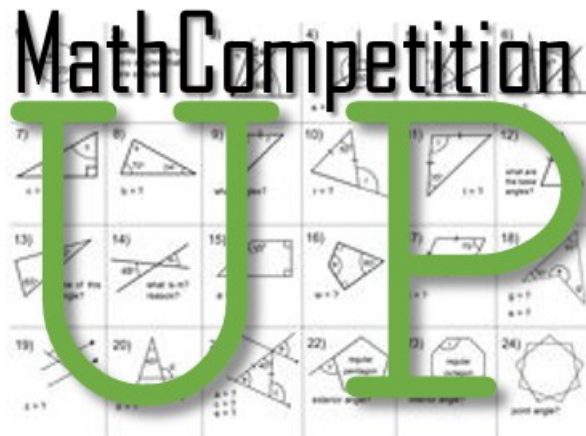


# Math Competition

# UJEP



Department of Mathematics and Applied  
Mathematics  
Departement Wiskunde en Toegepaste Wiskunde

**GRADES 8 AND 9**

**GRADE 8 EN 9**

31 July – 5 Aug 2017

31 July – 5 Aug 2017

TIME: 2 HOURS

TYD: 2 URE

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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 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**

$2^3 \times 4^5 =$

- (A)  $6^8$       (B)  $8^8$       (C)  $2^{13}$       (D)  $8^{15}$       (E)  $2^{30}$
- 

**Vraag 1**

$2^3 \times 4^5 =$

- (A)  $6^8$       (B)  $8^8$       (C)  $2^{13}$       (D)  $8^{15}$       (E)  $2^{30}$
- 

**Question 2**

How many hours are there in 20 days and 17 hours?

- (A) 305      (B) 497      (C) 340      (D) 1457      (E) 428
- 

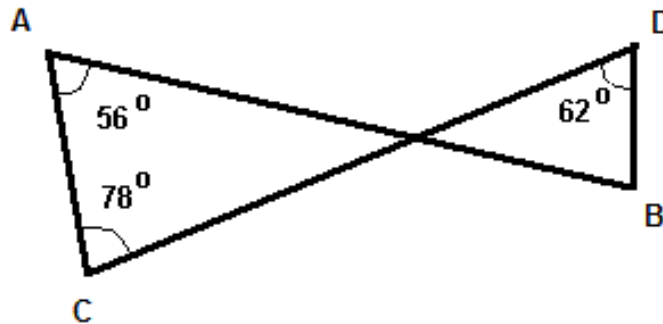
**Vraag 2**

Hoeveel ure is daar in 20 dae en 17 uur?

- (A) 305      (B) 497      (C) 340      (D) 1457      (E) 428
- 

**Question 3**

Find the size of the angle  $\hat{D}BA$  in the sketch below.

**Vraag 3**

Bereken die grootte van die hoek  $\hat{D}BA$  in die skets hieronder.

- (A)  $52^\circ$       (B)  $62^\circ$       (C)  $82^\circ$       (D)  $42^\circ$       (E)  $72^\circ$
- 

**Question 4**

Tuesday's maximum temperature was  $4^\circ\text{C}$  warmer than that of Monday's. Wednesday's maximum temperature was  $6^\circ\text{C}$  cooler than that of Monday's. If Tuesday's maximum temperature was  $23^\circ\text{C}$ , what was Wednesday's maximum temperature?

- (A)  $21^\circ\text{C}$       (B)  $25^\circ\text{C}$       (C)  $22^\circ\text{C}$       (D)  $13^\circ\text{C}$       (E)  $33^\circ\text{C}$
- 

**Vraag 4**

Dinsdag se maksimum temperatuur was  $4^\circ\text{C}$  warmer as Maandag se maksimum temperatuur. Woensdag se maksimum temperatuur was  $6^\circ\text{C}$  koeler as Maandag se maksimum temperatuur. As Dinsdag se maksimum temperatuur  $23^\circ\text{C}$  was, wat was Woensdag se maksimum temperatuur?

- (A)  $21^\circ\text{C}$       (B)  $25^\circ\text{C}$       (C)  $22^\circ\text{C}$       (D)  $13^\circ\text{C}$       (E)  $33^\circ\text{C}$
-

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**Question 5**

Which fraction below is equal to  $1,2\bar{4} = 1,244444444\dots$ ?

- (A)  $1\frac{24}{99}$       (B)  $1\frac{6}{25}$       (C)  $1\frac{11}{45}$       (D)  $1\frac{24}{101}$       (E)  $1\frac{23}{99}$
- 

**Vraag 5**

Watter breuk hieronder is gelyk aan  $1,2\bar{4} = 1,244444444\dots$ ?

**Question 6**

Solve for  $x$  if  $\sqrt{2x-1} = 10 - \sqrt{2x-1}$ .

- (A)  $x = 11$       (B)  $x = 13$       (C)  $x = 21$       (D)  $x = 31$       (E)  $x = 25$
- 

**Vraag 6**

Los op vir  $x$  as  $\sqrt{2x-1} = 10 - \sqrt{2x-1}$ .

**Question 7**

Which of the expressions below is equal to  $(x \div (y \times z)) \div ((x \times y) \div z)$ ?

- (A) 1      (B)  $\frac{1}{xyz}$       (C)  $\frac{1}{x^2}$       (D)  $\frac{1}{y^2}$       (E)  $\frac{1}{z^2}$
- 

**Vraag 7**

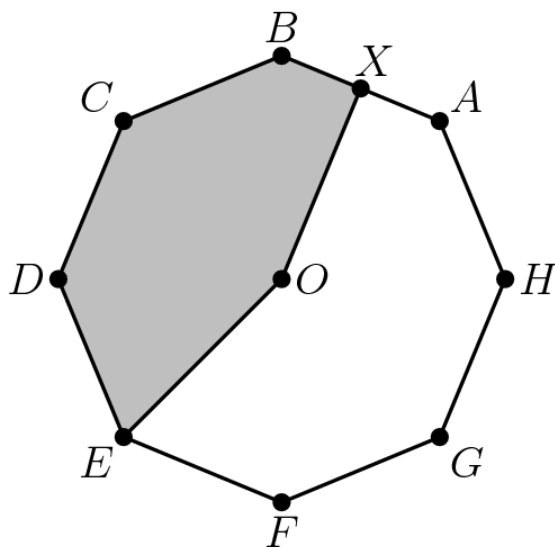
Watter van die volgende uitdrukkings is gelyk aan  $(x \div (y \times z)) \div ((x \times y) \div z)$ ?

**Question 8**

Below is a regular octagon. Point  $O$  is the center of the octagon and  $X$  is the midpoint of side  $AB$ . What fraction of the octagon is shaded?

**Vraag 8**

Hieronder is 'n reëlmatige agthoek. Punt  $O$  is die middelpunt van die agthoek en  $X$  is die middelpunt van sy  $AB$ . Watter breuk van die agthoek is ingekleur?



- (A)  $\frac{4}{9}$       (B)  $\frac{3}{8}$       (C)  $\frac{13}{32}$       (D)  $\frac{15}{32}$       (E)  $\frac{7}{16}$
-

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**Question 9**

If  $x - \frac{1}{x} = 9$ , what is  $x^2 + \frac{1}{x^2}$ ?

- (A) 77      (B) 79      (C) 81      (D) 83      (E) 85
- 

**Vraag 9**

As  $x - \frac{1}{x} = 9$ , wat is  $x^2 + \frac{1}{x^2}$ ?

- (A) 77      (B) 79      (C) 81      (D) 83      (E) 85
- 

**Question 10**

When a barrel is 70% full it contains 30 litres more than when it is 30% full. How many litres does the barrel hold when it is full?

- (A) 60      (B) 75      (C) 90      (D) 100      (E) 120
- 

**Vraag 10**

Wanneer 'n vaatjie 70% vol is, bevat dit 30 liter meer as wanneer dit 30% vol is. Hoeveel liter bevat die vaatjie as dit vol is?

- (A) 60      (B) 75      (C) 90      (D) 100      (E) 120
- 

**Question 11**

At a Pretoria bank you can trade dollars, pounds or rands. The bank offers  $a$  dollars for  $b$  pounds and  $c$  dollars for  $d$  rands. How many rands will you get for  $e$  pounds?

- (A)  $\frac{bcd}{ae}$       (B)  $\frac{bde}{ac}$       (C)  $\frac{ace}{bd}$       (D)  $\frac{bec}{ad}$       (E)  $\frac{ade}{bc}$
- 

**Vraag 11**

By 'n Pretoria bank, kan jy dollars, ponde of rande ruil. Die bank ruil  $a$  dollars vir  $b$  ponde en  $c$  dollars vir  $d$  rande. Hoeveel rande sal die bank jou gee vir  $e$  ponde?

- (A)  $\frac{bcd}{ae}$       (B)  $\frac{bde}{ac}$       (C)  $\frac{ace}{bd}$       (D)  $\frac{bec}{ad}$       (E)  $\frac{ade}{bc}$
- 

**Question 12**

Let the operation  $\bowtie$  be defined by  $U \bowtie P = U^2 + 2P + 1$ . For example,  $3 \bowtie 4 = 18$ . What is the value of  $(2 \bowtie 0) \bowtie (1 \bowtie 7)$ ?

- (A) 58      (B) 64      (C) 49      (D) 41      (E) 62
- 

**Vraag 12**

Laat die bewerking  $\bowtie$  gedefiniër word deur  $U \bowtie P = U^2 + 2P + 1$ . Byvoorbeeld,  $3 \bowtie 4 = 18$ . Wat is die waarde van  $(2 \bowtie 0) \bowtie (1 \bowtie 7)$ ?

- (A) 58      (B) 64      (C) 49      (D) 41      (E) 62
- 

**Question 13**

James tosses a fair coin 3 times. What is the probability of him getting at least two consecutive tails?

- (A)  $\frac{1}{8}$       (B)  $\frac{1}{4}$       (C)  $\frac{2}{3}$       (D)  $\frac{3}{8}$       (E)  $\frac{3}{4}$
- 

**Vraag 13**

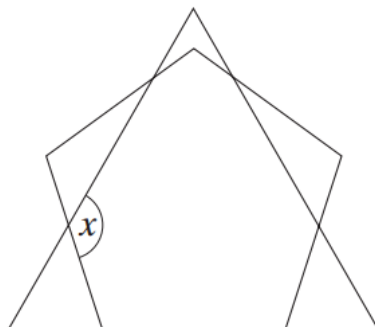
James skiet 'n regverdige muntstuk 3 keer op. Wat is die kans dat hy ten minste twee sterte in 'n ry gaan kry?

- (A)  $\frac{1}{8}$       (B)  $\frac{1}{4}$       (C)  $\frac{2}{3}$       (D)  $\frac{3}{8}$       (E)  $\frac{3}{4}$
-

---

**Question 14**

The diagram below shows an equilateral triangle and a regular pentagon. What is the size of the angle marked by  $x$ ?



- (A)  $124^\circ$       (B)  $130^\circ$       (C)  $132^\circ$       (D)  $136^\circ$       (E)  $140^\circ$
- 

**Question 15**

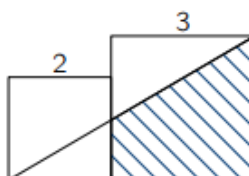
Solve for  $x$  if

$$\frac{3}{\frac{2}{\frac{1}{x+1} + \frac{1}{x+1} + \frac{1}{x+1}} + \frac{2}{\frac{1}{x+1} + \frac{1}{x+1} + \frac{1}{x+1}}} = 4.$$

- (A)  $\frac{-3}{2}$       (B)  $\frac{-9}{16}$       (C)  $\frac{-7}{12}$       (D)  $\frac{-9}{25}$       (E)  $\frac{-7}{16}$
- 

**Question 16**

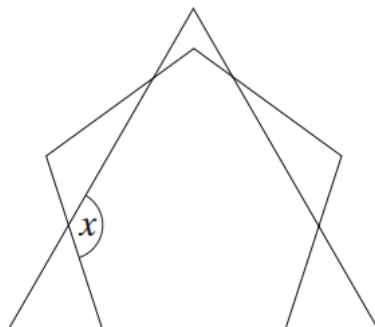
Two squares of side lengths 2 cm and 3 cm are placed next to each other on a straight line as shown below. What is the area of the shaded trapezium?



- (A)  $5 \text{ cm}^2$       (B)  $6,3 \text{ cm}^2$       (C)  $7 \text{ cm}^2$       (D)  $7,2 \text{ cm}^2$       (E)  $7,5 \text{ cm}^2$
- 

**Vraag 14**

In die diagram hieronder is daar 'n gelyksydige driehoek en 'n reëlmatige vyfhoek. Wat is die grootte van die hoek aangedui deur  $x$ ?



- (A)  $124^\circ$       (B)  $130^\circ$       (C)  $132^\circ$       (D)  $136^\circ$       (E)  $140^\circ$
- 

**Vraag 15**

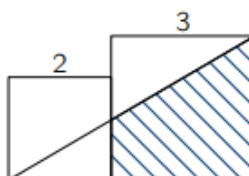
Bereken  $x$  as

$$\frac{3}{\frac{2}{\frac{1}{x+1} + \frac{1}{x+1} + \frac{1}{x+1}} + \frac{2}{\frac{1}{x+1} + \frac{1}{x+1} + \frac{1}{x+1}}} = 4.$$

- (A)  $\frac{-3}{2}$       (B)  $\frac{-9}{16}$       (C)  $\frac{-7}{12}$       (D)  $\frac{-9}{25}$       (E)  $\frac{-7}{16}$
- 

**Vraag 16**

Twee vierkante van sy lengtes 2 cm en 3 cm word langs mekaar gesit op 'n reguit lyn soos hieronder aangewys. Wat is die oppervlakte van die trapesium?



- (A)  $5 \text{ cm}^2$       (B)  $6,3 \text{ cm}^2$       (C)  $7 \text{ cm}^2$       (D)  $7,2 \text{ cm}^2$       (E)  $7,5 \text{ cm}^2$
-

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**Question 17**

In the figure below, a square of area  $40 \text{ cm}^2$  is inscribed in a semicircle. What is the area of the semi-circle?

**Vraag 17**

In die halwe sirkel hieronder, is 'n ingeskrewe vierkant met oppervlakte  $40 \text{ cm}^2$ . Wat is die oppervlak van die halwe sirkel?



- (A)  $20\pi \text{ cm}^2$       (B)  $25\pi \text{ cm}^2$       (C)  $30\pi \text{ cm}^2$       (D)  $40\pi \text{ cm}^2$       (E)  $50\pi \text{ cm}^2$
- 

**Question 18**

Thabo writes down nine numbers in increasing order. The average of the first five numbers is 23 and the average of the last five numbers is 51. If the middle number is the average of the nine numbers, what is the sum of all the numbers?

**Vraag 18**

Thabo skryf nege getalle in stygende volgorde neer. Die gemiddelde van die eerste vyf getalle is 23 en die gemiddeld van die laaste vyf getalle is 51. Wat is die som van al die getalle as die middelste getal die gemiddelde van al die nege getalle is?

- (A) 306      (B) 360      (C) 315      (D) 333      (E) 351
- 

**Question 19**

Cindy rides a bicycle from home to school at a constant speed. If she increases her speed by  $3 \text{ km/h}$ , she will arrive at school 3 times faster. How many times faster will she arrive at school if she increases her speed by  $6 \text{ km/h}$ ?

**Vraag 19**

Cindy ry met 'n fiets van haar huis na skool teen 'n konstante spoed. As sy haar spoed met  $3 \text{ km/h}$  vermeerder, sal sy 3 keer vinniger by die skool wees. Hoeveel keer vinniger sal sy by die skool uitkom as sy haar oorspronlike spoed met  $6 \text{ km/h}$  vermeerder?

- (A) 5      (B) 4,5      (C) 8      (D) 6      (E) 4
-

---

**Question 20**

A teacher gives a three-digit integer  $X$  to five students: Ann, Ben, Con, Dan and Epp. The following statements are made:

Ann: "The number  $X$  is divisible by 27."

Ben: "The number  $X$  is divisible by 11."

Con: "The sum of all the digits of the number  $X$  is 15."

Dan: "The number  $X$  is a perfect square."

Epp: "The number  $X$  is a factor of 648000."

Only 3 of the 5 sentences are true. What is the sum of the digits of  $X$ ?

(A) 8

(B) 9

(C) 10

(D) 11

(E) 15

---

**Vraag 20**

'n Onderwyser gee 'n drie-syfer heelgetal  $X$  vir vyf studente: Ann, Ben, Con, Dan and Epp. Die volgende bewerings word gemaak:

Ann: "Die getal  $X$  is deelbaar deur 27."

Ben: "Die getal  $X$  is deelbaar deur 11."

Con: "Die som van die syfers van die getal  $X$  is 15."

Dan: "Die getal  $X$  is 'n volkome vierkant."

Epp: "Die getal  $X$  is 'n faktor van 648000."

Slegs 3 van die 5 bewerings is waar. Wat is die som van die syfers van  $X$ ?