Mathematica Centrum

Together, let's shape the mathematicians of the future

PYTHAGORAS PREPARATORY TEST 2015
COMPLETE SOLUTIONS

1. The number of vertices (10) plus the number of edges (15) of a pentagonal prism is equal to 25.

2. 2 + 7 + 3 + 8 = 20.

3. The only product that is not even is 3 x 5 (the product of 2 odd numbers is always odd).

4. (1 + 2 + 3 + 4 + 5) - (4 + 3 + 2 + 1) = 5

5. The number is (48 ÷ 6) 8. The result of 8 x 3 is 24.

6. The sum of 3 + 5 + 7 + 9 is 24. The one's digit of 24 is 4.

7. The number of multiples of 5 between 10 and 30 is (30 - 10 = 20, 20 ÷ 5 = 4, and 4 - 1 = 3) 3.

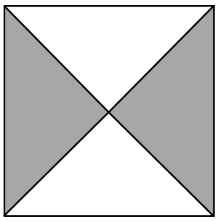
8. A quarter of an hour (15min) + half an hour (30min) + 1 hour (60min) is equal to 105 minutes.

9. Twice a number minus the same number is equal to the number. The number is equal to 10.

10. The largest 3-digit even number that can be formed using the digits 7, 5, and 4 only once is 754.

11. The fraction of the square that is shaded is 2/4 or 1/2.

12. If April 3 is a Monday, then the first of April was a Saturday. The dates of all Saturdays in the month of April are 1, 8, 15, 22, 29.

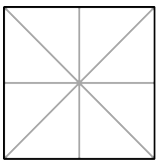


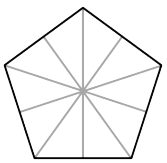
13. If you add 1 hundred + 2 tens + 26 ones to the number 121, the result will be 267.

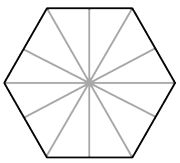
14. The equation that is false is 5¢ = 0.50$ (5¢ = 0.05$).

15. A rope 50 cm long is cut into 5 equal pieces. The length of each piece is 10 cm.

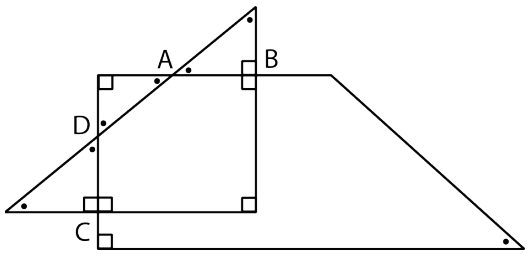
16. The number of lines of symmetry in a square (4) plus the number of lines of symmetry in a regular pentagon (5) plus the number of lines of symmetry in a regular hexagon (6) is equal to 15.





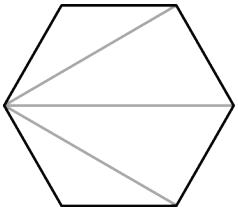


17. A right-angled triangle and a right-angled trapezium intersect at points A, B, C, and D as shown in the diagram. The number of right angles (already indicated) is 7. The number of acute angles (all indicated by dots) is 7. The number of acute angles plus the right angles shown in the diagram is 14.



18. The next number in the sequence: 30, 25, 21, 18, 16, … is 15.

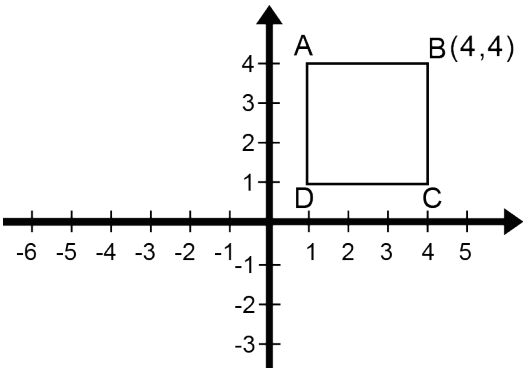
19. The sum of 1 + 2 + 3 + 4 + 5 + 6 is 21. This sum is divisible (division with no remainder) by 7.



20. The minimum number of triangles needed to form the hexagon is 4.

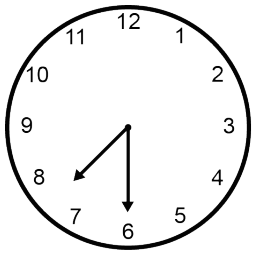
21. The average of the two prime numbers in the list: **5**, 8, 9, **13**, 18, 21 is equal to (5 + 13 = 18 and 18 ÷ 2 = 9) 9.

22. The image of vertex B will be 1 unit to the left (5 units left, then 4 units to the right) and 1 unit lower (5 units down, then 4 units up) than point B. The coordinates of this image are (3 , 3)



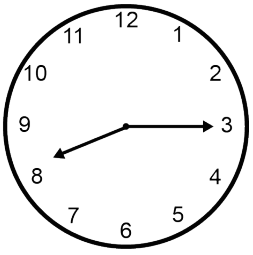
23. The smallest natural number which is a multiple of 2, 3, and 5 is (2 x 3 x 5) 30. This number (the LCM) multiplied by the fraction 2/3 is equal to (30 x 2/3) 20.

24. Four of the polygons have less than three diagonals (the triangle has no diagonal, the rectangle, the square, and the trapezium all have 2 diagonals). By the way, the square and the rectangle have two diagonals that are always of equal length.



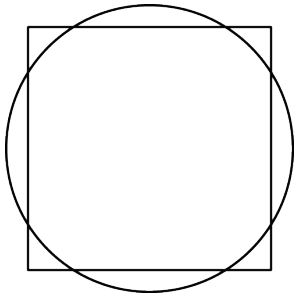
25. The factors of 6 are {1, 2, 3, 6}. The factors of 20 are {1, 2, 4, 5, 10, 20}. The factors of 36 are {1, 2, 3, 4, 6, 9, 12, 18, 36}. The number 36 has 9 factors. Numbers that are perfect squares always have an odd number of factors (do you know why?).

26. The first clock shows the beginning of the breakfast and the second one, the end of the breakfast. During these 45 minutes, the minute hand has turned (45/60 x 360º) 270º.



27. The sum of **3** 1/2 + 11/12 + **2** 1/3 is equal to (5 + 1/2 + 11/12 + 1/3 = 5 + 6/12 + 11/12 + 4/12) 6 9/12 or 6 3/4. The closest result to 6 3/4 is 7.

28. The maximum number of points at which a circle and square intersect is 8.



29. Mathew has worked 3/4 of an hour and Mathilda 2/3 of an hour. The number of minutes that one has worked more than the other is equal to (3/4 - 2/3 = 9/12 - 8/12 = 1/12 of an hour) or (1/12 x 60 minutes) 5 minutes.

30. The three series (S_1, S_2, and S_3) are shown in the diagram. There are 25 terms in each of these series. Each term in S_1 is 1 more than the corresponding term (term of the same rank) in series S_2. This implies that $S_1 > S_2$ and that $S_1 - S_2 = 25$. The answer $S_1 - S_2 = 50$ is false.

$$S_1 = 2 + 4 + 6 + 8 + \ldots + 50$$
$$S_2 = 1 + 3 + 5 + 7 + \ldots + 49$$
$$S_3 = 3 + 5 + 7 + 9 + \ldots + 51$$

31. I am a number smaller than 25. One of my factors is 3. I am an odd number and a multiple of 5. This number is a multiple of 15 because it is a multiple of 3 and a multiple of 5. This number is 15.

32. If 20% of a number is equal to 40, we know that 5/5 of this number (the number) is equal to (5 x 40) 200. If 30% of a second number is equal to 9, we know that 10% of the same number is equal to 3 and 100% of this number (the number) is equal to 30. The difference between the two numbers is (200 - 30) 170.

33. The prime factors of 30 are (2, 3, and 5). The sum of all the prime factors of 30 is (2 + 3 + 5) 10.

34. The sum of the numbers of its 6th line is (2 x 1 + 2 x 5 + 2 x 10) 32. Look carefully at this triangle and you will make surprising discoveries. For example, the third column contains the sequence of triangular numbers: 1, 3, 6, … . The 4th column contains the sequence of tetrahedral numbers: 1, 4, 10, … .

1					
1	1				
1	2	1			
1	3	3	1		
1	4	6	4	1	
1	5	10	10	5	1

35. The expression 1/3 + 1/4 ÷ 1/5 yields the greatest result and this result is equal to (1/3 + 1/4 x 5/1 = 1/3 + 5/4 = 4/12 + 15/12) 19/12.