SSC CGL Tier-2-17-February-2018 Maths

Instructions
For the following questions answer them individually

Question 1

What is the unit digit of the sum of first 111 whole numbers?

A 4

B 6

C 5

D 0

Answer: C

Explanation:
Sum of first 11 whole numbers is 0+1+2...110
i.e n(n+1)/2 =110*111/2
=55*111
Therefore units digit is 5

Question 2

How many 100 digit positive number are there?

A 9×10^{99}

B 9×10^{100}

C 10100

D 11×10^{98}

Answer: A

Explanation:
The given number has 100 digits
first digit can be any number other than 0 and so it has 9 values from 1 to 9
All the other 99 digits can be from 0 to 9 i.e 10 values
therefore 9*10*10....99 times
$=9 * 10^{99}$

Question 3

What is the value of $\frac{5.6\times0.36+0.42\times3.2}{0.8\times2.1}$ **?**

A 2

B 1

C 3

D $\frac{3}{2}$

Answer: A

Explanation:

$$= \frac{5.6\times0.36+0.42\times3.2}{0.8\times2.1}$$

$$= \frac{2.016+1.3444}{1.68}$$

$$= \frac{3.36}{1.68}$$

=2

Question 4

What is the value of $\frac{(1.2)^3+(0.8)^3+(0.7)^3-2.016}{1.35[(1.2)^2+(0.8)^2+(0.7)^2-0.96-0.84-0.56]}$ **?**

A $\frac{1}{4}$

B $\frac{1}{2}$

C 1

D 2

Answer: D

Explanation:

$x^3+y^3+z^3-3xyz=(x+y+z)(x^2+y^2+z^2-xy-yz-zx)$

x=1.2 y=0.8 z=0.7

$$\frac{(1.2)^3+(0.8)^3+(0.7)^3-2.016}{1.35[(1.2)^2+(0.8)^2+(0.7)^2-0.96-0.84-0.56]}$$

$$= \frac{((2.7)((1.2)^2+(0.8)^2+(0.7)^2-0.96-0.84-0.56)}{1.35[(1.2)^2+(0.8)^2+(0.7)^2-0.96-0.84-0.56]}$$

=2.7/1.35

=2

Question 5

What is the unit digit of $(217)^{413}\times(819)^{547}\times(414)^{624}\times(342)^{812}$**?**

A 2

B 4

C 6

D 8

Answer: D

Explanation:

Power series of 7 i.e units digit 7 power expansion has 7,9,3 and 1 and it is raised to power 413 i.e 413/4 remainder 1 and so last digit is 7

Power series of 9 i.e units digit 9 power expansion has 9 and 1 and it is raised to power 547 i.e 547/2 remainder 1 and so last digit is 9

Power series of 4 i.e units digit 4 power expansion has 4 and 6 and it is raised to power 624 i.e 624/2 remainder 0 and so last digit is 6

Power series of 2 i.e units digit 2 power expansion has 2,4,8 and 6 and it is raised to power 812 i.e 812/4 remainder 0 and so last digit is 6

All the last digits product=7*9*6*6

=8

Question 6

What is the value of $S = \frac{1}{1\times3\times5} + \frac{1}{1\times4} + \frac{1}{3\times5\times7} + \frac{1}{4\times7} + \frac{1}{5\times7\times9} + \frac{1}{7\times10} +$ **.....upto 20 terms, then what is the value of S?**

A $\frac{6179}{15275}$

B $\frac{6070}{14973}$

C $\frac{7191}{15174}$

D $\frac{5183}{16423}$

Answer: B

Explanation:

This series consists of two different series one having 2 numbers as product in denominator and the other has three numbers as product in the denominator

lat terms in each series is $\frac{1}{19\times21\times23}$ and $\frac{1}{28\times31}$

$\frac{1}{1\times3\times5} + \frac{1}{1\times4} + \frac{1}{3\times5\times7} + \frac{1}{4\times7} + \frac{1}{5\times7\times9} + \frac{1}{7\times10} +$ .....upto 20 terms

$= \frac{1}{1\times3\times5} + \frac{1}{3\times5\times7} + \ldots \frac{1}{1\times4} + \frac{1}{4\times7} + ..$

$= \frac{1}{4}\left(\frac{1}{1\times3} - \frac{1}{3\times5} + \frac{1}{5\times7} + \frac{1}{7\times9} \ldots - \frac{1}{21\times23} + \frac{1}{1\times3}\left(\frac{1}{1} - \frac{1}{4} + \frac{1}{4} - \frac{1}{7} \ldots . - \frac{1}{31}\right)\right.$

$= \frac{1}{4}\left(\frac{1}{1\times3} - \frac{1}{21\times23}\right) + \frac{1}{1\times3}\left(\frac{1}{1} - \frac{1}{31}\right)$

$= \frac{40}{483} + \frac{10}{31}$

$= \frac{6070}{14973}$

Question 7

Which of the following is TRUE?

$I. \frac{1}{\sqrt[3]{12}} > \frac{1}{\sqrt[4]{29}} > \frac{1}{\sqrt{5}}$

$II. \frac{1}{\sqrt[4]{29}} > \frac{1}{\sqrt[3]{12}} > \frac{1}{\sqrt{5}}$

$III. \frac{1}{\sqrt{5}} > \frac{1}{\sqrt[3]{12}} > \frac{1}{\sqrt[4]{29}}$

$IV. \frac{1}{\sqrt{5}} > \frac{1}{\sqrt[4]{29}} > \frac{1}{\sqrt[3]{12}}$

A only I

B only II

C only III

D only IV

Answer: C

Explanation:

$\frac{1}{\sqrt[3]{12}}, \frac{1}{\sqrt[4]{29}}, \frac{1}{\sqrt{5}}$

Here if we write $\frac{1}{\sqrt{5}}$ in terms of fourth root we have $\frac{1}{\sqrt[4]{25}}$

So $\frac{1}{\sqrt[4]{29}} > \frac{1}{\sqrt[4]{5}}$

$\sqrt[3]{12} = \sqrt[12]{144 * 144}$

$\frac{1}{\sqrt[4]{29}} = \frac{1}{\sqrt[12]{29*29*29}}$

Therefore $\sqrt[4]{29} > \sqrt[3]{12}$
As these are given in the denominators order will be reversed.
$\frac{1}{\sqrt{5}} > \frac{1}{\sqrt[3]{12}} > \frac{1}{\sqrt[4]{29}}$

Question 8

N is the largest two digit number, which when divided by 3, 4 and 6 leaves the remainder 1, 2 and 4 respectively. What is the remainder when N is divided by 5?

A 4

B 2

C 0

D 1

Answer: A

Explanation:
Given remainders are 1,2 and 4 for 3,4 and 6 respectively so in each case negative remainder is 1-3,2-4,4-6
i.e -2,-2 and -2
So in each case it has same negative remainder so the number should be in the form of LCM(3,4,6)-2
i.e 12k-6
As given largest 2 digit number we have for k=8 ,12*8-2=96-2=94
When 94 is divided by 5 remainder is 4

Question 9

Which of the following is TRUE?
$I. \sqrt[3]{11} > \sqrt{7} > \sqrt[4]{45}$

$II. \sqrt{7} > \sqrt[3]{11} > \sqrt[4]{45}$

$III. \sqrt{7} > \sqrt[4]{45} > \sqrt[3]{11}$

$IV. \sqrt[4]{45} > \sqrt{7} > \sqrt[3]{11}$

A only I

B only II

C only III

D only IV

Answer: C

Explanation:
$\sqrt[3]{11}, \sqrt{7}, \sqrt[4]{45}$
Here $\sqrt{7} = \sqrt[4]{49}$
$sqrt[4]45 < \sqrt[4]{49}$
Now $sqrt[4]45 >$\sqrt[3]{11} since 3rd power of 45 will be greater than 4th power of 11 i.e 14631

an so $\sqrt{7} > \sqrt[4]{45} > \sqrt[3]{11}$

Question 10

A and B are positive integers. If $A + B + AB = 65$, then what is the difference between A and $B(A, B \leq 15)$?

A 3

B 4

C 5

D 6

Answer: C

Explanation:
$A + B + AB = 65$
$A(1 + B) + B = 65$
$A = (65 - B)/(1 + B)$
As A and B < 15
let B=10 then A=55/11
=5
Therefore A=5 and B=10 will satisfy and difference =10-5=5

Question 11

What is the value of $14^3 + 16^3 + 18^3 + ... + 30^3$?

A 134576

B 120212

C 115624

D 111672

Answer: D

Explanation:
$14^3 + 16^3 + 18^3 + ... + 30^3$
=8($7^3 + 8^3 + 9^3 + ... + 15^3$)
Sum of n cubes =$(n(n + 1)/2)^2$
for n=6 we have 21^2=441
for n=15 we have 120^2=14400
Difference=14400-441
=13959
Therefore 8*13959=111672

Question 12

What is the value of $\sqrt{4600 + \sqrt{540 + \sqrt{1280 + \sqrt{250 + \sqrt{36}}}}}$?

A 69

B 68

C 70

D 72

Answer: B

Explanation:

$\sqrt{4600+\sqrt{540+\sqrt{1280+\sqrt{250+\sqrt{36}}}}}$

$=\sqrt{4600+\sqrt{540+\sqrt{1280+\sqrt{256}}}}$

$=\sqrt{4600+\sqrt{540+\sqrt{1296}}}$

$=\sqrt{4600+\sqrt{576}}$

$=\sqrt{4624}$

=68

Question 13

If $x+y+z=0$, then what is the value of $\frac{(3y^2+x^2+z^2)}{(2y^2-xz)}$?

A 2

B 1

C $\frac{3}{2}$

D $\frac{5}{3}$

Answer: A

Explanation:

Solution 1:

As the answer is independent of variables and so we can assume values for x,y and z an solve

let x=1,y=-1,z=0 therefore x+y+z=1-1+0=0

$\frac{(3y^2+x^2+z^2)}{(2y^2-xz)}$

$= \frac{(3(-1)^2+1^2+0^2)}{(2(-1)^2-1*(0))}$

$=\frac{4}{2}$

=2

Solution 2: $\frac{(3y^2+x^2+z^2)}{(2y^2-xz)}$ =k

$(3y^2+x^2+z^2)=k(2y^2-xz)$

$x^2+z^2+kxz=2ky^2-3y^2$

We know x+y+z=0

we can see that for k=2

we get $(x+z)^2=y^2$

x+z+y=0

Therefore value of k=2

Question 14

If $P=7+4\sqrt{3}$ and $PQ=1$, then what is the value of $\frac{1}{P^2}+\frac{1}{Q^2}$?

A 196

B 194

C 206

D 182

Answer: B

Explanation:
$P = 7 + 4\sqrt{3}$
PQ=1
Q=1/($7 + 4\sqrt{3}$)
Rationalizing the denominator i.e multiplying both numerator and denominator with $7 - 4\sqrt{3}$
Q= $7 - 4\sqrt{3}$
$\frac{1}{P^2} + \frac{1}{Q^2}$

$= \frac{P^2+Q^2}{P^2Q^2}$

$= \frac{(P+Q)^2-2PQ}{P^2Q^2}$

P+Q=$7 + 4\sqrt{3} + 7 - 4\sqrt{3}$
P+Q=14
PQ=1
Therefore =(196-2)/1
=194

Question 15

If $a^3 + 3a^2 + 9a = 1$**, then what is the value of** $a^3 + \binom{3}{a}$?

A 31

B 26

C 28

D 24

Answer: C

Explanation:
$a^3 + 3a^2 + 9a = 1$
$a(a^2 + 3a + 9) = 1$
$a^2 + 3a + 9 = 1/a$
$(a^3 - b^3)$=$(a - b)(a^2 + ab + b^2)$
for b=3
we have $(a^3 - 3^3)$=$(a - 3)(a^2 + 3a + 9)$
$(a^3 - 27)$=$(a - 3)(1/a)$
$a^3 + (3/a) = 1 + 27$
$a^3 + (3/a) = 28$

Question 16

x, y **and** z **are real numbers. If** $x^3 + y^3 + z^3 = 13, x + y + z = 1$ **and** $xyz = 1$**, then what is the value of** $xy + yz + zx$?

A -1

B 1

C 3

D -3

Answer: D

Explanation:
$x^3+y^3+z^3-3xyz$=$(x+y+z)(x^2+y^2+z^2-xy-yz-zx)$
$x^3+y^3+z^3-3xyz$=$(x+y+z)((x+y+z)^2-3(xy+yz+zx)$
13-3(1)=(1)(1-3((xy+yz+zx)))
10=1-3(xy+yz+zx)
(xy+yz+zx)=-3

Question 17

If $\binom{(a+b)}{c}=\frac{6}{5}$ **and** $\binom{(b+c)}{a}=\frac{9}{2}$**, then what is the value of** $\binom{(a+c)}{b}$ **?**

A $\frac{9}{5}$

B $\frac{11}{7}$

C $\frac{7}{11}$

D $\frac{7}{4}$

Answer: D

Explanation:
$\binom{(a+b)}{c}=\frac{6}{5}$
5a+5b=6c
$\binom{(b+c)}{a}=\frac{9}{2}$
2b+2c=9a
9a-2b=2c
27a-6b=6c
5a+5b=6c
27a-6b=5a+5b
22a=11b
b=2a
4a+2c=9a
2c=5a
c=(5/2)a
$\binom{(a+c)}{b}$
=((a+(5/2)a))/2a
=7a/4a
=7/4

Question 18

If $x^3+y^3+z^3=3(1+xyz), P=y+z-x, Q=z+x-y$ **and** $R=x+y-z$**, then what is the value of** $P^3+Q^3+R^3-3PQR$?

A 9

B 8

C 12

D 6

Answer: C

Question 19

If $x_1x_2x_3 = 4(4 + x_1 + x_2 + x_3)$, then what is the value of $\left[\frac{1}{(2+x_1)}\right] + \left[\frac{1}{(2+x_2)}\right] + \left[\frac{1}{(2+x_3)}\right]$?

A 1

B $\frac{1}{2}$

C 2

D $\frac{1}{3}$

Answer: B

Explanation:
$x_1x_2x_3 = 4(4 + x_1 + x_2 + x_3),$
From clear observation we can say that $x_1 = 4, x_2 = 4, x_3 = 4$ will satisfy the equation
i.e 4*4*4=4(4+12)
64=64
Therefore $\left[\frac{1}{(2+x_1)}\right] + \left[\frac{1}{(2+x_2)}\right] + \left[\frac{1}{(2+x_3)}\right]$=3(1/6)
=1/2

Question 20

If α and β are the roots of equation $x^2 - x + 1 = 0$, then which equation will have roots α^3 and β^3?

A $x^2 + 2x + 1 = 0$

B $x^2 - 2x - 1 = 0$

C $x^2 + 3x - 1 = 0$

D $x^2 - 3x + 1 = 0$

Answer: A

Explanation:
$x^2 - x + 1$= 0
$\alpha\beta$=1
$\alpha + \beta$=1
cubing on both sides
$\alpha^3 + \beta^3 + 3\alpha\beta(\alpha + \beta)$=1
$\alpha^3 + \beta^3 + 3 * 1(1)$=1
$\alpha^3 + \beta^3$=-2
$\alpha^3\beta^3$=1
Sum of the roots=-2
product=1
Required equation is $x^2 + 2x + 1 = 0$

Question 21

If $3x + 5y + 7z = 49$ and $9x + 8y + 21z = 126$, then what is the value of y?

A 4

B 2

C 3

D 5

Answer: C

Explanation:
$3x + 5y + 7z = 49$
multiplying with 3 on both sides
$9x + 15y + 21z = 147$
$9x + 8y + 21z = 126$
Subtracting we get
7y=21
y=3

Question 22

Cost of 4 pens, 6 note books and 9 files is Rs 305. Cost of 3 pens, 4 notebooks and 2 files is Rs 145. What is the cost (in Rs) of 5 pens, 8 notebooks and 16 files?

A 415

B 465

C 440

D Cannot be determined

Answer: B

Explanation:
let the cost of pen be 'p',note book be 'n' and of file be 'f'
given 4p+6n+9f=305
8p+12n+18f=610
3p+4n+2f=145
Subtracting we get
5p+8n+16f=465

Question 23

ABC is a right angled triangle. $\angle BAC = 90°$ and $\angle ACB = 60°$. What is the ratio of the circum radius of the triangle to the side AB?

A 1 : 2

B $1 : \sqrt{3}$

C $2 : \sqrt{3}$

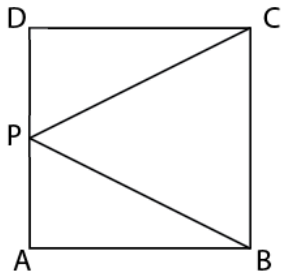
D 2 : 3

Answer: B

Explanation:
In a right angled triangle circum radius is half of the hypotenuse
AC/2 =R
AC=2R
Also Sin 60=AB/AC
$\sqrt{3}/2$=AB/AC
$\sqrt{3}/2$=AB/2R
R/AB=1:$\sqrt{3}$

Question 24

In the given figure, $ABCD$ is a square whose side is 4 cm. P is a point on the side AD. What is the minimum value (in cm) of $BP + CP$?



A $4\sqrt{5}$

B $4\sqrt{4}$

C $6\sqrt{3}$

D $4\sqrt{6}$

Answer: A

Explanation:
In this case if P is the midpoint then we will have the distance BP+CP as minimum since in every other position it will be more than as the distance increases when we go either way of AD
Given CD=4 cm
DP=2 cm
CP=$\sqrt{16+4}$
=$\sqrt{20}$
=2$\sqrt{5}$
BP=2$\sqrt{5}$
CP+BP=4$\sqrt{5}$

Question 25

Triangle ABC is similar to triangle PQR and $AB : PQ = 2 : 3$. AD is the median to the side BC in triangle ABC and PS is the median to the side QR in triangle PQR. What is the value of $(\frac{BD}{QS})^2$?

A $\frac{3}{5}$

B $\frac{4}{9}$

C $\frac{2}{3}$

D $\frac{4}{7}$

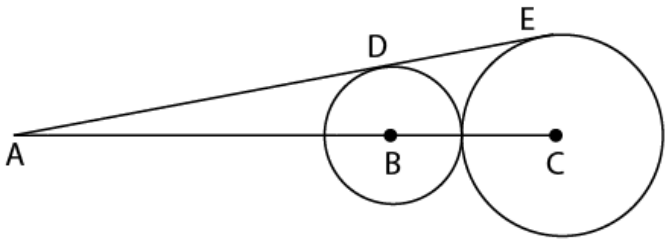
Answer: B

Explanation:

In the case of similar triangles AB/PQ =AC/PR =BC/QR
AB/PQ=2/3
AB/PQ=BC/QR
AB/PQ=2BD/2QS
AB/PQ=BD/QS
BD/QS=2/3
$(\frac{BD}{QS})^2$=4/9

Question 26

In the given figure, B and C are the centres of the two circles. ADE is the common tangent to the two circles. If the ratio of the radiu of both the circles is $3:5$ and $AC=40$, then what is the value of DE ?



A $3\sqrt{15}$

B $5\sqrt{15}$

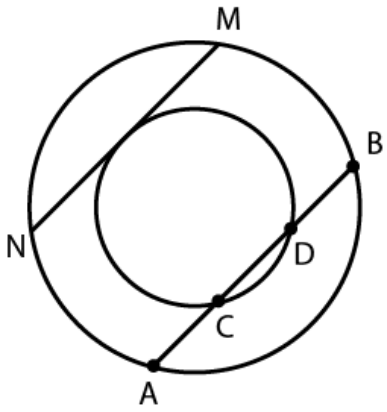
C $6\sqrt{15}$

D $4\sqrt{15}$

Answer: D

Question 27

In the given figure, Ab = 30 cm and CD = 24 cm. What is the value (in cm) of MN?



A 18

B 9

C 12

D 15

Answer: A

Question 28

AB and AC are the two tangents to a circle whose radius is 6 cm. If $\angle BAC = 60^\circ$ then what is the value (in cm) of $\sqrt{(AB^2 + AC^2)}$?

A $6\sqrt{6}$

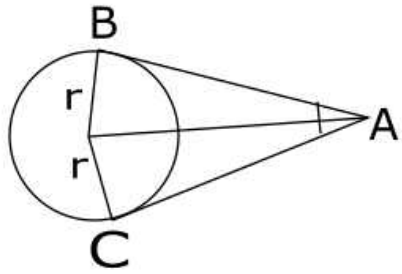
B $4\sqrt{6}$

C $9\sqrt{3}$

D $8\sqrt{3}$

Answer: A

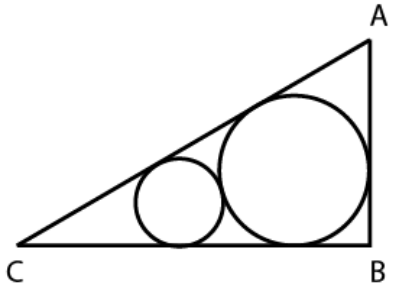
Explanation:



In the given figure we have angle OAB=30 and OAC=30
tan 30=r/AB
AB=r/tan 30
AB=r/(1/$\sqrt{3}$)
AB=r$\sqrt{3}$
AB=6$\sqrt{3}$
Similarly AC=6$\sqrt{3}$
$\sqrt{(AB^2 + AC^2)}$
=$\sqrt{((6\sqrt{3})^2 + ((6\sqrt{3}))^2)}$
=6$\sqrt{6}$

Question 29

In the given figure, ABC is a right angled triangle. $\angle ABC = 90^\circ$ and $\angle ACB = 60^\circ$. If the radius of the smaller circle is 2 cm, then what is the radius (in cm) of the larger circle ?



A 4

B 6

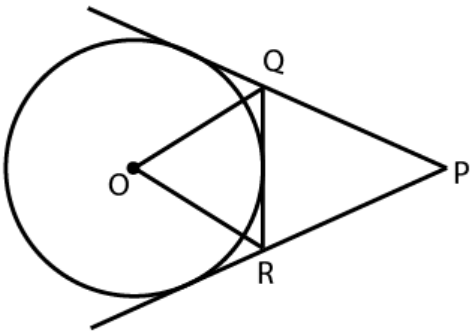
C 4.5

D 7.5

Answer: B

Question 30

In the given figure, O is centre of the circle. Circle has 3 tangents. If $\angle QPR = 45°$, then what is the value (in degrees) of $\angle QOR$?



A 67.5

B 72

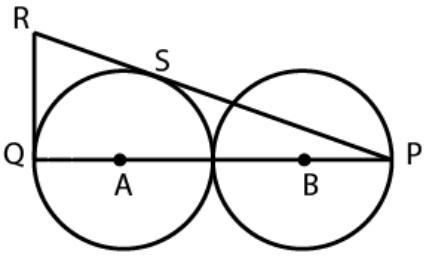
C 78.5

D 65

Answer: A

Question 31

In the given figure, two identical circles of radius 4 cm touch each other. A and B are the centres of the two circles. If RQ is a tangent to the circle, then what is the length (in cm) of RQ?



A $3\sqrt{3}$

B $2\sqrt{6}$

C $4\sqrt{2}$

D $6\sqrt{2}$

Answer: C

Question 32

The radius of two circles is 3 cm and 4 cm. The distance between the centres of the circles is 10 cm. What is the ratio of the length of direct common tangent to the length of the transverse common tangent?

A $\sqrt{51} : \sqrt{68}$

B $\sqrt{33} : \sqrt{17}$

C $\sqrt{66} : \sqrt{51}$

D $\sqrt{28} : \sqrt{17}$

Answer: B

Explanation:
Given distance between the centers=10 cm
Length of transverse common tangent= $\sqrt{d^2 - (r1 + r2)^2}$
=$\sqrt{10^2 - (3 + 4)^2}$
=$\sqrt{100 - 49}$
=$\sqrt{51}$
Length of direct common tangent= $\sqrt{d^2 - (r1 - r2)^2}$
=$\sqrt{100 - 1}$
=$\sqrt{99}$
Ratio=$\sqrt{99}/\sqrt{51}$
=$\sqrt{33}/\sqrt{17}$

Question 33

ABC is a triangle. $AB = 5cm$, $AC = \sqrt{41}cm$ and $BC = 8cm$. AD is perpendicular to BC. What is the area (in cm^2) of triangle ABD?

A 12

B 6

C 10

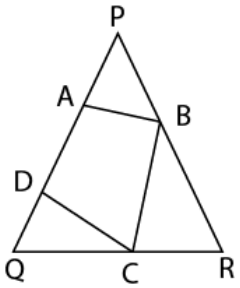
D 20

Answer: B

Explanation:
In the triangle ABC as AB=5 and AD is perpendicular to BD and so triangle ABD and triangle ADC are right angled triangles
AB=5 and so triangle ABD other sides may be 3 and 4 as BD=4 is not possible because if BD=4 then DC=4 the perpendicular is becoming also a bisector the the triangle ABC should be isosceles but it not the case so BD=3 and AD=4 and so DC=5
In triangle ADC also the condition satisfies and so area of the triangle ABD=(1/2)*3*4
=6 sq cm

Question 34

In the given figure, PQR is a triangle and quadrilateral ABCD is inscribed in it. QD = 2 cm, QC = 5 cm, CR = 3 cm. BR = 4 cm. PB = 6 cm. PA = 5 cm and AD = 3 cm. What is the area (in cm^2) of the quadrilateral ABCD?



A $\frac{(23\sqrt{21})}{4}$

B $\frac{(15\sqrt{21})}{4}$

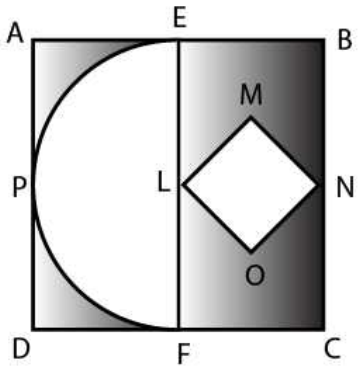
C $\frac{(17\sqrt{21})}{5}$

D $\frac{(23\sqrt{21})}{5}$

Answer: C

Question 35

In the given figure, ABCD is a square of side 14 cm. E and F are mid points of sides AB and DC respectively. EPF is a semicircle whose diameter is EF. LMNO is a square. What is the area (in cm^2) of the shaded region?



A 108.5

B 94.5

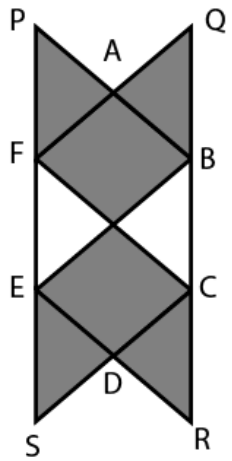
C 70

D 120

Answer: B

Question 36

In the given figure. $ABCDEF$ is a regular hexagon whose side is 6 cm. APF, QAB, DCR and DES are equilateral triangles. What is the area (in cm^2) of the shaded region?



A $24\sqrt{3}$

B $18\sqrt{3}$

C $72\sqrt{3}$

D $36\sqrt{3}$

Answer: C

Question 37

Length and breadth of a rectangle are 8 cm and 6 cm respectively. The rectangle is cut on its four vertices such that the resulting figure is a regular octagon. What is the side (in cm) of the octagon?

A $3(\sqrt{11}) - 7$

B $5(\sqrt{13}) - 8$

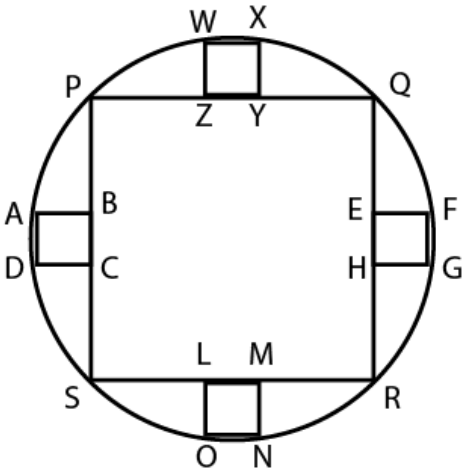
C $4(\sqrt{7}) - 11$

D $6(\sqrt{11}) - 9$

Answer: A

Question 38

In the given figure, radius of a circle is $14\sqrt{2}cm$. PQRS is a square. EFGH, ABCD, WXYZ and LMNO are four identical squares. What is the total area (in cm^2) of all the small squares?



A 31.36

B 125.44

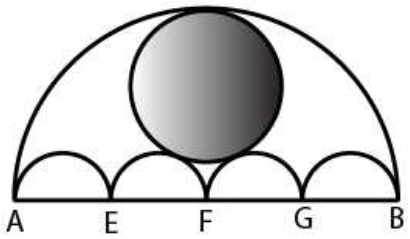
C 62.72

D 156.8

Answer: A

Question 39

In the given figure, AB, AE, EF, FG and GB are semicircles. AB = 56 cm and AE = EF = FG = GB. What is the area (in cm^2) of the shaded region?



A 414.46

B 382.82

C 406.48

D 394.24

Answer: D

Question 40

A right prism has a square base with side of base 4 cm and the height of prism is 9 cm. The prism is cut in three parts of equal heights by two planes parallel to its base. What is the ratio of the volume of the top, middle and the bottom part respectively?

A 1 : 8 : 27

B 1 : 7 : 19

C 1 : 8 : 20

D 1 : 7 : 20

Answer: E

Question 41

Radius of base of a hollow cone is 8 cm and its height is 15 cm. A sphere of largest radius is put inside the cone. What is the ratio of radius of base of cone to the radius of sphere?

A 5 : 3

B 4 : 1

C 2 : 1

D 7 : 3

Answer: A

Question 42

The ratio of curved surface area of a right circular cylinder to the total area of its two bases is 2 : 1. If the total surface area of cylinder is 23100 cm^2, then what is the volume (in cm^3) of cylinder?

A 247200

B 269500

C 312500

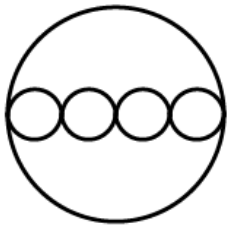
D 341800

Answer: B

Explanation:
The ratio of curved surface area of a right circular cylinder to the total area of its two bases is 2 : 1
$2\pi rh/2\pi r^2$=2/1
h/r=2/1
h=2r
Total surface area of the cylinder=$2\pi r(r+h)$
=2*(22/7)*r*(3r)
$132r^2/7$=23100
r^2=23100*7/132
r=35 cm
Volume of the cylinder=$\pi r^2 h$
=(22/7)*35*35*2*35
=269500

Question 43

A solid cylinder has radius of base 14 cm and height 15 cm. 4 identical cylinders are cut from each base as shown in the given figure. Height of small cylinder is 5 cm. What is the total surface area (in cm^2) of the remaining part?



A 3740

B 3432

C 3124

D 2816

Answer: B

Question 44

10 identical solid spherical balls of radius 3 cm are melted to form a single sphere. In this process 20% of solid is wasted. What is the radius (in cm) of the bigger sphere?

A 24

B 12

C 8

D 6

Answer: D

Explanation:
Given volume=$10 \times 0.8(4/3)\pi r^3$
Let the radius of bigger sphere=R
$(4/3)\pi R^3$=$10 \times 0.8(4/3)\pi r^3$
R^3=8*27
R=6 cm

Question 45

The radius of base of a solid cylinder is 7 cm and its height is 21 cm. It is melted and converted into small bullets. Each bullet is of same size. Each bullet consisted of two parts viz. a cylinder and a hemisphere on one of its base. The total height of bullet is 3.5 cm and radius of base is 2.1 cm. Approximately how many complete bullets can be obtained?

A 83

B 89

C 74

D 79

Answer: A

Question 46

A cuboid of size $50cm \times 40cm \times 30cm$ is cut into 8 identical parts by 3 cuts. What is the total surface area (in cm^2) of all the 8 parts?

A 11750

B 14100

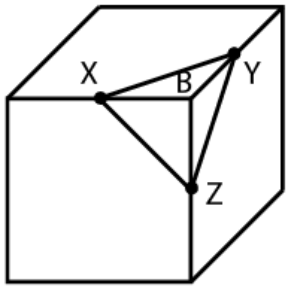
C 18800

D 23500

Answer: C

Question 47

A right triangular pyramid XYZB is cut from cube as shown in figure. The side of cube is 16 cm. X. Y and Z are mid points of the edges of the cube. What is the total surface area (in cm^2) of the pyramid?



A $48[(\sqrt{3})+1]$

B $24[4+(\sqrt{3})]$

C $28[6+(\sqrt{3})]$

D $32[3+(\sqrt{3})]$

Answer: D

Question 48

What is the value of $\frac{[(\sin x+\sin y)(\sin x-\sin y)]}{[(\cos x+\cos y)(\cos y-\cos x)]}$ **?**

A 0

B 1

C -1

D 2

Answer: B

Explanation:

$$\frac{[(\sin x+\sin y)(\sin x-\sin y)]}{[(\cos x+\cos y)(\cos y-\cos x)]}$$

$$= \frac{sin^2x-sin^2y}{cosxcosy-cosxcosy+cos^2x-cos^2y}$$

$$= \frac{sin^2x-sin^2y}{1-sin^2x-(1-sin^2y)}$$

$$= \frac{sin^2x-sin^2y}{sin^2x-sin^2}$$

=1

Question 49

What is the value of $\left[\frac{(\tan 5\theta+\tan 3\theta)}{4}\cos 4\theta(\tan 5\theta-\tan 3\theta)\right]$**?**

A $\sin 2\theta$

B $\cos 2\theta$

C $\tan 4\theta$

D $\cot 2\theta$

Answer: B

Question 50

What is the value of $\binom{4}{3}\cot^2\binom{p}{6}+3\cos^2(150^\circ)-4\,\mathrm{cosec}^2\,45^\circ+8\sin\binom{p}{2}$**?**

A $\frac{25}{4}$

B 1

C $-\frac{7}{2}$

D $\frac{13}{2}$

Answer: A

Question 51

What is the value of $\sin(B-C)\cos(A-D)+\sin(A-B)\cos(C-D)+\sin(C-A)\cos(B-D)$?

A $\frac{3}{2}$

B -3

C 1

D 0

Answer: D

Question 52

What is the value of $\frac{\{[4\cos(90-A)\sin^3(90+A)]-[4\sin(90+A)\cos^3(90-A)]\}}{\cos\left[\frac{180+8A}{2}\right]}$ **?**

A 1

B -1

C 0

D 2

Answer: B

Question 53

What is the value of

$\cos\left[\frac{(180-\theta)}{2}\right]\cos\left[\frac{(180-9\theta)}{2}\right]+\sin\left[\frac{(180-3\theta)}{2}\right]\sin\left[\frac{(180-13\theta)}{2}\right]?$

A $sin2\theta\sin 4\theta$

B $\cos 2\theta\cos 6\theta$

C $\sin 2\theta\sin 6\theta$

D $\cos 2\theta\cos 4\theta$

Answer: B

Question 54

What is the value of

$[\tan^2(90-\theta)-\sin^2(90-\theta)]\,\mathrm{cosec}^2(90-\theta)\cot^2(90-\theta)?$

A 0

B 1

C -1

D 2

Answer: B

Explanation:

$[(\sin^2(90-\theta)/\cos^2(90-\theta))-\sin^2(90-\theta)]\cos^2(90-\theta)/(\sin^4(90-\theta))$

$=(\sin^2(90-\theta)(1-\cos^2(90-\theta)/(\cos^2(90-\theta)))\ \cos^2(90-\theta)/(\sin^4(90-\theta))$

$(1-\cos^2(90-\theta)=\sin^2(90-\theta)$

$=(\sin^4(90-\theta)(\cos^2(90-\theta)/(\ \cos^2(90-\theta)/(\sin^4(90-\theta)))$

=1

Question 55

Two points P and Q are at the distance of x and y (where y > x) respectively from the base of a building and on a straight line. If the angles of elevation of the top of the building from points P and Q are complementary, then what is the height of the building?

A xy

B $\sqrt{\binom{y}{x}}$

C $\sqrt{\binom{x}{y}}$

D $\sqrt{(xy)}$

Answer: D

Question 56

The tops of two poles of height 60 metres and 35 metres are connected by a rope. If the rope makes an angle with the horizontal whose tangent is 5/9 metres, then what is the distance (in metres) between the two poles?

A 63

B 30

C 25

D 45

Answer: D

Question 57

A Navy captain going away from a lighthouse at the speed of $4[(\sqrt{3})-1]$ m/s. He observes that it takes him 1 minute to change the angle of elevation of the top of the lighthouse from 60° to 45°. What is the height (in metres) of the lighthouse?

A $240\sqrt{3}$

B $480[\sqrt{3}-1]$

C $360\sqrt{3}$

D $280\sqrt{2}$

Answer: A

Instructions

Read the following Table and Answer the questions that follow:

The table given below shows the number of applicants who have applied for exam at various centres as percentage of total number of applicants. The table also shows the number online applicants and absent applicants as a percentage of total applicants of each centre. Total number of applicants is 1200000.

Exam Centre	Total Applicants	Online applicants	Absent applicants
F	15%	30%	36%
G	25%	44%	25%
H	20%	52%	32%
J	24%	46%	18%
K	16%	38%	20%

Question 58

If A equals to 15% of total applicants who are present at exam centre F and B equals to present applicants at exam centre K, then A is what percent of B?

A 18.18

B 11.25

C 13.33

D 14.28

Answer: B

Question 59

Total number of offline applicants from exam centre H, K and F are how much less than the total number of present applicants from exam centre G and J?

A 111420

B 100920

C 127370

D 109990

Answer: B

Explanation:
total number of offline applications from F=(15/100)*(70/100)*1200000
=126000
total number of offline applications from H=(20/100)*(48/100)*1200000
=115200
total number of offline applications from K=(16/100)*(62/100)*1200000
=119040
Sum=360240
Total number of present applicants from G=(1/4)*(3/4)*1200000
=225000
Total number of present applicants from J=(24/100)*(82/100)*1200000
=236100
sum=461160
Difference=461160-360240
=100920

Question 60

What are the total number of offline applicants from the exam centre F, H, J and G?

A 393720

B 963000

C 564720

D 428540

Answer: C

Explanation:
total number of offline applications from F=(15/100)*(70/100)*1200000
=126000
total number of offline applications from H=(20/100)*(48/100)*1200000
=115200
total number of offline applications from J=(24/100)*(54/100)*1200000
=155520
total number of offline applications from G=(25/100)*(56/100)*1200000
=168000
Sum=564720

Question 61

What is the ratio of total number of present applicants from exam centre K to total number of offline applicants from exam centre J?

A 40 : 41

B 80 : 81

C 10 : 9

D 7 : 11

Answer: B

Explanation:
Total number of present applicant from K=(16/100)*(80/100)*120000
Total number of offline applicants from J=(54/100)*(24/100)*120000
Ratio=(16*80)/(54*24)
=80/81

Question 62

What are the total number of present applicants from exam centre H and G together?

A 238200

B 151800

C 388200

D 442650

Answer: C

Explanation:
From G total number of applicants present=(1/4)*(3/4)*1200000
=225000
From G total number of applicants present=(1/5)*(68/100)*1200000
=163200

Sum=388200

Instructions
For the following questions answer them individually

Question 63

Solution A contains 10% acid and solution B contains 30% acid. In what ratio should solution A be mixed with Solution B to obtain a mixture with 25% acid?

A 1 : 2

B 3 : 1

C 1 : 3

D 2 : 1

Answer: C

Explanation:
In solution 1 acid percent=10
In solution 2 acid percent=30
In the resulting mixture acid percent=25%
By applying the principle of allegations we have
=(30-25)/(25-10)
=5/15
=1:3

Question 64

In what ratio should coffee powder costing Rs 2500/kg be mixed with coffee powder costing Rs 1500/kg so that the cost of the mixture is Rs 2250/kg?

A 1 : 4

B 4 : 1

C 3 : 1

D 1 : 3

Answer: C

Explanation:
Given 2500 per kg and 1500 per kg
resultant is 2250 per kg
By applying the rule of allegation require ratio =(2250-1500)/(2500-2250)
=750:250
=3:1

Question 65

A and B started a partnership business investing in the ratio of 3 : 8. C joined them after 4 months with an amount equal to $\frac{3}{4^{th}}$ of B. What was their profit (in Rs) at the end of the year if C got Rs 24,000 as his share?

A 120000

B 150000

C 90000

D 180000

Answer: C

Explanation:
Let the investment of A and B be 3x and 8x
Investment of C =(3/4)8x
=6x
Ratio of their profits will be 3x*12:8x*12:6x*8
=3:8:4
C's share=24000
(4/15)*x=24000
x=90000

Question 66

A and B invest in a business in the ratio 4 : 5. After 10 months B leaves the business after withdrawing his investment. In the first year the business made a profit of Rs 49,000. What is B's share (in Rs) of this profit?

A 25000

B 20000

C 18000

D 22000

Answer: A

Explanation:
let the investments made by A and B be 4x and 5x
ratio of their profits is 4x*12+5x*10=48x:50x
=24:25
B's share (25/49)*49000
=Rs 25000

Question 67

Working together A and B can do a job in 40 days, B and C in 36 days and all three together in 24 days. In how many days can B alone do the job?

A 60

B 90

C 72

D 120

Answer: B

Explanation:
Given that three people together can do the work in 24 days
(1/a)+(1/b)+(1/c)=1/24
Also given (1/b) +(1/c)=1/36
1/a =1/24 - 1/36
1/a =(3-2)/72
a=72 days
(1/72)+(1/b)=1/40
(1/b)=(1/40)-(1/72)
(1/b)=9-5/360
1/b =1/90
b=90 days

Question 68

A, B and C can do a job working alone in 50, 75 and 20 days respectively. They all work together for 4 days, then C quits. How many days will A and B take to finish the rest of the job?

A 20

B 30

C 18

D 24

Answer: A

Explanation:
LCM of 50,75 an 20 is 300 units
Each day A can do 300/50 =6 units
Each day B can do 300/75 =4 units
Each day A can do 300/20 =15 units
In each day 6+4+15=25 units
for 4 days they do 4*25=100 units
Each day A and B an together do 10 units
Therefore 200/10 =20 days

Question 69

A can do 50% of the job in 16 days, B can do $\frac{1}{4^{th}}$ of the job in 24 days. In how many days can they do $\frac{3}{4^{th}}$ of the job working together?

A 24

B 9

C 21

D 18

Answer: D

Explanation:
A can complete the whole work in 16*2=32 days
B can complete the whole work in 24*4=96 days
they both can complete the whole work in (96*32)/(128)
=24 days
The can complete (3/4)th work in 24*3/4 =18 days

Question 70

A and B can together complete a task in 18 hours. After 6 hours A leaves. B takes 36 hours to finish rest of the task. How many hours would A have taken to do the task if he worked alone?

A 54

B 45

C 21

D 27

Answer: D

Explanation:
Let the total number of units of work =108
A and B can do in 18 hours so 108/18 =6 units
each hour they both can do 6 units
For 6 hours they both worked and so 36 units is done so 108-36=72 units of work is done by B alone in 36 hours
I.e 72/36 = 2 units per day
Therefore a+b=6
a=6-2
a=4 units per day
If A worked alone then 108/4 =27 hours

Question 71

1 packet of biscuits costs Rs 16 but a pack of 4 of the same packet of biscuits costs Rs 56. What is the effective discount (in %) on the pack?

A 8

B 10

C 7.5

D 12.5

Answer: D

Explanation:
Cost of 1 pack=Rs 16
Cost of 4 packs=Rs 64
But a set of 4 pack=Rs 56
Effective discount=((64-56)/64)*100
=100/8
=12.5 %

Question 72

The cost price of an article is Rs x. It is marked up by 200%. It is sold at Rs 540 after giving 25% discount. What is the value of x (in Rs)?

A 360

B 250

C 300

D 240

Answer: D

Explanation:
Given CP=x
MP=3x
Discount=25%
MP-Discount=540
(3/4)MP=540
MP=Rs 720
3x=720
x=240

Question 73

A Rs 750 tin of cheese is offered at 8% discount and a Rs 1,250 tin of butter at 20% discount. If we buy 5 tins of cheese and 3 tins of butter, what is the effective discount we get (in %)?

A 12

B 15

C 14

D 16

Answer: C

Explanation:
Each cheese tin cost Rs 750
Discount=8%
Cost of each=750*92/100
=690
Cost of 5 cheese tins=3450
Each butter tin=Rs 1250
discount=20%
Cost of each butter tin=1250*4/5
=1000
Cost of 3 butter tins=Rs 3000
Total cost=3450+3000
=6450
Total cost without discount=750*5+1250*3
=3750+3750
=7500
Percent=(6450/7500)*100
=86%
Discount=100-86
=14%

Question 74

The selling price of an article is Rs 816 if the discount on it is 15%. What would be the selling price of the article (in Rs) if the discount on it is 25%?

A 750

B 720

C 800

D 700

Answer: B

Explanation:
MP-discount=SP
0.85 MP=SP
MP=816/0.85
MP=Rs 960
Now discount =25%
MP-discount=SP
0.75*960=SP
SP=Rs 720

Question 75

The entry ticket at a fun park was increased in the ratio 7 : 9, due to which footfalls fell in the ratio 13 : 11. What is the new daily collection (in Rs), if the daily collection before the price hike was Rs 2,27,500?

A 237500

B 247500

C 232500

D 242500

Answer: B

Question 76

If 6A = 4B = 9C; What is A : B : C?

A 6 : 4 : 9

B 9 : 4 : 6

C 4 : 9 : 6

D 6 : 9 : 4

Answer: D

Explanation:
6A=k
4B=k
9C=k
A=k/6 B=k/4 C=k/9
A:B:C=(k/6):(k/4):(k/9)
LCM of 6,4,9 is 36
multiplying it we get 6k:9K:4k
ratio=6:9:4

Question 77

If 50 less had applied and 25 less selected, the ratio of selected to unselected would have been 9 : 4. So how many candidates had applied if the ratio of selected to unselected was 2 : 1.

A 125

B 250

C 375

D 500

Answer: C

Explanation:
Let the total applied =a and selected=s
Therefore not selected=a-s
s/(a-s) =2/1
s=2a-2s
3s=2a
s=(2/3)a

Also given (s-25)/(a-s-25)=9/4
(2a-75)/(a-75)=9/4
8a-300=9a-675
a=375

Question 78

What is the fourth proportional to 189, 273 and 153?

A 117

B 299

C 221

D 187

Answer: C

Explanation:
189:273::153:x
189x=273*153
x=273*153/189
x=221

Question 79

Rs 11,550 has to be divided between X, Y & Z such that X gets 4/5 of what Y gets and Y gets 2/3 of what Z gets. How much more does Z get over X (in Rs)?

A 7200

B 1800

C 2139

D 2450

Answer: D

Explanation:
given X=(4/5)Y
Y=(2/3)Z
Z=(3/2)*(5/4)Y
Z=15X/8
X+Y+Z=11550
X+(5/4)X+15X/8 =11550
33X/8 =11550
X=11550*8/33
X=2800
Z=15X/8
Z gets 7X/8
=7*2800/8
=2450

Question 80

Before a battle the ratio of tanks to planes in an army was 5 : 3. During the war 1000 tanks were destroyed and 800 planes were destroyed. The ratio of tanks to planes became 2 : 1. What is the number of tanks after the war.

A 2000

B 1000

C 3000

D 4000

Answer: A

Explanation:
let the number of tanks and planes be 5x and 3x
after war tanks=5x-1000 and planes =3x-800
(5x-1000)/(3x-800)=2:1
5x-1000=6x-1600
x=600
Total tanks=3000-1000
=2000

Question 81

The average marks of 50 students in an examination was 65. It was later found that the marks of one student had been wrongly entered as 83 instead of 38. The correct average is?

A 63.9

B 64.5

C 64.7

D 64.1

Answer: D

Explanation:
Sum of scores of all students=50*65
=3250
Adding and removing correct value and wrong value respectively
i.e 3250-83+38=3205
Correct average=3205/50
=64.1

Question 82

In a class of 50 students there are 22 girls who scored an average of 35 marks in the test. What is the average marks of the boys if the class average is 42 marks?

A 50

B 52.5

C 47.5

D 55

Answer: C

Explanation:
Sum of scores of all students=50*42=2100
Sum of 22 girls scores=35*22=770
Sum of scores of boys=2100-770
=1330
Average of boys=1330/28
=47.5

Question 83

The average of 41 consecutive odd numbers is 49. What is the largest number.

A 89

B 91

C 93

D 95

Answer: A

Explanation:
Given the average of 41 consecutive odd numbers=49
Therefore we can say that 21st odd number=49
Largest number will be 49+20*2=49+40
=89

Question 84

A batsman scores 87 runs in the 21^{st} match of his career. His average runs per match increases by 2. What was his average before the 21^{st} match.

A 45

B 46

C 44

D 43

Answer: A

Explanation:
Sum of scores till 20 matches=S
average of 20 matches=x
S=20x
(S+87)/21 =x+2
20x+87=21x+42
x=45

Question 85

Oil equal to 20% of the weight of ground nut is extracted in a mill. The matter left after extraction is sold as cattle feed at the rate of Rs 12.5/kg. The groundnuts are bought at Rs 20/kg. The processing cost is Rs 5/kg. At what price (Rs per kg) should the oil be sold to earn 20% profit on total costs (Total cost = Cost of groundnuts and Processing costs)?

A 250

B 150

C 200

D 100

Answer: D

Question 86

If a vendor sells a coconut at Rs 14.4 he makes 10% loss. If he wants to make 25% profit, then at what price (in Rs) should he sell?

A 18

B 20

C 16

D 22

Answer: B

Explanation:
Given SP=14.4
loss %=10 %
Therefore 0.9CP=14.4
CP=14.4/0.9
CP=16
Required profit=25%
SP=1.25CP
=(5/4)*16
=20

Question 87

At a village trade fair a man buys a horse and a camel together for Rs 51,250. He sold the horse at a profit of 25 % and the camel at a loss of 20 %. If he sold both the animals at the same price, then the cost price of the cheaper animal was Rs _____.

A 6600

B 7500

C 25000

D 20000

Answer: D

Question 88

On a certain item profit is 150%. If the cost price increases by 25% what will be the new profit margin (in %)?

A 25

B 50

C 100

D 75

Answer: C

Explanation:
Cp=x
SP=2.5x
Now CP=1.25x
SP=2.5x
Profit %=((2.5x-1.25x)/1.25x)*100
=100

Question 89

40% are the passing marks. A student gets 250 marks yet fails by 38 marks. What is the maximum marks?

A 720

B 750

C 800

D 840

Answer: A

Explanation:
let the total marks be x
passing marks=0.4x
Given 250+38=0.4x
0.4x=288
x=288*10/4
x=720

Question 90

Ravi is 12 years younger than Surya. Ravi's age is 40% of the sum of his and Surya's age. What will be Surya's age 9 years hence?

A 36

B 24

C 33

D 45

Answer: D

Explanation:
let surya's age=s
ravi's age=r
Given s-r=12
r=0.4(r+s)
0.6r=0.4s
0.6(s-12)=0.4s
0.6s-7.2=0.4s
0.2s=7.2
s=36 yers
9 years from now age will be 36+9=45 years

Question 91

5% of a = b, then b% of 20 is the same as _____.

A 20% of a/2

B 50% of a/20

C 50% of a/2

D 20% of a/20

Answer: D

Explanation:

(5/100)*a=b
a=20b
(b/100)*20=b/5
b=a/20
=a/100
in fourth option we have 20% of a/20
=a/100
4th option is the correct answer.

Question 92

A man's annual income has increased by Rs 5 lakhs but the tax on income that he has to pay has reduced from 12% to 10%. He now pays Rs 10,000 more income tax. What is his increased income (in Rs lakhs)?

A 20

B 25

C 15

D 10

Answer: B

Explanation:
Starting income=x
New income=x+500000
income tax at 1st=0.12x
Income tax now=(x+500000)*0.1
Difference=10000
0.1x+50000-0.12x=10000
400000=0.02x
x=2000000
x+5=25 lakhs

Question 93

A racing car going at an average speed of 108 km/hr takes 15 minutes to complete a lap on a racing track. By how much should it increase its speed (in km/hr) to complete the lap in 12 minutes?

A 24

B 21

C 27

D 30

Answer: C

Explanation:
Distance of the lap=108*(1/4)
=27 kilometers
Time in which lap has to be completed=12 minutes=12/60
=1/5 hr
Speed=27/(1/5)
=135 km/hr
Increase=135-108
=27 km/hr

Question 94

Train A takes 45 minutes more than train B to travel a distance of 450 km. Due to engine trouble speed of train B falls by a quarter, so it takes 30 minutes more than Train A to complete the same journey. What is the speed of Train A (in km/hr)?

A 90

B 120

C 100

D 110

Answer: C

Explanation:
let the speed of train A be 'a' and that of B be 'b'
Given a(t)=b(t-(3/4))
also given a(t)=b(t+(1/2))
Therefore

Question 95

Two cars A and B travel from one city to another, at speeds of 72 km/hr and 90 km/hr respectively. If car B takes 1 hour lesser than car A for the journey, then what is the distance (in km) between the two cities?

A 270

B 360

C 240

D 400

Answer: B

Explanation:
Both travel same distance and so distance =speed*time
time taken by B is t hours
72(t+1)=90t
72t+72=90t
18t=72
t=72/18
=4 hours
Distance=90*4
=360 kilometers

Question 96

B starts 4 minutes after A from the same point, for a place at a distance of 7 miles from the starting point. A on reaching the destination turns back and walks a mile where he meets B. If A's speed is a mile in 8 minutes then B's speed is a mile in ____ minutes.

A 9

B 12

C 10

D 8

Answer: C

Question 97

If the amount on a certain principal in 3 years at 12% rate of interest compounded annually is Rs 12,000, what will be the amount (in Rs) after the 4^{th} year?

A 14330

B 15440

C 13440

D 14550

Answer: C

Question 98

The amount (in Rs) received at 10% per annum compound interest after 3 yrs is Rs 1,19,790. What was the principal?

A 90000

B 1,00,000

C 80000

D 75000

Answer: A

Explanation:
$P(1+\frac{R}{100})^3$=119790

$P(1+\frac{10}{100})^3$=119790

$P(\frac{11}{10})^3$=119790

P=119790*1000/1331
P=Rs 90000

Question 99

In how many months will Rs 8,000 yield Rs 2,648 as compound interest at 20% per annum compounded semi-annually?

A 18

B 24

C 12

D 30

Answer: A

Explanation:
$P(1+\frac{R/2}{100})^{2n}-P$=2648
$$(1+\frac{R/2}{100})^{2n}-1=2648/8000

Question 100

What is the rate of interest (in %) if simple interest earned on a certain sum for the 3rd year is Rs 2,000 and compound interest earned in 2 years is Rs 4,160?

A 8

B 10

C 12

D 6

Answer: A

Explanation:
$PTR/100$=2000
PR=200000
$P(1+{}^{R}{}_{100}{}^{2})-P$=4160
$P((200+R)(R))$=4160
Dividing both the equations we have
1/(R+200) =20/4160
R+200=208
R=8%