Mathematica Centrum

Together, let's shape the mathematicians of the future

NEWTON PREPARATORY TEST 2020

1. What is the sum of 9 and the opposite of 7?

A) 16 B) 2 C) 3 D) -2 E) 4

2. Which of the following is not a prime number?

A) 7 B) 13 C) 11 D) 17 E) 21

3. The result of (-4 + 8) - 4(5 - (-6)) is

A) -41 B) -42 C) -40 D) 39 E) -39

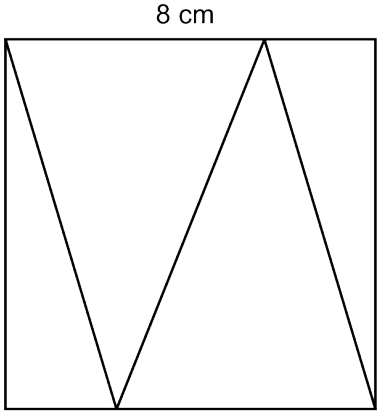
4. 100% x 100% + 50% x 200% = ?

A) 2 B) 2.25 C) 1.25 D) 2.5 E) 50%

5. If n x -6 = -24, then -n x -4 is equal to

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

6. What is the average area of the 4 triangles that form the square, on the right, whose side is 8 cm long?



A) 16 cm² B) 17 cm² C) 18 cm²
D) 19 cm² E) 20 cm²

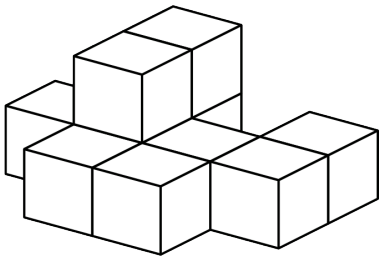
7. The product of the digits of a 3-digit natural number cannot be equal to

A) 2 B) 125 C) 12
D) 38 E) 36

8. The sum of all the factors of 8 is equal to

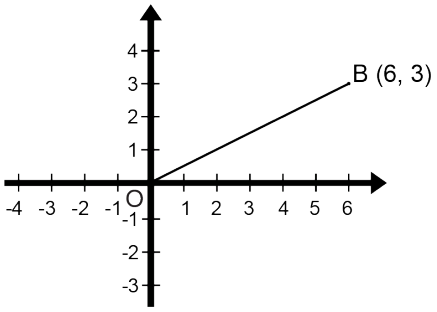
A) 11 B) 12 C) 13 D) 14 E) 15

9. Ten blocks have been glued together, as shown in the diagram. How many faces of these blocks have glue on them?



A) 18 B) 20 C) 22
D) 24 E) 26

10. Line segment OB is rotated 90º counterclockwise about centre O. The coordinates of point B after the rotation are

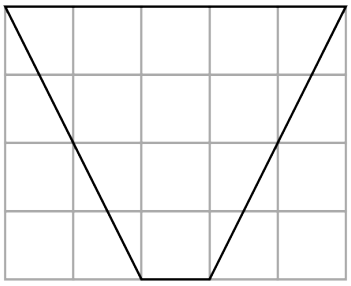


A) (3, -6) B) (-3, 6)
C) (-6, 3) D) (3, -3)
E) (3, 6)

11. Melissa uses 200 g of sugar for every 5 eggs. How many eggs should she use with 360 g of sugar?

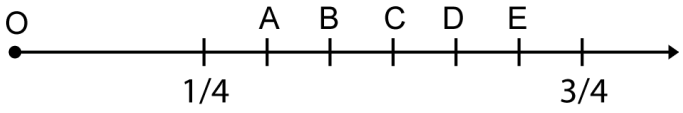
A) 10 B) 8 C) 9
D) 11 E) 12

12. Every small square in the grid has an area of 1 cm². What is the area of the quadrilateral shown in the diagram?



A) 11 cm² B) 12 cm²
C) 13 cm² D) 14 cm²
E) 15 cm²

13. The fractions 1/4 and 3/4 are represented on the number line below. If the origin O of the number line is 0, what letter represents the fraction whose value is closest to 55%?



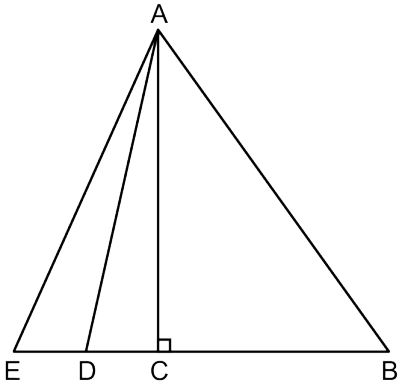
14. The sum of two integers is -3 and their product is -10. Their quotient could be

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

15. 10 cm² = ? mm²

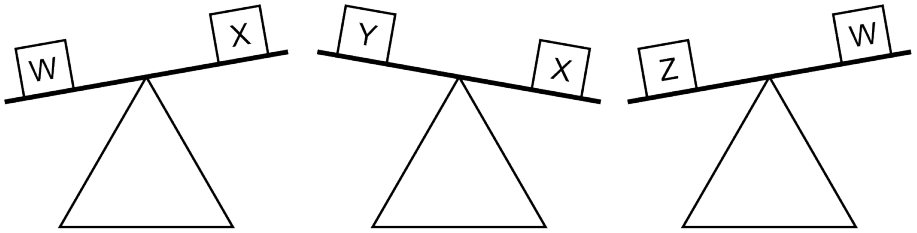
A) 10 B) 100 C) 1 000
D) 100 000 E) 10 000

16. If ED = DC and CB = 3ED, the area of triangle ABE is how many times larger than the area of triangle ACE?



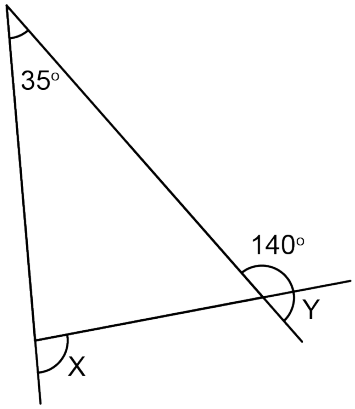
A) 2 times B) 2.5 times C) 3.5 times
D) 4 times E) 5 times

17. Which of the inequations below is false?



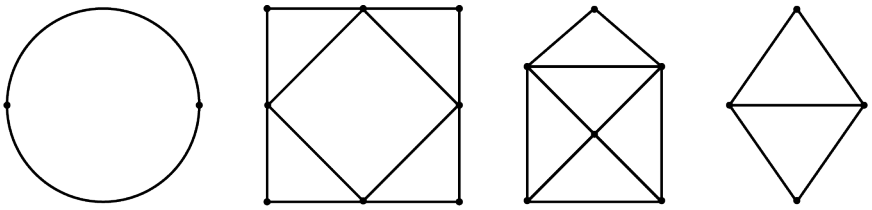
A) W > Y B) W > X
C) X > Y D) Y > Z
E) Z > W

18. What is the value of X + Y?



A) 105º B) 110º C) 115º
D) 100º E) 120º

19. How many of the networks shown below are Eulerian circuits?



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

20. What is the product of the LCM and the GCD of 6 and 9?

A) 27 B) 36 C) 18 D) 48 E) 54

21. The average of all multiples of 7 between 0 and N is 52.5. Which of the following cannot represent a possible value of N?

A) 100 B) 101 C) 103 D) 105 E) 106

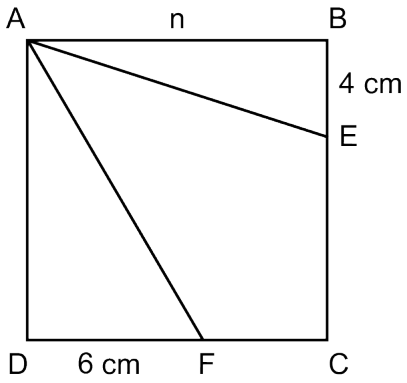
22. Andrea poured 5 litres of 10% cream into 2 litres of 14% cream. What is the percentage of cream in the final mixture?

A) 12 1/7% B) 11 1/7% C) 11 2/7% D) 12% E) 11 6/7%

23. The next term in the infinite sequence: 0, 1, 2, 5, 12, 29, 70, … is

A) 158 B) 168 C) 169 D) 160 E) 179

24. The side of square ABCD measures n cm. We know that n is a natural number and that the area of quadrilateral AECF is 66 cm². Of all the rectangles that have an area of $2n^2$, what is the perimeter of the one that has the smallest possible perimeter?



A) 48 cm B) 66 cm C) 46 cm
D) 72 cm E) 58 cm

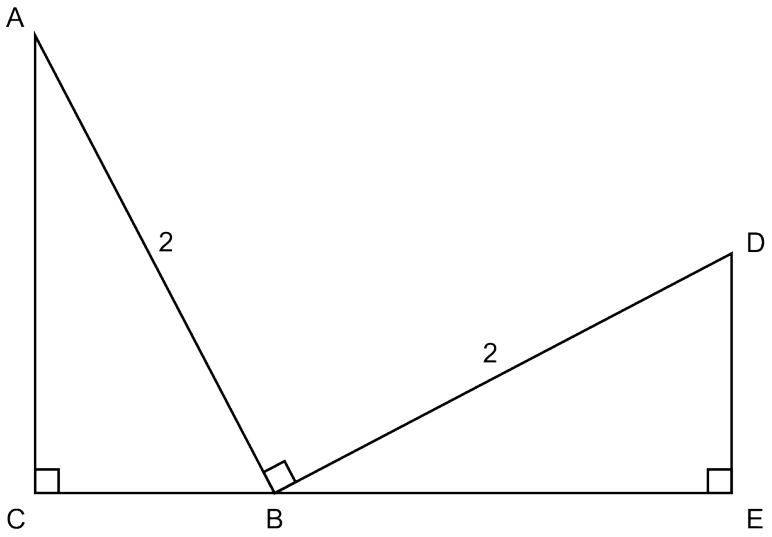
25. Which of the following answers represents a congruency with a remainder of 1?

A) $18 \equiv 25 \bmod 7$ B) $17 \equiv 7 \bmod 10$ C) $8 \equiv 15 \bmod 7$
D) $7 \equiv 21 \bmod 7$ E) $5 \equiv 17 \bmod 12$

26. Half of the students in a class are 12 years old or less and one sixth are 13 years old or more. The number of students that are between 12 and 13 years old is 6 more than the number of students that are 13 years old or more. How many students are between 12 and 13 years old?

A) 12 B) 13 C) 9 D) 10 E) 14

27. Prove that the two triangles shown are congruent. What is the value of BE if CA = 2CB?

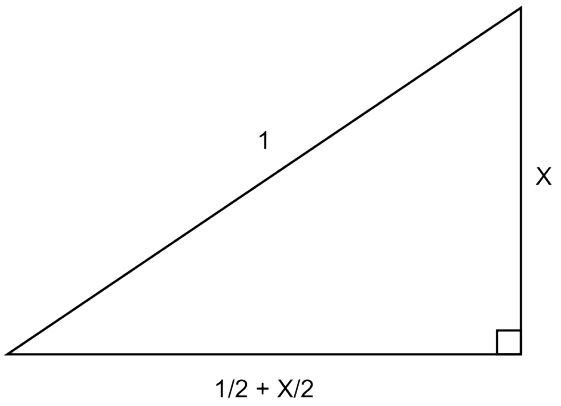


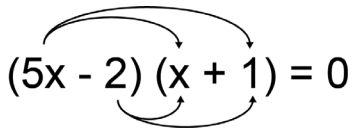
A) 1.1 B) $2/\sqrt{5}$ C) 1 D) $4/\sqrt{5}$ E) 0.9

28. Mathusalem did a trip of 300 km. He drove 40% of the distance at a speed of 80 km/h and the rest of the distance at a speed of 100 km/h. Which of the following is closest to the average speed at which he completed the 300 km trip?

A) 90 km/h B) 91 km/h C) 92 km/h D) 93 km/h E) 94 km/h

29. For which values of x is the trinomial $5x^2 + 3x - 2$ equal to 0. In other words, for which values of x is the equation $5x^2 + 3x - 2 = 0$, true? The trinomial $5x^2 + 3x - 2$ can be written as the product of two binomials ((5x - 2) (x + 1)). Verify that this is true by carrying out the operations shown in the diagram. The equation (5x - 2) (x + 1) = 0 will help us find the values of x we are looking for. Indeed, if the product of the two binomials is equal to 0, we can readily infer that either 5x - 2 = 0 or that x + 1 = 0. If 5x - 2 = 0, we find x = 2/5. If x + 1 = 0, we find x = -1. Use this technique to find the value of x that verifies the equation $(1/2 + X/2)^2 + X^2 = 1^2$ for the right triangle shown below.





A) 0.6 B) 0.3 C) 0.4 D) 0.5 E) 0.2