Mathematica Centrum

Together, let's shape the mathematicians of the future

PREPARATORY TEST 2009
COMPLETE SOLUTIONS

THALES (3rd) – BYRON-GERMAIN (4th) – FIBONACCI(5th) – PYTHAGORAS (6th)

1. The number of faces (5) plus the number of edges (9) of a triangular prism is equal to 14.

2. A natural number is multiplied by 8. The result could not be 63.

3. Half of 20 is 10. The double of 10 is equal to 20.

4. Round 5 426 to the nearest hundred. The answer is 5 400.

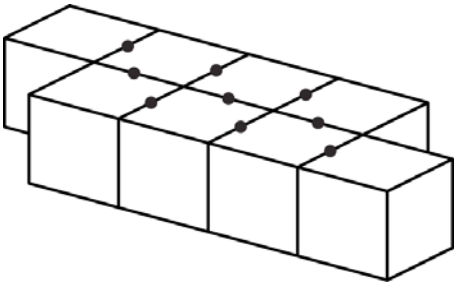
5. The number of sides of a trapezium (4) plus the number of vertices of a cube (8) minus the number of lines of symmetry of a square (4) is equal to 8.

6. The number of minutes in 3 hours is (3 x 60) 180.

7. The largest of the 5 following numbers: 12.010, 12.027, 12.043, 12.067, and 12.080 is 12.080.

8. 10 ones (10) plus 3 hundreds (300) plus 13 tens (130) is equal to (10 + 300 + 130) 440.

9. Each dot in the diagram accounts for 2 glued faces.
In all, there are (9 x 2) 18 faces that have glue on them?



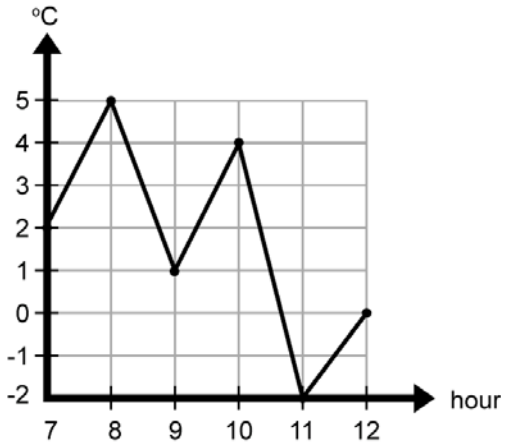
10. Solids 3 and 4 can slide but cannot roll because all their faces are plane. Solids 1 and 2 can slide and roll because they have plane faces as well as curved faces.

1 2 3 4

11. There are 9 natural numbers between 1 and 30 that are divisible by 3 (3, 6, 9, 12, 15, 18, 21, 24, and 27).

12. The next group of letters in the sequence: **A**BCD, **B**CDE, **C**DEF, … is **D**EFG.

13. The temperature recorded at 8 A.M. is 5 degrees. The one recorded at 9 A.M. is 1 degree. The difference between these two temperatures is (5 - 1) 4 degrees.

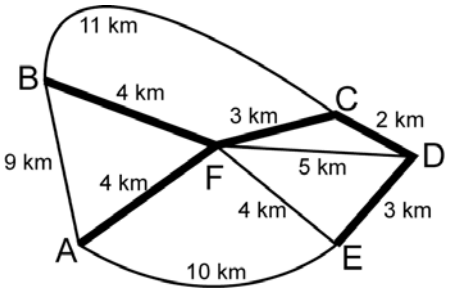


14. If the perimeter measures 100 m, the side is 25 m long.

15. There are 36 possible combinations (1-1, 1-2, 1-3, … 1-6, 2-1, 2-2, 2-3, …2-6, … 6-1, 6-2, 6-3, 6-4, 6-5, and 6-6). Only the combinations 5-6, 6-5, and 6-6 will give a sum that is greater than 10.

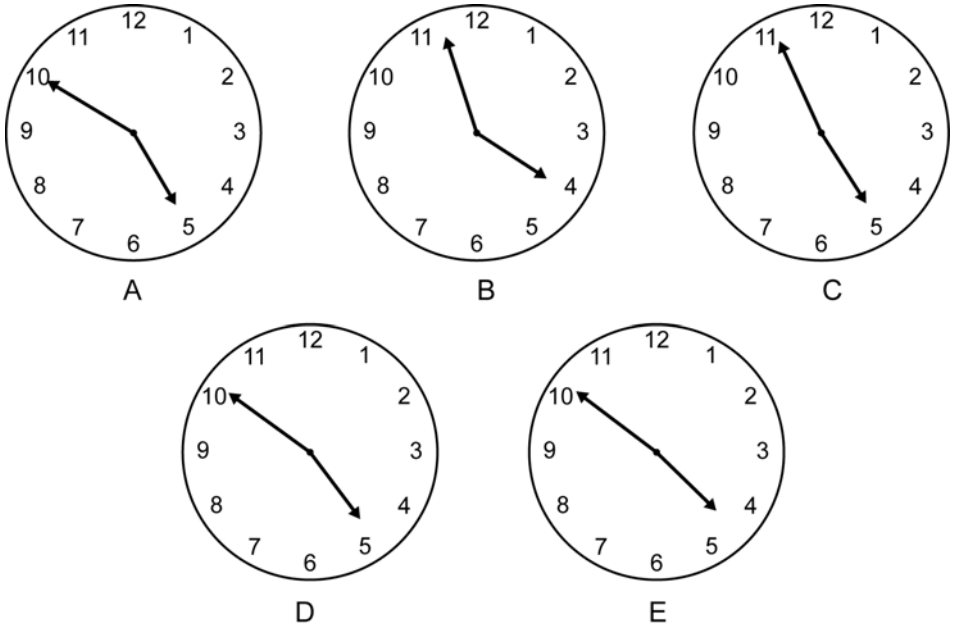
16. The mode of a set is the element of the set which occurs most often. Only 4 and 6 can represent the mode. If 4 is added to the set, the average becomes (2 + 4 + 4 + 4 + 6 + 6 + 9 + 11 = 46 and 46 ÷ 8 = 5.75) 5.75. If 6 is added to the set, the average and the mode will both be 6.

17. The path of the shortest distance is represented in bold type in the diagram. Starting from A, the salesman will have to drive to F, then to B. He will have to come back to F and then drive to C, D, and E. He will drive a total of (4 + 4 + 4 + 3 + 2 + 3) 20 km.



18. Mathew has scored an average of 32 goals during his last 4 seasons of soccer. He has scored a total of (4 x 32) 128 goals during these 4 seasons. If he wants to keep a minimum average of 28 goals per season for the 5 seasons, he will have to have scored a total of 140 goals. He must score (140 - 128) 12 goals or more this season if he wants to keep an average that is equal to or greater than 28 goals per season for the 5 seasons.

19. Clock D shows the right time.



20. Mathilda obtained a grade of 64% on a test of 25 questions. She obtained (64/100 = 16/25) 16 correct answers out of a total of 25 questions.

21. The expression 1/4 < 0.24 is false because 1/4 = 25/100 = 0.25 and 0.25 > 0.24.

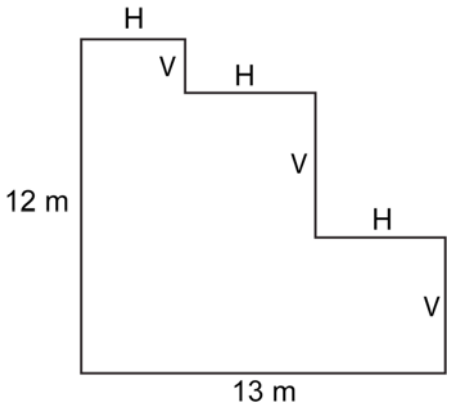
22. The value of N in the equation: 7 x 5 x 9 ÷ N = 7 x 9 is 5 because when N is equal to 5, the expression 7 x 5 x 9 ÷ N becomes 7 x 5 x 9 ÷ 5, then becomes 7 x 9 x 5 ÷ 5, then 7 x 9 x 1, and finally 7 x 9.

23. The factors of 10 are 1, 2, 5, and 10. The product of all the factors of 10 (1 x 2 x 5 x 10) is equal to 100.

24. If you throw the dice 66 times, you could expect to get an even number (1 time out of every 2) which is 33 times.

25. There are (2, 3, 5, and 7) 4 prime numbers between 1 and 10.

26. The length of the 3 horizontal (H) line segments is equal to 13. The length of the 3 vertical (V) line segments is equal to 12. The perimeter of the figure is equal to (12 + 12 + 13 + 13) 50 m.



27. There are 9 small triangles, 3 medium triangles (each one formed by 4 small triangles (fig. 1)), and 1 large triangle formed by 9 small triangles (fig. 2). In all, you can count (9 + 3 + 1) 13 equilateral triangles.

28. $1 + 10 + 10^2 + 10^3 = 1\,000 + 100 + 10 + 1 = 1\,111$.

29. The number 216 is the cube of 6 (6 x 6 x 6).

30. Any number that can be represented as the product of two or more prime factors is a composite number (any number that is not prime). Between 1 and 10, there are (2, 3, 5, and 7) 4 prime numbers. All other natural numbers between 1 and 10 are composite numbers. There are (8 - 4) composite numbers between 1 and 10 (4, 6, 8, and 9).

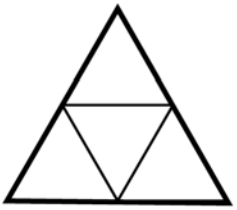


fig. 1

31. Olive lists all the natural numbers from 1 to 50 (25 odd and 25 even). She then erases 20 even numbers from this list. There are (25 - 20) 5 even and 25 odd numbers left. These 5 even numbers represent 5/30 or 1/6 of the remaining numbers.

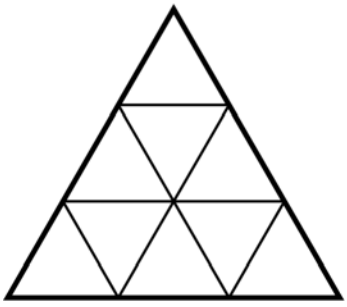


fig. 2

32. A number divided by 3 gives 6. This number is (6 x 3) 18. The same number (18) subtracted from 24 (24 - 18) gives 6.

33. Of all the choices, only January has 31 days?