MathCompetition UP

Department of Mathematics and Applied Mathematics

Departement Wiskunde en Toegepaste Wiskunde

GRADES 8 AND 9

27-31 July 2020

TIME: 2 HOURS

No calculators.

GRADE 8 EN 9

27-31 Julie 2020

TYD: 2 URE

Geen sakrekenaars.

UNIVERSITEIT VAN PRETORIA
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Denkleiers • Leading Minds • Dikgopolo tša Dihlalefi

Leading Minds

Question 1

Arrange the numbers $x-1$, $x+2$, $x-7$, $x+5$, and $2x-(3+x)$ from smallest to biggest. What is the middle number?

(**A**) $x-1$ (**B**) $x+2$ (**C**) $x-7$ (**D**) $x+5$ (**E**) $2x-(3+x)$

Vraag 1

Ranskik die getalle $x-1$, $x+2$, $x-7$, $x+5$, en $2x-(3+x)$ van kleinste na grootste. Watter getal is in die middel?

Question 2

If $6a+3b=9$ and $3a-b=7$, then what is a?

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

Vraag 2

As $6a+3b=9$ en $3a-b=7$, wat is a dan?

Question 3

If $a \bowtie b = \dfrac{a}{b} + \dfrac{b}{a}$, then $1 \bowtie 2 + 2 \bowtie 3$ is equal to?

(**A**) $\dfrac{14}{3}$ (**B**) $\dfrac{7}{3}$ (**C**) $\dfrac{7}{6}$ (**D**) $\dfrac{7}{2}$ (**E**) 1

Vraag 3

As $a \bowtie b = \dfrac{a}{b} + \dfrac{b}{a}$, dan is $1 \bowtie 2 + 2 \bowtie 3$ gelyk aan?

Question 4

Calculate $\dfrac{1}{1+\frac{1}{1+\frac{1}{2}}}$

(**A**) $\dfrac{1}{2}$ (**B**) $\dfrac{3}{5}$ (**C**) $\dfrac{5}{3}$ (**D**) $\dfrac{2}{3}$ (**E**) $\dfrac{3}{2}$

Vraag 4

Bereken $\dfrac{1}{1+\frac{1}{1+\frac{1}{2}}}$

Question 5

How many positive integers less than 100 are simultaneously multiples of 2, 3, and 4?

(**A**) 1 (**B**) 3 (**C**) 6 (**D**) 7 (**E**) 8

Vraag 5

Hoeveel positiewe heelgetalle kleiner as 100 is gelyktydig veelvoude van 2, 3, en 4?

Question 6

You pick a whole number, multiply it by five, and then divide it by two. The resulting number is an odd number, less than ten. What was the number you picked?

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

Vraag 6

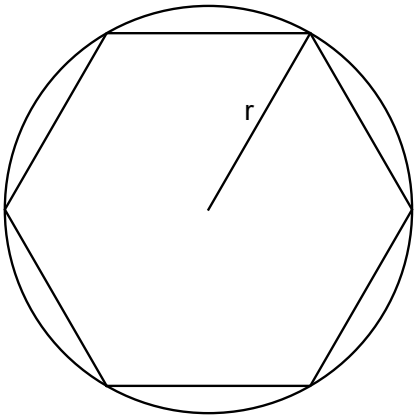
Jy kies 'n heelgetal. Jy maal die getal met vyf en deel dit dan deur twee. Die finale getal is 'n onewe getal, minder as tien. Wat was die getal wat jy gekies het?

Question 7

Winnie wants to calculate the circumference of a circle with radius $r = 3$ cm. However, Winnie doesn't know the formula for the circumference of a circle. She decided to approximate the circumference by inscribing a hexagon in the circle and determining the circumference of the hexagon. What is the circumference of the hexagon?

Vraag 7

Winnie wil die omtrek van 'n sirkel met radius $r = 3$ cm bereken. Winnie ken egter nie die formule vir die omtrek van 'n sirkel nie. Sy besluit om die omtrek te skat deur 'n seshoek in die sirkel te teken en die omtrek van die seshoek te bepaal. Wat is die omtrek van die seshoek?



(**A**) 10 cm (**B**) 12 cm (**C**) 14 cm (**D**) 16 cm (**E**) 18 cm

Question 8

When a water tank is 75% full, it contains 200 litres more water than when it is 25% full. How many litres does the water tank hold when it is full?

(**A**) 300 (**B**) 400 (**C**) 500 (**D**) 600 (**E**) 700

Vraag 8

As 'n watertenk 75% vol is, bevat dit 200 liter meer water as wanneer dit 25% vol is. Hoeveel liter hou die watertenk as dit vol is?

Question 9

A 30 cm stick casts a shadow which is 40 cm long. At the same time a tree has a shadow which is 12 m long. How tall is the tree?

(**A**) 6 m (**B**) 7 m (**C**) 8 m (**D**) 9 m (**E**) 10 m

Vraag 9

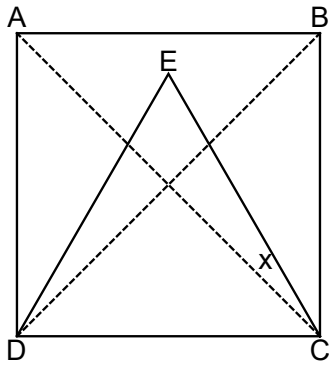
Die skaduwee van 'n 30 cm stok is 40 cm lank. Terselfdertyd het 'n boom 'n skaduwee wat 12 m lank is. Hoe lank is die boom?

Question 10

In the diagram below, ABCD is a square and CDE is an equilateral triangle. Find x (that is, the angle ACE).

Vraag 10

In die onderstaande diagram is ABCD 'n vierkant en CDE 'n gelyksydige driehoek. Bepaal x (dit wil sê die hoek ACE).



(**A**) 15° (**B**) 20° (**C**) 25° (**D**) 30° (**E**) 35°

Question 11

Boat A is traveling east at a speed of 6 km/h and Boat B is traveling north at 8 km/h. If the distance between the boats will be 0 km in 10 hours time, what will the distance between them be in 5 hours time?

Vraag 11

Boot A reis ooswaarts met 'n snelheid van 6 km/h en Boot B ry noordwaarts teen 8 km/h. As die afstand tussen die bote in 10 ure 0 km sal wees, wat sal die afstand tussen die bote in 5 ure wees?

(**A**) 10 km (**B**) 20 km (**C**) 30 km (**D**) 40 km (**E**) 50 km

Question 12

If a equilateral triangle with perimeter P has area A, then an equilateral triangle with perimeter $\frac{1}{3}P$ has what area?

Vraag 12

As 'n gelyksydige driehoek met omtrek P 'n oppervlakte van A het, wat is die oppervlakte van 'n gelyksydige driehoek met omtrek $\frac{1}{3}P$?

(**A**) $\frac{2}{3}A$ (**B**) $\frac{5}{9}A$ (**C**) $\frac{1}{3}A$ (**D**) $\frac{1}{6}A$ (**E**) $\frac{1}{9}A$

Question 13

Kamogelo looked at his watch and noticed that, at that moment, it was $6x$ minutes after 14:00 and $9x$ minutes before 15:00 for some value of x. What time was it at that moment?

(**A**) 14:24 (**B**) 14:28 (**C**) 14:32 (**D**) 14:36 (**E**) 14:40

Vraag 13

Kamogelo kyk na sy horlosie en let op dat dit $6x$ minute na 14:00 was en $9x$ minute voor 15:00 was vir 'n sekere x. Watter tyd van die dag was die oomblik?

Question 14

A train travels for 10 kilometers at a speed of 60 km/h and then the next 10 kilometers at 80 km/h. What is its average speed of the train over the 20 kilometer journey?

(**A**) 70 km/h (**B**) $\sqrt{4800}$ km/h (**C**) 72 km/h (**D**) $\frac{480}{7}$ km/h (**E**) 75 km/h

Vraag 14

'n Trein ry 10 kilometer met 'n snelheid van 60 km/h en nog 10 kilometer teen 80 km/h. Wat is die gemiddelde snelheid van die trein gedurende die 20 kilometer rit?

Question 15

The letters A, B, C, and D are to be placed in the grid so that each of these letters appears exactly once in each row and exactly once in each column. Which letter will go in the square marked with $*$?

A				D
	B			C
	*	C		B
B			D	A
	A			E

(**A**) A (**B**) B (**C**) C (**D**) D (**E**) E

Vraag 15

Die letters A, B, C, en D word in die vierkant ingevul sodat elkeen van die letters presies eenkeer verskyn in elke ry en presies eenkeer verskyn in elke kolom. Watter letter sal in die vierkant gemerk met $*$ verskyn?

Question 16

The price of a certain ice-cream increases by 10% each year. If the price in 2020 is $R11.00$, what was the price in 2018?

(**A**) R8.80 (**B**) R8.91 (**C**) R8.99 (**D**) R9.00 (**E**) R9.09

Vraag 16

Die prys van 'n sekere roomys verhoog elke jaar met 10%. As die prys in 2020 $R11.00$ is, wat was die prys in 2018?

Question 17

Sally throws two normal six-sided dice. What is the chance that the sum of the results add up to a prime number?

(**A**) $\frac{16}{36}$ (**B**) $\frac{15}{36}$ (**C**) $\frac{14}{36}$ (**D**) $\frac{13}{36}$ (**E**) $\frac{12}{36}$

Vraag 17

Sally gooi twee normale seskantige dobbelstene. Wat is die kans dat die som van die resultate 'n priemgetal is?

Question 18

Alex and Alicia write six tests in one semester. They both get 80% for the first four tests. Alex gets 90% and 100% for the last two tests. If Alicia average for all six tests is 10 percentage points less than Alex's average, then what is the lowest mark Alicia could possibly have gotten for one of the last two tests?

(**A**) 15% (**B**) 20% (**C**) 30% (**D**) 50% (**E**) 65%

Vraag 18

Alex en Alicia skryf ses toetse in een semester. Hulle kry albei 80% vir die eerste vier toetse. Alex kry 90% en 100% vir die laaste twee toetse. As Alicia se gemiddeld vir al ses toetse 10 persentasiepunte minder is as Alex se gemiddeld, wat is die laagste punt wat Alicia vir een van die laaste twee toetse kon behaal het?

Question 19

John, Lethabo and Mpho always wear either red, blue, or yellow shirts. No two of them ever where the same colour on the same day. Additionally,

1. If John wears a blue shirt, then Mpho wears a yellow shirt.
2. If Lethabo wears a yellow shirt, then John wears a red shirt.
3. If Mpho wears a yellow shirt, then Lethabo wears a blue shirt.

So it is possible that John could wear a yellow shirt, Lethabo could wear a red shirt, and Mpho could wear a blue shirt on the same day. This would be one possible colour combination. How many colour combinations are possible in total?

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

Vraag 19

John, Lethabo en Mpho dra altyd rooi, blou of geel hemde. Geen twee van hulle dra ooit dieselfde kleur op dieselfde dag nie. Verder:

1. As John 'n blou hemp dra, dan dra Mpho 'n geel hemp.
2. As Lethabo 'n geel hemp dra, dan dra John 'n rooi hemp.
3. As Mpho 'n geel hemp dra, dan dra Lethabo 'n blou hemp.

Dit is dus moontlik dat John 'n geel hemp kon dra, Lethabo 'n rooi hemp kon dra, en Mpho 'n blou hemp kon dra op dieselfde dag. Dit is een moontlike kleurkombinasie. Hoeveel kleurkombinasies is in totaal moontlik?

Question 20

Karabo goes for a walk. She starts by taking one step east. She then takes two steps north. Then she takes three steps east. She then takes four steps north. If she continuous this way she will have walked eight steps north after she had walked 17 steps in total. How many steps north will she have given after she has walked 817 steps in total?

(Hint: start by calculating how many steps (i) in total, (ii) east, and (iii) north she has given if she has given $1 + 2 + 3 + 4 + 5 + \cdots + 2n$ steps in total.)

(**A**) 397 (**B**) 400 (**C**) 417 (**D**) 420 (**E**) 423

Vraag 20

Karabo gaan stap. Sy begin met een tree oos. Sy neem dan twee treë noord. Dan neem sy drie treë oos. Sy neem dan vier treë noord. As sy so voortgaan, sal sy agt treë noord geloop het nadat sy altesaam 17 treë geloop het. Hoeveel treë noord sal sy gegee het nadat sy 'n totaal van 817 treë gestap het?

(Wenk: begin met die berekening van hoeveel treë (i) in totaal, (ii) oos, en (iii) noord sy gegee het as sy in totaal $1 + 2 + 3 + 4 + 5 + \cdots + 2n$ treë gegee het.)