MATHEMATICS & SCIENCE OLYMPIAD

2019

MATHEMATICS - *ALGEBRA*

1. **If x = 3 , y = 7 and z = - 9, find the value of : $x^2 - 2xy + z^2$**

Iwapo x = 3 , y = 7 and z = - 9, tafuta thamani ya : $x^2 - 2xy + z^2$

A) -48
B) 144
C) 132
D) 48
E) -144

3. **$(ab)^3 \div b^2a^2 = ?$**

A) ab^2
B) a^2b
C) $(ab)^2$
D) ab
E) a^2b^2

Genius Cup 04th May 2019

2. **Find the value of x in:** $\frac{x}{3} - \frac{(2x+8)}{5} = -2$

Tafuta thamani ya x katika: $\frac{x}{3} - \frac{(2x+8)}{5} = -2$

A) 11
B) -54
C) 6
D) -6
E) 54

4. **Find n from : $3^n = 3^2 \times 3^4 \div 3$**

Tafuta thamani ya n kutoka : $3^n = 3^2 \times 3^4 \div 3$

A) 5
B) 6
C) 7
D) -5
E) 4

5. The ratio of the ages of a father and his son now is 8:3. If 10 years ago, the ratio of their ages was 6:1, find father's present age.

Uwiano wa umri wa baba na mtoto wake kwa sasa ni 8:3. Ikiwa miaka 10 iliyopita, uwiano wa umri wao ulikuwa 6:1, tafuta umri wa sasa wa baba .

A) 40
B) 15
C) 60
D) 55
E) 10

6. Pipe A fills the tank in 4 minutes, pipe B can fill the same tank in 6 minutes and Pipe C can empty the tank in 12 minutes. After how many minutes will the tank be full if all the pipes are opened?

Bomba A linajaza tangi ndani ya dakika 4, bomba B linaweza kujaza tangi hilohilo ndani ya dakika 6 na bomba C linaweza kutoa vilivyomo kwenye tangi ndani ya dakika 12. Ikiwa mabomba yote yatafunguliwa kwa wakati mmoja, tangi litajaa baada ya dakika ngapi?

A) 6 minutes
B) 22 minutes
C) 2 minutes
D) 3 minutes
E) 10 minutes

7. The distance between Arusha and Lindi is 780 km. Shadida left Lindi at 08:00 am heading to Arusha at an average speed of 105 km/hr at the same time Fatma left Arusha heading to Lindi at an average speed of 90 km/hr. How far was their meeting place from Arusha?

Umbali baina ya Arusha na Lindi ni 780 km. Shadida aliondoka Lindi saa 02:00 asubuhi kuelekea Arusha kwa wastani wa mwendokasi 105 km/saa na wakati huo Fatma aliondoka Arusha kuelekea Lindi kwa wastani wa mwendokasi 90 km/saa. Kuna umbali gani kutoka Arusha mpaka sehemu watakapokutana?

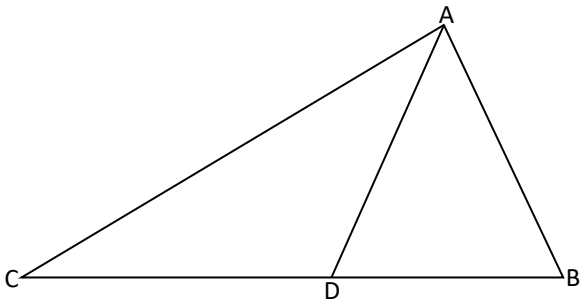
A) 360 km
B) 280 km
C) 240 km
D) 420 km
E) 780 km

Genius Cup 04th May 2019

GEOMETRY

8. In triangle ABC, |AD| = |DC|, |AB| = |BD|, ∠ABD = 40, What is ∠ACB ?

Katika pembetatu ABC, |AD| = |DC|, |AB| = |BD|, ∠ABD = 40, ni nini ukubwa wa pembe ∠ACB ?



A) 45°
B) 35°
C) 50°
D) 55°
E) 40°

9. Ally has three sticks with lengths 3cm,3cm and 5cm. He tried to make a triangle using these sticks. Which of the following is true?

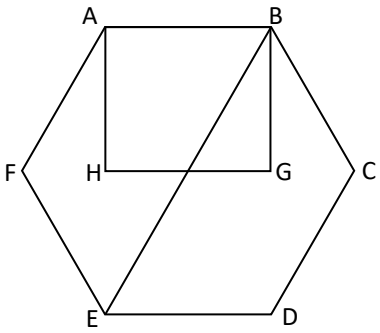
Ally ana fimbo zenye urefu wa 3cm,3cm and 5cm. Anajaribu kutengeneza umbo la pembetatu kwa kutumia fimbo hizo. Lipi katika haya majibu ni sahihi?

A) Information is not enough
Taarifa haijajitosheleza
B) He can make a triangle
Anaweza kutengeneza umbo la pembetatu
C) It is impossible to make a triangle
Haiwezekani kutengeneza umbo la pembetatu
D) He did not try
Hakujaribu
E) None of them is true
Hakuna jibu sahihi

Genius Cup 04th May 2019

10. Square ABGH and regular hexagon ABCDEF have a common side AB. What is |BE| if |AB| = 1 cm?

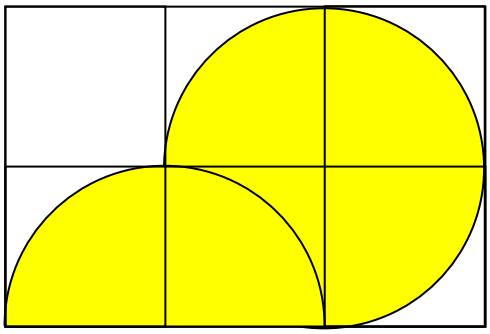
Umbo la mraba ABGH na umbo la pembe sita ABCDEF vinashirikiana upande AB. Ni nini urefu |BE| endapo |AB| = 1 cm?



A) $\frac{2}{\sqrt{3}}$
B) $\frac{4}{\sqrt{3}}$
C) $2\sqrt{3}$
D) 2
E) 3

11. In the figure, a circle and a semicircle is inscribed in a rectangle with sides 3×2. What is the area of the shaded region?

Katika umbo lifuatalo, duara na nusu duara vimewekwa ndani ya umbo mstatili wenye pande 3 kwa 2. Tafuta eneo lenye kivuli?



A) $\pi + 3$
B) $2\pi + 2$
C) $\pi + 2$
D) $2\pi + 1$
E) $\pi + 1$

12. What is the percentage increase of an area of a circle if you increase the radius by 20%?

Tafuta ongezeko la asilimia la eneo la duara ukiongeza nusu kipenyo kwa asilimia 20?

A) 25%
B) 30%
C) 40%
D) 44%
E) 50%

13. A circular wire with radius 3cm is cut to make a rectangle. The area of the rectangle is :

Waya wa duara lenye kipenyo cha 3cm umekatwa kutengenezea umbo la mstatili. Ni nini Eneo la mstatili?

A) $\pi\sqrt{3}$
B) $\pi^2\sqrt{3}$
C) 3π
D) $\pi 2\sqrt{3}$
E) $3\pi^2$

14. Sizes of internal angles of a triangle in the ratio 1: 3 : 5. What is the size of the largest angle?

Ukubwa wa pembe za ndani za umbo la pembetatu zipo katika uwiano 1:3:5. Ni nini ukubwa wa pembe kubwa kuliko zote?

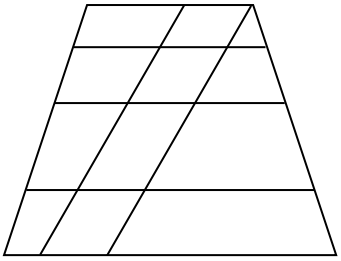
A) 20°
B) 30°
C) 60°
D) 100°
E) 140°

Genius Cup 04th May 2019

COMBINATORICS

15. How many parallelograms are there in the figure?

Kuna maumbo msambamba mangapi?



A) 15
B) 12
C) 11
D) 10
E) 9

16. A sector is divided into 4 sectors. At the beginning one sector contains only one 1 and the others contain one 0 each . In each turn Hassan must choose zero and make it 1 but make its neighbors 1. If he continues with this process what number can he get in all sectors?

Sekta inagawanywa na kuwa sekta 4. Mwanzoni sekta moja ina namba 1 na nyinginezo zina namba 0 kila moja. Hassan atakuwa anachagua 0 na kuifanya kuwa 1 huku akibadilisha 0 majirani kuwa 1. Akiendelea na utaratibu huu, atapata namba gani kwenye sekta zote?

A) All zero
zote namba 0
B) All one
zote namba 1
C) Only one 1
namba 1 ni 1 tu
D) one 1 and zeros
namba 1 na sifuri
E) None
Hakuna namba

17. What is the minimum number of vertices if you draw a figure with 4 sides do not cross each other?

Ni ipi idadi ndogo kabisa ya vipeo ikiwa umbo lenye pande 4 ambazo hazikutani?

A) 4
B) 5
C) 6
D) 7
E) none

18. How many 2-digit number with last digit 5 and divisible by 3?

Ni namba ngapi zenye tarakimu 2 ambazo tarakimu ya mwisho ni 5 na vilevile namba hizo zinagawanyika kwa 3?

A) 3
B) 4
C) 5
D) 6
E) 7

19. In how many ways can you paint 2×2 square by colors A,B,C such that each square must be painted by one color and adjacent squares are in different colors?

Katika njia ngapi unaweza kupaka rangi kwenye 2×2 mraba kwa rangi A, B, C katika namna ambayo kila mraba upakwe rangi moja na miraba inayopakana iwe na rangi tofauti?

A) 6
B) 9
C) 18
D) 27
E) 36

20. Numbers from 1 to 10 are written on a screen. Ridhwan and Collins decided to play a game. Ridhwan starts first. He deletes any two numbers instead he writes their sum. Each players do so in their turns if one number left, then the game is over. In how many turns may they finalize the game?

Namba 1 mpaka 10 zimeandikwa kwenye kiwambo. Ridhwan na Collins wakaamua kucheza mchezo. Ridhwan akaanza kucheza. Alifuta namba mbili kati ya zile na kuandika jumla ya namba hizo. Kila mchezaji akafanya hivyo katika zamu yake ikiwa namba moja imesalia, basi mchezo umeisha. Katika zamu ya ngapi mchezo wao utaisha?

A) 8
B) 9
C) 10
D) 11
E) 12

21. Candy has three skirts, two shirts and one trouser. She is supposed to dress 1 skirt, 1 shirt and 1 trouser in a day. In how many ways can she dress in three consecutive days if she dresses different skirts in each day?

Candy ana sketi 3, mashati 2 na suruali 1. Anatakiwa awe anavaa sketi 1, shati moja na suruali moja kwa siku. Kwa namna ngapi tofauti atavaa nguo hizi kwa siku tatu mfululizo iwapo kila siku atatakiwa kuvaa tofauti ?

A) 24
B) 30
C) 32
D) 44
E) 48

NUMBER THEORY

22. I am two digit number whose digit in the tens place is 1 less than twice the digit in the ones place. When the digit in the tenth place is divided by the digit in the ones place, the quotient is 1 and the remainder is 4. What am I?

Mimi ni namba yenye tarakimu 2 ambayo tarakimu ya makumi ni 1 pungufu ya mara mbili ya tarakimu ya mamoja. Tarakimu ya makumi ikigawanywa na tarakimu ya mamoja, hisa ni 1 na 4 inabakia. Mimi ni nani?

A) 92
B) 85
C) 95
D) 82
E) 85

23. A = 99999999995 has 11 digits. What is the sum of the digits of A^2?

A = 99999999995, namba A ina tarakimu 11. Nini jumla ya tarakimu zilizopo kwenye A^2?

A) 85
B) 90
C) 95
D) 97
E) 100

24. The positive integers x and y are the two smallest positive integers for which the product of 360 and x is a square and the product of 360 and y is a cube, what is the difference of x and y?

Namba x na y ni namba chanya ndogo kuliko zote ambazo zao la 360 na x ni namba mraba na zao la 360 na y ni namba mchemraba, nini tofauti kati ya x na y?

A) 65
B) 75
C) 85
D) 95
E) 101

25. n = abcd is 4-digit numbers. If n has two condition which;

i. n=abcd; a<b<c<d
ii. n=abcd is divisible by a,b,c and d.

which of the following digit can not be any digit of n?

n =abcd ni namba yenye tarakimu nne. Ikiwa n ina masharti 2 ambayo ni:

i. n = abcd; a<b<c<d
ii. n = abcd inaweza kugawanywa na a, b, c & d.

Ni ipi kati ya namba zifuatazo haiwezi kuwa tarakimu katika namba n yoyote?

A) 2
B) 3
C) 4
D) 5
E) 6

Genius Cup 04th May 2019

26. **If p is prime number, what could also be prime?**

Ikiwa p ni namba tasa, ni ipi kati ya zifutazo ni namba tasa pia?

A) 2p
B) P-2
C) P2
D) $\frac{p}{2}$
E) 3p

27. **The sum of four consecutive integers is 290. How many of these four integers are prime?**

Jumla ya namba nne zinazofuatana ni 290. Ni namba ngapi kati ya hizo ni tasa?

A) 0
B) 1
C) 2
D) 3
E) 4

28. **abc is 3-digit number and if $b = \frac{a+c}{2}$, abc is called feza number. How many feza number are there?**

abc ni namba yenye tarakimu 3 na iwapo $b = \frac{a+c}{2}$, abc inaitwa namba ya feza.
Kuna namba ngapi za Feza ?

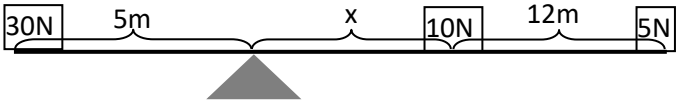
A) 35
B) 40
C) 45
D) 50
E) 55

Genius Cup 04th May 2019

SCIENCE

29. What is the value of X?

Ni ipi thamani ya X?



A) 5m
B) 6m
C) 7m
D) 8m
E) 9m

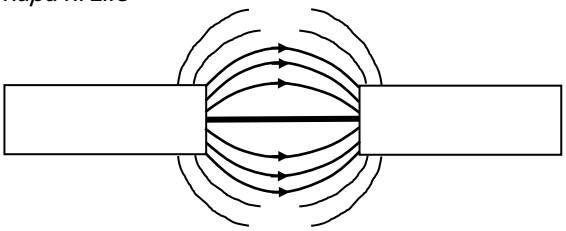
30. Platelets are cells formed in the blood. The function of pletelets is

Platelet ni seli zinazotengenezwa katika damu, ambazo hufanya kazi ya

A) Fight germs causing diseases
(zinapigana na wadudu wasababishao magonjwa)
B) Carry carbon dioxide
(hubeba kabondayoksaidi)
C) Carry oxygen
(usafirisha oksijeni)
D) Help in clotting of blood
(husaidia kuzuia damu kuchuruzika)
E) None of the above
(Yote sio majibu sahihi)

31. The magnetic field patterns shown below are those of

Nguvu za uvutano wa sumaku zinazo onyeshwa hapa ni zile



A) The North and South poles brought together
(ncha ya kaskazini na ya kusini zimewekwa pamoja)
B) Two South poles brought together
(ncha mbili za kusini zimewekwa pamoja)
C) A U shaped magnet brought to a circular magnet
(sumaku yenye umbo la U imetengenezwa kuwa ya duara)
D) Two North poles brought together
(ncha mbili za kaskazini zimewekwa pamoja)
E) Noneof the above
(Yote sio majibu sahihi)

32. Which one of the following statements is true about the formation of identical twins?

Taarifa ipi ni sahihi kuhusu kutengenezeka kwa mapacha wanaofanana?

A) A fertilized ovum divides into two separate embryos.
(Ovum iliyochavushwa hugawanyika katika embriyo mbili)
B) Two ova are released from each ovary at the same time and fertilized by two different sperms
(mayai ya kike mawili yanaporutubishwa na mbegu za kiume mbili tofauti)
C) the man is unable to produce sperms
(mwanaume anaposhindwa kuzalisha mbegu za kiume)
D) the woman has blocked oviducts
(mwanamke kufunga kuta za uzazi)
E) None of the above
(Yote sio majibu sahihi)

Genius Cup 04th May 2019

33. Change 200 ^{0}C into Fahrenheight.

Badili 200 ^{0}C kuwa Farenheiht

A) 453°F
B) 247°F
C) 392°F
D) 187°F
E) 190°F

34. Faeces and decaying bodies of animal and plants;

Vinyesi na miili iliyooza ya wanyama na mimea,

A) makes the soil unsuitable for cultivation *(hufanya ardhi kutofaa kwa kilimo)*
B) invites other insects which destroy crops *(hukaribisha wadudu wengine ambao ni waharibifu wa mazao)*
C) add humus to the soil *(huongeza virutubisho katika udongo)*
D) are of no importance to the soil *(havina umuhimu wowote katika udongo)*
E) Adds odour and smell to the soil *(huongeza ladha na harufu kwenye udongo)*

35. Find the average of the lenghts of maize plants that were exposed to different fertilizers as given in the table below.

Tafta wastani wa urefu wa mmea wa mahindi ambao umekuzwa kutokana na mbolea tofauti

Maize plant	A	B	C	D	E	F	G	H	I	J
Height in cm	160	173	176	179	185	190	196	201	208	212

A) 194
B) 192
C) 190
D) 188
E) 180

36. How many hours a healthy person should sleep in a day?

Mtu mwenye afya anatakiwa kulala masaa mangapi kwa siku?

A) 5 hours
B) 8 hours
C) 10 hours
D) 12 hours
E) 6 hours

37. A ray of light bends when it enters or leaves glass. This process is called:

Mwale wa mwanga hupinda unapoingia au unapotoka katika kioo. Hiki kitendo huitwa

A) Refraction
(kupinda kwa mwanga bada ya kubadilisha njia yake)
B) Transmission
(mnururisho)
C) Deflection
(kurudi kwa mwanga katika media ya mwanzo)
D) Reflection
(msambao)
E) Converging
(kukusanyika kwa mwanga)

38. Which among the following plants is a monocot_____

Mmea upi kati ya ifuatayo ni jamii ya monokot

A) Pea *(njegere)*
B) Maize *(mahindi)*
C) Bean *(maharage)*
D) Legume *(kunde)*
E) Ground nuts *(karanga)*

39. The absorption of foods takes place in the

Chakula hufyonzwa katika

A) Duodenum
(sehemu ya kwanza ya utumbo mwembamba)
B) Rectum
(rectam)
C) Ileum
(utumbo mwembamba)
D) Colon
(utumbo mpana)
E) Esophagus
(kooni)

40. How many types of sound are there?

Kuna aina ngapi za sauti?

A) Five *(tano)*
B) Four *(nne)*
C) Three *(tatu)*
D) Two *(mbili)*
E) Six *(sita)*

Genius Cup 04th May 2019

41. Which of the following may change alternating current to direct current?

Kifaa kipi hubadili mkondo geo kuwa mkondo mfulizo

A) Amplifier *(amplifaya)*
B) Recifier *(rectifaya)*
C) Transformer *(Transfoma)*
D) Ammeter *(amita)*
E) Motor *(mota)*

42. If we want to eradicate mosquitoes, we have to attack the following stage of their life cycle:

Kama tutahitaji kutokomeza mbu, tunatakiwa kuwashambulia katika hatua ifuatayo katika maisha yao

A) Adult *(utu uzima)*
B) Egg *(yai)*
C) Larva *(lava)*
D) All stages *(hatua zote)*
E) Ecdysis *(utoaji gamba gumu)*

43. When a fish swims in water the caudal fin helps it to :

Wakati samaki anapo ogelea katika maji, mapezi humsaidia

A) Cross a corner
(kukata kona)
B) Increase speed
(kuongeza kasi)
C) Swim
(kuogelea)
D) Get out of deep water
(kutoka katika kina kirefu)
E) Attachment
(kujishikiza)

44. One of the following is <u>NOT</u> a good method for maintaining soil nutrients:

Moja wapo SIO mbinu nzuri ya kudumisha rutuba ya udongo

A) Allowing a fallow period
(kuruhusu kuachanisha muda)
B) Growing mixed crops
(kupanda mazao mchanganyiko)
C) Growing legumes
(kupanda mikunde)
D) Using a tractor to cultivate a shamba every year
(kutumia trekta kulima shamba kila mwaka)
E) Using manures
(kutumia mbolea)

Genius Cup 04th May 2019

45. The eclipse of the sun occurs when:

Kupatwa kwa jua hutokea wakati

A) Meteorite is located between the moon and earth
(kimondo kinapokuwepo kati ya mwezi na dunia)
B) The earth is located between the sun and the moon
(dunia inapokuwepo kati ya jua na mwezi)
C) The moon is located between the sun and earth
(mwezi unapokuwepo kati ya jua na dunia)
D) The sun is located between the earth and moon
(jua linapokuwepo kati ya dunia na mwezi)
E) All of the above
(yote ni majibu sahihi)

46. Point out an example of the static energy out of the following sets:

Eleza mfano wa nishati tuli kutoka katika mifano ifuatayo

A) An arrow and a guitar
(mshale na gitaa)
B) A hammer and a spring balance
(nyundo na uzani msawazo)
C) Dynamite and charcoal
(dainamait na mkaa)
D) Hair and pen
(nywele na kalamu)
E) None of the above
(Yote sio majibu sahihi)

47. A glowing candle is extinguished when covered by a glass. This is caused by lack of the following gas:

Mshumaa unaowaka utazimika endapo utawekwa katika glasi kwa kukosa hewa ya

A) Carbon dioxide *(kabondayoksaid)*
B) Oxygen *(oksijeni)*
C) Nitrogen *(Naitrojeni)*
D) Hydrogen *(haidrojeni)*
E) Helium *(heliam)*

48. How many strokes do petrol engines have in their pistons?

Ingini zinazotumia petroli zina mapigo mangapi katika pistoni ?

A) Two or three *(mbili au tatu)*
B) Three to five *(tatu mpaka tano)*
C) Two to four *(mbili mpaka nne)*
D) Five to six *(tano mpaka sita)*
E) Ten to twelve *(kumi mpaka kumi nam bili)*

Genius Cup 04th May 2019

49. Which are the characteristics features of a mammal?

Ni sifa ipi kati ya zifuatazo ni ya mnyama?

A) Breast feding, cold-blooded, posses hair *(kunyonyesha, damu baridi na kuwa nywele)*
B) laying eggs, warm-clooded, breast feding *(kutaga mayai, damu moto, kunyonyesha)*
C) Posses hair, breast feding, warm blooded *(kuwana nywele, kunyonyesha na kuwa na damu moto)*
D) Aquatic, laying eggs, terrestarial *(kuishi majini, kutaga mayai, kutembea)*
E) Breastfeeding, hairy body, exoskeleton *(hunyonyesha, wana vinyweleo, wana skeleton nje)*

Genius Cup 04th May 2019

50. Killing all snails in ponds may help to reduce the spread of the disease known as:

Kuuwa konokono wote katika mabwawa huweza kupunguza ueneaji wa ugonjwa ujulikanao kama:

A) Sleeping sickness *(malale)*
B) Bilharzia *(kichocho)*
C) Elephantiasis *(matende)*
D) Thyphoid *(taifod)*
E) Diarrhea *(kuhara)*