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OPTCL Math Aptitude Sample Paper 2016 PDF Download

(1) The banker's discount on a bill due 4 months hence at 15% is Rs. 420. The true discount is:

[A] Rs. 400

[B] Rs. 360

[C] Rs. 480

[D] Rs. 320

Answer : [A]

Explanation:

$$\text{T.D.} = \frac{\text{B.D.} \times 100}{100 + (\text{R} \times \text{T})}$$

$$= \text{Rs.} \left[\frac{420 \times 100}{100 + \left(15 \times \frac{1}{3}\right)} \right]$$

$$= \text{Rs.} \left(\frac{420 \times 100}{105} \right)$$

$$= \text{Rs. } 400.$$

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(2) The banker's gain on a sum due 3 years hence at 12% per annum is Rs. 270. The banker's discount is:

[A] Rs. 960

[B] Rs. 840

[C] Rs. 1020

[D] Rs. 760

Answer : [C]

Explanation:

$$\text{T.D.} = \left(\frac{\text{B.G.} \times 100}{\text{R} \times \text{T}} \right) = \text{Rs.} \left(\frac{270 \times 100}{12 \times 3} \right) = \text{Rs. } 750.$$

$\therefore$ B.D. = Rs.(750 + 270) = Rs. 1020.

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(3) The present worth of a certain bill due sometime hence is Rs. 800 and the true discount is Rs. 36. The banker's discount is:

[A] Rs. 37

[B] Rs. 37.62

[C] Rs. 34.38

[D] Rs. 38.98

Answer : [B]

Explanation:

$$\text{B.G.} = \frac{(\text{T.D.})^2}{\text{P.W.}} = \text{Rs.} \left(\frac{36 \times 36}{800} \right) = \text{Rs. } 1.62$$

$\therefore$ B.D. = (T.D. + B.G.) = Rs. (36 + 1.62) = Rs. 37.62

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(4) The banker's discount of a certain sum of money is Rs. 72 and the true discount on the same sum for the same time is Rs. 60. The sum due is:

[A] Rs. 360

[B] Rs. 432

[C] Rs. 540

[D] Rs. 1080

Answer : [A]

Explanation:

Sum = $\frac{\text{B.D. x T.D.}}{\text{B.D. - T.D.}}$ = Rs. $\left(\frac{72 \times 60}{72 - 60}\right)$ = Rs. $\left(\frac{72 \times 60}{12}\right)$ = Rs. 360.

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(5) The banker's gain on a bill due 1 year hence at 12% per annum is Rs. 6. The true discount is:

[A] Rs. 72

[B] Rs. 36

[C] Rs. 54

[D] Rs. 50

Answer : [D]

Explanation:

T.D. = $\frac{\text{B.G. x 100}}{\text{R x T}}$ = Rs. $\left(\frac{6 \times 100}{12 \times 1}\right)$ = Rs. 50.

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(6)

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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(7) The present worth of a sum due sometime hence is Rs. 576 and the banker's gain is Rs. 16. The true discount is:

[A] Rs. 36

[B] Rs. 72

[C] Rs. 48

[D] Rs. 96

Answer : [D]

Explanation:
T.D. = P.W. x B.G. = 576 x 16 = 96.

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(8) The true discount on a bill of Rs. 540 is Rs. 90. The banker's discount is:

[A] Rs. 60

[B] Rs. 108

[C] Rs. 110

[D] Rs. 112

Answer : [B]

Explanation:
P.W. = Rs. (540 - 90) = Rs. 450.
∴ S.I. on Rs. 450 = Rs. 90.
S.I. on Rs. 540 = Rs. $\left(\frac{90}{450} \times 540\right)$ = Rs. 108.

∴ B.D. = Rs. 108.

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(9)
If $x = \frac{3+1}{3-1}$ and $y = \frac{3-1}{3+1}$, then the value of $(x^2 + y^2)$ is:

[A] 10

[B] 13

[C] 14

[D] 15

Answer : [C]

Explanation:
$x = \frac{(3+1)}{(3-1)} \times \frac{(3+1)}{(3+1)} = \frac{(3+1)^2}{(3-1)} = \frac{3+1+2\sqrt{3}}{2} = 2 + \sqrt{3}.$

$y = \frac{(3-1)}{(3+1)} \times \frac{(3-1)}{(3-1)} = \frac{(3-1)^2}{(3-1)} = \frac{3+1-2\sqrt{3}}{2} = 2 - \sqrt{3}.$

∴ $x^2 + y^2 = (2 + \sqrt{3})^2 + (2 - \sqrt{3})^2$
$= 2(4 + 3)$
$= 14$

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(10) The square root of $(7 + 3\sqrt{5})(7 - 3\sqrt{5})$ is

[A] $\sqrt{5}$

[B] 2

[C] 4

[D]

$3\sqrt{5}$

Answer : [B]

Explanation:
$(7 + 3\sqrt{5})(7 - 3\sqrt{5}) = (7)^2 - (3\sqrt{5})^2 = 49 - 45 = 4 = 2.$

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(11)

If $\sqrt{5} = 2.236$, then the value of $\frac{\sqrt{5}}{2} - \frac{10}{\sqrt{5}} + \sqrt{125}$ is equal to:

[A] 5.59

[B] 7.826

[C] 8.944

[D] 10.062

Answer : [B]

Explanation:

$\frac{\sqrt{5}}{2} - \frac{10}{\sqrt{5}} + \sqrt{125} = \frac{(\sqrt{5})^2 - 20 + 2\sqrt{5} \times 5\sqrt{5}}{2\sqrt{5}}$

$= \frac{5 - 20 + 50}{2\sqrt{5}}$

$= \frac{35}{2\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{35\sqrt{5}}{10}$

$= \frac{7 \times 2.236}{2}$

$= 7 \times 1.118$

$= 7.826$

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(12)

$\left(3 - \frac{1}{\sqrt{3}}\right)^2$ simplifies to:

[A] $\frac{3}{4}$

[B] $\frac{4}{3}$

[C] $\frac{4}{\sqrt{3}}$

[D] None of these

Answer : [C]

Explanation:

$\left(3 - \frac{1}{\sqrt{3}}\right)^2 = (\sqrt{3})^2 + \left(\frac{1}{\sqrt{3}}\right)^2 - 2 \times \sqrt{3} \times \frac{1}{\sqrt{3}}$

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

$= 1 + \frac{1}{3}$

$= \frac{4}{3}$

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(13) The square root of 64009 is:

[A] 253

[B] 347

[C] 363

[D] 803

Answer : [A]

Explanation:

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   2|6̄4̄0̄0̄9̄( 253     |4     |----------   45|240     |225     |----------  503|  1509     |  1509     |----------     |     X     |--------
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∴ 64009 = 253.

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(14) If $a - b = 3$ and $a^2 + b^2 = 29$, find the value of ab.

[A] 10

[B] 12

[C] 15

[D] 18

Answer : [A]

Explanation:
$2ab = (a^2 + b^2) - (a - b)^2$
$= 29 - 9 = 20$
$\Rightarrow ab = 10$.

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(15) The price of 2 sarees and 4 shirts is Rs. 1600. With the same money one can buy 1 saree and 6 shirts. If one wants to buy 12 shirts, how much shall he have to pay ?

[A] Rs. 1200

[B] Rs. 2400

[C] Rs. 4800

[D] Cannot be determined

[E] None of these

Answer : [B]

Explanation:
Let the price of a saree and a shirt be Rs. x and Rs. y respectively.
Then, $2x + 4y = 1600$ .... (i)
and $x + 6y = 1600$ .... (ii)
Solving (i) and (ii) we get $x = 400$, $y = 200$.
∴ Cost of 12 shirts = Rs. (12 x 200) = Rs. 2400.

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(16) Eight people are planning to share equally the cost of a rental car. If one person withdraws from the arrangement and the others share equally the entire cost of the car, then the share of each of the remaining persons increased by:

[A] $\frac{1}{7}$

[B] $\frac{1}{8}$

[C] $\frac{1}{9}$

[D] $\frac{7}{8}$

Answer : [A]

Explanation:

Original share of 1 person = $\frac{1}{8}$

New share of 1 person = $\frac{1}{7}$

Increase = $\left(\frac{1}{7} - \frac{1}{8}\right) = \frac{1}{56}$

$\therefore$ Required fraction = $\frac{(1/56)}{(1/8)} = \left(\frac{1}{56} \times \frac{8}{1}\right) = \frac{1}{7}$

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(17) To fill a tank, 25 buckets of water is required. How many buckets of water will be required to fill the same tank if the capacity of the bucket is reduced to two-fifth of its present ?

[A] 10

[B] 35

[C] 62.5

[D] Cannot be determined

[E] None of these

Answer : [C]

Explanation:

Let the capacity of 1 bucket = x.
Then, the capacity of tank = $25x$.

New capacity of bucket = $\frac{2}{5}x$

$\therefore$ Required number of buckets = $\frac{25x}{(2x/5)}$

$= \left(\frac{}{25x} \times \frac{5}{2x}\right)$

$= \frac{125}{2}$

$= 62.5$

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(18) One-third of Rahul's savings in National Savings Certificate is equal to one-half of his savings in Public Provident Fund. If he has Rs. 1,50,000 as total savings, how much has he saved in Public Provident Fund ?

[A] Rs. 30,000

[B] Rs. 50,000

[C] Rs. 60,000

[D] Rs. 90,000

Answer : [C]

Explanation:

Let savings in N.S.C and P.P.F. be Rs. x and Rs. (150000 - x) respectively. Then,

$\frac{1}{3}x = \frac{1}{2}(150000 - x)$

$\Rightarrow \frac{x}{3} + \frac{x}{2} = 75000$

$\Rightarrow \frac{5x}{6} = 75000$

$\Rightarrow x = \frac{75000 \times 6}{5} = 90000$

∴ Savings in Public Provident Fund = Rs. (150000 - 90000) = Rs. 60000

(19) In a regular week, there are 5 working days and for each day, the working hours are 8. A man gets Rs. 2.40 per hour for regular work and Rs. 3.20 per hours for overtime. If he earns Rs. 432 in 4 weeks, then how many hours does he work for ?

[A] 160

[B] 175

[C] 180

[D] 195

Answer : [B]

Explanation:
Suppose the man works overtime for x hours.
Now, working hours in 4 weeks = (5 x 8 x 4) = 160.
∴ 160 x 2.40 + x x 3.20 = 432
⇒ 3.20x = 432 - 384 = 48
⇒ x = 15.
Hence, total hours of work = (160 + 15) = 175.

(20) Free notebooks were distributed equally among children of a class. The number of notebooks each child got was one-eighth of the number of children. Had the number of children been half, each child would have got 16 notebooks. Total how many notebooks were distributed ?

[A] 256

[B] 432

[C] 512

[D] 640

[E] None of these

Answer : [C]

Explanation:
Let total number of children be x.
Then, $x \times \frac{1}{8}x = \frac{x}{2} \times 16 \Leftrightarrow x = 64$.

∴ Number of notebooks = $\frac{1}{8}x^2 = \left(\frac{1}{8} \times 64 \times 64\right) = 512$.