# Solution:

**Problem 1:**

Let the current ages of Allie, Diana, and Zoe be A, D, and Z, respectively.

We are given that the sum of their current ages is 15: $A + D + Z = 15$

Next year, each person will be one year older:

- Allie's age next year: $A + 1$
- Diana's age next year: $D + 1$
- Zoe's age next year: $Z + 1$

The sum of their ages next year will be: $(A + 1) + (D + 1) + (Z + 1)$

Rearrange the terms: $= A + D + Z + 1 + 1 + 1 = (A + D + Z) + 3$

Now, substitute the given sum of their current ages (15) into this expression: Sum of their ages next year = $15 + 3 = 18$.

The final answer is **B) 18**.

**Problem 2:**

1. **Define variables:**
   - Let A be the number of pencils in Box A = 14.
   - Let B be the number of pencils in Box B = 27.
   - Let x be the number of pencils to be moved from Box B to Box A.
2. **Express the number of pencils in each box after the move:**
   - Pencils in Box A after move: $A'=A+x=14+x$
   - Pencils in Box B after move: $B'=B-x=27-x$
3. **Set up the equation based on the given condition:** The condition is that there are 3 more pencils in Box B than in Box A after the move. So, $B'=A'+3$
4. **Substitute the expressions and solve for x:** $27-x=(14+x)+3$ $27-x=17+x$

Add x to both sides: $27=17+2x$

Subtract 17 from both sides: 27–17=2x, 10=2x

Divide by 2: x=10:2 x=5

Therefore, 5 pencils should be moved from Box B to Box A.

**Check the answer:**

- If 5 pencils are moved:
  - Box A will have 14+5=19 pencils.
  - Box B will have 27–5=22 pencils.
- Is there 3 more pencils in Box B than in Box A? 22=19+3. Yes, it is correct.

The final answer is **D) 5**.

**Problem 3:**

**Understand the two-digit number:** Hailey wrote a one-digit number (let's call it the first digit) and then another digit to its right (the second digit). This forms a two-digit number. If the first digit is D1 and the second digit is D2, the number formed is 10 * D1 + D2.

**Set up the equation:** She added 27 to this number and got 91.

(10 * D1 + D2) + 27 = 91

**Find the two-digit number she obtained:** Let the two-digit number be N. N + 27 = 91 To find N, subtract 27 from 91: N = 91 - 27 N = 64

**Identify the first digit:** The number she obtained was 64. In a two-digit number, the tens digit is the first digit written. So, the first digit D1 is 6. The second digit D2 is 4.

The first digit that Hailey wrote was 6.

The final answer is **B) 6**.

**Problem 4:**

The sequence is: 13, 16, 19, ..., 70, 73.

Notice that each number in the sequence goes up by 3 from the previous one (16-13=3, 19-16=3, and so on). This "jump" is always 3.

Here's how we can find how many numbers there are:

**Find the total distance (difference) from the first number to the last number:** The very last number is 73. The very first number is 13. The total difference is 73−13=60.

**Count how many "jumps" of 3 are in that total distance:** Since each jump is 3, we divide the total difference by the jump size: Number of jumps = 60÷3=20 jumps.

**Figure out the total number of numbers:** If there are 20 jumps, it means you started at the first number (13) and then made 20 steps to reach 73. So, you have the first number, plus the 20 numbers you landed on after each jump. Total numbers = (the first number) + (the number of jumps) Total numbers = 1+20=21 numbers.

There are 21 numbers in the sequence.

The final answer is **E) 21**.

**Problem 5:**

**List the amounts saved each month:** Cindy starts with $15. Each month, she saves $15 more than the month before.

- Month 1: $15
- Month 2: $15 + 15 = $30
- Month 3: $30 + 15 = $45
- Month 4: $45 + 15 = $60
- Month 5: $60 + 15 = $75
- Month 6: $75 + 15 = $90
- Month 7: $90 + 15 = $105
- Month 8: $105 + 15 = $120 (This is the amount she saved in the last month, so we stop here).

**Add all the amounts together:** Total savings = 15+30+45+60+75+90+105+120

To make adding easier, we can pair the numbers:

- (15+120)=135
- (30+105)=135
- (45+90)=135
- (60+75)=135

We have 4 pairs, and each pair sums to 135. Total savings = $135\times4=540$.
Cindy saved a total of $540.
The final answer is **540** C).

**Problem 6:**

1. **How many games were played in total?** Imagine each player plays everyone else.
   - The 1st player plays 5 other people.
   - The 2nd player has already played the 1st, so they play 4 *new* people.
   - The 3rd player has already played the 1st and 2nd, so they play 3 *new* people.
   - The 4th player plays 2 *new* people.
   - The 5th player plays 1 *new* person.
   - The 6th player (Monica) has already played everyone else. So, the total number of games played is $5+4+3+2+1=15$ games.
2. **How do wins relate to games?** Since there are no ties, every game has exactly one winner. This means the total number of "wins" collected by all players combined must equal the total number of games played. In this case, 15 wins were distributed.
3. **Sum up the wins of the other players:**
   - Helen: 4 wins
   - Ines: 3 wins
   - Janet: 2 wins
   - Kendra: 2 wins
   - Lara: 2 wins Total wins by these five players = $4+3+2+2+2=13$ wins.
4. **Find Monica's wins:** Monica's wins = (Total wins in the tournament) - (Total wins by other players) Monica's wins = $15-13=2$ wins.

So, Monica won 2 games.
The final answer is **2**.

**Problem 7:**

1. **Count the "jump" to the other side:** Asad is on seat number 2. Shaden is on seat number 7. To go from seat 2 to seat 7, you "jump" over a certain number of seats. The difference in their numbers tells us how many "jumps" make up half the merry-go-round. The difference is $7-2=5$.
2. **Double the jump for the full circle:** Since they are *exactly opposite*, this "jump" of 5 seats represents exactly half of the merry-go-round. To get the total number of seats, you just double this amount. Total seats = $5\times2=10$.

So, there are 10 seats on the merry-go-round.

The final answer is **D) 10**.

**Problem 8:**

**Imagine all the animals were chickens:**

- If all 30 animals were chickens, and each chicken has 2 legs, then you'd have $30\times2=60$ legs.

**Find the "extra" legs:**

- But the problem says there are 100 legs in total.
- So, we have $100-60=40$ "extra" legs.

**Figure out where the "extra" legs come from:**

- Rabbits are the animals with more legs!
- Each time you have a rabbit instead of a chicken, you add 2 extra legs
  (4 legs for a rabbit−2 legs for a chicken=2 extra legs).

**Calculate the number of rabbits:**

- Since each rabbit gives us 2 "extra" legs, we divide the total "extra" legs by 2:
- Number of rabbits = $40\div2=20$ rabbits.

So, there are 20 rabbits on the farm!

The final answer is **20**.

**Problem 9:**

In the problem, let x be the number of years ago when the father's age was three times his son's age.

Current age of the father =50 years Current age of the son =24 years

x years ago: Father's age =(50−x) years Son's age =(24−x) years

According to the problem statement, x years ago, the father's age was three times his son's age. So, we can set up the equation: $50-x=3(24-x)$

Now, we solve for x: $50-x=72-3x$

Add 3x to both sides of the equation: $50-x+3x=72-3x+3x$ $50+2x=72$

Subtract 50 from both sides of the equation: $50+2x-50=72-50$ $2x=22$

Divide both sides by 2: $x=22:2$, $x=11$

So, 11 years ago, the father's age was $50-11=39$ years, and the son's age was $24-11=13$ years. At that time, $39=3*13$, which confirms our solution.

The correct answer is 11.

**Problem 10:**

To count the number of times the digit "7" appears when writing numbers from 1 to 250, we can break this down by place value:

**1. Units place:** The digit "7" appears in the units place for numbers like 7, 17, 27, ..., 247. These numbers are of the form 10n+7. For n=0,7. For n=1,17. ... For n=24,247. So, from 1 to 247, the number of times 7 appears in the units place is 25 times (from $0\times10+7$ to $24\times10+7$).

**2. Tens place:** The digit "7" appears in the tens place for numbers like 70, 71, ..., 79, 170, 171, ..., 179.

- For numbers from 1 to 100: The numbers are 70, 71, 72, 73, 74, 75, 76, 77, 78, 79. This is 10 times.
- For numbers from 101 to 200: The numbers are 170, 171, 172, 173, 174, 175, 176, 177, 178, 179. This is 10 times.
- For numbers from 201 to 250: There are no numbers with 7 in the tens place (e.g., 270 is out of range).

So, for the tens place, the digit "7" appears 10+10=20 times.

**3. Hundreds place:** The digit "7" does not appear in the hundreds place for any number from 1 to 250, as the smallest number with 7 in the hundreds place would be 700.

**Total count:** Total occurrences of the digit "7" = (Occurrences in units place) + (Occurrences in tens place) + (Occurrences in hundreds place)

Total occurrences = 25+20+0=45

The correct answer is 45.

**Problem 11:**

Let's break it down using a simpler approach, like categorizing the students:

1. **Students with BOTH a math book AND color-pencils:** We are given this directly: 5 students.
2. **Students with ONLY a math book:** Total students with a math book = 14 Students with *both* = 5 So, students with *only* a math book = Total with math book - Students with both =14−5=9 students.
3. **Students with ONLY color-pencils:** Total students with color-pencils = 16 Students with *both* = 5 So, students with *only* color-pencils = Total with color-pencils - Students with both =16−5=11 students.
4. **Students with NONE of them:** We are given this directly: 4 students.

Now, to find the total number of students in the class, we just add up all these distinct groups of students:

Total students = (Students with both) + (Students with only math book) + (Students with only color-pencils) + (Students with none) Total students = 5+9+11+4 Total students = 14+11+4 Total students = 25+4 Total students = 29

The correct answer is 29.

**Problem 12:**

Let A be the weight of the apple. Let B be the weight of the banana. Let O be the weight of the orange.

We can set up a system of equations based on the given information:

**Equation 1:** When Tom weighed an apple and banana, the scale showed 230 grams. A+B=230 grams

**Equation 2:** When he replaced the apple with an orange, the scale showed 370 grams. (This means the banana and orange were on the scale). B+O=370 grams

**Equation 3:** When Tom put the apple back, the scale showed 540 grams. (This means the apple, banana, and orange were on the scale). A+B+O=540 grams

We want to find the combined weight of the apple and orange, which is A+O.

We can use Equation 3 and substitute parts of it using Equation 1 or Equation 2.

From Equation 1, we know A+B=230. We can substitute this into Equation 3: (A+B)+O=540 230+O=540

Now, solve for O: O=540−230 O=310 grams

So, the orange weighs 310 grams.

Now, we can use Equation 2 to find the weight of the banana: B+O=370 B+310=370 B=370−310 B=60 grams

So, the banana weighs 60 grams.

Finally, we can use Equation 1 to find the weight of the apple: A+B=230 A+60=230 A=230−60 A=170 grams

So, the apple weighs 170 grams.

The problem asks for the combined weight of the apple and orange (A+O). A+O=170+310 A+O=480 grams

The correct answer is 480 grams.