Mathematics Contest Centre

## DETAILED SOLUTIONS 2018
## PYTHAGORAS CONTEST

**1.** 2 + 0 + 1 + 8 = 11.

**2.** The solid that has 6 edges is **C** (triangular prism).

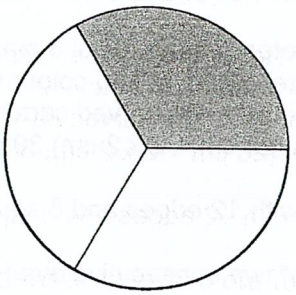
**3.** Thirty-four (34) plus twenty-six (26) is equal to 60.

**4.** You can buy (20 ÷ 6 = 3R2) three $6 cereal boxes with $20.

**5.** The sum of 1 + 2 + 3 + 4 = 5 + 6 (3 X 7 = 21) is a multiple of 7.

**6.** The sum of X + Y in the equation: 2 + 7 + X + 3 + Y -2 = 12 is (X + Y + 10 = 12) 2.

**7.** The quotient of 320 ÷ 80 is 4.

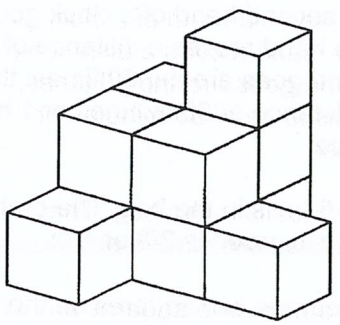


**8.** The fraction of the pie that has been eaten is 1/3.

**9.** Five dimes = 50¢ = 2 quarters. The value of the ? in the equation 10 quarters = ? quarters + 5 dimes = 10 quarters = ? quarters + 2 quarters is 8.

**10.** The double of 4 is 8. The number which is 4 less than 8 (8 - 4) is 4.

**11.** There are (2 x 4 + 3) 11 blocks in the pile.



**12.** The next term in the sequence: 2, 3, 5, 8, 12, 17, ... is (17 + 6) 23.

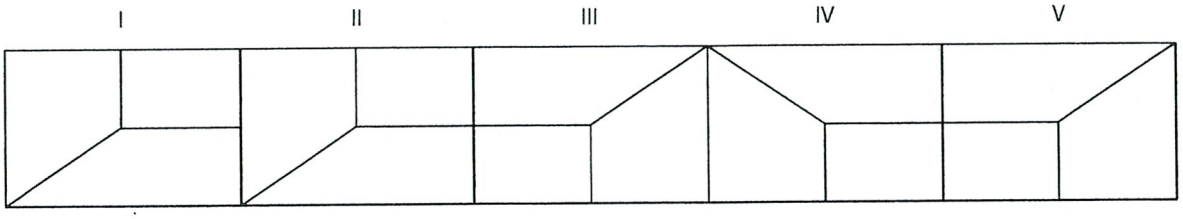
**13.** The hundreds digit in the product 10 x 15 (150) is 1.

**14.** Mathew has ((27 - 5) ÷ 2) 11 books.

**15.** The largest natural number that, when multiplied by 4, yields a result smaller than 80 is (76 ÷ 4) 19.

**16.** 100 cm = 10 x 10 cm = 10 x 1 dm = 10 dm.

**17.** Mathilda used a reflection (symmetry) to transform figure III into figure IV.




**18.** 2 hundreds (200) + 2 + 2 tens (20) is equal to (200 + 2 + 20) 222.

**19.** The number of sides (5) plus the number of angles (5) in a pentagon is equal to (5 + 5) 10.

**20.** The 8 animals have a total of (4 x 2 + 4 x 4 = 8 + 16) 24 feet.

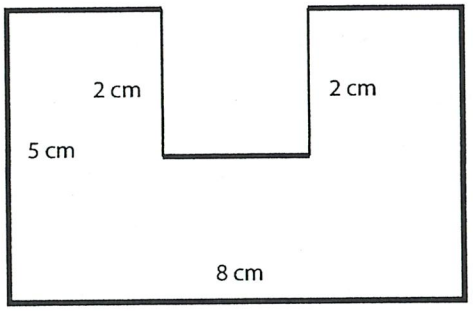
**21.** A heart beats 16 times every 15 seconds. Every minute, it beats (16 x 4) 64 times. In 2 minutes it will beat (2 x 64) 128 times. .

**22.** The time that will pass is (3 x 24 hours - 6 hours) 66 hours.

**23.** He bought an even number of $3 containers. He could not have paid a total of $40 if he had bought an odd number of $3 containers. He could not have bought 14 of these containers (14 x $3 = $42). He could have bought 10 of these containers (10 x $3 + 5 x $2 = $40).

**24.** Mathilda watched 90 minutes of a 3 hour movie. She watched 90 minutes of a (3 hours = 180 minutes) 180 minute movie. She watched 1/2 of the movie.

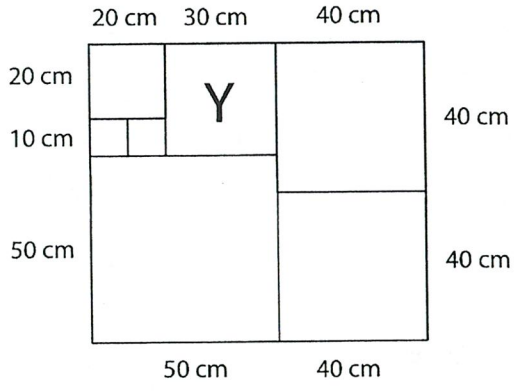
**25.** The perimeter of the original 8 cm x 5 cm rectangular carton represented in bold colour is (2 x (8 + 5) 26 cm. The perimeter of the carved carton shown in the diagram is (26 cm + 2 x 2 cm) 30 cm.




**26.** The solid with 12 edges and 6 square faces is a cube.

**27.** The sum of two consecutive even numbers is 14. The product of these two consecutive even numbers (6 and 8) is (6 x 8) 48.

**28.** When the second hand of a clock goes around once, the minute hand moves a distance of 1 minute. If the second hand goes around 60 times, the minute hand moves a distance of 60 minutes or 1 hour. It will go around once.

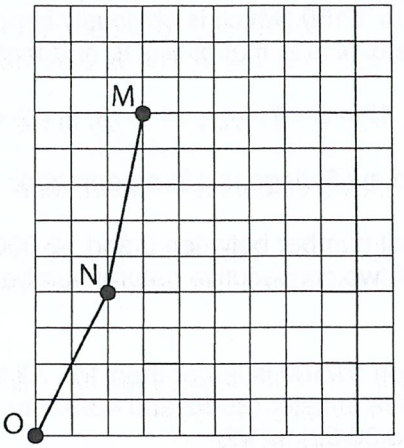



**29.** There are 6 balls in the bag. The probability that the ball chosen is green is 2/6 or 1/3.

**30.** Starting from the two squares on the right (80 = 2 x 40), we can deduce the length of the sides of every square. The perimeter of tile Y is (4 x 30 cm) 120 cm.

**31.** The numbers 3, 5, and 7 are prime numbers. Their greatest common factor is 1.

**32.** The second coordinate (called the y coordinate) of points O, N, and P is the square of the first coordinate (called the x coordinate). Indeed $0 = 0^2$, $4 = 2^2$, $9 = 3^2$. The coordinates of the next point could be (4 , 16).

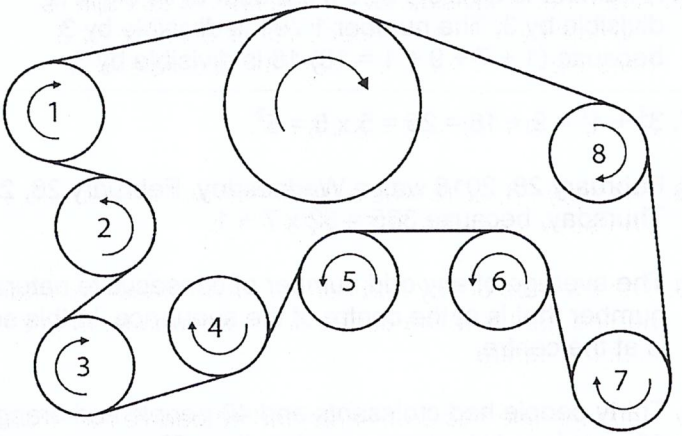



**33.** The thickness of one sheet of paper is (30 ÷ 1 000) 0.03 cm.

**34.** The natural number is 6. Adding 6 to 6 (6 + 6) is the same as doubling 6 (2 x 6).

**35.** I have $120. If I increase this amount by 50%, I will have ($120 + $60) $180. If I increase this new amount by another 50%, I will have ($180 + $90) $ 270.

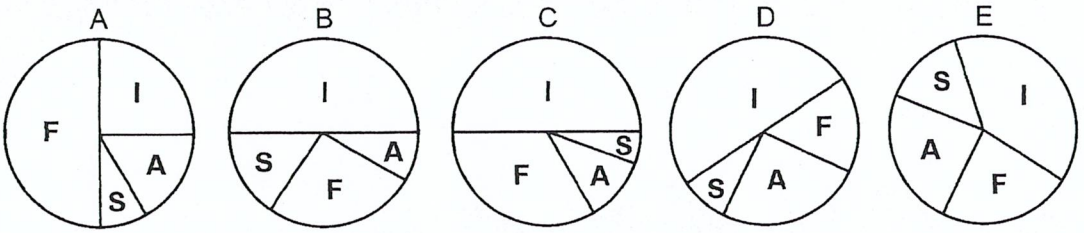
**36.** There are 2 x 5 tokens in pattern I; there are 3 x 6 tokens in pattern II; there are 4 x 7 tokens in pattern III. To form pattern IV, he will need (5 x 8) 40 tokens.




**37.** 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 + 1. If N is any even number (3 x **2** + 1 = 7, 3 x **4** + 1 = 13, ...), 3 x N + 1 is always odd.

**38.** When the big wheel turns in a clockwise direction, wheels 2 - 5 - 6 turn in a counter-clockwise direction. .

**39.** Melissa spent half of her money in Italy. Only graphs B, C, and D reflect that. It cannot be graph D because **A** should be smaller than **F**. It cannot be graph B because **A** should be larger than **S**. Graph C best represents what she spent in the four countries.




**40.** If the average of M, N, and P is 7, their sum is (9 x 3) 27. In the equation M + N + P = 21, the maximum value of M will occur when the values of N and P are minimal. If N = 1, and P = 3, the value of M is (21 - (1 + 3)) 17.

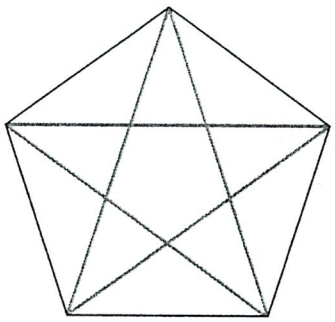
**41.** N cannot be greater than 2, because the sum of the numbers M7B and 1NBN is less than 3 000. N cannot be equal to 1, because if N = 1, the minimum value of M would be 2, and the sum of the two numbers would be equal to 1 160 (which is obviously impossible). The The value of N is 2, that of B is 8, and that of M is 9.

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

**42.** 8 = 3 + 5, 12 = 5 + 7, 24 = 11 + 13, 9 = 2 + 7, but 6 = 3 + 3.

**43.** You can draw 5 diagonals in a pentagon.

**44.** The largest number between 0 and 10 000 that is the product of two consecutive natural numbers is (99 x 100) 9 900.



**45.** The fraction 51/100 is larger than 1/2. All the other fractions are smaller (25/52 and 48/97) or equal (20/40 and 30/60) to 1/2.

**46.** A number is divisible by 3 if the sum of its digits is divisible by 3. The number 1 791 is divisible by 3 because (1 + 7 + 9 + 1 = 18) 18 is divisible by 3.

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**47.** $3^2 + 4^2 = 9 + 16 = 25 = 5 \times 5 = 5^2$.

**48.** February 28, 2018 was a Wednesday. February 28, 2019 (a year later or 365 days later) will be a Thursday, because 365 = 52 x 7 + 1.

**49.** 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 sequence of natural numbers (1 to 99) 50 is at the centre.

**50.** Thirty people had croissants and 40 people had orange juice. If 30 people only had croissants and 40 people only had orange juice, then 70 people must have had breakfast. But we know that 50 people ate breakfast, therefore we must conclude that (70 - 50) 20 people had both croissants and orange juice.