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| Station„M² – Mathe auf dem Maimarkt“Teil 2Arbeitsheft

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| Teilnehmercode |

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Liebe Schülerinnen und Schüler!

In dieser Station plant ihr einen Maimarkt. Hierfür bearbeitet ihr in drei Teilstationen verschiedene Aufgaben. In diesem Teil wird ein Flyer entwickelt, Limonade verkauft und ihr müsst dem Clown helfen seine Show zu verbessern.

Wichtig: Bearbeitet bitte alle Aufgaben der Reihe nach!



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|  | Zu dieser Aufgabe gibt es Hilfen im Hilfeheft. |
|  | Diskutiert hier eure wichtigsten Ergebnisse und fasst sie zusammen. |
|  | Zu dieser Aufgabe gibt es eine Simulation oder ein Video. |
|  | Zu dieser Aufgabe gibt es Material auf eurem Tisch. |

Wir wünschen Euch viel Spaß beim Experimentieren und Entdecken!

Das Mathematik-Labor-Team

Der Maimarktbetreiber möchte einen Flyer mit einem Weg durch den Maimarkt drucken lassen. Der Weg soll an allen Attraktionen und Ständen vorbeikommen. Außerdem soll es ein Rundweg sein, also wieder am Maimarkteingang enden.

Damit die Besucher nicht unnötig weit laufen müssen, möchte der Betreiber nun wissen, welche der möglichen Wege der Kürzeste ist.

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| **Material 1 + Material 3 + Material 4*** Magnetbrett + Auflage
* Magnetstreifen (Wegstücke)

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| **Anzahl** | **Farbe** | **Länge** |
| 9 | lila | l |
| 18 | weiß | w |
| 23 | schwarz-weiß | s |

 | C:\Users\Phimou\AppData\Local\Microsoft\Windows\INetCache\Content.Word\WhatsApp Image 2018-03-07 at 21.12.10.jpeg  |

Um nicht alle möglichen Wege abzulaufen, will der Betreiber die Wege zunächst planen.

* 1. Legt die Auflage (Material 3) auf das Magnetbrett.
	Erstellt mit den Wegstücken zwei verschiedene Rundwege durch den Maimarkt, der an allen Eingängen der Attraktionen und Ständen vorbeikommt. Schreibt dann den jeweiligen Term als Summe auf. Die Eingänge der Attraktionen sind mit folgendem Symbol gekennzeichnet:

Weg 1:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Weg 2:

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| **Farbe** | **Länge** |
| schwarz | 2 m |
| weiß | 3 m |
| lila | 7 m |

Der Maimarktbetreiber hat die einzelnen Wegstücke ausgemessen und weiß nun wie lang sie in der Realität sind:

Um die Längen der Wege schneller zu berechnen, ist es sinnvoll, die zwei Terme zu vereinfachen.

* 1. Berechnet den Wert des Terms aus Aufgabe 1.1.

Weg 1:

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* 1. Berechnet die Längen der zwei Wege in Metern. Welcher ist der kürzere?

Weg 1:

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Weg 2:

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Es ist oftmals sehr nützlich Terme zu vereinfachen. Der Maimarktbetreiber möchte nun wissen wie ihr das gemacht habt. Er hat eine Notiz seines Mitarbeiters gefunden, die leider etwas durcheinander gekommen ist.

* 1. Schreibt aus folgenden Satzbausteinen einen Merksatz auf, wie Terme vereinfacht werden.

**T**

**A**

**I**

**den Term ordnen,**

**nebeneinander stehen.**

**zu einem Produkt zusammengefasst.**

**Als Zweites werden**

**die gleichen Variablen**

**KK**

**R**

**M**

**A**

**M**

**sodass, gleiche Variablen**

**vereinfachen,**

**muss man als Erstes**

**Um einen Term zu**

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Hast du die Bausteine richtig geordnet, erhältst du mit den zugehörigen Buchstaben ein Lösungswort:

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Tom hat seine Spardose geleert und möchte sich einen spaßigen Tag auf dem Maimarkt machen. Er weiß schon ganz genau, was er alles fahren und besuchen möchte. Allerdings ist er sich noch nicht sicher, in welcher Reihenfolge er die Attraktionen besuchen soll. Auch weiß er nicht, ob sein Geld aus der Spardose für alle Fahrten ausreicht.



2.1 Plant Toms Tag auf dem Maimarkt. Öffnet dazu Simulation 2. Legt vier verschiedene Reihenfolgen fest, in denen Tom die Attraktionen besucht. Schreibt die zugehörigen Terme auf.

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|  |  | Ablauf 1: |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  | Ablauf 2: |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  | Ablauf 3: |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  | Ablauf 4: |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



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| **Attraktion** | **Variable** | **Kosten pro Fahrt** |
| Riesenrad  | r | 4,50 € |
| Box Autos  | b | 2,00 € |
| Achterbahn | a | 5,50 € |
| Kettenkarussell | k | 2,50 € |
| Zirkus | z | 8,00 € |
| Magieshow | m | 6,50 € |

2.2 Tom hat sich mittlerweile informiert, wie viel die verschiedenen Fahrten kosten. Berechnet nun, wie hoch die Kosten pro Tagesablauf für Tom sind.

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|  |  | Ablauf 1: |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  | Ablauf 2: |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  | Ablauf 3: |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  | Ablauf 4: |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

2.3 Was fällt auf, wenn man die Kosten der verschiedenen Tagesabläufe betrachtet?

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Scheinbar spielt die Reihenfolge der einzelnen Summanden für das Ergebnis keine Rolle.

Da diese Eigenschaft von Summen und Produkten immer gilt, hat sie einen eigenen Namen: Das **Kommutativgesetz**.

Es gilt beispielsweise: $a+b=b+a$ und $x•y=y•x$



2.4 Bringt die Satzteile in die richtige Reihenfolge und schreibt den Merksatz zum **Kommutativgesetz** auf.

**L**

**E**

**K**

**Das Kommutativgesetz**

**beliebig zu**

**der Faktoren**

**S**

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**Produkten die Reihenfolge**

**erlaubt es,**

**bei Summen die**

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**Reihenfolge der**

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Hast du die Bausteine richtig geordnet erhältst du mit den zugehörigen Buchstaben ein Lösungswort:

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Matthias möchte neue Cocktails in seiner Cocktailbar auf dem Maimarkt anbieten. Zuvor möchte er wissen, wie viel die benötigten Zutaten kosten.

Er hat folgende Säfte auf seiner Einkaufsliste:

* Apfelsaft
* Orangensaft
* Maracujasaft
* Birnensaft

Er bekommt den Saft in 1 Liter-Flaschen und muss pro Flasche 0,15 € Pfand bezahlen. Auch hat er noch leere Flaschen der vergangenen Tage zum Zurückgeben.



3.1 Stellt einen Term für die Kosten auf, wenn Matthias pro Sorte *m* Liter Saft kauft und 15 Flaschen dem Händler zurückbringt.

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Matthias hat von seinem Händler folgende Preisliste erhalten.



* 1 l Apfelsaft 1,25 €
* 1 l Orangensaft 1,40 €
* 1 l Maracujasaft 1,55 €
* 1 l Birnensaft 1,70 €

Pfand pro Liter-Flasche 0,15 €

3.2 Setzt in den Term aus 3.1 die passenden Preise ein und vereinfacht den Term.

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3.3 Matthias hat für die Zutaten der neuen Cocktails 31 € (inklusive Pfand) eingeplant. Berechnet wie viel Liter Saft er pro Sorte kaufen kann, wenn er von jedem Saft gleichviel einkauft und die 15 Flaschen zurückbringt.

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Da der Maimarktbetreiber Geld verdienen möchte, muss er von jedem Stand und jeder Attraktion Gebühren einsammeln. Diese hängen von der Fläche ab, die der Stand oder die Attraktion benötigt.



4.1 Stellt für jede Attraktion einen Term des Flächeninhalts auf und vereinfacht ihn.

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| Achterbahn |  |
| a | Term |
| bImbissbude | Term |
| ssrq |

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 |
| Kettenkarussellu | Term |
| kkm |  |
| Zirkusnl | Term

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Seine Mitarbeiter haben die Flächen ausgemessen. Jedoch haben sie verschiedene Terme für den Flächeninhalt gefunden.

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| **Attraktion** | **Term** |
| Achterbahn | $$(a•b)•4$$ |
| Imbissbude | $$\left(r+(s+s)\right)•q-(\left(q-u\right)•2•s)$$ |
| Kettenkarussell | $$m•n+\left(2•k\right)•l$$ |
| Zirkus | $$\left(x-z\right)•\left(u-z\right)+3•(z•v)$$ |

Mitarbeiter 1:

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| **Attraktion** | **Term** |
| Achterbahn | $$a•(b•4)$$ |
| Imbissbude | $$\left((r+s)+s\right)•q-\left(\left(q-u\right)•s\right)•2$$ |
| Kettenkarussell | $$m•n+2•(k•l)$$ |
| Zirkus | $$\left(x-z\right)•\left(u-z\right)+(3•z)•v$$ |

Mitarbeiter 2:

4.2 Vergleicht ob die Terme der beiden Mitarbeiter den gleichen Flächeninhalt beschreiben. Setzt dazu Zahlen für die Variablen ein und rechnet aus.

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Wenn du dich nicht verrechnet hast, fällt auf, dass die Terme gleichwertig sind. Obwohl bei einigen Termen die Klammern anders gesetzt wurden.

Ähnlich wie beim Kommutativgesetz, gibt es auch dafür einen Namen: Das **Assoziativgesetz.**

Es gilt beispielsweise: $a+\left(b+c\right)=\left(a+b\right)+c$ und $x•(y•z)=(x•y)•z$



4.3 Bringt die Satzbausteine in die richtige Reihenfolge und schreibt den Merksatz zum **Assoziativgesetz** auf.

**M**

**S**

**I**

**erlaubt es, bei Summen**

**SK**

**B**

**Klammern beliebig zu setzen.**

**Summanden und Produkten mit**

**mit mehr als zwei**

**mehr als zwei Faktoren,**

**I**

**Das Assoziativgesetz**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Hast du die Bausteine richtig geordnet, erhältst du mit den zugehörigen Buchstaben ein Lösungswort:

Der Zirkusclown braucht für seine neue Show ein Podest. Er hat auch schon einen Plan gemacht. Er weiß allerdings nicht genau, wie er das Volumen des Körpers berechnen kann.

5.1 Kreuzt an, welcher Term das Volumen des Körpers aus Simulation 3 richtig beschreibt. Es können auch mehrere Terme richtig sein.

* $(x•y•z+x•y•z+x•y•z)•2$
* $x•y•z•6$
* $6•(z•(y•x))$
* $\left(2•x•y•z\right)+\left(2•x•y•z\right)+\left(2•x•y•z\right)$

5.2 Findet einen weiteren Term, der das Volumen des Körpers aus Simulation 2 beschreibt.

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5.3 Berechnet das Volumen des Körpers aus Simulation 2, wenn die Seiten folgende Längen haben.

|  |  |  |
| --- | --- | --- |
| x | y | z |
| 4 cm | 2 cm | 5 cm |

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Variante A

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