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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. $\left(558 \times \frac{2}{3} \times 2 \right)$

= Rs. 744

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

∴ 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.

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

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(2) The banker's discount on Rs. 1600 at 15% per annum is the same as true discount on Rs. 1680 for the same time and at the same rate. The time is:

[A] 3 months

[B] 4 months

[C] 6 months

[D] 8 months

Answer : [B]

Explanation:

S.I. on Rs. 1600 = T.D. on Rs. 1680.

∴ Rs. 1600 is the P.W. of Rs. 1680, *i.e.,* Rs. 80 is on Rs. 1600 at 15%.

∴ Time = $\left(\frac{100 \times 80}{1600 \times 15} \right)_{\text{year}}$ = $\frac{1}{3}$ year = 4 months.

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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:

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

∴ B.D. = (T.D. + B.G.) = Rs. (36 + 1.62) = Rs. 37.62

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(4)

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. $\frac{3}{25}$.

∴ 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.

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

(5) If log 27 = 1.431, then the value of log 9 is:

[A] 0.934

[B] 0.945

[C] 0.954

[D] 0.958

Answer : [C]

Explanation:
log 27 = 1.431
$\Rightarrow$ log (3^3) = 1.431
$\Rightarrow$ 3 log 3 = 1.431
$\Rightarrow$ log 3 = 0.477
∴ log 9 = log(3^2) = 2 log 3 = (2 x 0.477) = 0.954.

(6) Which of the following statements is not correct?

[A] $\log_{10} 10 = 1$

[B] log (2 + 3) = log (2 x 3)

[C] $\log_{10} 1 = 0$

[D] log (1 + 2 + 3) = log 1 + log 2 + log 3

Answer : [B]

Explanation:
(a) Since $\log_a a = 1$, so $\log_{10} 10 = 1$.

(b) log (2 + 3) = log 5 and log (2 x 3) = log 6 = log 2 + log 3
    ∴ log (2 + 3) ≠ log (2 x 3)
(c) Since $\log_a 1 = 0$, so $\log_{10} 1 = 0$.
(d) log (1 + 2 + 3) = log 6 = log (1 x 2 x 3) = log 1 + log 2 + log 3.
So, (b) is incorrect.

(7) If log 2 = 0.3010 and log 3 = 0.4771, the value of $\log_5 512$ is:

[A] 2.870

[B] 2.967

[C] 3.876

[D] 3.912

Answer : [C]

Explanation:

$$\log_5 512 = \frac{\log 512}{\log 5}$$

$$= \frac{\log 2^9}{\log (10/2)}$$

$$= \frac{9 \log 2}{\log 10 - \log 2}$$

$$= \frac{(9 \times 0.3010)}{1 - 0.3010}$$

$$= \frac{2.709}{0.699}$$

$$= \frac{2709}{699}$$

$$= 3.876$$

(8) If $\log_{10} 2 = 0.3010$, then $\log_2 10$ is equal to:

[A]
$$\frac{699}{301}$$

[B]
$$\frac{1000}{301}$$

[C] 0.3010

[D] 0.6990

Answer : [B]

Explanation:

$$\log_2 10 = \frac{1}{\log_{10} 2} = \frac{1}{0.3010} = \frac{10000}{3010} = \frac{1000}{301}.$$

(9) If $a^x = b^y$, then:

[A]
$$\log \frac{a}{b} = \frac{x}{y}$$

[B]
$$\frac{\log a}{\log b} = \frac{x}{y}$$

[C]

$$\frac{\log a}{\log b} = \frac{y}{x}$$

[D] None of these

Answer : [C]

Explanation:

$a^x = b^y$

$\Rightarrow \log a^x = \log b^y$

$\Rightarrow x \log a = y \log b$

$\Rightarrow \frac{\log a}{\log b} = \frac{y}{x}.$

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(10) The value of $\log_2 16$ is:

[A]

$\frac{1}{8}$

[B] 4

[C] 8

[D] 16

Answer : [B]

Explanation:

Let $\log_2 16 = n$.

Then, $2^n = 16 = 2^4 \quad \Rightarrow \quad n = 4$.

$\therefore \log_2 16 = 4$.

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(11) A hollow iron pipe is 21 cm long and its external diameter is 8 cm. If the thickness of the pipe is 1 cm and iron weighs 8 g/cm^3, then the weight of the pipe is:

[A] 3.6 kg

[B] 3.696 kg

[C] 36 kg

[D] 36.9 kg

Answer : [B]

Explanation:

External radius = 4 cm,
Internal radius = 3 cm.

Volume of iron $= \left(\frac{22}{7} \times [(4)^2 - (3)^2] \times 21 \right)_{\text{cm}^3}$

$= \left(\frac{22}{7} \times 7 \times 1 \times 21 \right)_{\text{cm}^3}$

$= 462 \text{ cm}^3$.

$\therefore$ Weight of iron = (462 x 8) gm = 3696 gm = 3.696 kg.

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(12) 66 cubic centimetres of silver is drawn into a wire 1 mm in diameter. The length of the wire in metres will be:

[A] 84

[B] 90

[C] 168

[D] 336

Answer : [A]

Explanation:
Let the length of the wire be h.

Radius = $\frac{1}{2}$mm = $\frac{1}{20}$cm. Then,

$\Rightarrow \frac{22}{7} \times \frac{1}{20} \times \frac{1}{20} \times h = 66.$

$\Rightarrow h = \left(\frac{66 \times 20 \times 20 \times 7}{22}\right) = 8400$ cm = 84 m.

(13) 50 men took a dip in a water tank 40 m long and 20 m broad on a religious day. If the average displacement of water by a man is 4 m³, then the rise in the water level in the tank will be:

[A] 20 cm

[B] 25 cm

[C] 35 cm

[D] 50 cm

Answer : [B]

Explanation:
Total volume of water displaced = (4 x 50) m³ = 200 m³.

$\therefore$ Rise in water level = $\left(\frac{200}{40 \times 20}\right)$m 0.25 m = 25 cm.

(14) A boat having a length 3 m and breadth 2 m is floating on a lake. The boat sinks by 1 cm when a man gets on it. The mass of the man is:

[A] 12 kg

[B] 60 kg

[C] 72 kg

[D] 96 kg

Answer : [B]

Explanation:
Volume of water displaced = (3 x 2 x 0.01) m³

= 0.06 m³.

$\therefore$ Mass of man = Volume of water displaced x Density of water

= (0.06 x 1000) kg

= 60 kg.

(15) A cistern of capacity 8000 litres measures externally 3.3 m by 2.6 m by 1.1 m and its walls are 5 cm thick. The thickness of the bottom is:

[A] 90 cm

[B] 1 dm

[C] 1 m

[D] 1.1 cm

Answer : [B]

Explanation:
Let the thickness of the bottom be x cm.
Then, $[(330 - 10) \times (260 - 10) \times (110 - x)] = 8000 \times 1000$
$\Rightarrow 320 \times 250 \times (110 - x) = 8000 \times 1000$
$\Rightarrow (110 - x) = \dfrac{8000 \times 1000}{320 \times 250} = 100$

$\Rightarrow x = 10$ cm $= 1$ dm.

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(16) The price of 10 chairs is equal to that of 4 tables. The price of 15 chairs and 2 tables together is Rs. 4000. The total price of 12 chairs and 3 tables is:

[A] Rs. 3500

[B] Rs. 3750

[C] Rs. 3840

[D] Rs. 3900

Answer : [D]

Explanation:
Let the cost of a chair and that of a table be Rs. x and Rs. y respectively.
Then, $10x = 4y$ or $y = \dfrac{5}{2}x$.

$\because \ 15x + 2y = 4000$
$\Rightarrow 15x + 2 \times \dfrac{5}{2}x = 4000$

$\Rightarrow 20x = 4000$
$\therefore \ x = 200$.
So, $y = \left(\dfrac{5}{2} \times 200\right) = 500$.

Hence, the cost of 12 chairs and 3 tables $= 12x + 3y$
   $=$ Rs. $(2400 + 1500)$
   $=$ Rs. 3900.

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(17) 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 $x = 400$, $y = 200$.
$\therefore$ Cost of 12 shirts $=$ Rs. $(12 \times 200) =$ Rs. 2400.

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(18) A sum of Rs. 1360 has been divided among A, B and C such that A gets $\dfrac{2}{3}$ of what B gets and B gets $\dfrac{1}{4}$ of what C gets. B's share is:

[A] Rs. 120

[B] Rs. 160

[C] Rs. 240

[D] Rs. 300

Answer : [C]

Explanation:

Let C's share = Rs. x

Then, B's share = Rs. $\dfrac{x}{4}$,   A's share = Rs. $\left(\dfrac{2}{3} \times \dfrac{x}{4}\right)$ = Rs. $\dfrac{x}{6}$

$\therefore \dfrac{x}{6} + \dfrac{x}{4} + x = 1360$

$\Rightarrow \dfrac{17x}{12} = 1360$

$\Rightarrow x = \dfrac{1360 \times 12}{17}$ = Rs. 960

Hence, B's share = Rs. $\left(\dfrac{960}{4}\right)$ = Rs. 240.

(19) David gets on the elevator at the 11th floor of a building and rides up at the rate of 57 floors per minute. At the same time, Albert gets on an elevator at the 51st floor of the same building and rides down at the rate of 63 floors per minute. If they continue travelling at these rates, then at which floor will their paths cross ?

[A] 19

[B] 28

[C] 30

[D] 37

Answer : [C]

Explanation:
Suppose their paths cross after x minutes.
Then, $11 + 57x = 51 - 63x \iff 120x = 40$

$x = \dfrac{1}{3}$

Number of floors covered by David in (1/3) min. = $\left(\dfrac{1}{3} \times 57\right)$ = 19.

So, their paths cross at (11 +19) *i.e.,* 30th floor.

(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, $x \times \dfrac{1}{8} x = \dfrac{x}{2} \times 16 \iff x = 64$.

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