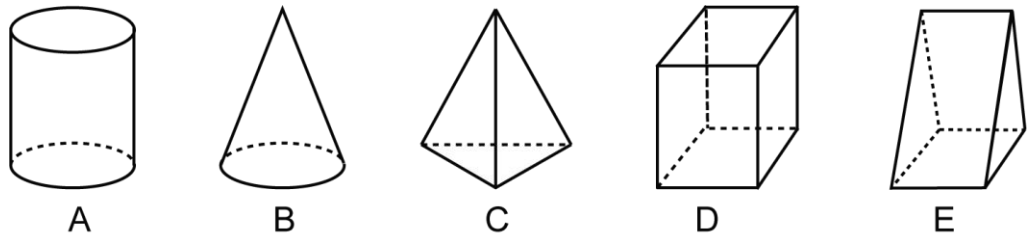
Mathematica Centrum

Together, let's shape the mathematicians of the future

PYTHAGORAS PREPARATORY TEST 2018
DETAILED SOLUTIONS

1. The solid which has 12 edges is the rectangular prism D.

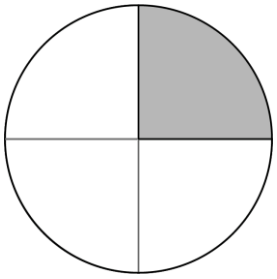


2. You can buy (24 ÷ 5 = 4R4) four $5 cereal boxes with $24.

3. The value of X in the equation: 2 + 9 + X + 3 - 2 = 13 is 1.

4. The quotient of 210 ÷ 70 is 3.

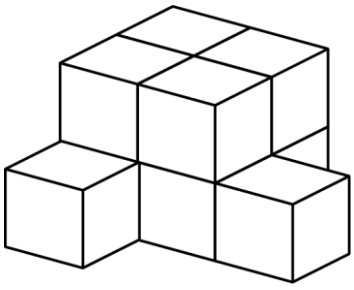
5. The fraction of the pie that has been eaten is 1/4.



6. Forty dimes = $4 = 16 quarters. The value of the ? in the equation: 20 quarters = ? quarters + 16 quarters is 4.

7. The tens digit in the product of 9 x 15 is (9 x 15 = 10 x 15 - 1 x 15 = 135) 3

8. There are (2 x 4 + 2) 10 blocks in the pile.

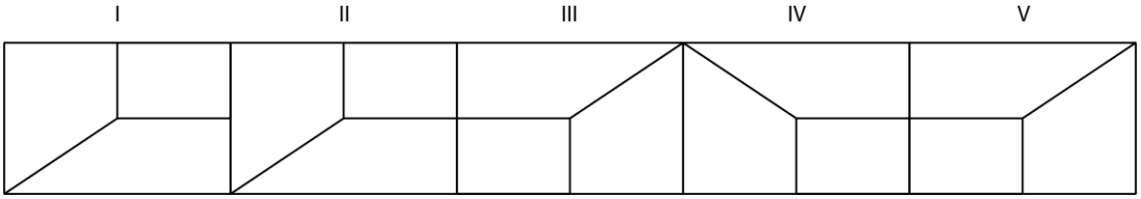


9. The next term in the sequence 2, 3, 5, 8, 13, 21, … is (13 + 21) 34.

10. Mathew has ((30 - 6) ÷ 2) 12 books. Mathilda has (30 - 12) 18 books.

11. 10 mm = 1 cm

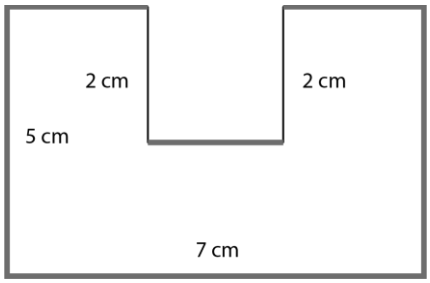
12. Mathilda used a reflection (symmetry) to transform figure IV into figure V.



13. The number of sides (6) plus the number of angles (6) in an hexagon is equal to (6 + 6) 12.

14. A heart beats 10 times every 10 seconds. It beats once every second. In 2 minutes (120 seconds) it will beat 120 times.

15. Mathilda watched 120 minutes of a 3 hour movie. She watched 120 minutes (2 hours) of a 3 hour movie. She watched (2 hours out of 3 hours) 2/3 of the total movie.



16. The perimeter of the original 7 cm x 5 cm rectangular carton represented in bold colour is (2 x (7 + 5)) 24 cm. The perimeter of the carved carton shown here in the the diagram is (24 cm + 2 x 2 cm) 28 cm.

17. The sum of two consecutive odd numbers is 16. The product of these two consecutive odd numbers (7 and 9) is (7 x 9) 63.

18. Let ‘s suppose it is 3 o’clock (fig.1). When the minute hand of the clock goes around once (60 minutes), the hour hand moves a distance of 1 hour, from 3 to 4 (fig. 2) or 1/12 of the clock’s circle. If the minute hand goes around 60 times, the hour hand will go around (60 ÷ 12) 5 times.

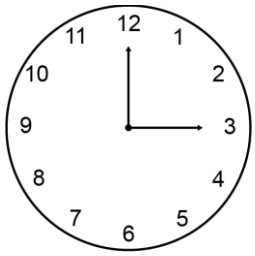


fig. 1

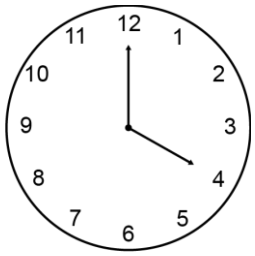
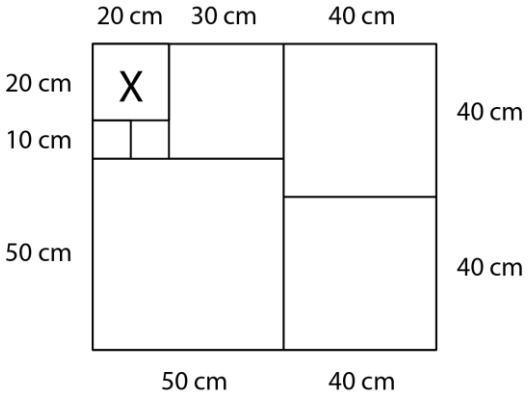


fig. 2

19. A bag contains 4 red balls, 3 green balls, and 2 blue balls. There are 9 balls in the bag. There are only 2 blue balls out 9 balls in the bag. If you randomly choose one of these balls, the probability that the ball chosen is blue is 2/9.

20. Melissa has used square tiles to completely cover a 80 cm x 90 cm rectangular surface. Starting from the two squares on the right (80 = 2 x 40), we can deduce the length of the sides of all the squares. The length of the side of tile X is 20 cm.



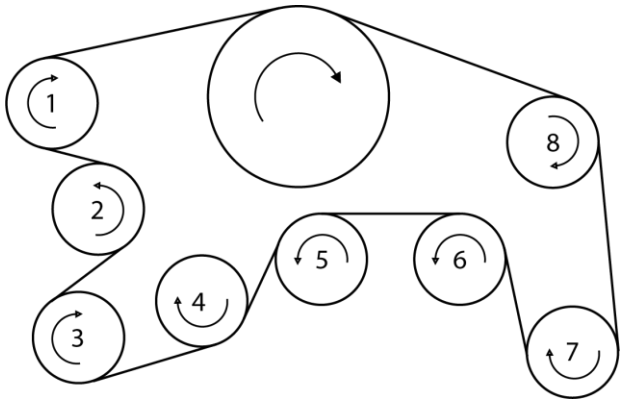
21. The factors of 3 are (1, **3**). The factors of 6 are (1, 2, **3**, 6). The factors of 12 are (1, 2, **3**, 4, 6, 12). The greatest common factor of 3, 6, and 12 is 3.

22. $1^2 = 1 \times 1 = 1$, $2^2 = 2 \times 2 = 4$, $3^2 = 3 \times 3 = 9$. The value of $4^2 + 5^2$ is $4 \times 4 + 5 \times 5 = 41$.

23. A pile of 100 identical sheets of paper is 4 cm high. The thickness of one sheet of the same paper is (4 cm ÷ 100) 0.04 cm.

24. I have $100. If I increase this amount by 50%, I will have ($100 + $50) $150. If I increase this new amount by another 50%, I will have ($150 + $75) $225.

25. When the big wheel turns in a clockwise direction, wheels 1 - 3 - 4 - 7 - 8 also turn in a clockwise direction.



26. If N is a natural number and N + 3 is an odd number, we must conclude that N is an even number. The only expression that can represent an odd number is 3 x N + 3. If N is any even number (3 x **2** + 3 = 9, 3 x **4** + 3 = 15, …) 3 x N + 3 is always odd.

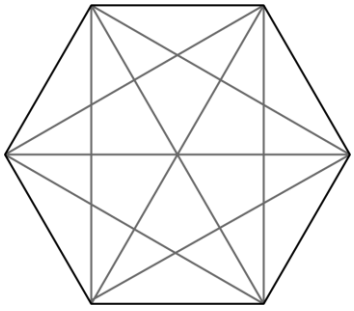
27. If the average of M, N, and P is 9, their sum is (9 x 3) 27. If M = 13, we can write that 13 + N + P = 27. From this equation, we find that the greatest possible value of P is 11 (P cannot be equal to 13).

28. N cannot be greater than 2, because the sum of the numbers M7B and 1NBN is less than 3 000. N cannot be equal to 1, because if N = 1, the minimum value of M would be 2, and the sum of the two numbers would be equal to 1 160 (which is obviously impossible). The value of letter N is 2.

$$\begin{array}{r} M\,7\,B \\ +\,1\,N\,B\,N \\ \hline N\,N\,6\,0 \end{array}$$

29. 14 = 3 + 11, 12 = 5 + 7, 24 = 11 + 13, 9 = 2 + 7, but 4 = 2 + 2.

30. You can draw 9 diagonals in an hexagon.



31. A number is divisible by 3 if the sum of its digits is divisible by 3. The number 2 682 is divisible by 3 because (2 + 6 + 8 + 2 = 18) 18 is divisible by 3.

32. April 18, 2018 will be a Wednesday. April 18, 2019 (a year later or 365 days later) will be a Thursday, because 365 = 52 x 7 + 1. April 17, 2019 will be a Wednesday.

33. The average of all the natural numbers from 1 to 9 is ((1 + 2 + 3 + 4 + **5** + 6 + 7 + 8 + 9 = 45 and 45 ÷ 9 = 5)) 5. The average of any odd number of consecutive natural numbers is always given by the natural number that is at the centre of the sequence (in this case the **5**).

34. The total amount paid ($30) being even, Mathusalem has bought an even number of $3 containers. He could not have bought 12 containers (12 x $3 = $36), he must have bought 8.