capacity (π = 22/7).

HARD 24. A circular path 7 m wide runs around the outside of a park of radius 35 m. Find the area of the path (π = 22/7).

HARD 25. A regular hexagon has side 4 cm. Find its area in terms of √(3).

HARD 26. The radius of a sphere is doubled. How many times does its volume become?

HARD 27. Water flows through a pipe of radius 2 cm at 7 m per minute into a cylindrical tank of radius 20 cm. By how much does the water level rise in 10 minutes?

QUANTITATIVE APTITUDE

# Probability

EASY 1. A die is thrown once. What is the probability of getting a prime number?

EASY 2. Three coins are tossed. What is the probability of getting at least two heads?

EASY 3. Two dice are thrown. What is the probability that the sum is at least 10?

EASY 4. One card is drawn from a pack of 52. What is the probability that it is a king or a heart?

EASY 5. A bag has 4 white and 6 black balls. One is drawn. What is the probability it is not white?

EASY 6. A number is chosen from 1 to 50. What is the probability that it is a perfect square?

EASY 7. Two dice are thrown. What is the probability of a doublet?

MEDIUM 8. A bag has 5 red and 4 blue balls. Two are drawn together. What is the probability both are red?

MEDIUM 9. A family has two children and at least one is a boy. What is the probability both are boys?

MEDIUM 10. Three dice are thrown. What is the probability that all three show different numbers?

MEDIUM 11. Two cards are drawn together from a pack of 52. What is the probability that one is a spade and one is a heart?

MEDIUM 12. Two dice are thrown. What is the probability that the product of the numbers is even?

MEDIUM 13. A bag has 3 red and 5 black balls. Two are drawn together. What is the probability of one of each colour?

MEDIUM 14. The odds in favour of an event are 3 : 5. What is the probability that it does NOT happen?

MEDIUM 15. A die is thrown twice. What is the probability that the second number is greater than the first?

HARD 16. A and B solve a problem independently with probabilities 1/2 and 1/3. What is the probability that the problem gets solved?

HARD 17. Three students solve a problem independently with probabilities 1/2, 1/3 and 1/4. What is the probability that the problem gets solved?

HARD 18. Two cards are drawn one after another without replacement. What is the probability both are aces?

HARD 19. A speaks the truth 3/4 of the time and B 4/5 of the time. What is the probability they contradict each other on a statement?

HARD 20. The letters of ASSASSIN are arranged at random. What is the probability that all four S come together?

HARD 21. Two dice are thrown. Given that the sum is even, what is the probability that it is 8?

HARD 22. A box has 6 good and 4 defective bulbs. 3 are picked at random. What is the probability that at least one is defective?

HARD 23. A coin is tossed 6 times. What is the probability of getting exactly 4 heads?

HARD 24. Four people are chosen from 5 men and 4 women. What is the probability that exactly 2 are women?

QUANTITATIVE APTITUDE

# Permutation and Combination

EASY 1. Arrangements of the letters of LEADER?

EASY 2. A committee of 3 men and 2 women from 6 men and 5 women?

EASY 3. Ways to seat 6 people round a table?

EASY 4. Arrangements of BANANA?

EASY 5. Number of diagonals in a decagon?

MEDIUM 6. 4-digit numbers with no repeated digit?

HARD 7. In how many ways can 5 boys and 3 girls sit in a row so that no two girls sit together?

HARD 8. A team of 5 is chosen from 7 men and 4 women with at least 2 women. Ways?

HARD 9. Arrangements of the letters of MATHEMATICS?

HARD 10. In how many ways can 5 letters go into 5 addressed envelopes so that none is in the right one?

HARD 11. 5 boys and 5 girls sit in a row, alternating. Ways?

HARD 12. 12 points, 5 of them on one line. How many triangles?

HARD 13. Choose 4 from 10 people so that 2 particular people are always in. Ways?

QUANTITATIVE APTITUDE

# Data Interpretation

EASY 1. Sales (Rs crore) 2024 / 2025: A 120/150, B 200/210, C 80/104, D 160/144, E 140/175. Highest % growth?

EASY 2. Same table: average 2025 sales?

EASY 3. Same table: B's 2024 sales : E's 2025 sales?

EASY 4. Monthly budget Rs 60,000: rent 30%, food 25%, transport 10%, savings 20%, other 15%. Central angle for food?

EASY 5. Same budget: by how much does food exceed transport?

MEDIUM 6. Same table: overall % growth from 2024 to 2025 (2 d.p.)?

HARD 7. Same sales table: company B's share of total 2025 sales (2 d.p.)?

HARD 8. Production (thousand units) 2021-2025: 40, 50, 45, 60, 72. Which year had the highest % growth over the year before?

LOGICAL REASONING

# Series

EASY 1. 2, 6, 12, 20, 30, ?

EASY 2. 3, 7, 15, 31, 63, ?

EASY 3. 1, 8, 27, 64, 125, ?

EASY 4. 5, 11, 23, 47, 95, ?

MEDIUM 5. Wrong number: 2, 5, 10, 17, 26, 38, 50

MEDIUM 6. 4, 6, 12, 14, 28, 30, ?

MEDIUM 7. AZ, CX, EV, GT, ?

HARD 8. 1, 2, 6, 15, 31, 56, ?

HARD 9. 3, 5, 9, 17, 33, ?

HARD 10. 7, 26, 63, 124, ?

HARD 11. 1, 4, 27, 256, ?

HARD 12. 2, 3, 5, 7, 11, 13, ? (next two terms)

LOGICAL REASONING

# Coding and Decoding

EASY 1. If COMPUTER is coded DPNQVUFS, how is MOUSE coded?

EASY 2. If CAT = 24 (sum of positions), DOG = ?

EASY 3. If MANGO is coded OCPIQ, how is APPLE coded?

MEDIUM 4. If GREEN is coded TIVVM (reverse alphabet), how is BLUE coded?

MEDIUM 5. If 'water' is called 'air', 'air' is called 'fire', and 'fire' is called 'sky', what do fish live in?

MEDIUM 6. If TEACHER is coded VGCEJGT, how is STUDENT coded?

HARD 7. If FRIEND is coded HUMJTK, how is CANDLE coded?

LOGICAL REASONING

# Directions

EASY 1. From home, walk 5 km east, 12 km north. Straight-line distance?

MEDIUM 2. Ravi walks 10 m north, turns right and walks 6 m, turns right and walks 18 m. How far (m) and which way from start?

MEDIUM 3. In the morning, Sita stands facing a pole; the pole's shadow falls to her right. Which way is she facing?

MEDIUM 4. A man faces north, turns 90 clockwise, then 180 anticlockwise, then 45 clockwise. Which way does he face?

HARD 5. A goes 4 km south, turns left and walks 3 km, turns left again and walks 8 km. Distance from start?

HARD 6. From home, walk 7 km north, turn right and walk 4 km, turn right and walk 1 km, turn left and walk 4 km. Distance from home?

LOGICAL REASONING

# Analogy

EASY 1. Doctor : Hospital :: Teacher : ?

EASY 2. 7 : 50 :: 9 : ?

EASY 3. Cow : Calf :: Dog : ?

EASY 4. ACE : BDF :: GIK : ?

MEDIUM 5. 11 : 1331 :: 13 : ?

MEDIUM 6. BCD : YXW :: FGH : ?

LOGICAL REASONING

# Ranking

EASY 1. Ram is 12th from the left and 18th from the right in a row. How many are in the row?

EASY 2. In a class of 40, Sita is 15th from the top. Rank from the bottom?

EASY 3. A and B are 10th and 25th from the left in a row of 40. How many between them?

MEDIUM 4. A is 14th from the left, B is 17th from the right, and there are 5 people between them (A to the left of B). Total?

MEDIUM 5. A and B swap places. A was 8th from the left and moves to 15th from the left; B was 12th from the right. B's new rank from the right?

HARD 6. Rita is 12th from the left, Mona 4th from the right. They swap, and Rita is now 15th from the left. How many are in the row?

LOGICAL REASONING

# Syllogisms

EASY 1. All pens are books. All books are tables. Does 'All pens are tables' follow?

EASY 2. Some roses are flowers. All flowers are plants. Does 'Some roses are plants' follow?

MEDIUM 3. All boys are girls. No girl is a teacher. Does 'No boy is a teacher' follow?

MEDIUM 4. Some apples are mangoes. Some mangoes are grapes. Does 'Some apples are grapes' follow?

HARD 5. No car is a bus. All buses are trucks. Conclusions: I. Some trucks are not cars. II. No truck is a car.

LOGICAL REASONING

# Seating Arrangement

EASY 1. Eight people around a round table, equally spaced. How many different people can sit directly opposite a given person?

MEDIUM 2. A, B, C, D, E, F sit around a round table facing the centre. A is opposite D. B is to A's immediate right (from A's view, i.e. anticlockwise when drawn). C is opposite B. Who is opposite E?

HARD 3. P, Q, R, S, T sit in a row facing north. R is in the middle. P is at the right end. S is immediately left of R. Q is not at an end. Who is at the left end?

LOGICAL REASONING

# Statements: Assumptions and Conclusions

EASY 1. Statement: 'Please book tickets in advance to avoid last-minute rush.' Assumption: there is usually a rush at the last minute.

EASY 2. Statement: 'All students who scored above 90% will get a scholarship. Ravi scored 92%.' Conclusion: Ravi will get a scholarship.

MEDIUM 3. Statement: 'The government has increased the fee for driving licences.' Conclusion: fewer people will now drive.

LOGICAL REASONING

# Puzzles

EASY 1. The sum of two numbers is 60 and their difference is 14. Larger number?

MEDIUM 2. In a group of cows and hens there are 48 heads and 140 legs. How many cows?

MEDIUM 3. P, Q, R, S, T live on floors 1-5 (1 = bottom). T is on floor 2. Q is immediately above T. R is on floor 1. S is above P. Who is on floor 5?

HARD 4. Three consecutive even numbers add to 138. The largest?

LOGICAL REASONING

# Odd One Out / Classification

EASY 1. Odd one: 2, 3, 5, 9, 11

EASY 2. Odd one: 16, 25, 36, 48, 64

EASY 3. Odd one: Apple, Mango, Potato, Banana

EASY 4. Odd one: 8, 27, 64, 100, 125

MEDIUM 5. Odd one: AZ, BY, CX, DV

LOGICAL REASONING

# Blood Relations

EASY 1. A is B's brother. C is A's mother. D is C's father. How is D related to B?

MEDIUM 2. Pointing to a photo, Arun says, 'She is the daughter of my grandfather's only son.' Who is she to Arun?

MEDIUM 3. If P + Q means P is the father of Q, P - Q means P is the wife of Q, and P × Q means P is the brother of Q, what does A - B + C mean for A and C?

MEDIUM 4. A is the son of B. C is B's sister. D is C's son. How is D related to A?

LOGICAL REASONING

# Counting Figures

EASY 1. Squares in a 4 × 4 grid?

EASY 2. Squares on a 6 × 6 board?

MEDIUM 3. Rectangles (including squares) in a 3 × 3 grid?

MEDIUM 4. Rectangles in a 2 × 4 grid?

MEDIUM 5. A triangle has 4 lines drawn from the top vertex to the base (including the two sides, so 4 lines total). Triangles?

HARD 6. Squares in a 5 × 5 grid?

HARD 7. Rectangles (including squares) in a 4 × 4 grid?

LOGICAL REASONING

# Cryptarithmetic

MEDIUM 1. AB + BA = 121 where A and B are distinct digits and A > B. How many such pairs (A, B)?

MEDIUM 2. A + A + A = BA (a 2-digit number). Find A and B.

HARD 3. TO + GO = OUT (different letters, different digits). Find OUT.

HARD 4. EAT + THAT = APPLE. Find APPLE.

# Answers and solutions

## Start here: 3 easy methods that solve most questions

**1. A shirt costs Rs 400. The shop gives 25% off. What do you pay?**

1. Take 100: 25% off leaves 75.
2. 75 per 100 means 75/100 of 400 = 300.

**Answer:** Rs 300

**2. Cost price Rs 500, selling price Rs 600. Profit percent?**

1. Profit = 100.
2. 100 out of 500 = 20 out of 100 = 20%.

**Answer:** 20%

**3. A number is increased by 10% and then by 10% again. Total increase?**

1. Start at 100.
2. +10% gives 110.
3. +10% of 110 = 11 gives 121.
4. 121 - 100 = 21%.

**Answer:** 21%

**4. A can do a job in 12 days and B in 6 days. How long together?**

1. LCM of 12 and 6 = 12 units.
2. A: 1 a day. B: 2 a day. Together 3 a day.
3. 12 / 3 = 4 days.

**Answer:** 4 days

**5. Rs 900 is shared between A and B in the ratio 4 : 5. How much does B get?**

1. 4 + 5 = 9 parts.
2. One part = 900 / 9 = 100.
3. B gets 5 parts = 500.

**Answer:** Rs 500

**6. The sum of two numbers is 50 and their difference is 10. The larger number? (a) 25 (b) 30 (c) 35 (d) 40**

1. Try 30: the other is 20. Sum 50, difference 10. Fits.

**Answer:** 30

**7. A shopkeeper marks goods 50% above cost and gives a 20% discount. Profit percent?**

1. Cost = 100.
2. Marked = 150.
3. 20% off 150 = 30 off, so sells at 120.
4. Profit 20 on 100 = 20%.

**Answer:** 20%

**8. Pipe A fills a tank in 20 min, pipe B empties it in 30 min. Both open, how long to fill?**

1. LCM of 20 and 30 = 60 litres.
2. A adds 3 a minute. B removes 2 a minute.
3. Net 1 a minute.
4. 60 / 1 = 60 minutes.

**Answer:** 60 minutes

**9. A, B and C finish a job in 10, 12 and 15 days. Together?**

1. LCM of 10, 12, 15 = 60 units.
2. Per day: 6 + 5 + 4 = 15.
3. 60 / 15 = 4 days.

**Answer:** 4 days

**10. Five years ago a mother was 4 times her daughter's age. Now the mother is 41. The daughter's age now? (a) 9 (b) 14 (c) 12 (d) 10**

1. Five years ago the mother was 36.
2. 36 / 4 = 9, so the daughter was 9.
3. Now 9 + 5 = 14.
4. Check option (b): 14 - 5 = 9, and 4 × 9 = 36 = 41 - 5. Fits.

**Answer:** 14

## Where these shortcuts come from

**1. 1000 - 478 (Nikhilam)**

1. 9-4, 9-7, 10-8.

**Answer:** 522

### 2. 100000 - 27394

1. 9-2, 9-7, 9-3, 9-9, 10-4 = 72606.

**Answer:** 72,606

### 3. 738 × 999 (Ekanyunena)

1. Left 737.
2. Right 999 - 737 = 262.

**Answer:** 7,37,262

### 4. Which sutra gives 996 × 993 fastest?

1. Both are just below 1000.

**Answer:** Nikhilam (base method)

### 5. Which sutra gives $75^2$ fastest?

1. Ends in 5: 7 × 8 | 25 = 5625.

**Answer:** Ekadhikena Purvena

### 6. Which sutra gives 58 × 52 fastest?

1. Same front 5, units 8 + 2 = 10: 5 × 6 | 16 = 3016.

**Answer:** Antyayor Dashake'π

## Multiply without long multiplication

### 1. 76 × 74

1. Same tens, units 6+4 = 10.
2. 7×8 = 56 | 6×4 = 24.
3. 5624.

**Answer:** 5624

### 2. 62 × 58

1. $60^2 - 2^2$ = 3600 - 4.

**Answer:** 3596

### 3. 4868 × 25

1. 486800 / 4 = 121700.

**Answer:** 1,21,700

### 4. 736 × 125

1. 736000 / 8 = 92000.

**Answer:** **92,000**

### 5. 857 × 99

1. 85700 - 857 = 84843.

**Answer:** **84,843**

### 6. 78 × 64

1. Units 8×4 = 32 → 2, c3.
2. Cross 7×4 + 8×6 = 76, +3 = 79 → 9, c7.
3. 7×6 = 42, +7 = 49.
4. 4992.

**Answer:** **4992**

### 7. 89 × 76

1. 9×6 = 54 → 4, c5.
2. 8×6 + 9×7 = 111, +5 = 116 → 6, c11.
3. 8×7 = 56 + 11 = 67.
4. 6764.

**Answer:** **6764**

### 8. 994 × 988

1. -6 and -12.
2. Left 994 - 12 = 982.
3. Right 6 × 12 = 72 → 072.
4. 982072.

**Answer:** **9,82,072**

### 9. 112 × 109

1. +12 and +9.
2. Left 112 + 9 = 121.
3. Right 108.
4. 121|08 → 12208.

**Answer:** **12,208**

### 10. 4789 × 11

1. 4 | 4+7 | 7+8 | 8+9 | 9 → 4 | 11 | 15 | 17 | 9.
2. Carry right to left: 9, 17 → 7 c1, 15+1 = 16 → 6 c1, 11+1 = 12 → 2 c1, 4+1 = 5.
3. 52679.

**Answer:** **52,679**

### 11. 347 × 256

1. 7×6 = 42 → 2 c4.
2. 4×6 + 7×5 = 59 +4 = 63 → 3 c6.
3. 3×6 + 4×5 + 7×2 = 52 +6 = 58 → 8 c5.
4. 3×5 + 4×2 = 23 +5 = 28 → 8 c2.
5. 3×2 = 6 +2 = 8.
6. 88832.

**Answer:** **88,832**

### 12. 623 × 418

1. 3×8 = 24 → 4 c2.
2. 2×8 + 3×1 = 19 +2 = 21 → 1 c2.
3. 6×8 + 2×1 + 3×4 = 62 +2 = 64 → 4 c6.
4. 6×1 + 2×4 = 14 +6 = 20 → 0 c2.
5. 6×4 = 24 +2 = 26.
6. 260414.

**Answer:** **2,60,414**

### 13. 58 × 473

1. Pad: 058 × 473.
2. 8×3 = 24 → 4 c2.
3. 5×3 + 8×7 = 71 +2 = 73 → 3 c7.
4. 0 + 5×7 + 8×4 = 67 +7 = 74 → 4 c7.
5. 0 + 5×4 = 20 +7 = 27.
6. 27434.

**Answer:** **27,434**

### 14. 104 × 93

1. +4 and -7.
2. Left 104 - 7 = 97 → 9700.
3. Right -28.
4. 9700 - 28 = 9672.

**Answer:** **9672**

### 15. 1234 × 5678 (hint: split 12|34 and 56|78 and criss-cross the pairs as if they were digits)

1. Treat 12|34 × 56|78 as 2-digit × 2-digit in base 100.
2. 34 × 78 = 2652 → write 52, carry 26.
3. 12×78 + 34×56 = 936 + 1904 = 2840, +26 = 2866 → write 66, carry 28.
4. 12 × 56 = 672, +28 = 700.
5. 700|66|52 → 7006652.

**Answer:** **70,06,652**

### 16. 867 × 934

1. 7×4 = 28 → write 8, carry 2
2. 7×3 + 6×4 + carry 2 = 47 → write 7, carry 4
3. 7×9 + 6×3 + 8×4 + carry 4 = 117 → write 7, carry 11
4. 6×9 + 8×3 + carry 11 = 89 → write 9, carry 8
5. 8×9 + carry 8 = 80 → write 80
6. Read the written digits right to left: 809,778.

**Answer:** **809,778**

### 17. 709 × 386

1. 9×6 = 54 → write 4, carry 5
2. 9×8 + 0×6 + carry 5 = 77 → write 7, carry 7
3. 9×3 + 0×8 + 7×6 + carry 7 = 76 → write 6, carry 7
4. 0×3 + 7×8 + carry 7 = 63 → write 3, carry 6
5. 7×3 + carry 6 = 27 → write 27
6. Read the written digits right to left: 273,674.

**Answer:** **273,674**

### 18. 47 × 865 (2-digit × 3-digit)

1. Pad the shorter number with zeros: 047 × 865.
2. 7×5 = 35 → write 5, carry 3
3. 7×6 + 4×5 + carry 3 = 65 → write 5, carry 6
4. 7×8 + 4×6 + 0×5 + carry 6 = 86 → write 6, carry 8
5. 4×8 + 0×6 + carry 8 = 40 → write 0, carry 4
6. 0×8 + carry 4 = 4 → write 4
7. Read the written digits right to left: 40,655.

**Answer:** **40,655**

### 19. 9996 × 9989 (base 10000)

1. Deviations -4 and -11.
2. Left 9996 - 11 = 9985.
3. Right 44, padded to 4 digits: 0044.
4. 99850044.

**Answer:** **9,98,50,044**

### 20. 1008 × 1012 (base 1000)

1. +8 and +12.
2. Left 1020.
3. Right 96 → 096.
4. 1020096.

**Answer:** **10,20,096**

### 21. 998 × 1003

1. -2 and +3.
2. Left 998 + 3 = 1001 → 1001000.
3. Right -6.
4. 1001000 - 6.

**Answer:** **10,00,994**

### 22. 87 × 83

1. Same tens, units 7 + 3 = 10.
2. 8 × 9 = 72 | 7 × 3 = 21.

**Answer:** **7221**

### 23. 12345 × 11

1. 1 | 1+2 | 2+3 | 3+4 | 4+5 | 5 → 1 3 5 7 9 5.

**Answer:** 1,35,795

### 24. 999 × 457

1. 457000 - 457.

**Answer:** 4,56,543

### 25. 48 × 52 × 25

1. 48 × 52 = $50^2$ - $2^2$ = 2496.
2. x25 = x100/4: 249600/4 = 62400.

**Answer:** 62,400

## Squares, cubes and roots in seconds

### 1. $95^2$

1. 9 × 10 | 25.

**Answer:** 9025

### 2. $115^2$

1. 11 × 12 = 132 | 25.

**Answer:** 13,225

### 3. $56^2$

1. 25 + 6 = 31 | 36.

**Answer:** 3136

### 4. $44^2$

1. 25 - 6 = 19 | 36.

**Answer:** 1936

### 5. $93^2$

1. 100 - 14 = 86 | 49.

**Answer:** 8649

### 6. $113^2$

1. 100 + 26 = 126 | 169 → 126 + 1 carry = 127 | 69.

**Answer:** **12,769**

### 7. Square root of 9409

1. Ends 9 → 3 or 7.
2. 94 between 81 and 100 → 9.
3. $95^2 = 9025 < 9409$ → 97.

**Answer:** **97**

### 8. Square root of 5329

1. Ends 9 → 3/7.
2. 53 between 49 and 64 → 7.
3. $75^2 = 5625 > 5329$ → 73.

**Answer:** **73**

### 9. Cube root of 571787

1. Ends 7 → 3.
2. 571 between 512 ($8^3$) and 729 → 8.
3. 83.

**Answer:** **83**

### 10. Cube root of 438976

1. Ends 6 → 6.
2. 438 between 343 and 512 → 7.
3. 76.

**Answer:** **76**

### 11. $998^2$

1. Base 1000, k = -2: 1000 - 4 = 996 | 004.

**Answer:** **9,96,004**

### 12. Square root of 15129

1. Ends 9 → 3 or 7.
2. Strike the last two digits: 151 is between 144 ($12^2$) and 169 → 12.
3. $125^2$ = 15625 > 15129, so the smaller: 123.

**Answer:** **123**

### 13. Cube root of 912673

1. Ends 3 → root ends 7.
2. 912 is between 729 ($9^3$) and 1000 → 9.
3. 97.

**Answer:** **97**

### 14. Square root of 65536

1. Ends 6 → 4 or 6.
2. 655 between 625 ($25^2$) and 676 → 25.
3. $255^2$ = 65025 < 65536 → larger: 256.

**Answer:** **256**

### 15. $997^2$

1. Base 1000, k = -3: 1000 - 6 = 994 | 009.

**Answer:** **9,94,009**

### 16. $1005^2$

1. Ends in 5: 100 × 101 = 10100 | 25.

**Answer:** **10,10,025**

### 17. $106^2 + 94^2$

1. $106^2$ = 112|36 = 11236.
2. $94^2$ = 88|36 = 8836.
3. Sum 20072.
4. (Or: $2 \times (100^2 + 6^2)$ = 20072.)

**Answer:** **20,072**

## Percent-fraction table and quick checks

### 1. 62.5% of 1,352

1. 5/8 × 1352 = 169 × 5 = 845.

**Answer:** **845**

### 2. 14.28% of 2,891 (approx 1/7)

1. 2891 / 7 = 413.

**Answer:** **413**

### 3. Which is the correct value of 487 × 36? (a) 17,532 (b) 17,542 (c) 17,432

1. Digit sums: 487 → 19 → 1, 36 → 9 → 0, product 0.
2. 17532 → 18 → 0 passes; 17542 → 19 → 1 fails; 17432 → 17 → 8 fails.

**Answer:** **(a) 17,532**

### 4. 83.33% of 2,454

1. 5/6 × 2454 = 409 × 5 = 2045.

**Answer:** **2045**

### 5. 11.11% of 5,868 + 9.09% of 4,741

1. 5868/9 = 652. 4741/11 = 431. Sum 1083.

**Answer:** **1083**

## Division, fractions and approximation under time pressure

### 1. Divide 2,375 by 25.

1. 2375 × 4 = 9500.
   **Why:** Dividing by 25 is multiplying by 4 and dividing by 100.
2. 9500 / 100 = 95.

**Answer:** **95**

### 2. Which is larger, 5/7 or 7/10?

1. Cross-multiply: 5 × 10 = 50 and 7 × 7 = 49.
   **Why:** Compare a × d with b × c.
2. 50 > 49, so 5/7 is larger.

**Answer:** **5/7**

**3. Divide 7,000 by 125.**

1. 7000 × 8 = 56,000.
   **Why:** 125 × 8 = 1000.
2. 56000 / 1000 = 56.

**Answer:** **56**

**4. Arrange 3/5, 5/8, 4/7 in increasing order.**

1. As percentages: 3/5 = 60%, 5/8 = 62.5%, 4/7 = 57.1%.
   **Why:** Converting to % is quick when you know the table.
2. 4/7 < 3/5 < 5/8.

**Answer:** **4/7, 3/5, 5/8**

**5. Simplify: 18 + 6 / 3 × 2 - 4**

1. Division and multiplication left to right: 6 / 3 = 2, then 2 × 2 = 4.
   **Why:** BODMAS: D and M before A and S, in reading order.
2. 18 + 4 - 4 = 18.

**Answer:** **18**

**6. Approximately what is 49.98% of 801.2 + 24.9% of 399.7? (a) 480 (b) 500 (c) 520 (d) 560**

1. 50% of 800 = 400 and 25% of 400 = 100.
   **Why:** The options are 20 apart, so rounding is safe.
2. 400 + 100 = 500.

**Answer:** **500**

**7. What is 3/7 as a decimal, to 6 places?**

1. 1/7 = 0.142857 repeating.
   **Why:** Sevenths all use the same cycle 142857.
2. 3/7 starts at the 4: 0.428571.

**Answer:** **0.428571**

**8. Approximately 1,249 / 24.96 + 19.97 × 5.02 = ? (a) 120 (b) 150 (c) 170 (d) 200**

1. 1250 / 25 = 50. 20 × 5 = 100.
   **Why:** Round each number to the nearest friendly one.
2. 50 + 100 = 150.

**Answer:** **150**

**9. Which is the largest: 7/9, 11/14, 15/19?**

1. 7/9 = 0.778, 11/14 = 0.786, 15/19 = 0.789.
   **Why:** Close fractions: divide to 3 places or cross-multiply pairwise.
2. 15/19 is the largest.

**Answer:** 15/19

## Number System

**1. Least number that leaves remainder 4 when divided by 6, 9 and 15**

1. LCM(6, 9, 15) = 90.
2. 90 + 4 = 94.

**Answer:** 94

**2. HCF of two numbers is 16, LCM 480. One number is 96. Find the other.**

1. 16 × 480 / 96 = 80.

**Answer:** 80

**3. What is the unit digit of $8^{43}$?**

1. 8's cycle: 8, 4, 2, 6.
   **Why:** Length 4.
2. 43 = 4 × 10 + 3.
   **Why:** Remainder 3.
3. Third in the cycle: 2.

**Answer:** 2

**4. How many factors does 180 have?**

1. $180 = 2^2 \times 3^2 \times 5$.
   **Why:** Prime factors.
2. (2+1)(2+1)(1+1) = 18.

**Answer:** 18

**5. How many zeros are at the end of 60!?**

1. 60/5 = 12, 60/25 = 2.
   **Why:** Count the 5s.
2. 12 + 2 = 14.

**Answer:** 14

### 6. Find the least number which when divided by 12, 16 and 24 leaves remainder 5 each time.

1. LCM(12, 16, 24) = 48.
   **Why:** Divisible by all three.
2. 48 + 5 = 53.

**Answer: 53**

### 7. Unit digit of $7^{95} \times 3^{58}$

1. 95 mod 4 = 3 → 7's cycle → 3.
2. 58 mod 4 = 2 → 3's cycle → 9.
3. 3 × 9 = 27 → 7.

**Answer: 7**

### 8. Remainder when 17 × 23 × 29 is divided by 12

1. 17 → 5, 23 → 11, 29 → 5.
2. 5 × 11 = 55 → 7. 7 × 5 = 35 → 11.

**Answer: 11**

### 9. Largest 4-digit number divisible by 12, 15 and 18

1. LCM = 180.
2. 9999 / 180 = 55 rem 99.
3. 9999 - 99 = 9900.

**Answer: 9900**

### 10. Number of trailing zeros in 250!

1. 250/5 = 50, /25 = 10, /125 = 2.
2. 50 + 10 + 2 = 62.

**Answer: 62**

### 11. Greatest number that divides 1657 and 2037 leaving remainders 6 and 5

1. Subtract the remainders: 1651 and 2032.
2. HCF(1651, 2032) = 127.

**Answer: 127**

### 12. Find the digit * so that 73*54 is divisible by 11

1. Alternate sum: 7 - 3 + * - 5 + 4 = 3 + *.
2. It must be 0 or 11, so * = 8.

**Answer:** **8**

### 13. Remainder when $3^{250}$ is divided by 13

1. $3^3 = 27$ leaves 1.
2. $250 = 3 \times 83 + 1$.
3. $1 \times 3^1 = 3$.

**Answer:** **3**

### 14. Remainder when $7^{100}$ is divided by 13

1. 13 is prime, so $7^{12}$ leaves 1 (Fermat).
2. $100 = 12 \times 8 + 4$, so $7^{100}$ leaves the same as $7^4 = 2401$.
3. 2401 mod 13 = 9.

**Answer:** **9**

### 15. How many factors does 1800 have?

1. $1800 = 2^3 \times 3^2 \times 5^2$.
2. $(3+1)(2+1)(2+1) = 36$.

**Answer:** **36**

### 16. Sum of all factors of 72

1. $72 = 2^3 \times 3^2$.
2. $(1+2+4+8)(1+3+9) = 15 \times 13$.

**Answer:** **195**

### 17. Highest power of 7 that divides 1000!

1. 1000/7 = 142, /49 = 20, /343 = 2.
2. 142 + 20 + 2.

**Answer:** **164**

**18. Smallest number that leaves remainder 3 when divided by 5, 6, 7, 8 but is divisible by 9**

1. Form 840k + 3.
2. 840 leaves 3 mod 9, so 3k + 3 must be divisible by 9 → k = 2.
3. 1683.

**Answer:** 1683

**19. Unit digit of $2^{2026} \times 3^{2027} \times 7^{2028}$**

1. 2026 mod 4 = 2 → 4.
2. 2027 mod 4 = 3 → 7.
3. 2028 mod 4 = 0 → 1.
4. 4 × 7 × 1 = 28 → 8.

**Answer:** 8

## Percentage

**1. If A's income is 25% more than B's, by what % is B's income less than A's?**

1. 25/125 × 100.

**Answer:** 20%

**2. Sugar price rises 25%. By what % must a family cut consumption to keep spending the same?**

1. 25/125 × 100.

**Answer:** 20%

**3. A town of 1,00,000 grows 10% in year 1 and falls 10% in year 2. Population after 2 years?**

1. 100000 × 1.1 × 0.9.

**Answer:** 99,000

**4. What is 45% of 360?**

1. 10% = 36, so 40% = 144, 5% = 18.
   **Why:** Build it from easy pieces.
2. 144 + 18 = 162.

**Answer:** 162

**5. A number increased by 15% becomes 460. Find the number.**

1. Number × 1.15 = 460.
   **Why:** 115% of the number.
2. 460 / 1.15 = 400.

**Answer: 400**

**6. Ravi spends 80% of his income. Income rises 20% and spending rises 10%. By what % do his savings rise?**

1. Income 100, spend 80, save 20.
2. New: 120, 88, 32.
3. 12/20 = 60%.

**Answer: 60%**

**7. A number is raised 20% and then cut 25%, giving 540. Find the number.**

1. x × 1.2 × 0.75 = 0.9x = 540.

**Answer: 600**

**8. If A is 50% more than B, by what percent is B less than A?**

1. B = 100, A = 150.
   **Why:** Take 100.
2. 50/150 × 100 = 33.33%.

**Answer: 33.33%**

**9. In an election between 2 candidates, 10% of votes were invalid. The winner got 58% of valid votes and won by 1,440. Total votes cast?**

1. Margin = 58 - 42 = 16% of valid.
2. Valid = 1440/0.16 = 9000.
3. That is 90% of total → 10000.

**Answer: 10,000**

**10. Price of petrol rises 20% and then another 10%. By how much must consumption fall (overall) to keep the bill the same? (2 d.p.)**

1. Net price rise = 20 + 10 + 2 = 32%.
2. Cut = 32/132 × 100 = 24.24%.

**Answer: 24.24%**

**11. The value of a machine depreciates 10% a year. It is worth Rs 72,900 after 3 years. Original value?**

1. $72900 / 0.9^3 = 72900 / 0.729$.

**Answer:** Rs 1,00,000

**12. 65% passed English, 60% passed Maths, 25% failed both. What % passed both?**

1. Failed English 35, failed Maths 40, failed both 25.
2. Failed at least one = 35 + 40 - 25 = 50.
3. Passed both = 50%.

**Answer:** 50%

**13. A salary is cut 20% and then raised 20%, giving Rs 9,600. Original salary?**

1. 0.8 × 1.2 = 0.96.
2. 9600/0.96.

**Answer:** Rs 10,000

**14. A earns 50% more than B; B earns 20% less than C. A's salary is what % of C's?**

1. A = 1.5B = 1.5 × 0.8C = 1.2C.

**Answer:** 120%

**15. A population rises 10%, then 20%, then falls 10%, reaching 11,880. Starting population?**

1. 1.1 × 1.2 × 0.9 = 1.188.

**Answer:** 10,000

**16. A student needs 36% to pass. She scores 150 and fails by 30 marks. Maximum marks?**

1. Pass mark 180 = 36%.
2. 180/0.36.

**Answer:** 500

## Profit and Loss

**1. CP of 15 pens = SP of 12 pens. Profit %?**

1. (15 - 12)/12 × 100.

**Answer:** 25%

**2. A dealer sells at cost price but uses a 900 g weight for 1 kg. Gain % (2 d.p.)?**

1. 100/900 × 100.

**Answer:** **11.11%**

**3. Two cycles are sold at Rs 990 each, one at 10% profit and the other at 10% loss. Net result?**

1. $x^2/100$ = 1% loss.
2. CPs: 900 and 1100 = 2000. SP 1980. Loss 20.

**Answer:** **1% loss (Rs 20)**

**4. By selling an article for Rs 720, a man loses 10%. At what price should he sell to gain 15%?**

1. CP = 720/0.9 = 800.
2. 800 × 1.15 = 920.

**Answer:** **Rs 920**

**5. A man buys oranges at 6 for Rs 5 and sells at 5 for Rs 6. Profit %?**

1. CP per orange 5/6, SP per orange 6/5.
2. (6/5)/(5/6) = 36/25 = 1.44.

**Answer:** **44%**

**6. If the SP is doubled, the profit triples. Profit %?**

1. 2S - C = 3(S - C) → S = 2C.
2. Profit = C = 100%.

**Answer:** **100%**

**7. Selling at Rs 1,040 gives the same % profit as the % loss when selling at Rs 880. CP?**

1. Equal % both sides → CP is the average: (1040 + 880)/2.

**Answer:** **Rs 960**

**8. Two articles sell for Rs 1,200 each, one at 20% gain and one at 20% loss. Net result in rupees?**

1. CPs: 1200/1.2 = 1000 and 1200/0.8 = 1500.
2. CP 2500, SP 2400.

**Answer:** **Loss of Rs 100**

**9. A trader cheats 20% when buying (takes 1200 g for 1 kg) and 20% when selling (gives 800 g for 1 kg), and sells at cost price. Gain %?**

1. He pays for 1000 g and gets 1200 g.
2. He charges for 1000 g but hands over 800 g.
3. 1200/800 = 1.5.

**Answer:** 50%

**10. Selling 33 m of cloth gains the selling price of 11 m. Gain %?**

1. SP(33) - CP(33) = SP(11), so CP(33) = SP(22).
2. Gain = 11/22.

**Answer:** 50%

**11. An article is sold at 20% profit. Bought 20% cheaper and sold Rs 75 cheaper, the profit would be 25%. CP?**

1. SP = 1.2C. New: 0.8C × 1.25 = C.
2. 1.2C - 75 = C → C = 375.

**Answer:** Rs 375

## Discount

**1. MP Rs 1,200, successive discounts 20% and 10%. SP?**

1. 1200 × 0.8 × 0.9.

**Answer:** Rs 864

**2. MP is 40% above CP; a 20% discount is given. Profit %?**

1. 1.4 × 0.8 = 1.12.

**Answer:** 12%

**3. Buy 4 get 1 free. Effective discount?**

1. 1/5.

**Answer:** 20%

**4. Single discount equal to 20%, 10% and 5% successively? (1 d.p.)**

1. 1 - 0.8 × 0.9 × 0.95 = 0.316.

**Answer:** 31.6%

**5. A trader marks goods 50% above CP and gives discounts of 20% and 10%. Profit %?**

1. 1.5 × 0.8 × 0.9 = 1.08.

**Answer:** **8%**

**6. After a 12% discount a shirt sells for Rs 1,452 at a 10% profit. CP?**

1. 1452 / 1.1 = 1320.

**Answer:** **Rs 1,320**

**7. A shop gives 10% off and still makes 17% profit. If it gave no discount, profit % would be?**

1. MP/CP = 117/90 = 1.3.

**Answer:** **30%**

**8. What must the MP be above CP so that a 12.5% discount still gives 40% profit?**

1. 140/87.5 = 1.6.

**Answer:** **60%**

**9. Two successive discounts x% and 10% equal a single discount of 28%. x?**

1. (1 - x/100) × 0.9 = 0.72 → 0.8.

**Answer:** **20**

**10. Three successive 10% discounts equal what single discount?**

1. $1 - 0.9^3 = 0.271$.

**Answer:** **27.1%**

## Ratio and Proportion

**1. A:B = 2:3 and B:C = 4:5. A:B:C?**

1. Make B equal: 8:12 and 12:15.

**Answer:** **8:12:15**

**2. Divide Rs 1,300 in the ratio 1/2 : 1/3 : 1/4. Largest share?**

1. x12: 6:4:3, 13 parts of 100.

**Answer:** **Rs 600**

**3. Mean proportional of 9 and 16?**

1. √(144).

**Answer:** 12

**4. Third proportional to 4 and 6?**

1. 36/4.

**Answer:** 9

**5. Two numbers are 3:5. Adding 10 to each makes it 5:7. The larger number?**

1. (3x+10)/(5x+10) = 5/7 → x = 5.

**Answer:** 25

**6. What must be added to each of 6, 10, 14 and 22 so they become proportional?**

1. (6+x)(22+x) = (10+x)(14+x) → 132 + 28x = 140 + 24x → x = 2.

**Answer:** 2

**7. Salaries of A and B are 2:3. Both get Rs 4,000 raises and the ratio becomes 3:4. B's new salary?**

1. (2x + 4000)/(3x + 4000) = 3/4 → 8x + 16000 = 9x + 12000 → x = 4000.
2. B new = 12000 + 4000.

**Answer:** Rs 16,000

**8. Incomes of A and B are 5:4, expenses 3:2, and each saves Rs 1,600. A's income?**

1. 5x - 3y = 1600 and 4x - 2y = 1600.
2. y = 2x - 800 → 5x - 6x + 2400 = 1600 → x = 800.

**Answer:** Rs 4,000

**9. Rs 5,625 is shared so that A gets half of what B and C together get, and B gets a quarter of what A and C together get. C's share?**

1. A = (B + C)/2 → A = 1/3 of total = 1875.
2. B = (A + C)/4 → B = 1/5 of total = 1125.
3. C = 5625 - 3000.

**Answer:** Rs 2,625

## Partnership

**1. A invests Rs 20,000 for the year. B invests Rs 30,000 after 4 months. Profit Rs 18,000. B's share?**

1. A = 20k × 12 = 2.4 L. B = 30k × 8 = 2.4 L.
2. 1:1.

**Answer:** **Rs 9,000**

**2. A is a working partner getting 10% of profit as salary; the rest is split 3:2 (A:B). Profit Rs 50,000. A's total?**

1. Salary 5000.
2. 45000 × 3/5 = 27000.
3. Total 32000.

**Answer:** **Rs 32,000**

**3. A starts with Rs 3,500. After 5 months B joins. Profit is split 2:3 at the year end. B's capital?**

1. 3500 × 12 : B × 7 = 2 : 3.
2. B = 3500 × 12 × 3 / (7 × 2) = 9000.

**Answer:** **Rs 9,000**

**4. A, B, C invest 5,000, 6,000, 8,000 for 12, 10, 6 months. Profit Rs 7,000. C's share?**

1. Rupee-months (thousands): 60, 60, 48 → 5 : 5 : 4.
2. 14 parts of 500.
3. C = 4 × 500.

**Answer:** **Rs 2,000**

**5. Profit ratio of A, B, C is 5:7:8 and their time ratio is 3:4:5. Capital ratio?**

1. 5/3 : 7/4 : 8/5, x60.

**Answer:** **100:105:96**

**6. A invests 3 times B, and B invests 2/3 of what C invests. Profit Rs 6,600. B's share?**

1. A = 3B, C = 1.5B → 3 : 1 : 1.5 = 6 : 2 : 3.
2. 11 parts of 600.

**Answer:** **Rs 1,200**

**7. A and B invest in 3:5. After 4 months A withdraws half his capital. Year-end profit Rs 5,600. A's share?**

1. A = 3 × 4 + 1.5 × 8 = 24. B = 5 × 12 = 60.
2. 24 : 60 = 2 : 5.
3. 2/7 of 5600.

**Answer:** **Rs 1,600**

## Simple Interest

**1. SI on Rs 5,000 at 8% for 3 years?**

1. 5000 × 8 × 3/100.

**Answer:** **Rs 1,200**

**2. A sum doubles in 8 years at SI. In how many years will it triple?**

1. Rate 12.5%.
2. Triple needs 200% interest → 16 years.

**Answer:** **16 years**

**3. Rs 12,000 is lent partly at 8% and partly at 12% SI. Total interest after 1 year is Rs 1,140. Amount lent at 8%?**

1. Alligation on rates: overall rate 9.5%.
2. (12 - 9.5):(9.5 - 8) = 2.5 : 1.5 = 5:3.
3. 5/8 × 12000.

**Answer:** **Rs 7,500**

**4. At what rate will SI be 3/8 of the principal in 6 years?**

1. R × 6 = 37.5.

**Answer:** **6.25%**

**5. A sum becomes 3/2 of itself in 10 years at SI. Rate?**

1. SI = 1/2 of P in 10 years.

**Answer:** **5%**

**6. SI on a sum for 3 years at 12% is Rs 5,400 less than the sum. The sum?**

1. SI = 0.36P = P - 5400 → 0.64P = 5400.

**Answer:** **Rs 8,437.50**

## Compound Interest

**1. Difference between CI and SI on Rs 15,000 for 2 years at 8%?**

1. 15000 × 0.0064.

**Answer:** **Rs 96**

**2. CI on Rs 8,000 at 10% p.a. compounded half-yearly for 1 year?**

1. $8000 \times 1.05^2 = 8820$.

**Answer:** **Rs 820**

**3. A sum doubles in 5 years at CI. In how many years does it become 8 times?**

1. $2^3 = 8 \rightarrow 3 \times 5$.

**Answer:** **15 years**

**4. Find the amount on Rs 5,000 at 20% a year compounded yearly for 2 years.**

1. 5000 × 1.2 × 1.2.
   **Why:** Multiply by 1.2 twice.
2. = 7,200.

**Answer:** **7200**

**5. Difference between CI and SI on Rs 10,000 for 3 years at 10%?**

1. $10000 \times 100 \times 310 / 10^6$.

**Answer:** **Rs 310**

**6. CI on Rs 16,000 at 20% p.a. compounded quarterly for 9 months?**

1. 5% per quarter, 3 quarters: 16000 × 1.157625 = 18522.

**Answer:** **Rs 2,522**

**7. A sum at CI becomes Rs 6,050 in 2 years and Rs 6,655 in 3 years. Principal?**

1. Rate = 605/6050 = 10%.
2. P = 6050 / 1.21.

**Answer:** **Rs 5,000**

**8. CI - SI on a sum for 2 years at 5% is Rs 25. The sum?**

1. $P \times 0.05^2 = 25$.

**Answer:** **Rs 10,000**

**9. Rs 8,000 is borrowed at 10% CI. Rs 4,400 is repaid after year 1. Amount to clear it after year 2?**

1. Year 1: 8800 - 4400 = 4400.
2. Year 2: 4400 × 1.1.

**Answer:** **Rs 4,840**

**10. What sum becomes Rs 4,913 in 3 years at 6.25% CI?**

1. 6.25% = 1/16, so x $(17/16)^3$.
2. 4913/4913 × 4096.

**Answer:** **Rs 4,096**

**11. A loan of Rs 2,100 is repaid in 2 equal yearly instalments at 10% CI. Each instalment?**

1. x/1.1 + x/1.21 = 2100.
2. x (2.1/1.21) = 2100 → x = 1210.

**Answer:** **Rs 1,210**

## Time and Work

**1. A can do a job in 12 days, B in 18. Together?**

1. 36/5.

**Answer:** **7.2 days**

**2. 12 men working 8 h a day finish in 18 days. How many days for 16 men at 9 h a day?**

1. 12 × 18 × 8 / (16 × 9).

**Answer:** **12 days**

**3. A+B do a job in 12 days, B+C in 15, C+A in 20. How long for A alone?**

1. Work 60. Rates 5, 4, 3. A+B+C = 6.
2. A = 6 - 4 = 2 → 30 days.

**Answer:** **30 days**

**4. A takes 20 days, B 30. They start together, but A leaves 5 days before the end. Total days?**

1. (T - 5)/20 + T/30 = 1 → 5T = 75.

**Answer:** **15 days**

**5. A is twice as good as B; together they finish in 14 days. A alone?**

1. Rates 2 and 1 = 3 per day, work 42.
2. 42/2 = 21.

**Answer:** **21 days**

**6. 10 men finish a job in 15 days; 15 women finish it in 12. How many days for 5 men and 6 women?**

1. Work = 150 man-days = 180 woman-days, so 1 man = 1.2 women.
2. 5 men + 6 women = 12 women → 180/12 = 15 days.

**Answer:** **15 days**

**7. A is 50% more efficient than B. Together they finish in 18 days. A alone?**

1. Rates 3:2, 5 units a day, work 90.
2. 90/3.

**Answer:** **30 days**

**8. 20 men can finish a job in 30 days. After 10 days, 5 men leave. How many more days to finish?**

1. Work 600 man-days, 200 done.
2. 400 / 15 men.

**Answer:** **26 2/3 days**

**9. 2 men and 3 women finish a job in 10 days; 3 men and 2 women in 8 days. How long for 2 men and 1 woman?**

1. Man = 7/200, woman = 1/100 per day (solve the two equations).
2. 2 men + 1 woman = 16/200 = 2/25 → 12.5 days.

**Answer:** **12 1/2 days**

**10. A takes 6 days, B 8 days; with C they finish in 3 days. The fee is Rs 3,200. C's share?**

1. In 3 days A does 1/2, B does 3/8, so C does 1/8.
2. 1/8 of 3200.

**Answer:** **Rs 400**

**11. A takes 10 days, B 15. They work together, but A leaves after 2 days. How many more days does B need?**

1. 2 days together = 2 × 1/6 = 1/3.
2. B does 2/3 at 1/15 a day.

**Answer:** **10 days**

## Pipes and Cisterns

**1. A fills in 20 min, B empties in 30 min. Both open?**

1. 1/20 - 1/30 = 1/60.

**Answer:** **60 min**

**2. A fills in 12 h, B in 15 h, C empties in 20 h. All open?**

1. (5 + 4 - 3)/60 = 1/10.

**Answer:** **10 h**

**3. A and B fill a tank in 20 and 30 min. Both are opened; after how many minutes must B be closed so the tank fills in exactly 15 min?**

1. A does 15/20 = 3/4.
2. B must do 1/4 → 30/4 = 7.5 min.

**Answer:** **7.5 min**

**4. A fills in 6 h, B in 8 h, opened alternately for 1 hour each, A first. Time to fill?**

1. 24 units. A 4, B 3 → 7 per 2 h.
2. 6 h → 21. A needs 3 of 4 → 3/4 h.

**Answer:** **6 3/4 h**

**5. Two pipes fill in 10 and 12 h; an outlet empties in 20 h. All open, but the outlet is closed after 2 h. Total time? (hours)**

1. First 2 h: 2 × (6 + 5 - 3)/60 = 16/60.
2. Left 44/60 at 11/60 per hour = 4 h.
3. Total 6 h.

**Answer:** **6 h**

**6. Two inlets fill a tank in 12 and 15 min. With an outlet also open, it fills in 20 min. Outlet alone empties it in?**

1. 1/12 + 1/15 - 1/x = 1/20.
2. 1/x = 9/60 - 3/60 = 1/10.

**Answer:** **10 min**

**7. One pipe fills a tank in 4 h. When it is half full, 3 more identical pipes are opened. Total time?**

1. First half: 2 h.
2. Then 4 pipes: the other half takes 1/2 h.

**Answer:** **2 1/2 h**

## Time and Distance

**1. A car goes at 40 km/h one way and 60 km/h back. Average speed?**

1. 2 × 40 × 60/100.

**Answer:** **48 km/h**

**2. At 5 km/h a man is 10 min late; at 6 km/h he is 5 min early. Distance?**

1. d/5 - d/6 = 15/60 → d = 7.5.

**Answer:** **7.5 km**

**3. A thief runs at 8 km/h. A policeman starts 10 min later at 10 km/h. When does he catch him (minutes after he starts)?**

1. Head start 8 × 1/6 = 4/3 km.
2. Closing 2 km/h → 2/3 h.

**Answer:** **40 min**

**4. A covers a distance at 3 speeds 10, 20, 30 km/h over equal thirds. Average speed? (2 d.p.)**

1. 3/(1/10 + 1/20 + 1/30) = 180/11.

**Answer:** **16.36 km/h**

**5. A walks at 4 km/h. 4 hours later B cycles after him at 10 km/h. How far from the start does B catch A?**

1. Head start 16 km, closing speed 6 km/h → 8/3 h.
2. 10 × 8/3.

**Answer:** **26 2/3 km**

**6. A man covers half a journey at 30 km/h. What speed on the second half gives an average of 40 km/h?**

1. 2 × 30 × v / (30 + v) = 40 → v = 60.

**Answer:** **60 km/h**

**7. Going 20% faster, a car arrives 10 min early. Usual time?**

1. Time becomes 5/6, the saved 1/6 = 10 min.

**Answer:** 60 min

## Problems on Trains

**1. A 150 m train at 54 km/h passes a pole in?**

1. 54 km/h = 15 m/s.

**Answer:** 10 s

**2. A 150 m train at 72 km/h crosses a 250 m platform in?**

1. 400/20.

**Answer:** 20 s

**3. How long does a train 150 m long, running at 54 km/h, take to pass a telegraph post?**

1. 54 km/h = 15 m/s.
   **Why:** x 5/18.
2. Distance = 150 m.
   **Why:** A post: only the train's length.
3. 150 / 15 = 10 seconds.

**Answer:** 10 s

**4. Trains 120 m and 180 m long run towards each other at 50 and 40 km/h. Time to cross?**

1. 90 km/h = 25 m/s. 300/25.

**Answer:** 12 s

**5. Trains 100 m and 80 m, same direction, 60 and 42 km/h. Time for the faster to pass the slower?**

1. 18 km/h = 5 m/s. 180/5.

**Answer:** 36 s

**6. Two trains leave A and B towards each other at the same time. After meeting, they take 9 h and 16 h to reach B and A. Ratio of speeds?**

1. √(16) : √(9).

**Answer:** 4:3

**7. A train at 54 km/h passes a man walking at 6 km/h in the same direction in 12 s. Length of the train?**

1. Relative 48 km/h = 40/3 m/s.
2. 40/3 × 12 = 160 m.

**Answer:** 160 m

**8. A train passes two men walking the same way at 2 km/h and 4 km/h in 9 s and 10 s. Train speed?**

1. (v - 2) × 9 = (v - 4) × 10 (same length).
2. v = 22.

**Answer:** 22 km/h

**9. Trains of 150 m and 200 m cross each other in 10 s going opposite ways and in 50 s going the same way. Faster train's speed in m/s?**

1. Sum of speeds 350/10 = 35, difference 350/50 = 7.
2. Faster = (35 + 7)/2.

**Answer:** 21 m/s

## Boats and Streams

**1. Boat 15 km/h in still water, stream 3 km/h. Time for 36 km down and back?**

1. 36/18 + 36/12.

**Answer:** 5 h

**2. A boat takes twice as long upstream as downstream for the same distance. Boat 9 km/h. Stream?**

1. b + s = 2(b - s) → b = 3s.

**Answer:** 3 km/h

**3. A man rows 48 km and back in 14 h. He can row 4 km downstream in the time he rows 3 km upstream. Stream speed?**

1. Down:up = 4:3 = 4k:3k.
2. 12/k + 16/k = 14 → k = 2.
3. Down 8, up 6, stream 1.

**Answer:** 1 km/h

**4. A boat goes 30 km upstream and 44 km downstream in 10 h, and 40 km up and 55 km down in 13 h. Stream speed?**

1. Up 5, down 11 fits both (6 + 4 = 10, 8 + 5 = 13).
2. Stream = (11 - 5)/2.

**Answer:** **3 km/h**

## Averages

**1. Average of 5 consecutive odd numbers is 61. Largest?**

1. Middle 61, step 2.

**Answer:** **65**

**2. 40 students average 50, another 60 average 60. Combined average?**

1. (2000 + 3600)/100.

**Answer:** **56**

**3. Average weight of 8 people rises 2.5 kg when one weighing 65 kg is replaced. New person's weight?**

1. 65 + 8 × 2.5.

**Answer:** **85 kg**

**4. Average of first 50 even numbers?**

1. n + 1.

**Answer:** **51**

**5. Average of 11 numbers is 60. First six average 58, last six average 63. The 6th number?**

1. 348 + 378 - 660.

**Answer:** **66**

**6. A batsman scores 85 in his 17th innings and raises his average by 3. New average?**

1. 85 - 16 × 3.

**Answer:** **37**

**7. A batsman's average after 16 innings is 36. After the 17th his average is 38. What did he score in the 17th?**

1. Total after 16 = 576. After 17 = 646.
   **Why:** Average × innings.
2. 646 - 576 = 70.

**Answer:** 70

**8. The average of 4 numbers is 42. The first is twice the second, the second is twice the third, and the fourth is 24 more than the third. Find the fourth.**

1. Third = x: 4x + 2x + x + (x + 24) = 168.
2. 8x = 144 → x = 18.
3. Fourth = 42.

**Answer:** 42

**9. The average of 30 marks was 60, but an 80 was read as 50. Correct average?**

1. Total short by 30 → +1 on average.

**Answer:** 61

**10. Replacing two men aged 20 and 24 by two women raises the average of 10 people by 2. Average age of the women?**

1. Total rises 20.
2. Women = 44 + 20 = 64, average 32.

**Answer:** 32

**11. A batsman averages 40 in 20 innings. His highest score beats his lowest by 100. Leaving both out, the average is 38. Highest score?**

1. 800 - 18 × 38 = 116 = H + L.
2. H - L = 100 → H = 108.

**Answer:** 108

## Ages

**1. The sum of ages of 5 children born 3 years apart is 50. Youngest?**

1. 5x + 3(0+1+2+3+4) = 50 → 5x = 20.

**Answer:** 4

**2. Ten years ago A was half B's age. Their present ages are 3:4. Sum of present ages?**

1. Now 3:4 (gap 1 unit). Then 1:2 (gap 1 unit) - gaps already match.
2. Each dropped 2 units (3 → 1, 4 → 2) = 10 years, so 1 unit = 5.
3. Ages 15 and 20, sum 35.

**Answer:** 35

**3. A is 4 years more than twice B's age; the product of their ages is 240. A's age?**

1. $b(2b + 4) = 240 \rightarrow b = 10$.

**Answer:** 24

**4. A couple's average age at marriage was 23. Five years later, with one child, the family's average age is 20. Child's age?**

1. At marriage total 46; 5 years later 56.
2. Family of 3 total 60 → child 4.

**Answer:** 4

**5. A father's age is twice the sum of his two children's ages. In 20 years his age will equal the sum of theirs. Father's age now?**

1. $F = 2S$. $F + 20 = S + 40$.
2. $2S + 20 = S + 40 \rightarrow S = 20$.

**Answer:** 40

**6. Six years ago Ravi was 3 times as old as Sita. Six years from now he will be twice her age. Ravi's age now?**

1. $r - 6 = 3(s - 6)$, $r + 6 = 2(s + 6)$.
2. $r = 3s - 12$ and $r = 2s + 6$, so $s = 18$.
3. $r = 42$.

**Answer:** 42

**7. The ratio of A's and B's ages is 5:7. After 8 years it will be 7:9. The age difference?**

1. Ratio gap 2 units in both.
2. 5 → 7 = 2 units = 8 years → 1 unit = 4.
3. Gap 2 units = 8.

**Answer:** 8

**8. A and B are 6:5 and their ages add to 44. Ratio after 8 years?**

1. 24 and 20 → 32 : 28.

**Answer:** 8:7

**9. Three years ago a family of 5 averaged 17 years. A baby has since been born, and the average is still 17. Baby's age?**

1. Now the 5 total 85 + 15 = 100.
2. 6 people × 17 = 102.

**Answer:** 2

**10. A mother is 4 times her daughter's age. In 5 years she will be 3 times. Mother's age now?**

1. m = 4d, m + 5 = 3(d + 5) → d = 10.

**Answer:** 40

**11. Two brothers differ by 10 years. 15 years ago the elder was twice the younger. Elder's age now?**

1. e = y + 10, e - 15 = 2(y - 15) → y = 25.

**Answer:** 35

## Mixtures and Alligation

**1. A milkman adds water and sells at cost price, gaining 25%. Water:milk?**

1. 25 : 100.

**Answer:** 1:4

**2. How much water must be added to 60 L of 80% milk solution so that milk becomes 60%?**

1. Milk 48 = 60% of 80 L.

**Answer:** 20 L

**3. A 40 L can of milk: 4 L removed and replaced with water, three times. Milk left (L)?**

1. $40 \times (0.9)^3$.

**Answer:** 29.16

**4. 60 L mixture of milk:water = 2:1. Water to add to make it 1:2?**

1. Milk 40 fixed. Need water 80. Add 60.

**Answer:** 60 L

**5. Alloys gold:copper 7:2 and 7:11 are mixed in equal amounts. Gold:copper in the new alloy?**

1. Gold fractions 14/18 and 7/18 → average 21/36.
2. Copper 15/36.

**Answer:** **7:5**

**6. Teas at Rs 126 and 135 per kg are mixed with a third variety in 1:1:2. The mix is worth Rs 153/kg. Price of the third?**

1. 126 + 135 + 2x = 612 → x = 175.5.

**Answer:** **Rs 175.5**

**7. 729 L of milk and water is 7:2. How much water must be added to make it 7:3?**

1. Milk 567, water 162.
2. For 7:3 water must be 243.

**Answer:** **81 L**

**8. From a can of pure milk, 10% is removed and replaced with water, four times. % of milk left?**

1. $0.9^4$ = 0.6561.

**Answer:** **65.61%**

**9. Vessel A is milk:water 5:3, vessel B is 1:3. In what ratio must they be mixed to get 1:1?**

1. Milk fractions 5/8 and 1/4, target 1/2.
2. (1/2 - 1/4) : (5/8 - 1/2) = 1/4 : 1/8.

**Answer:** **2:1**

**10. Sugar at Rs 20/kg and Rs 30/kg is mixed and sold at Rs 27.60, making 15% profit. Ratio?**

1. Cost of mix = 27.60/1.15 = 24.
2. (30 - 24) : (24 - 20) = 6 : 4.

**Answer:** **3:2**

## Mensuration

**1. Find the area of a triangle with base 12 cm and height 9 cm.**

1. 1/2 × 12 × 9.
   **Why:** Half of base times height.
2. = 54 $cm^2$.

**Answer:** **54 sq cm**

**2. The parallel sides of a trapezium are 9 cm and 15 cm and the height is 6 cm. Find its area.**

1. $1/2 \times (9 + 15) \times 6$.
   **Why:** Average of the parallel sides times height.
2. $= 12 \times 6 = 72$.

**Answer:** **72 sq cm**

**3. The diagonals of a rhombus are 10 cm and 24 cm. Find its area.**

1. $1/2 \times 10 \times 24$.
   **Why:** Half the product of the diagonals.
2. $= 120$.

**Answer:** **120 sq cm**

**4. A circle has circumference 44 cm (π = 22/7). Find its area.**

1. $2 \pi r = 44$ gives $r = 7$.
   **Why:** Radius first.
2. $22/7 \times 49 = 154$.

**Answer:** **154 sq cm**

**5. A cylinder has radius 7 cm and height 10 cm (π = 22/7). Find its volume.**

1. $22/7 \times 49 \times 10$.
   **Why:** $\pi r^2 h$.
2. $= 1540$.

**Answer:** **1540 cu cm**

**6. Find the area of a triangle with sides 13, 14 and 15.**

1. $s = 21$.
   **Why:** Half the perimeter.
2. $\sqrt{}(21 \times 8 \times 7 \times 6) = 84$.

**Answer:** **84**

**7. A cube has a diagonal of 6 √(3) cm. Find its volume.**

1. Diagonal $= a \sqrt{}(3)$, so $a = 6$.
   **Why:** Cube diagonal formula.
2. $6^3 = 216$.

**Answer:** **216**

**8. How many 2 cm cubes can be cut from a cuboid 10 × 8 × 6 cm?**

1. 5 × 4 × 3.
   **Why:** Count along each edge.
2. = 60.

**Answer: 60**

**9. Two angles of a triangle are 35° and 55°. What kind of triangle is it by its angles?**

1. Third angle = 180 - 35 - 55 = 90.
   **Why:** Angles add to 180.
2. One angle is 90, so it is right-angled.

**Answer: Right-angled**

**10. Each side of a rectangle is increased by 20%. By what percent does its area increase?**

1. 20 + 20 + 400/100.
   **Why:** x + y + xy/100.
2. = 44%.

**Answer: 44%**

**11. A parallelogram has sides 12 cm and 8 cm, and the height on the 12 cm side is 5 cm. Find its area.**

1. Area = base × perpendicular height = 12 × 5.
   **Why:** The 8 cm side is slanted; it is not the height.
2. = 60.

**Answer: 60 sq cm**

**12. The diagonals of a rhombus are 30 cm and 16 cm. Find its perimeter.**

1. Side = $\sqrt{(15^2 + 8^2)}$ = 17.
   **Why:** Half-diagonals make a right triangle (8-15-17).
2. Perimeter = 4 × 17 = 68.

**Answer: 68 cm**

**13. Each interior angle of a regular polygon is 150°. How many sides does it have?**

1. Exterior angle = 30.
   **Why:** 180 - 150.
2. 360 / 30 = 12.

**Answer: 12**

**14. How many diagonals does a regular octagon have?**

1. n(n - 3)/2 = 8 × 5 / 2.
   **Why:** Each corner joins 5 non-neighbours.
2. = 20.

**Answer: 20**

**15. Find the perimeter of a semicircular plate of radius 14 cm (π = 22/7).**

1. Curved part = 22/7 × 14 = 44.
   **Why:** Half of 2 π r.
2. Add the diameter 28.
   **Why:** The straight edge is part of the boundary.
3. 44 + 28 = 72.

**Answer: 72 cm**

**16. Find the area of a sector of angle 60° in a circle of radius 21 cm (π = 22/7).**

1. 60/360 = 1/6 of the circle.
   **Why:** Sector as a fraction.
2. 1/6 × 22/7 × 441 = 231.

**Answer: 231 sq cm**

**17. A sphere has radius 21 cm (π = 22/7). Find its volume.**

1. 4/3 × 22/7 × 9261.
   **Why:** Sphere formula; $21^3$ = 9261.
2. = 38,808.

**Answer: 38,808 cu cm**

**18. A cone has radius 6 and height 8. Find its curved surface area in terms of π.**

1. l = 10.
   **Why:** 6-8-10.
2. π × 6 × 10 = 60 π.

**Answer: 60 π**

**19. A wire bent into a square of area 121 sq cm is re-bent into a circle. Find the area of the circle (π = 22/7).**

1. Side 11, so the wire is 44 cm long.
   **Why:** Perimeter of the square = length of wire.
2. $2 \pi r = 44$ gives $r = 7$.
   **Why:** Same wire, now the circumference.
3. Area = 154.

**Answer: 154 sq cm**

**20. An isosceles trapezium has parallel sides 6 cm and 18 cm, and each slanted side is 10 cm. Find its area.**

1. Overhang each side = (18 - 6)/2 = 6.
   **Why:** The longer base sticks out equally.
2. Height = $\sqrt{}(100 - 36) = 8$.
   **Why:** 6-8-10 triangle.
3. $1/2 \times (6 + 18) \times 8 = 96$.

**Answer: 96 sq cm**

**21. A hemispherical bowl of radius 9 cm is full of liquid, which is poured into cylinders of radius 1.5 cm and height 4 cm. How many cylinders are filled?**

1. Bowl: $(2/3) \pi \times 729 = 486 \pi$. Cylinder: $\pi \times 2.25 \times 4 = 9 \pi$.
   **Why:** Volumes, keeping π.
2. 486 / 9 = 54.

**Answer: 54**

**22. A rectangle's length rises 20% and its breadth falls 20%. What is the change in area?**

1. $1.2 \times 0.8 = 0.96$.
   **Why:** Multiply the scale factors.
2. A 4% fall.

**Answer: -4%**

**23. A bucket (frustum) has radii 14 cm and 7 cm and height 15 cm. Find its capacity (π = 22/7).**

1. $R^2 + r^2 + Rr = 196 + 49 + 98 = 343$.
   **Why:** The bracket.
2. $1/3 \times 22/7 \times 15 \times 343 = 5390$.

**Answer: 5390 cu cm**

**24. A circular path 7 m wide runs around the outside of a park of radius 35 m. Find the area of the path (π = 22/7).**

1. R = 42, r = 35.
   **Why:** Add the width to the radius.
2. 22/7 × (42 + 35)(42 - 35) = 22/7 × 77 × 7.
   **Why:** Ring formula, factorised.
3. = 22 × 77 = 1694.

**Answer:** **1694 sq m**

**25. A regular hexagon has side 4 cm. Find its area in terms of √(3).**

1. 6 equilateral triangles of side 4.
   **Why:** A regular hexagon splits into 6 equilateral triangles.
2. Each: (√(3)/4) × 16 = 4 √(3).
   **Why:** Equilateral formula.
3. 6 × 4 √(3) = 24 √(3) $cm^2$.

**Answer:** **24 √(3)**

**26. The radius of a sphere is doubled. How many times does its volume become?**

1. Volume grows with $r^3$.
   **Why:** All lengths × 2 means volume × $2^3$.
2. $2^3$ = 8 times.

**Answer:** **8**

**27. Water flows through a pipe of radius 2 cm at 7 m per minute into a cylindrical tank of radius 20 cm. By how much does the water level rise in 10 minutes?**

1. In 10 minutes the water column in the pipe is 7 × 10 = 70 m = 7000 cm long.
   **Why:** Speed × time gives the length of water that came out.
2. Water volume = π × $2^2$ × 7000 = 28000 π $cm^3$.
   **Why:** That column is a cylinder of radius 2.
3. In the tank: π × $20^2$ × h = 28000 π, so 400 h = 28000.
   **Why:** The same volume now sits in the wide tank; cancel π.
4. h = 70 cm.

**Answer:** **70 cm**

## Probability

**1. A die is thrown once. What is the probability of getting a prime number?**

1. Primes on a die: 2, 3, 5.
   **Why:** 1 is not prime.
2. 3/6 = 1/2.

**Answer: 1/2**

**2. Three coins are tossed. What is the probability of getting at least two heads?**

1. Total 8.
   **Why:** $2^3$.
2. Two heads: 3 ways (3C2). Three heads: 1 way.
   **Why:** 'At least two' = two or three.
3. 4/8 = 1/2.

**Answer: 1/2**

**3. Two dice are thrown. What is the probability that the sum is at least 10?**

1. Sum 10: 3 ways, 11: 2 ways, 12: 1 way.
   **Why:** Ways = 13 - sum above 7.
2. 6/36 = 1/6.

**Answer: 1/6**

**4. One card is drawn from a pack of 52. What is the probability that it is a king or a heart?**

1. Kings 4, hearts 13, king of hearts counted in both.
   **Why:** Overlap of 1.
2. 4 + 13 - 1 = 16. 16/52 = 4/13.

**Answer: 4/13**

**5. A bag has 4 white and 6 black balls. One is drawn. What is the probability it is not white?**

1. Not white = black: 6 of 10.
   **Why:** Or 1 - P(white) = 1 - 4/10.
2. 6/10 = 3/5.

**Answer: 3/5**

**6. A number is chosen from 1 to 50. What is the probability that it is a perfect square?**

1. Squares up to 50: 1, 4, 9, 16, 25, 36, 49.
   **Why:** $7^2$ = 49 is the last one below 50.
2. 7/50.

**Answer: 7/50**

**7. Two dice are thrown. What is the probability of a doublet?**

1. Doublets: (1,1) to (6,6), 6 outcomes.
   **Why:** The diagonal of the 6 × 6 grid.
2. 6/36 = 1/6.

**Answer:** 1/6

**8. A bag has 5 red and 4 blue balls. Two are drawn together. What is the probability both are red?**

1. Total: 9C2 = 36.
   **Why:** Drawn together, so combinations.
2. Both red: 5C2 = 10.
   **Why:** Choose 2 of the 5 red.
3. 10/36 = 5/18.

**Answer:** 5/18

**9. A family has two children and at least one is a boy. What is the probability both are boys?**

1. Families: BB, BG, GB, GG. 'At least one boy' removes GG.
   **Why:** The given fact shrinks the sample space to 3.
2. BB is 1 of 3.

**Answer:** 1/3

**10. Three dice are thrown. What is the probability that all three show different numbers?**

1. Total 216.
   **Why:** $6^3$.
2. All different: 6 × 5 × 4 = 120.
   **Why:** First die any, second avoids one number, third avoids two.
3. 120/216 = 5/9.

**Answer:** 5/9

**11. Two cards are drawn together from a pack of 52. What is the probability that one is a spade and one is a heart?**

1. Total: 52C2 = 1326.
   **Why:** Drawn together.
2. One spade and one heart: 13 × 13 = 169.
   **Why:** Choose one from each suit and multiply.
3. 169/1326 = 13/102.

**Answer:** 13/102

**12. Two dice are thrown. What is the probability that the product of the numbers is even?**

1. The product is odd only when both numbers are odd: 3 × 3 = 9 outcomes.
   **Why:** One even number makes the whole product even.
2. P(even) = 1 - 9/36 = 3/4.

**Answer:** **3/4**

**13. A bag has 3 red and 5 black balls. Two are drawn together. What is the probability of one of each colour?**

1. Total 8C2 = 28.
   **Why:** Combinations.
2. One red AND one black: 3 × 5 = 15.
   **Why:** Multiply the choices.
3. 15/28.

**Answer:** **15/28**

**14. The odds in favour of an event are 3 : 5. What is the probability that it does NOT happen?**

1. 3 ways for, 5 ways against, 8 in total.
   **Why:** Odds in favour a : b means P = a/(a + b).
2. P(not) = 5/8.

**Answer:** **5/8**

**15. A die is thrown twice. What is the probability that the second number is greater than the first?**

1. Equal numbers: 6 outcomes. The other 30 split evenly between 'first bigger' and 'second bigger'.
   **Why:** By symmetry, the two cases are equally likely.
2. 15/36 = 5/12.

**Answer:** **5/12**

**16. A and B solve a problem independently with probabilities 1/2 and 1/3. What is the probability that the problem gets solved?**

1. P(both fail) = 1/2 × 2/3 = 1/3.
   **Why:** Solved = at least one solves it = 1 - P(both fail).
2. 1 - 1/3 = 2/3.

**Answer:** **2/3**

**17. Three students solve a problem independently with probabilities 1/2, 1/3 and 1/4. What is the probability that the problem gets solved?**

1. P(all fail) = 1/2 × 2/3 × 3/4 = 1/4.
   **Why:** Multiply the failure chances.
2. 1 - 1/4 = 3/4.

**Answer:** 3/4

**18. Two cards are drawn one after another without replacement. What is the probability both are aces?**

1. 4/52 for the first ace, 3/51 for the second.
   **Why:** One ace and one card are gone after the first draw.
2. 12/2652 = 1/221.

**Answer:** 1/221

**19. A speaks the truth 3/4 of the time and B 4/5 of the time. What is the probability they contradict each other on a statement?**

1. Contradict = exactly one tells the truth.
   **Why:** Both true or both false means they agree.
2. 3/4 × 1/5 + 1/4 × 4/5 = 3/20 + 4/20.
   **Why:** Two separate cases, so add.
3. 7/20.

**Answer:** 7/20

**20. The letters of ASSASSIN are arranged at random. What is the probability that all four S come together?**

1. Total arrangements: 8!/(4! 2!) = 840.
   **Why:** 4 S alike and 2 A alike.
2. Glue the four S into one block. Now arrange 5 items (SSSS, A, A, I, N): 5!/2! = 60.
   **Why:** The block counts as one item; the two A are alike.
3. 60/840 = 1/14.

**Answer:** 1/14

**21. Two dice are thrown. Given that the sum is even, what is the probability that it is 8?**

1. Even sums: 18 outcomes. Sum 8: 5 of them.
   **Why:** Shrink the sample space to the given fact.
2. 5/18.

**Answer:** 5/18

**22. A box has 6 good and 4 defective bulbs. 3 are picked at random. What is the probability that at least one is defective?**

1. P(none defective) = 6C3 / 10C3 = 20/120 = 1/6.
   **Why:** 'At least one' → complement.
2. 1 - 1/6 = 5/6.

**Answer:** 5/6

**23. A coin is tossed 6 times. What is the probability of getting exactly 4 heads?**

1. Ways: 6C4 = 15. Total: $2^6$ = 64.
   **Why:** Choose which 4 tosses are heads.
2. 15/64.

**Answer:** 15/64

**24. Four people are chosen from 5 men and 4 women. What is the probability that exactly 2 are women?**

1. Total: 9C4 = 126.
   **Why:** Choose any 4 of 9.
2. 2 women and 2 men: 4C2 × 5C2 = 6 × 10 = 60.
   **Why:** Choose each group separately and multiply.
3. 60/126 = 10/21.

**Answer:** 10/21

## Permutation and Combination

**1. Arrangements of the letters of LEADER?**

1. 6!/2!.

**Answer:** 360

**2. A committee of 3 men and 2 women from 6 men and 5 women?**

1. C(6,3) × C(5,2).

**Answer:** 200

**3. Ways to seat 6 people round a table?**

1. 5!.

**Answer:** 120

**4. Arrangements of BANANA?**

1. 6!/(3! 2!).

**Answer:** **60**

**5. Number of diagonals in a decagon?**

1. C(10,2) - 10.

**Answer:** **35**

**6. 4-digit numbers with no repeated digit?**

1. 9 × 9 × 8 × 7.

**Answer:** **4536**

**7. In how many ways can 5 boys and 3 girls sit in a row so that no two girls sit together?**

1. Seat boys: 5!. 6 gaps, pick and order 3: 6P3 = 120.
2. 120 × 120.

**Answer:** **14,400**

**8. A team of 5 is chosen from 7 men and 4 women with at least 2 women. Ways?**

1. 2W: 6 × 35 = 210. 3W: 4 × 21 = 84. 4W: 1 × 7 = 7.

**Answer:** **301**

**9. Arrangements of the letters of MATHEMATICS?**

1. 11!/(2! 2! 2!).

**Answer:** **49,89,600**

**10. In how many ways can 5 letters go into 5 addressed envelopes so that none is in the right one?**

1. Derangements: 5!(1 - 1 + 1/2 - 1/6 + 1/24 - 1/120) = 44.

**Answer:** **44**

**11. 5 boys and 5 girls sit in a row, alternating. Ways?**

1. Start with B or G: 2 × 5! x 5!.

**Answer:** **28,800**

**12. 12 points, 5 of them on one line. How many triangles?**

1. C(12,3) - C(5,3) = 220 - 10.

**Answer:** 210

**13. Choose 4 from 10 people so that 2 particular people are always in. Ways?**

1. C(8,2).

**Answer:** 28

## Data Interpretation

**1. Sales (Rs crore) 2024 / 2025: A 120/150, B 200/210, C 80/104, D 160/144, E 140/175. Highest % growth?**

1. A 25, B 5, C 30, D -10, E 25.

**Answer:** C (30%)

**2. Same table: average 2025 sales?**

1. 783 / 5.

**Answer:** 156.6

**3. Same table: B's 2024 sales : E's 2025 sales?**

1. 200 : 175.

**Answer:** 8:7

**4. Monthly budget Rs 60,000: rent 30%, food 25%, transport 10%, savings 20%, other 15%. Central angle for food?**

1. 25% of 360.

**Answer:** 90°

**5. Same budget: by how much does food exceed transport?**

1. 15% of 60000.

**Answer:** Rs 9,000

**6. Same table: overall % growth from 2024 to 2025 (2 d.p.)?**

1. 700 → 783: 83/700.

**Answer:** 11.86%

**7. Same sales table: company B's share of total 2025 sales (2 d.p.)?**

1. 210 / 783.

**Answer:** 26.82%

**8. Production (thousand units) 2021-2025: 40, 50, 45, 60, 72. Which year had the highest % growth over the year before?**

1. 2022 +25%, 2023 -10%, 2024 +33.3%, 2025 +20%.

**Answer:** 2024

## Series

**1. 2, 6, 12, 20, 30, ?**

1. n(n + 1).

**Answer:** 42

**2. 3, 7, 15, 31, 63, ?**

1. x2 + 1.

**Answer:** 127

**3. 1, 8, 27, 64, 125, ?**

1. cubes.

**Answer:** 216

**4. 5, 11, 23, 47, 95, ?**

1. x2 + 1.

**Answer:** 191

**5. Wrong number: 2, 5, 10, 17, 26, 38, 50**

1. $n^2$ + 1: 2, 5, 10, 17, 26, 37, 50.
2. 38 should be 37.

**Answer:** 38

**6. 4, 6, 12, 14, 28, 30, ?**

1. +2, x2 alternately.

**Answer:** 60

**7. AZ, CX, EV, GT, ?**

1. First letter +2, second -2.

**Answer:** IR

**8. 1, 2, 6, 15, 31, 56, ?**

1. Gaps 1, 4, 9, 16, 25 = squares.
2. Next gap 36.

**Answer:** 92

**9. 3, 5, 9, 17, 33, ?**

1. x2 - 1.

**Answer:** 65

**10. 7, 26, 63, 124, ?**

1. $n^3 - 1$ for n = 2..6.

**Answer:** 215

**11. 1, 4, 27, 256, ?**

1. $n^n$.

**Answer:** 3125

**12. 2, 3, 5, 7, 11, 13, ? (next two terms)**

1. Primes.

**Answer:** 17, 19

## Coding and Decoding

**1. If COMPUTER is coded DPNQVUFS, how is MOUSE coded?**

1. Each letter +1.

**Answer:** NPVTF

**2. If CAT = 24 (sum of positions), DOG = ?**

1. 4 + 15 + 7.

**Answer:** 26

**3. If MANGO is coded OCPIQ, how is APPLE coded?**

1. +2 each.

**Answer:** CRRNG

**4. If GREEN is coded TIVVM (reverse alphabet), how is BLUE coded?**

1. B → Y, L → O, U → F, E → V.

**Answer:** YOFV

**5. If 'water' is called 'air', 'air' is called 'fire', and 'fire' is called 'sky', what do fish live in?**

1. Fish live in water, and water is called 'air'.

**Answer:** air

**6. If TEACHER is coded VGCEJGT, how is STUDENT coded?**

1. +2 each.

**Answer:** UVWFGPV

**7. If FRIEND is coded HUMJTK, how is CANDLE coded?**

1. F+2, R+3, I+4, E+5, N+6, D+7.
2. Apply the same shifts to CANDLE.

**Answer:** EDRIRL

## Directions

**1. From home, walk 5 km east, 12 km north. Straight-line distance?**

1. 5-12-13.

**Answer:** 13 km

**2. Ravi walks 10 m north, turns right and walks 6 m, turns right and walks 18 m. How far (m) and which way from start?**

1. Net: 6 east, 8 south.
2. √(36 + 64) = 10, towards SE.

**Answer:** 10 m, south-east

**3. In the morning, Sita stands facing a pole; the pole's shadow falls to her right. Which way is she facing?**

1. Morning shadow points west.
2. West on her right → she faces south.

**Answer:** **South**

**4. A man faces north, turns 90 clockwise, then 180 anticlockwise, then 45 clockwise. Which way does he face?**

1. N → E → W → NW.

**Answer:** **North-west**

**5. A goes 4 km south, turns left and walks 3 km, turns left again and walks 8 km. Distance from start?**

1. South 4, left = east 3, left = north 8.
2. Net: 3 east, 4 north.
3. 3-4-5 → 5 km, north-east.

**Answer:** **5 km**

**6. From home, walk 7 km north, turn right and walk 4 km, turn right and walk 1 km, turn left and walk 4 km. Distance from home?**

1. N7, E4, S1, E4: net 8 east, 6 north.
2. 6-8-10 triangle → 10 km, north-east.

**Answer:** **10 km**

## Analogy

**1. Doctor : Hospital :: Teacher : ?**

1. Where they work.

**Answer:** **School**

**2. 7 : 50 :: 9 : ?**

1. $n^2 + 1$.

**Answer:** **82**

**3. Cow : Calf :: Dog : ?**

1. Young one.

**Answer:** **Puppy**

**4. ACE : BDF :: GIK : ?**

1. +1 each.

**Answer:** HJL

**5. 11 : 1331 :: 13 : ?**

1. Cube.

**Answer:** 2197

**6. BCD : YXW :: FGH : ?**

1. Reverse letters.

**Answer:** UTS

## Ranking

**1. Ram is 12th from the left and 18th from the right in a row. How many are in the row?**

1. 12 + 18 - 1.

**Answer:** 29

**2. In a class of 40, Sita is 15th from the top. Rank from the bottom?**

1. 40 - 15 + 1.

**Answer:** 26

**3. A and B are 10th and 25th from the left in a row of 40. How many between them?**

1. 25 - 10 - 1.

**Answer:** 14

**4. A is 14th from the left, B is 17th from the right, and there are 5 people between them (A to the left of B). Total?**

1. 14 + 5 + 17 = 36.

**Answer:** 36

**5. A and B swap places. A was 8th from the left and moves to 15th from the left; B was 12th from the right. B's new rank from the right?**

1. A moved 7 places right, so B moved 7 places left.
2. 12 + 7 = 19.

**Answer:** 19

**6. Rita is 12th from the left, Mona 4th from the right. They swap, and Rita is now 15th from the left. How many are in the row?**

1. Rita now sits where Mona was: 15th from left and 4th from right.
2. 15 + 4 - 1.

**Answer:** 18

## Syllogisms

**1. All pens are books. All books are tables. Does 'All pens are tables' follow?**

1. All + All = All.

**Answer:** Follows

**2. Some roses are flowers. All flowers are plants. Does 'Some roses are plants' follow?**

1. Some + All = Some.

**Answer:** Follows

**3. All boys are girls. No girl is a teacher. Does 'No boy is a teacher' follow?**

1. All + No = No.

**Answer:** Follows

**4. Some apples are mangoes. Some mangoes are grapes. Does 'Some apples are grapes' follow?**

1. Some + Some = no definite conclusion.

**Answer:** Does not follow

**5. No car is a bus. All buses are trucks. Conclusions: I. Some trucks are not cars. II. No truck is a car.**

1. The buses inside trucks are not cars, so some trucks are not cars.
2. Other trucks may be cars, so II fails.

**Answer:** Only I follows

## Seating Arrangement

**1. Eight people around a round table, equally spaced. How many different people can sit directly opposite a given person?**

1. With 8 seats, exactly one seat is opposite.

**Answer:** 1

**2. A, B, C, D, E, F sit around a round table facing the centre. A is opposite D. B is to A's immediate right (from A's view, i.e. anticlockwise when drawn). C is opposite B. Who is opposite E?**

1. Six seats: A and D, B and C, so E and F are the remaining opposite pair.

**Answer:** F

**3. P, Q, R, S, T sit in a row facing north. R is in the middle. P is at the right end. S is immediately left of R. Q is not at an end. Who is at the left end?**

1. Seats 1-5: R=3, P=5, S=2.
2. Q not at an end → 4. T = 1.

**Answer:** T

## Statements: Assumptions and Conclusions

**1. Statement: 'Please book tickets in advance to avoid last-minute rush.' Assumption: there is usually a rush at the last minute.**

1. The advice only makes sense if a rush happens.

**Answer:** Implicit

**2. Statement: 'All students who scored above 90% will get a scholarship. Ravi scored 92%.' Conclusion: Ravi will get a scholarship.**

1. Direct application of the rule.

**Answer:** Follows

**3. Statement: 'The government has increased the fee for driving licences.' Conclusion: fewer people will now drive.**

1. A fee change does not force driving behaviour.

**Answer:** Does not follow

## Puzzles

**1. The sum of two numbers is 60 and their difference is 14. Larger number?**

1. (60 + 14)/2.

**Answer:** 37

**2. In a group of cows and hens there are 48 heads and 140 legs. How many cows?**

1. All hens: 96 legs. Extra 44 / 2 = 22 cows.

**Answer:** 22

**3. P, Q, R, S, T live on floors 1-5 (1 = bottom). T is on floor 2. Q is immediately above T. R is on floor 1. S is above P. Who is on floor 5?**

1. T2, Q3, R1.
2. P and S take 4 and 5; S above P → S5.

**Answer:** S

**4. Three consecutive even numbers add to 138. The largest?**

1. Middle 46.

**Answer:** 48

## Odd One Out / Classification

**1. Odd one: 2, 3, 5, 9, 11**

1. Only non-prime.

**Answer:** 9

**2. Odd one: 16, 25, 36, 48, 64**

1. Not a perfect square.

**Answer:** 48

**3. Odd one: Apple, Mango, Potato, Banana**

1. Vegetable.

**Answer:** Potato

**4. Odd one: 8, 27, 64, 100, 125**

1. Only non-cube.

**Answer:** 100

**5. Odd one: AZ, BY, CX, DV**

1. Reverse pairs sum to 27: D(4)+W(23). DV is 4+22.

**Answer:** DV

## Blood Relations

**1. A is B's brother. C is A's mother. D is C's father. How is D related to B?**

1. D is C's father; C is B's mother.

**Answer:** Grandfather

**2. Pointing to a photo, Arun says, 'She is the daughter of my grandfather's only son.' Who is she to Arun?**

1. Grandfather's only son = Arun's father.
2. His daughter = Arun's sister.

**Answer:** Sister

**3. If P + Q means P is the father of Q, P - Q means P is the wife of Q, and P × Q means P is the brother of Q, what does A - B + C mean for A and C?**

1. A is B's wife; B is C's father.
2. So A is C's mother.

**Answer:** A is C's mother

**4. A is the son of B. C is B's sister. D is C's son. How is D related to A?**

1. C is A's aunt.
2. Her son D is A's cousin.

**Answer:** Cousin

## Counting Figures

**1. Squares in a 4 × 4 grid?**

1. 1 + 4 + 9 + 16.

**Answer:** 30

**2. Squares on a 6 × 6 board?**

1. 6 × 7 × 13 / 6.

**Answer:** 91

**3. Rectangles (including squares) in a 3 × 3 grid?**

1. C(4,2) × C(4,2) = 6 × 6.

**Answer:** 36

**4. Rectangles in a 2 × 4 grid?**

1. C(3,2) × C(5,2) = 3 × 10.

**Answer:** 30

**5. A triangle has 4 lines drawn from the top vertex to the base (including the two sides, so 4 lines total). Triangles?**

1. Choose 2 of the 4 lines: C(4,2).

**Answer:** 6

**6. Squares in a 5 × 5 grid?**

1. 1 + 4 + 9 + 16 + 25.

**Answer:** 55

**7. Rectangles (including squares) in a 4 × 4 grid?**

1. C(5,2) × C(5,2).

**Answer:** 100

## Cryptarithmetic

**1. AB + BA = 121 where A and B are distinct digits and A > B. How many such pairs (A, B)?**

1. 11(A + B) = 121 → A + B = 11.
2. (9,2), (8,3), (7,4), (6,5).

**Answer:** 4

**2. A + A + A = BA (a 2-digit number). Find A and B.**

1. 3A = 10B + A → 2A = 10B → A = 5B.
2. A = 5, B = 1.

**Answer:** A = 5, B = 1

**3. TO + GO = OUT (different letters, different digits). Find OUT.**

1. O = 1 (sum of two 2-digit numbers is at most 198).
2. Units: O + O = 2 = T, no carry.
3. Tens: 2 + G must carry. G = 9 would make U = 1, already taken by O.
4. So G = 8: 2 + 8 = 10 → U = 0, carry 1. 21 + 81 = 102.

**Answer:** 102

**4. EAT + THAT = APPLE. Find APPLE.**

1. A = 1 (leading carry). THAT < 10000 so T = 9 and P = 0.
2. Work the columns: E = 8, H = 2, L = 3.
3. 819 + 9219 = 10038.

**Answer: 10038**