



Grade 6 Math Circles
March 25/26, 2014
Gauss Contest Preparation - Solutions

General Information

The Gauss contest is an opportunity for grade 7/8 students to have fun and challenge their mathematical problem solving skills

Date and Registration

Registration Date: April 22, 2015

Test Writing Date: May 13, 2015

Format and Marking Scheme

- 60 minutes
- 25 multiple choice questions
- 150 marks:
 - Part A: 10 questions - 5 marks each
 - Part B: 10 questions - 6 marks each
 - Part C: 5 questions - 8 marks each
 - Unanswered Questions: 2 marks each (for up to 10 questions)

Contest Success Strategies

- **ELIMINATE** - choices that aren't sensible answers, making it easier to guess
- **DRAW** - diagrams representing your scenario to help clear up misconceptions
- **MOVE ON** - from questions you are stuck on to get as many marks as possible
- **FOCUS** - on Part B and Part C questions as Part A shouldn't pose a challenge
- **PRACTICE** - by studying from the contest bank on the CEMC website
- **LEARN** - techniques and short-cuts from past contest solutions

Scoring: There is *no penalty* for an incorrect answer.
Each unanswered question is worth 2, to a maximum of 10 unanswered questions

Part A: Each correct answer is worth 5.

1. (2008 Q1) The value of $-3 \times 2 + 7$ is
 (A) -27 (B) 1 (C) 13 (D) -1 (E) -13

$$= -3 \times 2 + 7$$

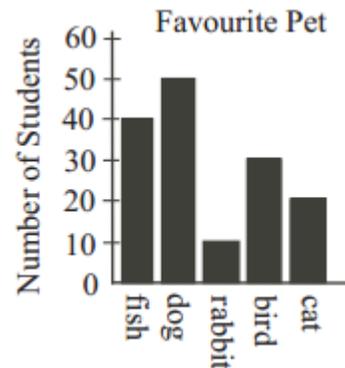
$$= -6 + 7$$

$$= 1$$

Answer: B

2. (2010 Q1) Students were asked what is their favorite pet. Given the Graph to the right how many students chose bird.

- (A) 10 (B) 20 (C) 30
 (D) 40 (E) 50



Answer: C

3. (2006 Q3) If Timmy has \$ 5000 in \$20 dollar bills, how many \$20 bills does he have?
 (A) 500 (B) 100 (C) 2500 (D) 250 (E) 1000

To find out how many bills he has, we divide the two numbers.

$$= 5000 \div 20$$

$$= 250$$

Answer: D

4. (2011 Q4) At the store the price for beef is \$10 per 2 pounds. If you want to buy 5 pounds it will cost you.
 (A) 50 (B) 25 (C) 13 (D) 30 (E) 5

Start by setting up the ratio then solve for the missing value.

$$\frac{10}{2} = \frac{x}{5}$$

$$\frac{50}{2} = x$$

$$x = 25$$

Answer: B

5. (2009 Q6) It is 19° in Florida. In Vancouver it is 13 degrees cooler and than Florida. In Calgary it is 9 degrees cooler then in Vancouver. What is the temperature in Calgary.

- (A) 2° (B) 0° (C) 10° (D) 6° (E) -3°

First we find the temperature in Vancouver $19 - 13 = 6$. Then we find the temperature in Calgary.

$$6 - 9 = -3.$$

Answer: E

6. (2011 Q8) Tommy is running a marathon(42 Km) an hour in he passes the 14 km marker. How much of the race does he have left?

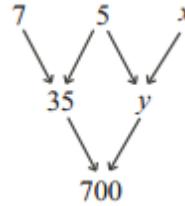
(A) $\frac{2}{4}$ (B) $\frac{1}{3}$ (C) $\frac{4}{5}$ (D) $\frac{2}{3}$ (E) $\frac{3}{4}$

Tommy has run $\frac{14}{42}$ of the marathon. If we simplify this fraction we get $\frac{1}{3}$. We want to know how much he has left to run, So if he was completed $\frac{1}{3}$ of a marathon then he has $1 - \frac{1}{3} = \frac{2}{3}$ of the marathon left.

Answer: D

7. (2010 Q10) Each number below the top row is the product of the number to the right and the number to the left in the row immediately above it. What is the value of x ?

(A) 6 (B) 5 (C) 4
(D) 8 (E) 7



Since the the numbers below are found by multiplying the numbers above, we can find the missing numbers above by division. We first find y :

$$y = 700 \div 35 = 20$$

Now we can find x :

$$x = 20 \div 5 = 4$$

$$x = 4$$

Answer: C

Part B: Each correct answer is worth 6.

8. (2007 Q11) A Fibonacci number is a number that falls in the patter: 1, 1, 2, 3, 5, 8, ... Each number in this patter is found by adding the two numbers before it. Knowing this which of the following numbers is a Fibonacci number?

(A) 33 (B) 22 (C) 20 (D) 34 (E) 27

If we continue the sequence we have:

{1, 1, 2, 3, 5, 8, 13, 21, 34, 55, ... }

Here we have 34 in the sequence and it is also one of the choices.

Answer: D

9. (2012 Q11)The perimeter of a square is 36 cm. The area of the square, in cm^2 , is

(A) 81 (B) 24 (C) 324 (D) 1296 (E) 36

A square has 4 equal length sides. So a perimeter of 36 means that each side has a length of $36 \div 4 = 9$. The area of a square is the side length square. So we get:

$$9^2 = 81$$

Answer: A

10. (2007 Q12) A lottery is held and 180 tickets are sold. How many tickets did Sam buy if he has a probability of winning of $\frac{1}{30}$

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

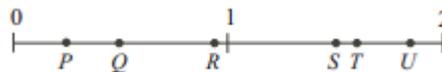
The odds of winning the lottery are $\frac{1}{180}$ because 180 tickets were sold. If Sam bought 2 tickets he would have a probability of $\frac{1}{180} + \frac{1}{180} = \frac{2}{180} = \frac{1}{90}$ of winning. This could be found the other way by doing

$180 \div 90 = 2$. In the question Sam has a probability of $\frac{1}{30}$. This means he bought $180 \div 30 = 6$ tickets.

Answer: B

11. (2009 Q14) Which of the points positioned on the number line best represents the value of $S \div T$?

(A) R (B) T (C) U
(D) Q (E) P



Looking at the number line we see S and T are very close to each other. Therefore dividing the two numbers will give something near 1. since we are doing $S \div T = \frac{S}{T}$, and from the number line T is greater than S we know that $\frac{S}{T}$ will be slightly less than 1. On the number line the approximate location of this is represented by R.

Answer: A

12. (2012 Q14) The digits 3, 4, 7 and 9 are each used once to create two 2-digit numbers. What is the largest possible difference between the two 2-digit numbers?

(A) 46 (B) 64 (C) 57 (D) 54 (E) 63

The largest number we can make with with digits 3, 4, 7, 9 is 97 and the smallest is 34. Therefore the difference between the largest and smallest is $97 - 34 = 63$

Answer: E

13. (2013 Q16) The average of 7 consecutive numbers is 23. What is the largest of these number?

(A) 23 (B) 24 (C) 25 (D) 26 (E) 27

If the average of 7 consecutive numbers is 23 that means that the middle number is 23. The middle number would be the 4th number, so that means that the largest number is 3 bigger than the middle number: 26

Answer: D

14. (2012 Q17) The ratio of boys to girls at Gauss Public School is 7 : 4. If there are 112 boys at the school, then how many students are there at the school?

(A) 154 (B) 308 (C) 196 (D) 64 (E) 176

Setting up the ratio we get: $\frac{4}{7} = \frac{Girls}{112} \Rightarrow Girls = 64$

This means that in total we have $112 \text{ boys} + 64 \text{ girls} = 176 \text{ students}$

Answer: E

Part C: Each correct answer is worth 8.

15. (2008 Q18) Billy wrote 4 of 5 test so far this year and got marks of 77,75,86,84. Each test is worth the same amount and is score from 0-100. Which of the following is a possible average after he writes his fifth and final test.

(A) 50 (B) 63 (C) 84 (D) 85 (E) 90

First we assume that Billy gets 0 on the final test. This means his final average would be:

$$\frac{77 + 75 + 86 + 84 + 0}{5} = \frac{322}{5} = 64.4$$

This means that the lowest possible average Billy can get is 64.4

Now assume Billy get 100 on the final test. This means his average would be:

$$\frac{77 + 75 + 86 + 84 + 100}{5} = \frac{422}{5} = 84.4$$

The highest possible average Billy can get is 84.4

So we found the highest and the lowest possible average. The only option above that falls in this range is 84.

Answer: C

16. (2010 Q22) An arithmetic sequence is a sequence in which each term after the first is obtained by adding a constant to the previous term. For example, 2, 4, 6, 8 and 1, 4, 7, 10 are arithmetic sequences. In the grid shown, the numbers in each row must form an arithmetic sequence and the numbers in each column must form an arithmetic sequence. The value of x is

0			
4			25
8			x
		30	

- (A) 22 (B) 32 (C) 42
 (D) 39 (E) 34

First we can easily find the number in the bottom left corner by doing $8+4 = 12$.

Next we know the the difference between 30 and 12 is 18. We also know that the missing number between 12 and 30 has to be in the middle or half the difference between then $2(9)$. So the number between 12 and 30 is $12 + 9 = 21$

Knowing the bottom row increases by 9 we can find the bottom right corner by doing $30 + 9 = 39$

Finally x has half way between 25 and 39. The difference here is 14, so half that is 7.

Therefore $x = 25 + 7 = 32$

Answer: B

17. (2006 Q23) In the addition of two 2-digit numbers, each blank space, including those in the answer, is to be filled with one of the digits 0, 1, 2, 3, 4, 5, 6, each used exactly once. The units digit of the sum is

+			
			?

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

Because we have two 2-digit numbers added together to become a 3-digit number the 10's digit for the 2-digit numbers has to be wither 4 and 6 or 5 and 6. If we chose 6 and 5 we get the number 1 repeated. Therefore it must be 4 and 6. This gives us:

$$4_ + 6_ = 10_$$

Here we have used the number 0, 1, 4, and 6. So we still need to use the numbers 2, 3, 5. We notice $2 + 3 = 5$ or equivalently $3 + 2 = 5$ Therefore the digit number of the answer must be 5.

Answer: A

Extra problems:

1. (2009 Q3)How many prime numbers are in the list: 31, 32, 33, 34, 35, 36, 37, 38, 39

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

A prime number is greater than 2 and only divisible by 1 and itself. The numbers that satisfy those conditions in the list are: 31 and 37. Therefore we have 2 of them.

Answer: C

2. (2006 Q7) What is the value of x in $-2+6x = 40$

- (A) 5.5 (B) 4 (C) 7 (D) 5 (E) 6

$$-2 + 6x = 40$$

$$6x = 42$$

$$x = \frac{42}{6}$$

$$x = 7$$

Answer: C

3. (2012 Q7) Which of the following statements is true?

(A) -5 is less than -8 (B) 4 is less than 2 (C) 0 is less than -8

(D) -7 is less than -4 (E) -3 is less than -6

You can visualize this by putting each case on a number line. If you don't see why the answer is D, put each case on the number line.

Answer: D

4. (2006 Q11) If a soccer ball costs 19.99 before tax and there is a 15% sales tax, how much does the ball cost with the tax included.

(A) 21.49 (B) 3.00 (C) 22.99 (D) 21.50 (E) 20.14

15% simply means $\frac{15}{100}$ or 0.15. Therefore 15% of 19.99 is:

$$19.99 \times 0.15 = 3.00 \text{ (after rounding 2.9985).}$$

We then add this to the original price to get:

$$19.99 + 3.00 = 22.99$$

Answer: C

5. (2007 Q15) How many positive whole numbers, including 1, divide exactly into both 30 and 75?

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

Factors of 30: 1,2,3,5,6,10,15,30

Factors of 75: 1,3,5,15,25,75

Factors in common: 1,2,5,15 there are 4 in common

Answer D

6. (2011 Q17) It's lunchtime! You are given one drink, either apple juice, orange juice or milk. You are given one meal either chicken or vegetarian. Finally you get either an apple, an orange or a banana. If you are given a meal at random what is the probability that you get apple juice in your meal?

(A) $\frac{1}{6}$ (B) $\frac{1}{2}$ (C) $\frac{2}{3}$ (D) $\frac{1}{3}$ (E) $\frac{5}{6}$

For this question we must notice that it doesn't matter which fruit or meal you get you will always get 1 of 3 drink choices because they are independent. Therefore the odds of getting apple juice is $\frac{1}{3}$

Answer: D

7. (2010 Q23) Johnny assigns a different value to each letter in the alphabet. Each word then has a score which is the product of the letters in that word. If BOB has a value of 25, ROB has a value of 30 and ROW has a value of 24, what is that value of BORROW?

(A) 780 (B) 720 (C) 500 (D) 600 (E) 640

First we notice BOB has a value that is a perfect square and it has a repeated letter. We know $B^2 \times O = 25$. We have 2 options here: either B is 5 and O is 1 or B is 1 and O is 25. However we notice O is also in ROW, and since row is less than 25 O can't be 25.

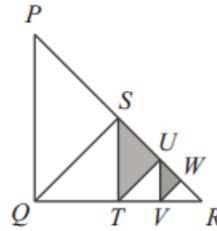
So far we have $B = 5$ and $O = 1$. With these 2 letters and the word ROB we can find the value of R since $R \times 1 \times 5 = 30 \Rightarrow R = 6$.

now with R and O we can find the value of W since $6 \times 1 \times W = 24 \Rightarrow W = 4$

Now we have all the value of *BORROW* so we simply multiply them together to get :
BORROW = $5 \times 1 \times 6 \times 6 \times 1 \times 4 = 720$

Answer: B

8. (2013 Q23) In the figure, each line through the triangles cuts them in half. That is the large triangle made by the points PQR, is split in half by the line that goes from Q to S. Similarly the triangle QSR is cut in half by the line going from S to T. The same applies to the smaller triangles. what fraction of the large triangle PQR is shaded.



- (A) $\frac{3}{16}$ (B) $\frac{3}{8}$ (C) $\frac{5}{16}$
 (D) $\frac{5}{32}$ (E) $\frac{7}{32}$

So we start with an area of 1. This area is then cut in half so we have $\frac{1}{2}$. This triangle is then cut in half again giving us an area of $\frac{1}{4}$. We are now at the area of the triangle STR. Half of this triangle is shaded. Half of $\frac{1}{4}$ is $\frac{1}{8}$.

now we must find the fraction of the smaller shaded area. The are of the smaller triangle UVW is using the same logic as before a quarter of the area of STU. A quarter of $\frac{1}{8}$ is simply $\frac{1}{8} \times \frac{1}{4} = \frac{1}{32}$

now we know our shaded area is $\frac{1}{8} + \frac{1}{32} = \frac{4+1}{32} = \frac{5}{32}$

Answer: D

Answer Key:

PART A

1. B 2. C 3. D 4. B 5. E 6. D 7. C

PART B

8. D 9. A 10. B 11. A 12. E 13. D 14. E

PART C

15. C 16. B 17. A

EXTRA QUESTIONS

1. C 2. C 3. D 4. C 5. D 6. D 7. B 8. D