# Englische Übungen zu Ganze Zahlen

**1.** A thermometer shows – 3°C . How much did the temperature change if it showed…before?

a. +5° C

b. +1° C

c. 0° C

d. - 3°C

e. -8° C

**2.** An account has a balance of – 358 €. How many Euros must be paid into the account to reach a balance of

a. – 50 €

b. 0 €

c. + 145 €

**3.** Which statements are incorrect? Correct them!

a. $|-13| = +13$

b. $|-20| < +17$

c. $|-23| > -27$

d. $-|-13| = +13$

e. $|-12| > -12$

f. $-|-1| = -1$

g. $|-7| \geq |+7|$

h. $-|-7| \leq -7$

i. $-|-7| = -7$

j. $-8 < |-1|$

k. $|-11| = |+11|$

l. $|+8| \geq 8$

**4.** Add the numbers from the top row to the numbers from the left column!

a.

| | $(-8)$ | $(+2)$ | $(-3)$ | $0$ |
|---|---|---|---|---|
| $+5$ | | | | |
| $-6$ | | | | |

b.

| | $(-10)$ | $(+9)$ | $(-3)$ | $(-1)$ |
|---|---|---|---|---|
| $-11$ | | | | |
| $0$ | | | | |

**5.** Subtract the numbers from the top row from the numbers from the left column!

a.

| | $(-8)$ | $(+2)$ | $(-3)$ | $0$ |
|---|---|---|---|---|
| $+6$ | | | | |
| $-2$ | | | | |
| $-9$ | | | | |

b.

| | $(-10)$ | $(+9)$ | $(-3)$ | $(-1)$ |
|---|---|---|---|---|
| $-6$ | | | | |
| $-12$ | | | | |
| $+9$ | | | | |

**6.** Calculate the results!

a. $(+3) - (-8) =$

b. $(+4) - (-2) =$

c. $(-1) - (+5) =$

d. $(-7) - (-2) =$

e. $(-12) - (+9) =$

f. $(-1) - (+7) =$

g. $(+45) - (-24) =$

h. $(+35) - (+48) =$

**7.** Compare the results!

a. $3 - (-4) - 6 =$

b. $3 - 4 - (-6) =$

c. $-3 - (-4) + 6 =$

d. $-3 - 4 - (-6) =$

e. $-3 - (+4) - 6 =$

f. $-3 - (-4) - (+6) =$

g. $3 - (4 - 6) =$

h. $3 - (-4 - 6) =$

**8.** Fill in the correct symbol: „<“, „>“ or „=“

a. $(+9) + (-17)$ $\quad$ $(+9) - (-14)$

b. $(+12) - (+23)$ $\quad$ $(+12) + (-23)$

c. $6 - 17$ $\quad$ $6 + 17$

d. $-5 - (-7)$ $\quad$ $7 - 5$

**9.** Multiply the numbers from the top row with the numbers from the left column!

a.

| | $(-7)$ | $(+3)$ | $0$ | $(-2)$ |
|---|---|---|---|---|
| $-8$ | | | | |
| $+11$ | | | | |
| $+13$ | | | | |

b.

| | $(+13)$ | $0$ | $(-9)$ | $(+12)$ |
|---|---|---|---|---|
| $-7$ | | | | |
| $+9$ | | | | |
| $-11$ | | | | |

**10.** Which sign does the product of three integers have

a. when two of them are positive and one is negative,

b. when two of them are negative and one is positive,

c. when all of them are negative?

**11.** Compare the results. Is the order of dividend and divisor important?

a. (+15) : (-5) =
(-5) : (+15) =

b. (-20) : (-2) =
(-2) : (-20) =

c. (-72) : (+18) =
(+18) : (-72) =

**12.** Compare the results!

a. |156| : (-13) + (-112) : |16| =

b. 156 : |-13| + |-112| : 16 =

c. 121 : |11| + |96| : (-12) =

d. (-121) : |-11| - |-96| : (-12) =

## Vocabulary

| Englisch | Deutsch |
|---|---|
| account | Konto |
| balance | Kontostand |
| to compare | vergleichen |
| sign | Vorzeichen |
| integer | ganze Zahl |
| order | Reihenfolge |
| important | wichtig |
| product | Produkt (Ergebnis der Multiplikation) |
| dividend | Dividend (Erster Teil der Division) |
| divisor | Divisor (Zweiter Teil der Division) |
| to calculte | berechnen |

## Solutions

**1.** a. 8°C b. 4°C c. 3°C d. 0°C e. 5°C

**2.** a. 308€ b. 358€ d. 503€

**3.**

a. $|-13| = +13$ true
b. $|-20| < +17$ false, $|-20| > +17$
c. $|-23| > -27$ true
d. $-|-13| = +13$ false, $-|-13| < +13$
e. $|-12| > -12$ true
f. $-|-1| = -1$ true
g. $|-7| \geq |+7|$ true
h. $-|-7| \leq -7$ true
i. $-|-7| = -7$ true
j. $-8 < |-1|$ true
k. $|-11| = |+11|$ true
l. $|+8| \geq 8$ true

**4.**

a.

| | $(-8)$ | $(+2)$ | $(-3)$ | $0$ |
|---|---|---|---|---|
| $+5$ | $-3$ | $+7$ | $+2$ | $+5$ |
| $-6$ | $-14$ | $-4$ | $-9$ | $-6$ |

b.

| | $(-10)$ | $(+9)$ | $(-3)$ | $(-1)$ |
|---|---|---|---|---|
| $-11$ | $-21$ | $-2$ | $-14$ | $-12$ |
| $0$ | $-10$ | $+9$ | $-3$ | $-1$ |

**5.**

a.

| | $(-8)$ | $(+2)$ | $(-3)$ | $0$ |
|---|---|---|---|---|
| $+6$ | $+14$ | $+4$ | $+9$ | $+6$ |
| $-2$ | $+6$ | $-4$ | $+1$ | $-2$ |
| $-9$ | $-1$ | $-11$ | $-6$ | $-9$ |

b.

| | $(-10)$ | $(+9)$ | $(-3)$ | $(-1)$ |
|---|---|---|---|---|
| $-6$ | $+4$ | $-15$ | $-3$ | $-5$ |
| $-12$ | $+2$ | $-21$ | $-9$ | $-11$ |
| $+9$ | $+19$ | $0$ | $+12$ | $+10$ |

**6.**

a. $3 + 8 = 11$
b. $4 + 2 = 6$
c. $-1 - 5 = -6$
d. $-7 + 2 = -5$
e. $-12 - 9 = -21$
f. $-1 - 7 = -8$
g. $45 + 24 = 69$
h. $35 - 48 = -13$

**7.**

a. $3-(-4)-6=1$
b. $3-4-(-6)\ =5$
c. $-3-(-4)+6=7$
d. $-3-4-(-6)=-1$
e. $-3-(+4)-6=-13$
f. $-3-(-4)-(+6)=-5$
g. $3-(4-6)=5$
h. $3-(-4-6)=13$

**8.**

a. $(+9)+(-17)\ <\ (+9)-(-14)$
b. $(+12)-(+23)=\ (+12)+(-23)$
c. $6-17\ <\ 6+17$
d. $-5-(-7)=\ 7-5$

**9.**

| | $(-7)$ | $(+3)$ | $\mathbf{0}$ | $(-2)$ |
|---|---|---|---|---|
| $-8$ | $+56$ | $-24$ | $0$ | $+16$ |
| $+11$ | $-77$ | $+33$ | $0$ | $-22$ |
| $+13$ | $-91$ | $+39$ | $0$ | $-26$ |

b.

| | $(+13)$ | $\mathbf{0}$ | $(-9)$ | $(+12)$ |
|---|---|---|---|---|
| $-7$ | $-91$ | $0$ | $+63$ | $-84$ |
| $+9$ | $+117$ | $0$ | $-81$ | $+108$ |
| $-11$ | $-143$ | $0$ | $+99$ | $-132$ |

**10.**

a. -,
b. +,
c. –

**11.**

a. -3, not possible in $\mathbb{Z}$
b. +10, not possible in $\mathbb{Z}$
c. -4, not possible in $\mathbb{Z}$

The order is important!

**12.**

a. -19, 19
b. 3, 19

# Englische Übungen zu Rationale Zahlen

**1.** Which of the rational numbers $-\frac{23}{24}$ and $-\frac{24}{23}$ is situated left to – 1, which one right to – 1 on the number line?

**2.** Calculate and compare the results. Which arithmetic property is to apply?

a.

1) $\left(-1\frac{7}{8}\right)+\left(+\frac{5}{4}\right)=$

2) $\left(+\frac{5}{4}\right)+\left(-1\frac{7}{8}\right)=$

b.

1) $\left(-\frac{5}{12}\right)+(-0.75)=$

2) $(-0.75)+\left(-\frac{5}{12}\right)=$

c.

1) $\left[\left(-2\frac{3}{5}\right)+\left(-\frac{7}{10}\right)\right]+\left(+\frac{3}{2}\right)=$

2) $\left(-2\frac{3}{5}\right)+\left[\left(-\frac{7}{10}\right)+\left(+\frac{3}{2}\right)\right]=$

**3.** Calculate the difference between the numbers!

a. $-\frac{3}{4}$ and $+\frac{4}{5}$

b. $-4\frac{2}{3}$ and $-1\frac{1}{2}$

c. $-1\frac{3}{4}$ and 1.5

d. $-3\frac{3}{4}$ and -1.2

**4.** Write down three rational numbers that are situated between – 1.5 and – 0.5. What algebraic sign does the product of these three numbers have? Give reasons for your answer without calculating the result.

**5.** What is the result?

a. $2\frac{1}{2}\cdot\frac{2}{3}-\left(-1\frac{1}{2}\right):\frac{4}{5}=$

b. $\left(-5\frac{1}{2}\right)\cdot\left(-2\frac{1}{3}\right)+\left(-\frac{3}{4}\right):\frac{2}{3}=$

c. $\left(-5\frac{1}{2}\right)\cdot 2\frac{1}{3}+\left(-\frac{3}{4}\right):\frac{2}{3}=$

d. $\left[\left(-4\frac{2}{3}\right)\cdot\left(-1\frac{1}{2}\right)+\left(-4\frac{2}{9}\right)\right]:4\frac{1}{6}=$

**6.** Write these ratios in their simplest form!

a. 5 : 15
b. 6 : 10
c. 3 : 33
d. 14 : 35
e. 0.5 : 4
f. 36 : 48
g. 4 : 6 : 8
h. 10 : 15 : 25

**7.** There are 5 adults and 60 pupils on a school excursion. Find the ratio of adults to pupils and write it in is simplest form!

**8.** This table shows the colour of smartphone cases sold. Write these ratios in their simplest form!

a. red to green smartphone cases
b. blue to black smartphone cases
c. green to black smartphone cases
d. black to red smartphone cases

| smartphone cases | |
|---|---|
| red | 24 |
| green | 16 |
| blue | 21 |
| black | 30 |

## Vocabulary

| **Englisch** | **Deutsch** |
|---|---|
| to be situated | sich befinden |
| number line | Zahlenstrahl |
| arithmetic property | Rechengesetze |
| to apply | verwenden, anwenden |
| algebraic sign | Vorzeichen |
| ratio | Verhältnis |
| adult | Erwachsene(r) |
| pupil | Schüler/in |
| school excursion | Schulausflug |

## Solutions

**1.** $-\frac{23}{24}$ is situated right of – 1, because $-1 < -\frac{23}{24}$.
$-\frac{24}{23}$ is situated left of – 1, because $-\frac{24}{23} < -1$.

**2.**

a. 1) $-\frac{5}{8}$ 2) $-\frac{5}{8}$. The results are equal. The commutative law is to apply.
b. 1) $-1\frac{1}{6}$ 2) $-1\frac{1}{6}$. The results are equal. The commutative law is to apply.
c. 1) $-1\frac{4}{5}$ 2) $-1\frac{4}{5}$. The results are equal. The associative law is to apply.

**3.**

a. $\frac{31}{20}$
b. $\frac{19}{6}$
c. 3.25
d. 2.55

**4.** Eg: -1,4; -1; -0,52. The algebraic sign is negative, because $(-a) \cdot (-b) \cdot (-c) = -(a \cdot b \cdot c)$ with a, b, c ∈ $\mathbb{Q}^+$.

**5.**

a. $+3\frac{13}{24}$
b. $+11\frac{17}{24}$
c. $-13\frac{23}{24}$
d. $+\frac{2}{3}$

**6.**

a. 1 : 3
b. 3 : 5
c. 1 : 11
d. 2 : 5
e. 1 : 8
f. 3 : 4
g. 2 : 3 : 4
h. 2 : 3 : 5

**7.** 1 : 12

**8.**

a. Red : green = 3 : 2
b. Blue : black = 7 : 10
c. Green : black = 8 : 15
d. Black : red = 5 : 4

# Englische Übungen zu Potenzen

**1.** Solve without a calculator.

a. $3^3 =$
b. $4^3 =$
c. $2 \cdot 3^2 - 3 \cdot 2^3 =$
d. $(5 \cdot 3 - 10)^2 =$
e. $2^3 - 3 \cdot 2 =$
f. $\left[\frac{1}{4} \cdot (5-3)^2\right]^2 =$

**2.** Find the pairs. Write the correct letter in the gap.

| | | |
|---|---|---|
| **1** | $2^3 \cdot 3^2 \cdot 5^2$ | |
| **2** | $4 \cdot 4 \cdot 5 \cdot 5 \cdot 7 \cdot 7$ | |
| **3** | $(-4)^3 \cdot 8 \cdot 2^3$ | |
| **4** | $\left(\frac{1}{3}\right)^5 \cdot 27$ | |

| | |
|---|---|
| **A** | $4^2 \cdot 5^2 \cdot 7^2$ |
| **B** | $360$ |
| **C** | $1800$ |
| **D** | $\left(\frac{1}{3}\right)^2$ |
| **E** | $-2^{12}$ |
| **F** | $3 \cdot \frac{1}{3}$ |

**3.** Which is smaller, the sum of the squares of 5 and 6 or the square of the sum of 5 and 6?

**4.** Write as a power of ten!

**For example:** Ten Hundred: $10 \cdot 10^2 = 10^3$

a. a thousand
b. a million
c. a hundred thousand
d. ten million
e. a hundred million
f. ten thousand

**Notice:** We say $5 \times 10^4$ as five times ten to the power of four.

# Vocabulary

| Englisch | Deutsch |
|---|---|
| calculator | Taschenrechner |
| square | Quadrat |
| power | Potenz |
| power of ten | Zehnerpotenz |
| ten to he power of four | 10 hoch vier |
| Billion | Milliarden |

## Solutions

**1.**

a. 27
b. 64
c. 42
d. 25
e. 2
f. 1

**2.** 1C, 2A, 3E, 4D

**3.** The sum of the squares of 5 and 6 is smaller than the square of the sum of 5 and 6. (61; 121)

**4.**

a. $10^3$
b. $10^6$
c. $10^5$
d. $10^7$
e. $10^8$
f. $10^4$

# Englische Übungen zu Prozentrechnung und Zinsenrechnung

1. A suit costs 335 € ex VAT. When buying it 20 % VAT is added. At the end-of-season-sale the suit is sold for 20 % less.
   a. How much does the suit cost during the sale?
   b. By how many percentage does the sales price differ from the original price ex VAT?

2. A businessman dealing with furniture buys a kitchen set from the manufacturer for 3.285 €. He adds 4 % delivery costs, 12 % expenses, and 8 % profit. Calculate the sales price including 20 % VAT.

3. Ingrid is earning a monthly salary of 1 817.20 €. After negotiations her salary will rise by 2.5 %.
   a. How much more does she get?
   b. What will her new salary be?
   c. One year later, Ingrid negotiates a salary of 2 000 €. How many percentage points is her second negotiation better?

4. A company (Ltd) made a profit of 20 720 € in the past year. The whole profit was distributed and Mr. Bauer got 7 770 €. What percentage did Mr. Bauer get?

5. Calculate the annual interest of a principal of 5 000 € that earns at an interest rate of 4.5 % p. a. Don't forget about the dividend tax of 25 %.

**6.** Work out the interest at an interest rate of 2.5 % p. a. for the given part of one year (one year = 360 days in a bank). Don't forget about the dividend tax of 25 %.

| | a) | b) | c) | d) | e) | f) | g) |
|---|---|---|---|---|---|---|---|
| principal | 420 € | 608 € | 936 € | 1 155 € | 1 465 € | 2 155 € | 35 000 € |
| time (days) | 180 | 90 | 270 | 172 | 34 | 340 | 285 |

**7.** Mr. Smith has lent 920 € for 2 and a half months and 720 € for 3 months at an annual interest rate of 8 %. What is the interest in Euros that each of these loans earns him?

**8.** A principal of 1 800 € is invested at an annual interest rate of 3.5 % in a savings account.

a. Calculate the interest after one year. Don't forget about the dividend tax of 25 %.

b. What is the principal after one year?

**9.** On her birthday (Tuesday, March $17^{th}$) Sophie gets a savings book. What is the interest in Euros on March $17^{th}$ of the following year?

a. 1 000 € principal; 3 % annual interest rate; 25% dividend tax

b. 500 € principal, 4.5 % annual interest rate; 25% dividend tax

## Vocabulary

| **Englisch** | **Deutsch** |
|---|---|
| VAT = value added tax | Mehrwertsteuer (MWSt.) |
| ex VAT | exkl. MWSt. |
| end-of-season-sale | Schlussverkauf |
| to differ | abweichen |
| manufacturer | Erzeuger |
| delivery costs | Zustellgebühren |
| expenses | Regien |
| salary | Gehalt |
| negotiation | Verhandlung |
| percentage point | Prozentpunkt |
| Ltd = Limited | GmbH |
| profit | Gewinn |
| to distribute | ausschütten |
| dividend tax | KESt. |
| interest | Zinsen |
| annual interest | jährliche Zinsen |
| principal | Kapital |
| to earn | einbringen, verdienen |
| interest rate | Zinssatz |
| loan | Darlehen |
| saving account | Sparkonto |
| savings book | Sparbuch |

## Solutions

1.
   a. The suit costs 321.60 € during the sale.
   b. The suit at the sale is 4% cheaper than the price ex VAT.
2. The sales price including VAT is 4 959 €. (4 958.97)
3.
   a. Her monthly salary will raise by 45.43€.
   b. Her new salary is 1 862.63 €.
   c. Her second negotiation is 4.9 percentage points higher.
4. The Bauers participate in the company with 37.5%
5. The annual interests are 168,75 €.
6.
   a. 3.94 €
   b. 2.85 €
   c. 13.16 €
   d. 10.35 €
   e. 2.60 €
   f. 38.16 €
   g. 519.53 €
7. The interests are 15.33 € respectively 14.40 €.
8.
   a. 47.25 €
   b. 1 847.25 €
9.
   a. 22.50 €
   b. 16.88 €

# Englische Übungen zu Terme

**1.** Write an expression for the following statements. Let the unknown number be n.

a. subtract 5 from a number

b. add 6 to a number

c. multiply a number by 9

d. divide a number by 8

e. multiply a number by 5 and then add 4

f. multiply a number by 6 and then subtract 3

g. add 4 to a number and then multiply by 3

h. subtract 3 from a number and then multiply by 4

**2.** Write a word description for the term.

a. $(a + b) : 21$

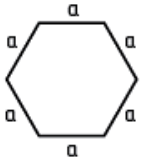
b. $\frac{15}{x-y}$

c. $(u \cdot v)^2$

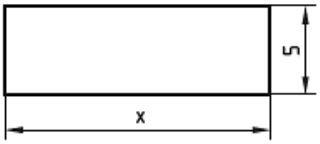
**3.** Write a formula for the total animal weight w of a cat weighing c kg, a dog weighing 20 kg and x chicken weighing 1.5 kg.

**4.** Give the formula of the perimeter p of the shape!

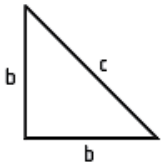
a)



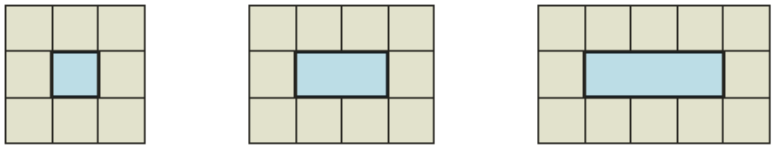

b)




c)



**5.** A gardener made ponds. They were all 1 m wide but of different lengths. She put paving stones around the edge. She wanted to know if there was a formula for the number of paving stones. Draw some more ponds that are 1 m wide. Fill in the table below. Try to find a formula that calculates the number of paving stones N for a pond of length L.



1 m x 1 m pond | 1 m x 2 m pond | 1 m x 3 m pond

| Length of Pond L | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Number of Paving Stones N | 8 | 10 | 12 | | | | | |

**6.** Simplify.

a. $2x(x-1)-(2x+1)^2=$

b. $(y-1)(y+4)-(y+2)^2=$

c. $(z-1)(2z-3)+(z-1)(2z+3)=$

d. $\frac{(m^5n^3)^2}{(-m^2n)^3}=$

**7.** Fill in the gaps.

a. $10x^2-5x=$ ____ $\cdot\,(\,2x-$ ____$)$

b. $(3k-4g)^2=$ _____ $+16g^2$

c. $(2r$ __ ____$)^2=$ ____ $-20rs$ __ ____

d. $\frac{a^3}{12}+\frac{3a^2}{4}-\frac{5a}{8}=$ ____ $\cdot\left(\frac{a^2}{3}+\right.$ _____$\left.\right)$

## Vocabulary

| Englisch | Deutsch |
|---|---|
| expression | Ausdruck |
| formula | Formel |
| total weight | Gesamtgewicht |
| to weigh | wiegen |
| perimeter | Umfang |
| shape | Figur |
| gardener | Gärtner/in |
| pond | Teich |
| paving stones | Pflastersteine |

# Solutions

**1.**

a. $n - 5$
b. $n + 6$
c. $9n$
d. $\frac{n}{8}$
e. $5n + 4$
f. $6n - 3$
g. $(n + 4) \cdot 3$
h. $(n - 3) \cdot 4$

**2.**

a. The sum of a and b divided by 21.
b. 15 is divided by the difference of x and y.
c. The square of u times v.

**3.** w = c + 20 + x · 1.5

**4.**

a. p = 6a
b. p = 2x +10
c. p = a + b + c

**5.** $N = 2 \cdot (3 + L)$

| L | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| N | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |

**6.**

a. $-2x^2 + 2x + 1$
b. $-y - 8$
c. $4z^2 - 4z$
d. $-m^4n^3$

**7.**

a. $5x \cdot (2x - 1)$
b. $9k^2 - 24\,kg + 16\,g^2$
c. $(2r - 5s)^2 = 4r^2 - 20rs + 25s^2$
d. $\frac{a}{4}\left(\frac{a^2}{3} + 3a - \frac{5}{2}\right)$

# Englische Übungen zu Gleichungen und Formeln

**1.** Simplify and solve the equation!

a. $12 – (2\,x + 5) = 23 – 8\,x$

b. $4{,}3x + 3{,}1 = 5 + 2{,}5x – (2{,}9 – 1{,}8x)$

c. $(x + 3)\,(x – 1) = (x + 1)\,(x – 2) – 2$

d. $(x + 6)\,(12\,x – 6) = 3 \cdot (2\,x)^2$

**2.** Find the numbers!

a. A number increased by 2 is 5 less than twice the number.

b. The sum of two consecutive integers is 1 less than 3 times the smaller.

3. There were a number of goats in a field. One of them had only three legs. The total number of legs was 155. How many goats were in the field?

4. Make the ratios eqivalent!
   a. 1 : 3 = 2 : ____
   b. 2 : 3 = 4 : ____
   c. 2 : 5 = ____ : 15
   d. 8 : 10 = 4 : ____
   e. 6 : 15 = 2 : ____
   f. 6 : 30 = 1 : ____

5. The ratio of men to women in a crowd is 3 : 5. If there are 12 men, how many women are there?

6. Express every variable in the formula $v = \frac{s}{t}$.

7. Andy, Ben and Chris did some work on a farm. They were paid in the ratio 4 : 2 : 1. Andy was paid the largest amount, 28 €. What did Ben and Chris get paid?

## Vocabulary

| Englisch | Deutsch |
|---|---|
| equation | Gleichung |
| to increase | vermehren |
| consecutive integers | aufeinander folgende ganze Zahlen |
| ratio | Verhältnis, Proportion |
| equivalent | äquivalent, übereinstimmend |
| express | ausdrücken |
| formula | Formel |
| crowd | Menge |

## Solutions

**1.**

a. $x = \frac{8}{3}$

b. no solution

c. $x = -\frac{1}{3}$

d. $x = \frac{6}{11}$

**2.**

a. x + 2 = 2x - 5; x = 7

b. x + (x + 1) = 3x – 1; x = 2

**3.** 155 = 4x + 3; x = 38. There are 39 goats on the field.

**4.**

a. 1 : 3 = 2 : 6

b. 2 : 3 = 4 : 6

c. 2 : 5 = 6 : 15

d. 8 : 10 = 4 : 5

e. 6 : 15 = 2 : 5

f. 6 : 30 = 1 : 5

**5.** There are 20 women in the crowd.

**6.** $s = v \cdot t;\ t = \frac{s}{v}$

**7.** Chris got paid 7 € and Ben got paid 14 €.

# Englische Übungen zu Wachstums- und Abnahmeprozesse

**1.** There are 5 miles to 8 kilometres.

a. Fill in the table.
b. Work out the ratio miles : kilometer for each pair of values in the table. What do you notice?
c. Is the number of kilometres directly proportional to the number of miles? Explain.
d. Draw the graph of this data. Put miles on the horizontal axis. Is it a straight line?

| Miles | Kilometres |
|---|---|
| 5 | 8 |
| 10 | |
| 15 | |
| 20 | |
| 25 | |

e. Find a formula for kilometres (y) depending on the variable miles (x).
f. How many kilometeres are
   1) 45 miles,
   2) 105 miles?

2. The two variables x and y are inversely proportional.

   (1| _____), (2|12), (3|8), (4|_____), (_____| 4)

   a. Calculate the missing values.
   b. Calculate the proportionality constant.
   c. Plot the curve.

3. Ann saved 5000 € at an interest rate of 4.5 %.
   a. Calculate the principal after four year. Don't forget about the dividend tax of 25 %.
   b. How much is the interest (minus taxes) after four years?
   c. After the four years, Ann decides to add 2500 €. Calculate the principal after another two years (new interest rate: 2 %).

## Vocabulary

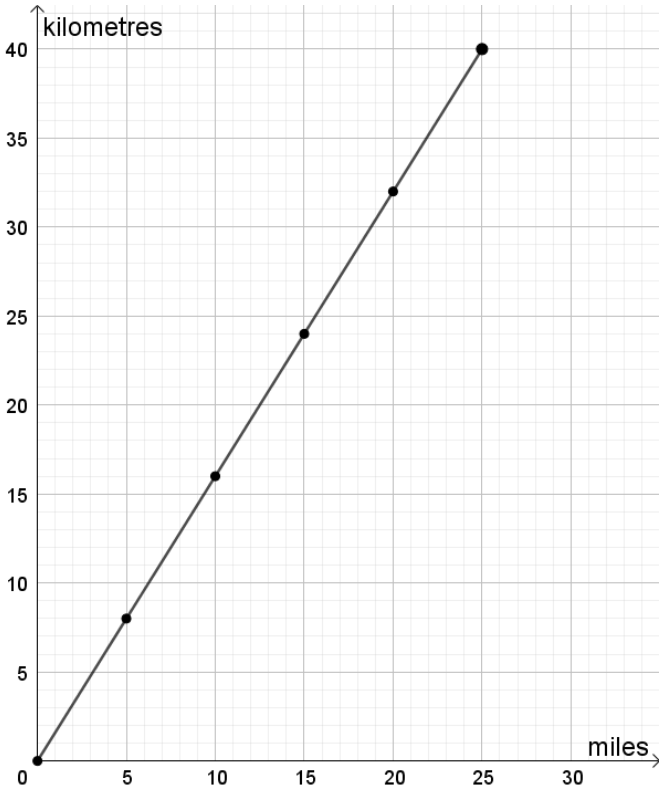
| Englisch | Deutsch |
|---|---|
| ratio | Verhältnis |
| value | Wert |
| directly proportional | direkt proportional |
| horizontal axis | horizontale Achse (x-Achse) |
| depending on | abhängig von |
| interest rate | Zinssatz |
| principal | Kapitel |
| dividend tax | KESt. |

# Solutions

**1.**

a.

| Miles | Kilometres |
|---|---|
| 5 | 8 |
| 10 | 16 |
| 15 | 24 |
| 20 | 32 |
| 25 | 40 |




b. m : k = 5 : 8; The ratio is always the same.

c. Yes, because the quotient „kilometres divided by miles“ is constant.

d. Compare the graph. Choose e.g. 1 miles ≙ 2mm, 1 km ≙1 mm

e. y = 1.6x

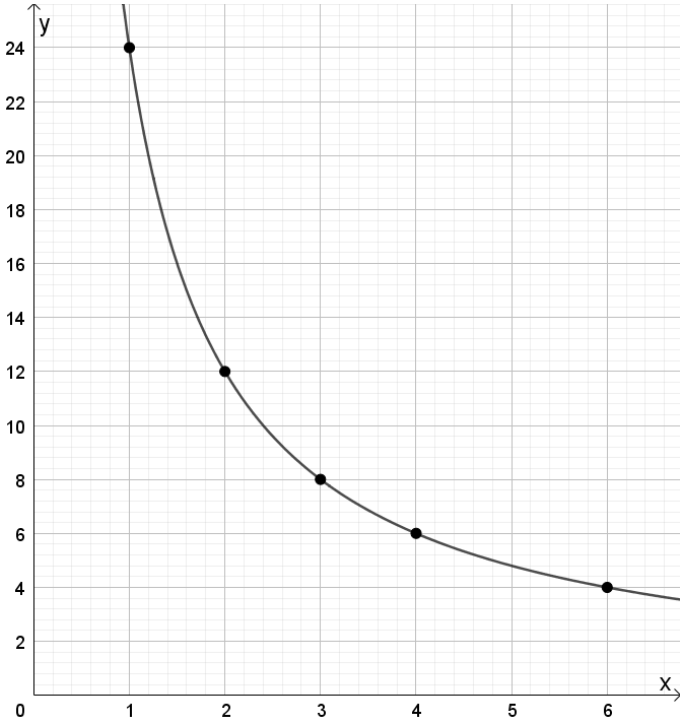
f.
1) 72 km
2) 168 km

**2.**

a. (1| 24), (2|12), (3|8), (4|6), (6|4)

b. The proportionality constant k is 24.

c. Choose e.g. x-axis: 1 ≙ 1 cm, y-axis: 1 ≙ 2 cm




**3.**

a. 6101,87 €
b. 1101,87 €
c. 8861,86 €

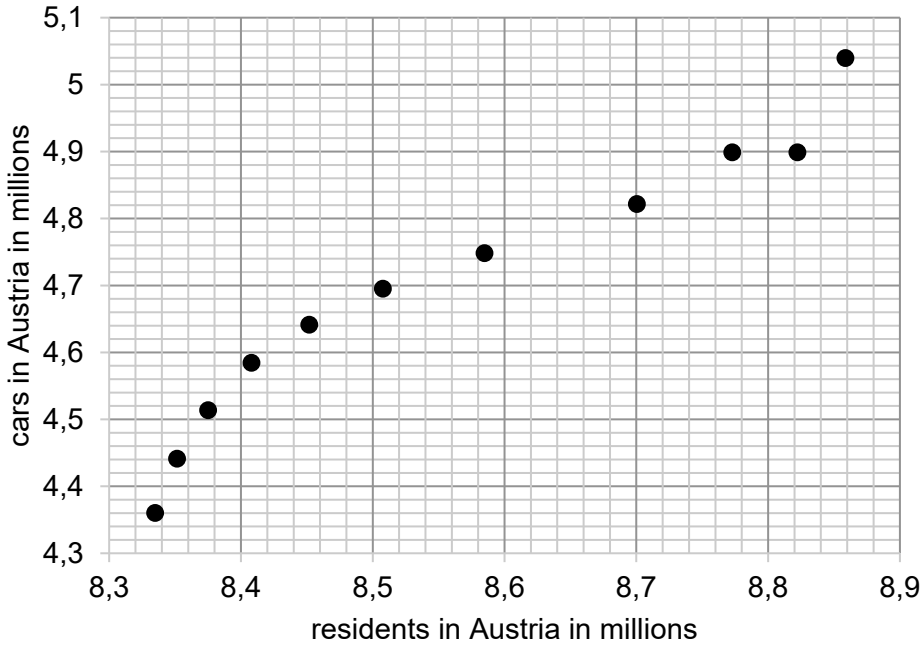
# Englische Übungen zu Statistik

1. A group of students is asked about their monthly pocket money in a survey. The results are (in €): 12, 20, 5, 9, 30, 40, 15, 20, 30, 20, 30, 30, 10, 15, 30, 40, 48, 15, 18, 25, 28, 45, 8, 10, 25
   a. Find the mean, median and mode of the data. What is the maximum and minimum pocket money?
   b. Divide the values into five equal-sized groups. Use a table to write down the frequency of each group.
   c. Approximate the mean of the grouped data by using the midpoint of each group.
   d. Use the table to draw a histogram of the monthly pocket money.

2. The table shows how many male and female students said that English is their best grade.
   a. Fill in the gaps. Calculate the percentage of students with English as the best grade for male and female students.
   b. Do more men or women say that English is their best grade?

| English best grade | male students | female students | **total** |
|---|---|---|---|
| yes | 157 | 68 | |
| no | 451 | 220 | |
| **total** | | | |

3. The scatter graph shows the relationship between the number of residents and cars in Austria. (source: statista.de, 2020; years: 2009-2019)
Is there any correlation between the number of residents and the number of cars in Austria? Find reasons for the type of correlation.




## Vocabulary

| Englisch | Deutsch |
|---|---|
| survey | Umfrage |
| mean | arithmetisches Mittel |
| median | Median |
| mode | Modus |
| equal-size group | gleich breite Klasse |
| table | Tabelle |
| frequency (of a group) | Häufigkeit (in einer Klasse) |
| tp approximate | annähern |
| grouped data | in Klassen eingeteilte Daten |
| midpoint of a group | Klassenmitte |
| histogram | Histogramm |
| grade | Note |
| percentage | Prozentsatz, relativer Anteil |
| scatter graph | Punktwolkendiagramm |
| relationship between | Zusammenhang zwischen |
| correlation | Zusammenhang (von Datensätzen) |

## Solutions

**1.**

a. mean: 23.1 €; median: 20 €; modus: 30 €; minimum: 5 €; maximum: 48 €

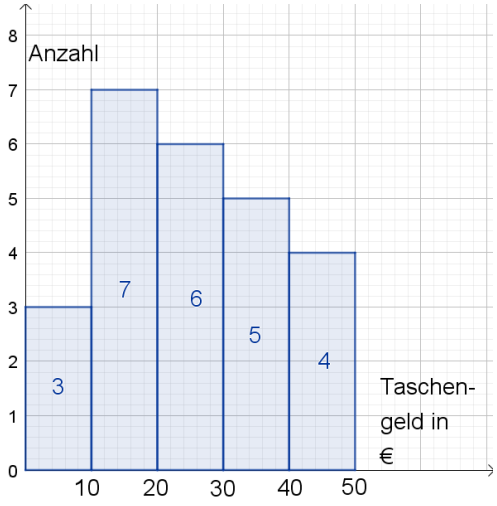
b.

| pocket money (in €) | frequency |
|---|---|
| 0 ≤ x < 10 | 3 |
| 10 ≤ x < 20 | 7 |
| 20 ≤ x < 30 | 6 |
| 30 ≤ x < 40 | 5 |
| 40 ≤ x < 50 | 4 |

c. $(5 \cdot 3 + 15 \cdot 7 + 25 \cdot 6 + 35 \cdot 5 + 45 \cdot 4) : 25 = 25$

The approxmation is 1,9 € less than exactly calculated mean.

d.




**2.**

a.

| English best grade | Male students | Female students | **total** |
|---|---|---|---|
| Yes | 157 // 17.5% | 68 // 7,6% | 225// 25.1% |
| No | 451 // 50.3% | 220 // 24,6% | 671// 74.9% |
| **total** | 608// 67,8 % | 288// 32,2% | 896// 100% |

b. There are 225 students, who say that English is their best grade. Only $\frac{68}{225} \approx 30,2\ \%$ of that students are female. Therefore more male students say that English is their best grade.

**3.** The two sets of data show a positive correlation. As the number of residents increases the number of cars increase with one acception. It can be assumed that these two things are connected.

# Englische Übungen zu Flächeninhalt ebener Vielecke

1. Plot the points A(– 8 |4), B(7|–7) and C(– 2|5) in a coordinate system and connect them. What is the size of the angle
   a. ∢ABC,
   b. ∢BCA,
   c. ∢CAB?

2. A parallelogram ABCD is given by A = 44 cm², b = 5.8 cm and $h_a$ = 5.5 cm. Calculate the length of side a and construct the parallelogram.

**3.** A triangle ABC is given by the coordinates of its vertices A(–6|–5), B(10|–3), C(4|9).

a. Find the coordinates of the circumcentre!
b. Find the coordinates of the incentre!
c. Find the coordinates of the centroid!
d. Find the coordinates of the orthocentre!
e. Calculate its area.

**4.** Calculate the area of the triangle ABC with side b = 6.1 cm and height $h_b$ = 7.3 cm.

**5.** A triangle ABC has area A = 166.6 $cm^2$ and height $h_c$ = 8.5 cm.
Calculate the length of side c.

**6.** Draw the given figure and calculate its area!

a. Kite with length a = 5.1 cm and diagonals e = 8.6 cm and f = 7.0 cm
b. Rhombus with the diagonals e = 10.3 cm and f = 7.6 cm
c. Square with the diagonal d = 6.8 cm

**7.** Calculate the area of the trapezoid (trapezium) ABCD with the parallel sides a = 4.8 cm and c = 2.6 cm and the height h = 2.3 cm.

8. This polygon is given by the coordinates of its vertices.
   Draw the polygon and calculate its area!
   a. A(– 5|–1), B(3|–2), C(3|1), D(–1|4)
   b. A(–3|–4), B(2|–6), C(7|–4), D(7|5), E(0|5)

## Vocabulary

| Englisch | Deutsch |
|---|---|
| to plot | zeichnen |
| coordinate system | Koordinatensystem |
| to connect | verbinden |
| size | Größe |
| coordinate | Koordinate |
| vertex (vertices) | Eckpunkt(e) |
| circumcentre | Umkreismittelpunkt |
| incentre | Inkreismittelpunkt |
| centroid | Schwerpunkt |
| orthocentre | Höhenschnittpunkt |
| to construct | konstruieren |
| side | Seite |
| parallelogram | Parallelogramm |
| triangle | Dreieck |
| height | Höhe |
| to draw | zeichnen |
| kite | Deltoid, Drache |
| rhombus | Rhombus |
| square | Quadrat |
| trapezoid (trapezium) | Trapez |
| polygon | Vieleck |

## Solutions

**1.**

a. ∢ABC = 17°
b. ∢BCA = 117°
c. ∢CAB = 46°

**2.** a = 8 cm

**3.**

a. U (1.5|0.2)
b. I (3.3|0.6)
c. S (2.7|0.3)
d. H (5.1|0.4)
e. A = 102 $E^2$

**4.** The area is $\approx 22\ cm^2$.

**5.** c = 39.2 cm

**6.**

a. A = 30.1 cm²
b. A $\approx 39\ cm^2$
c. A $\approx 23\ cm^2$

**7.** A $\approx 8.5\ cm^2$

**8.**

a. A = 28 cm²
b. A = 86.5 cm²

# Englische Übungen zu Satz des Pythagoras

1. A right-angled triangle is given by its hypotenuse c = 51 mm and one of its legs a = 24 mm.
   a. Draw the triangle and measure the length of side b.
   b. Calculate the other leg by using Pythagoras' theorem.
   c. Find the area of the triangle.
   d. How long is $h_c$? Compare your calculation with the measurement in your drawing.

2. A right-angled triangle has an area of 45.36 $cm^2$ and the leg b = 18.9 cm. How long is the other leg a and the hypotenuse c of this triangle?

3. An isosceles triangle is given by its equally long legs a = b = 7.5 cm and its height $h_c$ = 4.5 cm. Calculate the length of the base c and the area of the isosceles triangle!

4. Two of these trinagles are right-angled. Which ones?
   - O **A** 11.5 cm, 29.9 cm, 27.6 cm
   - O **B** 14.9 dm, 8.4 dm, 11.2 dm
   - O **C** 5.8 cm, 9.3 cm, 12.1 cm
   - O **D** 28 m, 45 m, 53 m

## Vocabulary

| **Englisch** | **Deutsch** |
|---|---|
| right-angled triangle (right triangle | rechtwinkeliges Dreieck |
| hypotenuse | Hypotenuse |
| measure | messen |
| Pythagoras theorem | Satz des Pythagoras |
| leg | Kathete |
| isosceles triangle | gleichschenkeliges Dreieck |
| leg | Schenkel |
| base | Basis |

## Solutions

**1.**

a. individual solution
b. b = 45 mm
c. A = 540 $mm^2$
d. ≈ 10.6 mm

**2.** a = 4.8 cm, c = 19.5 cm

**3.** c = 12 cm, A = 27 $cm^2$

**4.** A, D

# Englische Übungen zu Körper

1. A cuboid has the given lateral edges a, b and c. Calculate the
   a. volume,
   b. surface and
   c. length of its space diagonal and the diagonals of its lateral faces!
      1) a = 45 cm, b = 36 cm, c = 24 cm
      2) a = b = 12 m, c = 6 m
      3) a = b = c = 6.4 m

2. A cuboid has edges with the lengths of 12 cm, 15 cm and 30 cm.
   Calculate its mass if the cuboid is made of silver with density ρ = 10 500 kg/$m^3$!

3. A cube has edges with the length of 25 cm. Calculate its mass if the cube is made of the given material.
   a. Wood (ρ = 500 kg/$m^3$)
   b. Glass (ρ = 2 500 kg/$m^3$)
   c. Gold (ρ = 19 300 kg/$m^3$)

4. Choose to complete the following sentence correctly.
   The _____①_____ of a pyramid with square base of six centimetres and hight of 5 centimetres is calculated with _____②_____.

| ① | |
|---|---|
| O | mass |
| O | area |
| O | volume |

| ② | |
|---|---|
| O | $6^2 \cdot 5$ |
| O | $6 \cdot 2 \cdot 5$ |
| O | $6^2 + 5^2$ |

## Vocabulary

| Englisch | Deutsch |
|---|---|
| curboid | Quader |
| lateral edge | Seitenkante |
| lateral face | Seitenfläche |
| volume | Rauminhalt, Volumen |
| surface | Inhalt der Oberfläche |
| diagonals of a lateral face | Flächendiagonale |
| cuboid | Quader |
| edge | Kante |
| mass | Masse |
| silver | Silber |
| density | Dichte |
| cube | Würfel |
| space diagonal | Raumdiagonale |

## Solutions

**1.**

a.

1) $V \approx 38\,900\ cm^3$
2) O ≈ 7 130 cm²
3) $d_1 \approx 58\ cm;\ d_2 = 51\ cm;\ d_3 \approx 43\ cm; d \approx 62\ cm$

b.

1) $V = 864\ m^3$
2) $O = 576\ m^2$
3) $d_1 \approx 17\ m;\ d_2 = 13.4\ m;\ d_3 \approx 13.4\ m; d = 18\ cm$

c.

1) $V \approx 252\ m^2$
2) $O \approx 246\ m^2$
3) $d_1 \approx 9.1\ m; d \approx 11.1\ m$

**2.** The mass is 56.7 kg.

**3.**

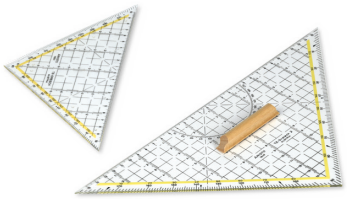
a. 7.8 kg
b. 39 kg
c. 302 kg

**4.** The volume of a pyramid with square base of six centimetres and hight of 5 centimetres is calculated with 6 · 2 · 5.

# Englische Übungen zu Ähnlichkeit

1. Draw a parallelogram with a = 6 cm, b = 4.5 cm, e = 9 cm.
   Draw a similar parallelogram with $e_1$ = 6 cm!

2. Why are the two triangles in the picture similar?



3. Divide a line segment PQ of 9 cm into 7 equal segments, applying the First Theorem of Proportional Segments.





picture ex 3: oebv/franc, 009

**4.** The ratio of the lengths of two line segments u and v is 3 : 5. The length of u is 2.7 cm.

a. Find the length of v by means of construction (Theorem of Proportional Segments)!

b. Verify the result by means of calculation and measuring!

**5.** The lengths of the sides of a quadrilateral are a = 3 cm, b = 1.8 cm, c = 1.2 cm, d = 2.4 cm. The perimeter of a similar quadrilateral is $u_1$ = 11.2 cm.

a. Calculate the lengths of the sides of the similar quadrilateral.

b. What is the ratio of the areas of the two quadrilaterals?

**6.** Enlarge the line segment PQ ($\overline{PQ}$ = 56 mm) at a ratio of 4 : 5.





picture ex 3: oebv/franc, 009

7. The shadow of a chimney is
   a. 26 m,
   b. 35 m,
   c. 48 m long.

   At the same time the shadow of a man who is 1.80 m tall is 2.25 m long. Calculate the height of the chimney!

## Vocabulary

| **Englisch** | **Deutsch** |
|---|---|
| similar | ähnlich |
| line segment | Strecke |
| First Theorem of Proportional Segments | erster Strahlensatz |
| ratio | Verhältnis |
| quadrilateral | Viereck |
| perimeter | Umfang |
| to enlarge | vergrößern |
| shadow | Schatten |
| chimney | Rauchfang |
| by means of | mit Hilfe von |
| to varify | prüfen |





picture ex 3: oebv/franc, 009

## Solutions

1. $a_1 = 4\ \text{cm};\ b_1 = 3\ \text{cm}$

2. Because all angles are equal.

3. One segment is approximately 1.3 cm long.

4. v = 4.5 cm

5.
   a. $a_1 = 4\ \text{cm};\ b_1 = 2.4\ \text{cm};\ c_1 = 1.6\ \text{cm};\ d_1 = 3.2\ \text{cm}$
   b. $A : A_1 = 9 : 16$

6. 70 mm

7.
   a. 20.8 m
   b. 28 m
   c. 38.4 m





picture ex 3: oebv/franc, 009