



## MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C



በጎንደርና አካባቢው ሀገር አቀፍ የ12ኛ ክፍል መልቀቂያ ፈተና የሚወሰዱ ተማሪዎችን በስነልቦናም ሆነ በክህሎት ማዘጋጀትና አጠቃላይ የሥራ፣ ማኅበራዊና ኢኮኖሚያዊ ግንዛቤን የማሳደግ ፕሮጀክት  
(ከዳሽን ቢራ ፋብሪካ አ.ማ ጋር በመተባበር የቀረበ )

ጎንደር የሰላምና የዕድገት ማኅበር (ጎ-ሰ'ማ) በጎንደር እና አካባቢው ከጊዜ ወደ ጊዜ ሥር እየሰደደ የመጣውን የሰላም እጦት እንዲሁም በአካባቢው ሰፍኖ የሚገኘውን ከፍተኛ ኢኮኖሚያዊ ችግር በመቅረፍ ረገድ መንግሥት የሚያደርገውን ጥረት ለመደገፍ የተቋቋመ እና ከኢ.ፌ.ዴ.ሪ የሲቪል ማኅበረሰብ ድርጅቶች ባለሥልጣን ዕውቅና የተሰጠው (የተመዘገበ) ማኅበር ነው፡፡

ጎንደርና አካባቢው እምቅ የሆኑ በርካታ የተፈጥሮ ፀጋዎችንና ሰው ሠራሽ ሃብቶችን ባለቤት ቢሆንም እነዚህን እምቅ ሃብቶች በጋራ አልምቶ በእጅጉ የወደቀውን ኑሮውን ለማሻሻል አልቻለም፡፡ ለዚህም ዋነኛው ምክንያት የማኅበረሰቡ የማኅበራዊና የኢኮኖሚ ግንዛቤ እጥረት መሆኑን በማመን የጎንደር የሰላምና የዕድገት ማኅበር (ጎ-ሰ'ማ) አስፈላጊውን የዘርፉ ንቃት ለመፍጠር እቅድ በመንደፍ እየተንቀሳቀሰ ይገኛል፡፡

ከማኅበረሰቡ አካላት መካከልም የዛሬው ትውልድ አካልና የነገ ሀገር ተረካቢ የሆኑት ተማሪዎች ላይ መሥራት፣ ለማኅበረሰቡ ካላቸው ቅርበት አንፃር ከወዲሁ የማኅበረሰባቸውን ኑሮ ለማሻሻል ዓልመው እንዲሰሩና በዚህ ዙሪያ በንቃት እንዲሳተፉ ማድረግ አጠቃላይ ሥራውን የተሳለጠና የሰመረ የሚያደርገው ይሆናል፡፡

በተለይም ከቅርብ ጊዜ ወዲህ የዩኒቨርሲቲ መግቢያ ፈተና እየወሰዱ ማለፍ ያልቻሉ ተማሪዎች ቁጥር እያሻቀበ መምጣቱ በዚህ ደረጃ ያሉትን ተማሪዎች ማንቃትና ማብቃት የተሻለ ነገን ለመፍጠር በር ከፋች መሆኑ እሙን ነው፡፡

ስለሆነም ይህን የማብቃትና የማንቃት ሥራ ጎ-ሰ'ማ፣ ከ2014 ዓ.ም ክረምት ወቅት ጀምሮ በሁሉም የጎንደር ዞኖች ሥር ባሉት ከ 66 በላይ ወረዳዎች ውስጥ በሚገኙና የ12ኛ ክፍል መልቀቂያ ፈተናን ከሚያስፈትኑ 143 ት/ት ቤቶች መካከል በ80ዎቹ ላይ ለመተግበር አልሟል፡፡ በመጀመሪያው ዙርም በውጤታቸው የተሻሉ 10,000 ( አስር ሺህ ) ተማሪዎችን በመመልመል ለፈተናቸው ዝግጁ እያደረገ እግረ መንገዱንም ለማኅበረሰባቸው የተሻለ ሃሳብና ራይዕ ያላቸው ዜጎች እንዲሆኑ በመሥራት ለራሳቸውም ሆነ ለአካባቢው ማኅበረሰብ ሥራ ፈጣሪና ሩቅ አላቢ፣ ኃላፊነት የሚሸከም ትውልድን ለመፍጠር ይሞክራል፡፡

ይህ ለሒሳብ ፈተና ማዘጋጃ የተዘጋጀ ሞጁል በዚህ አግባብ የቀረበ ሲሆን በጎ-ሰ'ማ አስተባባሪነት ከሥር ባሉት በጎ ፈቃደኛ ሙያተኞች የተሰናዳ ነው፡፡

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## MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

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**Grade 10**

1. What is the equivalent radian measure of an angle whose degree measure is  $324^0$ ?  
A.  $\frac{9}{5}\pi$                       B.  $\frac{7}{5}\pi$                       C.  $\frac{5}{9}\pi$                       D.  $\frac{5}{7}\pi$
2. Suppose that P(3,-1) is on the terminal side of an angle  $\theta$  in the standard position, what is  $\cot \theta$ ?  
A. -3                      B.  $-\frac{\sqrt{10}}{3}$                       C. -1/3                      D.  $\frac{\sqrt{10}}{3}$
3. Which one of the following is a positive value?  
A.  $\cos 250^0$                       B.  $\cos 170^0$                       C.  $\cos(280^0)$                       D.  $\cos(260^0)$
4. Let  $\theta = -420^0$ , which one of the following is TRUE about  $\theta$ ?  
A.  $\cos \theta = -\frac{1}{2}$                       B.  $\sin \theta = -\frac{1}{2}$                       C.  $\cos \theta = \frac{1}{2}$                       D.  $\sin \theta = \frac{1}{2}$
5. Let  $\theta$  be an acute angle, then which one of the following is TRUE?  
A.  $\sin \theta = \sin(90^0 - \theta)$                       C.  $\tan \theta = \cot(180^0 - \theta)$   
B.  $\sec \theta = \csc(90^0 - \theta)$                       D.  $\csc \theta = -\csc(180^0 - \theta)$
6. If x is an acute angle and  $\tan x = 3$ , then what is the value of  $\cos x$ ?  
A. 3/5                      B.  $\sqrt{10}$                       C.  $\frac{1}{\sqrt{5}}$                       D.  $\frac{\sqrt{10}}{10}$
7. If p(x, y) is a point on the terminal side of an angle  $\theta$  in standard position where the distance between p and the origin is r, then  $\csc \theta$  is—?  
A. r/y                      B. r/x                      C. x/r                      D. x/y
8. Which of the following is TRUE about the second quadrant angle  $\theta$  in standard position whose terminal side lies on the line  $2x+y=0$ ?  
A.  $\sin \theta = \frac{1}{\sqrt{5}}$                       B.  $\cos \theta = \frac{2}{\sqrt{5}}$                       C.  $\sin \theta = \frac{2}{\sqrt{5}}$                       D.  $\cos \theta = -\frac{2}{\sqrt{5}}$

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9. Which of the following is equal to  $\csc\left(\frac{11}{3}\pi\right)$
- A.  $-\frac{2\sqrt{3}}{3}$       B. -2      C.  $\frac{2\sqrt{3}}{3}$       D. 2
10. If  $\sin 18^\circ = 0.31$  and  $\cos 18^\circ = 0.95$ , then which of the following is correct?
- A.  $\sec 162^\circ = -\frac{10}{95}$       B.  $\cot 162^\circ = -\frac{95}{31}$       C.  $\tan 162^\circ = \frac{31}{95}$       D.  $\csc 162^\circ = \frac{10}{31}$
11. Suppose  $\cos \theta = 0.8$  and  $\csc \theta < 0$ , then  $\tan \theta$  is equal to?
- A.  $3/5$       B.  $4/5$       C.  $-3/4$       D.  $-4/3$
12. If  $\sin \alpha = r$  and  $\alpha + \theta = 90^\circ$ , then which of the following is true?
- A.  $\sec \theta = \frac{1}{r}$       B.  $\sin \theta = r$       C.  $\cos \theta = r$       D.  $\cos \alpha = \frac{1}{r}$
13. Which of the following is co-terminal with  $\theta = 120^\circ$ ?
- A.  $-480^\circ$       B.  $850^\circ$       C.  $-\frac{19\pi}{6}$       D.  $\frac{14\pi}{3}$
14. The slant height of a square pyramid is the distance measured from its vertex to—?
- A. The center of its base      C. one of the side of its base  
B. any point inside its base      D. one of the vertex of its base.
15. A frustum of a square pyramid has height 6cm, where its upper base has side 2cm and lower base of sides is 6cm then what is the volume of the frustum?
- A.  $104\text{cm}^3$       B.  $312\text{cm}^3$       C.  $260\text{cm}^3$       D.  $208\text{cm}^3$
16. A glass is in shape of a frustum of a right circular cone has slant height 10cm and radii 9cm and 3cm. what is the volume of the glass in  $\text{cm}^3$ ?
- A.  $240\pi$       B.  $312\pi$       C.  $192\pi$       D.  $204\pi$
17. If the radius of a sphere is doubled, what happens to the surface area?
- A. it becomes four times as large as the original surface area.  
B. it becomes eight times as large as the original surface area  
C. it also doubled

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D. it is increase by four square units.

18. If a metallic right circular cylinder of height 18cm and the base of the radius is 4cm is melted down to form a sphere, then which one of the following is correct?

A. The diameter of the sphere is  $12\sqrt[3]{4\pi}$  cm

B. The surface area of the sphere is  $144\pi cm^2$

C. The volume of the sphere is  $48\pi cm^3$

D. The radius of the sphere is  $\frac{3}{\sqrt{2}}\pi cm$

19. The diameter of the base and a height of a circular cone are found to be a and 2b units long respectively. What is the formula for the volume v of the cone?

A.  $V = \frac{2}{3}\pi a^2 b$

B.  $V = \frac{1}{3}\pi a^2 b$

C.  $V = \frac{1}{6}\pi a^2 b$

D.  $V = \frac{4}{3}\pi a^2 b$

20. The volume of a pyramid that has a height of 8cm and rectangular base of dimensions 6cm by 4cm is

A.  $96cm^3$

B.  $64cm^3$

C.  $576cm^3$

D.  $192cm^3$

21. If the frustum is formed from a regular pyramid, then which one of the following statement is TRUE about its lateral faces?

A. They are isosceles trapezium

B. Their altitude are NOT equal

C. They are rhombus

D. Their area are not equal

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**Grade 11 unit 1 - Further on Relations and Functions**

22. The inverse of a relation  $A = \{(x, y) : y < x - 1 \text{ and } y \leq -x\}$  is?

- A.  $\{(x, y) : y < x - 1 \text{ and } y \geq -x\}$       C.  $\{(x, y) : y > x + 1 \text{ and } x \leq -y\}$   
B.  $\{(x, y) : y > x - 1 \text{ and } y \geq -x\}$       D.  $\{(x, y) : y > x - 1 \text{ and } y \leq -x\}$

23. The domain of  $f(x) = \frac{1}{\sqrt{4-x^2}}$  is equal to—?

- A.  $(-\infty, -2)$       B.  $(2, \infty)$       C.  $(-2, 2)$       D.  $[-2, 2]$

24. Let  $g(x) = \text{sgn}[\log(4x + 10)]$ , then which one is TRUE?

- A.  $g(-2) = 0$       B.  $g\left(-\frac{9}{4}\right) = 1$       C.  $g\left(-\frac{99}{10}\right) = -1$       D.  $g(1) = 0$

25. Which of the following is neither even nor odd function?

- A.  $f(x) = \frac{|x|}{x}$       B.  $g(x) = x^2 - |x|$       C.  $h(x) = x^5 + 4x^3$       D.  $k(x) = x + 7$

26. The solution set of the equation  $|x + 5| = 2x + 4$  is?

- A.  $\{\}$       B.  $\{-3, 1\}$       C.  $\{-3\}$       D.  $\{1\}$

27. If  $f(x) = \sqrt{x}$  and  $g(x) = \sqrt{3-x}$ , the domain of  $f + g$  is

- A.  $[0, \infty)$       B.  $[0, 3]$       C.  $(-\infty, 3]$       D.  $(-\infty, 3] \cup (3, \infty)$

28. Let  $f(x) = 7$  and  $g(x) = x^2 - 9$ , then  $(f \circ g)(0)$  is equal to ?

- A. 7      B. 40      C. -2      D. 7

29. Which of the following is rational function?

- A.  $f(x) = \frac{\sqrt{x+1}}{x-1}$       B.  $f(x) = x^3 - 3x^2 + \log_2 3$       C.  $g(x) = \frac{x^2 + \sin x + 2}{x+3}$       D.  $k(x) = \frac{3-4x}{2x-3^x}$

30. If  $f(x) = \frac{\sqrt{x+1}}{x-1}$  and  $f(a) = 5$  then is the value/s of a:

- A. 1 or  $\frac{24}{25}$       B. -1 or  $\frac{24}{25}$       C. 1 or  $\frac{25}{24}$       D. 1 or  $-\frac{24}{25}$

31. What is the domain of the rational function  $f(x) = \frac{x+2}{x^2+4} x^{-2}$ ?

- A.  $\mathbb{R} \setminus \{-2, 2\}$       B.  $\mathbb{R} \setminus \{-2, 0\}$       C.  $\mathbb{R} \setminus \{0\}$       D.  $\mathbb{R}$

32. Let  $f(x) = \frac{2x+3}{x-1}$ , then what is the range of f?

- A.  $\mathbb{R} \setminus \{1\}$       B.  $\mathbb{R} \setminus \{3\}$       C.  $\mathbb{R}$       D.  $\mathbb{R} \setminus \{2\}$

33. What are the value of a and b which makes the mathematical statement

$$\frac{x+1}{x^2-9} = \frac{a}{x-3} + \frac{b}{x+3} \text{ true?}$$

- A.  $a=1, b=0$       B.  $a=\frac{1}{3}, b=\frac{3}{5}$       C.  $a=-\frac{2}{5}, b=1$       D.  $a=\frac{2}{3}, b=\frac{1}{3}$

34. What is the solution set of  $\frac{2}{x} - \frac{x-2}{x^2-2x} = 1 - \frac{2x-2}{3x-2}$  ?



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- A.  $\{-2,1\}$                       B.  $\{1,2\}$                       C.  $\{-1\}$                       D.  $\{1\}$
35. If the line with equation  $4x + ky = 8$  is parallel to the line with equation  $x + 2y = 0$ , then the value of  $K$  is?
- A. -8                      B. 8                      C. -2                      D. 2
36. What is the distance from the point  $(3,2)$  to the line  $4x + 3y = 13$ ?
- A. 1                      B. 2                      C.  $13/5$                       D.  $1/5$
37. What is the angle between the lines pass through  $(-1,3)$  and  $(2,3)$  and the line with equation  $\sqrt{3}y - x + 7 = 0$ ?
- A.  $120^\circ$                       B.  $60^\circ$                       C.  $30^\circ$                       D.  $45^\circ$
38. What will be the equation of a circle that has center  $(5,12)$  and it is tangent to the line with equation  $2x - y + 3 = 0$ ?
- A.  $(x - 5)^2 + (y - 12)^2 = \frac{1}{5}$                       C.  $(x - 5)^2 + (y - 12)^2 = 5$
- B.  $(x - 5)^2 + (y - 12)^2 = \frac{1}{\sqrt{5}}$                       D.  $(x - 5)^2 + (y - 12)^2 = 2$
39. What is the focus of the parabola whose equation is  $y^2 + 8x + 6y + 25 = 0$ ?
- A.  $(-2,-3)$                       B.  $(3,2)$                       C.  $(-4,-3)$                       D.  $(0,-2)$
40. Which of the following is not true about an ellipse whose equation is given by  $\frac{(x-1)^2}{9} + \frac{(y-2)^2}{4} = 1$ ?
- A. The major axis is 6                      C. The foci are  $(1 \pm \sqrt{5}, 2)$
- B. The latus rectum is  $\frac{2\sqrt{76}}{9}$                       D. The eccentricity is  $\frac{\sqrt{5}}{3}$
41. Which of the following is true about the equation  $3x^2 - 6x = y^2$ ?
- A. an ellipse with center at  $(1,0)$
- B. a hyperbola with center at  $(0,1)$
- C. an ellipse with center at  $(-1,0)$
- D. a hyperbola with one of its foci is  $(1,0)$
42. Let  $p$ ,  $q$  and  $r$  have truth values, F, F and T respectively, then which one of the following has a truth value "F"?
- A.  $\neg p \wedge \neg(q \wedge r)$
- B.  $\neg p \wedge (q \Rightarrow \neg r)$
- C.  $\neg q \Rightarrow (p \vee \neg r)$
- D.  $r \Leftrightarrow \neg(p \vee q)$

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43. If  $p$  and  $q$  are equivalent propositions then which of the following is tautology?

A.  $p \wedge \neg q$

B.  $\neg p \vee q$

C.  $p \Rightarrow \neg q$

D.  $\neg p \Leftrightarrow q$

44. Let  $p(x) = x^2 + x$  is a positive real number which of the following is equivalent to  $\neg(\exists x p(x))$ ?

A.  $(\forall x)(x^2 + x \leq 0)$

B.  $(\exists x)\neg(x^2 + x > 0)$

C.  $(\forall x)(x^2 + x < 0)$

D.  $(\exists x)(x^2 + x \leq 0)$

45. Let  $p =$  I pass the examination,

$q =$  I study hard, then which of the following represent the argument

"I pass the examination, if I study hard. I don't study hard therefore I pass the examination"

A.  $p \Rightarrow q, \neg q \vdash p$

B.  $p \Rightarrow q, q \vdash p$

C.  $q \Rightarrow p, \neg q \vdash p$

D.  $q \Rightarrow p, \neg q \vdash \neg p$

46. Which one of the following is a scalar matrix?

A.  $\begin{pmatrix} 0 & 2 \\ 2 & 0 \end{pmatrix}$

B.  $\begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$

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

D.  $\begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix}$

47. Let  $A = \begin{pmatrix} x+y & x-y \\ 2 & a+b \end{pmatrix}$ ,  $B = \begin{pmatrix} 2 & 6 \\ a-b & 8 \end{pmatrix}$  if  $A = B$  then which one is true?

A.  $a=3$

B.  $x=4$

C.  $y=2$

D.  $b=-3$

48. What is the  $n^{\text{th}}$  power of  $A = \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ ?

A.  $\begin{pmatrix} 1 & 4 \\ 0 & 1 \end{pmatrix}$

B.  $\begin{pmatrix} 1 & 2^n \\ 0 & 1 \end{pmatrix}$

C.  $\begin{pmatrix} 2n & 1 \\ 0 & 1 \end{pmatrix}$

D.  $\begin{pmatrix} 1 & 2n \\ 0 & 1 \end{pmatrix}$

49. Which one of the following is not true about determinant of a square matrix?

A. If  $A$  and  $B$  are square matrix, then  $\det(AB) = \det A \det B$ .

B. For any square matrix  $A$ ,  $\det A^t = \det A$ .

C. The determinant of a scalar matrix is the sum of its diagonal entries.

D. The determinant of a triangular matrix is the product of its diagonal entries.

50. Suppose  $A$  is  $3 \times 3$  non-singular matrix, then what is  $\det(2A^t A^{-1})$ ?

A. 2

B. 8

C. 6

D. 4



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51. Let  $A = \begin{pmatrix} 2 & 4 & 6 \\ -1 & 2 & 0 \\ 0 & 6 & 5 \end{pmatrix}$ , then what is the inverse of A

- A.  $\begin{pmatrix} \frac{5}{2} & 4 & -3 \\ \frac{5}{4} & \frac{5}{2} & -\frac{3}{2} \\ -\frac{3}{2} & -3 & 2 \end{pmatrix}$  B.  $\begin{pmatrix} 10 & 16 & -12 \\ 5 & 10 & -6 \\ -6 & -12 & 8 \end{pmatrix}$  C.  $\begin{pmatrix} 10 & 5 & -6 \\ 16 & 10 & -12 \\ -12 & -6 & 8 \end{pmatrix}$
- D.  $\begin{pmatrix} -\frac{5}{2} & -4 & 3 \\ -\frac{5}{4} & -\frac{5}{2} & \frac{3}{2} \\ \frac{3}{2} & 3 & 2 \end{pmatrix}$

52. The solution of the system of equation  $\begin{cases} x_1 + 2x_3 = 0 \\ x_1 + x_2 + x_3 = 4 \\ x_1 + 4x_2 = 14 \end{cases}$  for  $x_1, x_2$  &  $x_3$  respectively are?

A. 2, 3 & 1 B. 2, 3 & -1 C. 1, 2 & -1 D. -2, -3 & 1

53. Let  $A = \begin{pmatrix} 8 & -6 & 0 \\ 0 & -4 & -9 \\ 9 & 6 & 5 \end{pmatrix}$  find a matrix B so that  $2A - 3B$  is identity matrix?

- A.  $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$  B.  $\begin{pmatrix} 16 & -12 & 0 \\ 0 & -8 & -18 \\ 8 & 12 & 10 \end{pmatrix}$  C.  $\begin{pmatrix} 8 & -6 & 0 \\ 0 & -4 & -9 \\ 9 & 6 & 5 \end{pmatrix}$
- D.  $\begin{pmatrix} 5 & -4 & 0 \\ 0 & -3 & -6 \\ 6 & 4 & 3 \end{pmatrix}$

54. For what value of x is  $\begin{vmatrix} 1 & -3 \\ x & x-2 \end{vmatrix} = x + 1$ ?

A. 1 B.  $\frac{3}{2}$  C.  $\frac{1}{2}$  D. -1

55.  $\frac{2i}{1-i} =$  — A. i-1 B. 1-i C. 1+i D. i

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56. If the conjugate of  $(x+yi)(1-2i)$  be  $1+i$  then which one is true?

A.  $y = \frac{3}{5}$

B.  $x = \frac{1}{5}$

C.  $x-yi = \frac{1-i}{1+2i}$

D.  $x+yi = \frac{1-i}{1+2i}$

57. If  $\left(\frac{1+i}{1-i}\right)^x = 1$  then the value of  $x$  is

A.  $x=4n, n \in \mathbb{Z}^+$

B.  $x=4n+1, n \in \mathbb{Z}^+$

C.  $x=2n, n \in \mathbb{Z}^+$

D.  $x=2n+1,$

58.  $\left| (1+i) \left( \frac{2+i}{3+i} \right) \right| =$  — A. 1

B. -1

C.  $\frac{1}{2}$

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

59. What is the principal argument of  $z = -2 + 2\sqrt{3}i$

A.  $\frac{\pi}{3}$

B.  $-\frac{2\pi}{3}$

C.  $\frac{2\pi}{3}$

D.  $\frac{\pi}{6}$

60. In the set of complex number what is the solution set  $x^2 + 4x + 5$ ?

A.  $\{.\}$

C.  $\sqrt{8}^{50} \left( \cos \frac{\pi}{4} + i \sin \frac{\pi}{4} \right)$

B.  $8^{50} \left( \cos \frac{\pi}{4} + i \sin \frac{\pi}{4} \right)$

D.  $8^{50} (\cos 25\pi + i \sin 25\pi)$

61. The multiplicative inverse of  $\frac{1+2i}{1-i}$  is

A.  $-\frac{3}{5} - \frac{i}{5}$

B.  $-\frac{3}{5} + \frac{i}{5}$

C.  $\frac{3}{5} - \frac{i}{5}$

D.  $\frac{3}{5} + \frac{i}{5}$

62. If  $\vec{A} = 2i - 3j$  and  $\vec{B} = 3i$  find the unit vector in the direction of  $\vec{A} - \vec{B}$ ?

A.  $-i-3j$

B.  $-\frac{i}{\sqrt{10}} - \frac{3j}{\sqrt{10}}$

C.  $-\frac{i}{10} - \frac{3j}{10}$

D.  $-\frac{i}{\sqrt{10}} + \frac{3j}{\sqrt{10}}$

63. What is the product of  $\vec{U} = 4i$  and  $\vec{V} = 2i + 2j$

A. 8

B. -8

C. 0

D. 4

64. Given the vector  $\vec{U} = 3i + 2j$  and  $\vec{V} = mi - j$  for what value of  $m$  is the angle between them is  $45^\circ$

A. -5 or  $\frac{1}{5}$

B.  $\frac{1}{5}$  or 5

C. -5 or  $-\frac{1}{5}$

D. 5 or  $-\frac{1}{5}$

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65. What is the value of  $k$  if the vector  $\vec{U} = -3\mathbf{i} + k\mathbf{j}$  and  $\vec{V} = 2\mathbf{i} + 10\mathbf{j}$  are parallel?  
A.  $3/5$                       B.  $15$                       C.  $-3/2$                       D.  $-15$
66. If a translation  $T$ , takes the point  $A(1,-3)$  to  $B(3,2)$  then what is the image of the ellipse  $4(x-2)^2 + 9(y+3)^2 = 36$   
A.  $(x-2)^2 + (y+3)^2 = 36$   
B.  $4(x-2)^2 + 9(y+3)^2 = 1$   
C.  $4(x-4)^2 + 9(y-2)^2 = 36$   
D.  $4(x+2)^2 + 9y^2 = 36$
67. What is the image of the point  $P(2,3)$  after it is reflected by the line  $y = \sqrt{3}x$ ?  
A.  $(3,2)$       B.  $\left(-1 + \frac{3\sqrt{3}}{2}, \sqrt{3} + \frac{3}{2}\right)$       C.  $(2 + \sqrt{3}, 3 + \sqrt{3})$       D.  $\left(1 - \frac{3\sqrt{3}}{2}, \sqrt{3}\right)$
68. What is the image of  $(-2,3)$  after it is rotated through  $270^\circ$  about the origin in an anticlockwise direction?  
A.  $(-2, -3)$                       B.  $(-3, -2)$                       C.  $(-3, 2)$                       D.  $(3, 2)$
69. What is the image of a circle  $(x-3)^2 + (y-1)^2 = 1$  when it is rotated through  $\theta = \pi$  about  $(-2,3)$ ?  
A.  $(x+2)^2 + (y-3)^2 = 1$   
B.  $(x+7)^2 + (y-5)^2 = 1$   
C.  $(x-5)^2 + (y+2)^2 = 1$   
D.  $(x-7)^2 + (y+5)^2 = 1$
70. Which of the following is true about  $y = \csc x$   
A. Its Domain is  $\mathbf{IR}$                       C. its Asymptotes is  $x = k\pi, k \in \mathbf{Z}$   
B. it is even function                      D. its range is  $(-\infty, -1) \cup (1, \infty)$
71.  $\cos^{-1}\left(\cos \frac{3\pi}{4}\right) =$  —  
A.  $\frac{3\pi}{4}$                       B.  $\frac{\pi}{4}$                       C.  $-\frac{\sqrt{2}}{4}$                       D.  $\frac{\sqrt{2}}{4}$

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**Grade 12 - Sequence and Series**

72. What are the first 5 terms of the sequence whose general term  $a_n = n + \cos(n\pi)$ ?
- A. 3,2,5,4,7      B. 0,3,2,5,4      C. 4,7,6,9,8      D. 1,3,2,5,4
73. The 3<sup>rd</sup> term of the sequence  $\{a_n\}$  whose general term is  $a_n = \frac{4(-1)^n}{1+n!}$ ?
- A. 6      B.  $-\frac{4}{7}$       C.  $\frac{4}{3}$       D.  $\frac{5}{7}$
74. What is the general term of the sequence 4, 9, 16, 25 ... ?
- A.  $(-1)^n(n^2 + 1)$       B.  $(n + 1)^2$       C.  $(-1)^n(n^2 - 1)$       D.  $(-1)^{2n}(n^2 + 1)$
75. A sequence  $\{a_n\}$  is given by the formula  $a_n = -3(5)^{2n-1}$  which of the number belongs to  $a_n$ ?
- A. -1875      B. 1875      C. 1885      D. -1885
- Hint Check wither each number satisfies the given formula  $-3(5)^{2n-1}$  hence answer is D
76. If  $a_n$  is a sequence such that  $a_1 = 2, a_2 = -1$  and  $a_n = 3a_{n-1} + 2a_{n-2}$  for  $n \geq 3$ , then what is  $a_6$ ?
- A. 20      B. 6      C. 17      D. 12
77. Which one of the following is an arithmetic sequence?
- A. 1,3,5,7,9,11,...      B. 3,6,12,24,48,...      C. -3,6,-9,12,-15,...      D. 3,6,10,15,21,...
78. What is the 10<sup>th</sup> term of the arithmetic progression 2,7,12,...?
- A. 10      B. 47      C. 56      D. 27
79. Which term of the arithmetic progression 21,18,15, ... is  $-81$ ?
- A. 25      B. 35      C. 81      D. 15
80. How many two digit numbers are devisable by 3?
- A. 15      B. 20      C. 30      D. 13

81. In the arithmetic sequence, the  $n^{th}$  term is  $m$  and the  $m^{th}$  term is  $2m - n$  then



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the  $k^{th}$  term is?

A.  $a_k = m - n + k$  B.  $a_k = m + n - k$  C.  $a_k = n - m + k$  D.  $a_k = m - n - k$

82. What is the sum of the multiple s of 4 that lies between 10 and 250?

A. 2600 B. 2360 C. 7860 D. 7800

83. What is the sum of the first 6 terms of the series  $\frac{2}{3} - 1 + \frac{3}{2} - \frac{9}{2} + \dots$  ?

A.  $\frac{133}{48}$  B.  $-\frac{133}{48}$  C.  $\frac{48}{133}$  D.  $-\frac{48}{133}$

84. In a geometric sequence  $\{G_n\}$ ,  $G_3 = 24$  and  $G_6 = 192$  find the  $10^{th}$  term?

A. 3072 B. 4053 C. 3405 D. 4062

85. If  $\{G_n\}$  a geometric sequence  $G_2 = \frac{20}{9}$  and  $G_5 = \frac{160}{243}$ , find the general term of the sequence?

A.  $5 \left(\frac{2}{3}\right)^n$  B.  $5 \left(-\frac{2}{3}\right)^n$  C.  $\frac{10}{3} \left(-\frac{2}{3}\right)^n$  D.  $\frac{10}{3} \left(\frac{2}{3}\right)^n$

86. What is the value of  $\sum_{n=2}^{20} \left(\frac{1}{n-1} - \frac{1}{n}\right)$

A.  $\frac{19}{20}$  B.  $\frac{17}{20}$  C.  $\frac{21}{19}$  D.  $\frac{20}{19}$

87. The sum of the finite series  $\sum_{n=1}^{30} (-1)^n \left(\frac{1}{n} + \frac{1}{n+1}\right)$  is ?

A.  $-\frac{29}{30}$  B.  $\frac{29}{30}$  C.  $\frac{30}{31}$  D.  $-\frac{30}{31}$

88. What is the sum of the first 50 terms of the arithmetic sequence 3,10,17,24,... ?

A. 8750 B. 8490 C. 7850 D. 8725

89. If  $\sum_{n=1}^n (2k + 1) = 440$  then the value of  $n$  is?

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A. 20                      B. 22                      C. 12                      D.15

90. In an arithmetic progression  $A_3 = 14$  and  $A_6 = 35$  then the value of  $S_{10}$  is?

A. 315                      B. 325                      C. 350                      D.320

91. In the arithmetic sequence, the  $4^{th}$  term is 84 and the  $10^{th}$  term is 60. What is the maximum possible partial sum of the sequence?

A.1152                      B. 1200                      C. 1440                      D. 1250

92. If the  $n^{th}$  partial sum of arithmetic sequence is  $n^2 + 9n$  What is the  $10^{th}$  and the  $n^{th}$  term of the sequence respectively?

A. 20,  $a_n = 2n + 10$    B. 28,  $a_n = 2n + 8$    C. 190,  $a_n = n^2 + 9n$    D. 28,  $a_n = n^2 - 72$

93. What is the sum of the series  $\sum_{n=0}^{\infty} 3^n 2^{-2n}$ ?

A. -3                      B.  $\frac{1}{4}$                       C. 4                      D.  $-\frac{1}{3}$

94. What is the sum of the first 8 terms of the geometric progression: 3,-6,12,-24,...?

A.245                      B.255                      C.-245                      D. -255

95. A person has two parents four grand- parents and eight great grandparents and so on. What is the number of his ancestors during the ten generations preceding his own?

A. 1028                      B. 4096                      C. 2048                      D. 2046

96. What is the sum of the infinite series  $\sum_{n=1}^{\infty} \left( \frac{2^k + 5^k}{10^k} \right)$ ?

A.  $\frac{5}{4}$                       B.  $\frac{3}{5}$                       C.  $\frac{4}{5}$                       D.  $\frac{5}{3}$

97. What is the value of  $\lim_{x \rightarrow 4} \frac{\sqrt{x}-2}{x^2-4x}$  ?   A.  $\frac{1}{16}$                       B. 16                      C. 0                      D.  $\infty$

98. The value of the  $\lim_{x \rightarrow 9} \frac{3-\sqrt{x}}{x^2-81}$  is ?   A.  $\frac{1}{108}$                       B.  $-\frac{1}{108}$                       C. 108                      D. -108

99. What is the limit,  $\lim_{x \rightarrow a} \frac{x^2-a^2}{x^4-a^4}$  ?   A.  $2a^2$                       B.  $\frac{1}{2a^2}$                       C.  $-2a^2$                       D.  $-\frac{1}{2a^2}$



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100. What is the value of  $\lim_{x \rightarrow \infty} \frac{4^n - 2^n}{10^2}$ ? A.  $\frac{11}{12}$  B.  $\frac{1}{5}$  C.  $\frac{2}{3}$  D.  $\infty$
101. What is the value of  $\lim_{x \rightarrow 5} \frac{x-5}{\sqrt{x+4}-3}$ ? A.  $\infty$  B. 0 C. 1 D. 6
102. What is the value of  $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^{2x+4}$ ? A.  $e$  B.  $e^{-1}$  C.  $e^2$  D. 1
103. Let  $f(x) = \begin{cases} a - \cos x, & \text{if } x \leq 0 \\ 3e^x - a, & \text{if } x > 0 \end{cases}$  for what value of  $a$  is the function  $f$  continuous at  $x=0$ ?  
A. 3 B. 2 C. 0 D. 1
104. The  $\lim_{x \rightarrow 1} \frac{x^3 + x - 2}{x^2 - x}$ ? A. 4 B. 8 C.  $\infty$  D. 0
105. What is the value of  $\lim_{x \rightarrow \pi} \frac{x \sin(2x)}{x - \pi}$ ? A.  $2\pi$  B.  $\pi$  C.  $-\pi$  D.  $-2\pi$
106. Find  $\lim_{x \rightarrow \infty} \left(\frac{x}{x+1}\right)^{-3x}$ ? A.  $e^{-3}$  B.  $e^3$  C.  $e^6$  D.  $e^{-6}$
107. Let  $f(x) = \begin{cases} \frac{a \sin(2x)}{x}, & \text{if } x < 0 \\ e^{2x} - 2, & \text{if } x \geq 0 \end{cases}$  if  $f$  is continuous at  $x=0$  then what is the value of  $a$ ?  
A.  $\frac{1}{2}$  B.  $-\frac{1}{2}$  C. 2 D. -2
108. The value of the  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\tan(2x)}{x - \frac{\pi}{2}}$  = ? A. 4 B. 2 C.  $\infty$  D. 1
109. What is the value of  $\lim_{x \rightarrow 0} \left(\frac{x^2 - 5}{x}\right) \sin x$ ? A.  $\frac{1}{5}$  B. -5 C.  $\infty$  D. 0
110. Evaluate  $\lim_{n \rightarrow \infty} \frac{3n - \cos(2n)}{2 - n}$ ? A. 2 B. -3 C.  $\infty$  D.  $\frac{2}{3}$
111. Suppose that  $f$  and  $g$  are continuous function such that  $f(2) = 1$  and  $\lim_{n \rightarrow 2} (f(x) + g(x)) = 13$ , then  $g(2)$  is equal - ?  
A. 13 B. 12 C. 3 D. 10

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112. The left hand limit,  $\lim_{x \rightarrow 0^-} \frac{4x+|x|}{2x-|x|}$  is equal to A. 1 B. 5/3 C. 5 D. 3/2
113. What is the limit,  $\lim_{x \rightarrow a} \frac{x^{-2}-a^{-2}}{x^{-3}-a^{-3}}$ ? A.  $\frac{2}{3a}$  B.  $\frac{3a}{2}$  C.  $\frac{3}{2a}$  D.  $\frac{2a}{3}$
114. Let  $f(x) = -\sqrt{25 - x^2}$ , then what is the value of  $\lim_{x \rightarrow 1} \frac{f(x)-f(1)}{x-1}$ ?  
A.  $\frac{1}{24}$  B.  $\frac{\sqrt{24}}{24}$  C. -24 D.  $\sqrt{24}$
115. The value of the  $\lim_{x \rightarrow 0} \frac{1-\cos(2x)}{x^2}$  is equal to? A. 4 B. 2 C. 1 D. 0
116. Which one of the following is equal to  $\lim_{x \rightarrow 2} \frac{\sqrt{x}-\sqrt{2}}{x^2-4}$ ?  
A.  $8\sqrt{2}$  B.  $4\sqrt{2}$  C.  $\frac{1}{4\sqrt{2}}$  D.  $\frac{1}{8\sqrt{2}}$
117. Let  $f(x) = \begin{cases} 5a - x, & \text{if } x < 1 \\ b + 2, & \text{if } x = 1 \\ ax, & \text{if } x > 1 \end{cases}$  then what is the value of b if f is continuous at x=1?  
A.  $-\frac{7}{4}$  B.  $\frac{4}{7}$  C.  $\frac{-3}{5}$  D.  $\frac{1}{4}$

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## MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C



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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

**Grade 12 unit 3 & 4 - Derivatives**

118. The derivative of  $f(x) = \frac{2-x}{3x+1}$  is ? A.  $\frac{-7}{(3x+1)^2}$  B.  $\frac{6x-5}{(3x+1)^2}$  C.  $\frac{-9}{(3x+1)^2}$  D.  $\frac{7}{(3x+1)^2}$
119. The  $4^{th}$  and  $n^{th}$  derivative of  $f(x) = e^{nx}$  respectively are ?  
A.  $n^4 e^{nx}, n^n e^{nx}$  B.  $n^4 e^x, n e^{nx}$  C.  $n^4 e^{nx}, n^n e^x$  D.  $n^4 e^{nx}, n! e^{nx-1}$
120. What is the equation of the line tangent to the graph of  $f(x) = \frac{3x}{x-2}$  at  $(1, f(1))$ ?  
A.  $y = -6x + 3$  B.  $y = 6x + 3$  C.  $6x - 3$  D.  $y = -6x - 3$
121. Let  $k(x) = f(\sqrt{4x+1})$ . If  $f'(3) = 1/2$ , then  $k'(2) = \text{---?}$   
A. 3 B. 12 C.  $1/3$  D. 4
122. Write the equation of the line tangent to the graph of the function  
 $f(x) = \begin{cases} x - \pi, & x \leq 0 \\ 1 - 2\sin x, & x > 0 \end{cases}$  at  $(\pi, f(\pi))$ .  
A.  $y = 2x - 2\pi - 1$  B.  $y = 2x + 2\pi + 1$  C.  $y = 2x - 2\pi + 1$  D.  $y = -2x - 2\pi + 1$
123. For what value of a and b is the function  $f(x) = \begin{cases} 1 - 3x^2, & \text{for } x \leq 1 \\ ax + b, & \text{for } x > 1 \end{cases}$  is differentiable at  $x=1$ ?  
A.  $a=-6, b=4$  B.  $a=6, b=-4$  C.  $a=4, b=-6$  D.  $a=-4, b=6$
124. Find the equation of the line tangent to the graph of  $f(x) = e^x \sin x$  at  $x = 0$ .  
A.  $y = x$  B.  $y = -x$  C.  $y = 2x$  D.  $y = -2x$
125. Let  $f(x) = \cos(3x)$ , then what is the value of  $f'(\frac{\pi}{9})$ ?  
A.  $\frac{3\sqrt{3}}{2}$  B.  $-\frac{3\sqrt{3}}{2}$  C.  $\frac{\sqrt{3}}{2}$  D.  $-\frac{\sqrt{3}}{2}$
126. If  $g(x) = f(x^2 + x)$ ,  $f'(2) = -2$  and  $f''(2) = 3$  then  $g''(1) = \text{---?}$   
A. 27 B. 4 C. 23 D. 17

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127. What is the second derivative of  $f(x) = e^{2x} \sin x$  at  $x = 0$ ?
- A. 1                                      B. 4                                      C. 0                                      D. 3
128. For what value of  $k$  will  $f(x) = x + \frac{k}{x}$  have a relative maximum at  $x = -2$ ?
- A. -4                                      B. -2                                      C. 2                                      D. 4
129. If  $\sin x = e^y, 0 < x < \pi$ , what is  $\frac{dy}{dx}$  in terms of  $x$ ?
- A.  $-\tan x$                                       B.  $-\cot x$                                       C.  $\cot x$                                       D.  $\tan x$
130. If  $y = \cos^2 x - \sin^2 x$ , then  $\frac{dy}{dx} =$ —?
- A. -1                                      B. 0                                      C.  $-2 \sin(2x)$                                       D.  $-2(\cos x + \sin x)$
131. If  $f(x) = x \ln(x^2)$ , then what is the first derivative of  $f$ ?
- A.  $\ln(x^2) + 1$                                       B.  $\ln(x^2) + 2$                                       C.  $\ln(x^2) + \frac{1}{x}$                                       D.  $\frac{1}{x^2}$
132. The absolute maximum value of  $f(x) = x^3 - 3x^2 + 12$  on the closed interval  $[-2, 4]$  occurs at  $x =$ —?
- A. 4                                      B. 2                                      C. 1                                      D. 0
133. If  $y = 2x - 8$ , what is the minimum value of the product of  $x$  and  $y$ ?
- A. -16                                      B. -8                                      C. -4                                      D. 0
134. If  $f(x) = e^{5x} \cos x + \frac{x - \pi}{x^2 + 3}$ , then  $f'(0)$  is equal to—?
- A.  $5 - \frac{\pi}{2}$                                       B.  $\frac{16}{3}$                                       C.  $\frac{2}{9}$                                       D.  $\frac{7}{3}$
135. Given the function  $f(x) = x^3 + 6x^2 + 9x + 4$  which one of the following is not TRUE about the function  $f$ ?
- A.  $f$  is increasing on  $(-\infty, -3] \cup [-1, \infty)$
- B.  $f$  is decreasing on  $[-3, -1]$
- C. the graph of  $f$  is concave upward on  $(-2, \infty)$  and concave downward on  $(-\infty, -2)$
- D. Its inflection point is  $(-2, 9)$

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

136. The volume of a cylindrical tin can with closed on top and bottom is  $32\pi$  cubic unit. If a minimum amount of tin is used to construct the can, what must be the height of the can?
- A.  $2\sqrt[3]{2}$                       B.  $2\sqrt{2}$                       C.  $4\sqrt{2}$                       D.  $4\sqrt[3]{2}$



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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

**Grade 12 unit 5 - Integration**

137. If  $f'(x) = \frac{1}{x} + x$  and  $f(1) = \frac{5}{2}$ , then a formula for  $f(x)$  is—?
- A.  $\ln|x| + \frac{x^2}{2} + 2$       B.  $\ln|x| + \frac{x^2}{2} + 1$       C.  $\ln|x| - \frac{x^2}{2} + 2$       D.  $\ln|x| - \frac{x^2}{2} + 1$
138.  $\int x^2\sqrt{x^3-8} \, dx$  is equal to—?
- A.  $\frac{1}{3}(x^3-8)^{\frac{1}{2}} + c$       B.  $\frac{2}{9}(x^3-8)^{\frac{3}{2}} + c$       C.  $\frac{1}{2}(x^3-8)^{\frac{1}{3}} + c$       D.  $\frac{2}{9}(x^3-8)^{\frac{5}{2}} + c$
139. If  $f'(x) = \frac{1}{x} - 2x + 2$  and  $f(1) = 2$ , then a formula for  $f(x)$  is—?
- A.  $-\frac{1}{x^2} - x^2 + 2x - 1$       C.  $-\frac{1}{x^2} - x^2 + 2x + 1$   
B.  $\ln|x| - 2x + 2$       D.  $\ln|x| - x^2 + 2x + 1$
140. Which of the following is equal to  $\int x \sin x \, dx$ ?
- A.  $x^2 \cos x + c$       C.  $x^2 \sin x - x \cos x + c$   
B.  $-\sin x + x^2 \cos x + c$       D.  $\sin x - x \cos x + c$
141.  $\int \left(\frac{x}{x+1}\right)^2 dx = \text{—?—}$
- A.  $x + \ln|x+1| + c$       C.  $x - \frac{1}{x+1} - 2\ln|x+1| + c$   
B.  $\frac{1}{3}x + \frac{1}{3}\ln|x+1| + c$       D.  $x - \frac{2}{(x+1)^2} - \frac{1}{x+1} + c$
142. What is the volume of the solid generated by the graph of  $f(x) = 3^x$  and the  $x$ -axis between  $x = 0$  &  $x = 1$  about the  $x$ -axis in cubic units?
- A.  $8\pi \ln 3$       B.  $4\pi \log_3 e$       C.  $4\pi \ln 3$       D.  $8\pi \log_3 e$
143. If  $\int_0^1 \sqrt{1-x^2} = \frac{\pi}{4}$  then the value of  $\int_0^1 (4\sqrt{1-x^2} + 2) \, dx$  is
- A.  $2\pi + 4$       B.  $2\pi + 2$       C.  $\pi + 2$       D.  $\pi + 8$

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144. If  $\int_{-1}^4 f(x)dx = 4$  and  $\int_2^4 (3 - f(x))dx = 7$  then the value of  $\int_2^{-1} f(x)dx$  is?  
A. -5                                      B. -3                                      C. 5                                      D. 3
145. What is the area of the region enclosed by the graph of  $y = x$  and  $y = x^2 - 3x + 3$  in square unit?  
A. 27/3                                      B. 2                                      C. 64/3                                      D. 34/3
146. What is the area of the region bounded by the curve  $y = e^{3x}$  and the line  $x = 1, x = 4$  and  $y = 0$  in square unit?  
A.  $\frac{1}{3}e^3(e^9 - 1)$                                       B.  $e^3(e^9 - 1)$                                       C.  $e^{12} - 1$                                       D.  $3e^3(e^9 - 1)$



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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

**Solution of some selected questions from Grade 10**

147. What is the equivalent radian measure of an angle whose degree measure is  $324^\circ$ ?

A.  $\frac{9}{5}\pi$

B.  $\frac{7}{5}\pi$

C.  $\frac{5}{9}\pi$

D.  $\frac{5}{7}\pi$

Answer:- to change degree to radial measure we use q formula  $\frac{\pi\theta}{180^\circ} = \frac{\pi 324^\circ}{180^\circ} = \frac{9\pi}{5}$  ie B

148. Suppose that P(3,-1) is on the terminal side of an angle  $\theta$  in the standard position, what is  $\cot \theta$ ? A.-3 B.  $-\frac{\sqrt{10}}{3}$  C. -1/3 D.  $\frac{\sqrt{10}}{3}$

Answer:- if P(3,-1) then  $\cot \theta = \frac{x}{y} = \frac{3}{-1} = -\frac{1}{3}$  ie C

149. Which one of the following is a positive value?

A.  $\cos 250^\circ$

B.  $\cos 170^\circ$

C.  $\cos(280^\circ)$

D.  $\cos(260^\circ)$

Answer:- the cosine function have positive value if it is either in  $1^{st}$  or  $2^{nd}$  quadrant

Ie  $0^\circ \leq \theta < 90^\circ$  or  $270^\circ < \theta \leq 360^\circ$  there for answer is C

150. Let  $\theta = -420^\circ$ , which one of the following is TRUE about  $\theta$ ?

A.  $\cos \theta = -\frac{1}{2}$

B.  $\sin \theta = -\frac{1}{2}$

C.  $\cos \theta = \frac{1}{2}$

D.  $\sin \theta = \frac{1}{2}$

Answer:-  $\theta = -420^\circ$  is co-terminal with  $-60^\circ$  which is in 4<sup>th</sup> quadrant. Thus,

$\sin \theta < 0$  and  $\cos \theta > 0$  but  $\sin(-60^\circ) = -\frac{\sqrt{3}}{2}$  and  $\cos(-60^\circ) = \frac{1}{2}$  Answer is C

151. Let  $\theta$  be an acute angle, then which one of the following is TRUE?

A.  $\sin \theta = \sin(90^\circ - \theta)$

C.  $\tan \theta = \cot(180^\circ - \theta)$

B.  $\sec \theta = \csc(90^\circ - \theta)$

D.  $\csc \theta = -\csc(180^\circ - \theta)$

Note,

$$\sin \theta = \cos(90^\circ - \theta) \text{ and } \cos \theta = \sin(90^\circ - \theta) \text{ and } \sec \theta = \frac{1}{\cos \theta} \text{ and } \csc \theta = \frac{1}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta} = \frac{1}{\cos(90^\circ - \theta)} = \csc(90^\circ - \theta) \text{ therefor the answer is B}$$



MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

152. If  $x$  is an acute angle and  $\tan x = 3$ , then what is the value of  $\cos x$ ?

- A.  $\frac{3}{5}$                       B.  $\sqrt{10}$                       C.  $\frac{1}{\sqrt{5}}$                       D.  $\frac{\sqrt{10}}{10}$

Answer:-  $\tan x = \frac{y}{x}$  and given that  $\tan x = 3 \Rightarrow \frac{y}{x} = 3 \Rightarrow y = 3x$

Remember  $r^2 = x^2 + y^2 \Rightarrow r = \sqrt{x^2 + y^2} = \sqrt{x^2 + (3x)^2} = \sqrt{10x^2} = \sqrt{10} x$

$$\cos x = \frac{x}{r} = \frac{x}{\sqrt{10} x} = \frac{1}{\sqrt{10}} = \frac{\sqrt{10}}{10} \text{ there for answer is D}$$

153. If  $p(x, y)$  is a point on the terminal side of an angle  $\theta$  in standard position where the distance between  $p$  and the origin is  $r$ , then  $\csc \theta$  is—?

- A.  $r/y$                       B.  $r/x$                       C.  $x/r$                       D.  $x/y$

Answer is A

154. Which of the following is TRUE about the second quadrant angle  $\theta$  in standard position whose terminal side lies on the line  $2x+y=0$ ?

- A.  $\sin \theta = \frac{1}{\sqrt{5}}$                       B.  $\cos \theta = \frac{2}{\sqrt{5}}$                       C.  $\sin \theta = \frac{2}{\sqrt{5}}$                       D.  $\cos \theta = -\frac{2}{\sqrt{5}}$

Answer:-

Assume a point on  $l$  by taking  $x = -1$  then  $y = 2$  then  $r = \sqrt{x^2 + y^2} = \sqrt{(-1)^2 + (2)^2} = \sqrt{1+4} = \sqrt{5}$

In second quadrant  $\sin \theta > 0$  and  $\cos \theta < 0$  and  $\sin \theta = \frac{y}{r}$  and  $\cos \theta = \frac{x}{r}$ . Hence,  $\sin \theta = \frac{2}{\sqrt{5}}$  and  $\cos \theta = -\frac{1}{\sqrt{5}}$  there for answer is C

155. Which of the following is equal to  $\csc \left( \frac{11}{3} \pi \right)$

- A.  $-\frac{2\sqrt{3}}{3}$                       B.  $-2$                       C.  $\frac{2\sqrt{3}}{3}$                       D.  $2$

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Answer:-  $\csc\left(\frac{11}{3}\pi\right) = \csc\left(\frac{11}{3} \times 180^\circ\right) = \csc(11 \times 60^\circ) = \csc 660^\circ =$   
 $\csc(660 - 360)^\circ = \csc 300^\circ = \frac{1}{\sin 300^\circ} = \frac{1}{\sin(-60)^\circ} = -\frac{1}{\frac{\sqrt{3}}{2}} = -\frac{2}{\sqrt{3}} = -\frac{2\sqrt{3}}{3}$

Answer A

156. If  $\sin 18^\circ = 0.31$  and  $\cos 18^\circ = 0.95$ , then which of the following is correct?

A.  $\sec 162^\circ = -\frac{10}{95}$  B.  $\cot 162^\circ = -\frac{95}{31}$  C.  $\tan 162^\circ = \frac{31}{95}$  D.  $\csc 162^\circ = \frac{10}{31}$

Answer:- give  $\sin 18^\circ = 0.31$  and  $\cos 18^\circ = 0.95$  note if  $\theta$  is in second quadrant

$$\sin \theta = \sin(180^\circ - \theta) \text{ and } \cos \theta = -\cos(180^\circ - \theta)$$

$$\text{there for } \sin 162^\circ = \sin(180^\circ - 18^\circ) = 0.31 \text{ and}$$

$$\cos 162^\circ = -\cos(180^\circ - 18^\circ) = -0.95$$

$$\cot 162^\circ = \frac{\cos 162^\circ}{\sin 162^\circ} = -\frac{0.95}{0.31} = -\frac{95}{31} \text{ there for answer is B}$$

157. Suppose  $\cos \theta = 0.8$  and  $\csc \theta < 0$ , then  $\tan \theta$  is equal to?

A.  $3/5$  B.  $4/5$  C.  $-3/4$  D.  $-4/3$

Answer :-

$$\cos \theta = 0.8 \Rightarrow \theta \text{ is in } 1^{\text{st}} \text{ or } 4^{\text{th}} \text{ quadrant and } \csc \theta < 0 \Rightarrow \theta \text{ is in } 3^{\text{rd}} \text{ or } 4^{\text{th}} \text{ quadrant}$$

$$\text{There for } \theta \text{ is in } 4^{\text{th}} \text{ quadrant}$$

$$\cos \theta = 0.8 = \frac{8}{10} = \frac{x}{r} \Rightarrow 10x = 8r \text{ and } r^2 = x^2 + y^2 \Rightarrow \left(\frac{10}{8}x\right)^2 = x^2 + y^2$$

$$\Rightarrow y^2 = \frac{100}{64}x^2 - x^2 \Rightarrow y^2 = \frac{36}{64}x^2 \Rightarrow y = \frac{6}{8}x$$

$$-\tan \theta = \frac{y}{x} = \frac{\frac{6}{8}x}{x} = \frac{6}{8} = \tan \theta = -\frac{3}{4} \text{ answer is C}$$

158. If  $\sin \alpha = r$  and  $\alpha + \theta = 90^\circ$ , then which of the following is true?

A.  $\sec \theta = \frac{1}{r}$  B.  $\sin \theta = r$  C.  $\cos \theta = r$  D.  $\cos \alpha = \frac{1}{r}$



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Answer:-

Given  $\sin \alpha = r$  and  $\alpha + \theta = 90^\circ \Rightarrow \theta = 90^\circ - \alpha \Rightarrow \cos \theta = \cos(90^\circ - \alpha) = \sin \alpha = r$

$$\sec \theta = \frac{1}{\cos \theta} = \frac{1}{r} \text{ Answer is A}$$

159. Which of the following is co-terminal with  $\theta = 120^\circ$ ?

A.  $-480^\circ$

B.  $850^\circ$

C.  $-\frac{19\pi}{6}$

D.  $\frac{14\pi}{3}$

Answer:- *co – terminal angles are angles that have the same terminal side.*

*co – terminal with  $\theta = 120^\circ$*

$-480^\circ$  is co – terminal  $-480^\circ + 360^\circ = -120^\circ$

$850^\circ$  is co – terminal  $850^\circ - 720^\circ = 130^\circ$

$\frac{19}{6}\pi = \frac{19}{6} \times 180^\circ = 570^\circ$  coterminal  $570^\circ - 360^\circ = 210^\circ$

$\frac{14\pi}{3} = \frac{14}{3}\pi = \frac{14}{3} \times 180^\circ = 840^\circ$  co – terminal  $840^\circ - 720^\circ = 120^\circ$

*hence answer is D*



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**Grade 10 unit 6 - Plane Geometry**

160. The slant height of a square pyramid is the distance measured from its vertex to—?
- A. The center of its base  
B. any point inside its base  
C. one of the side of its base  
D. one of the vertex of its base.

From the definition Answer is C

161. A frustum of a square pyramid has height 6cm, where its upper base has side 2cm and lower base of sides is 6cm then what is the volume of the frustum ?
- A.  $104cm^3$       B.  $312cm^3$       C.  $260cm^3$       D.  $208cm^3$

Answer:- the volume of a frustum of pyramid is  $V = \frac{h'}{3}(A + A' + \sqrt{AA'})$

where  $h'$  is the height of the frustum and  $A$  lower base area  $A'$  upper base area

In our question lower base is a square with side 6cm then its area is  $36cm^2$

upper base is a square with side 2cm then its area is  $4cm^2$

and the height 6cm

$$\begin{aligned} \text{then its volume } V &= \frac{6cm}{3} (36cm^2 + 4cm^2 + \sqrt{36cm^2 \times 4cm^2}) \\ &= 2cm (40cm^2 + \sqrt{144cm^2}) = 2(40cm^2 + 12cm^2) = 104cm^3 \end{aligned}$$

answer is A

162. A glass is in shape of a frustum of a right circular cone has slant height 10cm and radii 9cm and 3cm. what is the volume of the glass in  $cm^3$ ?

- A.  $240\pi$       B.  $312\pi$       C.  $192\pi$       D.  $204\pi$

Answer:- the volume of a frustum of cone is  $V = \frac{\pi h'}{3}(r^2 + r'^2 + rr')$

where  $h'$  is the height of the frustum and  $r$  radius lower base  $r'$  radius

upper base In our question lower base have a radius 9cm and upper

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*base 3cm and slant height 10cm to find the height*

$$sh^2 = h^2 + (r - r')^2 \Rightarrow 10^2 = h^2 + (9 - 3)^2$$

$$\Rightarrow 1000cm^2 = h^2 + 36cm^2$$

$$\Rightarrow h = 8cm$$

$$\begin{aligned} V &= \frac{\pi h'}{3} (r^2 + r'^2 + rr') = \frac{\pi 8cm}{3} (9cm^2 + 3cm^2 + 9cm \times 3cm) \\ &= \frac{\pi 8cm}{3} (39cm^2) = 8\pi cm (13cm^2) = 204\pi cm^3 \end{aligned}$$

Answer D

163. If the radius of a sphere is doubled, what happens to the surface area?

- A. it becomes four times as large as the original surface area.
- B. it becomes eight times as large as the original surface area
- C. it also doubled
- D. it is increase by four-square units.

Answer:- *remember the surface area of sphere is given by*  $A = 4\pi r^2$

*when r is doubled area will become*  $A = 4\pi(2r)^2 = 4\pi 4r^2 = 16\pi r^2$  *ie it multiply by 4*

Answer is A

164. If a metallic right circular cylinder of height 18cm and the base of the radius is 4cm is melted down to form a sphere, then which one of the following is correct?

- A. The diameter of the sphere is  $12\sqrt[3]{4\pi}$  cm
- B. The surface area of the sphere is  $144\pi cm^2$
- C. The volume of the sphere is  $48\pi cm^3$
- D. The radius of the sphere is  $\frac{3}{\sqrt{2}}\pi cm$

Answer:-*given height of cylinder is 18cm and radius is 4cm*

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

**Volume** of cylinder given by  $V = \pi r^2 h = \pi(4cm)^2 18cm = \pi 16cm^2 18cm = 288\pi cm^3$

but the volume of the cylinder and volume of sphere are equal

$$\pi r^2 h = \frac{4}{3} \pi r^3 \Rightarrow 288\pi cm^3 = \frac{4}{3} \pi r^3 \Rightarrow r^3 = 216cm^3 \Rightarrow r = 6cm$$

Diameter of sphere is  $2r = 6 \times 2 = 12cm$

Surface area of sphere is  $A = 4\pi r^2 = 4\pi(6cm)^2 = 144\pi cm^2$

Volume of sphere is  $V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi(6cm)^3 = 288\pi cm^3$  Answer is B.

165. The diameter of the base and a height of a circular cone are found to be  $a$  and  $2b$  units long respectively. What is the formula for the volume  $v$  of the cone?

A.  $V = \frac{2}{3} \pi a^2 b$       B.  $V = \frac{1}{3} \pi a^2 b$       C.  $V = \frac{1}{6} \pi a^2 b$       D.  $V = \frac{4}{3} \pi a^2 b$

Answer:- given diameter  $d = a \Rightarrow r = \frac{a}{2}$  and height  $h = 2b$

$$\text{Volume } V = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \left(\frac{a}{2}\right)^2 2b = \frac{1}{3} \pi \frac{a^2}{4} 2b = \frac{\pi a^2 b}{6} \text{ answer is C}$$

166. The volume of a pyramid that has a height of 8cm and rectangular base of dimensions 6cm by 4cm is

A.  $96cm^3$       B.  $64cm^3$       C.  $576cm^3$       D.  $192cm^3$

Answer :- volume of pyramid is given by  $V = \text{base area} \times \text{height}$

$$V = 6cm \times 4cm \times 8cm = 192cm^3 \text{ Answer is D}$$

167. If the frustum is formed from a regular pyramid, then which one of the following statement is TRUE about its lateral faces?

- A. They are isosceles trapezium
- B. Their altitude are NOT equal
- C. They are rhombus
- D. Their area are not equal

Answer:- from its definition answer is A

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

- A.  $\{\}$                       B.  $\{-3, 1\}$                       C.  $\{-3\}$                       D.  $\{1\}$

solution:-  $|x + 5| = 2x + 4$  from the definition of  $|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$

so in our case we have two condition

condition1 if  $x + 5 < 0$  then  $|x + 5| = -x - 5$

thus our equation becomes  $-x - 5 = 2x + 4 \Rightarrow 3x = -9 \Rightarrow x = -3$

condition1 if  $x + 5 \geq 0$  then  $|x + 5| = x + 5$

thus our equation becomes  $x + 5 = 2x + 4 \Rightarrow x = 1$  there for answer is  $\{-3, 1\}$

Answer B.

173. If  $f(x) = \sqrt{x}$  and  $g(x) = \sqrt{3-x}$ , the domain of  $f + g$  is

- A.  $[0, \infty)$                       B.  $[0, 3]$                       C.  $(-\infty, 3]$                       D.  $(-\infty, 3] \cup (3, \infty)$

Solution the domain of  $f(x) + g(x)$  is the intersection of the domain of  $f(x) \cap g(x)$

Domain of  $f(x) = \sqrt{x}$  is  $x \geq 0$

Domain of  $g(x) = \sqrt{3-x}$  is  $x \leq 3$

Domain of  $f(x) + g(x) = x \geq 0 \cap x \leq 3 = 0 \leq x \leq 3 = [0, 3]$

Answer is B

174. Let  $f(x)=7$  and  $g(x)=x^2 - 9$ , then  $(f \circ g)(0)$  is equal to ?

- A. 7                      B. 40                      C. -2                      D. 7

Solution: given  $f(x) = 7$  and  $g(x) = x^2 - 9$

$(f \circ g)(x) = f(g(x)) \Rightarrow (f \circ g)(0) = f(g(0)) = f(0^2 - 9) = f(-9) = 7$

answer is A

175. Which of the following is rational function?

- A.  $f(x) = \frac{\sqrt{x+1}}{x-1}$                       B.  $f(x) = x^3 - 3x^2 + \log_2 3$                       C.  $g(x) = \frac{x^2 + \sin x + 2}{x+3}$                       D.  $k(x) = \frac{3-4x}{2x-3^x}$

Solution:-

From its definition a rational function is the ratio of two polynomial functions

since radicals, trigonometry and exponential are not polynomial there for A, C and D are not rational. Therefore Answer is B

176. If  $f(x) = \frac{\sqrt{x+1}}{x-1}$  and  $f(a) = 5$  then is the value/s of a:

- A. 1 or  $\frac{24}{25}$                       B. -1 or  $\frac{24}{25}$                       C. 1 or  $\frac{25}{24}$                       D. 1 or  $-\frac{24}{25}$

Solution:- given  $f(x) = \frac{\sqrt{x+1}}{x-1}$  and  $f(a) = 5$

$f(x) = \frac{\sqrt{x+1}}{x-1} \Rightarrow f(a) = \frac{\sqrt{a+1}}{a-1} = 5 \Rightarrow \sqrt{a+1} = 5a - 5$  squaring both side

$a + 1 = 25a^2 - 50a + 25 \Rightarrow 25a^2 - 49a + 24 = 0 \Rightarrow 25a^2 - 25a - 24 + 24 = 0$



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$$25a(a - 1) - (24(a - 1)) = (a - 1)(25a - 24) = 0 \Rightarrow a = 1 \text{ or } a = \frac{24}{25}$$

Answer is A

177. What is the domain of the rational function  $f(x) = \frac{x+2}{x^2+4}x^{-2}$ ?

- A.  $\mathbb{R} \setminus \{-2, 2\}$  B.  $\mathbb{R} \setminus \{-2, 0\}$  C.  $\mathbb{R} \setminus \{0\}$  D.  $\mathbb{R}$

Solution:-  $f(x) = \frac{x+2}{x^2+4}x^{-2} = \frac{x+2}{x^2+4} \times \frac{1}{x^2}$  the domain of rational function is  $d(x) \neq 0$

Therefore, our domain is the set of real number different from 0

Answer is C.

178. Let  $f(x) = \frac{2x+3}{x-1}$ , then what is the range of f?

- A.  $\mathbb{R} \setminus \{1\}$  B.  $\mathbb{R} \setminus \{3\}$  C.  $\mathbb{R}$  D.  $\mathbb{R} \setminus \{2\}$

Solution :-

$$f(x) = \frac{2x+3}{x-1} \Rightarrow y = \frac{2x+3}{x-1}$$

Solve for in terms of  $y \Rightarrow yx - y = 2x + 3 \Rightarrow yx - 2x = y + 3$

$$x(y - 2) = y + 3 \Rightarrow x = \frac{y+3}{y-2} \Rightarrow y \neq 2 \text{ there for range of } y \neq 2$$

Answer is D

179. What are the value of a and b which makes the mathematical statement

$$\frac{x+1}{x^2-9} = \frac{a}{x-3} + \frac{b}{x+3} \text{ true?}$$

- A.  $A=1, b=0$  B.  $a=\frac{1}{3}, \frac{3}{5}$  C.  $a=-\frac{2}{5}, b=1$  D.  $a=\frac{2}{3}, b=\frac{1}{3}$

$$\text{Solution:- } \frac{x+1}{x^2-9} = \frac{a}{x-3} + \frac{b}{x+3} \Rightarrow \frac{x+1}{(x-3)(x+3)} = \frac{a(x+3)+b(x-3)}{(x-3)(x+3)} \Rightarrow \frac{x+1}{(x-3)(x+3)} = \frac{ax+3a+bx-3b}{(x-3)(x+3)}$$

$$\Rightarrow \frac{x+1}{(x-3)(x+3)} = \frac{ax+bx+3a-3b}{(x-3)(x+3)} \Rightarrow \frac{x+1}{(x-3)(x+3)} = \frac{(a+b)x+3a-3b}{(x-3)(x+3)}$$

$$\Rightarrow \begin{matrix} a+b=1 \\ 3a-3b=1 \end{matrix} \text{ and } \Rightarrow \begin{matrix} 3a+3b=3 \\ 3a-3b=1 \end{matrix} \Rightarrow 6a=4 \Rightarrow a=\frac{4}{6}=\frac{2}{3}$$

by substituting the value of a in the equation  $a + b = 1$  we gat  $b = \frac{1}{3}$

Answer is D

180. What is the solution set of  $\frac{2}{x} - \frac{x-2}{x^2-2x} = 1 - \frac{2x-2}{3x-2}$  ?

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A.  $\{-2, 1\}$

B.  $\{1, 2\}$

C.  $\{-1\}$

D.  $\{1\}$

$$\text{Solution :- } \frac{2}{x} - \frac{x-2}{x^2-2x} = 1 - \frac{2x-2}{3x-2}$$

**note: -to solve rational equation first restrict the domain**

$$\text{Domain } \mathbb{R} \setminus \left\{0, \frac{2}{3}, 2\right\}$$

$$\frac{2}{x} - \frac{x-2}{x^2-2x} = 1 - \frac{2x-2}{3x-2} \Rightarrow \frac{2(x-2) - (x-2)}{x^2-2x} = \frac{3x-2 - (2x-2)}{3x-2}$$

$$\Rightarrow \frac{2x-4-x+2}{x^2-2x} = \frac{3x-2-2x+2}{3x-2}$$

$$\Rightarrow \frac{x-2}{x^2-2x} = \frac{1}{3x-2}$$

$$\frac{x-2}{x^2-2x} = \frac{1}{3x-2} \Rightarrow \frac{x-2}{x} = \frac{1}{3x-2} \Rightarrow 3x-2 = x \Rightarrow x^2-3x+2=0$$

$$(x-1)(x-2)=0 \Rightarrow x=1 \text{ or } x=2 \text{ but } 2 \text{ is not thememeber of the domain}$$

Answer is 1 only that is D

181. If the line with equation  $4x + ky = 8$  is parallel to the line with equation  $x + 2y = 0$ , then the value of  $K$  is?

A. -8

B. 8

C. -2

D. 2

**Solution:-note two lines are parallel if they have the same slope.**

The slope of the line  $4x + ky = 8 \Rightarrow ky = -4x + 8 \Rightarrow y = -\frac{4}{k}x + \frac{8}{k}$  then its slope  $m = -\frac{4}{k}$  and the line  $x + 2y = 0 \Rightarrow y = -\frac{1}{2}x$  have slope  $s = -\frac{1}{2}$

$$\text{To be parallel } -\frac{4}{k} = -\frac{1}{2} \Rightarrow k = 8$$

Answer is B

182. What is the distance from the point  $(3, 2)$  to the line  $4x + 3y = 13$ ?

A. 1

B. 2

C. 13/5

D. 1/5

**Solution:- note distance between a point  $P(x_1, y_1)$  and a line**

$$L: ax + by + c = 0 \text{ is given by } d = \frac{ax_1 + by_1 + c}{\pm\sqrt{a^2 + b^2}}$$

**In our case  $x_1 = 3, y_1 = 2$  and  $a = 4, b = 3$  and  $c = -13$**

$$\text{so } d = \frac{4 \times 3 + 3 \times 2 - 13}{\sqrt{4^2 + 3^2}} = \frac{12 + 6 - 13}{\sqrt{16 + 9}} = \frac{5}{5} = 1$$

Answer is A

183. What is the angle between the lines pass through  $(-1, 3)$  and  $(2, 3)$  and the with equation  $\sqrt{3}y - x + 7 = 0$ ?

A.  $120^\circ$

B.  $60^\circ$

C.  $30^\circ$

D.  $45^\circ$

**Solution:- Note if the slope of  $l_1 = m_1$  and the slope of  $l_2 = m_2$ , then the tangent**



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Of the angle between this two line  $l_1$  and  $l_2$  given by  
 $\tan\theta = \frac{m_2 - m_1}{1 + m_1 m_2}$  if  $m_1 m_2 \neq -1$  so in our case  $m_1 = \frac{3 - 3}{2 - (-1)} = 0$   
 and  $m_2$  of the line  $\sqrt{3}y - x + 7 = 0 \Rightarrow y = \frac{1}{\sqrt{3}}x - \frac{7}{\sqrt{3}} \Rightarrow m_2 = \frac{1}{\sqrt{3}}$   
 there for  $\tan\theta = \frac{m_2 - m_1}{1 + m_1 m_2} = \frac{\frac{1}{\sqrt{3}} - 0}{1 + \frac{1}{\sqrt{3}} \times 0} = \frac{\frac{1}{\sqrt{3}}}{1} = \frac{1}{\sqrt{3}} \Rightarrow \theta = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right) = 30^\circ$

Answer is C

184. What will be the equation of a circle that has center (5, 12) and it is tangent to the line with equation  $2x - y + 3 = 0$ ?

- A.  $(x - 5)^2 + (y - 12)^2 = \frac{1}{5}$  C.  $(x - 5)^2 + (y - 12)^2 = 5$   
 B.  $(x - 5)^2 + (y - 12)^2 = \frac{1}{\sqrt{5}}$  D.  $(x - 5)^2 + (y - 12)^2 = 2$

Solution :-

the radius  $r$  is equal to the distance between the center and the tangent line  
 In our case the center is (5, 12) and the tangent line is  $2x - y + 3 = 0$   
 we use the distance formula between the point and a line  
 with  $x_1 = 5, y_1 = 12$  and  $a = 2, b = -1$  and  $c = 3$

$$r = d = \frac{ax_1 + by_1 + c}{\pm\sqrt{a^2 + b^2}} = \frac{2 \times 5 + (-1)(12) + 3}{\pm\sqrt{(2)^2 + 1^2}} = \frac{10 - 12 + 3}{\pm\sqrt{4 + 1}} = \frac{1}{\sqrt{5}}$$

equation of circle is given by  $(x - h)^2 + (y - k)^2 = r^2$

$$(x - 5)^2 + (y - 12)^2 = \left(\frac{1}{\sqrt{5}}\right)^2 = (x - 5)^2 + (y - 12)^2 = \frac{1}{5}$$

Answer is A

185. What is the focus of the parabola whose equation is  $y^2 + 8x + 6y + 25 = 0$ ?

- A. (-2, -3) B. (3, 2) C. (-4, -3) D. (0, -2)

Solution:-

$$y^2 + 8x + 6y + 25 = 0 \Rightarrow y^2 + 6y + 8x + 25 = 0 \Rightarrow y^2 + 6y = -8x - 25$$

$$\Rightarrow y^2 + 6y + 9 = -8x - 25 + 9 \Rightarrow (y + 3)^2 = -8(x + 2)$$

$$(y + 3)^2 = -8(x + 2) \Rightarrow \text{vertex is } (-2, -3) \text{ and focal length } p = 2$$

$$\text{focus } (h - p, k) = (-2 - 2, -3) = (-4, -3)$$

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Answer is C

186. **Which of the following is not true about an ellipse whose equation is given**

by  $\frac{(x-1)^2}{9} + \frac{(y-2)^2}{4} = 1$ ?

A. The major axis is 6

C. The foci are  $(1 \pm \sqrt{5}, 2)$

B. The latus rectum is  $\frac{2\sqrt{76}}{9}$

D. The eccentricity is  $\frac{\sqrt{5}}{3}$

Solution:- center  $c(1,2)$  and  $a^2 = 9 \Rightarrow a = 3$  and  $b^2 = 4 \Rightarrow b = 2, c^2 = a^2 - b^2$

$$c^2 = 3^2 - 2^2 = 9 - 4 = 5 \Rightarrow c = \sqrt{5}$$

**A. Major axis is  $2a = 2 \times 3 = 6$**

**C. foci are  $(h \pm c, k) = (1 \pm \sqrt{5}, 2)$**

**D. eccentricity  $= \frac{c}{a} = \frac{\sqrt{5}}{3}$ . A, C and D all are true** so  
answer is B

187. **Which of the following is true about the equation  $3x^2 - 6x = y^2$**

A. **an ellipse with center at  $(1, 0)$**

B. **a hyperbola with center at  $(0, 1)$**

C. **an ellipse with center at  $(-1, 0)$**

D. **a hyperbola with one of its foci is  $(1, 0)$**

Solution:-  $3x^2 - 6x = y^2 \Rightarrow 3x^2 - 6x - y^2 = 0 \Rightarrow 3(x^2 - 2x + 1) - y^2 = 0 + 3$

$$3(x-1)^2 - y^2 = 3 \Rightarrow \frac{(x-1)^2}{1} - \frac{y^2}{3} = 1$$

this equation represents hyperbola with center at  $(1, 0)$  therefore, answer is D

188. Let p, q and r have truth values, F, F and T respectively, then which one of the following has a truth value "F"

A.  $\neg p \wedge \neg(q \wedge r)$

B.  $\neg p \wedge (q \Rightarrow \neg r)$

C.  $\neg q \Rightarrow (p \vee \neg r)$

D.  $r \Leftrightarrow \neg(p \vee q)$

Solution:- given p is false, q is false and r is true implies  $\neg p = T, \neg q = T$  and  $\neg r = F$

A)  $\neg p = F, (q \wedge r) = (F \wedge T) \Rightarrow \neg(q \wedge r) = F$  there for  $\neg p \wedge \neg(q \wedge r) = F \wedge F = F$

B)  $\neg p = F, (q \Rightarrow \neg r) = (F \Rightarrow F) = T$  There or  $\neg p \wedge (q \Rightarrow \neg r) = F \wedge T = F$

C)  $\neg q = T, (p \vee \neg r) = (F \vee F) = F$  there for  $\neg q \Rightarrow (p \vee \neg r) = T \Rightarrow F = F$

D)  $r = T, \neg(p \vee q) = \neg(F \vee F) = \neg F = T$  there for  $r \Leftrightarrow \neg(p \vee q) = T \Leftrightarrow T = T$

Answer is D

189. If p and q are equivalent propositions then which of the following is tautology?



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**A.  $p \wedge \neg q$**

**B.  $\neg p \vee q$**

**C.  $p \Rightarrow \neg q$**

**D.  $\neg p \Leftrightarrow q$**

Solution:- equivalent preposition mean having the same truth value

Therefore, both are true or both are false and

Tautoiogy mean always having true truth value

**A.  $P \wedge \neg q$  since  $p$  and  $q$  have the same truth value  $p$  and  $\neg q$  have opposite truth value hence  $p \wedge \neg q$  is  $F$**

**B. If  $p$  and  $q$  are equivalent prepositions then either of  $\neg p$  or  $q$  is  $T$  there**

$\neg p \vee q$  is always  $T$  hence it is tautology

Answer is B

190. Let  $p(x) = x^2 + x$  is a positive real number which of the following is equivalent to  $\neg(\exists x p(x))$ ?

A.  $(\forall x)(x^2 + x \leq 0)$

B.  $(\exists x)\neg(x^2 + x > 0)$

C.  $(\forall x)(x^2 + x < 0)$

D.  $(\exists x)(x^2 + x \leq 0)$

191. Let  $p = I$  pass the examination,

$q = I$  study hard, then which of the following represent the argument

"I pass the examination, if I study hard. I don't study hard there fore I pass the examination"

A.  $P \Rightarrow q, \neg q \vdash p$

B.  $p \Rightarrow q, q \vdash p$

C.  $q \Rightarrow p, \neg q \vdash p$

D.  $q \Rightarrow q, \neg q \vdash \neg p$

Answer is C

192. Which one of the following is a scalar matrix?

A.  $\begin{pmatrix} 0 & 2 \\ 2 & 0 \end{pmatrix}$

B.  $\begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$

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

D.  $\begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix}$

Solution:- Note a scalar matrix is a diagonal matrix with the value of the main diagonal are equal. The matrix in A,B and D are note diagonal matrix so they are not scalar matrix but C is the zero matrix it implies the diagonal matrix with the main diagonals are zero there for it is scalar.

Answer is C

193. Let  $A = \begin{pmatrix} x+y & x-y \\ 2 & a+b \end{pmatrix}, B = \begin{pmatrix} 2 & 6 \\ a-b & 8 \end{pmatrix}$  if  $A = B$  then which one is true?

A.  $a=3$

B.  $x=4$

C.  $y=2$

D.  $b=-3$

Solution:- **two matrix  $A = B$  are equal if  $a_{ij} = b_{ij}$  thus  $A = B$  implies**

$$x+y=2, x-y=6, 2=a-b \text{ and } a+b=8$$

From \*and\*\* we get  $2x=8 \Rightarrow x=4 \Rightarrow y=-2$  and from\*\*\* and \*\*\*\* we get  $2a=10 \Rightarrow a=5$  and  $b=3$

There for answer is B

194. What is the  $n^{\text{th}}$  power of  $A = \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ ?

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- A.  $\begin{pmatrix} 1 & 4 \\ 0 & 1 \end{pmatrix}$  B.  $\begin{pmatrix} 1 & 2^n \\ 0 & 1 \end{pmatrix}$  C.  $\begin{pmatrix} 2n & 1 \\ 0 & 1 \end{pmatrix}$  D.  $\begin{pmatrix} 1 & 2n \\ 0 & 1 \end{pmatrix}$

Solution:- from series of multiplication by induction we get the answer is D

195. Which one of the following is not true about determinant of a square matrix?

- A. If A and B are square matrix, then  $\det(AB) = \det A \det B$ .  
 B. For any square matrix A,  $\det A^t = \det A$ .  
 C. The determinant of a scalar matrix is the sum of its diagonal entries.  
 D. The determinant of a triangular matrix is the product of its diagonal entries.

Solution :-from the properties of determinant A,b and D are true but C is not necessarily true so the Answer is C

196. Suppose A is 3X3 non – singular matrix, then what is  $\det(2A^t A^{-1})$   
 A.2 B.8 C. 6 D.4

Solution:- from the property of det,  $\det(kA) = k \det(A)$   
 so  $\det(2A^t A^{-1}) = 2 \det(A^t A^{-1})$

$$= 2 \det(A^t A^{-1}) = 2 \det(A^t) \det(A^{-1}) \text{ but } \det(A^t) = \det(A) \text{ and } \det(A^{-1}) = \frac{1}{\det(A)}$$

$$= 2 \det(A^t A^{-1}) = 2 \det(A) \times \frac{1}{\det(A)} = 2$$

Answer is B

197. Let  $A = \begin{pmatrix} 2 & 4 & 6 \\ -1 & 2 & 0 \\ 0 & 6 & 5 \end{pmatrix}$ , then what is the inverse of A

- A.  $\begin{pmatrix} \frac{5}{2} & 4 & -3 \\ \frac{5}{4} & \frac{5}{2} & -\frac{3}{2} \\ -\frac{3}{2} & -3 & 2 \end{pmatrix}$  B.  $\begin{pmatrix} 10 & 16 & -12 \\ 5 & 10 & -6 \\ -6 & -12 & 8 \end{pmatrix}$  C.  $\begin{pmatrix} 10 & 5 & -6 \\ 16 & 10 & -12 \\ -12 & -6 & 8 \end{pmatrix}$  D.  $\begin{pmatrix} -\frac{5}{2} & -4 & 3 \\ -\frac{5}{4} & -\frac{5}{2} & \frac{3}{2} \\ \frac{3}{2} & 3 & 2 \end{pmatrix}$

Answer is A

31. The solution of the system of equation  $\begin{cases} x_1 + 2x_3 = 0 \\ x_1 + x_2 + x_3 = 4 \\ x_1 + 4x_2 = 14 \end{cases}$  for  $x_1, x_2$  &  $x_3$  respectively are?

- A. 2, 3 & 1 B. 2, 3 & -1 C. 1, 2 & -1 D. -2, -3 & 1

Solution:-by Gramer's rule

$$D = \begin{vmatrix} 1 & 0 & 2 \\ 1 & 1 & 1 \\ 1 & 4 & 0 \end{vmatrix} = 1 \begin{vmatrix} 1 & 1 \\ 4 & 0 \end{vmatrix} - 0 \begin{vmatrix} 1 & 1 \\ 1 & 0 \end{vmatrix} + 2 \begin{vmatrix} 1 & 1 \\ 1 & 4 \end{vmatrix} = -4 - 0 + 2(3) = 2$$



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$$D_1 = \begin{vmatrix} 0 & 0 & 2 \\ 4 & 1 & 1 \\ 14 & 4 & 0 \end{vmatrix} = 0 \begin{vmatrix} 1 & 1 \\ 4 & 0 \end{vmatrix} - 0 \begin{vmatrix} 4 & 1 \\ 14 & 0 \end{vmatrix} + 2 \begin{vmatrix} 4 & 1 \\ 14 & 4 \end{vmatrix} = 2(16 - 14) = 4$$

$$D_2 = \begin{vmatrix} 1 & 0 & 2 \\ 1 & 4 & 1 \\ 1 & 14 & 0 \end{vmatrix} = 1 \begin{vmatrix} 4 & 1 \\ 14 & 0 \end{vmatrix} - 0 \begin{vmatrix} 1 & 1 \\ 1 & 0 \end{vmatrix} + 2 \begin{vmatrix} 1 & 4 \\ 1 & 14 \end{vmatrix} = -14 - 0 + 2(14 - 4) = 6$$

$$D_3 = \begin{vmatrix} 1 & 0 & 0 \\ 1 & 1 & 4 \\ 1 & 4 & 14 \end{vmatrix} = 1 \begin{vmatrix} 1 & 4 \\ 4 & 14 \end{vmatrix} - 0 \begin{vmatrix} 1 & 4 \\ 1 & 14 \end{vmatrix} + 0 \begin{vmatrix} 1 & 1 \\ 1 & 4 \end{vmatrix} = 14 - 16 - 0 + 0 = -2$$

Thus,  $x_1 = \frac{D_1}{D} = \frac{4}{2} = 2$ ,  $x_2 = \frac{D_2}{D} = \frac{6}{2} = 3$  and  $x_3 = \frac{D_3}{D} = -\frac{2}{2} = -1$   
 Answer is B

198. Let  $A = \begin{pmatrix} 8 & -6 & 0 \\ 0 & -4 & -9 \\ 9 & 6 & 5 \end{pmatrix}$  find a matrix B so that  $2A - 3B$  is identity matrix?

A.  $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$  B.  $\begin{pmatrix} 16 & -12 & 0 \\ 0 & -8 & -18 \\ 8 & 12 & 10 \end{pmatrix}$  C.  $\begin{pmatrix} 8 & -6 & 0 \\ 0 & -4 & -9 \\ 9 & 6 & 5 \end{pmatrix}$  D.  $\begin{pmatrix} 5 & -4 & 0 \\ 0 & -3 & -6 \\ 6 & 4 & 3 \end{pmatrix}$

$A = \begin{pmatrix} 8 & -6 & 0 \\ 0 & -4 & -9 \\ 9 & 6 & 5 \end{pmatrix} \Rightarrow 2A = \begin{pmatrix} 16 & -12 & 0 \\ 0 & -8 & -18 \\ 18 & 12 & 10 \end{pmatrix}$  and let  $B = \begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix}$  then

$$2A - 3B = \begin{pmatrix} 16 & -12 & 0 \\ 0 & -8 & -18 \\ 18 & 12 & 10 \end{pmatrix} - \begin{pmatrix} 3a & 3b & 3c \\ 3d & 3e & 3f \\ 3g & 3h & 3i \end{pmatrix} = \begin{pmatrix} 16 - 3a & -12 - 3b & 0 - 3c \\ 0 - 3d & -8 - 3e & -18 - 3f \\ 18 - 3g & 12 - 3h & 10 - 3i \end{pmatrix}$$

$$2A - 3B = I \Rightarrow \begin{pmatrix} 16 - 3a & -12 - 3b & 0 - 3c \\ 0 - 3d & -8 - 3e & -18 - 3f \\ 18 - 3g & 12 - 3h & 10 - 3i \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

$$\Rightarrow 16 - 3a = 1 \Rightarrow a = 5, -12 - 3b = 0 \Rightarrow b = -4, 0 - 3c = 0 \Rightarrow c = 0$$

$$0 - 3d = 0 \Rightarrow d = 0, -8 - 3e = 1 \Rightarrow e = -3, -18 - 3f = 0 \Rightarrow f = -6$$

$$18 - 3g = 0 \Rightarrow g = 6, 12 - 3h = 0 \Rightarrow h = 4 \text{ and } 10 - 3i = 1 \Rightarrow i = 3$$

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Therefore,  $B = \begin{pmatrix} 5 & -4 & 0 \\ 0 & -3 & -6 \\ 6 & 4 & 3 \end{pmatrix}$  Answer is D

199. For what value of x is  $\begin{vmatrix} 1 & -3 \\ x & x-2 \end{vmatrix} = x+1$ ?

- A. 1 B.  $\frac{3}{2}$  C.  $\frac{1}{2}$  D. -1

Solution  $\begin{vmatrix} 1 & -3 \\ x & x-2 \end{vmatrix} = x+1 \Rightarrow 1(x-2) - 3(x) = x+1 \Rightarrow x-2+3x = x+1$   
 $= 4x-2 = x+1 \Rightarrow 3x = 3 \Rightarrow x = 1$

Answer is A

200.  $\frac{2i}{1-i} =$  A. i-1 B. 1-i C. 1+i D. i

Solution:-  $\frac{2i}{1-i} = \frac{2i}{1-i} \times \frac{1+i}{1+i} = \frac{2i-2}{1+1} = \frac{2(i-1)}{2} = i-1$

Answer is A

201. If the conjugate of  $(x+yi)(1-2i)$  be  $1+i$  then which one is true?

- A.  $y = \frac{3}{5}$  B.  $x = \frac{1}{5}$  C.  $x-yi = \frac{1-i}{1+2i}$  D.  $x+yi = \frac{1-i}{1+2i}$

Solution:-  $\overline{(x+yi)(1-2i)} = 1+i \Rightarrow (x-yi)(1+2i) = 1+i$  by  $\overline{Z_1 Z_2} = \overline{Z_1} \overline{Z_2}$   
 $(x-yi) = \frac{1+i}{(1+2i)} \Rightarrow x+yi = \frac{1-i}{1-2i}$

Answer is D

202. If  $\left(\frac{1+i}{1-i}\right)^x = 1$  then the value of x is

- A.  $x=4n, n \in \mathbb{Z}^+$  B.  $x=4n+1, n \in \mathbb{Z}^+$  C.  $x=2n, n \in \mathbb{Z}^+$  D.  $x=2n+1, n \in \mathbb{Z}^+$

Solution:-  $\frac{1+i}{1-i} = \frac{1+i}{1-i} \times \frac{1+i}{1+i} = \frac{1+2i-1}{1+1} = \frac{2i}{2} = i \Rightarrow \left(\frac{1+i}{1-i}\right)^x = (i)^x \Rightarrow x = 4n$

Answer is A

203.  $\left|(1+i)\left(\frac{2+i}{3+i}\right)\right| =$  A. 1 B. -1 C.  $\frac{1}{2}$  D.  $-\frac{1}{2}$

Solution:-  $\left|(1+i)\left(\frac{2+i}{3+i}\right)\right| = |1+i| \frac{|2+i|}{|3+i|} = \sqrt{2} \frac{\sqrt{5}}{\sqrt{10}} = \frac{\sqrt{10}}{\sqrt{10}} = 1$

Answer is A

204. What is the principal argument of  $z = -2+2\sqrt{3}i$

- A.  $\frac{\pi}{3}$  B.  $-\frac{2\pi}{3}$  C.  $\frac{2\pi}{3}$  D.  $\frac{\pi}{6}$

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12th MATHS MCQ (2014E.C)

# MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

Solution:-  $\arg(Z) = \tan^{-1}\left(\frac{2\sqrt{3}}{-2}\right) = \tan^{-1}(-\sqrt{3}) = \left(\pi - \frac{\pi}{3}\right) = \frac{2\pi}{3}$

Answer is C

205. In the set of complex number what is the solution set  $x^2 + 4x + 5$ ?

- A.  $\{.\}$  C.  $\sqrt{8}^{50} \left( \cos \frac{\pi}{4} + i \sin \frac{\pi}{4} \right)$   
 B.  $8^{50} \left( \cos \frac{\pi}{4} + i \sin \frac{\pi}{4} \right)$  D.  $8^{50} (\cos 25\pi + i \sin 25\pi)$

206. The multiplicative inverse of  $\frac{1+2i}{1-i}$  is

- A.  $-\frac{3}{5} - \frac{i}{5}$  B.  $-\frac{3}{5} + \frac{i}{5}$  C.  $\frac{3}{5} - \frac{i}{5}$  D.  $\frac{3}{5} + \frac{i}{5}$

207. If  $\vec{A} = 2\mathbf{i} - 3\mathbf{j}$  and  $\vec{B} = 3\mathbf{i}$  find the unit vector in the direction of  $\vec{A} - \vec{B}$ ?

- A.  $-i-3j$  B.  $-\frac{i}{\sqrt{10}} - \frac{3j}{\sqrt{10}}$  C.  $-\frac{i}{10} - \frac{3j}{10}$  D.  $-\frac{i}{\sqrt{10}} + \frac{3j}{\sqrt{10}}$

208. What is the product of  $\vec{U} = 4\mathbf{i}$  and  $\vec{V} = 2\mathbf{i} + 2\mathbf{j}$

- A. 8 B. -8 C. 0 D. 4

209. Given the vector  $\vec{U} = 3\mathbf{i} + 2\mathbf{j}$  and  $\vec{V} = m\mathbf{i} - \mathbf{j}$  for what value of m is the angle between them is  $45^\circ$

- A. -5 or 1/5 B. 1/5 or 5 C. -5 or -1/5 D. 5 or -1/5

210. What is the value of k if the vector  $\vec{U} = -3\mathbf{i} + k\mathbf{j}$  and  $\vec{V} = 2\mathbf{i} + 10\mathbf{j}$  are parallel?

- A. 3/5 B. 15 C. -3/2 D. -15

211. If a translation T, takes the point A(1,-3) to B(3,2) then what is the image of the ellipse

$$4(x-2)^2 + 9(y+3)^2 = 36$$

- A.  $(x-2)^2 + (y+3)^2 = 36$  C.  $4(x-4)^2 + 9(y-2)^2 = 36$   
 B.  $4(x-2)^2 + 9(y+3)^2 = 1$  D.  $4(x+2)^2 + 9y^2 = 36$

212. What is the image of the point P(2,3) after it is reflected by the line  $y = \sqrt{3}x$ ?

- A. (3,2) B.  $\left(-1 + \frac{3\sqrt{3}}{2}, \sqrt{3} + \frac{3}{2}\right)$  C.  $(2 + \sqrt{3}, 3 + \sqrt{3})$  D.  $\left(1 - \frac{3\sqrt{3}}{2}, \sqrt{3}\right)$

213. What is the image of  $(-2, 3)$  after it is rotated through  $270^\circ$  about the origin in an anticlockwise direction?

- A.  $(-2, -3)$  B.  $(-3, -2)$  C.  $(-3, 2)$  D.  $(3, 2)$

214. What is the image of a circle  $(x-3)^2 + (y-1)^2 = 1$  when it is rotated through  $\theta = \pi$  about  $(-2, 3)$ ?

- A.  $(x+2)^2 + (y-3)^2 = 1$  C.  $(x-5)^2 + (y+2)^2 = 1$   
 B.  $(x+7)^2 + (y-5)^2 = 1$  D.  $(x-7)^2 + (y+5)^2 = 1$

215. Which of the following is true about  $y = \csc x$

- A. Its Domain is  $\mathbf{R}$  C. its Asymptotes is  $x = k\pi, k \in \mathbf{Z}$

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B. it is even function

D. its range is  $(-\infty, -1) \cup (1, \infty)$

216.  $\cos^{-1}\left(\cos \frac{3\pi}{4}\right) = \text{---}$

A.  $\frac{3\pi}{4}$

B.  $\frac{\pi}{4}$

C.  $-\frac{\sqrt{2}}{4}$

D.  $\frac{\sqrt{2}}{4}$



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**Solution of same selected questions from g 12**

217. What are the first 5 terms of the sequence whose general term  $a_n = n + \cos(n\pi)$ ?

- A. 3,2,5,4,7      B. 0,3,2,5,4      C. 4,7,6,9,8      D. 1,3,2,5,4

Solution  $a_n = n + \cos(n\pi)$

$$a_1 = 1 + \cos(\pi) = 1 + (-1) = 0$$

$$a_2 = 2 + \cos(2\pi) = 2 + (1) = 3$$

There for the answer is B. 0,3,2,5,4

$$a_3 = 3 + \cos(3\pi) = 3 + (-1) = 2$$

$$a_4 = 4 + \cos(4\pi) = 4 + 1 = 5$$

$$a_5 = 5 + \cos(5\pi) = 5 + (-1) = 4$$

218. The 3<sup>rd</sup> term of the sequence  $\{a_n\}$  whose general term is  $a_n = \frac{4(-1)^n}{1+n!}$ ?

- A. 6      B. -4/7      C. 4/3      D.

5/7

Solution :- 3<sup>rd</sup> term is  $a_n = \frac{4(-1)^n}{1+n!}$  is  $a_3 = \frac{4(-1)^3}{1+3!} = \frac{4(-1)}{1+3 \times 2 \times 1} = \frac{-4}{1+6} = -\frac{4}{7}$  the answer is B

219. What is the general term of the sequence 4,9,16,25...?

- A.  $(-1)^n(n^2 + 1)$       B.  $(n + 1)^2$       C.  $(-1)^n(n^2 - 1)$       D.

$(-1)^{2n}(n^2 + 1)$

Solution :- 4, 9, 16, 25 ...  $a_1 = 4 = 2^2$ ,  $a_2 = 9 = 3^2$ ,  $a_3 = 16 = 4^2$ ,  $a_4 = 25 = 5^2$

If you compare the number of terms and the base of the exponent we have seen

That the base exceeds the term by one. Thus the term is n implies the base of the

exponent is n+1

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$a_n = (n + 1)^2$  hence the answer is B

220. A sequence  $\{a_n\}$  is given by the formula  $a_n = -3(5)^{2n-1}$  which of the number

belongs to  $a_n$ ?

A. -1875

B. 1875

C. 1885

D. -1885

Hint Check wither each number satisfies the given formula  $-3(5)^{2n-1}$  hence answer is D

221. If  $a_n$  is a sequence such that  $a_1 = 2, a_2 = -1$  and  $a_n = 3a_{n-1} + 2a_{n-2}$  for  $n \geq 3$ , then what is  $a_6$ ?

A. 20

B. 6

C. 17

D.

12

$$a_1 = 2, a_2 = -1$$

$$\text{and } a_n = 3a_{n-1} + 2a_{n-2} \text{ for } n \geq 3,$$

$$a_3 = 3a_{3-1} + 2a_{3-2}$$

$$a_3 = 3a_2 + 2a_1$$

$$a_3 = 3(-1) + 2(2)$$

$$a_3 = -3 + 4 = 1$$

$$a_3 = 1$$

$$a_4 = 3a_3 + 2a_2$$

$$a_4 = 3(1) + 2(-1)$$

$$a_4 = 3 - 2$$

$$a_4 = 1$$

$$a_5 = 3a_4 + 2a_3$$

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$$a_5 = 3 \times 1 + 2 \times 1$$

$$a_5 = 3 + 2$$

$$a_5 = 5$$

$$a_6 = 3a_5 + 2a_4$$

$$a_6 = 3 \times 5 + 2 \times 1$$

$$a_6 = 15 + 2$$

$$a_6 = 17$$

hence the answer is B

222. Which one of the following is an arithmetic sequence?

A. 1,3,5,7,9,11,...    B. 3,6,12,24,48,...    C. -3,6,-9,12,-15,...

D. 3,6,10,15,21,...

Answer is A

223. What is the **10<sup>th</sup>** term of the arithmetic progression 2,7,12,...?

A. 10

B. 47

C. 56

D. 27

**solution**  $a_1 = 2$   $d = a_2 - a_1 = 7 - 2 = 5$

$$a_n = a_1 + (n - 1)d$$

$$a_{10} = 2 + (10 - 1)5 = 2 + 9(5) = 2 + 45 = 47 \text{ hence answer is B}$$

224. Which term of the arithmetic progression 21,18,15, ... is -81?

A. 25

B. 35

C. 81

D. 15

Solution  $a_1 = 21$   $d = a_2 - a_1 = 18 - 21 = -3$

$$a_n = a_1 + (n - 1)d$$

$$-81 = 21 + (n - 1)(-3)$$

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$$-81-21=(n-1)(-3)$$

$$-102=(n-1)(-3)$$

$$\frac{-102}{-3} = n - 1$$

$$34=n-1$$

$$n=35$$

answer is B

225. How many two digit numbers are devisable by 3?

A. 15

B.20

C.30

D.13

Solution the list of two digit numbers that are divisible by 3are

12,15,18,...,99 it is an A.P

With  $a_1 = 12$  and  $d=3$

We need to find  $n$  where  $a_n = 99$

$$a_n = a_1 + (n - 1)d$$

$$99 = a_1 + (n - 1)d$$

$$99=12+(n-1)3$$

$$99-12=(n-1)3$$

$$87=(n-1)3 \Rightarrow n-1=\frac{87}{3} \Rightarrow n-1=29 \Rightarrow n=30 \quad \text{Answer is C}$$

226. In the arithmetic sequence, the

$n^{th}$  term is  $m$  and the  $m^{th}$  term is  $2m - n$  then

the  $k^{th}$  term is?

A.  $a_k = m - n + k$  B.  $a_k = m + n - k$  C.  $a_k = n - m + k$  D.  $a_k = m - n - k$

Solution given

$$a_n = m \text{ and } a_m = 2m - 1$$



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$$a_k = a_1 + (k - 1)d$$

$$a_n = a_1 + (n - 1)d$$

$$m = a_1 + (n - 1)d$$

$$m = a_1 + nd - d$$

$$a_1 = m - nd + d \text{ ***}$$

$$a_m = a_1 + (m - 1)d$$

$$a_m = a_1 + md - d$$

$$2m - n = a_1 + md - d$$

$$a_1 = 2m - n - md + d \text{ **}$$

*from \*\*\* and \*\* we get*

$$m - nd + d = 2m - n - md + d$$

$$m - nd = 2m - n - md$$

$$md - nd = 2m - m - n$$

$$(m - n)d = m - n$$

$$D = 1$$

$$a_1 = m - nd + d$$

$$a_1 = m - n + 1$$

$$a_k = a_1 + (k - 1)d$$

$$a_k = m - n + 1 + (k - 1)1$$

$$a_k = m - n + 1 + k - 1$$

$$a_k = m - n + k$$

There for answer is A

227. What is the sum of the multiple s of 4 that lies between 10 and 250?

A. 2600

B. 2360

C. 7860

D. 7800

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Solution the lists of numbers that are a multiple of 4 that lies between 10 and 250  
are

12,16,20,24,... 248

They form an A.P with  $a_1 = 12$  and common difference is  $d = 4$

$a_n = a_1 + (n - 1)d$  to find n we use  $a_n=248$

$$248 = a_1 + (n-1)d$$

$$248 = 12 + (n-1)4$$

$$248 - 12 = (n-1)4$$

$$236 = (n-1)4$$

$$n-1 = \frac{236}{4}$$

$$n-1 = 59$$

$$n = 60$$

$S_n$  for an A.P is given by the formula

$$S_n = \frac{n}{2} (a_1 + a_n)$$

$$S_n = \frac{60}{2} (12 + 248)$$

$$S_n = 30(260) = 7800$$

There for answer is D

228. What is the sum of the first 6 terms of the series  $\frac{2}{3} - 1 + \frac{3}{2} - \frac{9}{2} + \dots$  ?

A.  $\frac{133}{48}$

B.  $-\frac{133}{48}$

C.  $\frac{48}{133}$

D.  $-\frac{48}{133}$

Hint :-The series is a geometric series with  $g_1 = \frac{2}{3}$  and  $r = \frac{3}{2}$  Answer B

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

229. In a geometric

sequence  $\{G_n\}$ ,  $G_3 = 24$  and  $G_6 = 192$  find the 10<sup>th</sup> term?

A. 3072

B. 4053

C. 3405

D.

4062

230. In a geometric sequence with first term  $G_1$  and common ratio  $r$ ,

$$G_n = G_1 r^{n-1}$$

$$\text{Hence the given } G_3 = G_1 r^{3-1} \Rightarrow 24 = G_1 r^2$$

$$G_6 = G_1 r^{6-1} \Rightarrow 192 = G_1 r^5$$

$$\frac{G_6}{G_3} = \frac{G_1 r^5}{G_1 r^2} = \frac{192}{24} \Rightarrow r^3 = 8 \Rightarrow r = 2$$

$$G_3 = 24 = G_1 r^2 \Rightarrow G_1 2^2 = 24 \Rightarrow 4G_1 = 24 \Rightarrow G_1 = 6$$

$$G_1 r^{10} = G_1 r^{10-1} = G_1 r^9 = 6 \times 2^9 = 6 \times 512 = 3072$$

Answer is A

231. If  $\{G_n\}$  a geometric sequence  $G_2 = \frac{20}{9}$  and  $G_5 = \frac{160}{243}$ , find the general term of the sequence?

A.  $5 \left(\frac{2}{3}\right)^n$

B.  $5 \left(-\frac{2}{3}\right)^n$

C.  $\frac{10}{3} \left(-\frac{2}{3}\right)^n$

D.

$\frac{10}{3} \left(\frac{2}{3}\right)^n$

Solution first we must the value of  $r$  and  $G_1$

$$G_5 = G_1 r^4 = G_1 r r^3 = G_2 r^3$$

$$G_5 = G_2 r^3 \Rightarrow \frac{160}{243} = \frac{20}{9} r^3 \Rightarrow r^3 = \frac{160}{243} \times \frac{9}{20} \Rightarrow r^3 = \frac{8}{27} \Rightarrow r = \sqrt[3]{\frac{8}{27}} = \frac{2}{3}$$

$$G_2 = G_1 r \Rightarrow \frac{20}{9} = G_1 \times \frac{2}{3} \Rightarrow G_1 = \frac{20}{9} \times \frac{3}{2} = \frac{10}{3} \Rightarrow G_1 = \frac{10}{3}$$

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$$G_n = G_1 r^{n-1} \Rightarrow G_n = \frac{10}{3} \left(\frac{2}{3}\right)^{n-1} = \frac{10}{3} \left(\frac{2}{3}\right)^n \frac{3}{2} = 5 \left(\frac{2}{3}\right)^n$$

Hence, the answer is A

232. What is the value of  $\sum_{n=2}^{20} \left(\frac{1}{n-1} - \frac{1}{n}\right)$

A.  $\frac{19}{20}$

B.  $\frac{17}{20}$

C.  $\frac{21}{19}$

D.  $\frac{20}{19}$

$$\begin{aligned} \text{Solution:- } \sum_{n=2}^{20} \left(\frac{1}{n-1} - \frac{1}{n}\right) &= \left(1 - \frac{1}{2}\right) + \left(\frac{1}{2} - \frac{1}{3}\right) + \left(\frac{1}{3} - \frac{1}{4}\right) + \dots + \left(\frac{1}{19} - \frac{1}{20}\right) \\ &= 1 - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \dots + \frac{1}{18} - \frac{1}{19} + \frac{1}{19} - \frac{1}{20} = 1 - \frac{1}{20} = \frac{19}{20} \end{aligned}$$

answer A

233. The sum of the finite series  $\sum_{n=1}^{30} (-1)^n \left(\frac{1}{n} + \frac{1}{n+1}\right)$  is ?

A.  $-\frac{29}{30}$

B.  $\frac{29}{30}$

C.  $\frac{30}{31}$

D.  $-\frac{30}{31}$

$$\begin{aligned} \text{Solution:- } \sum_{n=1}^{30} (-1)^n \left(\frac{1}{n} + \frac{1}{n+1}\right) &= -1 \left(1 + \frac{1}{2}\right) + \left(\frac{1}{2} + \frac{1}{3}\right) - \left(\frac{1}{3} + \frac{1}{4}\right) + \dots + \\ &\quad \left(\frac{1}{30} + \frac{1}{31}\right) \\ &= -1 - \frac{1}{2} + \frac{1}{2} + \frac{1}{3} - \frac{1}{3} - \frac{1}{4} + \dots + \frac{1}{30} + \frac{1}{31} \\ &= -1 + \frac{1}{31} = -\frac{30}{31} \end{aligned}$$

Answer is D

234. What is the sum of the first 50 terms of the arithmetic sequence

3,10,17,24,... ?

A. 8750

B. 8490

C. 7850

D. 8725

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

Use the formula of partial sum of A.P, which is  $S_n = \frac{n}{2}(2a_1 + (n-1)d)$  with

$$n = 50 \quad a_1 = 3 \text{ and } d = 7 \Rightarrow S_n = \frac{50}{2}(2 \times 3 + (50-1)7) =$$

$$25(6 + 49 \times 7) = 8725$$

Answer D

235. If  $\sum_{k=1}^n (2k+1) = 440$  then the value of  $n$  is?

A. 20

B. 22

C. 12

D.15

Solution:-  $\sum_{k=1}^n (2k+1) = 3 + 5 + 7 + \dots + (2n+1) = 440$

$3+5+7+\dots+(2n+1)$  is an A.P with  $a_1 = 3$  and  $d = 2$

$$S_n = \frac{n}{2}(2a_1 + (n-1)d) = \frac{n}{2}(2 \times 3 + (n-1)2)$$

$$= \frac{n}{2}(6 + 2n - 2) = \frac{n}{2}(4 + 2n) = 440 \Rightarrow 880 = n(4 + 2n) \Rightarrow 880$$

$$= 4n + n^2$$

$$n^2 + 4n = 880 \Rightarrow n^2 + 4n - 880 = 0$$

by using quadratic formula we get  $n=-22$  or  $n=20$  but  $n$  is natural number

hence

answer is 20

answer A

236. In an arithmetic progression  $A_3 = 14$  and  $A_6 = 35$  then the value of  $S_{10}$  is?

A. 315

B. 325

C. 350

D.320

Answer A

237. In the arithmetic sequence, the

**$4^{th}$  term is 84 and the  $10^{th}$  term is 60.** What is the maximum possible partial sum of the sequence?

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

- A. 1152                      B. 1200                      C. 1440  
D. 1250

Solution:- given  $a_4 = 84$  and  $a_{10} = 60$

$$a_4 = 84 = a_1 + (n - 1)d = a_1 + 3d = 84$$

$$a_{10} = 60 = a_1 + (n - 1)d = a_1 + 9d = 60$$

$$a_1 + 9d = 60$$

$$a_1 + 3d = 84$$

$$6d = -24 \Rightarrow d = -4 \Rightarrow a_1 + 3(-4) = 84 \Rightarrow a_1 = 84 + 12 \Rightarrow a_1 = 96$$

In order to have max sum the terms must be greater or equal to 0

$$a_n = a_1 + (n - 1)d \geq 0$$

$$a_n = 96 + (n - 1)(-4) \geq 0$$

$$96 - 4n + 4 \geq 0$$

$$100 - 4n \geq 0$$

$$100 \geq 4n \Rightarrow 25 \geq n \text{ thus}$$

$$\text{the max sum is } S_n = \frac{n}{2}(2a_1 + (n - 1)d)$$

$$S_n = \frac{25}{2}(2 \times 96 + (25 - 1)(-4))$$

$$S_n = \frac{25}{2}(192 + 24(-4))$$

$$S_n = \frac{25}{2}(192 - 96) \Rightarrow S_n = \frac{25}{2}(96) = 25(48) = 1200$$

Answer is B

238. If the  $n^{\text{th}}$  partial sum of arithmetic sequence is

$n^2 + 9n$  What is the  $10^{\text{th}}$  and the  $n^{\text{th}}$  term of the sequence

respectively?

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

- A. 20,  $a_n = 2n + 10$  B. 28,  $a_n = 2n + 8$  C. 190,  $a_n = n^2 + 9n$  D.  
28,  $a_n = n^2 - 72$

$$\text{Solution:- } S_n = a_1 + a_2 + a_3 + \dots + a_{n-1} + a_n$$

$$S_{n-1} = a_1 + a_2 + a_3 + \dots + a_{n-1}$$

$$\Rightarrow S_n - S_{n-1} = a_n \text{ here } S_n = n^2 + 9n$$

$$a_n = S_n - S_{n-1} = n^2 + 9n - ((n-1)^2 + 9(n-1))$$

$$= n^2 + 9n - [n^2 - 2n + 1 + 9n - 9] = n^2 + 9n - n^2 + 2n - 1 - 9n + 9$$

$$a_n = 2n + 8 \Rightarrow a_{10} = 2 \times 10 + 8 = 20 + 8 = 28$$

answer B

239. What is the sum of the series  $\sum_{n=0}^{\infty} 3^n 2^{-2n}$ ?

- A. -3 B.  $\frac{1}{4}$  C. 4 D. -

$\frac{1}{3}$

$$\text{Solution:- } \sum_{n=0}^{\infty} 3^n 2^{-2n} = \sum_{n=0}^{\infty} \frac{3^n}{2^{2n}} = \sum_{n=0}^{\infty} \frac{3^n}{4^n} = \sum_{n=0}^{\infty} \left(\frac{3}{4}\right)^n = 1 + \frac{3}{4} + \frac{9}{16} +$$

...

Is a geometric series with  $G_1 = 1$  and  $r = \frac{3}{4} < 1$

There for its infinite sum is given by  $S_n = \frac{G_1}{1-r} = \frac{1}{1-\frac{3}{4}} = \frac{1}{\frac{1}{4}} = 4$  Answer is C

240. What is the sum of the first 8 terms of the geometric progression: 3,-  
6,12,-24,...?

- A.245 B.255 C.-245 D. -255

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

Solution:-  $G_1 = 3$  and  $r = \frac{-6}{3} = -2$

$$S_n = \frac{G_1(1-r^n)}{1-r} = \frac{3(1-(-2)^8)}{1-(-2)} = \frac{3(1-256)}{1+2} = \frac{3(-255)}{3} = -255$$

Answer is D

241. A person has two parents four grand- parents and eight great grandparents and so on.

What is the number of his ancestors during the ten generations preceding his own?

- A. 1028 B. 4096 C. 2048 D. 2046

Solution:- the sequence is a G.P with  $G_1 = 2, r = 2$  and  $n = 10$

Using the sum formula

$$S_n = \frac{G_1(1-r^n)}{1-r} \text{ then } S_{10} = \frac{G_1(1-r^{10})}{1-r} = \frac{2(1-2^{10})}{1-2} = \frac{2(1-1024)}{-1} = \frac{-2046}{-1} = 2046$$

Answer is D

242. What is the sum of the infinite series  $\sum_{n=1}^{\infty} \left( \frac{2^k+5^k}{10^k} \right)$ ?

- A.  $\frac{5}{4}$  B.  $\frac{3}{5}$  C.  $\frac{4}{5}$  D.  $\frac{5}{3}$

$$\begin{aligned} \text{Solution:- } \sum_{n=1}^{\infty} \left( \frac{2^k+5^k}{10^k} \right) &= \sum_{n=1}^{\infty} \left( \frac{2^k}{10^k} + \frac{5^k}{10^k} \right) = \sum_{n=1}^{\infty} \left( \frac{2^k}{10^k} \right) + \sum_{n=1}^{\infty} \left( \frac{5^k}{10^k} \right) \\ &= \sum_{n=1}^{\infty} \left( \frac{2}{10} \right)^k + \sum_{n=1}^{\infty} \left( \frac{5}{10} \right)^k = \sum_{n=1}^{\infty} \left( \frac{1}{5} \right)^k + \end{aligned}$$

$$\sum_{n=1}^{\infty} \left( \frac{1}{2} \right)^k$$

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

$$\sum_{n=1}^{\infty} \left(\frac{1}{5}\right)^k = \frac{1}{5} + \frac{1}{25} + \frac{1}{125} + \dots \text{ is G.P with } G_1 = \frac{1}{5} \text{ and } r = \frac{1}{5} \text{ then } S_n = \frac{G_1}{1-r} =$$

$$\frac{\frac{1}{5}}{1-\frac{1}{5}} = \frac{\frac{1}{5}}{\frac{4}{5}} = \frac{1}{4}$$

$$\sum_{n=1}^{\infty} \left(\frac{1}{2}\right)^k = \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots \text{ is G.P with } G_1 = \frac{1}{2} \text{ and } r = \frac{1}{2} \text{ then } S_n = \frac{G_1}{1-r} =$$

$$= \frac{\frac{1}{2}}{1-\frac{1}{2}} = 1$$

$$\frac{1}{4} + 1 = \frac{5}{4} \text{ Answer is A}$$

243. What is the value of  $\lim_{x \rightarrow 4} \frac{\sqrt{x}-2}{x^2-4x}$  ? A.  $\frac{1}{16}$  B. 16 C. 0  
D.  $\infty$

$$\text{Solution } \lim_{x \rightarrow 4} \frac{\sqrt{x}-2}{x^2-4x} = \lim_{x \rightarrow 4} \frac{\sqrt{x}-2}{x(x-4)} = \lim_{x \rightarrow 4} \frac{\sqrt{x}-2}{x(\sqrt{x}-2)(\sqrt{x}+2)} =$$

$$\lim_{x \rightarrow 4} \frac{1}{x(\sqrt{x}+2)} = \frac{1}{4(2+2)} = \frac{1}{16}$$

$$\lim_{x \rightarrow 4} \frac{\sqrt{x}-2}{x^2-4x} = \frac{1}{16} \text{ Answer is A}$$

244. The value of the  $\lim_{x \rightarrow 9} \frac{3-\sqrt{x}}{x^2-81}$  is ? A.  $\frac{1}{108}$  B.  $-\frac{1}{108}$  C. 108  
D. -108

$$\text{Solution } \lim_{x \rightarrow 9} \frac{3-\sqrt{x}}{x^2-81} = \lim_{x \rightarrow 9} \frac{3-\sqrt{x}}{(x-9)(x+9)} = \lim_{x \rightarrow 9} \frac{3-\sqrt{x}}{(\sqrt{x}-3)(3+\sqrt{x})(x+9)} =$$

$$\lim_{x \rightarrow 9} \frac{-1}{(3+\sqrt{x})(x+9)} = -\frac{1}{6 \times 18} = -\frac{1}{108} \text{ answer is B}$$

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

245. What is the limit,  $\lim_{x \rightarrow a} \frac{x^2 - a^2}{x^4 - a^4}$ ? A.  $2a^2$  B.  $\frac{1}{2a^2}$   
C.  $-2a^2$  D.  $-\frac{1}{2a^2}$

Solution:-  $\lim_{x \rightarrow a} \frac{x^2 - a^2}{x^4 - a^4} = \lim_{x \rightarrow a} \frac{x^2 - a^2}{(x^2 - a^2)(x^2 + a^2)} = \lim_{x \rightarrow a} \frac{1}{x^2 + a^2} = \frac{1}{2a^2}$

Answer B

246. What is the value of  $\lim_{x \rightarrow \infty} \frac{4^n - 2^n}{10^2}$ ? A.  $\frac{11}{12}$  B.  $\frac{1}{5}$   
C.  $\frac{2}{3}$  D.  $\infty$

Answer is B

247. What is the value of  $\lim_{x \rightarrow 5} \frac{x-5}{\sqrt{x+4}-3}$ ? A.  $\infty$  B. 0  
C. 1 D. 6

Solution:-  $\lim_{x \rightarrow 5} \frac{x-5}{\sqrt{x+4}-3} \times \frac{\sqrt{x+4}+3}{\sqrt{x+4}+3} = \lim_{x \rightarrow 5} \frac{(x-5)(\sqrt{x+4}+3)}{x-5} = \lim_{x \rightarrow 5} \sqrt{x+4} + 3 = 6$

Answer is D

248. What is the value of  $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^{2x+4}$ ? A.  $e$  B.  $e^{-1}$   
C.  $e^2$  D. 1

Solution:- N.B  $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^{ax+c} = e^a$  and  $\lim_{x \rightarrow \infty} \left(1 + \frac{c}{x}\right)^{dx+n} = e^{cd}$

There for  $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^{2x+4} = e^2$  answer is C

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249. Let  $f(x) = \begin{cases} a - \cos x, & \text{if } x \leq 0 \\ 3e^x - a, & \text{if } x > 0 \end{cases}$  for what value of  $a$  is the function  $f$  is continuous at  $x=0$ ?

- A.3 B.2 C.0  
D.1

Note a function is continuous at  $x=a$  if  $\lim_{x \rightarrow a} f(x) = f(a)$  and

$$i.e \lim_{x \rightarrow a^+} f(x) = \lim_{x \rightarrow a^-} f(x) = f(a)$$

Solution  $f(x)$  is continuous at 0 if  $\lim_{x \rightarrow 0} f(x) = f(0)$

$$\lim_{x \rightarrow 0^+} f(x) = \lim_{x \rightarrow 0^-} f(x) = f(0)$$

$$\lim_{x \rightarrow 0^+} (3e^x - a) = \lim_{x \rightarrow 0^-} (a - \cos x)$$

$$3 - a = a - 1 \Rightarrow 4 = 2a \Rightarrow a = 2 \text{ answer is B}$$

250. The  $\lim_{x \rightarrow 1} \frac{x^3 + x - 2}{x^2 - x}$ ? A. 4 B. 8 C.  $\infty$   
D. 0

251. What is the value of  $\lim_{x \rightarrow \pi} \frac{x \sin(2x)}{x - \pi}$ ? A.  $2\pi$  B.  $\pi$   
C.  $-\pi$  D.  $-2\pi$

$$\text{Note:- } \lim_{x \rightarrow 0} \frac{\sin x}{x} = 1, \lim_{x \rightarrow 0} \frac{\sin(ax)}{bx} = \frac{a}{b}, \lim_{x \rightarrow 0} \frac{\sin(ax)}{\sin(bx)} = \frac{a}{b},$$

Solution  $\lim_{x \rightarrow \pi} \frac{x \sin(2x)}{x - \pi} = ?$  by substitution  $y = x - \pi$ ,  $x \rightarrow \pi \Rightarrow y \rightarrow 0$  and

$x = y + \pi$  then our

$$\lim_{x \rightarrow \pi} \frac{x \sin(2x)}{x - \pi} = \lim_{y \rightarrow 0} \frac{(y + \pi) \sin(2(y + \pi))}{y} = \lim_{y \rightarrow 0} \frac{(y + \pi) \sin(2y + 2\pi)}{y} =$$



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$$\lim_{y \rightarrow 0} \frac{(y+\pi)\sin 2y \cos 2\pi + \sin 2\pi \cos 2y}{y} = \lim_{y \rightarrow 0} \frac{(y+\pi)\sin 2y + 0}{y} \text{ because } \sin 2\pi = 0$$

$$\text{and } \cos 2\pi = 1$$

$$\lim_{y \rightarrow 0} \frac{(y+\pi)\sin 2y}{y} = \lim_{y \rightarrow 0} \frac{\pi \sin 2y}{y} = 2\pi \quad \text{answer A}$$

252. Find  $\lim_{x \rightarrow \infty} \left(\frac{x}{x+1}\right)^{-3x}$  ?      A.  $e^{-3}$       B.  $e^3$       C.  $e^6$   
D.  $e^{-6}$

Solution  $\lim_{x \rightarrow \infty} \left(\frac{x}{x+1}\right)^{-3x} = \lim_{x \rightarrow \infty} \left(\frac{x+1}{x}\right)^{3x} = \lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^{3x} =$   
 $\lim_{x \rightarrow \infty} \left(\left(1 + \frac{1}{x}\right)^x\right)^3$   
 $\left(\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x\right)^3 = e^3 \text{ answer B}$

253. Let  $f(x) = \begin{cases} \frac{a \sin(2x)}{x}, & \text{if } x < 0 \\ e^{2x} - 2, & \text{if } x \geq 0 \end{cases}$  if  $f$  is continuous at  $x=0$  then what is the value of  $a$ ?  
A.  $\frac{1}{2}$       B.  $-\frac{1}{2}$       C. 2  
D. -2

Solution if  $f(x)$  is continuous at  $x=0$  then  $\lim_{x \rightarrow 0} f(x) = f(0)$

ie  $\lim_{x \rightarrow 0} \frac{a \sin(2x)}{x} = f(0) \Rightarrow a(2) = e^0 - 2 \Rightarrow 2a = 1 - 2 = -1 \Rightarrow a = -\frac{1}{2}$  answer B

254. The value of the  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\tan(2x)}{x - \frac{\pi}{2}} = \text{---?}$       A. 4      B. 2  
C.  $\infty$       D. 1

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Answer is

255. What is the value of  $\lim_{x \rightarrow 0} \left( \frac{x^2-5}{x} \right) \sin x$ ? ———? A.  $\frac{1}{5}$  B. -5  
C.  $\infty$  D. 0

Answer is B

256. Evaluates  $\lim_{n \rightarrow \infty} \frac{3n - \cos(2n)}{2-n}$ ? A. 2 B. -3 C.  $\infty$   
D.  $\frac{2}{3}$

Answer is B

257. Suppose that  $f$  and  $g$  are continuous function such that  $f(2) = 1$  and  $\lim_{n \rightarrow 2} (f(x) + g(x)) = 13$ , then  $g(2)$  is equal –?  
A. 13 B. 12 C. 3 D. 10

Answer is B

258. The left hand limit,  $\lim_{x \rightarrow 0^-} \frac{4x+|x|}{2x-|x|}$  is equal to A. 1 B.  $\frac{5}{3}$  C. 5  
D.  $\frac{3}{2}$

Answer A

259. What is the limit,  $\lim_{x \rightarrow a} \frac{x^{-2}-a^{-2}}{x^{-3}-a^{-3}}$ ? A.  $\frac{2}{3a}$  B.  $\frac{3a}{2}$   
C.  $\frac{3}{2a}$  D.  $\frac{2a}{3}$

Hint use factorization method Answer is D

260. Let  $f(x) = -\sqrt{25 - x^2}$ , then what is the value of  $\lim_{x \rightarrow 1} \frac{f(x)-f(1)}{x-1}$ ?

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- A.  $\frac{1}{24}$  B.  $\frac{\sqrt{24}}{24}$  C. -24  
D.  $\sqrt{24}$

Answer is B

261. The value of the  $\lim_{x \rightarrow 0} \frac{1 - \cos(2x)}{x^2}$  is equal to? A. 4 B. 2  
C. 1 D. 0

Solution  $\lim_{x \rightarrow 0} \frac{1 - \cos(2x)}{x^2} = \lim_{x \rightarrow 0} \frac{1 - (\cos^2 x - \sin^2 x)}{x^2} = \lim_{x \rightarrow 0} \frac{1 - \cos^2 x + \sin^2 x}{x^2}$

$$\lim_{x \rightarrow 0} \frac{\sin^2 x + \sin^2 x}{x^2} = 2 \lim_{x \rightarrow 0} \frac{\sin^2 x}{x^2} = 2 \left( \lim_{x \rightarrow 0} \frac{\sin x}{x} \right)^2 = 2 \cdot 1^2 = 2 \cdot 1 = 2$$

answer is B

262. Which one of the following is equal to  $\lim_{x \rightarrow 2} \frac{\sqrt{x} - \sqrt{2}}{x^2 - 4}$ ?  
A.  $8\sqrt{2}$  B.  $4\sqrt{2}$  C.  $\frac{1}{4\sqrt{2}}$   
D.  $\frac{1}{8\sqrt{2}}$

263. Let  $f(x) = \begin{cases} 5a - x, & \text{if } x < 1 \\ b + 2, & \text{if } x = 1 \\ ax, & \text{if } x > 1 \end{cases}$  then what is the value of b if f is continuous at x=1?

- A.  $-\frac{7}{4}$  B.  $\frac{4}{7}$  C.  $\frac{-3}{5}$   
D.  $\frac{1}{4}$

Solution f(x) is continuous at x=1 if  $\lim_{x \rightarrow 1^+} f(x) = \lim_{x \rightarrow 1^-} f(x) = f(1)$

$$\lim_{x \rightarrow 1^+} ax = \lim_{x \rightarrow 1^-} 5a - x = b + 2$$

$$1 \cdot a = 5a - 1 = b \Rightarrow a = b + 2 \text{ and } 5a - 1 = b + 2 \Rightarrow$$

$$a = 5a - 1 \Rightarrow$$

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$$4a = 1 \Rightarrow a = \frac{1}{4} \Rightarrow a = b + 2 \Rightarrow \frac{1}{4} = b + 2 \Rightarrow b = \frac{1}{4} - 2 = -\frac{7}{4}$$

Answer is A

### Grade 12 unit 3&4 - Derivatives

264. The derivative of  $f(x) = \frac{2-x}{3x+1}$  is ? A.  $\frac{-7}{(3x+1)^2}$  B.  $\frac{6x-5}{(3x+1)^2}$  C.  $\frac{-9}{(3x+1)^2}$  D.  $\frac{7}{(3x+1)^2}$

Solution apply the quotient rule for differentiation

$$\left(\frac{f}{g}\right)' = \frac{f'(x)g(x) - g'(x)f(x)}{(g(x))^2}$$

$$f(x) = \frac{2-x}{3x+1}$$

$$f'(x) = \frac{(2-x)'(3x+1) - (3x+1)'(2-x)}{(3x+1)^2}$$

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

$$= \frac{-3x - 1 - 6 + 3x}{(3x+1)^2}$$

$$= \frac{-7}{(3x+1)^2}$$

Answer is A

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

265. The **4<sup>th</sup>** and **n<sup>th</sup>** derivative of  $f(x)=e^{nx}$  respectively are ?

- A.  **$n^4 e^{nx}, n^n e^{nx}$**  B.  **$n^4 e^x, n e^{nx}$**  C.  **$n^4 e^{nx}, n^n e^x$**  D.  
 **$n^4 e^{nx}, n! e^{nx-1}$**

Answer A

266. What is the equation of the line tangent to the graph  
of  $f(x) = \frac{3x}{x-2}$  at  $(1, f(1))$ ?

- A.  $y=-6x+3$  B.  $y=6x+3$  C.  $6x-3$  D.  $y=-6x-3$

Note the equation of the line tangent to the graph of  $y=f(x)$  at  $(a, f(a))$  is given by

$$y - f(a) = f'(a)(x - a)$$

$$\left(\frac{f(x)}{g(x)}\right)' = \frac{f(x)'g(x) - g(x)'f(x)}{(g(x))^2}, g(x) \neq 0$$

$$\begin{aligned} f(x)' &= \frac{3(x-2) - 1(3x)}{(x-2)^2} \\ &= \frac{3x-6-3x}{(x-2)^2} \end{aligned}$$

$$\begin{aligned} f(x)' &= -\frac{6}{(x-2)^2} \text{ slope of the line } = f'(x) \text{ at } 1, f'(1) = -\frac{6}{(1-2)^2} \\ &= -6 \end{aligned}$$

Equation of the line tangent to the graph  $f(x)=\frac{3x}{x-2}$  at  $(1,-3)$  is

$$y - f(1) = f'(1)(x - 1)$$

$$y - 3 = -6(x - 1)$$

$$y + 3 = -6x + 6$$

$$y = -6x + 3 \quad \text{Answer is A}$$

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

267. Let  $k(x) = f(\sqrt{4x+1})$ . If  $f'(3) = 1/2$ , then  $k'(2) = \text{---?}$

A. 3

B. 12

C.  $1/3$

D. 4

Solution

$$k(x) = f(\sqrt{4x+1})$$

$$k'(x) = f'(x) \cdot (\sqrt{4x+1})'$$

$$k'(x) = f'(\sqrt{4x+1}) \cdot \frac{1}{2\sqrt{4x+1}} \cdot 4$$

$$k'(2) = f'(\sqrt{4 \cdot 2 + 1}) \cdot \frac{1}{2\sqrt{4 \cdot 2 + 1}} \cdot 4$$

$$= f'(\sqrt{9}) \cdot \frac{1}{2\sqrt{9}} \cdot 4$$

$$= f'(3) \cdot \frac{1}{2 \cdot 3} \cdot 4$$

$$= \frac{1}{2} \cdot \frac{1}{3} \cdot 4$$

$$= \frac{1}{3}$$

268. Write the equation of the line tangent to the graph of the function  $f(x) =$

$$\begin{cases} x - \pi, & x \leq 0 \\ 1 - 2\sin x, & x > 0 \end{cases} \text{ at } (\pi, f(\pi)).$$

A.  $y = 2x - 2\pi - 1$

B.  $y = 2x + 2\pi + 1$

C.  $y = 2x - 2\pi + 1$

D.  $y = -2x -$

$2\pi + 1$

269. For what value of a and b is the function  $f(x) = \begin{cases} 1 - 3x^2, & \text{for } x \leq 1 \\ ax + b, & \text{for } x > 1 \end{cases}$  is

differentiable at  $x=1$ ?

A.  $a=-6, b=4$

B.  $a=6, b=-4$

C.  $a=4, b=-6$

D.  $a=-4,$

$b=6$

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Note a function  $f(x)$  is said to be differentiable at  $x=a$  if the left and right derivatives

both exist and equal and it is continuous at  $a$ .  $f'(x) = \begin{cases} -6x & \text{for } x \leq 1 \\ a & \text{for } x > 1 \end{cases}$

$$f'(1^-) = f'(1^+) \Rightarrow -6(1) = a \Rightarrow a = -6$$

$$\lim_{x \rightarrow 1^+} f(x) = \lim_{x \rightarrow 1^-} f(x)$$

$$1 - 3 = a + b$$

$$-2 = a + b$$

$$b = -2 - a \text{ but } a = -6$$

$$b = -2 - (-6)$$

$$b = -2 + 6$$

Answer is A

270. Find the equation of the line tangent to the graph of  $f(x) = e^x \sin x$  at  $x = 0$ .

A.  $y = x$

B.  $y = -x$

C.  $y = 2x$

D.  $y = -$

2x

Solution:-  $f(x) = e^x \sin x$

$$f'(x) = (e^x)' \sin x + e^x (\sin x)' \text{ product rule}$$

$$\text{slope at } x = 0 \text{ is } f'(x) = e^x \sin x + e^x \cos x$$

$$f'(0) = e^0 \sin 0 + e^0 \cos 0$$

$$f'(0) = 1 \times 0 + 1 \times 1 = 1$$

The equation of the line tangent to the graph  $f(x) = e^x \sin x$  at  $x = 0$  is

$$y - f(0) = f'(0)(x - 0)$$

$$y - 0 = 1(x - 0)$$

$$y = x \text{ answer is A}$$

271. Let  $f(x) = \cos(3x)$ , then what is the value of  $f'\left(\frac{\pi}{9}\right)$ ?

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

- A.  $\frac{3\sqrt{3}}{2}$  B.  $-\frac{3\sqrt{3}}{2}$  C.  $\frac{\sqrt{3}}{2}$  D.  $-\frac{\sqrt{3}}{2}$

Solution **derivative of the composite function**  $(f(g(x)))' = f'(g(x))g'(x)$

Assume  $h(x) = \cos x$  and  $g(x) = 3x$  then  $f(x) = h(g(x))$

$$f'(x) = h'(g(x))g'(x)$$

$$f'(x) = -\sin(3x)3$$

$$f'\left(\frac{\pi}{9}\right) = -3\sin\left(3\left(\frac{\pi}{9}\right)\right)$$

$$f'\left(\frac{\pi}{9}\right) = -3\sin\frac{\pi}{3}$$

$$= -3\left(\frac{\sqrt{3}}{2}\right)$$

$$= -\frac{3\sqrt{3}}{2}$$

Answer is B

272. If  $g(x) = f(x^2 + x)$ ,  $f'(2) = -2$  and  $f''(2) = 3$  then  $g''(1) = -?$

- A. 27 B. 4 C. 23 D. 17

Solution:-

$$g(x) = f(x^2 + x)$$

$$g'(x) = f'(x^2 + x)(2x + 1)$$

$$g''(x) = f''(x^2 + x)(2x + 1)^2 + f'(x^2 + x)2$$

$$g''(1) = f''(2)(3)^2 + f'(2)2$$

$$g''(1) = 3(9) + (-2)(2)$$

$$g''(1) = 27 - 4$$

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

$$g''(1) = 23$$

Answer is C

273. **What is the second derivative of  $f(x) = e^{2x} \sin x$  at  $x = 0$ ?**

A. 1

B. 4

C. 0

D. 3

Solution:-

$$f(x) = e^{2x} \sin x \text{ at } x = 0$$

$$f'(x) = 2e^{2x} \sin x + e^{2x} \cos x$$

$$f''(x) = 4e^{2x} \sin x + 2e^{2x} \cos x + 2e^{2x} \cos x - e^{2x} \sin x$$

$$f''(x) = 3e^{2x} \sin x + 4e^{2x} \cos x$$

$$f''(x) = e^{2x} (3 \sin x + 4 \cos x)$$

$$f''(0) = e^0 (3 \sin 0 + 4 \cos 0)$$

$$f''(0) = 1(0 + 4 \times 1) = 1(4) = 4 \text{ answer is B}$$

274. for what value of k will  $f(x) = x + \frac{k}{x}$  have a relative maximum at  $x = -2$ ?

A. -4

B. -2

C. 2

D. 4

Solution:-  $f(x) = x + \frac{k}{x}$

$$f'(x) = 1 - \frac{k}{x^2}$$

$$f'(x) = 0 \Rightarrow 1 - \frac{k}{x^2} = 0$$

$$\frac{k}{x^2} = 1 \Rightarrow x^2 = k \Rightarrow k = (-2)^2 = 4 \text{ Answer is D}$$

275. If  $\sin x = e^y$ ,  $0 < x < \pi$ , what is  $\frac{dy}{dx}$  in terms of  $x$ ?



MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

A.  $-\tan x$

B.  $-\cot x$

C.  $\cot x$

D.  $\tan x$

Solution :-

$$\sin x = e^y, 0 < x < \pi, 1^{\text{st}} \text{ solve for } y \text{ in terms of } x$$

$$\ln \sin x = \ln e^y$$

$$\ln \sin x = y \ln e$$

$$y = \ln(\sin x) \text{ let } u = \sin x \text{ then } \frac{du}{dx} = \cos x, y = \ln u \Rightarrow \frac{dy}{du} = \frac{1}{u}$$

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx} = \frac{1}{u} \cos x = \frac{\cos x}{\sin x} \text{ Answer C}$$

60. if  $y = \cos^2 x - \sin^2 x$ , then  $\frac{dy}{dx} =$ —?

A. -1

B. 0

C.  $-2 \sin(2x)$

D. -

$2(\cos x + \sin x)$

Solution :-

$$y = \cos^2 x - \sin^2 x = (\cos x)^2 - (\sin x)^2$$

$$\frac{dy}{dx} = -2 \cos x \sin x - 2 \sin x \cos x = -4 \sin x \cos x =$$

$$-2(2 \sin x \cos x)$$

$$\frac{dy}{dx} = -2(\sin(2x))$$

Answer C

276. If  $f(x) = x \ln(x^2)$ , then what is the first derivative of  $f$ ?

A.  $\ln(x^2) + 1$

B.  $\ln(x^2) + 2$

C.  $\ln(x^2) + \frac{1}{x}$

D.  $\frac{1}{x^2}$

277. The absolute maximum value

of  $f(x) = x^3 - 3x^2 + 12$  on the closed interval

$[-2, 4]$  occurs at  $x =$ —?

A. 4

B. 2

C. 1

D. 0

Solution :-  $f(x) = x^3 - 3x^2 + 12$  first we must find the critical number



MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

$$f'(x) = 3x^2 - 6x \Rightarrow f'(x) = 0 \Rightarrow 3x^2 - 6x = 0$$

$$= 3x(x - 2) = 0 \text{ thus } 3x = 0 \text{ or } x - 2 = 0 \Rightarrow x = 0 \text{ or } x = 2$$

*both are in  $[-2, 4]$  to find the absolut max or min*

*evalut  $f$  at the critical number and the end point*

$$f(0) = 0 - 0 + 12 = 12$$

$$f(2) = 2^3 - 3(2)^2 + 12 = 8 - 12 + 12 = 8$$

$$f(-2) = (-2)^3 - 3(-2)^2 + 12 = -8 - 12 + 12 = -8$$

$$f(4) = 4^3 - 3(4)^2 + 12 = 64 - 48 + 12 = 28$$

Hence  $f(4) > f(x)$  for all  $x \in [-2, 4]$  there for 28 is absolut max

Answer is A

278. If  $y=2x-8$ , what is the minimum value of the product of  $x$  and  $y$  ?

A. -16

B.-8

C. -4

D.

0

Solution :-  $y = 2x - 8$ ,  $p(x, y) = xy \Rightarrow p(x) = x(2x - 8) = 2x^2 - 8x$

we find the minimum value of  $p(x) = 2x^2 - 8x$   $p'(x) = 4x - 8$ ,  $p'(x) = 0$

$$\Rightarrow 4x - 8 = 0 \Rightarrow x = 2 \text{ is the cr.no, } y = 2(2) - 8 = -4$$

$$\text{thus } xy = 2(-4) = -8 \text{ Answer is B}$$

279. if  $f(x) = e^{5x} \cos x + \frac{x-\pi}{x^2+3}$ , then  $f'(0)$  is equal to—?

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

- A.  $5 - \frac{\pi}{2}$  B.  $\frac{16}{3}$  C.  $\frac{2}{9}$  D.  $\frac{7}{3}$

280. Given the function  $f(x) = x^3 + 6x^2 + 9x + 4$  which one of the following is not TRUE

about the function f?

- A. f is increasing on  $(-\infty, -3] \cup [-1, \infty)$   
 B. f is decreasing on  $[-3, -1]$   
 C. the graph of f is concave upward on  $(-2, \infty)$  and concave downward on  $(-\infty, -2)$   
 D. Its inflection point is  $(-2, 9)$

281. The volume of a cylindrical tin can with closed on top and bottom is  $32\pi$  cubic unit.

If a minimum amount of tin is used to construct the can, what must be the height of the can?

- A.  $2\sqrt[3]{2}$  B.  $2\sqrt{2}$  C.  $4\sqrt{2}$  D.  $4\sqrt[3]{2}$

Grade 12 unit 5 - Integration

282. If  $f'(x) = \frac{1}{x} + x$  and  $f(1) = \frac{5}{2}$ , then a formula for f(x) is—?

- A.  $\ln|x| + \frac{x^2}{2} + 2$  B.  $\ln|x| + \frac{x^2}{2} + 1$  C.  $\ln|x| - \frac{x^2}{2} + 2$  D.  $\ln|x| - \frac{x^2}{2} + 1$

Solution:-  $f(x) = \int f'(x)dx + c$

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$$f(x) = \int \left( x + \frac{1}{x} \right) dx = \int x dx + \int \frac{1}{x} dx$$

$$f(x) = \ln|x| + \frac{x^2}{2} + c \text{ but } f(1) = \frac{5}{2}$$

$$f(1) = \ln 1 + \frac{1}{2} + c = \frac{5}{2} \Rightarrow c = 2 \text{ because } \ln 1 = 0$$

$$f(x) = \ln|x| + \frac{1}{2}x^2 + 2$$

Answer is A

283.  $\int x^2 \sqrt{x^3 - 8} dx$  is equal to—?

A.  $\frac{1}{3}(x^3 - 8)^{\frac{1}{2}} + c$       B.  $\frac{2}{9}(x^3 - 8)^{\frac{3}{2}} + c$       C.  $\frac{1}{2}(x^3 - 8)^{\frac{1}{3}} + c$       D.

$$\frac{2}{9}(x^3 - 8)^{\frac{5}{2}} + c$$

Solution:-  $\int x^2 \sqrt{x^3 - 8} dx$  solving by substitution let  $u = x^3 - 8 \Rightarrow \frac{du}{dx} = 3x^2 \Rightarrow$

$$du = 3x^2 dx$$

$$\Rightarrow \frac{du}{3} = x^2 dx \Rightarrow \int x^2 \sqrt{x^3 - 8} dx = \int \frac{\sqrt{u} du}{3} = \frac{1}{3} \int \sqrt{u} du = \frac{1}{3} \frac{u^{\frac{3}{2}}}{\frac{3}{2}} = \frac{1}{3} x^{\frac{2}{3}} u^{\frac{3}{2}} =$$

$$\frac{2}{9}(x^3 - 8)^{\frac{3}{2}} + c$$

Answer is B

284. If  $f'(x) = \frac{1}{x} - 2x + 2$  and  $f(1) = 2$ , then a formula for  $f(x)$  is—?

A.  $-\frac{1}{x^2} - x^2 + 2x - 1$

C.  $-\frac{1}{x^2} - x^2 + 2x + 1$

B.  $\ln|x| - 2x + 2$

D.  $\ln|x| - x^2 + 2x + 1$

Solution:-  $f(x) = \int f'(x) dx$

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

$$f(x) = \int \left( \frac{1}{x} - 2x + 2 \right) dx = \int \frac{1}{x} dx - \int 2x dx + \int 2 dx = \ln|x| - x^2 + 2x + c$$

$$f(x) = \ln|x| - x^2 + 2x + c \Rightarrow f(1) = \ln 1 - (1)^2 + 2 \cdot 1 + c = 2$$

$$\Rightarrow 0 - 1 + 2 + c = 2$$

$$c \Rightarrow c = 1 \text{ there for } f(x) = \ln|x| - x^2 + 2x + 1$$

Answer is D

285. Which of the following is equal to  $\int x \sin x \, dx$ ?

- A.  $x^2 \cos x + c$                       C.  $x^2 \sin x - x \cos x + c$   
 B.  $-\sin x + x^2 \cos x + c$             D.  $\sin x - x \cos x + c$

Solution:- *integration by parts*  $\int u dv = uv - \int v du$

let  $u = x \Rightarrow du = dx$  and  $dv = \sin x dx \Rightarrow v = -\cos x$

$$\int x \sin x \, dx = \int u dv = uv - \int v du = x(-\cos x) - \int -\cos x \, dx$$

$$= -x \cos x + \int \cos x \, dx = -x \cos x + \sin x + c$$

Answer is C

286.  $\int \left( \frac{x}{x+1} \right)^2 dx = \text{---?}$

- A.  $x + \ln|x+1| + c$                       B.  $\frac{1}{3}x + \frac{1}{3}\ln|x+1| + c$   
 C.  $x - \frac{1}{x+1} - 2\ln|x+1| + c$             D.  $x - \frac{2}{(x+1)^2} - \frac{1}{x+1} + c$

Solution:-  $\int \left( \frac{x}{x+1} \right)^2 dx = \int \left( 1 - \frac{1}{x+1} \right)^2 dx = \int \left( 1 - \frac{2}{x+1} + \frac{1}{(x+1)^2} \right) dx =$

$$\int 1 dx - \int \frac{2}{x+1} dx + \int \frac{1}{(x+1)^2} dx$$

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$$\begin{aligned}
 &= x - 2 \ln|x + 1| + \int \frac{1}{(x + 1)^2} dx \text{ let } u = x + 1 \Rightarrow du \\
 &= dx \int \frac{1}{(x + 1)^2} dx = \int \frac{1}{u^2} du \\
 &= -\frac{1}{u} = -\frac{1}{x + 1} \text{ there for } \int \left(\frac{x}{x + 1}\right)^2 dx = x - 2 \ln|x + 1| - \frac{1}{x + 1} + c
 \end{aligned}$$

**Answer is C**

287.

**What is the volume of the solid generated by the graph of  $f(x) = 3^x$  and the  $x$  – axis between 0 & 1 about the  $x$  axis in cubic units?**

A.  $8\pi \ln 3$

B.  $4\pi \log_3 e$

C.  $4\pi \ln 3$

D.  $8\pi \log_3 e$

Solution :-  $V = \pi \int_a^b (f(x))^2 dx$  thus  $V = \pi \int_0^1 (3^x)^2 dx = \pi \int_0^1 3^{2x} dx$

$$\text{Let } u = 2x \Rightarrow du = 2dx \Rightarrow \frac{du}{2} = dx$$

$$\begin{aligned}
 \pi \int_0^1 3^{2x} dx &= \pi \int_0^1 3^u \frac{du}{2} = \frac{\pi}{2} \int_0^1 3^u du = \frac{\pi}{2} \frac{3^u}{\ln 3} = \frac{\pi(3)^{2x}}{2 \ln 3} \int_0^1 = \frac{\pi}{2 \ln 3} (3^2 - 3^0) = \\
 \frac{\pi}{2 \ln 3} (9 - 1) &= \frac{8\pi}{2 \ln 3} = \frac{4\pi}{\ln 3} = 4\pi \log_3 e
 \end{aligned}$$

Answer is B

288. If  $\int_0^1 \sqrt{1 - x^2} = \frac{\pi}{4}$  then the value of  $\int_0^1 (4\sqrt{1 - x^2} + 2) dx$  is

A.  $2\pi + 4$

B.  $2\pi + 2$

C.  $\pi + 2$

D.  $\pi + 8$

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Solution:-

$$\begin{aligned} \int_0^1 (4\sqrt{1-x^2} + 2) dx &= \\ \int_0^1 4\sqrt{1-x^2} dx + \int_0^1 2 dx &= 4 \int_0^1 \sqrt{1-x^2} dx + \int_0^1 2 dx \\ &= \int_0^1 \sqrt{1-x^2} dx = 4 \frac{\pi}{4} + 2x \int_0^1 = \pi + 2(1-0) = \pi + 2 \end{aligned}$$

**Answer is C**

289. If

$$\int_{-1}^4 f(x) dx =$$

**4 and  $\int_2^4 (3 - f(x)) dx = 7$  then the value of  $\int_2^{-1} f(x) dx$  is?**

A.-5

B. -3

C. 5

D.3

Solution:- **Note  $\int_a^b f(x) dx = \int_a^c f(x) dx + \int_c^b f(x) dx$  where  $a < c < b$**

$$\begin{aligned} \int_a^b f(x) dx &= - \int_b^a f(x) dx \\ \int_{-1}^4 f(x) dx &= \int_{-1}^2 f(x) dx + \int_2^4 f(x) dx \end{aligned}$$

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$$\begin{aligned}
 & \int_2^4 (3 - f(x)) dx \\
 &= \int_2^4 3 dx - \int_2^4 f(x) dx \\
 &= 3(4 - 2) - \int_2^4 f(x) dx = 3x4 - 3x2 - \int_2^4 f(x) dx = 7 \\
 &12 - 6 - \int_2^4 f(x) dx = 7 \Rightarrow \int_2^4 f(x) dx = 6 - 7 = -1 \\
 &\int_{-1}^4 f(x) dx = \int_{-1}^2 f(x) dx + \int_2^4 f(x) dx \Rightarrow 4 = \int_{-1}^2 f(x) dx + (-1) \\
 &\Rightarrow \int_{-1}^2 f(x) dx = 5 \\
 &\int_2^{-1} f(x) dx = - \int_{-1}^2 f(x) dx = -5
 \end{aligned}$$

290. **What is the area of the region enclosed by the graph of  $y = x$  and**

**$y = x^2 - 3x + 3$  in square unit?**

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

- A.  $27/3$                       B. 2                      C.  $64/3$   
D.  $34/3$

Solution:- *the two boundaries are  $y = x$  and  $y = x^2 - 3x +$*

*3 to find the point*

*of intersections solve  $x = x^2 - 3x + 3 \Rightarrow x^2 - 4x + 3 = 0$   
 $\Rightarrow (x - 3)(x - 1) = 0$*

*$x = 3$  and  $x = 1$  are the point of intersection .*

*if  $x = 2 \Rightarrow$  in the equation  $y = x$  ,  $y = 2$  in the equation  $x y = x^2 - 3x + 3$  ,  $y = 1$*

*There for the area bounded by the equations is  $\int_1^3 (x - (x^2 - 3x + 3))dx$*

$$= \int_1^3 (x - x^2 + 3x - 3))dx$$

$$= \int_1^3 -(x^2 - 4x + 3)dx = - \int_1^3 (x^2 - 4x + 3))dx =$$

$$= - \int_1^3 x^2 dx - \int_1^3 4x dx + \int_1^3 3 dx = - \left( \frac{x^3}{3} - \frac{4x^2}{2} + 3x \right) \int_1^3 =$$

$$- \left( \left[ \frac{27}{3} - \frac{16}{2} + 9 \right] - \left[ \frac{1}{3} - \frac{4}{2} + 3 \right] \right) = 9 - 8 + 9 - \left( \frac{2 - 12 + 18}{6} \right) = 10 + \frac{8}{6} = \frac{68}{6} = \frac{34}{3}$$

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291. **What is the area of the region bounded by the curve  $y = e^{3x}$  and the line**

**$x = 1, x = 4$  and  $y = 0$  in square unit?**

- A.  $\frac{1}{3}e^3(e^9 - 1)$       B.  $e^3(e^9 - 1)$       C.  $e^{12} - 1$   
D.  $3e^3(e^9 - 1)$



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## MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C



ጎንደር የሰላም እና የዕድገት ማኅበር (ጎ-ሰ'ማ)  
GONDAR PEACE AND GROWTH ASSOCIATION (GPGA)

### በጎንደርና አካባቢው ሀገር አቀፍ የ12ኛ ክፍል መልቀቂያ ፈተና የሚወስዱ ተማሪዎችን በስነልቦናም ሆነ በክህሎት ማዘጋጀትና አጠቃላይ የሥራ፣ ማኅበራዊና ኢኮኖሚያዊ ግንዛቤን የማሳደግ ፕሮጀክት (ከዳሽን ቢራ ፋብሪካ አ.ማ ጋር በመተባበር የቀረበ )

ጎንደር የሰላምና የዕድገት ማኅበር (ጎ-ሰ'ማ) በጎንደር እና አካባቢው ከጊዜ ወደ ጊዜ ሥር እየሰደደ የመጣውን የሰላም እጦት እንዲሁም በአካባቢው ሰፍኖ የሚገኘውን ከፍተኛ ኢኮኖሚያዊ ችግር በመቅረፍ ረገድ መንግሥት የሚያደርገውን ጥረት ለመደገፍ የተቋቋመ እና ከኢ.ፌ.ዴ.ሪ የሲቪል ማኅበረሰብ ድርጅቶች ባለሥልጣን ዕውቅናና የተሰጠው (የተመዘገበ) ማኅበር ነው።

ጎንደርና አካባቢው እምቅ የሆኑ በርካታ የተፈጥሮ ፀጋዎችንና ሰው ሠራሽ ሃብቶችን ባለቤት ቢሆንም እነዚህን እምቅ ሃብቶች በጋራ አልምቶ በእጅጉ የወደቀውን ኑሮውን ለማሻሻል አልቻለም። ለዚህም ዋነኛው ምክንያት የማኅበረሰቡ የማኅበራዊና የኢኮኖሚ ግንዛቤ እጥረት መሆኑን በማመን የጎንደር የሰላምና የዕድገት ማኅበር (ጎ-ሰ'ማ) አስፈላጊውን የዘርፉ ንቃት ለመፍጠር እቅድ በመንደፍ እየተንቀሳቀሰ ይገኛል።

ከማኅበረሰቡ አካላት መካከልም የዛሬው ትውልድ አካልና የነገ ሀገር ተረካቢ የሆኑት ተማሪዎች ላይ መሥራት፣ ለማኅበረሰቡ ካላቸው ቅርበት አንፃር ከወዲሁ የማኅበረሰባቸውን ኑሮ ለማሻሻል ዓልመው እንዲሰሩና በዚህ ዙሪያ በንቃት እንዲሳተፉ ማድረግ አጠቃላይ ሥራውን የተሳለጠና የሰመረ የሚያደርገው ይሆናል።

በተለይም ከቅርብ ጊዜ ወዲህ የዩኒቨርሲቲ መግቢያ ፈተና እየወሰዱ ማለፍ ያልቻሉ ተማሪዎች ቁጥር እያሻቀበ መምጣቱ በዚህ ደረጃ ያሉትን ተማሪዎች ማንቃትና ማብቃት የተሻለ ነገን ለመፍጠር በር ከፋች መሆኑ እሙን ነው።

ስለሆነም ይህን የማብቃትና የማንቃት ሥራ ጎ-ሰ'ማ፣ ከ2014 ዓ.ም ክረምት ወቅት ጀምሮ በሁሉም የጎንደር ዞኖች ሥር ባሉት ከ 66 በላይ ወረዳዎች ውስጥ በሚገኙና የ12ኛ ክፍል መልቀቂያ ፈተናን ከሚያስፈትኑ 143 ት/ት ቤቶች መካከል በ80ዎቹ ላይ ለመተግበር አልሟል። በመጀመሪያው ዙርም በውጤታቸው የተሻሉ 10,000 ( አስር ሺህ ) ተማሪዎችን በመመልመል ለፈተናቸው ዝግጁ እያደረገ እግረ መንገዱንም ለማኅበረሰባቸው የተሻለ ሃሳብና ራይዕ ያላቸው ዜጎች እንዲሆኑ በመሥራት ለራሳቸውም ሆነ ለአካባቢው ማኅበረሰብ ሥራ ፈጣሪና ሩቅ አሳቢ፣ ኃላፊነት የሚሸከም ትውልድን ለመፍጠር ይሞክራል።

ይህ ለአጥቲትዩድ ፈተና ማዘጋጀት የተዘጋጀ ሞጁል በዚህ አግባብ የቀረበ ሲሆን በጎ-ሰ'ማ አስተባባሪነት ከሥር ባሉት በጎ ፈቃደኛ መያተኞች የተሰናዳ ነው።

ሐምሌ፣ 2014 ዓ.ም (July, 2022)

ጎንደር፣ ኢትዮጵያ ( Gondar, Ethiopia )

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MATHEMATICS MODEL QUESTION & ANSWER FOR GRADE12, 2014E.C

## Mathematics Aptitude Questions

1. Given the inequality  $y \leq 2x + 2$  which of the ordered pairs of numbers is not a solution of the given inequality?

- A. (-3,3)      B. (-1,10)      C. (2,3)      D. (0,2)

2. If x is 30% of 400, y is 40% of x and z is 25% of y. which one off the following is equal to  $xy+z$ ?

- A. 180      B. 576      C.690      D.175

3. If n is a two digit number and  $\frac{1}{n} = 0.\bar{n}$  then what is the value of n?

- A. 22      B.99      C.33      D. con not be determine

4. If  $n=3$ , what is the value of  $2^{2n} + 1$ ?

- A. 13      B.17      C.33      D.65

5. If  $2^x = x^2$  how many integral solution can x have?

- A. 3      B.2      C. 1      D. infinitely many

6. If the radius of a circle inscribed in a square is k, then the perimeter of square is?

- A.  $k^2$       B.  $\frac{k}{4}$       C.  $4k^2$       D. 8k

7. Which of the following frication has the smallest value?

- A.  $\frac{9}{2}$       B.  $\frac{1}{7}$       C.  $\frac{1}{8}$       D.  $\frac{3}{11}$

8. If the sum of three consecutive terms of an arithmetic sequence is 180 what is the value of the largest number ?

- A. 60      B.90      C. 80      D.60

9. If  $x > 0$  and  $2x-1 = \frac{1}{2}(x+1)$ , then the value of x is?

- A. 1      B.  $2\sqrt{2}$       C.  $\frac{1}{2}$       D.  $\sqrt{2}$

10. If  $y = \frac{a}{a+b}$  and  $x = \frac{a}{b}$ , then what is y in terms of x?



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

B.  $1 + x$

C.  $1 + \frac{1}{x}$

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

11. Which of the following has greatest value?

A.  $\sqrt{0.3}$

B. 0.3

C.  $\frac{1}{3}$

D.  $\frac{2}{5}$

12. What is the greatest common factor of 42,126 and 210?

A. 6

B. 14

C. 21

D. 42

13. Which of the following number does not have a reciprocal?

A. 0

B. -2

C.  $\frac{1}{3}$

D. 1

14. Which of the following is equal to the fraction  $\frac{c+x}{x}$ ?

A.  $c^2 + 1$

B.  $c$

C.  $\frac{c}{x} + 1$

D.  $\frac{c}{x} + x$

15. Which one of the following expression has an even integral value for all integers a and c?

A.  $8a+2ac$

B.  $3a+3c$

C.  $2a+c$

D.  $a+2c$

16. if  $x=3$  is one solution to the equation  $x^2 + rx - 20 = 4$  then the value of r is?

A. 5

B. -8

C. 3

D. 8

17. a triangle has a base b and a latitude a. A second triangle has base twice the altitude of the first triangle, and altitude twice the base of the first triangle what is the area of the second triangle?

A.  $\frac{1}{2}ab$

B.  $\frac{1}{2}a^2b^2$

C.  $2ab$

D.  $4ab$

18. A certain machine fills a bag with 7kg of potato chips in 3.5seconds. at this rate, haw many seconds will it take the machine to fill a bag with 15kg of potato chips?

A. 6.5

B. 7

C. 7.5

D. 8

19. In which of the following is the first number or expression equal to the second number or expression?

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A.  $\left[\frac{\frac{1}{3}+\frac{1}{4}}{\frac{1}{3}-\frac{1}{4}}\right], 7$       B.  $8-(-12)-5, 5+(-8)+12$       C.  $25(26)+26(75), 2500$       D.  $\frac{\left(\frac{5-\frac{1}{10}}{10+\frac{1}{10}}\right)}{\frac{1}{2}}, \frac{1}{2}$

20. Divide 64 by a quarter and add 5 what is the resulting number?

- A. 261      B. 256      C. 21      D. 11

21. Which of the following is equal to  $\frac{5^6-5^5}{4}$ ?

- A.  $\frac{1}{4}$       B.  $\frac{5}{4}$       C.  $5^5$       D. 5

22. if x and y are prime numbers greater than 2, which of the following is true?

- (I) x+y is even  
(II) xy is odd  
(III)  $x^2 - y^3$  is even

- A. I and II      B. I and III      C. II and III      D. I, II and III

23. If  $\frac{1}{5}$  of a certain number is 6, then  $\frac{1}{6}$  of the number is?

- A. 5      B. 6      C. 30      D. 36

24. if m is a number between 0 and 1, which one of the following is not more than m?

- A.  $m^2$       B.  $\frac{1}{m}$       C. 2m      D.  $\sqrt{m}$

25. if  $x=12 \times 7$ , which of the following is not integer?

- A.  $x \div 2$       B.  $x \div 5$       C.  $x \div 4$       D.  $x \div 7$

26. If the product of three consecutive positive integers is equal to their sum, what is the largest integer?

- A. 3      B. 2      C. 1      D. 0

27. What is the missing value of b in the sequence 33, b, 19, 12, 5?

- A. 25      B. 26      C. 27      D. 29

28. if  $a+3b=13$  and  $3a+3b=15$  what is the arithmetic mean of a and b?

- A. 3.5      B. 3      C. 2.5      D. 2

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29. if  $7x+17=49$ , what is the value of  $\sqrt{7x+49}$ ?

- A. 7                      B.  $4\sqrt{7}$                       C.  $8\sqrt{5}$                       D. 9

30. If a is 9 more than b, b is 4 more than c and d is 3 more than c, then what is the positive difference between a and b?

- A. 13                      B. 12                      C. 11                      D. 10

31. A team of seven teachers met for a discussion. Each teachers shook hands once with each other. How many hand shakes took place?

- A. 36                      B. 28                      C. 21                      D. 15

32. Which of the following number is different from the other in the group?

- A. 23                      B. 29                      C. 27                      D. 17

33. If x and y are integers such that  $2x+4>0$  and  $2y+4<0$  then which of the hollowing must be true?

- A. xy is negative      B. xy is positive      C. xy is odd      D. xy is even

35. What is the sum of the first five prime number?

- A. 28                      B. 26                      C. 18                      D. 11

36. If  $a+b=10$  and  $a-b=5$ , then what is  $a^2 - b^2$ ?

- A.  $\frac{1}{2}$                       B. 50                      C. 5                      D. 15

38. Which of the following is the larger fraction?

- A.  $\frac{7}{8}$                       B.  $\frac{3}{4}$                       C.  $\frac{4}{5}$                       D.  $\frac{8}{9}$

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