



## Grade 7/8 Math Circles

Feb 27/28, Mar 1/2

### BCC and Gauss Contest Prep - Problem Set

#### BCC Prep

1. Dream Dress (BCC Grade 7/8 2015)

Kate wants to buy her dream dress. It must

- have short sleeves, and
- have more than 3 buttons, and
- have stars on its sleeves

Four shops sell only the dresses shown:



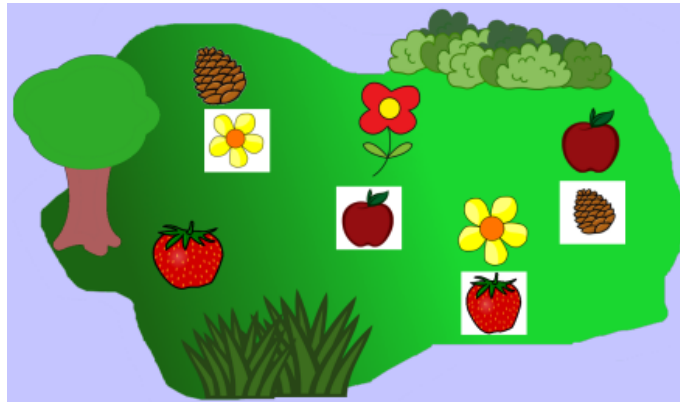
Which of these shops sells Kate's dream dress?

- (A) Beaver Yorker      (B) Beaver Nova      (C) B & B      (D) Tom Teaver

2. Secret Recipe (BCC Grade 7/8 2016)

Beavers are preparing for a Food Festival. They would like to bake a cake but their baker is on vacation. Keith decides to try to bake the cake. He remembers that it is important to add five essential ingredients in the correct order.

When he gets to the garden shown below, he finds a white piece of paper beside all but one ingredient. The paper shows which ingredient must be added next.



So, for example, a yellow five-petal flower must be added immediately after a pine cone. And, since there is no paper beside the strawberry, it must be added last.

Which ingredient must be added first?

- (A)  (B)  (C)  (D) 

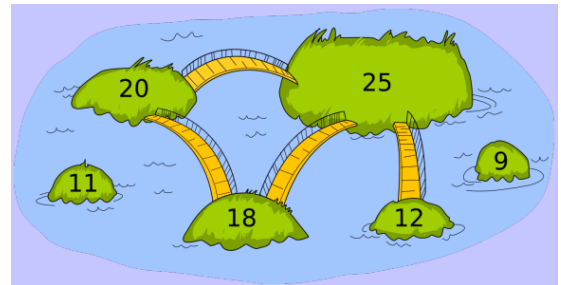
3. Connect the Islands (BCC Grade 7/8 2018)

People of Kastoria use only one rule to decide where bridges are to be built:

They choose one number called the bridge number. If the sum of the populations of two islands is greater than the bridge number, a bridge is built between the islands.

Otherwise, a bridge is not built between the two islands.

The six islands of Kastoria and their populations are shown in the picture. The bridges built using the above rule are also shown.



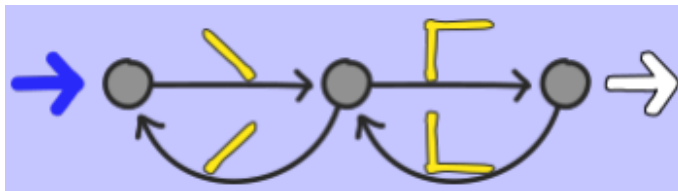
What bridge number was chosen?

- (A) 34 (B) 35 (C) 36 (D) 37



#### 4. Making Stitches (BCC 7/8 2019)

A sewing machine can make four different types of stitches. The rules that the machine follows are shown.



The machine starts a new line of stitches by following the thick blue arrow on the left.

Then the machine moves from circle to circle following in the direction of the arrows. Every time an arrow is followed, the machine makes the stitch shown on that arrow. If a circle has more than one arrow leading out of it, the user of the machine can choose to follow either one of the arrows.

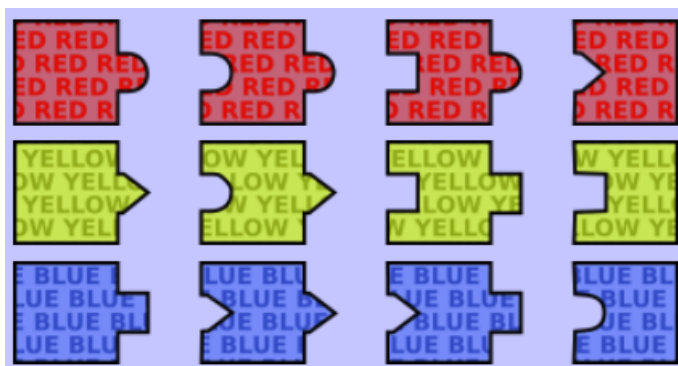
The machine finishes by following the outlined arrow on the right.

Which line of stitches **cannot** be made using the above rules?



#### 5. Puzzle Pieces

A beaver has a puzzle with 12 different types of pieces, 4 of which are red, 4 of which are yellow, and 4 of which are blue. There is an unlimited number of each type of piece, which is shown below.





Using these pieces, the beaver can create various colour sequences. The first piece in a sequence must have a flat left side and the last piece must have a flat right side. Pieces join in the usual way, but two pieces can't be joined on their flat sides and pieces can't be rotated. One possible sequence is shown below.



Which of the following colour sequences **cannot** be constructed?

- (A) YELLOW → BLUE → BLUE → RED → BLUE
- (B) BLUE → YELLOW → RED → YELLOW → RED
- (C) RED → RED → YELLOW → BLUE → BLUE
- (D) BLUE → RED → YELLOW → BLUE → RED

6. Missing Erasers

Four students were helping their teacher clean up. While cleaning, one of the students hid the blackboard erasers. When the teacher realized that the erasers were missing, she asked the students, “Which one of you hid the erasers?” Each student answered as follows:

Amélie: “I didn’t hide the erasers.”

Benin: “Dahila didn’t hide the erasers.”

Cai: “Amélie hid the erasers.”

Dahila: “Either Benin or Cai hid the erasers.”

Only one of these answers was true.

Which student hid the erasers?

- (A) Amélie
- (B) Benin
- (C) Cai
- (D) Dahila



## Gauss Contest Prep

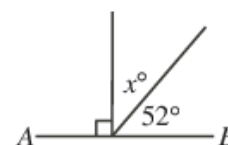
This problem set was created by the [CEMC Problem Set Generator](#).

1. What time is it 45 minutes after 10:20?

- (A) 11:00                      (B) 9:35                      (C) 11:15                      (D) 10:55                      (E) 11:05

(Source: 2015 Gauss (Grade 8), #2)

2. In the diagram,  $AB$  is a line segment. The value of  $x$  is



- (A) 128                      (B) 38                      (C) 48                      (D) 142                      (E) 308

(Source: 2009 Gauss (Grade 8), #4)

3. Which of the following integers is closest to zero?

- (A) -1101                      (B) 1011                      (C) -1010                      (D) -1001                      (E) 1110

(Source: 2014 Gauss (Grade 8), #5)

4. How many prime numbers are there between 20 and 30?

- (A) 0                      (B) 1                      (C) 2                      (D) 3                      (E) 4

(Source: 2006 Gauss (Grade 8), #6)

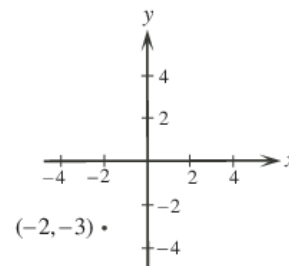
5. Yvon has 4 different notebooks and 5 different pens. He must bring exactly one notebook and exactly one pen to his class. How many different possible combinations of notebooks and pens could he bring?

- (A) 9                      (B) 16                      (C) 20                      (D) 10                      (E) 5

(Source: 2020 Gauss (Grade 8), #7)



6. The point  $(-2, -3)$  is reflected in the  $x$ -axis. What are the coordinates of its image after the reflection?



- (A)  $(2, -3)$                       (B)  $(3, -2)$                       (C)  $(2, 3)$                       (D)  $(-3, -2)$   
(E)  $(-2, 3)$

(Source: 2016 Gauss (Grade 8), #9)

7. The numbers 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 are written on separate cards and placed face down on a table. A card is chosen at random and flipped over. What is the probability that the number on this card is a prime number?

- (A)  $\frac{2}{11}$                       (B)  $\frac{4}{11}$                       (C)  $\frac{6}{11}$                       (D)  $\frac{3}{11}$                       (E)  $\frac{5}{11}$

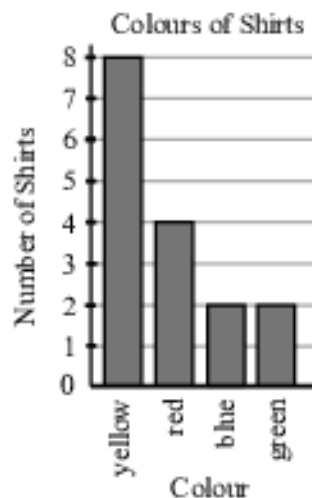
(Source: 2008 Gauss (Grade 8), #10)

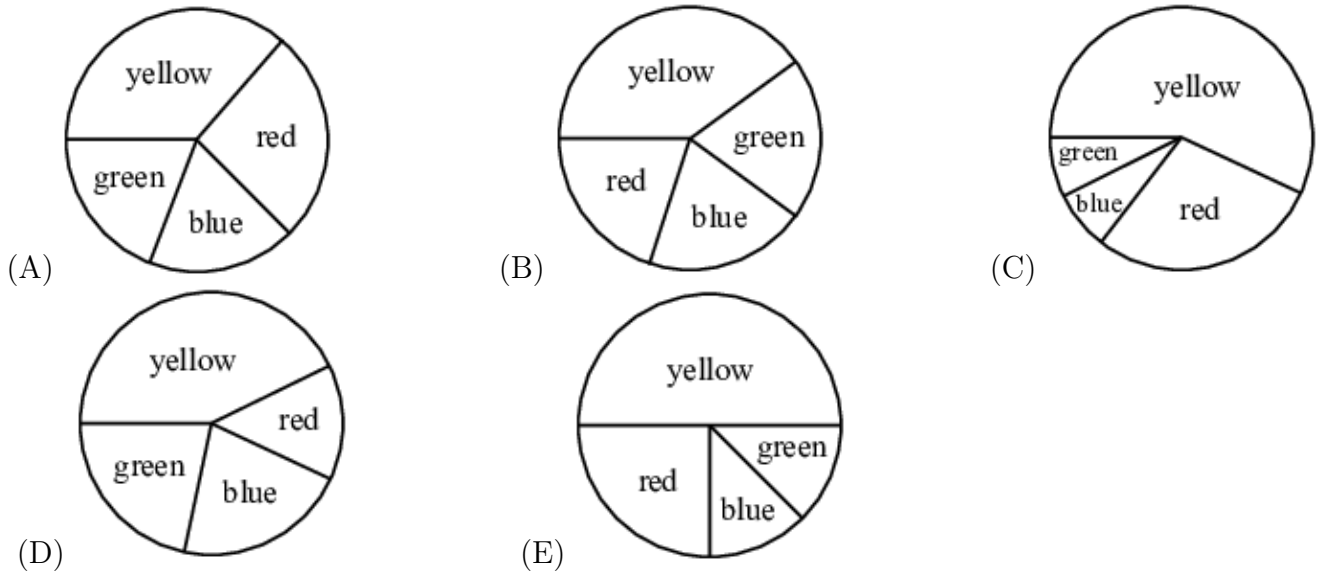
8. A pyramid has a square base. How many edges does the pyramid have?

- (A) 8                      (B) 6                      (C) 12                      (D) 5                      (E) 3

(Source: 2012 Gauss (Grade 8), #11)

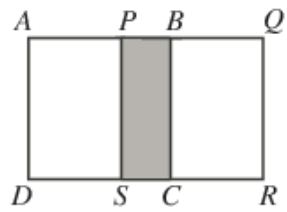
9. Which of the following circle graphs best represents the information in the bar graph shown?





(Source: 2021 Gauss (Grade 8), #13)

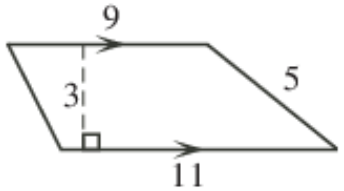
10. Two identical squares,  $ABCD$  and  $PQRS$  have side length 12. They overlap to form the 12 by 20 rectangle  $AQRD$  shown. What is the area of the shaded rectangle  $PBCS$ ?



- (A) 24                      (B) 36                      (C) 48                      (D) 72                      (E) 96

(Source: 2010 Gauss (Grade 8), #16)

11. What is the area of the figure shown?



- (A) 45                      (B) 55                      (C) 27                      (D) 30                      (E) 33

(Source: 2008 Gauss (Grade 8), #20)

12. The product of four *different* positive integers is 360. What is the maximum possible sum of these four integers?

- (A) 68                      (B) 66                      (C) 52                      (D) 39                      (E) 24

(Source: 2009 Gauss (Grade 8), #21)



13. Greg, Charlize, and Azarah run at different but constant speeds. Each pair ran a race on a track that measured 100 m from start to finish. In the first race, when Azarah crossed the finish line, Charlize was 20 m behind. In the second race, when Charlize crossed the finish line, Greg was 10 m behind. In the third race, when Azarah crossed the finish line, how many metres was Greg behind?

- (A) 20                      (B) 25                      (C) 28                      (D) 32                      (E) 40

(Source: 2013 Gauss (Grade 8), #23)

14. What is the tens digit of  $3^{2016}$ ?

- (A) 0                      (B) 2                      (C) 4                      (D) 6                      (E) 8

(Source: 2016 Gauss (Grade 8), #24)

15. Daryl first writes the perfect squares as a sequence

$$1, 4, 9, 16, 25, 36, 49, 64, 81, 100, \dots$$

After the number 1, he then alternates by making two terms negative followed by leaving two terms positive. Daryl's new sequence is:

$$1, -4, -9, 16, 25, -36, -49, 64, 81, -100, \dots$$

What is the sum of the first 2011 terms in this new sequence?

- (A) -4 042 109                      (B) -4 047 638                      (C) -4 038 094                      (D) -4 044 121  
(E) -4 046 132

(Source: 2011 Gauss (Grade 8), #25)