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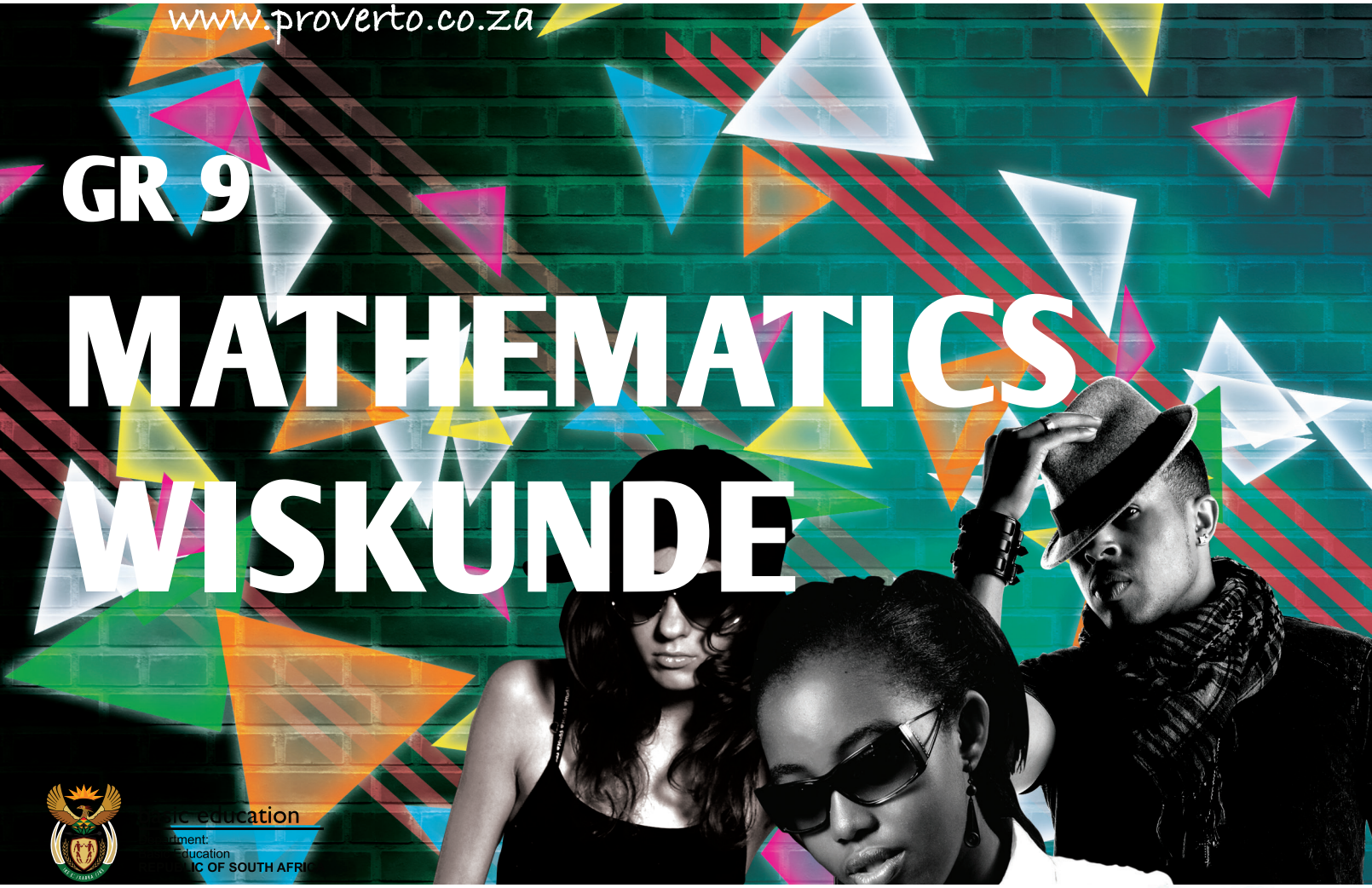

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Contents /Inhoud

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A rational number is any real number that can be written as a quotient of two integers with the denominator being nonzero, that is $\frac{a}{b} \in \mathbb{Q}$ where a and b are integers with $b \neq 0$.

The top number in the fraction is called the *numerator* and the bottom numbers the *denominator*.

- 0,5673 is a rational number because $2{,}5673 = \frac{25673}{10000} \in \mathbb{Q}$
- $0,\dot{3} = 0{,}333\ldots$ is a rational number because $0,\dot{3} = \frac{3}{9} = \frac{1}{3} \in \mathbb{Q}$

A fraction with a numerator greater than the denominator is an *improper fraction*, for example $\frac{8}{3}$ and $-\frac{12}{5}$.

A *mixed number* is the sum of an integer and a proper fraction, for example $2\frac{2}{5}$ of $-7\frac{3}{8}$.

Example: Convert $0,\overline{83}$ to a fraction

Call this number x. Then $x = 0{,}838383\ldots$

First, you have to count the number of digits in the repetend. If we multiply x by 100 (the reason we multiplied x by 100 is because we had two repeating digits. If we had four repeating digits, we would simply multiply by 1 0000), we get: $100x = 83{,}838383\ldots$

After we multiply we get:

$100x = 83 + 0{,}838383\ldots$

Then $100x = 83 + x$

$\therefore 99x = 83$

$\therefore x = \frac{83}{99}$ Therefore $0,\overline{83} = \frac{83}{99}$

'n Rasionale getal is enige heelgetal wat as die kwosiënt van twee heelgetalle, met die noemer ongelyk aan nul, geskryf kan word. Dit is $\frac{a}{b} \in \mathbb{Q}$ waar a en b heelgetalle is met $b \neq 0$.

Die boonste getal van die breuk word die *teller* genoem terwyl die onderste getal die *noemer* genoem word.

- 0,5673 is 'n rasionale getal aangesien $2{,}5673 = \frac{25673}{10000} \in \mathbb{Q}$
- $0,\dot{3} = 0{,}333\ldots$ is 'n rasionale getal aangesien $0,\dot{3} = \frac{3}{9} = \frac{1}{3} \in \mathbb{Q}$

'n Breuk waarvan die teller groter as noemer is word 'n *onegte breuk* genoem, byvoorbeeld $\frac{8}{3}$ and $-\frac{12}{5}$.

'n Gemengde getal is die som van 'n heelgetal en 'n egte breuk, byvoorbeeld $2\frac{2}{5}$ of $-7\frac{3}{8}$.

Voorbeeld: Herskryf $0,\overline{83}$ as 'n breuk

Noem hierdie getal x. Dan is $x = 0{,}838383\ldots$

Ons moet eerstens die aantal getalle in die herhalende gedeelte tel. Indien x met 'n 100 maal (die rede waarom ons met 100 maal is omdat daar twee getalle in die herhalende gedeelte van die breuk is. As daar vier getalle is moet met 1 0000 gemaal word): $100x = 83{,}8383\ldots$

Na vermenigvuldiging kry ons:

$100x = 83 + 0{,}838383\ldots$

Dan is $100x = 83 + x$

$\therefore 99x = 83$

$\therefore x = \frac{83}{99}$ Daarom is $0,\overline{83} = \frac{83}{99}$

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Exercise 1

1. Use your calculator to represent the following rational numbers in decimal form:
   $\frac{3}{4}$; $\frac{0}{7}$; $\frac{3}{8}$; $\frac{-23}{6}$

2. Express the following numbers as common fractions without using a calculator:
   0,34; $8\frac{3}{4}$; 0,125; –23,7; $0,\dot{6}$; $8,4\overline{56}$

3. Express as a fraction the amount by which 0,6696666… exceeds $\frac{2}{3}$.

4. Construct the irrational number $\sqrt{10}$ on the number line.

5. a) What is the meaning of π?
   b) Is π a rational number? Explain your answer.
   c) Is $\frac{22}{7}$ a rational number? Explain your answer.
   d) Is π exactly equals to $\frac{22}{7}$?

6. What number is halfway between
   a) 0,34 and 0,341
   b) $\frac{3}{5}$ and $\frac{4}{7}$
   c) 0,56 and $\frac{7}{12}$

7. Arrange the following numbers from smallest to largest:
   a) $2,3645\overline{9}$; $2,\overline{36459}$; $2,364\overline{59}$; $2,3\overline{6459}$; $2,36\overline{459}$
   b) $\frac{13}{30}$; $\frac{3}{7}$; $\frac{5}{12}$
   c) –3,38; $\frac{-22}{7}$; –π; $-\sqrt{10}$; $\frac{10}{-3}$; $-3,3\dot{2}$

Oefening 1

1. Gebruik ‘n sakrekenaar om die volgende rasionale getalle as desimale breuke te skryf:
   $\frac{3}{4}$; $\frac{0}{7}$; $\frac{3}{8}$; $\frac{-23}{6}$

2. Druk die volgende getalle uit as gewone breuke sonder om van ‘n sakrekenaar gebruik te maak:
   0,34; $8\frac{3}{4}$; 0,125; –23,7; $0,\dot{6}$; $8,4\overline{56}$

3. Druk die hoeveelheid wat 0,6696666… van $\frac{2}{3}$ verskil as ‘n breuk uit.

4. Konstrueer die getal $\sqrt{10}$ op die getalle lyn.

5. a) Wat beteken π?
   b) Is π ‘n rasionale getal? Verduidelik jou antwoord.
   c) Is $\frac{22}{7}$ ‘n rasionale getal? Verduidelik jou antwoord
   d) Is π presies gelyk aan $\frac{22}{7}$?

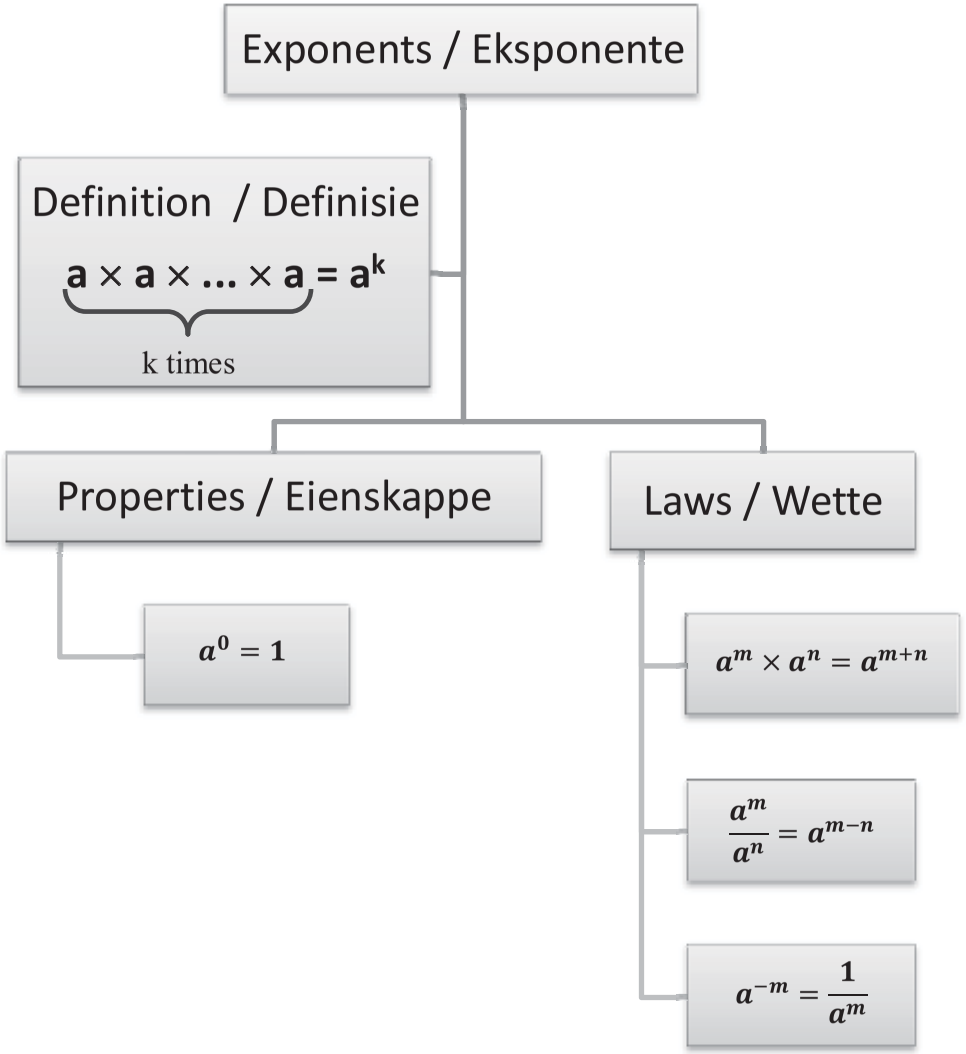
6. Bepaal die getal wat presies tussen die volgende getalle is:
   a) 0,34 en 0,341
   b) $\frac{3}{5}$ en $\frac{4}{7}$
   c) 0,56 en $\frac{7}{12}$

7. Herrangskik die volgende getalle van klein na groot:
   a) $2,3645\overline{9}$; $2,\overline{36459}$; $2,364\overline{59}$; $2,3\overline{6459}$; $2,36\overline{459}$
   b) $\frac{13}{30}$; $\frac{3}{7}$; $\frac{5}{12}$
   c) –3,38; $\frac{-22}{7}$; –π; $-\sqrt{10}$; $\frac{10}{-3}$; $-3,3\dot{2}$

8. Complete the following table (True or False):

8. Voltooi die volgende tabel (Waar of Vals):

Number	$\mathbb{N}_0$	$\mathbb{N}$	$\mathbb{Z}$	$\mathbb{Q}$	$\mathbb{Q}'$	$\mathbb{R}$
2,12						
120						
$3,\overline{485}$						
π						
3,14						
$\frac{22}{7}$						
$\sqrt{16}$						
$\sqrt{5}$						
$\sqrt[3]{-8}$						
$-3\frac{2}{3}$						
-8						
$\frac{14}{7}$						
$\frac{0}{12}$						



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Exercise 2

1. Are the following true or false?
   a) $2^5 \times 2^4 = 4^{4+5} = 4^9$
   b) $2^2 + 2^3 = 2^5$
   c) $6^0 = 0$
   d) $2^4.2^5 = 2^{20}$
2. Simplify without using a calculator:
   a) $\frac{3x^3 \times 4x^5}{6x^{10}}$
   b) $(8xy^4)^0$
   c) $\frac{(-8x^3y^4)(-2x^2y^2)}{32x^6y^{-3}}$
   d) $\frac{-20a^5b \times 3a^2b^3}{-10a^0b \times 2a^4b^5}$
   e) $3^0 + 3^{-2} + 3^2$
3. Write in scientific notation without the use of a calculator:
   a) 0,0000346
   b) 245300000
4. Express as a decimal number without the use of a calculator:
   a) $3{,}45 \times 10^{-4}$
5. Calculate without the use of a calculator:
   a) $(1{,}5 \times 10^{-16}) \times (3{,}0 \times 10^5)$
   b) $(2{,}4 \times 10^{-4}) \div (1{,}2 \times 10^{-9})$

Oefening 2

1. Is die volgende waar of vals?
   a) $2^5 \times 2^4 = 4^{4+5} = 4^9$
   b) $2^2 + 2^3 = 2^5$
   c) $6^0 = 0$
   d) $2^4.2^5 = 2^{20}$
2. Vereenvoudig sonder om 'n sakrekenaar te gebruik:
   a) $\frac{3x^3 \times 4x^5}{6x^{10}}$
   b) $(8xy^4)^0$
   c) $\frac{(-8x^3y^4)(-2x^2y^2)}{32x^6y^{-3}}$
   d) $\frac{-20a^5b \times 3a^2b^3}{-10a^0b \times 2a^4b^5}$
   e) $3^0 + 3^{-2} + 3^2$
3. Skryf in wetenskaplike notasie sonder om 'n sakrekenaar te gebruik:
   a) 0,0000346
   b) 245300000
4. Druk uit as 'n desimale getal sonder om 'n sakrekenaar te gebruik:
   a) $3{,}45 \times 10^{-4}$
5. Bereken sonder om 'n sakrekenaar te gebruik:
   a) $(1{,}5 \times 10^{-16}) \times (3{,}0 \times 10^5)$
   b) $(2{,}4 \times 10^{-4}) \div (1{,}2 \times 10^{-9})$

Ratio, rate and proportion / Verhoudings, tempo's en eweredighede

A ratio is an expression that compares two similar quantities by division

'n Verhouding is 'n uitdrukking wat twee soorgelyke hoeveelhede wat vergelyk word deur deling

There are diffrent ways to write the ratio of *a* to *b*: a / b or *a:b*

Daar bestaan verskillende wyses waarop die verhouding van a tot b aangedui kan word: a / b of *a:b*

A rate is an expression that compares two diffirent quantities by division

'n Tempo/koers is 'n uitdrukking wat twee verskillende hoeveelhede vergelyk deur deling

A *unit rate* compares a quantity to its unit of measure

'n Eenheids koers/tempo vergelyk 'n hoeveelheid met sy eenheidsmeting

Examples of unit rates / Voorbeelde van eenheidskoerse:

30 km ***per*** hour; R8,50 ***per*** litre; 12 km ***per*** litre

A proportion is a statement about the equality of two ratios or rates

'n Eweredigheid is 'n bewering wat handel oor die gelykheid van twee verhoudings (of tempo's)

When two ratios are equal, a proportion is formed / Wanneer twee verhoudings of koerse gelyk is, vorm dit 'n eweredigheid:

a/b = c/d or a:b = c:d

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Exercise 3

1. If two chocolates cost R8,00, what is the cost of a dozen of these chocolates?
2. The cost of one US dollar is R8,20. How many US dollars will you get for R1000,00?
3. A car travels 24 kilometers on 2 liters of petrol. How far will it travel on 15 liters of petrol?
4. A recipe requires 6 eggs to make 50 cookies. How many eggs do you need to bake 120 cookies?
5. It costs R 30 000 to build a home with an area of 20 square meters. What will it cost to build a home of 50 square meters?
6. If you work 3 months to earn R 6 000 how long do you have to work to buy a car that costs R 30 000?
7. Tembi's family traveled 692 km at 120 km/h. How long did the trip take?
8. To make 10 kg concrete you need 7 kg of cement. If you need 500 kg concrete how many bags of cement will you need if one bag contains 40 kg cement?
9. You paid R 20 000 rand to pave the driveway of 78 m^2, what was the price per m^2?
10. If Mapoela takes 5 hours to paint 35 m^2, what area can she paints in 44 hours?
11. It takes Andile 24 hours to paint a room. Peter needs 48 hours to paint the same room working alone. If Peter and Andile paint the room together, how long would it take?

Oefening 3

1. As twee sjokolades R8,00 kos, hoeveel sal een dosyn van hierdie sjokolades kos?
2. Die koste van een US dollar is R8,20. Hoeveel US dollars sal jy kan kry vir R1000,00?
3. 'n Motor kan 24 kilometers aflê met 2 liter petrol. Hoe ver sal die motor met 15 liters petrol kan ry?
4. 'n Resep benodig 6 eiers vir 50 koekies. Hoeveel eiers is nodig vir 120 koekies?
5. Dit kos R 30 000 om 'n huis met 'n oppervlakte van 20 vierkante meter te bou. Wat sal dit kos om 'n huis van 50 m^2 te bou?
6. As jy 3 maande werk om R 6 000 te verdien, hoe lank sal jy moet werk om 'n motor te koop wat R 30 000 kos?
7. Tembi se familie ry 692 km teen 120 km/h. Hoe lank het die rit geneem?
8. Om 10 kg beton aan te maak benodig jy 7 kg sement. As jy 500 kg beton benodig, hoeveel sakke sement sal jy nodig hê as een sak sement 40 kg bevat?
9. Jy betaal R 20 000 rand om plaveisel van 78 m^2 te lê, wat was die koste per vierkante meter?
10. As Mapoela 5 ure benodig om 'n oppervlakte van 35 m^2 te verf, watter oppervlakte behoort sy in 44 ure te kan verf?
11. Dit neem Andile 24 uur om 'n kamer alleen te verf. Peter het 48 uur nodig om die kamer op sy eie te verf. Indien Peter en Andile saamwerk, hoe lank sal dit neem om die kamer te verf?

Finance / Finansies

A: Accumulated or Future value / Toekomstige waarde

P: Principal or initial quantity / Huidige waarde

n: number of periods / Aantal tydperke

i: interest rate per period (decimal) / Rentekoers per tydperk (desimaal)

Simple interest / Enkelvoudige rente

$A = P(1+ in)$

Hire purchase / Huurkoop

Take immediate possession of an item BUT pay deposit & remainder in monthly instalments

Neem onmiddelik besit van item MAAR betaal deposito & betaal res in maandeliks paaiemente af

Step 1: Loan (*P*) = total price – deposit

Lening (*P*) = totale prys – deposito

Step 2: Calculate / Bereken $A = P(1 + in)$

Step 3: Calculate instalments: $A \div$ (number of instalments)

Bereken paaiemente: $A \div$ (aantal paaiemente)

Straight line depreciation

Reguitlyn-depresiasie

$A = P(1 - in)$

Compound interest / Saamgestelde rente:

$A = P(1 + i)^n$

Example: If you invest R 100 for 4 years at 18% per annum compounded:

Voorbeeld: Belê R 100 vir 4 jaar teen 18% per jaar saamgestel:

Monthly / Maandeliks

$P = 100$; $i = 0{,}18/12 = 0{,}015$; $n = 48 \Rightarrow A = 100(1 + 0{,}015)^{48} = R204{,}35$

Quaterly / Kwartaalliks

$P = 100$; $i = 0{,}18/4 = 0{,}045$; $n = 16 \Rightarrow A = 100(1 + 0{,}045)^{16} = R202{,}24$

Semi-annually / Halfjaarliks saamgestel

$P = 100$; $i = 0{,}18/2 = 0{,}09$; $n = 8 \Rightarrow A = 100(1 + 0{,}09)^{8} = R199{,}26$

Depreciation on a reducing balance

Depresiasie op verminderde balans

$A = P(1 - i)^n$

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Exercise 4

1. A savings account of R 2 300 earns simple interest at 12% per annum. Calculate
   a) the amount accumulated after ten years
   b) the total interest earned after the ten years
2. A savings account of R 2 300 earns compound interest at 12% per annum. Calculate
   a) the amount accumulated after ten years
   b) the total interest earned after the ten years
3. Esther is planning to buy a car on a hire purchase agreement. The cash price of the car R 30 000. The hire purchase price is 15% more than the cash price. The hire purchase agreement requires a deposit of 25% of the cash price. The interest charged on the loan is 18% per annum. Calculate the monthly installment if you have to pay the outstanding balance back in 5 years.
5. A new TV costs R 2 600 cash. You can buy it on hire purchase by paying a deposit of 20% followed by 12 installments of R 200. Calculate the total interest that you have to pay.
6. Belinda has a laptop which is worth R 7 000 today.
   a) What is the laptop worth after 5 years if you use straight-line depreciation to reduce the value at a rate of 15% per annum?
   b) What is the laptop worth after 5 years if you use depreciation on a reducing balance at a rate of 15% per annum?
   c) Draw the graphs of cases a) and b) showing the change in value of the laptop over the five years.

Oefening 4

1. 'n Spaarrekening van R 2 300 verdien enkelvoudige rente teen 12% per jaar. Bereken:
   a) die aangegroeide bedrag na tien jaar.
   b) die totale rente wat in tien jaar verdien word.
2. 'n Spaarrekening van R 2 300 verdien saamgestelde rente teen 12% per jaar. Bereken:
   a) die aangegroeide bedrag na tien jaar.
   b) die totale rente wat verdien word in tien jaar.
3. Ester is van plan op 'n motor op huurkoop te koop. Die kontantprys van die motor is R 30 000. Die huurkoopprys is 15% meer as die kontantprys. Die huurkoop ooreenkoms vereis 'n deposito van 25% van die kontantprys. Die rente koers wat op die lening gehef word is 18%. Bereken die maandelike paaiemente indien jy die uitstaande bedrag in 5 jaar moet delg.
4. 'n Nuwe TV kos R 2 600 kontant. Dit kan ook op huurkoop gekoop word deur 'n deposito van 20% gevolg deur 12 paaiemente van R 200. Bereken die totale rente wat betaal moet word.
6. Belinda het 'n laptop wat huidiglik R 7 000 werd is.
   a) Hoeveel sal die laptop na 5 jaar werd wees as dit teen 15% per jaar reguitlyn-depresiasie verminder?
   b) Hoeveel sal die laptop na 5 jaar werd wees as dit teen 15% per jaar met depresiasie op die verminderde balans bereken word?
   c) Teken die grafieke van gevalle a) en b) wat die verandering in die waarde van die laptop oor die vyf jaar periode voorstel.

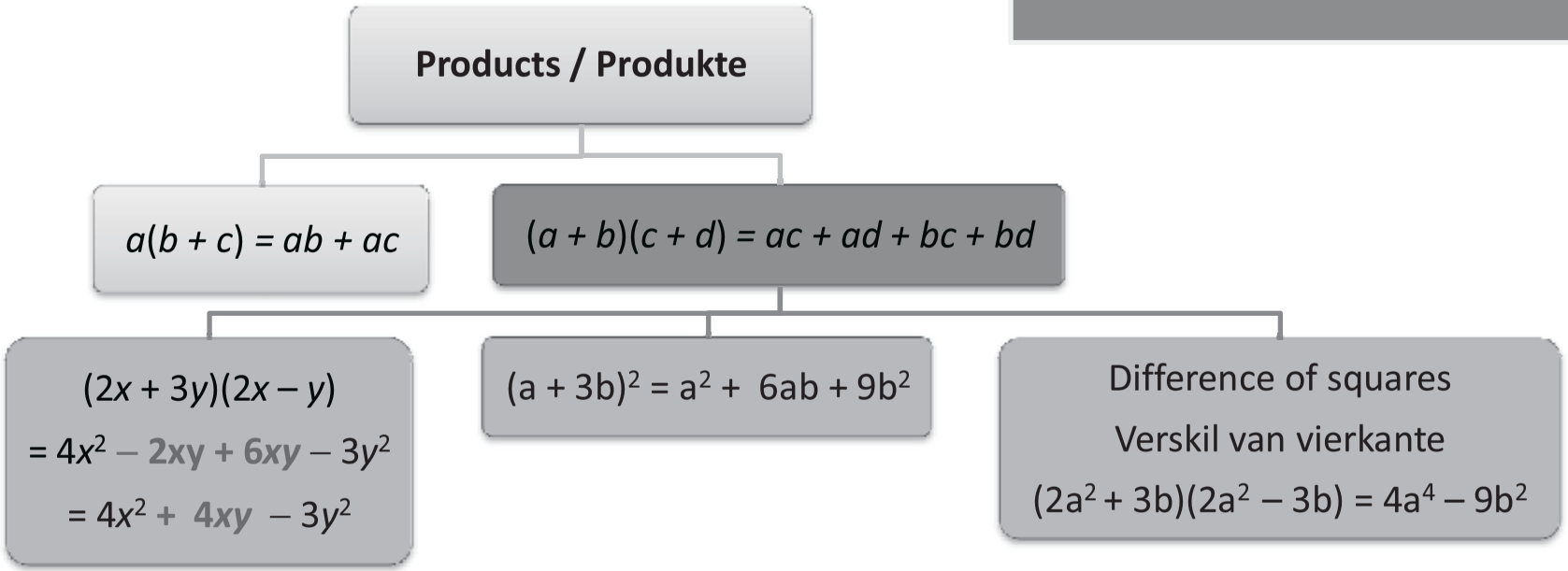
Example / Voorbeeld

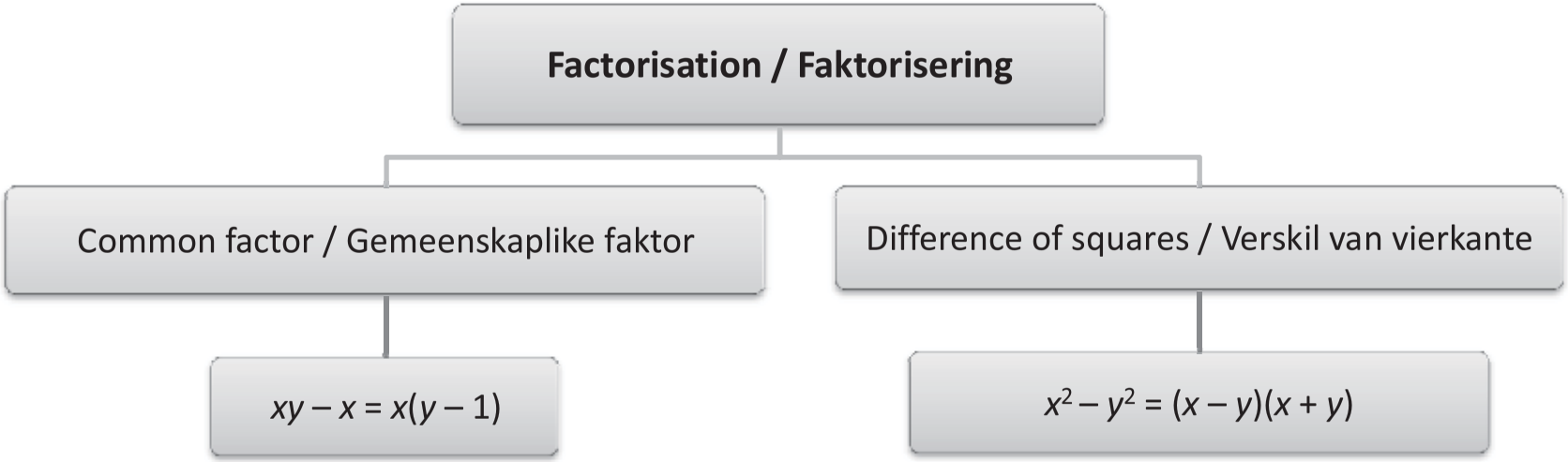
$2(a-7)(a+7)-(2a+1)^2+4(a-7)^2$

$=2(a^2-49)-(4a^2+4a+1)+4(a^2-14a+49)$

$=2a^2-98-4a^2-4a-1+4a^2-56a+196$

$=-2a^2-60a+97$





Exercise 5

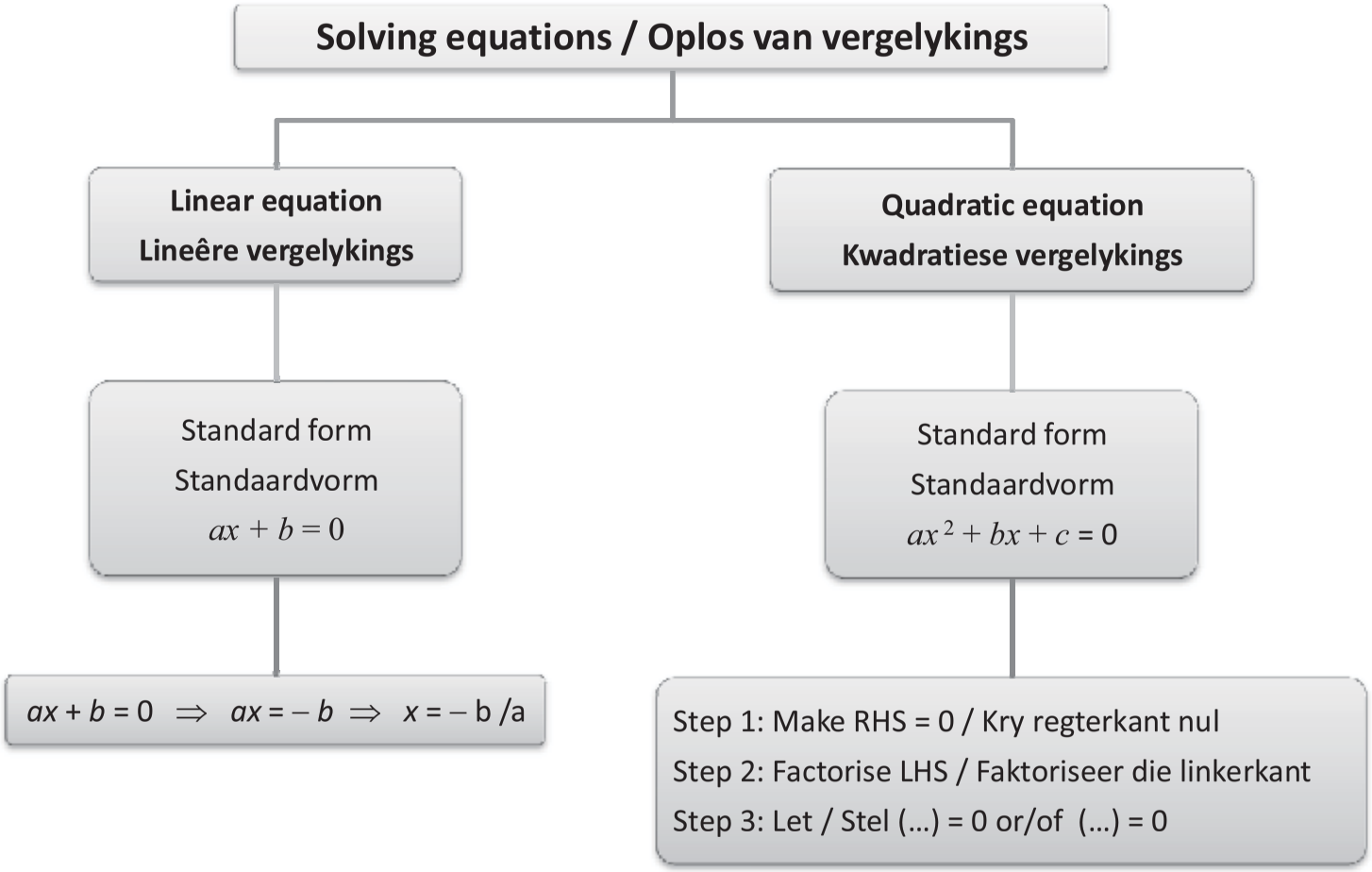
1. Simplify the expressions:
   a) $-2x-(3-2x)^2$
   b) $(x-2)^2-2x(x-2)(x+2)$
   c) $(x-2)(x+3)-2x$
   d) $\left(2x-\frac{1}{2}\right)^2$
   e) $-2x-(x-2)(2-x)+\ (x-2)(2+x)$
   f) $\left(2x-\frac{2}{x}\right)^2$
   g) $(x^a-y^3)^2$

2. Factorise:
   a) x^2+x-12
   b) x^2-x-12
   c) x^2+x+12
   d) x^6-x^3-12
   e) $(x-3)(x-2)-12$
   f) $7x^2-28$
   g) $45x^2y^4-20x^6$
   h) $8x^2+14xy+3y^2$
   i) $4x^2y^2-20xy^2-20xy^2+25y^2$

Oefening 5

1. Vereenvoudig die uitdrukkings:
   a) $-2x-(3-2x)^2$
   b) $(x-2)^2-2x(x-2)(x+2)$
   c) $(x-2)(x+3)-2x$
   d) $\left(2x-\frac{1}{2}\right)^2$
   e) $-2x-(x-2)(2-x)+\ (x-2)(2+x)$
   f) $\left(2x-\frac{2}{x}\right)^2$
   g) $(x^a-y^3)^2$

2. Faktoriseer:
   a) x^2+x-12
   b) x^2-x-12
   c) x^2+x+12
   d) x^6-x^3-12
   e) $(x-3)(x-2)-12$
   f) $7x^2-28$
   g) $45x^2y^4-20x^6$
   h) $8x^2+14xy+3y^2$
   i) $4x^2y^2-20xy^2-20xy^2+25y^2$



Exercise 6

Solve the following equations. Verify your answers by substituting into the equation to see if the value you found makes the equation true.

1. a) $2x - 6 = 12$
   b) $x^2 + x = 12$
   c) $2(x - 6) - (2x - 3)(-2) = (x - 6) - 2$
   d) $x(x - 1) = 12$
   e) $x^2 = 4$
   f) $7x^2 - 28 = 0$
   g) $2x - 2(x - 4) = 3x + 8$
   h) $(x - 3)(x - 2) = 12$
   i) $-2x - (x - 2)(2 - x) + (x - 2)(2 + x) = 0$
   j) $(3 - 2x)^2 = 9$
   k) $4x^2 - 36 = 0$
   l) $x + 2 = x + 2$
   m) $(2x - 3)(x - 1) = 15$
   n) $2x^2 + x = 6$
2. The length of a rectangle is 3 cm more than the width. If the perimeter is 15 cm, find the length and the width of the rectangle.
3. The length of a rectangle is 6 cm more than the width. If the area is 16 cm^2, find the length and the width of the rectangle.

Oefening 6

Los die volgende vergelykings op. Toets jou antwoorde deur dit terug te vervang in die vergelyking en bepal dan of dit die vergelyking bevredig.

1. a) $2x - 6 = 12$
   b) $x^2 + x = 12$
   c) $2(x - 6) - (2x - 3)(-2) = (x - 6) - 2$
   d) $x(x - 1) = 12$
   e) $x^2 = 4$
   f) $7x^2 - 28 = 0$
   g) $2x - 2(x - 4) = 3x + 8$
   h) $(x - 3)(x - 2) = 12$
   i) $-2x - (x - 2)(2 - x) + (x - 2)(2 + x) = 0$
   j) $(3 - 2x)^2 = 9$
   k) $4x^2 - 36 = 0$
   l) $x + 2 = x + 2$
   m) $(2x - 3)(x - 1) = 15$
   n) $2x^2 + x = 6$
2. Die lengte van ‘n reghoek is 3 cm langer as die breedte. As die omtrek van die reghoek 15 cm is, bepaal die lengte en breedte.
3. Die lengte van ‘n reghoek is 6 cm langer as die breedte. As die oppervlakte 16 cm^2 is, bepaal die lengte en breedte.

Functions / Funksies

Definition / Definisie

A function describes the dependence of one quantity on another

Examples / Voorbeelde

Distance travelled as a function of speed

Height as a function of age

Representations of functions
Voorstellings van funksies

Domain: The set of all x values for which the expression is defined

Range: The set of all possible values of $f(x)$, in other words y

Definisieversameling: Die versameling van alle x-waardes waarvoor die uitdrukking gedefinieer is.

Waardeversameling: Die versameling van alle waardes van $f(x)$ (y-waardes)

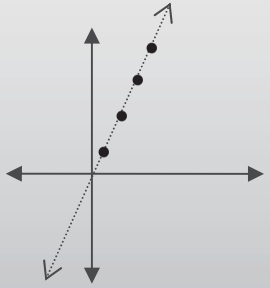
Verbal / Verbaal

$f(x)$ is twice the value of x

Algebraic / Algebraïes

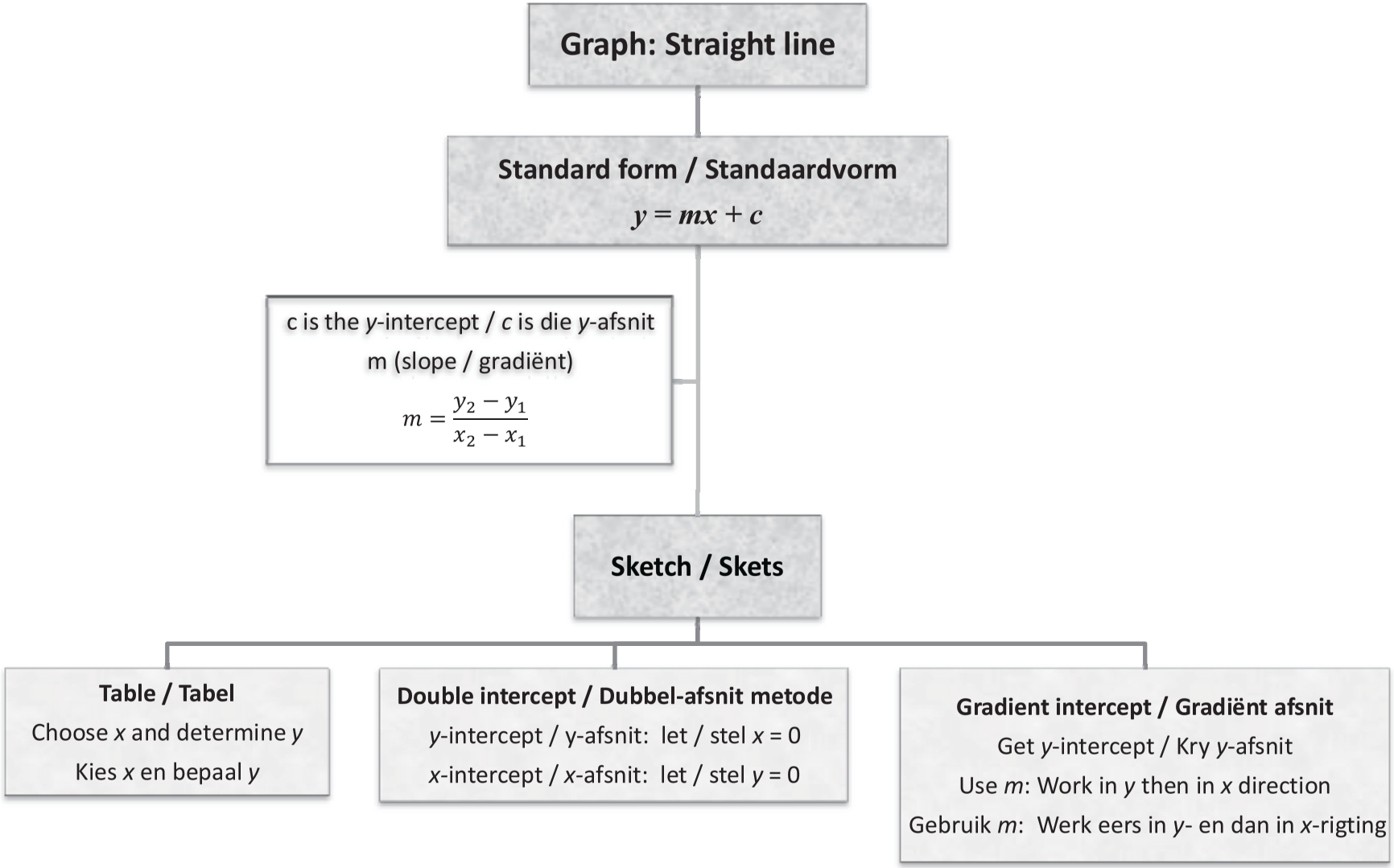
$f(x) = 2x; x \in \{1, 2, 3, 4\}$

Graph / Grafies: $y = 2x$



Set / Versameling

$f = \{(1; 2); (2; 4); (3; 6); (4; 8)\}$



Exercise 7

1. Find the equation of the line that passes through the given points:
   a) (2; 4) and (6; 8)
   b) (–2; 5) and (3;–5)
2. Use tables to sketch the given graphs:
   a) $y = 3x - 4$
   b) $2x + 6y = 12$
   c) $y = 4$
   d) $y = 4x$
3. Use the double intercept method to sketch the graph of $2x + 6y = 12$.
4. Use the gradient-intercept method to sketch the graph of
   a) $y = -\frac{2}{3}x + 2$
   b) $3x - 2y = 6$
   c) $y = -3x$
5. If $f(x) = 2x - 5$ calculate
   a) $f(-2)$
   b) $f(6)$
6. Hugo is working as a waiter and receives a flat rate of R 8,00 per session and an extra R4 for each table that he serves. Describe the money that he earns as a function of the number of tables.

Oefening 7

1. Bepaal die vergelyking van die lyn deur die volgende punte:
   a) (2; 4) en (6; 8)
   b) (–2; 5) en (3;–5)
2. Gebruik tabelle om die volgende grafieke te teken:
   a) $y = 3x - 4$
   b) $2x + 6y = 12$
   c) $y = 4$
   d) $y = 4x$
3. Gebruik die dubbel-afsnit metode om die grafiek van $2x + 6y = 12$ te skets.
4. Gebruik die gradiënt-afsnit metode om die volgende te skets:
   a) $y = -\frac{2}{3}x + 2$
   b) $3x - 2y = 6$
   c) $y = -3x$
5. As $f(x) = 2x - 5$ bereken
   a) $f(-2)$
   b) $f(6)$
6. Hugo werk as ‘n kelner en verdien ‘n basiese tarief van R 8,00 per sessie asook R4 vir elke tafel wat hy bedien. Druk sy verdienste uit as ‘n funksie van die aantal tafels wat hy bedien.

7. The monthly electricity cost depends on the number of units used during the month. Ann found that in April her electricity bill was R460 for 420 units and in May the bill was R620 for 720 units.

   a) Express the monthly cost C in terms of the number of units used x, assuming that a linear relationship gives a suitable model.

   b) Use a) to predict the cost of 2000 units per month.

   c) Draw the graph of the linear equation.

   d) What does the slope of the line represent?

   e) What does the y-intercept of the graph represent?

7. Die maandelikse koste van elektrisiteit hang af van die aantal eenhede wat gebruik word gedurende die maand. Ann se koste in April maand was R460 vir 420 eenhede wat sy gebruik het en in Mei was dit R620 vir 720 eenhede wat sy gebruik het.

   a) Druk die maandelikse koste C uit in terme van die aantal eenhede x wat gebruik is, as aanvaar word dat die model deur 'n lineêre verwantskap voorgestel kan word.

   b) Voorspel die koste van 2000 eenhede per maand.

   c) Stel die lineêre vergelyking grafies voor.

   d) Wat stel die gradiënt van die lyn voor?

   e) Wat stel die y-afsnit van die grafiek voor?

8. The table shows your monthly cell phone account for 2009. Study the table and answer the following questions:

8. Die tabel toon jou maandelikse selfoon rekening vir 2009. Bestudeer die tabel en antwoord dan die volgende vrae:

Month / Maand	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Talking time (minutes)	100	33	0	50	65	90				200	30	45
Monthly total Cost (R)	260	139,40	80	170	197	242	296	98	116			

   a) Calculate the cost per minute.

   b) What is the monthly basic fees of the telephone?

   c) Write down an expression for the cost per month (C) for x minutes of talk time.

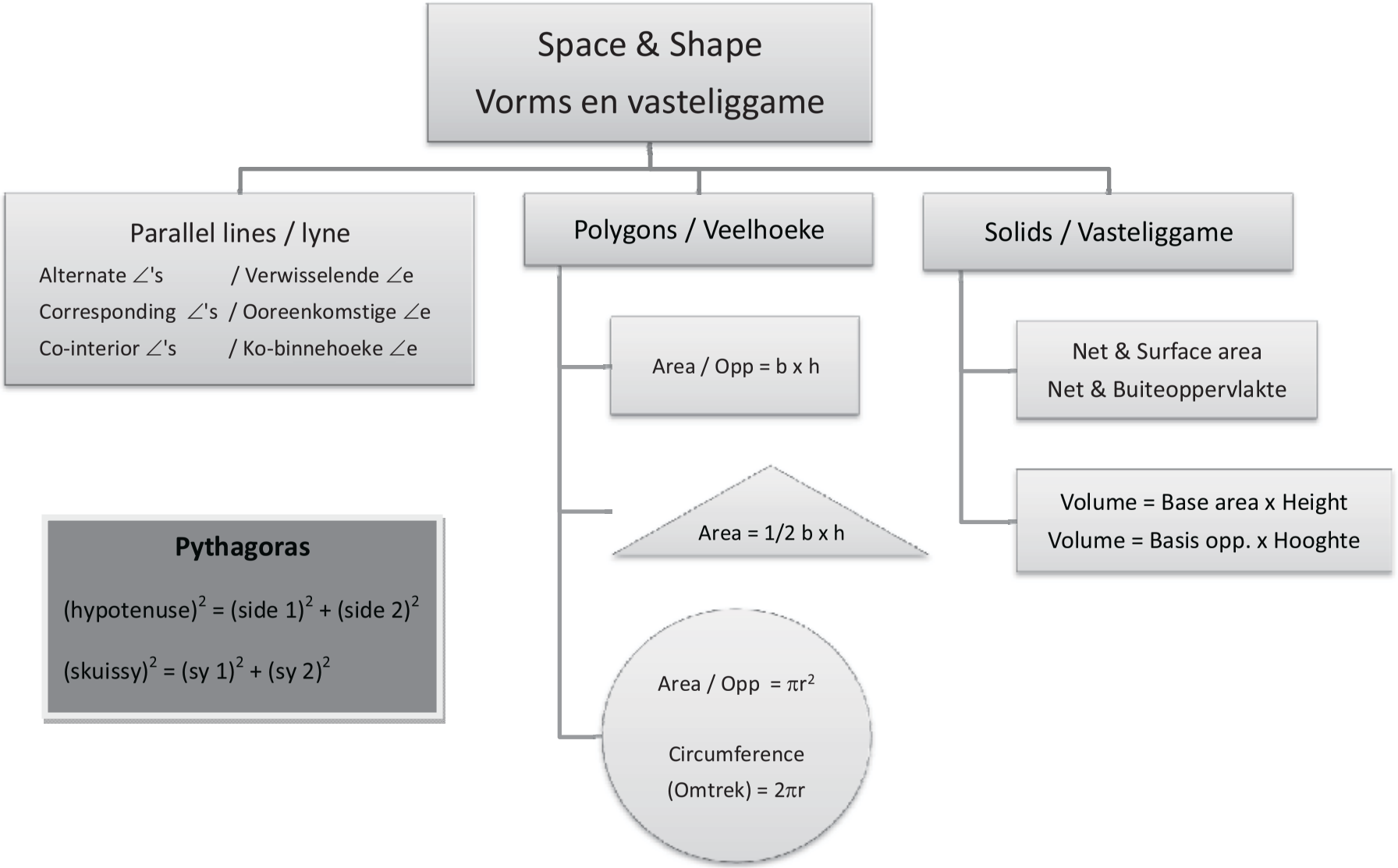
   d) Complete the table.

   a) Bereken die koste per minuut.

   b) Wat is die maandelikse basiese koste van die telefoon.

   c) Skryf 'n uitdrukking neer vir die maandelikse koste (C) vir x minute praattyd.

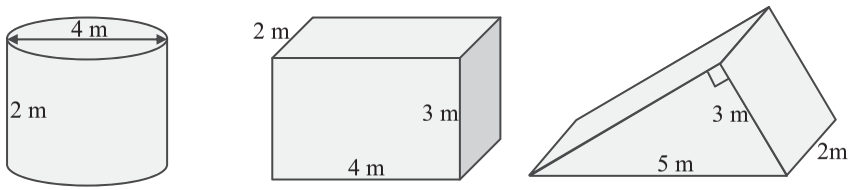
   d) Voltooi die tabel.



Exercise 8

1. Use the closed figures to answer the following questions:

P Q R



a) Calculate the volume of each figure

b) Make a rough sketch of a net of each figure

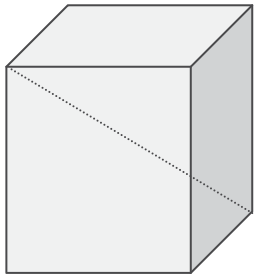
c) Calculate the surface area of each figure

d) If it is possible to cover an area of 12 m^2 with one 2 *l* - tin of paint, how many tins do you need for each figure?

e) If the cost of one 2 *l* - tin of paint is R 85,00 how much will it cost to paint each figure?

f) If the cost of concrete is R 2 600 per tonne what will it cost to fill each figure? (1 m^3 of concrete has a mass of 2,5 tonnes)

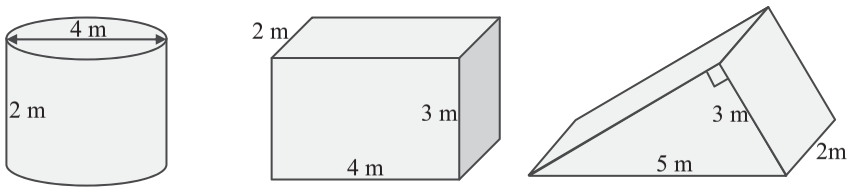
2. Calculate the length of the diagonal of the cube with a side lengths of 3 cm.



Oefening 8

1. Gebruik die volgende geslote figure en beantwoord die vrae:

P Q R



a) Bereken die volume van elke figuur

b) Maak 'n rowwe skets van die net van elke figuur

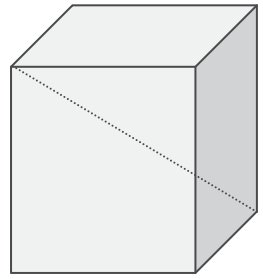
c) Bereken die buite-oppervlakte van elke figuur.

d) Indien dit moontlik is om 'n area van 12 m^2 te dek met een 2 *l* – blik verf, hoeveel blikke word benodig vir elke figuur?

e) As een 2 *l* - blik R 85,00 kos, wat sal dit kos om elke figuur te verf?

f) As die koste van beton R 2 600 per ton is, wat sal dit kos om elke figuur te vul? (1 m^3 beton het 'n massa van 2,5 ton)

2. Bereken die lengte van die diagonaal van die kubus met sy lengte van 3 cm.



Tranformations / Transformasies

Congruency (Same size & shape)

Kongruensie (Dieselfde vorm & grote)

Figures are congruent if it is possible to use rotations, translations and reflections to move one figure on top of the other.

Figure is kongruent as dit moontlik is om hulle op mekaar te laat pas deur van translasies, refleksies, en rotasies gebruik te maak.

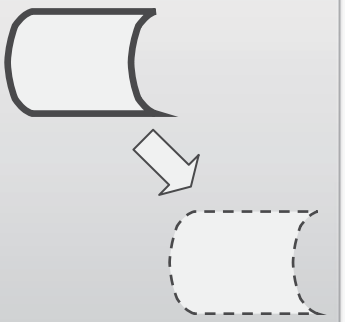
Similarity (same shape)

Gelykvormigheid (dieselfde vorm)

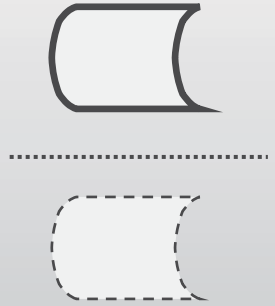
Figures are similar if it is possible to use rotations, translations, reflections and enlargements to move one figure on top of the other

Figure is kongruent as dit moontlik is om hulle op mekaar te laat pas deur van translasies, refleksies, en rotasies gebruik te maak.

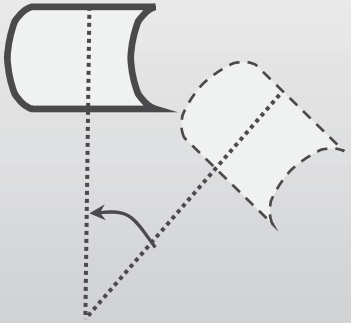
Translation / Translasie



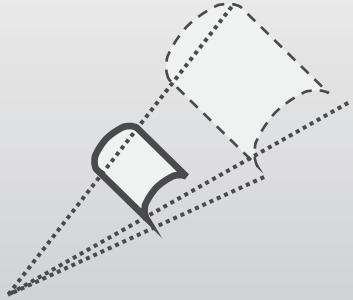
Reflection / Refleksie



Rotation / Rotasie



Enlargement / Vergroting



Positive ∠ of rotation: Anti clockwise

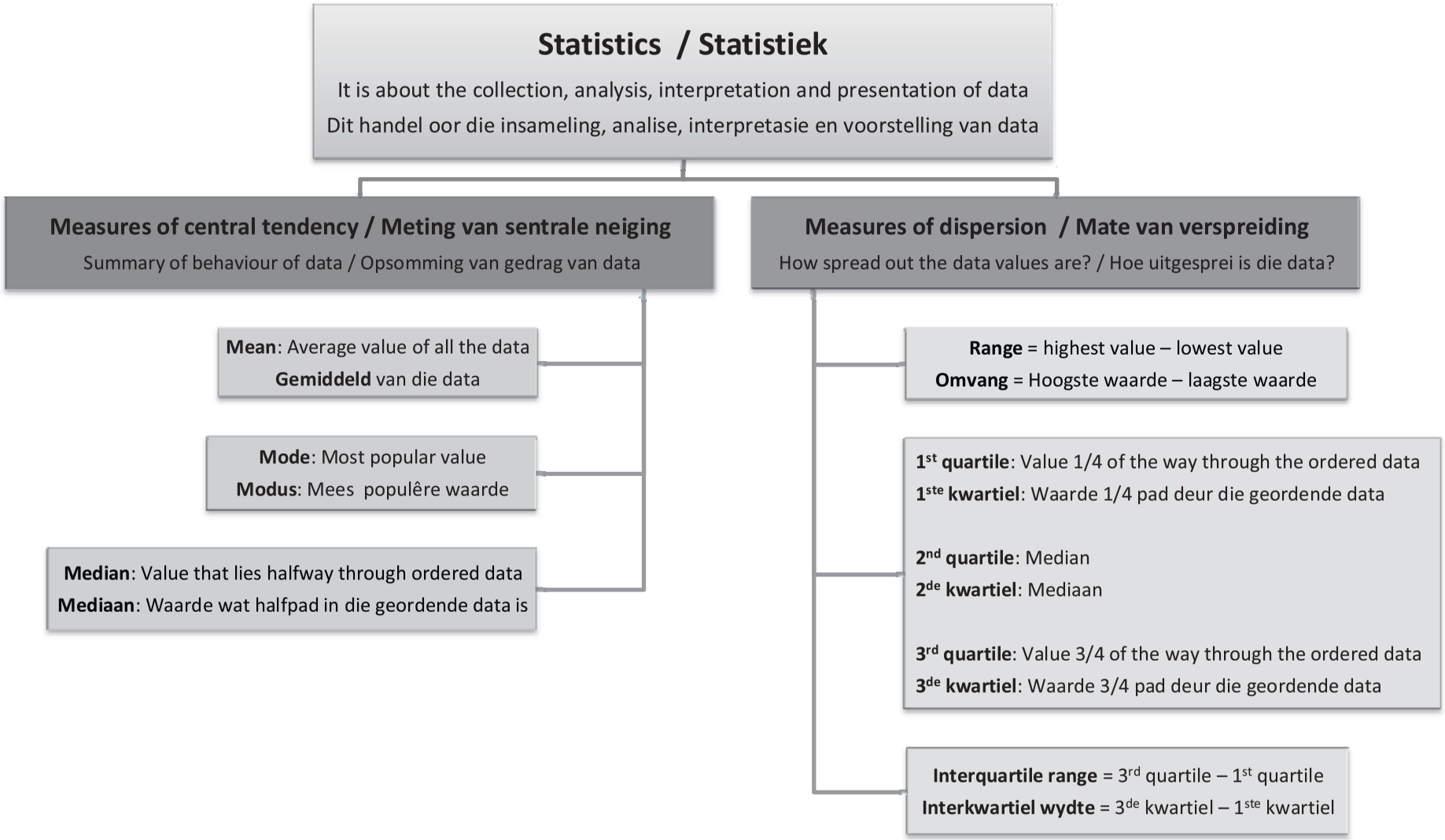
Positiewe ∠ van rotasie ⇒ Antikloksgewys

Exercise 9

1. The point P(−3; 2) lies in a Cartesian plane. Determine the coordinates of the image of P, by drawing a sketch, after
   a) a reflection about the x-axis
   b) an enlargement of factor 3 about the origin
   c) a translation 5 units to the right
   d) a translation 4 units downwards
   e) a rotation of –90° about the origin
   f) a rotation 270° about the origin
   g) a rotation 180° about the origin
   h) reduction of factor 1/2 about the origin
2. Write down the general transformation of a point (x; y) after the above mentioned transformations (see question 1).
3. The vertices of a polygon ABCD with coordinates are A(2; 4), B(4; 3); C(2; 2) and D(1; 3) are given.
   a) If each of the points of ABCD is rotated about the origin in a clockwise direction through an angle 90°. Write down the coordinates of the vertices of A'B'C'D'.
   b) The polygon A'B'C'D' is then enlarged through the origin by a scale factor of 3 to give the polygon A"B"C"D". Write down the coordinates of the vertices of A"B"C"D".
   c) The area of quadrilateral ABCD is 3 square units, calculate the area of quadrilateral A"B"C"D".

Oefening 9

1. Die punt P(−3; 2) lê in die Cartesiese-vlak. Bepaal die koördinate van die beeld van P, met behulp van ‘n skets, na
   a) ‘n refleksie om die x-as
   b) ‘n vergroting van faktor 3 ten opsigte van die oorsprong
   c) ‘n translasie 5 eenhede na regs
   d) ‘n translasie 4 eenhede afwaarts
   e) ‘n rotasie van –90° om die oorsprong
   f) ‘n rotasie van 270° om die oorsprong
   g) ‘n rotasie van 180° om die oorsprong
   h) verkleining van faktor 2 ten opsigte van die oorsprong
2. Skryf die algemene transformasie van die punt (x; y) na die bogenoemde transformasies neer (sien vraag 1).
3. Die hoekpunte van ‘n veelhoek ABCD met koördinate met A(2; 4), B(4; 3); C(2; 2) en D(1; 3) word gegee.
   a) As elkeen van die punte van ABCD met ‘n hoek van 90° in ‘n klokgewysde rigting om die oorsprong roteer word. Skryf die koördinate van die hoekpunte van vierhoek A'B'C'D' neer.
   b) Die veelhoek A'B'C'D' word daarna vergroot deur die oorsprong met ‘n skaalfaktor van 3 om A"B"C"D" te gee. Skryf die koördinate van die hoekpunte A"B"C"D" neer.
   c) Die oppervlakte van vierhoek ABCD 3 vierkante eenhede, bereken die oppervlakte van vierhoek A"B"C"D".



Exercise 10

1. The marks for a math test, out of 60, are given below:

   48 38 42 54 40 34 58 44 52 36 26 46 60 20 26

   a) What is the median for the above-mentioned data?

   b) Write down the lower quartile.

   c) Write down the upper quartile.

2. Given data: 5, 9, 7, 8, 3, 10, 8, 10, 9, 17, 33

   Find the following for the data:

   a) mean

   b) median

   c) mode

   d) range

   e) lower quartile

   f) upper quartile

   g) inter-quartile range

3. The weight of people in a lift is as follows:

   56; 34; 29; 76; 21; 45; 32

   a) Determine the mean.

   b) Determine the lower quartile.

   c) Determine the median.

   d) Determine the lower quartile.

Oefening 10

1. 'n Klas se wiskunde toetspunte, uit 60, word gegee:

   48 38 42 54 40 34 58 44 52 36 26 46 60 20 26

   a) Bepaal die mediaan vir die gegewe data.

   b) Bepaal die onderste kwartiel.

   c) Bepaal die boonste kwartiel.

2. Gegewe data: 5, 9, 7, 8, 3, 10, 8, 10, 9, 17, 33

   Bepaal die volgende vir die data:

   a) gemiddeld

   b) mediaan

   c) modus

   d) omvang

   e) onderste kwartiel

   f) boonste kwartiel

   g) inter-kwartiel wydte

3. Die massa van 'n mense in 'n hysbak is soos volg:

   56; 34; 29; 76; 21; 45; 32

   a) Bepaal die gemiddeld.

   b) Bepaal die onderste kwartiel.

   c) Bepaal die mediaan.

   d) Bepaal die onderste kwartiel.

4. The following is the maths test scores (%) of Grade 9 learners:

12 34 51 10 65 85 98 45 74 67 83 56 10 40 62 88 73 27 94 56 72 62 64
23 67 56 45 56 75 87 45 35 87 23 45 67 74 23 18 76 87 45 64 56 53 16

a) Calculate the mean and median of the given scores.

b) Complete the frequency table for the scores:

Test Scores (%)	Tally	Frequency
0 ≤ x < 10		
10 ≤ x < 20		
20 ≤ x < 30		
30 ≤ x < 40		
40 ≤ x < 50		
50 ≤ x < 60		
60 ≤ x < 70		
70 ≤ x < 80		
80 ≤ x < 90		

c) Draw a histogram for the distribution.

d) Determine the mode from the histogram.

4. Die volgende is Graad 9 leerders se wiskunde toetspunte (%):

12 34 51 10 65 85 98 45 74 67 83 56 10 40 62 88 73 27 94 56 72 62 64
23 67 56 45 56 75 87 45 35 87 23 45 67 74 23 18 76 87 45 64 56 53 16

a) Bereken die gemiddeld en mediaan van die gegewe punte.

b) Voltooi die volgende frekwensietabel vir die toetspunte:

Toetspunte (%)	Talli	Frekwensie
0 ≤ x < 10		
10 ≤ x < 20		
20 ≤ x < 30		
30 ≤ x < 40		
40 ≤ x < 50		
50 ≤ x < 60		
60 ≤ x < 70		
70 ≤ x < 80		
80 ≤ x < 90		

c) Teken ‘n histogram vir die verspreiding van die punte.

d) Bepaal die modus met behulp van die histogram.

Solutions / Antwoorde

Exercise 1/ Oefening 1

1. $\frac{3}{4} = 0{,}75$; $\frac{0}{7} = 0$; $\frac{3}{8} = 0{,}375$; $\frac{-23}{6} = 3{,}8\dot{3}$

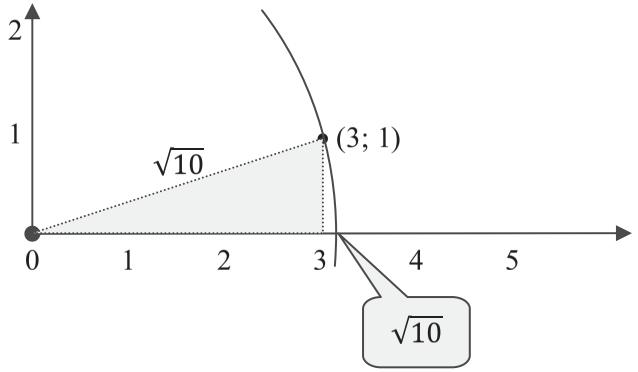
2. $0{,}34 = \frac{17}{50}$; $8\frac{3}{4} = \frac{35}{4}$; $0{,}125 = \frac{1}{8}$; $-23{,}7 = \frac{-237}{10}$; $0{,}\dot{6} = \frac{2}{3}$;

   $8{,}4\overline{56} = \frac{8372}{990}$

3. $0{,}003 = \frac{3}{1000}$

4. Pythagoras: $1^2 + 3^2 = 10 = \left(\sqrt{10}\right)^2$.

   Find the point (3; 1) and construct circle



5. a) $\pi = \frac{circumference\ of\ circle}{diameter\ of\ circle}$

   b) No, it is a never ending non repeating decimal

   c) Yes, $22 \in \mathbb{Z}$ & $7 \in \mathbb{Z}$

   d) No $\frac{22}{7}$ is a good estimate for π

6. a) 0,3405

   b) $\frac{41}{70}$

   c) $\frac{343}{600}$

7. a) $2{,}\overline{36459}$; $2{,}36\overline{459}$; $2{,}364\overline{59}$; $2{,}3\overline{6459}$; $2{,}3645\overline{9}$

   b) $\frac{5}{12}$; $\frac{3}{7}$; $\frac{13}{30}$

   c) $-3{,}38$; $\frac{10}{-3}$; $-3{,}3\dot{2}$; $-\sqrt{10}$; $\frac{-22}{7}$; $-\pi$

8.

Number	$\mathbb{N}_0$	$\mathbb{N}$	$\mathbb{Z}$	$\mathbb{Q}$	$\mathbb{Q}'$	$\mathbb{R}$
2,12	×	×	×	✓	×	✓
120	✓	✓	✓	✓	×	✓
$3,\overline{485}$	×	×	×	✓	×	✓
π	×	×	×	×	✓	✓
3,14	×	×	×	✓	×	✓
$\frac{22}{7}$	×	×	×	✓	×	✓
$\sqrt{16}$	✓	✓	✓	✓	×	✓
$\sqrt{5}$	×	×	×	×	✓	✓
$\sqrt[3]{-8}$	×	×	✓	✓	×	✓
$-3\frac{2}{3}$	×	×	×	✓	×	✓
–8	×	×	✓	✓	×	✓
$\frac{14}{7}$	✓	✓	×	✓	×	✓
$\frac{0}{12}$	×	✓	✓	✓	×	✓

Exercise 2 / Oefening 2

1. a) False
   b) False
   c) False
   d) False

2. a) $\frac{2}{x^2}$
   b) 1
   c) $\frac{y^9}{67108864\,x}$
   d) $\frac{3\,a^3}{b^2}$
   e) $\frac{91}{9}$

3. a) $3{,}46 \times 10^{-5}$
   b) $2{,}453 \times 10^{8}$

4. a) 0,000345

5. a) $4{,}5 \times 10^{-11}$
   b) $2{,}88 \times 10^{-13}$

Exercise 3 / Oefening 3

1. R 48,00
2. 121,95 US dollar
3. 180 km
4. 15 eggs
5. R 75 000
6. 15 months
7. 5,77 hours
8. 9 bags cement
9. R 256,41 per m^2
10. 308 m^2
11. Andile paints $\frac{1}{24}$ of the room in 1 hour

    Peter paints $\frac{1}{48}$ of the room in 1 hour

    Together they paint $\frac{1}{24} + \frac{1}{48} = \frac{1}{16}$ of the room in 1 hour.

    It will therefore take them 16 hours together.

Exercise 4 / Oefening 4

1. Simple interest / Enkelvoudige rente : $A = P(1 + in)$

   P = R 2 300

   i = 12% = 0,12 per annum / per jaar

   n = 10 years / jare

   a) $A = P(1 + in) = 2\,300(1 + (0{,}12)(10)) = \text{R } 5\,060$

   b) Total interest earned after the ten years = R 5 060 – R 2 300 = R 2 760

2. Compound interest / Saamgestelde rente : $A = P(1 + i)^n$

   P = R 2 300

   i = 12% = 0,12 per annum / per jaar

   n = 10 years / jare

   a) $A = P(1 + i)^n = 2\,300(1 + 0{,}12)^{10} = \text{R } 7\,143{,}45$

   b) Total interest earned after the ten years = R 7 143,45 – R 2 300 = R 4 843,45

3. Step 1: Loan (P) = total price – deposit

   Total price = 30 000 + (15% of/van 30 000)

   $= 30\,000 + \left(\frac{15}{100} \times 30\,000\right)$

   $= \text{R } 34\,500$

   Deposit = 25% of/van 30 000

   $= \left(\frac{25}{100} \times 30000\right)$

   $= \text{R } 7\,500$

Loan (P) = total price – deposit = R 34 500 – R 7 500 = R 27 000

Step 2: $A = P(1+ in) = 27\,000(1 + (0{,}18)(5)) =$ R 51 300

Step 3: Installments = R 51 300 ÷ (5×12) = R 855 per month

5. Total money paid on hire purchase

= 12(200) + (20% of R 2600)

$= 12(200) + (\frac{20}{100} \times 2600)$

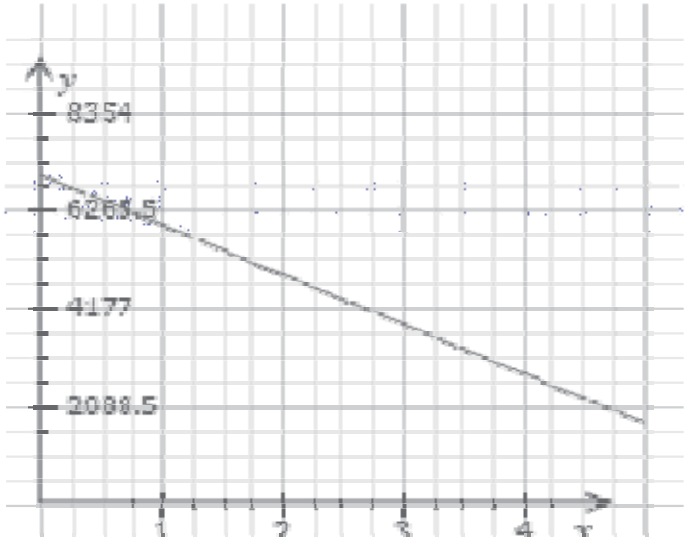
= R 2 920

Interest = R 2 920 – R 2 600 = R 320

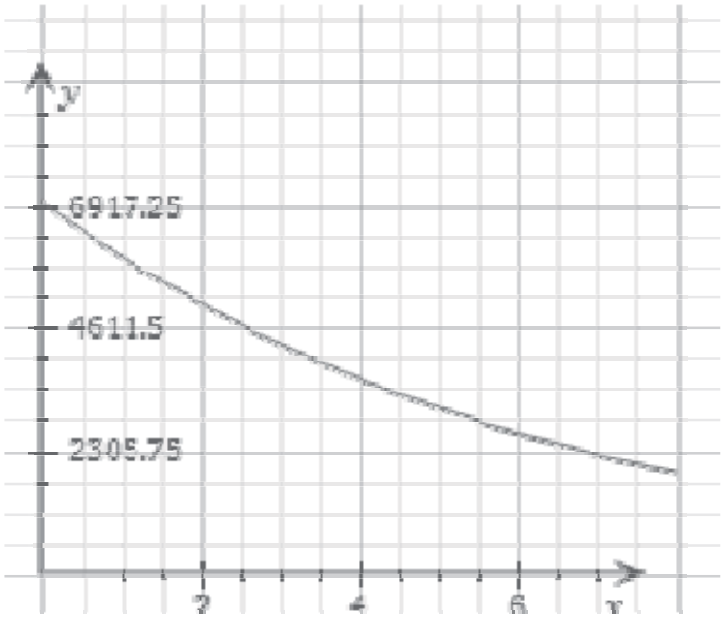
6. a) $A = P(1 - in) = 7000(1 - (0.15)(5)) =$ R 1750

b) $A = P(1 - i)^n = 7000(1 - 0.15)^5 =$ R 3 105,94

c) $A = 7000(1 - 0.15n)$



$A = 7000(1 - 0.15)^n$



Exercise 5 / Oefening 5

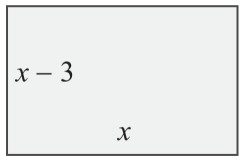
1. a) $-4\,x^2 + 10\,x - 9$
   b) $-2\,x^3 + x^2 + 4\,x + 4$
   c) $x^2 - x - 6$
   d) $4\,x^2 - 2\,x + \frac{1}{4}$
   e) $2\,x^2 - 6\,x$
   f) $\frac{4\,x^4 - 8\,x^2 + 4}{x^2}$ or $4x^2 - 8 + \frac{4}{x^2}$
   g) $x^{2a} - 2x^a y^3 + y^6$
2. Factorise:
   a) $(x - 3)\,(x + 4)$
   b) $(x - 4)\,(x + 3)$
   c) cannot factorise
   d) $(x^3 - 4)(x^3 + 3)$
   e) $(x - 6)\,(x + 1)$
   f) $7\,(x - 2)\,(x + 2)$
   g) $5x^2(3\,y^2 - 2\,x^2)\,(2\,x^2 + 3\,y^2)$
   h) $(4x + 1)(2x + 3)$
   i) $y^2(4x - 5)(x - 5)$

Exercise 6 / Oefening 6

1. a) $x = 1$
   b) $x = 3$ or $x = -4$
   c) $x = 2$
   d) $x = 4$ or $x = -3$
   e) $x = 2$ or $x = -2$
   f) $x = 2$ or $x = -2$
   g) $x = 0$
   h) $x = \pm\sqrt{2}$
   i) $x = 0$
   j) $x = 0$ or $x = 3$
   k) $x = 3$ or $x = -3$
   l) $x \in \mathbb{R}$
   m) $x = 4$ or $x = -\frac{3}{2}$
   n) $x = -2$ or $x = \frac{3}{2}$

2. Let x = length of rectangle

The width is then $x - 3$



Perimeter (Omtrek) = $2x + 2(x-3)$

$15 = 2x + 2(x-3)$

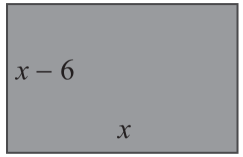
$15 = 4x - 6$

$x = 5{,}25$

Length = 5,25 & width = 8,25

3. Let x = length of rectangle

The width is then $x - 3$



$16 = x(x - 6)$

$x^2 - 6x - 16 = 0$

$(x - 8)(x + 2) = 0$

$x = 8$ or $x = -2$ (n/a)

Length = 8 & width = 8 – 6 = 2

Exercise 7 / Oefening 7

1. a) $y = mx + c$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8-4}{6-2} = 1$

Substitute point (2; 4) in $y = 1x + c$ to find c

$4 = 2 + c$

c = 2

Equation: $y = x + 2$

b) $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5-5}{3-(-2)} = -2$

Substitute point (–2; 5) in $y = -2x + c$ to find c

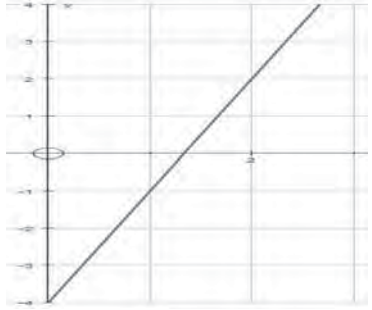
$5 = -2(-2) + c$

$c = 1$

Equation: $y = -2x + 1$

2. a) $y = 3x - 4$

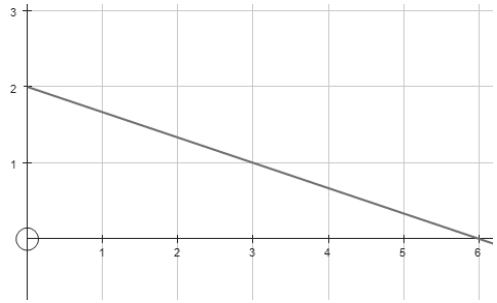
x	0	1	2
$y = 3x - 4$	–4	–1	–2



b) $2x + 6y = 12$

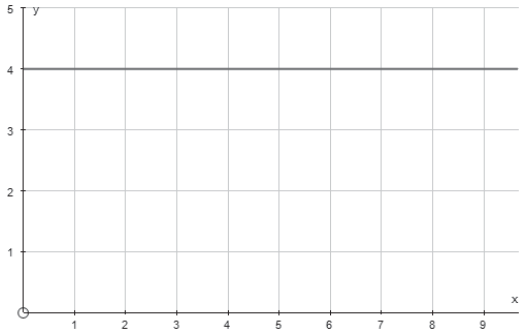
$y = -\frac{x}{3} + 2$

x	0	3	6
$y = -\frac{x}{3} + 2$	2	1	0



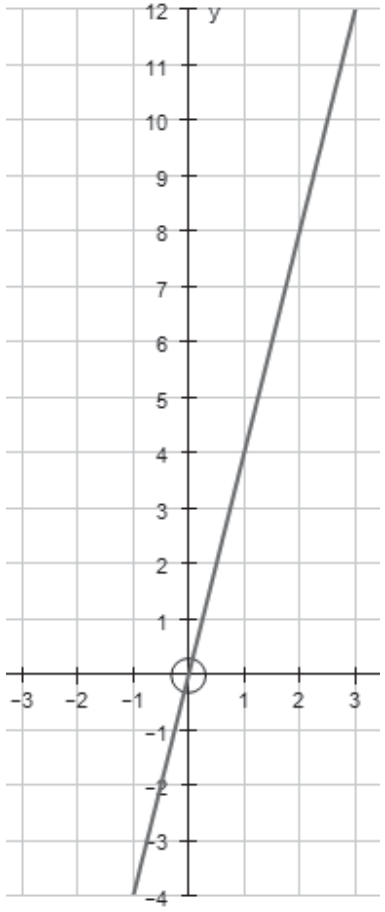
c) $y = 4$

x	0	1	2
$y = 4$	4	4	4



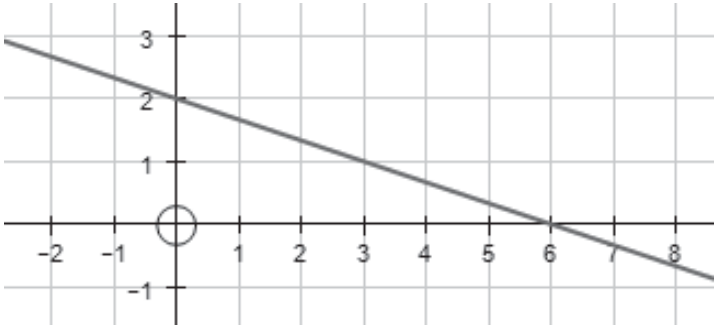
d) $y = 4x$

x	0	1	2
$y = 4x$	0	4	8

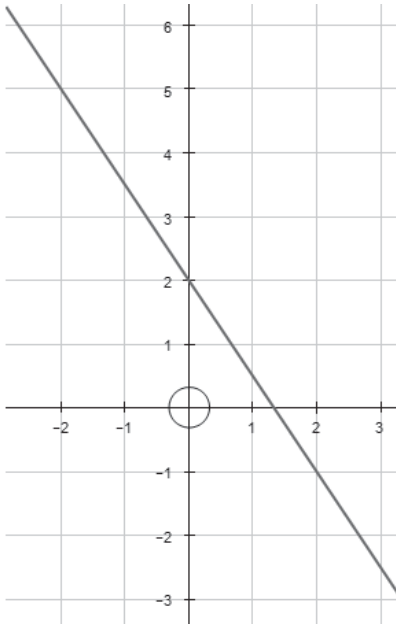


3. $2x + 6y = 12$

Intercepts / Afsnitte: $x = 6$ & $y = 2$

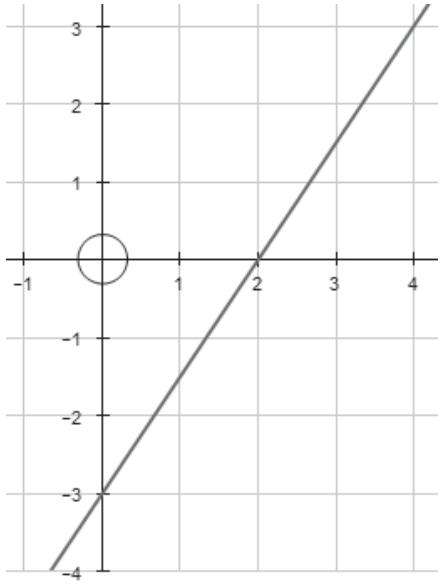


4. a) $y = -\frac{2}{3}x + 2$

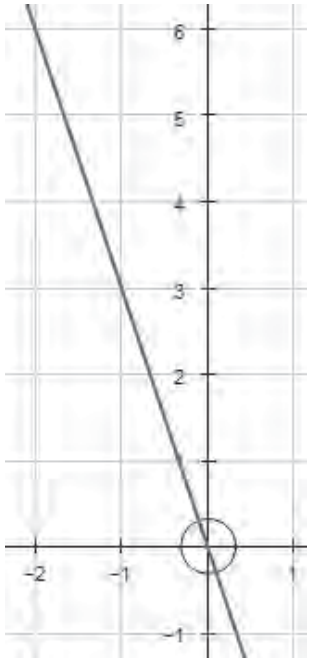


b) $3x - 2y = 6$

$y = \frac{3x}{2} - 3$



c) $y = -3x$



5. a) $f(-2) = -9$

   b) $f(6) = 7$

6. Money = 4(number of tables) + 8

7. a) Linear relationship: $y = mx + c$

   Points: (420; 460) & (720; 620)

   $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{620-460}{720-420} = \frac{8}{15}$

   Substitute point (420; 460) in $y = \frac{8}{15}x + c$ to find c

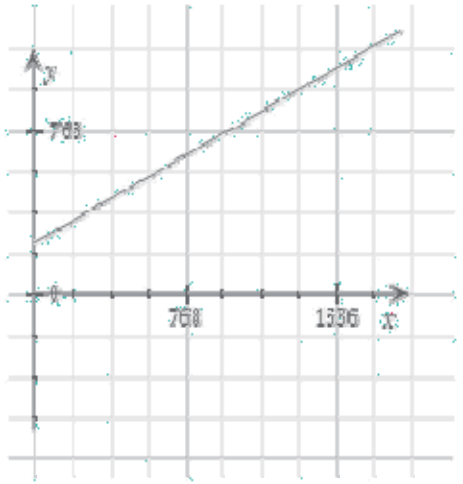
   $460 = \frac{8}{15}(420) + c$

   $c = 236$

   Equation: Cost = $\frac{8}{15}x + 236$

   b) Cost = $\frac{8}{15(2000)} + 236$ = R1302,67

   c) $y = \frac{8}{15}x + 236$



   d) The rate that the cost changes with respect to the units used.

   e) Basic cost

Q: Surface area $= 2(3 \times 4) + 2(2 \times 3) + 2(2 \times 4)$

$= 52 \text{ m}^2$

R: Pythagoras: $x^2 = 5^2 - 3^2$ therefore $x = 4$

Surface area = 2(triangles) + rect1 + rect2 + rect3

$= 2\left(\frac{1}{2}(4)(3)\right) + (5 \times 2) + (4 \times 2) + (3 \times 2)$

$= 36 \text{ m}^2$

c) P: $\frac{50.27}{12} = 4{,}19$ tins, that is 5 tins

Q: $\frac{52}{12} = 4{,}33$ tins, that is 5 tins

R: $\frac{36}{12} = 3$ tins

d) P: R 425

Q: R 425

R: R 255

e) P: R 425

Q: R 425

R: R 255

f) 1 m^3 concrete: Mass 2,5 tonnes: Cost 2,5×2 600

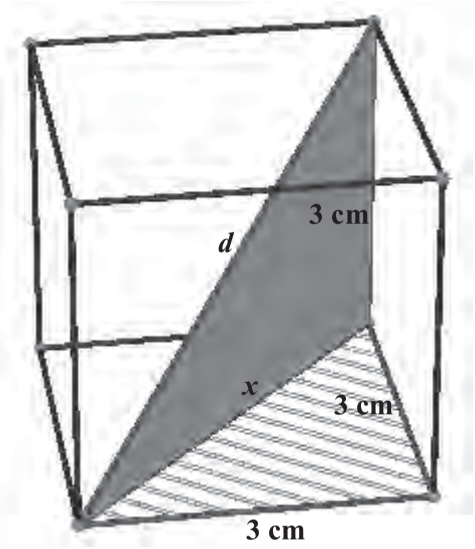
= R 6 500 / m^3

g) P: Cost = 25,13 m^3 × R 6 500 / m^3 = R 163 345

Q: Cost = 24 m^3 × R 6 500 / m^3 = R 156 000

R : Cost = 15 m^3 × R 6 500 / m^3 = R 97 500

2.



$x^2 = 3^2 + 3^2$ (Pythagoras)

$x = \sqrt{18}$

$d^2 = \sqrt{18}^2 + 3^2$

$d = 5{,}2$ cm

8. a) The basic monthly cost is R 80 (see March)

In January you paid R260 for 100 minutes

Therefore R260 – R80 = R180 for 100 minutes

Cost per minute = $\frac{180}{100}$ = R 1,80

b) The basic monthly cost is R 80 (see March)

c) $y = mx + c$: Cost = $1.8x + 80$

d)

Month / Maand	July	Aug	Sept	Oct	Nov	Dec
Minutes (x)	120	10	20	200	30	45
Cost = $\mathbf{1.8x + 80}$	296	98	116	440	134	161

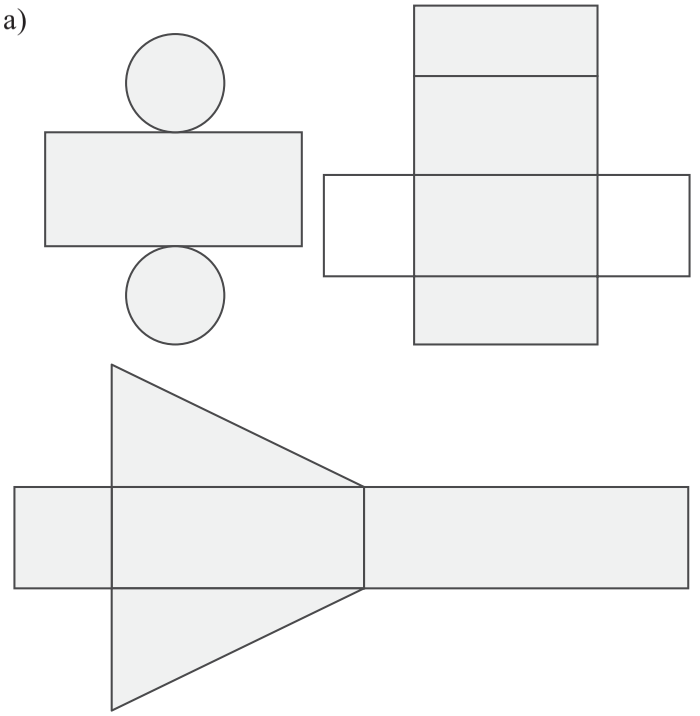
Exercise 8 / Oefening 8

1. P: $V = \pi r^2 \times H = \pi 2^2 \times 2 = 8\,\pi = 25{,}13\ \text{m}^3$

Q: $V = b \times w \times H = 4 \times 2 \times 3 = 24\ \text{m}^3$

R: $\left(\frac{1}{2}bh\right) \times H = \left(\frac{1}{2}(5)(3)\right) \times 2 = 15\ \text{m}^3$

a)



b) P: Surface area = 2(circles) + rectangle

$= 2(\pi r^2) + (2\pi r)(H)$

$= 2(\pi 2^2) + (2\pi(2))(2)$

$= 16\,\pi = 50{,}27\ \text{m}^2$

1. a) P'(–3; –2)
   b) P'(–9; 6)
   c) P'(2; 2)
   d) P'(–3; –2)
   e) P'(2; 3)
   f) P'(2; 3)
   g) P'(3;– 2)
   h) P'($-\frac{3}{2}$; 1)

2. a) $(x; y) \rightarrow (x ; -y)$
   b) $(x; y) \rightarrow (3x ; 3y)$
   c) $(x; y) \rightarrow (x + 5 ; y)$
   d) $(x; y) \rightarrow (x ; y - 5)$
   e) $(x; y) \rightarrow (y; -x)$
   f) $(x; y) \rightarrow (y; -x)$
   g) $(x; y) \rightarrow (-x ; -y)$
   h) $(x; y) \rightarrow (\frac{1}{2}x; \frac{1}{2}y)$

3. a) Clockwise rotation 90°: $(x; y) \rightarrow (y; -x)$
   A(2; 4) → A'(4; –2)
   B(4; 3) → B'(3 ; –4)
   C(2; 2) → C'(2 ; –2)
   D(1; 3) → D'(3 ; –1)

   b) Enlargement of factor 3: $(x; y) \rightarrow (3x ; 3y)$
   A'(4; –2) → A"(12; –6)
   B'(3 ; –4) → B"(9 ; –12)
   C'(2 ; –2) → C"(6 ; –6)
   D'(3 ; –1) → D"(9 ; –3)

   c) Area (A"B"C"D") = 3^2 × Area (ABCD)
   = 9 × 3 square units
   = 27 square units

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Must have:

- a minimum academic average of 65% in the year that you are applying for the bursary;
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