The CENTRE for EDUCATION in MATHEMATICS and COMPUTING

cemc.uwaterloo.ca

Gauss Contest Grade 7
Solutions

1. The value of $\frac{3 \times 4}{6}$ is
   (A) 1 (B) 2 (C) 3 (D) 4 (E) 6

Source: 2005 Gauss Grade 7 #1

Primary Topics: Number Sense

Secondary Topics: Fractions/Ratios | Operations

Answer: B

Solution:

Calculating the numerator first, $\frac{3 \times 4}{6} = \frac{12}{6} = 2$.

---

2. $0.8 - 0.07$ equals
   (A) 0.1 (B) 0.71 (C) 0.793 (D) 0.01 (E) 0.73

Source: 2005 Gauss Grade 7 #2

Primary Topics: Number Sense

Secondary Topics: Decimals | Operations

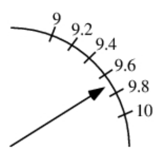
Answer: E

Solution:

Calculating, $0.8 - 0.07 = 0.80 - 0.07 = 0.73$.

---

3. Contestants on "Gauss Reality TV" are rated by an applause metre. In the diagram, the arrow for one of the contestants is pointing to a rating that is closest to



   (A) 9.4 (B) 9.3 (C) 9.7 (D) 9.9 (E) 9.5

Source: 2005 Gauss Grade 7 #3

Primary Topics: Data Analysis

Secondary Topics: Decimals | Estimation | Graphs

Answer: C

Solution:

Since the arrow is pointing between 9.6 and 9.8, it is pointing to a rating closest to 9.7.

---

4. Twelve million added to twelve thousand equals
   (A) 12 012 000 (B) 12 120 000 (C) 120 120 000
   (D) 12 000 012 000 (E) 12 012 000 000

Source: 2005 Gauss Grade 7 #4

Primary Topics: Number Sense

Secondary Topics: Digits | Operations

Answer: A

Solution:

Twelve million is written as 12 000 000 and twelve thousand is written as 12 000, so the sum of these two numbers is 12 012 000.

---

5. The largest number in the set $\{0.109, 0.2, 0.111, 0.114, 0.19\}$ is
   (A) 0.109 (B) 0.2 (C) 0.11 (D) 0.114 (E) 0.19

Source: 2005 Gauss Grade 7 #5

Primary Topics: Number Sense

Secondary Topics: Decimals

Answer: B

Solution:

To figure out which number is largest, we look first at the number in the tenths position. Since four of the given numbers have a 1 in the tenths position and 0.2 has a 2, then 0.2 is the largest.

---

6. At a class party, each student randomly selects a wrapped prize from a bag. The prizes include books and calculators. There are 27 prizes in the bag. Meghan is the first to choose a prize. If the probability of Meghan choosing a book for her prize is $\frac{2}{3}$, how many books are in the bag?
   (A) 15 (B) 9 (C) 21 (D) 7 (E) 18

Source: 2005 Gauss Grade 7 #6

Primary Topics: Counting and Probability

Secondary Topics: Probability

Answer: E

Solution:

Since Meghan chooses a prize from 27 in the bag and the probability of her choosing a book is $\frac{2}{3}$, then $\frac{2}{3}$ of the prizes in the bag must be books.
Therefore, the number of books in the bag is $\frac{2}{3} \times 27 = 18$.

---

7. Karen has just been chosen the new "Math Idol". A total of 1 480 000 votes were cast and Karen received 83% of them. How many people voted for her?
(A) 830 000 (B) 1 228 400 (C) 1 100 000 (D) 251 600 (E) 1 783 132

Source: 2005 Gauss Grade 7 #7

Primary Topics: Number Sense

Secondary Topics: Percentages

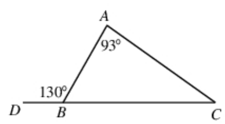
Answer: B

Solution:

Since 83% in decimal form is 0.83, then the number of people who voted for Karen is equal to $0.83 \times 1\,480\,000 = 1\,228\,400$.

---

8. In the diagram, the size of $\angle ACB$ is



(A) 57° (B) 37° (C) 47° (D) 60° (E) 17°

Source: 2005 Gauss Grade 7 #8

Primary Topics: Geometry and Measurement

Secondary Topics: Angles | Triangles

Answer: B

Solution:

Since $\angle ABC + \angle ABD = 180^\circ$ (in other words, $\angle ABC$ and $\angle ABD$ are supplementary) and $\angle ABD = 130^\circ$, then $\angle ABC = 50^\circ$. Since the sum of the angles in triangle ABC is 180° and we know two angles 93° and 50° which add to 143°, then $\angle ACB = 180^\circ - 143^\circ = 37^\circ$.

---

9. A movie theatre has eleven rows of seats. The rows are numbered from 1 to 11. Odd-numbered rows have 15 seats and even-numbered rows have 16 seats. How many seats are there in the theatre?
(A) 176 (B) 186 (C) 165 (D) 170 (E) 171

Source: 2005 Gauss Grade 7 #9

Primary Topics: Counting and Probability

Secondary Topics: Counting

Answer: D

Solution:

There are six odd-numbered rows (rows 1, 3, 5, 7, 9, 11).
These rows have $6 \times 15 = 90$ seats in total.
There are five even-numbered rows (rows 2, 4, 6, 8, 10).
These rows have $5 \times 16 = 80$ seats in total.
Therefore, there are $90 + 80 = 170$ seats in total in the theatre.

---

10. In relation to Smiths Falls, Ontario, the local time in St. John's, Newfoundland, is 90 minutes ahead, and the local time in Whitehorse, Yukon, is 3 hours behind. When the local time in St. John's is 5:36 p.m., the local time in Whitehorse is
(A) 1:06 p.m. (B) 2:36 p.m. (C) 4:06 p.m. (D) 12:06 p.m. (E) 10:06 p.m.

Source: 2005 Gauss Grade 7 #10

Primary Topics: Number Sense

Secondary Topics: Measurement

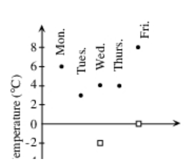
Answer: A

Solution:

When it is 5:36 p.m. in St. John's, it is 90 minutes or $1\frac{1}{2}$ hours earlier in Smiths Falls, so it is 4:06 p.m. in Smiths Falls.
When it is 4:06 p.m. in Smiths Falls, it is 3 hours earlier in Whitehorse, so it is 1:06 p.m. in Whitehorse.

---

11. The temperature range on a given day is the difference between the daily high and the daily low temperatures. On the graph shown, which day has the greatest temperature range?



(A) Monday (B) Tuesday (C) Wednesday (D) Thursday (E) Friday

Source: 2005 Gauss Grade 7 #11

Primary Topics: Data Analysis

Secondary Topics: Estimation | Graphs

Answer: A

Solution:

On each day, the temperature range is the difference between the daily high and daily low temperatures.
On Monday, the range is $6 - (-4) = 10$ degrees Celsius.
On Tuesday, the range is $3 - (-6) = 9$ degrees Celsius.
On Wednesday, the range is $4 - (-2) = 6$ degrees Celsius.
On Thursday, the range is $4 - (-5) = 9$ degrees Celsius.
On Friday, the range is $8 - 0 = 8$ degrees Celsius.
The day with the greatest range is Monday.

---

12. A bamboo plant grows at a rate of 105 cm per day. On May 1st at noon it was 2 m tall. Approximately how tall, in metres, was it on May 8th at noon?
(A) 10.4 (B) 8.3 (C) 3.05 (D) 7.35 (E) 9.35

Source: 2005 Gauss Grade 7 #12

Primary Topics: Number Sense

Secondary Topics: Rates | Decimals | Estimation | Measurement

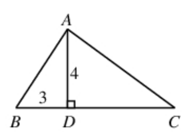
Answer: E

Solution:

Since the bamboo plant grows at a rate of 105 cm per day and there are 7 days from May 1st and May 8th, then it grows $7 \times 105 = 735$ cm in this time period.
Since 735 cm $= 7.35$ m, then the height of the plant on May 8th is $2 + 7.35 = 9.35$ m.

---

13. In the diagram, the length of DC is twice the length of BD. The area of the triangle ABC is



(A) 24 (B) 72 (C) 12 (D) 18 (E) 36

Source: 2005 Gauss Grade 7 #13

Primary Topics: Geometry and Measurement

Secondary Topics: Triangles | Area

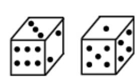
Answer: D

Solution:

Since $BD = 3$ and DC is twice the length of BD, then $DC = 6$. Therefore, triangle ABC has a base of length 9 and a height of length 4.
Therefore, the area of triangle ABC is $\frac{1}{2}bh = \frac{1}{2}(9)(4) = \frac{1}{2}(36) = 18$.

---

14. The numbers on opposite sides of a die total 7. What is the sum of the numbers on the unseen faces of the two dice shown?



(A) 14 (B) 20 (C) 21 (D) 24 (E) 30

Source: 2005 Gauss Grade 7 #14

Primary Topics: Other

Secondary Topics: Operations | Logic

Answer: C

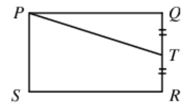
Solution:

Solution 1
Since the sum of the numbers on opposite faces on a die is 7, then 1 and 6 are on opposite faces, 2 and 5 are on opposite faces, and 3 and 4 are on opposite faces.
On the first die, the numbers on the unseen faces opposite the 6, 2 and 3 are 1, 5 and 4, respectively.
On the second die, the numbers on the unseen faces opposite the 1, 4 and 5 are 6, 2 and 3, respectively.
The sum of the missing numbers is $1 + 5 + 4 + 6 + 2 + 3 = 21$.

Solution 2
The sum of the numbers on a die is $1 + 2 + 3 + 4 + 5 + 6 = 21$ and so the sum of the numbers on two die is $2 \times 21 = 42$.
Since there is a sum of 21 showing on the six visible faces, the sum of the numbers on the six unseen faces is $42 - 21 = 21$.

---

15. In the diagram, the area of rectangle $PQRS$ is 24. If $TQ = TR$, the area of quadrilateral $PTRS$ is



(A) 18 (B) 20 (C) 16 (D) 6 (E) 15

Source: 2005 Gauss Grade 7 #15

Primary Topics: Geometry and Measurement

Secondary Topics: Area | Quadrilaterals | Triangles

Answer: A

Solution:

Solution 1
Since the area of rectangle $PQRS$ is 24, let us assume that $PQ = 6$ and $QR = 4$.
Since $QT = QR$, then $QR = 2QT$ so $QT = 2$. Therefore, triangle PQT has base PQ of length 6 and height QT of length 2, so has area $\frac{1}{2}(6)(2) = \frac{1}{2}(12) = 6$.
So the area of quadrilateral $PTRS$ is equal to the area of rectangle $PQRS$ (which is 24) minus the area of triangle PQT (which is 6), or 18.

Solution 2
Draw a line through T parallel to PQ across the rectangle parallel so that it cuts PS at point V. Since T is halfway between Q and R, then V is halfway between P and S.
Therefore, $SVTR$ is a rectangle which has area equal to half the area of rectangle $PQRS$, or 12.
Similarly, $VPQT$ is a rectangle of area 12, and $VPQT$ is cut in half by PT, so triangle PVT has area 6.
Therefore, the area of $PTRS$ is equal to the sum of the area of rectangle $SVTR$ and the area of triangle PVT, or $12 + 6 = 18$.

---

16. Nicholas is counting the sheep in a flock as they cross a road. The sheep begin to cross the road at 2:00 p.m. and cross at a constant rate of three sheep per minute. After counting 42 sheep, Nicholas falls asleep. He wakes up an hour and a half later, at which point exactly half of the total flock has crossed the road since 2:00 p.m. How many sheep are there in the entire flock?
(A) 630 (B) 621 (C) 582 (D) 624 (E) 618

Source: 2005 Gauss Grade 7 #16

Primary Topics: Counting and Probability

Secondary Topics: Fractions/Ratios | Rates

Answer: D

Solution:

Nicholas sleeps for an hour and a half, or 90 minutes.
Since three sleep cross the road per minute, then $3 \times 90 = 270$ sheep cross while he is asleep.
Since 42 sheep crossed before he fell asleep, then $42 + 270 = 312$ sleep have crossed the road in total when he wakes up.
Since this is half of the total number of sheep in the flock, then the total number in the flock is $2 \times 312 = 624$.

---

17. The symbol $\begin{array}{|c|c|}\hline 3 & 4 \\ \hline 5 & 6 \\ \hline\end{array}$ is evaluated as $3 \times 6 + 4 \times 5 = 38$. If $\begin{array}{|c|c|}\hline 2 & 6 \\ \hline 1 & \\ \hline\end{array}$ is evaluated as 16, then the number that should be placed in the empty space is
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

Source: 2005 Gauss Grade 7 #17

Primary Topics: Algebra and Equations

Secondary Topics: Operations | Equations Solving

Answer: E

Solution:

Solution 1
When we calculate the value of the symbol, we add the product of the numbers on each of the two diagonals.
The product of the entries on the diagonal with the 1 and the 6 is 6.
Since the symbol is evaluated as 16, then the product of the entries on the other diagonal is 10.
Since one of the entries on the other diagonal is 2, then the missing entry must be 5.

Solution 2
Let the missing number be x.
Using the definition for the evaluation of the symbol, we know that $2 \times x + 1 \times 6 = 16$ or $2x + 6 = 16$ or $2x = 10$ or $x = 5$.

---

18. A game is said to be fair if your chance of winning is equal to your chance of losing. How many of the following games, involving tossing a regular six-sided die, are fair?
   - You win if you roll a 2
   - You win if you roll an even number
   - You win if you roll a number less than 4
   - You win if you roll a number divisible by 3

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

Source: 2005 Gauss Grade 7 #18

Primary Topics: Other | Counting and Probability

Secondary Topics: Games | Probability

Answer: C

Solution:

When a die is rolled, there are six equally likely possibilities (1 through 6).
In order for the game to be fair, half of the six possibilities, or three possibilities, must be winning possibilities.

In the first game, only rolling a 2 gives a win, so this game is not fair.
In the second game, rolling a 2, 4 or 6 gives a win, so this game is fair.
In the third game, rolling a 1, 2 or 3 gives a win, so this game is fair.
In the fourth game, rolling a 3 or 6 gives a win, so this game is not fair.
Therefore, only two of the four games are fair.

---

19. Chris and Pat are playing catch. Standing 1 m apart, Pat first throws the ball to Chris and then Chris throws the ball back to Pat. Next, standing 2 m apart, Pat throws to Chris and Chris throws back to Pat. After each pair of throws, Chris moves 1 m farther away from Pat. They stop playing when one of them misses the ball. If the game ends when the 29th throw is missed, how far apart are they standing and who misses catching the ball?
(A) 15 m, Chris (B) 15 m, Pat (C) 14 m, Chris (D) 14 m, Pat
(E) 16 m, Pat

Source: 2005 Gauss Grade 7 #19

Primary Topics: Number Sense

Secondary Topics: Patterning/Sequences/Series

Answer: A

Solution:

At each distance, two throws are made: the 1st and 2nd throws are made at 1 m, the 3rd and 4th are made at 2 m, and so on, with the 27th and 28th throws being made at 14 m.
Therefore, the 29th throw is the first throw made at 15 m.
At each distance, the first throw is made by Pat to Chris, so Chris misses catching the 29th throw at a distance of 15 m.

---

20. While driving at 80 km/h, Sally's car passes a hydro pole every four seconds. Which of the following is closest to the distance between two neighbouring hydro poles?
(A) 50 m (B) 60 m (C) 70 m (D) 80 m (E) 90 m

Source: 2005 Gauss Grade 7 #20

Primary Topics: Number Sense

Secondary Topics: Rates

Answer: E

Solution:

Since Sally's car travels 80 km/h, it travels 80 000 m in one hour.
Since there are 60 minutes in an hour, the car travels $\frac{1}{60} \times 80\,000$ m in one minute.
Since there are 60 seconds in a minute, the car travels $\frac{1}{60} \times \frac{1}{60} \times 80\,000$ in one second.
Therefore, in 4 seconds, the car travels $4 \times \frac{1}{60} \times \frac{1}{60} \times 80\,000 \approx 88.89$ m.
Of the possible choices, this is closest to 90 m.

---

21. Emily was at a garage sale where the price of every item was reduced by 10% of its current price every 15 minutes. At 9:00 a.m., the price of a carpet was \$10.00. At 9:15 a.m., the price was reduced to \$9.00. As soon as the price of the carpet fell below \$8.00, Emily bought it. At what time did Emily buy the carpet?
(A) 9:45 a.m. (B) 9:15 a.m. (C) 9:30 a.m. (D) 10:15 a.m. (E) 10:00 a.m.

Source: 2005 Gauss Grade 7 #21

Primary Topics: Number Sense

Secondary Topics: Percentages | Rates

Answer: A

Solution:

Since the price of the carpet is reduced by 10% every 15 minutes, then the price is multiplied by 0.9 every 15 minutes.
At 9:15, the price was \$9.00.
At 9:30, the price fell to $0.9 \times \$9.00 = \$8.10$.
At 9:45, the price fell to $0.9 \times \$8.10 = \$7.29$.
So the price fell below \$8.00 at 9:45 a.m., so Emily bought the carpet at 9:45 a.m.

---

22. In a bin at the Gauss Grocery, the ratio of the number of apples to the number of oranges is 1 : 4, and the ratio of the number of oranges to the number of lemons is 5 : 2. What is the ratio of the number of apples to the number of lemons?
(A) 1 : 2 (B) 4 : 5 (C) 5 : 8 (D) 20 : 8 (E) 2 : 1

Source: 2005 Gauss Grade 7 #22

Primary Topics: Number Sense

Secondary Topics: Fractions/Ratios

Answer: C

Solution:

Solution 1
We start by assuming that there are 20 oranges. (We pick 20 since the ratio of apples to oranges is 1 : 4 and the ratio of oranges to lemons is 5 : 2, so we pick a number of oranges which is divisible by 4 and by 5. Note that we did not have to assume that there were 20 oranges, but making this assumption makes the calculations much easier.)
Since there are 20 oranges and the ratio of the number of apples to the number of oranges is 1 : 4, then there are $\frac{1}{4} \times 20 = 5$ apples.
Since there are 20 oranges and the ratio of the number of oranges to the number of lemons is 5 : 2, then there are $\frac{2}{5} \times 20 = 8$ lemons.
Therefore, the ratio of the number of apples to the number of lemons is 5 : 8.

Solution 2
Let the number of apples be x.
Since the ratio of the number of apples to the number of oranges is 1 : 4, then the number of oranges is $4x$.
Since the ratio of the number of oranges to the number of lemons is 5 : 2, then the number of lemons is $\frac{2}{5} \times 4x = \frac{8}{5}x$.

Since the number of apples is x and the number of lemons is $\frac{8}{5}x$, then the ratio of the number of apples to the number of lemons is $1 : \frac{8}{5} = 5 : 8$.

---

23. Using an equal-armed balance, if □ □ □ □ balances ○ ○ and ○ ○ ○ balances △ △, which of the following would not balance △ ○ □
(A) △ ○ □ (B) □ □ □ △ (C) □ □ ○ ○
(D) △ △ □ (E) ○ □ □ □ □

Source: 2005 Gauss Grade 7 #23

Primary Topics: Algebra and Equations

Secondary Topics: Logic | Equations Solving

Answer: D

Solution:

Solution 1
If 4 □ balance 2 ○, then 1 □ would balance the equivalent of $\frac{1}{2}$ ○.
Similarly, 1 △ would balance the equivalent of $1\frac{1}{2}$ ○. If we take each of the answers and convert them to an equivalent number of ○, we would have:
A: $1\frac{1}{2} + 1 + \frac{1}{2} = 3$ ○

B: $3\left(\frac{1}{2}\right) + 1\frac{1}{2} = 3$ ○

C: $2\left(\frac{1}{2}\right) + 2 = 3$ ○

D: $2\left(1\frac{1}{2}\right) + \frac{1}{2} = 3\frac{1}{2}$ ○

E: $1 + 4\left(\frac{1}{2}\right) = 3$ ○

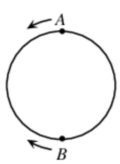
Therefore, 2 △ and 1 □ do not balance the required.

Solution 2
Since 4 □ balance 2 , then 1 ○ would balance 2 □.
Therefore, 3 ○ would balance 6 □, so since 3 ○ balance 2 △, then 6 □ would balance 2 △, or 1 △ would balance 3 □.
We can now express every combination in terms of □ only. 1 △, 1 ○ and 1 □ equals $3 + 2 + 1 = 6$ □. 3 □ and 1 △
equals $3 + 3 = 6$ □. 2 □ and 2 ○ equals $2 + 2 \times 2 = 6$ □. 2 △ and 1 □ equals $2 \times 3 + 1 = 7$ □.
1 ○ and 4 □ equals $2 + 4 = 6$ □.
Therefore, since 1 △, 1 ○ and 1 □ equals 6 □, then it is 2 △ and 1 □ which will not balance with this combination.

Solution 3
We try assigning weights to the different shapes. Since 3 ○
balance 2 △, assume that each ○ weighs 2 kg and each △ weighs 3 kg. Therefore, since 4 □ balance 2 ○, which weigh 4 kg combined, then each □ weighs 1 kg. We then look at each of the remaining combinations. 1 △, 1 ○ and 1 □ weigh $3 + 2 + 1 = 6$ kg. 3 □ and 1 △ weigh $3 + 3 = 6$ kg. 2 □ and 2 ○ weigh $2 + 2 \times 2 = 6$ kg. 2 △ and 1 □ weigh $2 \times 3 + 1 = 7$ kg. 1 ○ and 4 □ weigh $2 + 4 = 6$ kg.
Therefore, it is the combination of 2 △ and 1 □ which will not balance the other combinations.

---

24. On a circular track, Alphonse is at point A and Beryl is diametrically opposite at point B. Alphonse runs counterclockwise and Beryl runs clockwise. They run at constant, but different, speeds. After running for a while they notice that when they pass each other it is always at the same three places on the track. What is the ratio of their speeds?



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

Source: 2005 Gauss Grade 7 #24

Primary Topics: Algebra and Equations

Secondary Topics: Fractions/Ratios | Equations Solving

Answer: D

Solution:

Since Alphonse and Beryl always pass each other at the same three places on the track and since they each run at a constant speed, then the three places where they pass must be equally spaced on the track. In other words, the three places divide the track into three equal parts.
We are not told which runner is faster, so we can assume that Beryl is the faster runner. Start at one place where Alphonse and Beryl meet. (Now that we know the relative positions of where they meet, we do not actually have to know where they started at the very beginning.)
To get to their next meeting place, Beryl runs farther than Alphonse (since she runs faster than he does), so Beryl must run $\frac{2}{3}$ of the track while Alphonse runs $\frac{1}{3}$ of the track in the opposite direction, since the meeting placed are spaced equally at $\frac{1}{3}$ intervals of the track. Since Beryl runs twice as far in the same length of time, then the ratio of their speeds is $2 : 1$
.

---

25. How many different combinations of pennies, nickels, dimes and quarters use 48 coins to total $1.00?
(A) 3 (B) 4 (C) 5 (D) 6 (E) 8

Source: 2005 Gauss Grade 7 #25

Primary Topics: Counting and Probability

Secondary Topics: Counting | Decimals

Answer: B

Solution:

Solution 1
We want to combine 48 coins to get 100 cents.
Since the combined value of the coins is a multiple of 5, as is the value of a combination of nickels, dimes and quarters, then the value of the pennies must also be a multiple of 5.

Therefore, the possible numbers of pennies are 5, 10, 15, 20, 25, 30, 35, 40.
We can also see that because there are 48 coins in total, it is not possible to have anything other than 35, 40 or 45 pennies. (For example, if we had 30 pennies, we would have 18 other coins which are worth at least 5 cents each, so we would have at least $30 + 5 \times 18 = 120$ cents in total, which is not possible. We can make a similar argument for 5, 10, 15, 20 and 25 pennies.)

It is also not possible to have 3 or 4 quarters. If we did have 3 or 4 quarters, then the remaining 45 or 44 coins would give us a total value of at least 44 cents, so the total value would be greater than 100 cents. Therefore, we only need to consider 0, 1 or 2 quarters.

Possibility 1: 2 quarters
If we have 2 quarters, this means we have 46 coins with a value of 50 cents.
The only possibility for these coins is 45 pennies and 1 nickel.

Possibility 2: 1 quarter
If we have 1 quarter, this means we have 47 coins with a value of 75 cents.
The only possibility for these coins is 40 pennies and 7 nickels.

Possibility 3: 0 quarters
If we have 0 quarters, this means we have 48 coins with a value of 100 cents.
If we had 35 pennies, we would have to have 13 nickels.
If we had 40 pennies, we would have to have 4 dimes and 4 nickels.
It is not possible to have 45 pennies.

Therefore, there are 4 possible combinations.
Solution 2
We want to use 48 coins to total 100 cents.
Let us focus on the number of pennies.
Since any combination of nickels, dimes and quarters always is worth a number of cents which is divisible by 5, then the number of pennies in each combination must be divisible by 5, since the total value of each combination is 100 cents, which is divisible by 5.

Could there be 5 pennies? If so, then the remaining 43 coins are worth 95 cents. But each of the remaining coins is worth at least 5 cents, so these 43 coins are worth at least $5 \times 43 = 215$ cents, which is impossible. So there cannot be 5 pennies.
Could there be 10 pennies? If so, then the remaining 38 coins are worth 90 cents. But each of the remaining coins is worth at least 5 cents, so these 38 coins are worth at least $5 \times 38 = 190$ cents, which is impossible. So there cannot be 10 pennies.
We can continue in this way to show that there cannot be 15, 20, 25, or 30 pennies.
Therefore, there could only be 35, 40 or 45 pennies.

If there are 35 pennies, then the remaining 13 coins are worth 65 cents. Since each of the remaining coins is worth at least 5 cents, this is possible only if each of the 13 coins is a nickel. So one combination that works is 35 pennies and 13 nickels.

If there are 40 pennies, then the remaining 8 coins are worth 60 cents.
We now look at the number of quarters in this combination.
If there are 0 quarters, then we must have 8 nickels and dimes totalling 60 cents. If all of the 8 coins were nickels, they would be worth 40 cents, so we need to change 4 nickels to dimes to increase our total by 20 cents to 60 cents. Therefore, 40 pennies, 0 quarters, 4 nickels and 4 dimes works.
If there is 1 quarter, then we must have 7 nickels and dimes totalling 35 cents. Since each remaining coin is worth at least 5 cents, then all of the 7 remaining coins must be nickels. Therefore, 40 pennies, 1 quarter, 7 nickels and 0 dimes works.
If there are 2 quarters, then we must have 6 nickels and dimes totalling 10 cents. This is impossible. If there were more than 2 quarters, the quarters would be worth more than 60 cents, so this is not possible.

If there are 45 pennies, then the remaining 3 coins are worth 55 cents in total.
In order for this to be possible, there must be 2 quarters (otherwise the maximum value of the 3 coins would be with 1 quarter and 2 dimes, or 45 cents).
This means that the remaining coin is worth 5 cents, and so is a nickel.
Therefore, 45 pennies, 2 quarters, 1 nickel and 0 dimes is a combination that works.

Therefore, there are 4 combinations that work.