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(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) 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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(4) 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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(5)
The banker's discount on a certain sum due 2 years hence is $\frac{11}{10}$ of the true discount.
The rate percent is:

[A] 11%

[B] 10%

[C] 5%

[D] 5.5%

Answer : [C]

Explanation:
Let T.D. be Re. 1.
Then, B.D. = Rs. $\frac{11}{10}$ = Rs. 1.10.

∴ Sum = Rs. $\left(\frac{1.10 \times 1}{1.10 - 1}\right)$ = Rs. $\left(\frac{110}{10}\right)$ = Rs. 11.

∴ S.I. on Rs. 11 for 2 years is Rs. 1.10
∴ Rate = $\left(\frac{100 \times 1.10}{11 \times 2}\right)_{\%}$ = 5%.

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(6)
If $\log_{10} 7 = a$, then $\log_{10}\left(\frac{1}{70}\right)$ is equal to:

[A] $-(1 + a)$

[B] $(1 + a)^{-1}$

[C] $\frac{a}{10}$

[D] $\frac{1}{10a}$

Answer : [A]

Explanation:
$\log_{10}\left(\frac{1}{70}\right) = \log_{10} 1 - \log_{10} 70$

$= -\log_{10} (7 \times 10)$

$= -(\log_{10} 7 + \log_{10} 10)$

$= -(a + 1)$.

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(7) If $\log_{10} 2 = 0.3010$, the value of $\log_{10} 80$ is:

[A] 1.6020

[B] 1.9030

[C] 3.9030

[D] None of these

Answer : [B]

Explanation:

$\log_{10} 80 = \log_{10} (8 \times 10)$

$= \log_{10} 8 + \log_{10} 10$

$= \log_{10} (2^3) + 1$

$= 3 \log_{10} 2 + 1$

$= (3 \times 0.3010) + 1$

$= 1.9030$.

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(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:

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

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(9)

The value of $\left(\frac{1}{\log_3 60} + \frac{1}{\log_4 60} + \frac{1}{\log_5 60}\right)$ is:

[A] 0

[B] 1

[C] 5

[D] 60

Answer : [B]

Explanation:

Given expression $= \log_{60} 3 + \log_{60} 4 + \log_{60} 5$

$= \log_{60} (3 \times 4 \times 5)$

$= \log_{60} 60$

$= 1.$

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(10) If $\log_{10} 5 + \log_{10} (5x + 1) = \log_{10} (x + 5) + 1$, then x is equal to:

[A] 1

[B] 3

[C] 5

[D] 10

Answer : [B]

Explanation:
$\log_{10} 5 + \log_{10} (5x + 1) = \log_{10} (x + 5) + 1$
$\Rightarrow \log_{10} 5 + \log_{10} (5x + 1) = \log_{10} (x + 5) + \log_{10} 10$
$\Rightarrow \log_{10} [5 (5x + 1)] = \log_{10} [10(x + 5)]$
$\Rightarrow 5(5x + 1) = 10(x + 5)$
$\Rightarrow 5x + 1 = 2x + 10$
$\Rightarrow 3x = 9$
$\Rightarrow x = 3.$

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(11) How many times in a day, are the hands of a clock in straight line but opposite in direction?

[A] 20

[B] 22

[C] 24

[D] 48

Answer : [B]

Explanation:
The hands of a clock point in opposite directions (in the same straight line) 11 times in every 12 hours. (Because between 5 and 7 they point in opposite directions at 6 o'clcok only).
So, in a day, the hands point in the opposite directions 22 times.

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(12) The angle between the minute hand and the hour hand of a clock when the time is 8.30, is:

[A] 80?

[B] 75?

[C] 60?

[D] 105?

Answer : [B]

Explanation:
Angle traced by hour hand in $\frac{17}{2}$ hrs $= \left(\frac{360}{12} \times \frac{17}{2}\right)^? = 255.$

Angle traced by min. hand in 30 min. $= \left(\frac{360}{60} \times 30\right)^? = 180.$

$\therefore$ Required angle = (255 - 180)? = 75?.

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(13) At what time, in minutes, between 3 o'clock and 4 o'clock, both the needles will coincide each other?

[A]
$5\frac{1}{11}''$

[B]
$12\frac{4}{11}''$

[C]
$13\frac{4}{11}''$

[D]
$16\frac{4}{11}''$

Answer : [D]

Explanation:
At 3 o'clock, the minute hand is 15 min. spaces apart from the hour hand.
To be coincident, it must gain 15 min. spaces.
55 min. are gained in 60 min.
15 min. are gained in $\left(\frac{60}{55} \times 15\right)_{\text{min}} = 16\frac{4}{11}$ min.

$\therefore$ The hands are coincident at $16\frac{4}{11}$ min. past 3.

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(14) How many times do the hands of a clock coincide in a day?

[A] 20

[B] 21

[C] 22

[D] 24

Answer : [C]

Explanation:
The hands of a clock coincide 11 times in every 12 hours (Since between 11 and 1, they coincide only once, *i.e.,* at 12 o'clock).
AM
12:00
1:05
2:11
3:16
4:22
5:27
6:33
7:38
8:44
9:49
10:55

PM
12:00
1:05
2:11
3:16
4:22
5:27
6:33
7:38
8:44
9:49
10:55

The hands overlap about every 65 minutes, not every 60 minutes.
$\therefore$ The hands coincide 22 times in a day.

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(15) How many times in a day, the hands of a clock are straight?

[A] 22

[B] 24

[C] 44

[D] 48

Answer : [C]

Explanation:
In 12 hours, the hands coincide or are in opposite direction 22 times.
∴ In 24 hours, the hands coincide or are in opposite direction 44 times a day.

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(16) On what dates of April, 2001 did Wednesday fall?

[A] 1^{st}, 8^{th}, 15^{th}, 22^{nd}, 29^{th}

[B] 2^{nd}, 9^{th}, 16^{th}, 23^{rd}, 30^{th}

[C] 3^{rd}, 10^{th}, 17^{th}, 24^{th}

[D] 4^{th}, 11^{th}, 18^{th}, 25^{th}

Answer : [D]

Explanation: We shall find the day on 1^{st} April, 2001.
1^{st} April, 2001 = (2000 years + Period from 1.1.2001 to 1.4.2001)
Odd days in 1600 years = 0
Odd days in 400 years = 0
Jan. Feb. March April
(31 + 28 + 31 + 1) = 91 days ≡ 0 odd days.
Total number of odd days = (0 + 0 + 0) = 0
On 1^{st} April, 2001 it was Sunday.
In April, 2001 Wednesday falls on 4^{th}, 11^{th}, 18^{th} and 25^{th}.

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(17) How many days are there in *x* weeks *x* days?

[A] $7x^2$

[B] $8x$

[C] $14x$

[D] 7

Answer : [B]

Explanation:
x weeks x days = $(7x + x)$ days = $8x$ days.

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(18) The last day of a century cannot be

[A] Monday

[B] Wednesday

[C] Tuesday

[D] Friday

Answer : [C]

Explanation:
100 years contain 5 odd days.
∴ Last day of 1^{st} century is Friday.
200 years contain (5 x 2) ≡ 3 odd days.
∴ Last day of 2^{nd} century is Wednesday.
300 years contain (5 x 3) = 15 ≡ 1 odd day.
∴ Last day of 3^{rd} century is Monday.

400 years contain 0 odd day.
∴ Last day of 4^{th} century is Sunday.
This cycle is repeated.
∴ Last day of a century cannot be Tuesday or Thursday or Saturday.

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(19) If 6^{th} March, 2005 is Monday, what was the day of the week on 6^{th} March, 2004?

[A] Sunday

[B] Saturday

[C] Tuesday

[D] Wednesday

Answer : [A]

Explanation:
The year 2004 is a leap year. So, it has 2 odd days.
But, Feb 2004 not included because we are calculating from March 2004 to March 2005. So it has 1 odd day only.
∴ The day on 6^{th} March, 2005 will be 1 day beyond the day on 6^{th} March, 2004.
Given that, 6^{th} March, 2005 is Monday.
∴ 6^{th} March, 2004 is Sunday (1 day before to 6^{th} March, 2005).

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(20) On 8^{th} Feb, 2005 it was Tuesday. What was the day of the week on 8^{th} Feb, 2004?

[A] Tuesday

[B] Monday

[C] Sunday

[D] Wednesday

Answer : [C]

Explanation:
The year 2004 is a leap year. It has 2 odd days.
∴ The day on 8^{th} Feb, 2004 is 2 days before the day on 8^{th} Feb, 2005.
Hence, this day is Sunday.

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