Book For

Public Works Department (PWD)

Government of Maharashtra, India
Public Works Department

PWD Math Aptitude Sample Paper 2016 PDF Download

(1)

If $\log \frac{a}{b} + \log \frac{b}{a} = \log (a + b)$, then:

[A] $a + b = 1$

[B] $a - b = 1$

[C] $a = b$

[D] $a^2 - b^2 = 1$

Answer : [A]

Explanation:

$\log \frac{a}{b} + \log \frac{b}{a} = \log (a + b)$

$\Rightarrow \log (a + b) = \log\left(\frac{a}{b} \times \frac{b}{a}\right) = \log 1.$

So, $a + b = 1$.

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(2)

$\frac{\log 8}{\log 8}$ is equal to:

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

[B] $\frac{1}{4}$

[C] $\frac{1}{2}$

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

Answer : [C]

Explanation:

$\frac{\log 8}{\log 8} = \frac{\log (8)^{1/2}}{\log 8} = \frac{\frac{1}{2}\log 8}{\log 8} = \frac{1}{2}.$

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(3) 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

$\Rightarrow \log (3^3) = 1.431$

$\Rightarrow 3 \log 3 = 1.431$

$\Rightarrow \log 3 = 0.477$

$\therefore \log 9 = \log(3^2) = 2 \log 3 = (2 \times 0.477) = 0.954.$

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

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

[B] $\log (2 + 3) = \log (2 \times 3)$

[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 $\log (2 \times 3) = \log 6 = \log 2 + \log 3$
$\therefore \log (2 + 3) \neq \log (2 \times 3)$
(c) Since $\log_a 1 = 0$, so $\log_{10} 1 = 0$.
(d) $\log (1 + 2 + 3) = \log 6 = \log (1 \times 2 \times 3) = \log 1 + \log 2 + \log 3$.
So, (b) is incorrect.

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(5) 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:

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

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

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

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

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

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

$$= 3.876$$

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(6) What percentage of numbers from 1 to 70 have 1 or 9 in the unit's digit?

[A] 1

[B] 14

[C] 20

[D] 21

Answer : [C]

Explanation:
Clearly, the numbers which have 1 or 9 in the unit's digit, have squares that end in the digit 1. Such numbers from 1 to 70 are 1, 9, 11, 19, 21, 29, 31, 39, 41, 49, 51, 59, 61, 69.
Number of such number =14

$$\therefore \text{ Required percentage } = \left(\frac{14}{70} \times 100\right)\% = 20\%.$$

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(7) If A = x% of y and B = y% of x, then which of the following is true?

[A] A is smaller than B.

[B] A is greater than B

[C] Relationship between A and B cannot be determined.

[D] If x is smaller than y, then A is greater than B.

[E] None of these

Answer : [E]

Explanation:

$x\%$ of $y = \left(\frac{x}{100} \times y\right) = \left(\frac{y}{100} \times x\right) = y\%$ of x

$\therefore$ A = B.

(8) A batsman scored 110 runs which included 3 boundaries and 8 sixes. What percent of his total score did he make by running between the wickets?

[A] 45%

[B] $45\frac{5}{11}\%$

[C] $54\frac{6}{11}\%$

[D] 55%

Answer : [B]

Explanation:
Number of runs made by running = 110 - (3 x 4 + 8 x 6)
= 110 - (60)
= 50.

$\therefore$ Required percentage $= \left(\frac{50}{110} \times 100\right)\% = 45\frac{5}{11}\%$

(9) Two students appeared at an examination. One of them secured 9 marks more than the other and his marks was 56% of the sum of their marks. The marks obtained by them are:

[A] 39, 30

[B] 41, 32

[C] 42, 33

[D] 43, 34

Answer : [C]

Explanation:
Let their marks be $(x + 9)$ and x.

Then, $x + 9 = \frac{56}{100}(x + 9 + x)$

$\Rightarrow 25(x + 9) = 14(2x + 9)$
$\Rightarrow 3x = 99$
$\Rightarrow x = 33$
So, their marks are 42 and 33.

(10) A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, he had:

[A] 588 apples

[B] 600 apples

[C] 672 apples

[D] 700 apples

Answer : [D]

Explanation:
Suppose originally he had x apples.
Then, (100 - 40)% of x = 420.
$\Rightarrow \frac{60}{100} \times x = 420$

$\Rightarrow x = \left(\frac{420 \times 100}{60}\right) = 700.$

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(11) 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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(12) 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 = $(2x + x) - (2x - x) = 2x = 8$.

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(13) 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, $(10x + y) - (10y + x) = 36$
$\Rightarrow 9(x - y) = 36$
$\Rightarrow x - y = 4$.

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(14) 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 $\frac{8}{x}$ respectively.

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

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

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(15) 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 $x = 15 \Leftrightarrow x = 15 \times 12 = 180$.

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

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(16) An error 2% in excess is made while measuring the side of a square. The percentage of error in the calculated area of the square is:

[A] 2%

[B] 2.02%

[C] 4%

[D] 4.04%

Answer : [D]

Explanation:
100 cm is read as 102 cm.
$\therefore$ $A_1 = (100 \times 100)$ cm^2 and A_2 (102×102) cm^2.
$(A_2 - A_1) = [(102)^2 - (100)^2]$
$= (102 + 100) \times (102 - 100)$
$= 404$ cm^2.

$\therefore$ Percentage error = $\left(\frac{404}{100 \times 100} \times 100\right)_{\%} = 4.04\%$

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(17) The percentage increase in the area of a rectangle, if each of its sides is increased by 20% is:

[A] 40%

[B] 42%

[C] 44%

[D] 46%

Answer : [C]

Explanation:
Let original length = x metres and original breadth = y metres.
Original area = (xy) m^2.
New length = $\left(\frac{120}{100}x\right)_m = \left(\frac{6}{5}x\right)_m$.

New breadth = $\left(\frac{120}{100}y\right)_m = \left(\frac{6}{5}y\right)_m$.

New Area = $\left(\frac{6}{5}x \times \frac{6}{5}y\right)_{m^2} = \left(\frac{36}{25}xy\right)_{m^2}$.

The difference between the original area = xy and new-area 36/25 xy is
= (36/25)xy - xy
= xy(36/25 - 1)
= xy(11/25) or (11/25)xy
$\therefore$ Increase % = $\left(\frac{11}{25}xy \times \frac{1}{xy} \times 100\right)_{\%} = 44\%$.

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(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
$\Rightarrow l \times b = 216$
$\Rightarrow l \times \frac{2}{3}l = 216$

$\Rightarrow l^2 = 324$
$\Rightarrow l = 18$ cm.

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(19) A rectangular park 60 m long and 40 m wide has two concrete crossroads running in the middle of the park and rest of the park has been used as a lawn. If the area of the lawn is 2109 sq. m, then what is the width of the road?

[A] 2.91 m

[B] 3 m

[C] 5.82 m

[D] None of these

Answer : [B]

Explanation:
Area of the park = (60 x 40) m^2 = 2400 m^2.
Area of the lawn = 2109 m^2.
$\therefore$ Area of the crossroads = (2400 - 2109) m^2 = 291 m^2.
Let the width of the road be x metres. Then,
$60x + 40x - x^2 = 291$
$\Rightarrow x^2 - 100x + 291 = 0$
$\Rightarrow (x - 97)(x - 3) = 0$
$\Rightarrow x = 3$.

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(20) The ratio between the length and the breadth of a rectangular park is 3 : 2. If a man cycling along the boundary of the park at the speed of 12 km/hr completes one round in 8 minutes, then the area of the park (in sq. m) is:

[A] 15360

[B] 153600

[C] 30720

[D] 307200

Answer : [B]

Explanation:
Perimeter = Distance covered in 8 min. = $\left(\frac{12000}{60} \times 8\right)$ m = 1600 m.

Let length = $3x$ metres and breadth = $2x$ metres.
Then, $2(3x + 2x) = 1600$ or $x = 160$.
$\therefore$ Length = 480 m and Breadth = 320 m.
$\therefore$ Area = (480 x 320) m^2 = 153600 m^2.
