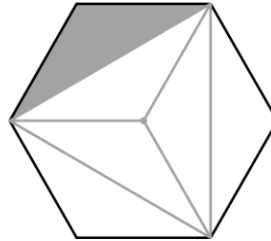


Mathematica Centrum

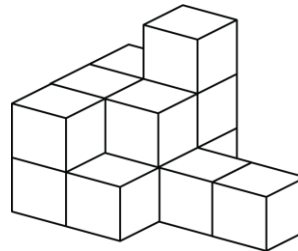
Together, let's shape the mathematicians of the future

FIBONACCI PREPARATORY TEST 2019 DETAILED SOLUTIONS

1. The missing number in the equation: $8 \times 3 = 4 \times ?$ is 6.
2. The sum of $8 + 50 + 200 + 6\,000$ is 6 258.
3. The value of $(15 \div 3) \times (16 - 9)$ is a multiple of (5×7) 5.
4. 20 nickels = 4 quarters.
5. The fraction of the hexagon that is shaded is $1/6$.

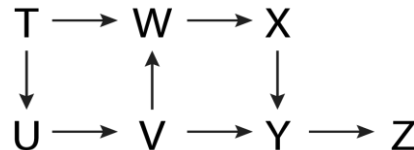


6. A natural number is multiplied by 7. The result could not be 88.
7. There are $((2 \times 6 - 1) + 3)$ 14 blocks in the pile?
8. If the last day of January is a Wednesday, then January 10 (31, 24, 17, 10) was a Wednesday and January 11 was a Thursday.



9. When twice 100 (200) is multiplied by one quarter of 12 (3), the result is (200×3) 600.
10. 10 dm = 1 m

11. T, U, V, W, X, Y, and Z are players that participated in a chess tournament. $T \rightarrow U$ means that T has won a game against U. Only one player (Z) has not won a single game.



12. A 2-digit natural number is multiplied by a 2-digit natural number. The product could have a minimum of $(10 \times 10 = 100)$ 3 digits, but must have less than $(100 \times 100 = 10\,000)$ 5 digits. The product could be a natural number that has 4 digits.

13. The $3!!$ does not refer to the double factorial function (which is way beyond the scope of this test) but to the factorial function iterated twice. The expression $3!!$ means here $(3!)!$. The value of $3!!$ is $(3!)! = 6!$. The expression $2! \times 3!!$ $(2 \times 6!)$ is the largest. By the way $2! = 2!! = 2!!! = 2$.

14. Andrea removed 7 coins having a total value of 82¢. She removed 2 pennies, 2 quarters, and 3 dimes.

15. The perimeter will increase by $(2 \times 5 + 2 \times 5)$ 20 m.

16. If I weigh 20 kg more than half of my weight, half of my weight must be equal to 20 kg. I must weigh $(2 \times 20 \text{ kg})$ 40 kg.

17. If you could spend \$1 every second, you could spend $(60 \times \$1)$ \$60 every minute.

18. A die is rolled once. The probability of getting a 6 is (1 chance out of 6 possible outcomes) $1/6$.

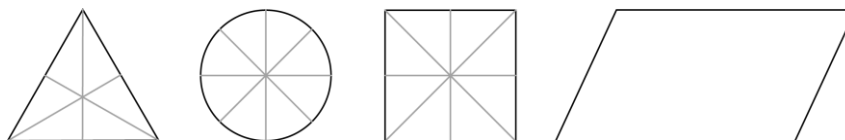
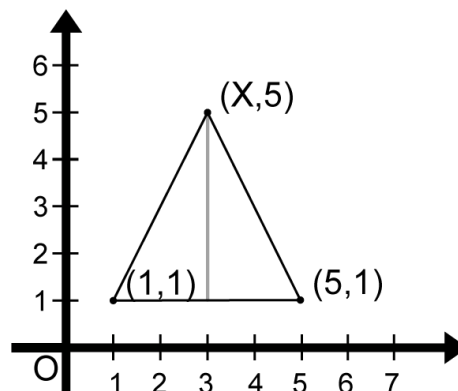
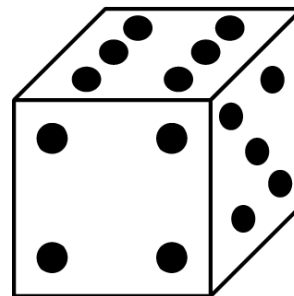
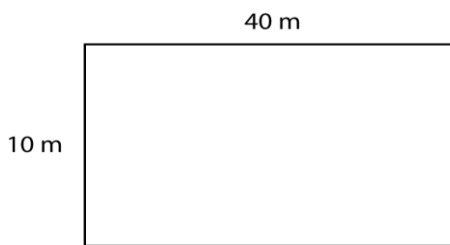
19. All even multiples of 3 are multiples of (2×3) 6. The first multiple of 6 between 0 and 100 is $6 = 1 \times 6$, the second is $12 = 2 \times 6$, the third is $18 = 3 \times 6$, The last multiple of 6 between 0 and 100 is $96 = 16 \times 6$. There are 16 even multiples of 3 between 0 and 100.

20. The value of $1 + 3 = 4 = 2^2$. The value of $1 + 3 + 5 = 9 = 3^2$. The value of $1 + 3 + 5 + 7 = 16 = 4^2$. If we know how many consecutive odd numbers (starting from 1) there are in a series, it is very easy to find its value. But how do we find out how many odd numbers there are in a series? In the series: $1 + 3$ there are 2. To find out how many odd numbers there are, just find the average of 1 and 3. The average of 1 and 3 is $((1 + 3) \div 2)$ 2. The series: $1 + 3 + 5 + 7$ has $((1 + 7) \div 2)$ 4 terms. The series: $1 + 3 + 5 + 7 + 9 + \dots 51$ has $((1 + 51) \div 2)$ 26 terms. The value of this series is (26^2) 676.

21. Points $(1, 1)$, $(5, 1)$, and $(X, 5)$ are the 3 vertices of an isosceles triangle. The value of coordinate X is $((1 + 5) \div 2)$ 3.

22. The factors of 10 are $\{1, 2, 5, 10\}$. The factors of 40 are $\{1, 2, 4, 5, 8, 10, 20, 40\}$. These two numbers have 4 factors in common.

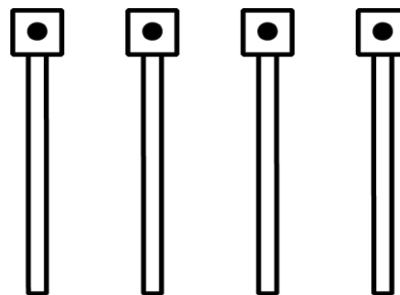
23. The circle and the square have at least 4 lines of symmetry. The square has 4 and the circle has an infinite number of lines of symmetry. The equilateral triangle has 3 and the parallelogram has 0.



24. The unit's digit of the product $9 \times 9 \times 9 \times 9$ is 1.

25. The marine rock must lose (0.1% of 10 000 000 kg) 10 000 kg. At a rate of 1 000 kg per year, it will take $(10\ 000 \text{ kg} \div 1\ 000 \text{ kg})$ 10 years to lose 0.1% of its mass.

26. If the white belt is first, she can hang the belts in 6 different ways (W-B-R-G, W-B-G-R, W-R-B-G,



W-R-G-B, W-G-B-R, W-G-R-B). If the blue is first, she can hang the belts in 6 different ways again. In all, she can hang her 4 belts in (6×4) 24 different ways.