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| Station„Mensch und Klima“Teil 2Arbeitsheft

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**Liebe Schülerinnen und Schüler!**

Der Klimawandel betrifft uns alle, deshalb soll Teil zwei der Station „Mensch und Klima“ dazu dienen, eine Querverbindung von der Normalverteilung, zu realen und bedrohlichen Umweltereignissen zu ziehen.

Darüber hinaus schauen wir uns an, wie wir mithilfe der Normalverteilung und den damit verbundenen Sigma-Regeln, Prognosen mit sogenannten Prognoseintervallen aufstellen können.

Auf den Prognoseintervallen wird das Hauptaugenmerk dieser Station liegen, weshalb ihr im Verlaufe der Station mittels verschiedener Simulationen die Thematik selbst ergründen dürft.

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



* 1. Schaut euch das **Video 1** zum Thema „Erderwärmung, die damit einhergehende Zunahme der heißen Tage in Karlsruhe und die Bedeutung von Prognoseintervallen“ bis 1:22 min an und notiert wesentliche Informationen.

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* 1. Schätzt nun, wie viele heiße Tage in Karlsruhe im Jahr 2100 erwartet werden und haltet eure Vermutung hier fest.

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1.3 Überprüft nun, ob eure Schätzung mit den wissenschaftlichen Prognosen übereinstimmt, indem ihr nach der zu erwarteten Anzahl der heißen Tage in Karlsruhe im Jahr 2100 online recherchiert. Notiert in Folge dessen die prognostizierte Anzahl der heißen Tage.

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1. Schaut euch das Erklärvideo ab 1:22 min. bis 3:15 min. weiter an. Notiert im Anschluss daran, was der Sinn eines Prognoseintervalls ist und erklärt in euren eigenen Worten, was ein **95%**- Prognoseintervall beschreibt.

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1. Schaut euch das Erklärvideo nun bis zum Ende an. Haltet danach hier fest, wie die Formel für die untere und die obere Intervallgrenze für ein 95%-Prognoseintervall aussehen muss.

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 Auf Basis der aktuellen Umfragen, werden für die nächste Bundestagswahl folgende Ergebnisse prognostiziert:

* 1,5°-Partei: 20%
* 2°-Partei: 30%
* Atompartei: 14%
* Freiheitspartei: 10%
* Fortschrittspartei: 26%

2.2 Stellt die obige Prognose mithilfe einer Wahlurne nach: Unter Berücksichtigung der prognostizierten Wahlergebnisse soll nun eine durchsichtige Wahlurne mit 30 Kugeln bestückt werden. (Durchsichtig deshalb, da wir die Prognose des Wahlergebnisses ja bereits kennen und dieses kein Geheimnis ist). Wie viele Kugeln müssen den Parteien jeweils zugeordnet werden? Rundet hierfür eure Ergebnisse auf ganze Zahlen und befüllt die Wahlurne.

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2.3 Wahlsimulation! Im Folgenden sollt ihr eine Wahl simulieren, indem ihr 20 Kugeln (mit Zurücklegen) aus der Urne zieht. Erstellt hierfür eine Strichliste, sodass ihr sehen könnt, wie oft ihr welche Partei gezogen habt. Die Strichliste benötigt ihr für die nächste Aufgabe nochmal.

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2.4 Experimentiert nun mit **Simulation 3**, um Aufgabe 2.4 a, b und c zu bearbeiten.

a) Die 1,5°-Partei soll laut Prognosen bei der nächsten Bundestagswahl 20% der Stimmen bekommen. Gebt mithilfe der **Simulation 3** das Prognoseintervall dafür an, wie viele der 30 Menschen aus eurer durchsichtigen Wahlurne mit einer Sicherheitswahrscheinlichkeit von 95% die 1,5°-Partei wählen.

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b) Überprüft, ob das Ergebnis eurer Ziehung aus Aufgabe 2.3, bezogen auf die 1,5°-Partei, im obigen 95%-Prognoseintervall liegt. Überlegt und haltet fest: Welche Gründe kann es haben, wenn ein Ergebnis nicht im
(95%-)Prognoseintervall liegt?

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c) Von welchem Parameter hängt die Verlässlichkeit des Prognoseintervalls ab und wie muss dieser Parameter gewählt werden, sodass ihr davon ausgehen könnt, dass das Ergebnis mit einer großen Wahrscheinlichkeit im berechneten Prognoseintervall liegt? Experimentiert mit **Simulation 4** und haltet euere Erkenntnisse hier fest.

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2.5 Nun habt ihr in der ersten Aufgabe dieser Station zunächst eine Punktschätzung betrachtet („Die heißen Tage in Karlsruhe“) und anschließend das Prognoseintervall kennengelernt („Wahlen“). Erklärt den Unterschied zwischen einer Punktschätzung und einem Prognoseintervall und geht hierbei darauf ein, welche der beiden Schätzungen eurer Meinung nach verlässlicher ist und warum.

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3.1 Ein politisches Meinungs- und Wahlforschungsinstitut hat 100 Wähler:innen befragt, welche Partei sie bei der nächsten Wahl wählen werden. Laut der Erhebung wählen 10% der Menschen in Deutschland die Freiheitspartei. Wenn wir davon ausgehen, dass diese Prognose mit einer Wahrscheinlichkeit von ca. 95% eintritt, wie sieht dann das zu erwartende Prognoseintervall aus? Rechnet dieses aus und gebt die Intervallgrenzen als relative Wahrscheinlichkeiten an.

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3.2 Die Anzahl der befragten Personen aus Aufgabe 3.1 wird nun auf 400 Menschen erhöht. Stellt zunächst eine Vermutung auf, ohne das Prognoseintervall auszurechnen: Wird sich das Prognoseintervall für relative Häufigkeiten im Vergleich zu Aufgabe 3.1 vergrößern oder verkleinern? Begründet.

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3.3 Berechnet nun das Prognoseintervall für Aufgabe 3.2 und gebt die Intervallgrenzen auch hier als relative Wahrscheinlichkeiten an.

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3.4 Was fällt euch auf, wenn ihr die beiden Intervalle für relative Häufigkeiten aus Aufgabe 3.1 und 3.3 nun vergleicht? Haltet hier fest, ob sich eure Vermutung aus Aufgabe 3.2 bewahrheitet.

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3.5 Experimentiert nun mit **Simulation 4** und überprüft, ob sich eure Vermutung aus Aufgabe 3.2 bestätigt, indem ihr mithilfe der Schieberegler verschiedene Fälle betrachtet. Formuliert einen Merksatz.

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| --- |
| GruppenergebnisFasst hier eure Ergebnisse aus den Aufgaben 2.1 bis 3.6 zusammen.Geht hierbei darauf ein: * Was ist eine Punktschätzung?
* Was ist im Vergleich dazu ein Prognoseintervall und wie berechnet man dieses?
* Welche Auswirkungen auf das Prognoseintervall sind zu beobachten, wenn man den Stichprobenumfang n vergrößert bzw. verkleinert?
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Mathematik-Labor „Mathe-ist-mehr“
Didaktik der Mathematik (Sekundarstufen)

Institut für Mathematik
Universität Koblenz-Landau
Fortstraße 7

76829 Landau

www.mathe-labor.de

Zusammengestellt von:

Shirley Betsch und Klara Ruff

Betreut von:

Alex Engelhardt

Variante A

Veröffentlicht am:

31.03.2022