

Problème de la Semaine

Problèmes et Solutions 2025-2026



Problème A

3e/4e année



Le CENTRE d'ÉDUCATION
en MATHÉMATIQUES et en INFORMATIQUE
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Les problèmes dans ce livret sont organisés par thème.
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Algèbre (A)

**Amène-moi à la
couverture**



Problème de la semaine

Problème A

La boîte à colorier

Mysha jouait avec une grille vierge de 10 par 10 sur une feuille de papier blanc. Elle veut créer un motif qui respecte les règles suivantes :

La case en haut à gauche de la grille est la case numéro 1.

Mysha compte les cases en suivant chaque rangée de gauche à droite. À la fin d'une rangée, elle passe à la rangée inférieure et continue à compter à partir du côté gauche de la rangée suivante.

À partir de la 5^e case de la première rangée, elle colorie en rouge chaque 5^e case.

À partir de la 7^e case de la première rangée, elle colorie en bleu chaque 7^e case.

À partir de la 9^e case de la première rangée, elle colorie en jaune chaque 9^e case.

Si une case fait partie de plus d'un motif, les couleurs se mélangent pour former une nouvelle couleur, selon les règles suivantes :

— Le rouge mélangé avec le bleu donnera du violet.

$$\boxed{\text{R}} + \boxed{\text{B}} = \boxed{\text{Vi}}$$

— Le bleu mélangé avec le jaune donnera du vert.

$$\boxed{\text{B}} + \boxed{\text{J}} = \boxed{\text{Ve}}$$

— Le jaune mélangé avec le rouge donnera de l'orange.

$$\boxed{\text{J}} + \boxed{\text{R}} = \boxed{\text{O}}$$

- (a) Combien de cases de chaque couleur y aura-t-il dans la grille quand Mysha aura fini de remplir les motifs ?
- (b) Une fois le coloriage terminé, combien de cases de la grille demeurent blanches ?



Problem of the Week

Problem A and Solution

Colouring Box

Problem

Mysha was playing with a blank 10 by 10 grid on white paper.
She wants to create a pattern that follows these rules:

The top left square of the grid is square 1.

Mysha counts along a row from left to right. From the end of one row, she moves to the leftmost square in the row below and continues counting.

Starting with the 5th square on the top row, she adds red to every 5th square.

Starting with the 7th square on the top row, she adds blue to every 7th square.

Starting with the 9th square on the top row, she adds yellow every 9th square.

If a square is part of more than one pattern, then the colours will mix together to make a new colour, according to the following rules:

- Red mixed with blue will make purple.

$$\boxed{\text{R}} + \boxed{\text{B}} = \boxed{\text{P}}$$

- Blue mixed with yellow will make green.

$$\boxed{\text{B}} + \boxed{\text{Y}} = \boxed{\text{G}}$$

- Yellow mixed with red will make orange.

$$\boxed{\text{Y}} + \boxed{\text{R}} = \boxed{\text{O}}$$

- (a) How many squares of each colour will there be in the grid when Mysha finishes filling in the patterns?
- (b) After finishing her colouring, how many squares of the grid are still white?



Solution

The grid below shows the result of following the pattern rules:

				R		B		Y	R
			B	R			Y		R
B				R		Y	B		R
				P	Y				R
	B			O				B	R
			Y	R	B				R
		G		R					P
	Y			R		B			R
Y			B	R					O
B				R			B	Y	R

An interactive version of the pattern can be found here:

<https://openprocessing.org/sketch/2537459>

(a) From the completed grid, we count the number of each colour:

16 red, 11 blue, 8 yellow, 2 purple, 1 green, 2 orange

Another way to calculate this is to use skip counting to keep track of the squares that are filled with colour and look for overlapping numbers to see where the colours purple, green, and orange will appear. We cross out the duplicates from the primary colours (red, blue, and yellow) to get the final tally of each colour.

Red squares:

5, 10, 15, 20, 25, 30, ~~35~~, 40, ~~45~~, 50, 55, 60, 65, ~~70~~, 75, 80, 85, ~~90~~, 95, 100

Blue squares: 7, 14, 21, 28, ~~35~~, 42, 49, 56, ~~63~~, ~~70~~, 77, 84, 91, 98

Yellow squares: 9, 18, 27, 36, ~~45~~, 54, ~~63~~, 72, 81, ~~90~~, 99

Purple (red and blue) squares: 35, 70

Green (blue and yellow) squares: 63

Orange (yellow and red) squares: 45, 90



Another way to calculate these totals is to consider common multiples. To start, we can calculate that there are $100 \div 5 = 20$ squares that will be coloured in red, $100 \div 7 = 14$ (remainder 2) squares that will be coloured in blue, and $100 \div 9 = 11$ (remainder 1) squares that will be coloured in yellow. Next we consider the common multiples of 5 and 7 that are less than or equal to 100. Since $5 \times 7 = 35$, then we can skip count by 35 to find these numbers, 35 and 70, for a total of 2 purple squares. Similarly the common multiples of 5 and 9 that are less than 100 are 45 and 90, for a total of 2 orange squares. Finally, the only common multiple of 7 and 9 that is less than 100 is 63, for a total of 1 green square.

Again, we can eliminate the duplicates from the primary colours count. We eliminate 4 from the number of red squares for a total of $20 - 4 = 16$. We eliminate 3 from the number of blue squares for a total of $14 - 3 = 11$. We eliminate 3 from the number of yellow squares for a total of $11 - 3 = 8$. The lowest common multiple of 5, 7, and 9 is $5 \times 7 \times 9 = 315$, which is greater than 100. So none of the squares in the grid will be filled in with all three primary colours.

- (b) Since the grid is 10 by 10, there are a total of $10 \times 10 = 100$ squares. In part (a), we found a total of $16 + 11 + 8 + 2 + 1 + 2 = 40$ squares filled with some colour. This means there is a total of $100 - 40 = 60$ white squares left in the grid.



Problème de la semaine

Problème A

La cueillette de fleurs

Julian cultive cinq types différents de fleurs dans son jardin : des lis, des crocus, des tulipes, des marguerites et des roses. Il cueille quelques fleurs de son jardin et fait les observations suivantes sur les fleurs qu'il a cueillies :

Il y a quatre marguerites de plus que de lis.
Il y a deux fois plus de roses que de crocus.
Il y a deux fois moins de tulipes que de marguerites.
Il y a deux lis de moins que de roses.
Il y a cinq crocus.

Combien de fleurs de chaque type Julien a-t-il cueillies ? Justifie ta réponse.





Problem of the Week

Problem A and Solution

Gathering Flowers

Problem

Julian grows five different types of flowers in his garden: lilies, crocuses, tulips, daisies, and roses. He picks some flowers from his garden and makes the following observations about the flowers he picked:

There are four more daisies than lilies.
There are twice as many roses as crocuses.
There are half as many tulips as daisies.
There are two fewer lilies than roses.
There are five crocuses.

How many of each type of flower did Julian pick? Justify your answer.

Solution

Since we know there are 5 crocuses and we know that there are twice as many roses as crocuses, there must be $5 \times 2 = 10$ roses.

Since we know there are 10 roses and we know that there are 2 fewer lilies than roses, there must be $10 - 2 = 8$ lilies.

Since we know there are 8 lilies and we know that there are 4 more daisies than lilies, there must be $8 + 4 = 12$ daisies.

Since we know there are 12 daisies and we know that there are half as many tulips as daisies, there must be $12 \div 2 = 6$ tulips.

In summary Julian picked:

5 crocuses, 10 roses, 8 lilies, 12 daisies, and 6 tulips.



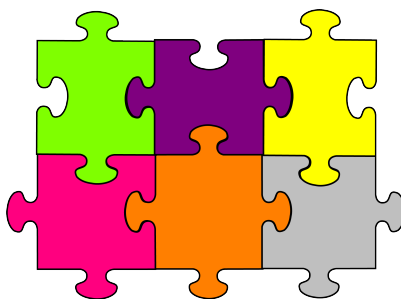
Problème de la semaine

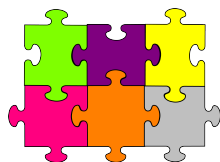
Problème A

Casse-tête complexe

Pakiza reçoit un casse-tête de 100 morceaux en cadeau. Une fois le casse-tête terminé, les morceaux forment une grille, où chaque rangée et chaque colonne contient le même nombre de morceaux.

- (a) Combien de morceaux y a-t-il dans chaque rangée et chaque colonne du casse-tête ?
- (b) Le lundi, Pakiza rassemble tous les morceaux de bordure et de coins, et elle les assemble pour former la bordure extérieure du casse-tête. Combien de morceaux de bordure et de coins y a-t-il en tout ?
- (c) Pakiza continue de travailler sur le casse-tête un peu chaque jour. Elle place 10 morceaux dans le casse-tête mardi. Chaque jour suivant, elle ajoute un morceau de plus que la veille, jusqu'à ce que le casse-tête soit complété. Donc, elle place 11 morceaux mercredi, 12 morceaux jeudi, et ainsi de suite jusqu'à ce que tous les morceaux soient en place. Quel jour de la semaine Pakiza termine-t-elle le casse-tête ? Justifie ta réponse.





Problem of the Week

Problem A and Solution

Puzzling Predicament

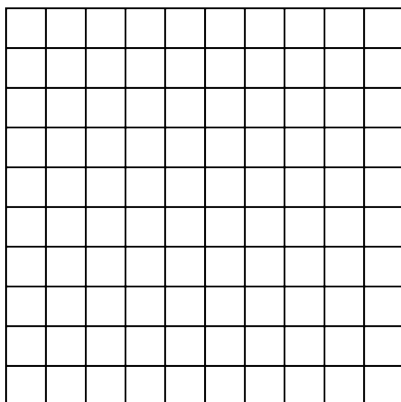
Problem

Pakiza gets a 100 piece puzzle as a gift. When the puzzle is finished, the pieces form a grid, where each row and each column of the grid has the same number of pieces.

- (a) How many pieces are in each row and each column of the puzzle?
- (b) On Monday, Pakiza gathers all the edge and corner pieces and puts them together to form the outside edge of the puzzle. How many edge and corner pieces does the puzzle have in total?
- (c) Pakiza continues to work on the puzzle a little bit every day. She places 10 pieces in the puzzle on Tuesday. On each day after that, she places one more puzzle piece than the day before, until the puzzle is complete. So, she places 11 pieces on Wednesday, 12 pieces on Thursday, and so on until all the pieces are in place. On what day of the week does Pakiza complete the puzzle? Justify your answer.

Solution

- (a) We know that each row and each column of the puzzle have the same number of pieces, and there are 100 pieces in total. Since $10 \times 10 = 100$, then each row and each column of the puzzle must contain 10 pieces.
- (b) It might help to look at a 10 by 10 grid in order to determine the total number of edge and corner pieces.



There are 4 corner pieces. Not counting the corners, there are 8 edge pieces on each side of the puzzle. So the total number of edge and corner pieces is: $4 + 8 + 8 + 8 + 8 = 36$.



Note: This is a classic example of the *fencepost problem*. If we are not careful, we might think that a 10×10 grid has $4 \times 10 = 40$ squares around its edge. However, this counts each corner piece twice, since a corner piece is part of two sides of the puzzle. The fencepost problem describes a situation where you may be off-by-one when counting. It can cause problems when writing computer programs that include some repetition.

- (c) We can make a table to keep track of how many pieces are filled in the puzzle over time. The first entry in the table will be on Monday when Pakiza assembles the 36 pieces to form the outside edge of the puzzle.

Day	Number of Pieces Added	Total Pieces
Monday	36	36
Tuesday	10	46
Wednesday	11	57
Thursday	12	69
Friday	13	82
Saturday	14	96

At this point, there are only 4 pieces left in the puzzle. So, we know Pakiza will complete the puzzle on the next day, which is Sunday.



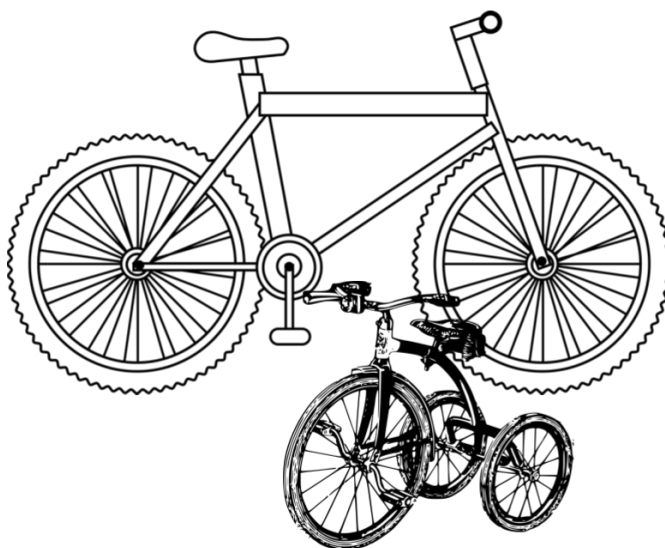
Problème de la semaine

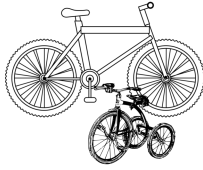
Problème A

Unité d'entreposage

Jerry a acheté le contenu de deux grandes unités d'entreposage lors d'une vente aux enchères pour un total de 500 \$. Une unité d'entreposage contient des bicyclettes et l'autre unité d'entreposage contient des tricycles.

- (a) Si chaque unité d'entreposage contient exactement 72 roues, combien y a-t-il de bicyclettes et de tricycles au total ? Justifie ta réponse.
- (b) Jerry prévoit vendre chaque tricyle à 10 \$ et chaque bicyclette à 25 \$. Quel est le profit maximal que Jerry peut réaliser, s'il parvient à vendre toutes les bicyclettes et tous les tricycles en stock à ces prix ? Justifie ta réponse.





Problem of the Week

Problem A and Solution

Storage Unit

Problem

Jerry bought the contents of two large storage units at an auction for a total of \$500. One storage unit contains some bicycles and the other storage unit contains some tricycles.

- (a) If each storage unit has exactly 72 wheels, how many bicycles and tricycles are there in total? Justify your answer.
- (b) Jerry plans to sell each tricycle for \$10 and each bicycle for \$25. What is the maximum profit Jerry can make if he is able to sell all the bicycles and tricycles in storage for these prices? Justify your answer.

Solution

- (a) Since a tricycle has 3 wheels and there are 72 wheels in one of the storage units, then we can determine the number of tricycles by dividing 72 by 3. There are $72 \div 3 = 24$ tricycles in one of the storage units.

Similarly, since a bicycle has 2 wheels and there are 72 wheels in one of the storage units, then we can determine the number of bicycles by dividing 72 by 2. There are $72 \div 2 = 36$ bicycles in the other storage unit.

- (b) To calculate the amount of money Jerry can make from selling the tricycles, we multiply $24 \times \$10 = \240 .

To calculate the amount of money Jerry can make from selling the bicycles, we multiply $36 \times \$25 = \900 . Alternatively, we can skip count by 25. A third way to figure out the amount of money is to notice that if he sells 4 bicycles, he would make \$100. Then we can use a table to figure out how much he would make selling 36 bicycles:

Bikes Sold	4	8	12	16	20	24	28	32	36
Money Made	\$100	\$200	\$300	\$400	\$500	\$600	\$700	\$800	\$900

Therefore, Jerry could make $\$240 + \$900 = \$1140$ if he sells all of the bikes. We need to subtract the amount he paid for the storage unit to determine the overall profit. Therefore, the maximum profit Jerry could make by selling all the bikes is $\$1140 - \$500 = \$640$.



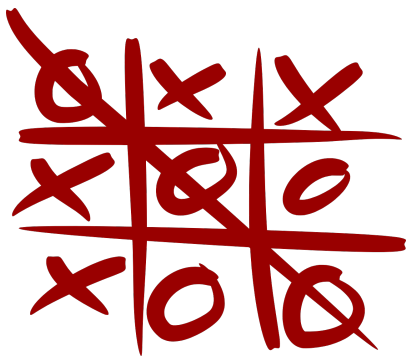
Problème de la semaine

Problème A

Tournoi d'équipes

Mme McNeil organise un tournoi de tic-tac-toe avec des poches (sacs de pois) pour sa classe. Elle divise sa classe en 6 équipes. Lorsqu'une équipe joue contre une autre équipe pendant le tournoi, on appelle cela une partie.

- (a) Au tournoi, chaque équipe doit jouer contre chacune des autres équipes une fois. Combien de parties chaque équipe jouera-t-elle pendant le tournoi ? Justifie ta réponse.
- (b) Combien de parties seront jouées au total pendant le tournoi ? Justifie ta réponse.





Problem of the Week

Problem A and Solution

Team Tournament

Problem

Ms. McNeil organizes a bean bag tic-tac-toe tournament for her class. She divides her class into 6 teams. When one team plays another team during the tournament, this is called a match.

- (a) In the tournament, each team has to play every other team once. How many matches will each team play during the tournament? Justify your answer.
- (b) How many matches are played in total during the tournament? Justify your answer.

Solution

- (a) Since each team has to play every other team once during the tournament, each team must play the other 5 teams. In other words, each team has 5 matches.
- (b) We will call the teams Team 1, Team 2, Team 3, Team 4, Team 5, and Team 6. One way to solve this problem is to write out all the matches, being careful to make sure we do not include duplicate matches. For example, when Team 1 plays Team 2, that match is the same as saying Team 2 plays Team 1.

The possible matches are:

- Team 1 and Team 2, Team 1 and Team 3, Team 1 and Team 4, Team 1 and Team 5, Team 1 and Team 6
- Team 2 and Team 3, Team 2 and Team 4, Team 2 and Team 5, Team 2 and Team 6
- Team 3 and Team 4, Team 3 and Team 5, Team 3 and Team 6
- Team 4 and Team 5, Team 4 and Team 6
- Team 5 and Team 6

Therefore, there are 15 matches in total in the tournament.

Alternatively, since each team has to play 5 matches and there are 6 teams, we can count the total number of matches in the tournament as $5 + 5 + 5 + 5 + 5 + 5 = 5 \times 6 = 30$.

However, this calculation actually double counts matches. For example, it counts the match between Team 1 and Team 2 as two separate matches (one match from the point of view of Team 1 and one match from the point of view of Team 2). This is true for every match between two teams. So, to get the true count of the total number of matches in the tournament, we need to divide by 2 to get $30 \div 2 = 15$ matches.

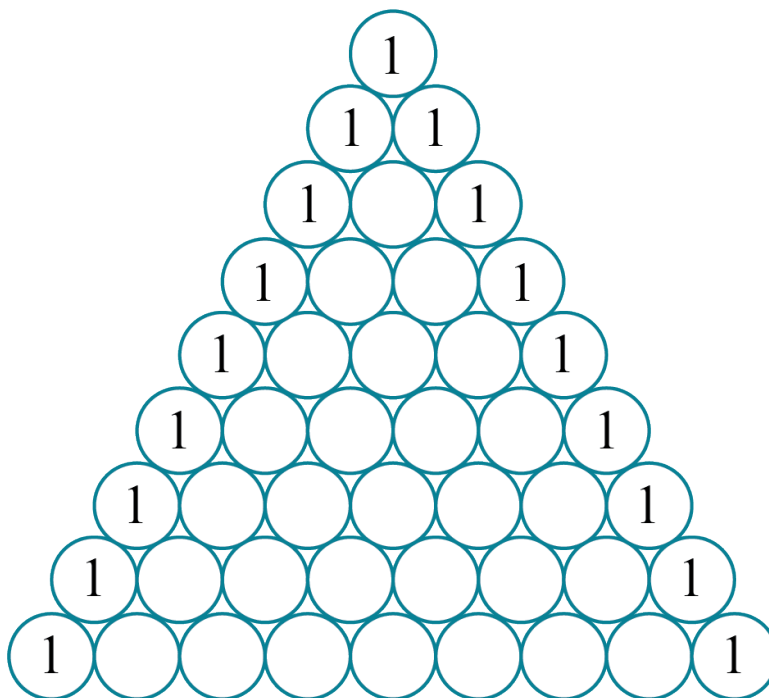


Problème de la semaine

Problème A

La pyramide de crayons

Juliane dispose des tubes cylindriques identiques pour former une pyramide. Elle met un crayon dans le tube du sommet, puis elle met un crayon dans les tubes à l'extrémité gauche et à l'extrémité droite de chacune des rangées qui restent, comme illustré.



Juliane remplit ensuite les autres tubes de la façon suivante :

Étape 1 : Trouve le tube vide le plus élevé et additionne le nombre de crayons dans les deux tubes qui le touchent dans la rangée au-dessus.

Étape 2 : Mets ce nombre de crayons dans le tube vide.

Étape 3 : Répète les étapes 1 et 2 jusqu'à ce que tous les tubes soient remplis.

- (a) Complète la pyramide en indiquant le nombre de crayons dans chaque tube.
- (b) Peux-tu trouver des régularités dans les nombres de la pyramide complétée ?
Si oui, explique-les.



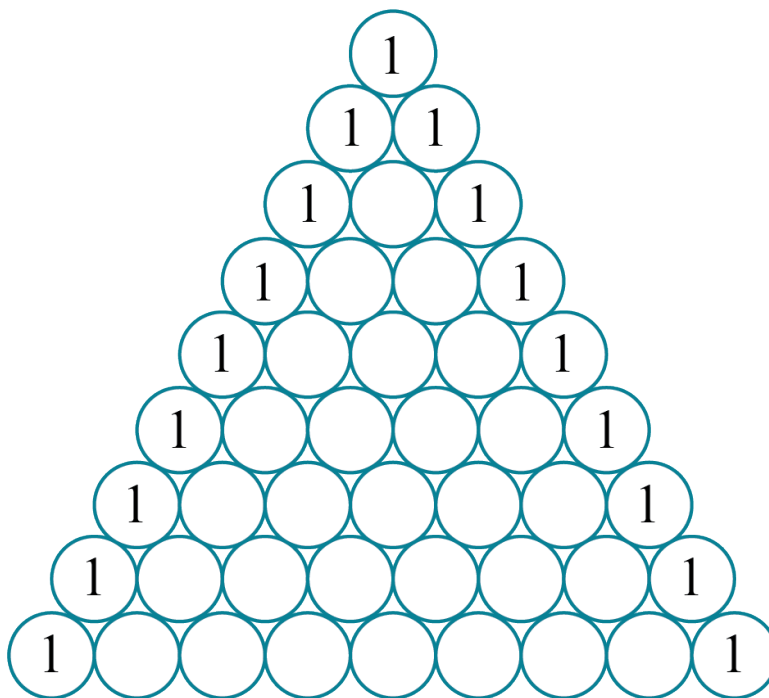
Problem of the Week

Problem A and Solution

Pencil Pyramid

Problem

Juliane arranges identical cylindrical tubes to form a pyramid. She puts one pencil in the top tube and then puts one pencil in the leftmost and rightmost tubes in each of the remaining rows, as shown.



Juliane then fills the remaining tubes as follows:

Step 1: Find the topmost empty tube and add up the number of pencils in the two tubes touching it in the row above.

Step 2: Put that many pencils in the empty tube.

Step 3: Repeat Steps 1 and 2 until all tubes are filled.

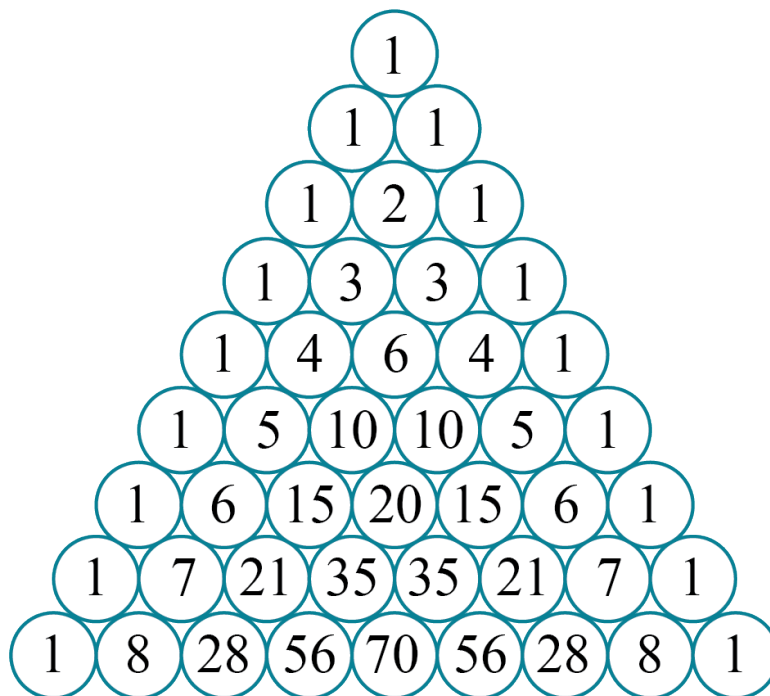
(a) Complete the pyramid with the number of pencils in each tube.

(b) Can you find any patterns in the numbers in the completed pyramid? If so, explain them.



Solution

(a) The completed pyramid is shown.



(b) Here are some patterns you may have noticed:

- The triangle is symmetric, so the left side matches the right side.
- Starting with the leftmost 1 in the second row and moving down diagonally we see the numbers 1, 2, 3, 4, 5, 6, 7, and 8.
- Starting with the leftmost 1 in the third row and moving down diagonally we see the numbers 1, 3, 6, 10, 15, 21, and 28. The pattern rule for this sequence is to add 2, then 3, then 4, then 5, etc.
- The sum of the numbers in any row is twice the sum of the numbers in the row above it.
- If you start from any 1, follow the diagonal down, and then change directions for the last number, the sum of the numbers in the diagonal will equal the last number. For example, $1 + 6 + 21 = 28$. This is called the *Hockey Stick Identity* because if you circle the numbers used, it will look somewhat like a hockey stick.



Teacher's Notes

This problem is an exploration of *Pascal's Triangle*, which is named for French mathematician Blaise Pascal (1623 - 1662). There are lots of patterns to be found in this triangle. We listed some of the patterns in the solution, but perhaps your students were able to find others!

Pascal's Triangle is also used in algebra. The numbers in the n^{th} row provide the coefficients for the expansion of a *binomial expression* raised to the n^{th} power. The expansions for $n = 0$ to $n = 4$ are shown.

$$(x + y)^0 = 1$$

$$(x + y)^1 = 1x + 1y$$

$$(x + y)^2 = 1x^2 + 2xy + 1y^2$$

$$(x + y)^3 = 1x^3 + 3x^2y + 3xy^2 + 1y^3$$

$$(x + y)^4 = 1x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + 1y^4$$

As the value of n increases, expanding the binomials manually becomes quite time consuming. Using Pascal's Triangle allows us to expand binomial expressions more efficiently.

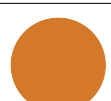
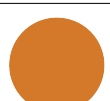
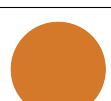
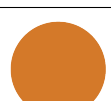


Problème de la semaine

Problème A

Les sommes de formes

Chaque symbole dans la grille ci-dessous représente un nombre. Les sommes des symboles dans la première rangée, la deuxième rangée et la rangée du bas, ainsi que celles dans la colonne la plus à gauche et la colonne la plus à droite, sont indiquées.

				20
				17
				?
				15
12	?	?	19	

Par exemple, nous savons que :  +  +  +  = 20

Détermine toutes les sommes qui manquent.



Problem of the Week

Problem A and Solution

Shape Sums

Problem

Each symbol in the grid below represents a number. The sums of the symbols in the first, second, and bottom rows and the leftmost and rightmost columns are shown.

				20
				17
				?
				15
12	?	?	19	

For example, we know:  +  +  +  = 20

Determine all the missing sums.

Solution

There are many ways to solve this problem. Here is one approach.

Since the leftmost column has two triangles and two circles, and the column beside it also has two triangles and two circles, the sum of these columns must be the same. So the sum of the second column must be 12.

From the top row we know that the sum of four triangles is 20. So the value of one triangle must be $\frac{1}{4}$ of 20 or $20 \div 4 = 5$.

Since the value of one triangle is 5, then the sum of two triangles is $5 + 5 = 10$. The leftmost column shows the sum of two triangles and two circles is 12, so the sum of two circles is $12 - 10 = 2$. Therefore, the value of one circle must be $\frac{1}{2}$ of 2 or $2 \div 2 = 1$.

The bottom row has a sum of 15 and contains two circles, one triangle, and one



square. Since we know the sum of two circles and one triangle is $2 + 5 = 7$, then the value of one square is $15 - 7 = 8$.

Now we know that the sum of the third column is $5 + 8 + 8 + 1 = 22$.

The second row has a sum of 17 and contains one triangle, one circle, one square and one hexagon. Since we know the sum of one triangle, one circle, and one square is $5 + 1 + 8 = 14$, then the value of one hexagon is $17 - 14 = 3$.

Now we know that the sum of the third row is $1 + 1 + 8 + 3 = 13$.

The completed grid is shown.

				20
				17
				13
				15
12	12	22	19	

Alternatively, we can find the sum of the third row without actually finding the value of the hexagon. Notice that the second and third rows have the same shapes in the last three columns, and only the shape in the first column is different. Since we know that the value of one triangle is 5 and the value of one circle is 1, then the sum of the third row must be $5 - 1 = 4$ less than the sum of the second row. Thus, the sum of the third row is $17 - 4 = 13$.



Teacher's Notes

We could look at this problem algebraically, where we are trying to solve a *linear system of equations*. If we assign variable names to the shapes,

- t = triangle
- c = circle
- s = square
- h = hexagon

then we can describe the information given in the problem as follows:

$$4t = 20$$

$$t + c + s + h = 17$$

$$2c + t + s = 15$$

$$2t + 2c = 12$$

$$t + 2h + s = 19$$

Now, we could use algebraic techniques to find the values of these four variables.

We expect that there is a single solution to these types of problems, and it turns out that there is for this problem. However, for some problems we are not given enough information to determine specific values for each variable. For a problem with four variables, a minimum requirement to guarantee a single solution is that we need *at least* four equations. Also, those equations must be *consistent*. This means that none of the equations can contradict each other. For example, if we added the equation $t = 7$ to the system in this problem, this would contradict the first equation. A system that is *inconsistent* has no solutions. This is something that students will learn more about in higher level math courses.



Problème de la semaine

Problème A

Le pointage au cribbage

Le cribbage est un jeu de cartes qui se joue avec un jeu standard de 52 cartes. Il existe quatre couleurs : le trèfle ♣, le carreau ♦, le cœur ♥ et le pique ♠. Chaque couleur compte 13 cartes identifiées par une lettre ou un nombre comme suit : A, 2, 3, 4, 5, 6, 7, 8, 9, 10, J (Valet), Q (Dame) et K (Roi). Ces lettres et ces nombres représentent le *rang* de la carte. Comme il y a quatre couleurs, il y a quatre cartes de même rang dans chaque jeu. *Note: Dans cette activité, nous ne tiendrons pas compte des couleurs et nous nous concentrerons uniquement sur les rangs.*

Pour déterminer le nombre de points que vaut une main, chaque joueur forme des combinaisons de 2, 3, 4 ou 5 de ses cartes. Une même carte peut être utilisée plus d'une fois dans des combinaisons différentes. Voici les combinaisons qui rapportent des points :

- Chaque combinaison dont la somme totale est égale à 15 vaut 2 points. Pour ces combinaisons, l'As (A) vaut 1, les figures (J, Q et K) valent 10 chacune, et les cartes numérotées valent leur valeur nominale ou leur rang. Par exemple :
 $6 + 9 = 15$ vaut 2 points
 $5 + Q = 15$ vaut 2 points
 $2 + 4 + 9 = 15$ vaut 2 points
- Chaque paire de cartes ayant le même rang vaut 2 points.
- Chaque combinaison de trois cartes ou plus formant une suite de rangs consécutifs vaut le nombre de cartes dans la suite. Par exemple :
3, 4, 5 vaut 3 points
8, 9, 10, J vaut 4 points

Laquelle des mains suivantes vaut le plus de points ?

Main A : 5♥, 10♦, J♠, Q♣ et K♠

Main B : A♠, 6♣, 7♦, 7♥ et 8♣

Main C : 5♣, 5♥, 5♠, 8♠ et Q♦

Justifie ta réponse.





Problem of the Week

Problem A and Solution

Cribbage Scoring

Problem

Cribbage is a card game that is played with a standard deck of 52 cards. There are four suits: clubs ♣, diamonds ♦, hearts ♥, and spades ♠. Each suit has 13 cards identified with either a letter or number as follows: A, 2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K. These letters and numbers are called the card's *rank*. Since there are four suits, there are four cards with the same rank in every deck. *Note: In this activity we will ignore the suits and just focus on the ranks.*

To determine the number of points a hand is worth, each player makes combinations using 2, 3, 4, or 5 of their cards. Cards can be used more than once in different combinations. These are the combinations that count for points:

- Each combination that totals 15 is worth 2 points. When making these combinations, an A is worth 1, a J, Q, or K is worth 10, and all number cards are worth their rank. For example:

$6 + 9 = 15$ is worth 2 points

$5 + Q = 15$ is worth 2 points

$2 + 4 + 9 = 15$ is worth 2 points

- Each pair of cards that have the same rank is worth 2 points.
- Each combination of three or more cards that form a sequence of consecutive ranked cards is worth the number of cards in the sequence. For example:

3, 4, 5 is worth 3 points

8, 9, 10, J is worth 4 points

Which of the following hands is worth the most points?

Hand A: 5♥, 10♦, J♠, Q♣, and K♠

Hand B: A♠, 6♣, 7♦, 7♥, and 8♣

Hand C: 5♣, 5♥, 5♠, 8♠, and Q♦

Justify your answer.



**Solution**

We record the combinations in each hand that earn points in the following tables.

Hand A:

Type of Combination	Combinations	Total Points
Cards that total 15	$5\heartsuit + 10\diamondsuit$, $5\heartsuit + J\spadesuit$, $5\heartsuit + Q\clubsuit$, $5\heartsuit + K\spadesuit$	$2 + 2 + 2 + 2 = 8$
Pairs of cards with the same rank	none	0
Sequences of consecutive ranked cards	$10\diamondsuit, J\spadesuit, Q\clubsuit, K\spadesuit$	4

The total points in this hand is $8 + 4 = 12$.

Hand B:

Type of Combination	Combinations	Total Points
Cards that total 15	$7\diamondsuit + 8\clubsuit$, $7\heartsuit + 8\clubsuit$, $A\spadesuit + 6\clubsuit + 8\clubsuit$, $A\spadesuit + 7\diamondsuit + 7\heartsuit$	$2 + 2 + 2 + 2 = 8$
Pairs of cards with the same rank	$7\diamondsuit$ and $7\heartsuit$	2
Sequences of consecutive ranked cards	$6\clubsuit, 7\diamondsuit, 8\clubsuit$ $6\clubsuit, 7\heartsuit, 8\clubsuit$	$3 + 3 = 6$

The total points in this hand is $8 + 2 + 6 = 16$.

Hand C:

Type of Combination	Combinations	Total Points
Cards that total 15	$5\clubsuit + Q\diamondsuit$, $5\heartsuit + Q\diamondsuit$, $5\spadesuit + Q\diamondsuit$, $5\clubsuit + 5\heartsuit + 5\spadesuit$	$2 + 2 + 2 + 2 = 8$
Pairs of cards with the same rank	$5\clubsuit$ and $5\heartsuit$, $5\clubsuit$ and $5\spadesuit$, $5\heartsuit$ and $5\spadesuit$	$2 + 2 + 2 = 6$
Sequences of consecutive ranked cards	none	0

The total points in this hand is $8 + 6 = 14$.

Therefore, **Hand B** is worth the most points.

The background features a complex arrangement of 3D cubes in various shades of blue and black, creating a sense of depth and perspective. A dark, textured banner with a white border is positioned horizontally across the middle of the image. The text is centered on this banner.

Raisonnement informatiques (C)

A dark, rounded rectangular box is centered below the main title. It contains a black triangle pointing upwards towards the text. The text is in a bold, white, sans-serif font.

**Amène-moi à la
couverture**



Problème de la semaine

Problème A

Quel nombre suis-je ?

Je suis un nombre à 4 chiffres. Utilise les indices suivants pour déterminer mes chiffres :

- (1) Mon chiffre des centaines est la différence entre le nombre de côtés d'un hexagone et le nombre de côtés d'un triangle.
- (2) De gauche à droite, mes chiffres sont disposés en ordre croissant, du chiffre des milliers au chiffre des unités. De plus, mes chiffres augmentent de la même valeur à chaque fois.
- (3) La différence entre mon chiffre des dizaines et mon chiffre des unités est égale au nombre de côtés d'un octogone divisé par le nombre d'angles droits dans un rectangle.

Quel nombre suis-je ?





Problem of the Week

Problem A and Solution

What Number Am I?

Problem

I am a 4-digit number. Use the following clues to determine my digits:

- (1) My hundreds digit is the difference between the number of sides of a hexagon and the number of sides of a triangle.
- (2) Reading my digits from left to right, they are in increasing order from the thousands digit to the ones digit. Also, they increase by the same amount each time.
- (3) The difference between my tens digit and my ones digit is equal to the number of sides of an octagon divided by the number of right angles in a rectangle.

What number am I?

Solution

Using Clue (1), the number of sides of a hexagon is 6 and the number of sides of a triangle is 3. The difference between these two numbers is $6 - 3 = 3$, so the hundreds digit is 3.

Using Clue (3), the number of sides of an octagon is 8 and the number of right angles in a rectangle is 4. So, the difference between the tens digit and the ones digit is $8 \div 4 = 2$.

Using Clue (2), since the digits increase by the same amount each time, then as we read the digits from left to right the numbers will increase by 2. Since the hundreds digit is 3, then the tens digit must be $3 + 2 = 5$. Since the tens digit is 5, then the ones digit must be $5 + 2 = 7$. Working backwards, since the hundreds digit is 3, then the thousands digit must be $3 - 2 = 1$.

Therefore the number is 1357.



Problème de la semaine

Problème A

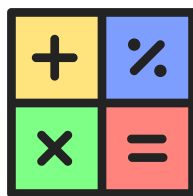
Suis les règles

Considère les consignes étape par étape suivantes :

1. Choisis un nombre à 2 chiffres.
2. Si le nombre est pair, divise-le par 2. Si le nombre est impair, ajoute 10 au nombre.
3. Si le résultat du calcul à l'étape 2 est un nombre à 2 chiffres, ajoute son chiffre des dizaines à son chiffre des unités. Sinon, ajoute 20 au nombre calculé à l'étape 2.
4. Si le résultat du calcul à l'étape 3 est un multiple de 5, divise-le par 5. Sinon, ajoute 12 au nombre calculé à l'étape 3.
5. Si le résultat du calcul à l'étape 4 est supérieur à 30, ajoute 1 à ce résultat. Sinon, soustrais 1 du nombre calculé à l'étape 4.

- (a) Quel est le résultat si tu suis ces consignes en commençant avec 25 ?
(b) Quel est le résultat si tu suis ces consignes en commençant avec 95 ?
(c) Quel est le résultat si tu suis ces consignes en commençant avec 16 ?





Problem of the Week

Problem A and Solution

Follow the Rules

Problem

Consider the following step-by-step instructions:

1. Pick a 2-digit number.
2. If the number is even, divide it by 2. If the number is odd, add 10 to the number.
3. If the result of the calculation in step 2 is a 2-digit number, add its tens digit to its ones digit. Otherwise, add 20 to the number calculated in step 2.
4. If the result of the calculation in step 3 is a multiple of 5, divide it by 5. Otherwise, add 12 to the number calculated in step 3.
5. If the result of the calculation in step 4 is greater than 30, add 1 to it. Otherwise, subtract 1 from the number calculated in step 4.

- (a) What is the result of following these instructions if you start with 25?
- (b) What is the result of following these instructions if you start with 95?
- (c) What is the result of following these instructions if you start with 16?

Solution

- (a) Following the steps and starting with 25 produces this sequence of numbers:

25, 35, 8, 20, 19

- (b) Following the steps and starting with 95 produces this sequence of numbers:

95, 105, 125, 25, 24

- (c) Following the steps and starting with 16 produces this sequence of numbers:

16, 8, 28, 40, 41



Problème de la semaine

Problème A

Le message secret

Alicia et Bao veulent s'envoyer des messages sans que les autres puissent les lire. Ils ont mis au point un code qui utilise uniquement des 0 et des 1 dans le message. Pour décoder le message, deux étapes sont nécessaires :

1. Lire le message, 4 chiffres à la fois. Ensuite, repérer chaque code à 4-chiffres dans le tableau ci-dessous et le remplacer par la lettre minuscule correspondante.

Code	0000	0001	0010	0011	0100	0101	0110	0111
Lettre	a	b	c	d	e	f	g	h

Code	1000	1001	1010	1011	1100	1101	1110	1111
Lettre	i	j	k	l	m	n	o	p

2. Lire le nouveau message, deux lettres consécutives à la fois. Ensuite, repérer chaque paire de lettres minuscules dans le tableau ci-dessous et la remplacer par la lettre majuscule correspondante. Le mot formé par ces lettres majuscules constitue le message secret.

Lettres minuscules	eb	ec	ed	ee	ef	eg	eh	ei	ij	ek	el	em	en
Lettre majuscule	A	B	C	D	E	F	G	H	I	J	K	L	M

Lettres minuscules	eo	ep	fa	fb	fc	fd	fe	ff	fg	fh	fi	fj	fk
Lettre majuscule	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Par exemple, si Alicia envoie le code 0100111101001011, après la première étape, le message devient **epel**, et après la deuxième étape, Bao découvre que le message est **OK**.

Décode le message suivant :

01010010010001010101001101010000010001010100001101010100

Essaie d'écrire et d'envoyer tes propres messages secrets.





Problem of the Week

Problem A and Solution

Secret Message

Problem

Alicia and Bao want to send messages to each other without other people being able to read them. They set up a code that uses just 0s and 1s in the message. To decode the message it takes two steps:

1. Read the message, 4 digits at a time. Then look up each 4-digit code in the tables below and replace it with the given lowercase letter.

Code	0000	0001	0010	0011	0100	0101	0110	0111
Letter	a	b	c	d	e	f	g	h

Code	1000	1001	1010	1011	1100	1101	1110	1111
Letter	i	j	k	l	m	n	o	p

2. Read the new message, two consecutive letters at a time. Then look up each pair of lowercase letters in the tables below and replace them with the given uppercase letter. The word formed by these uppercase letters is the secret message.

Lowercase Letters	eb	ec	ed	ee	ef	eg	eh	ei	ij	ek	el	em	en
Uppercase Letter	A	B	C	D	E	F	G	H	I	J	K	L	M

Lowercase Letters	eo	ep	fa	fb	fc	fd	fe	ff	fg	fh	fi	fj	fk
Uppercase Letter	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

For example, if Alicia sent the code 0100111101001011, after the first step the message becomes **epel**, and after the second step Bao knows the message is **OK**.

Decode the following message:

01010010010001010101001101010000010001010100001101010100

Try writing and sending secret messages of your own.



Solution

The first step in decoding the message is to convert each group of 4 digits into a single lowercase letter. This is shown in the following tables.

Code	0101	0010	0100	0101	0101	0011	0101	0000	0100	0101
Letter	f	c	e	f	f	d	f	a	e	f

Code	0100	0011	0101	0100
Letter	e	d	f	e

Next we take each pair of lowercase letters and decode them into a single uppercase letter, as shown below.

Lowercase Letters	fc	ef	fd	fa	ef	ed	fe
Uppercase Letter	R	E	S	P	E	C	T

So the secret message is RESPECT.



Teacher's Note

This process of decoding a sequence of 0s and 1s is actually very close to the way computers store and interpret simple text. Each character on an English language keyboard has a numerical value associated with it known as its *ASCII code*. That ASCII code is represented by an 8-bit code, where a *bit* is either a 0 or 1. Inside a computer, simple text data is stored as a sequence of 0s and 1s.

Another way an ASCII code is represented is by its 2-digit hexadecimal code. Each group of four bits is equivalent to a single digit in the hexadecimal number system. There are 16 digits in the hexadecimal number system (note that there are 10 digits in our decimal number system). The only difference between how ASCII codes work and this problem is that the hexadecimal digit values are: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, a, b, c, d, e, f. This problem uses lowercase letters to represent the hexadecimal digits to avoid confusion with the bits of the secret code and actual hexadecimal digits.

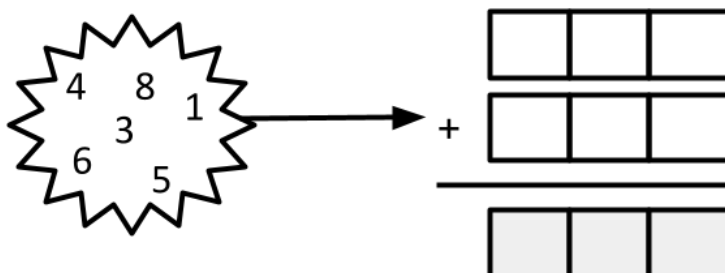


Problème de la semaine

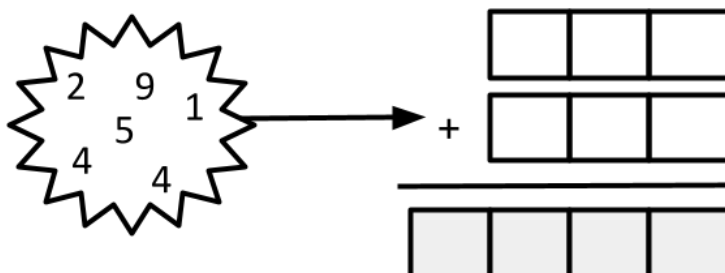
Problème A

Des défis de disposition

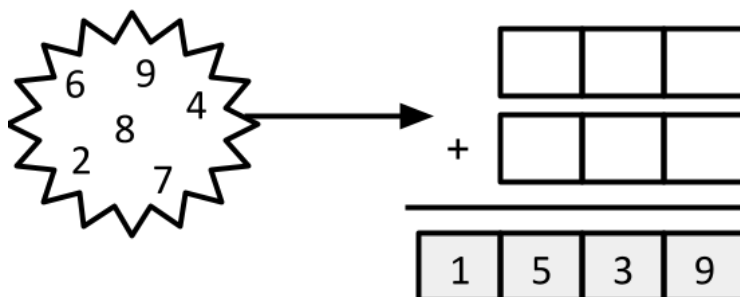
- (a) Dispose les nombres 4, 8, 1, 6, 3 et 5 pour former deux nombres à 3 chiffres dont la somme est la plus *petite* possible.



- (b) Dispose les nombres 2, 9, 1, 4, 5 et 4 pour former deux nombres à 3 chiffres dont la somme est la plus *grande* possible.



- (c) Dispose les nombres 6, 9, 4, 2, 8 et 7 pour former deux nombres à 3 chiffres dont la somme est égale à 1539.



Pour chaque partie, combien de solutions différentes peux-tu trouver ?



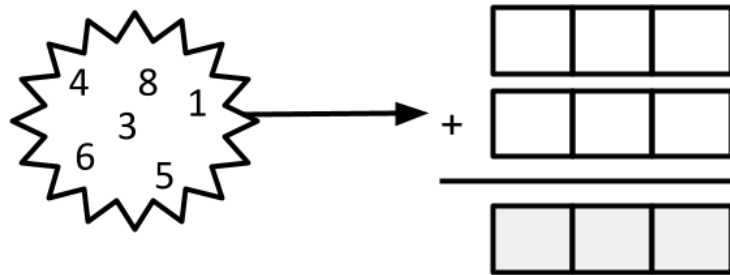
Problem of the Week

Problem A and Solution

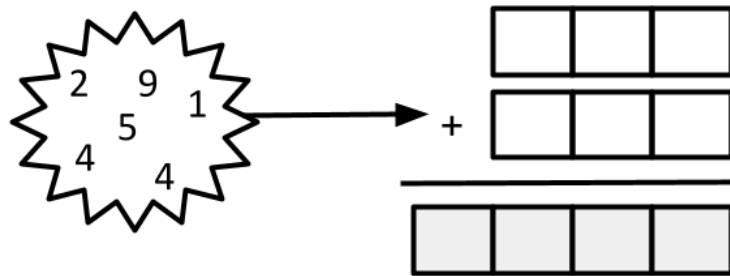
Just Filling In

Problem

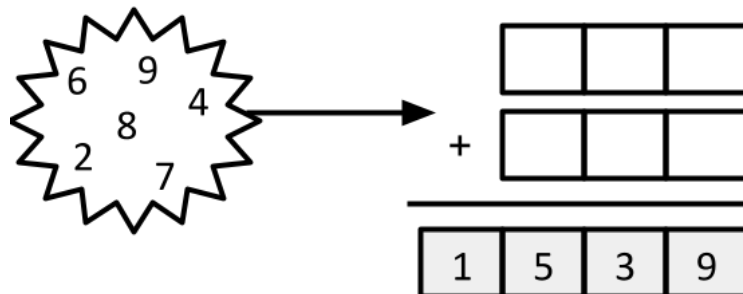
- (a) Arrange the numbers 4, 8, 1, 6, 3, and 5 to form two 3-digit numbers with the *smallest* possible sum.



- (b) Arrange the numbers 2, 9, 1, 4, 5, and 4 to form two 3-digit numbers with the *largest* possible sum.



- (c) Arrange the numbers 6, 9, 4, 2, 8, and 7 to form two 3-digit numbers that add to 1539.



For each part, how many different solutions can you find?



Solution

- (a) The strategy for creating the smallest (or largest) sum comes from recognizing that the hundreds digit has the most influence on the size of a number, and the ones digit has the least influence on the size of a number.

When we are choosing the digits for the smallest sum, we want the smallest numbers in the hundreds column, the next smallest numbers in the tens column, and the largest numbers in the ones column. So, in our answer we want 1 and 3 in the hundreds column, 4 and 5 in the tens column, and 6 and 8 in the ones column.

When adding two numbers, the order of the numbers does not affect the sum. Thus, the digits in each column can be arranged in 2 ways: with either the larger digit on top or the smaller digit on top. Since there are three columns in the sum, there are a total of $2 \times 2 \times 2 = 8$ solutions. The 8 solutions are shown.

$$\begin{array}{r} 146 \\ + 358 \\ \hline \end{array} \quad \begin{array}{r} 148 \\ + 356 \\ \hline \end{array} \quad \begin{array}{r} 156 \\ + 348 \\ \hline \end{array} \quad \begin{array}{r} 158 \\ + 346 \\ \hline \end{array} \quad \begin{array}{r} 346 \\ + 158 \\ \hline \end{array} \quad \begin{array}{r} 348 \\ + 156 \\ \hline \end{array} \quad \begin{array}{r} 356 \\ + 148 \\ \hline \end{array} \quad \begin{array}{r} 358 \\ + 146 \\ \hline \end{array}$$

In all arrangements, the sum is 504.

- (b) Using the strategy from part (a), we can arrange the numbers to find the largest possible sum. This time, we want the largest numbers, 5 and 9, in the hundreds columns and the smallest numbers, 1 and 2 in the ones columns. The remaining numbers are the same digit 4 and 4.

When adding two numbers, the order of the numbers does not affect the sum. Thus, the digits in the hundreds and ones columns can each be arranged in 2 ways: with either the larger digit on top or the smaller digit on top. Since the digits in the tens column are the same, they can be arranged in only 1 way. Therefore, there are $2 \times 2 \times 1 = 4$ possible solutions in this case. The 4 solutions are shown.

$$\begin{array}{r} 541 \\ + 942 \\ \hline \end{array} \quad \begin{array}{r} 542 \\ + 941 \\ \hline \end{array} \quad \begin{array}{r} 941 \\ + 542 \\ \hline \end{array} \quad \begin{array}{r} 942 \\ + 541 \\ \hline \end{array}$$

In all arrangements, the sum is 1483.

- (c) We need some logic to narrow down the choices in this example. Since we know the ones digit of the sum is 9, then the ones digits for each of the two



numbers being added must have a total of 9 or 19. It is not possible to add two single digits to get 19, so the sum must be 9. The only possible combinations given the digits we have are $2 + 7$ or $7 + 2$.

In the tens column, we need two numbers that add to 3 or 13. The sum of $6 + 7 = 13$, but we have already used 7 in the ones column. There is only one pair of the remaining digits we could use: $4 + 9 = 13$ or $9 + 4 = 13$. This means we carry 1 into the hundreds column, so the sum of the two digits in the hundreds column must be 14.

The remaining digits are 6 and 8, and fortunately the sum of these digits is 14.

As in part (a), we can arrange these digits in 8 different ways. The 8 solutions are shown.

642	647	692	697	842	847	892	897
<u>+897</u>	<u>+892</u>	<u>+847</u>	<u>+842</u>	<u>+697</u>	<u>+692</u>	<u>+647</u>	<u>+642</u>

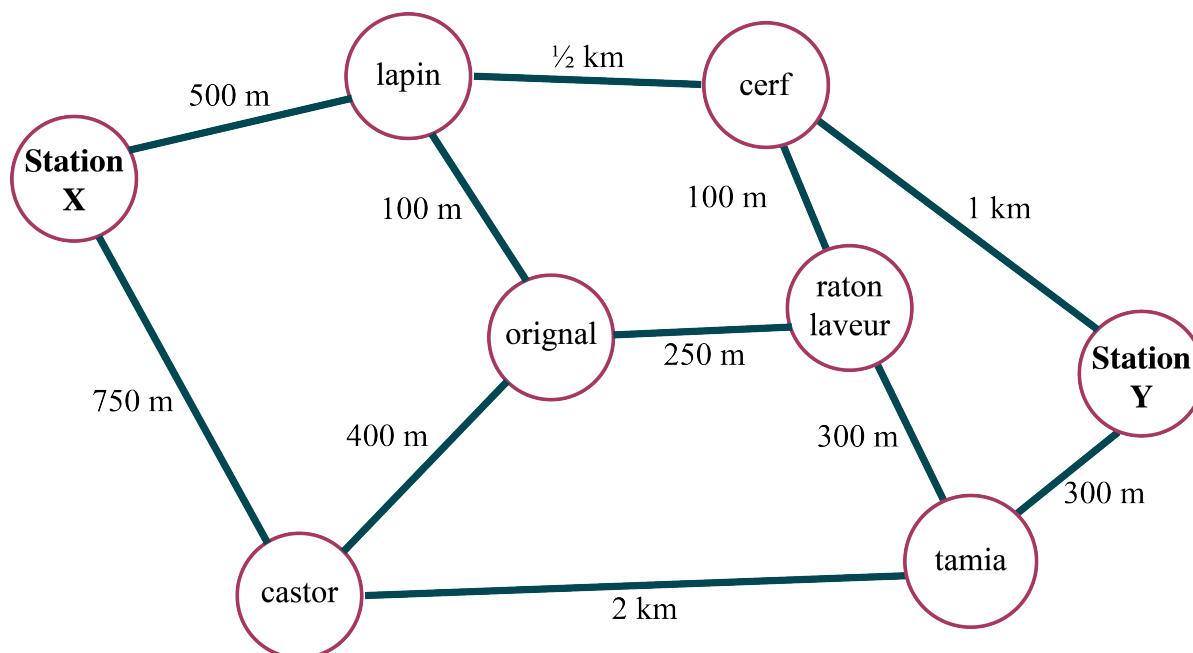


Problème de la semaine

Problème A

Les sentiers du parc

Le parc provincial Arrowhead possède plusieurs sentiers reliant la station des gardes de parc X à la station des gardes Y. Des balises de sentier sont placées à chaque intersection et portent le nom d'animaux que l'on peut observer dans le parc. La carte ci-dessous illustre les sentiers ainsi que les distances entre les balises. La carte n'est pas à l'échelle.



Trois randonneurs ont marché de la **station X** à la **station Y** en empruntant des chemins différents :

Chemin A: station X $\rightarrow$ lapin $\rightarrow$ cerf $\rightarrow$ station Y

Chemin B: station X $\rightarrow$ castor $\rightarrow$ tamia $\rightarrow$ station Y

Chemin C: station X $\rightarrow$ lapin $\rightarrow$ original $\rightarrow$ raton laveur $\rightarrow$ cerf $\rightarrow$ station Y

- (a) Qui a marché le plus loin ? Justifie ta réponse.
- (b) Trouve un chemin plus court que chacun des trois chemins empruntés par les randonneurs.

DÉFI: Quel est le chemin le plus court entre la **station X** et la **station Y** ?



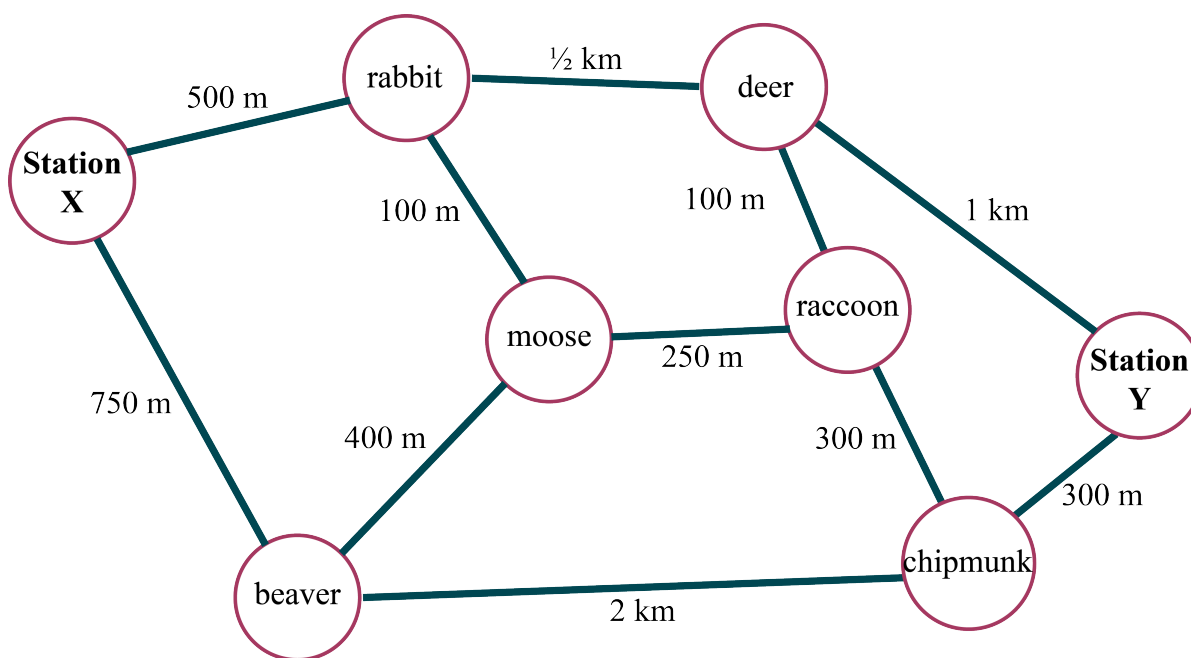
Problem of the Week

Problem A and Solution

Park Paths

Problem

Arrowhead Provincial Park has various trails that people can follow between Ranger Station X and Ranger Station Y. There are trail markers at each intersection which are named after animals that may be seen in the park. The map below shows the trails and the distances between markers. The map is not to scale.



Three hikers walked from **Station X** to **Station Y** along different paths:

Path A: Station X → rabbit → deer → Station Y

Path B: Station X → beaver → chipmunk → Station Y

Path C: Station X → rabbit → moose → raccoon → deer → Station Y

- (a) Who walked the furthest? Justify your answer.
- (b) Find a path that is shorter than any of the three paths the hikers took.

CHALLENGE: What is the shortest path from **Station X** to **Station Y**?

Solution

One way to solve this problem is to convert all the distances to metres. We know that 1 km is equal to 1000 m. So, 2 km is equal to 2000 m and $\frac{1}{2}$ km is equal to $1000 \div 2 = 500$ m.



(a) **Path A** is $500 + 500 + 1000 = 2000$ m or 2 km long.

Path B is $750 + 2000 + 300 = 3050$ m long.

Path C is $500 + 100 + 250 + 100 + 1000 = 1950$ m long.

The hiker that follows **Path B** walks the furthest.

(b) Answers will vary. Possible answers include:

Station X $\rightarrow$ rabbit $\rightarrow$ deer $\rightarrow$ raccoon $\rightarrow$ chipmunk $\rightarrow$ Station Y

The distance of this path is $500 + 500 + 100 + 300 + 300 = 1700$ m.

Station X $\rightarrow$ rabbit $\rightarrow$ moose $\rightarrow$ raccoon $\rightarrow$ chipmunk $\rightarrow$ Station Y

The distance of this path is $500 + 100 + 250 + 300 + 300 = 1450$ m.

CHALLENGE SOLUTION:

One way to try to find the shortest distance from **Station X** to **Station Y** is to look for the paths that have the fewest stops. Both **Path A** and **Path B** only have two stops between the starting point and the ending point. There are no possible paths that have only one stop between **Station X** and **Station Y**, so **Path A** and **Path B** have the fewest stops possible. However, as we already calculated, neither of these two paths can possibly be the shortest path since **Path C** is shorter. So this strategy for finding the shortest path does not work in general.

Another strategy for searching for the shortest path is called the *greedy algorithm*. With this strategy, at each intersection we pick the path with the shortest distance leaving that intersection. **Path C** follows this strategy.

At **Station X**, we follow the path that is 500 m instead of the path that is 750 m. At the **rabbit** intersection, we follow the path that is 100 m instead of the path that is $\frac{1}{2}$ km. At the **moose** intersection, we follow the path that is 250 m instead of the path that is 400 m. At the **raccoon** intersection, we follow the path that is 100 m instead of the path that is 300 m. At the **deer** intersection, we follow the path that is 1 km instead of the path that leads us back to an intersection we have already visited. We see that this strategy finds a path that is shorter than the other two paths that are listed, but is this the shortest possible path?

In this problem, we can use trial and error to find at least one other path that is shorter than **Path C**. So the greedy algorithm strategy for finding the shortest path does not work in general.

The next question is, how do we find the shortest path and know that there are no paths that are shorter? We could use trial and error and list all possible paths from **Station X** to **Station Y**. Then we choose the shortest path from all possible paths. However, this can get tricky and it is easy to miss one or more paths. There is a strategy that is used in higher mathematics called *Dijkstra's Algorithm*. We won't go through the details of this algorithm here, but the result of following this strategy leads us to the shortest path from **Station X** to **Station Y**:

Station X $\rightarrow$ rabbit $\rightarrow$ moose $\rightarrow$ raccoon $\rightarrow$ chipmunk $\rightarrow$ Station Y

The distance of this path is $500 + 100 + 250 + 300 + 300 = 1450$ m.



Problème de la semaine

Problème A

À chaque famille sa tente !

Quatre familles partent en camping. Chaque famille est d'une taille différente (soit 3, 4, 5 ou 6 membres) et possède une tente d'une couleur différente.

À l'aide des indices ci-dessous, détermine la taille et la couleur de la tente de chaque famille.

- (1) La famille Boivin utilise une tente jaune.
- (2) La famille qui possède la tente bleue est celle qui compte le moins de membres.
- (3) La famille Kerr n'est pas celle qui compte le plus de membres, et elle n'est pas dans la tente rouge.
- (4) La famille qui possède la tente jaune est celle qui compte le plus de membres.
- (5) La famille qui possède la tente rouge compte un membre de moins que la famille qui possède la tente jaune.
- (6) La famille Omanovic n'est ni dans la tente verte ni dans la tente bleue et ce n'est pas la famille qui compte le moins de membres.
- (7) La tente verte appartient à la famille ayant le deuxième plus petit nombre de membres.
- (8) La famille Banerjee compte la moitié du nombre de membres d'une autre famille.





Problem of the Week

Problem A and Solution

Tents Situation

Problem

Four families are going camping. The families are each of a different size, with 3, 4, 5, or 6 family members, and each have a different coloured tent.

Using the clues below, determine the family size and tent colour for each family.

- (1) The Boivin family uses a yellow tent.
- (2) The family with the blue tent has the fewest family members.
- (3) The Kerr family does not have the most people in their family and they are not in the red tent.
- (4) The family in the yellow tent has the most members in their family.
- (5) The family in the red tent has one fewer family member than the family in the yellow tent.
- (6) The Omanovic family is not in the green tent nor in the blue tent, and they are not the family with the fewest members.
- (7) The green tent has the second lowest number of family members.
- (8) The Banerjee family has half the number of family members as another family.



Solution

Here is one way to match the families with the number of family members and the tent colours.

Clue (1) tells us that the Boivin family uses the yellow tent. Then, from Clue (4), we know that the Boivin family has the most members in their family, and so has 6 family members.

Thus, the Boivin family has 6 family members and uses the yellow tent.

From Clue (5), we know that the family in the red tent has one fewer family member than the family in the yellow tent. Since the family in the yellow tent has 6 family members, the family in the red tent has 5 family members. From Clue (6), the Omanovic family is not in the green tent nor in the blue tent. Since the Boivin family is in the yellow tent, then the Omanovic family is not in the yellow tent. So the Omanovic family must be in the red tent.

Thus, the Omanovic family has 5 family members and is in the red tent.

Clue (8) tells us that the Banerjee family has 3 family members, because 3 is the only number that is half of another number of family members. Thus, the Banerjee family has the fewest family members. Clue (2) then tells us that the Banerjee family is in the blue tent.

Thus, the Banerjee family has 3 family members and is in the blue tent.

This means that the Kerr family must have 4 family members and be in the green tent.

So we have deduced the following matches:

The Boivin family has 6 members and a yellow tent.

The Omanovic family has 5 members and a red tent.

The Kerr family has 4 members and a green tent.

The Banerjee family has 3 members and a blue tent.

Once we think we have our final answer, we should double check that all of the clue statements are true. Note that our solution did not use Clue (3) or Clue (7), however these clues match our final answer.



Gestion des données (D)



**Amène-moi à la
couverture**



Problème de la semaine

Problème A

Comparer les communications

Plusieurs élèves ont comparé le nombre de courriels qu'ils avaient envoyés au cours de la semaine précédente.

Nombre de courriels envoyés	Nombre d'élèves
0	12
1	19
2	11
3	8
4	14
5	2
6	15

- (a) Combien d'élèves ont envoyé moins de 2 courriels ?
- (b) Combien d'élèves ont envoyé plus de 4 courriels ?
- (c) Sépare les élèves en deux groupes de sorte que tous les élèves d'un groupe aient envoyé plus de courriels que tous ceux de l'autre groupe, et que le nombre d'élèves dans chaque groupe soit aussi proche que possible.





Problem of the Week

Problem A and Solution

Comparing Communications

Problem

Several students compared how many emails they had sent during the previous week.

Number of Emails Sent	Number of Students
0	12
1	19
2	11
3	8
4	14
5	2
6	15

- (a) How many students sent fewer than 2 emails?
- (b) How many students sent more than 4 emails?
- (c) Separate the students into two groups so that all the students in one group sent more emails than all the students in the other group, and the number of students in each group are as close as possible.

Solution

We can use the table information to determine the answers.

- (a) The numbers 0 and 1 are less than 2. So the total number of students who sent fewer than 2 emails is $12 + 19 = 31$.
- (b) The numbers 5 and 6 are more than 4. So the total number of students who sent more than 4 emails is $2 + 15 = 17$.
- (c) The total number of students is $12 + 19 + 11 + 8 + 14 + 2 + 15 = 81$. If the number of students in each group are as close as possible, then one group would have 40 students and the other would have 41. This is our target.

We notice that the number of students who sent fewer than 3 emails is $12 + 19 + 11 = 42$. This is quite close to 41. In fact, it is as close as we can get to 41 because the number of students who sent 3 emails is 8 and the number of students who sent 2 emails is 11, so adding 8 or subtracting 11 from 42 would take us further away from 41. Thus, one group contains the 42 students who sent fewer than 3 emails and the other group contains the $81 - 42 = 39$ students who sent 3 or more emails.

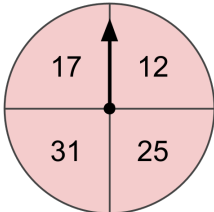
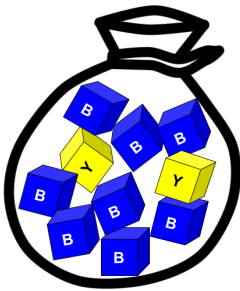


Problème de la semaine

Problème A

Probablement

Réfléchis à la probabilité associée aux situations suivantes. Identifie chaque situation comme étant « certaine », « probable », « équiprobable », « peu probable » ou « impossible ». Justifie tes réponses.

Événement	Probabilité
Étant donné la roue ci-dessous, quelle est la probabilité que le résultat du lancer soit un nombre impair plutôt qu'un nombre pair ? 	
Si aujourd'hui c'est jeudi, quelle est la probabilité que demain soit vendredi plutôt qu'un autre jour de la semaine ?	
Si tu demandes à quelqu'un de choisir un nombre entier entre 1 et 10, quelle est la probabilité que le nombre choisi soit supérieur à 8 et inférieur à 5 ?	
Si tu lances une pièce équilibrée à deux faces ayant un orignal d'un côté et un canot de l'autre, quelle est la probabilité qu'elle atterrisse avec la face de l'orignal vers le haut plutôt qu'avec celle du canot vers le haut ?	
Si tu piges un cube dans le sac ci-dessous sans regarder à l'intérieur, quelle est la probabilité que le cube pigé soit jaune plutôt que bleu ? 	



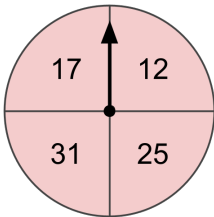
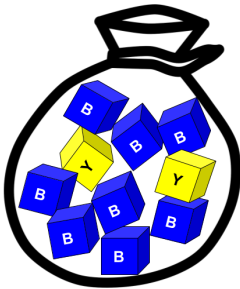
Problem of the Week

Problem A and Solution

Probably

Problem

Think about the probability related to the following situations. Identify each one as “*certain*”, “*likely*”, “*equally likely*”, “*unlikely*”, or “*impossible*”. Justify your answers.

Event	Probability
Given the spinner below, what is the probability the outcome of spinning is an odd number rather than an even number? 	
If today is Thursday, what is the probability that tomorrow is Friday rather than another day of the week?	
If you ask someone to pick a whole number between 1 and 10, what is the probability the number they choose is greater than 8 and less than 5?	
If you flip a fair two-sided coin that has a moose on one side and a canoe on the other side, what is the probability it lands with the moose side up rather than the canoe side up?	
If you pick a cube from the bag below without being able to see inside the bag, what is the probability that the cube you pick is yellow rather than blue? 	



Solution

Given the spinner, it is *likely* that the outcome will be an odd number since there are 3 times as many odd numbers as even numbers on the spinner and it appears each area for a number on the spinner is approximately the same size.

If today is Thursday, it is *certain* that tomorrow is Friday rather than another day of the week. Days of the week have a set sequence and Friday always follows Thursday.

If you ask someone to pick a whole number between 1 and 10, it is *impossible* that the number they choose is greater than 8 and less than 5. Since $5 < 8$, numbers that are less than 5 cannot also be greater than 8 and numbers that are greater than 8 cannot also be less than 5.

If you flip a fair two-sided coin that has a moose on one side and a canoe on the other side it is *equally likely* it lands with the moose side up rather than the canoe side up. Since there are only two sides to the coin, and it is a fair coin, over time the coin should land on each side approximately the same number of times.

If you pick a cube from the bag, without being able to see inside the bag, it is *unlikely* that the cube you pick is yellow rather than blue. The number of yellow cubes (2) is much smaller than the number of blue cubes (8) in the bag. If you are unable to see the colours of the cubes, then it is much less likely that you will pick a yellow cube rather than a blue cube randomly from the bag.



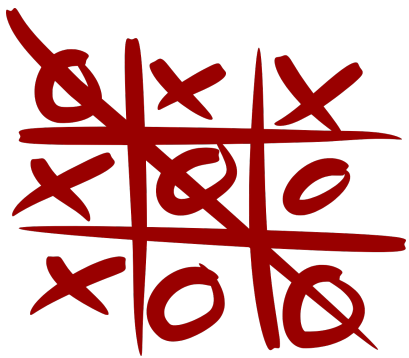
Problème de la semaine

Problème A

Tournoi d'équipes

Mme McNeil organise un tournoi de tic-tac-toe avec des poches (sacs de pois) pour sa classe. Elle divise sa classe en 6 équipes. Lorsqu'une équipe joue contre une autre équipe pendant le tournoi, on appelle cela une partie.

- (a) Au tournoi, chaque équipe doit jouer contre chacune des autres équipes une fois. Combien de parties chaque équipe jouera-t-elle pendant le tournoi ? Justifie ta réponse.
- (b) Combien de parties seront jouées au total pendant le tournoi ? Justifie ta réponse.





Problem of the Week

Problem A and Solution

Team Tournament

Problem

Ms. McNeil organizes a bean bag tic-tac-toe tournament for her class. She divides her class into 6 teams. When one team plays another team during the tournament, this is called a match.

- In the tournament, each team has to play every other team once. How many matches will each team play during the tournament? Justify your answer.
- How many matches are played in total during the tournament? Justify your answer.

Solution

- Since each team has to play every other team once during the tournament, each team must play the other 5 teams. In other words, each team has 5 matches.
- We will call the teams Team 1, Team 2, Team 3, Team 4, Team 5, and Team 6. One way to solve this problem is to write out all the matches, being careful to make sure we do not include duplicate matches. For example, when Team 1 plays Team 2, that match is the same as saying Team 2 plays Team 1.

The possible matches are:

- Team 1 and Team 2, Team 1 and Team 3, Team 1 and Team 4, Team 1 and Team 5, Team 1 and Team 6
- Team 2 and Team 3, Team 2 and Team 4, Team 2 and Team 5, Team 2 and Team 6
- Team 3 and Team 4, Team 3 and Team 5, Team 3 and Team 6
- Team 4 and Team 5, Team 4 and Team 6
- Team 5 and Team 6

Therefore, there are 15 matches in total in the tournament.

Alternatively, since each team has to play 5 matches and there are 6 teams, we can count the total number of matches in the tournament as $5 + 5 + 5 + 5 + 5 + 5 = 5 \times 6 = 30$.

However, this calculation actually double counts matches. For example, it counts the match between Team 1 and Team 2 as two separate matches (one match from the point of view of Team 1 and one match from the point of view of Team 2). This is true for every match between two teams. So, to get the true count of the total number of matches in the tournament, we need to divide by 2 to get $30 \div 2 = 15$ matches.

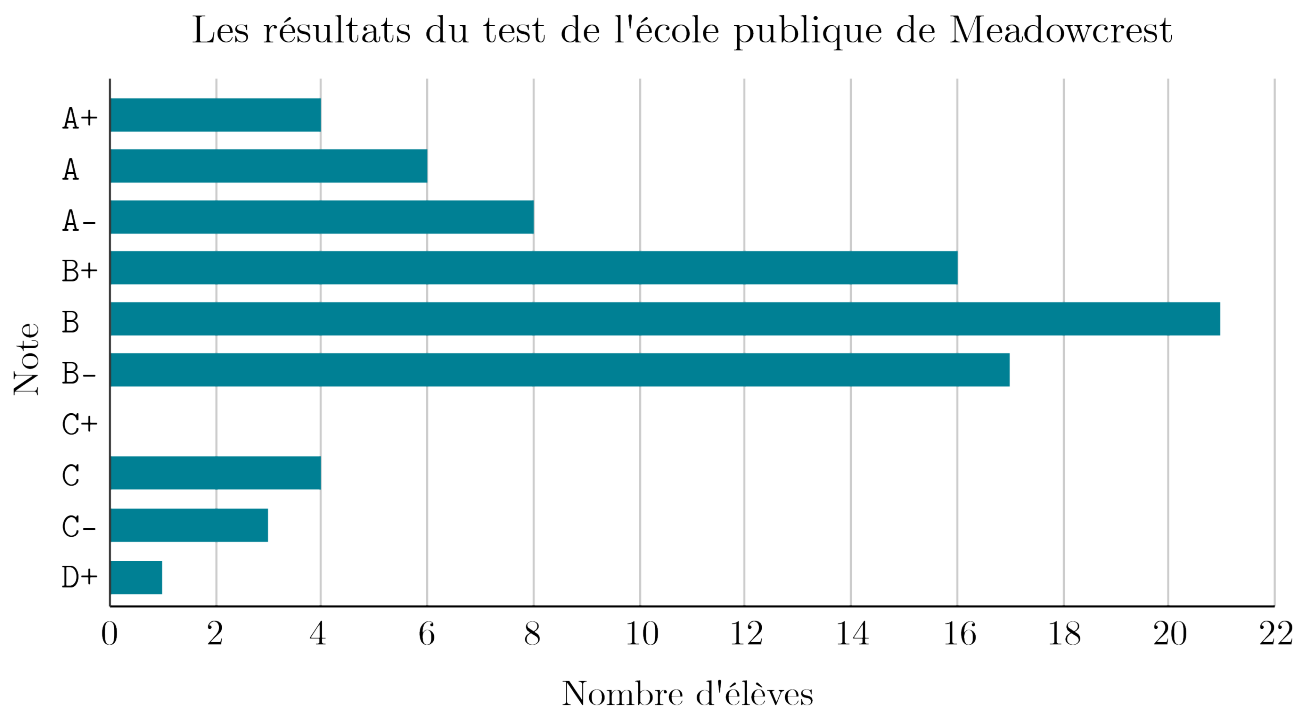


Problème de la semaine

Problème A

Les résultats du test

Les élèves de l'école publique de Meadowcrest ont passé un test de mathématiques normalisé. Le diagramme à bandes ci-dessous présente les résultats du test. De haut en bas, dans le diagramme à bandes, les notes sont classées de la plus haute à la plus basse. En d'autres termes, A+ est la note la plus haute et D+ est la note la plus basse.



- (a) Combien d'élèves ont passé le test ?
- (b) Quel est le mode des résultats du test ?
(Le mode est la note qui apparaît le plus souvent.)
- (c) Une note égale ou supérieure à B- signifie atteindre ou dépasser les attentes.
Combien d'élèves atteignent ou dépassent les attentes ?



Problem of the Week

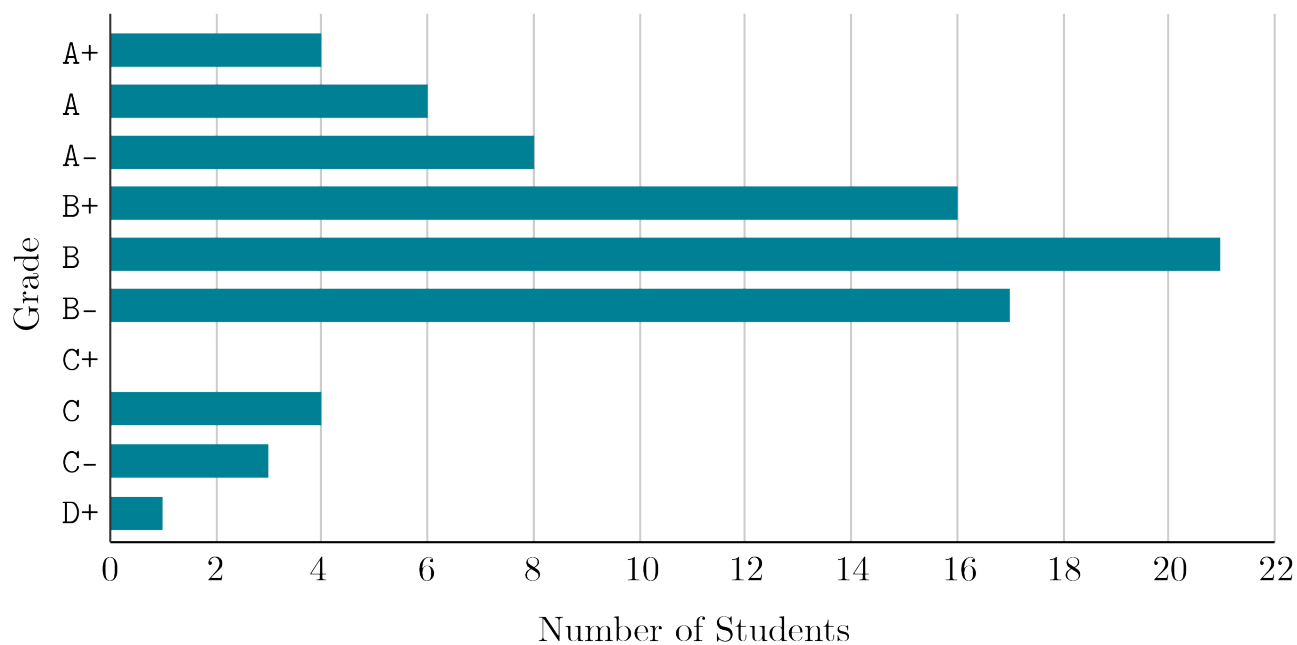
Problem A and Solution

Test Results

Problem

The students in Meadowcrest Public School wrote a standardized math test. The bar chart below shows the results of the test. Reading the grades from top to bottom in the bar chart, the grades appear from highest to lowest. In other words, A+ is the highest grade and D+ is the lowest grade.

Test Results for Meadowcrest PS



- (a) How many students wrote the test?
- (b) What is the mode of the test results?
(The mode is the score that occurs the most often.)
- (c) If a grade of B- or higher means meeting or exceeding expectations, how many students are meeting or exceeding expectations?



Solution

- (a) We can read the bar graph to determine how many students earned each grade on the test. The following table summarizes the results in the bar graph:

Grade	A+	A	A-	B+	B	B-	C+	C	C-	D+
Number of Students	4	6	8	16	21	17	0	4	3	1

So the total number of students who wrote the test is:

$$4 + 6 + 8 + 16 + 21 + 17 + 0 + 4 + 3 + 1 = 80$$

- (b) The mode of the data matches the longest bar in the graph. In this case the mode is **B** since that is the grade with the longest bar.
- (c) If we only consider the grades of B- or higher, we can add together the number of students who achieved grades of A+, A, A-, B+, B, and B-. This gives $4 + 6 + 8 + 16 + 21 + 17 = 72$.

Alternatively, we can subtract the number of students who achieved grades below B- from the total we found in part (a). This gives $80 - 4 - 3 - 1 = 72$.



Problème de la semaine

Problème A

Mode d'anniversaire

Jaylen et Julia sont dans des classes différentes à l'école. Ils effectuent tous les deux un sondage sur le mois de naissance de leurs camarades de classe. Ils notent chaque mois de naissance sous forme de nombre, avec janvier = 1, février = 2, mars = 3, et ainsi de suite.

Voici leurs deux ensembles de données :

Jaylen: 4, 5, 4, 8, 9, 3, 5, 6, 3, 4, 11, 6, 5, 12, 10, 12, 3, 1, 2

Julia: 12, 3, 4, 3, 5, 7, 8, 3, 6, 4, 11, 11, 6, 5, 3, 9, 10, 10, 9, 3, 5

Un nouvel élève arrive à l'école et se joint à l'une de leurs classes. Après avoir ajouté les renseignements sur l'anniversaire du nouvel élève aux résultats du sondage, Jaylen et Julia remarquent que les modes des deux ensembles de données sont les mêmes. (Le mode d'un ensemble de données est la valeur qui apparaît le plus souvent.)

En quel mois le nouvel élève est-il né et dans quelle classe est-il entré ?





Problem of the Week

Problem A and Solution

Birthday Mode

Problem

Jaylen and Julia are in different classes at school. They both take a survey of the birth month of their classmates. They record each birthday month as a number, with January = 1, February = 2, March = 3, and so on.

Here are their two data sets:

Jaylen: 4, 5, 4, 8, 9, 3, 5, 6, 3, 4, 11, 6, 5, 12, 10, 12, 3, 1, 2

Julia: 12, 3, 4, 3, 5, 7, 8, 3, 6, 4, 11, 11, 6, 5, 3, 9, 10, 10, 9, 3, 5

A new student comes into the school and joins one of their classes. After adding the new student's birthday information to the survey results, Jaylen and Julia notice that the modes of the two data sets are the same. (The mode of a data set is the value that appears most often.)

In what month was the new student born, and whose class did they enter?

Solution

We start by finding the mode of each of the data sets. To do so, we can make a table of the frequencies of each value in the data set:

Jaylen's data:

Month:	1	2	3	4	5	6	7	8	9	10	11	12
Frequency:	1	1	3	3	3	2	0	1	1	1	1	2

Julia's data:

Month:	1	2	3	4	5	6	7	8	9	10	11	12
Frequency:	0	0	5	2	3	2	1	1	2	2	2	1

Before the new student arrived, the mode of Julia's data was 3, since that value appears the most often (5 times).

There is a three-way tie for the mode of Jaylen's data, since the values 3, 4, and 5 all appear 3 times in the data set.

Since the modes of the two data sets are the same after adding only one more value to the data, then the two data sets must both have a mode of 3. If the new student joins Jaylen's class, and the student's birth month is March, then there will be 4 students that have March as their birthday month. With this update, the mode in Jaylen's data set is 3, the same as the mode of Julia's data set.

Note that the mode is the same for each data set, but the actual frequency of the mode value is different in the two classes.



Problème de la semaine

Problème A

Des biscuits en fuite

Janelle et Jean-Paul ont préparé 70 biscuits pour une vente de pâtisseries à l'école. Ils ont fait cinq sortes différentes de biscuits et il y avait un nombre pair de biscuits de chaque sorte. En arrivant à l'école, Janelle et Jean-Paul se sont rendu compte qu'ils n'avaient pas les biscuits *au sucre*.

Voici le pictogramme des biscuits qu'ils ont apportés à l'école.

Chaque  représente 4 biscuits.

Sorte de biscuit	Nombre de biscuits
Pépites de chocolat	     
Avoine et raisins	  
Pain d'épice	 
Au sucre	
Macaron à la noix de coco	    

Combien de biscuits *au sucre* ont-ils oubliés à la maison ?

Complète le pictogramme et explique ta réponse.





Problem of the Week

Problem A and Solution

Missing Cookies

Problem

Janelle and Jean-Paul baked 70 cookies for a school bake sale. They baked five different kinds of cookies and there was an even number of each kind of cookie. When Janelle and Jean-Paul got to school, they realized that they were missing the *sugar* cookies.

Below is a pictograph of the cookies that they brought to the school.

Each  represents 4 cookies.

Cookie Type	Number of Cookies
Chocolate Chip	     
Oatmeal Raisin	  
Gingerbread	 
Sugar	
Coconut Macaroon	    

How many *sugar* cookies had they forgotten at home? Complete the pictograph and explain your answer.

Solution

We start by counting the known number of cookies represented in the pictograph. Since each full oval represents four cookies, then a half oval must represent half as many cookies, or two cookies.

- *Chocolate Chip*: There are five full ovals, which represent $5 \times 4 = 20$ cookies. There is one half oval, which represents 2 cookies. So there are a total of $20 + 2 = 22$ chocolate chip cookies.
- *Oatmeal Raisin*: There are three full ovals, which represent $3 \times 4 = 12$ oatmeal raisin cookies.
- *Gingerbread*: There are two full ovals, which represents $2 \times 4 = 8$ gingerbread cookies.



- *Coconut Macaroon*: There are four full ovals, which represent a total of $4 \times 4 = 16$ coconut macaroon cookies. There is one half oval, which represents 2 cookies. So there are a total of $16 + 2 = 18$ coconut macaroons.

From this, the known total number of cookies is $22 + 12 + 8 + 18 = 60$.

Another way we could have computed the known number of cookies is by counting up all of the full ovals, for a total of 14, and counting up all of the half ovals, for a total of 2. The total number of cookies represented by full ovals is $14 \times 4 = 56$. The total number of cookies represented by half ovals is $2 \times 2 = 4$. Thus, the total number of cookies is $56 + 4 = 60$.

Since Janelle and Jean-Paul baked a total of 70 cookies, but we can only account for 60 of them, then there are $70 - 60 = 10$ cookies missing. These must be our *sugar* cookies.

We can figure out how many extra full ovals we need in our pictograph by dividing the number of sugar cookies we need to represent by 4, and getting the quotient of that calculation. Since $10 \div 4 = 2$ with a remainder 2, then we need 2 full ovals and 1 half oval to represent this number of sugar cookies.

The completed pictograph is shown.

Cookie Type	Number of Cookies
Chocolate Chip	
Oatmeal Raisin	
Gingerbread	
Sugar	
Coconut Macaroon	



Géométrie et mesure (G)

**Amène-moi à la
couverture**



Problème de la semaine

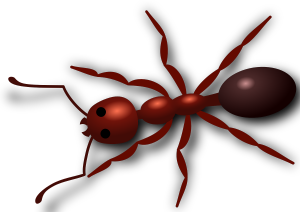
Problème A

L'argument métrique

Millie, Kai, Mircea et Candice débattaient au sujet des unités métriques qu'ils préféraient. Millie pensait que les millimètres étaient les meilleurs, Kai adorait les kilomètres, Mircea préférait les mètres, tandis que l'unité préférée de Candice était les centimètres.

Qui devrait mesurer chacune des longueurs suivantes avec son unité préférée, si le but était de garder chaque valeur entre 2 et 50 inclusivement ?

Longueur à mesurer	Mesureur/Mesureuse
La longueur d'une fourmi	
La longueur d'un autobus	
La longueur d'un marathon	
La longueur d'un pied d'adulte	
La longueur d'un nouveau crayon	
La longueur d'une piscine olympique	
La longueur d'une dent de lait humaine	





Problem of the Week

Problem A and Solution

The Metric Argument

Problem

Millie, Kai, Mircea and Candice were debating about which metric units they liked the most. Millie thought millimeters were best, Kai loved kilometers, Mircea loved meters, and Candice's favourite was centimeters.

Who should measure each of the following lengths with their favourite unit, if they want to keep each value between 2 and 50, inclusive?

Solution

In order to keep the measurement numbers between 2 and 50, inclusive, here is the completed table, along with an approximate measurement for each:

Length Being Measured	Measurer
The length of an ant	Millie (6 mm)
The length of a bus	Mircea (12 m)
The length of a marathon	Kai (42 km)
The length of an adult foot	Candice (25 cm)
The length of a new pencil	Candice (18 cm)
The length of an olympic swimming pool	Mircea (50 m)
The length of a human baby tooth	Millie (9 mm)



Problème de la semaine

Problème A

Quel nombre suis-je ?

Je suis un nombre à 4 chiffres. Utilise les indices suivants pour déterminer mes chiffres :

- (1) Mon chiffre des centaines est la différence entre le nombre de côtés d'un hexagone et le nombre de côtés d'un triangle.
- (2) De gauche à droite, mes chiffres sont disposés en ordre croissant, du chiffre des milliers au chiffre des unités. De plus, mes chiffres augmentent de la même valeur à chaque fois.
- (3) La différence entre mon chiffre des dizaines et mon chiffre des unités est égale au nombre de côtés d'un octogone divisé par le nombre d'angles droits dans un rectangle.

Quel nombre suis-je ?





Problem of the Week

Problem A and Solution

What Number Am I?

Problem

I am a 4-digit number. Use the following clues to determine my digits:

- (1) My hundreds digit is the difference between the number of sides of a hexagon and the number of sides of a triangle.
- (2) Reading my digits from left to right, they are in increasing order from the thousands digit to the ones digit. Also, they increase by the same amount each time.
- (3) The difference between my tens digit and my ones digit is equal to the number of sides of an octagon divided by the number of right angles in a rectangle.

What number am I?

Solution

Using Clue (1), the number of sides of a hexagon is 6 and the number of sides of a triangle is 3. The difference between these two numbers is $6 - 3 = 3$, so the hundreds digit is 3.

Using Clue (3), the number of sides of an octagon is 8 and the number of right angles in a rectangle is 4. So, the difference between the tens digit and the ones digit is $8 \div 4 = 2$.

Using Clue (2), since the digits increase by the same amount each time, then as we read the digits from left to right the numbers will increase by 2. Since the hundreds digit is 3, then the tens digit must be $3 + 2 = 5$. Since the tens digit is 5, then the ones digit must be $5 + 2 = 7$. Working backwards, since the hundreds digit is 3, then the thousands digit must be $3 - 2 = 1$.

Therefore the number is 1357.



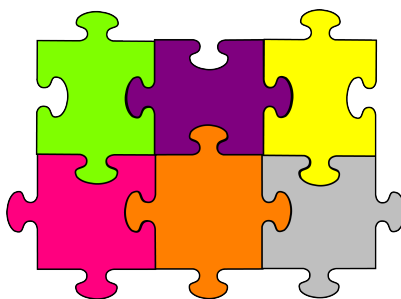
Problème de la semaine

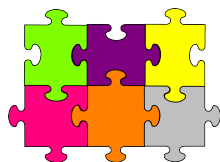
Problème A

Casse-tête complexe

Pakiza reçoit un casse-tête de 100 morceaux en cadeau. Une fois le casse-tête terminé, les morceaux forment une grille, où chaque rangée et chaque colonne contient le même nombre de morceaux.

- (a) Combien de morceaux y a-t-il dans chaque rangée et chaque colonne du casse-tête ?
- (b) Le lundi, Pakiza rassemble tous les morceaux de bordure et de coins, et elle les assemble pour former la bordure extérieure du casse-tête. Combien de morceaux de bordure et de coins y a-t-il en tout ?
- (c) Pakiza continue de travailler sur le casse-tête un peu chaque jour. Elle place 10 morceaux dans le casse-tête mardi. Chaque jour suivant, elle ajoute un morceau de plus que la veille, jusqu'à ce que le casse-tête soit complété. Donc, elle place 11 morceaux mercredi, 12 morceaux jeudi, et ainsi de suite jusqu'à ce que tous les morceaux soient en place. Quel jour de la semaine Pakiza termine-t-elle le casse-tête ? Justifie ta réponse.





Problem of the Week

Problem A and Solution

Puzzling Predicament

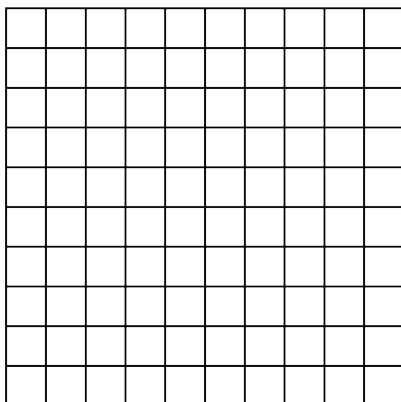
Problem

Pakiza gets a 100 piece puzzle as a gift. When the puzzle is finished, the pieces form a grid, where each row and each column of the grid has the same number of pieces.

- (a) How many pieces are in each row and each column of the puzzle?
- (b) On Monday, Pakiza gathers all the edge and corner pieces and puts them together to form the outside edge of the puzzle. How many edge and corner pieces does the puzzle have in total?
- (c) Pakiza continues to work on the puzzle a little bit every day. She places 10 pieces in the puzzle on Tuesday. On each day after that, she places one more puzzle piece than the day before, until the puzzle is complete. So, she places 11 pieces on Wednesday, 12 pieces on Thursday, and so on until all the pieces are in place. On what day of the week does Pakiza complete the puzzle? Justify your answer.

Solution

- (a) We know that each row and each column of the puzzle have the same number of pieces, and there are 100 pieces in total. Since $10 \times 10 = 100$, then each row and each column of the puzzle must contain 10 pieces.
- (b) It might help to look at a 10 by 10 grid in order to determine the total number of edge and corner pieces.



There are 4 corner pieces. Not counting the corners, there are 8 edge pieces on each side of the puzzle. So the total number of edge and corner pieces is: $4 + 8 + 8 + 8 + 8 = 36$.



Note: This is a classic example of the *fencepost problem*. If we are not careful, we might think that a 10×10 grid has $4 \times 10 = 40$ squares around its edge. However, this counts each corner piece twice, since a corner piece is part of two sides of the puzzle. The fencepost problem describes a situation where you may be off-by-one when counting. It can cause problems when writing computer programs that include some repetition.

- (c) We can make a table to keep track of how many pieces are filled in the puzzle over time. The first entry in the table will be on Monday when Pakiza assembles the 36 pieces to form the outside edge of the puzzle.

Day	Number of Pieces Added	Total Pieces
Monday	36	36
Tuesday	10	46
Wednesday	11	57
Thursday	12	69
Friday	13	82
Saturday	14	96

At this point, there are only 4 pieces left in the puzzle. So, we know Pakiza will complete the puzzle on the next day, which is Sunday.



Problème de la semaine

Problème A

La folie des petits gâteaux

Archie, Lin et Umar préparent des petits gâteaux à la vanille pour une vente de pâtisseries. Ils doivent préparer 8 douzaines de petits gâteaux en utilisant la recette ci-dessous.

Recette pour préparer 1 douzaine de petits gâteaux à la vanille :

- 250 grammes de farine
- $2\frac{1}{2}$ grammes de sel
- 8 grammes de poudre à pâte
- $\frac{1}{4}$ tasse de beurre
- 150 grammes de sucre
- 2 œufs
- 240 mL de lait
- 5 mL de vanille

- (a) De quelle quantité de chaque ingrédient ont-ils besoin pour préparer 8 douzaines de petits gâteaux ?
- (b) Ils ont déjà assez de sel, de poudre à pâte et de vanille. Ils n'ont aucun des autres ingrédients. Lorsqu'ils se rendent au magasin, ils constatent que les ingrédients dont ils ont besoin sont vendus en contenants selon les formats suivants :

- La farine est vendue en sacs de 1 kg.
- Le beurre est vendu en blocs de 1 tasse.
- Le sucre est vendu en sacs de 2 kg.
- Les œufs sont vendus à la douzaine.
- Le lait est vendu en boîtes de 1 L.

Combien de contenants de chaque ingrédient doivent-ils acheter pour en avoir assez pour préparer tous les petits gâteaux ?



Problem of the Week

Problem A and Solution

Cupcake Bonanza

Problem

Archie, Lin, and Umar are making vanilla cupcakes for a bake sale. They need to make 8 dozen cupcakes using the recipe below.

Recipe to make 1 dozen vanilla cupcakes:

- 250 grams flour
- $2\frac{1}{2}$ grams salt
- 8 grams baking powder
- $\frac{1}{4}$ cup of butter
- 150 grams sugar
- 2 eggs
- 240 mL milk
- 5 mL vanilla

- (a) How much of each ingredient do they need to make 8 dozen cupcakes?
- (b) They have enough salt, baking powder, and vanilla already. They do not have any of the other ingredients. When they go to the store, they see the ingredients they need are sold in packages in the following sizes:
- Flour is sold in 1 kg bags.
 - Butter is sold in 1 cup blocks.
 - Sugar is sold in 2 kg bags.
 - Eggs are sold by the dozen.
 - Milk is sold in 1 L cartons.

How many of each package of the ingredients do they need to buy to have enough to make all of the cupcakes?



Solution

- (a) Since the recipe makes 1 dozen cupcakes, to calculate how much of each ingredient we need to make 8 dozen cupcakes we must multiply the amount of each ingredient by 8. For the larger numbers, we can do this calculation by skip counting or multiple additions.

For example, calculating the amount of flour required we could

skip count: 250, 500, 750, 1000, 1250, 1500, 1750, 2000,

or do multiple additions: $250 + 250 + 250 + 250 + 250 + 250 + 250 + 250 = 2000$.

Another way we could calculate 8 times some number is to double the value 3 times.

Notice that if we double the number 1, we get 2. If we double the number 2, we get 4. If we double the number 4, we get 8. If we follow this same procedure with any starting number, the result will be 8 times the original value. For example, if we double 250, we get 500. If we double 500, we get 1000. If we double 1000, we get 2000.

Using any of these procedures, we determine that $8 \times 250 = 2000$.

The total amount of each ingredient needed to make 8 dozen cupcakes is below.

- Flour: $250 \times 8 = 2000$ g. Since $1000 \text{ g} = 1 \text{ kg}$, then $2000 \text{ g} = 2 \text{ kg}$ is needed.
 - Salt: $2\frac{1}{2} + 2\frac{1}{2} = 5$ grams, so 2 dozen cupcakes require 5 grams. Thus, 8 dozen cupcakes require $4 \times 5 = 20$ grams.
 - Baking powder: $8 \times 8 = 64$ grams required.
 - Butter: $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = 1$ cup, so 4 dozen cupcakes require 1 cup. Thus, 8 dozen cupcakes require 2 cups.
 - Sugar: $150 \times 8 = 1200$ grams required.
 - Eggs: $2 \times 8 = 16$ eggs required.
 - Milk: $240 \times 8 = 1920$ mL required.
 - Vanilla: $5 \times 8 = 40$ mL required.
- (b) We can use the total amounts calculated in part (a) to determine how many packages of each ingredient they must buy.
- Since flour is sold in 1 kg bags and they need 2 kg of flour, then they need 2 bags of flour.
 - Since butter is sold in 1 cup blocks, and they need 2 cups of butter, then they need 2 blocks of butter.
 - Since sugar is sold in 2 kg bags, and $2 \text{ kg} = 2000 \text{ g}$, then they need 1 bag of sugar to have at least 1200 g of sugar.
 - Since eggs are sold by the dozen, and there are 12 eggs in 1 dozen and 24 eggs in 2 dozen, then they need 2 cartons of eggs to have at least 16 eggs.
 - Since milk is sold in 1 L cartons, and since $1 \text{ L} = 1000 \text{ mL}$ and so $2 \text{ L} = 2000 \text{ mL}$, then they need 2 cartons of milk.



Problème de la semaine

Problème A

La collecte de fonds

La classe de Flynn amasse des fonds en recyclant des appareils électroniques pour un organisme de bienfaisance qui plante des arbres. Ils ont trouvé une entreprise locale qui leur versera 5 \$ par livre de déchets électroniques provenant de téléphones cellulaires et 2 \$ par livre de déchets électroniques provenant d'ordinateurs.

L'école a recueilli les appareils électroniques suivants pour le recyclage, mais les a pesés en grammes plutôt qu'en livres.

Téléphones cellulaires	Ordinateurs
10 téléphones uPhone : 200 g chacun	5 ordinateurs portables Bonobo : 800 g chacun
5 téléphones Mixel : 100 g chacun	7 tablettes uPad : 500 g chacune

Sachant qu'une livre équivaut à environ 454 g, estime le montant d'argent que la classe de Flynn récoltera. Justifie ta réponse.





Problem of the Week

Problem A and Solution

Fund Raising

Problem

Flynn's class is raising money for a tree-planting charity by recycling electronics. They have found a local company that will give them \$5 for each pound of cell phone e-waste and \$2 for each pound of computer e-waste.

The school has gathered the following electronics for recycling, but has weighed them in grams instead of pounds.

Cell Phones	Computers
10 uPhones: 200 g each	5 Bonobo laptops: 800 g each
5 Mixel phones: 100 g each	7 uPads: 500 g each

Knowing that 1 pound is about 454 g, estimate how much money Flynn's class will make. Justify your answer.

Solution

Solutions may vary, possibly resulting in different estimations. We will show two different approaches.

Since 1 pound is about 454 g, we will approximate 1 pound as 500 g. Then 2 pounds is approximately 1000 g.

Solution 1

In this solution, we find the total mass of each type of item and then estimate this in pounds before finding the total mass of all items.

Phones:

- uPhones: Each uPhone is 200 g, so 10 uPhones are $10 \times 200 = 2000$ g. Since 1000 g is approximately 2 pounds, then 2000 g is approximately 4 pounds.
- Mixel phones: Each Mixel phone is 100 g, so 5 Mixel phones are $5 \times 100 = 500$ g, which is approximately 1 pound.

This is approximately $4 + 1 = 5$ pounds of cell phone waste. The cell phone e-waste is worth approximately $\$5 \times 5 = \25 .

Computers:

- Bonobo laptops: Each laptop is 800 g, so 5 laptops are $5 \times 800 = 4000$ g. Since 1000 g is approximately 2 pounds, then 4000 g is approximately $4 \times 2 = 8$ pounds.
- uPads: Each uPad is 500 g, which is approximately 1 pound, so 7 uPads are approximately 7 pounds.

This is approximately $8 + 7 = 15$ pounds of computer waste. The computer e-waste is worth approximately $\$2 \times 15 = \30 . Therefore the total value is approximately $\$25 + \$30 = \$55$.



Solution 2

In this solution, we will find the total mass of computer waste and the total mass of cell phone waste, and then estimate these totals in pounds.

Phones:

- uPhones: Each uPhone is 200 g, so 10 uPhones are $10 \times 200 = 2000$ g.
- Mixel phones: Each Mixel phone is 100 g, so 5 Mixel phones are $5 \times 100 = 500$ g.

This is $2000 + 500 = 2500$ g. Since 500 g is approximately 1 pound and 1000 g is approximately 2 pounds, then 2500 g is approximately $2 + 2 + 1 = 5$ pounds. The cell phone e-waste is worth approximately $\$5 \times 5 = \25 .

Computers:

- Bonobo laptops: Each laptop is 800 g, so 5 laptops are $5 \times 800 = 4000$ g.
- uPads: Each uPad is 500 g, so 7 uPads are $7 \times 500 = 3500$ g.

This is $4000 + 3500 = 7500$ g. Since 500 g is approximately 1 pound and 1000 g is approximately 2 pounds, then 7500 g is approximately $2 \times 7 + 1 = 15$ pounds. The computer e-waste is worth approximately $\$2 \times 15 = \30 . Therefore the total value is approximately $\$25 + \$30 = \$55$.



Problème de la semaine

Problème A

La gardienne du zoo

Zoey travaille au zoo de la ville où elle s'occupe de nourrir et de prendre soin des animaux. Son horaire est identique chaque matin. Elle commence à travailler à 7h00. Le tableau ci-dessous présente la séquence de ses activités matinales ainsi que la durée de chacune d'elles. Les durées incluent le temps de déplacement vers chaque endroit.

Activité	Durée de l'activité
Réunion d'équipe	$\frac{1}{2}$ heure
Nourrissage des éléphants	30 minutes
Déplacement des oiseaux tropicaux vers l'habitat extérieur	45 minutes
Remplissage des mangeoires des singes avec des fruits et des noix	30 minutes
Pause	15 minutes
Changement du foin pour les chameaux	45 minutes
Nourrissage des morses et des phoques	$\frac{3}{4}$ heure
Nettoyage des enclos des rhinocéros	$\frac{1}{2}$ heure
Pause du dîner	une demi-heure

- (a) À quelle heure Zoey commence-t-elle à nourrir les éléphants ?
- (b) À quelle heure commence le nourrissage des singes ?
- (c) À quelle heure se termine la pause de Zoey ?
- (d) Combien de temps s'écoule-t-il entre le début de la réunion d'équipe et la fin de la pause du dîner de Zoey ?





Problem of the Week

Problem A and Solution

Zookeeper

Problem

Zoey works at the city's zoo feeding and caring for the animals. Her schedule is the same every morning. She starts work at 7:00 a.m. The table below lists the sequence of morning activities, along with the duration of each activity. The durations include the time it takes to travel to each spot.

Activity	Duration of Activity
Team meeting	$\frac{1}{2}$ hour
Feeding the elephants	30 minutes
Moving tropical birds to outside habitat	45 minutes
Filling the monkey feed bins with fruit and nuts	30 minutes
Break	15 minutes
Changing the hay for the camels	45 minutes
Feeding the walruses and seals	$\frac{3}{4}$ hour
Washing down the rhino stalls	$\frac{1}{2}$ hour
Lunch break	half an hour

- (a) What time does Zoey start feeding the elephants?
- (b) What time does the monkey feeding start?
- (c) What time does Zoey's break end?
- (d) How long is it from the time the team meeting starts to the time Zoey's lunch break ends?



Solution

We add two columns to the table, one with the start time of the activity and one with the end time. From this table, we can answer the questions.

Activity	Duration of Activity	Start Time	End Time
Team meeting	$\frac{1}{2}$ hour	7:00	7:30
Feeding the elephants	30 minutes	7:30	8:00
Moving tropical birds to outside habitat	45 minutes	8:00	8:45
Filling the monkey feed bins with fruit/nuts	30 minutes	8:45	9:15
Break	15 minutes	9:15	9:30
Changing the hay for the camels	45 minutes	9:30	10:15
Feeding the walruses and seals	$\frac{3}{4}$ hour	10:15	11:00
Washing down the rhino stalls	$\frac{1}{2}$ hour	11:00	11:30
Lunch break	half an hour	11:30	12:00

- (a) Zoey starts feeding the elephants at 7:30 a.m.
- (b) The monkey feeding starts at 8:45 a.m.
- (c) Zoey's break ends at 9:30 a.m.
- (d) Since the lunch break ends at 12:00 p.m., it is 5 hours after the team meeting starts.

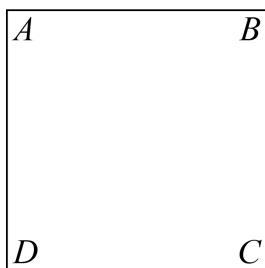


Problème de la semaine

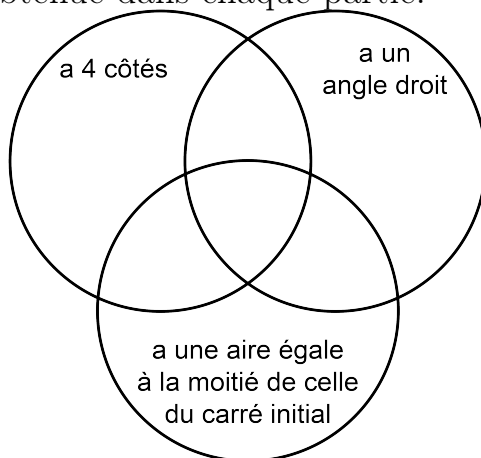
Problème A

Le pliage de papier

Commence avec une feuille de papier carrée et étiquette les coins A , B , C et D , en débutant par le coin supérieur gauche et en allant dans le sens des aiguilles d'une montre.



- (a) Plie la feuille de façon à ce que le coin A touche le coin C . Quelle forme as-tu obtenue ?
- (b) Déplie la feuille pour revenir au carré, mais avec un pli diagonal. Plie la feuille de façon à ce que le côté entre les coins A et B soit aligné avec le pli diagonal. Ensuite, plie la feuille de façon à ce que le côté entre les coins C et D soit aligné avec le pli diagonal. Quelle forme as-tu obtenue ?
- (c) Déplie la feuille pour revenir au carré. Plie la feuille de façon à ce que le coin D touche le coin A et que le coin C touche le coin B . Quelle forme as-tu obtenue ?
- (d) En continuant à partir de la forme obtenue en (c), plie la feuille de façon à ce que les coins B et C touchent la ligne du pli. Quelle forme as-tu obtenue ?
- (e) Remplis le diagramme de Venn ci-dessous avec les lettres a , b , c et d , représentant la forme obtenue dans chaque partie.





Problem of the Week

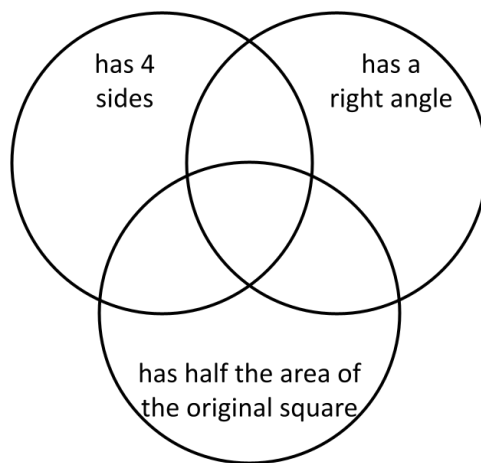
Problem A and Solution

Paper Folding

Problem

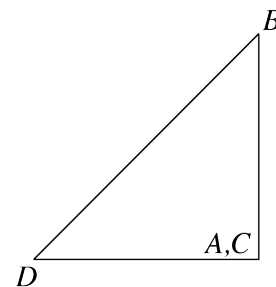
Start with a square piece of paper, and label the corners A , B , C , and D , starting with the top-left corner and moving clockwise.

- (a) Fold the paper so that corner A touches corner C . What shape did you make?
- (b) Open the paper up so that you are back to the square, but with a diagonal crease. Fold the paper so that the edge between corners A and B lines up with the diagonal crease. Then fold the paper so that the edge between corners C and D lines up with the diagonal crease. What shape did you make?
- (c) Open the paper up so that you are back to the square. Fold the paper so that corner D touches corner A and corner C touches corner B . What shape did you make?
- (d) Continuing from the shape you made in part (c), fold the paper so that corners B and C touch the fold line. What shape did you make?
- (e) Fill in the Venn diagram below with the letters a , b , c , and d , representing the shape you made in each part.



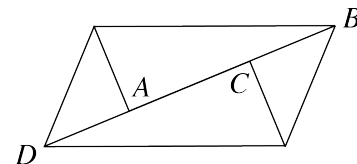
Solution

- (a) Since the angle at corners A and C is a right angle, the shape made is a right-angled triangle.

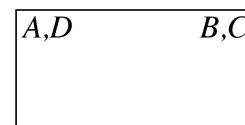




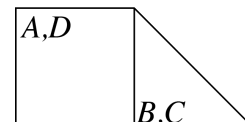
- (b) Since the pairs of opposite sides are parallel and equal in length, the shape made is a parallelogram.



- (c) Since the pairs of opposite sides are parallel and equal in length, and all angles are right angles, the shape made is a rectangle.



- (d) Since one pair of opposite sides is parallel, the shape made is a trapezoid. To be more specific, we can call it a right trapezoid since it contains two right angles.



- (e) We will look at each shape one by one to decide where it should go in the Venn diagram.

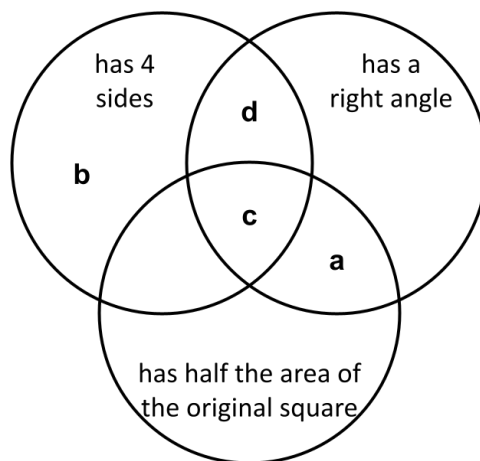
In part (a), we folded the paper in half along the diagonal between corners B and D , so the shape made has half the area of the original square. The shape has a right angle, but has 3 sides, not 4. So in the Venn diagram, this shape would go in the overlap between the circle labeled “has a right angle” and the circle labeled “has half the area of the original square”.

In part (b), the paper is not folded in half, so the shape made does not have half the area of the original square. The shape has 4 sides but does not have a right angle. So in the Venn diagram, this shape would go in the circle labeled “has 4 sides”.

In part (c), we folded the paper in half along the middle line between the top and bottom sides. The shape has 4 sides and 4 right angles. So in the Venn diagram, this shape would go in the overlap between all three circles.

In part (d), we started with the paper folded in half and then folded it further, so the shape made does not have half the area of the original square. The shape has 4 sides and 2 right angles. So in the Venn diagram, this shape would go in the overlap between the circle labeled “has 4 sides” and the circle labeled “has a right angle”.

The completed Venn diagram is shown.



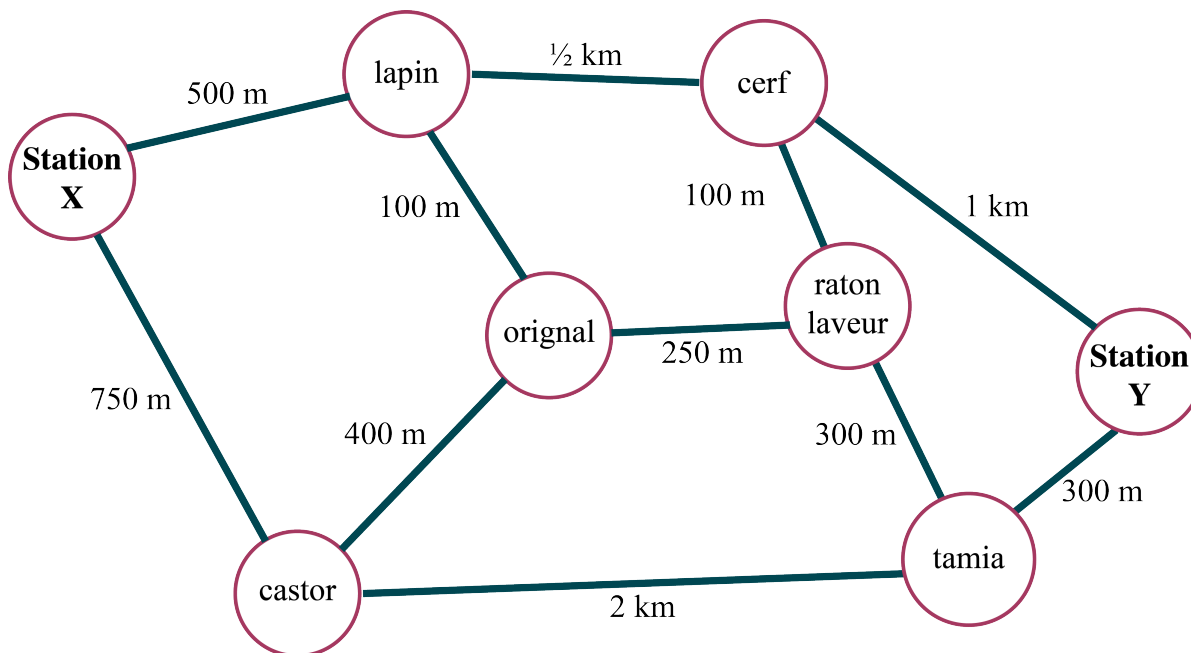


Problème de la semaine

Problème A

Les sentiers du parc

Le parc provincial Arrowhead possède plusieurs sentiers reliant la station des gardes de parc X à la station des gardes Y. Des balises de sentier sont placées à chaque intersection et portent le nom d'animaux que l'on peut observer dans le parc. La carte ci-dessous illustre les sentiers ainsi que les distances entre les balises. La carte n'est pas à l'échelle.



Trois randonneurs ont marché de la **station X** à la **station Y** en empruntant des chemins différents :

Chemin A: station X $\rightarrow$ lapin $\rightarrow$ cerf $\rightarrow$ station Y

Chemin B: station X $\rightarrow$ castor $\rightarrow$ tamia $\rightarrow$ station Y

Chemin C: station X $\rightarrow$ lapin $\rightarrow$ original $\rightarrow$ raton laveur $\rightarrow$ cerf $\rightarrow$ station Y

- (a) Qui a marché le plus loin ? Justifie ta réponse.
- (b) Trouve un chemin plus court que chacun des trois chemins empruntés par les randonneurs.

DÉFI: Quel est le chemin le plus court entre la **station X** et la **station Y** ?



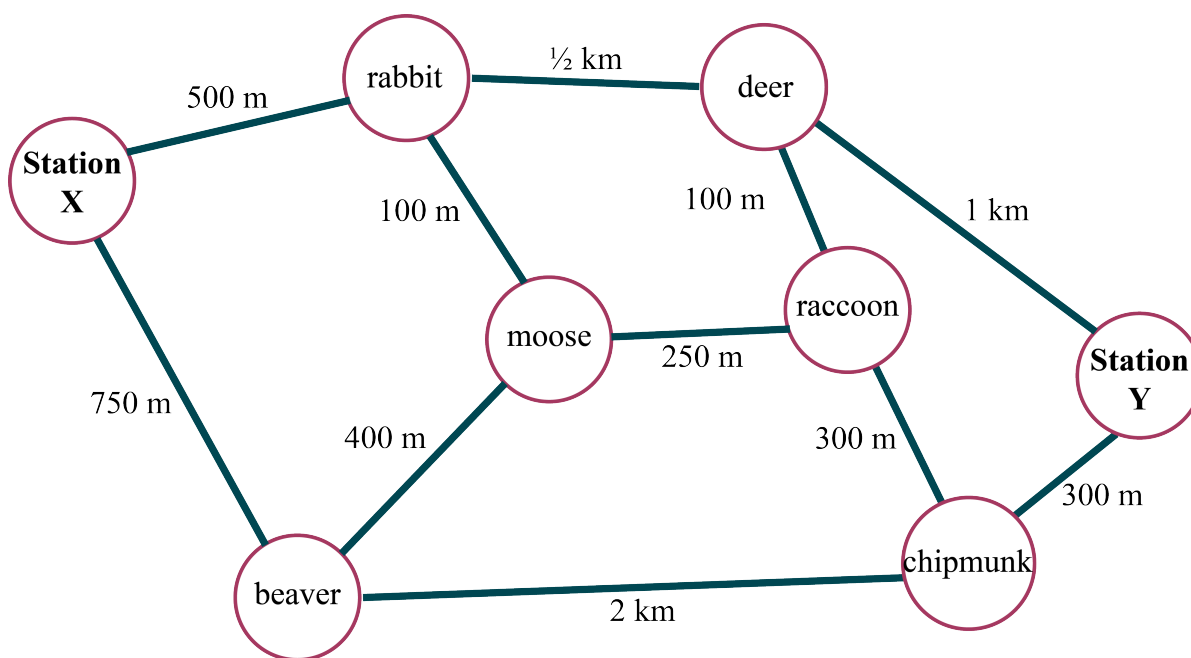
Problem of the Week

Problem A and Solution

Park Paths

Problem

Arrowhead Provincial Park has various trails that people can follow between Ranger Station X and Ranger Station Y. There are trail markers at each intersection which are named after animals that may be seen in the park. The map below shows the trails and the distances between markers. The map is not to scale.



Three hikers walked from **Station X** to **Station Y** along different paths:

Path A: Station X → rabbit → deer → Station Y

Path B: Station X → beaver → chipmunk → Station Y

Path C: Station X → rabbit → moose → raccoon → deer → Station Y

- (a) Who walked the furthest? Justify your answer.
- (b) Find a path that is shorter than any of the three paths the hikers took.

CHALLENGE: What is the shortest path from **Station X** to **Station Y**?

Solution

One way to solve this problem is to convert all the distances to metres. We know that 1 km is equal to 1000 m. So, 2 km is equal to 2000 m and $\frac{1}{2}$ km is equal to $1000 \div 2 = 500$ m.



(a) **Path A** is $500 + 500 + 1000 = 2000$ m or 2 km long.

Path B is $750 + 2000 + 300 = 3050$ m long.

Path C is $500 + 100 + 250 + 100 + 1000 = 1950$ m long.

The hiker that follows **Path B** walks the furthest.

(b) Answers will vary. Possible answers include:

Station X $\rightarrow$ rabbit $\rightarrow$ deer $\rightarrow$ raccoon $\rightarrow$ chipmunk $\rightarrow$ Station Y

The distance of this path is $500 + 500 + 100 + 300 + 300 = 1700$ m.

Station X $\rightarrow$ rabbit $\rightarrow$ moose $\rightarrow$ raccoon $\rightarrow$ chipmunk $\rightarrow$ Station Y

The distance of this path is $500 + 100 + 250 + 300 + 300 = 1450$ m.

CHALLENGE SOLUTION:

One way to try to find the shortest distance from **Station X** to **Station Y** is to look for the paths that have the fewest stops. Both **Path A** and **Path B** only have two stops between the starting point and the ending point. There are no possible paths that have only one stop between **Station X** and **Station Y**, so **Path A** and **Path B** have the fewest stops possible. However, as we already calculated, neither of these two paths can possibly be the shortest path since **Path C** is shorter. So this strategy for finding the shortest path does not work in general.

Another strategy for searching for the shortest path is called the *greedy algorithm*. With this strategy, at each intersection we pick the path with the shortest distance leaving that intersection. **Path C** follows this strategy.

At **Station X**, we follow the path that is 500 m instead of the path that is 750 m. At the **rabbit** intersection, we follow the path that is 100 m instead of the path that is $\frac{1}{2}$ km. At the **moose** intersection, we follow the path that is 250 m instead of the path that is 400 m. At the **raccoon** intersection, we follow the path that is 100 m instead of the path that is 300 m. At the **deer** intersection, we follow the path that is 1 km instead of the path that leads us back to an intersection we have already visited. We see that this strategy finds a path that is shorter than the other two paths that are listed, but is this the shortest possible path?

In this problem, we can use trial and error to find at least one other path that is shorter than **Path C**. So the greedy algorithm strategy for finding the shortest path does not work in general.

The next question is, how do we find the shortest path and know that there are no paths that are shorter? We could use trial and error and list all possible paths from **Station X** to **Station Y**. Then we choose the shortest path from all possible paths. However, this can get tricky and it is easy to miss one or more paths. There is a strategy that is used in higher mathematics called *Dijkstra's Algorithm*. We won't go through the details of this algorithm here, but the result of following this strategy leads us to the shortest path from **Station X** to **Station Y**:

Station X $\rightarrow$ rabbit $\rightarrow$ moose $\rightarrow$ raccoon $\rightarrow$ chipmunk $\rightarrow$ Station Y

The distance of this path is $500 + 100 + 250 + 300 + 300 = 1450$ m.



Sens du nombre (N)

**Amène-moi à la
couverture**



Problème de la semaine

Problème A

La différence de nombres

Considère les chiffres dans l'encadré ci-dessous :

2	5	6	1
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- (a) Quel est le plus grand nombre qui utilise chaque chiffre exactement une fois ?
- (b) Quel est le plus petit nombre qui utilise chaque chiffre exactement une fois ?
- (c) Trouve la différence entre le nombre que tu as obtenu à la partie (a) et celui que tu as obtenu à la partie (b).



Problem of the Week

Problem A and Solution

Difference of Numbers

Problem

Consider the digits in the box below:

2	5	6	1
---	---	---	---

- (a) What is the largest number that uses each digit exactly once?
- (b) What is the smallest number that uses each digit exactly once?
- (c) Find the difference between the number you found in part (a) and the number you found in part (b).

Solution

- (a) To create the largest number, the digits should be arranged in decreasing order with the largest digit in the thousands place and the smallest digit in the ones place. That number is 6521.
- (b) To create the smallest number, the digits should be arranged in increasing order with the smallest digit in the thousands place and the largest digit in the ones place. That number is 1256.
- (c) The difference between the numbers is $6521 - 1256 = 5265$.



Problème de la semaine

Problème A

Quel nombre suis-je ?

Je suis un nombre à 4 chiffres. Utilise les indices suivants pour déterminer mes chiffres :

- (1) Mon chiffre des centaines est la différence entre le nombre de côtés d'un hexagone et le nombre de côtés d'un triangle.
- (2) De gauche à droite, mes chiffres sont disposés en ordre croissant, du chiffre des milliers au chiffre des unités. De plus, mes chiffres augmentent de la même valeur à chaque fois.
- (3) La différence entre mon chiffre des dizaines et mon chiffre des unités est égale au nombre de côtés d'un octogone divisé par le nombre d'angles droits dans un rectangle.

Quel nombre suis-je ?





Problem of the Week

Problem A and Solution

What Number Am I?

Problem

I am a 4-digit number. Use the following clues to determine my digits:

- (1) My hundreds digit is the difference between the number of sides of a hexagon and the number of sides of a triangle.
- (2) Reading my digits from left to right, they are in increasing order from the thousands digit to the ones digit. Also, they increase by the same amount each time.
- (3) The difference between my tens digit and my ones digit is equal to the number of sides of an octagon divided by the number of right angles in a rectangle.

What number am I?

Solution

Using Clue (1), the number of sides of a hexagon is 6 and the number of sides of a triangle is 3. The difference between these two numbers is $6 - 3 = 3$, so the hundreds digit is 3.

Using Clue (3), the number of sides of an octagon is 8 and the number of right angles in a rectangle is 4. So, the difference between the tens digit and the ones digit is $8 \div 4 = 2$.

Using Clue (2), since the digits increase by the same amount each time, then as we read the digits from left to right the numbers will increase by 2. Since the hundreds digit is 3, then the tens digit must be $3 + 2 = 5$. Since the tens digit is 5, then the ones digit must be $5 + 2 = 7$. Working backwards, since the hundreds digit is 3, then the thousands digit must be $3 - 2 = 1$.

Therefore the number is 1357.



Problème de la semaine

Problème A

Comparer les communications

Plusieurs élèves ont comparé le nombre de courriels qu'ils avaient envoyés au cours de la semaine précédente.

Nombre de courriels envoyés	Nombre d'élèves
0	12
1	19
2	11
3	8
4	14
5	2
6	15

- (a) Combien d'élèves ont envoyé moins de 2 courriels ?
- (b) Combien d'élèves ont envoyé plus de 4 courriels ?
- (c) Sépare les élèves en deux groupes de sorte que tous les élèves d'un groupe aient envoyé plus de courriels que tous ceux de l'autre groupe, et que le nombre d'élèves dans chaque groupe soit aussi proche que possible.





Problem of the Week

Problem A and Solution

Comparing Communications

Problem

Several students compared how many emails they had sent during the previous week.

Number of Emails Sent	Number of Students
0	12
1	19
2	11
3	8
4	14
5	2
6	15

- (a) How many students sent fewer than 2 emails?
- (b) How many students sent more than 4 emails?
- (c) Separate the students into two groups so that all the students in one group sent more emails than all the students in the other group, and the number of students in each group are as close as possible.

Solution

We can use the table information to determine the answers.

- (a) The numbers 0 and 1 are less than 2. So the total number of students who sent fewer than 2 emails is $12 + 19 = 31$.
- (b) The numbers 5 and 6 are more than 4. So the total number of students who sent more than 4 emails is $2 + 15 = 17$.
- (c) The total number of students is $12 + 19 + 11 + 8 + 14 + 2 + 15 = 81$. If the number of students in each group are as close as possible, then one group would have 40 students and the other would have 41. This is our target.

We notice that the number of students who sent fewer than 3 emails is $12 + 19 + 11 = 42$. This is quite close to 41. In fact, it is as close as we can get to 41 because the number of students who sent 3 emails is 8 and the number of students who sent 2 emails is 11, so adding 8 or subtracting 11 from 42 would take us further away from 41. Thus, one group contains the 42 students who sent fewer than 3 emails and the other group contains the $81 - 42 = 39$ students who sent 3 or more emails.



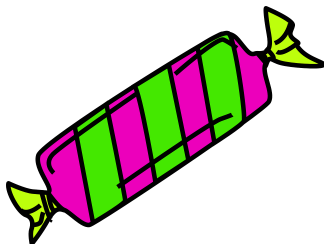
Problème de la semaine

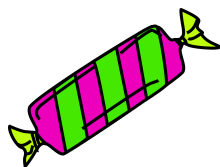
Problème A

Bonbons à croquer

Carissa a acheté une boîte de bonbons pour la partager avec ses amis. Cependant, lorsqu'elle a ouvert la boîte, elle a constaté qu'il y avait beaucoup moins de bonbons qu'elle ne s'y attendait. La boîte indique qu'elle contient un total de 420 grammes de bonbons. Dans cette boîte, il y a deux types de bonbons : les Super Surettes et les Caramellos. Chaque Super Surette a une masse de 15 grammes et chaque Caramello a une masse de 10 grammes.

Si elle compte 10 Super Surettes et 25 Caramellos dans la boîte, l'information inscrite sur la boîte est-elle correcte ? Justifie ta réponse.





Problem of the Week

Problem A and Solution

Candy Crunch

Problem

Carissa bought a box of candy to share with her friends. However, when she opened the box there was much less candy than she expected. The box says it contains a total of 420 grams of candy. In the box, there are two types of candies: Sour Sassies and Caramellos. Each Sour Sassy has a mass of 15 grams and each Caramello has a mass of 10 grams.

If she counts 10 Sour Sassies and 25 Caramellos in the box, was the information on the box correct? Justify your answer.

Solution

Since the Sour Sassies each have a mass of 15 grams and there are 10 Sour Sassies, we can use skip counting to calculate the total mass of the Sour Sassies:

15, 30, 45, 60, 75, 90, 105, 120, 135, 150

Alternatively, we can multiply to determine the total mass of the Sour Sassies is $10 \times 15 = 150$ grams.

Since the Caramellos each have a mass of 10 grams and there are 25 Caramellos, we can use skip counting to calculate the total mass of the Caramellos:

10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150,

160, 170, 180, 190, 200, 210, 220, 230, 240, 250

Alternatively, we can multiply to determine the total mass of the Caramellos is $25 \times 10 = 250$ grams.

The total mass of both candies is $250 + 150 = 400$ grams. This is less than the mass shown on the box, so the information on the box is incorrect.



Problème de la semaine

Problème A

L'affaire autobus

Mme Oakley emmène ses 20 élèves en excursion au Centre des sciences. Les coûts associés sont les suivants :

- Le transport par autobus aller-retour au Centre des sciences coûte 440 \$.
- Le droit d'entrée au Centre des sciences est de 20 \$ par élève.
L'admission de Mme Oakley est gratuite.
- Le coût pour visionner le film IMAX est de 7 \$ par élève.
L'admission de Mme Oakley est gratuite.

Le budget pour cette excursion est de 50 \$ par élève. Est-ce qu'il y a suffisamment d'argent dans le budget pour que tous les élèves puissent regarder le film IMAX lors de leur visite au Centre des sciences ? Justifie ta réponse.





Problem of the Week

Problem A and Solution

Bussing Business

Problem

Ms. Oakley is taking her 20 students on a field trip to the Science Centre. The costs are as follows:

- It costs \$440 for bus transportation to and from the Science Centre.
- The entrance fee to the Science Centre is \$20 per student.
There is no charge for Ms. Oakley.
- The cost to watch the IMAX movie is \$7 per student.
There is no charge for Ms. Oakley.

The budget for this field trip is \$50 per student. Do they have enough money in the budget for all students to watch the IMAX movie while they are at the Science Centre? Justify your answer.

Solution

Solution 1

One way to solve this problem is to calculate the total budget available, and the total cost for each component of the trip. Since there are 20 students and the budget for each student is \$50, then the total budget available is $20 \times 50 = \$1000$.

The cost of transportation for all students is \$440.

The cost for the entrance fee for all students is $20 \times \$20 = \400 .

The cost for all students to watch the IMAX movie is $20 \times \$7 = \140 .

Therefore the total cost of the trip, including the IMAX movie, would be $440 + 400 + 140 = \$980$. Since this is less than the \$1000 budget, they have enough money to watch the IMAX movie.

Solution 2

Another way to approach this problem is to calculate a cost per student for the trip. Since there are 20 students, then each student's share of the cost of the bus is $440 \div 20 = \$22$. Therefore, the total cost of the trip per student, including the IMAX movie, would be: $22 + 20 + 7 = \$49$. This is less than the budget of \$50 for each student, so they have enough money to watch the IMAX movie.



Problème de la semaine

Problème A

Le défi de la banque alimentaire

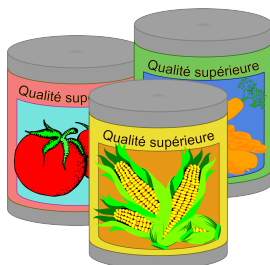
Deux classes de l'école élémentaire de Whitefish Bay ont relevé un défi visant à recueillir des dons pour une banque alimentaire locale. Différents types d'aliments valent différents nombres de points dans le cadre du défi.

- Aliments à 5 points : viandes en conserve, légumes en conserve, fruits en conserve, lentilles, riz
- Aliments à 4 points : céréales, craquelins, haricots en conserve, poisson en conserve, sauce pour pâtes
- Aliments à 3 points : noix, beurre d'arachide, barres granola
- Aliments à 2 points : croustilles, biscuits
- Aliments à 1 point : tous les autres produits alimentaires non périssables

Le tableau ci-dessous énumère les dons effectués par chaque classe.

Classe A	Classe B
6 conserves de thon	3 boîtes de riz
5 pots de beurre d'arachide	5 paquets de barres granola
2 sacs de lentilles	4 conserves de pêches
3 conserves de pois	2 paquets d'amandes
2 sacs de croustilles	7 boîtes de céréales
4 boîtes de pâtes	2 paquets de biscuits
4 pots de sauce pour pâtes	3 boîtes de lait en poudre

Quelle classe a remporté le défi ? Justifie ta réponse.





Problem of the Week

Problem A and Solution

Food Bank Challenge

Problem

Two classes at Whitefish Bay Elementary School took on a challenge to gather donations for a local food bank. Different types of food are worth different amounts of points in the challenge.

- 5-point foods: canned meat, canned veggies, canned fruit, lentils, rice
- 4-point foods: cereal, crackers, canned beans, canned fish, pasta sauce
- 3-point foods: nuts, peanut butter, granola bars
- 2-point foods: chips, cookies
- 1-point foods: all other non-perishable food items

The table below lists the donations made by each class.

Class A	Class B
6 cans of tuna fish	3 boxes of rice
5 jars of peanut butter	5 packages of granola bars
2 bags of lentils	4 cans of peaches
3 cans of peas	2 packages of almonds
2 bags of chips	7 boxes of cereal
4 boxes of pasta	2 packages of cookies
4 jars of pasta sauce	3 boxes of powdered milk

Which class won the challenge? Justify your answer.

Solution

For each class, we calculate how many points they earn for each type of food donated, and summarize in a table.

**Class A:**

Donation	Points per Unit	Total Points
6 cans of tuna fish	4	$6 \times 4 = 24$
5 jars of peanut butter	3	$5 \times 3 = 15$
2 bags of lentils	5	$2 \times 5 = 10$
3 cans of peas	5	$3 \times 5 = 15$
2 bags of chips	2	$2 \times 2 = 4$
4 boxes of pasta	1	$4 \times 1 = 4$
4 jars of pasta sauce	4	$4 \times 4 = 16$

Class B:

Donation	Points per Unit	Total Points
3 boxes of rice	5	$3 \times 5 = 15$
5 packages of granola bars	3	$5 \times 3 = 15$
4 cans of peaches	5	$4 \times 5 = 20$
2 packages of almonds	3	$2 \times 3 = 6$
7 boxes of cereal	4	$7 \times 4 = 28$
2 packages of cookies	2	$2 \times 2 = 4$
3 boxes of powdered milk	1	$3 \times 1 = 3$

Now we can add the total points for each class, to determine that Class A made $24 + 15 + 10 + 15 + 4 + 4 + 16 = 88$ points, and Class B made $15 + 15 + 20 + 6 + 28 + 4 + 3 = 91$ points.

Therefore, **Class B** won the challenge.



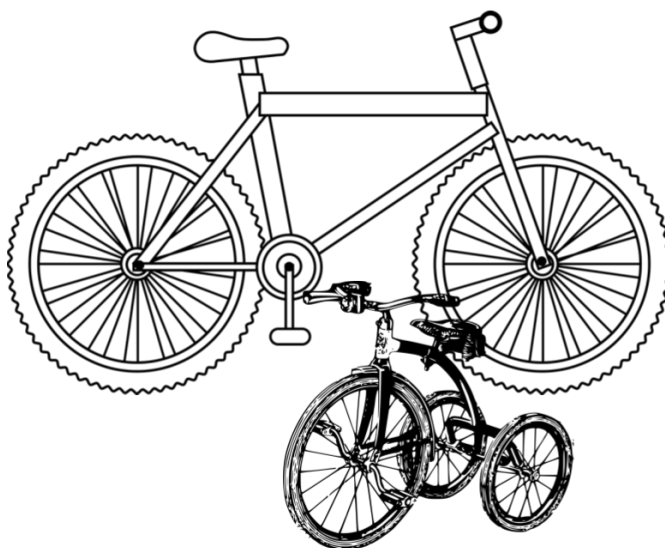
Problème de la semaine

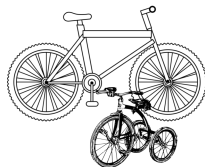
Problème A

Unité d'entreposage

Jerry a acheté le contenu de deux grandes unités d'entreposage lors d'une vente aux enchères pour un total de 500 \$. Une unité d'entreposage contient des bicyclettes et l'autre unité d'entreposage contient des tricycles.

- (a) Si chaque unité d'entreposage contient exactement 72 roues, combien y a-t-il de bicyclettes et de tricycles au total ? Justifie ta réponse.
- (b) Jerry prévoit vendre chaque tricyle à 10 \$ et chaque bicyclette à 25 \$. Quel est le profit maximal que Jerry peut réaliser, s'il parvient à vendre toutes les bicyclettes et tous les tricycles en stock à ces prix ? Justifie ta réponse.





Problem of the Week

Problem A and Solution

Storage Unit

Problem

Jerry bought the contents of two large storage units at an auction for a total of \$500. One storage unit contains some bicycles and the other storage unit contains some tricycles.

- (a) If each storage unit has exactly 72 wheels, how many bicycles and tricycles are there in total? Justify your answer.
- (b) Jerry plans to sell each tricycle for \$10 and each bicycle for \$25. What is the maximum profit Jerry can make if he is able to sell all the bicycles and tricycles in storage for these prices? Justify your answer.

Solution

- (a) Since a tricycle has 3 wheels and there are 72 wheels in one of the storage units, then we can determine the number of tricycles by dividing 72 by 3. There are $72 \div 3 = 24$ tricycles in one of the storage units.

Similarly, since a bicycle has 2 wheels and there are 72 wheels in one of the storage units, then we can determine the number of bicycles by dividing 72 by 2. There are $72 \div 2 = 36$ bicycles in the other storage unit.

- (b) To calculate the amount of money Jerry can make from selling the tricycles, we multiply $24 \times \$10 = \240 .

To calculate the amount of money Jerry can make from selling the bicycles, we multiply $36 \times \$25 = \900 . Alternatively, we can skip count by 25. A third way to figure out the amount of money is to notice that if he sells 4 bicycles, he would make \$100. Then we can use a table to figure out how much he would make selling 36 bicycles:

Bikes Sold	4	8	12	16	20	24	28	32	36
Money Made	\$100	\$200	\$300	\$400	\$500	\$600	\$700	\$800	\$900

Therefore, Jerry could make $\$240 + \$900 = \$1140$ if he sells all of the bikes. We need to subtract the amount he paid for the storage unit to determine the overall profit. Therefore, the maximum profit Jerry could make by selling all the bikes is $\$1140 - \$500 = \$640$.



Problème de la semaine

Problème A

Les intervalles

Adil complète un parcours de 12 km en utilisant l'entraînement par intervalles. L'entraînement par intervalles est une stratégie de préparation pour la course. Un intervalle consiste à courir une distance de $\frac{2}{3}$ d'un kilomètre, puis à marcher une distance de $\frac{2}{3}$ d'un kilomètre.

- (a) Combien d'intervalles fera-t-il en complétant le parcours de 12 km ?
- (b) Après deux semaines, il modifie ses intervalles : il court une distance de $\frac{3}{4}$ d'un kilomètre, puis il marche une distance de $\frac{3}{4}$ d'un kilomètre. À ce rythme, combien d'intervalles doit-il faire pour compléter le parcours de 12 km ?





Problem of the Week

Problem A and Solution

Intervals

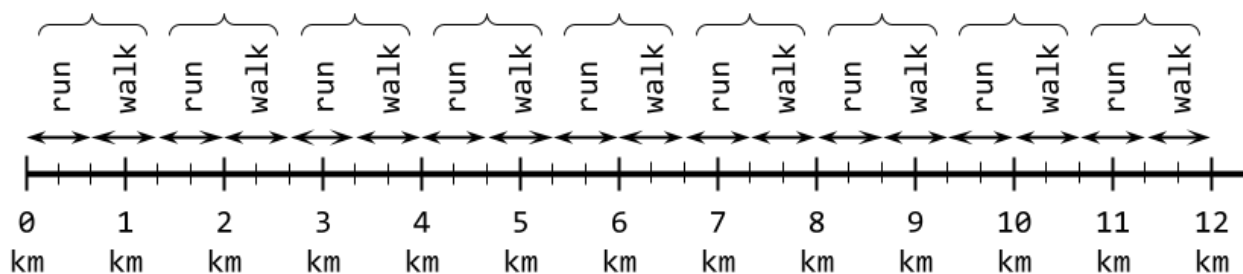
Problem

Adil completes a 12 km route using interval training. Interval training is a way to prepare for a race. One interval consists of running for $\frac{2}{3}$ of a kilometre followed by walking for $\frac{2}{3}$ of a kilometre.

- (a) How many intervals will he do when completing the 12 km route?
- (b) After two weeks, he changes his intervals to running for $\frac{3}{4}$ of a kilometre followed by walking for $\frac{3}{4}$ of a kilometre. At this pace, how many intervals does it take to complete the 12 km route?

Solution

- (a) One way to solve this problem is to create a number line from 0 km to 12 km, with a tick at every $\frac{1}{3}$ of a kilometre. Then, two spaces between ticks on the number line will correspond to the running portion of an interval, and two spaces between ticks on the number line will correspond to the walking portion of an interval. Thus, four spaces between ticks on the number line will correspond to one interval in the interval training. (And so, each interval covers $\frac{4}{3}$ of a kilometre.)

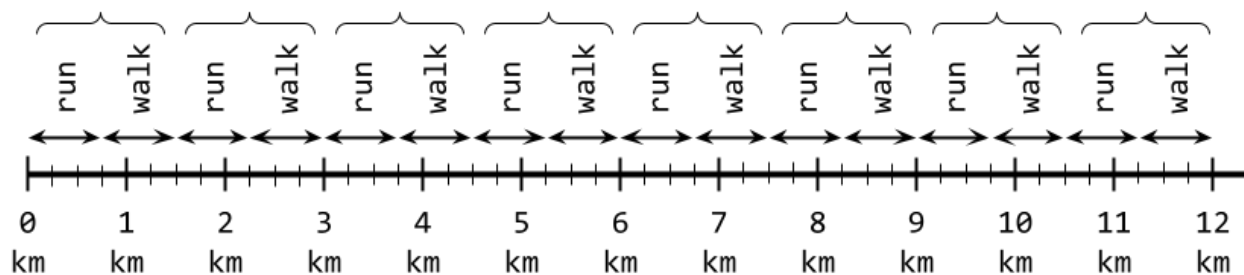


Counting the spaces between ticks, we determine that there are a total of 9 intervals necessary to complete the 12 km route.

We don't necessarily have to complete the whole number line to get the final answer. Notice that after 3 intervals Adil has completed 4 km. Since $4 \times 3 = 12$, Adil needs to complete 3 times that number of intervals to finish 12 km. So it takes $3 \times 3 = 9$ intervals to complete 12 km.



- (b) We create a number line from 0 km to 12 km, with a tick at every $\frac{1}{4}$ of a kilometre (rather than every $\frac{1}{3}$ of a kilometre). Then, three spaces between ticks on the number line will correspond to the running portion of an interval, and three spaces between ticks on the number line will correspond to the walking portion of an interval. Thus, six spaces between ticks on the number line will correspond to one interval in the interval training.



Counting the spaces between ticks, we determine that there are a total of 8 intervals necessary to complete the 12 km route.

Again, we don't necessarily have to complete the whole number line to get the final answer. Notice that after 2 intervals Adil has completed 3 km. Since $3 \times 4 = 12$, Adil needs to complete 4 times that number of intervals to finish 12 km. So it takes $2 \times 4 = 8$ intervals to complete 12 km.



Problème de la semaine

Problème A

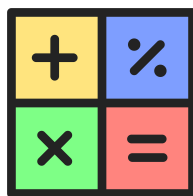
Suis les règles

Considère les consignes étape par étape suivantes :

1. Choisis un nombre à 2 chiffres.
2. Si le nombre est pair, divise-le par 2. Si le nombre est impair, ajoute 10 au nombre.
3. Si le résultat du calcul à l'étape 2 est un nombre à 2 chiffres, ajoute son chiffre des dizaines à son chiffre des unités. Sinon, ajoute 20 au nombre calculé à l'étape 2.
4. Si le résultat du calcul à l'étape 3 est un multiple de 5, divise-le par 5. Sinon, ajoute 12 au nombre calculé à l'étape 3.
5. Si le résultat du calcul à l'étape 4 est supérieur à 30, ajoute 1 à ce résultat. Sinon, soustrais 1 du nombre calculé à l'étape 4.

- (a) Quel est le résultat si tu suis ces consignes en commençant avec 25 ?
- (b) Quel est le résultat si tu suis ces consignes en commençant avec 95 ?
- (c) Quel est le résultat si tu suis ces consignes en commençant avec 16 ?





Problem of the Week

Problem A and Solution

Follow the Rules

Problem

Consider the following step-by-step instructions:

1. Pick a 2-digit number.
2. If the number is even, divide it by 2. If the number is odd, add 10 to the number.
3. If the result of the calculation in step 2 is a 2-digit number, add its tens digit to its ones digit. Otherwise, add 20 to the number calculated in step 2.
4. If the result of the calculation in step 3 is a multiple of 5, divide it by 5. Otherwise, add 12 to the number calculated in step 3.
5. If the result of the calculation in step 4 is greater than 30, add 1 to it. Otherwise, subtract 1 from the number calculated in step 4.

- (a) What is the result of following these instructions if you start with 25?
- (b) What is the result of following these instructions if you start with 95?
- (c) What is the result of following these instructions if you start with 16?

Solution

- (a) Following the steps and starting with 25 produces this sequence of numbers:

25, 35, 8, 20, 19

- (b) Following the steps and starting with 95 produces this sequence of numbers:

95, 105, 125, 25, 24

- (c) Following the steps and starting with 16 produces this sequence of numbers:

16, 8, 28, 40, 41

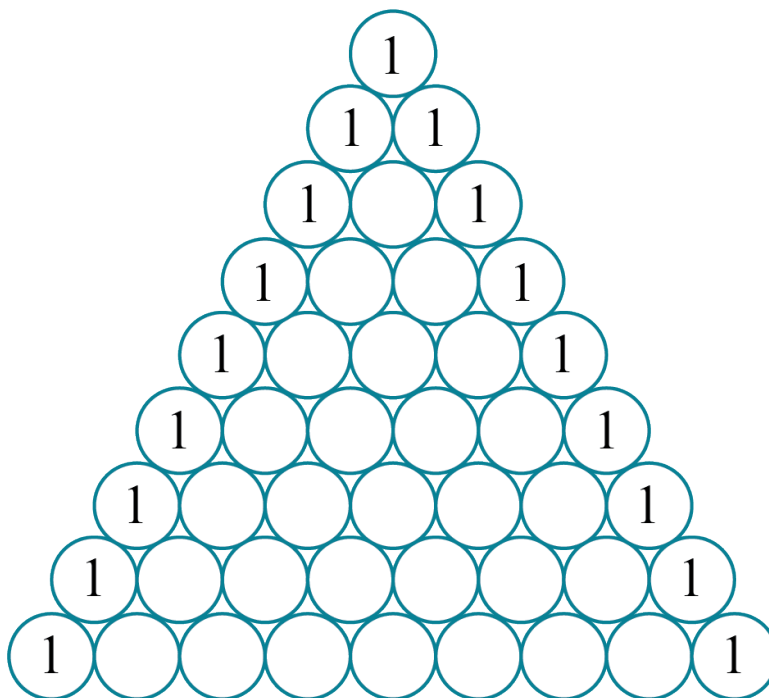


Problème de la semaine

Problème A

La pyramide de crayons

Juliane dispose des tubes cylindriques identiques pour former une pyramide. Elle met un crayon dans le tube du sommet, puis elle met un crayon dans les tubes à l'extrémité gauche et à l'extrémité droite de chacune des rangées qui restent, comme illustré.



Juliane remplit ensuite les autres tubes de la façon suivante :

Étape 1 : Trouve le tube vide le plus élevé et additionne le nombre de crayons dans les deux tubes qui le touchent dans la rangée au-dessus.

Étape 2 : Mets ce nombre de crayons dans le tube vide.

Étape 3 : Répète les étapes 1 et 2 jusqu'à ce que tous les tubes soient remplis.

- (a) Complète la pyramide en indiquant le nombre de crayons dans chaque tube.
- (b) Peux-tu trouver des régularités dans les nombres de la pyramide complétée ? Si oui, explique-les.



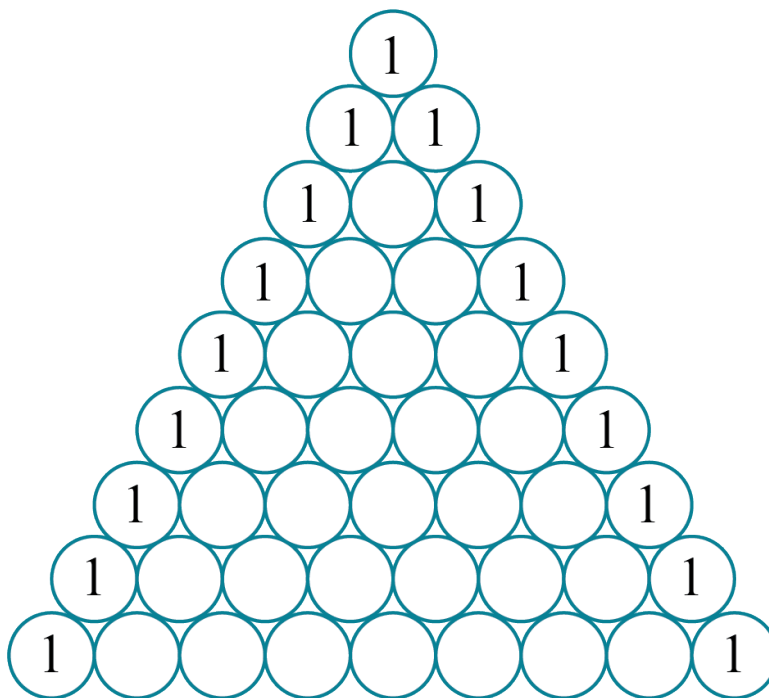
Problem of the Week

Problem A and Solution

Pencil Pyramid

Problem

Juliane arranges identical cylindrical tubes to form a pyramid. She puts one pencil in the top tube and then puts one pencil in the leftmost and rightmost tubes in each of the remaining rows, as shown.



Juliane then fills the remaining tubes as follows:

Step 1: Find the topmost empty tube and add up the number of pencils in the two tubes touching it in the row above.

Step 2: Put that many pencils in the empty tube.

Step 3: Repeat Steps 1 and 2 until all tubes are filled.

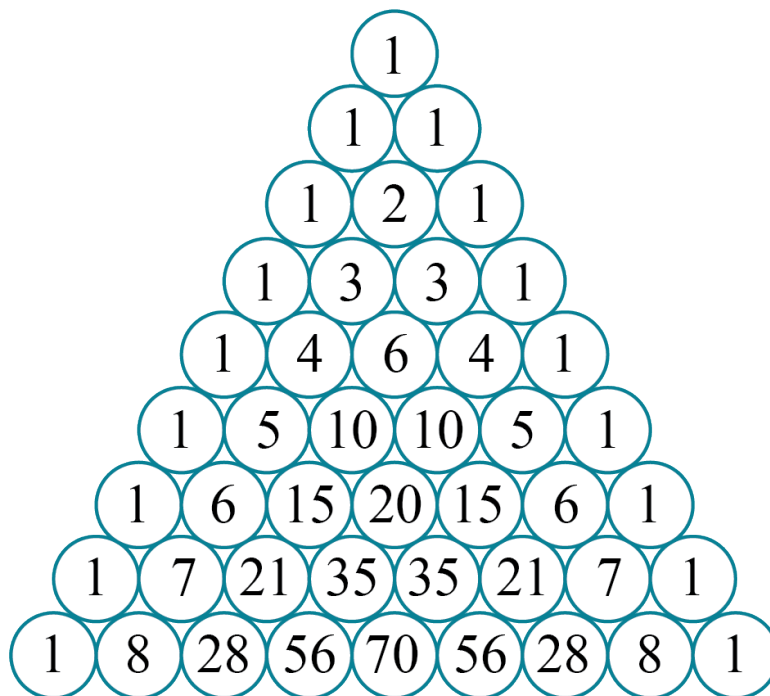
(a) Complete the pyramid with the number of pencils in each tube.

(b) Can you find any patterns in the numbers in the completed pyramid? If so, explain them.



Solution

(a) The completed pyramid is shown.



(b) Here are some patterns you may have noticed:

- The triangle is symmetric, so the left side matches the right side.
- Starting with the leftmost 1 in the second row and moving down diagonally we see the numbers 1, 2, 3, 4, 5, 6, 7, and 8.
- Starting with the leftmost 1 in the third row and moving down diagonally we see the numbers 1, 3, 6, 10, 15, 21, and 28. The pattern rule for this sequence is to add 2, then 3, then 4, then 5, etc.
- The sum of the numbers in any row is twice the sum of the numbers in the row above it.
- If you start from any 1, follow the diagonal down, and then change directions for the last number, the sum of the numbers in the diagonal will equal the last number. For example, $1 + 6 + 21 = 28$. This is called the *Hockey Stick Identity* because if you circle the numbers used, it will look somewhat like a hockey stick.



Teacher's Notes

This problem is an exploration of *Pascal's Triangle*, which is named for French mathematician Blaise Pascal (1623 - 1662). There are lots of patterns to be found in this triangle. We listed some of the patterns in the solution, but perhaps your students were able to find others!

Pascal's Triangle is also used in algebra. The numbers in the n^{th} row provide the coefficients for the expansion of a *binomial expression* raised to the n^{th} power. The expansions for $n = 0$ to $n = 4$ are shown.

$$(x + y)^0 = 1$$

$$(x + y)^1 = 1x + 1y$$

$$(x + y)^2 = 1x^2 + 2xy + 1y^2$$

$$(x + y)^3 = 1x^3 + 3x^2y + 3xy^2 + 1y^3$$

$$(x + y)^4 = 1x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + 1y^4$$

As the value of n increases, expanding the binomials manually becomes quite time consuming. Using Pascal's Triangle allows us to expand binomial expressions more efficiently.



Problème de la semaine

Problème A

La folie des petits gâteaux

Archie, Lin et Umar préparent des petits gâteaux à la vanille pour une vente de pâtisseries. Ils doivent préparer 8 douzaines de petits gâteaux en utilisant la recette ci-dessous.

Recette pour préparer 1 douzaine de petits gâteaux à la vanille :

- 250 grammes de farine
- $2\frac{1}{2}$ grammes de sel
- 8 grammes de poudre à pâte
- $\frac{1}{4}$ tasse de beurre
- 150 grammes de sucre
- 2 œufs
- 240 mL de lait
- 5 mL de vanille

- (a) De quelle quantité de chaque ingrédient ont-ils besoin pour préparer 8 douzaines de petits gâteaux ?
- (b) Ils ont déjà assez de sel, de poudre à pâte et de vanille. Ils n'ont aucun des autres ingrédients. Lorsqu'ils se rendent au magasin, ils constatent que les ingrédients dont ils ont besoin sont vendus en contenants selon les formats suivants :

- La farine est vendue en sacs de 1 kg.
- Le beurre est vendu en blocs de 1 tasse.
- Le sucre est vendu en sacs de 2 kg.
- Les œufs sont vendus à la douzaine.
- Le lait est vendu en boîtes de 1 L.

Combien de contenants de chaque ingrédient doivent-ils acheter pour en avoir assez pour préparer tous les petits gâteaux ?



Problem of the Week

Problem A and Solution

Cupcake Bonanza

Problem

Archie, Lin, and Umar are making vanilla cupcakes for a bake sale. They need to make 8 dozen cupcakes using the recipe below.

Recipe to make 1 dozen vanilla cupcakes:

- 250 grams flour
- $2\frac{1}{2}$ grams salt
- 8 grams baking powder
- $\frac{1}{4}$ cup of butter
- 150 grams sugar
- 2 eggs
- 240 mL milk
- 5 mL vanilla

- (a) How much of each ingredient do they need to make 8 dozen cupcakes?
- (b) They have enough salt, baking powder, and vanilla already. They do not have any of the other ingredients. When they go to the store, they see the ingredients they need are sold in packages in the following sizes:
- Flour is sold in 1 kg bags.
 - Butter is sold in 1 cup blocks.
 - Sugar is sold in 2 kg bags.
 - Eggs are sold by the dozen.
 - Milk is sold in 1 L cartons.

How many of each package of the ingredients do they need to buy to have enough to make all of the cupcakes?



Solution

- (a) Since the recipe makes 1 dozen cupcakes, to calculate how much of each ingredient we need to make 8 dozen cupcakes we must multiply the amount of each ingredient by 8. For the larger numbers, we can do this calculation by skip counting or multiple additions.

For example, calculating the amount of flour required we could

skip count: 250, 500, 750, 1000, 1250, 1500, 1750, 2000,

or do multiple additions: $250 + 250 + 250 + 250 + 250 + 250 + 250 + 250 = 2000$.

Another way we could calculate 8 times some number is to double the value 3 times.

Notice that if we double the number 1, we get 2. If we double the number 2, we get 4. If we double the number 4, we get 8. If we follow this same procedure with any starting number, the result will be 8 times the original value. For example, if we double 250, we get 500. If we double 500, we get 1000. If we double 1000, we get 2000.

Using any of these procedures, we determine that $8 \times 250 = 2000$.

The total amount of each ingredient needed to make 8 dozen cupcakes is below.

- Flour: $250 \times 8 = 2000$ g. Since $1000 \text{ g} = 1 \text{ kg}$, then $2000 \text{ g} = 2 \text{ kg}$ is needed.
 - Salt: $2\frac{1}{2} + 2\frac{1}{2} = 5$ grams, so 2 dozen cupcakes require 5 grams. Thus, 8 dozen cupcakes require $4 \times 5 = 20$ grams.
 - Baking powder: $8 \times 8 = 64$ grams required.
 - Butter: $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = 1$ cup, so 4 dozen cupcakes require 1 cup. Thus, 8 dozen cupcakes require 2 cups.
 - Sugar: $150 \times 8 = 1200$ grams required.
 - Eggs: $2 \times 8 = 16$ eggs required.
 - Milk: $240 \times 8 = 1920$ mL required.
 - Vanilla: $5 \times 8 = 40$ mL required.
- (b) We can use the total amounts calculated in part (a) to determine how many packages of each ingredient they must buy.
- Since flour is sold in 1 kg bags and they need 2 kg of flour, then they need 2 bags of flour.
 - Since butter is sold in 1 cup blocks, and they need 2 cups of butter, then they need 2 blocks of butter.
 - Since sugar is sold in 2 kg bags, and $2 \text{ kg} = 2000 \text{ g}$, then they need 1 bag of sugar to have at least 1200 g of sugar.
 - Since eggs are sold by the dozen, and there are 12 eggs in 1 dozen and 24 eggs in 2 dozen, then they need 2 cartons of eggs to have at least 16 eggs.
 - Since milk is sold in 1 L cartons, and since $1 \text{ L} = 1000 \text{ mL}$ and so $2 \text{ L} = 2000 \text{ mL}$, then they need 2 cartons of milk.



Problème de la semaine

Problème A

Les sommes de formes

Chaque symbole dans la grille ci-dessous représente un nombre. Les sommes des symboles dans la première rangée, la deuxième rangée et la rangée du bas, ainsi que celles dans la colonne la plus à gauche et la colonne la plus à droite, sont indiquées.

				20
				17
				?
				15
12	?	?	19	

Par exemple, nous savons que :  +  +  +  = 20

Détermine toutes les sommes qui manquent.



Problem of the Week

Problem A and Solution

Shape Sums

Problem

Each symbol in the grid below represents a number. The sums of the symbols in the first, second, and bottom rows and the leftmost and rightmost columns are shown.

				20
				17
				?
				15
12	?	?	19	

For example, we know:  +  +  +  = 20

Determine all the missing sums.

Solution

There are many ways to solve this problem. Here is one approach.

Since the leftmost column has two triangles and two circles, and the column beside it also has two triangles and two circles, the sum of these columns must be the same. So the sum of the second column must be 12.

From the top row we know that the sum of four triangles is 20. So the value of one triangle must be $\frac{1}{4}$ of 20 or $20 \div 4 = 5$.

Since the value of one triangle is 5, then the sum of two triangles is $5 + 5 = 10$. The leftmost column shows the sum of two triangles and two circles is 12, so the sum of two circles is $12 - 10 = 2$. Therefore, the value of one circle must be $\frac{1}{2}$ of 2 or $2 \div 2 = 1$.

The bottom row has a sum of 15 and contains two circles, one triangle, and one



square. Since we know the sum of two circles and one triangle is $2 + 5 = 7$, then the value of one square is $15 - 7 = 8$.

Now we know that the sum of the third column is $5 + 8 + 8 + 1 = 22$.

The second row has a sum of 17 and contains one triangle, one circle, one square and one hexagon. Since we know the sum of one triangle, one circle, and one square is $5 + 1 + 8 = 14$, then the value of one hexagon is $17 - 14 = 3$.

Now we know that the sum of the third row is $1 + 1 + 8 + 3 = 13$.

The completed grid is shown.

				20
				17
				13
				15
12	12	22	19	

Alternatively, we can find the sum of the third row without actually finding the value of the hexagon. Notice that the second and third rows have the same shapes in the last three columns, and only the shape in the first column is different. Since we know that the value of one triangle is 5 and the value of one circle is 1, then the sum of the third row must be $5 - 1 = 4$ less than the sum of the second row. Thus, the sum of the third row is $17 - 4 = 13$.



Teacher's Notes

We could look at this problem algebraically, where we are trying to solve a *linear system of equations*. If we assign variable names to the shapes,

- t = triangle
- c = circle
- s = square
- h = hexagon

then we can describe the information given in the problem as follows:

$$4t = 20$$

$$t + c + s + h = 17$$

$$2c + t + s = 15$$

$$2t + 2c = 12$$

$$t + 2h + s = 19$$

Now, we could use algebraic techniques to find the values of these four variables.

We expect that there is a single solution to these types of problems, and it turns out that there is for this problem. However, for some problems we are not given enough information to determine specific values for each variable. For a problem with four variables, a minimum requirement to guarantee a single solution is that we need *at least* four equations. Also, those equations must be *consistent*. This means that none of the equations can contradict each other. For example, if we added the equation $t = 7$ to the system in this problem, this would contradict the first equation. A system that is *inconsistent* has no solutions. This is something that students will learn more about in higher level math courses.



Problème de la semaine

Problème A

La collecte de fonds

La classe de Flynn amasse des fonds en recyclant des appareils électroniques pour un organisme de bienfaisance qui plante des arbres. Ils ont trouvé une entreprise locale qui leur versera 5 \$ par livre de déchets électroniques provenant de téléphones cellulaires et 2 \$ par livre de déchets électroniques provenant d'ordinateurs.

L'école a recueilli les appareils électroniques suivants pour le recyclage, mais les a pesés en grammes plutôt qu'en livres.

Téléphones cellulaires	Ordinateurs
10 téléphones uPhone : 200 g chacun	5 ordinateurs portables Bonobo : 800 g chacun
5 téléphones Mixel : 100 g chacun	7 tablettes uPad : 500 g chacune

Sachant qu'une livre équivaut à environ 454 g, estime le montant d'argent que la classe de Flynn récoltera. Justifie ta réponse.





Problem of the Week

Problem A and Solution

Fund Raising

Problem

Flynn's class is raising money for a tree-planting charity by recycling electronics. They have found a local company that will give them \$5 for each pound of cell phone e-waste and \$2 for each pound of computer e-waste.

The school has gathered the following electronics for recycling, but has weighed them in grams instead of pounds.

Cell Phones	Computers
10 uPhones: 200 g each	5 Bonobo laptops: 800 g each
5 Mixel phones: 100 g each	7 uPads: 500 g each

Knowing that 1 pound is about 454 g, estimate how much money Flynn's class will make. Justify your answer.

Solution

Solutions may vary, possibly resulting in different estimations. We will show two different approaches.

Since 1 pound is about 454 g, we will approximate 1 pound as 500 g. Then 2 pounds is approximately 1000 g.

Solution 1

In this solution, we find the total mass of each type of item and then estimate this in pounds before finding the total mass of all items.

Phones:

- uPhones: Each uPhone is 200 g, so 10 uPhones are $10 \times 200 = 2000$ g. Since 1000 g is approximately 2 pounds, then 2000 g is approximately 4 pounds.
- Mixel phones: Each Mixel phone is 100 g, so 5 Mixel phones are $5 \times 100 = 500$ g, which is approximately 1 pound.

This is approximately $4 + 1 = 5$ pounds of cell phone waste. The cell phone e-waste is worth approximately $\$5 \times 5 = \25 .

Computers:

- Bonobo laptops: Each laptop is 800 g, so 5 laptops are $5 \times 800 = 4000$ g. Since 1000 g is approximately 2 pounds, then 4000 g is approximately $4 \times 2 = 8$ pounds.
- uPads: Each uPad is 500 g, which is approximately 1 pound, so 7 uPads are approximately 7 pounds.

This is approximately $8 + 7 = 15$ pounds of computer waste. The computer e-waste is worth approximately $\$2 \times 15 = \30 . Therefore the total value is approximately $\$25 + \$30 = \$55$.



Solution 2

In this solution, we will find the total mass of computer waste and the total mass of cell phone waste, and then estimate these totals in pounds.

Phones:

- uPhones: Each uPhone is 200 g, so 10 uPhones are $10 \times 200 = 2000$ g.
- Mixel phones: Each Mixel phone is 100 g, so 5 Mixel phones are $5 \times 100 = 500$ g.

This is $2000 + 500 = 2500$ g. Since 500 g is approximately 1 pound and 1000 g is approximately 2 pounds, then 2500 g is approximately $2 + 2 + 1 = 5$ pounds. The cell phone e-waste is worth approximately $\$5 \times 5 = \25 .

Computers:

- Bonobo laptops: Each laptop is 800 g, so 5 laptops are $5 \times 800 = 4000$ g.
- uPads: Each uPad is 500 g, so 7 uPads are $7 \times 500 = 3500$ g.

This is $4000 + 3500 = 7500$ g. Since 500 g is approximately 1 pound and 1000 g is approximately 2 pounds, then 7500 g is approximately $2 \times 7 + 1 = 15$ pounds. The computer e-waste is worth approximately $\$2 \times 15 = \30 . Therefore the total value is approximately $\$25 + \$30 = \$55$.



Problème de la semaine

Problème A

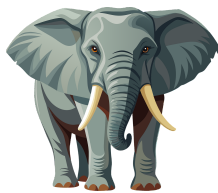
La gardienne du zoo

Zoey travaille au zoo de la ville où elle s'occupe de nourrir et de prendre soin des animaux. Son horaire est identique chaque matin. Elle commence à travailler à 7h00. Le tableau ci-dessous présente la séquence de ses activités matinales ainsi que la durée de chacune d'elles. Les durées incluent le temps de déplacement vers chaque endroit.

Activité	Durée de l'activité
Réunion d'équipe	$\frac{1}{2}$ heure
Nourrissage des éléphants	30 minutes
Déplacement des oiseaux tropicaux vers l'habitat extérieur	45 minutes
Remplissage des mangeoires des singes avec des fruits et des noix	30 minutes
Pause	15 minutes
Changement du foin pour les chameaux	45 minutes
Nourrissage des morses et des phoques	$\frac{3}{4}$ heure
Nettoyage des enclos des rhinocéros	$\frac{1}{2}$ heure
Pause du dîner	une demi-heure

- (a) À quelle heure Zoey commence-t-elle à nourrir les éléphants ?
- (b) À quelle heure commence le nourrissage des singes ?
- (c) À quelle heure se termine la pause de Zoey ?
- (d) Combien de temps s'écoule-t-il entre le début de la réunion d'équipe et la fin de la pause du dîner de Zoey ?





Problem of the Week

Problem A and Solution

Zookeeper

Problem

Zoey works at the city's zoo feeding and caring for the animals. Her schedule is the same every morning. She starts work at 7:00 a.m. The table below lists the sequence of morning activities, along with the duration of each activity. The durations include the time it takes to travel to each spot.

Activity	Duration of Activity
Team meeting	$\frac{1}{2}$ hour
Feeding the elephants	30 minutes
Moving tropical birds to outside habitat	45 minutes
Filling the monkey feed bins with fruit and nuts	30 minutes
Break	15 minutes
Changing the hay for the camels	45 minutes
Feeding the walruses and seals	$\frac{3}{4}$ hour
Washing down the rhino stalls	$\frac{1}{2}$ hour
Lunch break	half an hour

- (a) What time does Zoey start feeding the elephants?
- (b) What time does the monkey feeding start?
- (c) What time does Zoey's break end?
- (d) How long is it from the time the team meeting starts to the time Zoey's lunch break ends?



Solution

We add two columns to the table, one with the start time of the activity and one with the end time. From this table, we can answer the questions.

Activity	Duration of Activity	Start Time	End Time
Team meeting	$\frac{1}{2}$ hour	7:00	7:30
Feeding the elephants	30 minutes	7:30	8:00
Moving tropical birds to outside habitat	45 minutes	8:00	8:45
Filling the monkey feed bins with fruit/nuts	30 minutes	8:45	9:15
Break	15 minutes	9:15	9:30
Changing the hay for the camels	45 minutes	9:30	10:15
Feeding the walruses and seals	$\frac{3}{4}$ hour	10:15	11:00
Washing down the rhino stalls	$\frac{1}{2}$ hour	11:00	11:30
Lunch break	half an hour	11:30	12:00

- (a) Zoey starts feeding the elephants at 7:30 a.m.
- (b) The monkey feeding starts at 8:45 a.m.
- (c) Zoey's break ends at 9:30 a.m.
- (d) Since the lunch break ends at 12:00 p.m., it is 5 hours after the team meeting starts.

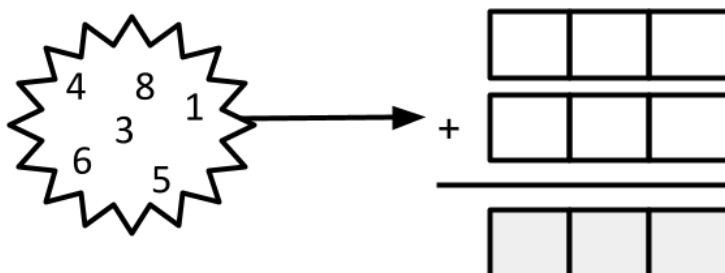


Problème de la semaine

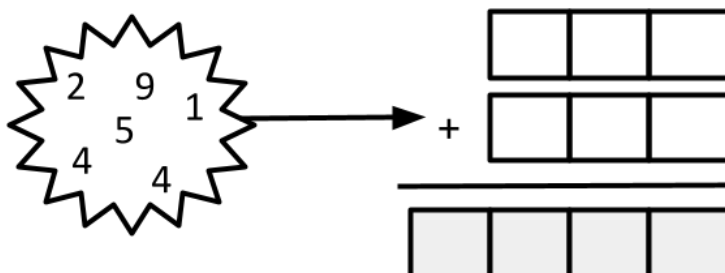
Problème A

Des défis de disposition

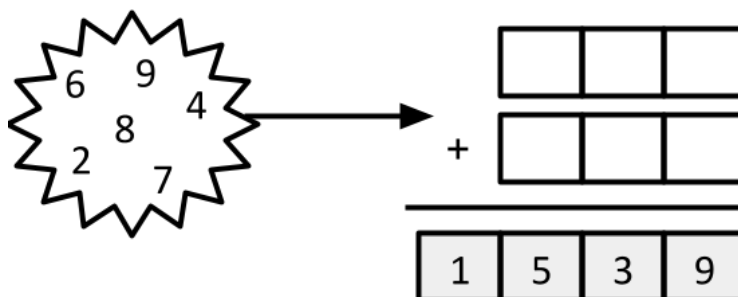
- (a) Dispose les nombres 4, 8, 1, 6, 3 et 5 pour former deux nombres à 3 chiffres dont la somme est la plus *petite* possible.



- (b) Dispose les nombres 2, 9, 1, 4, 5 et 4 pour former deux nombres à 3 chiffres dont la somme est la plus *grande* possible.



- (c) Dispose les nombres 6, 9, 4, 2, 8 et 7 pour former deux nombres à 3 chiffres dont la somme est égale à 1539.



Pour chaque partie, combien de solutions différentes peux-tu trouver ?



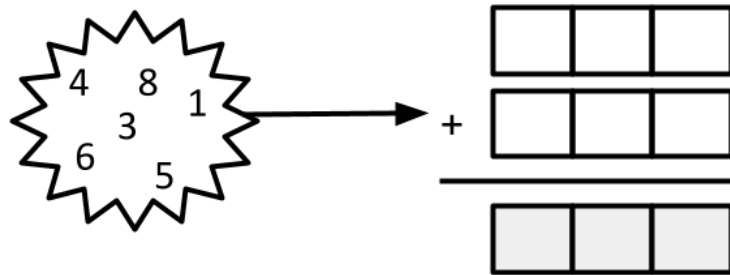
Problem of the Week

Problem A and Solution

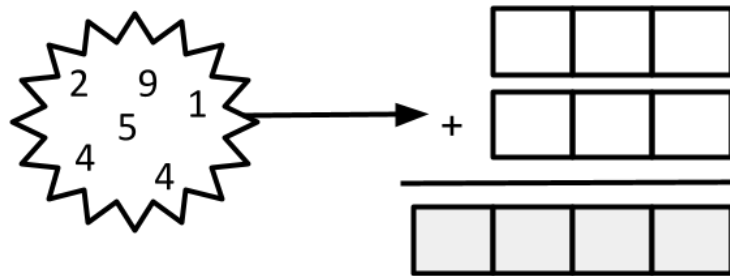
Just Filling In

Problem

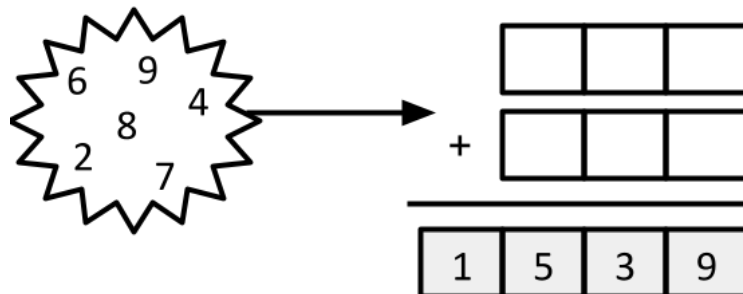
- (a) Arrange the numbers 4, 8, 1, 6, 3, and 5 to form two 3-digit numbers with the *smallest* possible sum.



- (b) Arrange the numbers 2, 9, 1, 4, 5, and 4 to form two 3-digit numbers with the *largest* possible sum.



- (c) Arrange the numbers 6, 9, 4, 2, 8, and 7 to form two 3-digit numbers that add to 1539.



For each part, how many different solutions can you find?



Solution

- (a) The strategy for creating the smallest (or largest) sum comes from recognizing that the hundreds digit has the most influence on the size of a number, and the ones digit has the least influence on the size of a number.

When we are choosing the digits for the smallest sum, we want the smallest numbers in the hundreds column, the next smallest numbers in the tens column, and the largest numbers in the ones column. So, in our answer we want 1 and 3 in the hundreds column, 4 and 5 in the tens column, and 6 and 8 in the ones column.

When adding two numbers, the order of the numbers does not affect the sum. Thus, the digits in each column can be arranged in 2 ways: with either the larger digit on top or the smaller digit on top. Since there are three columns in the sum, there are a total of $2 \times 2 \times 2 = 8$ solutions. The 8 solutions are shown.

$$\begin{array}{r} 146 \\ + 358 \\ \hline \end{array} \quad \begin{array}{r} 148 \\ + 356 \\ \hline \end{array} \quad \begin{array}{r} 156 \\ + 348 \\ \hline \end{array} \quad \begin{array}{r} 158 \\ + 346 \\ \hline \end{array} \quad \begin{array}{r} 346 \\ + 158 \\ \hline \end{array} \quad \begin{array}{r} 348 \\ + 156 \\ \hline \end{array} \quad \begin{array}{r} 356 \\ + 148 \\ \hline \end{array} \quad \begin{array}{r} 358 \\ + 146 \\ \hline \end{array}$$

In all arrangements, the sum is 504.

- (b) Using the strategy from part (a), we can arrange the numbers to find the largest possible sum. This time, we want the largest numbers, 5 and 9, in the hundreds columns and the smallest numbers, 1 and 2 in the ones columns. The remaining numbers are the same digit 4 and 4.

When adding two numbers, the order of the numbers does not affect the sum. Thus, the digits in the hundreds and ones columns can each be arranged in 2 ways: with either the larger digit on top or the smaller digit on top. Since the digits in the tens column are the same, they can be arranged in only 1 way. Therefore, there are $2 \times 2 \times 1 = 4$ possible solutions in this case. The 4 solutions are shown.

$$\begin{array}{r} 541 \\ + 942 \\ \hline \end{array} \quad \begin{array}{r} 542 \\ + 941 \\ \hline \end{array} \quad \begin{array}{r} 941 \\ + 542 \\ \hline \end{array} \quad \begin{array}{r} 942 \\ + 541 \\ \hline \end{array}$$

In all arrangements, the sum is 1483.

- (c) We need some logic to narrow down the choices in this example. Since we know the ones digit of the sum is 9, then the ones digits for each of the two



numbers being added must have a total of 9 or 19. It is not possible to add two single digits to get 19, so the sum must be 9. The only possible combinations given the digits we have are $2 + 7$ or $7 + 2$.

In the tens column, we need two numbers that add to 3 or 13. The sum of $6 + 7 = 13$, but we have already used 7 in the ones column. There is only one pair of the remaining digits we could use: $4 + 9 = 13$ or $9 + 4 = 13$. This means we carry 1 into the hundreds column, so the sum of the two digits in the hundreds column must be 14.

The remaining digits are 6 and 8, and fortunately the sum of these digits is 14.

As in part (a), we can arrange these digits in 8 different ways. The 8 solutions are shown.

642	647	692	697	842	847	892	897
<u>+897</u>	<u>+892</u>	<u>+847</u>	<u>+842</u>	<u>+697</u>	<u>+692</u>	<u>+647</u>	<u>+642</u>



Problème de la semaine

Problème A

Un tiroir bien trié

Jessie range son tiroir à chaussettes en disposant ses chaussettes en rangées.

Elle remarque que si elle place 5 paires de chaussettes par rangée, il restera une rangée avec seulement 1 paire de chaussettes. De plus, si elle place 3 paires de chaussettes par rangée, il restera une rangée avec seulement 2 paires de chaussettes.

Si Jessie possède moins de 60 paires de chaussettes, quel est le nombre maximal de chaussettes qu'elle pourrait avoir ?





Problem of the Week

Problem A and Solution

Sorting Socks

Problem

Jessie is organizing her sock drawer by arranging her socks in rows.

She notices that if she puts 5 pairs of socks in each row, there will be one row with only 1 pair of socks. Also, if she puts 3 pairs of socks in each row, there will be one row with only 2 pairs of socks.

If Jessie has fewer than 60 pairs of socks, what is the maximum number of socks she could have?

Solution

One way to solve this problem is to use skip counting. Since there are extra socks in one of the rows, we count up to but not including 60.

If she puts 5 pairs of socks in each row, then the total number of socks in the filled rows could be:

5, 10, 15, 20, 25, 30, 35, 40, 45, 50, or 55.

Since there is another row with only 1 pair of socks, the total number of socks for each of these options is:

6, 11, 16, 21, 26, 31, 36, 41, 46, 51, or 56.

If she puts 3 pairs of socks in each row, then the total number of socks in the filled rows could be:

3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, or 57.

Since there is another row with only 2 pairs of socks, the total number of socks for each of these options is:

5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, or 59.

We need to find the largest common number in the two lists containing the possible total number of socks. This number is 56.

Therefore, the maximum total number of socks Jessie could have is 56.



Problème de la semaine

Problème A

Le pointage au cribbage

Le cribbage est un jeu de cartes qui se joue avec un jeu standard de 52 cartes. Il existe quatre couleurs : le trèfle ♣, le carreau ♦, le cœur ♥ et le pique ♠. Chaque couleur compte 13 cartes identifiées par une lettre ou un nombre comme suit : A, 2, 3, 4, 5, 6, 7, 8, 9, 10, J (Valet), Q (Dame) et K (Roi). Ces lettres et ces nombres représentent le *rang* de la carte. Comme il y a quatre couleurs, il y a quatre cartes de même rang dans chaque jeu. *Note: Dans cette activité, nous ne tiendrons pas compte des couleurs et nous nous concentrerons uniquement sur les rangs.*

Pour déterminer le nombre de points que vaut une main, chaque joueur forme des combinaisons de 2, 3, 4 ou 5 de ses cartes. Une même carte peut être utilisée plus d'une fois dans des combinaisons différentes. Voici les combinaisons qui rapportent des points :

- Chaque combinaison dont la somme totale est égale à 15 vaut 2 points. Pour ces combinaisons, l'As (A) vaut 1, les figures (J, Q et K) valent 10 chacune, et les cartes numérotées valent leur valeur nominale ou leur rang. Par exemple :
 $6 + 9 = 15$ vaut 2 points
 $5 + Q = 15$ vaut 2 points
 $2 + 4 + 9 = 15$ vaut 2 points
- Chaque paire de cartes ayant le même rang vaut 2 points.
- Chaque combinaison de trois cartes ou plus formant une suite de rangs consécutifs vaut le nombre de cartes dans la suite. Par exemple :
3, 4, 5 vaut 3 points
8, 9, 10, J vaut 4 points

Laquelle des mains suivantes vaut le plus de points ?

Main A : 5♥, 10♦, J♠, Q♣ et K♠

Main B : A♠, 6♣, 7♦, 7♥ et 8♣

Main C : 5♣, 5♥, 5♠, 8♠ et Q♦

Justifie ta réponse.





Problem of the Week

Problem A and Solution

Cribbage Scoring

Problem

Cribbage is a card game that is played with a standard deck of 52 cards. There are four suits: clubs ♣, diamonds ♦, hearts ♥, and spades ♠. Each suit has 13 cards identified with either a letter or number as follows: A, 2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K. These letters and numbers are called the card's *rank*. Since there are four suits, there are four cards with the same rank in every deck. *Note: In this activity we will ignore the suits and just focus on the ranks.*

To determine the number of points a hand is worth, each player makes combinations using 2, 3, 4, or 5 of their cards. Cards can be used more than once in different combinations. These are the combinations that count for points:

- Each combination that totals 15 is worth 2 points. When making these combinations, an A is worth 1, a J, Q, or K is worth 10, and all number cards are worth their rank. For example:

$6 + 9 = 15$ is worth 2 points

$5 + Q = 15$ is worth 2 points

$2 + 4 + 9 = 15$ is worth 2 points

- Each pair of cards that have the same rank is worth 2 points.
- Each combination of three or more cards that form a sequence of consecutive ranked cards is worth the number of cards in the sequence. For example:

3, 4, 5 is worth 3 points

8, 9, 10, J is worth 4 points

Which of the following hands is worth the most points?

Hand A: 5♥, 10♦, J♠, Q♣, and K♠

Hand B: A♠, 6♣, 7♦, 7♥, and 8♣

Hand C: 5♣, 5♥, 5♠, 8♠, and Q♦

Justify your answer.



**Solution**

We record the combinations in each hand that earn points in the following tables.

Hand A:

Type of Combination	Combinations	Total Points
Cards that total 15	$5\heartsuit + 10\diamondsuit$, $5\heartsuit + J\spadesuit$, $5\heartsuit + Q\clubsuit$, $5\heartsuit + K\spadesuit$	$2 + 2 + 2 + 2 = 8$
Pairs of cards with the same rank	none	0
Sequences of consecutive ranked cards	$10\diamondsuit, J\spadesuit, Q\clubsuit, K\spadesuit$	4

The total points in this hand is $8 + 4 = 12$.

Hand B:

Type of Combination	Combinations	Total Points
Cards that total 15	$7\diamondsuit + 8\clubsuit$, $7\heartsuit + 8\clubsuit$, $A\spadesuit + 6\clubsuit + 8\clubsuit$, $A\spadesuit + 7\diamondsuit + 7\heartsuit$	$2 + 2 + 2 + 2 = 8$
Pairs of cards with the same rank	$7\diamondsuit$ and $7\heartsuit$	2
Sequences of consecutive ranked cards	$6\clubsuit, 7\diamondsuit, 8\clubsuit$ $6\clubsuit, 7\heartsuit, 8\clubsuit$	$3 + 3 = 6$

The total points in this hand is $8 + 2 + 6 = 16$.

Hand C:

Type of Combination	Combinations	Total Points
Cards that total 15	$5\clubsuit + Q\diamondsuit$, $5\heartsuit + Q\diamondsuit$, $5\spadesuit + Q\diamondsuit$, $5\clubsuit + 5\heartsuit + 5\spadesuit$	$2 + 2 + 2 + 2 = 8$
Pairs of cards with the same rank	$5\clubsuit$ and $5\heartsuit$, $5\clubsuit$ and $5\spadesuit$, $5\heartsuit$ and $5\spadesuit$	$2 + 2 + 2 = 6$
Sequences of consecutive ranked cards	none	0

The total points in this hand is $8 + 6 = 14$.

Therefore, **Hand B** is worth the most points.