Mathematica Centrum

Together, let's shape the mathematicians of the future

NEWTON PREPARATORY TEST 2026

1. The square root of the cube of 4 is equal to

A) 3 B) 4 C) 16 D) 8 E) 2

2. The value of (-3 + 6) - (-3 + 2) is

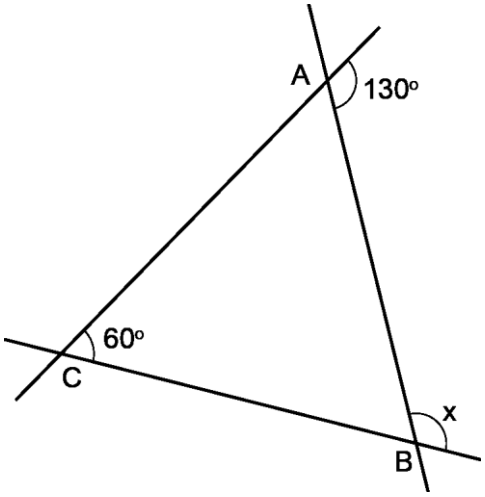
A) 4 B) 0 C) -8 D) 8 E) -4

3. 1/3 + 1/2 + 1/6 - 1/8 = ?

A) 1 B) 15/16 C) 7/8 D) 3/5 E) 5/6

4. What is the value of x + 60º in Δ ABC?

A) 65° B) 100° C) 110°
D) 70° E) 170°



5. The largest prime factor of 330 is

A) 2 B) 11 C) 3
D) 5 E) 7

6. If n = √25 ÷ √16, what is the value of n?

A) 3 B) 5/4 C) 2/3
D) 9/4 E) 4/3

7. The result of 1/5 x 5/3 x 3/4 is

A) 0.3 B) 0.4 C) 25% D) 0.5 E) 60%

8. 20% of 50 is equal to

A) 10% of 100 B) 9% of 100 C) 8% of 100 D) 6% of 200 E) 5% of 400

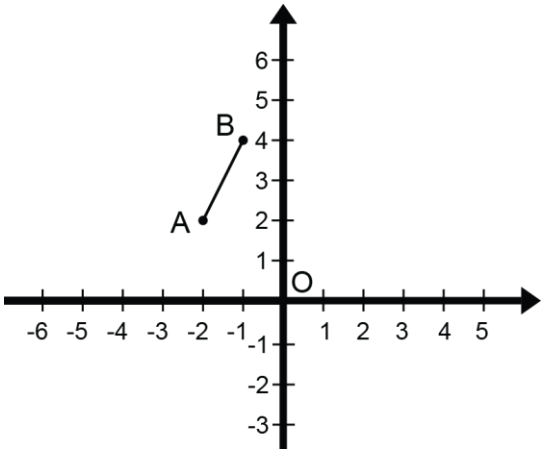
9. The number of minutes in 120 years is the same as the number of seconds in

A) 1 year B) 600 days C) 360 years D) 200 weeks E) 2 years

10. The result of $5^2 \times 5^2 + 3^2 \times 3^2 + 4^2 \times 4^2$ is equal to

A) 706 B) 690 C) 960 D) 961 E) 962

11. What are the coordinates of the images of points A and B of line segment AB if it is turned 180º around point O?

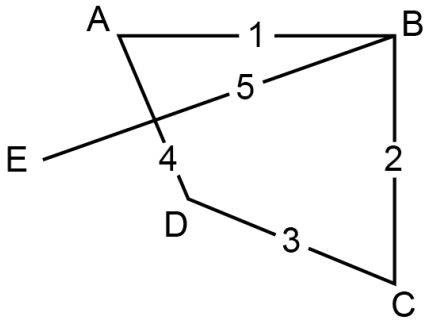


A) A'(2, -2), B'(1, -4)
B) A'(-4, 1), B'(-2, 2)
C) A'(2, 2), B'(4, 1)
D) A'(4, -1), B'(2, -2)
E) A'(4, 1), B'(2, 2)

12. Mathilda's age is one third that of Mathusalem's. If Mathusalem is 40 years older, what is Mathilda's age?

A) 14 years old B) 16 years old C) 20 years old
D) 18 years old E) 12 years old

13. Points A, B, C, D, and E represent five Canadian cities. The Canair company wants to establish full air service between these cities. How many different air routes can it offer? (the diagram on the right shows 5 of the air routes it can offer)



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

14. A 4-digit natural number is multiplied by a 2-digit natural number. The product could have

A) 7 digits B) 5 digits C) 4 digits D) 8 digits E) 9 digits

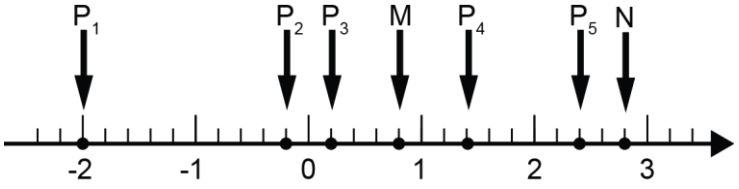
15. Which number below is not prime?

A) 3 B) 19 C) 51 D) 73 E) 13

16. The average of six numbers is 100. If two of these numbers are 58 and 110, what is the average of the other 4?

A) 152 B) 98 C) 107 D) 108 E) 112

17. Which point on the number line is 3 times further from point N than from point M?



A) P_1 B) P_3 C) P_2 D) P_5 E) P_4

18. The number which is a multiple of 3, but is not a multiple of 5 is

A) 45 B) 90 C) 180 D) 75 E) 66

19. The Syracuse conjecture (also known as the Collatz conjecture or 3n + 1 conjecture) states that if you apply two arithmetic operations repeatedly (division by 2 or 3n + 1) on any natural positive number greater than 1, you create a sequence or string of natural numbers that always reaches 1. This conjecture has never been proven, but it has never been contradicted. Let's use the number 5 as an example. If the number is even, we divide by 2; if it is odd, multiply by 3 and add 1. The number 5 being odd, we multiply it by 3 and add 1. We get (3 x 5 + 1) 16. The number 16 being even, we divide by 2 and obtain (16 ÷ 2) 8. We repeat the same operation (division by 2) three more times and we reach 1. The length of the string of numbers for 5 is (5, 16, 8, 4, 2, 1) 6. What is the string length for the number 20?

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

20. Four people (W, X, Y, and Z) are waiting in line at a banking machine. X is not second. Y is just behind X. Z is just in front of W who is neither first nor last. Who is first?

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

21. The product of two natural numbers is 240. Their difference is 1. What is their sum?

A) 30 B) 31 C) 32 D) 33 E) 34

22. Which of these numbers is the units digit of the number $2^{52} - 1$?

A) 2 B) 4 C) 6 D) 5 E) 8

23. If n is a positive integer, how many numbers of the form $2^n + 1$ smaller than 100 are divisible by 3?

A) 3 B) 5 C) 4 D) 8 E) 6

24. Melissa and Andrea go into a restaurant. There are 3 hooks on a wall. Each one hangs her coat on one of the hooks. How many different ways can they hang their coats?

A) 4 B) 12 C) 8 D) 6 E) 16

25. The natural number 4 224 is called a palindrome number. Reading from left to right or from right to left, it represents the same number. The numbers 515 and 828 are also palindrome numbers. How many palindrome numbers are there between 100 and 1 000?

A) 100 B) 90 C) 99 D) 180 E) 98

26. In mathematics, modular arithmetic (also called clock arithmetic) is simply an arithmetic for integers, where numbers start over again after reaching a certain value – the modulus. There is one modular arithmetic that we are all familiar with – arithmetic modulo 12. Three hours after 11 o'clock, it is always 2 o'clock. We might think that 11 + 3 should give 14, but in a 12 hours clock, there is no hour called 14 o'clock, since the numbers start over after reaching the value 12 – the modulus. This is called arithmetic modulo 12. We say that 14 o'clock and 2 o'clock are congruent, because they represent the same time. Mathematically, we represent this by writing $2 \equiv 14 \bmod 12$. We could also write that $0 \equiv 12 \bmod 12$ or that $5 \equiv 17 \bmod 12$. Note the use of the ≡ symbol (the symbol for congruency) and not the = symbol (the symbol for equality), because 2 is not equal to 14. These numbers are really congruent, because they represent the same time. Let us look at other examples. If today is Wednesday, what day will it be in 8 days, in 15 days? In 8 days, it will be

(8 ÷ 7 = 1 R 1) a Thursday. In 15 days, it will also be a Thursday (15 ÷ 7 = 2 R 1). When 2 integers leave the same remainder, when they are divided by the same number, we say that they are congruent. The operation of finding the remainder is called the modulo operation. We can write that 8 ≡ 15 mod 7. We can also write that 7 ≡ 21 mod 7, 18 ≡ 25 mod 7, and 17 ≡ 7 mod 10. Many daily operations – counting in weeks, in months, in hours, … are very practical applications of modular arithmetic. But modular arithmetic is used extensively in computer sciences, in number theory (solutions of diophantine equations) in chemistry and in a multitude of other sciences. Here is a problem in modulo 10 arithmetic that will help you understand a magic trick. Mathusalem has a deck of 52 cards. He just performed a magic card trick for Mathilda. He dealt 51 cards face up, so that he could keep track of them and dealt the last one, the 52^{nd}, face down. The object of the game is to guess the value of the last card that was dealt. Each ten, jack, queen, and king is worth 10 points. Every ace is worth 1 point, every 2 is worth 2 points, … every 9 is worth 9 points. In his last card trick Mathusalem noticed that, after he had dealt 44 cards, the total number of points dealt was a multiple of 10 and that the next seven cards that were dealt were 3, 6, ace, queen, king, 4, and 8. What was the value of the 52^{nd} card that was dealt?

A) 1 B) 4 C) 10 D) 8 E) 5

27. The measures of the 3 angles of a triangle are in the ratio 3 : 4 : 8. What is the value of the largest angle?

A) 132º B) 189º C) 190º D) 191º E) 192º

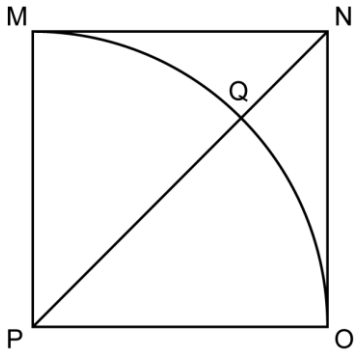
28. The theoretical probability of getting heads (or tails) when a coin is flipped one time is 1/2. The probability of getting 2 heads (or 2 tails) if the coin is flipped 2 times is $(1/2)^2$. If a coin is flipped 3 times, what is the probability that we will get 3 heads?

A) 5/8 B) 1/4 C) 1/2 D) 3/4 E) 1/8

29. The numbers q and r are two natural numbers. If q has 8 prime factors and r has 6 prime factors, how many prime factors does the product q x r have?

A) 14 B) 10 C) 16 D) 18 E) 12

30. The area of square MNOP is 9. MQO is a quarter-circle and PN is a diagonal. What is the length of line segment QN?



A) $2\sqrt{2} - 3$ B) $3(\sqrt{2} - 1)$ C) $3/\sqrt{2}$ D) 3 E) $3\sqrt{2} - 2$