Mathematics

Test Admission Ticket No.  
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Question Booklet Version Code A  
Question Booklet Sr. No. 84681  
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The volume of the tetrahedron formed by the points \((1, 1, 1), (2, 1, 3), (3, 2, 2)\), and \((3, 3, 4)\) in cubic units is

\[
\begin{align*}
\overrightarrow{AB} &= 2\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}, \\
\overrightarrow{AC} &= 2\mathbf{i} + 3\mathbf{j} + 3\mathbf{k}, \\
\overrightarrow{AD} &= 2\mathbf{i} + 2\mathbf{j} + 3\mathbf{k} \\
\text{Volume of the tetrahedron} &= \frac{1}{6} [\overrightarrow{AB} \times \overrightarrow{AC} \cdot \overrightarrow{AD}] = \frac{5}{6}
\end{align*}
\]
4. In the group \( \{1, -1\} \) under the binary operation \( \ast \) defined by \( a \ast b = ab + a + b \), the inverse of 10 is

a) \( \frac{1}{10} \)

b) \( \frac{11}{10} \)

c) \( \frac{-11}{10} \)

\( \checkmark \)

\( \frac{1}{10} \)

7. If \( 3x \)

a) \( \frac{1}{10} \)

b) \( \frac{1}{10} \)

c) \( \frac{-11}{10} \)

d) \( \frac{-1}{10} \)

3. In the group \( \{1, 2, 3, 4, 5, 6\} \) under multiplication mod 7, \( 2^4 \times 4 = \)

a) 1

b) 4

c) 2

\( \checkmark \)

d) 3

\( \checkmark \)

The group \( \mathbb{Z} \) has

a) exactly one subgroup

b) exactly two subgroups

c) no subgroups

\( \checkmark \) infinitely many subgroups

10. The group \( \mathbb{Z} \) has

a) exactly one subgroup

b) exactly two subgroups

c) no subgroups

d) infinitely many subgroups

Space for calculation / rough work
7. If $3x = 5 \pmod{7}$, then $x = 4$.
   a) $x = 2 \pmod{7}$
   b) $x = 3 \pmod{7}$
   c) $x = 4 \pmod{7}$
   d) none of these

8. The argument of the complex number $\sin \left( \frac{6\pi}{5} \right) + i \left( 1 + \cos \frac{6\pi}{5} \right)$ is
   a) $\frac{\pi}{10}$
   b) $\frac{5\pi}{6}$
   c) $\frac{3\pi}{10}$
   d) $\frac{2\pi}{5}$

9. The maximum value of $n < 101$ such that $1 + \sum_{i=1}^{n} i^2 = 0$ is
   a) 96
   b) 97
   c) 99
   d) 100
1. The value of \((1+\sqrt{-3})^2 + (-1-\sqrt{-3})^2\) is

(a) 2

(b) 4

(c) 2

(d) 0

2. The value of \((1+\sqrt{-3})^2 + (-1-\sqrt{-3})^2\) is

\[2 \cdot 6^2 \left[ \left( \frac{1+\sqrt{-3}}{2} \right)^6 + \left( \frac{-1-\sqrt{-3}}{2} \right)^6 \right]

3. The value of \((1+\sqrt{-3})^2 + (-1-\sqrt{-3})^2\) is

(a) 2

(b) 4

(c) 2

(d) 0

4. All complex numbers \(z\) which satisfy the equation \(\frac{z-6i}{z+6i} = 1\) lie on the

(a) imaginary axis

(b) real axis

(c) neither of the axes

(d) none of these

5. If \(x + iy = \text{cis} \theta\), then \(x^2 + y^2 = \text{cos}^2 \theta + \text{sin}^2 \theta\) is equal to

(a) 1

(b) 0

(c) \(\text{cis} \theta\)

(d) \(\text{cis} -\theta\)

6. The value of \(\sin \left( \cot^{-1} \left( \cos \left( \tan^{-1} \frac{1}{x} \right) \right) \right)\) is

(a) \(\frac{1-x^2}{1+x^2}\)

(b) \(\frac{1-x^2}{\sqrt{1+x^2}}\)

(c) \(\frac{1-x^2}{1+x^2}\)

(d) \(\frac{1+x^2}{\sqrt{1+x^2}}\)
3. The value of $\alpha \neq 0$ for which the function $f(x) = 1 + \alpha x$ is the inverse of itself is

4. Let $y = f(\chi)$, $\chi = 1 + \lambda \chi$ \implies $\chi = \frac{y - 1}{\alpha}$

5. $f(x)$ is the inverse of itself

6. $x - 1 = (1 + \lambda x)$

7. $\alpha^{2} - 1) \chi + (\lambda + 1) = 0$

8. $(\lambda + 1) \alpha \chi - \chi + 1 = 0$

9. If $x^{r}$ occurs the expansion of $\left(\frac{x + 1}{x}\right)^{r}$, then its coefficient is

10. $k^\text{th} \text{ term} = \frac{n!}{k!} \left(\frac{1}{x}\right)^{n-k}$

11. Power of $x$, $x^{2k-m}$.

12. Set $x^{2k-m} = y^{r}$,

13. $2k - m = \frac{n + m}{2}$

14. If $\tan A - \tan B = x$ and $\cot A - \cot B = y$, then $\cot (A - B) =$

15. \begin{align*}
    \frac{1}{y} - \frac{1}{x} & = \frac{\tan A - \tan B}{\tan A \cdot \tan B} = y \quad \text{Given} \quad \tan - \tan B = x - (2) \\
    \frac{1}{\tan B} + \frac{1}{\tan A} & = \frac{\tan A - \tan B}{\tan A \cdot \tan B} = y - (2) \\
    \text{Eq (2) + 3} & = \tan A - \tan B = x/y \quad \text{Put this value in eqn (1)}
\end{align*}

16. $\cot (A - B) = \frac{1 + \frac{1}{y}}{x} = \frac{1}{x} + \frac{1}{y}$
Mathematics

17. If \( \sin \theta, \cos \theta \), and \( \tan \theta \) are in G.P. then \( \cot \theta = \cot^2 \theta \) is

\[ \cos^2 \theta = \sin \theta \cdot \tan \theta \Rightarrow \cos^2 \theta = \sin^2 \theta \]

a) \( \sqrt{2} \)

b) \( \frac{3}{2} \) (c) \( \frac{1}{2} \)

d) \( 2 \)

18. If \( \frac{3x^2 - 2x + 4}{(x + 1)^3} = \frac{A}{x + 1} + \frac{B}{(x + 1)^2} + \frac{C}{(x + 1)^3} \) then

\( (A + B + C, A, B, C) = \)

a) \( (2,0,0) \)

b) \( (-8,12) \)

c) \( (8,-12) \)

d) \( (-8,12) \)

Put \( x = 0 , \)

then \( A_1 + A_2 + A_3 + A_4 + A_5 + A_6 = 4 \)

only "d" \( (-8,12) \) satisfies

the solution.
19. If \( \log_2 (2^{x+1} + 6) + \log_2 (4^{x+1}) = 5 \), then \( x = \) __________.

\( \log_2 (2^{x+1} + 6) \cdot \log_2 (4^{x+1}) = 5 \)

\( (2^{x+1} + 6) \cdot (2^{2x+2}) = 2^5 \)

\( y = 2^{x+1} \)

\( (y+6)y = 32 \) or \( (y-2)(y^2 + 8y + 16) = 0 \)

Possible values for \( y = 2^{x+1} = 2^1 \) or \( x+1 = 1 \) or \( x = 0 \.

20. If \( a, b, c, d \) are the roots of the equation \( x^4 + 2x^3 + 3x^2 + 4x + 5 = 0 \), then \( 1 + n^2 + b^2 + c^2 + d^2 \) is equal to

\( a) \ -2 \)

\( b) \ 2 \)

\( c) \ 1 \)

\( d) \ 1 \)

\( 1 + (a^2 + b^2 + c^2 + d^2) = 1 + (a + b + c + d)^2 - 2(ab + ac + ad + bc + bd + cd) \)

\( = 1 + (\text{sum of roots})^2 - 2(\text{sum of products of roots}) \)

\( = 1 + 1^2 - 2 \cdot 2 = 5 - 6 = 1 \)

21. If \( C_n, C_1, C_2, \cdots, C_n \) are binomial coefficients of order \( n \), then the value of \( \frac{C_1}{C_2} + \frac{C_3}{C_4} + \frac{C_5}{C_6} + \cdots = \)

\( \frac{2^n + 1}{n+1} \)

Integrate both sides from 0 to 1.

\( \frac{2^n + 1}{n+1} \)

\( m+1 \)

Again, \( \frac{2^n - 1}{m+1} \)

Integrate both sides from 0 to 1.

\( \frac{1}{m+1} \)

22. The value of \( \log_{0.2} \left( \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \cdots + \frac{1}{n} \right) \) is

\( a) \quad \) __________

\( b) \quad \) __________

\( c) \quad \) __________

\( d) \quad \) __________
27. If \( n(A) - n(B) = m \), then the number of possible bijections from \( A \) to \( B \) is
   a) \( m \)
   b) \( m! \)
   c) \( m^2 \)
   d) \( m \cdot m! \)

28. \( \sin^{-1} \left[ x \sqrt{1-x} - \sqrt{x \sqrt{1-x^2}} \right] = \sqrt{1-(x^2)} - \sqrt{x \sqrt{1-x^2}} \)
   a) \( \sin^{-1}x - \sin^{-1} \sqrt{1-x} \)
   b) \( \sin^{-1}x + \sin^{-1} \sqrt{1-x} \)
   c) \( \sin^{-1}x - \sin^{-1} \sqrt{x} \)
   d) \( \sin^{-1}x + \sin^{-1} \sqrt{x} \)

29. If \( \tan \theta + \tan 4\theta + \tan 7\theta = \tan \theta \cdot \tan 4\theta \cdot \tan 7\theta \), then the general solution is
   a) \( \theta = \frac{n \pi}{4} \)
   b) \( \theta = \frac{n \pi}{12} \)
   c) \( \theta = \frac{n \pi}{6} \)
   d) none of these

30. If a vehicle with the point \((-3, 1)\) as its center touches the straight line \(x + 2y + 9 = 0\) then the coordinates of the points of contact is
   a) \((-3, 3)\)
   b) \((-3, -3)\)
   c) \((0, 0)\)
   d) \((\frac{7}{3}, \frac{-17}{3})\)

   \[ \tan \theta = (1, 1) \]

31. \[ x - 2y = 0 \]
   \[ x + 2y + 9 = 0 \]
   \[ y = 2x + c \]
   \[ y = 2x - 3 \]
   \[ \text{solve eqns (1) & (3)} \]
   \[ x = -3 \]
   \[ y = -3 \]
17. If the circles $x^2 + y^2 + 2gx + 2fy = 0$, and $x^2 + y^2 + 2g'x + 2f'y = 0$ touch each other, then the given condition is:

$$\frac{2g}{2g'} = \frac{2f}{2f'} \Rightarrow g'g = f'f$$

b) 

28. The number of common tangents to the circles $x^2 + y^2 - 4$ and $x^2 + y^2 - 4x + 2y - 4 = 0$ is:

a) 2

b) 3

c) 4

d) none of these

29. The length of the tangent drawn from any point on the circle $x^2 + y^2 - 4x + 6y - 4 = 0$ to the circle $x^2 + y^2 - 4x + 6y - 4 = 0$ is:

a) 2

b) 4

c) 1

d) none of these

30. If the foci of the ellipse $\frac{x^2}{25} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$ coincide, then the value of $b^2$ is:

a) 25

b) 9

c) 16

d) 4

31. The latus rectum of the ellipse is half the minor axis. Then its eccentricity is

a) $\frac{1}{\sqrt{2}}$

b) $\frac{1}{\sqrt{3}}$

c) $\sqrt{3}$

d) none of these
32. The ends of the latus rectum of the parabola $x^2 + 10x - 16y + 25 = 0$ are

$$\sqrt{(3,4), (-13,4)}$$

b) $(5,-8), (-5,8)$

c) $(3,-4), (13,4)$

d) $(-3,-4), (13,-4)$

33. Which of the following functions is differentiable at $x=0$?

a) $\cos(|x|) + |x|$  

b) $\cos(|x|) - |x|$  

c) $\sin(|x|) + |x|$  

d) $\sin(|x|) - |x|$  

$$\frac{dy}{dx} = \frac{\cos t + \log \tan \frac{t}{2}}{2}, y = e^{\sin t}, \text{then } \frac{dy}{dx} =$$

a) $\tan t$  

b) $\cot t$  

c) $-\cot t$  

d) $-\tan t$

34. If

$$\frac{dy}{dt} = \frac{\cos t \sin t}{\cos^2 t} - \tan t$$

Find $\frac{dy}{dt}$ and $\frac{dx}{dt}$

$$\frac{dy}{dt} = \frac{\cos t \sin t}{\cos^2 t} - \tan t$$

a) $\tan t$  

b) $\cot t$  

c) $-\cot t$  

d) $-\tan t$

35. If

$$\begin{bmatrix}
\tan \theta & -1 \\
1 & \tan \theta
\end{bmatrix}
= \begin{bmatrix}
a & b \\
b & a
\end{bmatrix}^{-1}, \text{then}
$$

$$\begin{bmatrix}
1 - \tan^2 \theta & -2 \tan \theta \\
2 \tan \theta & 1 - \tan^2 \theta
\end{bmatrix}
= \begin{bmatrix}
\frac{\cos \theta - \sin \theta}{\cos \theta + \sin \theta} & -2 \sin \theta \\
\sin \theta \cos \theta & \cos \theta - \sin \theta
\end{bmatrix}
$$

a) $a = 1 = b$  

b) $a = \cos 2\theta, b = \sin 2\theta$  

c) $a = \sin 2\theta, b = \cos 2\theta$  

d) $a = \cos \theta, b = \sin \theta$

Space for calculation/rough work

36. If

$$\begin{bmatrix}
\cos \theta & -\sin \theta \\
\sin \theta & \cos \theta
\end{bmatrix}
= \begin{bmatrix}
a & -b \\
b & a
\end{bmatrix}^{1/2}, \text{then}
$$

$$\begin{bmatrix}
\cos \theta - \sin \theta \\
\sin \theta \cos \theta + \sin \theta
\end{bmatrix}
= \begin{bmatrix}
\cos \theta & -\sin \theta \\
\sin \theta & \cos \theta
\end{bmatrix}
$$

a) $a = \cos \theta$  

b) $b = \sin \theta$  

36. If \( A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} \), then \( A^n \) is
a) \( \begin{bmatrix} 1 & 2n \\ 0 & 1 \end{bmatrix} \)
b) \( \begin{bmatrix} 1 & n^2 \\ 0 & 1 \end{bmatrix} \)
c) \( \begin{bmatrix} 1 & 2^n \\ 0 & 1 \end{bmatrix} \)
d) \( \begin{bmatrix} 1 & n^2 \\ 1 & 1 \end{bmatrix} \)

37. If \( a, \beta, \gamma \) are the roots of the equation \( x^3 + px + q = 0 \) then the value of the determinant \( \begin{vmatrix} a & \beta & \gamma \\ \beta & \gamma & a \\ \gamma & a & \beta \end{vmatrix} \) is.
a) \( q 
\)
b) \( 0 
\)
c) \( p 
\)
d) \( p^2 - 2q 
\)

38. The number of distinct real roots of \( \begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} \) in the interval \( \left[ \frac{-\pi}{4}, \frac{\pi}{4} \right] \) is
a) 0
b) 1

Space for calculation/rough work
38. The sum of non-prime positive divisors of 450 is
   a) 1209
   b) 1299
   c) 1199
   d) 1099
   Answer: c)

40. The last digit of \( \sum_{p \leq 100} p \cdot \prod_{a=1}^{50} (2n)! \) is
   a) 2
   b) 4
   c) 6
   d) 8
   Answer: d)

41. The interval I such that \( \int_0^1 \frac{dx}{\sqrt{1+x^4}} \equiv 1 \) is given by
   a) \( (0, \frac{1}{\sqrt{2}}) \)
   b) \( \left[ \frac{1}{\sqrt{2}}, 1 \right] \)
   c) \( \left[ \sqrt{2}, 2 \right] \)
   d) \( \left[ \sqrt{2}, \frac{5}{4} \right] \)
   Answer: b)

42. \( \int \log(\tan x) \, dx = \)
   a) \( \frac{x}{2} \)
   b) \( 0 \)
   c) 1
   d) \( \frac{x}{4} \)
   Answer: b)

43. \( \int_0^{\frac{\pi}{2}} \log(\sin x) \, dx = \frac{\pi}{2} \log \left( \frac{\pi}{2} \right) - \int_0^{\frac{\pi}{2}} \log(\cos x) \, dx \)
   \( \Rightarrow \int_0^{\frac{\pi}{2}} \log(\sin x) \, dx = \int_0^{\frac{\pi}{2}} \log(\cos x) \, dx = 0 \)
The value of \( \int \left( ax^3 + bx + c \right) dx \) depends on the

a) value of b
b) value of c
c) value of a
d) values of a and b

The area of the region bound by the curves \( y = x^2 \) and \( y = 4x - x^2 \) is

a) \( \frac{16}{3} \) sq. units
b) \( \frac{8}{3} \) sq. units
c) \( \frac{4}{3} \) sq. units
d) \( \frac{2}{3} \) sq. units

The particular solution of \( \frac{dy}{dx} = \frac{1 + y^2}{1 + x^2} \), when \( x = 1, y = 2 \) is

a) \( 5 \left( 1 + y^2 \right) = 2 \left( 1 + x^2 \right) \)
b) \( 2 \left( 1 + y^2 \right) = 5 \left( 1 + x^2 \right) \)
c) \( 5 \left( 1 + y^2 \right) = (1 + x^2) \)
d) \( (1 + y^2) = 2 (1 + x^2) \)

The solution of the differential equation \( \frac{dy}{dx} = (x + y) \) is

a) \( \frac{1}{x + y} = c \)
b) \( \sin^{-1} (x + y) = x + c \)
c) \( \tan^{-1} (x + y) = c \)
d) \( \tan^{-1} (x + y) = x + c \)

\[ \int 2 \left( ax^3 + bx + c \right) dx = \int c \left( dx \right) \] ; integral depends upon the value of \( c \).

Given parabola are \( y = x^2 \), \( (y - 4) = -(x - 2)^2 \)
\( x \)-coordinate of intersect pt. \( = 0 \) \( \Rightarrow \)
area \( = \int \left( 4x - x^2 \right) dx \)
\( = \int \left( 2x^2 - \frac{2}{3} x^3 \right) dx \)
\( = \frac{8}{3} \) sq. units

The solution of the differential equation \( \frac{dy}{dx} = (x + y) \) is

a) \( \frac{1}{x + y} = c \)
b) \( \sin^{-1} (x + y) = x + c \)
c) \( \tan^{-1} (x + y) = c \)

Put \( x + y = 3 \) \( \Rightarrow \frac{dy}{dx} + 1 = \frac{dz}{dx} \)

Now given equation \( \frac{dz}{dx} + 1 = \frac{dx}{dz} \)
\( \Rightarrow \int dx = \int dz \)
\( \Rightarrow x = \tan^{-1} (x + y) \)
47. The maximum value of \( \left( \frac{1}{\sqrt{x}} \right) \) is
   a) \( e^{1/2} \)
   b) \( \sqrt{e} \)
   c) \( 1 \)
   d) \( e^2 \)

48. Let \( x \) be a number which exceeds its square by the greatest possible quantity, then \( x = \)
   a) \( \sqrt{2} \)
   b) \( \frac{1}{4} \)
   c) \( 3/4 \)
   d) \( 1/3 \)

49. The subtangent at \( x = \pi/2 \) on the curve \( y = x \sin x \) is
   a) 0
   b) 1
   c) \( \pi/2 \)
   d) none of these

50. The value of \( \int \frac{10^{x^2}}{\sqrt{10^{-x} - 10^x}} \, dx \) is
   a) \( \frac{1}{\log_{10}} \sin^{-1}(10^x) + c \)
   b) \( 2\sqrt{10^{-x^2}} + 10^x + c \)
   c) \( \frac{1}{\log_{10}} \sinh^{-1}(10^x) + c \)
   d) \( -\frac{1}{\log_{10}} \sinh^{-1}(10^x) + c \)

51. \( \int \frac{10^{x^2}}{\sqrt{10^{-x} - 10^x}} \, dx \) can be calculated as
   a) \( \frac{1}{\log_{10}} \int \frac{dy}{\sqrt{1 - y^2}} \) with \( y = 10^x \)
   b) \( \frac{1}{\log_{10}} \int \frac{dy}{\sqrt{1 - y^2}} \) with \( y = 10^{-x} \)
   c) \( \frac{1}{\log_{10}} \int \frac{dy}{\sqrt{1 - y^2}} \) with \( y = 10^x \log_{10} 10 \)
   d) \( \frac{1}{\log_{10}} \int \frac{dy}{\sqrt{1 - y^2}} \) with \( y = 10^{-x} \log_{10} 10 \)
\[ \int \left( \frac{1}{\cos^2 x} + \frac{\sin x \cos x}{\cos^3 x} \right) dx = \int e^x \left( \sec^2 x + \tan x \right) dx = \int e^x (f'(x) + f(x)) dx \]

\[ e^x \tan x + C \]

3. The locus of the midpoint of the intercept of the line \( x \cos \alpha + y \sin \alpha = p \) between the coordinate axes is

- a) \( x^2 + y^2 = 4p^2 \)
- b) \( x^2 + y^2 = p^2 \)
- c) \( x^2 + y^2 = 4p^2 \)
- d) \( x^2 + y^2 = p^2 \)

\[ \cos^2 \alpha + \sin^2 \alpha = 1 \]

\[ \frac{p^2}{4x^2} + \frac{p^2}{4y^2} = 1 \]

\[ x^2 + y^2 = 4p^2 \]
If the line through $A = (-1, -5)$ is inclined at an angle $45^\circ$ with the positive direction of the x-axis, then the coordinates of the two points on opposite sides of $A$ at a distance of $3\sqrt{2}$ units are

a) $(7, 2)$, $(1, 8)$

Slope $= \tan 45^\circ = 1$ \[ y = x + c \]

b) $(7, 2)$, $(1, -8)$

P$(4, 5)$ lies on line $8y$, $c = -9$

Now, $e^{\mu} \Rightarrow y = x - 9$

$\sqrt{17}$, $-2$, $(1, 8)$

c) Only $(7, 2)$ and $(1, -8)$ lies on above straight line $e^{\mu}$, do not need for further calculation

d) $(7, 2)$, $(-1, 8)$

If the line $px + qy = 0$ coincides with one of the lines given by $ax^2 + 2hxy + by^2 = 0$ then

a) $aq^2 + 2bhp + b^2 = 0$

$\gamma = -\frac{b}{a} x$; put in given pair of lines

b) $aq^2 + 2bhp + b^2 = 0$

$\alpha$, $a x^2 + 2h x (-\frac{b}{a} x) + b p^2 x^2 = 0$

c) $aq^2 - 2bhp + b^2 = 0$

$d$) None of these

The function $f(x) = \frac{\log((1+ax) - \log(1-bx)}{x}$ is undefined at $x = 0$. The value which should be assigned to $f$ at $x = 0$ so that it is continuous at $x = 0$ is

a) $\frac{a+b}{2}$

b) $a+b$

c) $\log_2(a+b)$

d) $a-b$

Space for calculation/rough work
Mathematics

67. \( \lim_{n \to \infty} \frac{(1^2 + 2^2 + \cdots + n^2)}{(n+1)(n+10)(n+100)} = \left( \lim_{n \to \infty} \frac{n(n+1)(2n+1)}{6(n+1)(n+10)(n+100)} \right) \left( \lim_{m \to \infty} \sqrt[m]{m} \right) \)

a) 3
b) \( \frac{1}{3} \)
c) 2
\( \frac{2}{3} \)
d) \( \infty \)

68. The number of triangles in a complete graph with 10 non-collinear vertices is

\[ \text{no. of triangle} = \binom{10}{3} = \frac{10 \times 9 \times 8 \times 7}{2 \times 3 \times 6} = 120 \]

69. The angle between hands of a clock when the time is 4.25 AM is

a) 17 \( \frac{1}{2} \)°
b) 14 \( \frac{1}{2} \)°
c) 13 \( \frac{1}{2} \)°
d) 12 \( \frac{1}{2} \)°

\[ \theta_1 = \frac{360 \times 4}{12} = 120° \]
\[ \theta_2 = \frac{360 \times 4 + 30 \times 25}{12} = 132.5° \]
\[ \theta_1 - \theta_2 = 150 - 132.5 = 17 \frac{1}{2}° \]