Book For

Desert Medicine Research Centre

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DMRC Math Aptitude Sample Paper 2016 PDF Download

(1)

The banker's gain on a certain sum due $1\frac{1}{2}$ years hence is $\frac{3}{25}$ of the banker's **discount. The rate percent is:**

[A]
$5\frac{1}{5}\%$

[B]
$9\frac{1}{11}\%$

[C]
$8\frac{1}{8}\%$

[D]
$6\frac{1}{6}\%$

Answer : [B]

Explanation:
Let, B.D = Re. 1.
Then, B.G. = Re. $\frac{3}{25}$.

$\therefore$ T.D. = (B.D. - B.G.) = Re. $\left(1 - \frac{3}{25}\right)$ = Re. $\frac{22}{25}$.

Sum = $\left(\frac{1 \times (22/25)}{1-(22/25)}\right)$ = Rs. $\frac{22}{3}$.

S.I. on Rs. $\frac{22}{3}$ for $1\frac{1}{2}$ years is Re. 1.

$\therefore$ Rate = $\left(\frac{100 \times 1}{\frac{22}{3} \times \frac{3}{2}}\right)\%$ = $\frac{100}{11}$ = $9\frac{1}{11}\%$.

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

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(3) From a point P on a level ground, the angle of elevation of the top tower is 30?. If the tower is 100 m high, the distance of point P from the foot of the tower is:

[A] 149 m

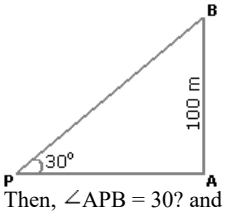
[B] 156 m

[C] 173 m

[D] 200 m

Answer : [C]

Explanation:
Let AB be the tower.



Then, ∠APB = 30? and AB = 100 m.

$\frac{AB}{AP}$ = tan 30? = $\frac{1}{3}$

⇒ AP = (AB x 3) m

= 100 3 m

= (100 x 1.73) m

= 173 m.

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(4) An observer 1.6 m tall is 20 3 away from a tower. The angle of elevation from his eye to the top of the tower is 30?. The heights of the tower is:

[A] 21.6 m

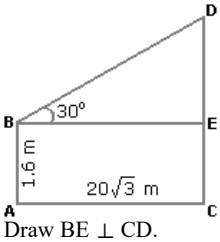
[B] 23.2 m

[C] 24.72 m

[D] None of these

Answer : [A]

Explanation:
Let AB be the observer and CD be the tower.



Draw BE ⊥ CD.
Then, CE = AB = 1.6 m,
BE = AC = 20 3 m.

$\frac{DE}{BE}$ = tan 30? = $\frac{1}{3}$

⇒ DE = $\frac{20\ 3}{3}$m = 20 m.

∴ CD = CE + DE = (1.6 + 20) m = 21.6 m.

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(5) Two ships are sailing in the sea on the two sides of a lighthouse. The angle of elevation of the top of the lighthouse is observed from the ships are 30? and 45? respectively. If the lighthouse is 100 m high, the distance between the two ships is:

[A] 173 m

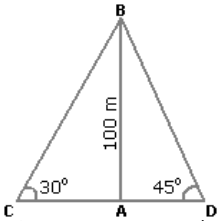
[B] 200 m

[C] 273 m

[D] 300 m

Answer : [C]

Explanation:
Let AB be the lighthouse and C and D be the positions of the ships.



Then, AB = 100 m, ∠ACB = 30? and ∠ADB = 45?.

$\frac{AB}{AC}$ = tan 30? = $\frac{1}{3}$ ⇒ AC = AB x 3 = 100 3 m.

$\frac{AB}{AD}$ = tan 45? = 1 ⇒ AD = AB = 100 m.

∴ CD = (AC + AD) = (100 3 + 100) m

= 100(3 + 1)

= (100 x 2.73) m

= 273 m.

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(6) There is 60% increase in an amount in 6 years at simple interest. What will be the compound interest of Rs. 12,000 after 3 years at the same rate?

[A] Rs. 2160

[B] Rs. 3120

[C] Rs. 3972

[D] Rs. 6240

[E] None of these

Answer : [C]

Explanation:

Let P = Rs. 100. Then, S.I. Rs. 60 and T = 6 years.

∴ R = $\left(\frac{100 \times 60}{100 \times 6}\right)$ = 10% p.a.

Now, P = Rs. 12000. T = 3 years and R = 10% p.a.

∴ C.I. = Rs. $\left[12000 \times \left\{\left(1 + \frac{10}{100}\right)^3 - 1\right\}\right]$

= Rs. $\left(12000 \times \frac{331}{1000}\right)$

= 3972.

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(7) The effective annual rate of interest corresponding to a nominal rate of 6% per annum payable half-yearly is:

[A] 6.06%

[B] 6.07%

[C] 6.08%

[D] 6.09%

Answer : [D]

Explanation:

Amount of Rs. 100 for 1 year when compounded half-yearly = Rs. $\left[100 \times \left(1 + \frac{3}{100}\right)^2\right]$ = Rs. 106.09

∴ Effective rate = (106.09 - 100)% = 6.09%

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(8) If the simple interest on a sum of money for 2 years at 5% per annum is Rs. 50, what is the compound interest on the same at the same rate and for the same time?

[A] Rs. 51.25

[B] Rs. 52

[C] Rs. 54.25

[D] Rs. 60

Answer : [A]

Explanation:

Sum = Rs. $\left(\frac{50 \times 100}{2 \times 5}\right)$ = Rs. 500.

Amount = Rs. $\left[500 \times \left(1 + \frac{5}{100}\right)^2\right]$

= Rs. $\left(500 \times \frac{21}{20} \times \frac{21}{20}\right)$

= Rs. 551.25

$\therefore$ C.I. = Rs. (551.25 - 500) = Rs. 51.25

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(9) The compound interest on a certain sum for 2 years at 10% per annum is Rs. 525. The simple interest on the same sum for double the time at half the rate percent per annum is:

[A] Rs. 400

[B] Rs. 500

[C] Rs. 600

[D] Rs. 800

Answer : [B]

Explanation:

Let the sum be Rs. P.

Then, $\left[P\left(1 + \frac{10}{100}\right)^2 - P\right]$ = 525

$\Rightarrow$ $P\left[\left(\frac{11}{10}\right)^2 - 1\right]$ = 525

$\Rightarrow$ P = $\left(\frac{525 \times 100}{21}\right)$ = 2500.

$\therefore$ Sum = Rs . 2500.

So, S.I. = Rs. $\left(\frac{2500 \times 5 \times 4}{100}\right)$ = Rs. 500

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(10) The difference between compound interest and simple interest on an amount of Rs. 15,000 for 2 years is Rs. 96. What is the rate of interest per annum?

[A] 8

[B] 10

[C] 12

[D] Cannot be determined

[E] None of these

Answer : [A]

Explanation:

$$\left[15000 \times \left(1 + \frac{R}{100}\right)^2 - 15000\right] - \left(\frac{15000 \times R \times 2}{100}\right) = 96$$

$$\Rightarrow 15000 \left[\left(1 + \frac{R}{100}\right)^2 - 1 - \frac{2R}{100}\right] = 96$$

$$\Rightarrow 15000 \left[\frac{(100 + R)^2 - 10000 - (200 \times R)}{10000}\right] = 96$$

$$\Rightarrow R^2 = \left(\frac{96 \times 2}{3}\right) = 64$$

$\Rightarrow$ R = 8.
$\therefore$ Rate = 8%.

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(11) The sum of the squares of three numbers is 138, while the sum of their products taken two at a time is 131. Their sum is:

[A] 20

[B] 30

[C] 40

[D] None of these

Answer : [A]

Explanation:
Let the numbers be a, b and c.
Then, $a^2 + b^2 + c^2 = 138$ and $(ab + bc + ca) = 131$.
$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca) = 138 + 2 \times 131 = 400$.
$\Rightarrow (a + b + c) = \sqrt{400} = 20$.

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(12) A number consists of two digits. If the digits interchange places and the new number is added to the original number, then the resulting number will be divisible by:

[A] 3

[B] 5

[C] 9

[D] 11

Answer : [D]

Explanation:
Let the ten's digit be x and unit's digit be y.
Then, number = $10x + y$.
Number obtained by interchanging the digits = $10y + x$.
$\therefore$ $(10x + y) + (10y + x) = 11(x + y)$, which is divisible by 11.

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(13) 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, $x + 17 = \frac{60}{x}$

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

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(14) The product of two numbers is 9375 and the quotient, when the larger one is divided by the smaller, is 15. The sum of the numbers is:

[A] 380

[B] 395

[C] 400

[D] 425

Answer : [C]

Explanation:
Let the numbers be x and y.
Then, $xy = 9375$ and $\frac{x}{y} = 15$.

$$\frac{xy}{(x/y)} = \frac{9375}{15}$$

$\Rightarrow y^2 = 625.$
$\Rightarrow y = 25.$
$\Rightarrow x = 15y = (15 \times 25) = 375.$
$\therefore$ Sum of the numbers $= x + y = 375 + 25 = 400.$

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(15) What is the sum of two consecutive even numbers, the difference of whose squares is 84?

[A] 34

[B] 38

[C] 42

[D] 46

Answer : [C]

Explanation:
Let the numbers be x and $x + 2$.
Then, $(x + 2)^2 - x^2 = 84$
$\Rightarrow 4x + 4 = 84$
$\Rightarrow 4x = 80$
$\Rightarrow x = 20.$
$\therefore$ The required sum $= x + (x + 2) = 2x + 2 = 42.$

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(16) From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done?

[A] 564

[B] 645

[C] 735

[D] 756

[E] None of these

Answer : [D]

Explanation:
We may have (3 men and 2 women) or (4 men and 1 woman) or (5 men only).
$\therefore$ Required number of ways $= ({}^7C_3 \times {}^6C_2) + ({}^7C_4 \times {}^6C_1) + ({}^7C_5)$

$$= \left(\frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times \frac{6 \times 5}{2 \times 1}\right) + ({}^7C_3 \times {}^6C_1) + ({}^7C_2)$$

$= 525 + \left(\frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times 6\right) + \left(\frac{7 \times 6}{2 \times 1}\right)$

$= (525 + 210 + 21)$

$= 756.$

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(17) In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?

[A] 159

[B] 194

[C] 205

[D] 209

[E] None of these

Answer : [D]

Explanation:
We may have (1 boy and 3 girls) or (2 boys and 2 girls) or (3 boys and 1 girl) or (4 boys).
∴ Required number of ways $= ({}^6C_1 \times {}^4C_3) + ({}^6C_2 \times {}^4C_2) + ({}^6C_3 \times {}^4C_1) + ({}^6C_4)$

$= ({}^6C_1 \times {}^4C_1) + ({}^6C_2 \times {}^4C_2) + ({}^6C_3 \times {}^4C_1) + ({}^6C_2)$

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

$= (24 + 90 + 80 + 15)$

$= 209.$

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(18) How many 3-digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9, which are divisible by 5 and none of the digits is repeated?

[A] 5

[B] 10

[C] 15

[D] 20

Answer : [D]

Explanation:
Since each desired number is divisible by 5, so we must have 5 at the unit place. So, there is 1 way of doing it.
The tens place can now be filled by any of the remaining 5 digits (2, 3, 6, 7, 9). So, there are 5 ways of filling the tens place.
The hundreds place can now be filled by any of the remaining 4 digits. So, there are 4 ways of filling it.
∴ Required number of numbers = (1 x 5 x 4) = 20.

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(19) In how many different ways can the letters of the word 'MATHEMATICS' be arranged so that the vowels always come together?

[A] 10080

[B] 4989600

[C] 120960

[D] None of these

Answer : [C]

Explanation:
In the word 'MATHEMATICS', we treat the vowels AEAI as one letter.

Thus, we have MTHMTCS (AEAI).
Now, we have to arrange 8 letters, out of which M occurs twice, T occurs twice and the rest are different.

$\therefore$ Number of ways of arranging these letters = $\frac{8!}{(2!)(2!)} = 10080$.

Now, AEAI has 4 letters in which A occurs 2 times and the rest are different.

Number of ways of arranging these letters = $\frac{4!}{2!} = 12$.

$\therefore$ Required number of words = (10080 x 12) = 120960.

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(20) In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together?

[A] 120

[B] 720

[C] 4320

[D] 2160

[E] None of these

Answer : [B]

Explanation:
The word 'OPTICAL' contains 7 different letters.
When the vowels OIA are always together, they can be supposed to form one letter.
Then, we have to arrange the letters PTCL (OIA).
Now, 5 letters can be arranged in 5! = 120 ways.
The vowels (OIA) can be arranged among themselves in 3! = 6 ways.
$\therefore$ Required number of ways = (120 x 6) = 720.
