

Total expenses of a boarding house are partly fixed and partly varying linearly with the number of boarders. The average expense per boarder is Rs. 700 when there are 25 boarders and Rs. 600 when there are 50 boarders. What is the average expense per boarder when there are 100 boarders?  
 a. 550      b. 580      c. 540      d. 570

no of boarders = N.  
 Variable exp = NV.

$$E = F + NV$$

$$AE = \text{Avg Exp} = \frac{E}{N} = \frac{F}{N} + V$$

for N=100

$$\begin{aligned} AE &= \frac{F}{100} + V \\ &= 50 + 500 \\ &= \underline{550} \end{aligned}$$

for N=25, AE=700.

$$700 = \frac{F}{25} + V \quad \text{--- (1)}$$

for N=50, AE=600.

$$600 = \frac{F}{50} + V \quad \text{--- (2)}$$

$$\begin{aligned} 700 &= \frac{F}{25} + V \\ - (600 &= \frac{F}{50} + V) \\ \hline 100 &= \frac{F}{25} - \frac{F}{50} \end{aligned}$$

$$\frac{2F}{50} - \frac{F}{50} = 100$$

$$\frac{F}{50} = 100$$

$$F = 5000$$

$$600 = 100 + V \quad \boxed{V = 500}$$

What is the value of the following expression?

$$\left(\frac{1}{2^2-1}\right) + \left(\frac{1}{4^2-1}\right) + \left(\frac{1}{6^2-1}\right) + \dots + \left(\frac{1}{20^2-1}\right)$$

a.  $\frac{9}{19}$

b.  $\frac{10}{19}$

c.  $\frac{10}{21}$  ✓

d.  $\frac{11}{21}$

$$S = \frac{1}{1 \times 3} + \frac{1}{3 \times 5} + \frac{1}{5 \times 7} + \dots + \frac{1}{19 \times 21}$$

$$\frac{1}{1} - \frac{1}{3} = \frac{3-1}{1 \times 3} = \frac{2}{1 \times 3}$$

$$\frac{1}{1 \times 3} = \frac{1}{2} \left[ \frac{1}{1} - \frac{1}{3} \right]$$

$$\frac{1}{3} - \frac{1}{5} = \frac{5-3}{3 \times 5} = \frac{2}{3 \times 5}$$

$$\frac{1}{3 \times 5} = \frac{1}{2} \left[ \frac{1}{3} - \frac{1}{5} \right]$$

$$\frac{1}{1 \times 3} = \frac{1}{2} \left[ 1 - \frac{1}{3} \right]$$

$$\frac{1}{3 \times 5} = \frac{1}{2} \left[ \frac{1}{3} - \frac{1}{5} \right]$$

$$\frac{1}{5 \times 7} = \frac{1}{2} \left[ \frac{1}{5} - \frac{1}{7} \right]$$

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

$$2^2 - 1 = (2+1)(2-1) = 3 \times 1$$

$$4^2 - 1 = (4+1)(4-1) = 5 \times 3$$

$$6^2 - 1 = (6+1)(6-1) = 7 \times 5$$

$$\dots$$

$$20^2 - 1 = (20+1)(20-1) = 21 \times 19$$

$$\frac{1}{7 \times 9} = \frac{1}{2} \left[ \frac{1}{7} - \frac{1}{9} \right]$$

$$\vdots$$

$$\frac{1}{19 \times 21} = \frac{1}{2} \left[ \frac{1}{19} - \frac{1}{21} \right]$$


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$$S = \frac{1}{2} \left[ 1 - \frac{1}{21} \right] = \frac{1}{2} \times \frac{20}{21} = \frac{10}{21}$$

If  $x > 5$  and  $y < -1$ , then which of the following statements is true?

- a.  $(x + 4y) > 1$     
 b.  $x > -4y$     
 c.  $-4x < 5y$     
 d. None of these

$x = 6$        $y = -10$        $x + 4y = 6 - 40 = -34$

$4y = -40$

$-4y = 40$

$-4x = -24$        $5y = -50$

Amol was asked to calculate the arithmetic mean of 10 positive integers, each of which had 2 digits. By mistake, he interchanged the 2 digits, say a and b, in one of these 10 integers. As a result, his answer for the arithmetic mean was 1.8 more than what it should have been. Then  $b - a$  equals

- a. 1       b. 2       c. 3       d. None of these

$$\frac{N_1 + N_2 + N_3 + \dots + N_{10}}{10} = \text{Avg}$$

$$\text{Sum} = N_1 + N_2 + N_3 + \dots + N_{10} = \text{Avg} \times 10$$

If the avg increases by 1.8, then the sum increases by  $1.8 \times 10 = 18$

$$9(b - a) = 18$$

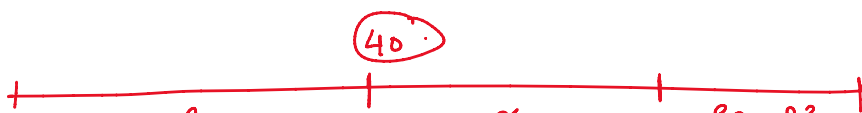
$$\underline{b - a = 2}$$

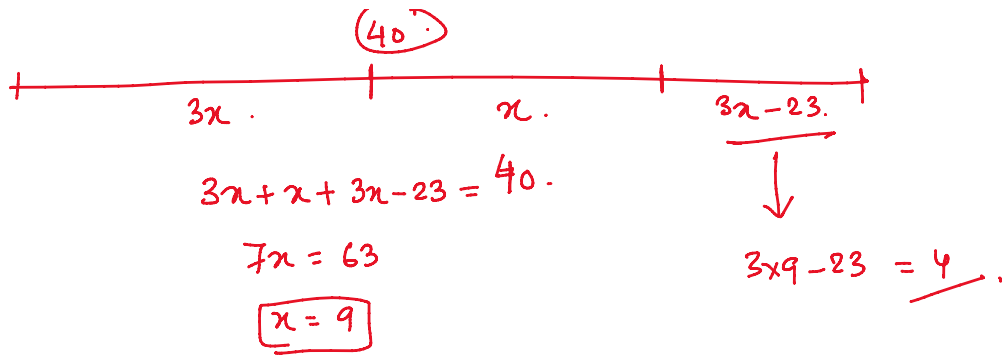
$$\left[ \begin{array}{l} \underline{a} \underline{b} = 10a + b \text{ (less)} \\ \underline{b} \underline{a} = 10b + a \text{ (more)} \end{array} \right]$$

$$\text{Diff} = 9b - 9a = 9(b - a)$$

A piece of string is 40 cm long. It is cut into three pieces. The longest piece is three times as long as the middle-sized and the shortest piece is 23 cm shorter than the longest piece. Find the length of the shortest piece.

- a. 27       b. 5       c. 4       d. 9





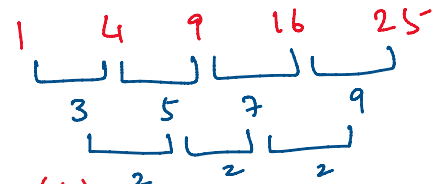
The infinite sum  $1 + \frac{4}{7} + \frac{9}{7^2} + \frac{16}{7^3} + \frac{25}{7^4} + \dots$  equals

a.  $\frac{27}{14}$

b.  $\frac{21}{13}$

c.  $\frac{49}{27}$

d.  $\frac{256}{147}$



$$S = 1 + 4 \times \left(\frac{1}{7}\right) + 9 \times \left(\frac{1}{7^2}\right) + 16 \times \left(\frac{1}{7^3}\right) + 25 \times \left(\frac{1}{7^4}\right) + \dots$$

let  $\frac{1}{7} = x$ .

$$S = 1 + 4x + 9x^2 + 16x^3 + 25x^4 + \dots \quad \text{--- (1)}$$

multiply both sides by  $x$ .

$$Sx = x + 4x^2 + 9x^3 + 16x^4 + 25x^5 + \dots \quad \text{--- (2)}$$

Subtract (2) from (1)

$$\begin{aligned} S &= 1 + (4x) + (9x^2) + 16x^3 + 25x^4 + \dots \\ - (Sx &= x + 4x^2 + 9x^3 + 16x^4 + 25x^5 + \dots) \\ \hline \end{aligned}$$

$$S - Sx = 1 + 3x + 5x^2 + 7x^3 + 9x^4 + \dots$$

$$S(1-x) = 1 + 3x + 5x^2 + 7x^3 + 9x^4 + \dots \quad \text{--- (3)}$$

multiply both sides by  $x$ .

$$S(1-x)x = x + 3x^2 + 5x^3 + 7x^4 + 9x^5 + \dots \quad \text{--- (4)}$$

Subtract (4) from (3)

$$S(1-x) - S(1-x)x = 1 + 2x + 2x^2 + 2x^3 + 2x^4 + \dots$$

$$S(1-x)(1-x) = 1 + 2x(1 + x + x^2 + x^3 + \dots)$$

infinite GP.

Sum of  $1 + x + x^2 + x^3 + \dots$   
 $= \frac{1}{1-x}$

$$S(1-x)(1-x) = 1 + 2x(1+x+x^2+x^3+\dots)$$

infinite A.P.

Sum of  $1+x+x^2+x^3+\dots$   
 $= \frac{1}{1-x}$

$$S(1-x)^2 = 1 + 2x \cdot \frac{1}{1-x}$$

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

$$S\left(1 - \frac{1}{7}\right)^2 = 1 + 2 \cdot \frac{1}{7} \cdot \frac{1}{1 - \frac{1}{7}} = 1 + 2 \cdot \frac{1}{7} \cdot \frac{7}{6} = 1 + \frac{2}{3} = \frac{5}{3}$$

$$S \times \left(\frac{6}{7}\right)^2 = \frac{5}{3}$$

$$S = \frac{5}{3} \times \frac{49}{36} = \frac{49}{27}$$

$$S \times \frac{36}{49} = \frac{5}{3}$$

If  $\frac{a}{b+c} = \frac{b}{c+a} = \frac{c}{a+b} = r$  then r cannot take any value except.

a.  $\frac{1}{2}$

b. -1

c.  $\frac{1}{2}$  or -1

d.  $-\frac{1}{2}$  or -1

if  $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = r$ .

$a = rb$   
 $c = rd$   
 $e = rf$

then  $r = \frac{a+c+e}{b+d+f}$

$a+c+e = rb+rd+rf$   
 $= r(b+d+f)$

$$r = \frac{a}{b+c} = \frac{b}{c+a} = \frac{c}{a+b} = \frac{(a+b+c)}{2(a+b+c)}$$

$a+b+c \neq 0$   
 $r = \frac{1}{2}$

$a+b+c = 0$

$r = -1$

$\frac{a+c+e}{b+d+f} = r$

$a+b = -c$

$a+c = -b$

$b+c = -a$

$r = \frac{c}{a+b} = -1$

$r = \frac{b}{a+c} = -1$

$\frac{a}{b+c} = -1 = r$

The total number of integers pairs (x, y) satisfying the equation  $x + y = xy$  is

a. 0

b. 1

c. 2

d. None of the above

$$x + y = xy$$

$$x + y - xy = 0.$$

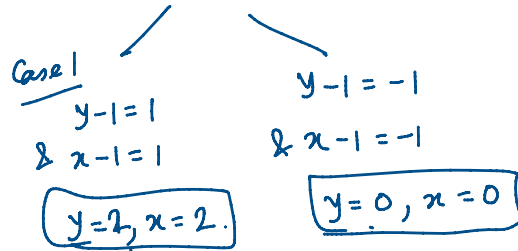
$$x + y - xy - 1 = -1$$

$$x - xy + y - 1 = -1$$

$$x(1-y) + (y-1) = -1$$

$$(1-y)(x-1) = -1$$

$$\boxed{(y-1)(x-1) = 1}$$



If  $R = \frac{30^{65} - 29^{65}}{30^{64} + 29^{64}}$ , then

a.  $0 < R \leq 0.1$

b.  $0.1 < R \leq 0.5$

c.  $0.5 < R \leq 1.0$

d.  $R > 1.0$

$$\frac{30^{65} - 29^{65}}{30^{64} + 29^{64}} > 1$$

$$30^{65} - 29^{65} > 30^{64} + 29^{64}.$$

$$30^{65} - 30^{64} > 29^{65} + 29^{64}.$$

$$30^{64}(30-1) > 29^{64}(29+1)$$

$$30^{64} \times 29 > 29^{64} \times 30.$$

$$\frac{30^{64}}{30} > \frac{29^{64}}{29}$$

$$30^{63} > 29^{63}$$

$30 > 29 \checkmark$

$$\frac{3^3 - 2^3}{3^2 + 2^2} = \frac{27 - 8}{9 + 4} = \frac{19}{13}$$

$\frac{19}{13} > 1$

**Que. 11** Directions: In the given sentence, three words are marked as (A), (B), and (C). These words may or may not be placed in their right places. Four options with different arrangements of these words are given below, mark the option with the correct arrangement as your answer. If no change is required mark 'No rearrangement required' as your answer.

No country can go far if a ~~invested~~(A) proportion of its population is illiterate, unhealthy, or malnourished, all the ~~significant~~(B) that are developed today ~~countries~~(C) well in education, health, and nutrition.

1. ACB
2. BCA
3. BAC
4. CBA
5. No rearrangement required

**Directions:** In the given sentence, three words are marked as (A), (B), and (C). These words may or may not be placed in their right places. Four options with different arrangements of these words are given below, mark the option with the correct arrangement as your answer. If no change is required mark 'No rearrangement required' as your answer.

The presence of foreign ~~competition~~(A) in India will bring in an element of ~~quality~~(B) and increase the standards and ~~universities~~(C) of Indian institutions.

1. CAB
2. CBA
3. ACB
4. BAC
5. No rearrangement required

**Que. 17** Which of the phrases given in the options should replace the word/phrase that is underlined in the sentence to make it grammatically correct? If the sentence is correct as it is given and no correction is required, select 'No correction required' as the answer.

Hardly had the peoples reached Mumbai then they were ordered to return to Delhi.

1. the peoples reached Mumbai then
2. the peoples reached Mumbai than
3. the people reached Mumbai when
4. the people's reached Mumbai when
5. No correction required

peoples X

**Que. 20** Rearrange the following five segments (A), (B), (C), (D) and (E) in the proper sequence to form a meaningful paragraph; then answer the questions given below them.

- A. NPCIL is a dividend-paying company with the highest credit rating of AAA by CRISIL and CARE  
B. At present, NPCIL operates 22 nuclear power reactors with an installed capacity of 6780 MW.  
C. NPCIL is responsible for siting, design, construction, commissioning and operation of nuclear power reactors.

D. Nuclear Power Corporation of India Limited (NPCIL), formed in 1987, is a Public Sector Enterprise under the administrative control of Department of Atomic Energy (DAE).

E. Safety is given overriding priority in all facets of nuclear power reactors.

Which is the **first** sentence according to the paragraph?

1. A
2. B
3. C
4. D
5. E

D C A (B, E) ✓  
D C B E A ✓

**Que. 27** Read the sentence below to find out if there is any error in it. The error, if any, will be in one part of the sentence. The letter of that part is the answer. If there is no error the answer is (5). (Ignore errors in punctuation if any).

The protesters will reach designated (A)/ public locations by any (B)/ means of transport including scooters, (C)/ motorcycles, tractor, car, buses, truck. (D)/ No error (E)

1. A
2. B
3. C
4. D
5. E

**Que. 35** In the given question, two equations numbered I and II are given. Solve both the equations and mark the appropriate answer.

I.  $4x^2 + 18x + 20 = 0$

II.  $3y^2 + 24y - 60 = 0$

1.  $x < y$
2.  $x > y$
3.  $x \leq y$
4.  $x \geq y$
5. No relation in x and y or  $x = y$

**Que. 38** Saurabh bought 45 kg tea at Rs. 140 per kg and 40 kg at Rs. 155 per kg. He mixed the two. Now at what price (app) per kg he should sell so that he may get 20% on this loss?

1. Rs. 118
2. Rs. 120
3. Rs. 115
4. Rs. 123

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**Que. 39** A and B can do a piece of work 18 days and 24 days respectively. Both started the work together but A left after 6 days and C joined B. They together finished the remaining work in 6 days. In how many days C alone can finish that work?

1. 36
2. 30
3. 32
4. 40
5. 46

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**Que. 57** The present age of Ram and Rohit are in the ratio of 7 : 8 respectively. After 6 years, the respective ratio between the age of Ram and Rohit will be 9 : 10. What is the age of Rohit after 10 years?

1. 30 years
2. 34 years
3. 40 years
4. 42 years
5. 27 years

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**Que. 66** **Direction:** Study the following information carefully to answer the given questions.  
6 people – A, B, C, P, Q, and R, work in the same school had their performance reviews in the months



subject. B had his performance review on the 26<sup>th</sup> of July. The Biology teacher had his performance review after the Maths teacher in the same month. The History teacher had his review before A, who did not teach Chemistry. 4 people had their reviews between P and C, who did not teach Physics. C was not the English teacher but had his review immediately after Q. R did not teach Biology. 2 people had their reviews between the Physics teacher and B. The English teacher had his review in December.  
Who is the Maths teacher?

1. B
2. C
3. P
4. Q
5. A

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**Que. 69** When did the English teacher have his review?

1. December 26
2. July 14
3. March 26
4. July 26
5. December 14