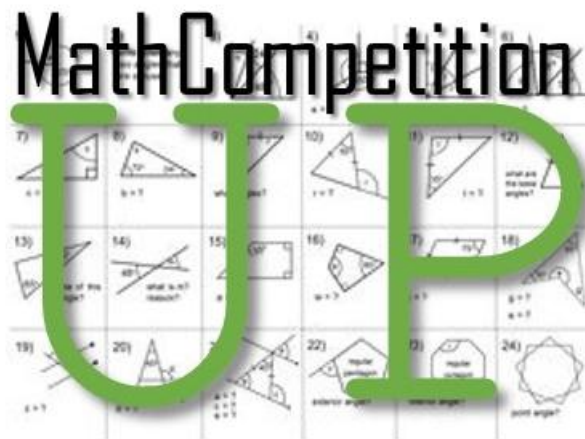


# Math Competition

# UJEP



Department of Mathematics and Applied  
Mathematics  
Departement Wiskunde en Toegepaste Wiskunde

**GRADES 8 AND 9**

**GRADE 8 EN 9**

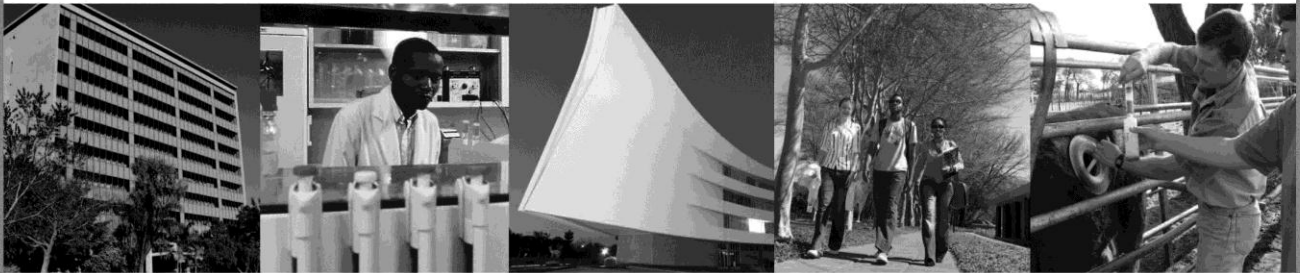
30 July – 3 Aug 2018

30 Julie – 3 Aug 2018

TIME: 2 HOURS

TYD: 2 URE

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## 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 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)

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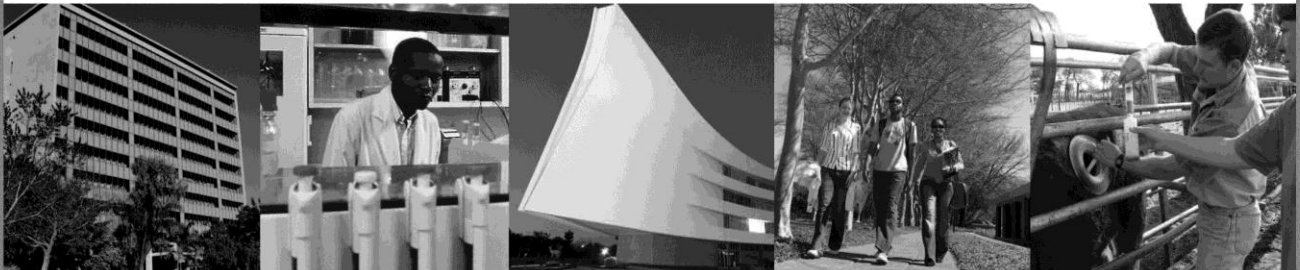
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### Voorbeeld:

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**

Simplify

- (A)  $\frac{1}{3}$       (B)  $\frac{5}{29}$       (C)  $\frac{3}{29}$       (D)  $\frac{1}{5}$       (E)  $\frac{9}{29}$
- 

**Vraag 1**

Vereenvoudig

$$\frac{2 + 3 \times 4 - 5}{6 + 5 \times 8 - 1} =$$

**Question 2**If  $\frac{x}{2} - \frac{4}{5} = \frac{1}{5}$ , then  $x$  equals

- (A)  $\frac{23}{5}$       (B)  $\frac{17}{5}$       (C) 2      (D) 5      (E) 6
- 

**Vraag 2**As  $\frac{x}{2} - \frac{4}{5} = \frac{1}{5}$ , dan is  $x$  gelyk aan**Question 3**

Determine the sum of the smallest six prime numbers.

- (A) 29      (B) 37      (C) 39      (D) 41      (E) 48
- 

**Vraag 3**

Bepaal die som van die kleinste ses priemgetalle.

**Question 4**What number is exactly halfway way between  $\frac{2}{3}$  and  $\frac{3}{4}$ ?

- (A)  $\frac{1}{12}$       (B)  $\frac{5}{8}$       (C)  $\frac{17}{24}$       (D)  $\frac{5}{6}$       (E)  $\frac{19}{24}$
- 

**Vraag 4**Watter getal is presies halfpad tussen  $\frac{2}{3}$  en  $\frac{3}{4}$ ?**Question 5**If  $a \oslash b = \frac{a}{b} + \frac{b}{a} - 2$ , then  $3 \oslash 4$  equals

- (A) 2      (B) 3      (C) 12      (D)  $\frac{25}{12}$       (E)  $\frac{1}{12}$
- 

**Vraag 5**As  $a \oslash b = \frac{a}{b} + \frac{b}{a} - 2$ , dan is  $3 \oslash 4$  gelyk aan**Question 6**

What is the remainder when 2018 is divided by 21?

- (A) 0      (B) 2      (C) 3      (D) 8      (E) 18

**Vraag 6**

Wat is die res as 2018 deur 21 gedeel word?

---

**Question 7**

Which of the expressions below is equal to  $(a - b \div c) \div (b \div c)$ ?

- (A)  $ac$       (B)  $\frac{ac}{b} - 1$       (C)  $\frac{a - b}{c}$       (D)  $\frac{ab - b^2}{c^2}$       (E)  $a$
- 

**Vraag 7**

Watter van die volgende uitdrukkings is gelyk aan  $(a - b \div c) \div (b \div c)$ ?

- (A)  $ac$       (B)  $\frac{ac}{b} - 1$       (C)  $\frac{a - b}{c}$       (D)  $\frac{ab - b^2}{c^2}$       (E)  $a$
- 

**Question 8**

If  $q$  is an integer, which of the following will be an odd number?

- (A)  $8q + 2$       (B)  $q^2 - q$       (C)  $q^3 + q$       (D)  $q^2 + 3q$       (E)  $q^2 + q + 1$
- 

**Vraag 8**

As  $q$  'n heelgetal is, watter een van die volgende sal 'n onewe getal wees?

- (A)  $8q + 2$       (B)  $q^2 - q$       (C)  $q^3 + q$       (D)  $q^2 + 3q$       (E)  $q^2 + q + 1$
- 

**Question 9**

The angles of a quadrilateral are in the ratio  $3 : 4 : 5 : 6$ . What is the size of the biggest angle in degrees?

- (A)  $20^\circ$       (B)  $30^\circ$       (C)  $60^\circ$       (D)  $120^\circ$       (E)  $240^\circ$
- 

**Vraag 9**

Die hoeke van 'n vierhoek is in die verhouding  $3 : 4 : 5 : 6$ . Wat is die grootte van die grootste hoek in grade?

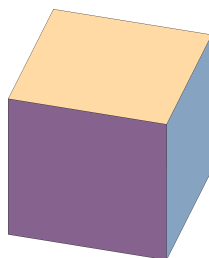
- (A)  $20^\circ$       (B)  $30^\circ$       (C)  $60^\circ$       (D)  $120^\circ$       (E)  $240^\circ$
- 

**Question 10**

A cube has the same numerical value for its surface area in  $\text{cm}^2$  as for its volume in  $\text{cm}^3$ . What is the volume of this cube?

**Vraag 10**

'n Kubus het dieselfde numeriese waarde vir sy buite-oppervlakte in  $\text{cm}^2$  as vir sy volume in  $\text{cm}^3$ . Wat is die volume van hierdie kubus?



- (A)  $\frac{1}{64} \text{ cm}^3$       (B)  $\frac{1}{216} \text{ cm}^3$       (C)  $64 \text{ cm}^3$       (D)  $216 \text{ cm}^3$       (E)  $512 \text{ cm}^3$
- 

**Question 11**

Class A has twice as many students as class B. Both classes write a Maths test. The average for both classes combined is 70%. If the average for class B is 80%, what is the average for class A?

- (A) 50%      (B) 60%      (C) 65%      (D)  $66\frac{2}{3}\%$       (E) 70%

**Vraag 11**

Klas A het twee keer soveel studente as klas B. Beide klasse skryf 'n Wiskunde toets. Die gemiddeld vir die twee klasse saam is 70%. As die gemiddeld vir klas B 80% is, wat is die gemiddeld vir klas A?

- (A) 50%      (B) 60%      (C) 65%      (D)  $66\frac{2}{3}\%$       (E) 70%

---

**Question 12**

Archimedes has been asked to calculate the volume of a crown. Archimedes has a plan. He fills a cylindrical bucket halfway with water. The bucket has height 30 cm and its base is formed by a circle of diameter 20 cm. After submerging the crown in the water, the water level rises by 1,7 cm. What is the volume of the crown?

- (A)  $170\pi \text{ cm}^3$       (B)  $334\pi \text{ cm}^3$       (C)  $340\pi \text{ cm}^3$       (D)  $1670\pi \text{ cm}^3$       (E)  $2830\pi \text{ cm}^3$
- 

**Question 13**

In the past three months, the amount of water in a dam has dropped by 20% each month, except for one month where it increased by 50%. If a positive percentage denotes an increase, and a negative percentage denotes a decrease, by what percentage has the amount of water in the dam change in total?

- (A) +10%      (B) -10%      (C) +4%      (D) -4%      (E) 0%
- 

**Question 14**

Bandile picks a number from the set  $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$ . You then pick a number from the remaining numbers. What are the chances that both your and Bandile's numbers are divisible by 3?

- (A)  $\frac{3}{38}$       (B)  $\frac{3}{10}$       (C)  $\frac{11}{20}$       (D)  $\frac{107}{190}$       (E)  $\frac{9}{100}$
- 

**Vraag 12**

Archimedes is gevra om die volume van 'n kroon te bereken. Archimedes het 'n plan. Hy vul 'n silindriese emmer halfpad met water. Die emmer het 'n hoogte van 30 cm en sy basis word gevorm deur 'n sirkel met middellyn 20 cm. Nadat die kroon in die water geplaas is, styg die wattervlak met 1,7 cm. Wat is die volume van die kroon?

- (A)  $170\pi \text{ cm}^3$       (B)  $334\pi \text{ cm}^3$       (C)  $340\pi \text{ cm}^3$       (D)  $1670\pi \text{ cm}^3$       (E)  $2830\pi \text{ cm}^3$
- 

**Vraag 13**

Gedurende die afgelope drie maande het die hoeveelheid water in 'n dam elke maand met 20% gedaal, behalwe vir een maand toe die hoeveelheid water met 50% gestyg het. As 'n positiewe persentasie 'n toename aandui, en 'n negatiewe persentasie op 'n afname dui, met watter persentasie het die hoeveelheid water in die dam in totaal verander?

- (A) +10%      (B) -10%      (C) +4%      (D) -4%      (E) 0%
- 

**Vraag 14**

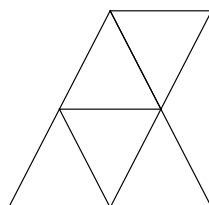
Bandile kies 'n getal uit die versameling  $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$ . Jy kies dan 'n getal uit die oorblywende getalle. Wat is die kans dat beide jou en Bandile se getalle deelbaar deur 3 is?

- (A)  $\frac{3}{38}$       (B)  $\frac{3}{10}$       (C)  $\frac{11}{20}$       (D)  $\frac{107}{190}$       (E)  $\frac{9}{100}$
-

---

**Question 15**

A trapezium is a quadrilateral with at least one pair of parallel sides. How many trapeziums are there in this diagram made up out of five identical small equilateral triangles? Some may overlap.



- (A) 3      (B) 4      (C) 5      (D) 8      (E) 9

---

**Question 16**

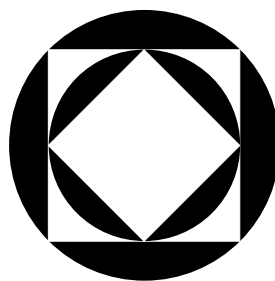
A container with 20 identical books weighs 12,7 kg. After removing 4 books, the container weighs 10,3 kg. If all the books were removed, how much would the box weigh?

- (A) 650 g      (B) 680 g      (C) 700 g      (D) 720 g      (E) 790 g

---

**Question 17**

Consider the figure below. A square is inscribed in a circle which is inscribed in a square which is inscribed in a circle. The outer circle has a radius of 1 unit. What is the area of the shaded region?



- (A)  $\frac{3\pi - 6}{2}$       (B)  $\frac{\sqrt{2}\pi - 1}{2}$       (C)  $\frac{\pi - \sqrt{2}}{2}$       (D)  $2\pi - 3$       (E)  $3\pi + 2$

**Vraag 15**

'n Trapezium is 'n vierhoek met ten minste een paar parallelle sye. Hoeveel trapesiums is daar in die volgende diagram wat bestaan uit vyf identiese klein gelyksydige driehoekies? Party mag oorvleuel.

---

**Vraag 16**

'n Houer met 20 identiese boeke weeg 12,7 kg. Nadat 4 boeke verwyder is, weeg die houer 10,3 kg. As al die boeke verwyder word, hoeveel sal die houer weeg?

---

**Vraag 17**

Beskou die figuur hieronder. 'n Vierkant is binne 'n sirkel geplaas wat binne 'n vierkant geplaas is en dan weer binne 'n sirkel. Die buitenste sirkel het 'n radius van 1 eenheid. Wat is die oppervlakte van die gekleurde gebied?



---

### Question 18

A train travels between two stations. If the train travels at 60 km/h, then it is 10 min late. If the train travels at 80 km/h, then it is 5 min early. At what speed should the train travel to be exactly on time?

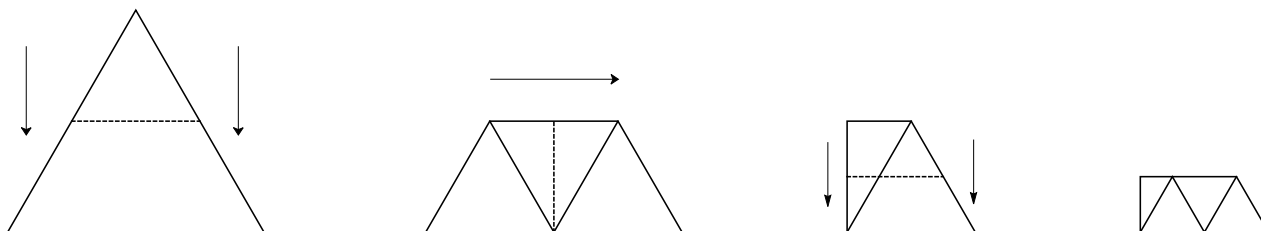
- (A) 70 km/h      (B) 72 km/h      (C) 74 km/h      (D) 76 km/h      (E) 78 km/h
- 

### Vraag 18

'n Trein reis tussen twee stasies. As die trein teen 60 km/h ry, is dit 10 minute laat. As die trein teen 80 km/h ry, is dit 5 minute vroeg. Teen watter spoed moet die trein reis om betyds te wees?

### Question 19

An equilateral triangle is folded three times as shown below. The area of the final quadrilateral is  $1,75 \text{ cm}^2$ . What was the total area of the original triangle?



- (A)  $8 \text{ cm}^2$       (B)  $9 \text{ cm}^2$       (C)  $10 \text{ cm}^2$       (D)  $11 \text{ cm}^2$       (E)  $12 \text{ cm}^2$
- 

### Vraag 19

'n Gelyksydige driehoek word drie keer gevou soos hieronder aangedui. Die oppervlakte van die finale vierhoek is  $1,75 \text{ cm}^2$ . Wat was die totale oppervlakte van die oorspronklike driehoek?

### Question 20

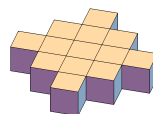
The beginning of a sequence of solid shapes, formed by sticking some identical cubes together, is shown. If the volume of each cube is  $1 \text{ cm}^3$ , what is the surface area for Case 10 in the sequence?



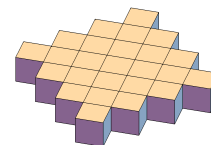
Case/Geval 1



Case/Geval 2



Case/Geval 3



Case/Geval 4

- (A)  $76 \text{ cm}^2$       (B)  $362 \text{ cm}^2$       (C)  $438 \text{ cm}^2$       (D)  $456 \text{ cm}^2$       (E)  $1086 \text{ cm}^2$
- 

### Vraag 20

Die begin van 'n reeks soliede voorwerpe, wat gevorm word deur identiese kubusse saam te plak, word getoon. As die volume van elke kubus  $1 \text{ cm}^3$  is, wat is die buite-oppervlakte vir Geval 10 in die ry?