Grade 7/8 Math Circles
October 31/November 1/2/3, 2022
Gauss Contests Preparation - Problem Set

This problem set was created by CEMC Problem Set Generator.

Please click the source on each question to see the full solution.

1. The value of $444 - 44 - 4$ is

   (A) 396   (B) 402   (C) 392   (D) 400   (E) 408

   (Source: 2016 Gauss (Grade 8), #1)

2. The value of $(-3)(-4)(-1)$ is

   (A) -12 (B) -8 (C) 8   (D) 11   (E) 12

   (Source: 2005 Gauss (Grade 8), #2)

3. The value of $(2 + 3)^2 - (2^2 + 3^2)$ is

   (A) 50   (B) 12   (C) 15   (D) -15 (E) -12

   (Source: 2018 Gauss (Grade 8), #3)

4. If $1 + 1.1 + 1.11 + \boxed{} = 4.44$, what number should be put in the box to make the equation true?
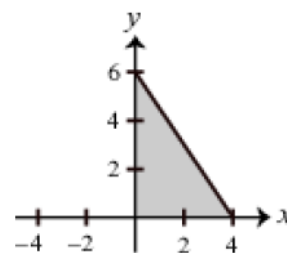
   (A) 3.33   (B) 1.23   (C) 0.12   (D) 2.13   (E) 3.21

   (Source: 2006 Gauss (Grade 8), #4)

5. A line segment is drawn joining the points $(0, 6)$ and $(4, 0)$, as shown. The area of the shaded triangle is

   (A) 12   (B) 5   (C) 18   (D) 10   (E) 48

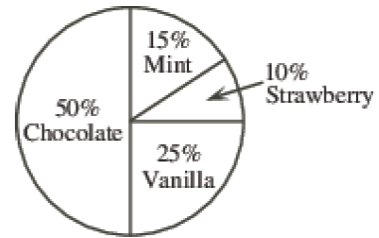   (Source: 2020 Gauss (Grade 8), #5)

6. If Clara doubles a number and then adds 3, the result is 23. The original number is

   (A) 13   (B) 10   (C) 49   (D) 17   (E) 20

   (Source: 2011 Gauss (Grade 8), #6)

7. The circle graph shows the favourite ice cream flavours of those surveyed. What fraction of people surveyed selected either chocolate or strawberry as their favourite flavour of ice cream?

(A) $\frac{3}{5}$ (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\frac{3}{4}$ (E) $\frac{5}{8}$

(Source: 2008 Gauss (Grade 8), #7)

8. Rich and Ben ate an entire chocolate cake. The ratio of the amount eaten by Rich to the amount eaten by Ben is $3 : 1$. What percentage of the cake did Ben eat?

(A) 66% (B) 50% (C) 75% (D) 25% (E) 10%

(Source: 2018 Gauss (Grade 8), #8)

9. A bag contains letters as shown. Elina randomly chooses one of the letters from the bag. What is the probability that Elina chooses a B?
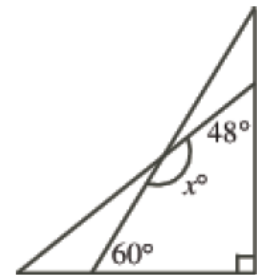
(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{4}{3}$ (D) $\frac{3}{4}$ (E) $\frac{1}{8}$

(Source: 2020 Gauss (Grade 8), #9)

10. In the diagram, the value of x is
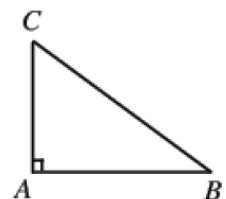
(A) 72 (B) 158 (C) 108 (D) 138 (E) 162

(Source: 2010 Gauss (Grade 8), #10)

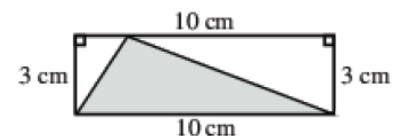11. In the diagram, $AB = 25$ cm, $AC = 20$ cm and $\angle A = 90°$. What is the area of triangle ABC?

(A) 500 cm^2 (B) 300 cm^2 (C) 60 cm^2 (D) 150 cm^2 (E) 250 cm^2

(Source: 2005 Gauss (Grade 8), #11)

12. In the diagram, what is the area of the shaded triangle?

(A) 6.5 cm^2 (B) 7.5 cm^2 (C) 15 cm^2 (D) 13 cm^2 (E) 22.5 cm^2

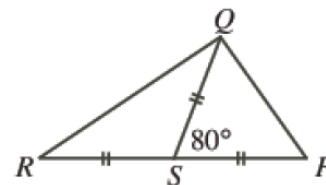(Source: 2006 Gauss (Grade 8), #12)

2

13. In the diagram, RSP is a straight line and $\angle QSP = 80°$. The measure of $\angle PQR$ is

    (A) 120°   (B) 90°   (C) 80°   (D) 60°   (E) 75°

    (Source: 2008 Gauss (Grade 8), #13)

14. March 3, 2009 or 3/3/09 was called a "square root day" because the day and the month are both the square root of the last two digits of the year. The number of square root days between January 1, 2012 and December 31, 2099 is

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

    (Source: 2011 Gauss (Grade 8), #14)

15. The measures of a triangle's three interior angles are in the ration $1 : 4 : 7$. What are the measures of the angles?

    (A) $12°, 48°, 120°$ (B) $10°, 40°, 70°$ (C) $20°, 25°, 155°$ (D) $15°, 60°, 105°$
    (E) $14°, 56°, 110°$

    (Source: 2021 Gauss (Grade 8), #15)

16. The seven numbers $1, 2, 5, 10, 25, 50, 100$ repeat to form the following pattern

    $$1, 2, 5, 10, 25, 50, 100, 1, 2, 5, 10, 25, 50, 100, \ldots$$

    What is the sum of the 18th and the 75th numbers in the pattern?

    (A) 110   (B) 11   (C) 27   (D) 7   (E) 35

    (Source: 2021 Gauss (Grade 8), #16)

17. On coach Wooden's basketball team:

    - Meghan is the tallest player,
    - Meghan's height is 188 cm, and
    - Avery is the shortest player.

    When used with the information above, which of the following single statements is enough to determine Avery's height?

    (A) The median of the players' heights is 170 cm
    (B) The mode of the players' heights is 160 cm
    (C) The mean of the players' heights is 165 cm

3

(D) The range of the players' heights is 33 cm

(E) There are 10 players on the team

(Source: 2017 Gauss (Grade 8), #17)

18. Kathy owns more cats than Alice and more dogs than Bruce. Alice owns more dogs than Kathy and fewer cats than Bruce. Which of the statements *must* be true?

(A) Bruce owns the fewest cats.

(B) Bruce owns the most cats.

(C) Kathy owns the most cats.

(D) Alice owns the most dogs.

(E) Kathy owns the fewest dogs.

(Source: 2019 Gauss (Grade 8), #18)

19. How many positive integers less than 400 can be created using only the digits $1, 2$ or 3, with repetition of digits allowed?
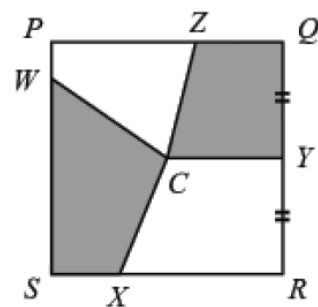
(A) 30   (B) 33   (C) 36   (D) 39   (E) 42

(Source: 2011 Gauss (Grade 8), #19)

20. $PQRS$ is a square with side length 60 and centre C. Point-W lies on PS so that $WS = 53$. Point X lies on SR so that $XR = 40$. The midpoint of QR is Y. Point-Z lies on PQ. What is the length of ZQ so that the total area of the shaded regions is equal to the total area of the non-shaded regions?

(A) 21   (B) 15   (C) 23   (D) 19   (E) 17
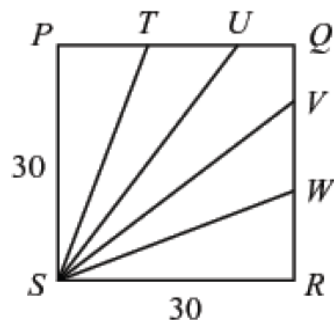
(Source: 2019 Gauss (Grade 8), #20)

21. Nathalie has some quarters, dimes and nickels. The ratio of the number of quarters to the number of dimes to the number of nickels that she has is $9 : 3 : 1$. The total value of these coins is \$18.20. How many coins does Nathalie have?

(A) 130   (B) 117   (C) 98   (D) 91   (E) 140

(Source: 2006 Gauss (Grade 8), #21)

22. Square $PQRS$ has side length 30, as shown. The square is divided into 5 regions of equal area: $\triangle SPT, \triangle STU, \triangle SVW, \triangle SWR$, and quadrilateral $SUQV$. The value of $\dfrac{SU}{ST}$ is closest to

    (A) 1.17   (B) 1.19   (C) 1.21   (D) 1.23   (E) 1.25

    (Source: 2018 Gauss (Grade 8), #22)

23. A wheel with radius 1 m is rolled in a straight line through one complete revolution on a flat horizontal surface. How many metres did the centre of the wheel travel horizontally from its starting location?

    (A) 4π (B) 2   (C) 2π (D) π (E) 1

    (Source: 2005 Gauss (Grade 8), #23)

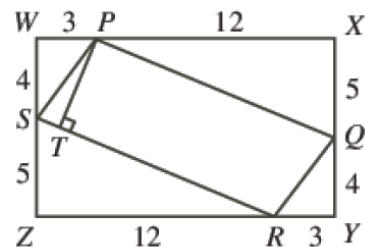24. The sum of all of the digits of the integers from 98 to 101 is

    $$9 + 8 + 9 + 9 + 1 + 0 + 0 + 1 + 0 + 1 = 38$$

    The sum of all of the digits of the integers from 1 to 2008 is

    (A) 30 054   (B) 27 018   (C) 28 036   (D) 30 036   (E) 28 054

    (Source: 2008 Gauss (Grade 8), #24)

25. In the rectangle $WXYZ$, the parallelogram $PQRS$ is formed as shown. The segment PT is perpendicular to SR. The length of ST is

    (A) $\frac{13}{12}$ (B) $\frac{13}{5}$ (C) $\frac{12}{13}$ (D) $\frac{16}{13}$ (E) 1

    (Source: 2012 Gauss (Grade 8), #25)