Consider the following for the next ten (10) items that follow:

Mark option (a) if the question can be answered by using one of the statements alone, but cannot be answered using the other statement alone.

Mark option (b) if the question can be answered by using either statement alone.

Mark option (c) if the question can be answered by using both the statements together, but cannot be answered using either statement alone.

Mark option (d) if the question cannot be answered even by using both the statements together.

1. Question : Is $\mathrm{m}>\mathrm{n}$ if $\mathrm{m}, \mathrm{n}$ are real numbers?

Statement -I:
$m=(1-p)\left(p^{2}+p+1\right)$ and
$\mathrm{n}=(\mathrm{p}+1)\left(\mathrm{p}^{2}-\mathrm{p}+1\right)$
Statement-II :
$m=p n$
$-2 a$
2. Question : What is the other root of the quadratic equation with real coefficients if one of the roots is $\frac{-4-\sqrt{10}}{2} ?=-2 \times 2-\sqrt{4}$.

## Statement -I:

The product of the roots is $-\frac{3}{2}(3+\sqrt{10})$.

## Statement-II :

The sum of roots of quadratic equation is -1 .
numbers?
Statement -I:
Statement -I:
LCM of the two numbers is 144
Statement -II:
One of the numbers is 72 .

## Statement-II:

$\frac{\mathrm{z}-\mathrm{y}}{\mathrm{x}}=\frac{\mathrm{x}}{\mathrm{z}}$
6. Question: What is the sum of two natural

$\frac{x+z}{y}=\frac{z}{x}$ )


Is average of the largest and the question of 4 given numbers greater than the rage of the 4 numbers?

The difference between the largest and the second largest numbers is less than the difference between the second smallest and the smallest of the numbers.

Siatement-II :
The difference between the largest and the smallest numbers is greater than the difference between the second largest and the second smallest of the numbers.

Question: Is $(\mathrm{a}-\mathrm{b}+\mathrm{c})>(\mathrm{a}+\mathrm{b}-\mathrm{c})$, where $\mathrm{a}, \mathrm{b}$ and care real numbers?

Statement -I:
b is negative.
Statement-II :
c is negative.
9. Question : What is the cost of 15 pens, 21 pencils and 18 note books?

## Statement -I :

The cost of 7 pens, 6 perils and 5 note books is ₹ 200 .

Statement-II :
The cost of 3 pens, 8 pencils and 7 note books is ₹ 210 .
10. Question: What is the area of the triangle inscribed in a semi-circle with the diameter as the base?

## Statement -I:

The diameter of semi-ciccle 1 s 20 cm .

## Statement-II:

Two shorter sides of the triangle are $1_{2} \mathrm{~cm}$ and 16 cm .

## JNUP-T-EMT


11.
14. In a triangle ABC , angle $\mathrm{B}=90^{\circ}$ and p is the length of the perpendicular from B to AC . If $\mathrm{BC}=10 \mathrm{~cm}$ and $\mathrm{AC}=12 \mathrm{~cm}$, then what is the value of $p$ ?
(a) $\frac{5 \sqrt{11}}{3}$
(b) $\frac{10 \sqrt{11}}{3}$
(c) $\frac{40}{\sqrt{61}}$
(d) $\frac{12}{25}$


15. The mean of $p, q, r, s$ and $t$ is 280 . If the mean of $p, r$ and $t$ is 240 , what is the mean of $q$ and $s$ ?'
(a) 310
(b) 320
(c) 330
(d) 340

Consider the following for the next (05) items that follow:
$A, B, C, D, E, F$ and $G$ are cousins. D is thrice as old as $A$. Further, $C$ is as many years younger to $B$, as $G$ to $E$ and $E$ to $D$. The average age of $D$ and $G$ is 16 years; the average age of $A$ and $E$ is 11 years; the average age of $B$ and $C$ is also 11 years. $B$ and $C$ have equal weight. A's weight is 10 kg less than that of B ; D is 4 kg heavier than $\mathrm{E} ; \mathrm{E}$ is 4 kg heavier than F; F is 4 kg heavier than G. Further, D has age-weight ratio of $9: 20$, where age is in years and weight in kg ; A has age-weight ratio of $2: 5$. Moreover, none of them is more than 40 kg .
16. What is D's age (in years) ?
(a) 15
(b) 16
(c) 17
(d) 18
17. What is the average age (in years) of $B, C, D$,
$E$ and $G$ ?
(a) 12
(b) 13
(c) 14
(d) $15 \quad 144$
18. What is the difference between the weights (in kg ) of $\mathrm{G}_{\text {and }} \mathrm{C}$ ?
(a) 4
(b) 3
(c) 2
(d) 1


19. What is the average weight (in kg ) of $\mathrm{A}, \Varangle, \mathrm{C}$,
$\mathrm{D}, \mathrm{E}, \mathrm{F}$ and G ?
(a) $\frac{201}{7}$
(b) $\frac{197}{7}$
(c) 30
(d) 32
20. Consider the following statements :

1. The age of F cannot be determined due to insufficient data.
2. The average weight of $D$ and $F$ is equal to weight of E .
3. The weight difference is maximum for $D$ and $A$.
Which of the statements given above are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1,2 and 3
4. Which of the following is/are
identity/identities?
5. $\frac{\sin ^{3} \theta+\cos ^{3} \theta}{\sin \theta+\cos \theta}+\sin \theta \cos \theta=1 ; 0<\theta<\frac{\pi}{2}$
6. $1-\sin ^{6} \theta=\cos ^{2} \theta\left(\cos ^{4} \theta+3 \sin ^{2} \theta\right)$

Select the correct answer using the code given below:
(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2
22. If $7 \sin ^{4} \theta+9 \cos ^{4} \theta+42 \sin ^{2} \theta=16,0<\theta<\frac{\pi}{2}$, then what is $\tan \theta$ equal to ?

23. An isosceles triangle has its base length 2 a and its height is $h$. On each side of the triangle a square is drawn external to the triangle. What is the area of the figure thus formed ?
(a) $6 \mathrm{a}^{2}+2 \mathrm{~h}^{2}+2 \mathrm{ah}$
(b) $6 \mathrm{a}^{2}+2 \mathrm{~h}^{2}+\mathrm{ah}$
(c) $4 a^{2}+2 h^{2}+a h$
(d) $6 \mathrm{a}^{2}+\mathrm{h}^{2}+\mathrm{ah}$
24. If $\mathrm{p}=$

$$
r=\frac{c^{2}}{(a-c)(b-a)}, q=\frac{b^{2}}{(c-b)(a-b)}, \text { then what is }(p+q+r)^{2},
$$

equal to ?
(a) 9
(b) 4
(c) 1

(d) 0

25. Which one of the following is a factor of $a^{2}-b^{2}-c^{2}+2 b c+a+b-c$ ?
(a) $\mathrm{a}+\mathrm{b}+\mathrm{c}+1$
$\operatorname{san} 30^{\circ}=1$
(b) $a-b-c+1$
$i^{5}$
2
(c) $\mathrm{a}+\mathrm{b}+\mathrm{c}-1$
(d) $a-b+c+1$.

## $\frac{\sin ^{2}}{16}$

26. Let $\alpha$ and $\beta$ be the roots of the equation $\frac{1}{x+a+b}=\frac{1}{x}+\frac{1}{a}+\frac{1}{b} ; a \neq 0, b \neq 0, x \neq 0$.

Which one of the following is a quadratic equation whose roots are $\alpha^{2}$ and $\beta^{2}$ ?
(a) $\mathrm{x}^{2}+\left(\mathrm{a}^{2}+\mathrm{b}^{2}\right) \mathrm{x}+\mathrm{a}^{2} \mathrm{~b}^{2}=0$
(b) $x^{2}-\left(a^{2}+b^{2}\right) x+a^{2} b^{2}=0$
(c) $x^{2}-\left(a^{2}+b^{2}\right) x-a^{2} b^{2}=0$
(d) $x^{2}+\left(a^{2}+b^{2}\right) x-a^{2} b^{2}=0$
27.

$$
\begin{aligned}
& \text { 7. If } x=\frac{6}{7-\frac{6}{7-\frac{6}{7-\frac{6}{7-x}}} ; x>1 \text {, then what is }} \text { ( } x=\frac{6}{7-x} \\
& \text { (he value of } x^{2}-3 x+2 \text { equal to ? } x=1,6 \\
& \text { (i) } 1-3+2 \\
& \text { (b) } 1 \\
& \text { (c) } 18 \quad-x^{2}+7 x=6 \\
& \text { (d) } 20 \quad x^{2}-7 x+6=0
\end{aligned}
$$

28. A train completely overtakes two persons, walking in the same direction with speeds $3 \mathrm{~km} / \mathrm{hr}$ and $4 \mathrm{~km} / \mathrm{hr}$ in 9 seconds and $\frac{75}{8}$ seconds respectively. What is the length of the train?
(a) 60 m
(b) 62.5 m
(c) 55 m

(d) 67.5 m

29. A person bought an article and sold it at a profit of $20 \%$. Had he bought it at $20 \%$ less, what would have been the profit percentage if the selling price had been the same ?
(a) $25 \%$
(b) $40 \%$

$$
100 x \rightarrow 120 x
$$

(c) $50 \%$

$$
80 x \longrightarrow 120 x
$$

(d) $60 \%$
30. If $2 \mathrm{~s}=\mathrm{a}+\mathrm{b}+\mathrm{c}$, then what is
$s^{2}+(s-a)(s-b)+(s-b)(s-c)+(s-c)(s-a)$
equal to ?
(a) $(\mathrm{a}+\mathrm{b}+\mathrm{c})^{2}$
(b) $\mathrm{ab}+\mathrm{bc}+\mathrm{ca}$
(c) $2(a b+b c+c a)$
(d) $3(a b+b c+c a)$
31.

A pendulum
$9^{\circ}$ and
and its ${ }^{\text {swings }}$ through an angle of
14.3 cm . What describes an arc of length (Take $\pi=\frac{22}{7}$ ) $\underbrace{\text { the length of the pendulum ? }}$
(a) 88 cm
(b) ${ }^{91} \mathrm{~cm}$
(c) 95 cm
(d) 98 cm

32. The arch of a bridge is in the form of an arc of a circle. If the span of the bridge is 40 m and height in the middle is 8 m , then what is the radius of curvature of the bridge?
(a) 25 m
(b) 27 m
(c) 29 m
(d) 31 m

33. If $a, b$ and $c$ are the sides of a right-angled triangle, where $\mathrm{a}>\mathrm{b}>\mathrm{c}$, then what is the value of the expression
$(a+b+c)(a+b-c)(a-b+c)(a-b-c) ?$
(a) $4 b^{2} c^{2}$
(b) $-4 b^{2} c^{2}$
(c) $-2 a^{2} b^{2}$
$\frac{40}{80}$
(d) $-4 a^{2} b^{2}$
34. The cube root of $x$ varies inversely as the square root of $y . x=8$ when $y=3$. What is the value of $x$ when $y=\sqrt[3]{3}$ ?
(a) 18
(b) 21

(c) 24
(d) 27
35. Thrice all id lead spheres of diameters 6 cm , $8 \mathrm{~mm}^{\text {ann }}{ }^{10} \mathrm{~cm}$ are melted together and recast $a^{s^{9}}{ }^{\text {son did }}$ sphere. What is the percentage dinliw of the surface area as compared to splereres?
(a) $25 \%$
(b)
$26 \%$
(c) $27 \%$
(d) $28 \%$
36. A solid sphere of radius 3 cm is melted to form a hollow cylinder of height 4 cm and external diameter 10 cm . What is the thickness of the cylinder?
(a) 0.42 cm
(b) 0.46 cm
(c) 0.50 cm
(d) 1.00 cm
37. Three glasses $P, Q$ and $R$ have capacities in the ratio $1: 2: 3$. All these glasses are completely filled with mixtures of milk and water. The ratio of milk to water in P is $1: 2$, in Q it is $2: 3$ and in R it is $3: 1$. If the content of all three glasses are put into a bigger container, what will be the ratio of milk to water in the container?
(a) 203:117
(b) $203: 157$
(c) $172: 91$

$$
\frac{1}{3} \times \frac{2}{5} \times \frac{3}{4}
$$

(d) $165: 88$
38. What is the $x=2, y=1$
$\frac{x^{3}-y^{3} \text { ? }}{7}{ }^{\text {(a) }}{ }^{\left.\operatorname{La}^{2}-y^{2}\right)} \underbrace{\frac{x^{4}+x^{2} y^{2}+y^{4}}{1+4+16}}_{\left(x^{4}+x^{2} y^{2}+y^{4}\right)^{2}}, \frac{x^{3}+y^{3}}{9}$
(b)
(b) $\left(x^{2}-y^{2}\right)\left(x^{4}+2 x^{2} y^{2}+y^{4}\right)$
(c) $\left(x^{6}-y^{6}\right)$ $\int 2$
(d) $\left(x^{6}+y^{6}\right)$


$$
7 \times(16+4+1)^{2}
$$

$\frac{x^{2}-y^{2}-z^{2}-2 y z}{x^{2}+y^{2}-z^{2}+2 x y}+\frac{x^{2}-y^{2}-z^{2}-2 y z}{x^{2}-y^{2}+z^{2}-2 x z}$ equal to ?
(a) $\frac{x}{x+y-z}$

(b) $\frac{y+z}{x+y-z}$
(c) $\frac{2 x}{x+y-z}$


## $26 x$

(d) $\frac{2 y+2 z}{x+y-z}$
40. If $\tan A+\cot A=2$, where $0<A<90^{\circ}$, then what is the value of

$$
\tan ^{2} \mathrm{~A}+\tan ^{3} \mathrm{~A}+\tan ^{4} \mathrm{~A}+\ldots .+\tan ^{n} \mathrm{~A} ?
$$

(a) 1
(b) $n-2$

41. What is the radius of the sphere passing through the corners of the cuboid with edges $8 \mathrm{~cm}^{\mathrm{m}} 12 \mathrm{~cm}^{1 \mathrm{~m}}$ and 24 cm ?
(a) 10.5 cm
(d) $14 \mathrm{cml}^{\prime \mathrm{m}}$
(d) 21 cm
(d) 28 cm

42. A lamp shade is in the shape of a part of a one and its top and bottom ends are circles whose circumferences are respectively 30 cm and 40 cm . The perpendicular distance between the ends is 6 cm . If the cone were to be completed, then how far would its vertex be from the top end?
(a) 20 cm
(b) 18 cm
(c) 12 cm
(d) 9 cm リй
sis

43. A sum $2 \underset{0}{ }$ interest per annum becomes more than 100 times in $n$ years. What is the least value of $n ?$ (Use $\log _{10} 2=0.301, \log _{10} 3=0.477$ )
(a) 23
(b) 24
(c) 25
(d) 26


469
(c) 25


JNUP-T-EMT
44. The corners of an equilateral triangular plate
were cut in such a regular he e ${ }_{\text {argon }}$ a manner that it forms a the $\operatorname{area}_{\text {of the }}$ the plate. What is the ratio of (a) $2: 1$ plate?
(b) $3: 2$
(c) $4: 3$
(d) $5: 3$

45. Two equal arcs of different circles $\mathrm{C}_{1}$ and $\mathrm{C}_{2}$ subtend angles of $60^{\circ}$ and $75^{\circ}$ respectively, at $\mathrm{C}_{1}$ and $\mathrm{C}_{2}$ the centres. What is the ratio of the radius of
$\mathrm{C}_{1}$ to the radius of $\mathrm{C}_{2}$ ? (a) radius of $\mathrm{C}_{2}$ ?
(a) $4: 5$
(b) $5: 4$
(c) $1: 1 \mathrm{n}$
(d) $3: 2$


(d) $3: 2$
46. ABC is
$\mathrm{BC}=28$ m $\mathrm{AB}=41 \mathrm{~cm}$, the midpoints of $A B, B C$ and $C A$ respective then what is the area of the triangle DEF ?
(a) 63 square cm
(b) 45 square cm
(c) 31.5 square cm
(A) 22.5 square cm

47. A triangle has sides $13 \mathrm{~cm}, 14 \mathrm{~cm}$ and 15 cm long. What is the length of the smallest altitude of the triangle ?
(a) 11 cm
(b) 112 cm
(c) 12 cm
(d) 122 cm
48. The dinuwference of a circle exceeds the dianneter tyy 16.8 cm . What is the diameter of the cincle? (Take $\pi=\frac{22}{7}$ )
(8) 0.24 cm
(b) 6.42 cm
(c) 7.64 cm
(d) 7.84 cm

49. The hypotenuse AC of a right-angled ABC is $3 \sqrt{5} \mathrm{~cm}$. If AB is doubled and BC is tripled such that ABC remains a right-angled triangle, the hypotenuse becomes 15 cm . What is $A B+B C$ equal to ?
(a) 10 cm

(c) $2 \sqrt{5} \mathrm{~cm}$
(d) 8 cm

50. What is the area of the region between two concentric circles if the chord of the outer circte of length 14 cm is a tangent of the inner circle? (Take $\pi=\frac{22}{7}$ )
(a) 125 square cm
(b) 132 square cm
(c) 144 square cm
(d) 154 square cm

Consider the following
items that follow: for the next two (02)


$$
2 \pi r+168=\frac{\pi r^{2}}{2 \pi r} \times \frac{2}{r}
$$

51. If $r$ is the radius of $S$ and $R$ is the radius of $S_{2}$, then which one of the following is correct?
(a) $\mathrm{R}=3 \mathrm{r}$

(c) $3 R=4 r$
(d) $2 R=3 r$

52. If $m$ is the area of the circle $S$ and $n$ is the area of semi-circle $S_{1}$, then which one of the following is correct ?
(a) $9 m=2 n$
(b) $9 m=4 n$
(c) $3 m=2 n$
(d) $7 m=3 n$

Consider the following for the next two (02) items the follow:
Let $\frac{(x-a)(x-b)}{(x-m b)}=\frac{(x+a)(x+b)}{(x+m a)(x+m b)}$;
53. That is $\frac{x^{2}+a b}{x^{2}+m^{2} a b}$ equal to ?
$\mathrm{m}, \mathrm{a}, \mathrm{b}>0$. items that foll ${ }_{0}$ :

The total monthly electricity bill for a house consists of the sum of two parts, one part is proportional to number of $\mathrm{r}_{0} \mathrm{~ms}$ and the other part is proportional to number of units consumed. ₹ 400 is the monthly electricity bill for a house with 8 rooms and consuming 240 units and ₹ 320 is the monthly electricity bill for a house with $\overline{6}$ rooms and consuming 200 units.
$=\frac{1}{m^{2}} \lambda \alpha R \frac{2}{1+a^{2}}$
$-\frac{2}{m} y \alpha$ units

| $=\frac{1}{m} \quad$ | $8 R+240$ |
| ---: | :--- |
|  | $m \times n \times 240$ |

54. What is x equal to ?
(a) $\pm \sqrt{m a b}$
$8 r+240 \times 4=980$
(b) $\pm \sqrt{\mathrm{ab}}$

$$
6 \dot{r}+2004^{\circ}=320
$$

(c) $\pm \sqrt{2 \mathrm{mab}}$
56. What is the monthly electricity bill for a house with 7 rooms consuming 300 units ?
(a) ₹ 500
(b) ₹ 440
(c) ₹ 340
(d) ₹ 300

$$
\begin{aligned}
y= & 320 \\
& =20 \\
& \frac{10}{\infty}
\end{aligned}
$$

JNUP-T-EMT


Consider the following for the next two (02) items that follow :
A grouped frequency distribution is given below :

| Weekly wages in <br> Rupees (₹) | Numbers of <br> workers |
| :---: | :---: |
| $2050-2550$ | 5 |
| $2550-3050$ | 10 |
| $3050-3550$ | k |
| $3550-4050$ | 8 |
| $4050-4550$ | 2 |
| $4550-5050$ | 10 |

57. If average weekly wages earned by a worker is $₹ 3,520$, then what is the value of k ?
(a) 10
(b) 12
(c) 15

| $2 i$ | $f i$ |
| :---: | :---: |
| 2300 | 5 |
| 2800 | 10 |
| 3300 | $k$ |
| 3800 | 8 |
| 4300 | 2 |
| 4800 | 10 |

58. What is the median (approximate value) of the distribution?

$$
3+5
$$

(a) ₹ 3,263
(b) ₹ 3,383 240 120500
(c) ₹ 3,413 084
(d) ₹ 3,483 86
480

JNUP-T-EMT

Consider the following for the next two (02) items that follow:

A quadratic equation is given by
$(a+b+c) x^{2}-(2 a+2 b) x+(a+b-c)=0 ;$
where $\mathrm{a}, \mathrm{b}$ and c are real and distinct.
59. What are the roots of the equation?
(a) $1, \frac{(\mathrm{a}+\mathrm{b}-\mathrm{c})}{(\mathrm{a}+\mathrm{b}+\mathrm{c})}$
(b) $1, \frac{(\mathrm{a}-\mathrm{b}+\mathrm{c})}{(\mathrm{a}+\mathrm{b}+\mathrm{c})}$
(c)
$-1, \frac{(-\mathrm{a}-\mathrm{b}+\mathrm{c})}{(\mathrm{a}+\mathrm{b}+\mathrm{c})}$
(d) $-1, \frac{(a+b-c)}{(a+b+c)}$

60. Consider the following statements :

1. One of the roots of the equation is always less than 1 if $\mathrm{a}, \mathrm{b}$ and c are all positive.
2. One of the roots of the equation is always negative if $\mathrm{a}, \mathrm{b}$ and c are all negative.

Which of the statements given above is/are correct?
(a) 1 only $\left(\frac{\left.33 k+\frac{1205}{35+k}\right)}{35} \times 100=3520\right.$
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2 $33 K+1205=3.52$

Consider the following for the next two (02) items that follow:

A flagstaff stands on the top of a vertical tower. The angle of elevation of the top of the flagstaff from a certain place on the same horizontal level with the base of the tower is found to be $\alpha$. Advancing a distance $d$ towards the tower in the same horizontal plane, the angle of elevation of the top of the flagstaff is observed to be $\beta$ and that of the top of the tower is observed to be $\gamma$. Let H be the height of the top of the flagstaff from the base of the tower and $h$ be the height of the tower.
61. Which one of the following is correct?
(a) $\mathrm{H} \tan \gamma-\mathrm{h} \tan \beta=0$
(b) $\mathrm{h} \tan \gamma-\mathrm{H} \tan \beta=0$
(c) $\mathrm{H} \tan \gamma-\mathrm{h} \tan \alpha=0$
(d) $\mathrm{h} \tan \gamma-\mathrm{H} \tan \alpha=0$
62. Which one of the following is correct ?
(a) $\mathrm{d}=\frac{\mathrm{H}(\cot \alpha-\cot \beta)}{2}$
(b) $\mathrm{d}=\frac{\mathrm{H}(\tan \alpha-\tan \beta)}{2}$
(c) $\mathrm{d}=\mathrm{H}(\cot \alpha-\cot \beta)$
(d) $\mathrm{d}=\mathrm{H}(\tan \alpha-\tan \beta)$

Consider the foll ${ }_{0}$ wing for the next two (02)
items that foll ${ }_{\text {ow: }}$ ( AB is a straight $r_{0}$
of height $h . Q_{\text {is }}$ at leading to the foot $P$ of a tower distance $y$ from $Q(P$ ance $x$ from $P$ and $R$ is at a $Q$ are on the same $(R$ is farther from $P$ than $Q ; R$, the top of the tower at $Q$ is angle of elevation of

$$
\begin{aligned}
& \text { (Use the formula } \tan 2 \theta=\frac{2 \tan \theta}{1-\tan ^{2} \theta} \text { ) }
\end{aligned}
$$

63. Which one of the following is correct?
(a) $x=y$
(b) $x<y$
(c) $x>y$
(d) Cannot be concluded due to insufficient
data
64. Which one of the following is correct?
(a) $\mathrm{h}^{2}=\mathrm{x}^{2}-\mathrm{y}^{2}$
(b) $\mathrm{h}^{2}=\mathrm{x}^{2}+\mathrm{y}^{2}$
(c) $\quad h^{2}=2\left(y^{2}-x^{2}\right)$
(d) $h^{2}=y^{2}-x^{2}$

Consider the following for the next two (02) items that follow:

Two parallel chords $A B$ and $C D$ of a circle are of lengths 60 cm and 80 cm respectively. They are on the same side of the centre O and 10 cm apart.
65. What is the diameter of the circle ?
(a) 120 cm
(b) 110 cm
(c) 100 cm
(d) 90 cm
66. If the chord AB subtends an angle $\alpha$ and chord $C D$ subtends an angle $\beta$ at the centre $O$, then what is the value of $\tan \left(\frac{\beta}{2}\right)-\tan \left(\frac{\alpha}{2}\right)$ ?
(a) $\frac{3}{4}$
(b) $\frac{5}{12}$
(c) $\frac{1}{2}$
(d) $\frac{7}{12}$

## Consider the following for the next two (02)

 items that follow :Let $p=x^{4}-y^{2} z^{2}, q=y^{4}-z^{2} x^{2}, r=z^{4}-x^{2} y^{2}$.
67. What is $\mathrm{px}^{2}+\mathrm{qy}^{2}+\mathrm{rz}^{2}$ equal to ?
(a) $\left(x^{2}+y^{2}+z^{2}\right)(p+q+r)$
(b) $-\left(x^{2}+y^{2}+z^{2}\right)(p+q+r)$
(c) $\left(\mathrm{y}^{2}+\mathrm{z}^{2}-\mathrm{x}^{2}\right)(\mathrm{r}-\mathrm{q}-\mathrm{p})$
(d) $\left(x^{2}+y^{2}-z^{2}\right)(p-q-r)$
68. What is $\mathrm{x}^{2}\left(\mathrm{px}^{2}+\mathrm{qy}^{2}+\mathrm{rz}^{2}\right)+\mathrm{qr}-\mathrm{p}^{2}$ equal to?
(a) 0
(b) 1
(c) $p+q+r$
(d) $x^{2}+y^{2}+z^{2}$

Consider the following for the next two (02)
items that follow:
A right conical cap just covers two spheres placed one above the other on a table such that it touches both the spheres. Let $r$ be the radius of the smaller sphere and $R$ be the radius of the bigger sphere. Let $2 \theta$ be the vertical angle of the cone.
69. What is the height of the cone ?
(a) $\frac{2 r^{2}}{R-r}$
(b) $\frac{2 R^{2}}{R-r}$
(c) $\frac{2\left(\mathrm{r}^{2}+\mathrm{R}^{2}\right)}{\mathrm{R}-\mathrm{r}}$
(d) $\frac{r^{2}+R^{2}}{R-r}$
70. What is the radius of the base of the cone?
(a) $\frac{2 r^{2} \tan \theta}{R-r}$
(b) $\frac{2 R^{2} \tan \theta}{R-r}$
(c) $\frac{2\left(\mathrm{r}^{2}+\mathrm{R}^{2}\right) \tan \theta}{\mathrm{R}-\mathrm{r}}$
(d) $\frac{\left(r^{2}+\mathrm{R}^{2}\right) \tan \theta}{\mathrm{R}-\mathrm{r}}$
71. Consider the following statements :

1. If $(a+b)$ is directly proportional to $(a-b)$, then $\left(a^{2}+b^{2}\right)$ is directly proportional to ab .
2. If $a$ is directly proportional to $b$, then $\left(a^{2}-b^{2}\right)$ is directly proportional to $a b$.
Which of the statements given above is/are correct?
(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2
3. If $(3 a+6 b+c+2 d) \times(3 a-6 b-c+2 d)=$
$(3 a-6 b+c-2 d) \times(3 a+6 b-c-2 d)$, then which one of the following is correct ?
(a) $\mathrm{ab}=\mathrm{cd}$
(b) $\mathrm{ac}=\mathrm{bd}$
(c) $\mathrm{ad}=\mathrm{bc}$
(d) $\mathrm{ad}+\mathrm{bc}=0$
4. If $3 \sin \theta+5 \cos \theta=5$, then what is the value of $5 \sin \theta-3 \cos \theta$ equal to ?
(a) 5
(b) $-3-16=7 C-38 n$
(c) $-2=$ ont.
(d) 0
5. The combined age of a man and his wife is 6 times the combined age of their children. Two years ago their combined age was 10 times the combined age of their children; and six years later their combined age will be 3 times the combined age of their children. How many children do they have if each child is at least 2 years old ?
(a) 2
(b) 3

6. What is $3(\sin x-\cos x)^{4}+6(\sin x+\cos x)^{2}+$ equal to ?
(a) 9
(b) 11
(c) 13
(d) 15 the equation $\cot ^{2} \theta-(\sqrt{3}+1) \cot \theta+\sqrt{3}=0$; $0<\theta<\frac{\pi}{4}$ ?
(a) $\sqrt{2} \quad x+y=6 \times c$
(b) $2 \quad x+y-4=10 \times\left(C-x_{2} \times x_{n}\right)$
(c) $\frac{\sqrt{3}+1}{2} \quad x+y+12=3 \times\left(c+6 x_{n}\right)$
(d) $\frac{\sqrt{3}-1}{2} 6 C-4=1 O C-20 n$
7. Which one of the following is a value of $\theta$, if $\theta$ satisfies the equation $\tan 2 \theta \tan 4 \theta-1=0$; $0<\theta<\frac{\pi}{2}$ ?
(a) $\frac{\pi}{12}$
(b) $\frac{\pi}{15}$
 tom ur $\frac{\pi}{84}$
(b) $\frac{\pi}{15}$
(c) $\frac{\pi}{6}$ $\tan (2 \theta+4 \theta)=\operatorname{san} 2 \theta+\tan \theta$
(d) $\frac{\pi}{5}$

$$
2 \theta=\frac{\pi}{2} 0 \frac{\pi}{2}
$$

79. How many values of $\theta$ will satisfy the equation $\left(\sin ^{2} \theta-4 \sin \theta+3\right)\left(4-\cos ^{2} \theta+4 \sin \theta\right)=0$, where $0<\theta<\frac{\pi}{2}$ ?
(d) $\frac{\sin \theta-\cos \theta}{2}$ (a)
(a) None $\quad 690 \begin{aligned} & 25 \\ & 15\end{aligned}$
(b) Only one
(c) Onle two
(d) Only three


$$
\cos ^{2}+n^{2}+
$$

80. If $\mathrm{x} \sin ^{3} \theta+\mathrm{y} \cos ^{3} \theta=\sin \theta \cos \theta$ and
 what is $x^{2}+y^{2}$ equal to?
(a) 0
(b) 1
(c) 2

(d) 3

JNUP-T-EMT
81. How many (b)
 $\sqrt{x+9}=x-3$ have?

> (a) Onle one
(b) Only two $\quad x^{2}-6 x+a=x+a$
(c) Only three

$$
x^{2}-7 x=0
$$

(d) None

$$
\begin{aligned}
& 270=0 \\
& x(x-7)=0,0
\end{aligned}
$$

82. If $x=97+56 \sqrt{3}$, then what is the value of $\times$ ? $\sqrt[4]{x}+\frac{1}{\sqrt[4]{x}} ?$
(a) 7 $5 \sqrt{3}, 5$
(b) 6
(c) 5
(d) 4
(6) $(2+\sqrt{3}) 716^{6}$
83. Let $L$ be the LCM and $H$ be the HCF of two If the numbers. L and H are in the ratio $3: 2$. If the sum of the two numbers is 45 , then what is the product of the numbers?
(a) 243
(b) 486
(c) 504
(d) Cannot be determined due insufficient data

$$
C \times \text { HIN }=45
$$ 4. A man walks at an average speed of $3 \mathrm{~km} / \mathrm{hr}$ from his home and reaches office 40 minutes early. If he walks at an average speed of $2 \mathrm{~km} / \mathrm{hr}$, he would reach office 40 minutes late. What is the distance between his home and office ?


(c) 10 km

のニ
equal to ? $\quad=6$, then what is $2^{x-1}+2^{3-x}$ (a) $4 \quad x_{1}=1 \quad 2^{3}+2^{1}$
(b) 3
(c) 2
(d) 1

86. If $x\left(a-b+\frac{a b}{a-b}\right)=y\left(a+b-\frac{a b}{a+b}\right)$ and $x+y=2 a^{3}$, then what is $x-y$ equal to?
(a) $-2 b^{3}$
(b) $-2 a b^{3}$
(c) $2 b^{3}$
(d) $2 a b^{3}$
87. Which one of the following is a factor of $3 \sqrt{3} x^{3}+2 \sqrt{2} y^{3}-18 x y+6 \sqrt{6} ?$
(a) $\sqrt{3} x+\sqrt{2} y-\sqrt{3}$
(b) $\sqrt{3} x+\sqrt{2} y-\sqrt{6}$
(c) $3 x^{2}+2 y^{2}-\sqrt{18} x-\sqrt{12} y-\sqrt{6} x y+6$
(d) $3 x^{2}+2 y^{2}+\sqrt{18} x+\sqrt{12} y-\sqrt{6} x y+6$
88. What is number of digits in the expansion of
$125^{100}$ ? (Given $\log _{10} 2=0.301$ )
(a) 69
(b) 70
(c) 209
(d) 210
89. What is the HCF of
$\stackrel{a c x^{3}+b c x^{2}+a d x^{2}+a c d x+b d x+b c d \text { and }}{ }$ $\mathrm{adx}^{3}+\mathrm{acx}{ }^{2}+\mathrm{bdx}{ }^{2}+\mathrm{bcx}+\mathrm{acdx}+\mathrm{bcd}$ if $\operatorname{HCF}(c, d)=1, c \neq d$ ?
(a) $\quad-$
(b) $\mathrm{cx}+\mathrm{d}$
(c) $a x+d$
(d) $a x+b$
90. If $\mathrm{x}^{\mathrm{n}}-\mathrm{py}+\mathrm{q} \mathrm{z}^{\mathrm{n}}$ is divisible by $x^{2}+a b y z-b z x-a x y$, then what is $\frac{p}{a^{n}}-\frac{q}{b^{n}}$ equal to ?
(a) -1
(b) 0
(c) 1
(d) 2
91. If $\mathrm{a}^{2}-\mathrm{bc}=\alpha, \mathrm{b}^{2}-\mathrm{ac}=\beta, \mathrm{c}^{2}-\mathrm{ab}=\gamma$, then
what is $\frac{\mathrm{a} \alpha+\mathrm{b} \beta+\mathrm{c} \mathrm{\gamma}}{(\mathrm{a}+\mathrm{b}+\mathrm{c})(\alpha+\beta+\gamma)}$ equal to ?
(a) $\mathrm{a}+\mathrm{b}-\mathrm{c}$
(b) $\mathrm{a}-\mathrm{b}+\mathrm{c}$
(c) $-\mathrm{a}+\mathrm{b}+\mathrm{c}$

12
(d) 1
92. If $(x-1)^{3}$ is a factor of $x^{4}+\alpha x^{3}+\beta x^{2}+\gamma x-1$,
(a) $\mathrm{x}+1$
(b) $x-3$
(c) $\mathrm{x}+2$
(d) $x$
93. A 2 -digit number is such that the sum of the number and the number obtained by reversing Fue order of the digits of the number is 55 . Further, the difference of the given number and the number obtained by reversing the order of the digits of the number is 45 . What is the product of the digits ?
(a) 5
(b) 2
(c) 1
(d) 0
94. If $A$ and $B$ can finish a work in 10 days, $B$ and C can finish the same work in 12 days, C and A can finish the same work in 15 days; then in how many days can $\mathrm{A}, \mathrm{B}$ and C together finish half of the work?

## (la) 8 days

(b) 5 days
(c) 4 days
(d) 3 days
95. A person borrowed $₹ 10,000$ at $12 \%$ rate of interest per annum compounded quarterly for 10,000 at $12 \%$ rate of
a period of 9 mone by him to settle his. What is the interest paid (a) settle his account after 9 months?
(a) ₹ 927.27
(b) ₹ $947 \cdot 47$
(c) ₹ 967.67
(d) ₹ 987.87
96. For what relation between $a$ and $b$ is the equation $\sin \theta=\frac{a+b}{2 \sqrt{a b}}$ possible? $a$ and $b$ is the

97. Three persons A, B and C together can do a piece of work in 36 days. $A$ and $B$ together can do five times as much work as $C$ alone; $B$ and $C$ together can do as much work as $A$ alone. If A and C together can do n times as much work as B alone, then what is the value
(a) 1.5
(b) 2
(c) 2.5

98. If $\frac{2 \mathrm{a}}{3}=\frac{4 \mathrm{~b}}{5}=\frac{3 \mathrm{c}}{4}$, then what is the value of

$$
\frac{18}{a} \sqrt{a^{2}+c^{2}-b^{2}} ?
$$

(a) $3 \sqrt{5}$
(b) $\sqrt{355}$
(c) $\sqrt{375}$
(d) $3 \sqrt{15}$
100. If the median of observations
$\stackrel{12,1}{-1} 8,54,61,28,45,35,21,17$
is $M$, then what is the value of $2 M+5$ ?
(a) 12
(b) 28
(c) 52

99. The sum of deviations of $n$ numbers from 10 and 20 are a, b respectively. If $\frac{b}{a}=-4$, then what is the mean of these $n$ numbers?
(a) 12
(b) 14
(c) 16
(d) 18

