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Bihar Public Service Commission

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BPSC Math Aptitude Sample Paper 2016 PDF Download

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(1) The banker's discount on a sum of money for $1\frac{1}{2}$ years is Rs. 558 and the true discount on the same sum for 2 years is Rs. 600. The rate percent is:

[A] 10%

[B] 13%

[C] 12%

[D] 15%

Answer : [C]

Explanation:

B.D. for $\frac{3}{2}$ years = Rs. 558.

B.D. for 2 years = Rs. $\left(558 \times \frac{2}{3} \times 2 \right)$

$\qquad\qquad\qquad$ = Rs. 744

T.D. for 2 years = Rs. 600.

$\therefore$ Sum = $\frac{\text{B.D. x T.D.}}{\text{B.D. - T.D}}$ = Rs. $\left(\frac{744 \times 600}{144} \right)$ = Rs. 3100.

Thus, Rs. 744 is S.I. on Rs. 3100 for 2 years.

$\therefore$ Rate = $\left(\frac{100 \times 744}{3100 \times 2} \right)_\%$ = 12%

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(2) The certain worth of a certain sum due sometime hence is Rs. 1600 and the true discount is Rs. 160. The banker's gain is:

[A] Rs. 20

[B] Rs. 24

[C] Rs. 16

[D] Rs. 12

Answer : [C]

Explanation:

B.G. = $\frac{(\text{T.D.})^2}{\text{P.W.}}$ = Rs. $\left(\frac{160 \times 160}{1600} \right)$ = Rs. 16.

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

[A] 9

[B] 11

[C] 13

[D] 15

Answer : [D]

Explanation:

Let the three integers be x, $x + 2$ and $x + 4$.

Then, $3x = 2(x + 4) + 3$ $\Leftrightarrow$ $x = 11$.

$\therefore$ Third integer = $x + 4 = 15$.

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(4) The difference between a two-digit number and the number obtained by interchanging the digits is 36. What is the difference between the sum and the difference of the digits of the number if the ratio between the digits of the number is 1 : 2 ?

[A] 4

[B] 8

[C] 16

[D] None of these

Answer : [B]

Explanation:
Since the number is greater than the number obtained on reversing the digits, so the ten's digit is greater than the unit's digit.
Let ten's and unit's digits be $2x$ and x respectively.
Then, $(10 \times 2x + x) - (10x + 2x) = 36$
$\Rightarrow 9x = 36$
$\Rightarrow x = 4.$
$\therefore$ Required difference $= (2x + x) - (2x - x) = 2x = 8.$

(5) The difference between a two-digit number and the number obtained by interchanging the positions of its digits is 36. What is the difference between the two digits of that number?

[A] 3

[B] 4

[C] 9

[D] Cannot be determined

[E] None of these

Answer : [B]

Explanation:
Let the ten's digit be x and unit's digit be y.
Then, $(10x + y) - (10y + x) = 36$
$\Rightarrow 9(x - y) = 36$
$\Rightarrow x - y = 4.$

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

[A] 18

[B] 24

[C] 42

[D] 81

Answer : [B]

Explanation:
Let the ten's and unit digit be x and $\dfrac{8}{x}$ respectively.

Then, $\left(10x + \dfrac{8}{x}\right) + 18 = 10 \times \dfrac{8}{x} + x$

$\Rightarrow 10x^2 + 8 + 18x = 80 + x^2$
$\Rightarrow 9x^2 + 18x - 72 = 0$
$\Rightarrow x^2 + 2x - 8 = 0$
$\Rightarrow (x + 4)(x - 2) = 0$
$\Rightarrow x = 2.$

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

[A] 35

[B] 36

[C] 45

[D] 54

Answer : [D]

Explanation:
Let the number be x.

Then, $\frac{1}{3}$ of $\frac{1}{4}$ of x = 15 $\Leftrightarrow$ x = 15 x 12 = 180.

So, required number = $\left(\frac{3}{10} \times 180 \right)$ = 54.

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(8) In a two-digit, if it is known that its unit's digit exceeds its ten's digit by 2 and that the product of the given number and the sum of its digits is equal to 144, then the number is:

[A] 24

[B] 26

[C] 42

[D] 46

Answer : [A]

Explanation:
Let the ten's digit be x.
Then, unit's digit = $x + 2$.
Number = $10x + (x + 2) = 11x + 2$.
Sum of digits = $x + (x + 2) = 2x + 2$.
$\because$ $(11x + 2)(2x + 2) = 144$
$\Rightarrow 22x^2 + 26x - 140 = 0$
$\Rightarrow 11x^2 + 13x - 70 = 0$
$\Rightarrow (x - 2)(11x + 35) = 0$
$\Rightarrow x = 2$.
Hence, required number = $11x + 2 = 24$.

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(9) Find a positive number which when increased by 17 is equal to 60 times the reciprocal of the number.

[A] 3

[B] 10

[C] 17

[D] 20

Answer : [A]

Explanation:
Let the number be x.
Then, $x + 17 = \dfrac{60}{x}$

$\Rightarrow x^2 + 17x - 60 = 0$
$\Rightarrow (x + 20)(x - 3) = 0$
$\Rightarrow x = 3$.

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

[A] 4

[B] 10

[C] 15

[D] 16

Answer : [D]

Explanation:
L.C.M. of 2, 4, 6, 8, 10, 12 is 120.
So, the bells will toll together after every 120 seconds(2 minutes).
In 30 minutes, they will toll together $\frac{30}{2}$ + 1 = 16 times.

(11) The ratio of two numbers is 3 : 4 and their H.C.F. is 4. Their L.C.M. is:

[A] 12

[B] 16

[C] 24

[D] 48

Answer : [D]

Explanation:
Let the numbers be $3x$ and $4x$. Then, their H.C.F. = x. So, $x = 4$.
So, the numbers 12 and 16.
L.C.M. of 12 and 16 = 48.

(12) Which of the following has the most number of divisors?

[A] 99

[B] 101

[C] 176

[D] 182

Answer : [C]

Explanation:
99 = 1 x 3 x 3 x 11
101 = 1 x 101
176 = 1 x 2 x 2 x 2 x 2 x 11
182 = 1 x 2 x 7 x 13
So, divisors of 99 are 1, 3, 9, 11, 33, .99
Divisors of 101 are 1 and 101
Divisors of 176 are 1, 2, 4, 8, 11, 16, 22, 44, 88 and 176
Divisors of 182 are 1, 2, 7, 13, 14, 26, 91 and 182.
Hence, 176 has the most number of divisors.

(13) Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?

[A] 210

[B] 1050

[C] 25200

[D] 21400

[E] None of these

Answer : [C]

Explanation:
Number of ways of selecting (3 consonants out of 7) and (2 vowels out of 4)

= $(^7C_3 \times {}^4C_2)$

= $\left(\frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times \frac{4 \times 3}{2 \times 1} \right)$

= 210.

Number of groups, each having 3 consonants and 2 vowels = 210.

Each group contains 5 letters.

Number of ways of arranging
5 letters among themselves $= 5!$

$\qquad = 5 \times 4 \times 3 \times 2 \times 1$

$\qquad = 120.$

∴ Required number of ways = (210 x 120) = 25200.

(14) In how many ways can the letters of the word 'LEADER' be arranged?

[A] 72

[B] 144

[C] 360

[D] 720

[E] None of these

Answer : [C]

Explanation:
The word 'LEADER' contains 6 letters, namely 1L, 2E, 1A, 1D and 1R.

∴ Required number of ways $= \dfrac{6!}{(1!)(2!)(1!)(1!)(1!)} = 360.$

(15) In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together?

[A] 360

[B] 480

[C] 720

[D] 5040

[E] None of these

Answer : [C]

Explanation:
The word 'LEADING' has 7 different letters.
When the vowels EAI are always together, they can be supposed to form one letter.
Then, we have to arrange the letters LNDG (EAI).
Now, 5 (4 + 1 = 5) letters can be arranged in 5! = 120 ways.
The vowels (EAI) can be arranged among themselves in 3! = 6 ways.
∴ Required number of ways = (120 x 6) = 720.

(16) A box contains 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the box, if at least one black ball is to be included in the draw?

[A] 32

[B] 48

[C] 64

[D] 96

[E] None of these

Answer : [C]

Explanation:
We may have(1 black and 2 non-black) or (2 black and 1 non-black) or (3 black).

∴ Required number of ways $= ({}^3C_1 \times {}^6C_2) + ({}^3C_2 \times {}^6C_1) + ({}^3C_3)$

$\qquad\qquad 6 \times 5 \qquad\quad 3 \times 2$

$$= \left(3 \times \frac{\quad}{2 \times 1}\right) + \left(\frac{\quad}{2 \times 1} \times 6\right) + 1$$

$$= (45 + 18 + 1)$$

$$= 64.$$

(17) How many 4-letter words with or without meaning, can be formed out of the letters of the word, 'LOGARITHMS', if repetition of letters is not allowed?

[A] 40

[B] 400

[C] 5040

[D] 2520

Answer : [C]

Explanation:
'LOGARITHMS' contains 10 different letters.
Required number of words = Number of arrangements of 10 letters, taking 4 at a time.

$$= {}^{10}P_4$$

$$= (10 \times 9 \times 8 \times 7)$$

$$= 5040.$$

(18) The ratio between the perimeter and the breadth of a rectangle is 5 : 1. If the area of the rectangle is 216 sq. cm, what is the length of the rectangle?

[A] 16 cm

[B] 18 cm

[C] 24 cm

[D] Data inadequate

[E] None of these

Answer : [B]

Explanation:
$$\frac{2(l + b)}{b} = \frac{5}{1}$$

$$\Rightarrow 2l + 2b = 5b$$
$$\Rightarrow 3b = 2l$$
$$b = \frac{2}{3}l$$

Then, Area = 216 cm^2
$$\Rightarrow l \times b = 216$$
$$\Rightarrow l \times \frac{2}{3}l = 216$$

$$\Rightarrow l^2 = 324$$
$$\Rightarrow l = 18 \text{ cm}.$$

(19) What is the least number of squares tiles required to pave the floor of a room 15 m 17 cm long and 9 m 2 cm broad?

[A] 814

[B] 820

[C] 840

[D] 844

Answer : [A]

Explanation:
Length of largest tile = H.C.F. of 1517 cm and 902 cm = 41 cm.
Area of each tile = (41 x 41) cm^2.

∴ Required number of tiles = $\left(\dfrac{1517 \times 902}{41 \times 41}\right)$ = 814.

(20) The difference between the length and breadth of a rectangle is 23 m. If its perimeter is 206 m, then its area is:

[A] 1520 m^2

[B] 2420 m^2

[C] 2480 m^2

[D] 2520 m^2

Answer : [D]

Explanation:
We have: $(l - b) = 23$ and $2(l + b) = 206$ or $(l + b) = 103$.
Solving the two equations, we get: $l = 63$ and $b = 40$.

∴ Area = $(l \times b) = (63 \times 40)$ m^2 = 2520 m^2.