Mathematica Centrum

Together, let's shape the mathematicians of the future

LAGRANGE PREPARATORY TEST 2015

1. What is the value of N in the equation: -4 x -2 + N = -4?

A) -14 B) -12 C) 4 D) -6 E) -4

2. How many of the natural numbers between 1 and 15 have only 2 factors?

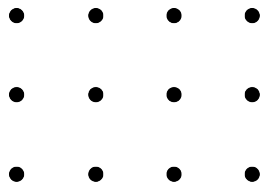
A) 3 B) 4 C) 2 D) 5 E) 6

3. Which of the numbers below is closest to 500?

A) 7^3 B) 4^4 C) 10^3 D) 2^9 E) 5^5

4. The number of squares (of all sizes) whose vertices coincide with the points in the diagram is

A) 9 B) 10 C) 11
D) 12 E) 13



5. 25% of a number is equal to 80% of 200. Twice the same number is equal to

A) 1 200 B) 1 280 C) 2 560
D) 3 000 E) 1 500

6. The sum of all the prime factors of 50 is equal to

A) 100 B) 14 C) 12 D) 10 E) 16

7. Mathilda can put the biscuits that she wants to sell into 10 boxes having the same number of biscuits or into 8 boxes having the same number of biscuits. What is the minimum number of biscuits that she can sell?

A) 40 B) 20 C) 80 D) 120 E) 28

8. Mathew has paid $6.30 for 2 hot dogs and 3 fries. Mathilda has paid $6.20 for 3 hot dogs and two fries. How much should they pay for 5 hot dogs and 5 fries?

A) $13.50 B) $15 C) $13 D) $12.50 E) $12

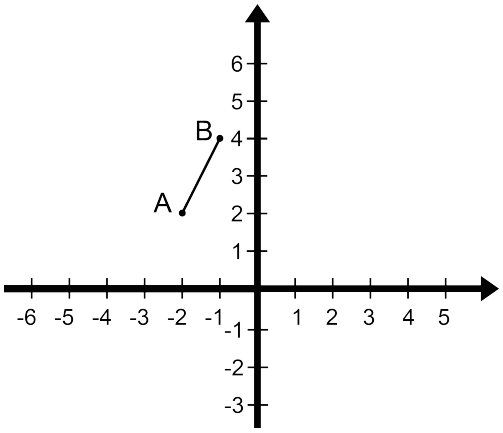
9. The perimeter of a rectangle is equal to 28 cm. What is the largest possible area of this rectangle?

A) 81 cm^2 B) 25 cm^2 C) 36 cm^2 D) 48 cm^2 E) 49 cm^2

10. What is the largest natural number, less than 50, that is equal to the sum of 5 consecutive natural numbers?

A) 45 B) 40 C) 42
D) 46 E) 48

11. What is the image of point A, if line segment AB is first reflected in the y-axis and then is moved (translation) by a value of t (3, -3)?



A) A'(4, -2) B) A'(5, -4) C) A'(4, -1)
D) A'(5, -2) E) A'(5, -1)

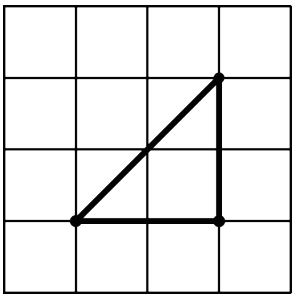
12. Starting with 0, all integers are written in increasing order: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, … . The 50^{th} digit that will be written is a

A) 9 B) 5 C) 8
D) 6 E) 7

13. Which decimal number corresponds to (80%)%?

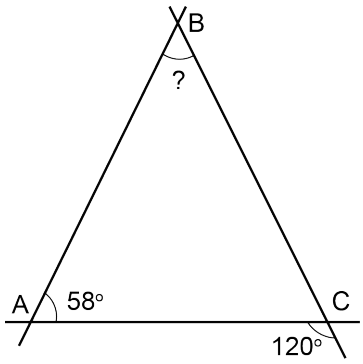
A) 0.0088 B) 0.08 C) 0.008
D) 0.0008 E) 0.8

14. An isosceles right-triangle whose vertices are grid points (points where two straight lines intersect) is shown in the diagram. The maximum number of isosceles right-triangles having the same dimensions that you could draw in this grid is



A) 36 B) 25 C) 48
D) 42 E) 32

15. The measure of angle ABC shown in the diagram is equal to



A) 64º B) 65º C) 62º
D) 63º E) 61º

16. Two dice are rolled. What is the probability of getting a sum smaller than 7?

A) 1/2 B) 13/36 C) 1/6
D) 5/12 E) 7/18

17. The average of two integers is -2. The sum of these two integers and the number -5 is equal to

A) -7 B) -6 C) -8 D) -10 E) -9

18. A team has 20 players. Five have blond hair, 12 have blue eyes, and 4 of them have both blond hair and blue eyes. How many players have neither blue eyes nor blond hair?

A) 5 B) 7 C) 8
D) 4 E) 6

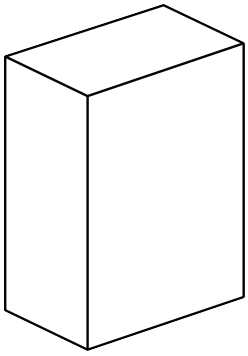
19. What is the value of the numerator in the fraction so that the fraction is equal to 3?

$$\frac{?}{n+1} = 3$$

.

A) 3n + 2 B) 2n + 2 C) 3n + 3
D) 2n + 1 E) n + 3

20. How many rectangular cereal boxes of 7 cm x 25 cm x 50 cm, like the one shown in the diagram, can be stacked in a rectangular box of 49 cm x 100 cm x 151 cm?



A) 86 B) 78 C) 82
D) 84 E) 80

21. If x = -2, what is the value of $2x - x^2 - x^3$?

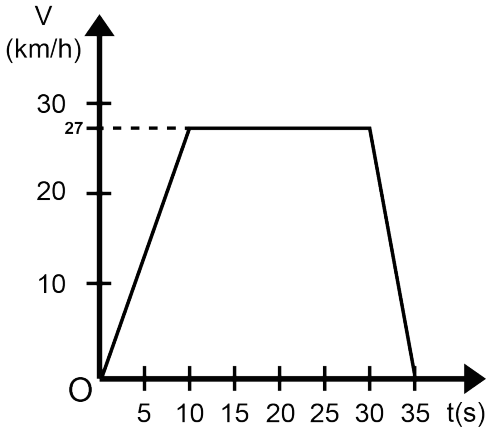
A) -12 B) -16 C) -8
D) -18 E) 0

22. The triangle of numbers shown in the diagram is called Pascal's triangle. Carefully study the structure of its first 6 lines, then find the sum of the numbers that form its 7^{th} line.

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1

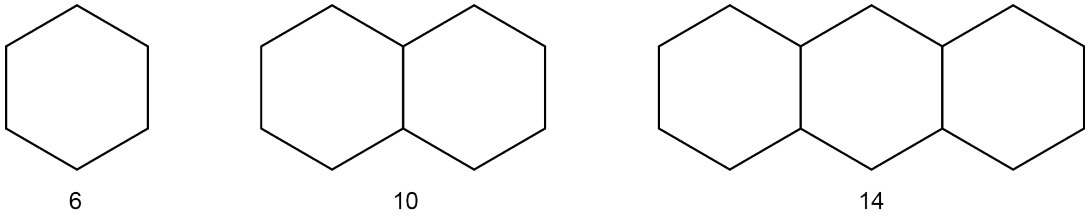
A) 66 B) 60 C) 64
D) 65 E) 61

23. The graph shows the relation between the speed V (in km/h) and the time t (in seconds) of a car that has moved for 35 seconds. From rest, the car increased its speed up to 27 km/h, a speed which it kept for a certain time. It then started slowing down and finally came to a stop. This car kept a constant speed for a period of time of



A) 20 s B) 10 s
C) 30 s D) 15 s
E) 25 s

24. A sequence of figures composed of hexagons is shown below. The perimeter of each figure (of each term in the sequence) is indicated under the figure. What is the perimeter of the 20th figure (20th term) in this sequence?



A) 78 B) 84 C) 80 D) 82 E) 86

25. If n is a positive integer and $5 < n < 12$, for how many different values of n is there a triangle with sides of lengths 3, 8, and n?

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

26. Mathusalem just washed 5 wine glasses that are right side up (fig.1) and wants to turn them over so that they can dry faster. By turning 3 glasses at a time, he wants to get 5 glasses that are upside down (fig.2). A glass that is upside down can be turned right side up. If the inversion of three glasses is equivalent to one operation, what is the minimum number of operations needed to complete the task?

fig. 1

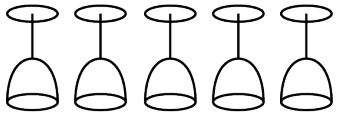


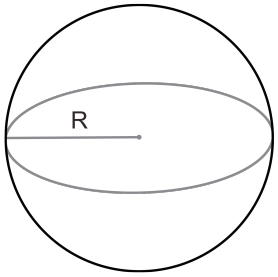
fig. 2

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

27. Mathew is 15 years older than Mathilda. If in 10 years, Mathew will be twice as old as Mathilda, what will Mathilda's age be in 20 years?

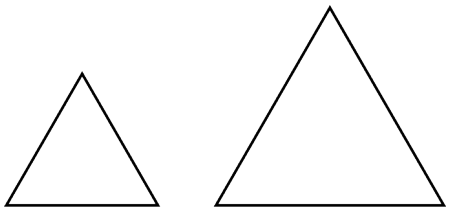
A) 45 years old B) 20 years old C) 30 years old
D) 40 years old E) 25 years old

28. An astronaut is moving around a perfectly spherical planet that has a radius which is R km long. If the astronaut measures exactly 2 metres and if she were able to move 30º around the planet, how many metres would her head move more than her feet?



A) 2π m B) π/2 m C) π/3 m
D) π m E) 4π m

29. The perimeter of the large equilateral triangle is 2 times larger than the perimeter of the small equilateral triangle. How many times is the area of the large triangle greater than the area of the small triangle?



A) 9 times B) 6 times C) 4 times D) 3 times E) 8 times