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Quantitative Aptitude - Handout

1-Equations, Ratio, Proportion & Variation

- 1) A student ask to find $\frac{3}{7}$ th of a number and he instead multiplied it by $\frac{7}{3}$. As a result, he got an answer, which was more than the correct answer by 1680. What was the number?
a) 882 b) 273 c) 840
d) 1684 e) None of the these
- 2) A and B each has some money. If A gives Rs.30 to B then B will have twice the money left with A. But if B gives Rs.10 to A, then A will have thrice as much as is left with B. How much money does B have?
a) Rs.20 b) Rs.28 c) Rs.24
d) Rs.34 e) None of these
- 3) X says to Y, "I am twice as old as you were when I was as old as you are". The sum of their present age is 63 years. Find the present age of X.
a) 43 years b) 39 years c) 36 years
d) 42 years e) None of these
- 4) A question paper consists of 50 questions. Each correct answer fetches 3 marks and 1 mark is deducted for each wrong answer. A student who attempted all the questions, scored 90 marks. Find the number of questions answered by him correctly
a) 35 b) 25 c) 15
d) 30 e) None of these
- 5) The sum of 3 single digit numbers is 15 less than their product. If we subtract 2 from first given number then sum of these numbers will become 7 more than their product. The product of given 3 numbers will be?
a) 6 b) 8 c) 12
d) 24 e) 30
- 6) If a carton containing a dozen mirrors is dropped, which of the following cannot be the ratio of broken mirrors to unbroken mirrors?
a) 2:1 b) 3:1 c) 3:2
d) 1:1 e) 7:5
- 7) The total cost of producing a certain number of units of an article is partly fixed and partly varies directly with the number of units of that articles produced. The average cost of producing 15000 units of that article is Rs.2 while that of producing 25000 units of that article is Rs.1.5. Find the variable cost of each unit of that article produced
a) Rs.1.25 b) Rs.0.75 c) Rs.1.50
d) Rs.2.50 e) None of these
- 8) i) $\frac{a}{b} = \frac{3}{7}$, Find the value of $\frac{5a+b}{4a+5b}$
a) 15:44 b) 22:35 c) 15:49
d) 22:47 e) Can't be determine
- ii) $\frac{a}{b} = \frac{3}{2}$, Find the value of $\frac{5a^2+b}{5a-b}$
a) 13:47 b) 47:13 c) 22:47

- d) 15:49 e) Can't be determine
- iii) $\frac{a}{b} = \frac{3}{2}$, Find the value of $\frac{2a-3b}{4a^3-b}$
a) 13:47 b) 0 c) 22:47
d) 15:49 e) Can't be determine

- 9) An amount of Rs.1560 was divided among A, B and C in the ratio $\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$. Find the share of C in this amount.
a) Rs.300 b) Rs.320 c) Rs.280
d) Rs.360 e) None of these
- 10) The ratio of present age of A and B is 11/4. 15 years ago, the ratio of their ages was 8/1. Five years ago, the ratio of the ages of B and C was $\frac{3}{2}$. What is C's present age?
a) 15 years b) 10 years c) 22 years
d) 25 years e) None of these
- 11) A varies directly with B when C is constant and inversely with C when B is constant. Given that A is 16, when B is 28 and C is 7. Find the value A, when B is 9 and C is 6.
a) 6 b) 7 c) 8
d) 9 e) None of these

- 12) Two men Ashok and Baban have the ratio of their monthly incomes as 6/5. the ratio of their monthly expenditure is 3/2. find the ratio of their monthly savings.
a) 1:1 b) 3:5 c) 3:10
d) 3:8 e) Can't be determine

Directions for questions 13 and 14:

There are two colleges in the town - college A and College B. There are 500 students more in college A than in college B. The ratio of the boys to that of the girls in college A is 3:2 and that in college B is 4:1. The ratio of number of Science, Humanities and Commerce student in college A and College B are respectively 2:5:3 and 2:3:3. The number of commerce students in both the colleges is the same.

- 13) How many students are there in college A?
a) 2000 b) 2500 c) 3000
d) 3500 e) None of these

- 14) How many girls are there in two colleges together?
a) 1400 b) 1600 c) 1700
d) 2000 e) None of these

- 15) The distance travelled by freely falling body is directly proportional to the square of the time for which it falls. A body fell 95 m in the 10th second. Find the distance it fell in the 14th second.
a) 54m b) 116.5m c) 108m
d) 135m e) None of these

- 16) Cost of precious stone varies directly as the square root of its weight. A certain precious stone broke into 3 pieces whose weights are in the ratio 1:4:4. As a result its value went up by Rs.12000. Find its initial value.
a) Rs.9000 b) Rs.15000 c) Rs.12000
d) Rs.18000 e) None of these

2-Percentage, Profit & Loss

1) Dipin's score is 15% more than that of Rafi. Rafi's score is 10% less than that of Chandar. If the difference between the scores of Dipin and Chandar is 14, what is the score of Rafi?
a) 180 b) 360 c) 120 d) 480

2) Anil spent 16.66% of his income on rent. 25% of the remaining on food, 60% of the remaining on education. If he saves ₹4500 per month, find his income
a) Rs.16,000 b) Rs.17,000
c) Rs.18,000 d) Rs.19,000

3) Pravin purchased the articles for Rs 123684. He sold 60% of those at a profit of 16.66% and rest at a loss. Find the loss percentage on the remaining if the overall loss is 14%?
a) 20% b) 60%
c) 33.33% d) 66.66%

4) Numerator of the fraction increase by 418% and denominator increase by 117% then the value of the fraction is $\frac{3}{31}$, what is the original fraction?
a) $\frac{11}{88}$ b) $\frac{3}{74}$ c) $\frac{5}{76}$ d) $\frac{2}{83}$

5) A dealer gives as much discount (in percent) as the markup (in percent) above the cost price. What is the profit or loss percent?
a) 10% b) 1% c) 4%
d) can't be determined

6) Two articles are sold at the same price. One at a profit of 20% and another one at a loss of 20%. What is the overall profit or loss percentage?
a) 4% loss b) 4% profit c) No profit, No loss
d) 2% loss

7) There are five equal glasses containing milk in the ratio 3:4:5:6:7. How many glasses are at least 50% full of milk if the total volume of milk in the glasses is 60% of the total volume of the glasses?
a) 2 b) 3 c) 4 d) 5

8) Price of the article increase by 12%, 20% and 25% successively. What is the effective percentage increase in the price of the article?
a) 65% b) 68% c) 72% d) 76%

9) The length and the breadth of rectangle are increase by 12% and x% respectively, thereby area of rectangle increase by 40%. What is the value of x?
a) 25 b) 28 c) 31 d) 34

10) A sugar trader declares that he sells sugar at the cost price. However, he uses a weight of 450g instead of 500g. His percentage profit is:
a) 10% b) $11\frac{1}{9}\%$ c) $12\frac{2}{9}\%$ d) 12%

11) The difference between CP and SP of a table fan is Rs 175 where it gives the profit of 14%. What is SP of that fan (in Rs.)?

a) 1225 b) 1450 c) 1425 d) 1275

12) The cost price of 20 articles is the same as the selling price of x articles. If the profit is 25%, then the value of x is:
a) 15 b) 16 c) 18 d) 25

13) An article was sold at a profit of 20%. If both the cost price and selling price decreases by Rs.3000, then the profit would be 25%. Find the original cost price.
a) Rs.15000 b) Rs.30000 c) Rs.45000
d) Rs.60000

14) The loss incurred by selling 16m of a cloth equals the selling price of 4m of that cloth. Find the loss percentage.
a) 15% b) 20% c) 33.33% d) 25%

15) A trader mixes 25% kerosene to his petrol and then he sells the whole mixture at the price of petrol. If the cost price of kerosene be 50% of the cost price of petrol, what is the net profit percent?
a) $11\frac{1}{9}\%$ b) $12\frac{1}{9}\%$ c) $9\frac{1}{11}\%$ d) 20%

16) A shopkeeper sells his goods at the same price as what he pays his supplier. But when he buys from his supplier, he takes 10% more than the indicated weight and when he sells to his customers he gives 10% less than the indicated weight. Find his profit percentage.
a) $18\frac{2}{11}\%$ b) $22\frac{2}{9}\%$ c) $20\frac{2}{9}\%$ d) 20%

3-Partnership, SI & CI

1) A and B invest in a business in the ratio 3:2 for the same time period. If 5% of the total profit goes to charity and A's share is Rs. 855, the total profit is.
a) Rs. 1425 b) Rs. 1500 c) Rs. 1537.50
d) Rs. 1576 e) None of these

2) A, B and C jointly thought of engaging themselves in a business venture. It was agreed that A would invest Rs. 6500 for 6 months, B, Rs. 8400 for 5 months and C, Rs. 10,000 for 3 months. A wants to be the working member for which, he was to receive 5% of the profits. The profit earned was Rs. 7400. Calculate the share of B in the profit.
a) Rs. 1900 b) Rs. 2660 c) Rs. 2800
d) Rs. 2840 e) None of these

3) A, B and C enter into a partnership in the ratio 7/2:4/3:6/5. After 4 months, A increases his share 50%. If the total profit at the end of one year be Rs. 21,600, then B's share in the profit is.
a) Rs. 2100 b) Rs. 2400 c) Rs. 3600
d) Rs. 4000 e) None of these

4) The simple interest on a certain sum for 3 years is Rs.8178. The rate of interest are 7%, 10% and 12% per annum for the first, second and third year respectively. Find the sum.
a) Rs. 28200 b) Rs. 29200 c) Rs. 22800
d) Rs. 22900 e) None of these

5) In how many years does a sum amount to four times itself at 25% p.a. simple interest?

- a) 15 years b) 12 years c) 10 years
d) 17 years e) None of these

6) A certain sum yields Rs.840 more simple interest if it is invested for two years at 18% p.a. than at 12% p.a. Find the principal

- a) Rs. 7500 b) Rs. 8500 c) Rs. 8000
d) Rs. 7000 e) None of these

7) Amit borrowed a sum of money from Yogesh at simple interest. The rate of interest is 10% per annum for the first 2 years and 12% per annum for the next 3 years and 15% per annum thereafter. If amit paid Rs.5332 as interest after 7 years, then find the sum that he borrowed.

- a) Rs. 6800 b) Rs. 6600 c) Rs. 6200
d) Rs. 6400 e) None of these

8) A sum of money doubles in 3 years at compound interest. In how many years does it amount to 16 times itself?

- a) 25 b) 18 c) 30 d) 12
e) None of these

9) The compound interest, interest being compounded annually, on a certain sum for the second and the third year are Rs.2880 and Rs.3398.40 respectively. Find the rate of interest per annum.

- a) 18% b) 14% c) 20%
d) 16% e) None of these

10) What is the compound interest on Rs.8000 at 20% p.a. for 9-month, interest being compounded quarterly?

- a) Rs. 1281 b) Rs. 1261 c) Rs. 1241
d) Rs. 1221 e) None of these

11) What is the difference between compound interest on Rs.12000 at 20% p.a. for one year when compounded yearly and half yearly?

- a) Rs. 140 b) Rs. 120 c) Rs. 130
d) Rs. 110 e) None of these

12) Palak borrows money on compound interest and return it in two equal half - yearly instalments of Rs 4410 each. Find the interest charged if the rate of interest is 10 % p.a. compounded half yearly.

- a) Rs 600 b) Rs 820 c) Rs 620
d) Rs 660 e) None of these

13) A sum of Rs 7500 is to be paid back in three equal quarterly instalments. How much is each instalment if the interest is compounded quarterly at 8% p.a.?

- a) Rs. 2600.66 b) Rs. 2700.06 c) Rs. 2701.58
d) Rs. 2706.08 e) None of these

4-Average, Mixture & Alligation

1) The average of 11 consecutive natural numbers is 'x'. If 6th number is 12, find x

- a) 9 b) 10 c) 18 d) 11 e) None of these

2) 16 men went to hotel. 15 of them paid Rs.80 each and the 16th man paid Rs.75 more than the average bill of all the sixteen men. Find the total bill

- a) Rs.1020 b) Rs.1280 c) Rs.1360
d) Rs.1360 e) None of these

3) The Average age of husband, wife and their child 3 years ago was 27 years and that of wife and child 5 years ago was 20 years. The present age of husband is.

- a) 35 years b) 40 years c) 50 years
d) 45 years e) None of these

4) The average age of 24 students and the principal is 15 years. When the principal's age is excluded, the average age decreases by 1 year. What is the age of the principal?

- a) 38 b) 40 c) 39 d) 37 e) None of these

5) Sachin Tendulkar has a certain average for 9 innings. In the 10th inning, He scores 100 runs thereby increases his average by 8 runs. His new average is

- a) 20 b) 24 c) 28 d) 32 e) None of these

6) The average length of any 4 fingers of my left hand is 600mm. Then the average length of all the five fingers of my left hand is.

- a) 800mm b) 750mm c) 480mm
d) 600mm e) Cannot be determined

7) Vessel A contain 5 litres of milk and vessel B contains 5 litres of water. One litre of milk is taken from A and is poured into B. one litre of the mixture in B is then poured into A. if the present quantity of milk in B and water in A are X and Y respectively, then which of the following holds true?

- a) $X > Y$ b) $X = Y$ c) $X < Y$
d) Cannot be determine

8) Fresh grapes contain 84% water while raisins contain 20% water. How many kg of raisins can be made from 80 kg of fresh grapes?

- a) 16 kg b) 18 kg c) 20 kg
d) 22 kg e) None of these

9) 8 litres are drawn from a cask full of wine and is then filled with water. The operation is performed three more times. The ratio of quantity of wine now left in the cask to that of water is 16:65 How much wine the cask holds originally?

- a) 18 litres b) 24 litres c) 42 litres
d) 32 litres e) None of these

10) A cup of milk contains 3 parts of pure milk and 1 part of water. How much the mixture must be withdrawn and water substituted in order that resulting mixture may be half milk and half water.

- a) $\frac{3}{4}$ th mixture b) $\frac{1}{4}$ th mixture c) $\frac{2}{3}$ rd mixture
d) $\frac{1}{3}$ rd mixture e) None of these

11) In what ratio must a grocer mix two varieties of pulses costing Rs.15 and Rs.20 per kg respectively so as to get a mixture worth Rs.16.50 per kg?

- a) 3:7 b) 5:7 c) 7:3 d) 7:5 e) None of these

12) Two cans A and B contains milk worth Rs.7 per litre and Rs.9 per litre respectively. If the contents of A and B are transferred to another can C in the ratio 3 : 7 then the cost per litre of the mixture in can C is:

- a) Rs.9.40 b) Rs.10.10 c) Rs.7.40
d) Rs.8.40 e) None of these

13) A milk vendor has 2 cans of milk. The first contains 25% water and the rest milk. The second contains 50% water. How much milk should he mix from each of the containers so as to get 12 litres of milk such that the ratio of water to milk is 3 : 5?

- a) 4 litres, 8 litres b) 6 litres, 6 litres
c) 5 litres, 7 litres d) 7 litres, 5 litres
e) None of these

14) The quantity of sugar costing Rs.6.10 per kg must be mixed with 126 kg of sugar priced at Rs.2.85 per kg, so that 20% may be gained by setting the mixture at Rs.4.80 per kg.

- a) 126 kg b) 89 kg c) 69 kg
d) 84 kg e) None of these

15) Two qualities of rice at Rs.63 per kg and Rs.67.50 per kg are mixed with another quality of rice in the ratio 2:2:3. The final mixture sold at Rs.76.50 per kg then the rate of third quality rice per kg was:

- a) Rs.87.50 b) Rs.91.50 c) Rs.81.50 d) Rs.99.50

5-Time and Work

1) A can do a work in 12 days and B can do the same work in 36 days, in how many days can they complete the work, working together?

- a)15 b) 9 c) 24 d)18 e)12

2) P and Q can do a work in 15 days and 21 days respectively. P joins Q after some days and the total work is completed in 14 days. After how many days did P join Q?

- a) 8 b) 7 c) 6 d) 9 e)12

3) A, B and C can do a work in 10 days, 15 days and 20 days respectively. They work together and completed the work, earning ₹312. What is the share of C?

- a) Rs.138 b) Rs.98 c) Rs.72
d) Rs.112 e) Rs.108

4) Mr. P and Mr. Q can build a wall in 10 days; Mr. Q & Mr. R can take 14 days to build the same wall and Mr. P and Mr. R can do it in 8 days. Who among them will take more time when they work alone?

- a) P b) Q c) R d) data inadequate

5) M and N together finish a work in 30 days. If they work together for 20 days and then N left. The remaining work was done by M alone in the next 20 days. N alone can finish the work in

- a) 48 days b) 70 days c) 40 days
d) 50 days e) 60 days

6) Lalit and Bipin can do a work in 3 days and 7 days respectively. If they work on alternate days, then find the minimum number of days required to complete the work?

- a) $4\frac{1}{3}$ b) $4\frac{1}{7}$ c) 7 d) 3 e) None of These

7) 33 binders can bind 2200 books in 24 days. Find the number of binders required to bind 1800 books in 18 days.

- a) 33 b) 30 c) 40 d) 36 e) None of these

8) Thirty-six men can do a work in 20 days. In how many days can 24 men do the same work, given that the time spent per day is decreased by $\frac{1}{3}$ rd of the previous time?

- a) 42 b) 39 c) 48 d) 45 e) 52

9) 10 men and 8 women can do a work in 10 days, 8 men and 19 women can do the same work in 8 days. In how many days can 4 men and 6 women do the same work?

- a) 20 b) 5 c) 15 d) 10 e) 25

10) Two men and four women can complete a piece of work in four days. One man and two women take the same time as five women to complete the work. Find the time by one woman to complete the work

- a) 20 days b) 25 days c) 30 days
d) 40 days e) 45 days

11) A contractor employs 280 men to complete a work in 10 days. But after 3 days it was found that only $\frac{1}{4}$ th of the work was done. How many additional men are required to finish the work on time?

- a) 360 b) 120 c) 140 d) 80 e) 120

12) Three pipes, of which two are filling and the third is draining, are fitted to a tank. The two pipes can fill an empty tank in 30 minutes and 40 minutes and the draining pipe empties the full tank in 60 minutes. In how many minutes is the empty tank completely full when all the three pipes are opened simultaneously?

- a) 36 b) 60 c) 30 d) 48 e) 24

13) Pipes A and B can fill an empty tank in 20 minutes and 30 minutes respectively, whereas C can empty the full tank in x minutes. When pipes A, B and C are opened simultaneously the tank will be filled in 15 minutes. What is the value of x?

- a) 50 b) 55 c) 45 d) 60 e) 30

14) Pipe A can fill a tank in 3 hours. A can fill the tank in 5 hours if it works along with the outlet pipe B. If B can empty the tank at 6 litres per minute, then what is the capacity of the tank?

- a) 2850 litres b) 3450 litres c) 3200 litres
d) 3600 litres e) 2700 litres

6-Time, Speed and Distance

1) A car covers a distance from town A to town B at a speed of 70 kmph and covers the distance from town B to town A at a speed of 90 kmph. What is the approximate average speed of the car?

- a) 70 kmph b) 79 kmph c) 80 kmph
d) 90 kmph e) None of these

2) Without stoppages a train travels a certain distance with an average speed of 60 km/h and with stoppages with an average speed of 40 km/h. How many minutes per hour does the train stop?

- a) 30 minutes b) 20 minutes c) 10 minutes

d) 15 minutes e) None of these

3) A car starts from a city X at 9 am and travels towards another city Y at 70 km/hr. Another car starts from the city Y at 10 am and travels towards the city X at 85 km/hr. If the distance between the cities X & Y is 690 km then at what time do they meet?

- a) 1 pm b) 1.30 pm c) 2 pm
d) 2.15 pm e) None of these

4) Two cyclists simultaneously start from city A to city B and city B to city A respectively. After crossing each other first cyclist reaches city B in 4 hours while the second cyclist reaches city A in 9 hours. Find the ratio of the speed of two cyclists.

- a) $\frac{2}{3}$ b) $\frac{3}{2}$ c) $\frac{4}{3}$ d) $\frac{3}{4}$ e) None of these

5) A police van travelling at 60 kmph crosses an escaping thief travelling in opposite direction at 48 kmph. The police van has to travel for a further 5 minutes before it can find a gap in the median where it can take a U turn and start chasing the thief. After how much time police van catch the thief?

- a) 25 minutes b) 45 minutes c) 50 minutes
d) 32 minutes e) None of these

6) A train travelling at 36 kmph completely crosses another train having half its length and travelling in the opposite direction at 54 kmph, in 12 seconds. If it also passes a railway platform in 60 seconds, the length of the platform is :

- a) 300 metres b) 350 metres c) 450 metres
d) 500 metres e) None of these

7) Two trains running in the opposite direction cross a man standing on platform in 31 sec and 23 sec respectively. Two trains cross each other in 29 sec. What is the ratio of their speeds?

- a) 3:1 b) 4:3 c) 2:1 d) 3:2 e) None of these

8) Two trains running at 45 kmph and 54 kmph cross each other in 12 seconds when they run in opposite directions. When they run in the same direction, a person in the faster train observe that he crossed the other train in 32 seconds. Find the lengths of the two trains?

- a) 250 m, 90 m b) 260 m, 70 m c) 240 m, 90 m
d) 250 m, 80 m e) None of these

9) A man can row a certain distance downstream in 2 hours while he takes 3 hours to come back. If the speed of the stream be 6 km/hr then the speed of the man in still water is:

- a) 15km/hr b) 30km/hr c) 25km/hr
d) 29km/hr e) None of these

10) A boat takes 7 hours to cover 24 km distance and comes back. And, it can cover 2 km with the stream in the same time as 1.5 km against the stream. The speed of the stream is:

- a) 1 km/hr b) 2 km/hr c) 3 km/hr
d) 4 km/hr e) None of these

11) In a 100 metre race. A beats B by 20 metre and C by 30 meters, then in the same race B beats C by how many metres?

- a) 10 metre b) 12.5 metre c) 15 metre

d) 20 metre e) None of these

12) In a race Palak gives Asha a head start of 350 m and still beats her by 50 m. If palak's speed is $1\frac{1}{4}$ times Asha's speed, What is the length of race?

- a) 1 km b) 2 km c) 4 km
d) 1.5 km e) None of these

13) Three runners A, B and C run a race, with runner A finishing 12 meters ahead of runner B and 18 meters ahead of runner C, while runner B finishes 8 meters ahead of runner C. Each runner travels the entire distance at a constant speed. What was the length of the race?

- a) 36 meters b) 72 meters c) 60 meters
d) 48 meters e) None of these

14) P, Q, R run around a circular track 1200 m long with speed of 9, 18, 27 kmph. If they start at the same point and at the same time in the same direction, when will they meet again at the starting point?

- a) 480 sec b) 360 sec c) 240 sec
d) 300 sec e) None of these

15) A can run one full round of a circular track in 6 min and B in 15 min. If both A and B start simultaneously from the same starting point then How many times would they meet in the time B has completed 10 rounds when running in same direction, and In opposite direction?

- a) 15, 10 b) 25, 30 c) 15, 35
d) 35, 10 e) None of these

7-Numbers

1) Find unit digit

i) 687^{567}

- a) 7 b) 3 c) 9 d) 1 e) None of these

ii) 763^{4539}

- a) 3 b) 1 c) 9 d) 7 e) None of these

iii) 568^{564}

- a) 8 b) 4 c) 2 d) 6 e) None of these

2) i) If a number is represented by $N=84 \times 192 \times 217 \times 301$. What will be remainder when N is divided by 27?

- a) 7 b) 6 c) 5 d) 9 e) None of these

ii) What will be remainder when $568+5468+2543+65259$ is divided by 13?

- a) 10 b) 11 c) 12 d) 13 e) None of these

3) i) Which of the following number is divisible by 11, 42, 72?

- a) 8736 b) 6240 c) 10032
d) 7392 e) None of these

ii) Which number we have to add in 2456210 to make it divisible by 11?

- a) 9 b) 7 c) 3 d) 5 e) None of these

iii) Which number we have to subtract from 468951 to make it divisible by 9?

- a) 14 b) 15 c) 17 d) 18 e) None of these

iv) What is the smallest number by which the number 222264 is to be divided such that the quotient becomes a perfect cube?

- a) 3 b) 4 c) 7 d) 8 e) None of these

4) i) The remainder when 6^{100} is divided by 7, is:

- a) 3 b) 0 c) 1 d) 2 e) None of these

- ii) The remainder when 54^{457} is divided by 63 is,
a) 19 b) 17 c) 13 d) 18 e) None of these
- 5) Three number are in the ratio of 3 : 4 : 5 and their L.C.M. is 2400. Their H.C.F. is:
a) 40 b) 80 c) 120 d) 200 e) None of these
- 6) LCM and HCF of $2\frac{7}{14}$ and $5\frac{3}{3}$ is
a) $45\frac{1}{14}$ b) $35\frac{30}{42}$ c) $30\frac{1}{42}$
d) $25\frac{30}{1}$ e) None of these
- 7) The greatest possible length which can be used to measure exactly the lengths 7 m, 3 m 85 cm, 12 m 95 cm is:
a) 15 cm b) 35cm c) 27cm
d) 52cm e) None of these
- 8) 6 different sweet varieties of count 32, 216, 136, 88, 184, 120 were ordered for a particular occasion. They need to be packed in such a way that each box has the same variety of sweet and the number of sweets in each box is also the same. What is the minimum number of boxes required to pack?
a) 129 b) 64 c) 48
d) 97 e) None of these
- 9) i) If $p \times q = 361$, p, q are integers then the value of $p + (q-1)^2$ can be:
a) 343 b) 111 c) 109 d) None of these
ii) If $p \times q = 289$ and p, q are integers then find the integer value of p/q .
a) 289 b) 1 c) $a \& b$ d) None of these
- 10) i) Simplify: $[(1113 + 626)^2 + (1113 - 626)^2] / (1113 \times 1113 + 626 \times 626)$
a) 1 b) 2 c) 1113^2 d) 487^2 e) None of these
ii) Simplify: $(1004 \times 1004 \times 1004 + 382 \times 382 \times 382) / (1004 \times 1004 - 1004 \times 382 + 382 \times 382)$
a) 1386 b) 622 c) 1004×382
d) 1 e) None of these
- 11) If the sum of two numbers is 55 and the H.C.F. and L.C.M. of these numbers are 5 and 120 respectively, then the sum of the reciprocals of the numbers is equal to:
a) $55/601$ b) $601/55$ c) $11/120$
d) $120/11$ e) None of these
- 12) i) Find the number of factors of 4320.
a) 40 b) 42 c) 36 d) 48 e) None of these
ii) Find the sum of factors of 4320.
a) 13172 b) 15120 c) 10890
d) 12144 e) None of these
- 13) Find the smallest 3 digit number which when divided by 4, 7 and 11 leaves a remainder of 3 in each case.
a) 308 b) 305 c) 311 d) 309 e) None of these
- 14) Find the smallest number which when divided by 5, 7, 11 and 13 leaves respective remainder of 2, 4, 8 and 10
a) 5005 b) 5002 c) 5500
d) 5020 e) None of these
- 15) Find the largest number with which when 437, 857 and 1557 are divided, leaves the same remainder in each case

- a) 130 b) 140 c) 150 d) 160 e) None of these

16) In a large school auditorium, the students are made to sit to watch the programmes. If the teachers make a row of students of 16 each, there will be 12 students left. If they make rows of 24 each, then there will be 20 students left, if they make rows of 25 each, there will be 21 students left and if they make rows of 30 each, there will be 26 students left. What is the minimum number of students present in the school?

- a) 1216 b) 1784 c) 1196
d) 2396 e) None of these

8-Geometry & Mensuration

1) The wheel of a motorcar makes 1000 revolutions in moving 550m. Find the diameter of wheel.

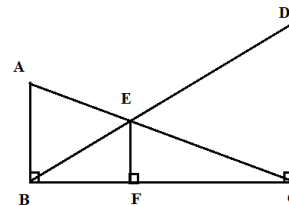
- a) 18 cm b) 20 cm c) 17.5 cm d) 18.5 cm

2) In parallelogram ABCD, AP and BP are the angle bisectors of $\angle DAB$ and $\angle ABC$. Find $\angle APB$.

- a) 85° b) 90° c) 70° d) 80° e) 95°

3) In a trapezium PQRS, PQ is parallel to RS and $PQ=10$ cm and $RS=20$ cm. What is the length of the line UV which is parallel to PQ and RS and divides the distance between them in the ratio 2:3 respectively?

- a) 15 cm b) 12 cm c) 14 cm
d) 16 cm e) 10 cm



4) In the above figure, $AB = 10$ cm, $CD = 40$ cm, Find EF.

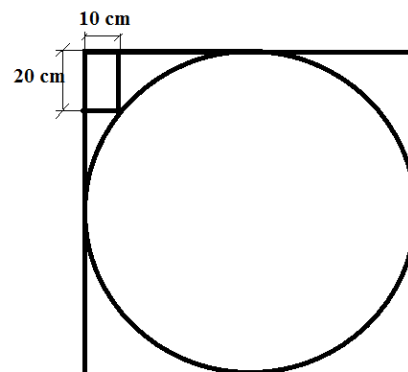
- a) 5 b) 6 c) 8 d) 4

5) Sum of the interior angles of a polygon is 1620. How many sides does polygon have?

- a) 12 b) 11 c) 10 d) 9 e) 8

6) In the diagram find the radius of the circle.

- a) 10 cm b) 50 cm c) 40 cm
d) 60 cm e) 30cm



7) T is an obtuse angle triangle. Two of its sides are 7 cm and 13 cm. How many possibilities exist for T such that the third side has an integral measure?

- a) 12 b) 7 c) 16 d) 9 e) 15

8) The area of similar triangles ABC and XYZ are 54 sq.cm and 150 sq.cm respectively. Find the perimeter of triangle XYZ, if the perimeter of the triangle ABC is 36 cm.

- a) 100 cm b) 30 cm c) 50 cm
d) 60 cm e) 70 cm

9) How far from the centre of a circle of diameter 170 cm is the chord 26 cm long?

- a) 84 cm b) 85 cm c) 82 cm
d) 83 cm e) 81 cm

10) A horse is put outside a fenced rectangular plot 60m×20m and is tethered to one of the corners of the plot by rope of length 30m. Find the total area that it can graze.

- a) 600π sq.m. b) 750π sq.m. c) 700π sq.m.
d) 500π sq.m. e) None of these

11) A solid sphere is cut into 8 identical pieces by three mutually perpendicular cuts. By what percentage is the sum of total surface area of the eight pieces more than the total surface area of the original sphere?

- a) 125% b) 150% c) 175% d) 200%

12) If the distance between the tops of two poles with lengths 13.42 m and 8.484 m both standing erect, is 6.17 m. Find the distance between their bases.

- a) 1.234 m b) 3.702 m c) 4.936 m
d) 2.468 m e) None of these

13) Radius and height of a right cylinder are each increase by 10%. Find the percentage increase in its volume.

- a) 30% b) 33.33% c) 33.1%
d) 300% e) None of these

14) A conical cup when filled with ice-cream forms a hemispherical shape on its open end. Find the approximate volume of ice-cream. If the radius of the base of the cone is 3.5 cm and the vertical height of cone is 7 cm.

- a) 165 cm^3 b) 185 cm^3 c) 170 cm^3
d) 175 cm^3 e) 180 cm^3

15) The minute hand of a clock is 24.5 cm long. Find the area swept by it between 10:10 am and 10:40 am of the same day.

- a) 900 sq.cm b) 948.75 sq.cm
c) 943.25 sq.cm d) 953.25 sq.cm

16) Four points P, Q, R and S lie on a straight line in the XY plane, such that $PQ=QR=RS$ and the length of PQ is 5 meters. A man wants to go from P to S. but there are dogs tethered with 5 metre chains at point Q and R. The man would not go within the reach of any dog. Minimum distance in meters the man must travel to reach the point S is.

- a) $5(\pi+1)$ b) $\frac{20\pi}{3}$ c) $\frac{40\pi}{3}$ d) $15\sqrt{2}$

17) A mosquito is flying in a room having dimensions 8 ft × 6 ft × 10 ft. It has to fly from one corner to the farthest opposite corner of a room to collect food. It collects the food and returns to its original spot. Find the minimum possible distance covered by the mosquito?

- a) $20\sqrt{2} \text{ ft}$ b) 20 ft.

c) $4\sqrt{47} \text{ ft}$

d) None of these

18) A peacock is sitting on a 19 m long pole, a snake is approaching the hole which is at bottom of the pole, the snake is 27 m away from the hole, if their speeds are same, find the distance from the hole at which the peacock pounces over the snake.

- a) 3.4 m b) 6.8 m c) 5.9 m d) 7.3 m

9-Permutation & Combination

1) If Naresh has 5 different shirts and 7 different pairs of pants, how many different combinations could he wear?

- a) 35 b) 30 c) 40 d) 45 e) None of these

2) There are 8 stations between Ernakulum and Chennai. How many second-class tickets have to be printed, so that a passenger can travel from one station to any other station?

- a) 70 b) 80 c) 90 d) 100 e) None of these

3) How many 4-digit numbers can be formed using digits 1, 2, 3, 4 and 5?

i) Without repetition of digits

- a) 240 b) 420 c) 625 d) 120 e) None of these

ii) With repetition of digits

- a) 420 b) 625 c) 120 d) 240 e) None of these

4) How many 4-digit numbers can be formed using digits 0, 1, 2, 3, 4 and 5?

i) Without repetition of digits

- a) 60 b) 120 c) 360 d) 300 e) None of these

ii) With repetition of digits

- a) 625 b) 1080 c) 750 d) 36 e) None of these

5) How many 4 digit numbers can be formed using digits 0, 5, 6, 7, 8 and 9 which are divisible by 4?

i) Without repetition of digits

- a) 36 b) 72 c) 96 d) 108 e) None of these

ii) With repetition of digits

- a) 240 b) 360 c) 270 d) 72 e) None of these

6) In how many ways 4 girls and 4 boys can seat in a row such that no 2 boys and no 2 girls are together?

- a) 20240 b) 1152 c) 576
d) 40320 e) None of these

7) How many ways 8 persons can seat around a circular table facing the centre such that 3 particular persons are always together?

- a) 5040 b) 40320 c) 241920
d) 30240 e) None of these

8) A letter lock consists of three rings each marked with six different letters. The number of distinct unsuccessful attempts to open the lock is at the most?

- a) 120 b) 216 c) 360 d) 215 e) None of these

9) How many 7 lettered words without repetition can be formed using the letters of the word "MISTAKE" so that no two vowels are together?

- a) 1240 b) 1220 c) 1420
d) 1440 e) None of these

10) A committee of 6 members is to be formed out of 10 members. How many ways can a selection of six members be made so that,

- i) A particular person is always included?
a) 126 b) 84 c) 210 d) 96 e) None of these
- ii) A particular person is always excluded?
a) 210 b) 120 c) 84 d) 126 e) None of these

11) In how many ways you can arrange the letters of the word

i) BINOCULARS

- a) $\frac{10!}{5!}$ b) $9!$ c) ${}^{10}C_{10}$ d) $10!$ e) None of these

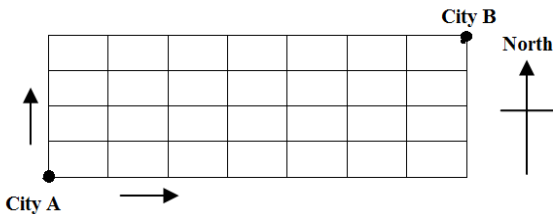
ii) ASSISTANTS

- a) $\frac{10!}{2! \times 4! \times 2!}$ b) $\frac{10!}{6!}$ c) $\frac{10!}{8!}$ d) ${}^{10}P_{10}$ e) None of these

iii) MISSISSIPPI

- a) $\frac{10!}{2! \times 2! \times 4!}$ b) ${}^{11}P_{10}$ c) $\frac{11!}{10!}$ d) $\frac{11!}{2! \times 4! \times 4!}$
e) None of these

12) In the figure given below, the lines represent the one-way roads allowing cars to travel only eastwards or northwards. In how many ways can car travel from the City A to the City B?



- a) 330 b) 304 c) 420
d) 840 e) None of these

13) Rohit attempted a multiple-choice question paper consisting of 10 questions and each question having 4 choices. The number of ways in which he can attempt the entire paper if he is making the answers at random is

- a) ${}^{10}P_4$ b) 4^{10} c) ${}^{10}C_4$ d) 10^4 e) None of these

14) There are 15 points in a plane of which 8 of them are on a straight line. Then by how many ways,

- i) Straight lines can be formed?
a) 105 b) 21 c) 78 d) 84 e) None of these
- ii) Triangles can be formed?
a) 399 b) 400 c) 434 d) 235 e) None of these

15) The total number of selections of 5 fruits which can be made from 4 oranges, 3 apples and 2 bananas taking at least one of each kind is:

- a) 44 b) 55 c) 98 d) 56 e) None of these

16) In how many ways selection of at least 1 ball can be made from 6 distinct balls?

- a) 2^6 b) 96 c) 63 d) 120 e) None of these

17) There are 4 identical books on Maths, 5 identical books on Science, and 3 identical books on English. In how many ways one or more books can be selected?

- a) 120 b) 119 c) 4096
d) 4095 e) None of these

18) Five persons A, B, C, D and E are standing in a row facing north. Find the number of possible arrangements in which A is to the left of B?

- a) 48 b) 64 c) 24
d) 60 e) None of these

19) In how many ways can Anil uncle distribute 10 identical chocolates in three children A, B and C?

- a) 4^{10} b) 3^{10} c) 66
d) 63 e) None of these

10-Probability

1) Four fair coins are tossed simultaneously. What is the probability of getting exactly 2 tails?

- a) $\frac{3}{8}$ b) $\frac{5}{8}$ c) $\frac{7}{16}$ d) $\frac{1}{2}$ e) None of these

2) Four fair coins are tossed simultaneously. What is the probability of getting at least 2 heads?

- a) $\frac{9}{16}$ b) $\frac{5}{8}$ c) $\frac{11}{16}$ d) $\frac{13}{16}$ e) None of these

3) If a die is thrown once, what is the probability of getting a prime number?

- a) $\frac{2}{3}$ b) $\frac{1}{6}$ c) $\frac{1}{2}$ d) $\frac{1}{3}$ e) None of these

4) Find a probability of getting a total more than 7, when sequentially throw a pair of dice?

- a) $\frac{2}{12}$ b) $\frac{3}{12}$ c) $\frac{5}{12}$ d) $\frac{7}{12}$ e) None of these

5) Three dices are thrown up simultaneously. What is the probability of having all the three different faces on the top?

- a) $\frac{4}{9}$ b) $\frac{1}{3}$ c) $\frac{5}{9}$ d) $\frac{2}{3}$ e) None of these

6) Two cards are drawn from a standard deck of 52 playing cards. What is the probability that both the cards are honour cards?

- a) $\frac{36}{221}$ b) $\frac{16}{221}$ c) $\frac{20}{221}$ d) $\frac{18}{221}$ e) None of these

7) i) Two cards are drawn from a standard deck of 52 playing cards one after another with replacement. What is the probability that both the cards are face cards?

- a) $\frac{9}{169}$ b) $\frac{18}{169}$ c) $\frac{15}{169}$ d) $\frac{12}{169}$ e) None of these

ii) Two cards are drawn from a standard deck of 52 playing cards one after another without replacement. What is the probability that both the cards are black cards?

- a) $\frac{27}{102}$ b) $\frac{25}{102}$ c) $\frac{31}{102}$ d) $\frac{21}{102}$ e) None of these

8) A card is drawn from a standard deck of 52 playing cards. What is the probability that the card is an ace or a king?

- a) $\frac{3}{13}$ b) $\frac{2}{13}$ c) $\frac{4}{13}$ d) $\frac{5}{13}$ e) None of these

9) A card is drawn from a standard deck of 52 playing cards. What is the probability that the card is a red card or a king?

- a) $\frac{6}{13}$ b) $\frac{15}{26}$ c) $\frac{8}{13}$ d) $\frac{15}{26}$ e) None of these

10) A box contains 12 electric bulbs, of which four are defective. Two bulbs are drawn at random from the bag. What is the probability that both are defective bulbs?

- a) $\frac{4}{11}$ b) $\frac{3}{11}$ c) $\frac{2}{11}$ d) $\frac{1}{11}$ e) None of these

11) The probability that it rains on a certain day is 0.6 and the probability that it rains on certain another day is 0.8. What is the probability that it will not rain on both days?

- a) 0.04 b) 0.08 c) 0.12
d) 0.16 e) None of these

12) Out of all the 2-digit integers between 1 and 100, a number is selected at random. What is the probability that the selected number is not divisible by 7?

- a) $\frac{13}{90}$ b) $\frac{79}{90}$ c) $\frac{80}{90}$ d) $\frac{77}{90}$ e) None of these

13) A seven-letter word is written at random with the letters of the word 'REPLACE'. What is the probability that it is REPLACE?

- a) $\frac{1}{630}$ b) $\frac{1}{1260}$ c) $\frac{1}{2520}$ d) $\frac{1}{5040}$ e) None of these

14) Six persons sit in a row randomly. What is a probability that three particular persons always appear together?

- a) $\frac{1}{5}$ b) $\frac{2}{5}$ c) $\frac{3}{5}$ d) $\frac{4}{5}$ e) None of these

15) Probability that a speak truth is $\frac{7}{10}$ and the probability that b speaks truth is $\frac{11}{15}$. What is the probability that both speak false while making a statement?

- a) $\frac{6}{25}$ b) $\frac{4}{25}$ c) $\frac{2}{25}$ d) $\frac{8}{25}$ e) None of these

16) The probability that M hits the target is 0.6, N hits the target is 0.65 and K hits the target is 0.55. What is the probability that at least of the person hits the target?

- a) 0.877 b) 0.897 c) 0.917
d) 0.937 e) None of these

17) A bag contains four red, three green, two yellow and five blue marbles. Three marbles are drawn at random from the bag
i) What is the probability that all the marbles are of the same colour?

- a) $\frac{15}{364}$ b) $\frac{19}{364}$ c) $\frac{23}{364}$ d) $\frac{27}{364}$ e) None of these

ii) What is the probability that all the marbles are of different colours?

- a) $\frac{11}{26}$ b) $\frac{1}{2}$ c) $\frac{15}{26}$ d) $\frac{11}{52}$ e) None of these

iii) What is the probability that at least one green coloured marble is drawn?

- a) $\frac{159}{264}$ b) $\frac{179}{264}$ c) $\frac{199}{264}$ d) $\frac{209}{264}$ e) None of these

Quantitative Aptitude Handout

Homework

1-Equations, Ratio, Proportion & Variation

1) A rope of 77 meters is cut into 2 pieces such that one piece is $\frac{4}{7}$ th of the other piece. What is the length of $\frac{3}{14}$ th of the longer piece in meters?

- a) 22.5 b) 245 c) 17.5
d) 10.5 e) None of these

2) Father is aged three times more than his son Sunil. After 8 years, he would be two and a half times of Sunil's age. After further 8 years, how many times would he be of Sunil's age?

- a) 4 times b) 5 times c) 2 times
d) 3 times e) None of these

3) In a regular week, there are 5 working days and for each day, the working hours are 8. A man gets Rs. 2.40 per hour for regular work and Rs. 3.20 per hours for overtime. If he earns Rs. 432 in 4 weeks, then how many hours does he work for?

- A) 160 b) 175 c) 180
d) 195 e) None of these

4) Weight of the solid right circular cone of a certain material varies directly as the square of its radius when its height is constant and varies directly as its height when its radius is constant. The weight of one such cone 12kg, its radius is 2 cm and its height is 4 cm. Find the weight of another such cone whose radius is 4 cm and whose height is 3 cm.

- a) 24kg b) 30kg c) 36kg
d) 39kg e) None of these

2-Percentage, Profit & Loss

1) Two students Sharan and Karan took the test. Sharan got 65% of the maximum marks and Karan got 55% percent of the maximum marks in the test. The difference between marks obtain by Sharan and Karan is 48. What are the maximum marks of the test?

- a) 360 b) 400 c) 440 d) 480

2) There are 4 containers W, X, Y and Z, each of which can hold a maximum quantity of 200 kg of a particular item. Container W has 40% more than X, X has 40% more than Y and Y has 30% less than Z. If W has 102.9 kg of contents, then what percentage of full quantity did Z has?

- a) 37.5% b) 12.9% c) 45.8% d) 82.4%

3) The length and the breadth of the rectangle are increase by 15% and 20% respectively. What is the percentage increase in the area of rectangle?

- a) 38% b) 42% c) 46% d) 50%

4) Marked price of the article is Rs.100. It sold with first discount of 10% and second discount was half of the previous discount then find the selling price after the two successive discounts.

- a) Rs.87.5 b) Rs.90 c) Rs.85.5 d) Rs.85

5) A vendor bought toffees at 6 for a rupee. How many for a rupee must he sell to gain 20%?

- a) 3 b) 4 c) 5 d) 6

3-Partnership, SI & CI

1) Amol started a business with Rs.2000 and after 5 months, Ashok joined him with Rs.4500. Amol received Rs.45250 including 10% of the profits as commission for managing the business at the end of one year. What amount did Ashok receive?

- a) Rs.47250 b) Rs.47500 c) Rs.47750
d) Rs.48000 e) None of these

2) A starts business with Rs. 3500 and after 5 months, B joins with A as his partner. After a year, the profit is divided in the ratio 2 : 3. What is B's contribution in the capital?

- a) Rs. 7500 b) Rs. 8000 c) Rs. 8500
d) Rs. 9000 e) None of these

3) If Rs.8000 has been lent at 10% p.a. the interest being compounded annually, what is the interest for the fifth year?

- a) Rs.1171.28 b) Rs.1161.28 c) Rs.1141.28
d) Rs.1151.28 e) None of these

4) The simple interest and compound interest at a certain rate on a certain sum for 2 years are Rs.800 and Rs.960 respectively. Find the rate of interest as well as sum

- a) 30% p.a.; Rs.2000 b) 40% p.a.; Rs.2000
c) 40% p.a.; Rs.1000 d) 45% p.a.; Rs.1000
e) None of these

4-Average, Mixture & Alligation

1) The average of 4 consecutive even numbers is 103. What is the product of the smallest and the largest number?

- a) 10400 b) 10504 c) 10605
d) 10600 e) None of these

2) A can contains 200 litres of pure milk. 20 litre was taken out and replace with water. How many times should this procedure be followed for the can to contain 145.8 litres of pure milk?

- a) 2 b) 3 c) 4 d) 5 e) None of these

3) In what ratio, a liquid A of cost Rs.31 per litre should be mixed with liquid B of cost Rs.36 per litre, so that cost of liquid of mixture is Rs.32.25 per litre?

- a) 2:1 b) 3:1 c) 3:2 d) 4:3 e) None of these

4) A shopkeeper sells wheat partly at 4% profit & at 16% profit. How much quantity should be sold at 4% profit if he has 600kg of wheat and wants to make an overall profit of 11%?

- a) 250 kg b) 120 kg c) 350 kg
d) 520 kg e) None of these

5-Time and Work

1) A is twice as good a workman as B and working together they finish a work in 14 days. In how many days can A alone finish the work?

- a) 19 b) 17 c) 43 d) 21 e) 42

2) Arun and Vinay can do a work in 12 days and 36 days respectively. If they work on alternate days, beginning with Arun, then in how many days will the work get completed?

- a) 24 b) 22 c) 18 d) 20 e) 25

3) 12 men or 16 women can do a work in 18 days, in how many days can 9 men and 24 women do the work?

- a) 12 b) 8 c) 10 d) 18 e) 14

6-Time, Speed and Distance

1) Had a person travelled 3 kmph faster he would have taken 2 hours less to cover a certain distance. Had he travelled 4 kmph slower he would have taken 5 hours more to cover the same distance. Find the distance.

- a) 180 km b) 120 km c) 140 km
d) 160 km e) None of these

2) A train, 350-meter-long, crosses a man, running in the same direction in 7 sec. The same train crosses a pole in 5 sec. What will be the speed of man?

- a) 14 m/s b) 36 m/s c) 25 m/s
d) 20 m/s e) None of these

3) Two bombs were exploded at a place P with a time interval of 40 minutes. A person moving away from P heard the first explosion at a point A and second explosion when he was at a point B. if he heard the explosions at an interval of 41 minutes and the speed of the sound is 331 m/s, what is the distance between A and B?

- a) 15240 m b) 18660 m c) 19860 m d) 20356 m

4) A motorboat can cover $10\frac{1}{3}$ km in 1 hour in still water. And it takes twice as much as time to cover up than as to cover down the same distance in running water. The speed of the current is:

- a) $3\frac{4}{9}$ km/hr b) $2\frac{1}{3}$ km/hr c) 4 km/hr
d) 3 km/hr e) None of these

5) Two toy trains start at same time from the same point on a circular track of circumference 1452 meters and run in opposite direction at 9 km/hr and 7.5 km/hr, respectively. They will meet in:

- a) 4.12 minutes b) 5.28 minutes c) 3.92 minutes
d) 4.08 minutes e) None of these

7-Numbers

1) The HCF and LCM of two numbers are 13 and 455 respectively. If one number lies between 85 and 125, then that number is :

- a) 99 b) 88 c) 91 d) 110 e) None of these

2) A rectangular courtyard 3.78 meters long 5.25 meters wide is to be paved exactly with square tiles, all of the same size. what is the minimum number of the tile which could be used for the purpose?

- a) 400 b) 450 c) 500
d) 600 e) None of these

3) i) The sum of squares of two numbers is 80 and the square of their difference is 36. The product of the two numbers is.

- a) 44 b) 22 c) 58 d) 116 e) None of these

ii) The sum of the squares of the three numbers is 138. While sum of their products taken two at a time is 131. Their sum is.

- a) 20 b) 30 c) 40 d) 50 e) None of these

4) Find the smallest number which when divided by 7 leaves a remainder of 6 and when divided by 11 leaves remainder of 8

- a) 37 b) 43 c) 47 d) 41 e) None of these

5) Find the largest number with which when 906 and 650 are divided they leave respective remainders of 3 and 5.

- a) 129 b) 127 c) 131 d) 133 e) None of these

8-Geometry & Mensuration

1) Find the perimeter of the semicircle whose radius is 35 cm.

- a) 110 cm b) 150 cm c) 180 cm
d) 220 cm e) None of these

2) A swimming pool 100 m long and 40 m wide is 1 m deep at the shallow end and 5m at deep end. Find the volume of water contain in the pool?

- a) 10000 cu.m. b) 12000 cu.m c) 15000 cu.m
d) 12500 cu.m e) 13500 cu.m

3) A cylindrical vessel of radius 21 m and height 5 m is 60% filled with water. How many pebbles of diameter 2 m are approximately required to fill the vessel?

- a) 540 b) 340 c) 662 d) 750

Quantitative Aptitude Handout Homework - Solutions

1-Equations, Ratio, Proportion & Variation

1) Suppose one piece is x then other piece is $(4/7)x$
 $x + (4/7)x = 77$ then $x = 49$

Longer piece is 49m and shorter piece is 28.
 $(3/14)$ of 49 = 10.5

2) If sunil's age is x then fathers age is $x + 3x = 4x$.

After 8 years,

$$(4x + 8) = 2(1/2)(x + 8)$$

By solving this $x = 8$.

Then after further 8 years father would be twice the age of sunil.

3) Without doing over time he earn 384

So total he earns $432 - 384 = 48$ by doing overtime.

So number of hours for which he did the overtime = $48/3.20 = 15$

Regular working hours = 60 hrs

over time = 15 hrs

Total number of hours = 75 hours

4) $W \propto r^2$ and $W \propto h$

By joint variation $W \propto r^2 \cdot h$

Equation becomes

$$\frac{W_1}{W_2} = \frac{r_1^2 \cdot h_1}{r_2^2 \cdot h_2}$$

$$W_1 = 12$$

$$W_2 = ?$$

$$r_1^2 = 2$$

$$r_2^2 = 4$$

$$h_1 = 4$$

$$h_2 = 3$$

Put values in above equation and get the value of W_2 .

2-Percentage, Profit & Loss

1) Maximum marks of the exam is suppose M

Then marks got by Sharan and Karan becomes 65% of M and 55% of M . Difference between their marks is 48.

$$65\% \text{ of } M - 55\% \text{ of } M = 48$$

Solving we will get value of Maximum marks as 480.

2) If content in the container Z is 100 kg.

Then content in the container Y is 70 kg.

Content in the container X is 98 kg.

Content in the container W is 137.5 kg.

But actual content in the container W is 102.9 kg that corresponds to 137.5.

Then actual content in the container Z that corresponds to 100.

So, actual content in the container Z will be 75 Kg and that is 37.5% of its maximum capacity.

3) Length \times Breadth = Area of Rectangle

	Length	Breadth	Area
Assumed values	20	10	200

New values	23(15% increase)	12(20% increase)	276
------------	------------------	------------------	-----

% increase in the area of Rectangle is 38%.

4) Marked price = Rs.100

1st discount = Rs.10(10% of the marked price)

2nd discount = Rs.5(Half of the first discount i.e. Rs.10)

So, at the end marked price becomes Rs. 85

5) A vendor bought toffees at 6 for a rupee.

Cost price of 1 toffee is Rs.1/6.

% profit = 20%

$$\% \text{ profit} = \frac{\text{Selling price} - \text{Cost price}}{\text{Cost price}} \times 100$$

From here we get the selling price of one toffee as 1/5.

So, in 1 rupee we can sell 5 toffees.

3-Partnership, SI & CI

1) the total time period is 1 year. Amol started the business and Ashok joined him 5 months after. So, Amol invested the capital for 12 months and Ashok invested the capital for 7 months.

Partners	Amount of investment	Time period	Ratio of profit
Amol	2000	12	16
Ashok	4500	7	21

Suppose total profit at the end is 100. Then A receives 10% as a commission then remaining 90 rupees get distributed among Amol and Ashok in the ratio 16:15.

So, amount received by Amol becomes $\frac{16}{37} \times 90$ + amount

received by Amol as a commission(10) and that $(\frac{16}{37} \times 90 + 10)$

corresponds to 45250(Amount received by Amol with 10% commission) then amount received by ashok when we assumed as 100 is $\frac{21}{37} \times 90$ that corresponds to what?

If we solve this then we will get answer as 47250.

2) A starts business with Rs. 3500 and after 5 months, B joins with A as his partner by investing x rupees suppose. Then A invested for 12 months and B invested for 7 months and at the end of the time period they share the profit in the ratio of 2:3.

So, $\frac{3500 \times 12}{x \times 7} = \frac{2}{3}$ Solve this and get the value of x that is amount invested by B in the business.

Value of x will be 9000.

3) the interest for the fifth year = Amount after 5 years - Amount after 4 years.

Rate of interest (r) = 10% p.a.

Principal (P) = 8000

$$\text{So, Interest for 5th year} = 8000(1 + \frac{10}{100})^5 - 8000(1 + \frac{10}{100})^4$$

If we solve above equation then we will get answer as 1171.28

OR

C.I. For 1st year = 800

C.I. For 2nd year = 880

C.I. For 3rd year = 968

C.I. For 4th year = 1064.8
C.I. For 5th year = 1171.28

4) Simple interest is same every year and Simple interest and compound is same for first year.

So,

	Simple Interest	Compound Interest
1st Year	400	400
2nd Year	400	560
Total Interest	800	960

The % increase in the compound interest in between any 2 consecutive year is same as the rate of interest.

So, % increase in the compound interest from 1st to 2nd year is 40%. Hence rate of interest is 40%.

Rate of interest is interest for one year on Principal.

So, 40% of Principal = 400

Hence Principal is 1000.

4-Average, Mixture & Alligation

1) If numbers are in the Arithmetic progression and even number of terms are there then average of all such terms will be the average of first and last term or average of second and second last term or average of third and third last term and so on.

The average of 4 consecutive even numbers is 103. So average of first and last or average of second and third numbers is 103. Then 2 consecutive even integers are there whose average is 103. The numbers are 102 and 104. So, second and third numbers are 102 and 104.

All 4 numbers are 100, 102, 104 and 106.

Multiplication of first and last number is 10600.

2) P = Initial quantity of Pure liquid.

Q = Quantity replaced every time.

n = Number of times procedure is repeated.

Then after n number of such operations,

a) Concentration of pure liquid in the final solution = $\left[\frac{P-Q}{P}\right]^n$

b) % Concentration of pure liquid in the final solution = $\left[\frac{P-Q}{P}\right]^n \times 100$

c) Quantity of pure liquid in the final solution = $\left[\frac{P-Q}{P}\right]^n \times P$

Now in Question we have to find out the value of $n-1$ (because we have to find out number of times such procedure is followed, its already perform one time at the start).

Q = 20 litres

P = 200 litres

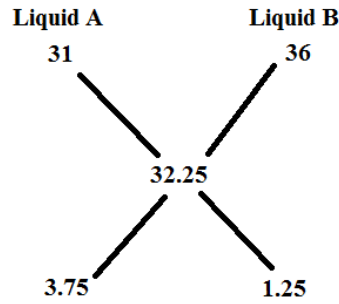
Put these values in formula (Formula c)

Then we will get equation

$$\left[\frac{200-20}{200}\right]^n \times 200 = 145.8$$

By solving above equation we get the value of n as 4.

So, 3 more times same procedure must be followed.

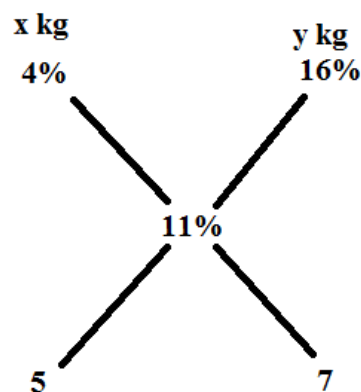


3)

So, liquid A and Liquid B are mixed in the ratio of 3.75 to 1.25 i.e. 3:1 so that cost of mixture becomes Rs.32.25 per litre

4) Suppose shopkeeper sells x kg at 4% profit and y kg at 16 % profit then total quantity after mixing these 2 types wheat will be 600 kg.

So, $x + y = 600$



Ratio of x and y must be 5:7 and $x+y=600$.

So, 250 kg must be sell at 4 % profit and 350 kg must be sell at 16% profit.

5-Time and Work

1) A is twice as good a workman as B. Means if B completes the work in $2x$ number of days then A completed the same amount of work in x number of days.

	Work done per day
A = x days	$1/x$
B = $2x$ days	$1/2x$
A and B = 14 days	$1/x + 1/2x = 1/14$

$$1/x + 1/2x = 1/14$$

If we solve above equation then value of x will be 21. So A alone can finish the work in 21 days.

2)

	Work done per day
Arun = 12 days	$1/12$
Vinay = 36 days	$1/36$

If they work on alternate days, beginning with Arun, then on odd number of days Arun will work and even number of days Vinay will work. So in a block of two days work completed by them = $\frac{1}{12} + \frac{1}{36} = \frac{1}{9}$.

So, in 2 days they complete $\frac{1}{9}$ th work so, number of days required to complete the total work would be 18.

$$3) \frac{M_1 T_1}{W_1} = \frac{M_2 T_2}{W_2} = \frac{M_3 T_3}{W_3}$$

M = Number of men to complete the work

T = Time required to complete the work

W = Amount of work

$$M_1 = 12m$$

$$M_2 = 16w$$

$$M_3 =$$

$$9m + 24w$$

$$T_1 = 18 \text{ days}$$

$$T_2 = 18 \text{ days}$$

$$T_3 =$$

?

$$W_1 = X$$

$$W_2 = X$$

$$W_3 = X$$

(Work is same in all the case.)

$$\frac{12m \cdot 18}{X} = \frac{16w \cdot 18}{X} = \frac{9m + 24w}{X}$$

By equating 1st and 2nd term we get the relation between number of men and number of women.

$$3m = 4w$$

After that either equate 1st and 3rd term or 2nd and 3rd term to calculate value of T_3 .

If we solve then we get value of T_3 as 8 days.

6-Time, Speed and Distance

1) Usual time taken and usual speed of a person is s kmph and t hours.

Now in the question distance travelled by a person is same in all the cases.

Had a person travelled 3 kmph faster he would have taken 2 hours less to cover a certain distance.

Equation becomes,

$$s \times t = (s+3)(t-2) \quad (1)$$

Had he travelled 4 kmph slower he would have taken 5 hours more to cover the same distance.

Equation becomes,

$$s \times t = (s-4)(t+5) \quad (2)$$

By solving 1 and 2 simultaneous equations we will get the value of s and t as 12 kmph and 10 hours.

$$\text{So, distance} = s \times t = 12 \times 10 = 120 \text{ km}$$

2) Suppose speed of man = x m/s

And speed of the train is = s m/s

A train, 350-meter-long, crosses a man, running in the same direction in 7 sec.

In this case 2 objects are Train and man.

So,

$$\text{Distance} = \text{Length of train} = 350 \text{ meter}$$

$$\text{Time} = 7 \text{ seconds}$$

$$\text{Speed} = s - x = \frac{D}{T} = \frac{350}{7} = 50 \text{ m/s}$$

$$s - x = 50 \quad (1)$$

The same train crosses a pole in 5 sec.

In this case 2 objects are Train and pole.

So,

$$\text{Distance} = \text{Length of train} = 350 \text{ meter}$$

$$\text{Time} = 5 \text{ seconds}$$

$$\text{Speed} = s = \frac{D}{T} = \frac{350}{5} = 70 \text{ m/s}$$

Put value of s in the 1st equation then we will get speed of man = $x = 20 \text{ m/s}$

3) Two bombs were exploded at a place P with a time interval of 40 minutes. A person moving away from P heard the first explosion at a point A and second explosion when he was at a

point B . So, time taken by the sound of bomb to travel from point A to B is 1 minute.

Distance between point A and B = Speed of Sound \times 1 minute (60 seconds)

$$= 331 \times 60 = 19860 \text{ metres.}$$

4) A motorboat can cover $10\frac{1}{3} \text{ km}$ in 1 hour in still water.

Speed of boat in still water is $S_b = 31/3 \text{ kmph}$.

It takes twice as much as time to cover up than as to cover down the same distance in running water.

Now distance is constant.

T_U = Time taken to cover the distance Upstream

T_D = Time taken to cover the distance Downstream.

$$T_U = 2 \cdot T_D$$

$$\text{So, } \frac{T_U}{T_D} = \frac{S_D}{S_U} = \frac{2}{1}$$

Where, S_D = Downstream speed = $S_b + S_s$

S_U = Upstream speed = $S_b - S_s$

$$S_b = 31/3 \text{ kmph}$$

Put these values in above equation and find out value of S_s we will get it as $3\frac{4}{9}$.

5) Two toy trains start at same time from the same point on a circular track of circumference 1452 meters and run in opposite direction at 9 km/hr and 7.5 km/hr, respectively.

So, time taken by 2 toy trains to meet for the first time =

$$\frac{\text{Distance}}{\text{Speed}}$$

$$\text{Distance} = 1452 \text{ meters}$$

$$\text{Speed} = (9+7.5) \times \frac{5}{18} \text{ m/s}$$

If we put these values in above equation then we get the value of time taken as 5.28 minutes.

7-Numbers

1) If A and B are two integers then,

$$A \times B = \text{LCM}(A,B) \times \text{HCF}(A,B)$$

$$A \times B = 13 \times 455$$

If we factorise this then it becomes $13 \times 5 \times 7 \times 13$

One number lies between 85 and 125. So that one number must be 91 and other number we get 65.

2) A rectangular courtyard 3.78 meters long 5.25 meters wide is to be paved exactly with square tiles, all of the same size. In this case dimension of square tile must be the factor of the length and width of courtyard. But minimum number of such tiles are required then we have to find the highest factor of length (378 cm) and width (525 cm) of the rectangular courtyard.

$$\text{So, HCF}(378, 525) = 21 \text{ cm}$$

Square tile must be of the size $21 \text{ cm} \times 21 \text{ cm}$.

$$\text{Minimum number of such tiles} = \frac{\text{Area of Courtyard}}{\text{Dimension of single tile}}$$

$$= \frac{378 \times 525}{21 \times 21} = 450$$

So, 450 tiles are required to paved the area with square tile.

3) i) The sum of squares of two numbers is 80 and the square of their difference is 36. The product of the two numbers is.

Let the 2 numbers are a and b ,

$$(a^2 + b^2) = 80$$

$$(a-b)^2 = 36$$

$$\text{So, } (a-b)^2 = (a^2 + b^2) - 2ab$$

Putting the values above we get the product of two numbers as 22

ii) The sum of the squares of the three numbers is 138. While sum of their products taken two at a time is 131.

Let the numbers are a , b and c .

$$(a^2 + b^2 + c^2) = 138$$

$$ab + bc + ca = 131$$

we have to find out $a + b + c = ?$

$$(a + b + c)^2 = (a^2 + b^2 + c^2) + 2(ab + bc + ca)$$

Putting the values in above equation we get value for $a + b + c = 20$

4) Find the smallest number which when divided by 7 leaves a remainder of 6 and when divided by 11 leaves remainder of 8.

Solution:

Take the larger of the two given divisors i.e. 11 in this case. The required number when divided by 11 gives a remainder of 8. We know that a number when divided by 11 giving remainder of 8 is of the form $11k + 8$, which means we are looking for a number of the form $11k + 8$.

Since the same remainder, when divided by 7 gives a remainder of 6, this number $7k + 6$ when divided by 7 gives a remainder of 6. We know that if there is a remainder in a division, by subtracting the remainder from the given number, the resulting number will then be exactly divisible by the divisor. This means if 6 is subtracted from $11k + 8$, the resulting number, i.e. $11k + 2$ will be exactly divisible by 7. We should now give value of 0, 1, 2, 3... to k and find out for what value of k , $11k + 2$ will be divisible by 7.

The smallest value of k which satisfy the above condition, we notice, is 3 and hence $k = 3$ will give us a number that we are looking for. Since the number, we said, is $11k + 8$ number is $11 \times 3 + 8$ i.e. 41. So 41 is the smallest number which satisfies the two given conditions.

5) Find the largest number with which when 906 and 650 are divided they leave respective remainders of 3 and 5.

The largest number with which the number P , Q , or R are divided giving remainders of S , T and U respectively will be the,

HCF of the three numbers of the form $(P - S)$, $(Q - T)$ and $(R - U)$.

So, answer is, $\text{HCF}[(906 - 3), (650 - 5)] = 129$

8-Geometry & Mensuration

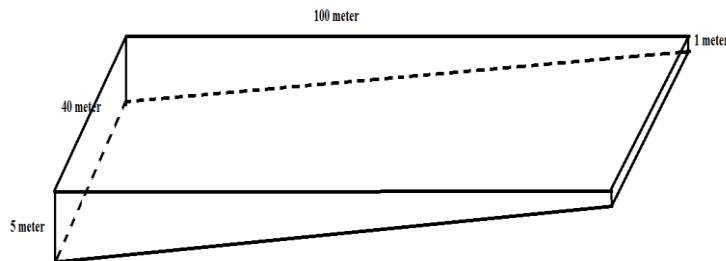
1) Perimeter of semi circle = Half of the perimeter of circle + Diameter of circle

$$= \pi r + 2r$$

$$= \pi(35) + 2 \times 35$$

$$= 180 \text{ cm}$$

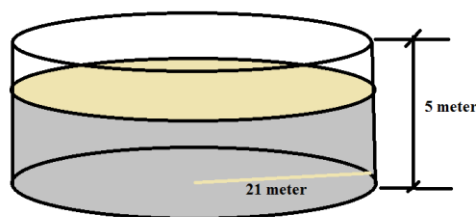
2)



Volume of pool = Area of trapezium with parallel sides 5 and 1 meter \times Width of pool

$$= \frac{1}{2} \times (1 + 5) \times 100 \times 40$$

After solving we will get answer as = 12000 cu.m



3)

A cylindrical vessel of radius 21 m and height 5 m is 60% filled with water. So, 40% of the cylinder is vacant.

Suppose n numbers of pebbles are required to fill the vessel completely then,

Number of pebbles required to fill this vessel completely = 40% of the volume of the cylinder.

$n \times \text{volume of single pebble} = 40\% \text{ of the volume of the cylinder.}$

$$n \times \frac{4}{3} \times \pi \times r^3 = \frac{40}{100} \times \pi \times r^2 \times h$$

$$n \times \frac{4}{3} \times \pi \times (1)^3 = \frac{40}{100} \times \pi \times (21)^2 \times (5)$$

$$n = 661.5$$

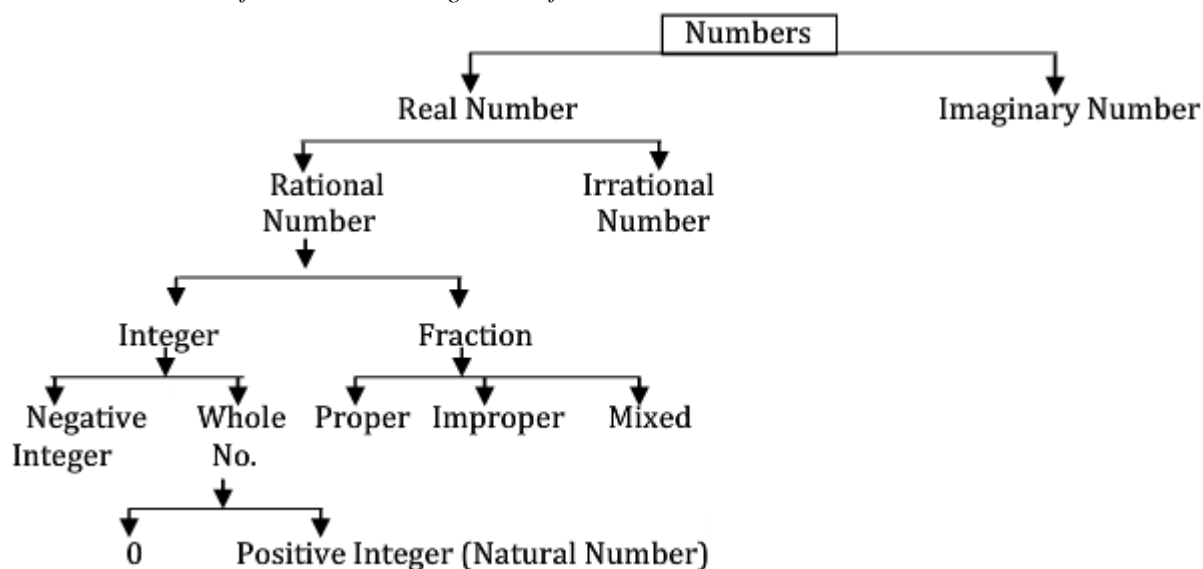
So, approximately 662 pebbles are required to fill the vessel completely.

Quantitative Aptitude

Chapter 01 - Number System

Number System & Simplification

Numbers can be classified in various categories as follows



REAL NUMBERS :

Numbers that can be represented on a number line are called Real Numbers.

IMAGINARY (COMPLEX) NUMBERS :

A number of the form $k.i$, where k is a real number, $k \neq 0$ and $i = \sqrt{-1}$ is called an imaginary number. A number of the form $a + bi$, where a, b are real numbers is a complex number.

Note :

(i) $i = \sqrt{-1}$

(ii) A number $a + bi$; if $a = 0$ the number is a purely imaginary number, if $b = 0$, the number is a purely real number

(iii) Any real number can be written in the form of a complex number.

CONJUGATE OF A COMPLEX NUMBER :

It is obtained by changing the sign of the imaginary part.

e.g., conjugate of $(2+3i)$ is $(2-3i)$

RATIONAL NUMBER :

Rational numbers can be expressed in the form of p/q , where p and q are integers and $q \neq 0$. Rational numbers can be both positive or negative.

e.g. $\frac{3}{1}, \frac{5}{2}, \frac{6}{7}, \frac{3}{4},$

Every rational number when expressed in decimal form is expressible in either terminating decimals or repeating decimals.

e.g. $\frac{4}{9} = 0.444444444\ldots \frac{1}{5} = 0.2$

IRRATIONAL NUMBERS :

Numbers those when expressed in decimal form are neither terminating nor repeating are known as irrational numbers.

e.g. $\sqrt{3}, \sqrt{7}, \pi$ etc.

INTEGERS :

An integer is any number of the set $\{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$ Corresponding to every natural number, there is a 'negative' number. These negative numbers and natural numbers form the set of integers along with 0. A set of integers is denoted by 'I'. The order of relation in the set I. $\dots < -3 < -2 < -1 < 0 < 1 < 2 < 3 < \dots$

NATURAL NUMBERS :

All the non negative counting numbers are known as natural numbers.

e.g. 1, 2, 3, 4, 5,..... is a set of natural numbers. 0 is not included in the set of natural numbers.

WHOLE NUMBERS :

All the Natural numbers including 0 forms the set known as whole numbers.

e.g. 0, 1, 2, 3, 4, 5 is a set of whole numbers.

Here, we can say that all natural numbers are also whole numbers.

EVEN NUMBERS :

All integers that are divisible by 2 are known as even numbers.

e.g. -2, -4, 12,16 etc are even numbers.

ODD NUMBERS :

All integers that are not divisible by 2 are known as odd numbers.

e.g. -3,1,-5,7,-11 etc are odd numbers.

FRACTION :

The fraction is a part of an integer. e.g. p/q , The denominator of a fraction cannot be Zero as division by zero is not defined.

Kinds of fractions :

Proper Fractions : A proper fraction is a fraction whose denominator is greater than its numerator.

i.e. $\frac{p}{q}$ such that $q > p$. e.g. $\frac{2}{3}$ is a proper fraction.

Improper Fractions :

An improper fraction is a fraction whose denominator is less than its numerator. i.e. $\frac{p}{q}$ such that $q < p$. e.g. $\frac{3}{2}$ is a proper fraction.

Mixed Fraction :

It is combination of two parts, an integer and a fraction.

e.g., $1\frac{1}{2}$ is a mixed fraction. 1 is an integer and $\frac{1}{2}$ is the fraction.

A mixed fraction can be expressed as an improper fraction and vice-versa.

$$1\frac{1}{2} = \frac{3}{2} \text{ and } \frac{3}{2} = 1 + \frac{1}{2} = 1\frac{1}{2}$$

PRIME NUMBERS :

Those numbers which are greater than 1 and having exactly two factors, i.e. 1 and the number itself, are known as prime numbers.

e.g. 2, 3, 5, 7, 11, 13, etc are prime numbers.

Note :

(i) 2 is the smallest prime number and it is the only even prime number.

(ii) If a number has no factor equal to or less than its square root, then that number must be prime.

(iii) 1 is neither prime nor composite

COMPOSITE NUMBERS :

Natural numbers greater than 1 that are not prime, are known as composite numbers.

e.g. 4, 6, 9, 10, 12 etc. are composite numbers.

RELATIVELY PRIME NUMBERS

Two positive integers are said to be relatively prime to each other if their highest common factor is 1.

e.g. 14 and 15 are relatively prime numbers.

DIVISIBILITY RULES :

(1) Divisibility by 2 : A number is exactly divisible by 2, if the last digit of that number is 0, 2, 4, 6 or 8.

e.g. 16, 18, 24, 36, 42 etc. are exactly divisible by 2.

(2) Divisibility by 3 : A number is exactly divisible by 3, if the sum of all its digit is divisible by 3.

e.g. $462 \Rightarrow 4+6+2=12$

12 is divisible by 3.

462 is divisible by 3.

(3) Divisibility by 4 : A number is exactly divisible by 4, if the last two digits of that number are either 00 or divisible by 4.

e.g. 1728. Here, last two digits are 28. 28 is divisible by 4.

Hence, 1728 is divisible by 4.

(4) Divisibility by 5 : A number is exactly divisible by 5, if its last digit is either 0 or 5.

(5) Divisibility by 6 : A number is exactly divisible by 6, if it is divisible by 2 as well as 3.

e.g. 54 is divisible by 2 as well as by 3. Hence, 54 is divisible by 6.

(6) Divisibility by 8 : A number is exactly divisible by 8, If the number formed by its last three digits of that number are either 000 divisible by 8.

e.g. 12520. here, last three digits are 520. 520 is divisible by 8.

Hence, 12520 is divisible by 8.

(7) Divisibility by 11 : A number is exactly divisible by 11. If the difference between the sum of digits at odd places and the sum of digits at even places is either 0 or divisible by 11.

e.g. 121

Sum of digits at odd places = $1 + 1 = 2$

Sum of digits at even places = 2

$2 - 2 = 0$

\therefore 121 is divisible by 11.

e.g. 563574

Sum of digits at odd places = $5 + 3 + 7 = 15$

Sum of digits at even places = $4 + 5 + 6 = 15$

$15 - 15 = 0$

\therefore 563574 is divisible by 11.

FACTOR AND MULTIPLES :

A number is a factor of another number if it divides that number exactly i.e. A is a factor of B if

A exactly divides B.

e. g. 30 is exactly divisible by 5.

Hence, 5 is a factor of 30.

If A is a factor of B, then B is called a multiple of A.

e.g. 30 is multiple of 5.

SOME IMPORTANT FORMULAE :

$$(a + b)^2 = a^2 + b^2 + 2ab$$

$$(a - b)^2 = a^2 + b^2 - 2ab$$

$$(a + b)^2 - (a - b)^2 = 4ab$$

$$(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$$

$$(a^2 - b^2) = (a + b)(a - b)$$

$$(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$$

$$(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$$

$$a^3 + b^3 + c^3 - 3abc = (a + b + c) \times (a^2 + b^2 + c^2 - ac - bc - ab)$$

If $a^3 + b^3 + c^3 - 3abc = 0$; then either $a + b + c = 0$.

Ex. 1 : Express $\overline{0.345}$ as a fraction.

$$\begin{aligned} \text{Sol. : Let } x &= \overline{0.345} = 1000x = 345.\overline{345} = 1000x - x \\ &= 345.\overline{345} - \overline{0.345} \\ &= 999x = 345 = x = 345/999 \end{aligned}$$

Ex. 2 : Find the total number of factors of 462.

Sol. : The factorized form of 462 is $(2 \times 3 \times 7 \times 11)$

$$\begin{aligned} \text{So the total number of factors is } &(1 + 1)(1 + 1)(1 + 1)(1 + 1) \\ &= 2 \times 2 \times 2 \times 2 = 16 \end{aligned}$$

Ex. 3 : What is remainder if 7^{23} is divided by 6 ?

$$\frac{7^{23}}{6} = \frac{7 \times 7 \times 7 \dots 7 (23 \text{ times})}{6}$$

Sol. :

7 divided by 6 leaves remainder 1.

Thus, 7^{23} when divided by 6 will leave remainder $1 \times 1 \times 1 \dots (23 \text{ times}) = 1$

Ex. 4 : Evaluate $(52)^2 + (48)^2 + 2 \times 52 \times 48$

$$\text{Sol. : } (a^2 + b^2 + 2ab) = (a + b)^2$$

$$(52 + 48)^2 = 100^2 = 10000$$

Ex. 5 : Find the unit digit in the product $269 \times 541 \times 366 \times 345 \times 38$

$$\text{Sol. : Unit digit in the product} = 9 \times 1 \times 6 \times 5 \times 8 = 0$$

Practice Set 1:

1) $(2222.5 - 1680 * 0.75) * 1.2 = ?$

- A) 1015 B) 1255 C) 1115
D) 1055 E) 1155

2) $[18 * 15 - 20] / [(3.2 + 9.4) - 7.6] = ?$

- A) 30 B) 40 C) 50
D) 70 E) 60

3) The sum of two number is 24. The greatest product of these two numbers can be

- A) 124 B) 144 C) 164 D) 140

4) $(a-b) = 1$, $(b-c) = 2$ and $(c-a) = 3$ then the value of $(a^3+b^3+c^3-3abc)/(a+b+c)$ is

- A) 5 B) 6 C) 7 D) 8

5) If $a = -2$ and $b = -5$ then find the value of $a^3 + b^3 - a^2 + b^2 + 2a - 3b$

- A) -98 B) -100 C) 101 D) -101

6) Which of the following number is divisible by 11 ?

- A) 29435417 B) 29435477
C) 57463822 D) 57648317

7) What is the no of zeroes at the end of the product of the no from 1 to 100 ?

- A) 20 B) 22 C) 24 D) 25

8) $x + (1/x) = 2$, then find the value of $x^{10} + (-1/x)^{10}$

- A) 0 B) 1 C) 2 D) 3

9) The average of 7 consecutive number is n , if the next 2 number also included then the new average will be increased by ?

- A) 0 B) 1 C) 2 D) 3

10) The number of prime factors of 510510

- A) 4 B) 5 C) 6 D) 7

11) How many numbers are there up to 1000 which are divisible by 4, 6 and 8 together?

- A) 39 B) 40 C) 41
D) 42 E) None of these

12) In the examination a candidate must get $3/8^{\text{th}}$ marks to pass, out of total marks. Shyam appeared in the exam and got 300 marks and still failed by 36 marks. The maximum mark is

- A) 856 B) 866 C) 876
D) 886 E) 896

13) Two different numbers are divided by the same divisor and left remainder 11 and 17 respectively and when their sum was divided by the same divisor, remainder was 4. What is the divisor?

- A) 20 B) 24 C) 25
D) 28 E) None of these

14) If the places of last two-digits of a three digit number are interchanged, a new number greater than the original number by 36 is obtained. What is the difference between the last two digits of that number?

- A) 2 B) 3 C) 4 D) 7 E) None of these

15) A number is divided by 2, 3, 4, 5 or 6, remainder in each case is one. But the number is exactly divisible by 7. The number lies between 250 and 350, the sum of digits of the number will be

- A) 4 B) 7 C) 6 D) 10 E) Cannot be determined

16) Sum of eight consecutive odd numbers is 656. Average of four consecutive even numbers is 87. What is the sum of the largest even number and largest odd number?

- A) 171 B) 191 C) 101
D) 181 E) 179

17) What is the remainder when 7^{100} is divided by 4?

- A) 1 B) 2 C) 0 D) 3 E) None of these

18) Remainder when (41×42) is divided by 43?

- A) 1 B) 2 C) 3 D) 0 E) None of these

19) Find the remainder when 51^{203} is divided by 7?

- A) 4 B) 5 C) 6 D) 3 E) None of these

20) Find the remainder when 21^{875} is divided by 17?

- A) 14 B) 15 C) 16 D) 13 E) None of these

21) How many factors of 1080 are perfect squares?

- A) 4 B) 6 C) 8 D) 5 E) None of these

22) How many factors of $25 * 36 * 52$ are perfect squares?

- A) 18 B) 24 C) 36 D) 8 E) None of these

23) How many factors of $24 * 53 * 74$ are odd numbers?

- A) 100 B) 99 C) 20
D) 24 E) None of these

24) How many factors of the number $2^8 * 3^6 * 5^4 * 10^5$ are multiples of 120?

- A) 540 B) 660 C) 594
D) 792 E) None of these

25) Number $N = 26 * 55 * 76 * 107$; how many factors of N are even numbers?

- A) 1183 B) 1200 C) 1050
D) 840 E) None of these

26) Numbers A, B, C and D have 16, 28, 30 and 27 factors. Which of these could be a perfect cube?

- A) A and B B) A and B C) A, B and C
D) A and B E) None of these

27) Six bells commence tolling together and toll at intervals of 2, 4, 6, 8, 10 and 12 seconds respectively. In 30 minutes, how many times do they toll together?

- A) 8 B) 11 C) 13 D) 16 E) None of these

28) The least multiple of 7, which leaves a remainder of 4, when divided by 6, 9, 15 and 18 is:

- A) 68 B) 98 C) 180 D) 364 E) None of these

29) The least number, which when divided by 48, 60, 72, 108 and 140 leaves 38, 50, 62, 98 and 130 as remainders respectively, is:

- A) 11115 B) 15110 C) 15130

D) 15310 E) None of these

30) The L.C.M. of two numbers is 48. The numbers are in the ratio 2 : 3. Then sum of the number is:

A) 30 B) 22 C) 40 D) 60 E) None of these

31) The least number, which when divided by 12, 15, 20 and 54 leaves in each case a remainder of 8 is:

A) 534 B) 486 C) 544
D) 548 E) None of these

32) The product of two numbers is 2028 and their H.C.F. is 13. The number of such pairs is:

A) 1 B) 2 C) 3 D) 5 E) None of these

33) The least number which should be added to 2497 so that the sum is exactly divisible by 5, 6, 4 and 3 is:

A) 10 B) 14 C) 23 D) 30 E) None of these

34) HCF of $\frac{4}{3}$, $\frac{8}{6}$, $\frac{36}{63}$ and $\frac{20}{42}$

A) $\frac{4}{126}$ B) $\frac{4}{8}$ C) $\frac{4}{36}$
D) $\frac{4}{42}$ E) None of these

35) A gardener had a number of shrubs to plant in rows. At first he tried to plant 8, then 12 and then 16 in a row but he had always 3 shrubs left with him. On trying 7 he had none left. Find the total number of shrubs.

A) 154 B) 147 C) 137
D) 150 E) None of these

Practice Set 2:

1) $186 \times 186 + 159 \times 159 - 2 \times 186 \times 159 = ?$

A) 329 B) 700 C) 729 D) 848

2) If one-third of one-fourth of a number is 15, then three-tenth of that number is:

A) 35 B) 36 C) 45 D) 54

3) Which one of the following is not a prime number?

A) 31 B) 61 C) 71 D) 91

4) $(112 \times 54) = ?$

A) 67000 B) 70000 C) 76500 D) 77200

5) $1397 \times 1397 = ?$

A) 1951609 B) 1981709 C) 18362619
D) 2031719 E) None of these

6) $(935421 \times 625) = ?$

A) 575648125 B) 584638125 C) 584649125
D) 585628125

7) Which of the following is a prime number?

A) 33 B) 81 C) 93 D) 97

8) $5358 \times 51 = ?$

A) 273258 B) 273268 C) 273348 D) 273358

9) The sum of first five prime numbers is:

A) 11 B) 18 C) 26 D) 28

10) $(12)^3 \times 6^4 \div 432 = ?$

A) 5184 B) 5060 C) 5148

D) 5084 E) None of these

11) $72519 \times 9999 = ?$

A) 725117481 B) 674217481 C) 685126481
D) 696217481 E) None of these

12) The smallest 3 digit prime number is:

A) 101 B) 103 C) 109 D) 113

13) $(?) - 19657 - 33994 = 9999$

A) 63650 B) 53760 C) 59640 D) 61560
E) None of these

14) The sum of first 45 natural numbers is:

A) 1035 B) 1280 C) 2070 D) 2140

15) $(?) + 3699 + 1985 - 2047 = 31111$

A) 34748 B) 27474 C) 30154 D) 27574
E) None of these

16) Which of the following numbers is divisible by 3, 7, 9 And 11?

A) 639 B) 2079 C) 3791 D) 37911
E) None of these

17) $39798 + 3798 + 378 = ?$

A) 43576 B) 43974 C) 43984 D) 49532
E) None of these

18) Which of the following numbers is exactly divisible by 99?

A) 114345 B) 913464 C) 135792
D) 3572404 E) None of these

19) $8756 \times 99999 = ?$

A) 796491244 B) 875591244 C) 815491244
D) 88324284 E) None of these

20) $469157 \times 9999 = ?$

A) 4586970843 B) 4686970743 C) 4691100843
D) 484649125 E) None of these

21) $935421 \times 625 = ?$

A) 575648125 B) 584638125 C) 584649125
D) 575628125 E) None of these

22) Which of the following is always odd?

A) Sum of two odd numbers
B) Product of two odd numbers
C) Difference of two odd numbers
D) Sum of two even numbers
E) None of these

23) Find the number which is nearest to 457 And is exactly divisible by 11?

A) 450 B) 451 C) 460
D) 462 E) None of these

24) The smallest three-digit prime number is:

A) 104 B) 103 C) 107
D) 100 E) None of these

25) $1399 \times 1399 = ?$

- A) 1687401 B) 1901541 C) 1943211
D) 1957201 E) None of these

26) Find the units digit of the expression

$$111+122+133+144+155+166$$

- A) 1 B) 9 C) 7 D) 0 E) 8

27) The last digit of the number obtained by multiplying the number $91 \times 92 \times 93 \times 94 \times 95 \times 96 \times 97 \times 98 \times 99$ will be

- A) 0 B) 9 C) 7 D) 2 E) 8

28) What is the remainder, when 2256 is divided by 17?

- A) 1 B) 16 C) 14 D) 10 E) None of these

29) Three times the first of three consecutive odd integers is 3 more than twice the third. The third integer is:

- A) 9 B) 11 C) 13 D) 15

30) A two-digit number is such that the product of the digits is 8. When 18 is added to the number, then the digits are reversed. The number is:

- A) 18 B) 24 C) 42 D) 81

Chapter 02: Percentages

The term percent means "divided by hundred". The word percent come from "Per Centum" or "Per hundred". The word centum means hundred X percent means $x / 100$
X percent is written as $x\%$

CONVERTING A DECIMAL INTO PERCENTAGE :

To convert a decimal into percent, Move the decimal point two places to the right and add the symbol %, to indicate percent.

e.g. $0.45 = 45\%$

$0.64 = 64\%$

$0.586 = 58.6\%$

$0.003 = 0.3\%$

CONVERTING A FRACTION INTO PERCENTAGE :

To convert a fraction into percent, Convert the given fraction into its, decimal then convert the decimal into percent by shifting the decimal point to two places on the right and adding % symbol.

e.g.

$$\frac{1}{4} = 0.25 = 25\%,$$

$$\frac{2}{3} = 0.6666..... = 66.66\%,$$

$$\frac{4}{5} = 0.8 = 80\%$$

CONVERTING A PERCENTAGE INTO DECIMAL :

To convert a percent to a decimal, drop the % symbol. Then move the decimal point two places to the left.

Add, if necessary,

e.g.

$$50\% = 0.5, 16.5\% = 0.165,$$

$$3\% = 0.03, 47.53\% = 0.4753$$

CONVERTING A PERCENTAGE INTO FRACTION :

To convert a percent to a fraction, drop the % symbol, write the number over 100 to form a fraction. Reduce to get the simplest fraction.

$$50\% = \frac{50}{100} = \frac{1}{2},$$

e.g.

$$16.5\% = \frac{16.5}{100} = \frac{33}{200}$$

PERCENT CHANGE (INCREASE AND DECREASE) :

Very often, we need to find the percent of increase or decrease in a given quantity. To find this, calculate the change (increase or decrease) and divide it by the original (initial) amount.

THIS CAN BE REPRESENTED AS.

$$\text{Percentage change} = \left(\frac{\text{Change}}{\text{Initial Value}} \times 100 \right) \%$$

$$\text{The percent increase of q quantity} = \frac{\text{actual increase}}{\text{original amount}} \times 100$$

$$\text{The percent decrease of q quantity} = \frac{\text{actual decrease}}{\text{original amount}} \times 100$$

SUCCESSIVE PERCENTAGE CHANGE :

If a no. is changed (increase / decrease) by $x\%$ and in the second step. This changed no. is again changed (increase/decrease) by $y\%$ then,

Net % change =

$$\left(x + y + \frac{xy}{100} \right) \%$$

If x and y shows decrease then put a (-ve) sign before x and y , otherwise (+ve) sign.

SOME IMPORTANT POINTS :

• If A is $R\%$ more than B , then B is less than A by =

$$= \left(\frac{R}{100+R} \times 100 \right) \%$$

• If A is $R\%$ less than B , then B is more than A by =

$$= \left(\frac{R}{100-R} \times 100 \right) \%$$

SOLVED EXAMPLES

Ex. 1 : $\frac{1}{5}$ is what percent of $\frac{1}{6}$?

$$\text{Required \%} = \left(\frac{1/5}{1/6} \right) \times 100\% = \frac{6}{5} \times 100\% = 120\%$$

Sol. :

Ex. 2 :

$x\%$ of 35 = 2.275, Find the value of x = ?

$$\frac{x \times 35}{100} = 2.275 \Rightarrow x = \frac{227.5}{35} = 6.5\%$$

Sol. :

Ex. 3 :

Find the number which exceeds 15% of itself by 51%

Sol. : $x - 15\%$ of $x = 51$

$$x - \frac{15 \times x}{100} = 51$$

$$\Rightarrow 100x - 15x = 5100$$

$$\Rightarrow 85x = 5100$$

$$\Rightarrow x = 60$$

Ex. 4 :

If the price of an item is increased by 30% and then a discount of 5% is given on the increased price. What will be the effect on sale ?

Sol. :

$$\text{Using \% change} = \left(x - y + \frac{xy}{100} \right) \%$$

$$= \left(30 - 5 - \frac{30 \times 5}{100} \right) \% = 23.5\% \text{ (increase)}$$

Ex. 5 : A 's income is 80% of B 's. B 's income is 60% of C 's. If C 's income is 80,000. What is A 's income ?

Sol. : B 's income = 60% of 80,000 = Rs. 48,000

A 's income = 80% of 48,000 = Rs. 38,400

Practice Set 1

1) A batsman scored 110 runs which included 3 boundaries and 8 sixes. What percent of his total score did he make by running between the wickets?

- A) 45% B) $45\frac{5}{11}\%$ C) $54\frac{6}{11}\%$ D) 55%

2) Find the missing figures: $? \%$ of 25 = 2.125

- A) 7.5 B) 8.5 C) 10.5 D) 11.2
E) None of these

3) 218% of 1674 = ? \times 1800

- A) 0.5 B) 4 C) 6 D) None of these

4) $\sqrt{784} + ? = 78\%$ of 500 :

- A) 342 B) 352 C) 362 D) 372

5) In a competitive examination in State A, 6% candidates got selected from the total appeared candidates. State B had an equal number of candidates appeared and 7% candidates got selected with 80 more candidates got selected than A. What was the number of candidates appeared from each State ?

- A) 7600 B) 8000 C) 8400
D) Data inadequate

6) Raj saves 20% of his salary. His salary has increased by 20% and his expenditure has increased by 30%. What is the percentage change in his savings?

- A) 20% fall B) 4% fall C) 20% rise
D) 4% rise

7) In an examination, 40% marks are required to pass. A obtains 10% less than the number of marks required to pass. B obtains $11\frac{1}{2}\%$ less than A and C obtained $41\frac{3}{17}\%$ less than the number of marks obtained by A and B together. What marks did C get?

- A) 50 B) 40 C) 35 D) 45

8) Sita's salary in 2012 was Rs.1000/day and her salary in 2013 was Rs.1250/day. Again Sita's salary in 2013 is Rs.1000/day. what is the percent change in the salary of the year 2013?

- A) 12.5% B) 6.67% C) 25% D) 35 %

9) A and B enter into a partnership. A puts in the whole capital of Rs.45000 on the condition that the profits will be equally divided after which B will pay an interest on half the capital at 10% p.a. and receive 60 per month from A for carrying on the concern. What is the yearly profit, if B's income is half of A's income?

- A) Rs.8190 B) Rs.9180 C) Rs.6180
D) Rs. 6900

10) In a certain school, 20% of students are below 8 years of age. The number of students above 8 years of age is $\frac{2}{3}$ of the number of students of 8 years of age which is 48. What is the total number of students in the school?

- A) 72 B) 80 C) 120 D) 150
E) 100

11) If the sales tax reduced from $3\frac{1}{2}\%$ to $3\frac{1}{3}\%$, then what difference does it make to a person who purchases an article with market price of Rs. 8400?

- A) 12 B) 13 C) 14 D) 15
E) None of these

12) 1100 boys and 700 girls are examined in a test; 42% of the boys and 30% of the girls pass. The percentage of the total who failed is:

- A) 58% B) $62\frac{2}{3}\%$ C) 64% D) 78%

13) While purchasing one item costing Rs. 400, I had to pay the sales tax at 7% and on another costing Rs. 6400, the sales tax was 9%. What percent of the sales tax I had to pay, taking the two items together on an average?

- A) 8% B) $8\frac{13}{17}\%$ C) $8\frac{15}{17}\%$ D) $8\frac{1}{2}\%$

14) Which one of the following shows the best percentage?

- A) $\frac{384}{540}$ B) $\frac{425}{500}$ C) $\frac{570}{700}$ D) $\frac{480}{660}$

15) The price of a car is Rs. 3,25,000. It was insured to 85% of its price. The car was damaged completely in an accident and the insurance company paid 90% of the insurance. What was the difference between the price of the car and the amount received?

- A) Rs. 32,500 B) Rs. 48,750 C) Rs. 76,375
D) Rs. 81,250

16) The price of mangoes has increased by 25%. By what percent the consumption needs to be reduced so that the expense on mangoes remains the same?

- A) 25% B) 33.33% C) 20% D) None

17) Mohan spends 40% of his salary on food items, 50% of the remaining on transport, 30% of the remaining on clothes, after spending on food and transport; and saves the balance. If he saves Rs 630 every month, what is his monthly salary?

- A) Rs 1500 B) Rs 3000 C) Rs 5000
D) Rs 6500

18) The population of rats in a locality increases by 20% in one year. Observing this, the pest control committee decided to use a special kind of pesticide 'xyz' which effectively kills 160 rats in 3 months. Just after 2 years, what is the net increase or decrease in the population of rats if, initially the population of rats is 3200 and pesticide is used effectively?

- A) Increase of 128 rats
B) Decrease of 128 rats.
C) Neither an increase nor a decrease in the population
D) None of these

19) One merchant correctly calculates his percentage profit on the cost price; another wrongly calculates it on the selling price. The difference in actual profits if both claim to make 17.5% profit on goods sold at Rs.3760 is

- A) Rs.98 B) Rs.56 C) Rs.65
D) Cannot be determined

20) If $A = x\%$ of y and $B = y\%$ of x , then which of the following is true?

- A) A is smaller than B.

B) A is greater than B

C) Relationship between A and B cannot be determined.

D) If x is smaller than y , then A is greater than B.

E) None of these

21) Two numbers A and B are such that the sum of 5% of A and 4% of B is two-third of the sum of 6% of A and 8% of B. Find the ratio of A:B.

- A) 2 : 3 B) 1 : 1 C) 3 : 4 D) 4 : 3

22) Rajeev buys good worth Rs. 6650. He gets a rebate of 6% on it. After getting the rebate, he pays sales tax @ 10%. Find the amount he will have to pay for the goods.

- A) Rs. 6876.10 B) Rs. 6999.20 C) Rs. 6654
D) Rs. 7000

23) Difference of two numbers is 1660. If 7.5% of the number is 12.5% of the other number, find the number?

- A) 2390 and 4050 B) 2490 and 4150
C) 2400 and 4060 D) 2490 and 4100
E) None of these

24) What percent of 6.5 litres is 130 ml?

- A) 1% B) 2% C) 3% D) 4%
E) None of these

25) In an election between two candidates, 75% of the voters cast their votes, out of which 2% of the votes were declared invalid. A candidate got 9261 votes which were 75% of the total valid votes. Find the total number of votes enrolled in that election?

- A) 16800 B) 17800 C) 26800
D) 306800 E) None of these

26) If A is 150 percent of B, then B is what percent of $(A + B)$?

- A) $33\frac{1}{3}\%$ B) 40% C) $66\frac{2}{3}\%$ D) 75%

27) If one number is 80% of the other and 4 times the sum of their squares is 656, then the numbers are:

- A) 4, 5 B) 8, 10 C) 16, 20
D) None of these

28) The price of a car is Rs. 3,25,000. It was insured to 85% of its price. The car was damaged completely in an accident and the insurance company paid 90% of the insurance. What was the difference between the price of the car and the amount received?

- A) Rs. 32,500 B) Rs. 48,750 C) Rs. 76,375
D) Rs. 81,250

29) In an examination, 5% of the applicants were found ineligible and 85% of the eligible candidates belonged to the general category. If 4275 eligible candidates belonged to other categories, then how many candidates applied for the examination?

- A) 30,000 B) 35,000 C) 37,000
D) None of these

Practice Set 2:

1) A student has to obtain 35% of the total marks to pass. He got 165 marks and failed by 45 marks. The maximum marks are:

- A) 300 B) 500 C) 800 D) 600

2) A's salary is first increased by 40% and then decreased by 50%. The result is the same as B's salary increased by 50% and then decreased by 40%. Find the ratio of B's salary to A's salary?

- A) 10 : 9 B) 6 : 7 C) 7 : 9 D) 9 : 10

3) A% of B is B% of :

- A) A B) $B/100$ C) $A/100$ D) 100A

4) The length of a rectangle plot is increased by 10% to keep its area unchanged, the width of the plot should be :

- A) Kept unchanged B) increased by 10%
C) increased by $9\frac{1}{11}\%$ D) Reduced by $9\frac{1}{11}\%$

5) A salesman averages Rs. 390 during a normal 30 h week. During a sale, his rates are increased by 50%. What is his commission if he puts in 50 h during the sale?

- A) 650 B) 540 C) 600 D) 975

6) A is 5 times as large as B. then percent by which B is less than A, is :

- A) $83\frac{1}{3}\%$ B) $16\frac{1}{3}\%$ C) 90% D) 80%

7) A secured 40% marks in Hindi, 50% in English and 60% in Maths and 70% in Science. What were his total marks if the maximum marks obtained in each of these 4 subjects was 60?

- A) 125 B) 120 C) 132 D) 150

8) Milk contains 6% water. What quantity of pure milk should be added to 15 liters of milk to reduce this to 4%?

- A) 6.5 liters B) 7 liters C) 7.5 liters
D) can't be determined

9) A man spends 25% of his income on food, 45% on children's education and 70% of the remaining on house rent. What percent of his income he is left with?

- A) 8% B) 10% C) 9% D) 14%

10) A bag contains 800 coins of 25 p and 1600 coins of 50 p. If 16% of 25 p coins and 32% of 50 p coins are removed, the percentage of money removed from the bag is nearly:

- A) 15.6% B) 17.8% C) 21.6% D) 28.8%

11) The length of a rectangle is increased by 30% and breadth is decreased by 15%. Calculate the percentage change in the area.

- A) 8.5% B) 8% C) 10% D) 10.5%

12) When the price of sugar was increased by 30%, a family reduced its consumption in such a way that the expenditure on sugar was only 30% more than before. If 25 kg were consumed per month before, find the new monthly consumption.

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

13) A scored 30% marks and failed by 18 marks. B scored 35% marks and obtained 12 marks more than those required to pass. The pass percentage is :

- A) 33% B) 38% C) 43% D) 46%

14) The price of a table is Rs. 350 more than that of a chair. If 7 tables and 7 chairs together cost Rs. 4550, by what percent is the price of the chair less than that of the table ?

- A) $33\frac{1}{3}\%$ B) 70% C) $66\frac{2}{3}\%$
D) None of these

15) A reduction of 23% in the price of Rice enables a person to buy 11.5 kg. more for Rs. 100. what is the reduced price per Kg. ?

- A) Rs 1/Kg B) Rs 2/ Kg C) Rs 3/Kg
D) Rs 4/Kg

16) In a restaurant, 70% had vegetarian dinner while 20% had non-vegetarian dinner and 10% had both types of dinner. If 120 people were present, how many did not eat either type of dinner?

- A) 20 B) 24 C) 26 D) 28

17) The price of a radio includes the manufacturing cost, 10% sales tax and 20% profit. What is the manufacturing cost, if the price is Rs. 16,900? (Sales tax and profit are to be calculated on manufacturing cost.)

- A) 10,000 B) 12,000 C) 13,000 D) 9,000

18) To a sugar solution of 4 liters containing 30% sugar, one liter of water is added. The percentage of sugar in the new solution is:

- A) $13\frac{1}{3}\%$ B) 15% C) 30% D) 24%

19) Jaya's Mathematics Test had 80 problems i.e., 40 arithmetic, 30 algebra and 10 geometry problems. Although she answered 80% of the arithmetic, 60% of the algebra and 50% of the geometry problems correctly, she did not pass the test because she got less than 75% of the problems right. How many more questions she must have attempted correctly to earn a 75% passing grade?

- A) 5 B) 10 C) 15 D) 20

20) The Salary of a person was reduced by 20%. By what percent should his reduced salary be raised so as to bring it with his original salary?

- A) $11\frac{1}{9}\%$ B) 20% C) 25%
D) None of these

21) During one year, the population of a town increased by 5% and during the next year, the population decreased by 5%. If the total population is 10374 at the end of the second year, then what was the population size in the beginning of the first year?

- A) 8000 B) 10000 C) 10400 D) 10100

22) Due to a reduction of $3\frac{1}{8}\%$ in the price of sugar, a man is able to buy 1 kg more for Rs. 208. Find the reduced rate of sugar.

- A) Rs. 5.50 per kg B) Rs. 6.50 per kg
C) Rs. 7.50 per kg D) None of these

23) The value of a machine depreciates at the rate of 20% per annum. If its present value is Rs. 1,87,500, what will be its worth after 2 years?

- A) Rs. 100000 B) Rs. 150000 C) 200000
D) Rs 120000

24) In an examination, 75% of the students passed in Science, 70% in Mathematics and 65% in both Science and Mathematics. If 60 students failed in both the subjects, find the total number of students.

- A) 100 B) 200 C) 300 D) 400

25) In an election a candidate who gets 82% of the votes is elected by a majority of 512 votes. What is the total number of votes polled?

- A) 672 B) 700 C) 749 D) 800

26) The population of a village is 6400. If the number of males increases by 40% and that of females increased by 30%, the population becomes 8380. Find the population of females in the town.

- A) 6400 B) 5800 C) 7000 D) 6000

27) An inspector rejects 0.06% of the meters as defective. How many will he examine to reject 3?

- A) 2000 B) 5000 C) 2500 D) 3000

28) If 50% of the 2 : 3 solution of milk and water is replaced with water, then the concentration of the solution is reduced by

- A) 25% B) 33.33% C) 50% D) 75%

29) Population of a district is 4,76,000 out of which 1,56,000 are males. 50% of the population is literate. If 60% males are literate, the number of women, who are literate, is:

- A) 17,000 B) 1,53,000 C) 1,44,400
D) 1,64,300

30) 40kg. Solution of salt and water contains 5% salt. What quantity of salt must be added to the solution to increase this to 8%?

- A) 2 2/3kg. B) 1.80 kg. C) 1.30 kg.
D) None of these

Chapter – 03: Profit & Loss, Partnership

A complete business transaction takes place when goods products are bought for one price and sold for another. The selling price of a product is denoted by SP and the cost price is denoted by CP.

There is a profit if SP is greater than CP or there can be a loss if SP is lesser than CP. If SP is same as that of CP, then the transaction is made at no profit and no loss basis.

➤ **Profit = SP - CP**

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

$$\text{SP} = \left(\frac{100 + \text{Profit\%}}{100} \right) \times \text{CP}$$

➤ **Loss = CP - SP**

$$\text{Loss \%} = \frac{\text{Loss}}{\text{CP}} \times 100 = \frac{\text{CP} - \text{SP}}{\text{CP}} \times 100$$

$$\text{SP} = \left(\frac{100 - \text{Loss \%}}{100} \right) \times \text{CP}$$

If CP = SP, then the transaction is made at no profit and no loss.

Profit or Loss is generally represented as a percentage of the cost price unless otherwise stated.

Example 1 : A camera is purchased for Rs. 999 and sold for Rs. 777. Find the loss percent

Solution :

$$\text{Loss \%} = \frac{\text{CP} - \text{SP}}{\text{CP}} \times 100 = \left(\frac{222}{999} \times 100 \right) \% = 22\frac{2}{9} \%$$

Example 2 :

I bought an article for Rs. 61.25 and sold it for Rs. 73.50. What is the gain percentage?

Solution : SP = Rs. 73.50, CP = 61.25, Profit = Rs. 73.50 - Rs.

$$\therefore \text{Profit \%} = \left(\frac{12.25}{61.25} \times 100 \right) \% = 20\%$$

$$61.25 = \text{Rs. } 12.25$$

Example 3 :

Selling an article for Rs. 390 means a loss of 12%. Find the cost price of that article.

Solution : SP = Rs. 390 ; Loss % = 12% ; CP = ?

$$\text{CP} - \text{SP} = \text{Loss} \Rightarrow \text{CP} - 390 = \text{Loss}$$

$$\text{Loss \%} = \left(\frac{\text{Loss}}{\text{CP}} \times 100 \right) \% \Rightarrow 12 = \frac{\text{CP} - 390}{\text{CP}} \times 100$$

$$\Rightarrow \frac{12\text{CP}}{100} = \text{CP} - 390 \Rightarrow \frac{88\text{CP}}{100} = 390$$

$$\Rightarrow \text{CP} \cong \text{Rs. } 443.18$$

If two items are sold at the same SP, one at a profit of P% and the other at a loss of P%, then

$$\text{Loss} = \frac{2P^2 \times \text{SP}}{(100)^2 - P^2} \quad \text{Loss\%} = \frac{P^2}{100}$$

Suppose SP of each item = Rs. x .

$$CP \text{ of one item} = \frac{100}{100+P} \times x$$

$$CP \text{ of other item} = \frac{100}{100-P} \times x$$

$$\text{Total CP} = \frac{100x}{100+P} + \frac{100x}{100-P} = \frac{20000x}{(100)^2 - P^2}$$

$$\text{Total SP} = 2x$$

$$\text{Loss} = \frac{20000x}{10000 - P^2} - 2x = \frac{2xP^2}{(100)^2 - P^2} = \frac{2P^2}{(100)^2 - P^2}$$

$$\text{Loss \%} = \frac{2P^2 \times SP}{20000SP} \times 100 = \frac{P^2}{100}$$

Example 4 :

A man sells two watches for Rs. 2900 each. On one watch he gains 10% and on the other he losses 10%. Find his gain/loss percentage on the whole transaction.

Solution : There is always a loss given by loss % =

$$= \frac{P^2}{100} = \frac{100}{100} \% = 1\%$$

Example 5 :

The CP of 11 articles is equal to the SP of 10 articles. Find the percentage profit.

Solution : If CP of 1 article is Re. 1 then CP of 10 articles is Rs. 10 and CP of 11 articles is Rs. 11. Given SP of articles = CP of 11 articles = Rs. 11.

\therefore Profit = Re. 1

$$\therefore \text{Percentage profit} = \frac{1}{10} \times 100\% = 10\%$$

DISCOUNT :

Buy x get y free i.e., if $x + y$ articles are sold at cost price of x articles, then the percentage discount

$$= \frac{y}{x+y} \times 100$$

By using false weight, If a substance is sold at cost price, the overall gain % is given by Gain %

$$= \frac{\text{True weight} - \text{False weight}}{\text{False weight}} \times 100\%$$

If two items have the same CP and loss % and gain % on the two are equal, the net loss or profit is zero.

DIFFERENT TERMS :

Marked Price : The price marked on the article is called as Marked Price or List price

Trade Discount : The reduction made on the marked price of an article is called as Trade Discount. If marked price = Rs. 80 and Discount = 16%

$$\text{Discount} = \frac{16}{100} \times 80 = \text{Rs. } 12.80$$

If discount is given, then selling price is different from marked price. It is also called as Net Price

Also, Selling price = Marked price – Discount

If discount is not given selling price is same as marked price.

In case of two successive discounts of $a\%$ and $b\%$, effective discount

$$\left(a + b - \frac{ab}{100}\right)\%$$

e.g. Let the marked price of a TV be Rs. 14,500 ; two successive discount of 10% and 20% are given, then effective discount

$$= \left(10 + 20 - \frac{10 \times 20}{100}\right)\% = 28\%$$

$$\therefore \text{Total discount} = 14500 \times \frac{28}{100} = \text{Rs. } 4060 \therefore \text{SP} = \text{Rs. } (14500 - 4060) = \text{Rs. } 10440$$

Example 6 : Rohan bought a music system at 15% discount on the marked price. Had he bought it at 18% discount, he would have saved Rs. 150. What is the price at which he bought the system ?

Solution : Let the price at which Rohan bought the system be Rs. x .

Let the labeled price be Rs. 100.

SP in the first case = Rs. 85, SP in the second case = Rs. 82

$$\therefore 3 : 100 :: 150 : x \Rightarrow x = \frac{100 \times 150}{3} = \text{Rs. } 5000.$$

$$\therefore \text{The price at which Rohan bought the system} = 5000 \times \frac{85}{100} = \text{Rs. } 4250.$$

Practice Set 1:

1) A fruit seller sells mangoes at the rate of Rs.9 per kg and thereby loses 20%. At what price per kg, he should have sold them to make a profit of 5%?

- A) Rs.11.81 B) Rs.12 C) Rs.12.25
D) Rs.12.31

2) A shopkeeper expects a gain of $22\frac{1}{2}\%$ on his cost price. If in a week, his sale was of Rs.392, what was his profit?

- A) Rs. 18.20 B) Rs. 70 C) Rs. 72
D) Rs. 88.25

3) If a man reduces the selling price of a fan from Rs.400 to Rs.380, his loss increases by 2%. The cost price of the fan is

- A) Rs. 480 B) Rs. 500 C) Rs. 600
D) Rs. 1000

4) If by selling 110 mangoes, the C.P. of 120 mangoes is realised, the gain percentage is :

- A) $9\frac{1}{11}\%$ B) $9\frac{1}{9}\%$ C) $10\frac{10}{11}\%$ D) $11\frac{1}{9}\%$

5) A man buys eggs at 2 for Re. 1 and an equal number at 3 for Rs. 2 and sells the whole at 5 for Rs. 3. His gain or loss percent is:

- A) $2\frac{2}{7}\%$ loss B) $3\frac{6}{7}\%$ gain C) $3\frac{2}{7}\%$ loss D) $2\frac{6}{7}\%$ gain

6) If selling price is doubled, the profit triples. Find the profit percent.

- A) $66\frac{2}{3}\%$ B) 100 C) $105\frac{1}{3}\%$ D) 120

7) A man buys a cycle for Rs. 1400 and sells it at a loss of 15%. What is the selling price of the cycle?

- A) Rs. 1090 B) Rs. 1160 C) Rs. 1190
D) Rs. 1202

8) A man buys a cycle for Rs.1400 and sells it at a loss of 15%. What is the selling price of the cycle?

- A) Rs. 1090 B) Rs. 1160 C) Rs. 1190
D) Rs. 1202

9) Peter purchased a machine for Rs. 80,000 and spent Rs.5000 on repair and Rs.1000 on transport and sold it with 25% profit. At what price did he sell the machine?

- A) Rs. 1,05,100 B) Rs. 1,06,250
C) Rs. 1,07,500 D) Rs. 1,17,500

10) I gain 70 paise on Rs.70. My gain percent is

- A) 0.1% B) 1% C) 7% D) 10%

11) The cost price of an article is 64% of the marked price. Calculate the gain percent after allowing a discount of 12%.

- A) 37.5% B) 48% C) 50.5% D) 52%

12) A trader mixes three varieties of groundnuts costing Rs. 50, Rs. 20 and Rs. 30 per kg in the ratio 2 : 4 : 3 in terms of weight, and sells the mixture at Rs. 33 per kg. What percentage of profit does he make?

- A) 8% B) 9% C) 10%
D) 11% E) None of these

13) A vendor loses the selling price of 4 oranges on selling 36 oranges, His loss percent is:

- A) 9% B) 10% C) 11%
D) 12% E) None of these

14) The ratio of the cost price and the selling price is 4 : 5. The profit percent is:

- A) 10% B) 20% C) 25%
D) 30% E) None of these

15) The cost price of 20 articles is the same as the selling price of x articles. If the profit is 25%, then the value of x is:

- A) 15 B) 16 C) 18 D) 25

16) On selling 17 balls at Rs. 720, there is a loss equal to the cost price of 5 balls. The cost price of a ball is:

- A) Rs. 45 B) Rs. 50 C) Rs. 55 D) Rs. 60

17) Samant bought a microwave oven and paid 10 % less than the original price. He sold it with 30% profit on the price he had paid. What percentage of profit did samant earn on the original price?

- A) 17% B) 20% C) 27% D) 32%

18) A book was sold for Rs.27.50 with a profit of 10%. If it were sold for Rs.25.75, then what would have been the percentage of profit or loss?

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

19) At what percent above the cost price must a shopkeeper mark his goods so that he gains 20% even after giving a discount of 10% on the marked price ?

- A) 25% B) 30% C) $33\frac{1}{3}\%$ D) $37\frac{1}{2}\%$

20) A person purchases 90 clocks and sells 40 clocks at a gain of 10% and 50 clocks at a gain of 20%. If he sold all of them at a uniform profit of 15%, then he would have got Rs. 40 less. The cost price of each clock is :

- A) Rs. 50 B) Rs. 60 C) Rs. 80 D) Rs. 90

21) A man buys an article for 10% less than its value and sells it for 10% more than its value. His gain or loss percent is :

- A) no profit, no loss B) 20% profit
C) less than 20% profit D) more than 20% profit

22) Jacob bought a scooter for a certain sum of money. He spent 10% of the cost of repairs and sold the scooter for a profit of Rs. 1100. How much did he spend on repairs if he made a profit of 20%?

- A) Rs. 400 B) Rs. 440 C) Rs. 500 D) Rs. 550

23) By selling 45 lemons for Rs. 40, a man loses 20%. How many should he sell for Rs. 24 to gain 20% in the transaction?

- A) 18 B) 19 C) 20
D) 23.8 E) None of these

24) A man buys an article for 10% less than its value and sells it for 10% more than its value. His gain or loss percent is:

- A) no profit, no loss B) 20% profit
C) less than 20% profit D) more than 20% profit
E) None of these

25) Alfred buys an old scooter for Rs. 4700 and spends Rs. 800 on its repairs. If he sells the scooter for Rs. 5800, his gain percent is:

- A) $4\frac{4}{7}\%$ B) $5\frac{5}{11}\%$ C) 10% D) 12%

26) The percentage profit earned by selling an article for Rs. 1920 is equal to the percentage loss incurred by selling the same article for Rs. 1280. At what price should the article be sold to make 25% profit?

- A) Rs. 2000 B) Rs. 2200 C) Rs. 2400
D) Data inadequate

27) A man bought goods worth Rs. 6000 and sold half of them at a gain of 10%. At what gain percent must he sell the remainder so as to get a gain of 25% on the whole ?

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

28) A sells an article which costs him Rs. 400 to B at a profit of 20%. B then sells it to C, making a profit of 10% on the price he paid to A. How much does C pay B?

- A) Rs. 472 B) Rs. 476 C) Rs. 528
D) Rs. 532

29) In a certain store, the profit is 320% of the cost. If the cost increases by 25% but the selling price remains constant, approximately what percentage of the selling price is the profit?

- A) 30% B) 70% C) 100% D) 250%

30) Arun purchased 30 kg of wheat at the rate of Rs. 11.50 per kg and 20 kg of wheat at the rate of Rs. 14.25 per kg. He mixed the two and sold the mixture. Approximately what price per kg should he sell the mixture to make 30% profit?

- A) 15.20 B) 16.30 C) 17.40
D) 18.50 E) None of these

31) Akash, Balu and Gopi invested Rs. 6000, Rs.4000 and Rs.8000 in a business. Akash left a business after 6 months. If after one year there was a gain of Rs.5200. Then what will be

the share of Akash ?

- A)1000 B)1020 C)1040
D)1004 E)None of these

32) Kiran and Yokesh partners in a business . Kiran contributes $\frac{1}{4}$ of the capital for 15 months and Yokesh received $\frac{2}{3}$ of the profit. Then how long Yokesh invest the money in the business ?

- A) 8 months B) 9 months C) 10 months
D) 1 year E) None of these

33) Three partners shared a profit in the ratio 5:7:8.They had partnered for 10 months,8 months and 7 months. What was the ratio of their investments?

- A) 28:46:60 B) 28:49:64 C) 24:45:63
D) 25:40:64 E) None of these

34) X, Y and Z hire a Auto Rs.250 and used it for 4,3 and 2 hours respectively. Hire charge paid by Z is

- A) 55 B) 55.50 C) 55.55
D) 55.25 E) None of these

35) A, B, C started a business with their investments in the ratio 2:4:5. After 8 months, A invested the same amount as before and both B and C withdrew half of their investments. The ratio of their profits at the end of the year is:

- A) 10:12:15 B) 12:20:25 C) 9:12:25
D) 12:25:20

36) A, B, C subscribe Rs. 60,000 for a business, A subscribes Rs.8000 more than B and B Rs. 5000 more than C. Out of a total profit of Rs. 40,000, A receives :

- A) Rs.20000 B) Rs.18000 C) Rs.16000
D) Rs.14000

37) A, B and C enter into a partnership in the ratio $\frac{5}{2}:\frac{4}{3}:\frac{7}{5}$. After 4 months, A increases his share 23%. If the total profit at the end of one year be Rs.31,800, then B's share in the profit is:

- A) Rs.7548.49 B) Rs.7548.96
C) Rs.7548.66 D) None of these

38) A starts a business with Rs 20,000 and after 4 months B also joins with some capital. After a year, the profit is divided between them in the ratio 5 : 3. How much did B invested?

- A) Rs 12,000 B) Rs 18,000 C) Rs 15,050
D) Rs 12,750 E) Rs 15,800

39) A and B started a business by investing Rs 8,000 and Rs 9,000 respectively. After 4 months A withdrew Rs 400 and B added Rs 400 more. What is the share of B from the profit of Rs 10,200?

- A) Rs 5460 B) Rs 5480 C) Rs 5560
D) Rs 4460 E) Rs 4640

40) The profit received at the end of a year is divided among A, B and C in the ratio 5:4:7 respectively. The share of A is Rs 2300 more than that of B. What is the amount that C got?

- A) Rs 26,100 B) Rs 16,800 C) Rs 14,100
D) Rs 16,100 E) Rs 19,140

Chapter 04: SI & CI

SIMPLE INTEREST :

When a sum of money is lent by A to B. A is called the lender (creditor) and B is called the borrower (debtor). The amount borrowed from A is called the 'principal'. B uses the money borrowed from A and pays him some extra amount for the time that he has used the money. This sum of money is called 'interest' This interest is known as 'Simple Interest' and is calculated as:

$$SI = \frac{PRT}{100}$$

where P = principal, T = time for which money is borrowed, R = rate (p.c.p.a.)

The sum of the principal and interest is called the 'amount', and is denoted by A.

$$A = P + (SI) \Rightarrow A = P + \frac{PRT}{100} = P \left(1 + \frac{RT}{100} \right)$$

COMPOUND INTEREST :

Money is said to be lent at compound interest when at the end of a year or at a fixed period, the interest that has become due is not paid to the lender, but is added to the sum lent and the amount thus obtained, becomes the principal for the next year or period. The difference between the final amount and the original principal is called the 'Compound Interest'.

$$\text{Amount : } A = P \left(1 + \frac{r}{100} \right)^N$$

$$\text{Compound interest : } CI = A - P$$

When Compound Interest is Reckoned Half-yearly

If the annual rate is r % per annum and is to be calculated for n years.

In this case, rate = $(r/2)\%$ and time = $(2n)$

\therefore From above

$$A = P \left(1 + \frac{r/2}{100} \times 100 \right)^{2n}$$

When Compound Interest is Reckoned Quarterly

In this case, rate = $(r/4)\%$ quarterly and time = $(4n)$ quarter years.

$$\therefore \text{As before } A = P \left(1 + \frac{r/4}{100} \times 100 \right)^{4n}$$

Note : The difference between the compound interest and the simple interest over two years is given by $Pr^2/100^2$

e.g. : If P = 2500, N = 2 years, R = 6 p.c.p.a., find SI and C.I.

Sol. :

$$S.I. = \frac{PNR}{100} ; S.I. = \frac{2500 \times 2 \times 6}{100} = \text{Rs. } 300$$

$$\text{Amount} = P \left(1 + \frac{R}{100} \right)^N = 2500 \left(1 + \frac{6}{100} \right)^2 = 2500 (1.06)^2 = \text{Rs. } 2809$$

$$C.I. = \text{Amount} - P = 2809 - 2500 = 309.$$

Population Formula :

The original population of a town is P and the annual increase is r%, then the population in n years is $P \left(1 + \frac{r}{100} \right)^n$ and if the annual decrease is r%, then the population in n years is given by a change of sign in the formula, i.e. $P \left(1 - \frac{r}{100} \right)^n$

e.g. if the annual increase in the population of a town is 4% and the present population is 15000, then the population after 2 years will be = $15000 (1.04)^2 = 16224$.

Depreciation Formula :

Let P = present value of the machine, R = rate of depreciation

$$\therefore \text{Value of the machine after } n \text{ years} = P \left(1 + \frac{r}{100}\right)^N$$

SOLVED EXAMPLES

Ex. 1 :

What invested at 6% for 4 months will yield a simple interest of Rs. 30 ?

Solution :

$$\begin{aligned} \text{S.I.} &= \frac{P \times R \times N}{100} = P \times \frac{6}{100} \times \frac{4}{12} \Rightarrow 30 = \frac{P \times 24}{1200} \\ \Rightarrow P &= \frac{30 \times 1200}{24} = 1500 \end{aligned}$$

Ex. 2 :

In what time will Rs. 1700 amount to Rs. 2924 at 8% per annum at simple interest ?

Solution :

$$P = \text{Rs. } 1700 ; A = \text{Rs. } 2924 ; \text{S.I.} = 2924 - 1700 = \text{Rs. } 1224$$

$$\therefore 1224 = \frac{1700 \times T \times 8}{100} \Rightarrow T = \frac{1224}{136} \Rightarrow T = 9 \text{ years}$$

Ex. 3 :

What is the compound interest on Rs. 15000 at 20% per annum for 4 years ?

Solution :

$$\text{Amount} = P \left(1 + \frac{R}{100}\right)^N$$

Here, $P = \text{Rs. } 15000$, $R = 20\%$, $N = 4$ years

$$\therefore \text{Amount} = 15000 \left(1 + \frac{20}{100}\right)^4 = 15000 (1.2)^4 = \text{Rs. } 31104$$

$$\therefore \text{Compound interest} = \text{Amount} - \text{Principal} = \text{Rs. } (31104 - 15000) = \text{Rs. } 16104$$

Ex. 4 :

Find the compound interest on Rs. 3000 at 10% per annum for 1 years, compounded half yearly.

Solution :

$$\text{Principal} = \text{Rs. } 3000, \text{Time} = 1 \text{ year} = 2 \text{ years}$$

$$\text{Rate} = 10\% \text{ per annum} = 5\% \text{ yearly}$$

$$\therefore \text{Amount} = 3000 \times \left(1 + \frac{5}{100}\right)^2 = 3000 \times \frac{21}{20} \times \frac{21}{20} = \text{Rs. } 3307.5$$

$$\therefore \text{C.I.} = \text{Rs. } (3307.5 - 3000) = \text{Rs. } 307.5$$

Ex. 5 :

The difference between the compound interest and the simple interest on a certain sum at 20% per annum for 2 years is Rs. 200. Find the sum.

Solution :

Let the sum be Rs. x

$$\therefore \text{S.I.} = \frac{x \times 20 \times 2}{100} = \frac{2x}{5} \text{ and}$$

$$\text{C.I.} = \left[x \left(1 + \frac{20}{100}\right)^2 - x \right] = \frac{44x}{100}$$

$$\therefore \text{C.I.} - \text{S.I.} = \frac{44x}{100} - \frac{2x}{5} = \text{Rs. } \frac{4x}{100}$$

$$\text{Given that Rs. } \frac{4x}{100} = 200 \Rightarrow x = \text{Rs. } 5000$$

Hence, the required sum is Rs. 5000.

Practice Set 1

1) The difference between simple and compound interests compounded annually on a certain sum of money for 2 years at 4% per annum is Re. 1. The sum (in Rs.) is:

- A) 625 B) 630 C) 640 D) 650

2) The effective annual rate of interest corresponding to a nominal rate of 6% per annum payable half-yearly is:

- A) 6.06% B) 6.07% C) 6.08% D) 6.09%

3) A sum fetched a total simple interest of Rs. 4016.25 at the rate of 9 p.c.p.a. in 5 years. What is the sum?

- A) Rs. 4462.50 B) Rs. 8032.50 C) Rs. 8900
D) Rs. 8925 E) None of these

4) An amount of Rs. 1,00,000 is invested in two types of shares. The first yields an interest of 9% per annum and the second, 11% per annum. If the total interest at the end of one year is $9\frac{3}{4}\%$, then the amount invested in each share was:

- A) Rs 52,500 ; Rs 47,500 B) Rs 72,500 ; Rs 27,500
C) Rs 62,500 ; Rs 37,500 D) Rs 82,500 ; Rs 17,500
E) None of these

5) Two equal amount of money was deposited in two banks, each at 15% per annum, 3.5 years and 5 years respectively. If the difference between the interest is Rs 144, each sum is:

- A) 620 B) 630 C) 640
D) 650 E) None of these

6) On a sum of money, the simple interest for 2 years is Rs. 660, while the compound interest is Rs. 696.30, the rate of interest being the same in both the cases. The rate of interest is:

- A) 10 B) 12 C) 15
D) 18 E) None of these

7) Divide Rs. 3903 between A and B, so that A's Share at the end of 7 years may equal to B's share at the end of 9 years, compound interest being at 4 percent.

- A) 2018 and 1885B) 2028 and 1875
C) 2008 and 1895 D) 2038 and 1865
E) None of these

8) If Rs. 1000 be invested at interest rate of 5% and the interest be added to the principal after 10 yr, then the number of years in which it will amount to Rs 2000 is ?

- A) $16\frac{2}{3}$ yr B) $16\frac{1}{4}$ yr C) 16 yr D) 11 yr

9) Sona invests an amount of Rs. 9535 at the rate of 4% per annum, for how many years did she invest the amount to obtain the double her sum?

- A) 10 yr B) 25 yr C) 5 yr D) 4 yr

10) The Simple interest on a certain sum for 2 years at 10% per annum is Rs. 90. The corresponding compound interest is:

- A) 99 B) 95.60 C) 94.50
D) 108 E) None of these

11) The rate of interest on a sum of money is 4% per annum for the first 2 years, 6% per annum for the next 4 years and 8% per annum for the period beyond 6 years. If the simple interest accrued by the sum for the total period of 9 years is Rs 1120. What is the sum?

- A) 1800 B) 1900 C) 2000
D) 2100 E) 2200

12) A sum of Rs. 800 amounts to Rs. 920 in 3 years at simple interest. If the interest rate is increased by 3%, it would amount to how much?

- A) 764 B) 992 C) 850
D) 770 E) None of these

13) A sum of money at simple interest amounts to Rs. 815 in 3 years and to Rs. 854 in 4 years. The sum is:

- A) Rs. 650 B) Rs. 690 C) Rs. 698 D) Rs. 700

14) There is 60% increase in an amount in 6 years at simple interest. What will be the compound interest of Rs. 12,000 after 3 years at the same rate?

- A) Rs. 2160 B) Rs. 3120 C) Rs. 3972
D) Rs. 6240 E) None of these

15) Amit borrowed a certain sum of money for 2 yr at 8% per annum on simple interest and immediately lent it to Ravi but at compound interest and gained by Rs 16. What amount did Amit borrow?

- A) Rs. 1600 B) Rs. 2500 C) Rs. 24000 D) Rs. 1800

16) Sumit lent some money to Mohit at 5% per annum simple interest. Mohit lent the entire amount to Birju on the same day at $8\frac{1}{2}\%$ per annum. In this transaction after a year, Mohit earned a profit of Rs. 350. Find the sum of money lent by Sumit to Mohit.

- A) Rs. 10000 B) Rs. 9000 C) Rs. 10200
D) None of these

17) Maninder puts equal amounts of money in two schemes: one at 10% per annum compound interest payable half yearly and the second at a certain per cent per annum compound interest payable yearly. If he gets equal amounts after 3 yr, what is the value of the second per cent?

- A) $10\frac{1}{4}\%$ B) 10% C) $9\frac{1}{2}\%$ D) $8\frac{1}{4}\%$

18) Albert invested an amount of Rs. 8000 in a fixed deposit scheme for 2 years at compound interest rate 5 p.c.p.a. How much amount will Albert get on maturity of the fixed deposit?

- A) Rs. 8600 B) Rs. 8620 C) Rs. 8820
D) None of these

19) How much time will it take for an amount of Rs. 450 to yield Rs. 81 as interest at 4.5% per annum of simple interest?

- A) 3.5 years B) 4 years C) 4.5 years D) 5 years

20) The Sum of money that will produce Rs. 1770, interest in $7\frac{1}{2}$ years at 8% simple interest per annum is:

- A) Rs 2950 B) Rs 2800 C) Rs 3120
D) Rs 3200 E) None of these

21) Mr. Mitesh invested an amount of Rs. 12000 at the simple interest rate of 10% per annum and another amount at the simple interest rate of 20% per annum. The total interest earned at the end of one year on the total amount invested became 14% per annum. Find the total amount invested?

- A) 20,000 B) 21,000 C) 20,800
D) 21,000 E) None of these

22) If the simple interest on Rs. 3000 is less than the Simple Interest on Rs. 2000 at 5% by Rs. 50, find the time?

- A) 1 B) 2 C) 3 D) 4
E) None of these

23) A candidate who gets 20% marks fails by 10 marks but another candidate who gets 42% marks gets 12% more than the passing marks. Find the maximum marks?

- A) 100 B) 80 C) 70 D) 60
E) None of these

24) A person invested some amount at the rate of 12% simple interest and a certain amount at the rate of 10% simple interest. He received yearly interest of Rs 130. But if he had interchanged the amounts invested, he would have received f 4 more as interest. How much did he invest at 12% simple interest?

- A) Rs 700 B) Rs. 500 C) Rs. 800 D) Rs. 400

25) A trader owes a merchant Rs. 10028 due in 1 yr; but the trader wants to settle the account after 3 months. If the rate of interest is 12% per annum, how much cash should he pay?

- A) Rs. 9025 B) Rs. 9200 C) Rs. 9600 D) Rs. 9200

26) Two equal sums of money were invested, one at 4% and the other at $4\frac{1}{2}\%$. At the end of 7 yr, the simple interest received from the latter exceeded that received from the former by Rs. 31.50. Each sum was?

- A) Rs 1000 B) Rs 500 C) Rs 750 D) Rs 900

27) The least number of complete years in which a sum of money put out at 20% compound interest will be more than doubled is:

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

28) Mr. Ramu invested an amount of Rs. 13,900 divided in two different schemes A and B at the simple interest rate of 14% p.a. and 11% p.a. respectively. If the total amount of simple interest earned in 2 years be Rs. 3508, what was the amount invested in Scheme B?

- A) Rs. 6400 B) Rs. 6500 C) Rs. 7200
D) Rs. 7500 E) None of these

29) Mr. Jumbo borrowed a sum of Rs. 10000 from a finance company for 6 years at 8% per annum. The amount returned by Mr. Prakash to the finance company is:

- A) Rs. 12600 B) Rs. 13300 C) Rs. 14800
D) Rs. 15200 E) None of these

30) A sum was put a simple interest at a certain rate for 2 years. Had it been put at 3% higher rate, it would have fetched Rs. 72 more. The sum is:

- A) 8% B) 9% C) 10% D) 11%
E) None of these

Practice Set 2:

1) If a sum of money at compound interest amounts to 4 times itself in 3 yr, then in how many years will it be 16 times itself ?

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

2) How much interest will Rs. 12,000 earn in 8 months at an annual rate of 8 percent ?

- A) 450 B) 500 C) 640 D) 600

3) A sum of money invested at compound interest amounts in 4 yr to Rs. 4200 and in 5 yr to Rs. 4410. The interest rate per annum is

- A) 6% B) 5% C) 10% D) 12%

4) On what principle will the compound interest for 3 yr at 4 percent amount to Rs. 62,432?

- A) Rs. 400 B) Rs. 500 C) Rs. 450 D) Rs. 550

5) The simple interest on a certain sum of money for 2 years at 5% per annum is Rs. 600. Find the compound interest at the same rate and for the same time?

- A) Rs. 600 B) Rs. 615 C) Rs. 620
D) None of these

6) A sum of money doubles itself in 20 years . What is the rate of interest?

- A) 10% B) 11% C) 5%
D) None of these

7) Vinod lent some money to Gaurang at 4% per annum simple interest. Gaurang lent the entire amount to Soham on the same day at 10½ % per annum. In this transaction, after a year Gaurang earned a profit of Rs. 650. Find the sum of money lent by Vinod to Gaurang.

- A) Rs.10,000 B) Rs. 9,000 C) Rs. 10,200
D) None of these

8) On what sum will the difference between simple interest and compound interest for 3 yr at 3 percent per annum is Rs. 8.181?

- A) Rs. 2700 B) Rs. 3000 C) Rs. 3500 D) Rs. 2520

9) The ratio of the amount for two years under CI annually and for one year under SI is 11:10. When the rate of interest is same, then the value of the rate of interest is

- A) 12.5% B) 10% C) 20% D) 16.66%

10) Find the difference between CI and SI on Rs. 6000 for 3 years at 2% pa.

- A) Rs. 12.120 B) Rs. 15.125 C) Rs. 18.150 D) None

11) The compound interest on a certain sum for 2 years is Rs. 61.80 and simple interest is Rs. 60. find the sum ?

- A) Rs. 500 B) Rs. 600 C) Rs. 700 D) Rs. 800

12) A sum of money placed at compound interest doubles itself in 4 years. In how many years will it amount to eight times itself ?

- A) 13 B) 14 C) 12 D) 15

13) At what rate percent compounded yearly will Rs. 48,400 amount to Rs. 52,900 in 2 years?

- A) 2% B) 3 ½ % C) 7 ¼ % D) 4⁶/₁₁ %

14) At what rate percent will be compound interest, does a sum of money become 16 times in 2 yr ?

- A) 100% B) 150% C) 300% D) 200%

15) A sum of money placed at compound interest amounts to 5 times itself in 4 yr. In how many years will it amount to 25 times itself?

- A) 8 yr B) 15 yr C) 14 yr D) 10 yr

16) The difference between the compound interest and simple interest on a certain sum at 10% per annum for 2 yr is Rs. 432. Find the sum?

- A) Rs. 43000 B) Rs. 43400 C) Rs. 43200 D) Rs. 64500

17) Find the compound interest on Rs. 15000 at 24% per annum for 6 months compounded quarterly.

- A) Rs. 1800 B) Rs. 1854 C) Rs. 1984 D) Rs. 1900

18) The compound interest on Rs. 400 for 1 yr at 6% per annum, the interest being payable half yearly, will be

- A) Rs. 424.36 B) Rs. 425.37 C) Rs. 14.14 D) Rs. 24.36

19) Rs. 6800 is borrowed at CI at the rate of 2% for the first year, 4% for the second year and 5% for the third year. Find the amount to be paid after 3 years?

- A) Rs. 6834.24 B) Rs. 7324.10
C) Rs. 7574.112 D) None of these

20) A man invested 1/3 of his capital at 9%, 1/4 at 8% and the remainder at 6%. If his annual income is Rs. 660, find the capital?

- A) Rs. 7600 B) Rs. 8800 C) Rs. 6600
D) None of these

21) Two equal amounts of money are deposited in two banks each at 8% per annum for 5½ years and 8 years respectively. If the difference between their interests is Rs. 170, find the sum?

- A) Rs. 850 B) Rs. 815 C) Rs. 800
D) None of these

22) A certain sum of money amounts to Rs. 2584 in 3 years at 12% per annum. In how many years will it amount to Rs. 3496 at the same rate?

- A) 5 Years B) 7 Years C) 15 Years D) 20Years

23) On what sum will the difference between SI and CI for 2 yrs. at 8% per annum is Rs. 2.88?

- A) 400 B) 350 C) 450 D) 500

24) What sum of money at compound interest will amount to Rs. 3439.17 in 3 years, if the rate of interest is 3% for the first year, 6% for the second year and 5% for the third year?

- A) Rs. 1500 B) Rs. 2000 C) Rs. 2500
D) Rs. 3000

25) A sum was put at SI at a certain rate for 3 years. Had it been put at 4% higher rate, it would have fetched Rs. 600 more. Find the sum ?

- A) Rs. 3500 B) Rs. 4500 C) Rs. 5000 D) Rs. 5500

26) The rate of interest for the first 3 years is 4% per annum, for the next 2 years is 6% per annum and for the period beyond 5 years 8% per annum. If a man gets Rs. 1200 as a simple interest for 7 years, how much money did he deposit?

- A) Rs. 3500 B) Rs. 3000 C) Rs. 3200 D) Rs. 3800

27) A certain sum of money amounts to Rs. 5320 in 3 years and to Rs. 5980 in $4\frac{1}{2}$ years. Find the rate of interest ?

- A) 10% B) 11% C) 12% D) 13%

28) At a certain rate of simple interest Rs. 600 amounts to Rs. 744 in 4 years. If the rate of interest be decreased by 3%, what will be the amount after 4 years?

- A) Rs. 600 B) Rs. 640 C) Rs. 660 D) Rs. 672

29) At a certain rate of simple interest Rs. 500 amounts to Rs. 665 in 3 years. If the rate of interest be increased by 4%, what will be the amount after 3 years?

- A) Rs. 700 B) Rs. 792 C) Rs. 725 D) Rs. 780

30) A sum of Rs. 2170 is lent out in two parts in such a way that the interest on one part at 8% for 3 years is equal to that on another part at 12% for 5 years. Find the II part?

- A) Rs. 600 B) Rs. 850 C) Rs. 700 D) Rs. 620

Chapter 05: Averages

The average (arithmetic mean) of a group or set of N numbers is defined as the sum of those numbers divided by N .

Here N is the number of values or observations in a set.

$$\text{Average} = \frac{\text{Sum of } N \text{ observations}}{\text{Total Numbers of observations}}$$

$$A = \frac{\text{Sum}}{N} \text{ or } \text{Sum} = N \times \text{Average}$$

Ex. 1: If weights of three Women are 60, 70 and 56 Kilogram, the average of the weights of Women can be calculated as :

Sol.:

$$\begin{aligned} \text{Average} &= \frac{\text{Sum of weight of Women}}{\text{Numbers of Women}} \\ &= \frac{60 + 70 + 56}{3} \\ &= \frac{186}{3} \end{aligned}$$

= 62 Kilogram

Ex. 2:

If average of 4, 6, 7 and x is 5, what is the value of x ?

Sol.:

We have been given $N = 4$ observations and average of these observations is 5.

So, Average =

$$\text{So, Average} = \frac{\text{Sum}}{N} \rightarrow 5 = \frac{4 + 6 + 7 + x}{4}$$

$$\Rightarrow 20 = 17 + x$$

$$\Rightarrow x = 3, \text{ Hence, the missing observation is 3.}$$

Ex.3 :

If the average of five numbers is 20 and the sum of three numbers is 26, then what is the average of other two numbers.

Sol.: Let the five numbers a, b, c, d and e .

$$\text{So, as given, } \frac{a+b+c+d+e}{5} = 20, \text{ Also, given } a+b+c = 26.$$

$$\Rightarrow \frac{d+e+26}{5} = 20 \Rightarrow d+e+26=100 \Rightarrow d+e=74.$$

$$\Rightarrow \frac{d+e}{2} = \frac{74}{2} = 37. \text{ So, the average of other two numbers is 37.}$$

Average in Different Cases :

1. If all the numbers in a set are the same, then that number is the average of that set. i.e.

Average of set of values 5, 5 and 5 is 5.

Also be theoretically, Average =

$$\text{Also be theoretically, Average} = \frac{\text{Sum}}{N} = \frac{5+5+5}{3} = \frac{15}{3} = 5$$

2. If the numbers in a set are not all the same, then the average must be greater than the smallest number and less than the greatest number in the set.

i.e. Average of set of values 73,74,77,87,89

$$\text{Average} = \frac{\text{Sum}}{N} = \frac{73+74+77+87+89}{5} = \frac{400}{5} = 80$$

Here, $89 > 80$ and $80 > 73$.

Weighted Average To calculate the weighted average of a set of numbers, multiply each number in the set by the number of times it appears, add all products and divide by the total number of observations in the set.

i.e. On one day, 30 out of 36 students take test and their average was 80. On another day, the rest 6 students take test and their average is 92. What was the average for the entire class ?

The average of entire class =

$$= \frac{30(80) + 6(92)}{36} = \frac{2400 + 552}{36} = 82.$$

Ex.4:

Find the average of first 60 natural Numbers?

Sol.: Sum of first N natural Number in

$$= \frac{n(n+1)}{2}$$

Average of first N Natural No.: =

$$= \frac{n(n+1)}{2n} = \frac{n+1}{2} = \frac{60+1}{2} = \frac{61}{2} = 30.5$$

Ex.5:

The average of 27 results is 16. The average of first 13 of them is 15 and that of last 13 in 14. Find the fourteenth result.

Sol.: 14^{th} result = Sum of 27 result – Sum of 26 Result
 $= 27 \times 16 - [(13 \times 15) + (13 \times 14)] \rightarrow 432 - (195 + 182) = 55$

Practice Set 1

1) A student was asked to find the arithmetic mean of the numbers 3, 11, 7, 9, 15, 13, 8, 19, 17, 21, 14 and x. He found the mean to be 12. What should be the number in place of x?

- A) 3 B) 7 C) 17 D) 31

2) The average age of 36 students in a group is 14 years. when teacher's age is included to it, the average increases by one. What is the teacher's age in years?

- A) 31 B) 36 C) 51
D) None of these

3) After replacing an old member by a new member, it was found that the average age of five members of a club is the same as it was 3 years ago. What is the difference between the ages of the replaced and the new member?

- A) 2 years B) 4 years C) 8 years
D) 15 years

4) Find the average of all the prime number between 30 and 50?

- A) 38 B) 38.8 C) 39 D) 39.8
E) None of these

5) The average of 11 results is 50. If the average of first 6 results is 49 and that of last 6 is 52, find the sixth result?

- A) 50 B) 56 C) 60 D) 64
E) None of these

6) Find the average of all the numbers between 6 and 34 which are divisible by 5

- A) 18 B) 20 C) 24 D) 30

7) The average age of a group of persons going for picnic is 16 years. Twenty new persons with an average age of 15 years join the group on the spot due to which their average age becomes 15.5 years. The number of persons initially going for picnic is:

- A) 5 B) 10 C) 20 D) 30

8) In a school with 600 students, the average age of the, boys is 12 years and that of the girls is 11 years. - If the average age of the school is 11 years 9 months, then the number of girls in the school is :

- A) 150 B) 250 C) 350 D) 450

9) The average price of three items of furniture is Rs. 15000. If their prices are in the ratio 3:5:7, the price of the cheapest item is :

- A) Rs. 9000 B) Rs. 15000 C) Rs. 18000
D) Rs. 21000

10) The average of 20 numbers is zero. Of them, at the most, how many may be greater than zero?

- A) 0 B) 1 C) 10 D) 19

11) The average age of boys in a class is 16 years and that of the girls is 15 years. The average age for the whole class is

- A) 15 years B) 15.5 years C) 16 years
D) Cannot be computed

12) The average of first five multiples of 3 is :

- A) 9 B) 10 C) 8 D) 11

13) The average age of 30 boys of a class is equal to 14 years. When the age of the class teacher is included the average becomes 15 years. Find the age of the class teacher?

- A) 40 B) 43 C) 45 D) 47
E) None of these

14) In the first 10 overs of a cricket game, the run rate was only 3, 2. What should be the run rate in the remaining 40 overs to reach the target of 282 runs?

- A) 6.25 B) 6.5 C) 6.75 D) 7

15) The average age of husband, wife and their child 3 years ago was 27 years and that of wife and the child 5 years ago was 20 years. The present age of the husband is :

- A) 35 years B) 40 years C) 50 years
D) None of these

16) Distance between two stations A and B is 778 km. A train covers the journey from A to B at 84 km per hour and returns back to A with a uniform speed of 56km per hour. Find the average speed of the train during the whole journey?

- A) 67.0 km /hr B) 67.2 km /hr
C) 69.0 km /hr D) 69.2 km /hr

17) The average of six numbers is X and the average of three of these is Y.If the average of the remaining three is z, then

- A) $x = y + z$ B) $2x = y + z$
C) $x = 2y + 2z$ D) None of these

18) Find the average of first 20 multiple of 7?

- A) 71.5 B) 73.5 C) 75.5 D) 77.5
E) None of these

19) Of the three numbers, the average of the first and the second is greater than the average of the second and the third by 15. What is the difference between the first and the third of the three numbers?

- A) 15 B) 45 C) 60
D) Data inadequate E) None of these

20) There are two sections A and B of a class, consisting of 36 and 44 students' respectively. If the average weight of section A is 40kg and that of section B is 35kg, find the average weight of the whole class.

- A) 30 kg B) 35 kg C) 42.5 kg
D) 37.25 kg

21) A batsman in his 17th innings makes a score of 85, and thereby increases his average by 3. What is his average after 17 innings?

- A) 35 B) 37 C) 39 D) 40
E) None of these

22) A car owner buys petrol at Rs 7.50, Rs. 8 and Rs. 8.50 per litre for three successive years. What approximately is the average cost per litre of petrol if he spends Rs. 4000 each year?

- A) Rs. 7.98 B) Rs. 8 C) Rs. 8.50 D) Rs. 9

23) Of the three numbers, the first is twice the second and the second is twice the third. The average of the reciprocal of the numbers is $\frac{7}{72}$. The numbers are :

- A) 16, 8, 4 B) 20, 10, 5 C) 24, 12, 6
D) 36, 18, 9

24) Distance between two stations A and B is 778km. A train covers the journey from A to B at 84km per hour and returns back to A with a uniform speed of 56km per hour. Find the average speed of train during the whole journey.

- A) 60 km/hr B) 30.5 km/hr C) 57 km/hr
D) 67.2 km/hr

25) $\frac{1}{3}$ rd of certain journey is covered at the rate of 25 km/hr, $\frac{1}{4}$ th at the rate of 30 km/hr and rest at 50 km/hr. Find the average speed for the whole journey?

- A) $32 \frac{1}{3}$ km/hr B) $33 \frac{1}{3}$ km/hr
C) $34 \frac{1}{3}$ km/hr D) $35 \frac{1}{3}$ km/hr
E) None of these

26) Three years ago, the average age of A and B was 18 years. With C joining them, the average age becomes 22 years, How old is C now?

- A) 24 years B) 27 years C) 28 years
D) 30 years

27) In the first 10 overs of a cricket game, the run rate was only 3.2. What should be the run rate in the remaining 40 overs to reach the target of 282 runs?

- A) 6.25 B) 6.5 C) 6.75 D) 7

28) A motorist travel to a place 150 km away at an average speed of 50 km/hr and returns at 30 km/hr. His average speed for the whole journey in km/hr is

- A) 35 B) 37 C) 37.5 D) 40

29) The Average of marks obtained by 120 candidates in a certain examination is 35. If the average marks of passed candidates is 39 and that of failed candidates is 15, what is the number of candidates who passed the examination?

- A) 95 B) 100 C) 105 D) 110
E) None of these

30) The average of all odd numbers upto 100 is:

- A) 49 B) 49.5 C) 50 D) 51

Practice Set 2:

1) The average salary of the entire staff in an office is Rs. 140 per month. The average salary of officers is Rs. 440 and that of Assistants is Rs. 130. If the number of officers is 16, then find the number of Assistance in the office.

- A) 480 B) 505 C) 510 D) 435

2) There were 40 students in a hostel. If the number of students increases by 8, the expenses of the mess increase by Rs. 48 per day while the average expenditure per head diminishes by Rs 2. Find the original expenditure of the mess.

- A) Rs. 700 B) Rs. 710 C) Rs. 680
D) Rs. 720

3) Find the average of first 71 natural numbers.

- A) 30 B) 31 C) 36 D) 34

4) The average age of students of a class is 17.4 years. The average age of boys in the class is 17.9 years and that of the girls is 16.8 years. The ratio of the number of boys to the number of girls in the class is :

- A) 6 : 5 B) 2 : 3 C) 6 : 3 D) 5 : 3

5) If average of 7 consecutive even numbers is 21, what is the difference between the smallest and the largest numbers ?

- A) 10 B) 11 C) 12 D) 13

6) The average weight of a class of 34 students is 45 kg. if the weight of the teacher be included, the average rises by 400 g. The weight of the teacher is :

- A) 59 kg B) 50 kg C) 53 kg D) 55 kg

7) The average age of 7 men is increased by 2 years when two of them whose ages are 22 years and 26 years are replaced by two new men. The average age of the two new men is :

- A) 22 years. B) 24 years C) 31 years
D) 30 years

8) The average weight of 8 oranges increase by 22 gm if one of them weighing 124 gm is replaced by another. The weight of new orange is

- A) 180 gm B) 200 gm C) 260 gm
D) 300 gm

9) A motorist travels to a place 170 km away at an average speed of 20 km/h and returns at 30 km/h. His average speed for the whole journey in km per hour is

- A) 35 B) 25.7 C) 37.5 D) 24

10) The average weight of 39 students is 38 kg. By the admission of a new student, the average weight is reduced to 37.5 kg. The weight of the new student is

- A) 18 kg B) 37.5 kg C) 19 kg D) 21 kg.

11) The average temperature on Monday, Tuesday and Wednesday was 51°C and on Monday, Wednesday and Thursday it was 50°C . If on Thursday it was exactly 49°C , then on Tuesday, temperature was

- A) 42°C B) 46°C C) 23°C D) 52°C

12) The average of the first and the second of three numbers is 20 more than the average of the second and the third of these numbers. What is the difference between the first and the third of these three numbers ?

- A) 10 B) 20 C) 30 D) 40

13) The average of 100 observations was calculated as 30. It was found later on that one of the observations was misread as 76 instead of 46. the correct average is :

- A) 40.3 B) 39.7 C) 29.7 D) 30.3

14) 2 years ago, the average age of a family of 5 members was 15 years. A baby having been born, the average age of the family is the same today. The present age of the baby is :

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

15) The average weight of A, B and C is 35 kg. If the average weight of A and B be 30 kg and that of B and C be 33 kg, then the weight of B is :

- A) 17 kg B) 20 kg C) 21 kg D) 31 kg

16) The average monthly income of L and M is Rs. 4040. The average monthly income of M and N is Rs. 5240 and the average monthly income of L and N is Rs. 4200. The monthly income of L is :

- A) Rs. 3500 B) Rs. 4000 C) Rs. 4050 D) Rs. 3000

17) The average of 40 numbers is 35. If two numbers, namely 45 and 63 are discarded, the average of remaining numbers is

- A) 36.5 B) 35 C) 34 D) 37.52

18. The average age of 28 students is 9 yr. If the age of their teacher is included, it becomes 10 yr. The age of the teacher (in years) is :

- A) 27 B) 31 C) 38 D) 40

19) The average income of Mohan and Ram is Rs. 300. The average income of Raghu and Jaya is Rs. 350. The average income of all four persons is

- A) Rs. 275 B) Rs. 225 C) Rs. 325 D) Rs. 250

20) The average age of the mother and her 4 children is 15 years which is reduced by 6 years if the age of the mother is excluded. How old is the mother?

- A) 40 years B) 42 years C) 48 years D) 39 years

21) The average weight of 6 persons increases by 3.5 kg when a new person comes in place of one of them weighing 59 kg. What might be the weight of the new person?

- A) 76 kg B) 80 kg C) 85 kg D) Data inadequate

22) A batsman had an average of 60 runs in 9 innings, but in the 10th inning, he was out on zero. What is the average after 10th inning?

- A) 51 B) 54 C) 53 D) 55

23) The average weight of 40 coins is 7 gm. If the weight of the bag be included the average weight increase by 0.07 gm. What is the weight of the bag ?

- A) 3.87 gm B) 5.87gm C) 9.87 gm D) 7.87 gm

24) Find the average of the consecutive even numbers given below.

40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64

- A) 50 B) 55 C) 52 D) 60

25) The average age of 28 boys of a class is equal to 15 years. When the age of the class teacher is included the average becomes 16 years. Find the age of the class teacher.

- A) 45 years B) 42 Years C) 40 Years D) 44 Years

26) The average weight of 5 men is increased by 4 kg when one of them who weighs 90 kg is replaced by another man. What is the weight of the new man ?

- A) 125 kg B) 110 kg C) 132 kg D) 142 kg

27) The average of marks obtained by 120 candidates in a certain examination is 33. If the average marks of passed candidates is 37 and that of the failed candidates is 13, what is the number of candidates who passed the examination?

- A) 100 B) 105 C) 110 D) 115

28) A batsman in his 15th innings makes a score of 90 and thereby increases his average by 4. What is his average after 15 innings?

- A) 27 B) 37 C) 30 D) 34

29) A person divides his total route of journey into three equal parts and decides to travel the three parts with speeds of 40, 30 and 15 km/hr respectively. Find his average speed during the whole journey.

- A) 21 km/hr B) 22km/hr C) 23 kh/hr D) 24 km/hr

30) The average age of all the students of a class is 23 years. The average age of boys of the class is 25 years and that of the girls is 20 years. If the number of girls in the class is 30, then find the number of boys in the class.

- A) 30 B) 45 C) 35 D) 40

Chapter 06 Ratio & Proportion

RATIO :

A ratio is a comparison of two numbers or quantities by division.

The ratio of 'a' to 'b' is written as $a : b$ where 'a' is called the 'antecedent' and 'b' is called the 'consequent'.

While comparing two quantities in terms of ratio.

(i) the two quantities must be of the same kind.

(ii) the units of the two quantities must be the same

(iii) ratio does not have any unit of measurement.

THE SIMPLEST FORM OF RATIO :

The expression of a ratio, both of whose terms that do not have any common factor other than 1, is called the ratio in its simplest form.

e.g. $\frac{185}{215} = \frac{5 \times 37}{5 \times 43} = \frac{37}{43}$

NOTE :

(i) As a/b is a real number, the operation of addition, subtraction, multiplication and division can be performed just like those on real numbers.

(ii) To compare the two ratios, apply the same method as in the case of real numbers.

e.g. Compare $\frac{3}{7}$ and $\frac{5}{8}$.

Consider 3×8 and 7×5

$35 > 24 \therefore \frac{5}{8} > \frac{3}{7}$

(iii) The ratio $b : a$ is the inverse ratio of $a : b$.

(iv) Property of equal ratio :

If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \frac{g}{h} = \dots$, then $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \frac{g}{h} = \dots = \frac{a+c+e+g+\dots}{b+d+f+h+\dots}$

PROPORTION :

The equality between the two ratios is called proportion.

If $\frac{a}{b} = \frac{c}{d} \Rightarrow a : b :: c : d$ then the numbers a, b, c and d are in proportion and they are called the first, the second, the third and the fourth proportional, respectively. 'a' and 'd' are called the extremes, while b and c are called the means.

e.g.,

$\frac{4}{12} = \frac{5}{15} \therefore 4, 12, 5$ and 15 are in proportion ; where 4 and 15 are extremes and 12 and 5 are means.

$\frac{a}{b} = \frac{c}{d} ; a \times d = c \times b$

When,

i.e., Product of extremes = Product of means

e.g. the fourth proportional to $3, 4, 6$ can be found as follows :

Let x be the fourth proportional.

i.e., $3, 4, 6$ and x are in proportion

$\Rightarrow 3x = 4 \times 6 \Rightarrow x = 24/3 \Rightarrow x = 8$

If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \frac{g}{h} \dots$, then a, b, c, d, e, f, \dots are said to be in proportion.

CONTINUED PROPORTION :

When a, b, c are in continued proportion $a : b = b : c$. Here, 'b' is called 'geometric mean' or 'mean' proportional between a and c .

$\frac{a}{b} = \frac{b}{c} = \frac{c}{d} = \dots$

..., then a, b, c, d, \dots are said to be in continued proportion.

If $\frac{a}{b} = \frac{b}{c}$, then $b^2 = ac$.

e.g., 6 is the geometric mean of 3 and x .

$\therefore 6^2 = 3 \times x \Rightarrow 36 = 3x \Rightarrow x = 12$.

PROPERTIES OF PROPORTION

1] If $\frac{a}{b} = \frac{c}{d}$, then $\frac{b}{a} = \frac{d}{c}$ e.g., If $\frac{7a}{3b} = \frac{3}{2}$, then $\frac{3b}{7a} = \frac{2}{3}$

2] Alternendo :

If $\frac{a}{b} = \frac{c}{d}$, then $\frac{a}{c} = \frac{b}{d}$ e.g., If $\frac{7a}{3b} = \frac{3}{2}$, then $\frac{7a}{3} = \frac{3b}{2}$

3] Componendo :

If $\frac{a}{b} = \frac{c}{d}$, then $\frac{a+b}{b} = \frac{c+d}{d}$

If $\frac{7a}{3b} = \frac{3}{2}$, then to find the value of $\frac{7a+3b}{3b}$, use 'componendo'

$\therefore \frac{7a+3b}{3b} = \frac{3+2}{2} = \frac{5}{2}$

DIVIDENDO :

4] If $\frac{a}{b} = \frac{c}{d}$, then $\frac{a-b}{b} = \frac{c-d}{d}$ e.g., If $\frac{7a}{3b} = \frac{3}{2}$, then $\frac{7a-3b}{3b} = \frac{3-2}{2} = \frac{1}{2}$

5] Componendo - Dividendo :

If $\frac{a}{b} = \frac{c}{d}$, then $\frac{a+b}{a-b} = \frac{c+d}{c-d}$ e.g., If $\frac{7a}{3b} = \frac{3}{2}$, then $\frac{7a+3b}{7a-3b} = \frac{3+2}{3-2} = \frac{5}{1}$

VARIATION :

1. DIRECT VARIATION :

If two quantities 'a' and 'b' are related such that any increase or decrease in 'b' produces a proportionate increase or decrease in 'a', or vice versa, then the two quantities are said to be in direct proportion. the quantities 'a' and 'b' are directly related and their relationship is expressed as $a \propto b$. In this case $a = kb$, where 'k' is non - zero constant.

e.g., If 14 oranges cost Rs., 28, then the cost of 5 oranges can be found as follows :

Oranges	Cost
14	28
↓	↓
5	x

$\therefore \frac{14}{5} = \frac{28}{x} \Rightarrow x = \frac{28 \times 5}{14} = \text{Rs. } 10$

2. INVERSE VARIATION :

The values of 'a' and 'b' vary (change) in such a way that the product of corresponding values of 'a' and 'b' is constant. Such a relation between a and b is known as inverse variation and

the relationship is expressed as $a \propto \frac{1}{b}$ i.e., $a = \frac{k}{b}$ i.e., $ab = k$, where 'k' is a non zero constant.

e.g., Ram drives a car at a speed of 30 kmph for 2 hours. If he has to cover the same distance in 1 hour, his speed can be found as follows :

Speed	Time
\uparrow x \downarrow 30	\downarrow 2 \uparrow 1
$\frac{x}{30} = \frac{2}{1} \Rightarrow x = 2 \times 30 = 60 \text{ kmph.}$	

SOLVED EXAMPLES

Example 1 :

If $a : b = 3 : 7$ and $b : c = 2 : 5$, find $a : b : c$.

Solution : $a : b = 3 : 7$

$$b : c = 2 \times \frac{7}{2} : 5 \times \frac{7}{2} = 7 : \frac{35}{2}$$

$$\therefore a : b : c = 3 : 7 : \frac{35}{2} = 6 : 14 : 35.$$

Example 2 :

If $\frac{a}{b} = \frac{4}{5}$ and $\frac{c}{b} = \frac{8}{15}$, find $\frac{a^2 - c^2}{a^2 + c^2}$

Solution :

$$\frac{a}{c} = \frac{a}{b} \times \frac{b}{c} = \frac{4}{5} \times \frac{15}{8} = \frac{3}{2} \therefore \frac{a^2}{c^2} = \frac{9}{4}$$

Required expression can be written

$$\therefore \frac{a^2 - c^2}{a^2 + c^2} = \frac{\frac{a^2}{c^2} - 1}{\frac{a^2}{c^2} + 1} = \frac{\frac{9}{4} - 1}{\frac{9}{4} + 1} = \frac{9 - 4}{9 + 4} = \frac{5}{13}$$

Example 3 :

Is $\frac{a}{y+z-x} = \frac{b}{z+x-y} = \frac{c}{x+y-z}$ equal to $\frac{a+b}{z} = \frac{b+c}{x} = \frac{a+c}{y}$?

Solution :

$$\frac{a}{y+z-x} = \frac{b}{z+x-y} = \frac{c}{x+y-z}$$

$$\text{Then, } \frac{a+b}{2z} = \frac{b+c}{2x} = \frac{a+c}{2y} \Rightarrow \frac{a+b}{z} = \frac{b+c}{x} = \frac{a+c}{y}$$

Example 4 :

The cost of sugar is directly proportional to its weight. 20 kg of sugar costs Rs. 160. Find the cost of 5 kg of sugar.

Solution :

Let us denote the cost of sugar by y and its weight x.

So, we have, $y \propto x$.

$\therefore y = kx$ (k is a constant)

Now, $y = 160$, when $x = 20$

$$\therefore 160 = k \times 20 \therefore k = \frac{160}{20} = 8$$

$\therefore y = 8x$ is the equation of variation

\therefore Putting $x = 5$ in the equation, we get $y = 8 \times 5 = 40$.

\therefore The cost of 5 kg of sugar is Rs. 40.

Example 5 :

16 workers take 3 days to pack 30 kgs of rice. How many days will be taken by 20 workers to pack 36 kgs of rice ?

Solutions :

Let the number of days required be x. workers \propto work

$$\text{workers} \propto \frac{1}{\text{days}}$$

$$x = \frac{16}{20} \times \frac{30}{36} \times 3 \Rightarrow x = 2 \text{ days.}$$

Practice set 1:

1) The third proportional to 0.36 and 0.48 is :

- A) 0.64 B) 0.1728 C) 0.42 D) 0.94

2) If $a : b = 5 : 9$ and $b : c = 4 : 7$, find $a : b : c$?

- A) 20:36:63 B) 20:63:36 C) 63:20:36
D) 36:63:20 E) None of these

3) Which of the following ratios is greatest ?

- A) 7 : 15 B) 15 : 23 C) 17 : 25 D) 21 : 29

4) If 10% of $x = 20\%$ of y , then $x : y$ is equal to:

- A) 1 : 2 B) 2 : 1 C) 5 : 1 D) 10 : 1

5) If $x : y = 3 : 4$, find $(4x + 5y) : (5x - 2y)$?

- A) 23/7 B) 32/7 C) 23/7 D) 21/6
E) None of these

6) The ratio of $4^{3.5} : 2^5$ is same as :

- A) 2 : 1 B) 4 : 1 C) 7 : 5 D) 7 : 10

7) If $A : B = 2 : 3$, $B : C = 4 : 5$ and $C : D = 6 : 7$, then $A : B : C : D$ is:

- A) 16 : 22 : 30 : 35 B) 16 : 24 : 15 : 35
C) 16 : 24 : 30 : 35 D) 18 : 24 : 30 : 35

8) A sum of money is to be distributed among A, B, C, D in the proportion of 5:2:4:3. If C gets Rs. 1000 more than D, what is B's share?

- A) Rs. 500 B) Rs. 1500 C) Rs. 2000
D) None of these

9) Find the fourth proportional to 4, 9, 12?

- A) 24 B) 21 C) 27
D) 36 E) None of these

10) If $(4x^2 - 3y^2) : (2x^2 + 5y^2) = 12 : 19$, then $(x : y)$ is :

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

11) The sides of a triangle are in the ratio $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ and its perimeter is 104 cm. The length of the longest side is :

- A) 52 cm B) 48 cm C) 32 cm D) 26 cm

12) If $0.75:x::5:8$, then x is equal to:

- A) 1.12 B) 1.20 C) 1.25 D) 1.30

13) Two number are in the ratio 3 : 5. If 9 is subtracted from each, the new numbers are in the ratio 12 : 23. The smaller number is:

- A) 27 B) 33 C) 49 D) 55

14) Divide Rs. 672 in the ratio 5 : 3?

- A) 420 and 252 B) 410 and 246 C) 400 and 240
D) 440 and 264 E) None of these

15) If $A : B : C = 2 : 3 : 4$, then, $\frac{A}{B} \cdot \frac{B}{C} \cdot \frac{C}{A}$ is equal to:

- A) 4 : 9 : 16 B) 8 : 9 : 12 C) 8 : 9 : 16 D) 8 : 9 : 24

16) If Rs. 782 be divided into three parts, proportional to $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$, then the first part is:

- A) Rs. 182 B) Rs. 190 C) Rs. 196
D) Rs. 204

17) Divide Rs. 1162 among A, B, C in the ratio 35 : 28 : 20?

- A) 480, 382 and 300 B) 490, 280 and 382
C) 490, 392 and 280 D) 392, 490 and 280
E) None of these

18) Zinc and copper are melted together in the ratio 9 : 11. What is the weight of melted mixture, if 28.8 kg of zinc has been consumed in it?

- A) 58 kg B) 60 kg C) 64 kg D) 70 kg

19) The ages of A and B are in the ratio of 3 : 1. Fifteen years hence, the ratio will be 2 : 1. Their present ages are :

- A) 30 years, 10 years B) 45 years, 15 years
C) 21 years, 7 years D) 60 years, 20 years

20) The fourth proportional to 5, 8, 15 is:

- A) 18 B) 24 C) 19 D) 20

21) A mixture contains alcohol and water in the ratio 4 : 3. If 5 litres of water is added to the mixture, the ratio becomes 4 : 5. Find the quantity of alcohol in the given mixture?

- A) 10 B) 12 C) 15 D) 18
E) None of these

22) Gold is 19 times as heavy as water and copper is 9 times as heavy as water. In what ratio should these be mixed to get an alloy 15 times as heavy as water?

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

23) If a carton containing a dozen mirrors is dropped, which of the following cannot be the ratio of broken mirrors to unbroken mirrors?

- A) 2 : 1 B) 3 : 1 C) 3 : 2 D) 7 : 5

24) A sum of Rs.312 was divided among 100 boys and girls in such a way that the boy gets Rs.3.60 and each girl Rs.2.40 the number of girls is

- A) 35 B) 40 C) 45 D) 50

25) A bag contains 50 p, 25 p and 10 p coins in the ratio 5 : 9 : 4, amounting to Rs. 206. Find the number of coins of 25 paise type?

- A) 200 B) 360 C) 160 D) 320
E) None of these

26) The prices of a scooter and a T.V. are in the ratio 7 : 5. If the scooter costs Rs. 8000 more than a T.V. set, then the price of a T.V. set is :

- A) Rs. 20,000 B) Rs. 24,000
C) Rs. 28,000 D) Rs. 32,000

27) A and B together have Rs. 1210. If $\frac{4}{15}$ of A's amount is equal to $\frac{2}{5}$ of B's amount, how much amount does B have?

- A) Rs. 460 B) Rs. 484 C) Rs. 550 D) Rs. 664

28) A and B are two alloys of gold and copper prepared by mixing metals in the ratio 7 : 2 and 7 : 11 respectively. If equal quantities of the alloys are melted to form a third alloy C, the ratio of gold and copper in C will be:

- A) 5 : 7 B) 5 : 9 C) 7 : 5 D) 9 : 5

29) The ratio of the number of boys and girls in a college is 7:8. If the percentage increase in the number of boys and girls be 20% and 10% respectively, what will be the new ratio?

- A) 8:9 B) 17:18 C) 21:22
D) Cannot be determined

30) Three containers have their volumes in the ratio 3 : 4 : 5, They are full of mixtures of milk and water. The mixtures contain milk and water in the ratio of (4 : 1), (3 : 1) and (5 : 2) respectively. The contents of all these three containers are poured into a fourth container. The ratio of milk and water in the fourth container is :

- A) 4 : 1 B) 151 : 48 C) 157 : 53 D) 5 : 2

Practice Set 2:

1) The ratio compounded of 3:2, 4:9, 6:5, 10:8 is :

- A) 1 : 1 B) 2 : 1 C) 1 : 2
D) None of these

2) Divide Rs. 858 in the ratio of Find first share: $\frac{1}{5} : \frac{1}{10} : \frac{1}{15}$

- A) Rs. 296 B) Rs. 288 C) Rs. 196
D) None of these

3) If $A : B = 7 : 3$, $B : C = 6 : 10$ & $C : D = 15 : 17$ then find $A : B : C : D$

- A) 6 : 7 : 9 : 12 B) 9 : 12 : 15 : 17
C) 21 : 4 : 8 : 15 D) 21 : 9 : 15 : 17

4) If $5A:6B$ is the duplicate ratio of $5A - C : 6B - C$ then :

- A) $c^2 = 6AB$ B) $c^2 = 30AB$ C) $2C = 3AB$
D) None of these

5) Ratio of boys to the girls in a class is 6 : 7. which of the following cannot be the number of students in the class ?

- A) 26 B) 52 C) 104 D) 67

6) Find the third proportional to the numbers 4 and 16.

- A) 64 B) 8 C) 25 D) 30

7) A dog chase a cat and takes 6 leaps for every 9 leaps of the cat, but 3 leaps of the dog are equal to 5 leaps of the cat.

Compare the speeds of the dog and the cat.

- A) 9 : 10 B) 10 : 9 C) 24 : 25 D) 25 : 24

8) Divide 150 into three parts such that the first part is 15 more than the second and the ratio between 1st and 3rd is 2 : 7, then find the ratio between three parts.

- A) 38 : 23 : 113 B) 30 : 15 : 105
C) 40 : 30 : 100 D) 34 : 30 : 119

9) What should be subtracted from each of the numbers 58, 76, 73 and 96, so that the remainders are in continued proportion?

- A) 9 B) 7 C) 4 D) None of these

10) x is inversely proportional to the square root of the cube of y. When x=2, y= 16. What is the value y when x=1024?

- A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) 4 D) 2

11) If $\frac{p}{q} = \frac{2}{5}$, then find the value of the expression $\frac{(7p - 2q)}{(7p + 3q)}$:

- A) $\frac{3}{29}$ B) $\frac{5}{29}$ C) $\frac{4}{29}$ D) $\frac{5}{58}$

12) A melon is cut into two pieces in the ratio of 5 : 6 by weight. The bigger of the two is further cut in the ratio of 6 : 7 by weight. Find the ratio of each of the three pieces

- A) 42 : 36 : 65 B) 65 : 36 : 42
C) 36 : 65 : 42 D) 30 : 60 : 40

13) If A : B = 2 : 3, B : C = 5 : 14, C : D = 7 : 10 & D : E = 8 : 7 then find A:E

- A) 1 : 4 B) 4 : 21 C) 3 : 16
D) None of these

14) A bag contains Rs. 6500 in the form of one rupee, 50 paise & 25 paise coins in the ratio of 5 : 6 : 8. find the total number of 25 paise coins in the bag.

- A) 650 B) 6000 C) 5200 D) 1300

15) Sunil's Salary is $\frac{7}{6}$ of Dhiraj's salary, and Dhiraj's salary is $\frac{6}{5}$ of Vijay's salary, while Sneha's salary is equal to the sum of salaries of Sunil, Dhiraj and Vijay. If salary of Vijay is Rs 1500, What is the salary of Sneha?

- A) 5500 B) 6500 C) 5400 D) 5800

16) The sum of the ages of the 4 members of Jain family is 143 years. 6 years ago the ages of the 4 members Amit, Aman, Mrs. Jain and Mr. Jain were in the ratio of 2 : 3 : 5 : 7. after how many years would Aman be as old as the present age of his Father?

- A) 10 Yrs B) 17 Yrs C) 30 Yrs D) 28 Yrs

17) An amount of money is to be distributed among Ram, Shyam and Mohan in the ratio 6 : 13 : 17 respectively. If the total

share of Shyam and Mohan is four times that of Ram. What is Ram's share?

- A) Rs. 3000 B) Rs. 5000 C) Can't be determined
D) None of these

18) The ratio between two numbers is 4:5, their LCM is 260. Determine the numbers?

- A) 60,45 B) 52,60 C) 52,65 D) 48, 64

19) Two numbers are in the ratio 3 : 5. if each number is increased by 7, the ratio becomes 2 : 3. The numbers are

- A) 5, 3 B) 18, 21 C) 21, 35 D) 20, 34

20) A mixture of 680 ml contains milk and water in the ratio 10 : 7. How much more water is added to get a new mixture containing milk and water in the ratio 5 : 4 ?

- A) 30 ml B) 20 ml C) 80 ml D) 40 ml

21) The sum of three no. is 126. If the ratio b/w 1st & 2nd be 3 : 4 & that between 2nd & 3rd be 5 : 7. Find the first no.

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

22) Two Books cost as much as 6 Pens, 8 pens as much as 10 Pencils, 15 Pencils as much as 20 rubbers, 10 rubbers as much as 50 Sharpeners. If the price of one Sharpener is Rs. 10. How much will one Book cost.

- A) Rs. 270 B) Rs. 250 C) Rs. 350 D) Rs. 370

23) In a Stationery Shop, the ratio of the no. of Books, Pen & Pencil is 2 : 7 : 9. If the difference between the numbers of Pen & Pencil is a multiple of 3 as well as 7, what is the minimum no. of Book, Pen and Pencil in the Shop:

- A) 415 B) 289 C) 378
D) Can't be determined

24) If A : B = 8 : 3, B : C = 6 : 7, find A : B : C

- A) 12 : 20 : 35 B) 16 : 20 : 28
C) 16 : 6 : 7 D) None of these

25) The ratio of the prices of two horses was 18 : 25. Three year later when the price of the first has increased by 10% & that of the second by Rs. 392, the ratio of the prices becomes 3 : 5. Find the original prices of the two horses:

- A) 848, 1219 B) 882, 1225
C) Can't be determined D) None of these

26) The monthly income of two persons are in the ratio 6 : 8 & their expenditure are in the ratio 14 : 19. If each saves Rs. 80 per month, find sum of their monthly incomes

- A) 900 B) 1400 C) 2800 D) 2600

27) Divide Rs. 616 among A, B & C such that for 3 times A's share equal to 6 times B's share is equal to 9 times of C share. Find the share of A.

- A) Rs. 168 B) Rs. 112 C) Rs. 369 D) Rs. 336

$$\frac{x}{3} = \frac{y}{5} = \frac{z}{7}$$

28) If $\frac{x}{3} = \frac{y}{5} = \frac{z}{7}$ then the value of $3x - 7y + 6z/3y$ is :

- A) 17/6 B) 15/2 C) 16/15 D) 18/19

29) If $\frac{a}{5} = \frac{b}{6} = \frac{c}{7}$, then prove that $\frac{a+b+c}{b}$:

A) 2 B) 3 C) C/2 D) None of these

30) A vessel contains liquids A & B in ratio 6 : 7, if 26 lit. of mixture is removed & the same quantity of liquid B is added then the ratio becomes 9 : 17. What quantity does the vessel hold :

A) 123 lit B) 98 lit C) 40 lit D) 104 lit

Chapter 07: Mixtures & Allegation

MIXTURE :

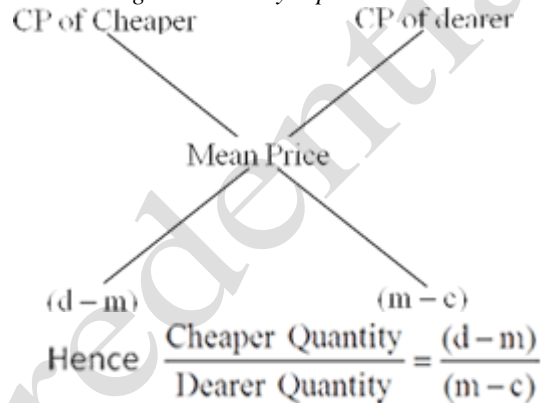
When two or more different ingredients are mixed together, the resulting formation is known as mixture.

ALLEGATION:

Allegation is a rule which states that, "when different quantities of the same or different ingredients, of different prices are mixed together to produce a mixture of a mean price, the ratio of their quantities is inversely proportional to the difference in their price from the mean price". We can say that,

$$\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}} = \frac{\text{CP of dearer} - \text{Mean price}}{\text{Mean price} - \text{CP of cheaper}}$$

We can diagrammatically represent it as :



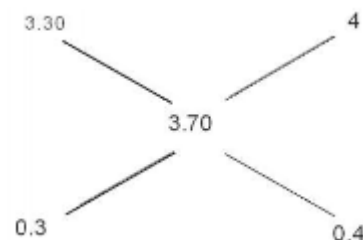
• Consider a vessel contains only 'a' unit of ingredient A. From this b is taken out and replaced by in equal amount of ingredient B, and the process is repeated 'n' times in all then,

$$\frac{\text{Amount of A left}}{\text{Amount of A originally present}} = \left(\frac{a - b}{a} \right)^n$$

SOLVED EXAMPLES

Ex. 1 : In what proportion should one variety of oil at Rs. 3.30 per litre be mixed with another at Rs. 4.00 per litre to get a mixture worth Rs. 3.70 per litre ?

Solution :



By allegation rule : $\frac{\text{Quantity of cheaper oil}}{\text{Quantity of dearer oil}}$

$$= \frac{\text{Price of Dear} - \text{Mean price}}{\text{Mean price} - \text{Price of cheaper}}$$

$$= \frac{0.3}{0.4} = \frac{3}{4}$$

They must be mixed in the ratio of 3:4.

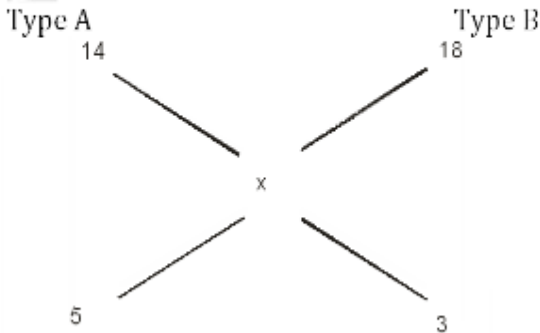
Ex. 2 : There are two types of rice. Type A costs Rs. 14 per kg and Type B costs Rs. 18 per kg. If A and B are mixed in the ratio 5 : 3, what is the cost price per kg of the resultant mixture ?

Solution :

$$\text{C.P.} = \frac{14 \times 5 + 18 \times 3}{8} = \frac{70 + 54}{8} = \frac{124}{8} = \text{Rs. } 15.5$$

Alternatively,

Let the C.P. of the mixture be Rs. x/kg.



$$\therefore \frac{18 - x}{x - 14} = \frac{5}{3} \Rightarrow 54 - 3x = 5x - 70 \Rightarrow 124 = 8x \Rightarrow x = \frac{124}{8} = 15.5$$

Ex. 3 :

A vessel contains 66 litres of a mixture of alcohol and water in the ratio 7 : 4. How much water should be mixed with it so that the alcohol to water ratio becomes 21 : 20?

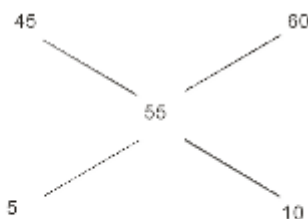
Solution : Let x litres of water be added to the mixture.

$$\therefore \frac{\text{Alcohol}}{\text{Water}} = \frac{\frac{7}{11} \times 66}{\frac{4}{11} \times 66 + x} = \frac{21}{20} \Rightarrow \frac{42}{24 + x} = \frac{21}{20} \Rightarrow x = 16$$

\therefore 16 litres of water should be added.

Ex. 4 : In what ratio must 45% alcohol be mixed with 60% alcohol to get a mixture of 55% alcohol strength ?

Solution :



By allegation rule,

$$\frac{\text{Quantity of 45\% alcohol}}{\text{Quantity of 60\% alcohol}} = \frac{5}{10} = \frac{1}{2}$$

\therefore They must be mixed in the ratio 1 : 2.

Ex. 5 :

A container contained 100 kg of milk. From this container 10 kg of milk was taken out and replaced by water. This process was further repeated two times. How much milk does the container have now ?

Solution : Amount of liquid left after n operations, when the container originally contains a units of liquid from which b units are taken out each time are

$$a \left(\frac{a-b}{a} \right)^n \text{ units} = 100 \left(\frac{100-10}{100} \right)^3 \text{ kg} = 100 \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10} = 72.9 \text{ kg}$$

Practice Set 1:

1) In what ratio must water be mixed with milk costing Rs. 12 per litre to obtain a mixture worth of Rs. 8 per litre?

- A) 1 : 2 B) 2 : 1 C) 4 : 3 D) 5 : 3

2) In what ratio must be a grocer mix two varieties of tea worth Rs. 60 a kg and Rs. 65 a Kg so that by selling the mixture at Rs. 68.20 a Kg he may gain 10% ?

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

3) In what ratio must a grocer mix two varieties of pulses costing Rs. 15 and Rs. 20 per kg respectively so as to get a mixture worth Rs. 16.50 kg?

- A) 3 : 7 B) 5 : 7 C) 7 : 3 D) 7 : 5

4) In what ratio must rice at Rs. 9.30 per Kg be mixed with rice at Rs. 10.80 per Kg so that the mixture be worth Rs. 10 per Kg ?

- A) 8 : 7 B) 7 : 8 C) 8 : 9 D) 9 : 8

5) Tea worth Rs. 126 per kg are mixed with a third variety in the ratio 1 : 1 : 2. If the mixture is worth Rs. 153 per kg, the price of the third variety per kg will be

- A) Rs. 169.50 B) Rs. 1700 C) Rs. 175.50
D) Rs. 180

6) A container contains 40 litres of milk. From this container 4 litres of milk was taken out and replaced by water. This process was repeated further two times. How much milk is now contained by the container?

- A) 26.34 litres B) 27.36 litres
C) 28 litres D) 29.16 litres

7) Tea worth Rs. 126 per kg and kg and Rs. 135 per kg are mixed with a third variety in the ratio 1 : 1 : 2. If the mixture is worth Rs. 153 per kg, the price of the third variety per kg will be :

- A) Rs. 169.50 B) Rs. 170
C) Rs. 175.50 D) Rs. 180

8) Two vessels A and B contain spirit and water in the ratio 5 : 2 and 7 : 6 respectively. Find the ratio in which these mixture be mixed to obtain a new mixture in vessel C containing spirit and water in the ration 8 : 5 ?

- A) 4 : 3 B) 3 : 4 C) 5 : 6 D) 7 : 9

9) A merchant has 1000 kg of sugar, part of which he sells at 8% profit and the rest at 18% profit. He gains 14% on the whole. The quantity sold at 18% profit is:

- A) 400 kg B) 560 kg C) 600 kg
D) 640 kg

10) A can contains a mixture of two liquids A and B in the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A was contained by the can initially?

- A) 10 B) 20 C) 21 D) 25

11) A can contains a mixture of two liquids A and B in the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A was contained by the can initially?

A) 10 B) 20 C) 21 D) 25

12) In what ratio must rice at Rs 9.30 per Kg be mixed with rice at Rs 10.80 per Kg so that the mixture be worth Rs 10 per Kg?

A) 6:5 B) 8:7 C) 3:7 D) 6:1

13) Find the ratio in which rice at Rs. 7.20 a kg be mixed with rice at Rs. 5.70 a kg to produce a mixture worth Rs. 6.30 a kg.

A) 1 : 3 B) 2 : 3 C) 3 : 4 D) 4 : 5

14) In what ratio must water be mixed with milk costing Rs. 12 per litre to obtain a mixture worth of Rs. 8 per litre?

A) 1 : 2 B) 2 : 1 C) 2 : 3 D) 3 : 2

15) A milk vendor has 2 cans of milk. The first contains 25% water and the rest milk. The second contains 50% water. How much milk should he mix from each of the containers so as to get 12 litres of milk such that the ratio of water to milk is 3 : 5 ?

A) 4litres, 8 litres B) 6litres, 6 litres
C) 5litres, 7 litres D) 7litres, 4 litres

16) In what proportion must rice at Rs. 3.10 per kg be mixed with rice at Rs. 3.60 per kg so that the mixture be worth Rs. 3.25 per kg?

A) 3 : 7 B) 5 : 3 C) 3 : 5 D) 7 : 3

17) In what ratio must a grocer mix two varieties of tea worth Rs. 60 a kg and Rs. 65 a kg so that by selling the mixture at Rs. 68.20 a kg he may gain 10%?

A) 3 : 2 B) 3 : 4 C) 3 : 5 D) 4 : 5

18) Tea worth Rs. 126 per kg and Rs. 135 per kg are mixed with a third variety in the ratio 1 : 1 : 2. If the mixture is worth Rs. 153 per kg, the price of the third variety per kg will be:

A) Rs. 169.50 B) Rs. 170 C) Rs. 175.50
D) Rs. 180

19) Two vessels A and B contain spirit and water mixed in the ratio 5 : 2 and 7 : 6 respectively. Find the ratio in which these mixture be mixed to obtain a new mixture in vessel C containing spirit and water in the ratio 8 : 5 ?

A) 4 : 3 B) 3 : 4 C) 5 : 6 D) 7 : 9

21) A merchant has 1000 kg of sugar part of which he sells at 8% profit and the rest at 18% profit. He gains 14% on the whole. The Quantity sold at 18% profit is

A) 400 kg B) 560 kg C) 600 kg
D) 640 kg

22) The cost of Type 1 rice is Rs. 15 per kg and Type 2 rice is Rs. 20 per kg. If both Type 1 and Type 2 are mixed in the ratio of 2 : 3, then the price per kg of the mixed variety of rice is:

A) Rs. 18 B) Rs. 18.50 C) Rs. 19
D) Rs. 19.50

23) A can contains a mixture of two liquids A and B in the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A was contained by the can initially?

A) 10 B) 20 C) 21 D) 25

24) In what ratio must tea Rs. 62 per kg be mixed with tea at Rs. 72 per kg so that the mixture must be worth Rs. 64.50 per kg?

A) 3 : 1 B) 3 : 2 C) 4 : 3 D) 5 : 3

25) In what ratio must tea at Rs.62 per Kg be mixed with tea at Rs. 72 per Kg so that the mixture must be worth Rs. 64.50 per Kg?

A) 3 : 1 B) 3 : 2 C) 4 : 3 D) 5 : 3

26) In what ratio must water be mixed with milk to gain 16 % on selling the mixture at cost price?

A) 1 : 6 B) 6 : 1 C) 2 : 3 D) 4 : 3

27) 8 litres are drawn from a cask full of wine and is then filled with water. This operation is performed three more times. The ratio of the quantity of wine now left in cask to that of the water is 16 : 65. How much wine the cask hold originally ?

A) 18 litres B) 24 litres C) 32 litres
D) 42 litres

28) In what ratio must wheat at Rs.3.20 per kg be mixed with wheat at Rs.2.90 per kg so that the mixture be worth Rs.3.08 per kg?

A) 3 : 4 B) 2 : 3 C) 3 : 2 D) 4 : 3

29) How many kilogram of sugar costing Rs. 9 per kg must be mixed with 27 kg of sugar costing Rs. 7 per kg so that there may be a gain of 10% by selling the mixture at Rs. 9.24 per kg?

A) 36 kg B) 42 kg C) 54 kg D) 63 kg

30) Two vessels A and B contain milk and water mixed in the ratio 8 : 5 and 5 : 2 respectively. The ratio in which these two mixtures be mixed to get a new mixture containing $69\frac{3}{13}$ % milk, is:

A) 2 : 7 B) 3 : 5 C) 5 : 2 D) 5 : 7

Chapter 8: Time & Work

Time = Work done / Efficiency

When work is same.

Time \propto 1 / Efficiency

If A can do a piece of work in n days.

Then, per day working efficiency of A = $1/n$

If working efficiency of A & B is $\rightarrow x : y$.

Then, the time taken by A & B to finish the work is in the ratio

$\rightarrow y : x$

e.g. If A does three times faster work than 'B', then ratio of work done by A and B is 3 : 1. Then

Ratio of time taken by A & B = 1 : 3

If A can do a piece of work in x days and B can do a piece of work in 4 days, then both of them working together will do the same work in

$xy/(x+y)$ days

Explanation

\Rightarrow A's 1 day's work = $1/x$

B's 1 day's work = $1/y$

(A + B)'s 1 day work = $1/x + 1/y = (x+y)/xy$

A + B will complete the work in = $xy/(x+y)$

Q. A can finish a piece of work by working alone in 6 days and B, while working alone, can finish the same work in 12 days. If both of them work together, then in how many days, the work will be finished?

Sol. $x = 6, y = 12$

Working together A + B will complete the work in = $xy/(x+y)$

= $(6 \times 12)/18$

= 4 days

If A, B & C will working alone, can complete a work in x, y and z days, respectively, then they will together complete the work in $xyz/(xy + yz + zx)$

Explanation

\Rightarrow A's 1 day work = $1/x$

B's 1 day work = $1/y$

C's 1 day work = $1/z$

(A + B + C)'s 1 day work = $1/x + 1/y + 1/z = (yz + xz + xy)/xyz$

(A + B + C) will complete the work in

= $xyz/(yz + xz + xy)$

Q. A, B and C can complete a piece of work in 10, 15 and 18 days, respectively. In how many days would all of them complete the same work working together?

Sol. $x = 10$ days, $y = 15$ days & $z = 18$ days

The work will be completed in

= $(10 \times 15 \times 18)/(10 \times 15 + 15 \times 18 + 18 \times 10)$

= $2700/600 = 4\frac{1}{2}$ days

Two persons A & B, working together, can complete a piece of work in x days. If A, working alone, can complete the work in y days, then B, working alone, will complete the work in $\Rightarrow xy/(y-x)$

Explanation

\Rightarrow A + B's 1 day work = $1/x$

A's 1 day work = $1/y$

B's 1 day work = $1/x - 1/y$

= $(y-x)/yx$

B will complete the work = $yx/(y-x)$

Q. A and B working together take 15 days to complete a piece of work. If A alone can do this work in 20 days, how long would B take to complete the same work?

Sol. $x = 15, y = 20$

B will complete the work in = $(15 \times 20)/5$

= 60 days

If A & B working together, can finish a piece of work in x days, B & C in 4 days, C & A in z days. Then, A + B + C working together will finish the job is

$\Rightarrow 2xyz/(xy + yz + zx)$

Explanation

\Rightarrow A + B's 1 day work = $1/x$

B + C's 1 day work = $1/y$

C + A's 1 day work = $1/z$

[(A + B) + (B + C) + (C + A)]'s 1 day's work

= $1/x + 1/y + 1/z$

= $(yz + xz + xy)/xyz$

2 (A + B + C)'s 1 day work = $(xy + yz + xz)/xyz$

A + B + C's 1 day work = $(xy + yz + xz)/2xyz$

A + B + C working together will complete the work in

= $2xyz/(xy + yz + xz)$

Q. A and B can do a piece of work in 12 days, B and C in 15 days, C and A in 20 days. How long would they take to complete the full work together?

Sol. $x = 12$ days, $y = 15$ days, $z = 20$ days

A + B + C = $(2 \times 12 \times 15 \times 20)/(180 + 300 + 240)$

= $7200/720 = 10$ days

If A can finish a work in x days and B is k times efficient than A, then the time taken by both A and B, working together to complete the work is

$x/(1+k)$

Explanation

\Rightarrow Ratio of working efficiency, A & B = 1 : k

Ratio of Time taken = $k : 1$

$k \rightarrow x$ days

$1 \rightarrow x/k$ days

A $\rightarrow x$ days

$B \rightarrow x/k$ days

1 day work of A = $1/x$

1 day work of B = k/x days

(A + B)'s 1 day work = $1/x + k/x = (k + 1)/x$

(A + B) will complete the work is = $x/(k + 1)$

Q. Harbans Lal can do a piece of work in 24 days. If Bansil Lal works twice as fast as Harbans Lal, how long would they take to finish the work working together?

Sol. $x = 24, k = 2$

Working together they will complete the work in = $24/(1 + 2)$
 $= 24/3 = 8$ days

If A & B working together can finish a work in x days & B is k times efficient than A, then the time taken by,

A working Alone will take $\Rightarrow (k + 1) x$

B working Alone will take $\Rightarrow ((k + 1) / k) x$

Explanation

\Rightarrow Efficiency Ratio $\rightarrow 1 : k$

Time Ratio $\rightarrow k : 1$

A's 1 day work = $1/k$

B's 1 day work = 1

(A + B)'s 1 day work = $1/x$

$1/k + 1 = 1/x$

$(k + 1)/k = 1/x$

$k = (k + 1) x$

A alone working together will take $\Rightarrow (k + 1) x$ days

1 ratio = $((k + 1) x)/k$

B Alone working Alone will take

$\Rightarrow ((k + 1) x)/k$

Q. A and B together can do a piece of work in 3 days. If A does thrice as much work as B in a given time, find how long A alone would take to do the work?

Sol. $x = 3, k = 3$

Time taken by A, working Alone to complete the work = $((3 + 1)/3) \times 3 = 4$ days

If A working Alone takes a days more than A & B, & B working Alone takes b days more than A & B. Then,
 Number of days, taken by A & B working together to finish a job is = \sqrt{ab}

Explanation :

\Rightarrow Let A + B takes x days

$A \rightarrow x + a$ days

$B \rightarrow x + b$ days

$1/(x + a) + 1/(x + b) = 1/x$

$(2x + a + b) / (x^2 + xa + xb + ab) = 1/x$

$2x^2 + xa + xb = x^2 + xa + xb + ab$

$x^2 = ab$

$x = \sqrt{ab}$ days

Q. A alone would take 8 hrs more to complete the job than if both A and B worked together. If B worked alone, he took $41/2$

hrs more to complete the job than A and B worked together. What time would they take if both A and B worked together?

Sol. $a = 8, b = 9/2$

$A + B$ will take = $\sqrt{(8 \times 9/2)}$

$= \sqrt{36}$

$= 6$ days

Points to remember:

1) If a man can do a piece of work in n days, work done by him

in one day = $\frac{1}{n}$ part of total work or he will finish $\frac{1}{n}$ th work in one day.

2) If a man completes $\frac{1}{n}$ th work in one day, he will complete the entire work in n days.

3) If A can complete a piece of work in X days and B can complete the same work in Y days, both A and B working

together can finish the same work in $\frac{XY}{X+Y}$ days.

4) If A is thrice as good as workman as B or A can work three times faster than B, the ratio of work done by A and B for the same duration of time will be = $3 : 1$. And the ratio of time taken by A and B to finish the same amount of work will be = $1 : 3$.

5) A, B and C can do a work in D_1, D_2 and D_3 days respectively. If they work for X_1, X_2 and X_3 days respectively;

○ Work done by A in X_1 days = $\frac{X_1}{D_1}$

○ Work done by B in X_2 days = $\frac{X_2}{D_2}$

○ Work done by C in X_3 days = $\frac{X_3}{D_3}$

6) If A, B, C can do a piece of work in X, Y , and Z days respectively, if they work together they can do the same work in $\left(\frac{XYZ}{XY+YZ+ZX} \right)$ days.

7) A and B working together can do a work in X days. If A alone can do the same work in Y days, B alone can do the same work

in $\left(\frac{XY}{Y-X} \right)$ days.

8) A and B working together can finish a piece of work in X days, B and C working together can finish the same work in Y days and C and A in Z days. Then;

○ A, B and C working together will finish the work

in $\left(\frac{2XYZ}{XY+YZ+ZX} \right)$ days.

○ A alone will finish the work in = $\left(\frac{2XYZ}{XY+YZ-ZX} \right)$ days.

○ B alone will finish the work in = $\left(\frac{2XYZ}{YZ+ZX-XY} \right)$ days.

○ C alone will finish the work in = $\left(\frac{2XYZ}{ZX+XY-YZ} \right)$ days.

9) A can do a work in X days. If B is P times efficient than A, A

and B working together can do the work in $\left(\frac{X}{1+P} \right)$ days.

10) A and B working together can complete a work in X days. If B is P times efficient than A;

○ A alone can complete the work in $(P + 1) X$ days.

○ B alone can complete the work in $\left(\frac{P+1}{P} \right) X$ days.

11) P working alone takes X days more to do a work than P and Q working together takes to do the same work. And, Q working alone takes Y days more to do the same work than P and Q working together takes to finish the same work. Then P and Q working together can finish the same work in \sqrt{XY} days.

12) A is P times more efficient than B and able to finish the work in X days less than B, then

- A and B working together can finish the work in

$$\left(\frac{PX}{P+P-X} \right) \text{ days.}$$

- A alone can finish the work in $\left(\frac{X}{P-X} \right)$ days.

- B alone can finish the work in $\left(\frac{PX}{P-X} \right)$ days.

13) If A completes $\frac{a}{b}$ part of a work in X days, $\frac{c}{d}$ part of the same work he can complete in $\left(\frac{b+c \cdot X}{a \cdot d} \right)$ days.

14) There are two groups of workers with same efficiency. In one group M1 workers can do W1 work in D1 days or time. In the second group M2 workers can do W2 work in D2 days or time. Then;

$$M1 D1 W2 = M2 D2 W1$$

15) There are two groups of workers with the same efficiency. In one group M1 workers can do W1 work in D1 time or days working T1 hours a day. In the second group, M2 workers can do W2 work in D2 time or days working T2 hours in a day. Then;

$$M1 D1 T1 W2 = M2 D2 T2 W1$$

- If the efficiency of the workers is different in these groups i.e. E1 and E2,; $M1 D1 T1 E1 W2 = M2 D2 T2 E2 W1$
- Also remember that efficient person takes less time to complete a given work. So, we can say that efficiency (E) is indirectly proportional to the number of days (D) taken to complete the given work.

Therefore, $ED = \text{constant}$

$$E1D1 = E2D2$$

More men will take fewer days and fewer men will take more days to complete a given work.

16) Wages are directly proportional to the work done by the individual and inversely proportional to the time taken by the individual.

Total wages = One person's one day's wage * number of persons * number of days

A's share : B's share : C's share = B's time * C time : A's time * C's time : A's time * B's time.

Practice set 1:

1) A can finish a work in 18 days and B can do the same in half the time taken by A. Then, working together, what part of the same work they can finish in a day?

- A) 1/6 B) 1/9 C) 2/5 D) 2/7

2) Two men, A and B, run a 4 km race on a circular course of 1/4 km. If their speeds are in the ratio of 5:4, how often does the winner pass the other?

- A) Once B) Twice C) Thrice
D) Four times

3) A alone can do a piece of work in 6 days and B alone in 8 days. A and B undertook to do it for Rs. 3200. With the help of C, they completed the work in 3 days. How much is to be paid to C?

- A) Rs. 375 B) Rs. 400 C) Rs. 600
D) Rs. 800

4) A and B together can complete a work in 12 days. A alone can complete it in 20 days. If B does the work only for half a day daily, then in how many days A and B together will complete the work?

- A) 10 days B) 11 days C) 15 days
D) 20 days

5) A and B can do a job together in 7 days. A is $1\frac{3}{4}$ times as efficient as B. The same job can be done by A alone in :

- A) 9 $\frac{1}{3}$ days B) 11 days C) 12 $\frac{1}{4}$ days
D) 16 $\frac{1}{3}$ days E) None of these

6) A and B together can complete a piece of work in 4 days. If A alone can complete the same work in 12 days. in how many days can B alone complete that work?

- A) 1/3 days B) 1/6 days C) 1/9 days
D) 1/12 days

7) 10 women can complete a work in 7 days and 10 children take 14 days to complete the work. How many days will 5 women and 10 children take to complete the work?

- A) 3 B) 5 C) 7
D) Cannot be determined E) None of these

8) A can finish a work in 18 days and B can do the same work in half the time taken by A. Then, working together, what part of the same work they can finish in a day?

- A) $\frac{1}{6}$ B) $\frac{2}{5}$ C) $\frac{1}{9}$ D) $\frac{2}{7}$

9) A, B and C can complete a piece of work in 24, 6 and 12 days respectively. Working together, they will complete the same work in:

- A) 1/24 days B) 3 $\frac{3}{7}$ days C) 3 days D) 4 days
E) None of these

10) Worker A takes 8 hours to do a job. Worker B takes 10 hours to do the same job. How long should it take both A and B, working together but independently, to do the same job?

- A) $2\frac{4}{9}$ B) $4\frac{4}{9}$ C) $5\frac{4}{9}$ D) $4\frac{2}{9}$

11) A, B and C can do a piece of work in 20, 30 and 60 days respectively. In how many days can A do the work if he is assisted by B and C on every third day?

- A) 12 days B) 15 days C) 16 days D) 18 days

12) A, B and C can do a piece of work in 11 days, 20 days and 55 days respectively, working alone. How soon can the work be done if A is assisted by B and C on alternate days?

- A) 7 days B) 8 days C) 9 days
D) 10 days

13) A works twice as fast as B. If B can complete a work in 12 days independently, the number of days in which A and B can together finish the work in :

- A) 4 days B) 6 days C) 8 days
D) 18 days E) None of these

14) A, B, and C can complete a piece of work in 24, 6 and 12 days respectively. Working together, they will complete the same work in

- A) $\frac{1}{24}$ day B) $\frac{7}{24}$ day C) $3 \times \frac{3}{7}$ days
D) 4 days

15) A can lay railway track between two given stations in 16 days and B can do the same job in 12 days. With help of C, they did the job in 4 days only. Then, C alone can do the job in:

- A) $9\frac{1}{5}$ B) $9\frac{2}{5}$ C) $9\frac{3}{5}$ D) 10

16) A can finish a work in 18 days and B can do the same work in 15 days. B worked for 10 days and left the job. In how many days, A alone can finish the remaining work?

- A) 5 B) 7 C) 6 D) 8

17) A can finish a work in 24 days, B in 9 days and C in 12 days. B and C start the work but are forced to leave after 3 days. The remaining work was done by A in:

- A) 5 days B) 6 days C) 8 days
D) 10 days E) None of these

18) Ronald and Elan are working on an assignment. Ronald takes 6 hours to type 32 pages on a computer, while Elan takes 5 hours to type 40 pages. How much time will they take, working together on two different computers to type an assignment of 110 pages?

- A) 7 hours 30 minutes B) 8 hours
C) 8 hours 15 minutes D) 8 hours 25 minutes

19) A and B can together finish a work 30 days. They worked together for 20 days and then B left. After another 20 days, A finished the remaining work. In how many days A alone can finish the work?

- A) 40 B) 50 C) 54 D) 60

20) A and B can do a work in 12 days, B and C in 15 days, C and A in 20 days. If A, B and C work together, they will complete the work in:

- A) 5 days B) $7\frac{5}{6}$ C) 10 days D) $15\frac{2}{3}$

21) Twenty women can do a work in sixteen days. Sixteen men can complete the same work in fifteen days. What is the ratio between the capacity of a man and a woman?

- A) 3 : 4 B) 4 : 3 C) 5 : 3
D) Data inadequate E) None of these

22) If 6 men and 8 boys can do a piece of work in 10 days while 26 men and 48 boys can do the same in 2 days, the time taken by 15 men and 20 boys in doing the same type of work will be:

- A) 4 days B) 5 days C) 6 days D) 7 days

23) A takes twice as much time as B or thrice as much time to finish a piece of work. Working together, they can finish the work in 2 days. B can do the work alone in:

- A) 4 days B) 6 days C) 8 days
D) 12 days

24) X can do a piece of work in 40 days. He works at it for 8 days and then Y finished it in 16 days. How long will they together take to complete the work?

- A) $13\frac{1}{3}$ days B) 15 days C) 20 days
D) 26 days E) None of these

25) 4 men and 6 women can complete a work in 8 days, while 3 men and 7 women can complete it in 10 days. In how many days will 10 women complete it?

- A) 35 B) 40 C) 45 D) 50

26) A and B can do a piece of work in 30 days, while B and C can do the same work in 24 days and C and A in 20 days. They all work together for 10 days when B and C leave. How many days more will A take to finish the work?

- A) 18 days B) 24 days C) 30 days
D) 36 days

27) A can do a work in 15 days and B in 20 days. If they work on it together for 4 days, then the fraction of the work that is left is

- A) $\frac{1}{4}$ B) $\frac{1}{10}$ C) $\frac{7}{15}$ D) $\frac{8}{15}$

28) A and B together can complete a piece of work in 35 days while A alone can complete the same work in 60 days. B alone will be able to complete the same working in:

- A) 74 Days B) 80 Days C) 84 Days
D) 90 Days

29) P can complete a work in 12 days working 8 hours a day. Q can complete the same work in 8 days working 10 hours a day. If both P and Q work together, working 8 hours a day, in how many days can they complete the work?

- A) $5\frac{5}{11}$ B) $5\frac{6}{11}$ C) $6\frac{5}{11}$ D) $6\frac{6}{11}$

30) If A can do $\frac{1}{4}$ of a work in 3 days and B can do $\frac{1}{6}$ of the same work in 4 days, how much will A get if both work together and are paid Rs. 180 in all?

- A) Rs. 36 B) Rs. 60 C) Rs. 108
D) Rs. 120

Practice set 2:

1) Worker A completes a task in 8 days, and worker B completes the same task in 10 days. If both A and B work together, in how many days they will complete the task?

- A) 40/10 days. B) 40/9 days. C) 40/8 days.
D) 40/7 days.

2) Vikas and Mohan working together can complete a work in 6 days. If Vikas alone completes the same work in 10 days, in how many days Mohan alone can complete the same work?

- A) 13 days B) 14 days C) 15 days
D) 16 days

3) A can do a work in 10 days and B can do the same work in 15 days. If they start working together but stop working after four days, find the fraction of the work that is left.

- A) $\frac{1}{a}$ B) $\frac{2}{3}$ C) $\frac{4}{7}$ D) $\frac{1}{2}$

4) Peter is twice as good as workman as Tom. When they work together they can finish a task in 16 days. If Tom works alone, in many days he will complete the task?

- A) 46 days B) 48 days C) 50 days
D) 52 days

5) A can do a job in 12 days and B can do the same job in 10 days. With the help of C they can do the same job in 4 days. In how many days C alone can do this job?

- A) 15 days B) 14 days C) 13 days
D) 12 days

6) A, B, C can do a job in 10, 20 and 40 days respectively. In how many days A can complete the job if he is assisted by B and C on every third day?

- A) 8 days B) 7 days C) 9 days
D) 6 days

7) If 5 men can colour 50-meter long cloth in 5 days, in many days 4 men can color a 40-meter long cloth?

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

8) If 4 men can finish 4 times of a work in 4 days, in how many days 6 men can finish the 6 times of same work ?

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

9) A can do a piece of work in 10 days. B is 50% more efficient than A. In how many days B alone can do the same job?

- A) 6.2 days B) 6.6 days C) 7 days
D) 7.2 days

10) A can do a job in 30 days. B alone can do the same job in 20 days. If A starts the work and joined by B after 10 days, in how many days the job will be done?

- A) 15 days B) 16 days C) 17 days
D) 18 days

11) A can do a piece of work in 6 days working 8 hours a day. B can do the same work in 4 days working 6 hours a day. If they work together 8 hours a day, in how many days they will do this work?

- A) 3 days B) 3.5 days C) 2 days
D) 2.5 days

12) A can finish a work in 6 days and B can finish the same work in 8 days. A and B charge Rs. 2800 for the work. If with the help of C they complete the work in 3 days, how much they will pay to C?

- A) Rs. 350 B) Rs. 345 C) Rs. 340
D) Rs. 320

13) 5 men undertook a piece of work and finished half the work in 18 days if two men drop out, in how many days the remaining work will be completed?

- A) 30 days B) 32 days C) 34 days
D) 36 days

14) If 5 workers can paint a house in 9 days, in how many days 3 workers can complete the same task?

- A) 13 days B) 14 days C) 15 days
D) 16 days

15) A group of workers undertakes a task. They can complete the task in 30 days. If 5 of them did not turn for the work and the remaining workers complete the task in 40 days, find the original number of workers.

- A) 25 days B) 23 days C) 21 days
D) 20 days

16) 40 men can paint a building in 15 days working 4 hours a day. In how many days 30 men working 5 hours a day will complete the work?

- A) 14 days B) 15 days C) 16 days
D) 17 days

17) A certain number of men can do a piece of work in 50 days. If there were 6 men more the same work could be done in 10 days less. Find the original number of men.

- A) 21 men B) 22 men C) 23 men
D) 24 men

18) A is twice as good as workman as B so he can do a work in 40 days less than B. If they work together, in how many days they can do the work?

- A) 80/4 days B) 80/5 days C) 80/3 days
D) 80/6 days

19) A is twice as good as workman as B and working together they can do a piece of work in 20 days. If A alone works, in how many days he will do the work?

- A) 30 days B) 33 days C) 37 days
D) 40 days

20) 3 workers can do a piece of work in 20 days. If one of them works only for half time in a day, in how many days the work will be done?

- A) 24 days B) 20 days C) 22 days
D) 23 days

21) A can finish the job at the same time in which B and C together do it. If A and B together can finish the work in 10 days and C alone can do the work in 50 days, how many days B will take to complete the same job?

- A) 20 days B) 22 days C) 22(1/2) days
D) 25 days

22) A and B working together can finish a work in 12 days, B and C working together can finish the work in 16 days. If A works for 5 days, B works for 7 days, and C completes the remaining work in 13 days, C alone can complete the work in how many days?

- A) 22 days B) 24 days C) 26 days
D) 28 days

23) A can finish a work in 10 days and B can finish the same work in 15 days. If they work alternatively, find the time taken to finish the job.

- A) 14 days B) 15 days C) 12 days
D) 14.5 days

24) A, B, and C individually can finish a job in 10, 15, and 30 days respectively. If A starts the work and continues until the end, B and C work alternatively, in how many days work will be done?

- A) 6 days B) 4 days C) $4\frac{1}{3}$ days
D) $6\frac{3}{5}$ days

25) A can finish a work in 10 days, B can finish the same work in 15 days, and C can finish it in 30 days. All three start working together, but after some days A leaves the job, then after one day B also left the job. C completes the remaining job in 3 days. Find the number of working days of B.

- A) 4 days B) 5 days C) 6 days D) 7 days

Chapter 09: Time Speed & Distance

Distance = Time \times Speed

- When Distance is constant

Time $\propto 1/\text{speed}$

- When Time is constant

Distance $\propto \text{speed}$

- When speed is constant

Distance $\propto \text{Time}$

- Average speed = (Total Distance) / (Total Time Taken)

When Distance is equal

Average speed = $2xy/(x + y)$

$x, y \rightarrow \text{speeds}$

Q1. A car takes half of the time taken by truck to go from Pune to Mumbai. A truck takes 20 hours to go for the same journey. What is the speed of truck, if the speed of car be 120 km/hr?

Sol. Time taken by truck = 20h

Time taken by car = $\frac{20}{2} = 10\text{h}$

	Car	Truck
Time \rightarrow	10	20
	1	2

Speed $\left(\propto \frac{1}{\text{Time}}\right) \rightarrow$ 2 1

2r \rightarrow 120 km/hr

1r \rightarrow 60 km/hr

Q2. Maitry when increases her speed from 24 km/hr to 30 km/hr she takes one hour less than the usual time to cover a certain distance. What is the distance usually covered by Maitry?

Sol. Speed's Ratio \rightarrow 24 : 30
4 : 5

Time's Ratio $\left(\propto \frac{1}{\text{speed}}\right)$ 5 : 4

Difference in time \rightarrow (5 - 4)r \rightarrow 1 hour
1r \rightarrow 1 hour
5r \rightarrow 5 hour

Distance = $24 \times 5 = 120 \text{ km}$

Q3. Kirti goes to school at 20 km/hr and reaches the school 4 minutes late. Next time, she goes at 25 km/hr and reaches the school 2 minutes earlier than the scheduled time. What is the distance of her school?

Sol. Speed's Ratio \rightarrow 20 : 25
4 : 5

Time's Ratio $\left(\propto \frac{1}{\text{speed}}\right) \rightarrow$ 5 : 4

Difference in time = $+2 - (-4)$
= 6

(5 - 4) ratio \rightarrow 6 minute

1 ratio \rightarrow 6 minute

5 ratio \rightarrow 30 minutes

Distance = $20 \times \frac{30}{60}$
= 10 km

Q4. Ramesh travels half of his journey by train at the speed of 120 km/hr and rest half by car at 80 km/hr. What is the average speed?

Sol. Average speed $\rightarrow \frac{2xy}{x+y}$

$x \rightarrow 120$

$y \rightarrow 80$

Average speed $= \frac{2 \times 120 \times 80}{200}$

$= 96 \text{ km/hr}$

Q5. Walking at $\frac{4}{5}$ of his normal speed, Ravi is 15 minutes late in reaching his club. What is the usual time taken by him to cover the distance?

Sol. Let usual speed $\rightarrow u$

Reduced speed $\rightarrow \frac{4}{5}u$

Speed Ratio $\rightarrow u : \frac{4}{5}u$

$5 : 4$

Time Ratio $\rightarrow 4 : 5$

$1r \rightarrow 15 \text{ minutes}$

Usual time $= 4 \times 15$

$= 60 \text{ minutes}$

$= 1 \text{ hour}$

Relative Speed \rightarrow

a) When two bodies move in the same direction, Let speed of two bodies be S_1 & S_2 .

Relative speed $= S_1 - S_2$

(b) When two bodies are moving in the opposite direction. Let the speed of two bodies be S_1 & S_2 .

Relative speed $= S_1 + S_2$.

(c) When two bodies moving towards each other than time taken by them to meet.

$D \rightarrow$ Distance between two bodies.

$S_1, S_2 \rightarrow$ Speed of two bodies.

T , time taken to meet other $= D/(S_1 + S_2)$

(d) When two bodies are moving in opposite direction, time taken to meet.

$D \rightarrow$ Distance between the two bodies.

$S_1, S_2 \rightarrow$ Speed of two bodies.

T , time taken $= D/(S_1 - S_2)$

(e) If two persons A & B, start at the same time from P and Q towards each other and after crossing they take T_1 & T_2 hrs in reaching Q & P

$S_1/S_2 = \sqrt{T_1/T_2}$

Q1. The distance between 2 places R and S is 42 km. Anita starts from R with a uniform speed of 4 km/hr towards S and at the same time Bipasha starts from S towards R also with some uniform speed. They meet each other after 6 hours. The speed of Bipasha is

Sol.

$T = \frac{d}{S_A + S_B}$

$6 = \frac{42}{4 \text{ km/hr} + S_B}$

$S_B = 3 \text{ km/hr}$

Q2. The distance between two cities A and B is 330 km. A train starts from A at 8 a.m. and travels towards B at 60 km/hr. Another train starts from B at 9 a.m. and travels towards A at 75 km/hr. At what time do they meet?

Sol. Distance covered by train started from A in 1 hour = 60 km/hr

Remaining distance $= 330 - 60 = 270$

Time $= 270/135 = 2 \text{ hours}$

They will meet at $9 + 2 = 11:00 \text{ am}$

Q3. A thief Bhagu Ram is spotted by the policeman Pakad Singh from a distance of 200m. Once they see each other they start Running. What is the distance Bhagu Ram, who is running at 5 km/hr would have covered before being caught by Pakad Singh running at 7 km/hr?

Sol. Time taken by Pakad Singh to catch Bhagu Ram

$$= \frac{200}{(7 - 5) \times \frac{5}{18}}$$

$$= \frac{200 \times 18}{5 \times 2}$$

$$= 360 \text{ sec}$$

Distance covered by Bhagu Ram $= 360 \times 5 \times \frac{5}{18}$

$$= 500 \text{ meter}$$

Q4. A train starts from A to B at 9:00 am and takes 6 hours to travel to B. Another train starts from B to A at 10:00 am and takes 8 hours to travel to A. At what time both train will meet?

Sol. Let Distance $= d$

$d = S_A \times 6$

$S_A = \frac{d}{6}$

$d = S_B \times 8$

$S_B = \frac{d}{8}$

Distance travelled A in 1 hour $= \frac{d}{6}$

Remaining distance

$= d - \frac{d}{6}$

$= \frac{5d}{6}$

Time $= \frac{5d/6}{d/6 + d/8}$

$= \frac{\frac{5d}{6}}{\frac{4d + 3d}{24}} = \frac{5d \times 24}{6 \times 7d}$

$= \frac{20}{7} \text{ hours}$

$= 2\frac{6}{7} \text{ hours}$

$= 2 \text{ hours } \frac{6}{7} \times 60$

$= 2 \text{ hours } 51 \text{ minutes } 25 \text{ second}$

They will meet at $\Rightarrow 12:51 \text{ am}$

Q5. Abhinav leaves Mumbai at 6 am and reaches Bangalore at 10 am. Praveen leaves Bangalore at 8 am and reaches Mumbai at 11:30 am. At what time do they cross each other?

Sol. Time taken by

Abhinav = 4 hours

Time taken by Praveen = 3:30 minutes

$$= 3 \frac{30}{60} = 3 \frac{1}{2}$$

$$= \frac{7}{2} \text{ hours}$$

Let distance between Mumbai + Bangalore → d

Speed of Abhinav, $S_A = d/4$

Speed of Praveen, $S_P = \frac{d}{4/2} = \frac{2d}{7}$

Distance travelled by Abhinav in 2 hours

$$= \frac{d}{4} \times 2 = \frac{d}{2}$$

Remaining distance

$$= d - \frac{d}{2} = \frac{d}{2}$$

$$\text{Time} = \frac{\frac{d}{2}}{\frac{d}{4} + \frac{2d}{7}}$$

$$= \frac{d \times 28}{2 \times 15d}$$

$$= \frac{14}{15} \text{ hours} = \frac{14}{15} \times 60 = 56 \text{ minutes}$$

They will meet at 8:56

Trains

(a) If a train of length l meters passes a platform or bridge of length m metres, then distance travelled is

$$\text{Distance} = l + m$$

(b) If a train of length l meters passes a pole, man, tree etc, then Distance travelled is

$$\text{Distance} = l \text{ meters}$$

(c) If two trains of lengths L_1 & L_2 are travelling in the same direction with speeds S_1 & S_2 then. Time taken by faster train to cross slower train is given by

$$T = (L_1 + L_2) / (S_1 - S_2)$$

(d) If two trains of length L_1 & L_2 are travelling in opposite direction with speeds S_1 & S_2 , then time taken by trains to cross each other is

$$T = (L_1 + L_2) / (S_1 + S_2)$$

(e) Two trains of length L_1 & L_2 run on parallel tracks. When running in same direction, the faster train passes slower train in T_1 secs, but when they are running in opposite direction with same speeds, they pass each other in T_2 sec. Then,

$$\text{Speed of Faster train} = \frac{L_1 + L_2}{2} \left(\frac{1}{T_1} + \frac{1}{T_2} \right)$$

$$\text{Speed of Slower train} = \frac{L_1 + L_2}{2} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$$

Q1. Two trains of length 200 m and 175 m run on parallel tracks. When running in the same direction the faster train crosses the slower train in $37\frac{1}{2}$ sec. While running in opposite directions they pass each other in $7\frac{1}{2}$ s. Find the speed of each train.

$$\text{Sol. } T_1 = 37\frac{1}{2} = \frac{75}{2} \text{ sec}$$

$$T_2 = 7\frac{1}{2} = \frac{15}{2} \text{ sec}$$

Speed of slower train

$$= \frac{L_1 + L_2}{2} \left(\frac{1}{T_2} - \frac{1}{T_1} \right)$$

$$= \frac{200 + 175}{2} \left(\frac{2}{15} - \frac{2}{75} \right)$$

$$= \frac{375}{2} \times \frac{60 \times 2}{75 \times 15}$$

$$= 20 \text{ m/sec}$$

Speed of faster train

$$= \frac{L_1 + L_2}{2} \left(\frac{1}{T_2} + \frac{1}{T_1} \right)$$

$$= \frac{375}{2} \times \frac{90 \times 2}{75 \times 15}$$

$$= 30 \text{ m/sec}$$

Q2. A train crosses a man coming from the opposite direction in 7.5 seconds. If the speed of man be 10 m/s and speed of train is 20 m/s, find the length of the train.

Sol. Length of train = Time × relative speed

$$= 7.5 \times (10 + 20)$$

$$= 7.5 \times 30 = 225 \text{ m}$$

Q3. Two trains coming from the opposite sides cross each other in 10 seconds if the lengths of first train and second train be 125 m and 175 m respectively, also the speed of first train be 36 km/hr, find the speed of second train.

Sol. Speed of 1st train = 36 km/hr

$$= 36 \times \frac{5}{18} = 10 \text{ m/sec}$$

$$\text{Time} = \frac{\text{Distance}}{\text{speed}}$$

$$10 = \frac{125 + 175}{10 + x}$$

$$100 + 10x = 300$$

$$10x = 200$$

$$x = 20 \text{ m/sec}$$

$$= 20 \times \frac{18}{5}$$

$$= 72 \text{ km/hr}$$

Q4. A train overtakes two girls who are walking in the opposite direction in which the train is going at the rate of 3 km/hr and 6 km/hr and passes them completely in 36 seconds and 30 seconds respectively. The length of the train (in metres) is:

$$\text{Sol. } l = (s + 3) \times \frac{36}{3600}$$

$$= \frac{1}{100} (s + 3)$$

$$l = (s + 6) \times \frac{30}{3600}$$

$$= \frac{1}{120} (s + 6)$$

$$\frac{s + 3}{100} = \frac{s + 6}{120}$$

$$6s + 18 = 5s + 30$$

$$s = 12 \text{ km/hr}$$

$$l = 15 \times \frac{5}{18} \times 36$$

$$= 150 \text{ m}$$

Boat & Stream

(a) Downstream → When boat & stream moves in the same direction.

Downstream Speed = $u + v$

u → speed of boat

v → speed of stream

(b) Upstream → When boat & stream moves in the opposite direction.

Upstream speed = $u - v$

u → speed of boat

v → speed of stream

(c) If D → is downstream speed, U → is upstream speed. Then,

Speed of boat = $(D + U)/2$

Speed of stream = $(D - U)/2$

(d) When the distance traveled by boat is downstream is same as the distance covered by boat is upstream, then,

$$\frac{\text{Time taken by boat in D. S}}{\text{Time taken by boat is u. S}} = \frac{\text{upstream speed}}{\text{downstream speed}}$$

Q1. A man can row 9 km/hr in still water. If takes him twice as long as to row up as to row down. Find the rate of stream of river.

Sol.

$$\frac{\text{Time taken upstream}}{\text{Time taken downstream}} = \frac{2}{1}$$

$$\frac{\text{Time taken upstream}}{\text{Time taken downstream}} = \frac{\text{Downstream speed}}{\text{Upstream speed}}$$

$$\frac{2}{1} = \frac{u + v}{u - v}$$

$$1 = \frac{u + v}{u - v}$$

$$2 = \frac{9 + v}{9 - v}$$

$$18 - 2v = 9 + v$$

$$3v = 9$$

$$v = 3 \text{ km/hr}$$

Q2. The speed of a boat downstream is 15 km/hr and the speed of current is 3 km/hr. Find the total time taken by the boat to cover 15 km upstream and 15 km downstream.

Sol. Downstream Speed = $u + v$

$$15 = u + 3$$

$$u = 12 \text{ km/hr}$$

$$v = 3 \text{ km/hr}$$

$$\text{Time upstream} = \frac{15}{9}$$

$$= 1 \frac{6}{9}$$

$$= 1 \text{ h } \frac{6}{9} \times 60$$

$$= 1 \text{ h } 40 \text{ minutes}$$

$$\text{Time downstream} = \frac{15}{15} = 1 \text{ hour}$$

$$\text{Total time} = 2 \text{ h } 40 \text{ minutes}$$

Q3. A man rows 12 km in 5 hours against the stream and the speed of current being 4 kmph. What time will be taken by him to row 15 km with the stream?

$$\text{Sol. Upstream speed} = \frac{12}{5} = 2.4 \text{ km/hr}$$

$$u - v = 2.4 \text{ km/hr}$$

$$u - 4 = 2.4 \text{ km/hr}$$

$$u = 6.4 \text{ km/hr}$$

$$t = \frac{15}{6.4 + 4}$$

$$= \frac{15}{10.4} = \frac{150}{104}$$

$$= 1 \text{ hour } 26 \frac{7}{13} \text{ minutes}$$

Practice set 1:

1) A train travels at an average of 50 miles per hour for $2 \times \frac{1}{2}$ hours and then travels at a speed of 70 miles per hour for $1 \times \frac{1}{2}$ hours. How far did the train travels in the entire 4 hours?

- A) 120 miles B) 150 miles
C) 200 miles D) 230 miles

2) Two trains starting at the same time from two stations 200 km apart and going in opposite directions cross each other at a distance of 110 km from one of the stations. What is the ratio of their speeds?

- A) 9 : 20 B) 11 : 9
C) 11 : 20 D) 9 : 20 E) None of these

3) One of the two buses completes a journey of 300 km in $7 \frac{1}{2}$ Hours and the other a journey of 450 km in 9 hours. The ratio of their average speeds is:

- A) 2:3 B) 3:4 C) 4:5 D) 8:9

4) A person crosses a 600 m long street in 5 minutes. What is his speed in km per hour?

- A) 3.6 B) 7.2 C) 8.4 D) 10

5) Excluding stoppages, the speed of a bus is 54 kmph and including stoppages, it is 45 kmph. For how many minutes does the bus stop per hour?

- A) 9 B) 10 C) 12 D) 20

6) Walking at the rate of 4kmph a man cover certain distance in 2hr 45 min. Running at a speed of 16.5 kmph the man will cover the same distance in.

- A) 12 min B) 25 min C) 40 min D) 60 min

7) 2 trains starting at the same time from 2 stations 200km apart and going in opposite direction cross each other at a distance of 110km from one of the stations. What is the ratio of their speeds?

- A) 11 : 9 B) 7 : 3 C) 18 : 4
D) None of these

8) An express train travelled at an average speed of 100 km/hr, stopping for 3 minutes after every 75 km. How long did it take to reach its destination 600 km from the starting point?

- A) 6 hrs 21 min B) 6 hrs 24 min
C) 6 hrs 27 min D) 6 hrs 30 min

9) The distance between two cities A and B is 330 km. A train starts from A at 8 a.m. and travels towards B at 60 km/hr. Another train starts from B at 9 a.m. and travels towards A at 75 km/hr. At what time do they meet?

- A) 10 am B) 10:30 am C) 11 am
D) 11:30 am E) None of these

10) If a train runs at 40 kmph, it reaches its destination late by 11 minutes but if it runs at 50 kmph, it is late by 5 minutes only. The correct time for the train to complete its journey is:

- A) 13 min B) 15 min C) 19 min D) 21 min

11) If a person walks at 14 km/hr instead of 10 km/hr, he would have walked 20 km more. The actual distance travelled by him is:

- A) 50 km B) 56 km C) 70 km D) 80 km

12) Excluding stoppages, the speed of a bus is 54 kmph and including stoppages, it is 45 kmph. For how many minutes does the bus stop per hour?

- A) 4 B) 6 C) 8 D) None of these

13) Two stations A and B are 110 km apart on a straight line. One train starts from A at 7 am and travel towards B at 20 km/hr speed. Another train starts from B at 8 am and travel towards A at 25 km/hr speed. At what time will they meet?

- A) 09 am B) 10 am C) 11 am
D) None of these

14) The speed of a car increases by 2 kms after every one hour. If the distance travelling in the first one hour was 35 kms. what was the total distance travelled in 12 hours?

- A) 456 kms B) 482 kms C) 552 kms D) 556 kms

15) A and B walk around a circular track. They start at 8 a.m. from the same point in the opposite directions. A and B walk at a speed of 2 rounds per hour and 3 rounds per hour respectively. How many times shall they cross each other before 9.30 a.m.?

- A) 5 B) 6 C) 7 D) 8
E) None of these

16) A train when moves at an average speed of 40 kmph, reaches its destination on time. When its average speed

becomes 35 kmph, then it reaches its destination 15 minutes late. Find the length of journey.

- A) 30 km B) 40 km C) 70 km D) 80 km

17) A man completes a journey in 10 hours. He travels first half of the journey at the rate of 21 km/hr and second half at the rate of 24 km/hr. Find the total journey in km.

- A) 220 km B) 224 km C) 230 km D) 234 km

18) A passenger train takes two hours less for a journey of 300km if its speed is increased by 5km/hr from its normal speed. The normal speed is:

- A) 35 km/hr B) 50 km/hr C) 25 km/hr
D) 30 km/hr

19) Sound is said to travel in air at about 1100 feet per second. A man hears the axe striking the tree, 11/5 seconds after he sees it strike the tree. How far is the man from the wood chopper?

- A) 2197 ft B) 2420 ft C) 2500 ft D) 2629 ft

20) A man in a train notices that he can count 21 telephone posts in one minute. If they are known to be 50 meters apart, then at what speed is the train travelling?

- A) 55 kmph B) 57 kmph C) 60 kmph
D) 63 kmph E) None of these

21) A boy rides his bicycle 10 km at an average speed of 12 km/hr and again travels 12 km at an average speed of 10 km/hr. His average speed for the entire trip is approximately

- A) 10.4 km/hr B) 10.8 km/hr C) 11 km/hr
D) 12.2 km/hr

22) A train can travel 50% faster than a car. Both start from point A at the same time and reach point B 75 kms away from A at the same time. On the way, however, the train lost about 12.5 minutes while stopping at the stations. The speed of the car is:

- A) 100 kmph B) 110 kmph C) 120 kmph
D) 130 kmph

23) Vikas can cover a distance in 1 hr 24 min by covering $\frac{2}{3}$ rd of the distance at 4 kmph and the rest at 5kmph. The total distance is?

- A) 4 km B) 6 km C) 8 km D) 10 km

24) A person crosses a 600 m long street in 5 minutes. What is his speed in km per hour?

- A) 3.6 B) 7.2 C) 8.4 D) 10

25) A farmer travelled a distance of 61 km in 9 hours. He travelled partly of foot @ 4km/hr and partly on bicycle @ 9 km/hr. The distance travelled on foot is:

- A) 14 km B) 15 km C) 16 km D) 17 km

26) The ratio between the speeds of two trains is 7 : 8. If the second train runs 400 km in 4 hours, then the speed of the first train is:

- A) 70 km/hr B) 75 km/hr C) 84 km/hr
D) 87.5 km/hr

27) A train covers a distance in 50 min, if it runs at a speed of 48kmph on an average. The speed at which the train must run to reduce the time of journey to 40min will be.

- A) 45 kmph B) 60 kmph C) 75 kmph
D) None of these

28) A man can row 4.5 km/hr in still water and he finds that it takes him twice as long to row up as to row down the river. Find the rate of the stream.

- A) 2 km/hr B) 2.5 km/hr C) 1.5 km/hr
D) 1.75 km/hr

29) Two guns were fired from the same place at an interval of 10 minutes and 30 seconds, but a person in the train approaching the place hears the second shot 10 minutes after the first. The speed of the train (in km/hr), supposing that speed travels at 330 metres per second, is:

- A) 19.8 B) 58.6 C) 59.4 D) 111.80

30) An airplane covers a certain distance at a speed of 240 kmph in 5 hours. To cover the same distance in $1\frac{2}{3}$ hours, it must travel at a speed of:

- A) 300 kmph B) 360 kmph C) 600 kmph
D) 720 kmph

31) In a race of 1000 meters, A can beat B by 100 meters, in a race of 800 meters, B can beat C by 100 meters. By how many meters will A beat C in a race of 600 meters?

- A) 125.5 Meters B) 126.5 Meters
C) 127.5 Meters D) 128.5 Meters
E) None Of These

32) A runs $1\frac{2}{3}$ times as fast as B. If A gives B a start of 80 m, how far must the winning post be so that A and B might reach it at the same time?

- A) 200 m B) 300m C) 270m
D) 160m E) None Of These

33) A can give B 100 meters start and C 200 meters start in a kilometre race. How much start can B give C in a kilometre race?

- A) 110.12 Meters B) 111.12 Meters
C) 112.12 Meters D) 113.12 Meters
E) None Of These

34) In a 200 metres race A beats B by 35 m or 7 seconds. A's time over the course is:

- A) 40 Sec B) 47sec C) 33sec
D) 35 Sec E) None Of These

35) In a 500 m race, the ratio of the speeds of two contestants A and B is 3 : 4. A has a start of 140 m. Then, A wins by:

- A) 60 M B) 40 M C) 20 M
D) 10 M E) None Of These

36) In a circular race of 1200m, A and B start from the same point and at the same time with speeds of 27kmph and 45 kmph. Find when will they meet again for the first time on the trace when they are running in the same direction and Opposite direction?

- A) 240, 60 Secs B) 200, 60 Secs

C) 200, 80 Sec

D) None Of These

37) In a circular race of 1200 m length, A and B start with speeds of 18kmph and 27 kmph starting at the same time from the same point. When will they meet for the first time at the starting point when running in the same direction and opposite direction?

- A) 240, 160 Secs B) 480, 480 Secs
C) 240, 240 Secs D) 160, 480 Secs

38) A, B and C run around a circular track of length 1200 m with respective speeds 9, 18, 27 kmph. If they started at the same time from the same point and run in the same direction when will they meet for the first time?

- A) 360 Sec B) 480 Sec C) 240 Sec
D) None Of These

39) P, Q, R run around a circular track 1200 m long with speed of 9, 18, 27 kmph. If they start at the same point and at the same time in the same direction, when will they meet again at the starting point?

- A) 360 Sec B) 480 Sec C) 240 Sec
D) None Of These

40) A can run one full round of a circular track in 6 min and B in 15 min. If both A and B start simultaneously from the same starting point then How many times would they met in the time B has completed 10 rounds when running in same direction, and In opposite direction?

- A) 15, 10 B) 25, 30 C) 25, 35
D) None Of These

Chapter 10 Pipe & Cistern

A pipe is connected to a tank or cistern. It is used to fill or empty the tank; accordingly, it is called an inlet or an outlet.

Inlet: A pipe which is connected to fill a tank is known as an inlet.

Outlet: A pipe which is connected to empty a tank is known as an outlet.

Problems on pipes and cisterns are similar to problems on time and work. In pipes and cistern problems, the amount of work done is the part of the tank of filled or emptied. And, the time taken to do a piece of work is the time take to fill or empty a tank completely or to a desired level.

Pipes and Cisterns Points to remember:

1) If an inlet connected to a tank fills it in X hours, part of the tank filled in one hour is $= 1/X$

2) If an outlet connected to a tank empties it in Y hours, part of the tank emptied in one hour is $= 1/Y$

3) An inlet can fill a tank in X hours and an outlet can empty the same tank in Y hours. If both the pipes are opened at the same time and $Y > X$, the net part of the tank filled in one hour is given by;

$$= (1/X - 1/Y)$$

Therefore, when both the pipes are open the time taken to fill the whole tank is given by;

$$= (XY/Y-X) \text{ Hours}$$

If X is greater than Y , more water is flowing out of the tank than flowing into the tank. And, the net part of the tank emptied in one hour is given by;

$$= (1/Y - 1/X)$$

Therefore, when both the pipes are open the time taken to empty the full tank is given by;

$$= (YX/X-Y) \text{ Hours}$$

4) An inlet can fill a tank in X hours and another inlet can fill the same tank in Y hours. If both the inlets are opened at the same time, the net part of the tank filled in one hour is given by;

$$= (1/X + 1/Y)$$

Therefore, the time taken to fill the whole tank is given by;

$$= (XY/Y+X) \text{ Hours}$$

In a similar way, If an outlet can empty a tank in X hours and another outlet can empty the same tank in Y hours, the part of the tank emptied in one hour when both the pipes start working together is given by;

$$= (1/X + 1/Y)$$

Example 1: A water tank has three taps A, B and C. A fills four buckets in 24 minutes, B fills 8 buckets in 1 hour and C fills 2 buckets in 20 minutes. If all the taps are opened together, a full tank is emptied in 2 hours. If a bucket can hold 5 liters of water, what is the capacity of the tank?

A) 120 Liters B) 240 Liters C) 180 Liters

D) 60 Liters

Solution: A fills 4 buckets in 24 minutes. Thus, A fills 1 bucket in $24/4 = 6$ minutes

Similarly, B fills 8 buckets in 1 hour. Thus B fills 1 bucket in $60/8$ minutes

Similarly, C fills one bucket in $20/2 = 10$ minutes

In 2 hours,

Number of buckets filled by A will be $= 120/6 = 20$ buckets

Number of buckets filled by B will be $= 120/(60/8) = (120 * 8) / 60 = 16$ buckets

Number of buckets filled by C will be $= 120 / 10 = 12$ buckets

Total number of buckets filled $= (20 + 16 + 12) = 48$ buckets

Total amount of water coming out of the tank = capacity of the tank $= 48 * 5$ liters $= 240$ liters

Answer Choice: B

Example 2: There is a leak in the bottom of the tank. This leak can empty a full tank in 8 hours. When the tank is full, a tap is opened into the tank which admit 6 liters per hour and the tank is now emptied in 12 hours. What is the capacity of the tank?

A) 8.8 Liters B) 36 Liters C) 144 Liters

D) Cannot Be Determined

Solution: Since the leak can empty the tank in 8 hours,

In one hour, part of the tank emptied by the leak $= 1/8$

Also, after opening the tap, in one hour, part of the tank emptied $= 1/12$

Let the tap can fill the tank in x hours. Therefore, In one hour, part of the tank filled by the tap $= 1/x$

As per question, $(1/x) - (1/8) = 1/12$

Or $x = 24$

Since the tap admits 6 liters of water per hour, it will admit $(6*24) = 144$ liters of water in 24 hours, which should be the capacity of the tank.

Correct Answer: 24 minutes

Example 3: Three small pumps and one large pump are filling a tank. Each of the three small pump works at $2/3$ of the rate of the large pump. If all four pumps work at the same time, they should fill the tank in what fraction of the time that it would have taken the large pump alone?

A) $4/7$

B) $1/3$

C) $2/3$

D) $3/4$

Solution: As per the question,

Capacity of three small pumps = Capacity of two large pumps

Also, if we want to express the capacity of three small pumps + one large pump in terms of large pump, we should add one large pump on both sides of the above equation

Adding one large pump on both sides of the above equation, we get

Three small pumps + one large pump = Three large pumps.

Thus, if all the four pumps are open together, they would fill the tank in $1/3$ rd of the time large pump would have taken alone.

Answer Choice B

Example 4: A tank is fitted with 8 pipes, some of which that fill the tank and others that empty the tank. Each of the pipes that

fills the tank fills it in 8 hours, while each of those that empty the tank empties it in 6 hours. If all the pipes are kept open when the tank is full, it will take 6 hours to drain the tank. How many of these are fill pipes?

- A) 2 Fill Pipes B) 4 Fill Pipes
C) 6 Fill Pipes D) 5 Fill Pipes

Solution: Let the number of fill pipes be 'n'

Therefore, there will be $(8 - n)$ waste pipes.

Each of the fill pipes can fill the tank in 8 hours.

Therefore, each of the fill pipes will fill $1/8$ th of the tank in an hour.

Hence, n fill pipes will fill $n/8$ th of the tank in an hour.

Similarly, each of the waste pipes will drain the full tank in 6 hours.

\therefore each of the waste pipes will drain $1/6$ th of the tank in an hour.

$(8 - n)$ waste pipes will drain $(8 - n)/6$ th of the tank in an hour.

Between the fill pipes and the waste pipes, they drain the tank in 6 hours.

That is, when all 8 of them are opened, $1/6$ th of the tank gets drained in an hour.

(Amount of water filled by fill pipes in 1 hour – Amount of water drained by waste pipes 1 hour) = $(1/6^{\text{th}})$ of the tank

Therefore,

$$(n/8) - ((8 - n)/6) = -1/6$$

Note: The right hand side has a negative sign because the tank gets drained.

Cross multiplying and solving the equations, $14n - 64 = -8$

or $14n = 56$ or $n = 4$

The correct answer is Choice (B).

Example 5: Pipe A usually fills a tank in 2 hours. On account of a leak at the bottom of the tank, it takes pipe A 30 more minutes to fill the tank. How long will the leak take to empty a full tank if pipe A is shut?

- A) 2 Hours 30 Minutes B) 5 Hours
C) 4 Hours D) 10 Hours

Pipe A fills the tank normally in 2 hours.

Therefore, it will fill $1/2$ of the tank in an hour.

Let the leak take x hours to empty a full tank when pipe A is shut.

Therefore, the leak will empty $1/x$ of the tank in an hour.

The net amount of water that gets filled in the tank in an hour when pipe A is open and when there is a leak = $(1/2 - 1/x)$ of the tank. — (1)

Now, when there is a leak, the problem states that it takes two and a half hours to fill the tank. i.e. $5/2$ hours.

Therefore, in an hour, $2/5$ th of the tank gets filled. — (2)

Equating (1) and (2), we get $1/2 - 1/x = 2/5$

$$\Rightarrow 1/x = 1/2 - 2/5 = 1/10$$

$$\Rightarrow x = 10 \text{ hours.}$$

The correct answer is Choice (D).

Practice Set 1:

1. Two taps A and B can fill a tank in 5 hours and 20 hours respectively. If both the taps are open then due to a leakage, it

took 30 minutes more to fill the tank. If the tank is full, how long will it take for the leakage alone to empty the tank?

- A) $4\frac{1}{2}$ hrs B) 9 hrs C) 18 hrs D) 36 hrs

2) Bucket P has thrice the capacity as bucket Q. It takes 60 turns for bucket P to fill the empty drum. How many turns it will take for both the buckets P and Q, having each turn together to fill the empty drum?

- A) 30 B) 40 C) 45 D) 90

3) A booster pump can be used for filling as well as for emptying a tank. The capacity of the tank is 2400 m^3 . The emptying of the tank is 10 m^3 per minute higher than its filling capacity and the pump needs 8 minutes lesser to empty the tank than it needs to fill it. What is the filling capacity of the pump?

- A) $50 \text{ m}^3/\text{min}$ B) $60 \text{ m}^3/\text{min}$ C) $72 \text{ m}^3/\text{min}$
D) None of these

4) Two pipes A and B can separately fill a cistern in 60 minutes and 75 minutes respectively. There is a third pipe in the bottom of the cistern to empty it. If all the three pipes are simultaneously opened, then the cistern is full in 50 minutes. In how much time, the third pipe alone can empty the cistern?

- A) 90 min B) 100 min C) 110 min
D) 120 min

5) Three taps A, B and C can fill a tank in 12, 15 and 20 hours respectively. If A is open all the time B and C are open for one hour each alternately, the tank will be full in:

- A) 6 hrs B) $6\frac{2}{3}$ hrs C) 7 hrs D) $7\frac{1}{2}$ hrs

6) Pipe A can fill a tank in 5 hours, pipe B in 10 hours and pipe C in 30 hours. If all the pipes are open in how many hours will the tank be filled?

- A) 2 B) 2.5 C) 3 D) 3.5

7) Two pipes can fill a tank in 10 hours and 12 hours respectively while a third pipe empties the full tank in 20 hours. If all the three pipes operate simultaneously, in how much time will the tank be filled?

- A) 7 hrs 30 min B) 7 hrs 45 min
C) 8 hrs 30 min D) 8 hrs 45 min

8) A leak in the bottom of a tank can empty the full tank in 8 hours. An inlet pipe fills water at the rate of 6 litres a minute. When the tank is full, the inlet is opened and due to the leak, the tank is empty in 12 hours. How many litres does the cistern hold?

- A) 7580 B) 7960 C) 8290 D) 8640

9) 12 buckets of water fill a tank when the capacity of each tank is 13.5 litres. How many buckets will be needed to fill the same tank, if the capacity of each bucket is 9 litres?

- A) 8 B) 15 C) 16 D) 18

10) A cistern can be filled by a tap in 4 hours while it can be emptied by another tap in 9 hours. If both the taps are opened simultaneously, then after how much time will the cistern get filled?

- A) 4.5 hrs B) 5 hrs C) 6.5 hrs D) 7.2 hrs

11) One pipe can fill a tank three times as fast as another pipe. If together the two pipes can fill the tank in 86 minutes, then the slower pipe alone will be able to fill the tank in
A) 81 min B) 108 min C) 144 min
D) 192 min

12) Two pipes A and B can fill a tank in 6 hours and 4 hours respectively. If they are opened on alternate hours and if pipe A is opened first, in how many hours, the tank shall be full ?
A) 4 hrs B) 5 hrs C) 7 hrs D) 9 hrs

13) Three pipes A, B and C can fill a tank from empty to full in 30 minutes, 20 minutes, and 10 minutes respectively. When the tank is empty, all the three pipes are opened. A, B and C discharge chemical solutions P, Q and R respectively. What is

the proportion of the solution R in the liquid in the tank after 3 minutes?

A) $\frac{5}{11}$ B) $\frac{6}{11}$ C) $\frac{7}{11}$ D) $\frac{8}{11}$

14) Pipes A and B can fill a tank in 5 and 6 hours respectively. Pipe C can empty it in 12 hours. If all the three pipes are opened together, then the tank will be filled in:

A) $1\frac{13}{17}$ hours B) $2\frac{8}{11}$ hours C) $3\frac{9}{17}$ hours D) $4\frac{1}{2}$ hours

15) A pump can fill a tank with water in 2 hours. Because of a leak, it took $2\frac{1}{3}$ hours to fill the tank. The leak can drain all the water of the tank in:

A) $4\frac{1}{3}$ hours B) 7 hours C) 8 hours
D) 14 hours

Chapter 11 - Mensuration

Mensuration is the evaluation or calculation using suitable formulae without actual measurements of the geometrical concepts such as:












length (of a straight line or any of the curve)

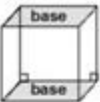
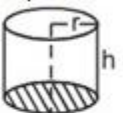




area (of the plane figure or bounded by curves)

Volume of a solid

Surface of a solid

Some basic Mensuration Formulas:

Shape	Perimeter	Area	Total Surface area	Volume	Lateral surface area	Nomenclature
Rectangle 	$2(l+b)$	lb	-	-	-	l-length; b-breadth
Square 	$4a$	a^2	-	-	-	a- side
Triangle 	$x+y+z$	$\frac{1}{2}bh$	-	-	-	x, y, z- sides, b-base; h-height.
Parallelogram 	$2(a+b)$	ah	-	-	-	a, b- sides; h-height
Rhombus 	$4a$	$\frac{1}{2}d_1d_2$	-	-	-	a-side; d-diagonals
Quadrilateral 	Sum of all sides	$\sqrt{(s-a)(s-b)(s-c)(s-d)}$	-	-	-	A, b, c, d- length of sides; $s = \frac{a+b+c+d}{2}$
Trapezium 	Sum of all sides	$\frac{1}{2}h(a+b)$	-	-	-	a, b- parallel sides; h-height
Circle 	$2\pi r$	πr^2	-	-	-	r-radius; $\pi = \frac{22}{7}$
Semi circle 	$\pi r + 2r$	$\frac{1}{2}\pi r^2$	-	-	-	r-radius; $\pi = \frac{22}{7}$
Cuboids 	-	-	$2(lb+bh+hl)$	lbh	$2h(l+b)$	l-length; b-breadth; h-height
Cube 	-	-	$6a^2$	a^3	$4a^2$	Side

Right prism 	-	-	LSA + (2×Area of base)	Area of base ×height	Perimeter of base × height	LSA- Lateral Surface Area
Cylinder 	-	-	$2\pi r(r + h)$	$\pi r^2 h$	$2\pi r h$	r- radius of the circle top or below; h- height of cylinder; $\pi = \frac{22}{7}$
Right Pyramid 	-	-	Area of base +LSA	$\frac{1}{3}$ (Area of base) × height	$\frac{1}{2}$ ×Perimeter of base × Slant height	LSA- Lateral Surface Area
Right Circular Cone 	-	-	$\pi r(l + r)$	$\frac{1}{3} \pi r^2 h$	$\pi r l$	l- slant height; r-radius; h- height
Sphere 	-	-	$4\pi r^2$	$\frac{4}{3} \pi r^3$	-	r- radius; $\pi = \frac{22}{7}$
Hemisphere 	-	-	$3\pi r^2$	$\frac{2}{3} \pi r^3$	$2\pi r^2$	r- radius; $\pi = \frac{22}{7}$

Practice Set 1:

1) The length and the breadth of a rectangular door are increased by 1 m each and due to this the area of the door increased by 21 sq. m. But if the length is increased by 1 m and breadth decreased by 1 m, area is decreased by 5 sq. m. Find the perimeter of the door.

- A) 25 M B) 20 M C) 40 M
D) 60 M E) 24 M

2) The perimeter of a rectangular plot is 340 m. Find the cost of gardening 1 m broad boundary around it at the rate of Rs 10 per sq. m.

- A) Rs 3450 B) Rs 3400 C) Rs 3400
D) Rs 3480 E) Rs 3440

3) The sides of a triangle are in the ratio 3 : 4 : 5 whose area is 216 sq. cm. What will be the perimeter of this triangle?

- A) 58 Cm B) 64 Cm C) 28 Cm
D) 36 Cm E) 72 Cm

4) If the base of a triangle is increased by 50% and its height is decreased by 50%, then what will be the effect on its area?

- A) 50% Decrease B) 75% Increase
C) No Effect D) 25% Decrease
E) 25% Increase

5) A rectangle whose sides are in the ratio 6 : 5 is formed by bending a circular wire of radius 42 cm. Find the largest side of the rectangle.

- A) 60 Cm B) 72 Cm C) 66 Cm
D) 78 Cm E) 84 Cm

6) A rectangular sheet of 0.5 cm thickness is made from an iron cube of side 10 cm by hammering it down. The sides of the sheet are in the ratio 1 : 5. Find the largest side of the sheet.

- A) 100 Cm B) 72 Cm C) 20 Cm
D) 70 Cm E) 88 Cm

7) The area of the inner part of a cylinder is 616 sq. cms and its radius is half its height. Find the inner volume of the cylinder.

- A) 1577.5 Cm³ B) 1768.2 Cm³ C) 1538.5 Cm³
D) 1435.8 Cm³ E) 1238.5 Cm³

8) A cylinder and a cone have equal base and equal height. The ratio of the radius of base to height is 5 : 12. Find the ratio of the total surface area of the cylinder to that of the cone.

- A) 7:15 B) 16:9 C) 17:9
D) 9:17 E) 15:7

9) A cone of radius 12 cm and height 5 cm is mounted on a cylinder of radius 12 cm and height 19 cm. Find the total surface area of the figure thus formed.

- A) 2498 Cm² B) 2400 Cm² C) 2476 Cm²
D) 2376 Cm² E) 2546 Cm²

10) How many spherical balls whose radius is half that of cylinder can be formed by melting a cylindrical iron rod whose height is eight times its radius?

- A) 44 B) 48 C) 60 D) 56
E) Cannot Be Determined

11) The radius of a wheel of car is 70 cm. How many revolutions per minute the wheel will make in order to keep a speed of 66 km/hr?

- A) 234 B) 272 C) 225 D) 300
E) 250

12) The length and breadth of a rectangle are in the ratio 3 : 2. If the length is increased by 5 m keeping the breadth same, the new area of rectangle is 2600 m². What is the breadth of the rectangle?

- A) 30 M B) 20 M C) 32 M
D) Cannot Be Determined E) None Of These

13) What will be the percentage increase in the surface area of the cube whose side is increased by 50%

- A) 75% B) 125% C) 150%
D) 100% E) 92%

14) The radius of base and height of a cylinder are in the ratio 2 : 3. Find the total surface area of the cylinder if its volume is 12936 cm³.

- A) 3080 Cm² B) 2680 Cm² C) 4940 Cm²
D) 3280 Cm² E) None Of These

15) A rectangular box has dimensions 1.6 m × 1 m × 0.6 m. How many cubical boxes each of side 20 cm can be fit inside the rectangular box?

- A) 220 B) 205 C) 120 D) 165
E) 124

16) If the volume of wire remains the same but its radius decreases to 1/3rd of previous, then the new length of the wire will be how many times of the previous length?

- A) 3 Times B) 4 Times C) 6 Times
D) 10 Times E) 9 Times

17) Four circular cardboard pieces, each of diameter 28 cm are placed in such a way that each piece touches two other pieces. Find the area of the space enclosed by the four pieces.

- A) 195 Cm² B) 134 Cm² C) 168 Cm²
D) 162 Cm² E) None Of These

18) Perimeter of a square and an equilateral triangle is equal. If the diagonal of the square is $10\sqrt{2}$ cm, then find the area of equilateral triangle?

- A) $(400\sqrt{3})/9$ B) $(400\sqrt{3})/7$ C) $(200\sqrt{3})/7$
D) $(200\sqrt{3})/9$ E) None Of These

19) Length of a rectangular field is increased by 10 meters and breadth is decreased by 4 meters, area of the field remains unchanged. If the length decreased by 5 meters and breadth is increased by 7 meters, again the area remains unchanged. Find the length and breadth of the rectangular field.

- A) 12, 11 B) 13, 12 C) 13, 11
D) 14, 12 E) 13, 15

20) If the length of the rectangle is increased by 20%, by what percent should the width be reduced to maintain the same area?

- A) 13.37 B) 16.67 C) 21.33
D) 33.33 E) None Of These

21) A cone of radius 12 cm and height 5 cm is mounted on a cylinder of radius 12 cm and height 19 cm. Find the total surface area of the figure thus formed?

- A) 2276 B) 2376 C) 2476 D) 2576

22) The sum of the radius and height of a cylinder is 19m. The total surface area of the cylinder is 1672 m^2 , what is the volume of the cylinder?(in m^3)

- A) 3080 B) 2940 C) 3220 D) 2660
E) 2800

23) If the area of a square is equal to the area of that rectangle whose width is double of the one side of the square then the ratio of the length to the breadth of the rectangle will be?

- A) 1 : 2 B) 1 : 4 C) 1 : 6 D) 1 : 8
E) None Of The Above

24) What is the volume of a right cone whose cross section is isosceles triangle with a base 10cm and slant height 13cm ?

- A) 312.4 Sq Cm B) 314.2 Sq Cm
C) 224.2 Sq Cm D) 354.2 Sq Cm
E) None Of These

25) In a swimming pool measuring 80 cm x 30 cm, 120 men take a dip. If the average displacement of water by a man is 5 cm cube, What will be the rise in water level ?

- A) $1/5 \text{ Cm}$ B) $1/3 \text{ Cm}$ C) $1/2 \text{ Cm}$
D) $1/4 \text{ Cm}$ E) None Of These

26) If the radius of the cone is doubled, keeping the height constant, what is the ratio of the volume of the smaller cone to larger cone?

- A) 2:9 B) 5:7 C) 1:4 D) 1:7
E) None Of These

27) After measuring 100m of a rope, it was discovered that the metre rod was 2cm longer. The true length of the rod is

- A) 95m B) 98m C) 96m D) 93m

28) The number of rounds that a wheel of diameter 14m will make in going 2 km is

- A) 62 Rounds B) 50 Rounds C) 45 Rounds
D) 56 Rounds E) None Of These

29) Meena wishes to start a 78 sq m triangular flower garden. Since she has only 20m barbed wire, she fences three sides of the garden letting her house compound wall act as the fourth side fencing. The dimension of the garden is

- A) $12 \text{ m} \times 3 \text{ m}$ B) $26 \text{ m} \times 13 \text{ m}$ C) $16 \text{ m} \times 13 \text{ m}$
D) $20 \text{ m} \times 11 \text{ m}$ E) None Of These

30) The perimeter of a rhombus is 300cm. If one of its diagonals is 16cm then the area of the rhombus is

- A) 1129 Sq Cm B) 1092 Sq Cm
C) 1022 Sq Cm D) 1192 Sq Cm

Chapter 12 - Permutation and Combination

Factorial

Before going deep into Permutation & Combination, let us figure out a term known as 'factorial'. The product of the numbers starting from 1 up to a number 'n' is known as factorial of number 'n'.

It means $n! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 \dots \dots \dots x(n-2) \times (n-1) \times n$
 $1! = 1$

$$2! = 1 \times 2 = 2$$

$$3! = 1 \times 2 \times 3 = 6$$

$$4! = 1 \times 2 \times 3 \times 4 = 24$$

$$5! = 1 \times 2 \times 3 \times 4 \times 5 = 120$$

Key points related to Factorial:

$0!$ & $1!$ are equal to 1.

We can't find factorial of a negative number.

Application of factorial:

Suppose we have 5 persons and we want to arrange them on 5 vacant places. Then we will start with the first place. We can choose 1 person out of 5 for the first place. We can do that in 5 ways.

Now only 4 seats are vacant and 4 persons are left. We will choose 1 person out of 4 for the second place now. We can do that in 4 ways.

In the same manner, for the third place, 3 ways, for the fourth place, 2 ways and for the last vacant place only 1 way of selection is possible. As we know that we have to do all of these activities, so we will multiply all these ways to get the final answer for getting the different ways of arrangement.

So total ways = $5 \times 4 \times 3 \times 2 \times 1$ which is $5! = 120$.

Or we can say that whenever we have to arrange 'n' things at 'n' places then total arrangements that can be made will always be equal to $n!$

Q.1) In how many ways can the letters of the word PATNA be rearranged?

Solution: PATNA has total 5 words. So we will arrange 5 letters at 5 places in $5! = 120$ ways.

But in this question, A is coming twice. Whenever any letter is more than once in the word, then we have to divide by the number of repetition of the word. So we have to divide the total 120 ways by $2! = 2$.

So total different words that can be made will be $120/2 = 60$.

Direct answer: $5!/2! = 60$.

Q.2) How many different words can be made using letters of PATNA starting with P?

Solution: PATNA has total 5 words. According to the question, P is fixed at 1st place, so we will arrange remaining 4 letters at 4 places in $4! = 24$ ways. But in this question, A is coming twice, so we have to divide the total 24 ways by $2! = 2$. So the different words starting from P will be $24/2 = 12$.

Direct answer: $4!/2! = 4 \times 3 = 12$

Whenever we have to choose certain things from a group and no arrangement is done. In that case combination comes into picture. So let us see concept of combination.

Combination

In combination, we select the things at random & check out the different possible ways of selection. So this is a one step process. Combination is also known as collection. The formula used for combination is nC_r .

$${}^nC_r = n! / [r! \times (n-r)!]$$

$${}^nC_r = [n \times (n-1) \times (n-2) \times (n-3) \times \dots \times (n-r+1) \times (n-r) \times \dots \times 1] / [1 \times 2 \times 3 \times \dots \times r] \times [(n-r) \times \dots \times 3 \times 2 \times 1]$$

$${}^nC_r = [n \times (n-1) \times (n-2) \times (n-3) \times \dots \times (n-r+1)] / [1 \times 2 \times 3 \times \dots \times r]$$

$$\text{For example: } {}^{12}C_2 = 12! / [2! \times (12-2)!] = 12! / (2! \times 10!) = [12 \times 11] / [1 \times 2] = 66$$

$${}^5C_2 = [5 \times 4] / [1 \times 2] = 10$$

$${}^nC_r = {}^nC_{(n-r)}$$

$$\text{For example: } {}^5C_3 = [5 \times 4 \times 3] / [1 \times 2 \times 3] = [5 \times 4] / [1 \times 2] = {}^5C_2 = 10$$

$${}^{10}C_7 = {}^{10}C_3 = [10 \times 9 \times 8] / [1 \times 2 \times 3] = 120.$$

Q.3) In a class there are 4 boys and 5 girls. In how many different ways a class monitor can be chosen?

Solution: As we can clearly see that we have to choose a student from total 9. So

we will use combination concept here which will give us the answer as ${}^9C_1 = 9/1 = 9$.

Q.4) In a class there are 4 boys and 5 girls. In how many different ways a boy and a girl can be selected for group leader of two groups?

Solutions: We have to choose a boy from 4 boys and a girl from 5 girls for two groups.

So total ways of selection = $4C1 \times 5C1 = 4 \times 5 = 20$

Q.5) In how many different ways a cricket team can be selected from total 16 players?

Solution: We need to select 11 players from total 16 players.

So the answer will be ${}^{16}C_{11} = 16! / 5! \times (16-5)! = 16! / 5! \times 11! = \{16 \times 15 \times 14 \times 13 \times 12\} / \{1 \times 2 \times 3 \times 4 \times 5\} = 4368$

Q.6) An urn contains 5 red and 3 blue balls. In how many different ways, 2 red and 1 blue balls can be drawn?

Solution: The urn contains 5 red and we want 2 red balls. So ways of selecting red balls = ${}^5C_2 = 10$

Similarly ways of selecting 1 blue ball from 3 blue balls = ${}^3C_1 = 3$

So total ways to select 2 red and 1 blue ball will be = $10 \times 3 = 30$

Q.7) In how many different ways a team of 11 can be selected from 15 players if 2 particular players are never selected?

Solution: It is given that 2 particular players are never selected. So we will do selection from rest of the players which means we will select 11 players out of 13 players.

So total ways of selection = $\{15-2\}C_{11} = {}^{13}C_{11} = {}^{13}C_2 = \{13 \times 12\} / \{1 \times 2\} = 78$

Q.8) In how many different ways a team of 11 can be selected from 15 players if 2 particular players are always selected?
Solution: It is given that we have to select two particular players always which means that we have choice of selection only for remaining 9 players and the possible options are only 13.

So total possible ways of selection = $(15-2)C(11-2) = {}^{13}C_9 = {}^{13}C_4 = (13 \times 12 \times 11 \times 10) / (1 \times 2 \times 3 \times 4) = 715$.

Whenever we have to choose certain things from a group and arrangement of those chosen things is to be done. In that case permutation comes into picture. So let us see concept of permutation.

Permutation

In permutation, we select the things and then arrange them to check out different possible ways of arrangement. So basically permutation is a two-step process. The formula used for permutation is $nPr = n! / (n-r)!$

Suppose we have 5 persons and we have to arrange them on 3 vacant places. Then first of all, we will choose 3 persons from 5. We can do that in 5C_3 different ways. After choosing 3 persons, we will have to arrange them on the 3 vacant places, for that we will use factorial concept. The total ways to arrange 3 persons on 3 places are $3!$

So total ways to arrange 3 persons from total 5 on 3 vacant places will be:

$${}^5C_3 \times 3! = {}^5C_2 \times 3! = 5! / (2! \times 3!) \times 3! = 5! / 2! = 60 \text{ ways.}$$

Q.9) A wicket-keeper and a bowler are to be chosen out of a team having 11 players. In how many different ways we can do this?

Solution: First of all, we will select 2 players from total 11 players. The ways of selection are ${}^{11}C_2 = (11 \times 10) / (1 \times 2) = 55$. After doing selection, we can arrange 2 players on 2 different positions in $2! = 2$ ways. So total ways of selecting a wicket-keeper and a bowler = ${}^{11}C_2 \times 2! = 55 \times 2 = 110$

Direct answer: ${}^{11}P_2 = 110$

Q.10) In how many ways can the letters of the word EQUATION be arranged so that all the vowels come together?

Solution: In word EQUATION, we have 5 vowels (E, U, A, I, O) and 3 consonants (Q, T, N). According to the question, all five vowels to take one place and other 3 consonants will be arranged on 3 places, So total 4 places.

So ways to arrange these on 4 places will be $4! = 24$

One important thing is that we can arrange the vowels order as well and we can do that in $5! = 120$ ways.

So total ways = $24 \times 120 = 2880$

Direct answer: $4! \times 5! = 24 \times 120 = 2880$

Q.11) There are 7 candidates for 4 different posts. In how many ways we can fill the posts?

Solution: First of all, we will select 4 candidates out of total 7 candidates. The ways of selection are,

$${}^7C_4 = {}^7C_3 = (7 \times 6 \times 5) / (1 \times 2 \times 3) = 35$$

After doing selection, we can arrange 4 candidates for 4 different posts in $4!$ ways

= 24 ways.

So total possible number of ways to fill the posts = $35 \times 24 = 840$

Direct answer: ${}^7P_4 = (7 \times 6 \times 5 \times 4) = 840$

Q.12) Twenty students are participating in a race. In how many ways can the first three prizes be won?

Solution: First of all, we will select 3 candidates from total 20 candidates. The ways of selection are,

$${}^{20}C_3 = (20 \times 19 \times 18) / (1 \times 2 \times 3) = 1140$$

After doing selection, we can arrange 3 candidates on 3 positions in $3! = 6$ ways. So total possible number of ways in which the first three prizes can be won = $1140 \times 6 = 6840$.

Direct answer = ${}^{20}P_3 = (20 \times 19 \times 18) = 6840$ ways.

Key points related to Permutation & Combination:

Whenever we want to arrange n things at n places, we have total $n!$ ways of arrangement.

Whenever we have to select r things out of n , we have total nC_r ways of selection.

Whenever we have to select r things from n and then arrange those r things at r places, we have total nPr ways.

$${}^nC_r = n! / [r! \times (n-r)!]$$

$${}^nC_r = {}^nC_{(n-r)}$$

$$nPr = n! / (n-r)!$$

Practice Set 1:

1) How many arrangement can be made from the word COMMERCE, such that all the vowels do not come together?

- A) 6800 B) 5600 C) 1080
D) 3600 E) None of these

2) 12 students participated in the competition and each get different score. In how many ways can three different prizes given?

- A) 1320 B) 1240 C) 1650
D) 1870 E) None of these

3) How many four digit number can be formed with the digits 5, 9, 1 and 3 only?

- A) 64 B) 216 C) 256
D) 324 E) None of these

4) In a exam paper 1st section contains 10 questions each with 5 choices and second section contains 5 questions each with 4 choices. In how many different ways can the paper be answered if all the questions are attempted?

- A) $10^5 \times 4^5$ B) $5^{10} \times 4^5$ C) $5^{10} \times 5^4$
D) $10^5 \times 5^4$ E) None of these

5) Three brothers have 5 shirts, 8 pants and 6 ties. In how many ways can they wear them?

- A) 2400200 B) 2419000 C) 2419200
D) 2419100 E) None of these

6) 5 men and 3 women are to be seated such that no 2 women sit together. Find the number of ways in which this can be arranged?

- A) 10000 B) 10800 C) 12525
D) 12144 E) None of these

7) A group consists of 3 couples in which each of the 3 men have one wife each. In how many ways could they be arranged in a straight line so that the men and women occupy alternate position?

- A) 216 B) 125 C) 256
D) 72 E) None of these

8) In how many ways can 5 different balls be distributed to 4 different boxes, when each of the can hold any number of balls?

- A) 1024 B) 1200 C) 1234 D) 1600
E) None of these

9) In how many ways the letters of the word 'AUTHOR' be arranged taking all the letters?

- A) 120 B) 720 C) 360 D) 60
E) None of these

10) How many words of 4 letters with or without meaning be made from the letters of the word 'LEADING', when repetition of letters is allowed?

- A) 4808 B) 57600 C) 2401 D) 57624
E) None of these

11) In how many ways letters of word 'INVISIBLE' be arranged such that all vowels are together?

- A) 2560 B) 2880 C) 5040 D) 2520
E) 720

12) In how many ways a group of 2 men and 4 women be made out of a total of 4 men and 7 women?

- A) 720 B) 210 C) 420 D) 360
E) 120

13) There are 8 men and 7 women. In how many ways a group of 5 people can be made such that at least 3 men are there in the group?

- A) 1545 B) 1626 C) 1722 D) 1768
E) 1844

14) There are 6 men and 7 women. In how many ways a committee of 4 members can be made such that a particular woman is always included.

- A) 180 B) 120 C) 240 D) 220
E) 260

15) There are 5 men and 3 women. In how many ways a committee of 3 members can be made such that 2 particular men are always to be excluded.

- A) 50 B) 20 C) 24 D) 48
E) None of these

16) A bag contains 4 red balls and 5 black balls. In how many ways can I make a selection so as to take at least 1 red ball and 1 black ball?

- A) 564 B) 345 C) 465
D) 240 E) None of these

17) In how many ways can 7 beads be strung into necklace?

- A) 2520 B) 5040 C) 720 D) 360
E) None of these

18) In how many ways can 7 girls and 4 boys stand in a row so that no 2 boys are together?

- A) 8467200 B) 9062700 C) 7407000
D) 8407200 E) None of these

19) In how many ways the letters of the word PERMUTATION be arranged?

- A) $10!/2!$ B) $10!$ C) $11!$ D) $11!/2!$
E) None of these

20) In how many ways all the letters of the word 'MINIMUM' be arranged such that all vowels are together?

- A) 60 B) 30 C) 90 D) 70 E) 120

21) How many 3 digit numbers are divisible by 4?

- A) 256 B) 225 C) 198 D) 252
E) 120

22) How many 3 digits numbers have exactly one digit 2 in the number?

- A) 225 B) 240 C) 120 D) 160
E) 185

23) In how many ways 5 African and five Indian can be seated along a circular table, so that they occupy alternate position.

- A) $5! 5!$ B) $4! 5!$ C) $5! 4!$ D) $4! 4!$

24) There are 15 points in a plane out of which 6 are collinear. Find the number of lines that can be formed from 15 points.

- A) 105 B) 90 C) 91 D) 95
E) None Of These

25) In party there is a total of 120 handshakes. If all the persons shake hand with every other person. Then find the number of person present in the party.

- A) 15 B) 16 C) 17 D) 18
E) None Of These

Chapter 13 - Probability

Meaning and definition of Probability

As the Oxford dictionary states it, Probability means 'The extent to which something is probable; the likelihood of something happening or being the case'.

In mathematics too, probability indicates the same – the likelihood of the occurrence of an event.

Examples of events can be :

- Tossing a coin with the head up
- Drawing a red pen from a pack of different colored pens
- Drawing a card from a deck of 52 cards etc.

Either an event will occur for sure, or not occur at all. Or there are possibilities to different degrees the event may occur.

An event that occurs for sure is called a Certain event and its probability is 1.

An event that doesn't occur at all is called an impossible event and its probability is 0.

This means that all other possibilities of an event occurrence lie between 0 and 1.

This is depicted as follows:

$$0 \leq P(A) \leq 1$$

where A is an event and P(A) is the probability of the occurrence of the event.

This also means that a probability value can never be negative. Every event will have a set of possible outcomes. It is called the 'sample space'.

Consider the example of tossing a coin.

When a coin is tossed, the possible outcomes are Head and Tail. So, the sample space is represented as {H, T}.

Similarly when two coins are tossed, the sample space is {(H,H), (H,T), (T,H), (T,T)}.

The probability of head each time you toss the coin is 1/2. So is the probability of tail.

Basic formula of probability

The Probability of the occurrence of an event A is defined as:

$$P(A) = (\text{No. of ways A can occur}) / (\text{Total no. of possible outcomes})$$

Another example is the rolling of dice. When a single die is rolled, the sample space is {1,2,3,4,5,6}.

What is the probability of rolling a 5 when a die is rolled?

No. of ways it can occur = 1

Total no. of possible outcomes = 6

So the probability of rolling a particular number when a die is rolled = 1/6.

Compound probability

Compound probability is when the problem statement asks for the likelihood of the occurrence of more than one outcome.

Formula for compound probability

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

where A and B are any two events.

P(A or B) is the probability of the occurrence of atleast one of the events.

P(A and B) is the probability of the occurrence of both A and B at the same time.

Mutually exclusive events:

Mutually exclusive events are those where the occurrence of one indicates the non-occurrence of the other

OR

When two events cannot occur at the same time, they are considered mutually exclusive.

Note: For a mutually exclusive event, $P(A \text{ and } B) = 0$.

Example 1: What is the probability of getting a 2 or a 5 when a die is rolled?

Solution:

Taking the individual probabilities of each number, getting a 2 is 1/6 and so is getting a 5.

Applying the formula of compound probability,

Probability of getting a 2 or a 5,

$$P(2 \text{ or } 5) = P(2) + P(5) - P(2 \text{ and } 5)$$

$$\Rightarrow 1/6 + 1/6 - 0$$

$$\Rightarrow 2/6 = 1/3.$$

Example 2: Consider the example of finding the probability of selecting a black card or a 6 from a deck of 52 cards.

Solution:

We need to find out P(B or 6)

Probability of selecting a black card = 26/52

Probability of selecting a 6 = 4/52

Probability of selecting both a black card and a 6 = 2/52

$$P(B \text{ or } 6) = P(B) + P(6) - P(B \text{ and } 6)$$

$$= 26/52 + 4/52 - 2/52$$

$$= 28/52$$

$$= 7/13.$$

Independent and Dependent Events

Independent Event

When multiple events occur, if the outcome of one event DOES NOT affect the outcome of the other events, they are called independent events.

Say, a die is rolled twice. The outcome of the first roll doesn't affect the second outcome. These two are independent events.

Example 1: Say, a coin is tossed twice. What is the probability of getting two consecutive tails ?

Probability of getting a tail in one toss = 1/2

The coin is tossed twice. So $1/2 * 1/2 = 1/4$ is the answer.

Here's the verification of the above answer with the help of sample space.

When a coin is tossed twice, the sample space is {(H,H), (H,T), (T,H), (T,T)}.

Our desired event is (T,T) whose occurrence is only once out of four possible outcomes and hence, our answer is 1/4.

Example 2: Consider another example where a pack contains 4 blue, 2 red and 3 black pens. If a pen is drawn at random from the pack, replaced and the process repeated 2 more times, What is the probability of drawing 2 blue pens and 1 black pen?

Solution

Here, total number of pens = 9

Probability of drawing 1 blue pen = $4/9$

Probability of drawing another blue pen = $4/9$

Probability of drawing 1 black pen = $3/9$

Probability of drawing 2 blue pens and 1 black pen = $4/9 * 4/9 * 3/9 = 48/729 = 16/243$

Dependent Events

When two events occur, if the outcome of one event affects the outcome of the other, they are called dependent events.

Consider the aforementioned example of drawing a pen from a pack, with a slight difference.

Example 1: A pack contains 4 blue, 2 red and 3 black pens. If 2 pens are drawn at random from the pack, NOT replaced and then another pen is drawn. What is the probability of drawing 2 blue pens and 1 black pen?

Solution:

Probability of drawing 1 blue pen = $4/9$

Probability of drawing another blue pen = $3/8$

Probability of drawing 1 black pen = $3/7$

Probability of drawing 2 blue pens and 1 black pen = $4/9 * 3/8 * 3/7 = 1/14$

Let's consider another example:

Example 2: What is the probability of drawing a king and a queen consecutively from a deck of 52 cards, without replacement.

Probability of drawing a king = $4/52 = 1/13$

After drawing one card, the number of cards are 51.

Probability of drawing a queen = $4/51$.

Now, the probability of drawing a king and queen consecutively is $1/13 * 4/51 = 4/663$

Conditional probability

Conditional probability is calculating the probability of an event given that another event has already occurred.

The formula for conditional probability $P(A/B)$, read as P(A given B) is

$$P(A/B) = P(A \text{ and } B) / P(B)$$

Consider the following example:

Example: In a class, 40% of the students study math and science. 60% of the students study math. What is the probability of a student studying science given he/she is already studying math?

Solution

$$P(M \text{ and } S) = 0.40$$

$$P(M) = 0.60$$

$$P(S|M) = P(M \text{ and } S) / P(M) = 0.40 / 0.60 = 2/3 = 0.67$$

Complement of an event

A complement of an event A can be stated as that which does NOT contain the occurrence of A.

A complement of an event is denoted as $P(A^c)$ or $P(A')$.

$$P(A^c) = 1 - P(A)$$

or it can be stated, $P(A) + P(A^c) = 1$

For example,

if A is the event of getting a head in coin toss, A^c is not getting a head i.e., getting a tail.

if A is the event of getting an even number in a die roll, A^c is the event of NOT getting an even number i.e., getting an odd number.

if A is the event of randomly choosing a number in the range of -3 to 3, A^c is the event of choosing every number that is NOT negative i.e., 0, 1, 2 & 3 (0 is neither positive or negative).

Consider the following example:

Example: A single coin is tossed 5 times. What is the probability of getting at least one head?

Solution:

Consider solving this using complement.

Probability of getting no head = $P(\text{all tails}) = 1/32$

$P(\text{at least one head}) = 1 - P(\text{all tails}) = 1 - 1/32 = 31/32$.

Sample Probability questions with solutions

Probability Example 1

What is the probability of the occurrence of a number that is odd or less than 5 when a fair die is rolled.

Solution

Let the event of the occurrence of a number that is odd be 'A' and the event of the occurrence of a number that is less than 5 be 'B'. We need to find $P(A \text{ or } B)$.

$P(A) = 3/6$ (odd numbers = 1, 3 and 5)

$P(B) = 4/6$ (numbers less than 5 = 1, 2, 3 and 4)

$P(A \text{ and } B) = 2/6$ (numbers that are both odd and less than 5 = 1 and 3)

Now, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$$= 3/6 + 4/6 - 2/6$$

$$P(A \text{ or } B) = 5/6.$$

Probability Example 2

A box contains 4 chocobars and 4 ice creams. Tom eats 3 of them, by randomly choosing. What is the probability of choosing 2 chocobars and 1 icecream?

Solution

Probability of choosing 1 chocobar = $4/8 = 1/2$

After taking out 1 chocobar, the total number is 7.

Probability of choosing 2nd chocobar = $3/7$

Probability of choosing 1 icecream out of a total of 6 = $4/6 = 2/3$

So the final probability of choosing 2 chocobars and 1 icecream = $1/2 * 3/7 * 2/3 = 1/7$

Probability Example 3

When two dice are rolled, find the probability of getting a greater number on the first die than the one on the second, given that the sum should equal 8.

Solution

Let the event of getting a greater number on the first die be G. There are 5 ways to get a sum of 8 when two dice are rolled = $\{(2,6), (3,5), (4,4), (5,3), (6,2)\}$.

And there are two ways where the number on the first die is greater than the one on the second given that the sum should equal 8, $G = \{(5,3), (6,2)\}$.

Therefore, $P(\text{Sum equals } 8) = 5/36$ and $P(G) = 2/36$.

Now, $P(G/\text{sum equals } 8) = P(G \text{ and sum equals } 8) / P(\text{sum equals } 8)$

$$= (2/36) / (5/36)$$

$$= 2/5$$

Practice set 1:

1) A bag contain 6 white balls and 4 red balls .Three balls are drawn randomly. What is the probability that one ball is red and other 2 are white

- A) 1/2 B) 2/1 C) 2/3 D) 1/3

2) A five digit number is formed with the digits 0,1,2,3 and 4 without repetition. Find the chance that the number is divisible by 5

- A) 3/5 B) 1/5 C) 2/5 D) 4/5

3) A dice is thrown twice. What is the probability that at least one of them comes up with number 4

- A) 12/36 B) 11/36 C) 1/6 D) 11/6

4) From a group of 5 men and 2 women, 2 persons are selected at random. Find the probability that at least one woman is selected?

- A) 11/7 B) 21/11 C) 11/21 D) 1/21

5) A bag contains 11 red and 5 green balls. Find the probability that 4 balls are red and 3 balls are green when 7 balls are drawn at random.

- A) 16/52 B) 15/52 C) 11/52 D) 10/52

6) A box contain 8 red balls, 6 green balls and 8 blue balls. A ball is drawn at random. What is the probability that the ball drawn is neither red nor green?

- A) 10/29 B) 2/11 C) 11/4 D) 4/11

7) P and Q throw a dice. Find the probability that P's throw is not greater than Q's through

- A) 7/5 B) 12/7 C) 7/12 D) 7/11
E) None of these

8) In a college 10% of the students speaking English, 70% speaking Hindi and 10% speaking both. If a student is selected at random, what is the probability of the students who speak English or Hindi?

- A) 9/5 B) 10/7 C) 7/10 D) 5/7
E) None of these

9) From a pack of 52 cards, 3 cards are drawn together at random, what is the probability of both the cards are king?

- A) 1/5225 B) 1/5525 C) 5525
D) 1/525 E) None of these

10) Out of a total 10 bulbs, 6 bulbs are working in order. One has to choose 2 bulbs out of 6. What is the probability that all the 2 bulbs will be glowing?

- A) 1/3 B) 1/2 C) 1/5 D) 1/6

11) From a group of 4 men, 3 women, 2 persons are selected at random, Find the probability at least one man is selected?

- A) 6/7 B) 7/6 C) 5/6 D) 11/21

12) There are 8 positive numbers and 6 negative numbers. 4 numbers are chosen at random and multiplied. Find the probability that the product is a positive number?

- A) 1001/505 B) 101/505
C) 505/1001 D) 450/965

13) If you toss a coin and roll a die. What is the probability of getting a head and a 3 on the die?

- A) 1/10 B) 1/8 C) 1/12 D) 2/3

14) The probability of two persons of passing the interview are 1/3 and 3/5. Then calculate the probability that only one of them pass the interview?

- A) 7/15 B) 8/15 C) 11/15 D) 13/15

15) The probability that the problem will be solved by three persons are 1/2, 1/3 and 1/6. Find the probability that the problem is solved?

- A) 11/18 B) 13/18 C) 15/18 D) 17/18

16) An elevator starts with 4 passenger and stops at 7 floors of an apartment. Find the probability that all 4 passengers travel to different floor?

- A) 110/343 B) 120/343 C) 18/49
D) 139/343

17) From a deck of 52 cards, a card is selected and without replacing the card a new card is selected. Find out the probability that the first card is an ace and second card is a king?

- A) $4/52 \times 3/51$ B) $4/51 \times 3/52$
C) $4/52 \times 4/51$ D) $3/52 \times 3/51$

18) In a class 30% of the students opt for Math, 20% opt for Computers and 10% opt for both. A student is selected at random, find the probability that he has opted either Math or Computers.

- A) 3/5 B) 2/5 C) 4/9 D) 6/11
E) None of these

19) From a pack of 52 cards, 2 cards are drawn at random. What is the probability that either both are red or both are kings?

- A) 55/221 B) 52/225 C) 44/221 D) 48/221
E) None of these

20) A bag contains 8 blue and 7 green balls. A ball is drawn out of it and put back in the bag. Then a ball is drawn again. What is the probability that both the balls are green?

- A) 36/225 B) 48/221 C) 49/225
D) 40/221 E) None of these

21) The probability of selecting a red ball at random from a jar that contains only red, blue and orange balls is 1/4. The probability of selecting a blue ball at random from the same jar 1/3. If the jar contains 10 orange balls, find the total number of balls in the jar.

- A) 24 B) 36 C) 30 D) 28
E) None of these

22) A box contains tickets numbered from 1 to 24. 3 tickets are to be chosen to give 3 prizes. What is the probability that at least 2 tickets contain a number which is multiple of 3?

- A) 35/256 B) 33/220 C) 63/253 D) 43/190
E) 59/253

Direction for Questions 23 to 25:

A Bag contain 6 orange, 4 green, 3 pink and 4 black balls

23) If 3 balls are picked at random, what is the probability that all are pink?

- A) $\frac{2}{650}$ B) $\frac{1}{680}$ C) $\frac{4}{630}$ D) $\frac{3}{680}$

24) If 5 balls are picked at random, what is the probability that none are orange?

- A) $\frac{33}{442}$ B) $\frac{442}{33}$ C) $\frac{15}{167}$ D) $\frac{23}{235}$

25) If 3 balls are drawn at random, what is the probability that 1 is green and the other 2 are black?

- A) $\frac{2}{85}$ B) $\frac{4}{87}$ C) $\frac{1}{85}$ D) $\frac{3}{85}$

Quantitative Aptitude Solutions

Chapter 01: Number System

Answer Set 1:

1) Answer – E. 1155

Explanation :

$$2222.5 - 1260 = 962.5; 962.5 \times 1.2 = 1155$$

2) Answer – C. 50

Explanation :

$$250 / 5 = 50$$

3) Answer -B) 144

Explanation :

$$X + Y = 24$$

Greatest Product then x and y must be equal

Possibility of getting 24

$$12 + 12 = 24$$

$$12 \times 12 = 144$$

4) Answer - C)7

Explanation :

$$(a^3 + b^3 + c^3 - 3abc) / (a + b + c) = 1/2[(a-b)^2 + (b-c)^2 + (c-a)^2] = 1/2(1+4+9) = 14/2 = 7$$

5) Answer - D)101

Explanation :

$$a^3 + b^3 - a^2 + b^2 + 2a - 3b$$

$$(-2)^3 + (-5)^3 - (-2)^2 + (-5)^2 + 2(-2) - 3(-5) = -8 - 125 - 4 + 25 - 4 + 15 = -101$$

6) Answer - A)29435417

$$\text{Explanation : } (9+3+4+7) - (2+4+5+1) = 11$$

7) Answer - C)24

$$\text{Explanation : } 100/5 + 100/25 = 20+4 = 24$$

8) Answer - C)2

Explanation :

$$X^2 + 1 = 2x$$

$$X^2 - 2x + 1 = 0$$

$$X = 1$$

$$x^{10} + (-1/x)^{10} = 1 + 1 = 2$$

9) Answer - B)1

Explanation :

$$\text{Avg of 7 no} = (7+1)/2 = 8/2 = 4$$

$$\text{Avg of 9 no} = (9+1)/2 = 5$$

$$5 - 4 = 1$$

Hence increased by 1

10) Answer - D)7

$$\text{Explanation : } 2 \times 3 \times 5 \times 7 \times 11 \times 13 \times 17 = 510510$$

11) Answer – c) 41

Explanation :

LCM of 4,6 and 8 is 24

Divide 1000 by 24, we get quotient = 41 and 16 as remainder so 41 numbers are there which are divisible by 4,6 and 8 together.

12) Answer – e) 896

Explanation :

Let total marks = M

$$(3/8) \times M = 300 + 36 = 336$$

$$M = 112 \times 8 = 896$$

13) Answer – b) 24

Explanation :

Let the divisor = D

so, first number = $D \times a + 11$ and second number = $D \times b + 17$

so sum of numbers = $D \times (a + b) + 28$

given that remainder is 4 so, the number is 24

14) Answer – c) 4

Explanation :

let the number be $100a + 10b + c$

$$(100a + 10b + c) - (100a + 10c + b) = 36$$

$$b - c = 4$$

15) Answer – A. 4

Explanation :

LCM of 2, 3, 4, 5 and 6 is 60

$$60 \times 5 + 1 = 7x$$

$$7x = 301$$

Number – 301 ; The sum of digits of the number = 4

16) Answer – E. 179

Explanation :

odd numbers — $x-8, x-6, x-4, x-2, x, x+2, x+4, x+6$

$$x-8 + x-6 + x-4 + x-2 + x + x+2 + x+4 + x+6 = 656$$

$$8x - 8 = 656$$

$$x = 83$$

Even numbers — $y-2, y, y+2, y+4$

$$4y + 4 = 87 \times 4$$

$$y = 86$$

sum of the largest even number and odd number = $89 + 90 = 179$

17) Answer – a) 1

Explanation :

Remainder[$7^1 / 4$] = 3, Remainder[$7^2 / 4$] = 1, Remainder[$7^3 / 4$] = 3, Remainder[$7^4 / 4$] = 1 and so on...

Pattern repeats in cycles of 2. Remainder [$7^n / 4$] is 3 when n is odd and is 1 when n is even.

7^{100} when divided by 4 gives a remainder of 1.

18) Answer – b) 2

Explanation :

Use negative remainder concept,

Remainder [$41 \times 42 / 13$] = Remainder[$(-2) \times (-1) / 43$] (as $41 = 43 \times 1 - 2$ and $42 = 43 \times 1 - 1$)

$$= \text{Remainder} [2 / 43] = 2$$

19) Answer – a) 4

Explanation:

$$51 / 7 \xrightarrow{R} 2 \text{ So}$$

$$\frac{51^{203}}{7} = \frac{2^{203}}{7}$$

$$= \frac{(2^3)^{67} \times 2^2}{7} = \frac{8^{67} \times 4}{7} = \frac{(7+1)^{67} \times 4}{7} \xrightarrow{R} 4$$

20) Answer – d) 13

Explanation:

$$\frac{21^{875}}{17} = \frac{4^{875}}{17}$$

Here our aim is obtained number as $2^4 = 16$ ($16 = 17 - 1$) so according to that rewrite the equation as follow as

$$\begin{aligned} &= \frac{(2^2)^{875}}{17} = \frac{(2^4)^{437} \times 2^2}{17} \\ &= \frac{(17-1)^{437} \times 2^2}{17} \xrightarrow{R} -1 \times 4 = -4 \end{aligned}$$

Final remainder is $17 - 4 = 13$

21) Answer - a) 4

Explanation:

$1080 = 2^3 * 3^3 * 5$. For any perfect square, all the powers of the primes have to be even numbers. So, if the factor is of the form $2^a * 3^b * 5^c$.

The values 'a' can take are 0 and 2, b can take are 0 and 2, and c can take the value 0.

Totally there are 4 possibilities. 1, 4, 9, and 36.

22) Answer - b) 24

Explanation:

Any factor of this number should be of the form $2^a * 3^b * 5^c$.

For the factor to be a perfect square a, b, c have to be even.

a can take values 0, 2, 4...

b can take values 0, 2, 4, 6...

and c can take values 0, 2...

Total number of perfect squares = $3 * 4 * 2 = 24$.

23) Answer: - c) 20

Explanation:

Any factor of this number should be of the form $2^a * 3^b * 5^c$.

For the factor to be an odd number,

a should be 0.

b can take values 0, 1, 2, 3.

and c can take values 0, 1, 2, 3, 4.

Total number of odd factors = $4 * 5 = 20$.

24) Answer: c) 594

Explanation:

The prime factorization of $2^8 * 3^6 * 5^4 * 10^5$ is $2^{13} * 3^6 * 5^9$.

For any of these factors questions, start with the prime factorization. Remember that the formulae for number of factors, sum of factors, are all linked to prime factorization.

120 can be prime-factorized as $2^3 * 3 * 5$.

All factors of $2^{13} * 3^6 * 5^9$ that can be written as multiples of

120 will be of the form $2^3 * 3 * 5 * K$.

$$2^{13} * 3^6 * 5^9 = 2^3 * 3 * 5 * K$$

$$\Rightarrow K = 2^{10} * 3^5 * 5^8$$

The number of factors of N that are multiples of 120 is identical to the number of factors of K.

Number of factors of K = $(10 + 1) (5 + 1) (8 + 1) = 11 * 6 * 9 = 594$

25) Answer: a) 1183

Explanation:

The prime-factorization of $2^6 * 5^5 * 7^6 * 10^7$ is $2^{13} * 5^{12} * 7^6$

The total number of factors of $N = 14 * 13 * 7$

We need to find the total number of even factors. For this, let us find the total number of odd factors and then subtract this from the total number of factors. Any odd factor will have to be a combination of powers of only 5 and 7.

Total number of odd factors of $2^{13} * 5^{12} * 7^6 = (12 + 1) * (6 + 1) = 13 * 7$

Total number of factors = $(13 + 1) * (12 + 1) * (6 + 1)$

Total number of even factors = $14 * 13 * 7 - 13 * 7$

Number of even factors = $13 * 13 * 7 = 1183$

26) Answer: a) A and B

Explanation:

Any number of the form $p^a q^b r^c$ will have $(a + 1) (b + 1) (c + 1)$ factors, where p, q, r are prime. In order for the number to be a perfect cube a, b, c will have to be multiples of 3.

We can assume that $a = 3m$, $b = 3n$, $c = 3l$.

This tells us that the number of factors will have to be of the form $(3n + 1) * (3m + 1) * (3l + 1)$. In other words $(a + 1)$, $(b + 1)$ and $(c + 1)$ all leave a remainder of 1 on division by 3. So, the product of these three numbers should also leave a remainder of 1 on division by 3. Of the four numbers provided, 16 and 28 can be written in this form, the other two cannot..

So, a perfect cube can have 16 or 28 factors. Now, let us think about what kind of numbers will have 16 factors..

A number of the form p^{15} or $q^3 r^3$ will have exactly 16 factors.

Both are perfect cubes. Note that there are other prime factorizations possible that can have exactly 16 factors. But these two forms are perfect cubes, which is what we are interested in.

Similarly, a number of the form p^{27} or $q^3 r^6$ will have 28 factors. Both are perfect cubes.

27) Answer – D) 16

Explanation – L.C.M. of 2, 4, 6, 8, 10, 12 is 120. So, the bells will toll together after every 120 seconds, i.e, 2 minutes. In 30 minutes, they will toll together $30/2 + 1 = 16$

28) Answer – D. 364

Explanation – L.C.M. of 6, 9, 15 and 18 is 90.

Let required number be $90k + 4$, which is multiple of 7.

Least value of k for which $(90k + 4)$ is divisible by 7 is $k = 4$.

Required number = $(90 * 4) + 4 = 364$.

29) Answer – B. 15110

Explanation – Here $(48 - 38) = 10$, $(60 - 50) = 10$, $(72 - 62) = 10$, $(108 - 98) = 10$ & $(140 - 130) = 10$.

Required number = (L.C.M. of 48, 60, 72, 108, 140) – 10 = $15120 - 10 = 15110$

30) Answer – C. 40

Explanation – Let the numbers be $2x$ and $3x$.

Then, their L.C.M. = $6x$.

So, $6x = 48$ or $x = 8$.

The numbers are 16 and 24.

Hence, required sum = $(16 + 24) = 40$.

31) Answer – D. 548

Explanation – Required number = (L.C.M. of 12, 15, 20, 54) + 8

$$= 540 + 8$$

$$= 548.$$

32) Answer – B. 2

Explanation – Let the numbers 13a and 13b.

Then, $13a \times 13b = 2028$

$ab = 12$.

Now, the co-primes with product 12 are (1, 12) and (3, 4).

33) Answer – C. 23

Explanation – L.C.M. of 5, 6, 4 and 3 = 60. On dividing 2497 by 60, the remainder is 37. Number to be added = $(60 - 37) = 23$

34) Answer : A) 4/126

Explanation:

HCF of numerator(4,8,36,20) = 4

LCM of denominator(3,6,63,42) = 126

35) Answer – B) 147

Explanation :

$$\begin{array}{r} 7 \overline{) 147} \\ 7 \overline{) 21} \\ 1 \end{array}$$

Answer Set 2:

1) Answer - C (729)

Explanation - Given Exp.

$a^2 + b^2 - 2ab$, where $a = 186$ and $b = 159$

$= (a - b)^2 = (186 - 159)^2 = (27)^2$

$= (20 + 7)^2 = (20)^2 + 7 + 2 \times 20 \times 7 = 400 + 49 + 280 = 729$

2) Answer : Option D

Explanation:

Let the number be x .

Then, $\frac{1}{3}$ of $\frac{1}{4}$ of $x = 15 \Leftrightarrow x = 15 \times 12 = 180$

So, Required number = $\left(\frac{3}{10} \times 180\right) = 54$

3) Answer : Option D

Explanation:

91 is divisible by 7. So, it is not a prime number.

4) Answer : Option B

Explanation:

$$(112 \times 5^4) = 112 \times \left(\frac{10}{2}\right)^4 = \frac{112 \times 10^4}{2^4} = \frac{1120000}{16} = 70000$$

5) Answer : Option A

Explanation:

$$\begin{aligned} 1397 \times 1397 &= (1397)^2 \\ &= (1400 - 3)^2 \\ &= (1400)^2 + (3)^2 - (2 \times 1400 \times 3) \\ &= 1960000 + 9 - 8400 \\ &= 1960009 - 8400 \\ &= 1951609 \end{aligned}$$

6) Answer : Option B

Explanation:

$$935421 \times 625 = 935421 \times 5^4 = 935421 \times \left(\frac{10}{2}\right)^4$$

$$\frac{935421 \times 10^4}{2^4} = \frac{9354210000}{16}$$

$$= 584638125$$

7) Answer : Option D

Explanation:

Clearly, 97 is a prime number.

8) Answer : Option A

Explanation:

$$\begin{aligned} 5358 \times 51 &= 5358 \times (50 + 1) \\ &= 5358 \times 50 + 5358 \times 1 \\ &= 267900 + 5358 \\ &= 273258. \end{aligned}$$

9) Answer : Option D

Explanation:

Required sum = $(2 + 3 + 5 + 7 + 11) = 28$.

Note: 1 is not a prime number.

Definition: A prime number (or a prime) is a natural number that has exactly two distinct natural number divisors: 1 and itself.

10) Answer : Option A

Explanation:

$$\text{Given Exp.} = \frac{(12)^3 \times 6^4}{432} = \frac{(12)^3 \times 6^4}{12 \times 6^2} = (12)^2 \times 6^2 = (72)^2 = 5184$$

11) Answer : Option A

Explanation:

$$\begin{aligned} 72519 \times 9999 &= 72519 \times (10000 - 1) \\ &= 72519 \times 10000 - 72519 \times 1 \\ &= 725190000 - 72519 \\ &= 725117481. \end{aligned}$$

12) Answer : Option A

Explanation:

The smallest 3-digit number is 100, which is divisible by 2.

$\therefore 100$ is not a prime number.

$\sqrt{101} < 11$ and 101 is not divisible by any of the prime numbers 2, 3, 5, 7, 11.

$\therefore 101$ is a prime number.

Hence 101 is the smallest 3-digit prime number.

13) Answer : Option A

Explanation:

$$\begin{aligned} 19657 \quad \text{Let } x - 53651 &= 9999 \\ 33994 \quad \text{Then, } x &= 9999 + 53651 = 63650 \\ \text{-----} \\ 53651 \\ \text{-----} \end{aligned}$$

14) Answer : Option A

Explanation:

Let $S_n = (1 + 2 + 3 + \dots + 45)$. This is an A.P. in which $a = 1$, $d = 1$, $n = 45$.

$$\begin{aligned} S_n &= \frac{n}{2} 2a + (n - 1)d \\ &= \frac{45}{2} \times 2 \times 1 + (45 - 1) \times 1 \\ &= \frac{45}{2} \times 46 \end{aligned}$$

$$\begin{aligned}
 &= (45 \times 23) \\
 &= 45 \times (20 + 3) \\
 &= 45 \times 20 + 45 \times 3 \\
 &= 900 + 135 \\
 &= 1035.
 \end{aligned}$$

Shortcut Method:

$$S_n = \frac{n(n+1)}{2} = \frac{45(45+1)}{2} = \mathbf{1035}$$

15) Answer : Option B

Explanation:

$$\begin{aligned}
 x + 3699 + 1985 - 2047 &= 31111 \\
 \Rightarrow x + 3699 + 1985 &= 31111 + 2047 \\
 \Rightarrow x + 5684 &= 33158 \\
 \Rightarrow x &= 33158 - 5684 = 27474.
 \end{aligned}$$

16) Answer & Explanation

Answer - B (2079)

Explanation - (a) 639 is not divisible by 7

(b) 2079 is divisible by 3, 7, 9 and 11

(c) 3791 is not divisible by 3

(d) 37911 is not divisible by 9

17) Answer - B (43974)

Explanation - $39798 + 3798 + 378 = 43974$

18) Answer - A (114345)

Explanation - The required number should be divisible by both 9 and 11.

Clearly, 114345 is divisible by both 9 and 11. So, it is divisible by 99

19) Answer - B (875591244)

Explanation - $8756 \times 99999 = 8756 \times (100000 - 1) = (8756 \times 100000) - (8756 \times 1)$

$$= (875600000 - 8756) = 875591244$$

20) Answer - C (4691100843)

Explanation - $469157 \times 9999 = 469157 \times (10000 - 1) =$

$$(469157 \times 10000) - (469157 \times 1)$$

$$= (4691570000 - 469157) = 4691100843$$

21) Answer - B (584638125)

Explanation - $935421 \times 625 = 935421 \times 5^4$

$$= 9354210000 / 2^4$$

$$= 9354210000 / 16$$

$$= 584638125$$

22) Answer - B (Product of two odd numbers)

Explanation - Product of two odd numbers is always odd.

23) Answer - D (462)

Explanation - On dividing 457 by 11, remainder is 6.

Required number is either 451 or 462. Nearest to 456 is 462

24) Answer - E (None of these)

Explanation - 100 is divisible by 2, so it is not prime.

101 is not divisible by any of the numbers 2, 3, 5, 7. So, it is prime.

Hence, the smallest 3-digit prime number is 101

25) Answer - D (1957201)

Explanation - $(1399 \times 1399) = (1399)^2$

$$= (1400 - 1)^2 = (1400)^2 + 1^2 - 2 \times 1400 \times 1$$

$$= 1960000 + 1 - 2800 = 1960001 - 2800 = 1957201$$

26) Answer: B.

27) Answer: A

28) Answer: A

Explanation:

We can write 17 as $24 + 1$ and 2256 as $(24)64$.

If $f(x)$ is divided by $(x - a)$, the remainder is $f(a)$

\therefore The remainder is $(-1)64 = 1$.

29) Answer : D

Explanation:

Let the three integers be x , $x + 2$ and $x + 4$.

Then, $3x = 2(x + 4) + 3 \Leftrightarrow x = 11$.

\therefore Third integer $= x + 4 = 15$

30) Answer : B

Explanation:

Let the ten's and unit digit be x and $\frac{8}{x}$ respectively.

$$\text{Then, } \left(10x + \frac{8}{x}\right) + 18 = 10x \frac{8}{x} + x$$

$$\Rightarrow 10x^2 + 8 + 18x = 80 + x^2$$

$$\Rightarrow 9x^2 + 18x - 72 = 0$$

$$\Rightarrow x^2 + 2x - 8 = 0$$

$$\Rightarrow (x + 4)(x - 2) = 0$$

$$\Rightarrow x = 2.$$

Chapter 02: Percentages

Practice Set 1:

1) Answer: B

Explanation:

Number of runs made by running = $110 - (3 \times 4 + 8 \times 6)$
 $= 110 - (60)$
 $= 50.$

$$\therefore \text{Required percentage} = \left(\frac{50}{110} \times 100 \right) \% = 45 \frac{5}{11} \%$$

Or

Answer – (B)

Answer::

Number of runs made by running = $110 - (3 \times 4 + 8 \times 6)$
 $= 110 - (60)$
 $= 50.$

$$\text{Required percentage} = \frac{50}{100} \times 100\% = 45 \frac{5}{11} \%$$

2) Answer - B (8.5)

Explanation - Let $a\%$ of 25 = 2.125. Then, $(a/100) \times 25 = 2.125$
 $a = (2.125 \times 4) = 8.5$

3) Answer : D

Explanation :

Let 218% of 1674 = $x \times 1800$.

$$\text{Then, } x = \frac{218}{100} \times 1674 \times \frac{1}{1800} = 2.0274.$$

4) Answer : C

Explanation :

Let $\sqrt{784} + x = 78\%$ of 500.

$$\text{Then, } x = \frac{78}{100} \times 500 - \sqrt{784} = (390 - 28) = 362.$$

5) Answer:

Explanation:

Let the number of candidates appeared from each state be x .

Then, 7% of $x - 6\%$ of $x = 80$

$$\Leftrightarrow 1\% \text{ of } x = 80$$

$$\Leftrightarrow x = 80 \times 100$$

$$= 8000.$$

6) Answer:

Explanation:

Let A be the income.

Expenditure = $0.8A$

Savings = $0.2A \Rightarrow 20\%$

New income = $1.2A$ (since 20% rise)

New expenditure = $(0.8A) \times 1.3$ (Since 30% rise)
 $= 1.04A$

So, new savings = $1.2A - 1.04A = 0.16A \Rightarrow 16\%$

% decrease = $(20-16)/20 \times 100 = 20\%$

7) Answer

Explanation:

Let the total marks be 100

Minimum marks required to pass the exam = 40

Marks obtained by A = $40 - (40 \times 10/100) = 36$ marks

Marks obtained by B = $36 - (100/9 \times 36/100) = 32$ marks

Marks obtained by C = $(36 + 32) - ((36 + 32) \times 700/(17 \times 100))$
 $= 68 - 28$

$= 40$ marks

8) Answer:

Explanation: C

This is a simple question of percentage change

The percentage change = $(\text{final value} - \text{initial value}) / (\text{initial value}) \times 100$

So in 2011 Sita's salary was 1000 i.e the initial value and then her salary increased to 1250, that is final value.

So the percentage change is $(1250-1000) / 1000 \times 100 = 25\%$

9) Answer

Explanation : Option B

Interest on Rs.22500 = $0.1 \times 22500 = 2250$

Charges for managing the concern = $60 \times 12 = 720$

If yearly profit is x , then B's share and A's share = $(x/2)$

$$\therefore (x/2) - 2250 + 720$$

$$= (1/2)((x/2) - 720 + 2250)$$

$$\Rightarrow x = \text{Rs. } 9180.$$

10) Answer: Option E

Explanation:

Let the number of students be x . Then,

Number of students above 8 years of age = $(100 - 20)\%$ of $x = 80\%$ of x .

$$\therefore 80\% \text{ of } x = 48 + \frac{2}{3} \text{ of } 48$$

$$\Rightarrow \frac{80}{100} x = 80$$

$$\Rightarrow x = 100.$$

11) Answer - C (14)

Explanation - Required difference

$= 3 \frac{1}{2} \% \text{ of Rs. } 8400 - 3 \frac{1}{3} \% \text{ of Rs. } 8400$

$= (7/2 - (10/3))\% \text{ of Rs. } 8400$

$= 1/6 \% \text{ of Rs. } 8400$

$= \text{Rs. } (1/6) \times (1/100) \times 8400$

$= \text{Rs. } 14$

12) Answer : B

Explanation :

Total number of students = $1100 + 700 = 1800$.

Numbers of student passed = $(42\% \text{ of } 1100 + 30\% \text{ of } 700) = (462 + 210) = 672$

Number of failures = $1800 - 672 = 1128$.

$$\text{Percentage failure} = \frac{1128}{1800} \times 100\% = 62 \frac{2}{3} \%$$

13) Answer : C

Explanation :

Total sales tax paid = 7% of Rs. 400 + 9% of Rs. 6400

$$= \text{Rs. } \frac{7}{100} \times 400 + \frac{9}{100} \times 6400 = \text{Rs. } (28 + 576) = \text{Rs. } 604.$$

Total cost of the items = Rs. $(400 + 6400) = \text{Rs. } 6800$.

$$\text{Required percentage} = \frac{604}{6800} \times 100\% = 8 \frac{15}{17} \%$$

14) Answer : B

Explanation :

$$\frac{384}{540} \times 100\% = 71 \frac{1}{9} \%$$

$$\frac{425}{500} \times 100\% = 85\%$$

$$\frac{570}{700} \times 100\% = 81 \frac{3}{7} \%$$

$$\frac{480}{660} \times 100\% = 72\frac{8}{11}\%$$

$\frac{425}{500}$ shows the best percentage

15) Answer:

Explanation:

Amount paid to car owner

= 90% of 85% of Rs. 3,25,000.

= Rs. $(90/100 \times 85/100 \times 325000)$

= Rs. 2,48,625.

Required difference = Rs. $(325000 - 248625)$

= Rs. 76,375.

16) Answer: C

Explanation:

We solve this question using the principle of constancy.

Let original price = P

Increased Price- 1.25P

Original Consumption = C

Increased Consumption = I

It is given that expense is the same, that is:

$1.25 \times I = P \times C$

$I = 0.8 C$

% decrease = $\{(1 - 0.8)/1\} \times 100 = 20\%$

17) Answer:

Explanation: B

Let the monthly salary be (s)

So going by the condition given in the question, we have:

$4s/10 + (10s - 4s)/10 \times 50/100 + (6s - 3s)/10 \times 30s/100 + \text{saving} = s$

$4s/10 + 6s/10 \times 50/100 + 3s/10 \times 30s/100 + \text{saving} = s$

$\Rightarrow 4s/10 + 3s/10 + 9s/10 + 630 = s$

$\Rightarrow 630 = (100s - 70s - 9s)/100$

$\Rightarrow 630 = 21s/100$

$\Rightarrow s = \text{Rs } 3000$

18) Answer: Option C

Explanation :

Growth rate of rat population in 3 months = $20 \times (3/12) = 5\%$

Increase in first 3 months = $3200 \times 1.05 = 3360$

Also, net decrease in 3 months = 160

Rat population = $3360 - 160 = 3200$

In the same way, after every 3 months, rat population remains the same

Hence, even after 3 x 8 months i.e., 2 years, the population is Maintained

19) Answer: Option A

Explanation :

CP of the merchant who calculates his % profit on CP = $(3760/1.175) = \text{Rs. } 3200$

His profit = $0.175 \times 3760 = \text{Rs. } 560$

Profit of the merchant who calculates his % profit on SP = $0.175 \times 3760 = \text{Rs. } 658$

Difference in profit = $658 - 560 = \text{Rs. } 98$.

20) Answer: Option E

Explanation:

$x\% \text{ of } y = \left(\frac{x}{100} \times y\right) = \left(\frac{y}{100} \times x\right) = y\% \text{ of } x$

$\therefore A = B$.

21) Answer: Option D

Explanation:

$5\% \text{ of } A + 4\% \text{ of } B = \frac{2}{3} (6\% \text{ of } A + 8\% \text{ of } B)$

$\Rightarrow \frac{5}{100}A + \frac{4}{100}B = \frac{2}{3} \left(\frac{6}{100}A + \frac{8}{100}B \right)$

$\Rightarrow \frac{1}{20}A + \frac{1}{25}B = \frac{1}{25}A + \frac{4}{75}B$

$\Rightarrow \left(\frac{1}{20} - \frac{1}{25} \right)A = \left(\frac{4}{75} - \frac{1}{25} \right)B$

$\Rightarrow \frac{1}{100}A = \frac{1}{75}B$

$\Rightarrow \frac{A}{B} = \frac{100}{75} = \frac{4}{3}$

\therefore Required ratio = 4 : 3

22) Answer: Option A

Explanation:

Rebate = 6% of Rs. 6650 = Rs. $\left(\frac{6}{100} \times 6650 \right) = \text{Rs. } 399$

Sales tax = 10% of Rs. $(6650 - 399) = \text{Rs. } \left(\frac{10}{100} \times 6251 \right) =$

Rs. 625.10

\therefore Final amount = Rs. $(6251 + 625.10) = \text{Rs. } 6876.10$

23) Answer - B (2490 and 4150)

Explanation - Let the numbers be a and b.

Then, 7.5 % of a = 12.5% of b

$a = 125 \times b/75 = 5 \times b/3$.

Now, $a - b = 1660$

$5 \times b/3 - b = 1660$

$2 \times b/3 = 1660$

$b = (1660 \times 3)/2 = 2490$.

One number = 2490, Second number = $5 \times b/3 = 4150$

24) Answer - B (2%)

Explanation - Required Percentage = $(130/(6.5 \times 1000)) \times 100\% = 2\%$.

25) Answer - A (16800)

Explanation - Let the number of votes enrolled be a.

Then, Number of votes cast = 75% of a.

Valid votes = 98% of (75% of a). 75% of (98% of (75% of a)) = 9261.

$(75/100) \times (98/100) \times (75/100) \times a = 9261$.

$a = (9261 \times 100 \times 100 \times 100)/(75 \times 98 \times 75) = 16800$

26) Answer : B)

Explanation :

$A = 150\% \text{ of } B$

$$A = \frac{150}{100} B$$

$$\frac{A}{B} = \frac{3}{2}$$

$$\frac{A}{B} + 1 = \frac{3}{2} + 1$$

$$\frac{A+B}{B} = \frac{5}{2}$$

$$\frac{B}{A+B} = \frac{2}{5}$$

Required percentage =

$$\frac{B}{A+B} \times 100 \% = \frac{2}{5} \times 100 \% = 40\%$$

27) Answer : B

Explanation :

Let one number = x, Then, other number = 80% of $x = \frac{4}{5}x$

$$4x^2 + \frac{4}{5}x^2 = 656$$

$$x^2 + \frac{16}{25}x^2 = 164$$

$$\frac{41}{25}x^2 = 164$$

$$x^2 = \frac{164 \times 25}{41} = 100 \quad x = 100$$

So, the numbers are 10 and 8.

28) Answer : C

Explanation :

Amount paid to car owner = 90% of 85% of Rs. 3,25,000

$$= \text{Rs. } \frac{90}{100} \times \frac{85}{100} \times 325000 = \text{Rs. } 2,48,625$$

Required difference = Rs. (325000 - 248625) = Rs. 76,375

29) Answer:

Explanation:

Let the number of applicants be x. Number of eligible candidates = 95% of x.

Eligible candidates of each other categories = 15% of (95% of x).

$$= (15/100 \times 95/100 \times x)$$

$$= 57/400 \times x.$$

Therefore, $57/400 \times x = 4275$

$$\Leftrightarrow x = (4275 \times 400 / 57)$$

$$\Leftrightarrow 30000.$$

30) Answer:

Explanation:

Total number of votes polled = (1136 + 7636 + 11628) = 20400.

Required percentage = $(11628 / 20400 \times 100)\% = 57\%$.

Practice Set 2:

1) Answer: D

Explanation:

Let the maximum marks be x

Then, 35% of $x = 165 + 45$

$$\Leftrightarrow \frac{35}{100}x = 210 \Leftrightarrow x = \left(\frac{210 \times 100}{35}\right) = 600$$

2) Answer: C

Explanation:

$$A \times 1.4 \times 0.5 = B \times 1.5 \times 0.6$$

$$\Rightarrow .7A = .9B$$

$$\Rightarrow B/A = 7/9$$

3) Answer: A

Explanation:

$$\frac{A}{100} \times B = \frac{B}{100} \times A$$

$\therefore A\%$ of B is $B\%$ of A.

4) Answer: D

Explanation:

Let the original length and breadth be 10 cm each then original area = 100 cm^2

New length = $10 \times 1.1 = 11 \text{ cm}$

Let new breadth be x.

Then, $11x = 100$

$$\Rightarrow x = \frac{100}{11}$$

Hence % reduction in breadth =

$$= \frac{10/11}{10} \times 100 = 9\frac{1}{11}\%$$

5) Answer: D

Explanation:

Rate is increased from Rs. 13 per h to Rs. 19.5 per h.

Commission = $19.5 \times 50 = \text{Rs. } 975$

6) Answer: D

Explanation:

$A = 5B$

B is less than A by $(5B - B = 4B)$

$$\left(\frac{4B}{5B} \times 100\right)\% = 80\%$$

7) Answer: C

Explanation:

Marks obtained in Hindi = 24.

Marks obtained in English = 30

Marks obtained in Maths = 36

Marks obtained in Science = 42.

Total marks obtained = 132.

8) Answer: C

Explanation:

Quantity of water in 15 liters = 6% of 15 liters = 0.9 liters.

Let x liters of pure milk be added. Then,

$$0.9 = \frac{15+x}{25} \Leftrightarrow 22.5 = 15+x \Leftrightarrow x = 7.5$$

9) Answer: C

Explanation:

Let the total income be x.

Then, income left = $(100 - 70)\%$ of $[100 - (25 + 45)]\%$ of $x = 30\%$ of 30% of x

$$= \left(\frac{30}{100} \times \frac{30}{100} \times 100\right)\% \text{ of } x = 9\% \text{ of } x.$$

10) Answer: D

Explanation:

$$\text{Total money} = \text{Rs. } \left(800 \times \frac{25}{100} + 1600 \times \frac{50}{100}\right) = \text{Rs. } 1000.$$

$$25 \text{ paise coins removed} = \left(\frac{16}{100} \times 800\right) = 128.$$

$$50 \text{ paise coins removed} = \left(\frac{32}{100} \times 1600\right) = 512.$$

$$\text{Money removed} = \text{Rs. } \left(128 \times \frac{25}{100} + 512 \times \frac{50}{100}\right) = \text{Rs. } 32 + 256 = 288.$$

$$\therefore \text{Required percentage} = \left(\frac{288}{1000} \times 100\right)\% = 28.8\%$$

11) Answer: D

Explanation:

Percentage change in area

$$= 1 - b - \frac{lb}{100} = 30 - 15 - \frac{450}{100} = (15 - 4.5)\% = 10.5\%$$

12) Answer: B

Explanation:

Let the original price be Rs. x per kg

We know that = Price \times Consumption = Expenses

\therefore Original expenses = $x \times 25$ = Rs. $25x$

After increase, let the new consumption be y kg

Given, New price = $1.30x$

New expenses = $1.3 \times 25x$ $1.30x \times y = 1.3 \times 25x$

$$\Rightarrow y = \frac{1.3 \times 25x}{1.30x} = 25 \text{ kg.}$$

Hence, new monthly consumption = 25 kg.

13) Answer: A

Explanation:

Let total marks = x . Then, $(30\% \text{ of } x) + 18 = (35\% \text{ of } x) - 12$

$$\Leftrightarrow \frac{30}{100}x + 18 = \frac{35}{100}x - 12 \Leftrightarrow 30 = \frac{5}{100}x \Rightarrow 600 = x$$

$$\text{So passing marks} = (30\% \text{ of } x) + 18 = \left(\frac{30}{100} \times 600 + 18\right) = 180 + 18 = 198$$

$$\therefore \text{Pass percentage} = \left(\frac{198}{600} \times 100\right)\% = 33\%$$

14) Answer: B

Explanation:

Let the price of a chair be Rs. x . Then, price of a table = Rs. $(x + 350)$.

So, $7(x + 350) + 7x = 4550$

$$\Leftrightarrow 14x = 4550 - 2450$$

$$\Leftrightarrow x = \frac{2100}{14} = 150$$

Price of a table = Rs. 500 ; Price of a chair = Rs. 150.

$$\text{Required percentage} = \left(\frac{350}{500} \times 100\right)\% = 70\%$$

15) Answer: B

Explanation:

Suppose a person used to purchase x kg rice for Rs. 100 before reduction. Then after reduction, he is getting 11.5 kg more in addition to x kg for the same price i.e. Rs. 100.

It means a reduction of 23% in Rs. 100, i.e. Rs 23 enables him to buy 11.5 kg more.

Therefore reduced price is Rs. 23 for 11.5 kg or Rs. 2 per kg.

16. Answer: B

Explanation:

$$n(A) = \left(\frac{70}{100} \times 120\right) = 84, n(B) = \left(\frac{20}{100} \times 120\right) = 24, n(A \cap B) = \left(\frac{10}{100} \times 120\right)$$

$$\therefore n(A \cup B) = n(A) + n(B) - n(A \cap B) = 84 + 24 - 12 = 96.$$

So people who had either or both types of dinner = 96.

Hence, people who had neither type of dinner = $(120 - 96) = 24$

17) Answer: C

Explanation:

Since sales tax and profit are to be calculated on manufacturing cost, therefore

single percentage change = 30%

Now manufacturing cost $\times 1.3 = 16,900$

$$\therefore \text{Manufacturing cost} = \frac{16,900}{1.3} = \text{Rs. } 13,000$$

18) Answer: D

Explanation:

$$\text{Quantity of sugar} = \left(\frac{30}{100} \times 4\right) \text{ kg} = 1.2 \text{ kg}$$

$$\therefore \text{New percentage} = \left(\frac{1.2}{5} \times 100\right)\% = 24\%$$

19) Answer: A

Explanation:

Number of questions attempted correctly = $(80\% \text{ of } 40 + 60\% \text{ of } 30 + 50\% \text{ of } 10)$

$$= (32 + 18 + 5) = 55$$

Questions to be answered correctly for 75% grade = 75% of 80 = 60.

$$\therefore \text{Required Number of questions} = (60 - 55) = 5$$

20) Answer: C

Explanation:

Let the original salary be Rs. 100 New salary = Rs. 80.

Increase on 80 = 20. Increase on 100 =

$$= \left(\frac{20}{80} \times 100\right)\% = 25\%$$

21) Answer: C

Explanation:

Population in the beginning of the first year

$$= \frac{10374}{\left(1 + \frac{5}{100}\right)\left(1 - \frac{5}{100}\right)} = \left(10374 \times \frac{20}{21} \times \frac{20}{19}\right) = 10400$$

22) Answer: B

Explanation:

Let original rate be Rs. x per kg.

$$\text{Reduced rate} = \text{Rs. } \left[\left(100 - \frac{25}{8}\right) \times \frac{1}{100}x\right] = \text{Rs. } \frac{31x}{32} \text{ per kg.}$$

$$\therefore \frac{208}{31x/32} - \frac{208}{x} = 1 \Leftrightarrow 208\left(\frac{32}{31x} - \frac{1}{x}\right) = 1 \Rightarrow x = 6.70$$

So, original rate = Rs. 6.70 per kg.

$$\text{Reduced rate} = \text{Rs. } \left(\frac{31}{32} \times 6.70\right) \text{ per kg} = \text{Rs. } 6.50 \text{ per kg.}$$

23) Answer: D

Explanation:

Value of the machine after 2 years

$$= \text{Rs. } \left[187500 \times \left(1 - \frac{20}{100}\right)^2\right] = \text{Rs. } \left(187500 \times \frac{4}{5} \times \frac{4}{5}\right) = \text{Rs. } 1,20,000$$

24) Answer: C

Explanation:

Let the total number of student be x

Let A and B represent the sets of students who passed in English and Mathematics respectively.

Then, number of students passed in one or both the subjects

$$= n(A \cup B) = n(A) + n(B) - n(A \cap B) = 75\% \text{ of } x + 70\% \text{ of } x - 65\% \text{ of } x$$

$$= \left(\frac{75}{100}x + \frac{70}{100}x - \frac{65}{100}x \right) = \frac{80}{100}x = \frac{8}{10}x$$

$$\therefore \text{Student who failed in both the subjects} = \left(x - \frac{8x}{10} \right) = \frac{2x}{10} = \frac{x}{5}$$

$$\text{So, } \frac{x}{5} = 60 \text{ or } x = 300. \text{ Hence, total number of students} = 300.$$

25) Answer: D

Explanation:

Let the total number of votes polled be x .

Then, votes polled in favor of other candidate = $(100 - 82)\%$ of $x = 18\%$ of x .

$$\therefore 82\% \text{ of } x - 18\% \text{ of } x = 512$$

$$\Leftrightarrow \frac{64}{100}x = 512 \Leftrightarrow x = \left(\frac{512 \times 100}{64} \right) = 800.$$

26) Answer: B

Explanation:

$$\text{Given } M + F = 6400$$

$$1.4M + 1.3F = 8380$$

$$\therefore M = 600 \text{ and } F = 5800$$

27) Answer: B

Explanation:

Let the inspector examined x meters, then 0.06% of $x = 3$

$$\Rightarrow \frac{x \times 0.06}{100} = 3 \Rightarrow x = 5000$$

28) Answer: C

Explanation:

Let the quantity of milk and water be 40 and 60 respectively, after removing 50% of solution

Quantity of milk = 20 and quantity of water = 30

Therefore, the concentration of the solution is reduced from 40 to 20 i.e., reduced by 50%

29) Answer: C

Explanation:

Number of literate women =

$$= 4,76,000 \times \frac{50}{100} - 1,56,000 \times \frac{60}{100} = 1,44,400$$

30) Answer: C

Explanation:

Amount of salt in 40 kg solution =

$$= \left(\frac{5}{100} \times 40 \right) \text{ kg} = 2 \text{ kg}$$

Let x kg of pure salt be added.

$$\text{Then, } \frac{2+x}{40+x} = \frac{8}{100} \Leftrightarrow 200+100x = 320+8x \Leftrightarrow 92x = 120 \Leftrightarrow x = \frac{120}{92}$$

Chapter 02: Percentages

1) Answer: B

Explanation:

Number of runs made by running = $110 - (3 \times 4 + 8 \times 6)$

$$= 110 - (60)$$

$$= 50.$$

$$\therefore \text{Required percentage} = \left(\frac{50}{110} \times 100 \right) \% = 45\frac{5}{11}\%$$

Or

$$\text{Answer} - (B)$$

Answer::

$$\text{Number of runs made by running} = 110 - (3 \times 4 + 8 \times 6)$$

$$= 110 - (60)$$

$$= 50.$$

$$\text{Required percentage} = \frac{50}{100} \times 100\% = 45\frac{5}{11}\%$$

2) Answer - B (8.5)

Explanation - Let $a\%$ of 25 = 2.125. Then, $(a/100) \times 25 = 2.125$
 $a = (2.125 \times 4) = 8.5$

3) Answer : D

Explanation :

$$\text{Let } 218\% \text{ of } 1674 = x \times 1800.$$

$$\text{Then, } x = \frac{218}{100} \times 1674 \times \frac{1}{1800} = 2.0274.$$

4) Answer : C

Explanation :

$$\text{Let } \sqrt{784} + x = 78\% \text{ of } 500.$$

$$\text{Then, } x = \frac{78}{100} \times 500 - \sqrt{784} = (390 - 28) = 362.$$

5) Answer:

Explanation:

Let the number of candidates appeared from each state be x .

$$\text{Then, } 7\% \text{ of } x - 6\% \text{ of } x = 80$$

$$\Leftrightarrow 1\% \text{ of } x = 80$$

$$\Leftrightarrow x = 80 \times 100$$

$$= 8000.$$

6) Answer:

Explanation:

Let A be the income.

$$\text{Expenditure} = 0.8A$$

$$\text{Savings} = 0.2A \Rightarrow 20\%$$

$$\text{New income} = 1.2A \text{ (since 20\% rise)}$$

$$\text{New expenditure} = (0.8A) \times 1.3 \text{ (Since 30\% rise)}$$

$$= 1.04A$$

$$\text{So, new savings} = 1.2A - 1.04A = 0.16A \Rightarrow 16\%$$

$$\% \text{ decrease} = (20-16)/20 \times 100 = 20\%$$

7) Answer

Explanation:

Let the total marks be 100

$$\text{Minimum marks required to pass the exam} = 40$$

$$\text{Marks obtained by A} = 40 - (40 \times 10/100) = 36 \text{ marks}$$

$$\text{Marks obtained by B} = 36 - (100/9 \times 36/100) = 32 \text{ marks}$$

$$\text{Marks obtained by C} = (36+32) - (36+32) \times 700/(17 \times 100)$$

$$= 68 - 28$$

$$= 40 \text{ marks}$$

8) Answer:

Explanation: C

This is a simple question of percentage change

$$\text{The percentage change} = (\text{final value} - \text{initial value}) / (\text{initial value}) \times 100$$

So in 2011 Sita's salary was 1000 i.e the initial value and then

her salary increased to 1250, that is final value.
So the percentage change is $(1250-1000) / 1000 \times 100 = 25\%$

9) Answer

Explanation : Option B

Interest on Rs.22500 = $0.1 \times 22500 = 2250$

Charges for managing the concern = $60 \times 12 = 720$

If yearly profit is x, then B's share and A's share = $(x/2)$

$\therefore (x/2) - 2250 + 720$

$= (1/2)((x/2) - 720 + 2250)$

$\Rightarrow x = \text{Rs. } 9180.$

10) Answer: Option E

Explanation:

Let the number of students be x. Then,

Number of students above 8 years of age = $(100 - 20)\%$ of x = 80% of x.

$\therefore 80\% \text{ of } x = 48 + \frac{2}{3} \text{ of } 48$

$\Rightarrow \frac{80}{100}x = 80$

$\Rightarrow x = 100.$

11) Answer - C (14)

Explanation - Required difference

$= 3\frac{1}{2}\% \text{ of Rs. } 8400 - 3\frac{1}{3}\% \text{ of Rs. } 8400$

$= (7/2 - 10/3)\% \text{ of Rs. } 8400$

$= 1/6\% \text{ of Rs. } 8400$

$= \text{Rs. } (1/6) \times (1/100) \times 8400$

$= \text{Rs. } 14$

12) Answer : B

Explanation :

Total number of students = $1100 + 700 = 1800.$

Numbers of student passed = $(42\% \text{ of } 1100 + 30\% \text{ of } 700) = (642 + 210) = 672$

Number of failures = $1800 - 672 = 1128.$

Percentage failure = $\frac{1128}{1800} \times 100\% = 62\frac{2}{3}\%$

13) Answer : C

Explanation :

Total sales tax paid = $7\% \text{ of Rs. } 400 + 9\% \text{ of Rs. } 6400$

$= \text{Rs. } \frac{7}{100} \times 400 + \frac{9}{100} \times 6400 = \text{Rs. } (28 + 576) = \text{Rs. } 604.$

Total cost of the items = $\text{Rs. } (400 + 6400) = \text{Rs. } 6800.$

Required percentage = $\frac{604}{6800} \times 100\% = 8\frac{15}{17}\%$

14) Answer : B

Explanation :

$\frac{384}{540} \times 100\% = 71\frac{1}{9}\%$

$\frac{425}{500} \times 100\% = 85\%$

$\frac{570}{700} \times 100\% = 81\frac{3}{7}\%$

$\frac{480}{660} \times 100\% = 72\frac{8}{11}\%$

$\frac{425}{500}$ shows the best percentage

15) Answer:

Explanation:

Amount paid to car owner

$= 90\% \text{ of } 85\% \text{ of Rs. } 3,25,000.$

$= \text{Rs. } (90/100 \times 85/100 \times 325000)$

$= \text{Rs. } 2,48,625.$

Required difference = $\text{Rs. } (325000 - 248625)$

$= \text{Rs. } 76,375.$

16) Answer: C

Explanation:

We solve this question using the principle of constancy.

Let original price = P

Increased Price- $1.25P$

Original Consumption = C

Increased Consumption = I

It is given that expense is the same, that is:

$1.25 \times I = P \times C$

$I = 0.8 C$

% decrease = $\{(1-0.8)/1\} \times 100 = 20\%$

17) Answer:

Explanation: B

Let the monthly salary be (s)

So going by the condition given in the question, we have:

$4s/10 + (10s-4s)/10 \times 50/100 + (6s-3s)/10 \times 30s/100 + \text{saving} = s$

$4s/10 + 6s/10 \times 50/100 + 3s/10 \times 30s/100 + \text{saving} = s$

$\Rightarrow 4s/10 + 3s/10 + 9s/10 + 630 = s$

$\Rightarrow 630 = (100s - 70s - 9s)/100$

$\Rightarrow 630 = 21s/100$

$\Rightarrow s = \text{Rs } 3000$

18) Answer: Option C

Explanation :

Growth rate of rat population in 3 months = $20 \times (3/12) = 5\%$

Increase in first 3 months = $3200 \times 1.05 = 3360$

Also, net decrease in 3 months = 160

Rat population = $3360 - 160 = 3200$

In the same way, after every 3 months, rat population remains the same

Hence, even after 3×8 months i.e., 2 years, the population is Maintained

19) Answer: Option A

Explanation :

CP of the merchant who calculates his % profit on CP =

$(3760/1.175) = \text{Rs. } 3200$

His profit = $0.175 \times 3760 = \text{Rs. } 560$

Profit of the merchant who calculates his % profit on SP =

$0.175 \times 3760 = \text{Rs. } 658$

Difference in profit = $658 - 560 = \text{Rs. } 98.$

20) Answer: Option E

Explanation:

$x\% \text{ of } y = \left(\frac{x}{100} \times y\right) = \left(\frac{y}{100} \times x\right) = y\% \text{ of } x$

$\therefore A = B.$

21) Answer: Option D

Explanation:

$5\% \text{ of } A + 4\% \text{ of } B = \frac{2}{3} (6\% \text{ of } A + 8\% \text{ of } B)$

$\Rightarrow \frac{5}{100}A + \frac{4}{100}B = \frac{2}{3} \left(\frac{6}{100}A + \frac{8}{100}B\right)$

$\Rightarrow \frac{1}{20}A + \frac{1}{25}B = \frac{1}{25}A + \frac{4}{75}B$

$\Rightarrow \left(\frac{1}{20} - \frac{1}{25}\right)A = \left(\frac{4}{75} - \frac{1}{25}\right)B$

$$\Rightarrow \frac{1}{100}A = \frac{1}{75}B$$

$$\Rightarrow \frac{A}{B} = \frac{100}{75} = \frac{4}{3}$$

∴ Required ratio = 4 : 3

22) Answer: Option A

Explanation:

$$\text{Rebate} = 6\% \text{ of Rs. } 6650 = \text{Rs. } \left(\frac{6}{100} \times 6650\right) = \text{Rs. } 399$$

$$\text{Sales tax} = 10\% \text{ of Rs. } (6650 - 399) = \text{Rs. } \left(\frac{10}{100} \times 6251\right) = \text{Rs. } 625.10$$

$$\text{∴ Final amount} = \text{Rs. } (6251 + 625.10) = \text{Rs. } 6876.10$$

23) Answer - B (2490 and 4150)

Explanation - Let the numbers be a and b.

Then, 7.5 % of a = 12.5% of b

$$a = 125 \times b / 75 = 5 \times b / 3.$$

$$\text{Now, } a - b = 1660$$

$$5 \times b / 3 - b = 1660$$

$$2 \times b / 3 = 1660$$

$$b = (1660 \times 3) / 2 = 2490.$$

$$\text{One number} = 2490, \text{ Second number} = 5 \times b / 3 = 4150$$

24) Answer - B (2%)

Explanation - Required Percentage = $(130 / (6.5 \times 1000)) \times 100\% = 2\%$.

25) Answer - A (16800)

Explanation - Let the number of votes enrolled be a.

Then, Number of votes cast = 75% of a.

Valid votes = 98% of (75% of a). 75% of (98% of (75% of a)) = 9261.

$$(75/100) \times (98/100) \times (75/100) \times a = 9261.$$

$$a = (9261 \times 100 \times 100 \times 100) / (75 \times 98 \times 75) = 16800$$

26) Answer : B

Explanation :

A = 150% of B

$$A = \frac{150}{100} B$$

$$\frac{A}{B} = \frac{3}{2}$$

$$\frac{A}{B} + 1 = \frac{3}{2} + 1$$

$$\frac{A+B}{B} = \frac{5}{2}$$

$$\frac{B}{A+B} = \frac{2}{5}$$

Required percentage =

$$\frac{B}{A+B} \times 100 \% = \frac{2}{5} \times 100 \% = 40\%$$

27) Answer : B

Explanation :

Let one number = x, Then, other number = 80% of x = $\frac{4}{5}x$

$$4x^2 + \frac{4}{5}x^2 = 656$$

$$x^2 + \frac{16}{25}x^2 = 164$$

$$\frac{41}{25}x^2 = 164$$

$$x^2 = \frac{164 \times 25}{41} = 100 \quad x = 100$$

So, the numbers are 10 and 8.

28) Answer : C

Explanation :

Amount paid to car owner = 90% of 85% of Rs. 3,25,000

$$= \text{Rs. } \frac{90}{100} \times \frac{85}{100} \times 325000 = \text{Rs. } 2,48,625$$

Required difference = Rs. (325000 - 248625) = Rs. 76,375

29) Answer:

Explanation:

Let the number of applicants be x. Number of eligible candidates = 95% of x.

Eligible candidates of each other categories = 15% of (95% of x).

$$= (15/100 \times 95/100 \times x)$$

$$= 57/400 \times x.$$

Therefore, $57/400 \times x = 4275$

$$\Rightarrow x = (4275 \times 400 / 57)$$

$$\Rightarrow 30000.$$

30) Answer:

Explanation:

Total number of votes polled = (1136 + 7636 + 11628) = 20400.

Required percentage = $(11628 / 20400 \times 100)\% = 57\%$.

Chapter – 3: Profit & Loss, Partnership

1) Answer: : A, 85 : 9 = 105 : x

Explanation:

$$x = (9 \times 105 / 80)$$

$$= \text{Rs. } 11.81$$

Hence, S.p per Kg = Rs. 11.81

2) Answer: C

Explanation:

$$C.P = \text{Rs. } (100 / 122.50 \times 392)$$

$$= \text{Rs. } (1000 / 1225 \times 392)$$

$$= \text{Rs. } 320.$$

Therefore, Profit = Rs. (392 - 320)

$$= \text{Rs. } 72.$$

3) Answer: : D

Explanation:

Let C.P be Rs. x

Then, 2% of x = (400 - 380)

$$= 20$$

$$x / 50 = 20$$

$$x = 1000.$$

4) Answer: : A

Explanation :

Let C.P. of each mango be Re. 1.

C.P. of 110 mangoes = Rs. 110; S.P. of 110 mangoes = Rs. 120

$$\text{Gain\%} = \frac{10}{110} \times 100\% = 9\frac{1}{11}$$

5) Answer: : D

Explanation :

Suppose he buys 6 eggs of each kind

C.P. of 12 eggs = Rs. $\frac{1}{2} \times 6 + \frac{2}{3} \times 6 = \text{Rs. } 7$,

S.P. of 12 eggs = Rs. $\frac{3}{5} \times 12 = \text{Rs. } 7.20$,

Gain = $\frac{0.20}{7} \times 100\% = 2\frac{6}{7}\%$

6) Answer:: Option B

Explanation:

Let C.P. be Rs. x and S.P. be Rs. y .

Then, $3(y - x) = (2y - x) \Rightarrow y = 2x$.

Profit = Rs. $(y - x) = \text{Rs. } (2x - x) = \text{Rs. } x$.

$\therefore \text{Profit \%} = \left(\frac{x}{x} \times 100\right)\% = 100\%$

7) Answer:: Option C

Explanation:

S.P. = 85% of Rs. 1400 = Rs. $\left(\frac{85}{100} \times 1400\right) = \text{Rs. } 1190$

8) Answer: C

Explanation:

S.P. = 85% of Rs. 1400

= Rs. $(85/100 \times 1400) = \text{Rs. } 1190$.

9) Answer: C

Explanation:

C.P. = Rs. $(80000 + 5000 + 1000) = \text{Rs. } 86000$

Profit = 25%.

S.P. = 12.5% of Rs. 86000

= Rs. $(125/100 \times 86000) = \text{Rs. } 107500$.

10) Answer: B

Explanation:

Gain% = $(0.70/70 \times 100)\% = 1\%$.

11) Answer:: Option A

Explanation:

Let marked price = Rs. 100.

Then, C.P. = Rs. 64. S.P. = Rs. 88.

$\therefore \text{Gain \%} = \left(\frac{24}{64} \times 100\right)\% = 37.5\%$

12) Answer: - C (10%)

Explanation - Suppose he bought 2 kg, 4 kg and 3 kg of the three varieties.

C.P. of 9 kg = Rs. $(2 \times 50 + 4 \times 20 + 3 \times 30) = \text{Rs. } 270$

S.P. of 9 kg = Rs. $(9 \times 33) = \text{Rs. } 297$

Profit% = $\frac{27}{270} \times 100\% = 10\%$

13) Answer: - B (10%)

Explanation - (C.P. of 36 mangoes) - (S.P. of 36 mangoes) -

Loss = (S.P. of 4 mangoes)

S.P. of 40 mangoes = C.P. of 36 mangoes

Let C.P. of each mango be Re. 1.

C.P. of 40 mangoes = Rs. 40; S.P. of 40 mangoes = Rs. 36

Loss% = $\frac{4}{40} \times 100\% = 10\%$

14) Answer: - C (25%)

Explanation -

Let C.P. = Rs. $4x$. Then, S.P. = Rs. $5x$. Gain = Rs. $(5x - 4x)$ = Rs. x

Gain% = $\frac{x}{4x} \times 100\% = 25\%$

15) Answer:: Option B

Explanation:

Let C.P. of each article be Re. 1 C.P. of x articles = Rs. x .

S.P. of x articles = Rs. 20.

Profit = Rs. $(20 - x)$.

$\therefore \left(\frac{20-x}{x} \times 100 = 25\right)$

$\Rightarrow 2000 - 100x = 25x$

= $125x = 2000$

$\Rightarrow x = 16$.

16) Answer:: Option D

Explanation:

(C.P. of 17 balls) - (S.P. of 17 balls) = (C.P. of 5 balls)

\Rightarrow C.P. of 12 balls = S.P. of 17 balls = Rs. 720.

C.P. of 1 ball = Rs. $\left(\frac{720}{12}\right) = \text{Rs. } 60$

17) Answer:

Explanation:

Let the original price = Rs. 100.

Then, C.P. = Rs. 90.

S.P. = 130% of Rs. 90 = Rs. $(130/100 \times 90) = \text{Rs. } 117$.

Required percentage = $(117 - 100)\% = 17\%$.

18) Answer:

Explanation:

S.P. = Rs. 27.50

Then Profit = 10%

So, C.P. = Rs. $(100/110 \times 27.50) = \text{Rs. } 25$.

when S.P. = Rs. 25.75

Profit = Rs. $(25.75 - 25) = \text{Rs. } 0.75$.

Profit % = $(0.75/25 \times 100)\% = 3\%$.

19) Answer:: Option C

Explanation:

Let C.P. = Rs. 100.

Then, S.P. = Rs. 120

Let marked price be Rs. x .

Then, 90% of $x = 120$

= $x = \left(\frac{120 \times 100}{90}\right)$

\therefore Marked Price = $33\frac{1}{3}\%$ above C.P.

20) Answer:: Option C

Explanation:

Let C.P. of each clock be Rs. x .

Then, C.P. of 90 clock = Rs. $90x$.

$\therefore (110\% \text{ of } 40x) + (120\% \text{ of } 50x) - (115\% \text{ of } 90x) = 40$

$\Rightarrow 44x + 60x - 103.5x = 40$

$\Rightarrow 0.5x = 40$

$\Rightarrow x = 80$

21) Answer: : D

Explanation :

Let the article be worth Rs. x .

C.P. = 90% of Rs. $x = \text{Rs. } \frac{9x}{10}$;

S.P. = 110% of Rs. $x = \text{Rs. } \frac{11x}{10}$

$$\text{Gain} = \text{Rs. } \frac{11x}{10} - \frac{9x}{10} = \text{Rs. } \frac{x}{5}$$

$$\text{Gain}\% = \frac{x}{5} \times \frac{10}{9x} \times 100 \% = 22\frac{2}{9}\% > 20\%.$$

22) Answer: : C

Explanation :

Let the C.P. be Rs. x. Then, 20% of x = 1100

$$\frac{20}{100} \times x = 1100 \Rightarrow x = 5500$$

C.P. = Rs. 5500, Expenditure on repairs = 10%.

$$\text{Actual price} = \text{Rs. } \frac{100}{110} \times 5500 = \text{Rs. } 5000.$$

Expenditure on repairs = Rs. (5500 - 5000) = Rs. 500

23) Answer: - A (18)

Explanation -

Let S.P. of 45 lemons be Rs. x. Then, 80 : 40 = 120 : x or x =

$$\frac{120 \times 40}{80} = 60$$

For Rs. 60, lemons sold = 45. For Rs. 24, lemons sold =

$$\frac{45 \times 24}{60} = 180$$

24) Answer: - D (more than 20% profit)

Explanation -

Let the article be worth Rs. x.

$$\text{C.P.} = 90\% \text{ of Rs. } x = \text{Rs. } \frac{9x}{10}$$

$$\text{S.P.} = 110\% \text{ of Rs. } x = \text{Rs. } \frac{11x}{10}$$

$$\text{Gain} = \frac{11x}{10} - \frac{9x}{10} = \text{Rs. } \frac{x}{5}$$

$$\text{Gain} = \frac{x}{5} \times \frac{10}{9x} \times 100\% = 22\frac{2}{9}\% > 20\%$$

25) Answer:: Option B

Explanation:

Cost Price (C.P.) = Rs. (4700 + 800) = Rs. 5500.

Selling Price (S.P.) = Rs. 5800.

Gain = (S.P.) - (C.P.) = Rs. (5800 - 5500) = Rs. 300.

$$\text{Gain \%} = \left(\frac{300}{5500} \times 100 \right) \% = 5\frac{5}{11}\%$$

26) Answer:: Option A

Explanation:

Let C.P. be Rs. x.

$$\text{Then, } \frac{1920 - x}{x} \times 100 = \frac{x - 1280}{x} \times 100$$

$$\Rightarrow 1920 - x = x - 1280$$

$$\Rightarrow 2x = 3200$$

$$\Rightarrow x = 1600$$

∴ Required S.P. = 125% of Rs. 1600

$$= \text{Rs. } \left(\frac{125}{100} \times 1600 \right) = \text{Rs. } 2000.$$

27) Answer:: Option D

Explanation:

Let the required gain percent be x%.

Then, (110% of 3000) + (100 + x)% of 3000 = 125% of 6000

$$\Rightarrow \left(\frac{110}{100} \times 3000 \right) + \left[\frac{(100+x)}{100} \times 3000 \right] = \frac{125}{100} \times 6000$$

$$\Rightarrow 30(100 + x) = 4200$$

$$\Rightarrow 100 + x = 140$$

$$\Rightarrow x = 40\%$$

28) Answer: : C

Explanation :

C.P. for B = 120% of Rs. 400

$$= \text{Rs. } \frac{120}{100} \times 400 = \text{Rs. } 480.$$

C.P. for C = 110% of Rs. 480

$$= \text{Rs. } \frac{110}{100} \times 480 = \text{Rs. } 528.$$

29) Answer: : B

Explanation :

Let C.P. = Rs. 100. Then, Profit = Rs. 320, S.P. = Rs. 420

New C.P. = 125% of Rs. 100 = Rs. 125; New S.P. = Rs. 420

Profit = Rs. (420 - 125) = Rs. 295

$$\text{Required percentage} = \frac{295}{420} \times 100\% = \frac{1475}{21}\% = 70\%$$

30) Answer: - B (16.30)

Explanation - C.P. of 50 kg wheat = Rs. (30 x 11.50 + 20 x 14.25)

$$= \text{Rs. } (345 + 285) = \text{Rs. } 630$$

$$\text{S.P. of 50 kg wheat} = 130\% \text{ of Rs. } 630 = \frac{130}{100} \times 630 = \text{Rs. } 819$$

$$\text{S.P. per kg} = \frac{819}{50} = \text{Rs. } 16.38 = \text{Rs. } 16.30.$$

31) Answer -C) 1040

Explanation :

A	B	G
6000 × 6	4000 × 12	8000 × 12
3	4	8

$$A:B:G = 3:4:8$$

$$\text{Akash's share} = 5200 \times (3/15) = 1040$$

32) Answer -C) 10 months

Explanation :

Let's profit x

$$\text{Yokesh profit} = 2x/3$$

$$\text{Kiran profit} = x - (2x/3) = x/3$$

$$K : Y = 1 : 2$$

Let's capital C, Yokesh time = N

$$\frac{((1/4)C \times 15)}{((3/4) \times N)} = \frac{1}{2} \Rightarrow N = \frac{(15 \times 2)}{3} = 10 \text{ months}$$

33) Answer -B) 28:49:64

Explanation :

$$10 \times a : 8 \times b : 7 \times c = 5 : 7 : 8$$

$$10a/8b = 5/7 \Rightarrow b = 7/5 a$$

$$10a/7c = 5/8 \Rightarrow c = 16/7 a$$

$$a:b:c = a:7/5a:16/7a = 28a:49a:64a \Rightarrow 28:49:64$$

34) Answer -C) 55.55

Explanation :

$$X:Y:Z = 4:3:2$$

$$Z = 250 \times (2/9) = 55.55$$

35) Answer - B) 12:20:25

Solution:

Investments: 2x, 4x, 5x

$$A:B:C = 2x*8 + 2x*4 : 4x*8 + (4x/2)*4 : 5x*8 + (5x/2)*4$$

$$A:B:C = 12:20:25$$

36) Answer – B) Rs. 18000

Solution:

Let $C = x$ then $B = x + 5000$ and $A = x + 5000 + 8000 = x + 13000$.

$$x + x + 5000 + x + 13000 = 60000 \Rightarrow 3x = 42000, x = 14000.$$

$$A:B:C = 27000 : 19000 : 14000 = 27 : 19 : 14$$

$$A's \text{ share} = \text{Rs. } (40000 * 27/60) = \text{Rs. } 18,000$$

37) Answer – B) Rs. 7548.96

Solution:

$$\text{Ratio} = 75:40:42$$

$$A:B:C = 75x : 40x : 42x = 75 : 40 : 42$$

$$80 : 84$$

$$B's \text{ share} = 80/337 * 31800 = \text{Rs. } 7548.96$$

38) Answer - B) Rs 18,000

Explanation:

Let B invests Rs x, then ratio of their profits

$$20000*12 : x*8 = 30,000 : x$$

$$\text{So } 30,000/x = 5/3$$

$$\text{Solve, } x = 18,000$$

39) Answer - C) Rs 5560

Explanation:

$$8000*4 + 7600*8 : 9000*4 + 9400*8$$

$$116 : 139$$

$$\text{Share of B} = 139/(116+139) * 10200 = 5560$$

40) Answer - D) Rs 16,100

Explanation:

Their shares are 5x, 4x, 7x resp.

$$5x - 4x = 2300$$

$$x = 2300$$

$$\text{So C got } 7*2300$$

Chapter 04: SI & CI

Practice set 1 Answers:

1) Answer:: Option A

Explanation :

Let the sum be Rs. x. Then,

$$C.I. = \left[x \left(1 + \frac{4}{100} \right)^2 - x \right] = \left(\frac{676}{625} x - x \right) = \frac{51}{625} x$$

$$S.I. = \left(\frac{x \times 4 \times 2}{100} \right) = \frac{2x}{25}$$

$$\therefore \frac{51x}{625} - \frac{2x}{25} = 1$$

$$\Rightarrow x = 625.$$

2) Answer:: Option D

Explanation :

Amount of Rs. 100 for 1 year
when compounded half-yearly

$$= \text{Rs. } \left[100 \times \left(1 + \frac{3}{100} \right)^2 \right] = \text{Rs. } 106.09$$

$$\therefore \text{Effective rate} = (106.09 - 100) \% = 6.09\%$$

3) Answer:: Option D

Explanation:

$$\text{Principal} = \text{Rs. } \left(\frac{100 \times 4016.25}{9 \times 5} \right)$$

$$= \text{Rs. } \left(\frac{401625}{45} \right)$$

$$= \text{Rs. } 8925.$$

4) Answer: - C (Rs 62,500 ; Rs 37,500)

Explanation -

Let the sum invested at 9% be Rs. a and that invested at 11% be Rs. (100000 - a).

$$\text{Then, } \frac{a \times 9 \times 1}{100} + \frac{(100000 - a) \times 11 \times 1}{100}$$

$$= 100000x \quad \frac{39}{4} \times \frac{1}{100}$$

$$\frac{9a + 1100000 - 11a}{100} = \frac{39000}{4} = 9750$$

$$2a = (1100000 - 975000) = 125000$$

$$a = 62500$$

$$\text{Sum invested at 9\%} = \text{Rs. } 62500$$

$$\text{Sum invested at 11\%} = \text{Rs. } (100000 - 62500) = \text{Rs. } 37500$$

5) Answer: - C (640)

Explanation -

$$\text{Sum} = \frac{\text{Difference in Interest}}{\text{Rate} \times \text{Difference in times}}$$

$$= \frac{144 \times 100}{15 \times 1.5} = 640$$

6) Answer: - D (None of these)

Explanation -

$$\text{Difference in C.I. and S.I. for 2 years} = \text{Rs. } (696.30 - 660) = \text{Rs. } 36.30$$

$$\text{S.I. for one year} = \text{Rs. } 330.$$

$$\text{S.I. on Rs. } 330 \text{ for 1 year} = \text{Rs. } 36.30$$

$$\text{Rate} = \frac{100 \times 36.30}{330 \times 1} \% = 11\%$$

7) Answer: - B (2028 and 1875)

Explanation -

$$\text{We have (A's present share)} = \left(1 + \frac{4}{100} \right)^7$$

$$= (\text{B's present share}) = \left(1 + \frac{4}{100} \right)^9$$

$$\frac{\text{A's present share}}{\text{B's present share}} = \left(1 + \frac{4}{100} \right)^2$$

$$\left(\frac{26}{25} \right)^2 = \frac{676}{625}$$

Dividing Rs. 3903 in the ratio of 676:625

$$\text{A's present share} = \frac{676}{(625+676)} \text{ of Rs. } 3903 = \text{Rs. } 2028$$

$$\text{B's present share} = \text{Rs. } 3903 - \text{Rs. } 2028 = \text{Rs. } 1875$$

8) Answer:

Explanation : A

First we calculate the SI for 10 years SI for 10 years is

$$\Rightarrow (1000 \times 5 \times 10)/100 = \text{Rs } 500$$

Now new principal is

$$P = \text{Rs. } 1500$$

$$A = \text{Rs. } 2000$$

$$SI = \text{Rs. } 500$$

$$SI = (P \times R \times T)/100$$

$$T = (500 \times 100)/1500 \times 5 = 6^{2/3} \text{ yr}$$

$$\text{So, the total amount of Time is } 10 + 6^{2/3} \text{ yr} = 16^{2/3} \text{ yr}$$

9) Answer:

Explanation : B

Let Sona invested for Y years

A sum will be double when interest is equal to principal

$$9535 = (9535 \times 4 \times Y)/100$$

$$4Y = 100$$

$$Y = 25 \text{ years}$$

10) Answer: - C (94.50)

Explanation -

$$\text{Sum} = \frac{100 \times 90}{2 \times 10} = \text{Rs. } 450$$

$$\begin{aligned} \text{C.I.} &= \text{Rs. } 450 \times \left(1 + \frac{10}{100}\right)^2 - 450 \\ &= \text{Rs. } 94.50 \end{aligned}$$

11) Answer: - C (2000)

Explanation -

$$\begin{aligned} \text{Sum} &= \frac{I \times 100}{R_1 \times T_1 + R_2 \times T_2 + R_3 \times T_3} \\ &= \frac{1120 \times 100}{4 \times 2 + 6 \times 4 + 8 \times 3} \\ &= 2000 \end{aligned}$$

12) Answer: - B (992)

Explanation -

$$S.I = \text{Rs. } (920 - 800) = \text{Rs. } 120; P = \text{Rs. } 800, T = 3 \text{ yrs}$$

$$R = \frac{(100 \times 120)}{800 \times 3} \% = 5\%$$

$$\text{New rate} = (5 + 3) \% = 8\%$$

$$\text{New S.I.} = \text{Rs. } \frac{(800 \times 8 \times 3)}{100} = \text{Rs. } 192.$$

$$\text{New amount} = \text{Rs. } (800 + 192) = \text{Rs. } 992$$

13) Answer:: Option C

Explanation :

$$S.I. \text{ for 1 year} = \text{Rs. } (854 - 815) = \text{Rs. } 39.$$

$$S.I. \text{ for 3 years} = \text{Rs. } (39 \times 3) = \text{Rs. } 117.$$

$$\therefore \text{Principal} = \text{Rs. } (815 - 117) = \text{Rs. } 698.$$

14) Answer:: Option C

Explanation :

Let P = Rs. 100. Then, S.I. Rs. 60 and T = 6 years.

$$\therefore R = \left(\frac{100 \times 60}{100 \times 6} \right) = 10\% \text{ p.a.}$$

Now, P = Rs. 12000. T = 3 years and R = 10% p.a.

$$\begin{aligned} \therefore \text{C.I.} &= \text{Rs. } \left[12000 \times \left\{ \left(1 + \frac{10}{100} \right)^3 - 1 \right\} \right] \\ &= \text{Rs. } \left(12000 \times \frac{331}{1000} \right) \\ &= 3972. \end{aligned}$$

15) Answer:

Explanation : B

Let the amount borrowed by Amit is A

Then,

$$A \left(1 + \frac{8}{100} \right)^2 - 1 - (A \times 8 \times 2)/100 = 16$$

$$= 0.1664A - 0.16A = 16$$

$$= A = (16/0.0064) = \text{Rs. } 2500$$

16) Answer:

Explanation : A

Let a be the amount lent by Sumit at 5% rate

So therefore according to the question

$$8\frac{1}{2} \% \text{ of } a - 5\% \text{ of } a = 350$$

$$17a/200 - 5a/100 = 350$$

$$7a/200 = 3500$$

$$a = 10000$$

17) Answer:

Explanation : A

Let the equal amount = A (each)

And the interest = r

Using the equation for compound interest:

$$A(1 + 5/100)^6 = A(1 + r/100)^3(1 + 5/100)^2 = (1 + r/100)(105 \times 105)/100 \times 100 = (100 + r)$$

$$r = 10.25\%$$

18) Answer:: Option C

Explanation :

$$\begin{aligned} \text{Amount} &= \text{Rs. } \left[8000 \times \left(1 + \frac{5}{100} \right)^2 \right] \\ &= \text{Rs. } \left(8000 \times \frac{21}{20} \times \frac{21}{20} \right) \\ &= \text{Rs. } 8820 \end{aligned}$$

19) Answer:: Option B

Explanation :

$$\text{Time} = \left(\frac{100 \times 81}{450 \times 4.5} \right) \text{ years} = 4 \text{ years.}$$

20) Answer: - A (Rs 2950)

Explanation -

Here, I = Rs. 1770, R = 8% per annum,

$$T = \frac{15}{2} \text{ years}$$

$$\text{Principal (P)} = \frac{100 \times I}{R \times T} = \frac{100 \times 1770}{8 \times \frac{15}{2}} = \text{Rs. } 2950$$

21) Answer: - A (20,000)

Explanation -

Here, P₁ = Rs. 12000, R₁ = 10%, P₂ = ?, R₂ = 20%, R = 14%

Therefore, using the formula

$$R = \frac{P_1 R_1 + P_2 R_2}{P_1 + P_2}$$

We get, $14 = \frac{12000 \times 10 + P \times 20}{12000 + P}$

or, $P = \text{Rs. } 8000$

Total amount invested = Rs. (12000 + 8000) = Rs. 20000

22) Answer: - A (1)

Explanation -

Here

$P_1 = \text{Rs. } 3000$

$P_2 = \text{Rs. } 2000$

Difference in interest = $\frac{(\text{Difference in } P) \times N \times R}{100}$

$50 = \frac{1000 \times 5 \times N}{100} = N = 1 \text{ year}$

23) Answer: - A (100)

Explanation -

Let the maximum marks be x .

From the given statement pass percentage is 42% - 12% = 30%

By hypothesis, 30% of x - 20% of $x = 10$ (marks)

i.e., 10% of $x = 10$

Therefore, $x = 100$ marks.

24) Answer:

Explanation : B

Amount invested at 12% = Rs A

Amount invested at 10% = Rs B

$= 130 = (A \times 12 \times 1) / 100 + (B \times 10 \times 1) / 100$

$= 13000 = 12A + 10B \dots\dots 1$

$= 134 = (A \times 10 \times 1) / 100 + (B \times 12 \times 1) / 100$

$= 13400 = 10A + 12B \dots\dots 2$

Solving equations 1 and 2 we get

$A = \text{Rs } 500$

So the amount invested at the rate of 12% is Rs 500

25) Answer:

Explanation : D

Present value of money = v

Then $(v \times 12) / 100 + v = 10028$

$= (0.12v \times v) = 10028$

$= (v) = 10028 / 1.12$

Now this amount will become after 3 months

$\{(10028 / 1.12) \times 12 \times 3\} / (12 \times 100) + 10028 / 1.12$

$= \{(10028 \times 3) / 1.12 \times 100\} + 10028 / 1.12$

$= (10028 / 103) / 112 = 9222.17 = \text{Rs } 9200$

26) Answer:

Explanation : D

Let each sum be Rs a , then

From the given condition

$\{(a \times 4 \frac{1}{2} \times 7) / 100\} - \{(a \times 4 \times 7) / 100\} = 31.50$

$= 7a / 100 \times \frac{1}{2} = 63 / 2$

$= a = \text{Rs } 900$

27) Answer:: Option B

Explanation :

$P \left(1 + \frac{20}{100} \right)^n > 2P \Rightarrow \left(\frac{6}{5} \right)^n > 2$

Now, $\left(\frac{6}{5} \times \frac{6}{5} \times \frac{6}{5} \times \frac{6}{5} \right) > 2$.

So, $n = 4$ years.

28) Answer:: Option A

Explanation :

Let the sum invested in Scheme A be Rs. x and that in Scheme B be Rs. (13900 - x).

Then, $\left(\frac{x \times 14 \times 2}{100} \right) + \left(\frac{(13900 - x) \times 11 \times 2}{100} \right) = 3508$

$\Rightarrow 28x - 22x = 350800 - (13900 \times 22)$

$\Rightarrow 6x = 45000$

$\Rightarrow x = 7500$.

So, sum invested in Scheme B = Rs. (13900 - 7500) = Rs. 6400.

29) Answer: - C (Rs. 14800)

Explanation -

We have, $P = \text{Rs. } 10000$, $R = 8\%$ per annum, $T = 6$ years

$I = \frac{P \times R \times T}{100} = \frac{10000 \times 8 \times 6}{100}$

$A = P + I = 10000 + 4800 = \text{Rs. } 14800$

This, Mr. Jumbo returned Rs. 14800 to the finance company

30) Answer: - C (10%)

Explanation:

We have, $T = 2$ years

Let the principal be Rs. X

Then, simple interest (I) = Rs $\frac{x}{5}$

Rate of interest (R) = $\frac{100 \times I}{P \times T} = \frac{100 \times \frac{x}{5}}{x \times 2}$

$\frac{100}{5 \times 2} = 10\% \text{ p.a.}$

Practice set 2 Answers:

1. Answer: B

Explanation:

It will become $(4)^2$ times in $2 \times 3 = 6$ yr.

$SI = \frac{12000 \times 8 \times 8}{12 \times 100} = \text{Rs. } 640$

2. Answer: C

3. Answer: B

Explanation:

Let the rate of interest be $r\%$

Then, $\frac{4410}{4200} = \frac{(1 + r / 100)^5}{(1 + r / 100)^4} = \frac{63}{60} = 1 + \frac{r}{100} = r = 5\%$

4. Answer: B

Explanation:

$P \left\{ \left(1 + \frac{4}{100} \right)^3 - 1 \right\} = \text{Rs. } 62.432 \Rightarrow P \left\{ \left(\frac{104}{100} \right)^3 - 1 \right\} = 62.432$

$\Rightarrow P \left\{ \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} - 1 \right\} = 62.432 \Rightarrow P \left\{ \frac{17576}{15625} - 1 \right\} = 62.432$

$\Rightarrow P \left\{ \frac{1951}{15625} \right\} = 62.432 \Rightarrow P = 500$

5. Answer: B

Explanation:

	SI	CI
Ist year	300	300
IInd year	300	$300 + 300 \times 5\% = 315$
	600	615

6. Answer: C

Explanation:

Let the sum be Rs. 100

After 20 years it becomes Rs. 200

\therefore Interest = 200 - 100 = 100

$$\text{Then, rate} = \frac{100I}{Pt} = \frac{100 \times 100}{100 \times 20} = 5\%$$

7. Answer: A

Explanation:

According to question, $10\frac{1}{2}\%$ of P - 4% of P = 650 $\Rightarrow 6.5\%$ of P = 650

$$\therefore P = \frac{650}{6.5} \times 100 = \text{Rs. } 10,000$$

8. Answer: B

Explanation:

$$\text{Sum} = \frac{8.181 \times (100)^3}{3 \times 3(300 + 3)} = \frac{8181000}{2727} = \text{Rs. } 300$$

9. Answer: B

Explanation:

The second year (in terms of CI) is

$$\frac{P \left(1 + \frac{r}{100}\right)^2}{P \left(1 + \frac{r}{100}\right)} = \frac{11}{10} \Rightarrow \left(1 + \frac{r}{100}\right) = \frac{11}{10} \Rightarrow \frac{1}{10} = \frac{r}{100} \Rightarrow r = 10\%$$

10. Answer: D

Explanation:

$$\text{Difference} = \frac{\text{Sum} \times r^2 (300 + r)}{(100)^3} = \frac{6000 \times 2 \times 2(300 + 2)}{1000000} = \text{Rs. } 7.248$$

11. Answer: A

Explanation:

$$= \text{Rs. } \frac{60}{2} = \text{Rs. } 30$$

First Year's SI

CI - SI = Rs. 61.80 - Rs. 60 = Rs. 1.80

Interest on Rs. 30 for 1 year = Re. 1.80

\therefore Interest on Rs. 100 for 1 year = Rs.

$$= \text{Rs. } \frac{1.80}{30} \times 100 = \text{Rs. } 6$$

\therefore rate = 6%

$$\text{Now, principal P is given by } P = \frac{100 \times I}{rt} = \frac{100 \times 60}{2 \times 6} = \text{Rs. } 500$$

12. Answer: C

Explanation:

$$\text{We have } P \left(1 + \frac{r}{100}\right)^4 = 2P \therefore \left(1 + \frac{r}{100}\right)^4 = 2$$

$$\left(1 + \frac{r}{100}\right)^{12} = 2^3 = 8 \quad \text{or, } P \left(1 + \frac{r}{100}\right)^{12} = 8P$$

Hence, the required time is 12 years.

13. Answer: D

Explanation:

$$A = P \left(1 + \frac{R}{100}\right)^n \Rightarrow \frac{52900}{48400} = \left(1 + \frac{R}{100}\right)^2 \Rightarrow \frac{23}{22} = 1 + \frac{R}{100} \Rightarrow R = 4\frac{6}{11}\%$$

14. Answer: C

Explanation:

$$16 = \left(1 + \frac{R}{100}\right)^2 \Rightarrow 4 = \left(1 + \frac{R}{100}\right) \Rightarrow R = 300\%$$

15. Answer: A

Explanation:

It will become $(5)^2$ times in $2 \times 4 = 8$ yr

16. Answer: C

Explanation:

Let the sum be Rs. x

$$CI = x \left(1 + \frac{10}{100}\right)^2 - x = \frac{21x}{100} \quad SI = \frac{x \times 10 \times 2}{100} = \frac{x}{5}$$

$$\text{Given, } \frac{21x}{100} - \frac{x}{5} = 432 \Rightarrow x = \text{Rs. } 43200$$

17. Answer: B

Explanation:

In the case $R = 6\%$; $T =$ months or 2

$$\therefore \text{Amount} = 15000 \times \left(1 + \frac{6}{100}\right)^2 \\ = 15000 \times \frac{106}{100} \times \frac{106}{100} = \text{Rs. } 16854$$

$$CI = (16854 - 15000) = \text{Rs. } 1854$$

18. Answer: D

Explanation:

$$A = P \left(1 + \frac{R/2}{100}\right)^{2n} \Rightarrow A = 400 \left(1 + \frac{3}{100}\right)^2 \Rightarrow A : \\ = 400 \left(\frac{103 \times 103}{100 \times 100}\right) \Rightarrow A = \frac{103 \times 103}{25} = 424.36$$

\therefore Compound interest = Rs. 424.36 - Rs. 400 = Rs. 24.36

19. Answer: C Explanation:

$$\text{Amount} = 6800 \left[1 + \frac{2}{100}\right] \left[1 + \frac{4}{100}\right] \left[1 + \frac{5}{100}\right] = \frac{6800 \times 102 \times 104 \times 105}{100 \times 100 \times 100} = \text{Rs. } 7574.112$$

20. Answer: B

Explanation:

From the question,

$$9\% \frac{1}{3}x + 8\% \text{ of } \frac{1}{4}x + 6\% \text{ of } \left[1 - \left(\frac{1}{3} + \frac{1}{4}\right)\right]x = \text{Rs. } 660$$

$$\text{or, } 660 = \frac{\frac{1}{3}x \times 9}{100} + \frac{\frac{1}{4}x \times 8}{100} + \frac{\frac{5}{12}x \times 6}{100} \Rightarrow 660 = \frac{3x}{100} + \frac{2x}{100} + \frac{5/2x}{100} \\ \Rightarrow 660 = \frac{x}{100} \left(3 + 2 + \frac{5}{2}\right) = \frac{x}{100} \left(\frac{15}{2}\right) \Rightarrow 660 = \frac{3x}{40} \Rightarrow x = 8800$$

21. Answer: A

Explanation:

Let the sum be Rs. x, then

$$\frac{x \times 8 \times 8}{100} - \frac{x \times 11 \times 8}{200} = 170 \Rightarrow \frac{x}{100} [64 - 44] = 170 \Rightarrow x = \frac{17000}{20} = 850$$

22. Answer: B

$$\text{Principal} = \frac{100 \times \text{Amount}}{100 + rt} = \frac{100 \times 2584}{100 + 36} = \text{Rs. 1900}$$

$$\text{Again, } 1900 = \frac{100 \times 3496}{100 + 12t} \Rightarrow 1900 = \frac{349600}{100 + 12t} \Rightarrow t = 7$$

23. Answer: C

Explanation:

$$\text{Difference between CI and SI} = \frac{PR^2}{(100)^2} \text{ for 2 years}$$

$$\Rightarrow 2.88 = \frac{P \times 8^2}{(100)^2} \Rightarrow P = 450$$

24. Answer: D

Explanation:

$$A = P \left(1 + \frac{r_1}{100} \right) \left(1 + \frac{r_2}{100} \right) \left(1 + \frac{r_3}{100} \right) \dots$$

Where, A = Amount, P = Principal, and r_1, r_2, r_3 , are the rates of interest for different years.

In the above case,

$$3439.17 = P \left(1 + \frac{3}{100} \right) \left(1 + \frac{6}{100} \right) \left(1 + \frac{5}{100} \right) \Rightarrow 3439.17 = P \left(\frac{103}{100} \times \frac{106}{100} \times \frac{105}{100} \right)$$

$$\therefore P = \frac{343917}{1.03 \times 1.06 \times 1.05} = \text{Rs. 3000}$$

25. Answer: C

Explanation:

Let the sum be Rs x and the original rate be y% per annum.

Then, new rate = (y+4)% per annum.

$$\therefore \left(1 + \frac{R}{100} \right)^n = \frac{52900}{48400} = \left(1 + \frac{R}{100} \right)^2 \Rightarrow \frac{23}{22} = 1 + \frac{R}{100} \Rightarrow R = 4\frac{6}{11}\%$$

26. Answer: B

Explanation:

Let the deposit = Rs. 100

Interest for first 3 years = Rs. 12

Interest for next 2 years = Rs. 12

Interest for the last 2 year = Rs. 16

Total interest = Rs. 40

When interest is Rs. 40 deposited amount is Rs. 100

\therefore When interest is Rs. 1200, deposited amount =

$$= \frac{100}{40} \times 1200 = \text{Rs. 3000}$$

27. Answer: B

Explanation:

Amount for 3 yrs. = 5320

Amount for $4\frac{1}{2}$ yrs. = 5980

\Rightarrow So interest for $1\frac{1}{2}$ yrs. = 660

$$= \frac{660 \times 2}{3} = 440$$

\therefore Interest for 1 yrs =

\Rightarrow So interest for 3 yrs = 1320

P = A for 3yrs - I for 3yrs. = 5320 - 1320 = 4000

$$\therefore R = \frac{SI \times 100}{P \times T} = \frac{1320 \times 100}{4000 \times 3} = 11\%$$

28. Answer: D

Explanation:

First rate of interest =

$$= \frac{144 \times 100}{600 \times 4} = 6\%$$

New rate = 6 - 3 = 3%

$$\therefore \text{New interest} = \frac{600 \times 4 \times 3}{100} = \text{Rs. 72}$$

\therefore New Amount = 600 + 72 = Rs. 672

29. Answer: C

Explanation:

First rate of interest =

$$= \frac{165 \times 100}{500 \times 3} = 11\%$$

New rate = 11 + 4 = 15%

$$\therefore \text{New interest} = \frac{500 \times 3 \times 15}{100} = \text{Rs. 225}$$

\therefore New Amount = 500 + 225 = Rs. 725

30. Answer: D

Explanation:

Each Interest =

$$\text{Each Interest} = \frac{I \text{ Part} \times 3 \times 8}{100} = \frac{II \text{ Part} \times 5 \times 12}{100}$$

$$\text{Or, } \frac{I \text{st Part}}{2 \text{nd Part}} = \frac{5 \times 12}{3 \times 8} = \frac{5}{2} \Rightarrow$$

$$\therefore II \text{ part} = \frac{2170 \times 2}{7} = \text{Rs. 620}$$

Chapter 05 Averages

Practice set I Answers

1) Answer: B

Explanation:

Clearly, we have (3 + 11 + 7 + 9 + 15 + 13 + 8 + 19 + 17 + 21 + 14 + x/12) = 12

$$137 + x = 144$$

$$X = 144 - 137$$

$$X = 7$$

2) Answer: C

Explanation:

Age of the teacher = (37 x 15 - 36 x 14) years = 51 years.

3) Answer: D

Explanation:

Age decreased = (5 x 3) years = 15 years

So, required difference = 15 years.

4) Answer - D (39.8)

Explanation -

There are 5 prime numbers- 31, 37, 41, 43, 47

$$\text{Average} = \frac{31+37+41+43+47}{5} = \frac{199}{5} = 39.8$$

5) Answer - B (56)

Explanation -

The total of 11 results = 11 x 50 = 550

The total of first 6 results = 6 x 49 = 294

The total of last 6 results = 6 x 52 = 312

The sixth result is common to both:

$$\text{Sixth result} = 294 + 312 - 550 = 56$$

6) Answer B

Explanation :

$$\text{Average} = \frac{10+15+20+25+30}{5} = \frac{100}{5} = 20$$

7) Answer : C

Explanation :

Let the initial number of persons be x . Then,

$$16x + 20 \times 15 - 15.5(x + 20)$$

$$0.5x = 10$$

$$x = 20$$

8) Answer: Option A

Explanation:

Let the number of girls be x . Then, number of boys = $(600 - x)$.

$$\text{Then, } \left(11\frac{3}{4} \times 600\right) = 11x + 12(600 - x)$$

$$= x = 7200 - 7050$$

$$= x = 150$$

9) Answer: Option A

Explanation:

Let their prices be $3x$, $5x$, and $7x$.

Then, $3x + 5x + 7x = (15000 \times 3)$, or $x = 3000$

Hence, cost of cheapest item = $3x = \text{Rs. } 9000$

10) Answer: : A

Explanation:

Average of 20 numbers = 0

Sum of 20 numbers = $(0 \times 20) = 0$.

It is quite possible that 19 of these numbers may be positive and if there sum is a , then 20th number is $(-a)$.

11) Answer: : D

Explanation:

Clearly, to find the average, we ought to know the numbers of boys, girls or students in the class, neither of which has been given.

so the data provided is inadequate.

12) Answer - (A)

Explanation:

Basic Formula:

$1, 2, 3, \dots, n$

If n is odd, the formula is $\frac{n+1}{2}$ th term

The five multiples of 3 is 3, 6, 9, 12, 15

$$= \frac{n+1}{2} = \frac{5+1}{2} \text{th term}$$

$$\Rightarrow \frac{6}{2} \text{th term} = 3 \text{rd term}$$

Here 3rd term is 9

13) Answer - C (45)

Explanation -

Total ages of 30 boys = $14 \times 30 = 420$ years

Total age when class teacher is included = $15 \times 31 = 465$ years

Age of class teacher = $465 - 420 = 45$ years

14) Answer : A)

Explanation :

$$\text{Required run rate} = \frac{282 - (3.2 \times 10)}{40} = \frac{250}{40} = 6.25$$

15) Answer: Option b

Explanation:

Sum of the present ages of husband, wife and child = $(27 \times 3 + 3 \times 3)$ years = 90 years.

Sum of the present ages of husband, wife and child = $(20 \times 2 + 5 \times 2)$ years = 90 years.

Husband's present age = $(90 - 50)$ years = 40 years

16) Answer: : B

Required average speed = $(2xy / x + y)$ km/hr

$$= 2 \times 84 \times 56 / (84 + 56)$$

$$= (2 \times 84 \times 85 / 140)$$

$$= 67.2 \text{ km/hr.}$$

17) Answer: : B

Clearly, we have $X = (3y + 3z/6)$ or $2x = y + z$

18) Answer - B (73.5)

Explanation -

$$\text{Average} = \frac{7(1+2+3+\dots+20)}{20} = \frac{7 \times 20 \times 21}{20 \times 2} = 73.5$$

19) Answer: Option E

Explanation:

Let the number be x , y , and z .

$$\text{Then, } \left(\frac{x+y}{2}\right) - \left(\frac{y+z}{2}\right)$$

$$= 15 \text{ or } (x+y) - (y+z) = 30 \text{ or } x - z = 30$$

20) Answer - (D)

Explanation:

Total weight of $(36+44)$ Students = $(36 \times 40 + 44 \times 35)$ kg = 2980 kg

Therefore average weight of the whole class = $(2980/80)$ kg

Therefore average weight = 37.25 kg

21) Answer - B (37)

Explanation -

Let the average after 16th innings be a , then total score after 17th innings =

$$16a + 85 = 17(a + 3)$$

$$a = 85 - 51 = 34$$

$$\text{Average after 17 innings} = a + 3 = 34 + 3 = 37$$

22) Answer : A)

Explanation :

Total quantity of petrol consumed in 3 years =

$$\frac{4000}{7.50} + \frac{4000}{8} + \frac{4000}{8.50} \text{ litres}$$

$$= 4000 \left(\frac{2}{15} + \frac{1}{8} + \frac{2}{17} \right) = \frac{76700}{51} \text{ litres}$$

Total amount spent = Rs. (3×4000) = Rs. 12000

$$\text{Average cost} = \text{Rs. } \frac{12000 \times 51}{76700} = \text{Rs. } \frac{6120}{767} = \text{Rs. } 7.98$$

23) Answer: Option c

Explanation:

Let the third number be x . Then, second number = $2x$. First number = $4x$

$$\therefore \frac{1}{x} + \frac{1}{2x} + \frac{1}{4x} = \left(\frac{7}{72} \times 3\right) \text{ or } \frac{7}{4x} = \frac{7}{24}$$

Or $4x = 24$ or $x = 6$

So, the numbers are 24, 12 and 6.

24) Answer - (D)

Explanation:

$$\text{Average speed} = \frac{2xy}{x+y} \text{ km/hr}$$

$$= \frac{2 \times 84 \times 56}{84 + 56} \text{ km/hr} = \frac{2 \times 84 \times 56}{84 + 56} \text{ km/hr} = 67.2 \text{ km/hr}.$$

25) Answer - B (33 1/3)

Explanation - Let the journey by a km. Then $a/3$ km at the speed of 25 km/hr and $a/4$ km at 30 km/hr and the rest distance ($a - a/3 - a/4$) = $5/12$ x a at the speed of 50 km/hr.

Total time taken during the journey of a km

$$\frac{a}{3 \times 25} + \frac{a}{4 \times 60} + \frac{5a}{12 \times 50} = \frac{18a}{600}$$

$$= \frac{3a}{100} = \frac{a}{100} = \frac{100}{3} = 33\frac{1}{3} \text{ km/hr}$$

26) Answer : A)

Explanation :

Present age of (A + B) = (18 x 2 + 3 x 2) years = 42 years.

Present age of (A + B + C) = (22 x 3) years = 66 years.

C's age = (66 - 42) years = 24 years.

27) Answer: Option A

Explanation:

$$\text{Required run rate} = \frac{282 - (3.2 \times 10)}{40} = \frac{250}{40} = 6.25$$

28) Answer: : C

Explanation:

$$\text{Average Speed} = (2xy/x + y) \text{ km/hr}$$

$$= (2 \times 50 \times 30 / 50 + 30)$$

$$= 37.5 \text{ km/hr}.$$

29) Answer - B (100)

Explanation -

Let the number of passed candidates be a

Then total marks => $120 \times 35 = 39a + (120 - a) \times 15$

$$4200 = 39a + 1800 - 15a$$

$$a = 100$$

30) Answer : C)

Explanation :

Sum of odd numbers upto 100 = $1 + 3 + 5 + 7 + \dots + 95 + 97 + 99$.

$$= (1 + 99) + (3 + 97) + (5 + 95) + \dots + \text{upto 25 pairs}.$$

$$= 100 + 100 + 100 + \dots (25 \text{ times}) = 2500.$$

$$\text{Average} = \frac{2500}{50} = 50$$

Practice set Answers: 2

1) Answer : A

Explanation :

Let the required number of assistance = x

$$\Rightarrow 130x + 440 \times 16 = 140(16 + x)$$

$$\Rightarrow 130x + 7040 = 2240 + 140x$$

$$\Rightarrow 4800 = 10x$$

$$\Rightarrow x = 480$$

2) Answer : D

Explanation :

Suppose the average expenditure was Rs. x. Then total expenditure = 40x.

When 8 more students join the mess, total expenditure = 40x + 48.

$$= \frac{40x + 48}{40 + 8}$$

Now, the average expenditure =

Now, we have

$$\frac{b^m}{1 + a^{(n-m)}} + \frac{1}{(1 + a^{(m-n)})} \cdot \frac{b^m}{b^{-m}} = \frac{b^m}{\left(1 + \frac{a^n}{a^m}\right)} + \frac{b^m}{\left(1 + \frac{a^m}{a^n}\right)}$$

$$= b^m \left[\frac{a^m}{(a^m + a^n)} + \frac{a^n}{(a^m + a^n)} \right] = \frac{(a^m + a^n)b^m}{(a^m + a^n)} = b^m$$

$$\Rightarrow 40x + 48 = 48(x - 2)$$

$$\Rightarrow 40x + 48 = 48x - 96$$

$$\Rightarrow 8x = 144$$

$$\Rightarrow x = 18.$$

Thus the original expenditure of the mess = 40×18 = Rs. 720

3. Answer : C

Explanation :

$$= \frac{71+1}{2} = \frac{72}{2} = 36$$

we have the required average =

4) Answer : A

Explanation :

Let the ratio be k : 1. Then, $k \times 17.9 + 1 \times 16.8 = (k + 1) \times 17.4$

$$\Rightarrow k \times 17.9 + 1 \times 16.8 = (k + 1) \times 17.4$$

$$\Rightarrow (17.9 - 17.4)k = 17.4 - 16.8$$

$$\Rightarrow .5k = .6$$

$$\Rightarrow k = \frac{0.6}{0.5} = \frac{6}{5},$$

$$\text{Required ratio} = \frac{6}{5} : 1 = 6 : 5.$$

5) Answer : C

Explanation :

we have the required answer = $2(7 - 1) = 12$

6) Answer : A

Explanation :

Weight of the teacher = $(45.4 \times 35 - 45 \times 34)$ kg = 59 kg.

7) Answer : C

Explanation :

Total age increased = (7×2) years = 14 years

Sum of ages of two new men = $(22 + 26 + 14)$ years = 62 years.

Average age of 2 new member = $62/2 = 31$ years.

8) Answer : D

Explanation :

Total increase in weight of 8 Oranges $(22 \times 8) = 176$ gm. This increase in the weight is due to replacement of a orange with a new orange whose weight is 176 gm more than the orange

replaced. Therefore, weight of new orange = $(124 + 176) = 300$ gm.

9) Answer : D

Explanation :

$$\text{Averaged speed} = \frac{\text{Sum of N observations}}{\text{Total Numbers of observations}} = 24 \text{ km}$$

10) Answer : A

Explanation :

$$\text{Total weight of 39 students} = 39 \times 38 = 1482 \text{ kg}$$

$$\text{Total weight of 40 student} = 40 \times 37.5 = 1500 \text{ kg}$$

$$\therefore \text{Weight of new student} = (1500 - 1482) \text{ kg} = 18 \text{ kg}$$

11) Answer : D

Explanation :

$$\text{Mon.} + \text{Tues.} + \text{Wed.} = 51 \times 3 = 153^\circ \text{C} \dots (i)$$

$$\text{Mon.} + \text{Wed.} + \text{Thu.} = 50 \times 3 = 150^\circ \text{C} \dots (ii)$$

$$\text{Thu.} = 49^\circ \text{C} \text{ Mon.} + \text{Wed.} = 150 - 49 = 101^\circ \text{C} \dots (iii)$$

$$\text{From Eqs. (i) and (iii), Tues.} = 153 - 101 = 52^\circ \text{C}$$

12) Answer : D

Explanation :

Average of the first and the second numbers =

$$= \frac{\text{First} + \text{Second}}{2} \text{ and}$$

Average of the second and the third numbers =

$$= \frac{\text{Second} + \text{Third}}{2},$$

$$\text{According to the question, } \frac{\text{First} + \text{Second}}{2} - \frac{\text{Second} + \text{Third}}{2} = 2$$

$$\therefore \text{First} - \text{Third} = 40$$

13) Answer : C

Explanation :

$$\text{Total of 100 observations} = 3000$$

$$\text{Correct total of 100 observations} = (3000 - 76 + 46) = 2970$$

$$\therefore \text{Correct average} = 29.7$$

14) Answer : D

Explanation :

$$\text{Total age of 5 members, 2 years ago} = (15 \times 5) \text{ years} = 75 \text{ years}$$

$$\text{Total age of 5 members now} = (75 + 2 \times 5) \text{ years} = 85 \text{ years}$$

$$\text{Total age of 6 members now} = (15 \times 6) \text{ years} = 90 \text{ years}$$

$$\text{Age of the baby} = (90 - 85) \text{ years} = 5 \text{ years}$$

15) Answer : C

Explanation :

Let A, B, C represent their respective weights. Then, we have :

$$A + B + C = (35 \times 3) = 105 \dots (i)$$

$$A + B = (30 \times 2) = 60 \dots (ii)$$

$$B + C = (33 \times 2) = 66 \dots (iii)$$

$$\text{Adding (ii) and (iii), we get : } A + 2B + C = 126 \dots (iv)$$

$$\text{Subtracting (i) from (iv), we get : } B = 21$$

$$\therefore B\text{'s weight} = 21 \text{ kg.}$$

16) Answer : D

Explanation :

Let L, M and N represent their respective monthly incomes.

Then, we have :

$$L + M = (4040 \times 2) = 8080 \dots (i)$$

$$M + N = (5240 \times 2) = 10480 \dots (ii)$$

$$N + L = (4200 \times 2) = 8400 \dots (iii)$$

$$\text{Adding (i), (ii) and (iii), we get : } 2(L + M + N) = 26960 \text{ or}$$

$$L + M + N = 13480 \dots (iv)$$

$$\text{Subtracting (ii) from (iv), we get } L = 3000.$$

$$\therefore L\text{'s monthly income} = \text{Rs. } 3000$$

17) Answer : C

Explanation :

Average of remaining numbers

$$= \frac{(40 \times 35) - (45 + 63)}{38} = \frac{1400 - 108}{38} = \frac{1292}{38} = 34$$

18) Answer : C

Explanation :

$$\text{Total age of 28 students} = 28 \times 9 = 252 \text{ yr.}$$

$$\text{Total age of 29 persons including one teacher} = 29 \times 10 = 290 \text{ yr.}$$

$$\therefore \text{Age of teacher} = (290 - 252) = 38 \text{ yr.}$$

19) Answer : C

Explanation :

$$\text{Total income of Mohan and Ram} = 2 \times 300 = \text{Rs. } 600$$

$$\text{Total income of Raghu and Jaya} = 2 \times 350 = \text{Rs. } 700$$

$$\text{Average income of all the four persons} =$$

$$= \frac{600 + 700}{4} = \text{Rs. } 325.$$

20) Answer : D

Explanation :

$$\text{Age of the mother} = (15 \times 5 - 9 \times 4) \text{ years} = 39 \text{ years.}$$

21) Answer : B

Explanation :

$$\text{Total weight increased} = (6 \times 3.5) = 21 \text{ kg.}$$

$$\text{So the weight of new person} = 59 + 21 = 80 \text{ kg.}$$

22) Answer : B

Explanation :

$$\text{Total runs in 9 innings} = 60 \times 9 = 540$$

$$\text{Total runs in 10 inning} = 540$$

$$\text{Average runs after 10}^{\text{th}} \text{ inning} = \frac{540}{10} = 54$$

23) Answer : C

Explanation :

$$\text{Weight of bag} = \text{Old average} + \text{Increase in average} \times \text{Total no. of objects}$$

$$= 7 + 0.07 \times 41 = 9.87 \text{ gm}$$

24) Answer : C

Explanation :

$$\text{Average} = \frac{\text{Sum of observation}}{\text{No. of observation}}$$

$$= \frac{n/2[2a+(n-1)d]}{n} = \frac{(2 \times 40) + (12 \times 2)}{2} = \frac{80+24}{2} = \frac{104}{2} = 52$$

25) Answer : D

Explanation :

Total ages of 28 boys = $28 \times 15 = 420$ years

Total ages when class teacher is included = $29 \times 16 = 464$ years.

\therefore Age of class teacher = $464 - 420 = 44$ years

26) Answer : B

Explanation :

If the average is increased by 4 kg, then the sum of weights increases by $5 \times 4 = 20$ kg.

And this increase in weight is due to the extra weight included due to the inclusion of new person.

\therefore Weight of new person = $90 + 20 = 110$ kg

27) Answer : A

Explanation :

Let the number of passed candidates be x .

Then total marks = $120 \times 33 = 37x + (120 - x) \times 13$

$$3960 = 37x + 1560 - 13x$$

$$\Rightarrow 3960 - 1560 = 24x$$

$$\Rightarrow 2400 = 24x$$

$$\Rightarrow x = 100$$

\therefore Number of passed candidate = 100

28) Answer : C

Explanation :

Let his average after 14th innings be x

$$\text{So, } 14x + 90 = 15(x + 4)$$

$$\Rightarrow 14x + 90 = 15x + 60$$

$$\Rightarrow 30 = x$$

29) Answer : D

Explanation :

$$\text{Average speed} = \frac{3 \times 40 \times 30 \times 15}{40 \times 30 + 30 \times 15 + 40 \times 15}$$

$$= \frac{3 \times 40 \times 30 \times 15}{2250} = 24 \text{ km/hr.}$$

30) Answer : B

Explanation :

We have the required answer

$$= \frac{30(23-20)}{25-23} = \frac{30 \times 3}{2} = 45.$$

Chapter 06: Ratio & Proportion

Practice set Answers 1:

1) Answer : A

Explanation :

Let the third proportional to 0.36 and 0.48 be x

$$\text{Then, } 0.36 : 0.48 :: 0.48 : x$$

$$x = \frac{0.48 \times 0.48}{0.36} = 0.64$$

2) Answer - A (20:36:63)

Explanation -

$$a:b=5:9 \text{ and } b:c=4:7$$

$$= (4 \times 9/4) : (7 \times 9/4) = 9:63/4$$

$$a:b:c = 5:9:63/4 = 20:36:63$$

3) Answer : D

Explanation :

$$\frac{7}{15} = 0.466, \quad \frac{15}{23} = 0.652, \quad \frac{17}{25} = 0.68 \text{ and } \frac{21}{29} = 0.724.$$

4) Answer : B

Explanation :

$$10\% \text{ of } x = 20\% \text{ of } y \Rightarrow \frac{10x}{100} = \frac{20y}{100} \Rightarrow \frac{x}{10} = \frac{y}{5} \Rightarrow \frac{x}{y} = \frac{10}{5} = \frac{2}{1}$$

$$x : y = 2 : 1.$$

5) Answer - B (32/7)

Explanation -

$$x/y = 3/4$$

$$(4x + 5y)/(5x + 2y) = (4(x/y) + 5)/(5(x/y) + 2)$$

$$= (4(3/4) + 5)/(5(3/4) + 2)$$

$$= (3 + 5)/(7/4) = 32/7$$

6) Answer : B

Explanation :

$$\frac{4^{35}}{2^5} = \frac{(2^2)^{35}}{2^5} = \frac{2^{(2 \times 35)}}{2^5} = \frac{2^7}{2^5} = 2^2 = 4.$$

Required ratio is 4 : 1

7) Answer : C

Explanation :

$$A : B = 2 : 3, B : C = 4 : 5 =$$

$$4x \times \frac{3}{4} : 5x \times \frac{3}{4} = 3 : \frac{15}{4}$$

$$\text{and } C : D = 6 : 7 = \frac{6x \times \frac{15}{24}}{7x \times \frac{15}{24}} = \frac{15}{4} : \frac{25}{8}$$

$$A : B : C : D = 2 : 3 : \frac{15}{4} : \frac{35}{8} = 16 : 24 : 30 : 35$$

8) Answer - (C)

Explanation :

Let the shares of A, B, C and D be Rs. $5x$, Rs. $2x$, Rs. $4x$ and Rs. $3x$ respectively.

$$\text{Then, } 4x - 3x = 1000$$

$$\Rightarrow x = 1000.$$

$$B's \text{ share} = Rs. 2x = Rs. (2 \times 1000) = Rs. 2000.$$

9) Answer - C (27)

Explanation -

Let the fourth proportional to 4, 9, 12 be a .

$$\text{Then, } 4 : 9 :: 12 : a$$

$$4a = 9 \times 12$$

$$a = (9 \times 12)/4 = 27;$$

Fourth proportional to 4, 9, 12 is 27

10) Answer : C

Explanation :

$$\frac{4x^2 - 3y^2}{2x^2 + 5y^2} = \frac{12}{19}$$

$$= 19(4x^2 - 3y^2) = 12(2x^2 + 5y^2)$$

$$= 52x^2 = 117y^2$$

$$= 4x^2 = 9y^2$$

$$\frac{x^2}{y^2} = \frac{9}{4}$$

$$= \frac{x}{y} = \frac{3}{2}$$

11) Answer : B

Explanation :

$$\text{Ratio of sides} = \frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3.$$

$$\text{Largest side} = 104 \times \frac{6}{13} \text{ cm} = 48 \text{ cm}.$$

12) Answer : (B)

Answer::

$$x \cdot 5 = 0.75 \cdot 8$$

$$\Rightarrow x = \frac{6}{5} = 1.20$$

13) Answer : Option B

Explanation:

Let the numbers be $3x$ and $5x$.

$$\text{Then, } \frac{3x - 9}{5x - 9} = \frac{12}{23}$$

$$\Rightarrow 23(3x - 9) = 12(5x - 9)$$

$$\Rightarrow 9x = 99$$

$$\Rightarrow x = 11.$$

∴ The smaller number = $(3 \times 11) = 33$.

14) Answer : A (420 and 252)

Explanation -

Sum of ratio terms = $(5 + 3) = 8$.

First part = Rs. $(672 \times (5/8)) = \text{Rs. } 420$;

Second part = Rs. $(672 \times (3/8)) = \text{Rs. } 252$

15) Answer : D

Explanation :

Let $A = 2x$, $B = 3x$ and $C = 4x$. Then

$$\frac{A}{B} = \frac{2x}{3x} = \frac{2}{3}, \frac{B}{C} = \frac{3x}{4x} = \frac{3}{4} \text{ and } \frac{C}{A} = \frac{4x}{2x} = \frac{2}{1}$$

$$\frac{A}{B} : \frac{B}{C} : \frac{C}{A} = \frac{2}{3} : \frac{3}{4} : \frac{2}{1} = 8 : 9 : 24.$$

16) Answer : (D)

Explanation :

$$\text{Given ratio} = \frac{1}{2} : \frac{2}{3} : \frac{3}{4} = 6 : 8 : 9$$

$$\Rightarrow \text{1st part} = \text{Rs. } (782 \times \frac{6}{23}) = \text{Rs. } 204$$

17) Answer : C (490, 392 and 280)

Explanation -

Sum of ratio terms = $(35 + 28 + 20) = 83$.

A's share = Rs. $(1162 \times (35/83)) = \text{Rs. } 490$;

B's share = Rs. $(1162 \times (28/83)) = \text{Rs. } 392$;

C's share = Rs. $(1162 \times (20/83)) = \text{Rs. } 280$

18) Answer : C

Explanation :

For 9 kg zinc, mixture melted = $(9 + 11) \text{ kg}$.

For 28.8 kg zinc, mixture melted = $\frac{20}{9} \times 28.8 \text{ kg} = 64 \text{ kg}$.

19) Answer : B

Explanation :

Let the ages of A and B be $3x$ years and x years respectively.

$$\text{Then, } \frac{3x + 15}{x + 15} = \frac{2}{1}$$

$$2x + 30 = 3x + 15 = x = 15$$

So, A's age = $(3 \times 15) \text{ years} = 45 \text{ years}$ and B's age = 15 years

20) Answer : Option B

Explanation:

Let the fourth proportional to 5, 8, 15 be x .

Then, $5 : 8 : 15 : x$

$$\Rightarrow 5x = (8 \times 15)$$

$$= x = (8 \times 15)/5 = 24$$

21) Answer : A (10)

Explanation -

Let the quantity of alcohol and water be $4x$ litres and $3x$ litres respectively

$$4x/(3x+5) = 4/5$$

$$20x = 4(3x+5)$$

$$8x = 20$$

$$x = 2.5$$

Quantity of alcohol = $(4 \times 2.5) \text{ litres} = 10 \text{ litres}$

22) Answer : D

Explanation :

$$G = 19W \text{ and } C = 9W$$

Let 1 gm of gold be mixed with x gm of copper to get $(1 + x)$ gm of the alloy

$(1 \text{ gm gold}) + (x \text{ gm copper}) = (x + 1) \text{ gm of alloy}$

$$19W + 9Wx = (x + 1) \times 15W$$

$$19 + 9x = 15(x + 1)$$

$$6x = 4$$

$$= x = 2/3$$

Ratio of gold with copper = $2/3 = 3:2$

23) Answer : C

Explanation :

For dividing 12 into two whole numbers, the sum of the ratio terms must be a factor of 12.

So, they cannot be in the ratio $3 : 2$.

24) Answer : (B)

Explanation :

Step (i) Let x be the number of boys and y be the number of girls.

Given total number of boys and girls = 100

$$x + y = 100 \text{----- (i)}$$

Step (ii) A boy gets Rs. 3.60 and a girl gets Rs. 2.40

The amount given to 100 boys and girls = Rs. 312

$$3.60x + 2.40y = 312 \text{----- (ii)}$$

Step (iii)

Solving (i) and (ii)

$$3.60x + 3.60y = 360 \text{----- Multiply (i) by 3.60}$$

$$\Rightarrow 3.60x + 2.40y = 312 \text{ ----- (ii)}$$

$$1.20y = 48$$

$$y = \frac{48}{1.20} = 40$$

$$= \text{Number of girls} = 40$$

25) Answer - B (360)

Explanation -

Let the number of 50 p, 25 P and 10 p coins be $5x$, $9x$ and $4x$ respectively.

$$(5x/2) + (9x/4) + (4x/10) = 206$$

$$50x + 45x + 8x = 4120$$

$$103x = 4120$$

$$x = 40.$$

$$\text{Number of 50 p coins} = (5 \times 40) = 200;$$

$$\text{Number of 25 p coins} = (9 \times 40) = 360;$$

$$\text{Number of 10 p coins} = (4 \times 40) = 160.$$

26) Answer : A

Explanation :

Let the prices of a scooter and a T.V. set be Rs. $7x$ and Rs. $5x$ respectively.

$$\text{Then, } 7x - 5x = 8000$$

$$2x = 8000$$

$$x = 4000$$

$$\text{Price of a T.V. set} = \text{Rs. } (5x \times 4000) = \text{Rs. } 20000.$$

27) Answer - (B)

Explanation :

$$\frac{4}{15} \times A = \frac{2}{5} \times B$$

$$\Rightarrow A = \left(\frac{2}{5} \times \frac{15}{4}\right) B$$

$$\Rightarrow A = \frac{3}{2} B$$

$$\Rightarrow \frac{A}{B} = \frac{3}{2}$$

$$\Rightarrow A:B = 3:2.$$

$$B's \text{ share} = \text{Rs. } 1210 \times \frac{2}{5} = \text{Rs. } 484.$$

28) Answer : C

Explanation :

$$\text{Gold in C} = \frac{7}{9} + \frac{7}{18} \text{ units} = \frac{7}{6} \text{ units.}$$

$$\text{Copper in C} = \frac{2}{9} + \frac{11}{18} \text{ units} = \frac{5}{6} \text{ units.}$$

$$\text{Gold : Copper} = \frac{7}{6} : \frac{5}{6} = 7 : 5.$$

29) Answer - (C)

Explanation :

Originally, let the number of boys and girls in the college be $7x$ and $8x$ respectively.

Their increased number is (120% of $7x$) and (110% of $8x$).

$$\Rightarrow \left(\frac{120}{100} \times 7x\right) = \left(\frac{110}{100} \times 8x\right)$$

$$\Rightarrow \frac{42x}{5} \text{ and } \frac{44x}{5}$$

$$\Rightarrow \text{So, the required ratio} = \frac{42x}{5} : \frac{44x}{5}$$

$$= 21 : 22$$

30) Answer : C

Explanation :

Let the three containers contain $3x$, $4x$ and $5x$ liters of mixtures respectively.

$$\text{Milk in 1st mix.} = 3x \times \frac{4}{5} \text{ liters} = \frac{12x}{5} \text{ Liters.}$$

$$\text{Water in 1st mix.} = 3x - \frac{12x}{5} \text{ liters} = \frac{3x}{5} \text{ Liters.}$$

$$\text{Milk in 2nd mix.} = 4x \times \frac{3}{4} \text{ liters} = 3x \text{ liters}$$

$$\text{Water in 2nd mix.} = (4x - 3x) \text{ liters} = x \text{ liters.}$$

$$\text{Milk in 3rd mix.} = 5x \times \frac{5}{7} \text{ liters} = \frac{25x}{7} \text{ Liters.}$$

$$\text{Water in 3rd mix.} = 5x - \frac{25x}{7} \text{ liters} = \frac{10x}{7} \text{ Liters.}$$

$$\text{Total milk in final mix.} = \frac{12x}{5} + 3x + \frac{25x}{7} \text{ liters} = \frac{314x}{35} \text{ Liters.}$$

$$\text{Total water in final mix.} = \frac{3x}{5} + x + \frac{10x}{7} \text{ liters} = \frac{106x}{35} \text{ Liters.}$$

$$\text{Required ratio of milk and water} = \frac{314x}{35} : \frac{106x}{35} = 157 : 53.$$

Practice set Answers 2:

1) Answer: A

Explanation:

$$\text{Compounded Ratio} = \frac{3 \times 4 \times 6 \times 10}{2 \times 9 \times 5 \times 8} = \frac{10}{10} = \frac{1}{1} = 1$$

2) Answer: D

Explanation:

$$\frac{1}{5} : \frac{1}{10} : \frac{1}{15} \quad \text{LCM of 5, 10 and 15 is 30 So, } (1/5 : 1/10 : 1/15) 30 = 6 : 3 : 2$$

$$\text{So, share of first is } \frac{6 \times 858}{11} = 468$$

3) Answer: D

Explanation:

$$\text{Given } A : B = 7 : 3, B : C = 6 : 10 = 3 : 5,$$

$$C : D = 15 : 17 = \frac{15}{3} : \frac{17}{3} = 5 : \frac{17}{3}$$

$$\text{So, } A : B : C : D = 7 : 3 : 5 : \frac{17}{3} = 21 : 9 : 15 : 17$$

4) Answer: B

Explanation:

$$\frac{(5A - C)^2}{(6B - C)^2} = \frac{5A}{6B} \Rightarrow \frac{25A^2 + C^2 - 10AC}{36B^2 + C^2 - 12BC} = \frac{5A}{6B}$$

$$180AB^2 + 5AC^2 - 60ABC = 150A^2B + 6BC^2 - 60ABC$$

$$180AB^2 - 150A^2B = 6BC^2 - 5AC^2$$

$$30AB(6B - 5A) = C^2(6B - 5A)$$

$$30AB = C^2$$

5) Answer: D

Explanation:

The total number of students should be divisible by $(6 + 7) = 13$

6) Answer: A

Explanation:

Let the third proportional be x , then $4 : 16 = 16 : x \Rightarrow x = 64$

7) Answer: B

Explanation:

$$6 \text{ leaps of dogs} = \frac{6 \times 5}{3} \text{ leaps of cat}$$

\therefore Speed of dog : Speed of cat = 10:9

8) Answer: B

Explanation:

Let first and third part be $2x$ and $7x$, then second part be $2x - 15$

$$(2x) + (2x - 15) + 7x = 150$$

$$\Rightarrow 11x = 150 + 15 = 165$$

$$\Rightarrow x = 15$$

Therefore, three parts are 30, 15 and 105.

9) Answer: C

Explanation:

Let the number x be subtracted from each of the numbers,

$$\text{then } \frac{58-x}{76-x} = \frac{73-x}{96-x}$$

For $x = 4$, this relation is correct.

10) Answer: B

Explanation:

$$x \propto \frac{1}{\sqrt{y^3}} \Rightarrow x \propto \frac{1}{y^{3/2}} \Rightarrow x = \frac{k}{y^{3/2}}$$

So $x=2, y=16$ (where k is constant)

$$2 = \frac{k}{(4^2)^{3/2}} \Rightarrow k = 2 \times 4^3 = 128$$

$$\text{When } x = 1024 \therefore y = \left(\frac{128}{1024} \right)^{2/3} = \left(\frac{1}{8} \right)^{2/3} = \frac{1}{4}$$

11) Answer: C

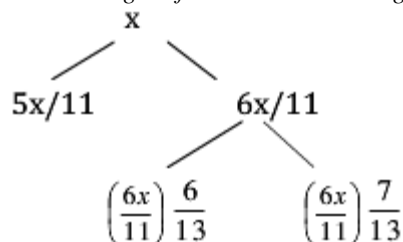
Explanation:

$$\frac{7p-2q}{7p+3q} = \frac{7 \times \frac{p}{q} - 2}{7 \times \frac{p}{q} + 3} = \frac{i \times \frac{2}{5} - 2}{i \times \frac{2}{5} + 3} = \frac{4}{29}$$

12) Answer: B

Explanation:

Let the weight of water melon be x kg.



Required ratio = 65 : 36 : 42.

13) Answer: B

Explanation:

$$\frac{A}{E} = \frac{A}{B} \times \frac{B}{C} \times \frac{C}{D} \times \frac{D}{E} = \frac{2}{3} \times \frac{5}{14} \times \frac{7}{10} \times \frac{8}{7} = 4 : 21$$

14) Answer: C

Explanation:

Let the no. of coins be $5x$, $6x$ and $8x$ respectively.

So, Money Value:

$$5x \times 1 + 6x \times \frac{1}{2} + 8x \times \frac{1}{4} = 6500 \Rightarrow 5x + 3x + 2x = 6500$$

$10x = 6500, x = 650$, So the number of 25 paise in the bag is =

$$8x = 8 \times 650 = 5200 \text{ Rs.}$$

15) Answer: C

Explanation:

Let Salary of Vijay = Rs. 1500

$$= \frac{6}{5} \times 1500 = \text{Rs. 1800}$$

Salary of Dhiraj =

$$= \text{Rs. } \frac{7}{6} \times 1800 = \text{Rs. 2100}$$

Salary of Sunil =

Salary of Sneha = (Rs. (1500 + 1800 + 2100) = Rs. 5400

16) Answer: D

Explanation:

Let their ages 6 years ago be $2x$, $3x$, $5x$ and $7x$.

Their ages now $2x + 6$, $3x + 6$, $5x + 6$, $7x + 6$.

$$\text{Or, } 17x + 24 = 143$$

$$\Rightarrow x = 7$$

Present age of Aman = $3x + 6 = 21 + 6 = 27$ years

Present age of Father = $7x + 6 = 49 + 6 = 55$ years

Hence, required years (55 - 27) years = 28 years.

17) Answer: C

Explanation:

It cannot be determined because the total money to be distributed is not given.

18) Answer: C

Explanation:

If the numbers are $4a$ and $5a$, then $20a = 260 \rightarrow a = 13$

\therefore the first number is $(4 \times 13) = 52$ and Second number is $(5 \times 13) = 65$

19) Answer: C

Explanation:

$$\frac{3x+7}{5x+7} = \frac{2}{3} \Rightarrow 9x + 21 = 10x + 14 \Rightarrow 21 - 14 = x \Rightarrow 7 = x$$

\therefore Numbers are 21 and 35.

20) Answer: D

Explanation:

Quantity of milk in 680 ml. mixture is

$$= \frac{680 \times 10}{17} = 400 \text{ and water is } = 680 - 400 = 280$$

Let x ml water be added :

$$\frac{400}{280+x} = \frac{5}{4} \Rightarrow x = 40 \text{ ml.}$$

21) Answer: C

Explanation:

$$\frac{\text{I Number}}{\text{II Number}} = \frac{3}{4} \text{ and } \frac{\text{II Number}}{\text{III Number}} = \frac{5}{7}$$

$$\text{So, I: II: III} = 3:4 \text{ --- } 5:7$$

$$15:20:28$$

$$\text{So, I Number} = \frac{126 \times 15}{63} = 30$$

22) Answer: B

Explanation:

$$2 \text{ Book} = 6 \text{ Pen} \Rightarrow \frac{\text{Book}}{\text{Pen}} = \frac{6}{2} = \frac{3}{1}, 8 \text{ Pen} = 10 \text{ Pencil} \Rightarrow \frac{\text{Pen}}{\text{Pencil}} = \frac{10}{8} = \frac{5}{4}$$

$$15 \text{ Pencil} = 20 \text{ Rubber} \Rightarrow \frac{\text{Pencil}}{\text{Rubber}} = \frac{20}{15} = \frac{4}{3}, 10 \text{ Rubber}$$

$$= 50 \text{ Sharpner} \Rightarrow \frac{\text{Rubber}}{\text{Sharpner}} = \frac{5}{1}$$

$$\Rightarrow \frac{\text{Book}}{\text{Sharpner}} = \frac{\text{Book}}{\text{Pen}} \times \frac{\text{Pen}}{\text{Pencil}} \times \frac{\text{Pencil}}{\text{Rubber}} \times \frac{\text{Rubber}}{\text{Sharpner}} = \frac{3}{1} \times \frac{5}{4} \times \frac{4}{3} \times \frac{5}{1} = \frac{25}{1}$$

$$\frac{\text{Book}}{10} = \frac{25}{1} \Rightarrow \text{Book} = 250$$

23) Answer: C

Explanation:

Let the no. of Book, pen and pencil in the Shop be $18x$

Difference between the no of Pens & Pencils = $2x$

Now, $2x$ to be multiple of 21

So, x has to be a multiple of 21.

So, total number of book, pen and pencil = $18x = 18 \times 21 = 378$

24) Answer: C

Explanation:

$$\text{A: B} \quad 8:3$$

$$\text{B: C} \quad 6:7$$

$$\text{AB:BB:BC} = \text{A:B:C} = 48:18:21$$

$$\text{So, A:B:C} = 16:6:7$$

25) Answer: B

Explanation:

$$\frac{18x + 1.8x}{25x + 392} = \frac{3}{5} \Rightarrow \frac{19.8x}{25x + 392} = \frac{3}{5} \Rightarrow 99x = 75x + 1176$$

$$24x = 1176$$

$$\Rightarrow x = 49$$

The Original prices of two horses was $18x$ and $25x$ so, $18 \times 49 = \text{Rs. } 882$, $25 \times 49 = \text{Rs. } 1225$

26) Answer: C

Explanation:

Let the incomes be $6x$ and $8x$ so

$$\frac{6x - 80}{8x - 80} = \frac{14}{19} \Rightarrow 114x - 1520 = 112x - 1120$$

$$\Rightarrow 2x = 400 \Rightarrow x = 200$$

So, The sum of their monthly incomes be Rs. 2800.

27) Answer: D

Explanation:

$$A : B = 6 : 3 = 2 : 1, B : C = 9 : 6 = 3 : 2$$

$$A : B : C$$

$$\text{B:C} \quad 3:2$$

$$\text{AB:BB:BC} = \text{A:B:C} = 6:3:2$$

$$\text{A's share} = \frac{616}{11} \times 6 = \text{Rs. } 336$$

28) Answer: C

Explanation:

$$\frac{x}{3} = \frac{y}{5} = \frac{z}{7} = K \Rightarrow x = 3k, y = 5k, z = 7k$$

$$\Rightarrow 3x - 7y + 6z/3y$$

$$= \frac{3(3k) - 7(5k) + 6(7k)}{3 \times 5k} = \frac{9k - 35k + 42k}{15k} = \frac{16k}{15k} = \frac{16}{15}$$

29) Answer: B

Explanation:

$$\frac{a}{5} = \frac{b}{6} = \frac{c}{7} = K \Rightarrow a = 5k, b = 6k, c = 7k$$

$$\therefore \frac{a+b+c}{b} = \frac{18k}{6k} = 3$$

30) Answer: D

Explanation:

$$\frac{6x - 26 \times \frac{6}{13}}{7x - 26 \times \frac{7}{13} + 26} = \frac{9}{17} \Rightarrow \frac{6x - 12}{7x - 14 + 26} = \frac{9}{17}$$

$$\Rightarrow 102x - 204 = 63x + 108$$

$$\Rightarrow 39x = 312$$

$$\Rightarrow x = 8$$

So, the quantity be $13x = 13 \times 8 = 104$ lit.

Chapter 07: Mixture & Allegation

Practice set 1 Answers:

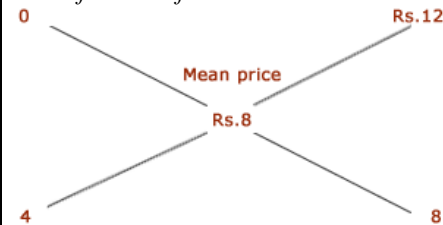
1) Answer: :

Explanation :

By the rule of allegation:

C.P. of 1 litre of water

C.P. of 1 litre of milk



\therefore Ratio of water to milk = $4 : 8 = 1 : 2$

2) Answer:: :

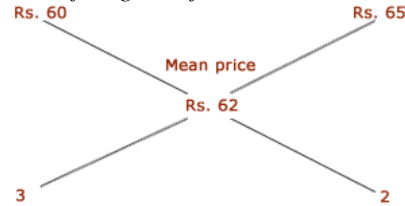
Explanation :

S.P. of 1 kg of the mixture = Rs. 68.20, Gain = 10 %

C.P. of 1 kg of the mixture = Rs. $(100 / 110 \times 68.20)$ = Rs. 62.

By the rule of alligation:

C.P. of 1 kg tea of 1st kind C.P. of 1 kg tea of 2nd kind

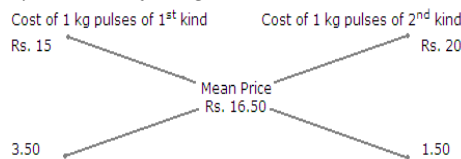


∴ Required ratio = 3 : 2

3) Answer: Option C

Explanation:

By the rule of alligation:



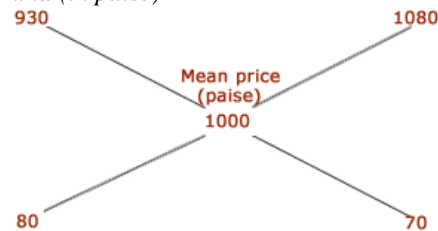
∴ Required rate = 3.50 : 1.50 = 7 : 3.

4) Answer:: :

Explanation :

By the rule of alligation:

C.P. of 1 kg rice of 1st kind (in paise) C.P. of 1 kg rice of 2nd kind (in paise)



∴ Required ratio = 80 : 70 = 8 : 7.

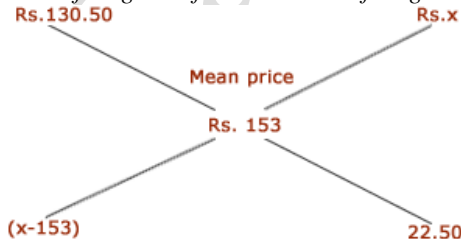
5) Answer:: :

Explanation :

Since first second varieties are mixed in equal proportions, so their average price = Rs. $(126 + 135 / 2)$ = Rs. 130.50

So, the mixture is formed by mixing two varieties, one at Rs. 130.50 per kg and the other at say, Rs. x per kg in the ratio 2 : 2, i.e., 1 : 1. We have to find x.

Cost of 1 kg tea of 1st kind Cost of 1 kg tea of 2nd kind



∴ $x - 153 / 22.50 = 1 \Rightarrow x - 153 = 22.50 \Rightarrow x = 175.50$.

Hence, price of the third variety = Rs. 175.50 per kg.

6) Answer: Option D

Explanation:

Amount of milk left after 3 operations = $\left[40 \left(1 - \frac{4}{40} \right)^3 \right]$ litres

$$\left(40 \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10} \right) = 29.16 \text{ litres.}$$

7) Answer : C

Explanation :

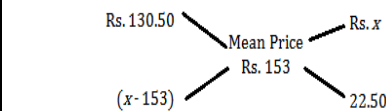
Since first and second varieties are mixed in equal proportions, so their average price

$$= \text{Rs. } \frac{126 + 135}{2} = \text{Rs. 130.50}$$

So, the mixture is formed by mixing two varieties, one at Rs. 130.50 per kg and the other at say, Rs. x per kg in the ratio 2 : 2, i.e., 1 : 1. We have to find x.

By the rule of alligation, we have :

Cost of 1 kg tea of 1st kind Cost of 1 kg tea of 2nd kind



$$\frac{x - 153}{22.50} = 1$$

$$= x - 153 = 22.50$$

$$= x = 175.50$$

Hence, price of the third variety = Rs. 175.50 per kg.

8) Answer:: :

Explanation :

Let the C.P. of spirit be Re. 1 litre.

Spirit in 1 litre mix. of A = 5/7 litre, C.P. of 1 litre mix. in A = Re. 5/7

Spirit in 1 litre mix. of B = 7/13 litre, C.P. of 1 litre mix. in B = Re. 7/13

Spirit in 1 litre mix. of C = 8/13 litre, Mean price = Re. 8/13.

By the rule of alligation, we have:

Cost of 1 litre mixture in A Cost of 1 litre mixture in B

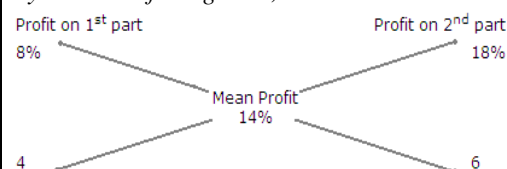


∴ Required ratio = 1/13 : 9/91 = 7:9.

9) Answer: Option C

Explanation:

By the rule of allegation, we have:



Ration of 1st and 2nd parts = 4 : 6 = 2 : 3

∴ Quantity of 2nd kind = $\left(\frac{3}{5} \times 1000 \right)$ kg = 600 kg.

10) Answer : C

Explanation :

Suppose the can initially contains 7x and 5x litres of mixtures A and B respectively.

$$\text{Quantity of A in mixture left} = 7x - \frac{7}{12} \times 9 \text{ litres}$$

$$= 7x - \frac{21}{4} \text{ Litres.}$$

$$\text{Quantity of B in mixture left} = 5x - \frac{5}{12} \times 9 \text{ litres}$$

$$= 5x - \frac{15}{4} \text{ Litres.}$$

$$\frac{7x - \frac{21}{4}}{5x - \frac{15}{4} + \frac{21}{4}} = \frac{7}{9}$$

$$\frac{28x - 21}{20x + 21} = \frac{7}{9}$$

$$252x - 189 = 140x + 147$$

$$112x = 336$$

$$x = 3$$

So, the can contains 21 litres of A.

11) Answer:: :

Explanation :

Suppose the can initially contains 7x and 5x litres of mixtures A and B respectively

Quantity of A in mixture left

$$= (7x - \frac{7}{12} \times 9) \text{ litres} = (7x - \frac{21}{4}) \text{ litres.}$$

Quantity of B in mixture left

$$= (5x - \frac{5}{12} \times 9) \text{ litres} = (5x - \frac{15}{4}) \text{ litres.}$$

$$\frac{7x - \frac{21}{4}}{(5x - \frac{15}{4}) + 9} = \frac{7}{9}$$

$$= \frac{28x - 21}{20x + 21} = \frac{7}{9}$$

$$= 252x - 189 = 140x + 147$$

$$= 112x = 336 = x = 3.$$

So, the can contained 21 litres of A.

12) Answer – (B)

Explanation :

C.P of 1 Kg

rice of 1st

kind (930p)

C.P of 1 Kg

rice of 2nd

kind (1080p)

Mean Price
(1000p)

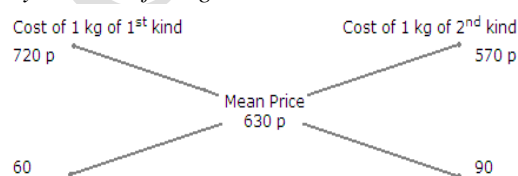
$$\frac{(1080 - 1000)}{80} : \frac{(1000 - 930)}{70}$$

Thus, required ratio = 80 : 70 = 8 : 7

13) Answer: Option B

Explanation:

By the rule of allegation:



∴ Required ratio = 60 : 90 = 2 : 3.

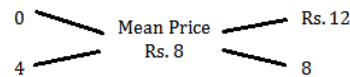
14) Answer : A

Explanation :

By the rule of allegation:

C.P. of 1 litre of water

C.P. of 1 litre of milk



Ratio of water to milk = 4 : 8 = 1 : 2

15) Answer:: :

Explanation :

Let the cost of 1 litre milk be Re. 1

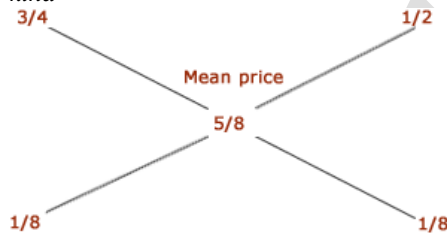
Milk in 1 litre mix. in 1st can = 3/4 litre, C.P. of 1 litre mix. in 1st can Re. 3/4

Milk in 1 litre mix. in 2nd can = 1/2 litre, C.P. of 1 litre mix. in 2nd can Re. 1/2

Milk in 1 litre of final mix. = 5/8 litre, mean price = Re. 5/8.

By the rule of alligation, we have:

Cost of 1 kg mixture of 1st kind Cost of 1 kg mixture of 2nd kind



∴ Ratio of two mixtures = 1/8 : 1/8 = 1:1.

So, quantity of mixture taken from each can = (1/2 X 12) = 6 litres.

16) Answer – (D)

Explanation :

C.P of a unit quantity of 1st kind = 310p (in paise)

C.P of a unit quantity of 2nd kind = 360p

Mean price = 325p

C.P of unit quantity
of 1st kind

(310p)

C.P of unit quantity
of 2nd kind

(360p)

Mean Price
(325p)

$$\frac{(360 - 325)}{35} : \frac{(325 - 310)}{15}$$

Required ratio = 35 : 15 = 7 : 3

They must be mixed in the ratio 7 : 3

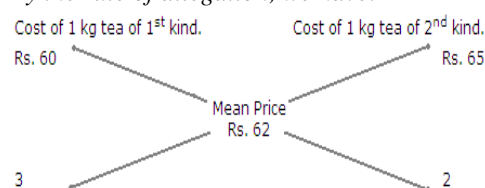
17) Answer: Option A

Explanation:

S.P. of 1 kg of the mixture = Rs. 68.20, Gain = 10%.

C.P. of 1 kg of the mixture = Rs. $\frac{100}{110} \times 68.20 = \text{Rs. } 62.$

By the rule of allegation, we have:



∴ Required ratio = 3 : 2.

18) Answer: Option C

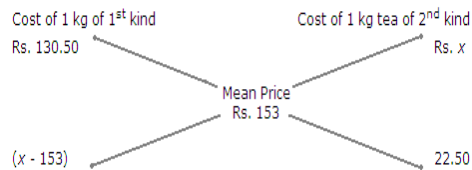
Explanation:

Since first and second varieties are mixed in equal proportions.

So, their average price = Rs. $\left(\frac{126+135}{2}\right)$ = Rs. 130.50

So, the mixture is formed by mixing two varieties, one at Rs. 130.50 per kg and the other at say, Rs. x per kg in the ratio 2 : 2, i.e., 1 : 1. We have to find x .

By the rule of alligation, we have:



$$\therefore \frac{x-153}{22.50} = 1$$

$$\Rightarrow x - 153 = 22.50$$

$$\Rightarrow x = 175.50$$

20) Answer : D

Explanation :

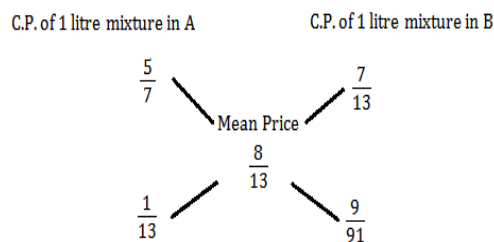
Let the C.P. of spirit be Re. 1 per litre.

Spirit in 1 litre mix. of A = $\frac{5}{7}$ litre; C.P. of 1 litre mix. in A = Re. $\frac{5}{7}$

Spirit in 1 litre mix. of B = $\frac{7}{13}$ litre; C.P. of 1 litre mix. in B = Re. $\frac{7}{13}$

Spirit in 1 litre mix. of C = $\frac{8}{13}$ litre; Mean price = Re. $\frac{8}{13}$

By the rule of alligation, we have :



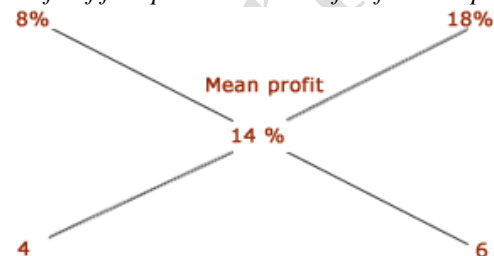
$$\text{Required ratio} = \frac{1}{13} : \frac{9}{91} = 7:9$$

21) Answer:: :

Explanation :

By the rule of allegation:

Profit of first part Profit of second part



So, ratio of 1st and 2nd parts = 4 : 6 = 2 : 3.

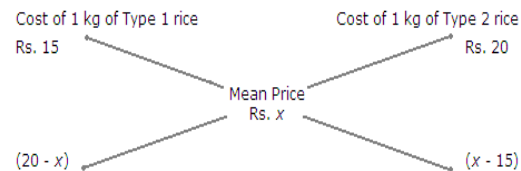
\therefore Quantity of 2nd kind = $(\frac{3}{5} \times 1000)$ kg = 600 kg.

22) Answer: Option A

Explanation:

Let the price of the mixed variety be Rs. x per kg.

By rule of allegation, we have:



$$\therefore \frac{(20-x)}{(x-15)} = \frac{2}{3}$$

$$\Rightarrow 60 - 3x = 2x - 30$$

$$\Rightarrow 5x = 90$$

$$\Rightarrow x = 18.$$

23) Answer: Option C

Explanation:

Suppose the can initially contains $7x$ and $5x$ of mixtures A and B respectively.

Quantity of A in mixture left = $\left(7x - \frac{7}{12} \times 9\right)$ litres = $\left(7x - \frac{21}{4}\right)$ litres

Quantity of B in mixture left = $\left(5x - \frac{5}{12} \times 9\right)$ litres = $\left(5x - \frac{15}{4}\right)$ litres

$$\therefore \frac{\left(7x - \frac{21}{4}\right)}{\left(5x - \frac{15}{4}\right) + 9} = \frac{7}{9}$$

$$\frac{28x - 21}{20x + 21} = \frac{7}{9}$$

$$\Rightarrow 252x - 189 = 140x + 147$$

$$\Rightarrow 112x = 336$$

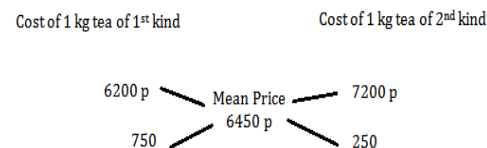
$$\Rightarrow x = 3.$$

So, the can contained 21 litres of A.

24) Answer : A

Explanation :

By the rule of allegation:



$$\text{Required rate} = 750 : 250 = 3 : 1$$

25) Answer:: :

Explanation :

By the rule of allegation:

Cost of 1 kg tea of 1st kind Cost of 1 kg tea of 2nd kind



$$\therefore \text{Required ratio} = 750 : 250 = 3 : 1$$

26) Answer: Option A

Explanation:

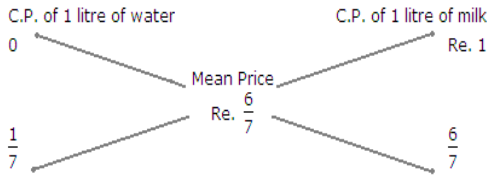
Let C.P. of 1 litre milk be Re. 1.

S.P. of 1 litre of mixture = Re.1, Gain = $\frac{50}{3}\%$.

$$\therefore \text{C.P. of 1 litre of mixture} = 100 \times \frac{3}{100 + 50} = 6$$

$$\left(\begin{array}{c} 350 \end{array} \right) 7$$

By the rule of allegation, we have:



∴ Ratio of water and milk = $\frac{1}{7} : \frac{6}{7} = 1 : 6$.

27) Answer:: :

Explanation :

Let the quantity of the wine in the cask originally be x litres then, quantity of wine left in cask after 4 operations = $x(1 - 8/x)^4$ litres.

Therefore $x(1 - 8/x)^4 / x = 16/81$

$$\Rightarrow (1 - 8/x)^4 = (2/3)^2$$

$$\Rightarrow (x - 8/x) = 2/3$$

$$\Rightarrow 3x - 24 = 2x$$

$$\Rightarrow x = 24.$$

28) Answer – (C)

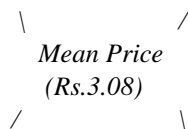
Explanation :

C.P of a unit quantity of 1st kind = Rs. 3.20

C.P of a unit quantity of 2nd kind = Rs. 2.90

Mean price = Rs.3.08

C.P of unit quantity of 1st kind	C.P of unit quantity of 2nd kind
(Rs. 3.20)	(Rs. 2.90)



$$\frac{(3.08 - 2.90)}{0.18} : \frac{(3.20 - 3.08)}{0.12} = 3 : 2$$

Required ratio = $0.18 : 0.12 = 3 : 2$

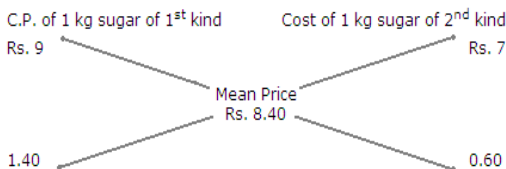
29) Answer: Option D

Explanation:

S.P. of 1 kg of mixture = Rs. 9.24, Gain 10%.

$$\therefore \text{C.P. of 1 kg of mixture} = \text{Rs. } \frac{100}{110} \times 9.24 = \text{Rs. } 8.40$$

By the rule of allegation, we have:



∴ Ratio of quantities of 1st and 2nd kind = $14 : 6 = 7 : 3$.

Let x kg of sugar of 1st be mixed with 27 kg of 2nd kind.

Then, $7 : 3 = x : 27$

$$\Rightarrow x = \frac{7 \times 27}{3} = 63 \text{ kg.}$$

30) Answer : A

Explanation :

Let cost of 1 litre milk be Re. 1.

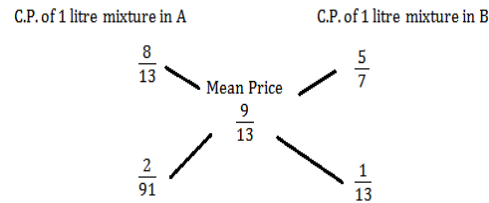
Milk in 1 litre mix. in A = $\frac{8}{13}$ litre; C.P. of 1 litre mix. in A = Re.

$$\frac{8}{13}$$

Milk in 1 litre mix. of B = $\frac{5}{7}$ litre; C.P. of 1 litre mix. in B = Re. $\frac{5}{7}$

Milk in 1 litre of final mix. = $\frac{900}{13} \times \frac{1}{100} = \frac{9}{13}$ litre; Mean price = Re $\frac{9}{13}$

By the rule of allegation, we have



$$\text{Required ratio} = \frac{2}{91} : \frac{1}{13} = 2 : 7$$

Chapter 08 : Time & Work

Practice set 1 Answers:

1) Answer:: A

Explanation :

A's 1 day's work = $1/18$

and B's 1 day's work = $1/9$

(A+B)'s 1 day's work = $(1/18 + 1/9) = 1/6$

2) Answer:: Option C :

Explanation :

When A runs 5 rounds, B runs 4 rounds (ratio of speeds)

A passes B each time A has run 5 rounds or $5 \times 1/4 = 5/4$ km. = $1 \frac{1}{4}$ km

$1 \frac{1}{4}$ km is contained in 4 km 3 times. Hence A passes B thrice.

3) Answer:: Option B

Explanation :

$$C's 1 day's work = \frac{1}{3} - \left(\frac{1}{6} + \frac{1}{8} \right) = \frac{1}{3} - \frac{7}{24} = \frac{1}{24}$$

$$A's \text{ wages} : B's \text{ wages} : C's \text{ wages} = \frac{1}{6} : \frac{1}{8} : \frac{1}{24} = 4 : 3 : 1.$$

$$\therefore C's \text{ share (for 3 days)} = \text{Rs. } \left(3 \times \frac{1}{24} \times 3200 \right) = \text{Rs. } 400$$

4) Answer: : C

Explanation :

$$B's 1 day's work = \frac{1}{12} - \frac{1}{20} = \frac{2}{60} = \frac{1}{30}$$

$$\text{Now, (A + B)'s 1 day's work} = \frac{1}{20} + \frac{1}{60} = \frac{4}{60} = \frac{1}{15}. \text{ B works for half}$$

day only

So, A and B together will complete the work in 15 days.

5) Answer: - B (11 days)

Explanation :

$$(A's 1 day's work) : (B's 1 day's work) = 7/4 : 1 = 7 : 4$$

Let A's and B's 1 day's work be $7x$ and $4x$ respectively.

$$\text{Then, } 7x + 4x = 1/7$$

$$11x = 1/7$$

$$x = 1/77$$

$$A's 1 day's work = (1/77) \times 7 = 1/11$$

6) Answer:: B

Explanation :

$$(A+B)'s 1 day's work = 1/4$$

A's 1 day's work = $1/12$

B's 1 day's work = $(1/4 - 1/12) = 1/6$.

Hence, B alone can complete the work in 6 days.

7) Answer:: Option C

Explanation :

1 woman's 1 day's work = $\frac{1}{70}$

1 child's 1 day's work = $\frac{1}{140}$

(5 women + 10 children)'s day's work $\left(\frac{5}{70} + \frac{10}{140}\right) = \left(\frac{1}{14} + \frac{1}{14}\right) = \frac{1}{7}$

∴ 5 women and 10 children will complete the work in 7 days.

8) Answer: : A

Explanation :

A's 1 day's work = $\frac{1}{18}$ and B's 1 day's work = $\frac{1}{9}$

∴ (A + B)'s 1 day's work = $\frac{1}{18} + \frac{1}{9} = \frac{1}{6}$

9) Answer: - B ($3\frac{3}{7}$ days)

Explanation :

(A + B + C)'s 1 day's work = $\frac{1}{24} + \frac{1}{6} + \frac{1}{12} = \frac{7}{24}$

So, A, B and C together will complete the job in $\frac{7}{24} = 3\frac{3}{7}$ days.

10) Answer:: B

Explanation :

A's 1 day's work = $1/8$

B's 1 day's work = $1/10$

(A+B)'s 1 day's work = $(1/8 + 1/10) = 9/40$.

Both A and B will finish the work in $= 40 / 9 = 4\frac{4}{9}$

11) Answer:: Option B

Explanation :

A's 2 day's work = $\left(\frac{1}{20} \times 2\right) = \frac{1}{10}$

(A + B + C)'s 1 day's work = $\left(\frac{1}{20} + \frac{1}{30} + \frac{1}{60}\right) = \frac{6}{60} = \frac{1}{10}$.

Work done in 3 days = $\left(\frac{1}{10} + \frac{1}{10}\right) = \frac{1}{5}$.

Now, $\frac{1}{5}$ Work is done in 3 days.

∴ Whole work will be done in $(3 \times 5) = 15$ days.

12) Answer: : B

Explanation :

(A + B)'s 1 day's work = $\frac{1}{11} + \frac{1}{20} = \frac{31}{220}$.

= (A + C)'s 1 day's work = $\frac{1}{11} + \frac{1}{55} = \frac{6}{55}$

Work done in 2 days = $\frac{31}{220} + \frac{6}{55} = \frac{55}{220} = \frac{1}{4}$

Now, $\frac{1}{4}$ work is done by A in 2 days

Whole work will be done in $(2 \times 4) = 8$ days.

13) Answer: - A (4 days)

Explanation :

Ratio of rates of working of A and B = $2 : 1$.

So, ratio of times taken = $1 : 2$.

B's 1 day's work = $\frac{1}{12}$.

A's 1 day's work = $\frac{1}{6}$; (2 times of B's work)

(A + B)'s 1 day's work = $\frac{1}{6} + \frac{1}{12} = \frac{3}{12} = \frac{1}{4}$

So, A and B together can finish the work in 4 days.

14) Answer:: C

Explanation :

(A+B+C)'s 1 day's work = $(1/24 + 1/6 + 1/12) = 7/24$.

So, A, B and C together will complete the job in $24/7 = 3\frac{3}{7}$ days.

15) Answer:: Option C

Explanation :

(A + B + C)'s 1 day's work = $\frac{1}{4}$

A's 1 day's work = $1/16$

B's 1 day's work = $1/12$

∴ C's 1 day's work = $\frac{1}{4} - \left(\frac{1}{16} + \frac{1}{12}\right) = \left(\frac{1}{4} + \frac{7}{48}\right) = \frac{5}{48}$.

So, C alone can do the work in $\frac{48}{5} = 9\frac{3}{5}$ days.

16) Answer: : C

Explanation :

B's 10 day's work = $\frac{1}{15} \times 10 = \frac{2}{3}$.

Remaining work = $1 - \frac{2}{3} = \frac{1}{3}$

Now, $\frac{1}{18}$ work is done by A in 1 day.

$\frac{1}{3}$ work is done by A in $18 \times \frac{1}{3} = 6$ days.

17) Answer: - D (10 days)

Explanation :

(B + C)'s 1 day's work = $\frac{1}{9} + \frac{1}{12} = \frac{7}{36}$

Work done by B and C in 3 days = $\frac{7}{36} \times 3 = \frac{7}{12}$

Remaining work = $1 - \frac{7}{12} = \frac{5}{12}$

Now, $\frac{1}{24}$ work is done by A in 1 day

So, $\frac{5}{12}$ work is done by A in $24 \times \frac{5}{12} = 10$ days.

18) Answer:: C

Explanation :

Number of pages typed by ronald in 1 hour = $32/6 = 16/3$.

Number of pages typed by elan in 1 hour = $40/5 = 8$.

Number of pages typed by both in 1 hour = $(16/3 + 8) = 40/3$.

Time taken by both to type 110 pages = $(110 \times 3/40)$ hrs =

$8 \times 1/4$ hrs = 8 hrs 15 min.

19) Answer:: Option D

Explanation :

(A + B)'s 20 day's work = $\left(\frac{1}{30} \times 20\right) = \frac{2}{3}$

Remaining work = $1 - \frac{2}{3} = \frac{1}{3}$

Now, $\frac{1}{3}$ work is done by A in 20 days

Therefore, the whole work will be done by A in $(20 \times 3) = 60$ days.

20) Answer: : C

Explanation :

(A + B)'s 1 day's work = $\frac{1}{12}$; (B + C)'s 1 day's work = $\frac{1}{15}$; (A +

C)'s 1 day's work = $\frac{1}{20}$

Adding, we get: $2(A + B + C)$'s 1 day's work = $\frac{1}{12} + \frac{1}{15} + \frac{1}{20} = \frac{12}{60} = \frac{1}{5}$

$(A + B + C)$'s 1 day's work = $\frac{1}{10}$

So, A, B and C together can complete the work in 10 days.

21) Answer: - B (4 : 3)

Explanation :

(20 x 16) women can complete the work in 1 day.

1 woman's 1 day's work = $\frac{1}{320}$

(16 x 15) men can complete the work in 1 day.

1 woman's 1 day's work = $\frac{1}{240}$

or, required ratio = $\frac{1}{240} : \frac{1}{320}$
 $= \frac{1}{3} : \frac{1}{4} = 4:3$ (cross multiplied)

22) Answer:: Option A

Explanation :

Let 1 man's 1 day's work = x and 1 boy's 1 day's work = y.

Then, $6x + 8y = 1/10$ and $26x + 48y = 1/2$

Solving these two equations, we get : $x = 1/100$ and $y = 1/200$

(15 men + 20 boy)'s 1 day's work = $(15/100) + (20/200) = 1/4$

∴ 15 men and 20 boys can do the work in 4 days.

23) Answer: : B

Explanation :

Suppose A, B and C take $x/2$, and $x/3$ hours respectively to finish the work.

Then, $\frac{1}{x} + \frac{2}{x} + \frac{3}{x} = \frac{1}{2} \cdot \frac{6}{x} = \frac{1}{2} \cdot x = 12$.

So, B takes 6 hours to finish the work.

24) Answer: - A (13 $\frac{1}{3}$ days)

Explanation :

Work done by X in 8 days = $\frac{1}{40} \times 8 = \frac{1}{5}$

Remaining work = $1 - \frac{1}{5} = \frac{4}{5}$

Now, $\frac{4}{5}$ work is done by Y in 16 days.

Whole work will be done by Y in $16 \times \frac{5}{4} = 20$ days

X's 1 day's work = $\frac{1}{40}$, Y's 1 day's work = $\frac{1}{20}$

$(X + Y)$'s 1 day's work = $\frac{1}{40} + \frac{1}{20} = \frac{3}{40}$

Hence, X and Y will together complete the work in $\frac{40}{3} = 13\frac{1}{3}$ days.

25) Answer:: Option B

Explanation :

Let 1 man's 1 day's work = x and 1 woman's 1 day's work = y.

Then, $4x + 6y = 1/8$ and $3x + 7y = 1/10$

Solving the two equations, we get: $x = \frac{11}{400}$, $y = \frac{1}{400}$.

∴ 1 woman's 1 day's work $\frac{1}{400}$.

\Rightarrow 10 women's 1 day's work = $\left(\frac{1}{400} \times 10\right) = \frac{1}{40}$

Hence, 10 women will complete the work in 40 days.

26) Answer: : A

Explanation :

$2(A + B + C)$'s 1 day's work = $\frac{1}{30} + \frac{1}{24} + \frac{1}{20} = \frac{15}{120} = \frac{1}{8}$

$(A + B + C)$'s 1 day's work = $\frac{1}{16}$

Work done by A, B and C in 10 days = $\frac{10}{16} = \frac{5}{8}$

Remaining work = $1 - \frac{5}{8} = \frac{3}{8}$

A's 1 day's work = $\frac{1}{16} - \frac{1}{24} = \frac{1}{48}$

Now, $\frac{1}{48}$ Work will be done by A in 1 day.

So, $\frac{3}{8}$ Work is done by A in $48 \times \frac{3}{8} = 18$ days.

27) Answer:: D

Explanation :

A's 1 day's work = $1/15$

B's 1 day's work = $1/20$

$(A+B)$'s 1 day's work = $(1/15 + 1/20) = 7/60$.

$(A+B)$'s 4 day's work = $(7/60 \times 4) = 7/15$.

Remaining Work = $(1 - 7/15) = 8/15$.

28) Answer: - (C)

Explanation :

Formula Used:

Subtraction of fraction

$$\frac{a}{b} - \frac{c}{d} = \frac{ad - cb}{bd}$$

A and B finish one work with company = 35 days

= $(A + B)$'s one day's work = $\frac{1}{35}$

A alone finish the same work = 60 days

= A's one day's work = $\frac{1}{60}$

= B's one day's work = $(A + B)$'s one day's work - A's one day's work

= $\frac{1}{35} - \frac{1}{60}$ (take LCM)

= $\frac{12 - 7}{420} = \frac{5}{420} = \frac{1}{84}$

= B alone can complete the work in 84 days

29) Answer:: Option A

Explanation :

P can complete the work in (12×8) hrs. = 96 hrs.

Q can complete the work in (8×10) hrs. = 80 hrs.

∴ P's 1 hour's work = $1/96$ and Q's 1 hour's work = $1/80$

$(P + Q)$'s 1 hour's work = $\frac{1}{96} + \frac{1}{80} = \frac{11}{480}$

So, both P and Q will finish the work in $\frac{480}{11}$ hrs

∴ Number of days of 8 hours each = $\frac{480}{11} \times \frac{60}{11} \text{ days} = 5\frac{5}{11} \text{ days}$

30) Answer: : D

Explanation :

Whole work is done by A in $(3 \times 4) = 12$ days.

Whole work is done by B in $(4 \times 6) = 24$ days.

A's wages : B's wages = A's 1 day's work : B's 1 day's work =

= $\frac{1}{12} : \frac{1}{24} = 2 : 1$

A's share = Rs. $(2/3) \times 180$ = Rs. 120.

Practice set 2 Answers:

1) Solution: The Correct answer is (B)

Explanation:

Worker A completes the task in 8 days. So, in one day, he will complete $1/8$ part of the task.

So, A's one day work = $\frac{1}{8}$

Similarly, B's one day work = $\frac{1}{10}$

$\therefore (A+B)$'s one day work = $\frac{1}{8} + \frac{1}{10} = \frac{9}{40}$

$\frac{9}{40}$ of the task is completed in one day so both will complete the whole task in $\frac{40}{9}$ days

2) Solution: The Correct answer is (C)

Explanation:

Vikas and Mohan together can complete the task in 6 days. So, in one day, they will complete $\frac{1}{6}$ part of the task.

Therefore, (Vikas + Mohan)'s one day work will be = $\frac{1}{6}$

Similarly, Vikas's one day work = $\frac{1}{10}$

Therefore, Mohan's one day work = $\frac{1}{6} - \frac{1}{10}$
 $= \frac{5-3}{30} = \frac{2}{30} = \frac{1}{15}$

In one day Mohan completes the $\frac{1}{15}$ part of the work so he will complete the entire work in 15 days.

3) Solution: The Correct answer is (A)

Explanation:

A's one day work = $\frac{1}{10}$

B's one day work = $\frac{1}{15}$

$(A + B)$'s one day work = $\frac{1}{10} + \frac{1}{15}$
 $= \frac{3+2}{30} = \frac{5}{30} = \frac{1}{6}$

A and B's four day work = $\frac{1}{6} \times 4 = \frac{4}{6} = \frac{2}{3}$

Therefore, the remaining work = $1 - \frac{2}{3} = \frac{1}{3}$

4) Solution: Solution: The Correct answer is (B)

Explanation:

$(\text{Peter} + \text{Tom})$'s one-day work = $\frac{1}{16}$

As per the question, Peter can finish twice as much work as finished by Tom in a given duration of time.

Therefore, $\frac{2}{3}$ of their one day's work will be completed by Peter

and $\frac{1}{3}$ of their one day work will be completed by Tom.

So, Tom's one day work will be = $\frac{1}{16} \times \frac{1}{3} = \frac{1}{48}$

So, Tom will take 48 days to complete the task.

5) Solution: The Correct answer is (A)

Explanation:

A's one day work = $\frac{1}{12}$

B's one day work = $\frac{1}{10}$

$(A+B+C)$'s one day work = $\frac{1}{4}$

Therefore, C's one day work = $(A+B+C)$'s one day work $(A+B)$'s one day work

So, C's one day work = $\frac{1}{4} - (\frac{1}{12} + \frac{1}{10})$

$= \frac{1}{4} - \frac{11}{60} = \frac{60-44}{240} = \frac{16}{240} = \frac{1}{15}$

So, C will complete the work in 15 days.

6) Solution: The Correct answer is (A)

Explanation:

A's one day work = $\frac{1}{10}$

B's one day work = $\frac{1}{20}$

C's one day work = $\frac{1}{40}$

$(A+B+C)$'s one day work = $\frac{1}{10} + \frac{1}{20} + \frac{1}{40} = \frac{7}{40}$

Work done in three days will be the sum of A's two-day work and $(A+B+C)$'s one day work.

A's two-day work = $\frac{1}{10} \times 2 = \frac{1}{5}$

Therefore, the work is done in three days =

$\frac{1}{5} + \frac{7}{40} = \frac{75}{200} = \frac{3}{8}$

$\frac{3}{8}$ part of the job is done in 3 days.

The entire job will be done by A in = $3 \times \frac{8}{3} = 8$ days.

7) Solution: The Correct answer is (A)

Explanation:

5 men colour 50-meter long cloth in 5 days.

1 man will colour $\frac{50}{5} = 10$ -meter long cloth in five days.

So, in one day one man can colour $\frac{10}{5} = 2$ -meter long cloth. Now, as per question 4 men are supposed to colour the 40-meter long cloth.

One man has to colour the $\frac{40}{4} = 10$ meter cloth

For 2-meter long cloth one man takes 1 day

So, to paint 10-meter long cloth he will take = $\frac{1}{2} \times 10 = 5$

As, 4 men are working together so 40 m long cloth will be coloured in 5 days

Quicker method:

Apply formula: $M1D1W2 = M2D2W1$

$5 \times 5 \times 40 = 4 \times D2 \times 50$

$D2 = \frac{1000}{200} = 5$ days

8) Solution: The Correct answer is (B)

Explanation:

4 men can finish 4 times of work in four days.

Therefore, one man can finish the one time of work in four days.

So, 6 men will finish the six times of work in the same time (4 days)

Quicker method:

Apply formula: $M1D1W2 = M2D2W1$

Let the work be X

Work done by 4 men, $W1 = 4X$

Work done by 6 men, $W2 = 6X$

$$4 * 4 * 6X = 6 * D2 * 4X$$

$$96X = D2 * 24X$$

$$D2 = 4 \text{ days}$$

9) Solution: The Correct answer is (B)

Explanation:

B is $50\% \left(\frac{150}{100}\right)$ more efficient than A so he will take less time to do a piece of work.

Therefore, the ratio of the time taken by A and B = $\frac{150}{100} = \frac{3}{2}$
Let B takes X days to do the job.

Then, $\frac{3}{2} = \frac{10}{X}$

$$3X = 20$$

$$X = 6.6 \text{ days}$$

10) Solution: The Correct answer is (D)

Explanation:

$$A's \text{ one day work} = \frac{1}{30}$$

$$A's \text{ ten-day work} = \frac{1}{30} * 10 = \frac{10}{30} = \frac{1}{3}$$

$$\text{So the remaining work would be} = 1 - \frac{1}{3} = \frac{2}{3}$$

$$B's \text{ one day work} = \frac{1}{20}$$

$$A \text{ and } B's \text{ one day work} = \frac{1}{30} + \frac{1}{20} = \frac{50}{600} = \frac{1}{12}$$

$$\frac{1}{12} \text{ of the job will be done by them in one day.}$$

$$\text{So, the remaining job } \left(\frac{2}{3}\right) \text{ will be done in } \frac{2}{3} * \frac{12}{1} = 8 \text{ days}$$

Therefore, the total number of days required to do the job would be = $10 + 8 = 18 \text{ days}$

11) Solution: The Correct answer is (C)

Explanation:

A can complete the work in, $6 * 8 = 48 \text{ hour}$

B can complete the same work in = $4 * 6 = 24 \text{ hours}$

$$A's \text{ one hour work} = \frac{1}{48}$$

$$B's \text{ one hour work} = \frac{1}{24}$$

$$(A + B)'s \text{ one hour work} = \frac{1}{48} + \frac{1}{24} = \frac{9}{144}$$

$$\frac{9}{144}$$

They will complete 144

So, the entire work will be completed in $1/9 * 144$

$$/9 = 144 \text{ hours}$$

Both work 8 hours a day so the number of days required to

$$\text{complete the work} = \frac{144}{9 * 8} = \frac{144}{72} = 2 \text{ days}$$

12) Solution: The Correct answer is (A)

Explanation:

A's one hour work = $1/6$

B's one hour work = $1/8$

(A + B)'s one hour work = $1/6 + 1/8 = 7/24$

(A+B+C)'s one day work = $1/3$

Therefore, C's one day work = $1/3 - 7/24 = 1/24$

The ratio of A, B and C's wages will be equal to the ratio of work done by them in one day.

A's wages: B's wages: C's wages = $1/6 : 1/8 : 1/24$

C's share of three days = $3 * C's \text{ share for one day}$

$$= 3 * (1/24 * 2800) = 350$$

13) Solution: The Correct answer is (A)

Explanation:

5 men completed half of the work in 18 days so the entire work will be completed in 36 days.

5 men' one day work will be = $1/36$

$$\text{One man's one day work} = \frac{1}{36 * 5} = \frac{1}{180}$$

Two men drop out, so the three men have to complete the remaining work.

$$\text{Three men's one day work will be} = \frac{1}{180} * 3 = \frac{1}{60}$$

$\frac{1}{60}$ part of the work is completed by three men in one day

Therefore, the remaining $\frac{1}{2}$ part of the work will be completed

$$\text{in } \frac{60}{1} * \frac{1}{2} = 30 \text{ Days.}$$

14) Solution: The Correct answer is (C)

Explanation:

Using formula: $M1D1W2 = M2D2W1$

We have = $5 * 9 * W2 = 3 * D2 * W1$

$W2 = W1$ as the task is the same in both the cases, so the amount of work to be done would be the same.

Therefore, we have $5 * 9 = 3 * D2$

$$45 = 3 * D2$$

$$D2 = \frac{45}{3} = 15 \text{ days}$$

15) Solution: The Correct answer is (D)

Explanation:

Let the original number of workers = X

X workers can complete the work in 30 days. And (X - 50) complete the same task in 40 days.

Apply formula: $M1D1W2 = M2D2W1$

$W1 = W2$ as the task is the same in both the cases.

Therefore, $X * 30 = (X - 5) * 40$

$$30X = 40X - 200$$

$$200 = 40X - 30X$$

$$200 = 10X$$

$$X = 200/10 = 20 \text{ days}$$

16) Solution: The Correct answer is (C)

Explanation:

Let the work will be completed in X days.

Apply formula: $M_1 D_1 T_1 W_2 = M_2 D_2 T_2 W_1$

$W_1 = W_2$

Therefore, $40 * 15 * 4 = 30 * D_2 * 5$

$2400 = 150 * D_2$

$D_2 = \frac{2400}{150} = 16 \text{ days}$

17) Solution: The Correct answer is (D)

Explanation:

Let the original number of men = X

X men do the work in 50 days.

As per the question, X + 6 men can do the work in 40 days (50 - 10).

Apply formula: $M_1 D_1 W_2 = M_2 D_2 W_1$

$W_1 = W_2$

Therefore, $X * 50 = (X + 6) * 40$

$50X = 40X + 240$

$10X = 240$

$X = \frac{240}{10} = 24 \text{ men}$

18) Solution: The Correct answer is (C)

Explanation:

A is twice as good as workman as B so he will take less time to do a piece of work than B and the ratio of time taken by A and B would be = 1:2

So, if there is a difference of one day (2-1), B takes 2 days.

As per question the difference in time taken by A and B is 40 days.

So, if the difference is of 40 days, B will take $2 * 40 = 80$ days.

A takes 40 days less than B. So, A will take 40 days (80 - 40) to do the work.

A's one day work = $\frac{1}{40}$

B's one day work = $\frac{1}{80}$

(A + B)'s one day work = $\frac{1}{40} + \frac{1}{80} = \frac{2}{80} = \frac{1}{40}$

So, working together they will do the work in $\frac{80}{3}$ days

19) Solution: The Correct answer is (A)

Explanation:

As per question:

Work done by A in 1 day: work done by B in 1 day = 2:1

A and B working together can complete the work in 20 days.

So, (A + B)'s one day work = $\frac{1}{20}$

Therefore, A's one day work will be = $\frac{1}{20} * \frac{2}{3} = \frac{2}{60} = \frac{1}{30}$

Therefore, A alone can finish the work in 30 days

20) Solution: The Correct answer is (A)

Explanation:

3 men's one day work = $\frac{1}{20}$

One man works for half day, so his one day's work = $\frac{1}{60 * 2} = \frac{1}{120}$

Sum of each man one day's work

= $\frac{1}{60} + \frac{1}{60} + \frac{1}{120} = \frac{2}{60} = \frac{1}{30}$

Therefore, they will do the work in 24 days

21) The correct answer is: D

Explanation:

ATQ,

The efficiency of A = B + C

(A + B) can finish the work in 10 days, and C can finish the work in 50 days.

Now, A + B = 10 days

C = 50 days

Note: Assume the total work = LCM of the given days

Take the LCM of days = LCM of (10 and 50) = 50

Let the total work = 50

Note: One day work = (total work / days)

Now,

C's one day work = $50/50 = 1$

(A + B)'s one day work = 5

i.e., (A + B + C)'s one day work = $5 + 1 = 6$

i.e., A + B = 6

Or, A's one day work efficiency = 3

A + B = 5, i.e., 3 + B = 5

Or, B's one day efficiency = 2

Hence, B alone can work in $50/2 = 25$ days

22) Solution: The correct answer is : B

Explanation:

ATQ,

A + B = 12 days

B + C = 16 days

Note: Assume the total work = LCM of the given days

Take the LCM of days = LCM of (12 and 16) = 48

Let the total work = 48

Note: One day work = (total work / days)

Now,

(A + B)'s one day work = $48/12 = 4$ unit

(B + C)'s one day work = $48/16 = 3$ unit

As per the question:

A works for 5 days

B works for 7 days or (5 + 2) days, that means B works 5 days with A and remaining 2 days with C.

C works 13 days or (2 + 11) days, that means C works 2 days with B and remaining 11 days alone.

That means total work done by (A + B) in 5 days

A + B = 5 days * 4 unit = 20 units

And, total work done by (B + C) = 2 days * 3 unit = 6 units

So, A + B + C finish the 26 units of work.

Remaining work = $48 - 26 = 22$ unit work

And C completes the remaining work in 11 days.

i.e., C's one day's works = $22/11 = 2$ units.

C alone can finish total work in [total work / C's one day work] = $[48/2] = 24$ days.

23) Solution: The correct Answer is: C

Explanation:

Note: Assume the total work = LCM of the given days

Take the LCM of days = LCM of (10 and 15) = 30

Let the total work = 30

Note: One day work = (total work / days)

Now,

A's one day work = $30/10 = 3$ unit

B's one day work = $30/15 = 2$ unit

That means A and B works 5 unit works in 2 days

i.e., 2 days = 5 unit work

To complete the 30 work, multiply both sides with 6.

i.e., 2 days * 6 = 5 unit work * 6

Or, 12 days = 30 works

So, A and B require 12 days to finish the work.

24) Solution: The correct Answer is: D

Explanation:

Note: Assume the total work = LCM of the given days

Take the LCM of days = LCM of (10, 15, and 30) = 30

Let the total work = 30

Note: One day work = (total work/ days)

Now,

A's one day work = $30/10 = 3$ unit

B's one day work = $30/15 = 2$ unit

C's one day work = $30/30 = 1$ unit

ATQ, A work continuously and B and C works alternatively

i.e., (A+B)'s one day work = $3+2 = 5$ unit

And (A+C)'s one day work = $3+1 = 4$ unit

Or, 2 days work = 9 unit

To complete the 27 units work, multiply both sides with 3.

i.e., 2 days * 3 = 9 unit * 3

Or, 6 days = 27 units of work

Now, on the 7th day, the remaining work is done by A + B.

If (A+B)'s one day work = 5 unit work

i.e.,

1 work = $1/5$ days

Or, 3 work = $3/5$ days

Hence, the work will be finished in $6+3/5$ days or $6[3/5]$ days.

25) Solution: the correct Answer is : B

Explanation:

Note: Assume the total work = LCM of the given days

Take the LCM of days = LCM of (10, 15, and 30) = 30

Let the total work = 30

Note: One day work = (total work/ days)

Now,

A's one day work = $30/10 = 3$ unit

B's one day work = $30/15 = 2$ unit

C's one day work = $30/30 = 1$ unit

Let A works for days = D

Note: man * days = total work

ATQ, (A+B+C) works 6 units work per day till D days, so their total work = $6 * D$

(B+C) works 3 unit work per day till 1 day, so their total work = $3 * 1 = 3$

C works 1 unit work per day till 3 days, so his total work = $1 * 3 = 3$

Or, $6*D + 3*1 + 1*3 = 30$ (total work)

$6D = 30-6$

$D = 24/6$

$D = 4$

So, A works for 4 days, B works for $4+1=5$ days, and C works for $4+1+3=8$ days.

1) Answer: D

Explanation :

Total distance travelled = $(50 \times 2 \times 1/2) + (70 \times 1 \times 1/2)$
 $= (125 + 105)$ miles
 $= 230$ miles.

2) Answer:

Explanation :

- B (11 : 9)

Explanation - In the same time, they cover 110 km and 90 km respectively.

Ratio of their speeds = $110 : 90 = 11 : 9$

3) Answer: : C

Explanation :

Ratio of speeds =

$$300 \times \frac{2}{15} : \frac{450}{9} = 40 : 50 = 4 : 5$$

4) Answer: : Option B

Explanation:

$$\text{Speed} = \left(\frac{600}{5 \times 60} \right) \text{m/sec.}$$

$$= 2 \text{ m/sec.}$$

Converting m/sec to km/hr

$$= \left(2 \times \frac{18}{5} \right) \text{km/hr}$$

$$= 7.2 \text{ km/hr.}$$

5) Answer: : Option B

Explanation:

Due to stoppages, it covers 9 km less.

$$\text{Time taken to cover 9 km} = \left(\frac{9}{54 \times 60} \right)_{\text{min}} = 10 \text{ min.}$$

6) Answer: - (C)

Explanation:

Distance = Speed * time

$$\text{Here time} = 2 \text{ hr } 45 \text{ min} = 2 \frac{3}{4} \text{ hr} = \frac{11}{4} \text{ hr}$$

$$\text{distance} = 4 * \frac{11}{4} = 11 \text{ km}$$

New Speed = 16.5 kmph

$$\text{Therefore time} = \frac{D}{S} = \frac{11}{16.5} = 40 \text{ min}$$

7) Answer: - (A)

Explanation :

In same time, they cover 110km & 90 km respectively.

For the same time speed and distance is inversely proportional.
 so ratio of their speed = $110:90 = 11:9$

8) Answer: A

Explanation:

Time taken to cover 600 km

$$= (600/100) \text{hrs} = 6 \text{ hrs.}$$

$$\text{Number of stoppages} = 600/75 - 1 = 7.$$

$$\text{Total Time of stoppages} = (3 \times 7) \text{min} = 21 \text{ min.}$$

Hence, total time taken = 6 hrs 21 min.

9) Answer:

Explanation - C (11 am)

Suppose they meet x hrs after 8 a.m.

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Then, (Distance moved by first in x hrs) + Distance moved by second in $(x-1)$ hrs = 330

$$60x + 75(x-1) = 330$$

$$x = 3$$

So, they meet at $(8+3)$, i.e. 11 a.m

10) Answer: : C)

Explanation :

Let the correct time to complete the journey be x min

Distance covered in $(x+11)$ min. at 40 kmph = Distance covered in $(x+5)$ min. at 50 kmph

$$\frac{(x+11)}{60} \times 40 = \frac{(x+5)}{60} \times 50$$

$$x = 19 \text{ min}$$

11) Answer: : Option A

Explanation:

Let the actual distance travelled be x km.

$$\text{Then, } \frac{x}{10} = \frac{x+20}{14}$$

$$\Rightarrow 14x = 10x + 200$$

$$\Rightarrow 4x = 200$$

$$\Rightarrow x = 50 \text{ km.}$$

12) Answer: - (D)

Explanation:

Due to stoppages, it covers 9 km less.

$$\text{Time taken to cover 9 km} = \frac{9}{54} \times 60 \text{ min} = 10 \text{ min.}$$

13) Answer: - (B)

Explanation:

A ----- C ----- B

7am ----- 8am

AC = 20 km, CB = 90 km

Distance travelled in 1 hour = 20 km

Remaining distance = 110 - 20 = 90 km

$$\text{Time taken} = \frac{\text{Distance}}{\text{Relative speed}}$$

$$= \frac{90}{20+25} = 2 \text{ hr}$$

$$\text{So, time} = 8 \text{ am} + 2 = 10 \text{ am}$$

14) Answer: C

Explanation :

Total distance travelled in 12 hours = $(35 + 37 + 39 + \dots \text{ upto } 12 \text{ terms})$

This is an A.P with first term, $a = 35$, number of terms, $n = 12$, $d = 2$.

$$\begin{aligned} \text{Required distance} &= 12/22 \times 35 + \{12 - 1\} \times 2 \\ &= 6(70 + 23) \\ &= 552 \text{ kms.} \end{aligned}$$

15) Answer:

Explanation - C (7)

Explanation - Relative speed = $(2+3) = 5$ rounds per hour

So, they cross each other 5 times in an hour and 2 times in half an hour Hence, they cross each other 7 times before 9.30 a.m.

16) Answer: : C)

Explanation :

$$\text{Difference between timings} = 15 \text{ min} = \frac{1}{4} \text{ hr}$$

Let the length of journey be x km.

$$\text{Then, } \frac{x}{35} - \frac{x}{40} = \frac{1}{4}$$

$$8x - 7x = 70$$

$$x = 70 \text{ km}$$

17) Answer: : Option B

Explanation:

$$\frac{(1/2)x}{21} + \frac{(1/2)x}{24} = 10$$

$$\Rightarrow \frac{x}{21} + \frac{x}{24} = 20$$

$$\Rightarrow 15x = 168 \times 20$$

$$\Rightarrow x = \left(\frac{168 \times 20}{15} \right) = 224 \text{ km.}$$

18) Answer: - (C)

Explanation:

Let the normal speed be ' s ' km/hr

Then new speed = $(s+5)$ km/hr

$$\frac{300}{s} - 2 = \frac{300}{s+5}$$

On solving this equation we get:

$$s = 25 \text{ km/hr}$$

19) Answer: B

$$\begin{aligned} \text{Distance} &= (1100 \times 11/5) \text{ feet} \\ &= 2420 \text{ feet.} \end{aligned}$$

20) Answer:

Explanation - C (60 kmph)

Explanation - Number of gaps between 21 telephone posts = 20
Distance traveled in 1 minute = $(50 \times 20) \text{ m} = 1000 \text{ m} = 1 \text{ km}$
Speed = 60 km/hr

21) Answer: : B)

Explanation :

Total distance travelled = $(10 + 12) \text{ km/hr} = 22 \text{ km/hr}$

$$\text{Total time taken} = \frac{10}{12} + \frac{12}{10} \text{ hrs} = \frac{61}{30} \text{ hrs}$$

$$\text{Average speed} = 22 \times \frac{30}{61} \text{ km/hr} = 10.8 \text{ km/hr}$$

22) Answer: : Option C

Explanation:

Let speed of the car be x kmph.

$$\text{Then, speed of the train} = \frac{150}{100}x = \left(\frac{3}{2}x \right)$$

$$\therefore \frac{75}{x} - \frac{75}{(3/2)x} = \frac{125}{10 \times 60}$$

$$\Rightarrow \frac{75}{x} - \frac{50}{x} = \frac{5}{24}$$

$$\Rightarrow x = \left(\frac{25 \times 24}{5} \right) = 120$$

23) Answer: - (B)

Explanation:

Let total distance be S

total time = 1 hr 24 min = 84 min

$$= \frac{84}{60} \text{ hr} = \frac{7}{5} \text{ hr}$$

Let Vikas travels from A->T->S

A ----- T ----- S

$$< \text{-----} \frac{2}{3}S \text{-----} > < \text{-----} \frac{1}{3}S \text{-----} >$$

A to T :: speed = 4 kmph

$$\text{Distance} = \frac{2}{3} \times S$$

T to S :: speed = 5 km

$$\text{Distance} = 1 - \frac{2}{3} S = \frac{1}{3} S$$

$$\text{Total time: } \frac{21}{15} \text{ hr} = \frac{2S}{4} + \frac{1S}{5}$$

$$84 = 10S + 4S \text{ (Multiply both sides by } 15 \times 4 \text{)}$$

$$S = \frac{84}{14}$$

$$= 6 \text{ km}$$

24) Answer: B

Explanation :

$$\text{Speed} = (600 / 5 \times 60) \text{ m/sec}$$

$$= 2 \text{ m/sec}$$

$$= (2 \times 18/5) \text{ km/hr}$$

$$= 7.2 \text{ km/hr.}$$

25) Answer: : C)

Explanation :

Let the distance traveled on foot be x km

Then, distance traveled on bicycle = (61 - x) km

$$\text{So, } \frac{x}{4} + \frac{(61 - x)}{9} = 9$$

$$9x + 4(61 - x) = 9 \times 36$$

$$= 5x = 80$$

$$= x = 16 \text{ km}$$

26) Answer: : Option D

Explanation:

Let the speed of two trains be 7x and 8x km/hr

$$\text{Then, } 8x = \left(\frac{400}{4}\right) = 100$$

$$\rightarrow x = \left(\frac{100}{8}\right) = 12.5$$

$$\therefore \text{Speed of first train} = (7 \times 12.5) \text{ km/hr} = 87.5 \text{ km/hr}$$

27) Answer: - (B)

Explanation:

$$\text{Time} = \frac{50}{60} \text{ hr} = \frac{5}{6} \text{ hr}$$

$$\text{Speed} = 48 \text{ mph}$$

$$\text{distance} = S \times T = 48 \times \left(\frac{5}{6}\right) = 40 \text{ km}$$

$$\text{time} = \frac{40}{60} \text{ hr} = \frac{2}{3} \text{ hr}$$

$$\text{New speed} = 40 \times \left(\frac{2}{3}\right) \text{ kmph} = 60 \text{ kmph}$$

28) Answer: - (C)

Explanation:

Let the speed of the current be x km/hr

Thus upward speed = (4.5 + x) km/hr

and downward speed = (4.5 - x) km/hr

Let distance travelled be y, then

$$\frac{y}{(4.5 - x)} = \frac{2y}{(4.5 + x)} \Rightarrow x = 1.5 \text{ km/hr}$$

29) Answer: : C)

Explanation :

Let the speed of the train be x m/sec. Then,

Distance travelled by the train in 10 min. = Distance travelled by sound in 30 sec

$$x \times 10 \times 60 = 330 \times 30$$

$$x = 16.5$$

$$\text{Speed of the train} = 16.5 \text{ m/sec} = 16.5 \times (18/5) \text{ km/hr} = 59.4 \text{ km/hr}$$

30) Answer: : Option D

Explanation:

$$\text{Distance} = (240 \times 5) = 1200 \text{ km.}$$

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

$$\text{Speed} = 1200 / (5/3) \text{ km/hr. We can write } 1\frac{2}{3} \text{ hours as } 5/3 \text{ hours)}$$

$$\therefore \text{Required speed} = (1200 \times 3) \text{ km/hr} = 720 \text{ km/hr}$$

31) Answer: C) 127.5 meters

Explanation:

When A runs 1000 meters, B runs 900 meters and when B runs 800 meters, C runs 700 meters.

Therefore, when B runs 900 meters, the distance that C runs = (900 x 700)/800 = 6300/8 = 787.5 meters.

So, in a race of 1000 meters, A beats C by (1000 - 787.5) = 212.5 meters to C.

So, in a race of 600 meters, the number of meters by Which A beats C = (600 x 212.5)/1000 = 127.5 meters.

32) Answer: A) 200 m

Explanation:

Ratio of the speeds of A and B = 5 : 1 = 5 : 3

Thus, in race of 5 m, A gains 2 m over B.

2 m are gained by A in a race of 5 m.

80 m will be gained by A in race of 5/2 * 80 m = 200m

=> Winning post is 200 m away from the starting point.

33) Answer: B) 111.12 meters

Explanation:

A runs 1000 meters while B runs 900 meters and C runs 800 meters.

Therefore, B runs 900 meters while C runs 800 meters.

So, the number of meters that C runs when B runs 1000 meters = (1000 x 800)/900 = 8000/9 = 888.88 meters

Thus, B can give C (1000 - 888.88) = 111.12 meters start

34) Answer: C) 33sec

Explanation:

B runs 35 m in 7 sec.

B covers 200 m in (7/35 * 200) = 40 sec.

B's time over the course = 40 sec.

A's time over the course (40 - 7) sec = 33 sec.

35) Answer :- c) 20m

Explanation:

As the speed of A and B r given in ratio 3:4 consider speed of A as 3x and that of B as 4x

A is already ahead by 140m so he has to cover a distance of 500 - 140 = 360m ... time required by A to complete this distance is 360/3x {time=distance/speed} at that same time B will travel a distance = 4x * 360/3x = 480 m

As total distance for B is 500m A wins the race by 500 - 480 = 20 m

36) Answer - a. 240, 60 Secs

Explanation:

Length of the track L = 1200m

$$\text{Speed of A} = 27 \times 51827 \times 518 = 7.5 \text{ m/s}$$

Speed of B = $45 \times 51845 \times 518 = 12.5 \text{ m/s}$

(i) same direction

Time = $L / \text{Relative Speed} = 1200 / 12.5 - 7.5 = 240 \text{ sec}$

(ii) Opposite Direction

Time = $L / \text{Relative Speed} = 1200 / 12.5 + 7.5 = 60 \text{ sec}$

37) Answer - b. 480, 480 Secs

Explanation:

Length of the track L = 1200 m

Speed of A = $18 \times 51818 \times 518 = 5 \text{ m/s}$

Speed of B = $27 \times 51827 \times 518 = 7.5 \text{ m/s}$

Time taken by A to complete one round = $1200 / 5 = 240 \text{ sec}$

Time take by B to complete one round = $1200 / 7.5 = 160 \text{ sec}$

(i) Same direction:

They will meet at the starting point at a time which is the LCM of the timings taken by each of them to complete one full round. i.e., the LCM of 160s and 240 s which is 480 Sec

(ii) Opposite Direction:

They will meet at the starting point at a time which is the LCM of the timings taken by each of them to complete one full round. i.e., the LCM of 160s and 240s which is 480 Sec

38) Answer - b. 480 sec

Explanation:

L = 1200 m

Speed of A (a) = $9 \times 5 / 18 = 2.5 \text{ m/sec}$

Speed of B (b) = $18 \times 5 / 18 = 5 \text{ m/sec}$

Speed of C (c) = $27 \times 5 / 18 = 7.5 \text{ m/sec}$

They will meet for the first time at a time which is the L/a-b,

L/b-c seconds

L/a-b = $1200 / 5 - 2.5 = 480 \text{ sec}$

L/b-c = $1200 / 7.5 - 5 = 480 \text{ sec}$

So they will meet for the first time after 480 sec. i.e., 8 min after they start.

39) Answer - b. 480 sec

Explanation :

L = 1200 m

Speed of P(p) = $9 \times 5 / 18 = 2.5 \text{ m/sec}$

Speed of Q (q) = $18 \times 5 / 18 = 5 \text{ m/sec}$

Speed of R (r) = $27 \times 5 / 18 = 7.5 \text{ m/sec}$

They will meet for the first time at a time which is the LCM of

L/p, L/a, L/r

L/p = $1200 / 2.5 = 480$

L/q = $1200 / 5 = 240$

L/r = $1200 / 7.5 = 160$

LCM of 480, 240, 160 is 480 Sec. So they meet after 8 min.

40) Answer - d. None of these

Explanation:

When B has completed 10 rounds, A would have completed $10 \times 15/6 = 25$ rounds.

When running in same direction, this would mean A having run 15 rounds more than B and would thus have met 15 times (For every one round that A runs more than B, A meets B)

When running in Opposite direction, this would mean A and B together having run 35 rounds and thus would have met 35 times.

Chapter 10: Pipe & Cistern

1) Answer : D

Explanation :

Part filled by (A+B) in 1 hour = $\frac{1}{5} + \frac{1}{20} = \frac{1}{4}$

So, A and B together can fill the tank in 4 hours.

Work done by the leak in 1 hour = $\frac{1}{4} - \frac{2}{9} = \frac{1}{36}$

Leak will empty the tank in 36 hrs.

2) Answer : C

Explanation :

Let capacity of P be x liters. Then, capacity of Q = $\frac{x}{3}$ liters

Capacity of the drum = 60x liters.

Required number of turns = $\frac{60x}{x + \frac{x}{3}}$

= $60x \times \frac{3}{4x} = 45$

3) Answer : A

Explanation :

Let the filling capacity of the pump be $x \text{ m}^3 / \text{min}$.

Then, emptying capacity of the pump = $(x + 10) \text{ m}^3 / \text{min}$

So, $\frac{2400}{x} - \frac{2400}{(x+10)} = 8$

$x^2 + 10x - 3000 = 0$

$(x - 50)(x + 60) = 0$

$x = 50$.

neglecting the -ve value of x

4) Answer : B

Explanation :

Work done by the third pipe in 1 min.

= $\frac{1}{50} - \frac{1}{60} + \frac{1}{75}$

= $\frac{1}{50} - \frac{3}{100} = -\frac{1}{100}$ -ve Sign means emptying

The third pipe alone can empty the cistern in 100 min.

5) Answer : C

Explanation :

(A + B)'s 1 hour's work = $\frac{1}{12} + \frac{1}{15} = \frac{9}{60} = \frac{3}{20}$

(A + C)'s 1 hour's work = $\frac{1}{12} + \frac{1}{20} = \frac{8}{60} = \frac{2}{15}$

Part filled in 2 hrs = $\frac{3}{20} + \frac{2}{15} = \frac{17}{60}$

Part filled in 6 hrs = $3 \times \frac{17}{60} = \frac{17}{20}$

Remaining part = $1 - \frac{17}{20} = \frac{3}{20}$

Now, it is the turn of A and B and $\frac{3}{20}$ Part is filled by A and B in 1 hour.

Total time taken to fill the tank = $(6 + 1) \text{ hrs} = 7 \text{ hrs}$

6) Answer:

Explanation :

part filled by (A+B+C) in 1 hour = $(1/5 + 1/6 + 1/30) = 1/3$.

All the three pipes together will fill the tank in 3 hours

7) Answer:

Explanation :

Net aprt filled in 1 hour = $(1/10 + 1/12 - 1/20)$

= $8/60$

= $2/15$.

Therefore the tank will be full in $15/2 \text{ hours} = 7 \text{ hrs } 30 \text{ min}$.

8) Answer:

Explanation :

Work done by the inlet in 1 hour = $(1/8 - 1/12) = 1/24$.

Work done by the inlet in 1 min. = $(1/24 \times 1/60) = 1/1440$.

Volume of $1/1440$ part = 6 litres.

Therefore, Volume of whole = $(1440 \times 6) = 8640$ litres

9) Answer:

Explanation :

Capacity of the tank = (12×13.5) litres = 162 litres.

Capacity of each bucket = 9 litres.

Number of buckets needed = $(162/9) = 18$.

10) Answer:

Explanation :

Net part filled in 1 hour = $(1/4 - 1/9) = 5/36$.

Therefore, the cistern will be filled in $36/5$ hrs i.e., 7.2 hrs.

11) Answer:

Explanation :

Let the slower pipe alone fill the tank in x minutes.

Then, faster pipes will fill it in $x/3$ minutes.

Therefore, $1/x + 3/x = 1/36$

$= 4/x = 1/36$

$= x = 144$ min.

12) Answer:

Explanation :

A's work in 1 hour = $1/6$.

B's work in 1 hour = $1/4$.

$(A+B)$'s 2 hour's work when opened alternately = $(1/6 + 1/4) = 5/12$.

$(A+B)$'s 4 hour's work when opened alternately = $10/12 = 5/6$.

Remaining part = $(1 - 5/6) = 1/6$.

Therefore, total tank to fill the tank $(4+1)$ hrs = 5 hrs.

13) Answer: Option B

Explanation:

Part filled by $(A + B + C)$ in 3 minutes = $3 \left(\frac{1}{30} + \frac{1}{20} + \frac{1}{10} \right) = \left(3 \times \frac{11}{60} \right) = \frac{11}{20}$

Part filled by C in 3 minutes = $\frac{3}{10}$.

\therefore Required ratio = $\left(\frac{3}{10} \times \frac{20}{11} \right) = \frac{6}{11}$

14) Answer: Option C

Explanation:

Net part filled in 1 hour = $\frac{1}{5} + \frac{1}{6} - \frac{1}{12} = \frac{17}{60}$

The Tank will be full in $\frac{60}{17}$ hrs i.e., $3 \frac{9}{17}$ hrs.

15) Answer: Option D

Explanation:

Work done by the leak in 1 hour = $\left(\frac{1}{2} - \frac{3}{7} \right) = \frac{1}{14}$

\therefore Leak will empty the tank in 14 hrs

Chapter 11 - Mensuration

1) Answer - c) 40 m

Explanation:

Let original length = l , breadth = b , so area = lb

When l and b increased by 1:

$(l+1)(b+1) = lb + 21$

Solve, $l + b = 20$

When l increased by 1, b decreased by 1:

$(l+1)(b-1) = lb - 5$

Solve, $l - b = 6$

Now solve both equations, $l = 13$, $b = 7$

Perimeter = $2(13+7)$

2) Answer - d) Rs 3440

Explanation:

Given $2(l+b) = 340$

1 m broad boundary means increase in l and b by 2 m

So area of the boundary will be $[(l+2)(b+2) - lb] = 2(l+b) + 4 = 340 + 4 = 344$

So cost of gardening = 344×10

3) Answer - e) 72 cm

Explanation:

Sides $3x$, $4x$, $5x$

So semi-perimeter, $s = (3x+4x+5x)/2 = 6x$

Area = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{6x \cdot 3x \cdot 2x \cdot x} = 6x^2 \text{ cm}^2$

So $6x^2 = 216$, this gives $x = 6$

Perimeter = $12x = 12 \times 6$

4) Answer - d) 25% decrease

Explanation:

Area of triangle = $(1/2) \times \text{base} \times \text{height}$

So effect on area = $+50 + (-50) + (50)(-50)/100 = -25\%$

5) Answer - b) 72 cm

Explanation:

Length of wire = $2\pi r = 264$ which should be equal to the perimeter of rectangle in which it is bent.

So $2(6x + 5x) = 264$

Solve, $x = 12$

Largest side = $6x = 6 \times 12$

6) Answer - a) 100 cm

Explanation:

Sides = x and $5x$

Now vol. of rectangle = vol. of cube

$x \times 5x \times (0.5) = 10 \times 10 \times 10$

Solve, $x = 20$

Largest side = $5x = 5 \times 20$

7) Answer - b) 1538.5 cm^3

Explanation:

Given $2\pi rh + \pi r^2 = 616$ and $r = (1/2) \times h$

So $2\pi \times (1/2)h \times h + \pi \times (1/4)h^2 = 616$

Solve, $h = 28/\sqrt{5}$

Volume = $\pi r^2 h = (22/7) \times (1/4) \times h^2 \times h$

Put $h = 28/\sqrt{5}$, vol. ≈ 1538.5

8) Answer - c) 17 : 9

Explanation:

Let radius = $5x$ and height = $12x$

Then slant height = $\sqrt{(5x)^2 + (12x)^2} = 13x$

Required ratio = $2\pi r(h+r) : \pi r(l+r)$

9) Answer - d) 2376 cm²

Explanation:

Slant height of cone, $l = \sqrt{(12^2 + 5^2)} = 13$ cm

Total surface area of final figure = curved surface area of cone

+ curved surface area of cylinder + area of base

$$= \pi r l + 2\pi r h + \pi r^2$$

$$= \pi r (l + 2h + r)$$

$$= (22/7) * 12 (13 + 2*19 + 12)$$

10) Answer - b) 48

Explanation:

Let radius of rod = r , then height = $8r$

Radius of 1 spherical ball = $r/2$

So number of balls = Vol. of cylindrical rod / Vol. of 1 spherical ball

$$= \pi \times r^2 \times 8r / (4/3) \times \pi \times (r/2)^3$$

11) Answer - e) 250

Explanation:

Distance to be covered in 1 min = $66 * (1000/60) = 1100$ m

70 cm = 0.70 m

Circumference of wheel = $2 * (22/7) * 0.70 = 4.4$ m

Number of revolutions = $(1100/4.4) = 250$

12) Answer - b) 20 m

Explanation:

$3x, 2x$

So $(3x+5)*2x = 2600$

$$6x^2 + 10x = 2600$$

$$3x^2 + 5x - 1300 = 0$$

$$3x^2 - 60x + 65x - 1300 = 0$$

$$3x(x-20) + 65(x-20) = 0$$

Solve, $x = 20$

So breadth = 20 m

13) Answer - b) 125%

Explanation:

Surface area of cube = $6a^2$

A increases by 50%

So area increases by $50 + 50 + (50)(50)/100 = 125\%$

14) Answer - a) 3080 cm²

Explanation:

$$(22/7) * (2x)^2 * 3x = 12936$$

Solve, $x = 7$

So radius = 7 cm, height = 21 cm

$$\text{Total surface area} = 2 * (22/7) * 14 * (21 + 14) = 3080$$

15) Answer - c) 120

Explanation:

20 cm = 0.2 m

So number of boxes that can fit = $1.6 \times 1 \times 0.6/0.2 \times 0.2 \times 0.2$

16) Answer - e) 9 times

Explanation:

Wire will be taken as cylinder.

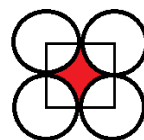
$$R = r/3$$

$$\pi r^2 h = \pi R^2 H$$

$$r^2 h = (r/3)^2 H$$

so $H = 9h$

17) Answer - c) 168 cm²



Explanation:

Required area = area of square shown in figure – 4 * areas of 1/4th parts of each circle, so

$$\text{Required area} = 28 * 28 - 4 * (1/4) * (22/7) * 14 * 14$$

18) Answer – a) $(400\sqrt{3})/9$

Explanation :

Diagonal of a square = $a\sqrt{2} = 10\sqrt{2}$

so $a = 10$, perimeter of square = $4 * 10 = 40 = 3x$ (x is the length of each side of triangle)

$$x = 40/3, \text{ so area of equilateral triangle} = \sqrt{3}/4 * 40/3 * 40/3 = (400\sqrt{3})/9 \text{ cm}^2$$

19) Answer – c) 13, 11

Explanation :

Length = l and breadth = b ,

$$(l + 10) * (b - 4) = lb \text{ and } (l - 5) * (b + 7) = lb$$

Solve both equation to get l and b

20) Answer – b) 16.67

Explanation :

let length = 100 and breadth = 100

now new length = 120 and let breadth = b

$$\text{so, } 100 * 100 = 120 * b$$

$$b = 250/3, \text{ so \% decrease} = 100 - 250/3 = 50/3 = 16.67\%$$

21) Answer – b) 2376

Explanation :

total surface area = curved surface area of cone + curved surface area of cylinder + base area

$$= (22/7) * 12 * 13 + (22/7) * 12 * 19 + (22/7) * 12 * 12 = 2376 \text{ cm}^2$$

22) Answer – a) 3080

Explanation :

$$r + h = 19 \text{ m}$$

$$2\pi r(r + h) = 1672$$

$$r = 1672 * 7/2 * 22 * 19 = 14$$

$$r = 14 ; h = 5$$

$$\text{volume of the cylinder} = \pi r^2 h = (22/7) * 14 * 14 * 5 = 3080 \text{ m}^3$$

23) Answer – b) 1 : 4

Explanation :

$$b = 2a$$

$$a = b/2$$

Area of square = $b^2/4$ = Area of rectangle

$$l * b = b^2/4 \Rightarrow l = b/4$$

$$l/b = (b/4)/b \Rightarrow 1:4$$

24) Answer – b) 314.2 Sq cm

Explanation :

Base of the cone (r) = $10/2 = 5$ cm

Height of the cone (h) = $\sqrt{169 - 25} = \sqrt{144} = 12$

$$\text{Volume} = 1/3 \pi r^2 h$$

$$= 22 * 5 * 5 * 12/7 * 3 = 314.2 \text{ Sq cm}$$

25) Answer – d) $1/4$ cm

Explanation :

Total volume displaced by 8 men = 120×5 cm cube

However volume = $l \times b \times h = 80 \times 30 \times h$

$$80 \times 30 \times h = 120 \times 5$$

$$h = 120 \times 5 / 80 \times 30 = 600 / 2400 = 0.25.$$

so the water level rises by 0.25 cm = $1/4$ cm

26) Answer – c) 1:4

Explanation :

$$v_1/v_2 = (r_1^2) \times h_1 / (r_2^2) \times h_2 \quad (h_1 = h_2)$$

$$(r)^2 / (2r)^2$$

$$v_1/v_2 = 1:4$$

27) Answer - b) 98m

Explanation :

$$100 \times 2 = 200 \text{ cm measured long}$$

$$\text{Correct length} = 100 - (200/100) = 100 - 2 = 98 \text{ m}$$

28) Answer - c) 45 rounds

$$\text{Explanation : } N = 2000 / (14 \times 22 / 7) = 2000 / 44 = 45.45 = 45 \text{ rounds}$$

29) Answer – b) $26 \text{ m} \times 3 \text{ m}$

Explanation :

$$L = 20 - 2b$$

$$\text{area of the garden} = 78 \text{ sq m,}$$

$$L \times b = 78$$

$$b \times (20 - 2b) = 78$$

$$20b - 2b^2 = 78$$

$$b^2 - 10b + 39 = 0$$

$$b = 3 \quad b = 13$$

$$b = 3 \text{ then } L = 26$$

$$b = 13 \text{ then } L = 6$$

$$\text{Dimension} = 26 \text{ m} \times 3 \text{ m}$$

30) Answer – d) 1192 sq cm

Explanation :

$$\text{Length of one side of rhombus} = 300/4 = 75 \text{ cm}$$

$$\text{Other diagonal} = 2 \times \text{root of } (75)^2 - 8^2$$

$$= 149$$

$$\text{Area} = 1/2 \times 16 \times 149$$

Chapter 12 - Permutation and Combination

Practice Set 1 Answer:

1) Answer – D. 3600

Explanation :

Number of consonants = 5

Number of Vowels = 3

We can arrange the vowels by $5!$ ways. In between these consonants 6 spaces are there we have to arrange 3 vowels at 6 places. We can do that by 6P_3 ways.

$$\text{Total number of ways} = \frac{5! \times {}^6P_3}{2! \times 2!} = 3600$$

2) Answer – A. 1320

Explanation :

$$12 \times 11 \times 10 = 1320$$

3) Answer – C. 256

Explanation :

$$4 \times 4 \times 4 \times 4 = 256$$

4) Answer – B. $5^{10} \times 4^5$

Explanation :

$$10 \text{ questions with 5 choices} = 5^{10}$$

$$20 \text{ questions with 4 choices} = 4^5$$

5) Answer – C. 2419200

Explanation :

$${}^5P_3 \times {}^8P_3 \times {}^6P_3 = 60 \times 336 \times 120 = 2419200$$

6) Answer – B) 10800

Explanation :

5 men can sit in $5!$ Ways and adjacent to men total 6 vacant places are there, at there we can arrange 3 women in 6P_3 ways.
 $5! \times {}^6P_3 = 10800$

7) Answer – D. 72

Explanation :

$$3! \times 3! + 3! \times 3! = 36 + 36 = 72$$

8) Answer – A. 1024

Explanation :

$$\text{No of way} = 4^5 = 1024$$

9) Answer - B) 720

Explanation:

AUTHOR contains 6 letters, so total $6!$ ways.

10) Answer - C) 2401

Explanation:

LEADING is 7 letters.

We have 4 places where letters are to be placed.

For first letter there are 7 choices, since repetition is allowed, for second, third and fourth letter also we have 7 choices each, so total of $7 \times 7 \times 7 \times 7$ ways = 2401 ways.

11) Answer - B) 2880

Explanation:

First make IIIIE in a circle. So we have

N V S B L IIIE

Now we have N, V, S, B, L and box, their arrangements can be done in $6!$

Letters inside circle are also to be arranged, we have I, I, I, E so ways are $4!/3!$

$$\text{Total ways } 6! \times 4!/3!$$

12) Answer - B) 210

Explanation:

We have to select 2 men from 4 men, and 4 women from 7 women

$$\text{So total ways} = {}^4C_2 \times {}^7C_4$$

13) Answer - C) 1722

Explanation:

Case 1: 3 men and 2 women

$${}^8C_3 \times {}^7C_2 = 1176$$

Case 2: 4 men and 1 women

$${}^8C_4 \times {}^7C_1 = 490$$

Case 3: all 5 men

$${}^8C_5 = 56$$

Add all the cases.

14) Answer - D) 220

Explanation:

There are total 13 people, a particular woman is to be included, so now 12 people are left to be chosen from and 3 members to be chosen. So ways are ${}^{12}C_3$.

15) Answer - B) 20

Explanation:

Total 8 people, 2 men are to be excluded, so 6 men left to be chosen from and 3 members to be chosen. So ways are 6C_3 .

16) Answer - C) 465

Explanation :

$$2^4 - 1 = 16 - 1 = 15$$

$$2^5 - 1 = 32 - 1 = 31$$

$$15 \times 31 = 465$$

17) Answer - D) 360

Explanation :

$$\begin{aligned} \text{No of way in Necklace} &= (n-1)!/2 = 6!/2 \\ &= 720/2 = 360 \end{aligned}$$

18) Answer - A) 8467200

Explanation :

$$\text{No of ways} = 7! \times {}^8P_4$$

$$7! = 5040$$

$${}^8P_4 = 8 \times 7 \times 6 \times 5 = 1680$$

$$\text{No of ways} = 5040 \times 1680 = 8467200$$

19) Answer - D) 11!/2!

Explanation :

$$\text{No of ways} = 11!/2!$$

20) Answer - A) 60

Explanation:

Take vowels in a box together as one - IIU, M, N, M, M

So there are 5 that to be placed for this 5!, now 3 Ms, so 5!/3!, so arrangement of vowels inside box gives 3!/2!

$$\text{So total} = 5!/3! \times 3!/2!$$

21) Answer - B) 225

Explanation:

A number is divisible by 4 when its last two digits are divisible by 4

For this the numbers should have their last two digits as 00, 04, 08, 12, 16, ... 96

$$\text{By the formula, } a_n = a + (n-1)d$$

$$96 = 0 + (n-1) \times 4$$

$$n = 25$$

so there are 25 choices for last 2 digits and 9 choices (1-9) for the 1st digit

$$\text{so total} = 9 \times 25$$

22) Answer - A) 225

Explanation:

0 cannot be placed at first digit to make it a 3 digit number.

3 cases:

Case 1: 2 is placed at first place

1 choice for the first place, 9 choices each for the 2nd and 3rd

digit (0-9 except 2)

$$\text{So numbers} = 1 \times 9 \times 9 = 81$$

Case 2: 2 is placed at second place

8 choices for the first place (1-9 except 2), 1 choice for the 2nd digit and 9 choices for the 3rd digit (0-9 except 2)

$$\text{So numbers} = 8 \times 1 \times 9 = 72$$

Case 3: 2 is placed at third place

8 choices for the first place (1-9 except 2), 9 choices for the 2nd digit (0-9 except 2) and 1 choice for the 3rd digit

$$\text{So numbers} = 8 \times 9 \times 1 = 72$$

$$\text{So total numbers} = 81 + 72 + 72 = 225$$

23) Answer - b) 4! 5!

Explanation :

First 5 African are seated along the circular table in (5-1)!

Ways = 4!. Now Indian can be seated in 5! Ways, so 4! 5!

24) Answer - c) 91

Explanation :

$$\text{From 15 points number of lines formed} = {}^{15}C_2$$

6 points are collinear, number of lines formed by these = 6C_2

$$\text{So total lines} = {}^{15}C_2 - {}^6C_2 + 1 = 91$$

25) Answer - b) 16

Explanation :

$${}^NC_2 = 120 \text{ (N is the number of persons)}$$

Chapter 13 - Probability

Practice Set 1 Answer:

1) Answer -A) 1/2

Explanation :

$$\text{Total no of balls} = 6 + 4 = 10$$

$$3 \text{ balls drawn} = {}^{10}C_3 = (10 \times 9 \times 8) / (3 \times 2 \times 1) = 120$$

one ball is red and other 2 are white = ${}^4C_1 \times {}^6C_2$

$${}^4C_1 \times {}^6C_2 = (4 \times 6 \times 5) / (1 \times 2) = 60$$

$$P = 60/120 = 1/2$$

2) Answer -B) 1/5

Explanation :

$$5 \text{ digit number} = 5! = 120$$

Divisible by 5 then the last digit should be 0

Then the remaining position have the possibility = 4! = 24

$$P = (4!/5!) = 24/120 = 1/5$$

3) Answer -B) 11/36

Explanation:

Number of favourable outcomes = (1,4), (2,4), (3,4), (4,4), (5,4), (6,4), (4,1), (4,2), (4,3), (4,5), (4,6). = 11

Number of all possible outcomes = 36

$$\text{Probability} = 11/36$$

4) Answer - C) 11/21

Explanation :

$P(\text{At least one woman is selected}) = 1 - P(\text{No woman is selected})$

$$= 1 - {}^5C_2 / {}^7C_2$$

$$= 11/21$$

5) Answer -B) 15/52

Explanation :

$$n(S) = {}^{16}C_7 = 11440$$

$$n(E) = {}^{11}C_4 \times {}^5C_3 = 330 \times 10 = 3300$$

$$P = n(E)/n(S) = 3300/11440 = 15/52$$

6) Answer -D) 4/11

Explanation :

Total no of balls = 8+6+8 = 22

$$P(B) = 8/22$$

$$P(\text{neither red nor green}) = 8/22 = 4/11$$

7) Answer - C) 7/12

Explanation :

P	Q
1	1 2 3 4 5 6
2	2 3 4 5 6
3	3 4 5 6
4	4 5 6
5	5 6
6	6

$$n(E) = 21$$

$$n(S) = 36$$

$$P = 21/36 = 7/12$$

$$P = 21/36 = 7/12$$

$$n(E) = 21$$

$$n(S) = 36$$

$$P = 21/36 = 7/12$$

8) Answer - C) 7/10

Explanation :

$$P(a) = 10/100 = 1/10$$

$$P(b) = 70/100 = 7/10$$

$$P(\text{both}) = 10/100 = 1/10$$

$$P(a \cup b) = (1+7-1)/10 = 7/10$$

9) Answer - B) 1/5525

Explanation :

$$n(S) = {}^{52}C_3 = 132600/6 = 22100$$

$$n(E) = {}^4C_3 = 24/6 = 4$$

$$p = 4/22100 = 1/5525$$

10) Answer - A) 1/3

Explanation :

$${}^6C_2 = 6 \times 5/2 \times 1 = 30/2 = 15$$

$${}^{10}C_2 = 10 \times 9/2 \times 1 = 45$$

$$P = 15/45 = 1/3$$

11) Answer - A) 6/7

Explanation :

$${}^7C_2 = 7 \times 6/2 = 21$$

$${}^4C_1 \times {}^3C_1 + {}^4C_2 = 4 \times 3 + (4 \times 3)/2 = 12 + 6 = 18$$

$$P = 18/21 = 6/7$$

12) Answer - C) 505/1001

Explanation :

$${}^{14}C_4 = 14 \times 13 \times 12 \times 11/4 \times 3 \times 2 \times 1 = 1001$$

$$4 \text{ No positive} + 4 \text{ no negative} + (2 \text{ no positive} \times 2 \text{ no negative})$$

$$= {}^6C_4 + {}^8C_4 + ({}^6C_2 \times {}^8C_2) = 15 + 70 + 15 \times 28 = 505$$

$$P = 505/1001$$

13) Answer - C) 1/12

Explanation : $1/2 \times 1/6 = 1/12$

14) Answer - B) 8/15

Solution :

$$PF + FP \quad (P = \text{pass}, F = \text{fail})$$

$$1/3 \times 2/5 + 2/3 \times 3/5 = 8/15$$

15) Answer - B) 13/18

Solution :

$$1 - 1/2 \times 2/3 \times 5/6 = 13/18$$

16) Answer - B) 120/343

Solution :

$$\text{Total number of outcomes} = 7 \times 7 \times 7$$

$$\text{Favourable outcome} = 7 \times 6 \times 5 \times 4$$

$$P = (7 \times 6 \times 5 \times 4)/7 \times 7 \times 7 = 120/343$$

17) Answer - C) 4/52 \times 4/51

Solution : $4/52 \times 4/51$

18) Answer - B) 2/5

Explanation:

$$\text{Prob. of math} = 30/100 = 3/10, \text{ Prob. of computers} = 20/100 =$$

$$1/5, \text{ prob. for both} = 10/100 = 1/10$$

$$\text{So required prob.} = 3/5 + 1/5 - 1/10$$

19) Answer - A) 55/221

Explanation:

$$\text{Prob. of both red} = {}^{26}C_2 \times {}^{52}C_2$$

$$\text{Prob. of both kings} = {}^4C_2 \times {}^{52}C_2$$

Since there are also cards which are both red and king, so we will subtract there prob. There are 2 red cards which are kings

$$\text{Prob. of both red and king} = {}^2C_2 \times {}^{52}C_2$$

$$\text{So required prob.} = {}^{26}C_2 \times {}^{52}C_2 + {}^4C_2 \times {}^{52}C_2 - {}^2C_2 \times {}^{52}C_2 = 55/221$$

20) Answer - C) 49/225

Explanation:

$$7/15 \times 7/15$$

1) Answer - A) 24

Explanation :

We know,

$$P(\text{getting red ball}) = 1/4$$

$$P(\text{getting blue ball}) = 1/3$$

$$\text{Let the no. of balls} = x$$

$$\text{Therefore, } P(\text{getting orange ball}) = 10/x$$

We know,

$$P(\text{getting red ball}) + P(\text{getting blue ball}) + P(\text{getting orange ball}) = 1$$

$$\Rightarrow 1/4 + 1/3 + 10/x = 1$$

$$\Rightarrow 10/x = 1 - 1/4 - 1/3$$

$$\Rightarrow 10/x = 1 - 7/12$$

$$\Rightarrow 10/x = 5/12$$

$$\Rightarrow 10 \times 12 = 5 \times x$$

$$\Rightarrow x = 24$$

Therefore, the no. of balls = $x = 24$

22) Answer - C) 63/253

Explanation:

From 1 to 24, there are 8 numbers which are multiple of 3

Case 1: 2 are multiple of 3, and one any other number from (24-8) = 16 tickets

$${}^8C_2 \times {}^{16}C_1 / {}^{24}C_3 = 56/253$$

Case 2: all are multiples of 3.

$${}^8C_3 / {}^{24}C_3 = 7/253$$

Add both cases.

23) Answer - B) $1/680$

Explanation :

$${}^{17}C_3 = 17*16*15/3*2*1 = 4080/6 = 680$$

$${}^3C_3 = 1$$

$$P = 1/680$$

24) Answer - A) $33/442$

Explanation :

$${}^{17}C_5 = 17*16*15*14*13/5*4*3*2*1 = 742560/120 = 6188$$

$${}^{11}C_5 = 11*10*9*8*7/5*4*3*2*1 = 55440/120 = 462$$

$$P = 462/6188 = 33/442$$

25) Answer - D) $3/85$

Explanation :

$${}^{17}C_3 = 17*16*15/3*2*1 = 4080/6 = 680$$

$${}^4C_1 \times {}^4C_2 = 4*4*3/2*1 = 24$$

$$P = 24/680 = 3/85$$