RATIO AND PROPORTION

1. Ans: [c]
Let the two numbers be 4x and 13x.
Given LCM = 312
Here HCF = x
52x = 312
x = 6
So largest number is 13(6) = 78

2. Ans: [c]
Let the digits of two digit number be x and y.
So number is 10x + y
By interchanging digits we get 10y + x
Difference = 36
10x + y – (10y +) = 36
9x – 9y = 36
x – y = 4
Given x and y are in the ratio 2:1
x = 2a and y = a
2a – a = 4
a = 4
Numbers are 8 and 4
$\Rightarrow (8 + 4) - (8 - 4)$
$\Rightarrow 12 - 4 = 8$

3. Ans: [c]
Ratio of increase in wages = 22:25
Ratio of decrease of labourers = 15:11
Total ratio of wages of labourers = $(22\times15):(15\times11)$
= 333:275
Given present bill = 5000
i.e for 275 Ratio wages = 5000
for '1' $=\frac{5000}{275}$
for '330' $=\frac{5000}{275}\times330 = 6000$

4. Ans: [a]
Let x be the number of pants and 'y' be the number of shirts.
480x + 130y = 3620
48x + 13y = 362
Option verification : [a] 7:2
48(7) + 13(2) = 362

5. Ans: [b]
Let the number of Rs.1,50p and 25p coins be 3x, 4x and 12x.
∴ Converting everything rupees into paise
$600\times100 = 60000p$
$3x\times100 = 300x$
$4x\times50 = 200x$
$12x\times25 = 300x$
300x + 200x + 300x = 60,000
800x = 60,000
x = 75
Number of 25p coins = 12(75) = 900

6. Ans: [c]
79.20 is divided among 7 men, 11 women, 5 boys
7M + 11W + 5B = 79.20
Given W = 3B
M = W + B
M = 4B
7(4B) + 11(3B) + 5B = 79.20
66B = 79.20
B = 1.2
M = 4B = 4(1.2)
Share of men = 4.80

7. Ans: [a]
Let A's income be 4x.
Income = Savings + Expenditure
A's expenditure = 4x – 25
Let B's income be 5x
B's expenditure = 5x – 50
Given Ratio of expenses = 5:6
24x – 150 = 25x – 250
x = 100
A's income is 400 and B's 500.

8. Ans: [c]
Given A;B and B:C = 3:2
A:B = 3:2
B:C = 3:2
To make B equal A:B = 9:6
B:C = 6:4
∴ A:B:C = 9:6:4
Runs made by A $=\frac{9}{19}\times342 = 162$

9. Ans: [b]
Sum of marks = 275
Average of marks $=\frac{275}{2} = 137.5$
Let total marks for which exam was conducted be x.
Then $\frac{137.5}{x}\times100 = 68.75$
$x = \frac{137.5\times100}{68.75}$
x = 200

10. Ans: [c]

Ratio of present ages is 6:4

$\frac{A}{B}=\frac{6}{4}$

4A = 6B

$2A = 3B \Rightarrow A=\frac{3B}{2}$

5 years ago, ratio was 5:3

$\frac{A-5}{B-5}=\frac{5}{3}$

3A – 15 = 5B – 25

3A – 5B = – 25 + 15

$3\left(\frac{3B}{2}\right)-5B=-10$

B = 20

$A=\frac{3(20)}{2}$

A = 30; B = 20

11. Ans: [a]

A, B, C can complete a job in 6, 8, 12 days alone.

Let work done by A, B, C in 1 day be $\frac{1}{6},\frac{1}{8},\frac{1}{12}$

Total work done by 3 of them in 1 day $=\frac{1}{6}+\frac{1}{8}+\frac{1}{12}=\frac{9}{24}$

Work done by C in a day $=\frac{\frac{1}{12}}{\frac{9}{24}}=\frac{2}{9}$

Total earning on completion of a job = 2340

C's share = $\frac{2}{9}\times 2340$ = Rs.520

12. Ans: [a]

Let the maximum marks in each subject be Rs.100

$\therefore$ Candidate scored 60% of 3×100 = 60% of 300 marks

= 180

Let marks scored in 3 subjects be 4x, 5x, 6x

4x + 5x + 6x = 180

x = 12

$\therefore$ Marks scored are 48, 60 and 72

Hence marks scored by candidate in one subject is more than 60%

13. Ans: [e]

By using statement (a) alone we cannot find

By using statement (b) alone we cannot find

Not given selling price so we cannot find by using both the statements also.

14. Ans: [c]

By using both the statements we can find the profit in selling 1 kg of diluted HCL.

15. Ans: [e]

Coffee and chicory resultant ratio cannot be found because we cannot assume the quantity that is mixed.

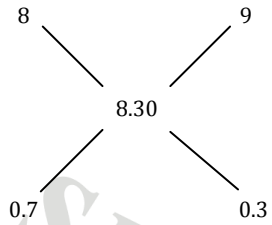
MIXTURES AND ALLIGATIONS

1. Ans: [b]

Milk (1) cost = Rs.8

Milk (2) cost = Rs.9

Resulting mixture = Rs.8.30



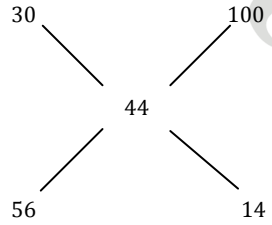
0.7:0.3 $\Rightarrow$ 7:3

Ratio is 7:3

2. Ans: [d]

In 10 litres 30% alcohol,

Resulting mixture = 44% alcohol



4:1

2.5 litres should be added.

3. Ans: [d]

Cost price of Rice 1 = 38

Cost price of Rice 2 = 32

Selling price of mixture = 42.5

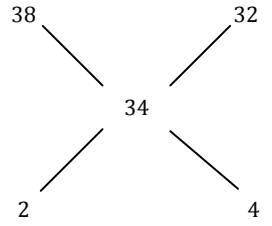
Gain = 25%

125% of CP = 42.5

CP = $42.5\times\frac{4}{5}=8.5\times 4$

CP = 34

By Alligation method,



Ratio is 1:2.

4. Ans: [d]

Mixture of 60 litres

M:W $\Rightarrow$ 2:1

3:W = 40 litres : 20 litres

If the M:W Ratio is 1:2

(20 + x) = 80

x = 60

$\Rightarrow$ 40:80

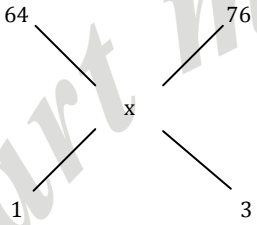
The amount of water to be added is 60 litres.

5. Ans: [a]

Ariel detergent cost = Rs.64

Surf excel cost = Rs.76

Ratio is 1:3



$\frac{x}{3x}=\frac{76-x}{x-64}$

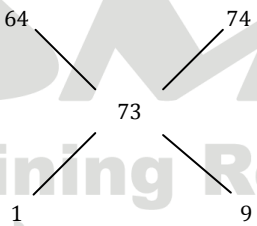
x – 64 = 3(76 – x)

x – 64 = 228 – 3x

4x = 292

x = 73

Then, S.E cost drops to 74



1:9

Ratio is 9:1.

6. Ans: [a]

Initially given 36 litres of milk $\Rightarrow$ 36litres = 100%

After adding X litres of water, solution has 80% of milk

Now, 36 litres = 80%

To make it as 100% solution 20% is to added.

36 = 80%

$\Rightarrow$ 9 = 20%

$\Rightarrow$ 100% = 36 + 9

So, water should be added is 9 litres

7. Ans: [a]

Consider, initially we have x litres in vessel.

Out of x, $\rightarrow$ 5 litres have drawn and replaced with water and repeated again.

Now, ratio of milk & water is 36:13

$$FC = IC\left(1-\frac{\text{Removed}}{\text{initial}}\right)^k$$

$$\frac{36}{49}=1\left(1-\frac{5}{x}\right)^2$$

$$1-\frac{5}{x}=\frac{6}{7}$$

$$1-\frac{6}{7}=\frac{5}{x}$$

$$\frac{1}{7}=\frac{5}{x}$$

x = 35 litres

8. Ans: [a]

A vessel contains wine solution with wine & water ratio as 4:1, after adding water the ratio changed to 3:2 & the resultant mixture is 100 litres

3x + 2x = 100

x = 20 litres

The resultant mixture have

$3\times20=60$ litres Wine

$2\times20=40$ litres Water

Now, 60 : (40 – x) : : 4:1

60 = (40 – x) 4

4x = 100

x = 25 litres

So, 25 litres of water should be added.

9. Ans: [a]

The cost price of three types of sugars are, Rs.5, Rs.6 and Rs.6.80 per bag & Rs.6.5 for

Let the quantities taken be x, y & z.

Now, 5x + 6y + 6.8z = 6.5 (x + y + z)

0.3z = 1.5x + 0.5y

By option verification, option [a]

3(10) = 15(1) + 5(3)

30 = 30

x:y:z = 1:3:10

10. Ans: [a]

Initially, K	P
1 litre	1 litre

100 ml kerosene is removed & added to petrol

K	P
1000 ml	1000 ml
– 100 ml	+ 100 ml
900 ml (K)	1000 ml (P) + 100 ml (K)

Again, this process is repeated P:K in vessel 2 is 10:1

So, $\frac{10}{11}$ part of petrol & $\frac{1}{11}$ part of kerosene is removed from vessel 2 and added in vessel 1

I	P	II	K
$900+\frac{1000}{11}+\frac{100}{11}$		$1000-\frac{10}{11}\times100+\frac{100}{11}$	
$\frac{10000}{11}$		$\frac{10000}{11}$	

They both are equal in fractions.

11. Ans: [a]

38 kgs of rice worth 8/kg

42 kgs of rice worth 12.5/kg

Now, 38(8) + 42(12.5)

= 304 + 525

= Rs.829 is cost price.

He sells the mixture at rate of Rs.11.25 per kg

SP = (11.25)(80)

= Rs.900

$\therefore P = \frac{71}{829}\times100 = 8.05\%$

12. Ans: [a]

A can contain 200 litres of pure spirit. Now, 20 litres have been removed & this process is repeated for two more times.

$FC = IC\left(1-\frac{\text{Removed}}{\text{Initial}}\right)^k$

$= 1\left(1-\frac{20}{200}\right)^3$

$=\left(\frac{200-20}{200}\right)^3$

$=\left(\frac{180}{200}\right)^3$

$=\left(\frac{9}{10}\right)^3$

$=\frac{729}{1000}$

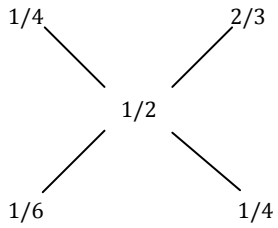
FC = 72.9%

13. Ans: [a]

I	II
Water:Spitit	Water:Spirit
=3:1	1:2

Resultant is 1:1

By alligation method,



A:B = 2:3

In third vessel, total 15 litres

2x + 3x = 15 litres

5x = 15

x = 3

$\therefore$ In second vessel, 3(3) = 9 litres.

14. Ans: [c]

By using 1st statement alone we cannot find answer

By using 2nd statement alone also we can't answer

So, both 1st and 2nd statements are required to answer.

15. Ans: [a]

Statement 1st alone is sufficient to answer the question.

SIMPLE EQUATION BASED PROBLEMS

WORD PROBLEMS

1. Ans: [a]

Finally they have 24 tractors each,

A	B	C
24	24	24

Before C gave tractors each had,

A	B	C
12	12	48

Before B gave tractors each had,

A	B	C
6	42	24

Before A gave tractors each had, that is, original number of tractors each had in the beginning is,

A	B	C
39	21	12

2. Ans: [c]

We should proceed from the last step.

Finally they have 8 each. One stage before they have

4	4	16	STAGE 3
2	8	14	STAGE 2
4	7	13	STAGE 1

Therefore their ages are 7 10 16

3. Ans: [d]

Cost of fuel is proportional to square of the speed:

$E = KS^2$

Given: E = 64 and S = 16

K = (1/4)

Total cost = $\frac{1}{4} \times S^2t + 400t$

Most economical speed, checking options we get most economical speed at 40km/hr.

4. Ans: [a]

Cost of fuel is proportional to square of the speed:

$E = KS^2$

Given: E = 64 and S = 16

$K = (\frac{1}{4})$

Total cost = $\frac{1}{4} \times S^2t + 400t$

Most economical speed, checking options we get most economical speed at 40km/hr.

Total cost at 40km/hr = $\frac{1}{4} \times 40^2 \times (\frac{400}{40})$ = Rs.8,000

5. Ans: [c]

If the Abhishek had x Re 1, y Rs.2 coins and z Rs.10 coins,

The total value of coins he had: = x(1) + y(2) + z(10) = x + 2y + 10z = 160

Since, 6y = x

Thus, 8y + 10z = 160 i.e. 8y is a multiple of 10 i.e. y = 5 or y = 10

i.e. (x, y, z) = (30, 5, 12) or (60, 10, 18)

Thus, the maximum value of 'z' is 12.

6. Ans: [b]

Let the age of husband wife and daughter be denoted by h, w and d respectively.

h + 2w + 3d = 85 ... (i)

2h + 4w + 6d = 170 ... (ii)

5h + 10w + 15d = 450 ... (iii)

Multiplying the first equation by 5 we get 5h + 10w + 15d = 425

but Eq (iii) gives 5h + 10w + 15d = 450

So no solution is possible.

7. Ans: [a]

In 1990, 1 Xs = 0.6Ys

Price levels in 2006 change by 150 and 400 for X and Y respectively with 1990 as base 100.

In 2006, 150 × 1Xs = 400 × 0.6Ys

Xs = $(\frac{240}{150})$ × Ys

Xs = 1.6 Ys

8. Ans: [a]

Day (1) -> Number of insects -> p

Day (2) -> Number of insects -> 2p−q

Day (3) -> Number of insects -> 4p−3q

Day (4) -> Number of insects -> 8p−7q

Thus, 8p−7q=0

$q=\frac{8}{7} \times p$

p has to multiple of 7 so that q is an integer. If p=63,then the value of q is 72.

9. Ans: [a]

Day (1) -> Number of insects -> p

Day (2) -> Number of insects -> 2p−q

Day (3) -> Number of insects -> 4p−3q

Day (4) -> Number of insects -> 8p−7q

Thus, 8p−7q=0

q =$(\frac{8}{7} \times p)$

p has to multiple of 7 so that q is an integer. For q is to minimum p=7, q=8.

10. Ans: [b]

Day (1) -> Number of insects -> p

Day (2) -> Number of insects -> 2p−q

Day (3) -> Number of insects -> 4p−3q

Day (4) -> Number of insects -> 8p−7q

Thus, 8p − 7q = 0

q = $(\frac{8}{7}) \times p$

P has to multiple of 7 so that q is an integer. For p is to minimum q = 8. Thus, p = 7.

11. Ans: [a]

To have the minimum differences in the ages of the oldest and youngest.

One of them should be born in February.

Also the other two should be born in March and April of January and March.

Difference between the youngest and the oldest is the number of days from 2nd Feb. to 4th Mar.: = (26 + 31 + 4) = 61 or, 1st Jan to 3rd Mar. = 30 + 28 + 3 = 61 days.

12. Ans: [a]

From the given information, Sum of the first (x − 1) natural numbers = Sum of natural number from (x +1) to 49.

So, $\frac{(x-1)x}{2} = \frac{49 \times 50}{2} - \frac{x \times (x+1)}{2}$

$2x^2 = 49 \times 50$

$x = 7 \times 5 = 35$

13. Ans: [b]

Let wide = x and byes = x + 8

Runs of Raj + Shyam = 26x

x + x + 8 + 26x = 232

28x = 224

X = 8

Therefore, Runs of Ram + shyam = 26x = 26 ×8 = 208

R : S = 6:7

R = $(\frac{6}{13}) \times 208 = 96$

14. Ans: [d]

Let X and Y be the number of trees used by A and B respectively. Given B used 4 more than A. Then we have Y − 4 = X => Y = X +4 ... (1)

Since A picks 4 from each tree, A will have 4(X) fruits ... (2)

And since B picks 3 from each tree, B will have 3(Y) = 3(X + 4) fruits ... (3)

(we have substituted the value of Y from eq (1))

Also it is given that the total fruits collected by A and B are equal. i.e values of (2) and (3) should be equal.

Therefore we get, 4X = 3(X + 4) 4X = 3X + 12 X = 12 Substituting the value of X in eq 2, we get, Fruits picked by A = 4(12) = 48. Since we know B also equal number of fruits i.e. 48.

Then the required total number of fruits = 48 + 48 = 96.

15. Ans: [a]

Let the 1st type hose be used X minutes to fill up the cistern.

Given 1st requires 6 minutes lesser than by 2nd.

Then the 2nd one takes X + 6 minutes to fill the cistern.

1st hose is 5/2 times faster than the second one.

1st hose's speed = 5/2 (2nd hose's speed)

1st hose's speed/2nd hose's speed = 5/2

Speed = Distance/Time.

In other words, Speed is inversely proportional to Time.

Therefore, we can write,

Speed of hose 1/ Speed of hose 2 = Time taken by hose 2 / Time taken by hose 1

Substituting the values, we get,

5/2 = (X + 6)/ × 5X = 2X + 12, 3X = 12 = 4 minutes = time taken by 1st hose to fill up the cistern.

16. Ans: [c]

Let the population of the two villages A and B will be equal after x years.

6800 - 120 x = 4200 + 80 x

20 x = 2600

x = 13

17. Ans: [a]

From the given information,

2 + G + R = B

3R + 2G = 2B

R + G+ B = 22

On solving, R =4, G= 6, B = 12

18. Ans: [a]

Suppose Mohan Rs.y and and Ram has Rs.x

2(x – 30) = y + 30

x + 10 = 3 (y – 10)

⟹ 2x – y = 90 and x – 3y = – 40

On solving we get, x = 62 and y = 34

19. Ans: [a]

Originally, the lady had, say, x one-rupees notes and y 20-paise coins.

On returning, she had y one-rupee notes and x 20-paise coins.

The balance was Rs.$(\frac{1}{3}(x+\frac{y}{5})$

$(x+\frac{y}{5})-(y+\frac{x}{5})=(\frac{1}{3}(x+\frac{y}{5})$

On solving we get, x = 13 and y= 7, then originally she had Rs.14.40 with her.

⟹ On returning, she had Rs.9.60

She had spent Rs.4.80 or a multiple of 4.80, i.e. Rs.14.40, which is alternative (a).

20. Ans: [a]

In the given time Ramesh can read 80 pages of Engineering Maths and 100 pages of Engineering drawing or he can read 50 pages of Engineering Maths and 250 pages of Engineering drawing.

30 pages of Engineering Maths ≈ 150 pages of Engineering Drawing.

10 pages of Engineering Maths ≈ 50 pages of Engineering Drawing.

So in the given time Ramesh can read = 80 + $(\frac{100}{50}\times 10)$ = 80 + 20 = 100 pages of Engineering Maths.

PROBLEMS ON AGES

1. Ans: [b]

Hint: If ages in the numerical are mentioned in ratio A : B, then their ages will be Ax and Bx

1) At present: Ratio of their ages = 5 : 3. Therefore, the ages will be 5x and 3x.

Abhishek's age 4 years ago = 5x – 4

Salman's age after 4 years = 3x + 4

2) Ratio of Abhishek's age 4 years ago and Salman's age after 4 years is 1 : 1

Therefore,

$$\frac{(5x-4)}{(3x+4)}=\frac{1}{1}$$

Solving, we get x = 4

3) We are asked to find the ratio between Abhishek's age 4 years hence and Salman's age 4 years ago.

Abhishek's age : (5x + 4)

Salman's age: (3x – 4)

Ratio of Salman's age and Abhishek's age,

$$\frac{(5x+4)}{(3x-4)}=\frac{24}{8}=\frac{3}{1}=3:1$$

2. Ans: [a]

Let the present age of the brother be x and hence the present age of the sister is 29 – x.

It is given, 4 years ago sister's age was 6 times the age of her brother.

Therefore,

(29 – x) – 4 = 6 (x – 4)

25 – x = 6x – 24

7x = 49

x = 7

Future age (after 5 yrs) = (x + 5) = (7 + 5) = 12 years

3. Ans: [c]

Let the son's age be x.

Father's age is 3 times more aged than his son. Father's present age = x + 3x = 4x

After 5 years, father's age is 3 times more than his son's age.

(4x + 5) = 3 (x + 5)

Solving, x = 10

After 5 years, father's age = (4x + 10) and son's age = (x + 10)

$\frac{(4x+10)}{(x+10)} = ?$

Substitute the value of x, we get

$\frac{[(4\times10)+10]}{[10+10]} = \frac{50}{20} = 2.5$

After further 5 years, father would be 2.5 times of son's age.

4. Ans: [b]

Let the age of Mohan be y years.

∴ Paviesh's age = (y + 15).

Paviesh's age 5 years ago = (y + 15 – 5)

Mohan's age before 5 years = (y – 5)

5 years ago, **Paviesh was 3 times as old as Mohan**

(y + 15 – 5) = 3 (y – 5)

(y + 10) = (3y – 15)

2y = 25

y = 12.5

Mohan's age = 12.5 years

Paviesh's age = (y + 15) = (12.5 + 15) = 27.5 years

5. Ans: [c]

Let Akshay's present age be x years.

Akshay's age before 10 years = (x – 10)

Akshay's age after 20 years = (x + 20)

We are given that Akshay's age after 20 years will be 10 times his age 10 years back.

Therefore, (x + 20) = 10 (x – 10)

Solving the equation, we get x + 20 = 10x – 100

9x = 120, x = 13.3 years

Akshay's present age = 13.3 years

6. Ans: [b]

Let the present age of Sachin be 5x and that of Dravid be 3x years.

Sachin's age 4 years ago = 5x – 4

Dravid's age after 4 years = 3x + 4

Ratio of Sachin's age 4 years ago and Dravid's age after 4 years is 1 : 1

Therefore,

(5x – 4) / (3x + 4) = 1/1

Solving, we get x = 4

We are required to find the ratio between Sachin's age 4 years hence and Dravid's age 4 years ago.

→ Sachin's age: (5x + 4)

→ Dravid's age: (3x – 4)

Putting the value of x, we get,

(5x + 4) / (3x – 4) = 3/1 = 3 : 1

7. Ans: [a]

Let Bhema's age now be B years and Aditi's age be A years.

(A – 6) = P(B – 6)

But A is 17 and therefore 11 = P(B – 6)

11/P = B – 6

(11/P) + 6 = B

8. Ans: [b]

Let the present ages of Pooja, Quincy, Riya and Sruthi be P, Q, R and S respectively.

According to the given data,

P + Q = 41 ... (1)

R – 1 = P + 2

R = P + 3 and P + 4 = Q – 1

=> Q = P + 5 ... (2)

From (1) & (2)

P = 18

Q = 18 + 5 = 23

R = 18 + 3 = 21

=> P/S = 3/4

=> S = 4/3 x 18 = 24

Required difference = S – R = 24 – 21 = 3 years

9. Ans: [a]

Let the ages of Vijay, Paviu and Uma be V, P and U years respectively.

According to the given data,

(V + P)/2 = 24

Now, after joining of Uma,

(V + P + U)/3 = 25.5

Hence, Uma's age = 3(25.5) – 2(24) = 76.5 – 48 = 28.5 years.

10. Ans: [d]

Arun = (Pavi + 5) + 9

= Pavi + 14 ... (I)

Pavi = (Vino – 4) + 7

= Vino + 3 ... (II)

Pavi's age = 19 + 3 = 22 years

After 5 years Arun's age = 22 + 14 + 5 = 41 years

11. Ans: [c]

Let the average age of the family members at the time of marriage be x years.

Sum of the ages of the family members at that time is 7x ... (i)

After 12 years (i.e. now) the age each of all the seven would have increased by 12 each i.e by 84 years (12 X 7)

Hence total age of all the members currently = 7x + 84

Now that the mother has died and the new baby is born,

mother's age should be subtracted from the current total and the baby's age should be added to the total.

Current total age of all the members = 7x + 84 – mother's age + baby's age = 7x + 84 – mother's age (since baby's age is zero) ... (2)

As the average age of the family now is the same as that 12 years ago, the current total and the total at the time of marriage should be equal.

∴ 7x + 84 – mother's age = 7x

Hence mother's age = 84 years.

12. Ans: [b]

Let the father's current age be A years.

Then, Peter's current age = $\frac{2}{5}$A years.

$\frac{2}{5}A + 8 = \frac{1}{2}(A + 8)$

2(2A + 40) = 5(A + 8)

A = 40

Current age of the father = 40 years

13. Ans: [c]

Let the total of the current ages of the 2 daughters be A years.

Then, father's current age = 10A years.

5 years hence, (10A + 5) = 5 (A +10)

10A + 5 = 5A + 50

5A = 45

A = 45/5 = 9

Therefore, father's current age = 90 years.

14. Ans: [d]

Let the ages of Vimala and Sasi one year ago be 4A and A years respectively.

Then, [(4A + 1) + 6] – [(A + 1) + 6] = 9

3A = 9 => A = 3

Required ratio = (4A + 1) : (A + 1) = 13 : 4

15. Ans: [d]

Let the age of Kishore be k_1 years and that of Kaviya be k_2 years.

Given K2 – (K1 + 5) = 3

K2 – K1 = 8

K2 = 8 + K1

Now,

k1/8 + k1 = 4/5 (Given)

=> K1 = 32 years

Therefore K2 = 40 years.

K1 + K2 = 72 years.

∴ Required total = 72 years

16. Ans: [d]

Sum of the ages of (w + x + y) = 43 × 3 = 129 ... (i)

Sum of the ages of (w + y + z) = 49 × 3 = 147 ...(ii)

Subtracting (i) from (ii), (w + y + z) – (w + x + y) = 147 – 129, z – x = 18 ... (iii)

Given Z's age => z = 54, so from (iii), x = 54–18 = 36

∴ Age of x = 36 years

17. Ans: [b]

Let the present age of Rohini be x and hence the present age of Dileep = x + 2x = 3x

After 10 years, the age of Dileep is twice the age of Rohini.

(3x + 10) = 2 (x + 10)

x = 10→Dileep is 30 years old and Rohini is 10 years at present.

After 30 years, Dileep will be 60years and Rohini will be 40 years.

n= 6/4 => 1.5

After 30 years, Dileep's age will be 1.5 times of Rohini's age.

18. Ans: [d]

Let Joseph's age be J and Sangeetha's age be S.

Their ages be J = S + 6

Before thirty years their ages was, 3(J –30) – 4(S–30) = 6

3(S + 6 – 30) – 4(S – 30) = 6

By solving this we get, J = 48 & S = 42

At present Sangeetha is 42 years old. She got married at the age of 22.

From thirty years now, they will celebrate the 50th wedding anniversary when Joseph's age will be 78 and Sangeetha's age will be 72.

19. Ans: [b]

Let x be the daughter's present age and y be the father's present age.

The son's present age is x + 4.

In two years the father will be (i.e) (y + 2) = 7x ... (i)

In ten years the father's age will be (y + 10) = x + 10 + x + 14 + 14 ... (ii)

Applying (i) in (ii),

(7x – 2 + 10) = (x + 10) + (x + 14) + 14.

By solving, x = 6

Therefore, father's present age = 40 years

20. Ans: [a]

Let the father's age be F and his son's age be R.

(i.e) F = R + 2R = 3R ... (i)

After 6 years their ages will be, $F + 6 = \frac{7}{3}(R + 6)$ ... (ii)

By solving (i) and (ii), we get R = 12 and F = 36

After 12 years, their ages will be R = 24 and F = 48.

Therefore, father's age will be twice his son's age after 12 years.

21. Ans: [d]

Rina, Meena and Tina ages are in the ratio 7:4:3.

Tina will get $\frac{3}{(7+4+3)} \times 770$ pearls

Tina will get 165 pearls.

22. Ans: [a]

The basic quantities to be found out are the ages of the eldest and the youngest children. So, let *e* and *y* be their respective ages.

Twice the age of the eldest child is just 6 years short of thrice the age of the youngest child => $2e = 3y - 6$ or

$3y - 2e = 6$ ... (1)

Twice the age of the youngest child exceeds the age of the eldest child by 19 years => $2y = e + 19$ or

$2y - e = 19$ ... (2)

(2) × 2: $4y - 2e = 38$ ... (3)

(3) – (1) gives $y = 32$ ... (4)

(4) in (2) gives

$(2 \times 32) - e = 19$ or

$e = 64 - 19$

$= 45$

So, the age of the eldest child = 45 years. [Answer for (a)]

Now, $e - y = 45 - 32$

$= 13$

So, the youngest child is younger than the eldest child by 13 years.

23. Ans: [d]

Let 'x' be the average age of present lecturers.

Then the sum of their ages is 10x.

5 years ago, the sum of the ages of 10 lecturers = 10x

Present age of 10 lecturers before replacement = 10x + 50

Difference between the age of old lecturer and new lecturer = 10x + 50 – 10x = 50 years.

As the age of new lecturer is not given the age of the lecturer who left the department cannot be determined.

24. Ans: [a]

Let Sampath present age be "S", Vamsi present age be "V" and Rakesh present age be "R".

V – S = S - R ... (1)

V + R = 56 ... (2)

From (1)

V + R = 2S

Sub (2)

2S = 56

S = 56/2 = 28

Sampath present age is 28 years.

25. Ans: [c]

Let Jerry present age be "J"

J = 3(J + 3) – 3(J – 3)

J = 3J + 9 – 3J + 9

J = 18

Jerry present age is 18 years

26. Ans: [b]

Let daughter's age be x

Son's age = x + 3

In one year, man will be 6 times daughter's age.

Man's age = 6x – 1

In ten years:

Man's age = 6x – 1 + 10

Daughter = x + 10

Son = x + 3 + 10

(6x – 1) + 10 = (x + 10) + (x + 13) + 14

6x + 9 = 2x + 23 + 14

x = 7

Man's age = 42 – 1 = 41 years

27. Ans: [a]

Let father present age be "F" and my sister present age "S"

3F + 7S = 183 ... (1)

6(F – S) + 9 = 3 (F + S) ... (2)

From (2)

6F – 6S + 9 = 3F + 3S

3F – 9S = 9 ... (3)

Solving (1) and (3)

3F + 7S = 183

3F – 9S = 9

By solving

16 S = 192

S = 12

So, sister's present age is 12 years

28. Ans: [c]

Total members =7 Let's consider the mother age as x.

Total 7x then after 12 years it will be 12 * 7 = 84

Mother died and wife gave birth so 7x

7x + 84 = 7x

x = 84 years

29. Ans: [b]

Let the present age of father be "F" and son be "S".

F + S = 55 ... (1)

Again, if father lives another years equal to present age of son, then the age of father will be (F + S) years and age of son will be (S + S) = 2s years

Given that sum of their age will be 93 years

Therefore F + S + 2S = 93 (or) F + 3S = 93 ... (2)

Solving (1) and (2)

F + S = 55

F + 3S = 93

2S = 38

S = 19

Sub S = 19 in eq (1)

F + 19 = 55

F = 55 – 19

F = 36

30. Ans: [c]

Let "*E*" stand for my age in 2000, and let "*W*" stand for William's age.

Then *E* = 11*W* + 1in the year 2000 (from "eleven times as much, plus another one").

In the year 2009 (nine years after the year 2000), William and I will each be nine years older, so our ages will be *E* + 9 and *W* + 9.

Also, I was seven more than three times as old as William was,

So *E* + 9 = 3(*W* + 9) + 7 = 3*W* + 27 + 7 = 3*W* + 34.

E = 11*W* + 1

E + 9 = 3*W* + 34

E + 9 = 3*W* + 34

(11*W* + 1) + 9 = 3*W* + 34

11*W* – 3*W* = 34 – 9 – 1

8*W* = 24

W = 3 years

31. Ans: [a]

Let the present age of A be x years and present age of B be y years.

Therefore x + y = 63 ... (1)

Difference of their ages is (x – y) years

When A was as old as B, then A's age was y years and B's age was [y – (x – y)] = (2y – x) years [difference is always constant]

Given that, present age of A is twice the past age of B.

Therefore x = 2 (2y – x)

x = 4y – 2x => 3x = 4y ... (2)

Sub x = (4/3) y in eq (1)

(4/3) y + y = 63

7 y = 63 × 3

7y = 189

Y = 27

Sub y = 27 in eq (1)

X + 27 = 63

X = 63 – 27

X = 36

A's present age is 36 years and B's present age is 27 years

32. Ans: [c]

Let Sunil's father present age be "F" and Sunil present age be "S"

F = 3S+S = 4S ... (1)

F + 8 = 2 ½ (S + 8) ... (2)

Sub (1) in (2)

4S + 8 = 5/2 (S + 8)

8S + 16 = 5S + 40

8S – 5S = 40 – 16

3S = 24

S = 8 years

Sub S= 8 in (1)

F = 4 × 8 = 32

Father present age is 32 years and Sunil present age is 8 years.

After 8 years and again further 8 years, So, after 16 years we want to find the how many times father age be Sunil's age.

F = 32 + 16 = 48 years

S = 8+16 = 24

F/S = 48 /24 = 2

So, Father age is 2 times of Sunil's age after 16 years.

33. Ans: [a]

Let the present age of Aftab be x years and that of daughter be y years.

So, 7 years ago,

Age of Aftab was (x – 7) years

Age of daughter was (y – 7) years

On the basis of this information

	Past	Present	Future
Daughter	y – 7	y	y + 3
Aftab	x – 7	x	x + 3

We have, (x – 7) = 7(y – 7) ... (1)

Again, after 3 years

Age of Aftab will be (x+3) years and age of daughter will be (y+3) years

Then (x +3) = 3(y + 3) => x – 3y = 6 ... (2)

On solving (1) and (2)

We get

– 4y = – 48

Y = 12 and x = 42

Aftab present age is 42 years and daughter present age is 12 years.

34. Ans: [a]

Let R be the age of Ravi

Let V be the age of Vimala

R = V + 3 ... (1)

3(V-40) – 2(R – 40) = 16 ... (2)

Sub(1) in (2)

3(V – 40) – 2(V + 3 – 40) = 16

By solving,V = 62, thus R = 65

10 years later they'll celebrate their golden anniversary.

So Ravi will be 75 years old and Vimala will be 72 years old.

35. Ans: [c]

Current age of Nitin = 26 years, because Nitin's age was equal to square of some number (25 = 5^2) last year and the following year it would be cube of a number (27= 3^3).

Next cube age will be 64 =4^3 which will come after 64 – 26 = 38 years.

36. Ans: [a]
Let Father present age be "F" and Son present age be "S".
F = 3+3S ... (1)
F + 3 = 10 + 2(S+3) ... (2)
Sub (1) in (2)
3+3S+3 = 10 + 2S + 6
3S – 2S = 10+6-6
S = 10
Sub S = 10 in (1)
F = 3 + (3*10)
F = 33
Father present age is 33 years and Son present age is 10 years.

37. Ans: [a]

38. Ans: [a]
A = 2 + B ... (1)
B = 2C ... (2)
A + B + C = 27 ... (3)
Sub (1) and (2) in (3)
(2 + B) + B + (B/2) = 27
4 + 4B + B = 27 * 2
5B + 4 = 54
5B = 50
B = 10 years

39. Ans: [b]
Let my present age be "F" and my son present age be "S".
F = 3S ... (1)
F + 5 = 2 ½ (S + 5) (or) F +5 = 5/2(S + 5) ... (2)
Sub eq (1) in (2)
3S + 5 = 5/2 (S + 5)
6S + 10 = 5S +25
6S – 5S = 25 – 10
S = 15 years
Sub S = 15 in (1)
F = 3*15 = 45 years
My present age is 45 years and my son present age is 15 years.

40. Ans: [a]
Let Sobha's present age be "S" and her brother present age be "B".
Sobha's father 's age = S + 38
Sobha's mother's age = (S – 4) + 36
Difference between her parents age = Father age – Mother age
= (S + 38) – [(S – 4) + 36]
= S + 38 – S + 4 – 36
= 6 years

PERCENTAGES

1. Ans: [a]
62. 5% of 160 = 50% of 160 + 12.5 % of 160
= ½ * 160 + 1/8 * 160
= 80 + 20 = 100

2. Ans: [b]
= 100% of 1200 + 66.66% of 1200
= 1200 + 2/3 * 1200
= 1200 + 800 = 2000

3. Ans: [b]
40% of a = b => (40/100)a = b
b% of 40 =(b/100) x 40 = (40a/100) x (1/100) x (40)
= 16a/100 = 16% of a.

4. Ans: [c]
Let the equivalent dry fruit be x kg.
68 % of 15 kg = 15% of x kg
By property 1 => x% of y = y% of x
68 % of 15 kg = 15% of 68 kg
∴ Required dry fruit = 68 kg

5. Ans: [b]
Let Hari's total income be Rs.100.
45% of his income is spent on food = 45% of 100 = Rs.45
25% on children's education = 25% of 100 = Rs.25
Now the remaining = Rs.100 – Rs.(45+25) = Rs.30
On house rent = 80% of Rs.30 = Rs.24 → 24% of income
Hence, percent of Hari's income left with is 6%

6. Ans: [a]
72% of 180 + 24% of 210 – x
→ 129. 6 + 50.4 – x = 420
⇒180 – x = 420
⇒x = – 240

7. Ans: [c]
24% of 400 = (25% –1%) of 400
= 100– 4 = 96 coins
12% of 600 = (10% + 2%) of 600
= 60 + 12 = 72 coins
Hence percentage of coins removed = (168/1000) * 100 = 16.8%

8. Ans: [b]
Total amount in the bag = 400 coins of 25 pasie + 600 coins of 50 paise
= Rs.100 + Rs.300 = Rs.400
24% of 400 coins of 25 paise = 96 coins which is Rs.24
12% of 600 coins of 50 paise = 72 coins which equal for Rs.36
Total amount = 24 + 36 = Rs.60
Percentage of money removed = 60/400 * 100 →15%

9. Ans: [c]
Let the original quantity be x litres. Water in x litres = (40x / 100) litres = (2x / 5) litres
Now, (2x/5)/(x + 10) = 20/100
=> 2x / (5x + 50) = 1/5
=> 5x = 50
=> x = 10 litres.
∴ Original quantity = 10 litres

10. Ans: [b]
Let the salary be 100%. Out of this, 10%, 25%, 20% and 15% are spent on certain expenses. Totally 70% of his salary are spent and the remaining 30% is left with him.
30% (salary) = 594 (Given)
Salary = $\frac{594}{30} * 100 \rightarrow$ is 1980/–

11. Ans: [a]
15% are spent on medical expenses, so 10% on 1980 = 198, 5% on 1980 = 99. Totally, 198 + 99= Rs.297/–

12. Ans: [b]
79% of 8400 = 75% of 8400 + 4%of 8400 = 6300 + 336 = 6636
66.66% of 4800 = $\frac{2}{3} * 4800$ = 3200.Totally, 6636+3200 = 9836.
120% of 7200 = $\frac{6}{5} * 7200$ = 8640. Remaining, 9836–8640 = 1196 →x% of 4784
$\therefore x = \frac{1196}{4784} \times 100 = 25\%$

13. Ans: [d]
Let the total population be 1000.
40% are educated, so 400 people are educated. Out of this 35% are employed, so 140 are educated and employed.
60% are uneducated, so 600 people are uneducated. Out of this, 45% are unemployed, so employed will be 55%. 55% of 600 = 330.
Total employed persons will be 140+330 = 470.
$\rightarrow \frac{470}{1000} \times 100 = 47\%$

14. Ans: [c]
Physics, 65% of 120 = 78
Chemistry, 78% of 150 = 117
Mathematics, 84% of 125 = 105
Total marks secured by the student are 354.
Marks secured in English, 354 – (78+117+105) = 54.
Percentage, $\frac{54}{75} \times 100 = 72\%$

15. Ans: [a]
Total marks secured by him = 354
Overall percentage $= \frac{354}{470} \times 100 = 75.31\%$

16. Ans: [c]
$\frac{35}{100} \times A = B$
$\therefore$ B % of 35 $= \frac{35}{100} \times \frac{A}{100} \times 35 = 35 \times 0.35A = 12.25\%A$

17. Ans: [b]
$\frac{1}{4}(A + B) + B = (A + B)$
$B = \frac{3}{4}(A + B)$
4B = 3A + 3B
B = 3A. So, $\frac{A}{B} = \frac{1}{3}$
So, $\frac{A}{A+B} = \frac{1}{1+3} = \frac{1}{4}$

18. Ans: [d]
As per the rule, x % of y = y % of x
20% of 1750 = 1750% of 20

19. Ans: [b]
Let the total number of votes be x.
Difference between the votes of A and B = 17% of x = 255
x = $\frac{255}{17} * 100$
x = 1500

20. Ans: [d]
Votes secured by party A = 35% of 1500 = 525
Votes secured by party B = 52% of 1500 = 780
party A + party B = 525 + 780 = 1305
Number of votes not valid = 1500 – 1305 = 195.

21. Ans: [c]
Percentage change = +a – b – ab/100
➔ 20 –25 – 500/100
➔– 10%
Thus, the value is decreased by 10%.

22. Ans: [a]
10 + 5 + 50/100 = 15.5%
15.5% of 85000 = 13175 yielding 98175.

23. Ans: [c]
Two years ago, the population of the town was 280000.
In the first year, it increased by 7% ➔ 107 * 280000 /100 = 299600
In the second year, the population increased by 5% ➔ 105 * 299600 /100 = 314580
The present population is 314580.

24. Ans: [b]
Ramesh has Rs.800 with him
Then it is increased by 25% ➔ 125 * 800 / 100 = 1000
Again it is increased by 20% ➔ 120 * 1000 / 100 = 1200

Percentage change = (1200 – 800) *100 /800 = 50%.

Another way: 20 + 25 + 500/100 = 50% (increases by 50%).

25. Ans: [b]

Net change in revenue = –30 + 30 – 900/100

$\Rightarrow$ – 9%

Thus, the revenue decreases by 9% in the month of July.

The revenue in the month of July is (1 – 9/100) * 75000

➔0.91 * 75000 = 68250

26. Ans: [d]

Difference in the taxes is 28 – 7 = 21%

Difference in his purchases will be 21 * 6000 / 100 = 1260.

27. Ans: [b]

Price of the washing machine is increased by 20% and then decreased by 15%.

Then the net change = +20 – 15 – 300/100

$\Rightarrow$ +2 %

Thus, price of the washing machine is increased by 2%.

The final price of the washing machine = 102 * 8900 / 100 = 9078

28. Ans: [b]

In the 1st year, the population increased by 10%. Then, the population was $28500\times\frac{110}{100}=31350$

In the 2nd year, it decreased by 20%. And the population was $31350\times\frac{80}{180}=25080$

In the 3rd year, it increased by 10%. The population of the town at present is $25080\times\frac{110}{100}=27588$.

29. Ans: [c]

The girl scored 360 marks and failed by 140 marks.

$\therefore$ Pass marks = 500

We know that the minimum passing percentage for girls is 50%.

So, 50% of total marks = 500

Thus, the total marks = 1000

Boy's minimum passing percentage is 40% and passing marks will be 400.

The boy scored 220 marks and 180 marks are required to pass in the test.

30. Ans: [a]

The easiest way to solve this question is by assuming a value for S.

Take S to be 100.

Therefore, K = 200% of S = 200% of 100 = 200.

So, S + K = 200 + 100 = 300.

We need to find out S as a percentage of (S + K)

i.e., (100 * 100) / 300= 33 1/3% = 33.33%

31. Ans: [b]

Mahesh buys a television at Rs.7580.

After rebate of 8%, the price of the television will be Rs.6973.6

Then, he pays service tax of 18%.

Final amount = Rs.6973.6 * 1.18 = Rs.8228.848

32. Ans: [d]

Let the initial price of an article be 100.

After three successive discounts of 10%, 16% and 20%, the price of the article = 100 * (0.9) * (0.84) * (0.8) = 60.48

So, single discount = 100 – 60.48 = 39.52%

33. Ans: [a]

The price of a good increases by A% and then decreases by B%.

Net percent change $=A-B-\frac{AB}{100}=0$ (Given)

$\rightarrow 100(A-B)=\frac{AB}{100}$

$\rightarrow \frac{100A}{100+A}=B$

In order to maintain the price as constant, B = A/(100 + A) * 100.

34. Ans: [d]

The output of the company increases by 15% and by holiday rush it increases further by 30%.

Therefore, net change in the increase of output = +15 +30 + (450/100)

$\Rightarrow$ 49.5%

To decrease the output and to restore to original output = 49.5/(100 + 49.5) * 100

$\Rightarrow$ 4950/149.5 $\Rightarrow$ 33.11%

35. Ans: [b]

Normal time t = 600/60 = 10 hrs

He wasted 1 hr = 1/10 * 100 = 10%

He wants to reach on time he has to increase the speed by

= 10/(100 – 10) * 100

$\Rightarrow$ 11.11%

36. Ans: [c]

The price of the sugar increased by 25%.

To remain at the same expenditure, the consumption of sugar is reduced by = 25/100 + 25 * 100

➔25/125 * 100 ➔20%

The consumption of sugar is to be reduced by 20% by the family to maintain the same expenditure.

37. Ans: [a]
Length of the books is 50 cm.
Number of books = 30.
If the length of the book is reduced by 50%, the number of books is increased,
➔ 50/(100 + 50) * 100
➔ 33.33%
Thus, 33.33% of 30 books will be 10 books.
So, the total number of books that can be arranged in the box is 40.

38. Ans: [d]
50 men do a work in 10 days.
Number of men decreases by 50%.
To finish the work on time, the number of days get increased by b = a/(100 – a) * 100
$\Rightarrow$ 50/(100 – 50) * 100 $\Rightarrow$ 100%
Thus, the number of days increases by 100% to finish the work on time.

39. Ans: [b]
Let the initial price of petrol be Rs.100 per litre.
Initial consumption = 20 litres per month
Total expenditure on petrol = 100 × 20 = Rs.2000 per month
New price of petrol = Rs.145 per litre
Total expenditure = Rs.2400 per month (because 20% increase from Rs.2000)
Present consumption = 2400/145 = 16.55 litres per month

40. Ans: [d]
The price of barley increases by 37%.
To maintain the expenditure, a person has to reduce the consumption.
Percentage of reduction = 37/(100+37) * 100
37/137 * 100
$\Rightarrow$ 27.007 ➔ 27%
So, the person has to reduce 27% of his consumption of barley to avoid the rise of expenditure.

INTEREST CALCULATION

1. Ans: [a]
p = 2000
r = 5%
1st year: SI = 100 CI = 100
2nd year SI = 100 CI = 100 + 5
SI = 100 + 100 = 200
CI = 100 + 105 = 205
Difference = 205 – 200 = 5

2. Ans: [b]
P = 1331 A = 1728, n = 3 yrs

$$A = p\left(1+\frac{r}{100}\right)^n$$

$$1728 = 1331\left(1+\frac{r}{100}\right)^3$$

$$\sqrt[3]{\frac{1728}{1331}} = \left(1+\frac{r}{100}\right)$$

$$\frac{12}{11} = 1+\frac{r}{100} \Rightarrow \frac{r}{100} = \frac{12-11}{11}$$

$$r = \frac{100}{11} = 9.09\%$$

3. Ans: [b]
C.P of van $\rightarrow$ Rs.1,96,000
Rate of Depreciation $\rightarrow 14\frac{2}{7}\%$
Value after 2 yrs ?
1st year $\rightarrow$ 14.28% of 1,96,000 = 28,000
1st year $\rightarrow$ 1,68,000
2nd year $\rightarrow$ 14.28% of 1,68,000 = 24000
2nd year $\rightarrow$ 1,44,000

4. Ans: [a]
S.I for 2 years
Rs.60 more fetched when 2% higher rate for 2 years.
For 2 years S.I $\rightarrow$ 4% $\Rightarrow$ 60
1% $\Rightarrow$ 15
Amount $\Rightarrow$ 100% = 1500

5. Ans: [d]
Interest $\Rightarrow$ 688.25
Total money $\Rightarrow$ Rs.10,000
8% and 5% Rate of interest S.I.

$$\frac{x\times1\times5}{100}+\frac{(10{,}000-x)\times1\times8}{100}=688.25$$

$$\frac{5x}{100}+\frac{80000}{100}-\frac{8x}{100}=688.25$$

5x – 8x + 80000 = 68825
– 3x = – 11175
x = 3725

6. Ans: [b]
P $\rightarrow$ doubles $\rightarrow$ 2P $\rightarrow$ 5 years
Four times $\rightarrow$ 4P $\Rightarrow$ 2×2P
2×5 yrs $= 10$

7. Ans: [b]
A = 22,500, N = 10 yrs
r = 10% S.I

Rate of interest for 10 yrs = 100%

200% of P = 22500

$P = \frac{22500}{2} = 11250$

8. Ans: [a]

RBI lends to SBI.

S.I for 2 years $\rightarrow$ 20%

Assume P = 100

$\text{Amount} = P + \frac{PNR}{100}$

$= 100\% + \frac{100 \times 2 \times 20}{100}$

A = 140%

SBI lends to Bharati telecom for 2 years C.I.

$A = P\left(1 + \frac{r}{100}\right)^n$

$= 100\left(1 + \frac{20}{100}\right)^2$

$= 100(1.2)^2 = 100(1.44)$

A = 144%

Percentage earning = 144 – 140 = 4%

9. Ans: [a]

S.I = 3 yrs, R = 10%

Rate of Interest for 3 years = 30%

30% of P = 300

100% of P = 1000

C.I. $\Rightarrow$ r = 10% for 3 years

1st year $\Rightarrow$ 10% of P $\Rightarrow$ 100

2nd year $\Rightarrow$ 10% of P + 10% of I $\Rightarrow$ 100 + 10

3rd year $\Rightarrow$ 10% of P + 10% of I + 10% of I of I

$\Rightarrow$ 100 + 10 + 10 +1 = 331

10. Ans: [b]

Rate of Interest

S.I for 3 years $10\% \times 3 = 30\%$

C.I for 3 years.

1st year $\Rightarrow$ 10%

2nd year $\Rightarrow$ 10% + 1%

3rd year $\Rightarrow$ 10% + 1% + 1% + 0.1% = 33.1%

Difference = 3.1%

3.1% = 620

$1\% = \frac{620}{3.1} = \frac{6200}{31}$

$1\%\ \text{of amount} = \frac{6200}{31} = 200$

$\text{Amount} = 200 \times 100 = 20,000$

11. Ans: [b]

C.I of 20% rate of interest

$P\left(1 + \frac{20}{100}\right)^n > 2P$ (double the P)

$\left(1 + \frac{20}{100}\right)^n > 2$

$\left(\frac{6}{5}\right)^n > 2$

n = 4 then only it will be greater than 2

12. Ans: [a]

Total = 27,000

x = A, 27,000 – x = B, N = 2 yrs

$x\left(1 + \frac{8}{100}\right)^2 + (27000 - x)\left(1 + \frac{9}{100}\right)^2 - 27000 = 4818.30$

$x(1.08)^2 + (27000 - x)(1.09)^2 = 31818.30$

1.1664x + 32078.7 – 1.1881x = 31818.30

0.0217x = 260.4

$x = \frac{260.4}{0.0217} = 12000$

13. Ans: [a]

Data sufficiency

Statement 1 $\rightarrow$ we can find the P value and rate of interest.

Statement 2 $\rightarrow$ not necessary

14. Ans: [c]

Statement 1 $\rightarrow$ we get rate of interest

Statement 2 $\rightarrow$ we get principal

Both the statements are necessary.

15. Ans: [c]

Statement 1 $\rightarrow$ we get no of years and Interest

Statement 2 $\rightarrow$ we get Rate of Interest

16. Ans: [a]

Sum = 4800

Two equal installments, interest = 5% compounded annually.

$P = \frac{A}{\left(1 + \frac{r}{100}\right)}$

$4800\left(1 + \frac{5}{100}\right)^2 = x\left(1 + \frac{5}{100}\right) + x$

$4800\left(\frac{21}{20}\right)^2 = x\left(\frac{21}{20}\right) + x$

$4800(1.05)^2 = 2.05\,x$

$x = \frac{5292}{2.05}$

$x = 2581.46$

17. Ans: [c]

	SI	CI
I-year	x	x
II-year	x	x + 15% of x

15% of x = 360

$$x = \frac{36000}{15}$$

$$x = 2400$$

15% of x = 2400

$$x = \frac{240000}{15}$$

$$x = 16,000$$

18. Ans: [a]

10% → half yearly

Ist year → 5% of P

IInd year → 5% of P + 5% (5% of P)

5% of P + 0.25% of P ⇒ 10.25% of P

∴ 10.25% in the second scheme

19. Ans: [c]

Prince's share × $(1+0.05)^9$

= Fernando's share × $(1+0.5)^{11}$

$$\frac{\text{prince's share}}{\text{F. share}} = (1+0.05)^2$$

$$= \frac{441}{400}$$

$$\left(\frac{441}{841}\right) \times 5887 = 3087$$

20. Ans: [d]

x

x + 20

x + 20 + 20 + 1

⇒ Total ⇒ 61

x% of 20 = 1

$\boxed{x = 5}$

5% of x = 20

$\boxed{x = 400}$

$\therefore 5\% \text{ of } x = 400$

$\boxed{x = 8000}$

21. Ans: [c]

$I^{st} \rightarrow 2\% \rightarrow 150$

$II^{nd} \rightarrow 3\% \rightarrow 225 + 4.5$

$III^{rd} \rightarrow 225 + 4.5 + 6.75 + 0.135$

$IV^{th} \rightarrow 300 + 6 + 9 + 0.18 + 9.4554$

Total = 8440

22. Ans: [d]

$$P\left(1+\frac{r}{100}\right)^2 = x\left(1+\frac{r}{100}\right) + x$$

$$4500\left(1+\frac{10}{100}\right)^2 = x\left(1+\frac{10}{100}\right) + x$$

$$5445 = 2.1x$$

$$x = 2592.8$$

23. Ans: [d]

S.I

x% of 27500 9900

x = 36% (for 3 years)

1 year = 12%

CI

$$\left.\begin{array}{l} I \rightarrow 3300 \\ II \rightarrow 3300 + 396 \\ III \rightarrow 3300 + 396 + 396 + 47.52 \end{array}\right\} = 11135.52$$

$$11135.52 - 9900 = 1235.52$$

24. Ans: [d]

	SI	CI
I → x = 275		275
II → x = 275		275 + 55

x% of 275 = 55

x = 20%

20% of x = 275

$\boxed{x = 1375}$

Total before investing = 2750

25. Ans: [c]

P = 7000

Interest for 2 years = 700

7000 – 4000 ⇒ 3000

Principle = 3000

Interest $= 150 \times 3$

$\Rightarrow 450$

$3000 + 450 + 700 \Rightarrow 4150$

26. Ans: [a]

C.I

3% of x

3% of x + 3% (3% of x)

6% of x + 0.09% of x = 6.09% of x

27. Ans: [c]

12% of x + 27% of x + 56% of x = 11400

95% of x = 11400

$$x = \frac{1140000}{95}$$

$$x = 12,000$$

28. Ans: [a]

SI	CI
400	400
400	400 + 32

$x\%$ of $400 = 32$

$\boxed{x = 8}$

	SI	CI
IIIrd year $\Rightarrow$	400	400 + 32 + 32 + 2.56

Total $\Rightarrow$ SI $\Rightarrow$ 1200

CI = 1298.56

Diff = 98.56

29. Ans: [b]

P = 14000, r = 9%

First year Interest will be

9% (14000) = 1260

Hence, till first year she has to pay 15260.

Out of this, she paid only certain amount.

Let the amount which she paid be x.

Remaining will be 15260 – x

For second year,

(15260 – x) + 9% (15260 – x) = 11990

$\frac{109}{100}(15260 - x) = 11990$

15260 – x = 11000

x = 4260

30. Ans: [d]

Let 'x' be the installment,

$$\left(x + \frac{x \times 5 \times 1}{100}\right) + \left(x + \frac{x \times 5 \times 2}{100}\right) + \left(x + \frac{x \times 5 \times 3}{100}\right) + x = 6450$$

$$\left(x + \frac{x}{20}\right) + \left(x + \frac{2x}{20}\right) + \left(x + \frac{3x}{20}\right) + x = 6450$$

$$\frac{21x}{20} + \frac{22x}{20} + \frac{23x}{20} + x = 6450$$

$$\frac{21x + 22x + 23x + 20x}{20} = 6450$$

$$86x = 12900$$

$$\boxed{x = 1500}$$

31. Ans: [c]

P = be the principal

r = be the rate of Interest

n = be the numbers of years

x = be the monthly installment

t = be the upcoming months after 1st installment.

$$P + \frac{Pnr}{100} = \left(x + \frac{x \times t \times r}{100}\right) + \left(x + \frac{x(t-1) \times r}{100}\right) + \left(x + \frac{x(t-2) \times r}{100}\right) + \ldots.$$

Hence P = 10 $n = \frac{6}{12}$ yrs $t = 5$ $x = 3$

$$10 + \frac{10 \times \frac{6}{12} \times r}{100} = \left(3 + \frac{3 \times \frac{5}{12} \times r}{100}\right) + \left(3 + \frac{3 \times \frac{4}{12} \times r}{100}\right)$$

$$+ \left(3 + \frac{3 \times \frac{3}{12} \times r}{100}\right) + \left(3 + \frac{3 \times \frac{2}{12} \times r}{100}\right) + \left(3 + \frac{3 \times \frac{1}{12} \times r}{100}\right) + 3$$

$$10 + \frac{r}{20} = 18 + \frac{3r}{1200}(5 + 4 + 3 + 2 + 1)$$

$$\frac{r}{20} = 18 + \frac{3r}{1200}(15) \Rightarrow 8 = \frac{r}{20} - \frac{3r}{20}$$

$$\Rightarrow r = 640\%$$

32. Ans: [a]

$$7500 = \left(1 + \frac{5}{100}\right)^3 = x\left(1 + \frac{5}{100}\right)^2 + x\left(1 + \frac{5}{100}\right) + x$$

$$7500\left(\frac{21}{20}\right)^3 = x\left(\frac{21}{20}\right)^2 + x\left(\frac{21}{20}\right) + x$$

$$7500(1.1576) = x(1.1025) + x(1.05) + x$$

$$8682 = 3.125\,x$$

$$x = 2754$$

33. Ans: [c]

$$\frac{3}{8}P = \frac{P \times 3 \times R}{100}$$

$R = 12.5\%$

34. Ans: [40]

SI	CI
1000	1000
1000	1000 + 400

$x\%$ of 1000 = 400

x = 40%

35. Ans: [a]

A'share $\times (1.05)^5$ = B' share $\times (1.05)^7$

$$\frac{\text{A' share}}{\text{B' share}} = (1.05)^2$$

$$= \frac{441}{400}$$

$$\text{A' share} \Rightarrow \left(\frac{441}{841} \times 3364\right) = 1764$$

B' share = 1600

NUMBER PROPERTIES

1. Ans: [a]

Let $x = 0.0512512....$

$10000x = 512.512512512....$

$(-) \quad 10x = 0.512512512...$

$9990x = 512$

$x = \frac{512}{9990}$

2. Ans: [c]

For a number to be divisible by 12, it should satisfy the criteria's of 3 and 4.

Criteria for 3

Sum of the digits of the given number should be divisible by 3.

Criteria for 4

Last two digits of the given number should be a multiple of 4.

Given number $43xy20xy$

Sum of the digits = 9.

xy should be the multiple of 4

So possible numbers for x and y are

$x = 1 \quad y = 2$

$x = 2 \quad y = 4$

$x = 3 \quad y = 6$

$x = 4 \quad y = 8$

$x = 6 \quad y = 0$

$x = 7 \quad y = 2$

$x = 8 \quad y = 4$

$x = 9 \quad y = 6$

Totally 8 possibilities are there.

3. Ans: [c]

Given $N = 5ab42ab$

For a number to be divisible by 180, it should satisfy the criteria's of 4, 5 and 9. Because $180 = 5 \times 4 \times 9$. So obviously b = 0 (or) 5, then only it will be a multiple of 5. But b = 5 is not possible because it should satisfy the criteria of 4 also, but no multiple of 4 end in 5. Finally the sum should be divisible by 9. The only possibility is a = 8, b = 0

The number is 5804280. Sum of this number is 27.

4. Ans: [d]

We know that product of the two numbers $= HCF \times LCM$

$x \times 365 = 73 \times 2555$

$\Rightarrow x = 511$

5. Ans: [d]

Longest four digit number = 9999

LCM of 12, 14, 33 and 42 = 924

So add 5793 and 9999. We will get 15792.

Divide 15792 by 924, we get remainder as 84, that should be subtracted from 9999

The answer is 9999 – 84 = 9915

6. Ans: [b]

The number which is divisible by 10, 13, 15 and 26 = LCM of (10, 13, 15, 26) = 390

The largest 5 digit number is 99999.

Largest 5 digit multiple of 390 is $390 \times 256 = 99840$

Common difference is 6.

So subtract it from the number.

Required answer is $99840 - 6 = 99834$

7. Ans: [d]

Let $a = k \times p, \quad b = k \times q$ [p and q are co-primes]

So LCM $= k \times p \times q$ HCF = K

It is given that $HCF + LCM = 77$

$k + (kpq) = 77$

$k(1 + pq) = 77$

77 can be written as 1×77

7×11

11×7

Case I: $1 \times 77 = 7$

$k = 1 \quad 1 + pq = 77$

$pq = 76$

Possible pairs are (4, 19), (1, 76)

Case II: $7 \times 11 = 77$

$k = 7 \quad 1 + pq = 11$

$pq = 10$

Possible pairs are (5, 2) (1, 10)

Case III: $11 \times 7 = 77$

$k = 11 \quad 1 + pq = 7$

$pq = 6$

Possible pairs are $(1, 6)(2, 3)$

8. Ans: [c]

Let the two number be x and y

$x = k \times a \quad y = k \times b$ [a and b are coprimes]

$x \times y \Rightarrow k^2 \times a \times b$

$xy \times (HCF)^2 = 240$

$k^2 \times a \times b \times k^2 = 240$

$a \times b \times k^4 = 240$

Prime factorization of 240 $= 2^4 \times 3 \times 5$

So $k=2$ possible pair = (3, 5)

We also have one more possibility if k = 1

So possible pairs are $\left[\left(2^4\times3\right),5\right]$

$\left[3,\left(2^4\times5\right)\right]$

$\left[2^4,(3\times5)\right]$

$\left[1,\left(2^4\times3\times5\right)\right]$

Totally 5 possible pairs.

9. Ans: [c]

$pqpq=101\times pq$

It is given that pq has 3 divisors.

$\Rightarrow$ It is a square of a prime number.

$=101\times(\text{prime})^2$

$=(1+1)(2+1)$

$=2\times3=6$

10. Ans: [b]

Total number of divisors

$1400=2^3\times5^2\times7$

$=(3+1)(2+1)(1+1)$

$=(4\times3\times2)$

= 24 factors

First we are going to find how many perfect square factors are there in 1400.

Any factor of 1400 can be written as $2^a\times5^b\times7^c$

a can take values 0 and 2

b and take values 0 and 2

c can take the value 0. $\Rightarrow2\times2\times1$

Totally there are 4 possibilities

So the remaining 20 factors are not perfect squares.

11. Ans: [a]

Total no. of divisors of 2016

$2016=2^5\times7\times9$

$\Rightarrow(5+1)(1+1)(1+1)$

$\Rightarrow6\times2\times2=24$ factors

Odd factors $\Rightarrow$ only we have to take

7×9 $(1+1)(1+1)=4$ factors

Even factors $=24-4=20$

12. Ans: [c]

Sum of the divisors of 2475.

Sum of the factors for a number $N=P^a\times q^b\times r^c$

$\left(\frac{p^{a+1}-1}{p-1}\right)\left(\frac{q^{b+1}-1}{q-1}\right)\left(\frac{r^{c+1}-1}{r-1}\right)$

2475 can be written as $3^2\times5^2\times11$

Using the above we get

$\left(\frac{3^3-1}{3-1}\right)\left(\frac{5^3-1}{5-1}\right)\left(\frac{11^2-1}{11-1}\right)=4836$

13. Ans: [b]

Here $N=2^7\times3^3\times11^2$

Any factor of N can be written as $2^a\times3^b\times11^c$

'a' can take the values 0, 2, 4, 6

'b' can take the values 0, 2

'c' can take the values 0, 2

Total possible factors which are perfect squares $=4\times2\times2=16$ factors

14. And: [d]

Any number of the form $p^a\times q^b\times r^c$ will have $(a+1)(b+1)(c+1)$ factors

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 the number of factors will have to be of the form $(3m+1)(3n+1)(3l+1)$.

In other words $(a+1)(b+1)(c+1)$ all leave remainder of 1 on division by 3.

So the product of these numbers should also leave a remainder of 1 on division by 3.

Out of the given four numbers 10 and 49 can be written in this form.

15. Ans: [d]

We know that the last two digits of 127! is zero. The remainder when it is divided by four is zero. If the remainder is zero, the answer is last value in the cycle of 7

$\Rightarrow7,9,3,\mathbf{1}$.

16. Ans: [b]

$80^1=80$

$80^2=6400$

$80^3=512000$

$80^4=40960000$

$80^5=3276800000$

$80^6=262144000000$

.

.

.

$80^{1230} \Rightarrow$ the last non zero digit of this number is

$R\left(\frac{1230}{4}\right)=2$

Answer is 4.

17. Ans: [d]
When the unit digit for our given number is 2.

Divide the power by 4, check the remainder $R\left(\frac{52^{52}}{4}\right)=0$

The answer is last value in the cycle of 2
2 4 8 **6**

18. Ans: [b]

$5 \mid 229$
$5 \mid 45$
$5 \mid 9$
1

$45+9+1$

One five and one two will give one zero.
Number of five's will be less than number of two's.
Number of five's = 55

19. Ans: [a]
24! has 4 zeros
25! has 6 zeros
124! has 28 zeros
125! has 31 zeros
So the answer is (a)

20. Ans: [a]
128! have 31 zeros (31 fives) (63 fours)(30 nines)

The greatest value n that exactly divides 180^n

$180=2^2\times3^2\times5$

21. Ans: [b]

$N=Dq_1+6$ ... (1)

$N=3Dq_2+19$ ... (2)

Dividing (2) by D, we get remainder as

$R\left(\frac{N}{D}\right)=R\left(\frac{3Dq_2}{D}\right)+R\left(\frac{19}{D}\right)$

$=R\left(\frac{19}{D}\right)$

$\therefore R\left(\frac{19}{D}\right)=6$ by (1)

$\Rightarrow D=13$

$2N=2Dq_1+12$ by (1)

$R\left(\frac{2N}{13}\right)=R\left(\frac{12}{13}\right)=12$

22. Ans: [a]

$R\left(\frac{6^{90}-5^{90}}{91}\right)=?$

$6^{90}-5^{90}=\left(6^3\right)^{30}-\left(5^3\right)^{30}=216^{30}-125^{30}$

a^n-b^n is divisible by a – b

$\therefore 6^{90}-5^{90}$ is divisible by 91

So the remainder is 0.

23. Ans: [c]

$3^{5555}+5^{3333}=\left(3^5\right)^{1111}+\left(5^3\right)^{1111}$

$=(243)^{1111}+(125)^{1111}$

a^n+b^n is divisible by $a+b$ when n is odd.

$\therefore 243^{1111}+125^{1111}$ is divisible by 368

Since 23 is a factor of 368, $243^{1111}+125^{1111}$ is divisible by 23.

$\therefore$ Remainder = 0

24. Ans: [a]

$R\left(\frac{23^{24^{25}}}{7}\right)=R\left(\frac{23}{7}\right)^{24^{25}}=R\left(\frac{2^{24^{25}}}{7}\right)$

Cyclicity of powers of 2 divided by 7.

$R\left(\frac{2}{7}\right)=2$

$R\left(\frac{2^2}{7}\right)=4$

$R\left(\frac{2^3}{7}\right)=1$

Cyclicity 3
On dividing the exponent by 3, we get remainder as 0.
$\therefore$ Remainder = 1

25. Ans: [d]

$R\left(\frac{35^{182}}{37}\right)=?$

Since 37 is prime and 35 is co-prime to 37, by Fermat's theorem,

$R\left(\frac{35^{36}}{37}\right)=1$

$\Rightarrow R\left(\frac{35^{182}}{37}\right)=R\left(\frac{35^{36}}{37}\right)^5 R\left(\frac{35^2}{37}\right)$

$=1(-2)(-2)=4$

$\therefore$ Remainder = 4

26. And: [d]

$$R\left(\frac{3451+3452+...+3794}{345}\right)=R\left(\frac{3451}{345}\right)+R\left(\frac{3452}{345}\right)+...+\left(\frac{3794}{345}\right)$$

$$=R\left(\frac{1+2+...+344}{345}\right)$$

$1+2+...+344=\frac{344(345)}{2}$, multiple of 345

$\therefore$ Remainder = 0

27. Ans: [c]

A number that leaves a remainder of 2 on division by 5 and a remainder of 5 on division by 7 is 12. (first such number)

The other numbers are $12+35,12+35(2),...$

The numbers which satisfy the given condition from 1 to 500 is $12+35(0),12+35(1),...12+35(13)$.

28. Ans: [b]

$N=33q+10$

$$R\left(\frac{N}{22}\right)=R\left(\frac{33q}{22}\right)+R\left(\frac{10}{22}\right)$$

i) $R\left(\frac{33q}{22}\right)$

By cancelling the common factor 11. We get $R\left(\frac{3q}{2}\right)$

It has two possible remainders 0 and 1.

So (i) has two possible remainder 10 and 11.

$\therefore$ n can take 2 values.

29. Ans: [c]

$$R\left(\frac{2^{64}}{160}\right)=R\left(\frac{2^4\times2^{60}}{2^4\times10}\right)$$

By cancelling the common factor, we get $R\left(\frac{2^{60}}{10}\right)$

Finding the above remainder is same as finding the unit digit of 2^{60} and that is 6.

$\therefore$ Required remainder $=16\times6=96$

30. Ans: [a]

The last two digits of the expression is 80.

31. Ans: [c]

$31^{77}=11 \quad (3\times7=21)$

$75^{84}=25 \quad (7\times4=28)$

Last two digits of $31^{77}\times75^{84}=11\times25$

$=75$

32. Ans: [a]

$59^{27}=\left(59^2\right)^{13}\cdot59=81^{13}\cdot59=(....41)(59)$

Last two digits = 19

33. Ans: [b]

$78^{35}=(39)^{35}\cdot2^{35}$

$39^{35}=\left(39^2\right)^{17}\cdot39=(21)^{17}\cdot39$

$=(...41)(39)=99$

$2^{35}=2^{20}.2^{10}\cdot2^5=(...76)(...24)(...32)$

$=68$

Required answer = 32

34. Ans: [a]

$16^{26}=\left(2^4\right)^{26}=2^{104}=\left(2^{20}\right)^5\cdot2^4$

$=(...76)(16)=16$

35. Ans: [c]

$31^{15}=(...51)$

$24^{15}=\left(2^3\right)^{15}\cdot3^{15}=2^{45}\cdot\left(3^4\right)^3\cdot3^3$

$=\left(2^{20}\right)^2\cdot2^5\cdot(81)^3\cdot27$

$=76.32\cdot(....41)\cdot(27)=24$

Required answer $=51-24=27$

36. Ans: [b]

$140^5=\left(2^2\times7\times5\right)^5=2^{10}\times7^5\times5^5$

$=(2\times5)\times\left(2^9\times7^5\times5^4\right)$

The number of factors that have at least one zero

$=10\times6\times5=300$

37. Ans: [b]

The number that has exactly three factors is square of a prime number. [Since 40! Has two 19 in it i.e. (38)]

$\therefore K=19^2=361$

$K-1=360=2^3\times3^2\times5$

Number of factors $=4\times3\times2=24$

38. Ans: [a]

2N has 28 factors $(28=7\times4)$ $2n=2^6*3^3$

3N has 30 factors $(30=6\times5)$ from this $n=2*2^5*3^3$

$\Rightarrow N=2^5\times3^3$ $3n=2^5*3^4$

$6N=2^6\times3^4$ which has from this $n=3*2^5*3^3$

$7\times5=35$ factors.

39. Ans: [d]

$38^{38^{38}}$

We know that cyclicity of 8 is 4.

$$R\left(\frac{38^{38}}{4}\right)=R\left(\frac{2^{38}}{4}\right)=0$$

So the unit digit is 6.

40. Ans: [b]

$$25!=2^{22}\times3^{10}\times5^{6}\times7^{3}\times11^{2}\times13\times17\times19\times23$$

$$=\left(2^{6}\times5^{6}\right)\times2^{16}\times3^{10}\times7^{3}\times11^{2}\times13\times17\times19\times23$$

Last non-zero digit is 4.

41. Ans: [c]

$x=0.22727.....$

$100x=227.272727.....$

$10x=2.272727.....$

$990x=225$

$$x=\frac{225}{990}$$

$$x=\frac{5}{22}$$

42. Ans: [d]

$74p58p4$ is divisible by 9.

Sum $=7+4+5+8+4=28$

Minimum value of p is 4.

$757qp$ is divisible by 8

Last three digits should be divisible by 8.

We know that $p=4$

So $q=0$

$p+q=4+0=4$

43. Ans: [a]

Perfect squares will not end in 2 4 7 8

So we have to check only with (a) and (b) using divisibility criteria we can say that 361524 is not a multiple of 11.

So ans is (a)

44. Ans: [d]

Two numbers are in the ratio 16:15

$\Rightarrow$ The numbers re 16x, 15x

Given HCF = 13

$\Rightarrow x=13$

$\therefore$ The numbers are $16\times13, 15\times13$

$208, 195$

45. Ans: [c]

Let the two numbers be x and y.

$x=a\times k$

$y=b\times k$

It is given that $x+y+2(HCF)=221$

$$(a\times k)+(b\times k)+2k=221$$

$$k(a+b+2)=221$$

It is given that non coprime positive integers.

So $k=17(or)13$

So $k=13$ $\quad a+b+2=17$

$a+b=15$

Possible pairs $(1,14)(7,8)$

$(2,13)$

$(4,11)$

If $k=17$ $\quad a+b=11$

Possible pairs

$(1,10)(2,9)(3,8)(4,7)(5,6)$

46. Ans: [c]

$98000=2^{4}\times5^{3}\times7^{2}$

Odd factors of 98000 means we should not include 2.

So $5^{3}\times7^{2}$ have $(3+1)(2+1)=4\times3=12$ factors.

47. Ans: [a]

Divide 479 by 4 $\Rightarrow$ Remainder = 3

2323^{479} ends in 7

9 to the power odd number will end in 9.

$7\times9=6\boxed{3}$

48. Ans: [d]

We know that unit digit of 232! will end in zero.

49. Ans: [b]

112! have 26 zeros

115! have 27 zeros

Difference = 1

50. Ans: [a]

$15=5\times3$

87! have 20 five's

51. Ans: [d]

$$R\left(\frac{6^{70}+8^{70}}{100}\right)=R\left(\frac{\left(6^{2}\right)^{35}+\left(8^{2}\right)^{35}}{100}\right)$$

$$=R\left(\frac{36^{35}+64^{35}}{100}\right)=R\left(\frac{36^{35}+64^{35}}{36+64}\right)$$

In the format of $a^{n}+b^{n}$ divided by a + b.

Remainder = 0

52. Ans: [a]

$$R\left[\frac{\left(10^{3}+9^{3}\right)^{3089}}{12^{3}}\right]\Rightarrow R\left[\frac{1729^{3089}}{1728}\right]$$

$$= R\left[\left(\frac{1729}{1728}\right)^{3089}\right]$$

$$= 1^{3089} = 1$$

53. Ans: [c]

$$R\left(\left(\frac{52}{17}\right)^{53^{54}}\right)$$

$$R\left(\left(\frac{52}{17}\right)^{53^{54}}\right) \Rightarrow 1^{53^{54}}$$

$$\Rightarrow 1$$

54. Ans: [a]

By Wilson's theorem,

$$R\left[\frac{(P-1)!}{P}\right] = P-1$$

$$\therefore R\left[\frac{(73-1)!}{73}\right] = 73-1$$

$$\therefore R\left[\frac{(73-1)!+1}{73}\right] = 73-1+1$$

$$= R\left(\frac{73}{73}\right) = 0$$

55. Ans: [d]

By Fermat's theorem, as 101 is prime number.

$$R\left[\frac{a^{P-1}}{P}\right] = 1$$

$$\therefore R\left[\frac{3^{101-1}}{101}\right] = 1$$

$$\therefore R\left[\frac{3^{100}}{101}\right] = 1 \qquad \therefore R\left[\frac{3^{101}}{101}\right] = 3$$

56. Ans: [a]

1! + 2! + 3! + 4! + 5! + 6! + 7! + 8! + 9! + [from here onwards, it have 0 in units & tens digit]

$$1+2+6+24+\underbrace{20+20+40+20+80}_{\text{Tens and units digit only}}$$

$$\Rightarrow 13$$

57. Ans: [b]

$$83^{26}$$

$$\Rightarrow \left(83^4\right)^6 \cdot 83^2$$

$$\Rightarrow \left(21^6\right) \cdot 89$$

$$\Rightarrow 21 \cdot 89$$

$$\Rightarrow 1869$$

58. Ans: [d]

$$44^{63} \rightarrow 22^{126}$$

$$2^{126} \times 11^{126}$$

$$\left(2^{20}\right)^6 \times 2^6 \times 11^{126}$$

$$76 \times 64 \times 61$$

$$\Rightarrow 04$$

59. Ans: [a]

2	1080
2	540
3	270
3	90
3	30
2	10
	5

$1080 = 2^3 \times 3^3 \times 5^1$

Odd factors = 8

Even factors = 24

Difference = 24 – 8 = 16 factors

60. Ans: [d]

Sum of (4n + 3) prime numbers = even

Sum of odd number of odd prime numbers is odd.

To make it even, there should be one even number in the list. So it must be 2.