Mathematica Centrum

Together, let's shape the mathematicians of the future

Pythagoras 2020 contest

April 22, 2020

Time: 1h 15 min

Calculators are not permitted

Instructions

1. You must wait for the contest supervisor's signal before starting the contest.

2. You may use scrap paper, a ruler and a compass to do your work.

3. Be sure that you understand the coding system of the response form. If you have any questions, ask the contest supervisor. Verify that you have received the response form with the title **Pythagoras Contest.**

4. This contest is composed of 50 multiple choice questions. Each question is followed by 5 possible answers: A, B, C, D, and E. There is only one correct answer. When you make your choice, record your answer by filling in the appropriate circle.

5. If you change an answer, make sure to erase your first answer completely.

6. Each correct answer is worth one point. Incorrect answers will not be penalised.

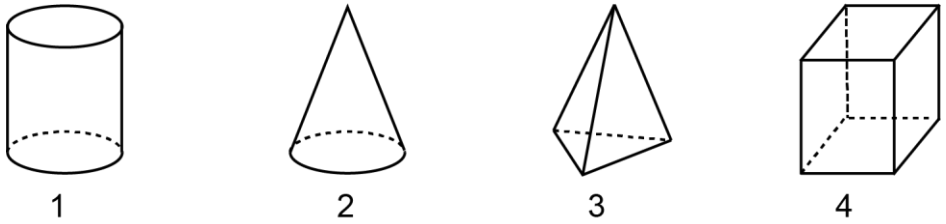
7. After the supervisor's signal, you will have exactly 75 minutes to finish. Do not lose time on a specific problem; move on to the next one.

8. When you are finished, give the question booklet and the response form to the contest supervisor.

1. 764 - 532 = ?

A) 232 B) 231 C) 233 D) 230 E) 332

2. How many of the solids shown can roll when put in movement?



A) 1 and 3 B) 1 and 2 C) 3 and 4 D) 2 and 4 E) 1 and 4

3. A number divided by 5 gives 5. If 10 is subtracted from this number, the result will be

A) 10 B) 15 C) 20 D) 5 E) 25

4. The sum of 7 + 7 + 7 + 7 is

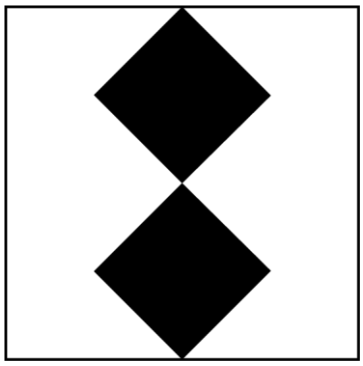
A) 21 B) 35 C) 28 D) 27 E) 29

5. The sixth letter after the tenth letter of the alphabet is the letter

A) m B) n C) o D) p E) q

6. What is the sum of the 3 unknown terms (X, Y, and Z) in the sequence: 5, 10, 15, 20, X, Y, Z, 40 …?

A) 75 B) 80 C) 85
D) 90 E) 95



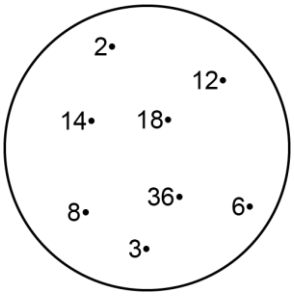
7. 20 nickels = 2 quarters + ? dimes.

A) 10 B) 4 C) 5
D) 6 E) 3

8. What fraction of the larger square do the shaded squares represent?

A) 1/6 B) 1/5 C) 1/4
D) 1/3 E) 1/2

9. How many elements of the set shown are divisors of 24?

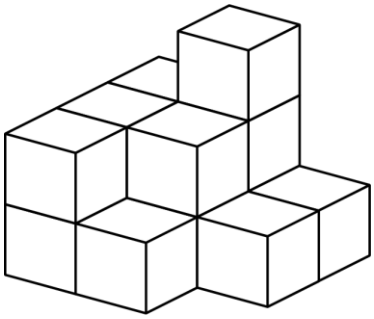


A) 1 B) 2 C) 3
D) 4 E) 5

10. One half of one half of 40 is less than

A) 7 B) 8 C) 9
D) 11 E) 10

11. How many blocks are there in the pile?

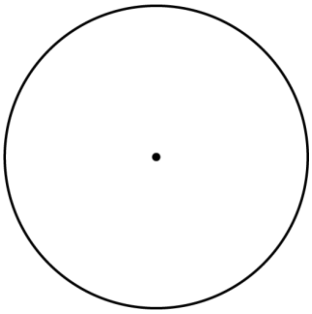


A) 10 B) 12 C) 16
D) 13 E) 14

12. The number of faces of a cube plus the number of vertices of a cone plus the number of sides of a pentagon is equal to

A) 12 B) 13 C) 11
D) 10 E) 14

13. How many even 3-digit natural numbers can be formed using the digits 2, 7, and 8?



A) 4 B) 5 C) 3
D) 2 E) 6

14. The value of the unknown number in the equation $16 \div ? = 1 \times ?$ could be

A) 6 B) 2 C) 3
D) 4 E) 8

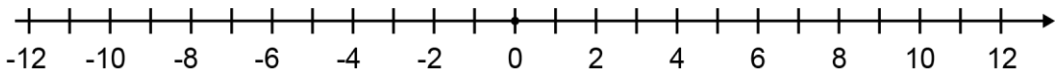
15. A round pizza is cut through its centre. How many pieces of pizza can be eaten, if it is cut 7 times?

A) 8 B) 16 C) 14 D) 12 E) 18

16. 100 cm = ? dm

A) 100 B) 50 C) 1 000 D) 1 E) 10

17. The initial temperature in a northern city was 11 degrees. If the temperature decreased by 3 degrees each day for 6 consecutive days, then increased by 2 degrees each day for 3 consecutive days, what was the final temperature after 9 days?



A) 0 degree B) -1 degree C) -2 degrees D) 2 degrees E) 3 degrees

18. The number that is equal to 15 tens is

A) 1 500 B) 15 C) 150 D) 1 505 E) 151

19. How many natural numbers between 99 and 150 are even?

A) 21 B) 22 C) 23 D) 24 E) 25

20. Which of the following is the largest?

A) $1 \times 2 \times 3$ B) $4!$ C) $2! \times 3!$ D) $2!$ E) $3 \times 3!$

21. Which of the following is closest to 1 000 hours?

A) 38 days B) 42 days C) 39 days D) 50 days E) 40 days

22. The multiplication below shows that when a 3-digit number 2N5 is multiplied by 4, the result is another 3-digit number 86M. The value of M + N in this equation is

$$2N5 \times 4 = 86M$$

A) 1 B) 2 C) 3 D) 4 E) 5

23. If a heart beats 10 times in 8 seconds, how many times does it beat in 1 minute?

A) 70 times B) 80 times C) 60 times D) 75 times E) 90 times

24. When a natural number is divided by 3, the remainder is even. This number could not be

A) 23 B) 8 C) 11 D) 20 E) 13

25. Use the information below to find the unknown value.

$$\sqrt{4} = 2,\ \sqrt{9} = 3,\ \sqrt{16} = 4,\ \sqrt{81} = ?$$

A) 8 B) 9 C) 10 D) 11 E) 7

26. With 2 oranges you can prepare 150 ml of juice. How many oranges do you need to prepare 750 ml of juice?

A) 10 B) 9 C) 11 D) 7 E) 8

27. A party starts at 9:45 and lasts 2h 20min. At what time does it end?

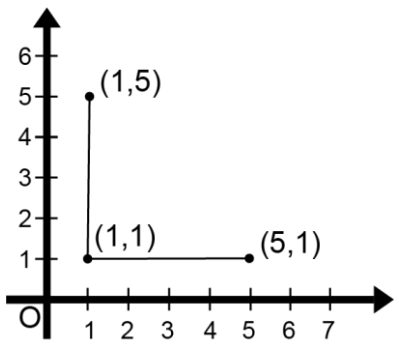
A) 12:00 B) 11:55 C) 12:05 D) 12:10 E) 12:20

28. A new school has built lockers for its students. All the digits from 0 to 9, together with the letters A to Y, have been used to identify the lockers. Only 4 digits have been used to identify the lockers with the letter Z. How many lockers have been built in this school, if each locker is identified by one letter and one digit?

A) 239 B) 238 C) 245 D) 254 E) 246

29. How many of the following points: (2, 0), (2, 4), (4, 6), (6, 4), and (6, 3) are on the same horizontal straight line?

A) 2 B) 3 C) 4
D) 5 E) 0



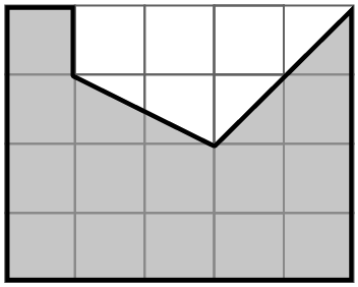
30. The sum of all the natural numbers from 1 to 100 is 5 050. What is the sum of all the natural numbers from 11 to 101?

A) 5 000 B) 5 098 C) 4 995
D) 5 096 E) 5 100

31. Mathilda adds up all the natural numbers from 1 to 10 and obtains a sum of S. Then she adds up an even number and an odd number between 1 and 10 and gets a sum of s. Which of the following could not be the value of S - s?

A) 46 B) 36 C) 38
D) 45 E) 44

32. What is the area of the shaded surface, if the area of a small square is equal to 1 cm^2?



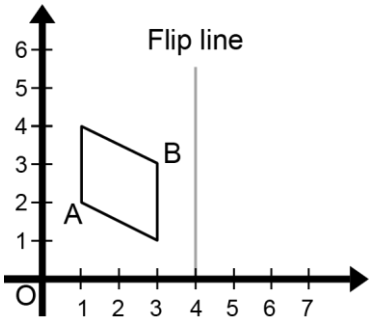
A) 18 cm^2 B) 14 cm^2 C) 15 cm^2
D) 17 cm^2 E) 16 cm^2

33. The product of 9 x 99.99 is equal to

A) 900.81 B) 1 000.91 C) 899.91
D) 999.91 E) 1 000

34. The sum of the ages of Mathilda, Mathew, and Mathusalem is 43 years. Mathew is 13 years old and is the second oldest. If Mathusalem is 10 years older than Mathilda, what is the sum of the ages of Mathew and Mathilda?

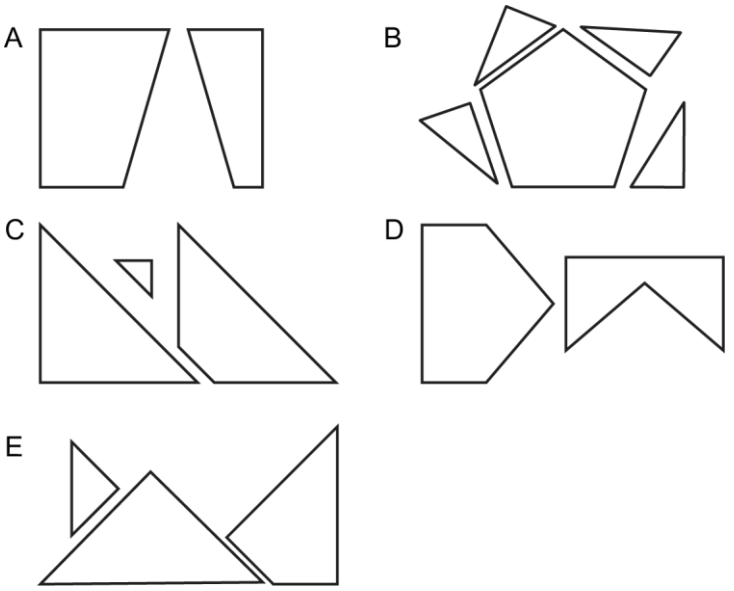
A) 23 years B) 30 years C) 33 years
D) 24 years E) 26 years



35. The images of points A and B (shown above to the right) after the reflection are respectively,

A) (7,3) and (5,2) B) (7,3) and (5,3) C) (7,2) and (6,3) D) (6,3) and (5,3) E) (7,2) and (5,3)

36. Five sets of geometrical figures are shown below. Which set of figures cannot be put together to form a perfect square?



37. Flower F measures 15 cm and flower G measures 8 cm. Flower G grows at a rate of 4 cm per week, while flower F grows at a rate of 3 cm per week. If each flower continues to grow at its own rate, in how many weeks will they attain the same height?

A) 8 B) 9 C) 6 D) 5 E) 7

38. A watch loses 3 minutes every hour. If it presently shows 9:30, what time did it show exactly 24 hours ago?

A) 10:52 B) 10:42 C) 8 :40 D) 8:42 E) 11:00

39. When a number is divided by 10, the remainder is 8. When it is divided by 100, the remainder is 78. When it is divided by 1 000, the remainder is 578. Which of the following could be that number?

A) 4 538 B) 6 875 C) 7 578 D) 1 875 E) 16

40. An animal breathes for 3 minutes, then stops breathing for 3 minutes. When it breathes, it breathes at a rate of 60 times per minute. At this rate, how many times will it breathe during a period of one hour?

A) 1 800 times B) 10 800 times C) 800 times D) 8 000 times E) 900 times

41. How many prime numbers between 1 and 50 have a ones digit that is a 3?

A) 1 B) 2 C) 3 D) 4 E) 5

42. If n x 10% = 20, what is the value of n?

A) 200 B) 250 C) 240 D) 100 E) 2 000

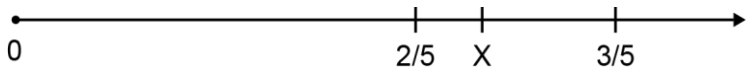
43. The next term in the sequence: 0, 3, 6, 9, 18, … is

A) 19 B) 15 C) 36 D) 20 E) 21

44. What is the average of 1, 2, 3, 4, and 5?

A) 4 B) 3.5 C) 2 D) 2.8 E) 3

45. What fraction X lies at 1/3 of the distance between 2/5 and 3/5?



A) 1/2 B) 7/15 C) 9/20 D) 9/25 E) 3/4

46. Which of the following has the least number of factors?

A) 9 B) 10 C) 11 D) 12 E) 15

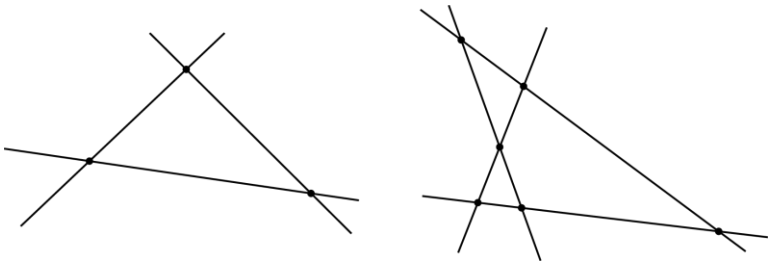
47. The average of 5 consecutive odd numbers is 17. The largest of these numbers is

A) 17 B) 19 C) 21 D) 23 E) 25

48. What is the smallest prime factor of the product 10 x 20 x 30?

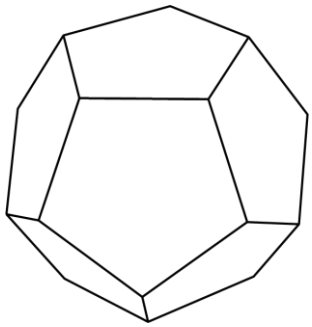
A) 1 B) 2 C) 3 D) 4 E) 5

49. The maximum number of points at which 2 straight lines can intersect is 1. Three straight lines can intersect at a maximum of 3 points and four straight lines at a maximum of 6. What is the maximum number of points at which 5 straight lines can intersect?



A) 12 B) 8 C) 9 D) 10 E) 11

50. A regular dodecahedron is a solid that has 12 pentagonal plane faces. How many edges could you count on this solid?



A) 56 B) 32 C) 28 D) 60 E) 30

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Name: _____ Contest: _____

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2	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	12	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	22	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	32	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	42	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
3	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	13	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	23	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	33	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	43	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
4	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	14	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	24	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	34	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	44	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
5	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	15	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	25	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	35	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	45	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
6	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	16	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	26	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	36	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	46	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
7	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	17	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	27	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	37	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	47	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
8	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	18	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	28	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	38	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	48	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
9	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	19	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	29	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	39	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	49	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
10	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	20	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	30	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	40	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	50	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ