MathCompetition UP

Department of Mathematics and Applied Mathematics
Departement Wiskunde en Toegepaste Wiskunde

GRADES 10 AND 11

AUGUST 2016

TIME: 2 HOURS

GRADE 10 EN 11

AUGUSTUS 2016

TYD: 2 URE

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Denkleiers • Leading Minds • Dikgopolo tša Dihlalefi

Leading Minds

INSTRUCTIONS

- No calculators or other calculation aids are allowed.

- **Mark allocation**
  Every question counts 1 mark.
  Random guessing is not advisable, as the mark allocated to a question may be deducted for a wrong answer.

- Every question has five possible answers, (**A**) to (**E**).
  Only **ONE** answer is correct.
  Colour in the rectangle of the correct answer on the answer sheet.
  Do not colour outside the rectangle.
  Use a soft pencil.

Example:
Suppose Question 21 reads:
The smallest integer larger than 1 is

(**A**) 0 (**B**) -1 (**C**) 1 (**D**) 2 (**E**) 3

The correct answer is 2, which is answer (**D**).
On the answer sheet you must colour in the rectangle (**D**) against Question 21.

Question 21 / Vraag 21 (**A**) (**B**) (**C**) (**D**) (**E**)

INSTRUKSIES

- Geen sakrekenaars of ander rekenhulpmiddels word toegelaat nie.

- **Puntetoekenning**
  Elke vraag tel 1 punt.
  Raaiery word nie aanbeveel nie, aangesien die punt toegeken aan die vraag afgetrek mag word vir ’n ’n verkeerde antwoord.

- Elke vraag het vyf moontlike antwoorde, (**A**) tot (**E**).
  Slegs **EEN** antwoord is korrek.
  Kleur die reghoek van die korrekte antwoord op die antwoordvel in.
  Moenie buite die reghoek inkleur nie.
  Gebruik ’n sagte potlood.

Voorbeeld:
Gestel Vraag 21 is:
Die kleinste heelgetal groter as 1 is

(**A**) 0 (**B**) -1 (**C**) 1 (**D**) 2 (**E**) 3

Die korrekte antwoord is 2, en dit is antwoord (**D**).
Op die antwoordvel moet jy die reghoek (**D**) inkleur teenoor Vraag 21.

Question 21 / Vraag 21 (**A**) (**B**) (**C**) (**D**) (**E**)

Question 1

$$6102 - 2016 =$$

(**A**) 4014 (**B**) 4086 (**C**) 4096 (**D**) 4114 (**E**) 4196

Vraag 1

$$6102 - 2016 =$$

(**A**) 4014 (**B**) 4086 (**C**) 4096 (**D**) 4114 (**E**) 4196

Question 2

If $f(a, b, c) = a^b - b^c + c^a$ then $f(1, -1, 2)$ equals

(**A**) -4 (**B**) -2 (**C**) 0 (**D**) 2 (**E**) 4

Vraag 2

As $f(a, b, c) = a^b - b^c + c^a$ dan is $f(1, -1, 2)$ gelyk aan

(**A**) -4 (**B**) -2 (**C**) 0 (**D**) 2 (**E**) 4

Question 3

Solve for x if $\dfrac{1 + \sqrt{x}}{1 - \sqrt{x}} = 3$.

(**A**) $\dfrac{1}{2}$ (**B**) $\dfrac{1}{\sqrt{3}}$ (**C**) $\dfrac{1}{3}$ (**D**) $\dfrac{9}{4}$ (**E**) $\dfrac{1}{4}$

Vraag 3

Bereken x as $\dfrac{1 + \sqrt{x}}{1 - \sqrt{x}} = 3$.

(**A**) $\dfrac{1}{2}$ (**B**) $\dfrac{1}{\sqrt{3}}$ (**C**) $\dfrac{1}{3}$ (**D**) $\dfrac{9}{4}$ (**E**) $\dfrac{1}{4}$

Question 4

A group of 20 engineers is instructed to inspect bridges for their safety. They decide that each engineer will inspect exactly 16 bridges and each bridge must be inspected by exactly 4 people. How many bridges will be inspected?

(**A**) 60 (**B**) 80 (**C**) 100 (**D**) 160 (**E**) 320

Vraag 4

'n Groep van 20 ingenieurs moet 'n paar brûe inspekteer vir hulle veiligheid. Hulle besluit dat elke ingenieur presies 16 brûe gaan ondersoek en dat elke brug deur presies 4 persone ondersoek gaan word. Hoeveel brûe moet ondersoek word?

(**A**) 60 (**B**) 80 (**C**) 100 (**D**) 160 (**E**) 320

Question 5

The angles of a quadrilateral is in the ratio 1 : 2 : 3 : 4. What is the size of the smallest angle?

(**A**) 24° (**B**) 30° (**C**) 36° (**D**) 40° (**E**) 45°

Vraag 5

Die hoeke van 'n vierhoek is in die verhouding 1 : 2 : 3 : 4. Wat is die grootte van die kleinste hoek?

(**A**) 24° (**B**) 30° (**C**) 36° (**D**) 40° (**E**) 45°

Question 6

If $x > 6$, which of the following real numbers is the smallest?

(**A**) $\dfrac{6}{x}$ (**B**) $\dfrac{6}{x-1}$ (**C**) $\dfrac{x+1}{6}$ (**D**) $\dfrac{6}{x+1}$ (**E**) $\dfrac{x}{6}$

Vraag 6

As $x > 6$, watter een van die volgende reële getalle is die kleinste?

(**A**) $\dfrac{6}{x}$ (**B**) $\dfrac{6}{x-1}$ (**C**) $\dfrac{x+1}{6}$ (**D**) $\dfrac{6}{x+1}$ (**E**) $\dfrac{x}{6}$

Question 7

Four of the five points below lay on a single straight line. Which point does not lie on this line?

(**A**) $(-3,-3)$ (**B**) $(-2,-1)$ (**C**) $(2,5)$ (**D**) $(4,11)$ (**E**) $(5,13)$

Vraag 7

Vier van die vyf punte hieronder lê op 'n reguitlyn. Watter punt lê nie op die reguitlyn nie?

Question 8

If $\dfrac{1}{x+2} = 3$ then $\dfrac{1}{x+4} =?$

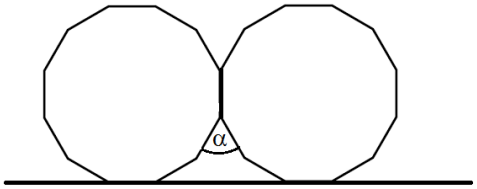
(**A**) $\dfrac{3}{7}$ (**B**) 5 (**C**) $-\dfrac{5}{3}$ (**D**) $-\dfrac{7}{12}$ (**E**) $\dfrac{11}{3}$

Vraag 8

As $\dfrac{1}{x+2} = 3$ dan is $\dfrac{1}{x+4} =?$

Question 9

Two regular 12-sided coins are balanced next to each other on a table so that they meet along one edge, as shown. What is the value of α in the diagram below?



(**A**) 48° (**B**) 50° (**C**) 60° (**D**) 64° (**E**) 72°

Vraag 9

Twee reëlmatige 12-sydige muntstukke word langs mekaar gebalanseer soos getoon hieronder. Wat is die waarde van α in die figuur?

Question 10

Which one of the following factorizations is wrong?

(A) $x^2 - 5xy + 6y^2 = (x-3y)(x-2y)$

(B) $x^2 - 3xy - 10y^2 = (x-5y)(x+2y)$

(C) $x^2 + 4xy + 3y^2 = (x+y)(x+3y)$

(D) $x^2 + xy - 12y^2 = (x+3y)(x-4y)$

(E) $x^2 + 2xy - 8y^2 = (x-2y)(x+4y)$

Vraag 10

Watter een van die volgende faktoriserings is verkeerd?

Question 11

Suppose the radius of a cylinder is decreased by 20% and the height is doubled. What effect does this change have on the volume of the cylinder?

Vraag 11

Veronderstel die radius van 'n silinder word verminder met 20% en die hoogte word verdubbel. Watter effek het die verandering op die volume van die silinder?

(A) The volume is 10% more. / Die volume is 10% meer.

(B) The volume is 32% more. / Die volume is 32% meer.

(C) The volume is 40% more. / Die volume is 40% meer.

(D) The volume is 36% more. / Die volume is 36% meer.

(E) The volume is 28% more. / Die volume is 28% meer.

Question 12

A sprinter completes a 200 meter sprint in 20 seconds. What is his average speed in km/hour?

Vraag 12

'n Naelloper voltooi 'n 200 meter wedloop in 20 sekondes. Wat is sy gemiddelde spoed in km/uur?

(**A**) 24 (**B**) 36 (**C**) 12 (**D**) 18 (**E**) $3,6$

Question 13

Which one of the numbers below is a term of the arithmetic sequence $10, 23, 36, 49, \ldots$? (Note the common difference!)

Vraag 13

Watter een van die volgende getalle is 'n term van die rekenkundige ry $10, 23, 36, 49, \ldots$? (Let op die konstante verskil!)

(**A**) 1000 (**B**) 2000 (**C**) 3000 (**D**) 4000 (**E**) 5000

Question 14

For which value of c is $2 - \sqrt{17}$ a root of $x^2 - 4x + c = 0$?

Vraag 14

Vir watter waarde van c is $2 - \sqrt{17}$ 'n wortel van $x^2 - 4x + c = 0$?

(**A**) -21 (**B**) -13 (**C**) 13 (**D**) 21 (**E**) None of these/Geen van die

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Question 15

Seven red and four blue socks are in a drawer. Two socks are drawn at random, without replacement. What is the probability that they have the same colour?

Vraag 15

Sewe rooi en vier blou sokkies is in 'n laai. Twee sokkies word willekeurig getrek, sonder om dit terug te sit. Wat is die waarskynlikheid dat hulle altwee dieselfde kleur het?

(**A**) $\frac{11}{28}$ (**B**) $\frac{13}{42}$ (**C**) $\frac{5}{11}$ (**D**) $\frac{6}{11}$ (**E**) $\frac{27}{55}$

Question 16

Out of forty boys, 14 play hockey and 29 play rugby. If five of these boys play both sports, how many of them do neither of these two sports?

Vraag 16

Uit 'n groep van veertig seuns, speel 14 hokkie en 29 rugby. As vyf van die seuns beide sporte speel, hoeveel seuns speel nie een van die twee sporte nie?

(**A**) 1 (**B**) 2 (**C**) 3 (**D**) 4 (**E**) 5

Question 17

Note in the number pattern below, the last entry in rows $1, 2, 3$, etc. is $1, 5, 11$. What is the last number in the nth row if this pattern continues?

Vraag 17

Let daarop dat in die getalle patroon hieronder, die laaste getal in rye $1, 2, 3$, ens. $1, 5, 11$ is. Wat sal die laaste getal in ry n wees as die patroon aangaan?

$$\begin{aligned} 1^3 &= 1 = 1 \\ 2^3 &= 8 = 3 + 5 \\ 3^3 &= 27 = 7 + 9 + 11 \\ 4^3 &= 64 = 13 + 15 + 17 + 19 \\ 5^3 &= 125 = 21 + 23 + 25 + 27 + 29 \\ 6^3 &= 216 = 31 + 33 + 35 + 37 + 39 + 41 \\ 7^3 &= 343 = 43 + 45 + 47 + 49 + 51 + 53 + 55 \\ &\dots \end{aligned}$$

(**A**) $4n-3$ (**B**) $2n^2-n$ (**C**) $-\frac{n^3}{6}+2n-\frac{5}{6}n$ (**D**) n^2+n+1 (**E**) n^2+n-1

Question 18

Find a if the following equations are all true.

Vraag 18

Bepaal a as die volgende vergelykings almal waar is.

$$\begin{aligned} 2a+b+c &= 2016 \\ a+2b+c &= 20 \\ a+b+2c &= 16 \end{aligned}$$

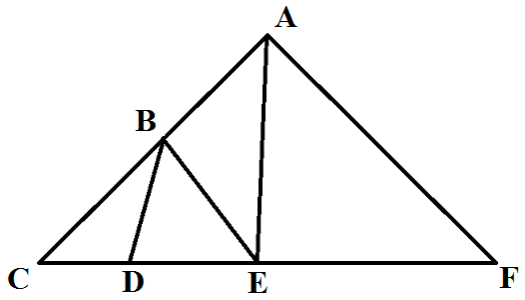
(**A**) 1485 (**B**) 1539 (**C**) 1496 (**D**) 1503 (**E**) 1512

Question 19

In the figure (not drawn to scale), $AC = AF, DC = DB, ED = EB$ and $AB = AE$. Find $A\hat{C}F$ if $A\hat{E}F - A\hat{E}B = 60°$.

Vraag 19

In die figuur (nie volgens skaal geteken) is $AC = AF, DC = DB, ED = EB$ en $AB = AE$. Bereken $A\hat{C}F$ as $A\hat{E}F - A\hat{E}B = 60°$.



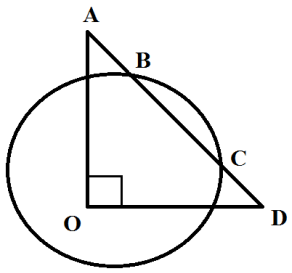
(**A**) 36° (**B**) 40° (**C**) 42° (**D**) 45° (**E**) 48°

Question 20

In the figure (not drawn to scale), the radius of the circle with center O is 10. Find the area of triangle AOD if $AO = DO$ and $AB = BC = CD$.

Vraag 20

In die figuur (nie volgens skaal geteken) is O die middelpunt van die sirkel en sy radius is 10. Bereken die oppervlakte van driehoek AOD as $AO = DO$ en $AB = BC = CD$.



(**A**) 90 (**B**) 100 (**C**) 85 (**D**) $\frac{850}{9}$ (**E**) 110