MATHS

BOOKS - KCET PREVIOUS YEAR PAPERS

MODEL TEST PAPER 4

Mathematics

1. Let G be subset of real numbers. For a,b, $\hat{I}$ G, define $a * b = a + b - ab$. Then $*$ is not a binary operation on the set of

A. natural numbers

B. integers

C. rational numbers

D. real numbers

Answer: A

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2. If $z = x + iy$ and $x^2 + y^2 = 1$. Then the argument of the complex, number $\frac{(z-1)}{(z+1)}$ is

A. 0

B. $\pi/3$

C. $\pi/4$

D. $\pi/2$.

Answer: D

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3. Let α represent an imaginary cube root of unity Then the value of

$$\left(2+\alpha^{13}+\alpha^{29}\right)^{99}+\left(1+\alpha^{19}-\alpha^{35}\right)^{96}-\left(1-3\alpha^{25}+\alpha^{38}\right)^{48}$$

is

A. $1/2$

B. $-1/2$

C. -1

D. 1

Answer: D

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4. If A,G,H be the arithmetic, geometric and harmonic means, respectively, of two different natural numbers, then

A. $A > H > G$

B. $H > A > G$

C. $A > G > H$

D. $G > A > H.$

Answer: C

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5. The value of the product

$6^{\frac{1}{2}} \times 6^{\frac{1}{4}} \times^{\frac{1}{8}} \times 6^{\frac{1}{16}} \ldots\ldots \infty$ is

A. 6

B. 36

C. 216

D. ∞

Answer: A

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6. If the roots of the equation $x^2 - lx + m = 0$ differ by 1, then

A. $l^2 - 4m - 1 = 0$

B. $l^2 + 4m + 1 = 0$

C. $m^2 + 4l + 1 = 0$

D. $m^2 - 4l - 1 = 0$

Answer: A

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7. In the expression of $\left(\sqrt{x} + \frac{1}{3x^2}\right)^{10}$ the constant term, independent of x, is

A. 5

B. 8

C. 45

D. 90

Answer: A

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8. If $A = \begin{bmatrix} 0 & 1 \\ 0 & 2 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 \\ 0 & 0 \end{bmatrix}$, then AB is equal to

A. $\begin{bmatrix} 2 & 4 \\ 0 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 0 & 2 \\ 0 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 0 & 5 \\ 0 & 0 \end{bmatrix}$

Answer: C

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9. If $A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 0 & 2 \\ 2 & 1 & 0 \end{bmatrix}$ then the matrix of co-factors of A, is

A. $\begin{bmatrix} 2 & 1 & 2 \\ 3 & 0 & 1 \\ 1 & 2 & 0 \end{bmatrix}$

B. $\begin{bmatrix} -2 & 4 & 1 \\ 1 & -2 & 4 \\ 6 & -3 & -3 \end{bmatrix}$

C. $\begin{bmatrix} -2 & 1 & 6 \\ 4 & -2 & -3 \\ 1 & 4 & -3 \end{bmatrix}$

D. $\begin{bmatrix} -2 & -4 & 1 \\ -1 & -2 & -4 \\ 6 & 3 & -3 \end{bmatrix}$

Answer: B

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10. If $B = \begin{bmatrix} 6 & 7 \\ 8 & 9 \end{bmatrix}$ then B^{-1} is equal to

A. $\begin{bmatrix} \frac{25}{3} & -8 \\ -7 & 6 \end{bmatrix}$

B. $\begin{bmatrix} 9 & -7 \\ -8 & 6 \end{bmatrix}$

C. $\begin{bmatrix} -\frac{9}{2} & \frac{7}{2} \\ 4 & -3 \end{bmatrix}$

D. $\begin{bmatrix} -6 & -7 \\ -8 & -9 \end{bmatrix}$

Answer: C

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11. If p is a prime integer, the set $G = \{1, 2, \ldots . P - 1\}$ will form an abelion group with respect to the binary composition defined as

A. addition of integers

B. multiplication of integers

C. addition modulo p

D. multiplication modulo p.

Answer: D

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12. The value of $\sin^2 5^\circ + \sin^2 10^\circ + \sin^2 15^\circ + ... + \sin^2 90^\circ$ is equal to

A. 7

B. 8

C. 9

D. $9\frac{1}{2}$.

Answer: D

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13. $\frac{\sin^3 A + \sin 3A}{\sin A} + \frac{\cos^3 A - \cos 3A}{\cos A}$ is equal to

A. $\sin 3A$

B. $\cos 3A$

C. $\sin^3 A + \cos^3 A$

D. 3

Answer: D

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14. If $\cos\theta = \dfrac{(a\cos\phi + b)}{(a + b\cos\phi)}$, then the value of $\tan(\theta/2)$ is equal to

A. $\sqrt{\dfrac{a-b}{a+b}}\tan\dfrac{\phi}{2}$

B. $\sqrt{\dfrac{a+b}{a-b}}\tan\dfrac{\phi}{2}$

C. $\sqrt{\dfrac{a-b}{a+b}}\cos\dfrac{\phi}{2}$

D. $\sqrt{\dfrac{a+b}{a-b}}\sin\dfrac{\phi}{2}$.

Answer: A

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15. If $(\sin A + \sin B = a)$ and $(\cos A + \cos B = b)$ then the value of $\cos(A + B)$ is equal to

A. $\frac{a^2 + b^2}{b^2 - a^2}$

B. $\frac{2ab}{a^2 + b^2}$

C. $\frac{b^2 - a^2}{a^2 + b^2}$

D. $\frac{a^2 - b^2}{a^2 + b^2}$

Answer: C

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16. The value of $\tan\left[2 \tan^{-1}\frac{1}{5} - \frac{\pi}{4}\right]$ is equal to

A. $-7/17$

B. $5/16$

C. $5/4$

D. $7/17$

Answer: A

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17. The value of $\cot^{-1} 9 + \operatorname{cosec}^{-1}\left(\frac{\sqrt{41}}{4}\right)$, is equal to

A. $\pi/4$

B. $\pi/3$

C. $\pi/2$

D. π

Answer: A

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18. Value of $[2(\cos 15^\circ + i\sin 15^\circ)]^6$, is equal to

A. 32 i

B. 48 i

C. 64 i

D. 128 i

Answer: C

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19. The solution set of $\sin^2\theta = \cos\theta + \frac{1}{4}$, in the interval $0 \leq \theta \leq 2\pi$, is

A. $\left(\frac{\pi}{3}, \frac{2\pi}{3}\right)$

B. $\left(\frac{\pi}{3}, \frac{5\pi}{3}\right)$

C. $\left(-\frac{\pi}{3}, \frac{2\pi}{3}\right)$

D. $\left(\frac{2\pi}{3}, \frac{5\pi}{3}\right)$

Answer: B

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20. If the equation

$hxy + gx + fy + c = 0 (h \neq 0)$, represents a pair of straight lines, then

A. $fc = gh$

B. $\mathrm{f\,h} = cg$

C. $\mathrm{f\,h} = c^2g^2$

D. $fg = ch.$

Answer: D

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21. The orthocentre of the triangle whose sides are given by equations $x = 1, y = 0$ and $x + y - 2 = 0$, is

A. $(-1, 0)$

B. $(0, 1)$

C. $(1, 0)$

D. $(1, 1)$

Answer: C

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22. The points $(1, 3)$ and $(5, 1)$ are the opposite vertices of a rectangle. The other two vartices lie on the line $y = 2x + c,$ then the value of c will be

A. 2

B. -2

C. 4

D. -4

Answer: D

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23. If angle C of the triangle ABC is right angle and the coordinates of A and B are $(-3, 4)$ and $(3, -4)$ respectively, then the equation of the circumcircle of the ΔABC, is

A. $x^2 + y^2 - 6x + 8y = 0$

B. $x^2 + y^2 - 8x + 1 = 0$

C. $x^2 + y^2 = 25$

D. $x^2 + y^2 - 6x = 4$

Answer: C

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

A. 1

B. 2

C. 3

D. 4

Answer: C

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25. The length of the major axis of the ellipse

$2x^2 + y^2 - 8x - 2y + 1 = 0$ is

A. 2

B. $2\sqrt{2}$

C. 4

D. $4\sqrt{2}$

Answer: B

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26. The focus of the parabola

$2y = x^2 + 2x + 2$ is

A. $(-1, -1)$

B. $(-1, 1)$

C. $(1, -1)$

D. $(1, 1)$.

Answer: B

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27. The locus of the point $(2 - \sec\theta, 1 + 2\tan\theta)\theta$ being the parameter, is

A. circle

B. parabola

C. ellipse

D. hyperbola.

Answer: D

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28. The number of normals that can be drawn from an external point to the parabola $y^2 = 4ax$, is

A. 0

B. 1

C. 2

D. 3

Answer: D

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29. If $f(x) = \frac{x-2}{x+2}, x \neq -2$ then $f^{-1}(x)$, is equal to

A. $\frac{4(x+2)}{x-2}$

B. $\frac{(x+2)}{4(x-2)}$

C. $\frac{x+2}{x-2}$

D. $\frac{2(1+x)}{1-x}$

Answer: D

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30. $f(xy) = f(x) + f(y)$ is true for all

A. polynomial functions f

B. trigonometric functions f

C. exponential functions f

D. logarithmic functions f.

Answer: D

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31. $\lim_{x \to 0} \frac{e^{x^2} - \cos x}{x^2}$, is equal to

A. $1/2$

B. $3/2$

C. $2/3$

D. 2

Answer: B

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32. If $\lim_{x \to 0} \phi(x) = a^2, a \neq 0$, then $\lim_{x \to 0} \phi(x/a)$ is equal to

A. a^2

B. $1/a^2$

C. addition modulo p

D. $1/a^3$

Answer: A

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33. To make $f(x) = (x+1)^{\cot x}$ continuous at $x = 0$, $f(0)$ must defined as

A. 0

B. e

C. $1/e$

D. 1

Answer: B

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34. If $y = \log_{10} x + \log_x 10 + \log_x x + \log_{10} 10,$ then $\left(\frac{dy}{dx}\right)_{x=10}$ is equal to

A. 2

B. 1

C. -1

D. 0

Answer: D

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35. The minium distance from the point (4,2) to the curve $y^2 = 8x$, is equal to

A. $\sqrt{2}$

B. $2\sqrt{2}$

C. 2

D. $3\sqrt{2}$

Answer: B

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36. If $y = x^{x^{x^{x^{\infty}}}}$, then $x\frac{dy}{dx}$ is equal to

A. $\frac{y}{1 - y\log x}$

B. $\frac{y}{x(1 - y\log x)}$

C. $\frac{y^2}{x(1 - \log x)}$

D. $\frac{y^2}{1 - y \log x}$.

Answer: D

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37. The derivative of $\sec^{-1}\left[\frac{1}{2x^2 - 1}\right]$ with respect to $\sqrt{1 - x^2}$ at $x = 1/2$ is given by

A. 2

B. $1/2$

C. 4

D. $1/4$

Answer: C

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38. If $y = \sin(\log x)$, then

A. $\frac{d^2y}{dx^2} = -y$

B. $\frac{d^2y}{dx^2} = 0$

C. $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$

D. $\frac{d^2y}{dx^2} = -y^2$

Answer: C

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39. If $\int \frac{dx}{\sqrt{1-x^2}} = \sin^{-1} x \equiv f_1(x)$ (say) and $\int \frac{dx}{\sqrt{1-x^2}} = -\cos^{-1} x \equiv f_2(x)$ (say), then

A. $f_1(x) = f_2(x)$

B. $f_1(x) \cdot f_2(x) =$ constant

C. $\frac{f_1(x)}{f_2(x)} =$ constant

D. $f_1(x) - f_2(x) =$ constant

Answer: D

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40. $\int e^{e^{e^x}} \cdot e^{e^x} \cdot e^x \, dx$ equal to

A. $e^{e^{e^x}}$

B. e^{e^x}

C. e^x

D. x.

Answer: A

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41. $\int_0^{\pi/2} |\sin x - \cos x| dx$ is equal to

A. 0

B. $2\left(\sqrt{2}-1\right)$

C. $2\sqrt{2}$

D. $2\left(\sqrt{2}+1\right)$

Answer: B

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42. $\int_0^{a+b} \frac{f(x-a)}{f(x-a)+f(b-x)} dx$, is equal to

A. a

B. b

C. 0

D. $(a+b)/2$.

Answer: D

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43. The area bounded by the parabolas $y = x - x^2$ and $y = x^2 - x$, is equal to

A. $1/5$

B. $1/3$

C. $1/2$

D. 1

Answer: B

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44. $\int_0^1 x(1-x)''dx$ is equal to

A. $\frac{1}{n+1} + \frac{1}{n+2}$

B. $\frac{n+1}{n+2}$

C. $\frac{1}{(n+1)(n+2)}$

D. $(n+1)(n+2)$

Answer: C

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45. The order and degree of the differential equation $\left[2-\left(\frac{dy}{dx}\right)^2\right]^{2/3}=\frac{d^2y}{dx^2}$, are respectively given by

A. 2,2

B. 1,1

C. 1,3

D. 2,3

Answer: D

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46. Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three independent vectors In the vector $\vec{a} + 2\vec{b} + \lambda\vec{c} = \lambda\vec{a} + \mu\vec{b} + \vec{c}$, then

A. $\lambda = \mu$

B. $\lambda = 2\mu$

C. $\lambda = 1, \mu = 2$

D. $\lambda = \mu^2, \mu = \lambda^2$

Answer: C

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47. If $\vec{A}+\vec{B}+\vec{C}=0$ and $\left|\vec{A}\right|=4, \left|\vec{B}\right|=5$ and $\left|\vec{C}\right|=1$, then the angle between vectors $\vec{B}$ and $\vec{C}$ is equal to

A. 0°

B. 180°

C. 30°

D. 60°

Answer: B

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48. The value of $\hat{i} \times \left(\vec{a} \times \hat{i}\right) + \hat{j} \times \left(\vec{a} \times \hat{j}\right) + \hat{k} \times \left(\vec{a} \times \vec{k}\right)$ is equal to

A. $2\vec{a}$

B. $\vec{a}$

C. $\vec{a}/2$

D. $\vec{a}/3.$

Answer: A

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49. If $\left[\vec{a}, \vec{b}, \vec{c}\right]$ denotes the scalar triple product of the vectors $\vec{a}, \vec{b}, \vec{c}$, then $\left[\vec{a}+\vec{b}, \vec{b}+\vec{c}, \vec{c}+\vec{a}\right]$ is equal to

A. 0

B. $\left[\vec{a}, \vec{b}, \vec{c}\right]$

C. $3\left[\vec{a}, \vec{b}, \vec{c}\right]$

D. $2\left[\vec{a}, \vec{b}, \vec{c}\right]$

Answer: D

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50. The equation $r^2 - 2\vec{r} \cdot \vec{c} = 0$ represents.

A. a sphere with centre having position vector $-\vec{c}$ and radius of magnitude $\left|\vec{c}\right|$

B. a pair of coincident planes

C. a sphere with origin as centre and radius of magnitude $\left|\vec{c}\right|$

D. a sphere with centre having a position vector $\vec{c}$ and radius of the magnitude $\left|\vec{c}\right|$

Answer: D

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51. The length of the intercepts on the coordinate axes made by the plane $\vec{r} \cdot \left(5\hat{i} + 2\hat{j} + \hat{k}\right) = 13$ are

A. 5,2,1, units

B. $\frac{12}{5}, \frac{13}{2}, 13$ units

C. $\frac{5}{13}, \frac{2}{13}, \frac{1}{13}$ units

D. $\frac{5}{\sqrt{30}}, \frac{2}{\sqrt{3}}, \frac{1}{\sqrt{30}}$ units .

Answer: C

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52. The moment of force $\hat{i} + 2\hat{j} + 3\hat{k}$ passing through the point $A(2, 1, 4)$ about the point $B(5, 0, 1)$, is equal to

A. $3\hat{i} - 2\hat{j} - 9\hat{k}$

B. $-3\hat{i} + 2\hat{j} + 9\hat{k}$

C. $-3\hat{i} + 12\hat{j} - 7\hat{k}$

D. $3\hat{i} + 12\hat{j} + 7\hat{k}$

Answer: C

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53. A particle being acted upon by the forces $5\hat{i} - 2\hat{j} + \hat{k}$ and $3\hat{i} + \hat{j} - 2\hat{k}$ is displaced from the point $(2, 3, 5)$ to the point $(7, -2, 4)$. The work done by the forces is equal to

A. 34 units

B. 46 units

C. 56 units

D. 66 units.

Answer: B

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54. If $p \to (q \vee r)$ is false, then the truth values of p,q,r are respectively

A. T,T,T

B. F,T,T

C. F,F,F

D. T,F,F.

Answer: D

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55. The contrapositive of the statement "If $2^2 = 5$ then I get first class" is

A. if I do not get a first class, then $2^2 = 5$

B. if I so not get a first class, then $2^2 \neq 5$

C. if I get a first class, then $2^2 = 5$

D. none of these.

Answer: B

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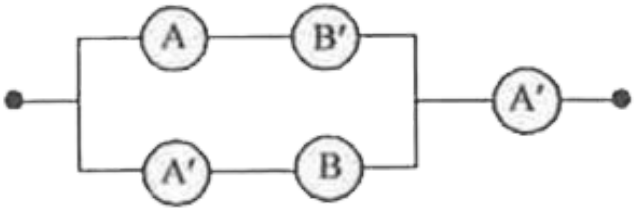
56. Determine when the current will flow in the circuit



A. there would be no current flow

B. when A is off and is on

C. when A is on and is off

D. when A is on and B is on.

Answer: B

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57. If $f: R \to$ is defined by $f(x) = \frac{1-x}{1+x}$. Then the composition $(fofofof)(x)$ has the value

A. $+4x$

B. $\left(\frac{1-x}{1+x}\right)^4$

C. x

D. $\frac{1-x}{1+x}$.

Answer: C

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58. Pick out a function which is one - one but not onto

A. Let $A = \{a, b, c\}, B = \{2, 4\}$. Define

$$f: A \to B \text{ as } f(a) = 4, f(b) = 2, f(c) = 2.$$

B. Let $A = \{a, b, c\}, B = \{2, 4, 6, 8\}$. Define

$$f: A \to B \text{ as } f(a) = 8, f(b) = 2, f(c) = 4.$$

C. Let $A = \{a, b, c\}, B = (2, 4, 6\}$. Define

$$f: A \to B \text{ as } f(a) = 2, f(b) = 4, f(c) = 6$$

D. Let $A = \{a, b, c\}, B = \{2, 4, 6, 8\}$. Define

$$f: A \to B \text{ as } f(a) = 2, f(b) = 2, f(c) = 2.$$

Answer: B

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59. Which of the following is false ?

A. if $(a, b) = c$, then c/a and c/b

B. if $ax + by = 1$, then $(a, b) = 1$

C. the number of even primes is finite

D. a composite number need not have a prime divisor.

Answer: D

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60. If $2^8 \equiv (a + 1)(\text{mod } 7)$ is true then a is

A. 3

B. 4

C. 0

D. 5

Answer: A