

11th Pangea Mathematics Competition 2018

Preliminary Round-Grade 3

1-Point Tasks

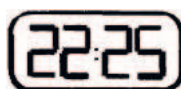
1. Daniel wants to buy a skateboard for 109 €. He has already saved € 95. How many more euros does he need?

- a) 13 € b) 14 € c) 16 € d) 24 e) 26 €
-

2. $\square 3 + 92 = 125$. What number is the \square ?

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

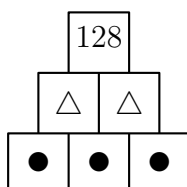
3. How many minutes is it until midnight?



- a) 35 min b) 75 min c) 95 min d) 135 min e) 175 min
-

2-Point Tasks

4. Here's a number wall. Each shape represents the same number.



What is the number for ●?

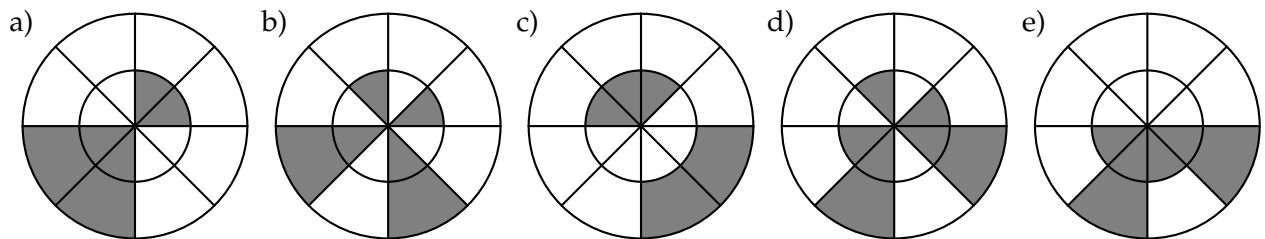
- a) 28 b) 29 c) 30 d) 31 e) 32
-

5. Sarah has 7 days of autumn holidays, 14 days of Christmas holidays, 2 weeks of Easter celebrations and 6 weeks of summer holidays this school year. How many days of holiday does she have in total?

a) 29 b) 55 c) 67 d) 77 e) 84

3-Point Tasks

6. An arrow is thrown at targets. Whoever hits a grey field wins. With which disc do you have the best chance to win?



7. Lisa is in a queue. She is in the 8th place, if you count from the front, and in the 7th place, if you count from the back. How many people are in the queue altogether?

a) 13 b) 14 c) 15 d) 16 e) 17

8. Melissa has 24 pearls on her necklace. It has 8 green pearls and 3 times as many red as yellow pearls. How many yellow pearls does the necklace have?

a) 4 b) 6 c) 8 d) 12 e) 16

4-Point Tasks

9. Caroline celebrates her 9th birthday. For the celebration, 5 bottles of apple juice and 3 bottles of water are purchased. 2 cakes and 16 muffins are baked. Every child receives a small gift. How many children did Caroline invite?

a) 8 b) 9 c) 10 d) 16 e) You cannot work the question out

10. In a football tournament, each class should play exactly once against each other class. How many games are there in total if 5 classes participate?

a) 5 b) 10 c) 20 d) 24 e) 25

5-Point Tasks

11. You want to make 25 equal squares with matches. As few matches as possible should be used. How many matches do you need?
TIP: If you place squares directly next to each other, you can save matches.

a) 60 b) 75 c) 76 d) 80 e) 100

12. Class 3a is making stars.
- 5 children make one star each.
 - 7 children make 2 stars each.
 - All other children make 3 stars each.

Overall, the class has made 70 stars. How many children are in class 3a in total?

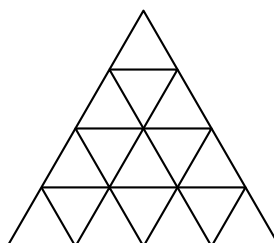
a) 17 b) 19 c) 29 d) 31 e) 51

13. Here is a dice net, from which you can build up a cube. Which side is on the opposite side of the grey marked side?



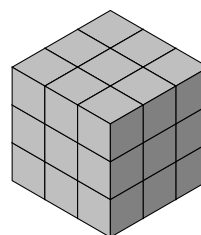
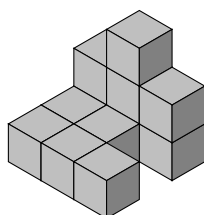
a) 1 b) 2 c) 3 d) 4 e) 5

14. How many triangles are shown in the picture?



a) 16 b) 17 c) 25 d) 27 e) none of these numbers is correct

15. How many cubes do you need to complete the cube construction on the left to the big cube on the right? (There are no holes in this diagram.)



a) 14 b) 15 c) 16 d) 17 e) 24

11th Pangea Mathematics Competition 2018

Preliminary Round-Grade 4

1-Point Tasks

1. Calculate: $8 \cdot 21 - 20 \cdot 8$

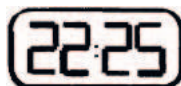
- a) 0 b) 8 c) 16 d) 64 e) 328
-

2. Complete the missing numbers. Which digit represents \square ?

$$\begin{array}{r} 76\bigcirc \\ - \square 93 \\ \hline 4\triangle 5 \end{array}$$

- a) 2 b) 3 c) 4 d) 7 e) 8
-

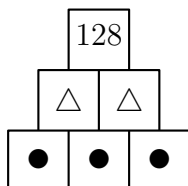
3. How many minutes is it until midnight?



- a) 35 min b) 75 min c) 95 min d) 135 min e) 175 min
-

2-Point Tasks

4. Here's a number wall. Each shape represents the same number.



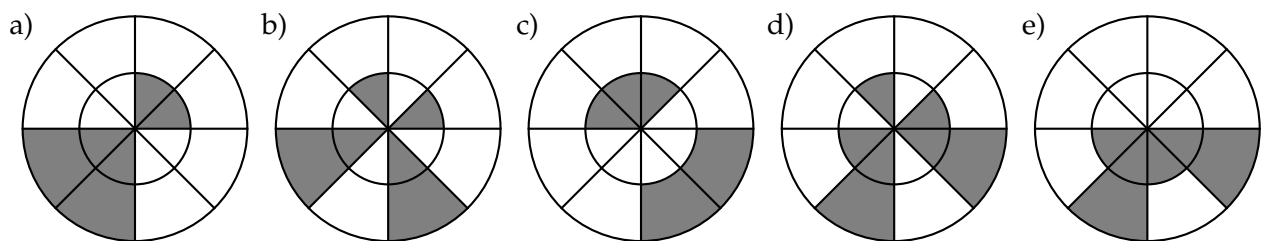
What is the number for \bullet ?

- a) 28 b) 29 c) 30 d) 31 e) 32
-

5. Mrs. Stolz is 41 years old. She has been a sports teacher for 10 years. She buys new tennis balls: 20 cans with 3 balls each and 10 cans with 6 balls each. A 3-balls-box costs 9 €, a 4-balls-box 10 € and a 6-balls-box 12 €. How many balls does Mrs. Stolz buy?
- a) 30 b) 120 c) 143 d) 1260 e) Problem cannot be solved.
-

3-Point Tasks

6. An arrow is thrown at targets. Whoever hits a grey field wins. With which disc do you have the best chance to win?



7. How often does the number 9 appear in all numbers between 1 and 100?

a) 9 b) 10 c) 11 d) 19 e) 20

8. Which number stands for the symbol \square ?

$$117 - \square = 43 + \square$$

a) 27 b) 32 c) 33 d) 37 e) 74

4-Point Tasks

9. Anna, Miriam, Leyla and Susanne have their 13th, 14th, 15th and 16th birthday today. When are the four girls together 102 years old? In which year?

a) 2018 b) 2029 c) 2044 d) 2062
e) There is no year in which they are 102 years old together

10. In a football tournament, each class should play exactly once against each other class. How many games are there in total if 5 classes participate?

a) 5 b) 10 c) 20 d) 24 e) 25

5-Point Tasks

11. You want to make 25 equal squares with matches. As few matches as possible should be used. How many matches do you need?

TIP: If you place squares directly next to each other, you can save matches.

- a) 60 b) 75 c) 76 d) 80 e) 100

12. Melissa has 24 pearls on her necklace. It has 8 green pearls and 3 times as many red as yellow pearls. How many yellow pearls does the necklace have?

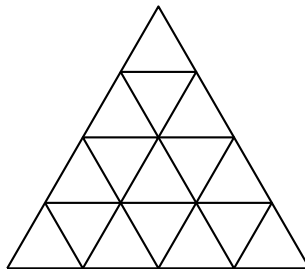
- a) 4 b) 6 c) 8 d) 12 e) 16

13. The symbols \square , \circ and \triangle represent digits. The same symbol stands for the same number. Work out the calculation and find out the value for the square.

$$\begin{array}{r}
 \square \\
 + \quad \quad \square \\
 + \quad \quad \circ \quad \circ \\
 \hline
 \triangle \quad \triangle \quad \triangle
 \end{array}$$

- a) 0 b) 1 c) 5 d) 6 e) 9

14. How many triangles are shown in the picture?



- a) 16 b) 17 c) 25 d) 27 e) none of these numbers is correct

15. I think of a number. It is divisible by 3, by 7 and by 8. It is greater than 300 and less than 400. What is my number?

- a) 312 b) 315 c) 336 d) 357 e) 392

11th Pangea Mathematics Competition 2018

Preliminary Round-Grade 5

1-Point Tasks

1. Calculate: $8 \cdot 21 - 20 \cdot 8$

- a) 0 b) 8 c) 16 d) 64 e) 328
-

2. Which number is thirty four less than twenty one thousand?

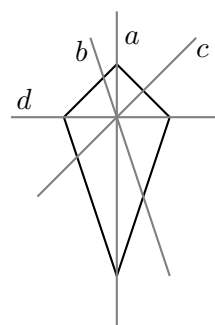
- a) 1957 b) 1966 c) 20957 d) 20966 e) 21966
-

3. It is 20:18. How many minutes is it until midnight?

- a) 198 min b) 222 min c) 318 min d) 342 min e) 382 min
-

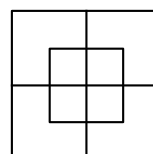
2-Point Tasks

4. Which line is a line of symmetry in this quadrilateral?



- a) *a* b) *b* c) *c* d) *d* e) none
-

5. How many squares are there in this diagram?



- a) 2 b) 4 c) 5 d) 6 e) 10
-

6. Which number has the same remainder when it is divided by 4 or by 5?

- a) 5 b) 9 c) 13 d) 17 e) 21
-

3-Point Tasks

7. Ali, Betül and Christian have 60€ altogether. Christian has 5€ more than Betül and Ali has 5€ more than Christian. How much money does Betül have?

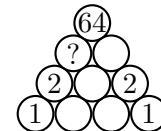
- a) 10 € b) 15 € c) 20 € d) 25 € e) 50 €
-

8. Anna, Miriam, Leyla and Susanne have their 13th, 14th, 15th and 16th birthday today. When are the four girls together 102 years old? In which year?

- a) 2018 b) 2029 c) 2044 d) 2062
e) There is no year in which they are 102 years old together
-

9. Here is a multiplication wall. Which number is in the box with the question mark?

Example



- a) 2 b) 4 c) 8 d) 16 e) 32
-

4-Point Tasks

10. Jasmine hides two marbles under five cups. How many ways does she have to hide the marbles? Both marbles also fit under a cup.

- a) 2 b) 5 c) 10 d) 15 e) 21
-

11. Alex runs twice as fast as Boris and Boris runs three times as fast as Christian. All three start a race at the same time. What is the distance from Boris to Christian when Alex has covered 120 meters?

- a) 20 m b) 40 m c) 60 m d) 80 m e) 100 m
-

12. If you add together the sizes of all angles in a polygon, you can get the inner angle sum. This sum is always 180° for triangles. For squares, the inside angles always add to 360° . What is the inner angle sum of a 7-sided shape?

- a) 540° b) 700° c) 720° d) 900° e) 1260°
-

13. In the maths after school club, there were 21 students at the beginning of the school year. In February, 5 boys came into the club and 2 girls moved to another after school club. After this in February there are twice as many girls as boys in the maths after school club. How many girls were in the maths after school club at the beginning?

- a) 10 b) 12 c) 14 d) 16 e) 18

5-Point Tasks

14. The symbols \square , \circ and \triangle stand for digits. The same symbol represents always the same digit. Work out the digits for the symbols so that the calculation is correct. What is the digit for \square ?

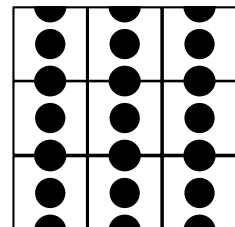
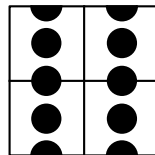
$$\begin{array}{r}
 \square \\
 + \square \\
 + \triangle \circ \circ \\
 \hline
 \triangle \triangle
 \end{array}$$

- a) 0 b) 1 c) 5 d) 6 e) 9

15. This diagram shows a square with a black circle and two black semi circles.



You can make a big square out of several small squares. Here are two examples.



Leon has a lot of these squares. He puts together a 10x10 square of 100 small squares. How many full circles can be produced?

- a) 160 b) 180 c) 190 d) 200 e) 300

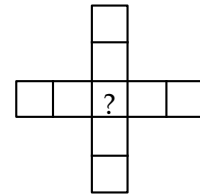
16. One sheet of paper is about 0.01 mm thick. It is folded ten times. How thick is the folded paper?

- a) 0.1 mm b) 0.11 mm c) 2.56 mm d) 5.12 mm e) 10.24 mm

17. Thomas has a lot of gummy bears. The first day he eats one half and the 3 more gummy bears. The next day he eats again one half and then 3 more of the remaining gummy bears. He does that in total exactly four times and has then exactly one gummy bear left. How many gummy bears did he have at the beginning?

- a) 108 b) 106 c) 61 d) 28 e) 16

18. Write the numbers 1 to 9 once each into this diagram, so that the sum of the numbers from top to bottom as well as from left to right equals 25. Which number is in position of the question mark?



a) 1

b) 2

c) 5

d) 9

e) not possible

11th Pangea Mathematics Competition 2018

Preliminary Round-Grade 6

1-Point Tasks

1. Find the least common multiple of 6 and 12.

- a) 3 b) 6 c) 12 d) 18 e) 72
-

2. What is the name of the connection between two points in geometry?

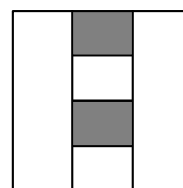
- a) straight line b) segment c) ray d) line e) ruler
-

3. Mrs. Koch is baking a cake. At 11:40, she puts the cake into the oven. The recipe says that the cake should remain in the oven for 1 hour and 35 minutes. At what time must Mrs. Koch take the cake out of the oven?

- a) 12 : 15 Uhr b) 12 : 35 Uhr c) 13 : 05 Uhr d) 13 : 15 Uhr e) 13 : 35 Uhr
-

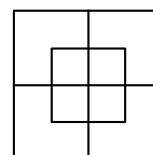
2-Point Tasks

4. Write the grey shaded area of the figure as a fraction.



- a) $\frac{1}{12}$ b) $\frac{1}{6}$ c) $\frac{2}{6}$ d) $\frac{2}{4}$ e) $\frac{2}{3}$
-

5. How many squares you can find in the figure below?



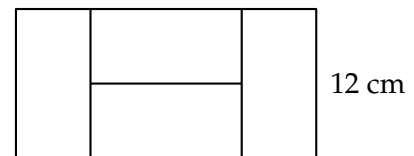
- a) 2 b) 4 c) 5 d) 6 e) 10
-

6. The track around a sports field is 400 m long. Alex runs 3000 metres. How many times he has to run around the track?
- a) $6\frac{1}{2}$ -times b) 7-times c) $7\frac{1}{2}$ -times d) 8-times e) $8\frac{1}{2}$ -times
-

3-Point Tasks

7. Given the following number sequence: 1; 3; 6; 10; 15
Find the after next number of the sequence.
- a) 20 b) 21 c) 25 d) 26 e) 28
-
8. At the Max-Muster School there are 512 pupils. There are 32 more girls than boys. How many girls go to Max-Muster School?
- a) 224 b) 240 c) 256 d) 272 e) 288
-

9. Luke has four identical rectangular plates and places them together to a large rectangle as shown on the right. What is the perimeter of the large rectangle?

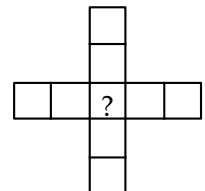


- a) 36 cm b) 72 cm c) 84 cm d) 144 cm e) 288 cm
-

4-point tasks

10. One sheet of paper is about 0.01 mm thick. It is folded ten times. How thick is the folded paper?
- a) 0.1 mm b) 0.11 mm c) 2.56 mm d) 5.12 mm e) 10.24 mm
-

11. Write the numbers 1 to 9 each once in a square, such that the sum of the numbers gives 25 both vertically and horizontally. Which number stands in the place of the question mark?

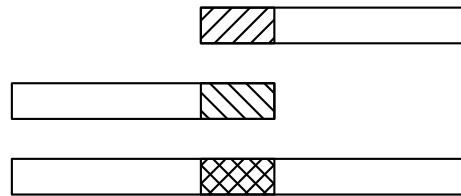


- a) 1 b) 2 c) 5 d) 9 e) not possible
-

12. Anne and Bernd play a game. They agree that for each game the winner gets 3 points and the loser gets 1 point. In the end, Anne has won exactly four games and Bernd reached 10 points. How many times have they played the game?

- a) five times b) six times c) seven times d) eight times e) cannot be determined
-

13. Matthias has four strips of paper of equal length. He sticks two strips together with an overlap of 10 cm and thus gets a 50 cm long rectangular strip of paper. With the other two strips he wants to stick a strip of 56 cm length. How long should the overlap be?



- a) 2 cm b) 4 cm c) 6 cm d) 7 cm e) 8 cm

5-point tasks

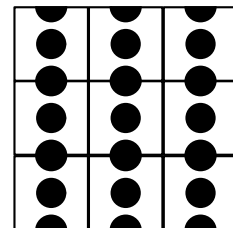
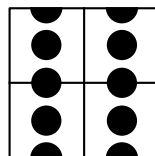
14. How often does the digit 9 appear in the smallest possible number with checksum 2018? The checksum is the sum of all digits of the number. For example the checksum of 123 is 6 since $1 + 2 + 3 = 6$.

- a) 0-times b) 2-times c) 11-times d) 224-times e) cannot be determined

15. In the diagram a square with one black circle and two black semi-circles is shown.



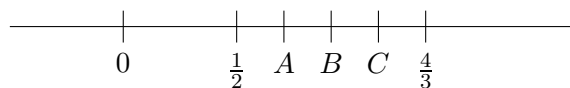
You can build up a big square out of several small squares like this



Leon has a lot of these squares and he builds up a 10x10-square out of 100 small squares. How many complete circles you'll find in Leon's big square?

- a) 160 b) 180 c) 190 d) 200 e) 300

16. The segment between $\frac{1}{2}$ and $\frac{4}{3}$ is divided to four segments of equal length. Which number stand for the letter C on the number tray?



- a) $\frac{8}{9}$ b) 1 c) $\frac{22}{24}$ d) $\frac{9}{8}$ e) $\frac{11}{4}$

17. Thomas has a lot of gummy bears. The first day he eats one half and the 3 more gummy bears. The next day he eats again one half and then 3 more of the remaining gummy bears. He does that in total exactly four times and has then exactly one gummy bear left. How many gummy bears did he have at the beginning?

a) 108

b) 106

c) 61

d) 28

e) 16

18. Mrs. Rossi is baking pizza today. On every pizza comes tomato sauc and cheese. The pizza can be coverd with the toppings chmpignons, black olives, corn and paprika. How many different options does Mrs. Rossi have if at least one topping should be on each pizza?

a) 4

b) 15

c) 16

d) 24

e) 32

11th Pangea Mathematics Competition 2018

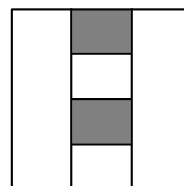
Preliminary Round-Grade 7

1-Point Tasks

1. The sum of two prime numbers equals 8. Find the product of the prime numbers.
(A prime number is a whole number greater than 1, and can be divided exactly only by 1, or itself.)

a) 7 b) 10 c) 12 d) 15 e) 16

2. Write the grey shaded area of the figure as a fraction.



a) $\frac{1}{12}$ b) $\frac{1}{6}$ c) $\frac{2}{6}$ d) $\frac{2}{4}$ e) $\frac{2}{3}$

3. Calculate:

$$\frac{3}{2} : \left(\frac{4}{3} - \frac{1}{2} \right)$$

a) $\frac{1}{2}$ b) $\frac{4}{5}$ c) $\frac{5}{4}$ d) $\frac{3}{2}$ e) $\frac{9}{5}$

2-Point Tasks

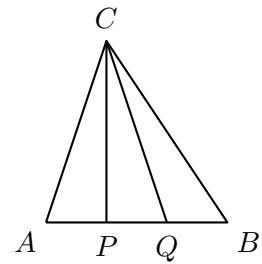
4. Which of the following number is not a divider of 330?

a) 2 b) 3 c) 5 d) 7 e) 11

5. Given the following number sequence: 1; 3; 6; 10; 15
Find the after next number of the sequence.

a) 20 b) 21 c) 25 d) 26 e) 28

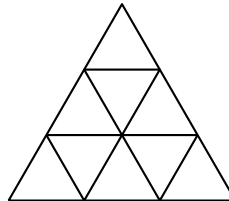
6. The triangle ABC has an area of 27 cm^2 . The segments \overline{AP} , \overline{PQ} and \overline{QB} have all equal length. Find the area of the triangle AQC ?



- a) 9 cm^2 b) 15 cm^2 c) 18 cm^2 d) 24 cm^2 e) 27 cm^2

3-Point Tasks

7. How many triangles can be found in the figure below?

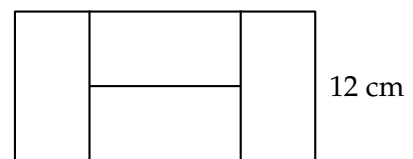


- a) 9 b) 10 c) 11 d) 12 e) 13

8. A starting number is multiplied by 17, the 17 is added. The result will then be divided by 17. Then the starting number is subtracted. What is the final result?

- a) 0 b) 1 c) 17 d) Starting number+1 e) Cannot be determined

9. Lukas has four equal sized rectangular plats and puts these together to a big rectangle as shown on the right. Find the perimeter of the big rectangle.



- a) 36 cm b) 72 cm c) 84 cm d) 144 cm e) 288 cm

10. Tim's mother checks his room every evening. For each day she finds his room cleaned up he gets 4 € at the end of the month. For each day Tim's room is not cleaned up, he has to pay 1 € at the end of the month. How many times Tim has to clean up his room in order to pay nothing at the end of the month (30 days)?

- a) 5-times b) 6-times c) 7-times d) 10-times e) 12-times

4-Point Tasks

11. Each letter in the following calculation represents a digit.

$$\begin{array}{r}
 P \ A \ P \ A \\
 + \ P \ A \ P \ A \\
 \hline
 M \ A \ M \ A \ S
 \end{array}$$

Find the sum $A + M + P + S$.

- a) 8 b) 13 c) 15 d) 18 e) 22
-

12. The perimeter of triangle equals 22 cm. All side length are natural numbers. What is the highest possible value that the longest side of the triangle can take?

- a) 7 cm b) 8 cm c) 9 cm d) 10 cm e) 11 cm
-

13. Anne and Bernd play a game. They agree that for each game the winner gets 3 points and the loser gets 1 point. In the end, Anne has won exactly four games and Bernd reached 10 points. How many times have the played the game?

- a) five times b) six times c) seven times d) eight times e) cannot be determined
-

14. Mr. Müller throws 1 € in an empty money-box on the day of his daughter's birth. At every birthday of his daughter he throws 2 € more in the money-box than the year before. How many money is on the day after the 18th birthday in the money-box, if by then nothing has been taken out of the money-box.

- a) 324 € b) 342 € c) 361 € d) 369 € e) 380 €
-

15. There are black, red and yellow balls in a box. You know the following:

- $\frac{2}{3}$ of the balls are **not** red.
- $\frac{4}{5}$ of the balls is **not** yellow.

Which part of the balls is **not** black?

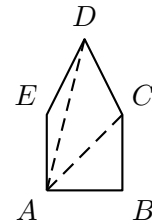
- a) $\frac{2}{15}$ b) $\frac{3}{15}$ c) $\frac{7}{15}$ d) $\frac{8}{15}$ e) $\frac{12}{15}$
-

5-Point Tasks

16. How often does the digit 9 appear in the smallest possible number with checksum 2018? The checksum is the sum of all digits of the number. For example the checksum of 123 is 6 since $1 + 2 + 3 = 6$.

a) 0-times b) 2-times c) 11-times d) 224-times e) cannot be determined

17. The figure on the right is constructed out of an isosceles triangle ECD and a square $ABCE$ with side length 4 cm. The area of the figure $ABCDE$ equals 24 cm^2 .



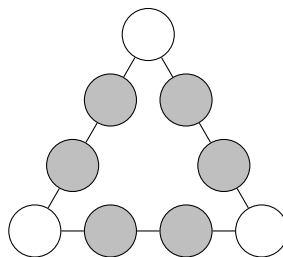
Determine the area of the triangle ACD .

a) 12 cm^2 b) 13 cm^2 c) 14 cm^2 d) 15 cm^2 e) 16 cm^2

18. A wooden cube with side length 3 cm is glued to a plate. A second wooden cube with side length 2 cm is glued in the center of the top of the first cube. Now each accessible surface area of the two cubes is painted. Find the painted area.

a) 35 cm^2 b) 61 cm^2 c) 65 cm^2 d) 69 cm^2 e) 70 cm^2

19. Write the numbers 1 to 9 in the empty field such that the sum of the numbers in each row equals 20. Each number may occur only once. Find the sum of the numbers in the grey fields.



a) 10 b) 15 c) 20 d) 30 e) 35

20. The number $111 \dots 1$ consists of exactly 2018 ones. The number $222 \dots 2$ consists of exactly 2017 twos. Find the checksum of the difference $111 \dots 1 - 222 \dots 2$.

a) 16125 b) 16128 c) 16136 d) 16137 e) 16145

11th Pangea Mathematics Competition 2018

Preliminary Round-Grade 8

1-Point Tasks

1. The sum of two prime numbers equals 8. Find the product of the prime numbers.
(A prime number is a whole number greater than 1, and can be divided exactly only by 1, or itself.)

a) 7 b) 10 c) 12 d) 15 e) 16

2. Calculate:

$$5 - (1 - (4 - (2 - 3)))$$

a) -5 b) 1 c) 7 d) 9 e) 13

3. Calculate:

$$\frac{3}{2} : \left(\frac{4}{3} - \frac{1}{2} \right)$$

a) $\frac{1}{2}$ b) $\frac{4}{5}$ c) $\frac{5}{4}$ d) $\frac{3}{2}$ e) $\frac{9}{5}$

2-Point Tasks

4. A starting number is multiplied by 17, the 17 is added. The result will then be divided by 17. Then the starting number is subtracted. What is the final result?

a) 0 b) 1 c) 17 d) Starting number+1 e) Cannot be determined

5. Given the following number sequence: 1; 3; 6; 10; 15
Find the after next number of the sequence.

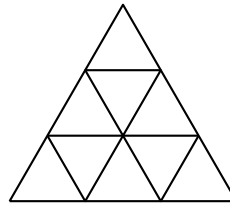
a) 20 b) 21 c) 25 d) 26 e) 28

6. A product originally cost 100 €. The price has first been reduced by 20%. After that the new price was increased by 20%.
Find the price of product now.

a) 64 € b) 80 € c) 96 € d) 100 € e) 120 €

3-Point Tasks

7. How many triangles can be found in the figure below?

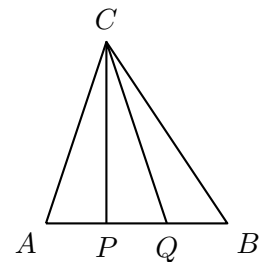


- a) 9 b) 10 c) 11 d) 12 e) 13

8. Mr. Müller throws 1 € in an empty money-box on the day of his daughter's birth. At very birthday of his daughter he throws 2 € more in the money-box than the year before. How many money is on the day after the 18th birthday in the money-box, if by then nothing has been taken out of the money-box.

- a) 324 € b) 342 € c) 361 € d) 369 € e) 380 €

9. The triangle ABC has an area of 27 cm^2 . The segments \overline{AP} , \overline{PQ} and \overline{QB} have all equal length. Find the area of the triangle AQC ?



- a) 36 cm^2 b) 54 cm^2 c) 63 cm^2 d) 90 cm^2 e) 108 cm^2

10. Find the biggest possible natural number n such that $\frac{3}{8}$ is smaller than $\frac{8}{n}$?

- a) 20 b) 21 c) 22 d) 23 e) 24

4-Point Tasks

11. Each letter in the following calculation represents a digit.

$$\begin{array}{r}
 P \ A \ P \ A \\
 + \ P \ A \ P \ A \\
 \hline
 M \ A \ M \ A \ S
 \end{array}$$

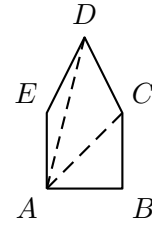
Find the sum $A + M + P + S$?

- a) 8 b) 13 c) 15 d) 18 e) 22

12. A cuboid has side lengths of 4 cm, 6 cm and 8 cm. How many of these cuboids do you need at least to build up a cube?

- a) 13 b) 24 c) 64 d) 72 e) 192

13. The figure on the right is constructed out of an isosceles triangle ECD and a square $ABCE$ with side length 4 cm. The area of the figure $ABCDE$ equals 24 cm^2 .



Determine the area of the triangle ACD .

- a) 12 cm^2 b) 13 cm^2 c) 14 cm^2 d) 15 cm^2 e) 16 cm^2

14. A triangle has the angles $\alpha = (3m + 30)^\circ$, $\beta = (2m + 7n)^\circ$, $\gamma = (n + 50)^\circ$, where m and n are natural numbers with $m > n$. Find $m + n$.

- a) 13 b) 14 c) 15 d) 16 e) 17

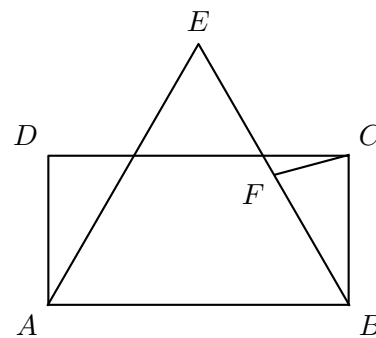
15. A quadrangle has side lengths of 4,5 cm, 5,5 cm, 6,5 cm and x cm, where x is a natural number. How many different values can x have?

- a) less than 10 b) 15 c) 16 d) 17 e) more than 20

5-Point Tasks

16. For the figure shown on the right, the following is true:

- $ABCD$ is a rectangle.
- $\overline{AB} = 2 \cdot \overline{BC}$.
- F is the midpoint of the segment \overline{BE} .
- ABE is an equilateral triangle.



Find the angle BFC . (Figure is not drawn to scale.)

- a) 75° b) 70° c) 60° d) 45° e) 30°

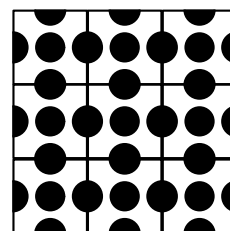
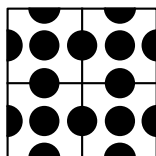
17. In a club there are three categories of members: juniors, adults and seniors. The ratio between juniors and adults is 3:2. The ratio between adults and seniors is 2:3. How many members does the club have at least?

- a) 64 b) 69 c) 73 d) 78 e) 82

18. The diagram shows a square with one complete black circle and four black semi-circles.



You can build up bigger squares out of several small squares as shown.



Leon has lots of these small squares. He builds up a big square out of 100 small squares. How many complete circles do you recognize in that figure?

- a) 120 b) 260 c) 280 d) 300 e) 2660
-
19. A wooden cube with side length 3 cm is glued to a plate. A second wooden cube with side length 2 cm is glued in the center of the top of the first cube. Now each accessible surface area of the two cubes is painted. Find the painted area.
- a) 35 cm^2 b) 61 cm^2 c) 65 cm^2 d) 69 cm^2 e) 70 cm^2
-
20. The number $111\dots 1$ consists of exactly 2018 ones. The number $222\dots 2$ consists of exactly 2017 twos. Find the checksum of the difference $111\dots 1 - 222\dots 2$.
- a) 16125 b) 16128 c) 16136 d) 16137 e) 16145
-

11th Pangea Mathematics Competition 2018

Preliminary Round-Grade 9

1 Point Tasks

1. The sum of two prime numbers equals 8. Find the product of the prime numbers.
(A prime number is a whole number greater than 1, and can be divided exactly only by 1, or itself.)

a) 7 b) 10 c) 12 d) 15 e) 16

2. Shorten the following 36 fractions completely. How many fractions with denominator 6 result from this?

$$\frac{1}{36}; \frac{2}{36}; \frac{3}{36}; \dots; \frac{35}{36}; \frac{36}{36}$$

a) 1 b) 2 c) 3 d) 5 e) 6

3. What is the radius of the largest sphere that fits into a box with side lengths of 3 cm, 4 cm and 5 cm?

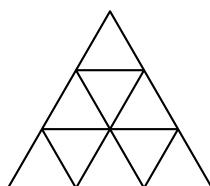
a) $\frac{1}{2}$ cm b) $\frac{3}{2}$ cm c) $\frac{5}{2}$ cm d) $\frac{3}{2} \cdot \pi$ cm e) $\frac{\sqrt{50}}{2}$ cm

2-Point Tasks

4. A starting number is multiplied by 17, the 17 is added. The result will then be divided by 17. Then the starting number is subtracted. What is the final result?

a) 0 b) 1 c) 17 d) Starting number+1 e) Cannot be determined

5. How many triangles can be found in the figure below?



a) 9 b) 10 c) 11 d) 12 e) 13

6. Calculate: $7,\bar{2} + 6,\bar{3} + 5,\bar{4} + 4,\bar{5} + 3,\bar{6} + 2,\bar{7}$

a) 29

b) $29,\bar{7}$ c) $29,\bar{7}$

d) 30

e) $30,\bar{1}$

3-Point Tasks

7. Petra has three different juices to choose from:

- Juice *A* has a fruit content of 10 %
- Juice *B* has a fruit content of 20 %
- Juice *C* has a fruit content of 40 %

She mixes in big pot 1 liter of juice *A* with (3) 2 liters of juice *B* and 4 liters of juice *C*. What is the fruit content in the mixture?

a) 23,33 %

b) 30 %

c) 35 %

d) 45 %

e) 70 %

8. You take exactly two numbers out of the following number set $\{1, 3, 5, 7, 9, 11, 13, 15, 17, 19\}$. The sum of the remaining numbers in that set is now 66. Now you subtract the smaller number from the bigger one that you have taken out in the beginning. Find the result of this subtraction.

a) 0

b) 2

c) 4

d) 6

e) 8

9. Each letter in the following calculation represents a digit.

$$\begin{array}{r} P A P A \\ + P A P A \\ \hline M A M A S \end{array}$$

Find the sum $A + M + P + S$.

a) 8

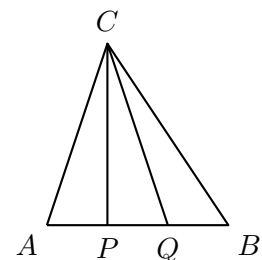
b) 13

c) 15

d) 18

e) 22

10. The triangle ABC has an area of 27 cm^2 . The segments \overline{AP} , \overline{PQ} and \overline{QB} have all equal length. Find the area of the triangle AQC ?

a) 36 cm^2 b) 54 cm^2 c) 63 cm^2 d) 90 cm^2 e) 108 cm^2

4-Point Tasks

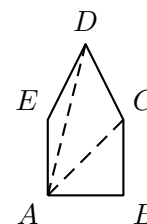
11. If you add a natural number n with its digits the result will be 2029. Find the checksum of n ?

- a) 6 b) 7 c) 11 d) 13 e) 28
-

12. A cuboid has side lengths of 4 cm, 6 cm and 8 cm. How many of these cuboids do you need at least to build up a cube?

- a) 13 b) 24 c) 64 d) 72 e) 192
-

13. The figure on the right is constructed out of an isosceles triangle ECD and a square $ABCE$ with side length 4 cm. The area of the figure $ABCDE$ equals 24 cm^2 .

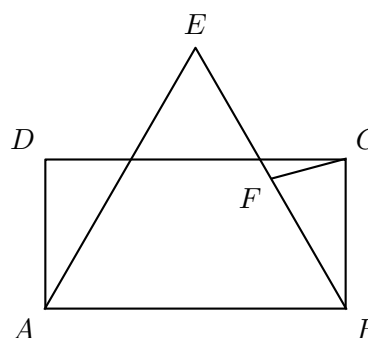


Determine the area of the triangle ACD .

- a) 12 cm^2 b) 13 cm^2 c) 14 cm^2 d) 15 cm^2 e) 16 cm^2
-

14. For the figure shown on the right, the following is true:

- $ABCD$ is a rectangle.
- $\overline{AB} = 2 \cdot \overline{BC}$.
- F is the midpoint of the segment \overline{BE} .
- ABE is an equilateral triangle.



Find the angle BFC . (Figure is not drawn to scale.)

- a) 75° b) 70° c) 60° d) 45° e) 30°
-

15. A triangle has the angles $\alpha = (3m + 30)^\circ$, $\beta = (2m + 7n)^\circ$, $\gamma = (n + 50)^\circ$, where m and n are natural numbers with $m > n$. Find $m + n$.

- a) 13 b) 14 c) 15 d) 16 e) 17
-

5-Point Tasks

16. What stand on the unit position of the number 2^{2018} ?

- a) 0 b) 2 c) 4 d) 6 e) 8
-

17. Calculate:

$$1 \cdot 2 \cdot \left(\frac{1}{1} - \frac{1}{2}\right) + 2 \cdot 3 \cdot \left(\frac{1}{2} - \frac{1}{3}\right) + 3 \cdot 4 \cdot \left(\frac{1}{3} - \frac{1}{4}\right) + \dots + 2017 \cdot 2018 \cdot \left(\frac{1}{2017} - \frac{1}{2018}\right)$$

a) $\frac{2017}{2018}$

b) 1

c) 2016

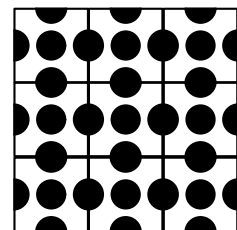
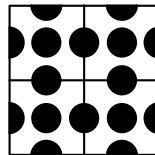
d) 2017

e) 2018

18. The diagram shows a square with one complete black circle and four black semi-circles.



You can build up bigger squares out of several small squares as shown.



Leon has lots of these small squares. He builds up a big square out of 100 small squares. How many complete circles do you recognize in that figure?

a) 120

b) 260

c) 280

d) 300

e) 2660

19. A wooden cube with side length 2 cm is glued to a plate. A second wooden cube with side length 1.6 cm is glued in the center of the top of the first cube. Now each accessible surface area of the two cubes is painted. Find the painted area.

a) 27,68 cm²

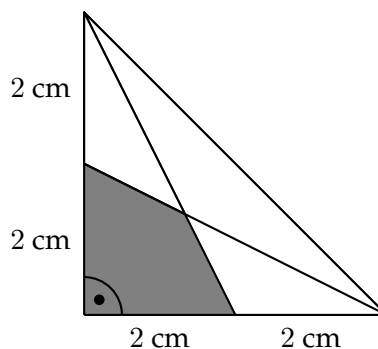
b) 30,24 cm²

c) 32,80 cm²

d) 34,24 cm²

e) 36,80 cm²

20. Find the grey shaded area.



a) $\frac{5}{2}$ cm²

b) $\frac{8}{4}$ cm²

c) $\frac{8}{3}$ cm²

d) 4 cm²

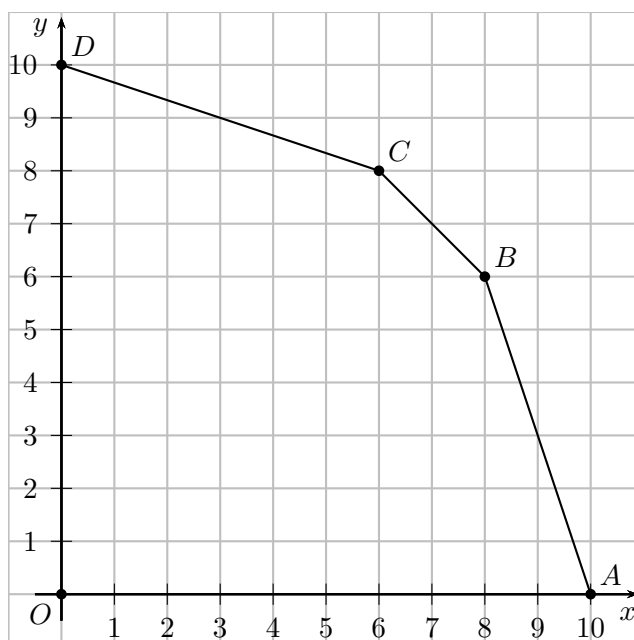
e) $\frac{8}{6}$ cm²

11th Pangea Mathematics Competition 2018

Preliminary Round-Grade 10

1-Point Tasks

1. Find the area of the polygon $OABCD$.



- a) 72 FE b) 74 FE c) 77 FE d) 84 FE e) 88 FE

2. Shorten the following 36 fractions completely. How many fractions with denominator 6 result from this?

$$\frac{1}{36}; \frac{2}{36}; \frac{3}{36}; \dots; \frac{35}{36}; \frac{36}{36}$$

- a) 1 b) 2 c) 3 d) 5 e) 6

3. What is the radius of the largest sphere that fits into a box with side lengths of 3 cm, 4 cm and 5 cm?

- a) $\frac{1}{2}$ cm b) $\frac{3}{2}$ cm c) $\frac{5}{2}$ cm d) $\frac{3}{2} \cdot \pi$ cm e) $\frac{\sqrt{50}}{2}$ cm

2-Point Tasks

4. Calculate: $7,\bar{2} + 6,\bar{3} + 5,\bar{4} + 4,\bar{5} + 3,\bar{6} + 2,\bar{7}$

- a) 29 b) 29,7 c) $29,\bar{7}$ d) 30 e) $30,\bar{1}$

5. $3a2$ and $2a3$ are each 3-digit numbers, where a is any digit.
Find $3a2 - 2a3$?

- a) 0 b) 99 c) 101 d) 119 e) hängt von a ab

6. A fair six-sided dice is thrown twice. What is the probability that the number of points on the first roll is smaller than on the second.

- a) $\frac{12}{36}$ b) $\frac{15}{36}$ c) $\frac{18}{36}$ d) $\frac{21}{36}$ e) $\frac{35}{36}$

3-Point Tasks

7. Petra has three different juices to choose from:

- Juice A has a fruit content of 10 %
- Juice B has a fruit content of 20 %
- Juice C has a fruit content of 40 %

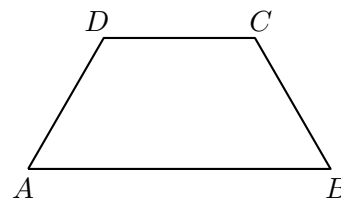
She mixes in big pot 1 liter of juice A with (3) 2 liters of juice B and 4 liters of juice C . What is the fruit content in the mixture?

- a) 23,33 % b) 30 % c) 35 % d) 45 % e) 70 %

8. For the trapezium $ABCD$ on the right the following is given:

- $\overline{BC} = \overline{CD} = \overline{AD} = 2$ cm
- $\overline{AB} = 4$ cm

Find the area of the trapezium.



- a) $\sqrt{3}$ cm² b) $2\sqrt{3}$ cm² c) $3\sqrt{3}$ cm² d) $5\sqrt{3}$ cm² e) 6 cm²

9. If $\frac{1}{x+3} = 2$, find the value of $\frac{1}{x+4}$?

- a) $-\frac{5}{2}$ b) $\frac{2}{3}$ c) $\frac{3}{2}$ d) 1 e) not solvable

10. Let l , m and n be whole numbers for which the following is true:

$$l^3 \cdot m \cdot n^2 < 0 \qquad l^2 \cdot m < 0 \qquad l^2 \cdot m \cdot n > 0$$

Which algebraic sign have l , m and n ?

- a) $\begin{array}{|c|c|c|} \hline l & m & n \\ \hline - & - & + \\ \hline \end{array}$ b) $\begin{array}{|c|c|c|} \hline l & m & n \\ \hline + & - & + \\ \hline \end{array}$ c) $\begin{array}{|c|c|c|} \hline l & m & n \\ \hline + & + & - \\ \hline \end{array}$ d) $\begin{array}{|c|c|c|} \hline l & m & n \\ \hline + & - & - \\ \hline \end{array}$ e) $\begin{array}{|c|c|c|} \hline l & m & n \\ \hline - & + & - \\ \hline \end{array}$

4-Point Tasks

11. If you add a natural number n with its digits the result will be 2029. Find the checksum of n ?
- a) 6 b) 7 c) 11 d) 13 e) 28
-
12. A cuboid has side lengths of 4 cm, 6 cm and 8 cm. How many of these cuboids do you need at least to build up a cube?
- a) 13 b) 24 c) 64 d) 72 e) 192
-
13. Given two squares. The sum of their areas equals 338 cm^2 . The sum of their perimeters equals 96 cm. What is the positive difference of the side lengths of the squares?
- a) 5 b) 7 c) 10 d) 12 e) 24
-
14. A wooden cube with side length 2 cm is glued to a plate. A second wooden cube with side length 1.6 cm is glued in the center of the top of the first cube. Now each accessible surface area of the two cubes is painted. Find the painted area.
- a) $27,68 \text{ cm}^2$ b) $30,24 \text{ cm}^2$ c) $32,80 \text{ cm}^2$ d) $34,24 \text{ cm}^2$ e) $36,80 \text{ cm}^2$
-
15. The following is true for a function f :
- $f(0) = 0$ and $f(n + 1) = f(n) + n + 1$,
- where n is a natural number. Find $f(89)$.
- a) 3916 b) 4004 c) 4005 d) 4094 e) 4095
-

5-Point Tasks

16. What stand on the unit position of the number 2^{2018} ?

- a) 0 b) 2 c) 4 d) 6 e) 8
-

17. For two positive real numbers x and y the following equations are given:

$$2^x \cdot 4^y = 32$$

$$2x + y = 4$$

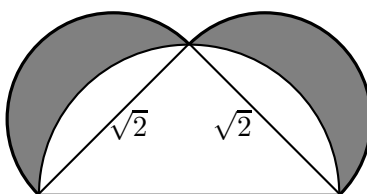
Find $x - y$.

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

18. What is one half of $1,0 \cdot 10^{2018}$?

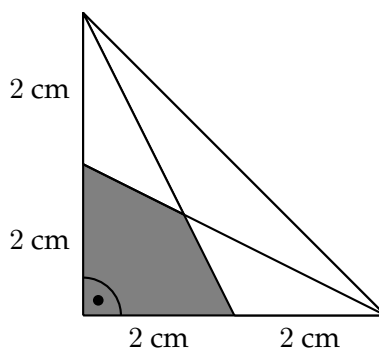
- a) $1,0 \cdot 10^{1009}$ b) $1,0 \cdot 10^{2017}$ c) $5,0 \cdot 10^{1009}$ d) $5,0 \cdot 10^{2017}$ e) $1,0 \cdot 10^{1008}$
-

19. In this figure everything was constructed with a circle and a ruler. Find the grey shaded area.



- a) 1 FE b) $\frac{\pi}{2}$ FE c) 2 FE d) $(\pi - 1)$ FE e) $(2 \cdot \pi - 1)$ FE
-

20. Find the grey shaded area.



- a) $\frac{5}{2} \text{ cm}^2$ b) $\frac{8}{4} \text{ cm}^2$ c) $\frac{8}{3} \text{ cm}^2$ d) 4 cm^2 e) $\frac{8}{6} \text{ cm}^2$
-