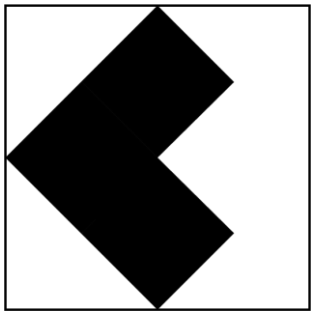
Mathematica Centrum

Together, let's shape the mathematicians of the future

PYTHAGORAS PREPARATORY TEST 2020
DETAILED SOLUTIONS

1. 734 - 530 = 204.

2. If 5 is subtracted from this number (16 - 5), the result is 11.

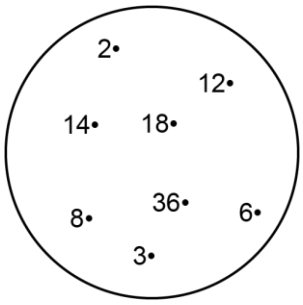


3. The fifth letter after the ninth letter of the alphabet is the letter (5 + 9 = 14th letter) n.

4. The sum of X + Y is (25 + 30) 55.

5. 10 x 5¢ = 2 x 25¢ + 0 dimes.

6. Draw the two diagonals of the large square. The large square can be divided in 16 small triangles, just like the ones (6) you see after having drawn the two diagonals. The shaded area represents (6/16) or 3/8 of the large square.

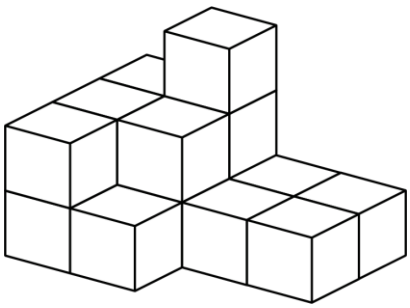


7. The elements 2, 3, 6, 8, 12, and 36 are divisors of 36.

8. One half of one half of 20 plus 3 is equal to (1/2 x 1/2 x 20 + 3) 8.

9. There are 16 blocks in the pile.

10. The number of faces of a cube (6) plus the number of vertices of a cone (1) plus the number of sides of an hexagon (6) is equal to 13.

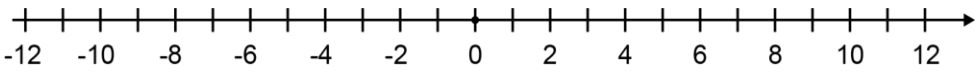


11. The units digit of an odd number is odd. There are only two 3-digit natural numbers that can be formed using the digits 2, 7, and 8. These numbers are 287 and 827.

12. A round pizza is cut through its centre. There are 2 pieces of pizza after one cut. There are 4 pieces of pizza after 2 cuts. There are 6 pieces after 3 cuts. Sixteen (16) pieces of pizza (8 x 2) can be eaten, if it is cut 8 times.

13. 10 cm = 1 dm.

14. The final temperature after 9 days was (9 - (2 x 6) + (3 x 3)) or (9 - 12 + 9 = 18 -12) 6 degrees.

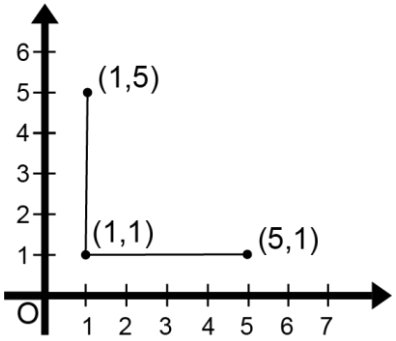


15. How many odd natural numbers are there between 1 and 4? There is only one (3). How many are there between 1 and 6? There are two (3 and 5) How many are there between 1 and 12? There are (((12 - 1) -1) ÷ 2) five odd natural numbers between 1 and 12 (3, 5, 7, 9, and 11) There are (((150 - 99) - 1) ÷ 2) 25 odd natural numbers between 99 and 150.

16. The heart beats twice every second. In 1 minute or 60 seconds, it beats (60 x 2) 120 times.

17. When a natural number is divided by 3, the remainder is odd. This number could not be 5 because when 5 is divided by 3, the remainder is even (5 ÷ 3 = 1R2). When all the other numbers are divided by 3, the remainder is odd (1).

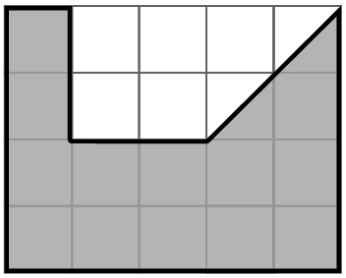
18. The $\sqrt{25} = 5$.



19. With 2 oranges, you can prepare 120 ml of juice. Each orange gives 60 ml of juice. You need (720 ÷ 60 or 72 ÷ 6) 12 oranges to prepare 720 ml of juice.

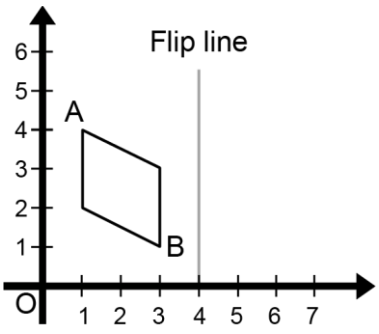
20. The points (2, 4) and (6, 4) are on the same vertical straight line.

21. Mathilda adds up all the natural numbers from 1 to 10 and obtains a sum S of (5 x 11) 55. Then she adds up two even numbers between 1 and 10 and gets a sum s that is even. The number S - s is (odd number - even number) odd. The value of S - s could not be 44.



22. The area of the shaded surface is equal to 14 cm^2.

23. The sum of the ages of Mathilda, Mathew, and Mathusalem is 40 years. Mathew is 13 years old and is the second oldest. From this information, we can infer that the sum of the ages of Mathusalem and Mathilda is 27 years. If Mathusalem is 13 years older than Mathilda, then Mathilda is ((27 -13) ÷ 2) 7 years old. The sum of the ages of Mathew and Mathilda is (13 + 7) 20 years.



24. The images of points A and B after the reflection are respectively, (7,4) and (5,1).

25. A watch loses 2 minutes every hour. In 24 hours, it lost (24 x 2) 48 minutes. Presently, the watch should be showing a time of (9:30 + 0:48) 10:18. Therefore 24 hours ago, the watch must have shown the same exact time of 10:18.

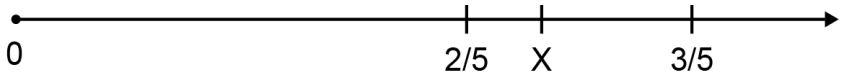
26. Every 5 minutes, the animal breathes for 2 minutes. In those 2 minutes, it breathes (60 x 2) 120 times. In a period of 1 hour or 60 minutes, it will breathe ((60 ÷ 5) x 120) 1 440 times.

27. The prime numbers between 1 and 40 that have a ones digit that is a 3 are 3, 13, 23. The number 33 is not a prime number.

28. If n x 10% = 30, the value of n is (10 x 30) 300.

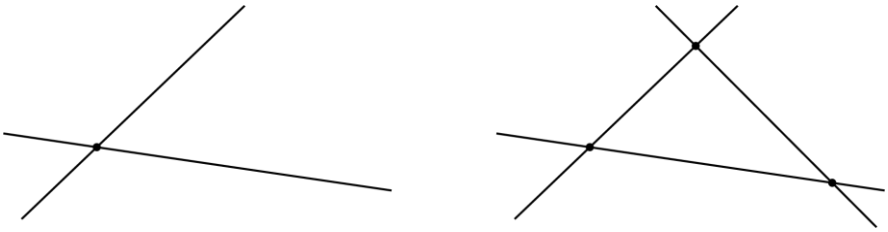
29. The average of 0, 1, **2**, 3, and 4 is ((0 + 1 + 2 + 3 + 4) ÷ 5) 2. This is the number that is exactly in the middle of the sequence of the 5 consecutive natural numbers.

30. The distance between 2/5 and 3/5 is 1/5. The fraction X lies at a distance of (3/8 x 1/5) 3/40 from the fraction 2/5 (16/40). The fraction X is equal to (3/40 + 16/40) 19/40.



31. The number 17 has the least number of factors because it is a prime number. A prime number has only 2 factors, 1 and itself.

32. The maximum number of points at which 4 straight lines can intersect is 6 (see diagram) because the fourth line will intersect the other 3 lines at a maximum of 3 points. The maximum number of points at which 4 straight intersect is (3 + 3) 6 points. Another way to solve this problem is to identify a sequence. Two lines intersect at a maximum of 1 point. Three lines intersect at a maximum of 3 points (2 more than two lines). Four lines intersect at a maximum of 6 points (3 more than three lines). We can readily say that five straight lines will intersect at a maximum of (6 + 4) 10 points.



33. A prime factor is a factor or divisor that is a prime number. The factors of 6 are {1, 2, 3, 6}. The number 6 has two prime factors (2 and 3). The number 8 has one prime factor (2). The number 10 has two prime factors (2 and 5). The largest prime factor of the product 6 x 8 x 10 is 5.