Regional Round Solutions 2026

Round 1

Question 1

A lottery win is shared between three people. Marcin gets 20% more than Jane, and 25% more than Charlie. Jane's share is €3,600. What is the total prize money.

Solution

Marcin

$$3600\ (1.2) = 4320$$

Chaz

$$1.25 = 4320$$

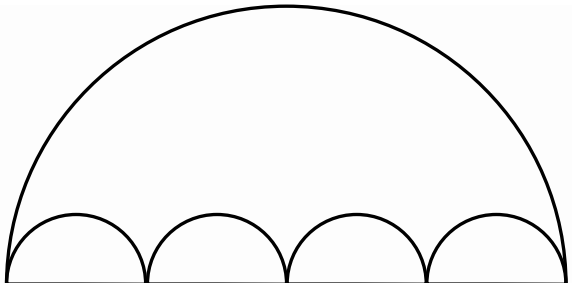
$$3456$$

$$3600 + 4320 + 3456$$

$$€11376$$

Question 2

The figure below was constructed by taking a semicircle with diameter 64cm and replacing the diameter with four semicircles each having equal diameter.



What is the perimeter of the figure in terms of π?

Solution

$L(large\ semicircle) = 2\pi r = 2.\pi.32 = 64\pi \div 2 = 32\pi$
$L(small\ semicircle) = 2\pi r = 2.\pi.8 = 16\pi \div 2 = 8\pi$
$32\pi + 4(8\pi) = 64\pi.$

Round 2

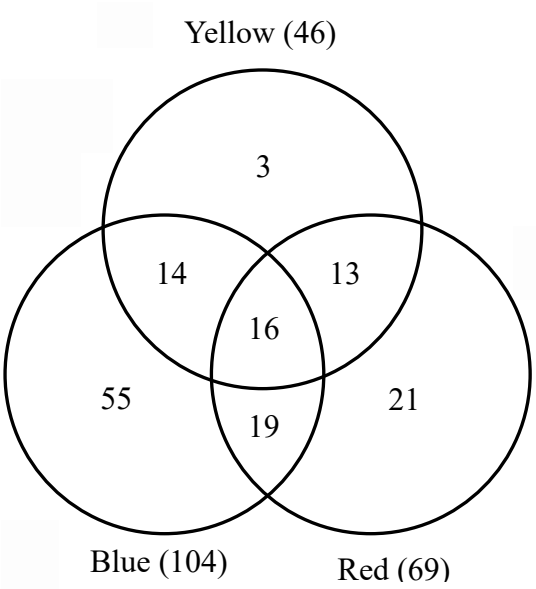
Question 1

A group of N students doing an art project used red, blue, and yellow paint. Every student used at least one colour, and some students used more than one colour.

- The yellow paint was used by a total of 46 students.
- The red paint was used by a total of 69 students.
- The blue paint was used by a total of 104 students.
- Exactly 14 students used both yellow and blue and did not use red.
- Exactly 13 students used both yellow and red and did not use blue.
- Exactly 19 students used both blue and red and did not use yellow.
- Exactly 16 students used all three colours.

What is the value of N?

Solution



$N = 3 + 14 + 16 + 13 + 55 + 19 + 21 = 141$.

Question 2

Solution

x is an integer. Find the possible values of x, when

$4x - 3 > 5$ and $6x + 2 < 32$.

solution

$$4x - 3 > 5$$

$$4x > 8$$

$$x > 2$$

$$6x + 2 < 32$$

$$6x < 30$$

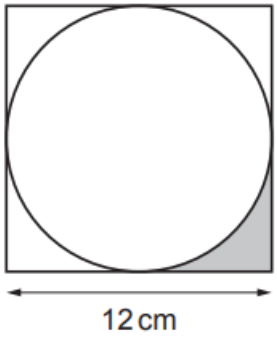
$$x < 5$$

$$x = 3 \; and \; 4$$

Round 3

Question 1

The diagram shows a circle inside a square of side 12cm. Work out the percentage of the square that is shaded to the nearest percentage.



Solution

Area of square

$$12 \times 12 = 144cm^2$$

Area of circle

$$r = 6cm$$

$$\pi r^2$$

$$\pi(6)^2$$

$$36\pi \; cm^2$$

Area of shaded

$$144 - 36\pi$$

$$30.90266$$

Percentage of square

$$\frac{30.9}{144} \times 100 \div 4$$

$$21.4691 \div 4$$

$$5.367275\%$$

$$5\%$$

Question 2

A positive integer n between 10 and 99, inclusive, is chosen at random. If every such integer is equally likely to be chosen, what is the probability that the sum of the digits of n is a multiple of 7?

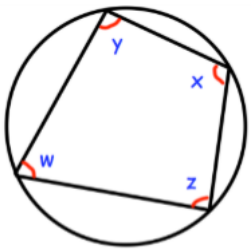
Solution

Digits whose sums are multiples of 7: 16, 25, 34, 43, 52, 61, 70
Digits whose sums are multiples of 14: 59, 68, 77, 86, 95

$$P(sum,\ multiple\ of\ 7) = \frac{12}{90} = \frac{2}{15}$$

Round 4

Question 1



$w : x = 2 : 3$,$x : y = 9 : 8$ .Find the value of z° .

Solution:

w+x=180° $w+x=180°$
(opposite angles in a cyclic quadrilateral add to 180°)

$w + x = 180°$ and $z + y = 180°$
(opposite angles of cyclic quadrilateral add to $180°$)
$2 + 3 = 5$ parts $\Longrightarrow 1$ part $= \dfrac{180°}{5} = 36°$
$w = 2 \times 36° = 72°$; $x = 3 \times 36° = 108°$
$x = 9$ parts $\Longrightarrow \dfrac{108°}{9} = 12°$; $y = 8 \times 12° = 96°$
$z = 180° - 96° = 84°$

Question 2

A stack of 10 paper cups is 13 cm high. Another stack of 30 of the same type of paper cups is 23 cm high. How high (in cm) would a stack of 100 paper cups be?

Solution

$$23 - 13 = 10cm$$

$$10cm = increase\ of\ 20\ cups$$

$$23 + 10 + 10 + 10 = 90\ cups$$

$$53cm = 90\ cups$$

$$5cm = 10\ cups$$

$$53 + 5 = 58cm$$

Round 5

Question 1

Brad has a six-sided die with sides numbered 1 through 6. Brad throws the die twice and writes down the numbers. What is the probability that the second number is greater than the first?

Solution

Total possible outcomes $6\ (6) = 36$

list these possibilities:

- If the first number is 1, the second number can be 2, 3, 4, 5, or 6 (5 outcomes).
- If the first number is 2, the second number can be 3, 4, 5, or 6 (4 outcomes).
- If the first number is 3, the second number can be 4, 5, or 6 (3 outcomes).
- If the first number is 4, the second number can be 5 or 6 (2 outcomes).
- If the first number is 5, the second number can be 6 (1 outcome).
- If the first number is 6, the second number cannot be greater (0 outcomes).

Adding these up, the total number of favourable outcomes is 5+4+3+2+1=15

$$\frac{15}{36} \qquad \text{or } \frac{5}{12}$$

Question 2

The expression $2(x-3)^2-12$ can be written as ax^2+bx+c for some numbers a, b, c. What is the value of $10a-b-4c$?

Solutions

Expanding and simplifying,

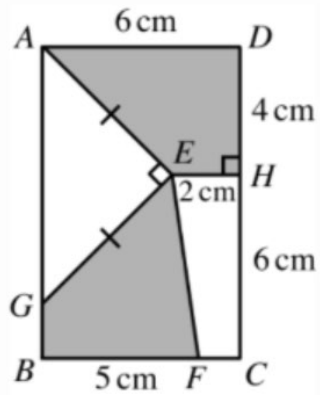
$$2(x-3)^2-12 = 2(x^2-6x+9)-12 = 2x^2-12x+6$$

Thus, $a=2$, $b=-12$, and $c=6$.
This means that $10a-b-4c = 10(2)-(-12)-4(6) = 8$.

Round 6

Question 1

In rectangle $ABCD$, what is the total area of the shaded region?



Solution

Total area $= 60cm^2$

Area of white trapezium $= (\frac{1+2}{2})6 = 9cm^2$

Use Pythagoras' theorem to find the length of the side of the white triangle.

$4^2 + 4^2 = x^2$

$32 = x^2$

$x = \sqrt{32}$

Find the area of the white triangle: $\frac{1}{2}(\sqrt{32})(\sqrt{32}) = 16cm^2$

So, $60cm^2 - 9cm^2 - 16cm^2 = 35cm^2$

Question 2

Lucy has more than 100 barbie dolls. When she counts them in groups of two, three or five, there is always one left over. What is smallest number of barbie dolls Lucy owns?

Solution

Multiples greater than 100

$$2: 102,104,106,108,110,112,114,116,118,120$$

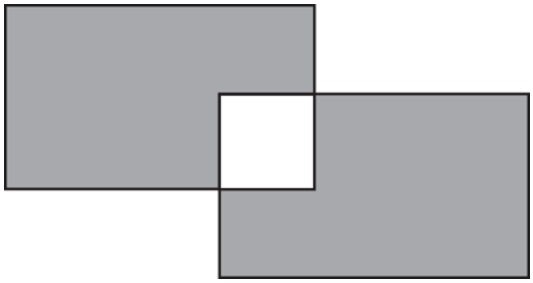
$$3: 102,105,108,111,114,117,120$$

$$5: 105,110,115,120$$

Number of dolls = 121

Round 7

Question 1



In the diagram, two 8 by 10 rectangles overlap to form a 4 by 4 square. What is the total area of the shaded region?

Solution

Area of a rectangle $8(10) = 80$

Area of white square = $4(4) = 16$

$$80 - 16$$

$$64$$

$$2(64)$$

$$128\ units^2\ (total\ area)$$

Question 2

What is the smallest positive integer n for which $\sqrt[3]{2026 - n}$ is an integer?

Solution

$\sqrt[3]{2026 - n} = 12{\cdot}65357219$

$12^3 = 1728 \qquad 2026 - 1728 = 298$

$\sqrt[3]{2026 - 298} = 12$

The smallest value of n is 298

Question 3

Fred lists the four-digit positive integers that can be made using the digits 2, 4, 5, and 9, each once. Fred lists these integers in increasing order. What is the 13th number in his list?

Solution

$$4 \times 3 \times 2 \times 1 = 24$$

Options on the list.

2459	4259	5249	9245
2495	4295	5294	9254
2549	4529	5429	9425
2594	4592	5492	9452
2945	4925	5924	9524
2954	4952	5942	9542

$$T_{13} = 5249$$

Question 4

The manufacturers of a certain pen claim that it can cover an area of 2.7 square metres before it runs dry. If the line the pen draws is 0.3 millimetres wide, how long in kilometres is the line it could draw before it runs dry?

Solution

$$2.7m^2 = 2.7\ (100)^2(10)^2$$

$$2700000$$

$$2700000 \div 0.3$$

$$900000$$

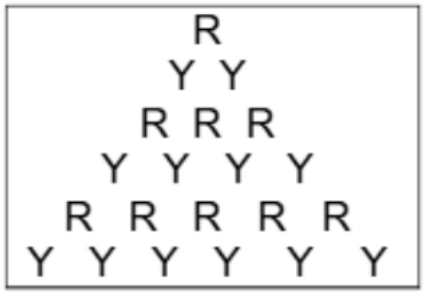
$$900000 \div 10 \div 1000 \div 1000$$

$$9km$$

Round 8

Question 1

Marsha plants red roses and yellow roses in alternating rows as shown below.
Marsha continues planting until she has 15 rows of alternating red and yellow roses.



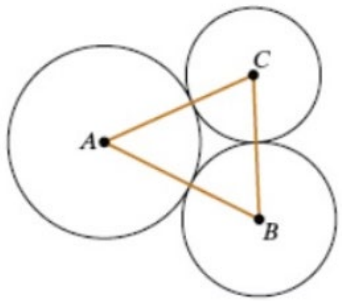
How many yellow roses did she plant in total?

Solution

Row	Number of Y
1	2
2	4
3	6
4	8
5	10
6	12
7	14
8	16
9	18
10	20
11	22
12	24
13	26
14	28
15	30
Total	240

Answer 240

Question 2



In the diagram below, the centres of the circles are at the vertices of triangle ABC. Given AB = 14cm, AC = 12cm and BC = 10cm, what is the radius of the smallest circle

Solution

$$|AB| = 14cm = 8 + 6$$

$$|AC| = 12cm = 8 + 4$$

$$|BC| = 10cm = 6 + 4$$

Or

$$x = radius\ of\ C$$

$$z = radius\ of\ A$$

$$y = radius\ of\ B$$

$$|AB| = 14cm = z + y$$

$$|AC| = 12cm = z + x$$

$$|BC| = 10cm = y + x$$

$$|AB| = 14$$

$$|AC| = 12$$

$$z + y = 14$$

$$z + x = 12$$

$$y - x = 2$$

$$y + x = 10$$

$$2y = 12$$

$$y = 6$$

$$y + x = 10$$

$$6 + x = 10$$

$$x = 4cm$$

Question 3

The line l passes through the points $(-4,8)$ and (k,k) for some real number k.
The line l is perpendicular to the line passing through the points
$(11,-7)$ and $(15,5)$

What is the value of k?

Solution

The slope of $(11, -7)$ and $(15, 5)$ is 3

The slope of any line perpendicular is $\frac{-1}{3}$.

Therefore the slope of $(-4, 8)$ and (k, k) is $\frac{-1}{3}$.

$$\frac{k-8}{k+4} = \frac{-1}{3}$$
$$3k - 24 = -k - 4$$
$$4k = 20$$
$$k = 5$$

Question 4

The integers x, y and z satisfy $\frac{x}{5} = \frac{6}{y} = \frac{z}{2}$. What is the largest possible value of $x + y + z$?

Solution

Since $\frac{x}{5} = \frac{6}{y}$, then $xy = 30$.

Since $\frac{6}{y} = \frac{z}{2}$, then $yz = 12$.

Since we would like the maximum value of $x + y + z$, we may assume that each of x, y and z is positive.

Since $xy = 30$ and $yz = 12$ and y is a positive integer, then y is a divisor of each of 30 and 12.

This means that y must equal one of 1, 2, 3, or 6.

If $y = 1$, then $x = 30$ and $z = 12$ which gives $x + y + z = 43$.

If $y = 2$, then $x = 15$ and $z = 6$ which gives $x + y + z = 23$.

If $y = 3$, then $x = 10$ and $z = 4$ which gives $x + y + z = 17$.

If $y = 6$, then $x = 5$ and $z = 2$ which gives $x + y + z = 13$.

Therefore, the maximum possible value of $x + y + z$ is 43.

Answer: 43