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APTITUDE QUESTIONS

1.A three digit number consists of 9,5 and one more number . When these digits are reversed and then subtracted from the original number the answer yielded will be consisting of the same digits arranged yet in a different order. What is the other digit?

Sol. Let the digit unknown be n.
The given number is then 900+50+n=950+n.

When reversed the new number is 100n+50+9=59+100n.
Subtracting these two numbers we get 891-99n.
The digit can be arranged in 3 ways or 6 ways.
We have already investigated 2 of these ways.
We can now try one of the remaining 4 ways. One of these is n 95
100n+90+5=891-99n
or 199n =796
so, n=4
the unknown digit is 4.

2.A farmer built a fence around his 17 cows,in a square shaped region.He used 27 fence poles on each side of the square. How many poles did he need altogether???

Ans.104 poles

Sol. Here 25 poles Must be there on each side .And around four corners 4 poles will be
present. 4*25+4=100+4=104 poles.

3.On the first test of the semester, kiran scored a 60. On the last test of the semester, kiran scored
75%
By what percent did kiran's score improve?

Ans: 25%

Sol. In first test kiran got 60
In last test he got 75.
% increase in test (60(x+100))/100=75
0.6X+60=75
0.6X=15
X=15/0.6=25%

4.A group consists of equal number of men and women. Of them 10% of men and 45% of women are unemployed. If a person is randomly selected from the group. Find the probability for the selected person to be an employee.
Ans:29/40
Sol: Assume men=100,women=100 then employed men & women r (100-10)+(100-45)=145

So probability for the selected person to be an employee=145/200=29/40

5. Randy's chain of used car dealership sold 16,400 cars in 1998. If the chain sold 15,744 cars in
1999, by what percent did the number of cars sold decrease?

Ans: 4%

Sol. Let percentage of decrease is x , then
16400(100-x)/100=15744
16400-15744=164x
x=656/164=4%

6. A radio when sold at a certain price gives a gain of 20%. What will be the gain percent, if sold for thrice the price?

A) *260%*

B) *150%*

C) *100%*

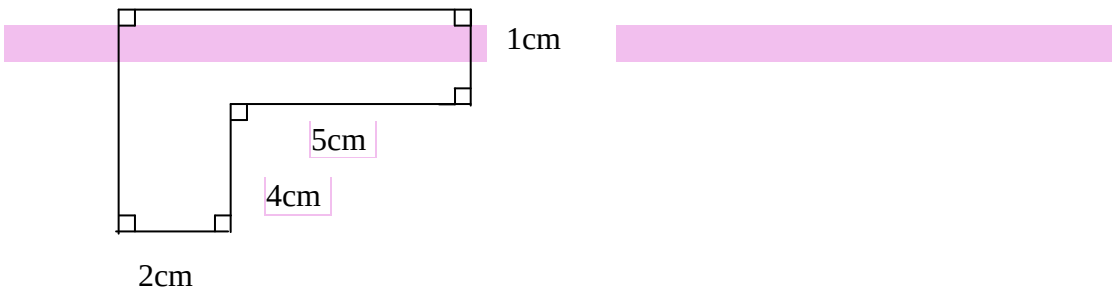
D) 50%

E) None of these
Ans: 260%

Sol. Let x be original cost of the radio.
The solding price = (100+20)x=120x
If , it is sold for thrice the price ,then 3*120x=360x

So, gain percent is (360-100)=260%.

7. Find the perimeter of the shape below.



Ans: 24cm

Sol: 2+4+5+1+7+5=24

8.If the Arithmetic mean is 34 and geometric mean is 16 then what is greates number in that series of numbers?

Ans. 64

Sol. Let two numbers be x, y;
Arthmetic mean=34=>(x+y)/2=34
x+y=68
geometric mean=16=>(xy)pow 1/2=16
xy=16*16=256

By trail and error 16*16=64*4

And 64+4/2=34
So the greatest number int hat series is 64.

9. The diameter of the driving wheel of a bus is 140cm. How many revolutions per minute must the wheel make in order to keep a speed of 66 kmph?
Ans. 250

Sol. Distance to be covered in 1 min=(66*1000)/60 m=1100m
Circumference of the wheel =(2*22/7*0.70)m=4.4m.
So, Number of revolutions per min=1100/4.4=250.

10. The boys and girls in a college are in the ratio 3:2. If 20% of the boys and 25% of the girls are adults, the percentage of students who are not adults is:??
Ans.78%

Sol: Suppose boys = 3x and girls = 2x
Not adults = (80*3x/100) + (75*2x/100) = 39x/10
Required percentage = (39x/10)*(1/5x)*100 = 78%

11. Vivek travelled 1200km by air which formed 2/5 of his trip.One third of the whole trip , he travelled by car and the rest of the journey he performed by train. The distance travelled by tain was???
Ans.800km

Sol: Let the total trip be x km.
Then 2x/5=1200
x=1200*5/2=3000km
Distance travelled by car =1/3*3000=1000km
Journey by train =[3000-(1200+1000)]=800km.

12. In a college ,1/5 th of the girls and 1/8 th of the boys took part in a social camp.What of the total number of students in the college took part in the camp?
Ans: 2/13

Sol: Out of 5 girls 1 took part in the camp
out of 8 boys 1 took part in the camp
so, out of 13 students 2 took part in the camp.
So, 2/13of the total strength took part in the camp.

13. On sports day,if 30 children were made to stand in a column,16 columns could be formed. If 24 children were made to stand in a column , how many columns could be formed?
Ans. 20

Sol: Total number of children=30*16=480
Number of columns of 24 children each =480/24=20.

14. Two trains 200mts and 150mts are running on the parallel rails at this rate of 40km/hr and 45km/hr.In how much time will they cross each other if they are running in the same direction.

Ans: 252sec

Sol: Relative speed=45-40=5km/hr=25/18 mt/sec
Total distance covered =sum of lengths of trains =350mts.
So, time taken =350*18/25=252sec.

15. 5/9 part of the population in a village are males. If 30% of the males are married, the percentage of unmarried females in the total population is:

Ans: (250/9)%

Sol: Let the population =x Males=(5/9)x
Married males = 30% of (5/9)x = x/6
Married females = x/6
Total females = (x-(5/9)x)=4x/9
Unmarried females = (4x/9 – x/6) = 5x/18
Required percentage = (5x/18 * 1/x * 100) = (250/9)%

16. From height of 8 mts a ball fell down and each time it bounces half the distnace back. What will be the distance travelled

Ans.: 24

Sol. 8+4+4+2+2+1+1+0.5+0.5+ and etc .. =24

17. First day of 1999 is sunday what day is the last day

Ans.: Monday

18. Increase area of a square by 69% by what percent should the side be incresed

Ans.: 13

Sol:Area of square=x^2

Then area of increase=100+69=169

square root of 169 i.e 13 .

19. Ten years ago, chandrawathi's mother was four times older than her daughter. After 10years, the mother will be twice older than daughter. The present age of Chandrawathi is:

Ans.20 years

Sol: Let Chandrawathi's age 10 years ago be x years.
Her mother's age 10 years ago = 4x
(4x+10)+10=2(x+10+10)
x=10
Present age of Chandrawathi = (x+10) = 20years

20. Finding the wrong term in the given series
7, 28, 63, 124, 215, 342, 511
Ans:28

Sol: Clearly, the correct sequence is
2^3 – 1, 3^3 – 1, 4^3 – 1, 5^3 – 1, …….
Therefore, 28 is wrong and should be replaced by (3^3 – 1) i.e, 26.

21. If a man walks at the rate of 5kmph, he misses a train by only 7min. However if he walks at the rate of 6 kmph he reaches the station 5 minutes before the arrival of the train.Find the distance covered by him to reach the station.

Ans:6km.
Sol: Let the required distance be x km.
Difference in the times taken at two speeds=12mins=1/5 hr.
Therefore x/5-x/6=1/5 or 6x-5x=6 or x=6km.
Hence ,the required distance is 6 km

22. Walking 5/6 of its usual speed, a train is 10min late. Find the usual time to cover the journey?
Ans:50 min

Sol: New speed = 5/6 of usual speed
New time = 6/5 of usual time
Therefore, (6/5 of usual time) – usual time = 10min
Therefore Usual time = 50min

23.A train running at 54 kmph takes 20 seconds to pass a platform. Next it takes 12 seconds to pass a man walking at 6 kmph in the same direction in which the train is going. Find the length of the train and the length of the platform.

Ans. length of the train=160m
length of the platform=140 m.

Sol: Let the length of the train be x meters and length of the platform be y meters.
Speed of the train relative to man=(54-6) kmph =48 kmph.

=(48*5/18) m/sec =40/3 m/sec.

In passing a man, the train covers its own length with relative speed.

Therefore, length of the train=(Relative speed *Time)

=(40/3 * 12) m =160 m.

Also, speed of the train=(54 * 5/18) m/sec=15 m/sec.

Therefore, x+y/2xy=20 or x+y=300 or y=(300-160 m=140 m.

Therefore, Length of the platform=140 m.

24. A man is standing on a railway bridge which is 180m long. He finds that a train crosses the bridge in 20seconds but himself in 8 seconds. Find the length of the train and its speed.

Ans: length of train=120m

Speed of train=54kmph

Sol: Let the length of the train be x meters

Then, the train covers x meters in 8 seconds and (x + 180) meters in 20 seconds.

Therefore x/8 = (x+180)/20 ⇔ 20x = 8(x+180) ⇔ x = 120

Therefore Length of the train = 120m

Speed of the train = 120/8 m/sec = 15 m/sec =15 * 18/5 kmph = 54kmph

25. A man sells an article at a profit of 25%. If he had bought it at 20 % less and sold it for Rs.10.50 less, he would have gained 30%. Find the cost price of the article?

Ans. Rs. 50.

Sol: Let the C.P be Rs.x.

1st S.P =125% of Rs.x.= 125*x/100= 5x/4.

2nd C.P=80% of x. = 80x/100 =4x/5.

2nd S.P =130% of 4x/5. = (130/100* 4x/5) = 26x/25.

Therefore, 5x/4-26x/25 = 10.50 or x = 10.50*100/21=50.

Hence, C.P = Rs. 50.

26. A grosser purchased 80 kg of rice at Rs.13.50 per kg and mixed it with 120 kg rice at Rs. 16 per kg. At what rate per kg should he sell the mixture to gain 16%?

Ans: Rs.17.40 per kg.

Sol: C.P of 200 kg of mix. = Rs (80*13.50+120*16) = Rs.3000.

S.P = 116% of Rs 3000= Rs (116*3000/100) = Rs.3480.

Rate of S.P of the mixture = Rs.3480/200.per kg. = Rs.17.40 per kg.

27. Two persons A and B working together can dig a trench in 8 hrs while A alone can dig it in 12 hrs. In how many hours B alone can dig such a trench?

Ans:24hours.

Sol: (A+B)'s one hour's work =1/8, A's one hour's work =1/12

Therefore, B's one hour's work = (1/8-1/12) =1/24.

Hence, B alone can dig the trench in 24 hours.

28. A and B can do a piece of work in 12 days ; B and C can do it in 20 days. In how many days will A, B and C finishes it working all together?
Also, find the number of days taken by each to finish it working alone?

Ans:60 days

Sol: (A+B)'s one day's work=1/12; (B+C)'s one day's work=1/15 and (A+C)'s one day's
work=1/20.
Adding, we get: 2(A+B+C)'s one day's work = (1/12+1/15+1/20)=1/5.
Therefore, (A+B+C)'s one day's work=1/10.
Thus, A, B and C together can finish the work in 10 days.
Now, A's one day's work
= [(A+B+C)'s one day's work] – [(B+C)'s one day's work]
= 1/10-1/15)
= 1/30.
Therefore, A alone can finish the work in 30 days.
Similarly, B's 1 day's work = (1/10 -1/20) = 1/20.
Therefore, B alone can finish the work in 20 days.
And, C's 1 day's work= (1/10-1/12) = 1/60.
Therefore, C alone can finish the work in 60 days.

29. A is twice as good a workman as B and together they finish a piece of work in 18 days.In how many days will A alone finish the work?

Ans:27 days.

Sol: (A's 1 day's work): (B's 1 day's work) = 2:1.
(A + B)'s 1 day's work = 1/18.
Divide 1/18 in the ratio 2:1.
Therefore A's 1 day's work = (1/18 * 2/3) = 1/27.
Hence, A alone can finish the work in 27 days.

30. 2 men and 3 boys can do a piece of work in 10 days while 3 men and 2 boys can do the same work in 8 days. In how many days can 2 men and 1 boy do the work?

Ans: 12 ½ days.

Sol: Let 1 man's 1 day's work = x and 1 boy's 1 day's work =y.
Then, 2x+3y=1/10 and 3x+2y=1/8.
Solving, we get: x=7/200 and y=1/100.
Therefore (2 men +1 boy)'s 1 day's work = (2*7/200 + 1*1/100) = 16/200 = 2/25.
So, 2 men and 1 boy together can finish the work in 25/2 =12 ½ days.

31. What was the day of the week on 12th January, 1979?

Ans: Friday

Sol: Number of odd days in (1600 + 300) years = (0 + 1) = 1 odd day.

78 years = (19 leap years + 59 ordinary years) = (38 + 59) odd days = 6 odd days
12 days of January have 5 odd days.
Therefore, total number of odd days= (1 + 6 + 5) = 5 odd days.
Therefore, the desired day was Friday.

32. Find the day of the week on 16th july, 1776.

Ans: Tuesday

Sol: 16th july, 1776 means = 1775 years + period from 1st january to 16th july
Now, 1600 years have 0 odd days.
100 years have 5 odd days.
75 years = 18 leap years + 57 ordinary years
= (36 + 57) odd days = 93 odd days
= 13 weeks + 2 odd days = 2 odd days
Therefore, 1775 years have (0 + 5 + 2) odd days = 0 odd days.
Now, days from 1st Jan to 16th july; 1776
Jan Feb March April May June July
31 + 29 + 31 + 30 + 31 + 30 + 16 = 198 days
= (28 weeks + 2 days) odd days
Therefore, total number of odd days = 2
Therefore, the day of the week was Tuesday

33 .Find the angle between the minute hand and hour hand of a click when the time is 7.20?
Ans: 100deg
Sol: Angle traced by the hour hand in 12 hours = 360 degrees.
Angle traced by it in 7 hrs 20 min i.e. 22/3 hrs = [(360/12) * (22/3)] = 220 deg.
Angle traced by minute hand in 60 min = 360 deg.
Angle traced by it in 20 min = [(360/20) * 60] = 120 deg.
Therefore, required angle = (220 - 120) = 100deg.

34.The minute hand of a clock overtakes the hours hand at intervals of 65 min of the correct time. How much of the day does the clock gain or lose?

Ans: the clock gains 10 10/43 minutes

Sol: In a correct clock, the minute hand gains 55 min. spaces over the hour hand in 60
minutes.
To be together again, the minute hand must gain 60 minutes over the hour hand.
55 minutes are gained in 60 min.
60 min. are gained in [(60/55) * 60] min == 65 5/11 min.
But they are together after 65 min.
Therefore, gain in 65 minutes = (65 5/11 - 65) = 5/11 min.
Gain in 24 hours = [(5/11) * (60*24)/65] = 10 10/43 min.

Therefore, the clock gains 10 10/43 minutes in 24 hours.

35.A clock is set right at 8 a.m. The clock gains 10 minutes in 24 hours. What will be the true time when the clock indicates 1 p.m. on the following day?

Ans. 48 min. past 12.

Sol: Time from 8 a.m. on a day to 1 p.m. on the following day = 29 hours.
24 hours 10 min. of this clock = 24 hours of the correct clock.
145/6 hrs of this clock = 24 hours of the correct clock.
29 hours of this clock = [24 * (6/145) * 29] hrs of the correct clock
= 28 hrs 48 min of the correct clock.
Therefore, the correct time is 28 hrs 48 min. after 8 a.m.
This is 48 min. past 12.

36. At what time between 2 and 3 o' clock will the hands 0a a clock together?

Ans: 10 10/11 min. past 2.

Sol: At 2 o' clock, the hour hand is at 2 and the minute hand is at 12, i.e. they are 10 min space apart.
To be together, the minute hand must gain 10 minutes over the other hand.
Now, 55 minutes are gained by it in 60 min.
Therefore, 10 min will be gained in [(60/55) * 10] min = 10 10/11 min.
Therefore, the hands will coincide at 10 10/11 min. past 2.

37. A sum of money amounts to Rs.6690 after 3 years and to Rs.10035 after 6 years on compound interest. Find the sum.

Ans: Rs. 4460

Sol: Let the Sum be Rs. P. Then
P [1 + (R/100)]^3 = 6690……..(i)
P [1 + (R/100)]^6 = 10035……..(ii)
On dividing, we get [1 + (R/100)]^3 = 10035/6690 = 3/2.
P * (3/2) = 6690 or P = 4460.
Hence, the sum is Rs. 4460.

38. Simple interest on a certain sum is 16/25 of the sum. Find the rate percent and time, if both are numerically equal.

Ans: Rate = 8% and Time = 8 years

Sol: Let sum = X. Then S.I. = 16x/25
Let rate = R% and Time = R years.
Therefore, x * R * R/100 = 16x/25 or R^2 = 1600/25, R = 40/5 = 8
Therefore, Rate = 8% and Time = 8 years.

39. Find

i. S.I. on RS 68000 at 16 2/3% per annum for 9 months.
ii. S.I. on RS 6250 at 14% per annum for 146 days.
iii. S.I. on RS 3000 at 18% per annum for the period from 4th Feb 1995 to 18th April 1995.

Ans: i. RS 8500.
ii. RS 350.
iii. RS 108.

Sol:

i. P = 68000, R = 50/3% p.a. and T = 9/12 year = ¾ years
Therefore, S.I. = (P * Q * R/100)
= RS (68000 * 50/3 * ¾ * 1/100) = RS 8500.
ii. P = RS 6265, R = 14% p.a. and T = (146/365) year = 2/5 years.
Therefore, S.I. = RS (6265 * 14 * 2/5 *1/100) = RS 350.
iii. Time = (24 + 31 + 18) days = 73 days = 1/5 year
P = RS 3000 and R = 18% p.a.
Therefore, S.I. = RS (3000 * 18 * 1/5 * 1/100) = RS 108

40. A sum at simple interest at 13 ½% per annum amounts to RS 2502.50 after 4 years. Find the sum.

Ans: sum = RS 1625

Sol: Let sum be x. Then,
S.I. = (x * 27/2 * 4 * 1/100) = 27x/50
Therefore, amount = (x + 27x/50) = 77x/50
Therefore, 77x/50 = 2502.50 or x = 2502.50 * 50 / 77 = 1625
Hence, sum = RS 1625

41. A sum of money doubles itself at C.I. in 15 years. In how many years will it become eight times?

Ans.45 years.

Sol: P [1 + (R/100)]^15 = 2P ➔ [1 + (R/100)]^15 = 2…….(i)
Let P [1 + (R/100)]^n = 8P ➔ P [1 + (R/100)]^n = 8 = 2^3
= [{1 + (R/100)}^15]^3.
➔ [1 + (R/100)]^n = [1 + (R/100)]^45.
➔ n = 45.
Thus, the required time = 45 years.

42. A certain sum amounts to Rs. 7350 in 2 years and to Rs. 8575 in 3 years. Find the sum and rate percent.

Ans: Sum = Rs. 5400,Rate=16 2/3 %.

Sol: S.I. on Rs. 7350 for 1 year = Rs. (8575-7350) = Rs. 1225.
Therefore, Rate = (100*1225 / 7350*1) % = 16 2/3 %.

Let the sum be Rs. X. then, x[1 + (50/3*100)]^2 = 7350.

➔ x * 7/6 * 7/6 = 7350.

➔ x = [7350 * 36/49] = 5400.

Therefore, Sum = Rs. 5400.

43. A, B and C start a business each investing Rs. 20000. After 5 months A withdrew Rs. 5000, B withdrew Rs. 4000 and C invests Rs. 6000 more. At the end of the year, a total profit of Rs. 69,900 was recorded. Find the share of each.

Ans. A's share = Rs. 20,500
B's share = Rs. 21200
C's share = Rs. 28200

Sol: Ratio of the capitals of A, B and C
= (20000*5+ 15000*7) : (20000*5+16000*7): (20000*5+26000*7)
=205000: 212000 : 282000 = 205:212:282
Therefore, A's share = Rs. (69900*205/699) = Rs. 20,500
B's share = Rs. (69900*212/699) = Rs. 21200,
C's share = Rs. (69900*282/699) = Rs. 28200.

44. Sanjiv started a business by investing Rs. 36000. After 3 months Rajiv joined him by investing Rs. 36000. Out an annual profit of Rs. 37100, find the share of each?

Sol: Ratio of their capitals= 36000*12:36000*9 = 4:3
Sanjiv's share= Rs. (37100*4/7) = Rs. 21200.
Rajiv's share = Rs. (37100*3/7) = Rs.15900.

45. If 20 men can build a wall 56m long in 6 days, what length of a similar wall can be built by 35 men in 3 days?

Ans. Length=49m.

Sol: Since the length is to be found out, we compare each item with the length as shown below.
More men, more length built (Direct).
Less days, less length built (Direct).
Men 20:35 :: 56: x
Similarly, days 6:3 :: 56: x.
Therefore, 20*6*x= 35*3*56 or x= 49.
Hence, the required length= 49m.

46.If 9 engines consume 24 metric tonnes of coal, when each is working 8 hours a day; how much coal will be required for 8 engines, each running 13 hours a day, it being given that 3 engines of the former type consume as much as 4 engines of latter type.

Ans:26metric tonnes.

Sol: We shall compare each item with the quantity of coal.
Less engines, less coal consumed (direct)

More working hours, more coal consumed (direct)
If 3 engines of former type consume 1 unit, then 1 engine will consume 1/3 unit.
If 4 engines of latter type consume 1 unit, then 1 engine will consume 1/4 unit.
Less rate of consumption, less coal consumed (direct).
Therefore, number of engines 9:8 :: 24:x
Working hours 8:13 :: 24:x
Rate of consumption 1/3:1/4 :: 24:x.
9*8*1/3*x= 8*13*1/4*24 or x= 26.
Therefore, required consumption of coal 26 metric tonnes.

47. A contract is to be completed in 46 days and 117 men were set to work, each working 8 hours a day. After 33 days 4/7 of the work is completed. How many additional men may be employed so that the work may be completed in time, each man now working 9 hours a day?

Ans.81

Sol: Remaining work = 1-4/7 =3/7.
Remaining period = (46-33) days =13 days.
Less work, less men (direct)
Less days, more men (indirect).
More hours per day, less men (indirect)
Therefore, work 4/7:3/7 ::117/x
Days 13:33 :: 117/x
Hrs/day 9:8:: 117/x
Therefore, 4/7*13*9*x= 3/7*33*8*117 or x= 198.
Therefore, additional men to be employed =(198-117) =81.

48. A garrison of 3300 men had provisions for 32 days, when given at the rate of 850gms per head. At the end of 7 days, reinforcement arrives and it was found that the provisions will last 17 days more, when given at the rate of 825gms per head. What is the strength of the reinforcement?

Ans: 1700

Sol: The problem becomes:
3300 men taking 850gms per head have provisions for (32-7) or 25 days. How many
men taking 825gms each have provisions for 17 days?
Less ration per head, more men (indirect).
Less days, more men (indirect)
Ration 825:850::3300:x
Days 17:25::3300:x
Therefore, 825*17*x= 850*25*3300 or x= 5000.
Therefore, strength of reinforcement = 5000-3300 = 1700.

49. Find the slant height, volume, curved surface area and the whole surface area of a cone of radius 21 cm and height 28 cm.

Sol: Slant Height, l = √(r^2 + h^2) =√(21^2 + 28^2) = √1225 = 35 cm

Volume = 1/3πr^2h = (1/3 * 22/7 * 21 * 21 * 28) cm^3 = 12936 cm^3
Curved surface area = πrl = 22/7 * 21 *35 cm^3 = 2310 cm^2
Total Surface Area = (πrl + πr^2) = (2310 + 22/7 * 21 * 21) cm^2 = 3696 cm^2

50. If the radius of the sphere is increased by 50%, find the increase percent in volume and the increase percent in the surface area.

Sol: Let the original radius = R. Then, new radius = 150/100 R = 3R/2
Original Volume = 4/3πR^3, New volume = 4/3π(3 R/2)^3 = 9πR^3/2
Original surface area = 4πR^2 , New surface area = 4π(3R/2)^2 = 9πR^2
Increase % in surface area = (5πR^2/4πR^2 * 100)% = 125%

51. If each edge of a cube is increased by 50%, find the percentage increase in its surface area.

Sol: Let the original length of each edge = a
Then, Original surface area = 6a^2
New surface area = 6 * (3a/2)^2 = 27a^2/2
Increase percent in surface area = (15/2a^2 * 1/(6a^2) * 100)% = 125%

52. Find the number of the bricks, each measuring 25 cm by 12.5 cm by 7.5 cm, required to build a wall 6 m long, 5 m high and 50cm thick, while the mortar occupies 5% of the volume of the wall.

Sol: Volume of the Wall = (600 * 500 * 50) cu. Cm.
Volume of the bricks = 95% of the volume of the wall.
= (95/100 * 600 * 500 * 50) cu. Cm.
Volume of 1 brick = (25 * 25/2 * 75/2) cu. Cm.
Therefore, Number of bricks = (95/100 * (600 * 500 * 50 * 2 * 10)/(25 * 25 * 75))=6080

53. The base of a triangular field is three times its altitude. If the cost of cultivating the field at Rs. 24.68 per hectare be Rs. 333.18, find its base and height.

Sol: Area of the field = Total cost/Rate = (333.18/24.68) hectares =13.5 hectares.
= (13.5*10000) m^2 =135000m^2.
Let altitude = x meters and base = 3x meters.
Then, ½ *3x* x= 135000 or x^2 = 9000 or x= 300.
Therefore, base =900 m & altitude = 300m.

54. Find the area of a rhombus one side of which measures 20cm and one diagonal 24cm.
Sol: Let, other diagonal = 2x cm,
Since halves of diagonals and one side of rhombus form a right angled triangle with side as hypotenuse, we have:
(20)^2 =(12)^2+x^2 or x=√(20)^2-(12)^2 =√256=16 cm.
Therefore, other diagonal = 32 cm.

55. A tank is fitted with 8 pipes, some of them that fill the tank and others that are waste pipe meant to empty the tank. Each of the pipes that fill the tank can fill it in 8 hours, while each of

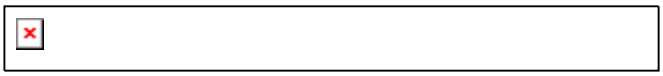
those that empty the tank can empty it in 6 hours. If all the pipes are kept open when the tank is full, it will take exactly 6 hours for the tank to empty. How many of these are fill pipes?

Sol. 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. That is, each of the waste pipes will drain $1/6^{th}$ of the tank in an hour.
Therefore, (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)
= $1/6^{th}$ capacity of the tank drained in 1 hour.

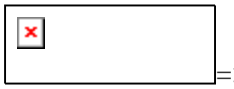


56. A pump can be used either to fill or to empty a tank. The capacity of the tank is 3600 m^3. The emptying capacity of the pump is 10 m^3/min higher than its filling capacity. What is the emptying capacity of the pump if the pump needs 12 more minutes to fill the tank than to empty it?

Sol. Let 'f' m^3/min be the filling capacity of the pump. Therefore, the emptying capacity of the pump will be = (f + 10) m^3 / min.

The time taken to fill the tank will be =  minutes

And the time taken to empty the tank will be =  .
We know that it takes 12 more minutes to fill the tank than to empty it

i.e  => 3600 f + 36000 - 3600 f = 12 (f^2 + 10 f)
=> 36000 = 12 (f^2 + 10 f) => 3000 = f^2 + 10 f => f^2 + 10 f - 3000 = 0.
Solving for positive value of 'f' we get, f = 50.
Therefore, the emptying capacity of the pump = 50 + 10 = 60 m^3 / min

57. X alone can do a piece of work in 15 days and Y alone can do it in 10 days. X and Y undertook to do it for Rs. 720. With the help of Z they finished it in 5 days. How much is paid to Z?

Sol. In one day X can finish $1/15^{th}$ of the work.
In one day Y can finish $1/10^{th}$ of the work.
Let us say that in one day Z can finish $1/Z^{th}$ of the work.

When all the three work together in one day they can finish 1/15 + 1/10 + 1/Z = 1/5th of the work.

Therefore, 1/Z = 1/30.

Ratio of their efficiencies = 1/15: 1/10: 1/30 = 2: 3: 1.Therefore Z receives 1/6th of the total money.

According to their efficiencies money is divided as 240: 360: 120.

Hence, the share of Z = Rs. 120.

58. 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?

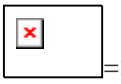
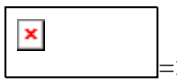
Ans:10 hours

Sol. Pipe A fills the tank normally in 2 hours. Therefore, it will fill ½ 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  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 =  of the tank. — (1)

When there is a leak, the problem states that Pipe A takes two and a half hours to fill the tank. i.e.  hours. Therefore, in an hour,  of the tank gets filled. – (2)

Equating (1) and (2), we get  =>  => x = 10 hours.

The problem can also be mentally done as follows.

Pipe A takes 2 hours to fill the tank. Therefore, it fills half the tank in an hour or 50% of the tank in an hour.

When there is a leak it takes 2 hours 30 minutes for the tank to fill. i.e  hours to fill the tank or  or 40% of the tank gets filled.

On account of the leak, (50 - 40)% = 10% of the water gets wasted every hour.

Therefore, the leak will take 10 hours to drain a full tank.

59. How many number of times will the digit ‘7' be written when listing the integers from 1 to 1000?

Sol:7 does not occur in 1000. So we have to count the number of times it appears between 1 and
999. Any number between 1 and 999 can be expressed in the form of xyz where $0 \leq x, y, z \leq 9$.

1. The numbers in which 7 occurs only once. e.g 7, 17, 78, 217, 743 etc
This means that 7 is one of the digits and the remaining two digits will be any of the other
9 digits (i.e 0 to 9 with the exception of 7)

You have 1*9*9 = 81 such numbers. However, 7 could appear as the first or the second
or the third digit. Therefore, there will be 3*81 = 243 numbers (1-digit, 2-digits and 3-
digits) in which 7 will appear only once.

In each of these numbers, 7 is written once. Therefore, 243 times.

2. The numbers in which 7 will appear twice. e.g 772 or 377 or 747 or 77
In these numbers, one of the digits is not 7 and it can be any of the 9 digits (0 to 9 with
the exception of 7).
There will be 9 such numbers. However, this digit which is not 7 can appear in the first
or second or the third place. So there are 3 * 9 = 27 such numbers.

In each of these 27 numbers, the digit 7 is written twice. Therefore, 7 is written 54 times.

3. The number in which 7 appears thrice - 777 - 1 number. 7 is written thrice in it.

Therefore, the total number of times the digit 7 is written between 1 and 999 is 243 + 54 + 3 = 300

60. There are 5 Rock songs, 6 Carnatic songs and 3 Indi pop songs. How many different albums can be formed using the above repertoire if the albums should contain at least 1 Rock song and 1 Carnatic song?

Sol: There are 2^n ways of choosing 'n' objects. For e.g. if n = 3, then the three objects can be chosen in the following 2^3 ways - ${}^3C_0$ ways of choosing none of the three, ${}^3C_1$ ways of choosing one out of the three, ${}^3C_2$ ways of choosing two out of the three and ${}^3C_3$ ways of
choosing all three.

In the given problem, there are 5 Rock songs. We can choose them in 2^5 ways. However, as
the problem states that the case where you do not choose a Rock song does not exist (at least one rock song has to be selected), it can be done in $2^5 - 1 = 32 - 1 = 31$ ways.

Similarly, the 6 Carnatic songs, choosing at least one, can be selected in $2^6 - 1 = 64 - 1 =$
63 ways.

And the 3 Indi pop can be selected in $2^3 = 8$ ways. Here the option of not selecting even

one Indi Pop is allowed.

Therefore, the total number of combinations = 31 * 63 * 8 = 15624

61. A takes 3 min 45 seconds to complete a kilometre. B takes 4 minutes to complete the same 1 km track. If A and B were to participate in a race of 2 kms, how much start can A give B in terms of distance?

Solution: A can give B a start of 15 seconds in a km race.

B takes 4 minutes to run a km. i.e  = 250 m/min =  m/sec

Therefore, B will cover a distance of  = 62.5 meters in 15 seconds.

The start that A can give B in a km race therefore, is 62.5 meters, the distance that B run in 15 seconds. Hence in a 2 km race, A can give B a start of 62.5 * 2 = 125 m or 30 seconds.

62. P can give Q a start of 20 seconds in a kilometer race. P can give R a start of 200 meters in the same kilometer race. And Q can give R a start of 20 seconds in the same kilometer race. How long does P take to run the kilometer?

Solution:
P can give Q a start of 20 seconds in a kilometer race. So, if Q takes 'x' seconds to run a kilometer, then P will take x – 20 seconds to run the kilometer.

Q can give R a start of 20 seconds in a kilometer race. So, if R takes 'y' seconds to run a kilometer, then Q will take y – 20 seconds to run the kilometer.

We know Q takes x seconds to run a kilometer
Therefore, x = y – 20

Therefore, P will take x – 20 = y – 20 – 20 = y – 40 seconds to run a kilometer.

i.e. P can give R a start of 40 seconds in a kilometer race, as R takes y seconds to run a kilometer and P takes only y – 40 seconds to run the kilometer.

We also know that P can give R a start 200 meters in a km race.
This essentially means that R runs 200 meters in 40 seconds.
Therefore, R will take 200 seconds to run a km.

If R takes 200 seconds to run a km, then P will take 200 – 40 = 160 seconds to run a km.

63. How many squares can be formed using the checkered 1 * 1 squares in a normal chessboard?

Solution:

The number of squares that can be formed using the 1 * 1 checkered squares of a chess board are given by the relation $1^2 + 2^2 + 3^2 + 4^2 + ... + 8^2 = 204$

64. A and B enter in to a partnership and A invests Rs. 10,000 in the partnership. At the end of 4 months he withdraws Rs.2000. At the end of another 5 months, he withdraws another Rs.3000. If B receives Rs.9600 as his share of the total profit of Rs.19,100 for the year, how much did B invest in the company?

Solution:
The total profit for the year is 19100. Of this B gets Rs.9600. Therefore, A would get (19100 – 9600) = Rs.9500.
The partners split their profits in the ratio of their investments.
Therefore, the ratio of the investments of A : B = 9500 : 9600 = 95 : 96.
A invested Rs.10000 initially for a period of 4 months. Then, he withdrew Rs.2000.
Hence, his investment has reduced to Rs.8000 (for the next 5 months).
Then he withdraws another Rs.3000. Hence, his investment will stand reduced to Rs.5000 during the last three months.

So, the amount of money that he had invested in the company on a money-month basis will be = 4 * 10000 + 5 * 8000 + 3 * 5000 = 40000 + 40000 + 15000 = 95000
If A had 95000 money months invested in the company, B would have had 96,000 money months invested in the company (as the ratio of their investments is 95 : 96).

If B had 96,000 money-months invested in the company, he has essentially invested
96000/12 = Rs.8000

65. Four horses are tethered at 4 corners of a square field of side 70 metres so that they just cannot reach one another. The area left ungrazed by the horses is:

Sol: The length of the rope in which the horses tied should be equal to half of the side of the square plot so that they just cannot reach one another.
Therefore, the length of the rope is 35m (70/2).

The area covered by each horse should be equal to the area of sector with radius of 70/2 =
35m(length of the rope).

Total area covered by the four horses = 4* area of sector of radius 35 metres = Area of circle of radius 35m.

Area left ungrazed by the horses = Area of square field - Area covered by four horses.

$= 70^2 - (22/7)*35*35 = 4900 - 3850 = 1050$ sq.m.

66. The area of a square field is 24200 sq m. How long will a lady take to cross the field diagonally at the rate of 6.6 km/hr?

Sol: Let ‘a’ meters be the length of a side of the square field.
Therefore, its area = a^2 square meters. --- (1)
We know that the length of the diagonal ‘d’ of a square whose side is ‘a’ meters =
$\sqrt{2}$a –-- (2)

From (1) and (2), we can deduce that the square of the diagonal = $d^2 = 2a^2$

Or d = meters.

The time taken to cross a length of 220 meters while traveling at 6.6 kmph is given by

(converting 1 km = 1000 meters and 1 hour = 60 minutes).

= 2 minutes

67. For what values of 'm' is y = 0, if $y = x^2 + (2m + 1)x + m^2 - 1$? x is a real number.

(1) m ≥ 2
(2) m < 0
(3) m = 0
(4) m ≥ 1.25

Solution: When x is real, then the discriminant of a quadratic equation ($ax^2 + bx + c = 0$) ≥ 0.

i.e. $D = b^2 - 4ac \geq 0$

In this case,

$(2m + 1)^2 \geq 4(m^2 - 1)$

$4m^2 + 4m + 1 \geq 4(m^2 - 1)$

Solving for m, we get m ≥ 1.25

68. A 20 litre mixture of milk and water contains milk and water in the ratio 3 : 2. 10 litres of the mixture is removed and replaced with pure milk and the operation is repeated once more. At the end of the two removal and replacement, what is the ratio of milk and water in the resultant mixture?

Solution:

The 20 litre mixture contains milk and water in the ratio of 3 : 2. Therefore, there will be 12 litres of milk in the mixture and 8 litres of water in the mixture.

Step 1. When 10 litres of the mixture is removed, 6 litres of milk is removed and 4 litres of water is removed. Therefore, there will be 6 litres of milk and 4 litres of water left in the container. It is then replaced with pure milk of 10 litres. Now the container will have 16 litres of milk and 4 litres of water.

Step 2. When 10 litres of the new mixture is removed, 8 litres of milk and 2 litres of water is removed. The container will have 8 litres of milk and 2 litres of water in it. Now 10 litres of pure milk is added. Therefore, the container will have 18 litres of milk and 2 litres of water in it at the end of the second step.

Therefore, the ratio of milk and water is 18 : 2 or 9 : 1.

69. A merchant mixes three varieties of rice costing Rs.20/kg, Rs.24/kg and Rs.30/kg and sells the mixture at a profit of 20% at Rs.30 / kg. How many kgs of the second variety will be in the mixture if 2 kgs of the third variety is there in the mixture?

Solution:
If the selling price of mixture is Rs.30/kg and the merchant makes a profit of 20%, then the cost price of the mixture =  = Rs.25/kg.

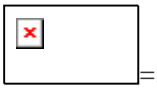
We need to find out the ratio in which the three varieties are mixed to obtain a mixture costing Rs.25 /kg.
Let variety A cost Rs.20/kg, variety B cost Rs.24 / kg and variety C cost Rs.30/kg. The mean desired price falls between B and C.

Step 1: Find out the ratio QA : QC using alligation rule. 
Step 2: Find out the ratio QB : QC using alligation rule. 
Step 3: QC is found by adding the value of QC in step 1 and step 2 = 1 + 1 = 2
Therefore, the required ratio = 1 : 5 : 2
If there are 2 kgs of the third variety in the mixture, then there will be 5 kgs of the second variety in the mixture.

70.Rs.432 is divided amongst three workers A, B and C such that 8 times A's share is equal to 12 times B's share which is equal to 6 times C's share. How much did A get?

Solution:
8 times A's share = 12 times B's share = 6 times C's share.
Note that this is not the same as the ratio of their wages being 8 : 12 : 6

In this case, find out the L.C.M of 8, 12 and 6 and divide the L.C.M by each of the above numbers to get the ratio of their respective shares.

The L.C.M of 8, 12 and 6 is 24.
Therefore, the ratio A:B:C ::  => A : B : C :: 3 : 2 : 4

The sum of the total wages = 3x + 2x + 4x = 432 => 9x = 432 or x = 48.
Hence A gets 3 * 48 = Rs. 144.

71. A zookeeper counted the heads of the animals in a zoo and found it to be 80. When he counted the legs of the animals he found it to be 260. If the zoo had either pigeons or horses, how many horses were there in the zoo?

Solution:
Let the number of horses = x
Then the number of pigeons = 80 – x.
Each pigeon has 2 legs and each horse has 4 legs.
Therefore, total number of legs = 4x + 2(80-x) = 260
=>4x + 160 – 2x = 260
=>2x = 100
=>x = 50.

72. A group of workers can do a piece of work in 24 days. However as 7 of them were absent it took 30 days to complete the work. How many people actually worked on the job to complete it?

Solution:
Let the original number of workers in the group be 'x'
Therefore, actual number of workers = x-7.
We know that the number of manhours required to do the job is the same in both the cases.
Therefore, x (24) = (x-7).30
24x = 30x - 210
6x = 210
x = 35.
Therfore, the actual number of workers who worked to complete the job = x - 7 = 35 -7 = 28.

73. How many litres of water should be added to a 30 litre mixture of milk and water containing milk and water in the ratio of 7 : 3 such that the resultant mixture has 40% water in it?
Solution:

30 litres of the mixture has milk and water in the ratio 7 : 3. i.e. the solution has 21 litres of milk and 9 litres of water.

When you add more water, the amount of milk in the mixture remains constant at 21 litres. In the first case, before addition of further water, 21 litres of milk accounts for 70% by volume. After water is added, the new mixture contains 60% milk and 40% water.

Therefore, the 21 litres of milk accounts for 60% by volume.

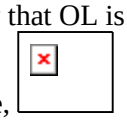
Hence, 100% volume =  = 35 litres.

We started with 30 litres and ended up with 35 litres. Therefore, 5 litres of water was added.

74. The ratio of marks obtained by vinod and Basu is 6:5. If the combined average of their percentage is 68.75 and their sum of the marks is 275, find the total marks for which exam was conducted.
Solution:
Let Vinod marks be 6x and Basu's is 5x. Therefore, the sum of the marks = 6x + 5x = 11x.
But the sum of the marks is given as 275 = 11x. We get x = 25 therefore, vinod marks is 6x = 150 and Basu marks = 5x = 125.
Therefore, the combined average of their marks = (150 + 125) / 2 = 137.5.
If the total mark of the exam is 100 then their combined average of their percentage is 68.75
Therefore, if their combined average of their percentage is 137.5 then the total marks would be (137.5 / 68.75)*100 = 200.

75. A spherical ball of radius 'r' placed on the ground subtends an angle of 600 at point A of the ground. What is the distance between the center of the ball and the point A?
Solution:

In an equilateral triangle all three sides are of the same length and let this be 'a' units.
From the diagram it is clear that OA is the angle bisector of angle LAM.

Therefore, angle OAL = 30In the right triangle OAL, sin 30 = 
We know that OL is the radius of the sphere = r
Therefore, 
Or OA = 2r

76. If the cost price of 20 articles is equal to the selling price of 16 articles, What is the percentage of profit or loss that the merchant makes?

Solution:
Let Cost price of 1 article be Re.1.
Therefore, Cost price of 20 articles = Rs. 20.
Selling price of 16 articles = Rs. 20
Therefore, Selling price of 20 articles = (20/16) * 20 = 25
Profit = Selling price - Cost price
= 25 - 20 = 5
Percentage of profit = Profit / Cost price * 100.
= 5 / 20 * 100 = 25% Profit

77. 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.
Solution:
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.

78. Train A traveling at 60 km/hr leaves Mumbai for Delhi at 6 P.M. Train B traveling at 90 km/hr also leaves Mumbai for Delhi at 9 P.M. Train C leaves Delhi for Mumbai at 9 P.M. If all three trains meet at the same time between Mumbai and Delhi, what is the speed of Train C if the distance between Delhi and Mumbai is 1260 kms?

Solution:
All three trains meet at the same time between Delhi and Mumbai. Which means Train A and Train B are at the same point at that time. This will happen when Train B is overtaking Train A.

Train A starts 3 hours before Train B. Therefore, by the time Train B leaves Mumbai, Train A has covered 3 * 60 = 180 kms.

The relative speed between Train A and Train B = 90 - 60 = 30 kmph. Therefore, Train B will overtake Train A in  = 6 hours from the time Train B leaves Mumbai. That is at 3 A.M, Train B will overtake Train A. The point between Mumbai and Delhi at which Train B overtakes Train A will be 6*90=540 kms from Mumbai.

Train C will also be at that point at 3 A.M while Train B is overtaking Train A. And Train C

would have travelled 1260-540 = 720 kms in these 6 hours. Therefore, the speed of Train C =  = 120 km/hr.

79. In an election contested by two parties, Party D secured 12% of the total votes more than Party R. If party R got 132,000 votes, by how many votes did it lose the election?

Solution:

Let the percentage of the total votes secured by Party D be x%

Then the percentage of total votes secured by Party R = (x – 12)%

As there are only two parties contesting in the election, the sum total of the votes secured by the two parties should total up to 100%

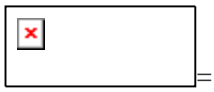
i.e., x + x – 12 = 100

2x – 12 = 100

or 2x = 112 or x = 56%.

If Party D got 56% of the votes, then Party got (56 – 12) = 44% of the total votes.

44% of the total votes = 132,000 i.e.,  = 132,000

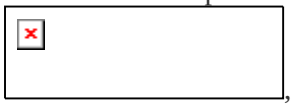
ð T =  = 300,000 votes.

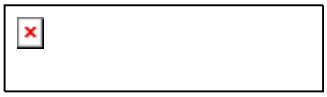
The margin by which Party R lost the election = 12% of the total votes

= 12% of 300,000 = 36,000.

80. Two trains A and B start simultaneously from stations X and Y towards each other respectively. After meeting at a point between X and Y, train A reaches station Y in 9 hours and train B reaches station X in 4 hours from the time they have met each other. If the speed of train A is 36 km/hr, what is the speed of train B?

Solution:

The ratio of the speed of the two trains A and B is given by  , where b is the time taken by train B to reach its destination after meeting train A and a is the time taken by train A to reach its destination after meeting train B.

In this case, 

⇨ Speed of train B =  * Speed of train A =  * 36 = 54 km/hr

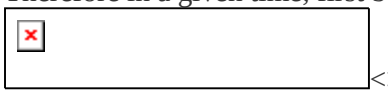
81. When processing flower-nectar into honeybees' extract, a considerable amount of water gets reduced. How much flower-nectar must be processed to yield 1kg of honey, if nectar contains 50% water, and the honey obtained from this nectar contains 15% water?

Solution:

Flower-nectar contains 50% of non-water part.
In honey this non-water part constitutes 85% (100-15).
Therefore 0.5 X Amount of flower-nectar = 0.85 X Amount of honey = 0.85 X 1 kg
Therefore amount of flower-nectar needed = (0.85/0.5) * 1kg = 1.7 kg.

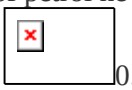
82. Two boys begin together to write out a booklet containing 535 lines. The first boy starts with the first line, writing at the rate of 100 lines an hour; and the second starts with the last line then writes line 534 and so on, backward proceeding at the rate of 50 lines an hour. At what line will they meet?

Solution:

Writing ratio = 100:50= 2:1
Since equal quantities are taken,
Therefore in a given time, first boy will be writing the line number

<>
Hence, both of them shall meet on 357th line

83. If the price of petrol increases by 25%, by how much must a user cut down his consumption so that his expenditure on petrol remains constant?

Solution:

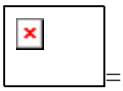
Let the price of petrol be Rs.100 per litre. Let the user use 1 litre of petrol. Therefore, his expense on petrol = 100 * 1 = Rs.100
Now, the price of petrol increases by 25%. Therefore, the new price of petrol = Rs.125.
As he has to maintain his expenditure on petrol constant, he will be spending only Rs.100 on petrol.
Let ‘x’ be the number of litres of petrol he will use at the new price.
Therefore, 125*x = 100 => x =  0.8 litres.
He has cut down his petrol consumption by 0.2 litres =  = 20% reduction.
There is a short cut for solving this problem.
If the price of petrol has increased by 25%, it has gone up  of its earlier price.
Therefore, the % of reduction in petrol that will maintain the amount of money spent on petrol constant =  =  = 20%

84. A train traveling at 72 kmph crosses a platform in 30 seconds and a man standing on the platform in 18 seconds. What is the length of the platform in meters?

Solution:

When the train crosses a man standing on a platform, the distance covered by the train is equal to the length of the train.
However, when the same train crosses a platform, the distance covered by the train is equal to the length of the train plus the length of the platform.
The extra time that the train takes when crossing the platform is on account of the extra

distance that it has to cover = length of the platform.
Therefore, length of the platform = speed of train * extra time taken to cross the platform
Length of platform = 72 kmph * 12 seconds

converting 72 kmph into m/sec, we get 72 kmph =  = 20 m/sec
Therefore, length of the platform = 20 * 12 = 240 meters.

85. A man can row 50 km upstream and 72 km downstream in 9 hours. He can also row 70 km upstream and 90 km downstream in 12 hours. Find the rate of current.

Solution:
Let x and y be the upstream and downstream speed respectively.
Hence 50/x + 72/y = 9 and 70/x + 90/y = 12
Solving for x and y we get x = 10 km/hr and y = 18 km/hr
We know that Speed of the stream = 1/2 * (downstream speed - upstream speed) = 1/2 (18 – 10) = 4 km/hr.

86. By walking at 3/4th of his usual speed, a man reaches office 20 minutes later than usual. What is his usual time?

Solution:
3/4 of a man's usual speed means, he takes 4/3 of his usual time to cover the same distance, i.e. he takes 4/3 – 1 = 1/3 time extra.
1/3 time is 20 minutes (given)
Usual time = 20 * 3 = 60 minutes.

87. Yana and Gupta leave points x and y towards y and x respectively simultaneously and travel in the same route. After meeting each other on the way, Yana takes 4 hours to reach her destination, while Gupta takes 9 hours to reach his destination. If the speed of Yana is 48 km/hr, what is the speed of Gupta?

Solution:
Yana and Gupta travel for the same amount of time till the time they meet between x and y. So, the distance covered by them will be the same as the ratio of their speeds. Let the time that they have taken to meet each other be x hours from the time they have started.

Therefore, the cover the entire distance, Yana would take x + 4 hours and Gupta will take x + 9 hours.
Ratio of time taken Yana : Gupta :: x + 4 :: x + 9

=>Ratio of speeds of Yana : Gupta :: x + 9 :: x + 4 or 1 : 
By the time Yana and Gupta meet, Yana would have traveled 48X kms. After meeting, this is the distance that Gupta takes 9 hours to cover.

Hence, Gupta's speed =  km/hr.

=> But we know that the ratio of Yana's and Gupta's speeds are 1 : 

=> Therefore, 48 :  :: 1 : 

Or =

=> $x^2 + 9x = 9x + 36$

=> $x^2 = 36$ or x = 6 hours.

Hence, speed of Gupta = = 32 kmph = 20mph

88. The difference between the compound interest and the simple interest on a certain sum at 12% p.a. for two years is Rs.90. What will be the value of the amount at the end of 3 years?

Solution:

The difference in the simple interest and compound interest for two years is on account of the interest paid on the first year's interest, when interest is reckoned using compound interest, interest being compounded annually.

Hence 12% of simple interest = 90 => simple interest = =750.

As the simple interest for a year = 750 @ 12% p.a., the principal = = Rs.6250.

If the principal is 6250, then the amount outstanding at the end of 3 years = 6250 + 3(simple interest on 6250) + 3 (interest on simple interest) + 1 (interest on interest on interest) = 6250 + 3(750) + 3(90) + 1(10.80) = 8780.80.

89. How long will it take for a sum of money to grow from Rs.1250 to Rs.10,000, if it is invested at 12.5% p.a simple interest?

Solution:

Simple interest is given by the formula SI = (pnr/100), where p is the principal, n is the number of years for which it is invested, r is the rate of interest per annum

In this case, Rs. 1250 has become Rs.10,000.

Therefore, the interest earned = 10,000 – 1250 = 8750.

8750 = [(1250*n*12.5)/100]

=> n = 700 / 12.5 = 56 years.

90. If the wheel of a bicycle makes 560 revolutions in travelling 1.1 km, what is its radius?

Solution:

The distance covered by the wheel in 560 revolutions = 1100 m . Hence, the distance covered per revolution = metres. The distance covered in one revolution = circumference of the wheel.

Circumference = => r = 31.25 cm.

91. The time in a clock is 20 minute past 2. Find the angle between the hands of the clock.

Solution:

Time is 2:20. Position of the hands: Hour hand at 2 (nearly).

Minute hand at 4
Angle between 2 and 4 is 60 degrees [(360/12) * (4-2)]
Angle made by the hour hand in 20 minutes is 10 degrees, since it turns through ½ degrees in a minute.
Therefore, angle between the hands is 60 degrees - 10 degrees = 50 degrees

92. A man buys an article for Rs. 27.50 and sells it for Rs. 28.60. Find his gain percent.

Solution:
C.P. = Rs.27.50, S.P. = Rs. 28.60.
Therefore Gain = Rs. (28.60 – 27.50) = Rs.1.10.
Therefore Gain % = (1.10*100/27.50) % = 4%.

93. Find S.P., when:
(i) C.P. = Rs. 56.25, gain = 20%.
(ii) C.P. = Rs. 80.40, loss = 15%.

Solution:

(i) S.P. = 120% of Rs. 56.25 = Rs. (120*56.25/100) = Rs. 67.50.
(ii) S.P. = 85% of Rs. 80.40 = Rs. (85*80.40/100) = Rs. 68.34.

94. A scooterist covers a certain distance at 36 kmph. How many meters does he cover in 2min?
Solution:
Speed = 36 kmph = 36 * 5/18 = 10mps
Therefore, Distance covered in 2 min = (10 * 2 * 60)m = 1200m

95. A gentleman buys every year Bank's cash certificates of value exceeding the last year's purchase by Rs. 300. After 20 years, he finds that the total value of the certificates purchased by him is Rs. 83,000. Find the value of the certificates purchased by him in the 13^{th} year.

Solution:
Let the value of the certificates purchased in the first year be Rs. a.
The difference between the value of the certificates is Rs. 300 (d = 300).
Since, it follows Arithmetic progression the total value of the certificates after 20 years is given by
S_n = n/2 [2a + (n - 1) d] = 20/2[2a + 19(300)] = 83,000.
By simplifying we get 2a + 5700 = 8300.

Therefore, a = Rs. 1300.
The value of the certificates purchased by him in nth year = a + (n - 1) d.
Therefore, the value of the certificates purchased by him in 13th year = 1300 + (13 - 1) 300 = Rs. 4900.

96. How often between 11 O'clock and 12 O'clock are the hands of the clock together at an integral number value?

Solution:
At 11 O'clock, the hour hand is 5 spaces apart from the minute hand.
During the next 60 minutes, i.e. between 11' O clock and 12' O clock the hour hand will move five spaces [integral values as denoted by the 56 minute, 57 minute, 58 minute, 59 minute and 60 minute positions].
For each of these 5 positions, the minute hand will be at the 12th minute, 24th minute, 36th

minute, 48th minute and 60th minute positions.
Hence the difference between the positions of the hour hand and the minute hand will have an integral number of minutes between them.

i.e. 5 positions.

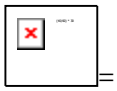
97. At how many points between 10 O'clock and 11 O'clock are the minute hand and hour hand of a clock at an angle of 30 degrees to each other?
Solution:

Between 10 and 11, the minute hand and hour hand are at an angle of 30^o to each at 
minutes past 10 =  minutes past 10. The next time they will be at angle of 30^o to each other will be at 11.

98. A clock loses 1% time during the first week and then gains 2% time during the next one week. If the clock was set right at 12 noon on a Sunday, what will be the time that the clock will show exactly 14 days from the time it was set right?

Solution:
The clock loses 1% time during the first week.
In a day there are 24 hours and in a week there are 7 days. Therefore, there are 7 * 24 = 168 hours in a week.
If the clock loses 1% time during the first week, then it will show a time which is 1% of 168 hours less than 12 Noon at the end of the first week = 1.68 hours less.
Subsequently, the clock gains 2% during the next week. The second week has 168 hours and the clock gains 2% time = 2% of 168 hours = 3.36 hours more than the actual time.
As it lost 1.68 hours during the first week and then gained 3.36 hours during the next week, the net result will be a -1.68 + 3.36 = 1.68 hour net gain in time.
So the clock will show a time which is 1.68 hours more than 12 Noon two weeks from the time it was set right.
1.68 hours = 1 hour and 40.8 minutes = 1 hour + 40 minutes + 48 seconds.
i.e. 1 : 40 : 48 P.M.

99. What is the angle between the minute hand and the hour hand when the time is 1540 hours?

Solution:
The total angle made by the minute hand during an hour is 360^o. If it takes 360^o for an hour, it will take  = 240^o. The angle between the hour hand the minute hand will therefore, be somewhere between 240 - 90 = 150^o, as the hour hand is between 3 and 4.
The angle made by the hour hand when it moves from say 3 to 4 will be 30^o. That is the hour hand makes 30^o during the course of an hour.
The hour hand will therefore, move  = 20^o.
Therefore, the net angle between the hour hand and the minute hand will be 150 - 20 = 130^o.

100. Given that on 27th February 2003 is Thursday. What was the day on 27th February 1603?

Solution:
After every 400 years, the same day occurs.
Thus, if 27th February 2003 is Thursday, before 400 years i.e., on 27th February 1603 has to be Thursday.