Mathematica Centrum

Together, let's shape the mathematicians of the future

A. <u>You will need</u>:

1. A **blank response** form with the title "Mathematica", identical (except for the title) to the ones which are used for the Contests. Download this form and make as many copies as you need, so that your students can write the preparatory test and learn how to properly fill out a response form. (Remember that these copies cannot be used for the Contests. Your students will use the response forms that will be sent to you. Each student registered for a contest will receive a response form corresponding to the contest that he is writing. The only reason you are doing these copies is to show your students how to properly fill out a response form).

2. The **preparatory test** (this document), which your students can write to become familiar with multiple choice questions. Download this test and make as many copies as you need. (Remember that you are doing this to explain to your students the purpose of the preparatory test. The preparatory test defines the type of problems that appear in the actual contest.)

3. The **answer key**. Download the answer key and make as many copies as you need.

B. <u>How to fill out a response form properly</u>:

Use an **<u>HB pencil</u>** for coding all parts of the form. Do not use a ball point pen or felt-tip marker.

In the box at the top part of the form, tell your students to **PRINT** their school's name in full as well as their city/town and province. To the right of the box, tell them to **PRINT** their date of birth and sign their name to certify that the answers given represent their own work.

In the box on the mid-left of the form, tell your students to **PRINT** their last and first names. Tell them to code each letter by filling in the appropriate circle under each letter. (If your last name is Mathews, first you code the letter M by filling in the circle containing the M right under the letter M of Mathews, then you code the A by filling in the circle containing the A right under the letter A of Mathews. Do this for every other letter of your last name and for each letter of your first name). If the last name of a student is hyphenated, for example Jones-Smith, or if his/her first name is hyphenated, like Carol-Ann, inform the student to simply write Jones Smith and Carol Ann.

The mid-right part of the form outlines important instructions which are a reminder of what to do to code the response form correctly. The lower part of this box shows examples of incorrect coding. Remind your students to **completely** fill in each circle.

The box at the bottom of the form is made of circles which your students will fill in to record their answers to the questions. Again, tell them to fill each circle completely!

C. <u>Problems</u>:

Allow your students to write the preparatory test to be sure that they understand how to properly fill out the response form and to prepare them as to the type of problems that appear in the actual contests. It is important that your students do the problems intended for them :

Pythagoras : all of the problems #1 to #31
Fibonacci : all of the problems except #28 and #31
Byron-Germain : problems #1 to #16 plus # 18 and #27
Thales : problems #1 to #14 and #27

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PREPARATORY TEST 2010

THALES (3rd) – BYRON-GERMAIN (4th) – FIBONACCI(5th) – PYTHAGORAS (6th)

1. The number of vertices of a triangular pyramid is

A) 5 B) 4 C) 3 D) 6 E) 7

2. The value of X in the equation: X + 13 = 27 is

A) 32 B) 24 C) 14 D) 40 E) 34

3. What number is eighteen more than twenty-seven?

A) 45 B) 47 C) 55 D) 46 E) 35

4. The vowel closest to the third letter before the 14th letter of the alphabet is

A) O B) U C) E D) I E) A

5. 2 x 2 x 10 x 5 x 5 = ?

A) 400 B) 500 C) 100 D) 10 000 E) 1 000

6. When half of 24 is divided by the double of 3, the result is

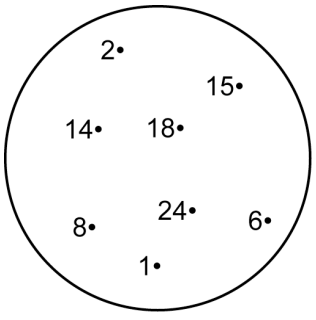
A) 3 B) 6 C) 4 D) 5 E) 2

7. How many nickels are equal in value to 20 quarters?

A) 60 B) 50 C) 100
D) 40 E) 125

8. 8 - 4 ÷ 2 + 4 = ?

A) 6 B) 4 C) 10
D) 8 E) 12



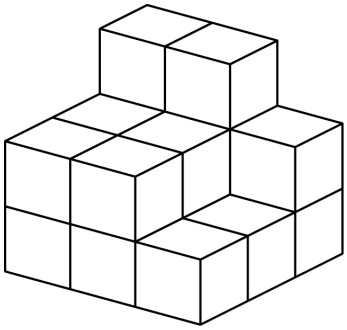
9. How many elements of the set shown on the right are not divisors of 36?

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

10. The next number in the sequence: 10, 20, 18, 36, 34, … is

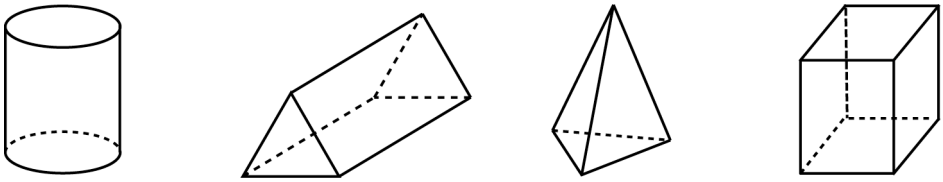
A) 68 B) 48 C) 36 D) 32 E) 64

11. What is the minimum number of blocks that have to be added to, or subtracted from, the pile of 18 blocks to get a pile of blocks that will have the shape of a cube?



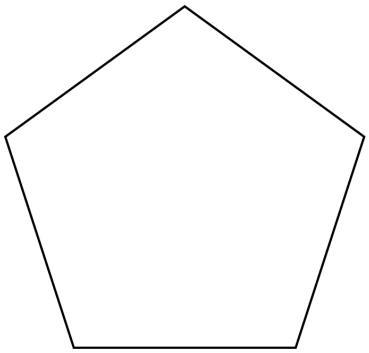
A) 10 B) 9 C) 8
D) 7 E) 11

12. How many of the solids shown are not prisms?



A) 1 B) 2 C) 3 D) 4 E) none

13. How many lines of symmetry does the pentagon have?



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

14. The number 0 is a square number (because 0 x 0 = 0). The numbers 1, 4, 9, and 16 are also square numbers (because 1 x 1 = 1, 2 x 2 = 4, 3 x 3 = 9, and 4 x 4 = 16). How many square numbers are there between 0 and 100?

A) 12 B) 8 C) 11
D) 10 E) 9

15. How many seconds are there in 2 hours?

A) 7 200 B) 120 C) 360 D) 6 000 E) 600

16. If the digits 1, 2, 3, and 4 are all used to form 4-digit natural numbers, how many different numbers can be formed?

A) 12 B) 24 C) 4 D) 8 E) 16

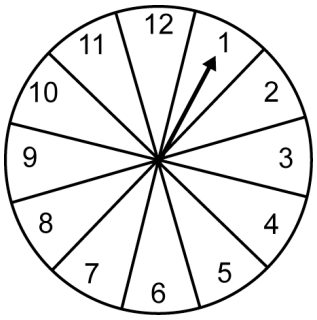
17. The first even number is 0, the second is 2, the third is 4, the fourth is 6, the fifth is 8, … the 15^{th} even number is

A) 24 B) 28 C) 30 D) 26 E) 32

18. Andrea got home at 1:41 P.M. She read for 30 minutes. Then she ate for 45 minutes and finally, she studied for 1 h 15 min. At what time did she finish studying?

A) 3:52 P.M. B) 4:42 P.M. C) 4:11 P.M. D) 4:41 P.M. E) 3:42 P.M.

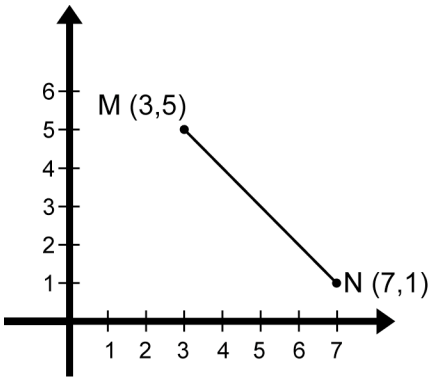
19. Mathilda has made a circular spinner like the one shown in the diagram. If she spins the spinner once, what is the probability that she will get a number that is a prime number?



A) 1/2 B) 1/3 C) 1/4
D) 5/12 E) 7/12

20. Which of the following pairs of coordinates represents the mid point on segment MN?

A) (4 , 5) B) (5 , 4) C) (6 , 3)
D) (5 , 3) E) (4 , 4)



21. The LCM of 12 and 15 is

A) 30 B) 60 C) 180
D) 150 E) 90

22. How many of the following fractions: 2/10, 11/45, 101/505, 25/115 et 14/70 are equivalent to 1/5?

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

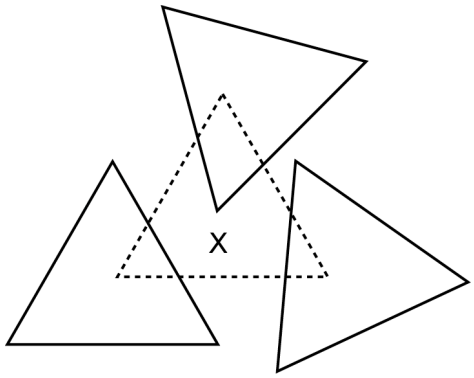
23. The value of N in the equation: 2 x N - 4 x 1.3 = 15.2 is

A) 11.2 B) 10 C) 9.8 D) 10.4 E) 10.2

24. How many natural numbers between 0 and 40 are multiples of 2, 3, and 5?

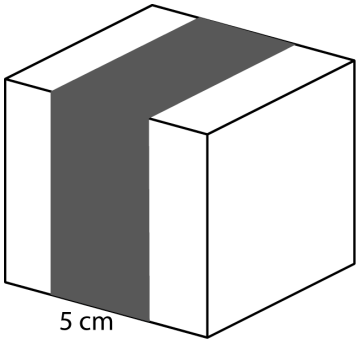
A) 9 B) 10 C) 1
D) 2 E) 13

25. Mathilda has 11 identical equilateral triangles that are made of transparent plastic. She takes one and writes an X on it. In the diagram, we can see that Mathilda has placed 3 triangles on triangle X (in dotted lines). What is the maximum number of triangles that she can place on triangle X, if the triangles can touch each other but cannot overlap?



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

26. Mathew painted part of a wooden cube (10 cm x 10 cm x 10 cm). He applied a coat of paint perpendicular to the edges of the cube (all around the cube) that looks like a strip of ribbon 5 cm wide. What fraction of the cube's total surface did he paint?



A) 1/3 B) 1/5 C) 2/7
D) 1/4 E) 3/10

27. The product of 3 consecutive natural numbers could not be

A) 6 B) 120 C) 24 D) 60 E) 12

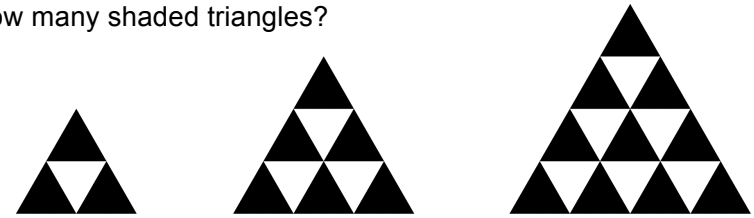
28. The product of 9 x 10 x 11 x 101 lies between

A) 10^2 and 10^3 B) 10^5 and 10^6 C) 10^4 and 10^5 D) 10^3 and 10^4 E) 10^6 and 10^7

29. Which of the following is not the product of two prime numbers?

A) 10 B) 6 C) 35 D) 21 E) 20

30. The first 3 figures in a sequence are shown in the diagram. The first figure is composed of 3 shaded triangles, the second figure is composed of 6 shaded triangles, and the third is composed of 10. The 10th figure in the sequence will be composed of how many shaded triangles?



A) 55 B) 66 C) 45 D) 54 E) 46

31. In a 100 m race, Mathilda finished 5 m ahead of Mathew. If they run a second race of only 99 m at exactly the same speed they ran the first race, how many metres ahead of Mathew will Mathilda finish the race?

A) 4.88 m B) 4.93 m C) 4.85 m D) 4.95 m E) 5 m