Mathematica Centrum

Together, let's shape the mathematicians of the future

EULER PREPARATORY TEST 2016

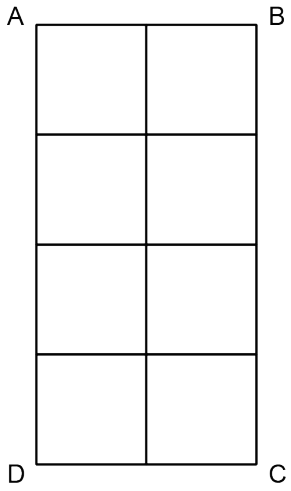
1. What is the largest prime factor of 333?

A) 2 B) 7 C) 47 D) 37 E) 3

2. How many of the following numbers:1, 4, 9, 27, 64, and 100 are perfect squares and cubes?

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

3. Rectangle ABCD has been divided into 8 small squares. How many rectangles (not including squares) can you count in the diagram?



A) 19 B) 17 C) 18
D) 21 E) 20

4. How many cubes with edges 2 cm long are needed to form a cube with edges 6 cm long?

A) 25 B) 9 C) 27
D) 36 E) 18

5. Which of the following choices represents the average of the other four?

A) 4 B) -3 C) -4 D) -17 E) 5

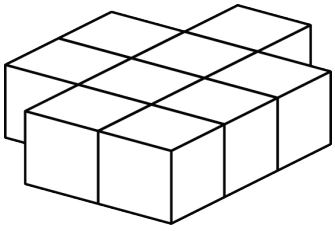
6. I gave away half of one third of one quarter of my money. What fraction did I give away?

A) 47/48 B) 1/24 C) 3/5 D) 1/12 E) 23/24

7. The sum of all natural numbers from 1 to 2 000 is equal to

A) 2 001 000 B) 2 000 000 C) 1 001 000
D) 1 000 000 E) 500 550

8. Nine blocks have been glued together, as shown in the diagram. How many blocks have at least two faces that are covered with glue?



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

9. If half of N is 12, what is the value of 4 times N?

A) 96 B) 36 C) 48 D) 72 E) 144

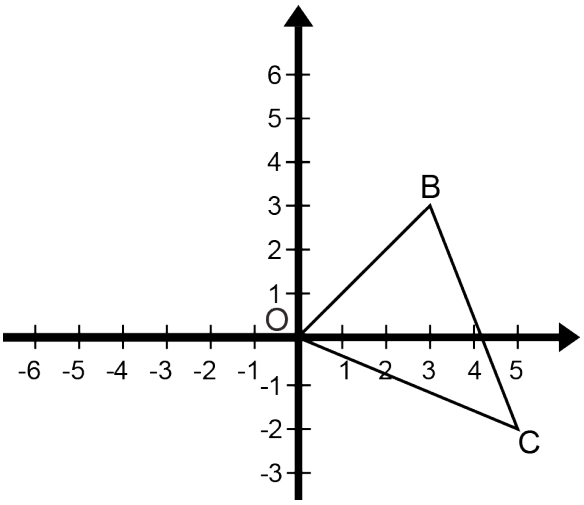
10. If the length of each side of a square were reduced by 25%, the area of the square would be reduced by

A) 50% B) 75% C) 25%
D) 56.25% E) 43.75%

11. The LCM (3, 7) x the GCD (12, 18) is equal to

A) 252 B) 126 C) 146
D) 130 E) 96

12. Rotate ∆ OBC 180º about the origin O. The coordinates of B' (image of B) are



A) (5, -2) B) (-3, -3) C) (-5, 2)
D) (3, -3) E) (2, 5)

13. Mathusalem has lost 40% of his weight during the summer. Rounded to the nearest kg, what was his weight at the beginning of the summer, if his weight at the end of the summer was 100 kg?

A) 160 kg B) 170 kg C) 188 kg D) 167 kg E) 171 kg

14. If 1/2 + 1/3 + 1/n = 53/6, then n is equal to

A) 8 B) 4 C) 1/8 D) 1/4 E) 6

15. Mathilda has 4 sweaters (one yellow, one green, one blue, and one red) and 2 skirts (one cotton and one wool). If she randomly chooses a sweater and a skirt, what is the probability that she will choose the yellow sweater and the wool skirt?

A) 1/6 B) 1/3 C) 1/12 D) 1/8 E) 1/7

16. Using the digit 1, you can form only one 1-digit natural number (1). Using the digits 1 and 2, you can form four 2-digit natural numbers (11, 22, 12, and 21). How many 3-digit natural numbers can you form using the digits 1, 2, and 3?

A) 6 B) 4^3 C) 26 D) 4^4 E) 3^3

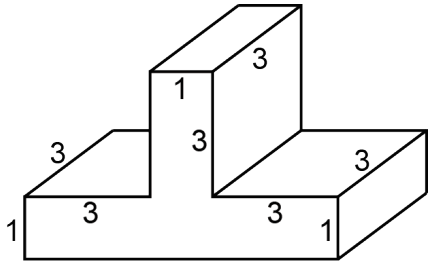
17. If $P = 10 + 10^2 + 10^3 + 10^4 + 10^5$, then the sum of P's digits is

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

18. The algebraic expression 3n + 1 (n being a natural number) can generate the sequence of all the numbers that yield a remainder of 1 when divided by 3. Indeed, if n takes the successive values of 0, 1, 2, 3, …, we get the sequence 1, 4, 7, 10, 13, …. Which of the following algebraic expressions can generate the sequence of numbers that yield a remainder of 2 when divided by 4?

A) 3n + 3 B) 4n + 4 C) 4n + 2 D) 3n + 4 E) 4n + 3

19. What is the volume, in cm^3, of the rectangular solid shown if all measurements in the diagram are in centimetres?

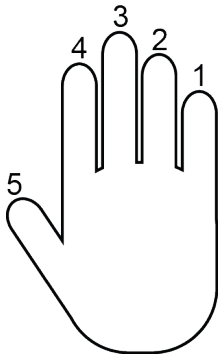


A) 28 B) 29 C) 30
D) 31 E) 32

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

A) -5 B) -2 C) 30
D) 28 E) 27

21. Binary Ben has only one hand, but he found a way to represent certain numbers. When his 5 fingers are all straight, as in the diagram, it represents the number 31. If all his fingers are curled into a fist, it represents the number 0. If fingers 2, 3, and 4 are straight and the other two fingers are curled, it represents 14. Which fingers must he hold straight if he wants to represent the number 7?



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

22. A, B, C, D, and E represent 5 different non-zero digits. What is the value of D?

$$\begin{array}{r} A\ B\ C\ B \\ \times \qquad 5 \\ \hline D\ E\ D\ B \end{array}$$

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

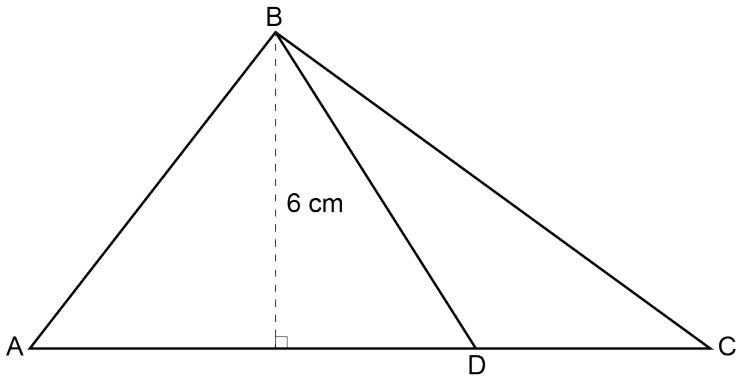
23. The digits of a 3-digit natural number are all different. If the product of the 3 digits is equal to 210, what is their sum?

A) 18 B) 17 C) 15 D) 16 E) 19

24. If $P = p_1 \times p_2 \times p_3 \times p_4 \times \ldots p_{50}$ represents the product of the 50 first positive prime numbers, how many of the following numbers: 10, 20, 30, 40, and 100 are factors of P?

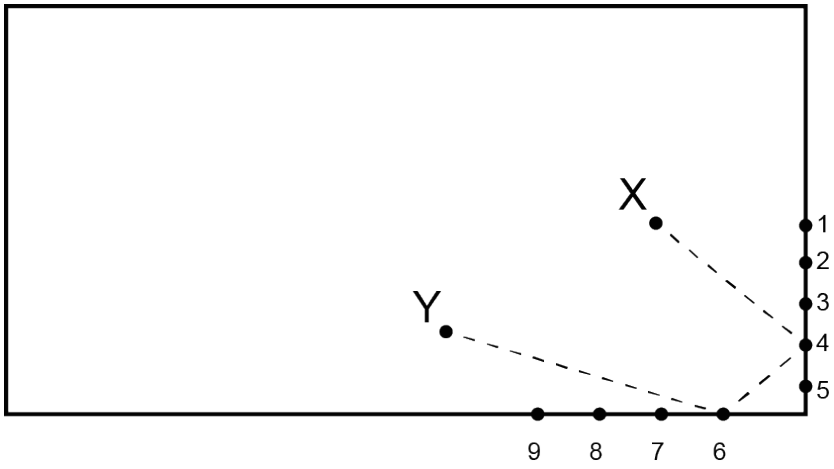
A) 1 B) 2 C) 3 D) 4 E) 5

25. Point D of line segment BD divides AC of triangle ABC in the ratio AD : DC = 3. What is the area of Δ BDC if the height and area of Δ ABC are equal to 6 cm and 24 cm^2?



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

26. A physical education teacher wants his students to run the distance between two points on the gym floor. He does not want them to run from point X to point Y in a straight line. First, they must run to a point on one wall, then run to a point on a second wall, and finally, they must run to point Y. To win, a student must run fast, but he must also follow the shortest path from point X to point Y. The diagram below shows the path X-4-6-Y followed by one student. Which path should Mathilda take if she wants to increase her chances of winning the race?



A) X-4-6-Y B) X-3-9-Y C) X-2-9-Y D) X-2-7-Y E) X-3-8-Y