# Mathematica Centrum

Together, let's shape the mathematicians of the future

**LAGRANGE PREPARATORY TEST 2017**

**1.** How many of the following numbers: 5, 8, 9, 12, and 24 cannot be written as the sum of two prime numbers?

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

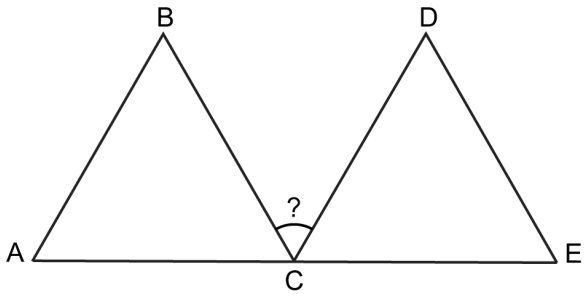
**2.** The number 20 has 6 divisors (1, 2, 4, 5, 10, 20). How many divisors does 10 have?

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

**3.** Today is Wednesday. What day will it be in 85 days?

A) Wednesday B) Thursday
C) Friday D) Monday
E) Tuesday

**4.** ABC and CDE are two equilateral triangles.
A, C, and E are three points of line segment AE.
What is the value of angle BCD?




A) 30º B) 50º C) 40º
D) 60º E) 45º

**5.** Mathilda printed 100 consecutive integers. If the largest of these integers is 40, which one is the smallest?

A) -56 B) -57 C) -58 D) -59 E) -60

**6.** How many prime numbers between 1 and 10 are factors of 120 ?

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

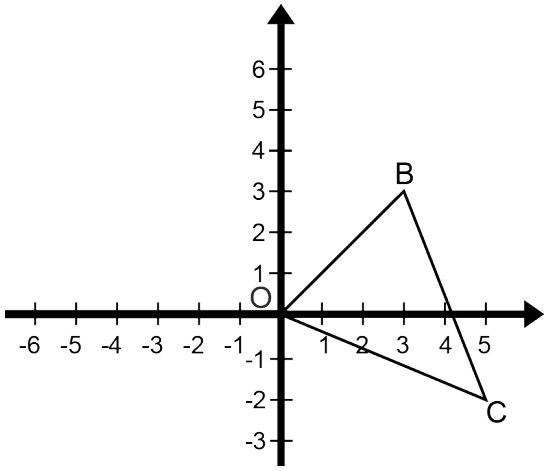
**7.** Andrea has a 60 cm x 50 cm painting. She is going to replace it by a 50 cm x 80 cm painting. By what percent will the area of the surface covered by the painting increase?

A) 30% B) 33 1/3% C) 25% D) 40% E) 35%

**8.** If 1/n is the average of 1/2 and 1/6, what is the value of 4n?

A) 15 B) 20 C) 18 D) 16 E) 12

**9.** Rotate $\Delta$ OBC 90º clockwise about the origin O. The coordinates of B' (image of B) are




A) (-2, -4) B) (2, -2) C) (3, -3)
D) (-3, 3) E) (3, -2)

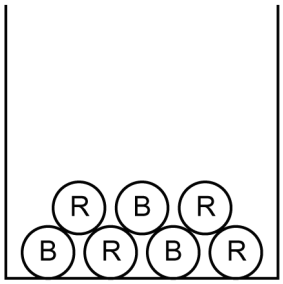
**10.** Mathusalem has chosen three different integers from the following set: {-4, -3, -1, 0, 3, 4}. What is the smallest possible product of the three integers chosen?

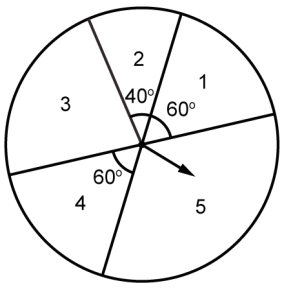
A) -36 B) -96 C) 0
D) 9 E) -48

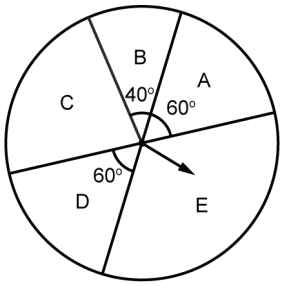
**11.** 10 $dm^2$ = ? $cm^2$.

A) 10 000 B) 1 000 C) 100 000 D) 100 E) 10

**12.** Mathilda will conduct a three part experiment. First, she will randomly pick a ball in a box containing 4 red balls and 3 blue balls. Then, she will spin the arrow of a spinner with numbers once and, finally, she will spin the arrow of a spinner with letters once. What is the probability that she will get a red ball, an even number and a vowel?




A) 1/6 B) 1/21 C) 5/63 D) 1/22 E) 1/16

**13.** If N and M are two positive integers and $N^2 = 3M$, how many of the following: 6, 12, 18, and 24 can represent the sum of N + M?

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

**14.** In 20 years, Mathusalem will be twice as old as he was 20 years ago. How old will he be in 10 years?

A) 40 years old B) 80 years old C) 68 years old D) 70 years old E) 60 years old

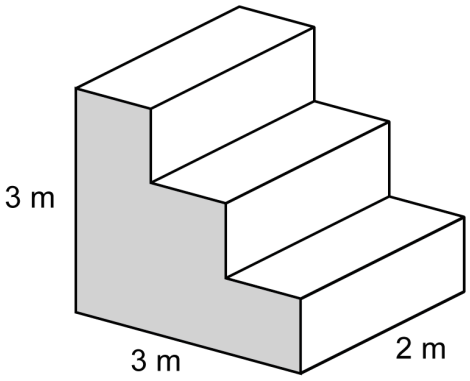
**15.** There are 8 teams in a tournament. Each team will play every other team 2 times. How many games need to be scheduled for the tournament?

A) 56 games B) 84 games C) 96 games D) 112 games E) 66 games

**16.** The value of n in the equation $10^6 \times 10^n = 1\,000^4$ is

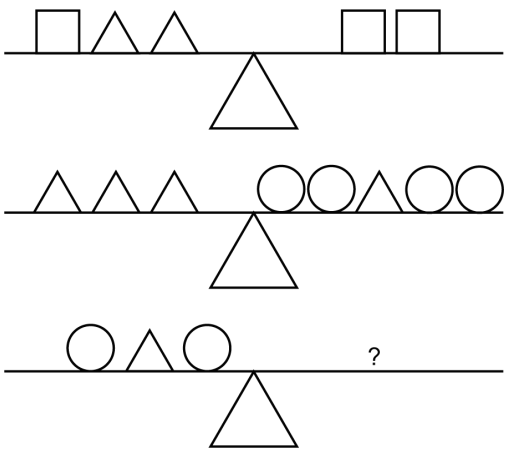
A) 3 B) 5 C) 2 D) 4 E) 6

**17.** All the measures in the diagram opposite are in metres. The area of the shaded surface is 6 $m^2$. All the edges of the prism are either parallel or perpendicular. What is the total area of the surface of the prism?




A) 18 $m^2$ B) 28 $m^2$
C) 36 $m^2$ D) 32 $m^2$
E) 30 $m^2$

**18.** In each of the first two diagrams, the weights on the left side of the scale balance the weights on the right side. How many square weights does it take to balance the weights that are on the left side of the third diagram?

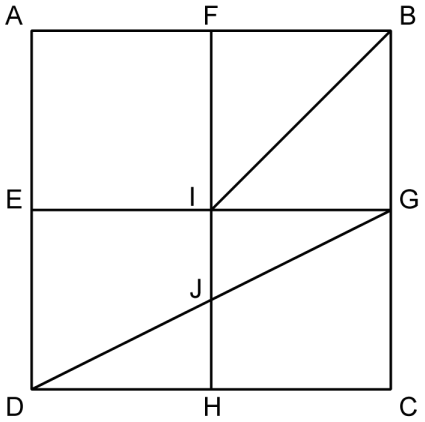



A) 1 B) 2
C) 3 D) 4
E) 5

**19.** E, F, G, and H are the mid-points of the sides of square ABCD. Line segment DG is a diagonal of rectangle EGCD, and line segment IB is a diagonal of square FBGI. The area of trapezium EIJD is what fraction of the area of trapezium ABIE?

A) 1/6 B) 1/2
C) 2/5 D) 3/10
E) 2/3

**20.** Mathusalem has given a 20% discount on the price of a shirt but still made a profit of 20%. What would have been his profit if he had not given the discount?




A) 62% B) 64%
C) 66 2/3% D) 50%
E) 60%

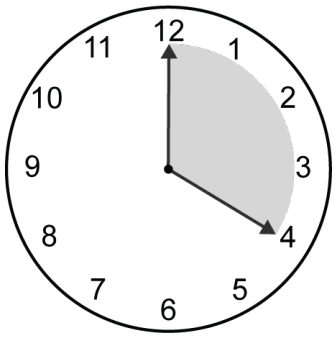
**21.** There are between 20 and 40 identical marbles in a bag. When I count the marbles by groups of 4, I have 3 left. When I count them by groups of 5, I have 2 left. How many marbles were in the bag?

A) 38 B) 34 C) 27
D) 30 E) 25

**22.** Mathilda has 1 000 g of a solution of salt and water which contains 600 g of water. From 500 g of this solution, she wants to prepare a solution which contains 80% of water. How much water must she add to the 500 g of the original solution?

A) 500 g B) 400 g C) 800 g D) 600 g E) 450 g

**23.** The minute hand of a clock measures 12 cm. In 20 minutes, it will cover an area of




A) $48\pi$ cm$^2$ B) $36\pi$ cm$^2$ C) $60\pi$ cm$^2$
D) $64\pi$ cm$^2$ E) $42\pi$ cm$^2$

**24.** What is the maximum value of the algebraic expression $x + 4y$, if $x$ and $y$ are positive integers and if $2x + 3y = 40$?

A) 35 B) 50 C) 45
D) 40 E) 55