

11th Pangea Mathematics Competition 2018

Semifinal-Grade 3

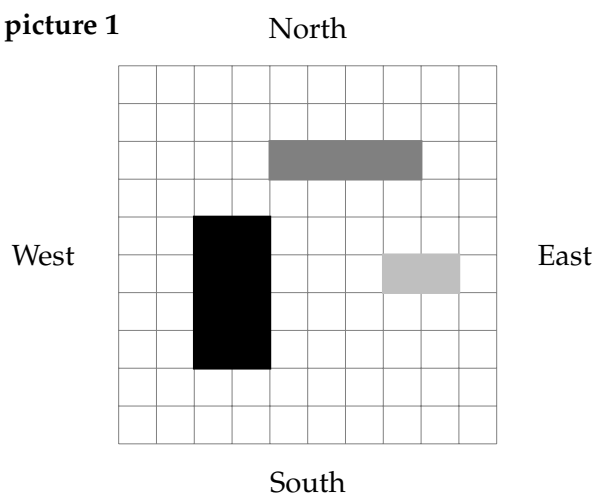
3-Point-Tasks

1. Anton, Bea and Carl are all together 21 years old. Find their age in three years.

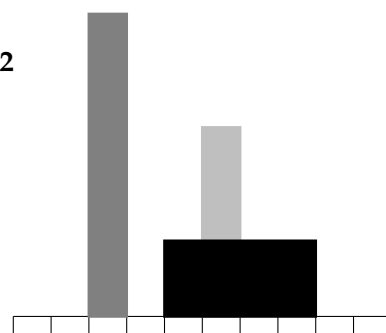
- a) 24 b) 27 c) 29 d) 30 e) 33
-

2. In picture 1 you see the top view of three cuboids (black, grey and light grey). From which direction do you see the three cuboids in picture 2?

picture 1



picture 2



- a) from the north b) from the east c) from the south d) from the west e) cannot be determined
-

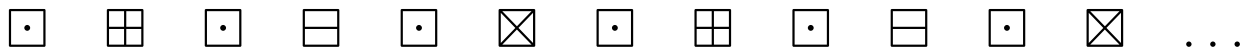
4-Point-Tasks

3. In class 3c are 15 children. Classroom teacher Mrs Meier brings a bag with 0 candies to class. Then she says: „Everyone is allowed to take only one, two or three candies.“
How many children are allowed to take three candies at most when all other children get at least one candy?

- a) 4 b) 5 c) 6 d) 7 e) 8
-

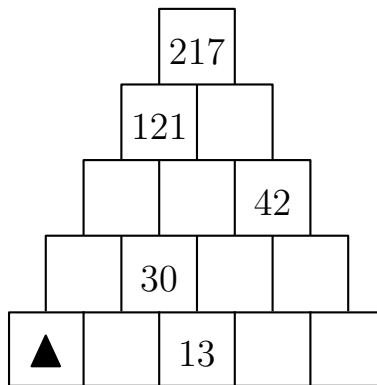
4. The following pattern is always repeated after six symbols.

Which are the 50th and 51st symbols?



- a) b) c) d) e)

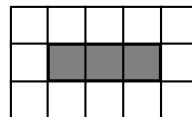
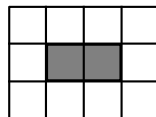
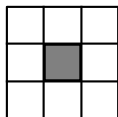
5. Here you see an incomplete number wall. Which number is represented by ▲?



- a) 18 b) 19 c) 20 d) 21 e) 22

5-Point-Tasks

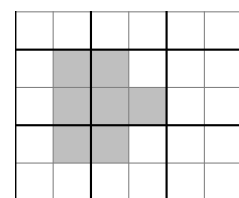
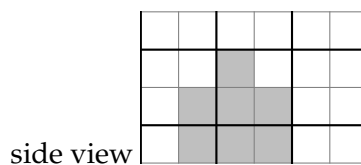
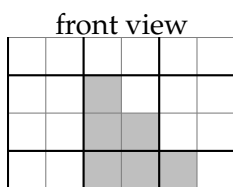
6. How many white squares surround 15 grey squares?



und so weiter

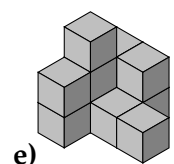
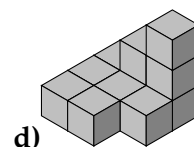
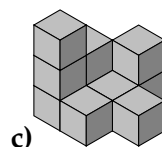
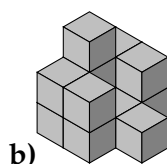
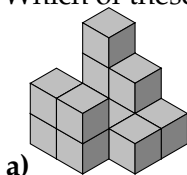
- a) 30 b) 34 c) 36 d) 51 e) 60

7. Here you see the front view, side view and the supervision of a cube that is built up out of small cubes.



supervision

Which of these cubes fits to all three views?



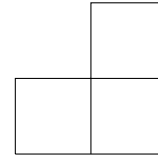
8. $\triangle \nabla$ and $\triangleleft \triangleright$ are different 2-digit numbers with different digits greater than 0. Assume that $\triangle \nabla + \triangleleft \triangleright = 100$. Find $\triangle + \nabla + \triangleleft + \triangleright$.

a) 1 b) 10 c) 17 d) 19 e) 20

9. Here you see all possible different square triplets. They are different because you cannot put them congruent on top of each other when you cut them out.



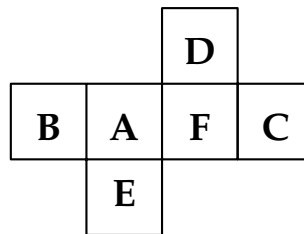
If you put four squares together, you get one square-quadrangles. How many different square-quadrangles are possible?



(Note: Each two squares must be adjacent to each other with a complete side)

a) 2 b) 4 c) 5 d) 6 e) 8

10. In the diagram you see the net of a cube. Which letter stands opposite to **D** if you fold the net to a real cube?



a) A b) B c) C d) E e) F

11th Pangea Mathematics Competition 2018

Semifinal-Grade 4

3-Point-Tasks

1. Which of the following calculations is incorrect?

- a) $145 \cdot 9 = 1305$ b) $216 \cdot 9 = 1944$ c) $704 \cdot 9 = 6336$ d) $809 \cdot 9 = 7381$ e) $999 \cdot 9 = 8991$

2. $\triangle \nabla$ and $\triangleleft \triangleright$ are different 2-digit numbers with different digits greater than 0. Assume that $\triangle \nabla + \triangleleft \triangleright = 100$. Find $\triangle + \nabla + \triangleleft + \triangleright$.

- a) 1 b) 10 c) 17 d) 19 e) 20

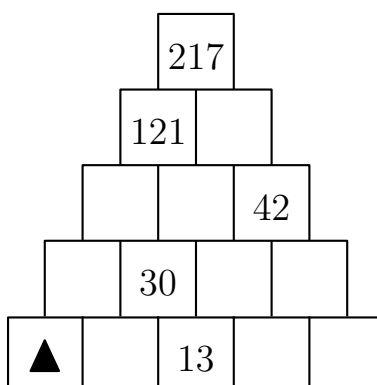
4-Point-Tasks

3. Simple Sudoku: In every row and column the numbers 1 to 5 are allowed to appear only once. Which number represents the black triangle ▲?

	2		5	
	3		2	
1				4
		▲	4	3
5				

- a) 1 b) 2 c) 3 d) 4 e) 5

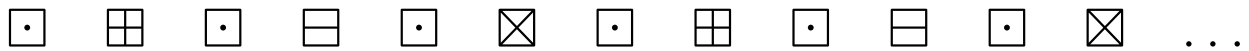
4. Here you see an incomplete number wall. Which number is represented by ▲?



- a) 18 b) 19 c) 20 d) 21 e) 22

5. The following pattern is always repeated after six symbols.

Which are the 50th and 51st symbols?



- a) b) c) d) e)

5-Point-Tasks

6. To harvest the apples at Farmer Müller’s farm, 20 helpers need 4 days. But on harvest day only 16 helpers come.

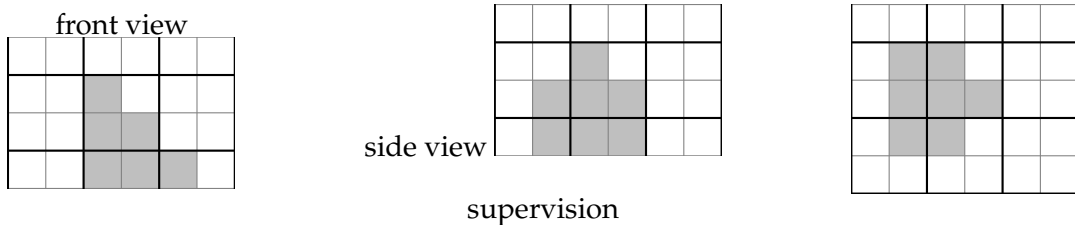
How many days do the 16 helpers need to collect in the harvest?

- a) 3 days b) 4 days c) 5 days d) 6 days e) 8 days

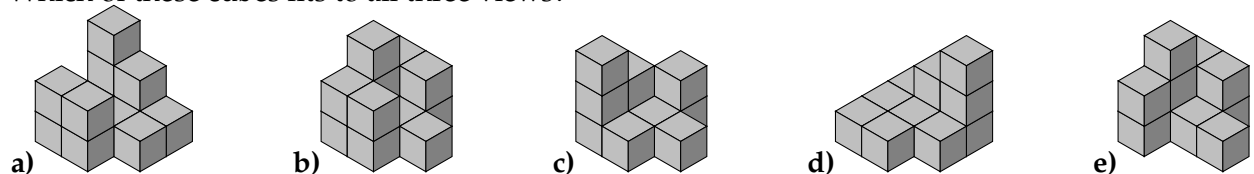
7. Pizzeria Roma sells pizzas with tomato sauce and cheese. Customers can choose mushrooms, pineapple and ham as an extra treat. Each additional covering costs 1 euro extra. How many different pizzas can the customers put together?

- a) 3 b) 4 c) 6 d) 7 e) 8

8. Here you see the front view, side view and the supervision of a cube that is built up out of small cubes.



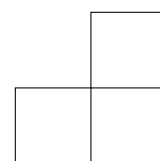
Which of these cubes fits to all three views?



9. Here you see all possible different square triplets. They are different because you cannot put them congruent on top of each other when you cut them out.

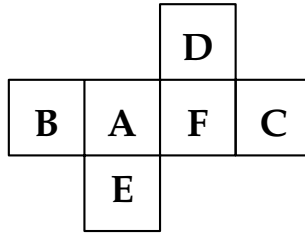
If you put four squares together, you get one square-quadrangle. How many different square-quadrangles are possible?

(Note: Each two squares must be adjacent to each other with a complete side)



- a) 2 b) 4 c) 5 d) 6 e) 8

10. Pictured is the net of a cube. Which letter is opposite **D** when you fold the net into a cube?



a) A

b) B

c) C

d) E

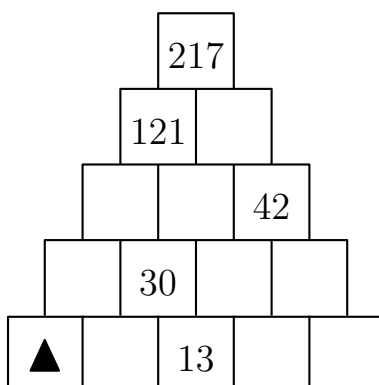
e) F

11th Pangea Mathematics Competition 2018

Semifinal-Klasse 5

3-Point-Tasks

1. Here you see an incomplete number wall. Which number is represented by ▲?



- a) 18 b) 19 c) 20 d) 21 e) 22

2. A water tank contains 360 litres of water when it is a quarter full. How many litres of water does the water tank contain when it is a quarter empty?

- a) 360 litres b) 720 litres c) 750 litres d) 1080 litres e) 1440 litres

3. \triangle and ∇ are different 2-digit numbers with different digits greater than 0. Assume that $\triangle + \nabla + \triangle + \nabla = 100$. Find $\triangle + \nabla$.

- a) 1 b) 10 c) 17 d) 19 e) 20

4-Point-Tasks

4. We are looking for three-digit numbers, where the sum of the first two digits gives the third digit. Example: 257, $2 + 5 = 7$. How many such numbers are there?

- a) 36 b) 45 c) 54 d) 81 e) 90

5. Pizzeria Toni sells pizzas with tomato sauce and cheese. Customers can choose mushrooms, pineapples, ham and onions as an additional topping. Each additional covering costs 1 euro extra. How many different pizzas can the customers put together?

a) 4 b) 8 c) 12 d) 15 e) 16

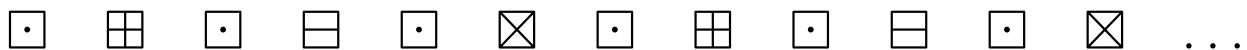
6. Simple Sudoku: In every row and column the numbers 1 to 5 are allowed to appear only once.
Which number represents the black triangle ▲?

	2		5	
	3		2	
1				4
		▲	4	3
5				

a) 1 b) 2 c) 3 d) 4 e) 5

7. The following pattern is always repeated after six symbols.

Which are the 50th and 51st symbols?



a) b) c) d) e)

5-Point-Tasks

8. $abc5$ is a four-digit number. The following applies:

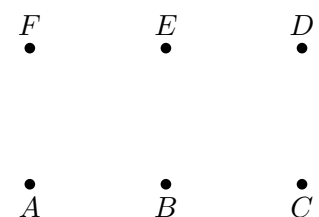
$$abc5 \cdot 3 = 28abc$$

Find $a + b + c$.

a) 16 b) 20 c) 28 d) 30 e) cannot be determined

9. The points A, B, E and F and B, C, D and E are the vertices two squares.

How many different right-angled triangles you can build if you connect three points by straight lines?

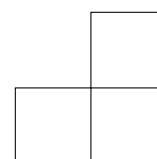


a) 6 b) 8 c) 10 d) 12 e) 14

10. Here you see all possible different square triplets. They are different because you cannot put them congruent on top of each other when you cut them out.

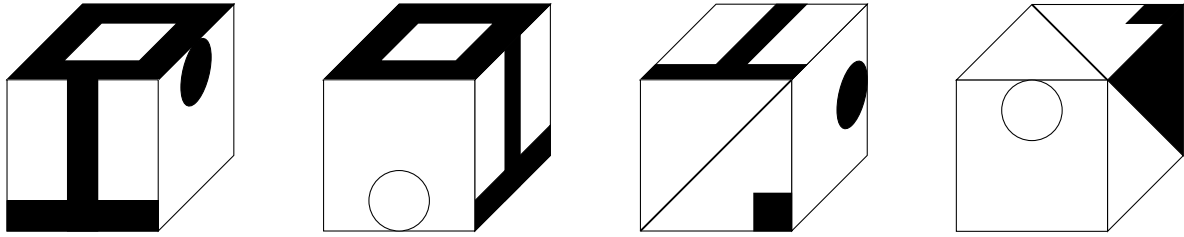
If you put five squares together, you get one square-pentagon. How many different square pentagons are possible?

(Note: Each two squares must be adjacent to each other with a complete side)

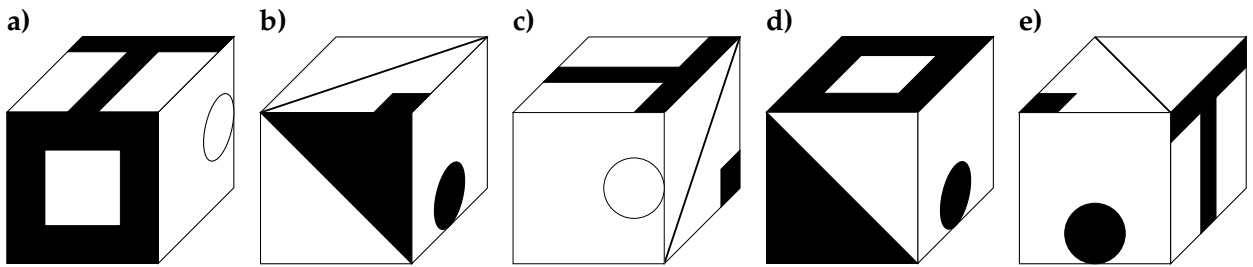


a) 5 b) 11 c) 12 d) 13 e) 16



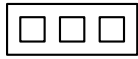
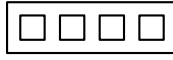
11. Here are four views of the same cube.



Which of the following pictures is **not** a view of the cube?



12. The 2nd figure is 7 cm long. The 7th figure is 22 cm. How long is the 40th figure?

1. 
 2. 
 3. 
 4. 
- ⋮

a) 120 cm

b) 121 cm

c) 140 cm

d) 141 cm

e) 161 cm

11th Pangea Mathematics Competition 2018

Semifinal-Grade 6

3-Point-Tasks

1. Calculate:

$$2.018 \cdot 2017 - 20.17 \cdot 201.8$$

- a) 0 b) 18 c) 20 d) 2017 e) 2018

2. Three boys and two girls want to line up such that boys and girls take turns side by side. How many different possibilities are there?

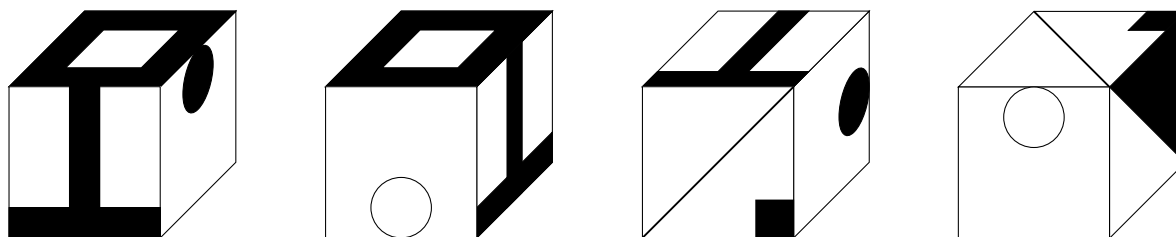
- a) 5 b) 6 c) 9 d) 12 e) 15

3. $\triangle \nabla$ and $\triangleleft \triangleright$ are two different 2-digit numbers with different digits greater than 0. Assume $\triangle \nabla + \triangleleft \triangleright = 100$. Find $\triangle + \nabla + \triangleleft + \triangleright$.

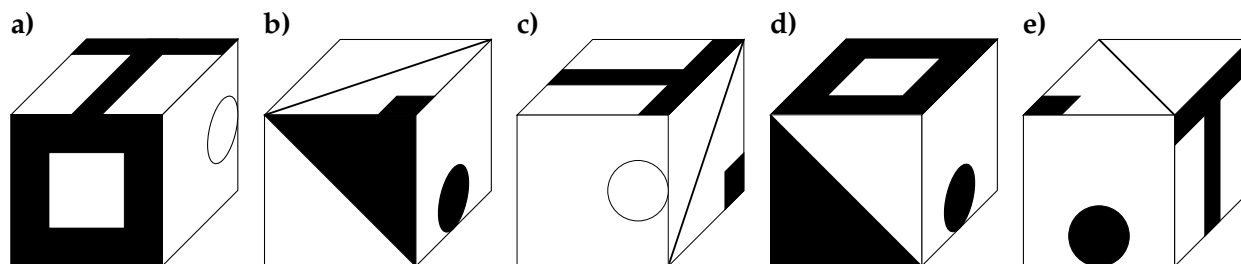
- a) 1 b) 10 c) 17 d) 19 e) 20

4-Point-Tasks

4. Here are four different views of the same cube.



Which of the following figures is **not** a view of the cube?



5. Pizzeria Toni sells pizzas with tomato sauce and cheese. Customers can choose additional: mushrooms, pineapple, ham and onions. Each additional covering costs 1 euro extra.
How many different pizzas can you choose in Pizzeria Toni

a) 4 b) 8 c) 12 d) 15 e) 16

6. Simple Sudoku: In every row and column the numbers 1 to 5 are allowed to appear only once. Which number represents the black triangle ▲?

	2		5	
	3		2	
1				4
		▲	4	3
5				

a) 1 b) 2 c) 3 d) 4 e) 5

7. Last year 555 students attended the Max-Muster-Schule. 333 of them were girls. This year, 560 students attend the Max-Muster-Schule. The proportion of girls is still the same.
How many girls attend the Max Muster School this year?

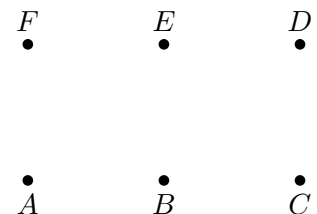
a) 222 b) 224 c) 227 d) 333 e) 336

5-Point-Tasks

8. We are looking for a three-digit number. If you divide this number by 10, 11 or 12, the rest at the division will be always 9. What is the checksum of the number we are looking for

a) 6 b) 12 c) 15 d) 18 e) 21

9. The points A , B , E and F and B , C , D and E are the vertices of two squares.
How many different right-angled triangles you can build if you connect three points by straight lines?



a) 6 b) 8 c) 10 d) 12 e) 14

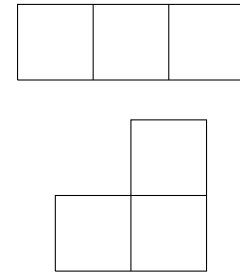
10. $abc5$ is a 4-digit number. Assume that the following is true:

$$abc5 \cdot 3 = 28abc$$

Find $a + b + c$.

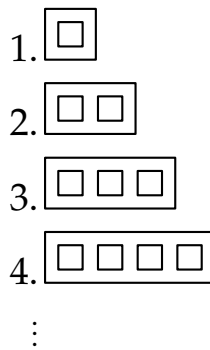
a) 16 b) 20 c) 28 d) 30 e) can not be solved

11. Here you see all possible different square triplets.
They are different because you cannot put them congruent on top of each other when you cut them out.
If you put five squares together, you get one square-pentagon. How many different square pentagons are possible?
(Note: Each two squares must be adjacent to each other with a complete side)



- a) 5 b) 11 c) 12 d) 13 e) 16

12. The 2nd figure is 7 cm long. The 7th figure is 22 cm.
Find the length of the 40th figure?



- a) 120 cm b) 121 cm c) 140 cm d) 141 cm e) 161 cm

11th Pangea Mathematics Competition 2018

Semifinal-Grade 7

3-Point-Tasks

1. Calculate:

$$\frac{3}{5} + \frac{3}{50} + \frac{3}{500}$$

- a) 0.018 b) $0.0\overline{162}$ c) 0.333 d) 0.666 e) $0.\overline{6}$
-

2. Three boys and two girls want to line up such that boys and girls take turns side by side. How many different possibilities are there?

- a) 5 b) 6 c) 9 d) 12 e) 15
-

3. Johannes has only black and white marbles. One third of his marbles are black. He has 12 white marbles more than black ones. How many marbles does Johannes have in total?

- a) 24 b) 36 c) 48 d) 60 e) 72
-

4-Point-Tasks

4. Simple Sudoku: In every row and column the numbers 1 to 5 are allowed to appear only once. Which number represents the black triangle ▲?

	2		5	
	3		2	
1				4
		▲	4	3
5				

- a) 1 b) 2 c) 3 d) 4 e) 5
-

5. $abcd5$ is a 5-digit number. Assume that the following is true: $abcd5 \cdot 2 = 8abcd$

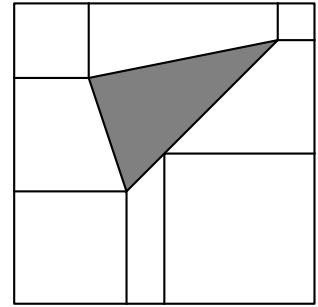
Find $a + b + c + d$.

- a) 7 b) 11 c) 12 d) 14 e) 15
-

6. 22 spoons and 32 forks together weigh 920 g.
42 spoons and 52 forks together weigh 1620 g.
How much do 16 spoons and 21 forks weigh?

- a) 610 g b) 620 g c) 635 g d) 660 g e) can not be evaluated
-

7. In a square with side length 8 cm are four small squares drawn with the side lengths 1 cm, 2 cm, 3 cm and 4 cm. Determine the area of the grey shaded triangle. (The figure is not drawn to scale)



- a) 4 cm^2 b) 8 cm^2 c) 12 cm^2 d) 13 cm^2 e) $15,5 \text{ cm}^2$

5-Point-Tasks

8. We are looking for a three-digit number. If you divide this number by 10, 11 or 12, the rest at the division will be always 9. What is the checksum of the number we are looking for?

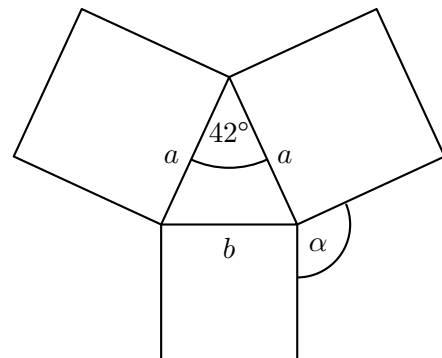
- a) 6 b) 12 c) 15 d) 18 e) 21

9. Given is a big rectangle that is divided into nine smaller rectangles. In five of these small rectangles the areas are already entered. The side lengths of all rectangles are integers. Find the area of the grey shaded rectangle. (The figure is not drawn to scale)

	21	42
40		
20	14	

- a) 40 FE b) 46 FE c) 52 FE d) 56 FE e) 60 FE

10. Given is an isosceles triangle. A square is drawn over each side of the triangle. Find the angle α ? (The figure is not drawn to scale)



- a) 101° b) 111° c) 113° d) 132° e) 138°

11. Tom and Jerry both want to buy a pizza "four-cheese" each. Tom missing for his pizza 3,20 €. Jerry is missing for his pizza € 3.40. They put all their money together and buy one pizza together for both of them. Now there are 1,40 € left. What was the price of the pizza?

- a) 4,70 € b) 5,20 € c) 6,60 € d) 8,00 € e) 9,40 €

12. Two candles, each 42 cm high, are lit at the same time. One candle burns down in 6 hours, the other in 7 hours. How many minutes does it take for one candle to be twice the size of the other candle?

- a) 300 min b) 315 min c) 324 min d) 330 min e) that can not happen

11th Pangea Mathematikcs Competition 2018

Semifinal-Grade 8

3-Point-Tasks

1. Which of the following numbers can **not** be written as the sum of two prim numbers?

- a) 7 b) 9 c) 11 d) 13 e) 15

2. Find the unit position of the following product.

$$1 \cdot 3 \cdot 5 \cdot 7 \cdot 9 \cdot 11 \cdot 13 \cdot 15 \cdot 17 \cdot 19$$

- a) 1 b) 3 c) 5 d) 7 e) 9

3. A water tank is filled to two-thirds. Then 25 liters are pumped out of the tank. After that the water tank is only half filled. How many liters of water are now in the tank?

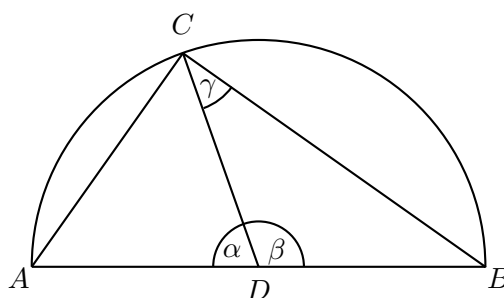
- a) 50 liters b) 75 liters c) 100 liters d) 125 liters e) 150 liters

4-Point-Tasks

4. Assume the following for the figure on the right:

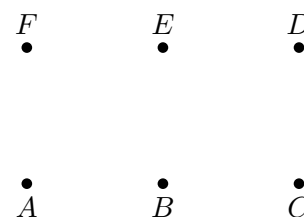
- D is midpoint of the semi-circle
- $\beta = 1,5 \cdot \alpha$

Find the angle γ .
(The figure is not drawn to scale)



- a) 30° b) 36° c) 40° d) 72° e) 90°

5. The points A, B, E and F and B, C, D and E are the vertices of two squares.
How many different right-angled triangles you can build if you connect three points by straight lines?



- a) 6 b) 8 c) 10 d) 12 e) 14

6. Consider: $1^2 + 2^2 + 3^2 + \dots + 9^2 + 10^2 = 385$

Find $3^2 + 6^2 + 9^2 + \dots + 27^2 + 30^2$.

- a) 1155 b) 3456 c) 3465 d) 3850 e) 5511
-

7. 22 spoons and 32 forks together weigh 920 g.
42 spoons and 52 forks together weigh 1620 g.
How much do 16 spoons and 21 forks weigh?

- a) 610 g b) 620 g c) 635 g d) 660 g e) cannot be evaluated
-

5-Point-Tasks

8. Assume that a, b, c and d are positive integers with $0 < a < b < 20 < c < d$. The average of a, b, c, d and 20 equals 24. Find the highest value for d that is possible.

- a) 42 b) 52 c) 76 d) 78 e) 96
-

9. Boris is older than 11 years but younger than 19 years. His father is 2 years older than his mother and 13-times as old as his sister. Boris is 22 years younger than his father.
How old is Boris?
Note: all ages are positive integers.

- a) 14 years b) 15 years c) 16 years d) 17 years e) 18 years
-

10. A wooden stake stand in a lake. One-third of the wooden stake is in the ground, one-seventh is in the water and 2.2 meters are standing above the water.
Find the total length of the wooden stake.

- a) 2,75 m b) 4,20 m c) 4,40 m d) 4,62 m e) 6,30 m
-

11. Mr. Gustav calculates the total costs of a trip and notes the following:

- If all participants pay 45 € each, then 224 € are missing from the total costs
- If all participants pay 49 € each, then there are 224 € left.

How many persons participate?

- a) 47 b) 56 c) 94 d) 112 e) 188
-

12. There are 3 bags in a box with 9 marbles each. The bags are externally indistinguishable.

- In the first bag there are 3 green and 6 red marbles.
- In the second bag there are 4 green and 5 red marbles.
- In the third bag there are 5 green and 4 red marbles.

Randomly Dora takes first one bag out of the box and then one marbles out of this bag.
Find the probability that the marble is green.

- a) $\frac{4}{27}$ b) $\frac{4}{15}$ c) $\frac{4}{9}$ d) $\frac{4}{6}$ e) $\frac{4}{5}$

11th Pangea Mathematics Competition 2018

Semifinal-Grade 9

3-Point-Tasks

1. Marco and Daniel go out for dinner together and share the costs evenly between each other. The bill of 24.50 € is paid by Marco with his credit card. Daniel gives a tip of 1.50 €. What amount does Daniel owe to his friend Marco?

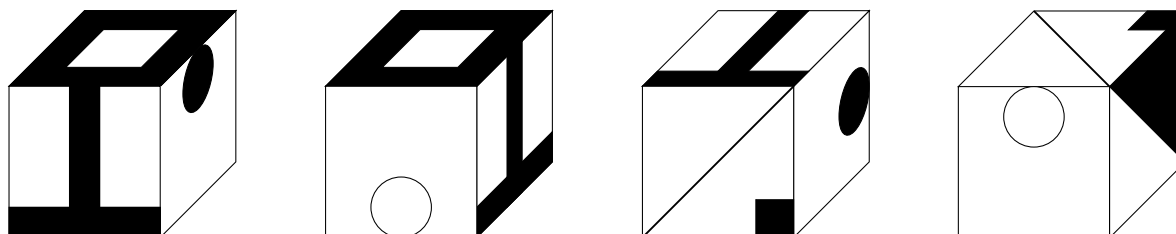
- a) 10.75 € b) 11.50 € c) 12.25 € d) 12.50 € e) 13.00 €

2. Find the unit position of the following product.

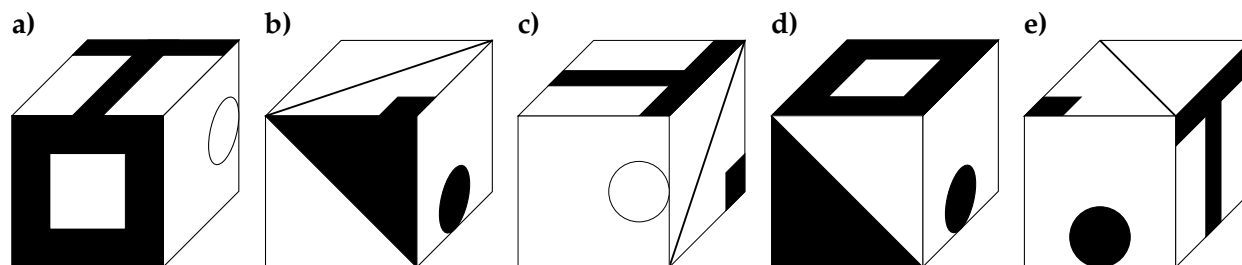
$$1 \cdot 3 \cdot 5 \cdot 7 \cdot 9 \cdot 11 \cdot 13 \cdot 15 \cdot 17 \cdot 19$$

- a) 1 b) 3 c) 5 d) 7 e) 9

3. Here are four different views of the same cube.

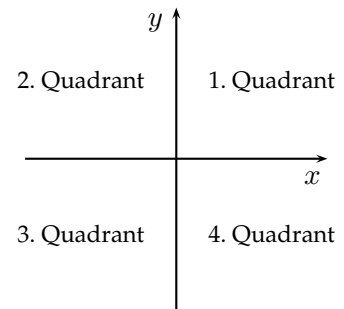


Which of the following figures is not a view of the cube?



4-Point-Tasks

4. For which rational numbers m do you find the intersection points of the linear functions $f(x) = x - 2$ and $g(x) = m \cdot x + 3$ in the fourth quadrant of the coordinate system?



- a) $m < -\frac{3}{2}$ b) $m < -1$ c) $m < -\frac{2}{3}$ d) $m = 0$ e) $m < 1$

5. Consider: $1^2 + 2^2 + 3^2 + \dots + 9^2 + 10^2 = 385$

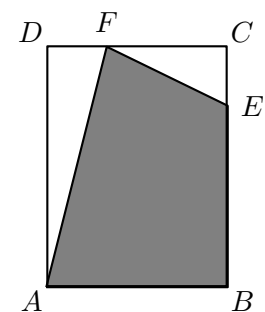
Find $3^2 + 6^2 + 9^2 + \dots + 27^2 + 30^2$.

- a) 1155 b) 3456 c) 3465 d) 3850 e) 5511

6. Find the average of the numbers $3.\bar{2}$ and $2.\bar{3}$?

- a) $2.7\bar{25}$ b) 2.75 c) $2.7\bar{5}$ d) $2.7\bar{75}$ e) $2.\bar{7}$

7. Given a rectangle with side length of $\overline{AB} = 6$ cm and $\overline{BC} = 8$ cm. The grey shaded area represents 70% of the area of that rectangle. Assume that $\overline{CE} = 2$ cm. Find the length of \overline{DF} .



- a) 1 cm b) $\sqrt{2}$ cm c) 2 cm d) 2,4 cm e) 2,8 cm

5-Point-Tasks

8. Calculate:

$$1 - (2 - (3 - (4 - (\dots - (48 - (49 - 50)) \dots))))$$

- a) -24 b) 24 c) -25 d) 25 e) 26

9. $abcd$ is a 4-digit number with the following property: If you interchange the digits a and d , the number $dbca$ is around 999 greater than $abcd$. How many numbers exist with that property.

- a) 8 b) 9 c) 800 d) 900 e) keine

10. Lukas has 2 red, 2 blue and 2 yellow tiles. How many possibilities are there to put the tiles in a row such that no tiles of the same colour are next to each other?

- a) 24 b) 28 c) 30 d) 32 e) 36

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How many persons participate?

a) 47

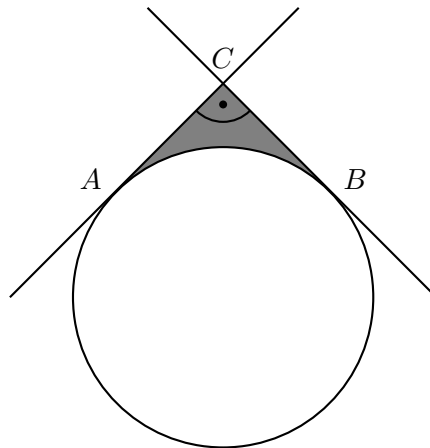
b) 56

c) 94

d) 112

e) 188

12. The straight lines intersect perpendicular to each other in C and touch the circle in A and B . The segment AC has a length of 4 cm. Find the grey shaded area.



a) $(16 - \pi) \text{ cm}^2$

b) $(16 - 2\pi) \text{ cm}^2$

c) $(16 - 3\pi) \text{ cm}^2$

d) $(16 - 4\pi) \text{ cm}^2$

e) $(16 - 5\pi) \text{ cm}^2$

11th Pangea Mathematics Competition 2018

Semifinal-Grade 10

3-Point-Tasks

1. Marco and Daniel go out for dinner together and share the costs evenly between each other. The bill of 24.50 € is paid by Marco with his credit card. Daniel gives a tip of 1.50 €. What amount does Daniel owe to his friend Marco?

a) 10.75 € b) 11.50 € c) 12.25 € d) 12.50 € e) 13.00 €

2. Find the unit position of the following product.

$$1 \cdot 3 \cdot 5 \cdot 7 \cdot 9 \cdot 11 \cdot 13 \cdot 15 \cdot 17 \cdot 19$$

a) 1 b) 3 c) 5 d) 7 e) 9

3. For how many natural numbers n is the following inequality valid?

$$\frac{5}{11} < \frac{n}{22} < \frac{4}{5}$$

a) 4 b) 5 c) 6 d) 7 e) 8

4-Point-Tasks

4. Write as a completely reduced fraction:

$$\frac{8^{18} - 18 \cdot 8^{16}}{8^{13} \cdot 2^8 \cdot 23^2}$$

a) $\frac{1}{23 \cdot 32}$ b) $\frac{4}{23^2}$ c) $\frac{3^2}{23^2}$ d) $\frac{2}{23}$ e) $\frac{4}{23}$

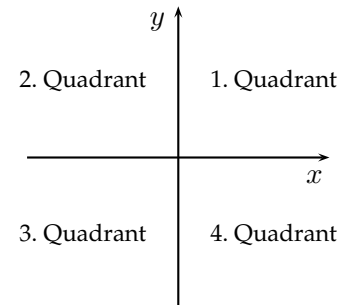
5. Family Miller has an average age of 20 years (Mr. and Mrs. Miller and their children). The average age of the family decreases to 15 years, if you doesn't include the age of the 40-year-old Mr. Miller. How many children do Mr. and Mrs Miller have?

a) 6 b) 5 c) 4 d) 3 e) 2

6. There 10 couples on a party. At the end of the party, the couples say goodbye to each other with a handshake and go home in pairs. That means that each person shakes the hand of every other person except his/her companion.
How often were hands shaken?

a) 160-times b) 180-times c) 190-times d) 200-times e) 360-times

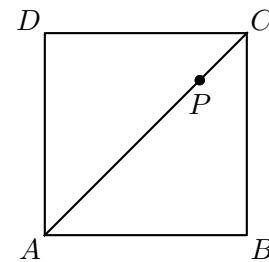
7. For which rational numbers m do you find the intersection points of the linear functions $f(x) = x - 2$ and $g(x) = m \cdot x + 3$ in the fourth quadrant of the coordinate system?



a) $m < -\frac{3}{2}$ b) $m < -1$ c) $m < -\frac{2}{3}$ d) $m = 0$ e) $m < 1$

5-Point-Tasks

8. $ABCD$ is a square with side length 12 cm.
Assume $\overline{PC} = 4$ cm.
Find the area of the triangle ABP ?
Skizze nicht maßstabsgetreu.



a) $36 - 6\sqrt{2}$ cm² b) $72 - 6\sqrt{2}$ cm² c) $72 - 12\sqrt{2}$ cm² d) $144 - 24\sqrt{2}$ cm² e) $144 - 48\sqrt{2}$ cm²

9. Determine the rest of the following division $7^{98} : 5$?

a) 0 b) 1 c) 2 d) 3 e) 4

10. Assume the following for the sides a , b and c of a right-angled triangle:

- $a + b + c = 28$
- $a^2 + b^2 + c^2 = 288$

Find $a \cdot b \cdot c$.

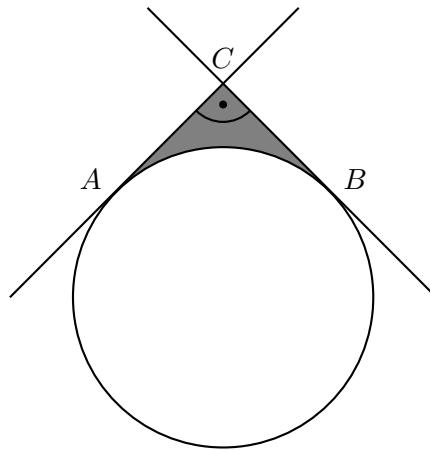
a) 660 b) 672 c) 720 d) 768 e) 2888

11. Assume x and y to be non-negative integers. How many number pairs (x, y) fulfill the following equation:

$$\frac{x}{20} + \frac{y}{18} = 2$$

a) 0 b) 3 c) 4 d) 5 e) infinite many

12. The straight lines intersect perpendicular to each other in C and touch the circle in A and B . The segment AC has a length of 4 cm. Find the grey shaded area.



- a) $(16 - \pi) \text{ cm}^2$ b) $(16 - 2\pi) \text{ cm}^2$ c) $(16 - 3\pi) \text{ cm}^2$ d) $(16 - 4\pi) \text{ cm}^2$ e) $(16 - 5\pi) \text{ cm}^2$