MathCompetition UP

Department of Mathematics and Applied Mathematics
Departement Wiskunde en Toegepaste Wiskunde

GRADES 10 AND 11

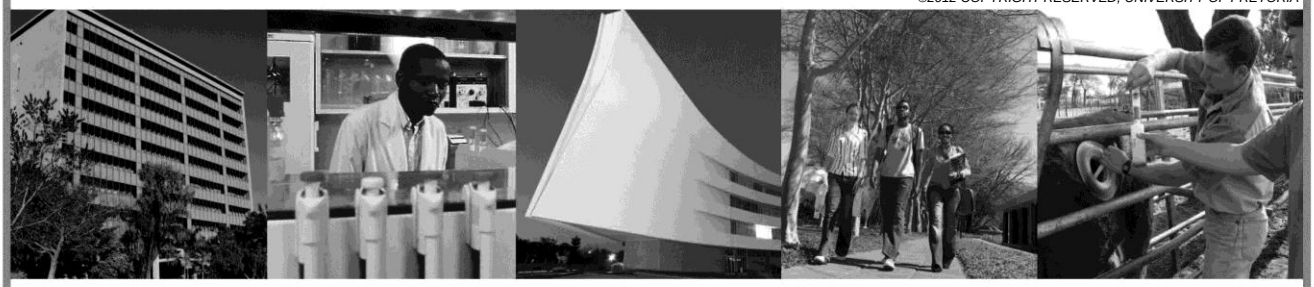
30 July – 3 Aug 2018

TIME: 2 HOURS

GRADE 10 EN 11

30 Julie – 3 Aug 2018

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

What is $0,20 \times 0,18$?

(**A**) $3,06$ (**B**) $3,6$ (**C**) $0,36$ (**D**) $0,036$ (**E**) $0,306$

Vraag 1

Wat is $0,20 \times 0,18$?

Question 2

Suppose an item including 14% VAT costs U rand. If the VAT is increased to 15% the price is P rand. Which equation below is true?

(**A**) $P = \frac{11U}{10}$ (**B**) $P = \frac{101U}{86}$ (**C**) $P = \frac{100U}{85}$ (**D**) $P = \frac{15U}{14}$ (**E**) $P = \frac{115U}{114}$

Vraag 2

Veronderstel 'n item wat 14% BTW insluit kos U rand. As die BTW vermeerder word na 15%, is die prys P rand. Watter vergelyking hieronder is waar?

Question 3

Solve for x if $\frac{x+\sqrt{x}}{x-\sqrt{x}} = 5$.

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

Vraag 3

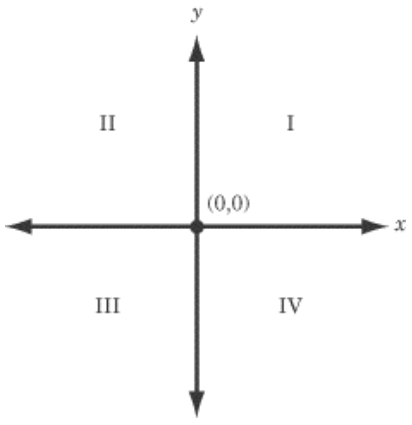
Los op vir x as $\frac{x+\sqrt{x}}{x-\sqrt{x}} = 5$.

Question 4

Consider the line $y = -4.4x + 44$. Which quadrant does this line not pass through?

Vraag 4

Beskou die lyn $y = -4.4x + 44$. In watter kwadrant het die lyn geen punte nie?



(**A**) I (**B**) II (**C**) III (**D**) IV (**E**) None of them/Geen van hulle

---

Question 5

The average of the numbers $20, 1, 8$ and x is 30. What is x?

(**A**) 85 (**B**) 87 (**C**) 89 (**D**) 91 (**E**) 93

Vraag 5

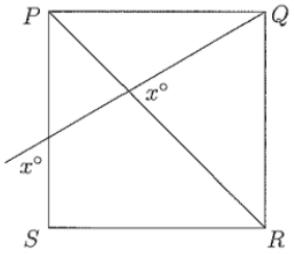
Die gemiddeld van die getalle $20, 1, 8$ en x is 30. Wat is x?

Question 6

What is x if $PQRS$ is a square?

Vraag 6

Wat is x as $PQRS$ 'n vierkant is?



(**A**) 62.5 (**B**) 70 (**C**) 65 (**D**) 60 (**E**) 67.5

Question 7

A circle of radius r has area $A = \pi r^2$ and circumference $C = 2\pi r$. Which equation below is correct?

Vraag 7

Die area van 'n sirkel met radius r is $A = \pi r^2$ en die omtrek is $C = 2\pi r$. Watter vergelyking hieronder is korrek?

(**A**) $A = \frac{C}{4\pi}$ (**B**) $A = \frac{C^2}{2\pi}$ (**C**) $A = \frac{C^2}{4\pi}$ (**D**) $4A = C^2$ (**E**) $2A\pi = C^2$

Question 8

Determine $(\sqrt{p+2}+p)^0 - \sqrt{p+1}+8(p-\sqrt[3]{p})$ if $p = 8$.

Vraag 8

Bepaal $(\sqrt{p+2}+p)^0 - \sqrt{p+1}+8(p-\sqrt[3]{p})$ as $p = 8$.

(**A**) 43 (**B**) 44 (**C**) 45 (**D**) 46 (**E**) 47

Question 9

Rory is 5 times as old as his son. Twenty-one years from now, he will be twice as old as his son. How old is Rory now?

Vraag 9

Rory is 5 keer so oud as sy seun. Oor een-en-twintig jaar sal hy twee keer so oud soos sy seun wees. Hoe oud is Rory nou?

(**A**) 32 (**B**) 35 (**C**) 36 (**D**) 40 (**E**) 42

Question 10

What is the 2018th root of $2018^{2018^{2018}}$?

Vraag 10

Wat is die 2018ste wortel van $2018^{2018^{2018}}$?

(**A**) 2018^{2018} (**B**) 2018^{2017} (**C**) $2018^{2017^{2018}}$ (**D**) $2017^{2018^{2018}}$ (**E**) $2018^{2018^{2017}}$

Question 11

Which expression below is equal to $x^4 + x^3 - x + 1$?

Vraag 11

Watter uitdrukking hieronder is gelyk aan $x^4 + x^3 - x + 1$?

(A) $(x^2 - \frac{x}{2} - 1)^2 + \frac{7x^2}{4}$

(B) $(x^2 + \frac{x}{2} - 1)^2 + \frac{7x^2}{4}$

(C) $(x^2 - \frac{x}{2} + 1)^2 + \frac{7x^2}{4}$

(D) $(x^2 + \frac{x}{2} + 1)^2 + \frac{7x^2}{4}$

(E) $(x^2 + \frac{x}{2} + 1)^2 - \frac{7x^2}{4}$

Question 12

A normal die is numbered 1 to 6. If you throw two dice, what is the probability that at least one of the two numbers is a prime number?

Vraag 12

'n Normale dobbelsteen is van 1 tot 6 genommer. As jy twee dobbelstene gooi, wat is die waarskynlikheid dat ten minste een van die twee getalle 'n priemgetal sal wees?

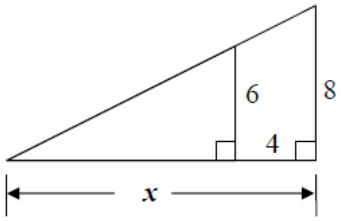
(A) $\frac{2}{3}$ **(B)** $\frac{17}{24}$ **(C)** $\frac{3}{4}$ **(D)** $\frac{7}{12}$ **(E)** $\frac{25}{36}$

Question 13

What is the length x in the diagram?

Vraag 13

Wat is die lengte x in die diagram?



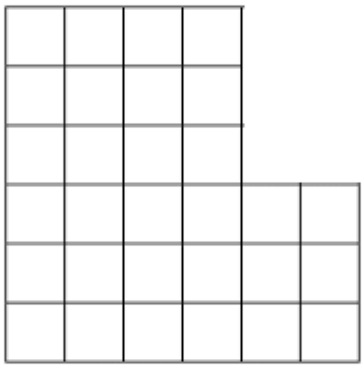
(A) $\frac{11}{3}$ **(B)** 3 **(C)** 12 **(D)** 18 **(E)** 16

Question 14

How many different rectangles (of all sizes) are there in this figure? Some do overlap.

Vraag 14

Hoeveel verskillende reghoeke (van alle groottes) is daar in hierdie figuur? Party oorvleuel wel.



(**A**) 246 (**B**) 256 (**C**) 266 (**D**) 276 (**E**) 286

Question 15

If $pq \neq 0$ and $p > q$ which of the following is always true?

Vraag 15

As $pq \neq 0$ en $p > q$, watter van die volgende is altyd waar?

(A) $\frac{1}{p} < \frac{1}{q}$ **(B)** $\frac{p}{q} > 1$ **(C)** $p^2 > q^2$ **(D)** $\frac{1}{pq^2} > \frac{1}{p^2q}$ **(E)** $\frac{p}{q} > \frac{q}{p}$

Question 16

In the puzzle below, four integers are inserted to make all the statements true. Which of these four integers is the biggest?

The sum of all the answers, except this one, is _____.
Double the next answer plus 7 is _____.
A third of the next answer plus 9 is _____.
The second answer minus the third answer is _____.

Vraag 16

Jy kan vier heelgetalle in die raaisel hieronder invul om al die bewerings waar te maak. Watter een van hierdie vier getalle is die grootste?

Die som van al die antwoorde, behalwe hierdie een is _____.
Dubbel die volgende antwoord plus 7 is _____.
'n Derde van die volgende antwoord plus 9 is _____.
Die tweede antwoord minus die derde antwoord is _____.

(**A**) 80 (**B**) 82 (**C**) 84 (**D**) 86 (**E**) 88

Question 17

What is the sum of all 3-digit numbers divisible by 17?

(**A**) 28828 (**B**) 28830 (**C**) 28836 (**D**) 28834 (**E**) 28832

Vraag 17

Wat is die som van al die 3-syfer getalle deelbaar deur 17?

Question 18

A regular hexagon has perimeter 24 cm. What is the area of the regular hexagon in cm^2?

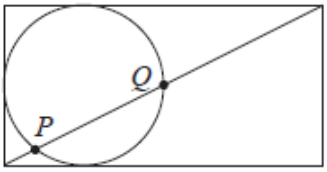
(**A**) $16\sqrt{3}$ (**B**) $20\sqrt{3}$ (**C**) $24\sqrt{3}$ (**D**) $30\sqrt{3}$ (**E**) $32\sqrt{3}$

Vraag 18

'n Reëlmatige seshoek het 'n omtrek van 24 cm. Wat is die oppervlak van die reëlmatige seshoek in cm^2?

Question 19

The diagram shows a circle of radius 1 touching three sides of a 2×4 rectangle. A diagonal of the rectangle intersects the circle at P and Q, as shown. What is the length of the chord PQ?



(**A**) $\sqrt{5}$ (**B**) $\frac{4}{\sqrt{5}}$ (**C**) 2 (**D**) $\sqrt{5}-\frac{2}{\sqrt{5}}$ (**E**) $\frac{5\sqrt{5}}{6}$

Vraag 19

In die 2×4 reghoek hieronder is 'n sirkel van radius 1 wat drie sye van die reghoek raak. Een hoeklyn van die reghoek sny die sirkel by P en Q. Wat is die lengte van die koord PQ?

Question 20

We say that a number is ascending if its digits are strictly increasing. For example, 145 and 3569 are ascending while 175 and 477 are not. There is a unique 3-digit number n, such that both n and $6n$ are ascending. What is the remainder when n is divided by 11?

(**A**) 6 (**B**) 3 (**C**) 8 (**D**) 2 (**E**) 4

Vraag 20

Ons sê dat 'n getal stygend is as al die syfers van die getal stygend is. Byvoorbeeld 145 en 3569 is stygend, maar 175 en 477 is nie. Daar is 'n unieke stygende 3-syfer getal n, sodat ook $6n$ stygend is. Wat is die res as jy n deur 11 deel?