

Mathematics
for the
Senior Phase
Grade 7 - Grade 9

Solutions Booklet

Acknowledgements

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Everything Mathematics Grade 10 textbook (www.everythingmaths.co.za) for the diagram on the number system on Unit 1.1. Wits Maths Connect project for Question 16 of Unit 1.9. ANA exemplar from DBE for Questions 7 – 9 of Unit 3.4. Ukuqonda Mathematics workbooks for Grades 7 – 9 published by the Institute and Sasol Inzalo Foundation: Question 4 and 7 from Unit 1.5; Protractor diagram in Unit 3.1; Questions 2 – 13 in Unit 3.1; Questions 5 – 12 in Unit 3.2; Questions 5 and 7 from Unit 3.3; Questions 1, 2 and 10 – 12 from Unit 3.4; The diagrams and questions in Unit 3.5; The diagrams and questions in Unit 3.6; Questions 8 – 10 in Unit 4.1; Question 18 from Unit 4.2.



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This learner book is not intended to replace the learner's textbook in the classroom.

5. $120 \times 57 = 6\,840$ for the T-shirts
 $7\,000 - 6\,840 = 160$
 R160 left over.
6. $50 \text{ boxes} \times 36 \text{ bananas} = 1\,800 \text{ bananas}$.
 $1\,800 - 18 = 1\,782 \text{ bananas sold}$.
 $1\,782 \div 3 = 594 \text{ bags}$
 $594 \times R4 = R2\,376$
 $R2\,376 - R452 = R1\,924 \text{ profit}$.
7. $34,50 + 24,65 + 13,25 + 27,50 + 25,70$
 $= R125,60$. So R100 is not enough.
8. a) $2\,453 + 1\,072 = 3\,525$
 b) $5 \times 735 = 3\,675$
 c) $14\,391 - 9\,870 = 4\,521$
 d) $1\,161 \div 3 = 387$
 e) $345 - 246 + 123 = 222$
 f) $7 \times 46 + 21 = 343$
- 9a. Round off to estimate:
 $2\,215 + 3\,014 + 5\,986$
 $\approx 2\,200 + 3\,000 + 6\,000 = 11\,200$
- b. $3\,962 \div 9 \approx 4\,000 \div 10 = 400$ OR
 $3\,962 \div 10 \approx 396,2$
- c. $32 \times 47 \approx 30 \times 50 = 1\,500$
- d. $999 \times 103 \approx 1\,000 \times 100 = 100\,000$
- 10a. smaller because 4 is half of 8
 b. $4 \times 54 = 8 \times 27$
 because 4 is half of 8 and 54 is half of 27
 c. 24 is three times bigger than 8, but 12 is bigger than one third of 27, so it is larger.
 d. $5 \times 8 \times 27 \div 2$. 5×8 is 5 times bigger than 8; $27 \div 2$ is not one fifth of 27. It is larger.
 So the sum is larger than 8×27
11. $3\,546 - 2\,397$
 a. We subtract 2 398 so the answer is smaller.
 b. The answers are equal because both numbers are one bigger than the original sum.
 c. We subtract from 3 547, so the answer is one larger than in the original sum.
- 12a) 399×400 estimate: 160 000
 The actual answer is smaller because 399 is smaller than the estimate of 400 for it.
 b) $6\,052 \div 30$ estimate: 200
 The actual answer is larger because 6 052 is larger than the estimate of 6 000 for it.
 c) $80\,000 \div 380$ estimate: 200
 The actual answer is smaller because 380 is smaller than the estimate of 400 for it.
13. $67 \times 63 = 4\,221$.
 a) $67 \times 630 = 42\,210$.
 b) $6\,700 \times 6\,300 = 42\,210\,000$
 c) $4\,221 \div 63 = 67$
 d) $68 \times 63 = (67 \times 63) + (1 \times 63)$
 $= 4\,221 + 63 = 4\,284$

Unit 1.3: Multiples, factors and primes**Grade 7, 8 & 9**

- A prime number is any whole number greater than 1 that only has one and itself as factors.
 - A composite number is a number that has more than two factors.
 - No. A prime number must be greater than 1
 - 1 is a factor of every number.
 - 2; 3; 5; 7; 11; 13; 17.
 - 2 is a factor of all even numbers.
- 7a. 24; 48; 8; 2; 1.
 b. 24; 48
 c. 13; 2
- 8a. 1; 2; 3; 4; 6; 12.
 b. 1; 2; 3; 4; 6; 8; 12; 24.
 c. 1; 3; 7; 9; 21; 63
 d. 1; 7; 49
 e. No. It can be divided by 3.
 f. 8 is the HCF for 8 and 16.
 g. Factors of 18: 1, 2, 3, 6, 9, 18
 Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24.
 HCF is 6 and LCM is 48
 h. Factors of 36: 1, 2, 3, 4, 9, 12, 18, 36.
 Factors of 99: 1, 3, 9, 11, 33, 99.
 Therefore 9 is the HCF
 $36 = 2^2 \times 3^2$ and $99 = 3^2 \times 11$
 Therefore LCM is $2^2 \times 3^2 \times 11 = 396$
- i. $8 = 2^3$ $16 = 2^4$ $24 = 2^3 \times 3$
 Therefore HCF is 2^3 or 8 and LCM is $2^4 \times 3 = 48$
- j. $140 = 2 \times 2 \times 5 \times 7$ and $168 = 2 \times 2 \times 2 \times 3 \times 7$
 Therefore HCF is $2^2 \times 7 = 28$
- k. $1\,820 = 2 \times 2 \times 5 \times 7 \times 13$
 l. $3\,510 = 2 \times 3 \times 3 \times 3 \times 5 \times 13$
 m. $315 = 3 \times 3 \times 5 \times 7$
 n. $1\,320 = 2 \times 2 \times 2 \times 3 \times 5 \times 11$
10. Factors of 4: 1, 2 and 4
 Factors of 9: 1, 3 and 9
 Factors of 25: 1, 5 and 25
11. 6 has factors 1, 2, 3 and 6
 8 has factors 1, 2, 4 and 8
 10 has factors 1, 2, 5 and 10
12. 16 has factors 1, 2, 4, 8, 16.
13. Examples: 24 and 60; 12 and 36.
14. Examples: 12 and 72; 36 and 84.
15. 15; 30; 45; 60; 75; 90
16. 21; 42; 63; 84.
- Grade 8 & 9**
17. $1\,820 = 2^2 \times 5 \times 7 \times 13$
 $3\,510 = 2 \times 3^3 \times 5 \times 13$
 HCF is $2 \times 5 = 10$
18. $\text{LCM} = 2^2 \times 3^3 \times 5 \times 7 \times 13 = 49\,140$
19. $315 = 3 \times 3 \times 5 \times 7$ and $1\,320 = 2 \times 2 \times 2 \times 3 \times 5 \times 11$
 HCF is $3 \times 5 = 15$
20. $\text{LCM} = 2^3 \times 3^2 \times 5 \times 7 \times 11 = 27\,720$
21. 12 and 35; 15 and 28; 20 and 21.

22. 70 and 6. Use the prime factors of 420 to make two factors as in Q 21.

23a. LCM of a and b is ab

b. HCF of a and b is a because it is a factor of b .

24a. LCM of a and b is ab

b. HCF of a and b is also ab .

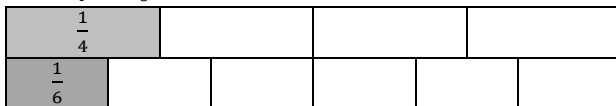
Unit 1.4: Common fractions

Grade 7, 8 & 9

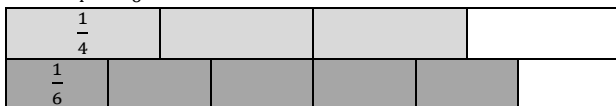
- $\frac{2}{5}$
- $\frac{1}{7}$
- $\frac{3}{8}$
- 3 blocks out of 15 are shaded.



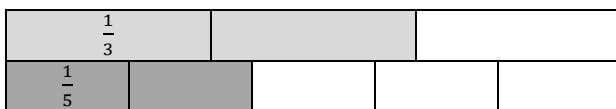
5a. $\frac{1}{4} > \frac{1}{6}$



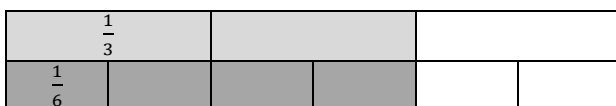
b. $\frac{3}{4} < \frac{5}{6}$



c. $\frac{2}{3} > \frac{2}{5}$



d. $\frac{2}{3} = \frac{4}{6}$



6a. $\frac{3}{5} = \frac{9}{15}$ b. $\frac{2}{7} = \frac{6}{21}$ c. $\frac{24}{28} = \frac{6}{7}$

d. $\frac{25}{30} = \frac{5}{6}$

7a. $\frac{23}{5} = 4\frac{3}{5}$ b. $\frac{36}{11} = 3\frac{3}{11}$ c. $\frac{8}{3} = 2\frac{2}{3}$

d. $\frac{12}{4} = 3$

8a. $5\frac{1}{3} = \frac{16}{3}$ b. $4\frac{6}{11} = \frac{50}{11}$ c. $7\frac{2}{3} = \frac{23}{3}$

d. $6\frac{3}{4} = \frac{27}{4}$

9a. $\frac{3}{8} + \frac{5}{8} = \frac{8}{8} = 1$ b. $\frac{7}{9} - \frac{2}{9} = \frac{5}{9}$

c. $4\frac{2}{5} + 3\frac{1}{5} = 7\frac{3}{5}$

d. $6\frac{1}{3} - 2\frac{2}{3} = 5 + 1 + \frac{1}{3} - 2\frac{2}{3} = 3\frac{2}{3}$

e. $\frac{5}{6} + \frac{1}{4} = \frac{10}{12} + \frac{3}{12} = \frac{13}{12} = 1\frac{1}{12}$

f. $\frac{2}{9} + \frac{3}{5} = \frac{10}{45} + \frac{27}{45} = \frac{37}{45}$

g. $\frac{17}{24} - \frac{1}{6} = \frac{17}{24} - \frac{4}{24} = \frac{13}{24}$

h. $3\frac{3}{5} + 2\frac{1}{6} = \frac{18}{5} + \frac{13}{6} = \frac{108}{30} + \frac{65}{30} = \frac{173}{30} = 5\frac{23}{30}$

i. $2\frac{1}{3} - 1\frac{2}{4} = \frac{7}{3} - \frac{6}{4} = \frac{28}{12} - \frac{18}{12} = \frac{10}{12} = \frac{5}{6}$

j. $\frac{1}{6} \times \frac{2}{9} = \frac{1}{27}$

k. $\frac{2}{11} \times \frac{33}{46} = \frac{3}{23}$

l. $\frac{16}{21} \times \frac{3}{4} = \frac{4}{7}$

m. $1\frac{3}{7} \times 2\frac{1}{3} = \frac{10}{7} \times \frac{7}{3} = \frac{10}{3} = 3\frac{1}{3}$

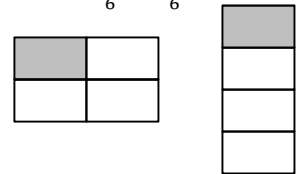
n. $3\frac{2}{5} \times 1\frac{1}{4} = \frac{17}{5} \times \frac{5}{4} = \frac{17}{4} = 4\frac{1}{4}$

o. $\frac{2}{3} \times \left(1 + \frac{1}{2}\right) = \frac{2}{3} \times \frac{3}{2} = 1$

p) $\frac{3}{4} \times \frac{4}{5} + 1\frac{2}{5} = \frac{3}{5} + 1\frac{2}{5} = 2$

10. $2\frac{1}{2} + 3\frac{2}{3} = 5 + \frac{3}{6} + \frac{4}{6} = 6\frac{1}{6}$ and $10 - 6\frac{1}{6} = 3\frac{5}{6}$.

I have $3\frac{5}{6}$ fizzers left.



11. It would be 4 times the size of the block

12. a. 60 is $\frac{1}{4}$ of 240 b. 60 is $\frac{3}{4}$ of 80

13. 40 minutes out of 90 minutes = $\frac{40}{90} = \frac{4}{9} = \frac{2}{3}$

14. $4\frac{2}{3} = 4 \times \frac{3}{3} + \frac{2}{3} = \frac{14}{3}$. So there are 14 one thirds in $4\frac{2}{3}$

15. $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} = 3$ litres in 4 bottles.

One more $\frac{3}{4}$ from 4th litre. So 5 bottles can be filled.

16. a) $\frac{3987}{11961} = \frac{443}{1329} = \frac{1}{3}$ or $\frac{4000}{12000} = \frac{1}{3}$

b) $\frac{4952}{14856} = \frac{619}{1857} = \frac{1}{3}$ or $\frac{5000}{15000} = \frac{1}{3}$

c) $\frac{2997}{8991} = \frac{3000}{9000} = \frac{1}{3}$ d) $\frac{5996}{21879} = \frac{6000}{22000} = \frac{3}{11}$

e) $\frac{1999}{5997} = \frac{3000}{9000} = \frac{1}{3}$ So d) is not equivalent to $\frac{1}{3}$

17. I drank $\frac{1}{4}$ of $\frac{1}{2}$ litre = $\frac{1}{8}$ of a litre. So there is $\frac{1}{8}$ of a litre of orange juice left.

18. $\frac{1}{2}$ million rand out of $\frac{3}{4}$ million rand
 $= 500\,000$ out of $750\,000 = \frac{50}{75} = \frac{2}{3}$ of his winnings
 $= \frac{3}{8} \times 1\,000\,000 = R375\,000$

19. $\frac{5}{8} \times x = 25$. so $x = 25 \times \frac{8}{5} = 40$. The number is 40.

20. $R32 \times 2\frac{1}{2} = 32 \times \frac{5}{2} = 80$. I must pay R80.

21. $\frac{3}{4} \times 6 = \frac{9}{2} = 4\frac{1}{2}$. I need $4\frac{1}{2}$ cups of flour.

22. $\frac{3}{4}$ of money is R60.

So $\frac{1}{4}$ of money is R20. I spend R20.

23. 16 sausages $\div$ 5 children = 3 each and $\frac{1}{5}$ of the last sausage.
 So they get $3\frac{1}{5}$ each.

24. $\frac{3}{4}$ kg of flour $\times x$ loaves of bread = 10 kg
 $\frac{3}{4}x = 10$ so $x = 10 \times \frac{4}{3} = 13\frac{1}{3}$ loaves of bread

Grade 8 & 9

25a) $6 \div \frac{3}{4} = 6 \times \frac{4}{3} = 8$ b) $3\frac{1}{3} \div \frac{5}{9} = \frac{10}{3} \times \frac{9}{5} = 6$

c) $\frac{5}{8} \div 2 = \frac{5}{8} \times \frac{1}{2} = \frac{5}{16}$

d) $2\frac{1}{6} \div 1\frac{1}{3} = \frac{13}{6} \div \frac{4}{3} = \frac{13}{6} \times \frac{3}{4} = \frac{13}{8} = 1\frac{5}{8}$

$$\begin{aligned} \text{e) } 1\frac{4}{5} - \frac{8}{15} \div 1\frac{1}{2} &= \frac{9}{5} - \left(\frac{8}{15} \div \frac{3}{2}\right) = \frac{9}{5} - \left(\frac{8}{15} \times \frac{2}{3}\right) \\ &= \frac{9}{5} - \frac{16}{45} = \frac{81}{45} - \frac{16}{45} = \frac{65}{45} = \frac{13}{9} = 1\frac{4}{9} \\ \text{f) } \left(\frac{3}{4} \times \frac{4}{7}\right) - \left(\frac{6}{7} \div 3\right) &= \frac{3}{7} - \left(\frac{6}{7} \times \frac{1}{3}\right) = \frac{3}{7} - \frac{2}{7} = \frac{1}{7} \end{aligned}$$

Unit 1.5: Decimal numbers**Grade 7, 8 & 9**

$$\begin{aligned} \text{1a) } 0,8 &= \frac{8}{10} = \frac{4}{5} & \text{b) } 0,02 &= \frac{2}{100} = \frac{1}{50} \\ \text{c) } 0,005 &= \frac{5}{1000} = \frac{1}{200} & \text{d) } 0,25 &= \frac{25}{100} = \frac{1}{4} \\ \text{e) } 0,305 &= \frac{305}{1000} = \frac{61}{200} & \text{f) } 4,05 &= 4\frac{5}{100} = 4\frac{1}{20} \\ \text{g) } 80,75 &= 80\frac{75}{100} = 80\frac{3}{4} & \text{h) } 3,12 &= 3\frac{12}{100} = 3\frac{3}{25} \\ \text{i) } 54,89 &= 54\frac{89}{100} & \text{j) } 10,379 &= 10\frac{379}{1000} \\ \text{2a) } \frac{2}{10} &= 0,2 & \text{b) } \frac{7}{100} &= 0,07 \\ \text{c) } \frac{9}{1000} &= 0,009 & \text{d) } \frac{43}{100} &= 0,43 \\ \text{e) } \frac{231}{1000} &= 0,231 & \text{f) } \frac{34}{1000} &= 0,034 \\ \text{g) } \frac{1}{5} &= \frac{2}{10} = 0,2 & \text{h) } \frac{3}{4} &= \frac{75}{100} = 0,75 \\ \text{i) } 3\frac{14}{100} &= 3,14 & \text{j) } 10\frac{1}{2} &= 10\frac{5}{10} = 10,5 \\ \text{3a) } 0,3 &= & & \\ \text{a) } 0,3 &= \frac{3}{10} = \frac{300}{1000}; & 0,03 &= \frac{3}{100} = \frac{30}{1000}; \\ 0,042 &= \frac{42}{1000} & & \\ \text{So ascending order is } &0,03; 0,042; 0,3 & & \\ \text{b) } 0,2 &= 0,20; & 0,21; & 0,12 \\ \text{So ascending order is } &0,12; 0,2; 0,21 & & \\ \text{c) } 0,7 &= 0,7000; & 0,3256; & 0,09 = 0,0900 \\ \text{So ascending order is } &0,09; 0,3256; 0,7 & & \\ \text{d) } 0,980; & 1,000; & 0,0643 & \\ \text{So ascending order is } &0,0643; 0,98; 1 & & \\ \text{e) } 0,78; & 0,60; 0,09 & & \\ \text{So ascending order is } &0,09; 0,6; 0,78 & & \\ \text{f) } 0,0045; & 0,0060; 0,0100 & & \\ \text{So ascending order is } &0,0045; 0,006; 0,01 & & \\ \text{4a) Number line goes up in intervals of } &0,01. & & \\ \text{So A is } 3,09; & \text{B is } 3,14; & \text{C is } 3,19; & \\ \text{D is } 3,265 & \text{(halfway between 3,26 and 3,27)} & & \\ \text{b) Number line goes up in intervals of } &0,001. & & \\ \text{So A is } 0,4499; & \text{B is } 0,4502; & \text{C is } 0,4505; & \text{D is } 0,4509 \\ \text{5a) Rounding } 6\,543,2348: & \text{(i) } 7\,000 & \text{(ii) } 6\,540 & \\ & \text{(iii) } 6\,543,2 & \text{(iv) } 6\,543,235 & \\ \text{b) Rounding } 7\,269,8063: & \text{(i) } 7\,300 & \text{(ii) } 7\,270 & \\ & \text{(iii) } 7\,270,0 & \text{(iv) } 7\,269,81 & \\ \text{c) Rounding } 6\,399,2318: & \text{(i) } 6\,000 & \text{(ii) } 6\,400 & \\ & \text{(iii) } 6\,399,2 & \text{(iv) } 6\,399,232. & \\ \text{d) Round off } 6\,053,7247: & \text{(i) } 6\,100 & \text{(ii) } 6\,050 & \\ & \text{(iii) } 6\,053,7 & \text{(iv) } 6\,053,725. & \\ \text{e) Round off } 689,9828: & \text{(i) } 1\,000 & \text{(ii) } 690 & \\ & \text{(iii) } 690,0 & \text{(iv) } 689,983 & \\ \text{6a) } 3,30 + 4,83 &= 8,13 & \text{b) } 9,4 + 3,7 &= 13,1 \\ \text{c) } 3,560 + 4,689 &= 8,249 & \text{d) } 9,43 - 3,21 &= 6,22 \\ \text{e) } 9,43 - 3,56 &= 5,87 & \text{f) } 0,06 + 3,2 + 5,75 &= 8,81 \end{aligned}$$

$$\begin{aligned} \text{g) } 0,07 + 4,21 - 4,2 &= 0,08 & \text{h) } 1 - 0,03 &= 0,97 \\ \text{i) } 100 - 0,03 &= 99,97 & \text{j) } 0,04 + 5,06 &= 5,1 \\ \text{7a) } 13,3 + 1,4 + \underline{\quad} &= 18,2 & \text{So } 18,2 - 14,7 &= \underline{3,5} \\ \text{b) } 25,31 - \underline{10,25} &= 15,06 & \text{c) } 14,9 + \underline{0,1} &= 15 \\ \text{d) } 14,09 + \underline{0,91} &= 15 & \text{e) } 1 - \underline{0,7} &= 0,3 \\ \text{f) } 1 - \underline{0,22} &= 0,78 & & \\ \text{8a) } 51,7 \times 100 &= 5\,170 & \text{b) } 0,2 \div 10 &= 0,02 \\ \text{c) } 0,071 \times 1\,000 &= 71 & \text{d) } 521,23 \div 100 &= 5,2123 \\ \text{e) } 31,75 \times 10 &= 317,5 & \text{f) } 0,03 \div 10 & \\ \text{g) } 1,2 \div 100 & & \text{h) } 2,6 \div 10 & \\ \text{i) } 5\,413,217 \div 1\,000 &= 5,413217 & & \\ \text{9a) } 4 \times 0,3 &= 1,2 & & \\ \text{b) } 0,02 \times 0,3 &= 0,006 & \text{c) } 7,2 \div 9 &= 0,8 \\ \text{d) } (0,1)^2 &= 0,1 \times 0,1 = 0,01 & & \\ \text{e) } 451,2 \div 0,02 &= 4,512 \div 2 = 2,456 & & \\ \text{f) } 2,1 \div 0,3 &= 21 \div 3 = 7 & & \\ \text{g) } 5,365 \div 0,05 &= 536,5 \div 5 = 107,3 & & \\ \text{h) } 1,44 \div 1,2 &= 1,2 & & \\ \text{i) } 0,8 \times 3,81 &= 3,048 & & \\ \text{j) } 1,2 \times 3,4 &= 12 \times 34 \div 100 \\ &= 340 + 68 \div 100 = 4,08 & & \\ \text{10 } 45 \times 24 &= 1\,080. & & \\ \text{a) } 4,5 \times 2,4 &= 10,80 & & \\ \text{b) } 0,045 \times 0,24 &= 0,01080 & & \\ \text{c) } 0,45 \times 240 &= 108,0 & & \\ \text{11. } 23 \times 37 &= 851 & & \\ \text{a) } 2,3 \times 3,7 &= 8,51 & \text{b) } 0,23 \times 0,370,0851 & \\ \text{c) } 0,23 \times 370 &= 85,1 & & \\ \text{12a) } 0,35 + (0,2 \times 0,1) &= 0,35 + 0,02 = 0,37 & & \\ \text{b) } (0,42 \div 0,2) + (3,1 \times 3) &= 0,021 + 9,1 = 9,121 & & \\ \text{c) } \frac{3,2 + 4,05}{0,05} &= \frac{7,25}{0,05} = \frac{725}{5} = 125 & & \\ \text{d) } 0,75 + 0,1 \times 2 &= 0,75 + 0,2 = 0,95 & & \\ \text{e) } (0,24 \div 0,3) + (1,4 \times 2) &= (2,4 \div 3) + 2,8 \\ &= 0,8 + 2,8 = 3,6 & & \\ \text{f) } \frac{3,4 + 4,92}{0,02} &= \frac{8,32}{0,02} = \frac{832}{2} = 416 & & \\ \text{13a) } R32,60 \times 2 \text{ kg} &= R65,20 & & \\ \text{b) } 0,2 \text{ kg cost } &R6,52 & & \\ \text{c) } 0,5 \text{ kg cost} &= R16,30 & & \\ \text{14a) } R14,06 \times 5 \text{ kl} &= R14,06 \times 10 \div 2 = R70,30 & & \\ \text{b) } R14,06 \times 6,5 \text{ kl} &= R70,30 + R14,06 + R7,03 = R91,39 & & \\ \text{15a) } (0,04)^2 &= 0,016 \text{ so } 0,04 \text{ is bigger} & & \\ \text{b) } \sqrt{0,04} &= 0,2 \text{ so } \sqrt{0,04} \text{ is bigger.} & & \\ \text{c) } (0,3)^2 &= 0,09 \text{ so } 0,3 \text{ is bigger} & & \\ \text{d) } \sqrt{0,3} &\text{ is bigger (following the pattern of question b).} & & \\ \text{16a) } 2,7; 3,0; 3,3; 3,6; 3,9; 4,2 &\text{ (adding 0,3 each time).} & & \\ \text{b) } 3,28; 3,3; 3,32; 3,34; 3,36; 3,38; \underline{3,4}. & & & \\ \text{(adding 0,02 each time)} & & & \\ \text{c) } 0,89; 0,81; 0,73; 0,65; 0,57; \underline{0,49} & & & \\ \text{(subtracting 0,08 each time).} & & & \\ \text{d) } 0,8; 1,6; 3,2; 6,4; 12,8; \underline{25,6}. & & & \\ \text{(doubling each time)} & & & \end{aligned}$$

Unit 1.6: Percentages**Grade 7, 8 & 9**

- 1a) $1\% = 0,01 = \frac{1}{100}$ b) $2\% = 0,02 = \frac{2}{100} = \frac{1}{50}$
 c) $30\% = 0,3 = \frac{3}{10}$ d) $25\% = 0,25 = \frac{1}{4}$
 e) $75\% = 0,75 = \frac{75}{100} = \frac{3}{4}$
 f) $50\% = 0,5 = \frac{50}{100} = \frac{1}{2}$ g) $45\% = 0,45 = \frac{45}{100} = \frac{9}{20}$
 h) $68\% = 0,68 = \frac{68}{100} = \frac{17}{25}$ i) $40\% = 0,4 = \frac{40}{100} = \frac{2}{5}$
 j) $55\% = 0,55 = \frac{55}{100} = \frac{11}{20}$
 2a) 4% b) 9% c) 60% d) 27%
 e) 25% f) 80% g) 32% h) 100%
 i) 29,5% j) 7,5%
 3a) $\frac{1}{4} = \frac{25}{100} = 0,25 = 25\%$ b) $\frac{1}{2} = 50\%$
 c) $\frac{3}{4} = 75\%$ d) $\frac{1}{25} = \frac{4}{100} = 4\%$
 e) $\frac{2}{25} = \frac{8}{100} = 8\%$ f) $\frac{3}{20} = \frac{15}{100} = 15\%$
 g) $\frac{12}{50} = \frac{24}{100} = 24\%$ h) $\frac{7}{20} = \frac{35}{100} = 35\%$
 i) $\frac{3}{5} = \frac{60}{100} = 60\%$ j) $\frac{9}{25} = \frac{36}{100} = 36\%$
 4a) $15\% = 0,15$; $\frac{1}{5} = 0,2$; $0,25$
 b) $0,02$; $\frac{1}{25} = 0,04$; $5\% = 0,05$
 c) $3\% = 0,03$; $\frac{3}{10} = 0,3$; $0,32$
 d) $0,06$; $40\% = 0,4$; $\frac{23}{50} = 0,46$.
 e) $35\% = 0,35$; $0,4$; $\frac{1}{2} = 0,5$
 f) $0,1$; $\frac{3}{25} = 0,12$; $15\% = 0,15$
 5a) $\frac{10}{100} \times 600 = 60$ b) $\frac{25}{100} \times 368 = 92$
 c) $\frac{75}{100} \times 328 = 246$ d) $\frac{20}{100} \times 125 = 25$
 e) $\frac{40}{100} \times 500 = 200$ f) $\frac{30}{100} \times 12\,300 = 3\,690$
 6a) $\frac{40}{100} \times 30 = 12$. The mark is 12 out of 30.
 b) $\frac{24}{30} \times 100 = 80$. You get 80% for the test.
 c) $\frac{25}{100} \times 60 = 15$. There are 15 boys at the camp.
 d) $\frac{15}{100} \times 1\,000 = 150$. My brother gets R150.
 e) 20% of water = 14 litres.
 So 1% of water is $\frac{14}{20}$, so 80% is $\frac{14}{20} \times 80 = 56$ litres.
 f) $\frac{11,90 - 10,00}{10,00} \times \frac{100}{1} = 19\%$.
 The price of milk increases by 19%.
 g) $\frac{16 - 40}{40} \times \frac{100}{1} = -60\%$. The percentage of people attending drops by 60%.
 h) $\frac{20}{100} \times 600 = 120$.
 So the shirt costs R600 – R120 = R480.
 i) $\frac{14}{100} \times 150\,000 = R21\,000$.
 So the price with VAT is R171 000.
 7a) $\frac{6\,000\,000 - 4\,000\,000}{4\,000\,000} \times \frac{100}{1} = 50\%$ profit.
 b) $\frac{2\,760 - 3\,000}{2\,760} \times \frac{100}{1} = 8,7\%$ discount.

c) 20% of total = R3 000

$$1\% \text{ of total} = \frac{3\,000}{20} = R150.$$

$$100\% = R150 \times 100 = R15\,000.$$

d) $\frac{14}{100} \times 400 = R56$. I must pay R456. **Grade 8 & 9**e) 3% of total is R10 000 **Grade 9 only**

$$1\% \text{ of total} = \frac{10\,000}{3} = R3\,333,33$$

$$100\% = R3\,333,33 \times 100 = R333\,333.$$

f) $\frac{300 - 360}{300} \times \frac{100}{1} = 20\%$. **Grade 7, 8 & 9**

$$\frac{450 - 530}{450} \times \frac{100}{1} = 17,8\%$$

Thandi makes a bigger percentage profit.

Unit 1.7: Simple and compound interest**Grade 7, 8 & 9**

- 1a) $A = P(1 + in) = 1\,000(1 + 0,05 \times 3) = 1\,000(1 + 0,15)$
 $= 1\,000(1,15) = R1\,150$
 b) $A = P(1 + i)^n = 1\,000(1 + 0,05)^3 = R1\,157,63$
 c) $A = 5\,000(1 + 0,1 \times 3) = R6\,500$
 d) $A = P(1 + i)^n = 5\,000(1 + 0,1)^3 = R6\,655$
 2a) $SI = P.n.i = 3\,000 \times 3 \times 0,04 = R360$
 b) $A = P(1 + i)^n = 3\,000(1 + 0,04)^3 = R3\,374,60$
 So interest after 3 years is R374,60
 c) $SI = P.n.i = 6\,000 \times 3 \times 0,12 = R2\,160$
 d) $A = P(1 + i)^n = 6\,000(1 + 0,12)^3 = R8\,429,57$
 So interest after 3 years is R2 429,57
 3. We are looking for P. $n = 1$ and $i = 0,05$ $SI = R10$
 $SI = P.n.i$ so $10 = P(1)(0,05)$
 $P = 10 \div 0,05 = 200$. I invested R200
 4. We are looking for P. $n = 3$ and $i = 0,1$ $SI = R120$
 $SI = P.n.i$ so $P = \frac{SI}{n \times i} = \frac{120}{0,3} = 400$
 So I invested R400.
 5. $P = R2\,000$ and $A = R4\,000$ $i = 0,05$ per month $n = ?$
 $A = P(1 + in)$
 $4\,000 = 2\,000(1 + 0,05n)$
 $2 = 1 + 0,05n$
 $1 = 0,05n$
 $n = 1 \div 0,05 = 20$
 It will take 20 months to double the amount I borrowed.

Grade 8 & 9

6. $P = R4\,000$ $i = 0,15$ p.a.; $n = 3$ years = 3 months; $A = ?$
 a) $A = P(1 + in) = 4\,000(1 + 0,15 \times 3) = R5\,800$
 b) For monthly installments, divide by number of months.
 $R5\,800 \div 36 = R161,11$ per month.
 7. Deposit of $20\% = R8\,000 \times \frac{20}{100} = R1\,600$
 So there is $R8\,000 - R1\,600 = R6\,400$ left to pay.
 So $P = R6\,400$; $i = 0,25$ p.a. $n = 5$ years = 60 months
 $A = 6\,400(1 + (0,25)(5))$
 $A = 6\,400(2,25) = R14\,400$
 For monthly installments, divide by number of months.
 $R14\,400 \div 60 = R240$ per month

Grade 9 only

- 8a) $A = P(1 + i)^n = 1\,000(1 + 0,08)^5 = R1\,469,33$
 b) $A = P(1 + i)^n = 8\,000(1 + 0,08)^5 = R11\,754,62$
 9a) $A = P(1 + i)^n = 1\,000(1 + 0,16)^5 = R2\,100,34$
 b) $A = P(1 + i)^n = 8\,000(1 + 0,16)^5 = R16\,802,73$
 10. $A = R5\,000$; $n = 6$ months; $i = 10\% = 0,1$ per month.
 $A = P(1 + in)$
 $5\,000 = P(1 + 0,1 \times 6)$
 $5\,000 = P(1,6)$
 $P = 5\,000 \div 1,6 = R3\,125$. I can borrow R3 125.
 11. The first 5 years:
 $P = R3\,000$; $i = 8\% = 0,08$ p.a.; $n = 5$ years
 $A = P(1 + i)^n = 3\,000(1 + 0,08)^5 = R4\,407,98$
 $R4\,407,98 + R4\,000 = R8\,407,98$
The next 2 years:
 $P = R8\,407,98$; $i = 8\% = 0,08$ p.a.; $n = 2$ years
 $A = P(1 + i)^n = 8\,407,98(1 + 0,08)^2 = R9\,807,07$
 12. 5% compound interest is better because you earn interest on the interest of the years before.
 13. i) $P = R3\,000$; $i = 0,08$ p.a.; $n = 5$ years
 $A = P(1 + in) = 3\,000(1 + 0,08 \times 5) = R4\,200$
 ii) $P = R3\,000$; $i = 0,08$ p.a.; $n = 5$ years
 $A = P(1 + i)^n = 3\,000(1 + 0,08)^5 = R4\,207,66$.
 This investment gives you more.

Unit 1.8: Simple and compound interest**Grade 7, 8 & 9**

- 1a) $400 \times 1 : 400 \times 3$. I must use 1 200 ml of water.
 b) concentrate : total cooldrink = 1 : 4
 $\times 2 \quad \left(\begin{array}{c} 1 : 4 \text{ (litres)} \\ ? : 8 \\ 2 : 8 \end{array} \right) \times 2$
 So I need 2 litres of concentrate for 8 litres of cooldrink.
 c)
 $\div 4 \quad \left(\begin{array}{c} 1 : 4 \text{ (in litres)} \\ ? : 1 \end{array} \right) \div 4$
 So I need $\frac{1}{4}$ litre of concentrate for 1 litre of cooldrink.
 d) I need 10 times more cooldrink than in question c).
 $\frac{1}{4} : 1$
 $10 \times \frac{1}{4} : 1 \times 10$
 So $\frac{1}{4} \times 10 = 2,5$ litres of cooldrink
 2a) There are $5 + 1 = 6$ parts. Each part is $R240 \div 6 = R40$.
 $1 : 5 = 40 : 200$ Nathi gets R40 and Ayanda gets R200.
 b) There are $5 + 7 = 12$ parts.
 Each part is $R240 \div 12 = R20$.
 $5 : 7 = 100 : 140$
 c) There are 6 parts. Each part is $R240 \div 6 = R40$.
 $1 : 2 : 3 = 40 : 80 : 120$
 Anna gets R40, Tebogo gets R80 and Khotso gets R120.
 3a) $\$50 \times 10,30 = \515
 b) $R1\,030 \div 10,30 = \$100$
 c) $R100 \div 10,30 = \$9,71$

- 4a) $30 : 2$ (biscuits to eggs) $\left(\begin{array}{c} \times 4 \\ 120 : ? \end{array} \right)$
 $2 \times 4 = 8$ eggs are needed.
 b) $30 : 2$ (biscuits to eggs) $\left(\begin{array}{c} \times \frac{7}{2} \\ ? : 7 \end{array} \right)$
 $30 \times \frac{7}{2} = 105$ biscuits can be made.
 5a) $400 \text{ km} \div 80 \text{ km/h} = 5$ hours
 b) $600 \text{ km} \div 80 \text{ km/h} = 7,5$ hours
 c) $4,5 \text{ hours} \times 80 \text{ km/h} = 360 \text{ km}$
 d) $12 \text{ minutes} = \frac{12}{60} = \frac{1}{5}$ hour
 $\frac{1}{5} \text{ hour} \times 80 \text{ km/h} = 16 \text{ km}$
 6a) $\text{£}10 \times 17,20 = \text{£}172,00$
 b) $\text{£}28 \times 17,20 = \text{£}481,60$
 c) $R100 \div 17,20 = \text{£}5,81$
 d) $R1 \div 17,20 = \text{£}0,058 = \text{£}0,06$
 7a) $\$1 = \text{€}0.80 \quad \left(\begin{array}{c} \frac{4}{5} \times \frac{5}{4} = 1 \\ 1 : 0,8 \\ ? : 1 \end{array} \right) \times \frac{5}{4}$
 $\$1,25 = \text{€}1$
 b) $\$1 = R12$ and $\$1 = \text{€}0.80$ so $R12 = \text{€}0.80$
 So $R1 = \frac{0,8}{12} = \text{€}0,067$
 So $R100 = 0,0667 \times 100 = \text{€}6,67$
 8a) 1 person for 30 days, so 10 people for 3 days.
 b) $5 \text{ days} \times 6 \text{ people} = 30$, so there is enough food for 6 people for 5 days.
 9a) $4 \text{ kg} \times R35/\text{kg} = R140$
 b) $\frac{1}{2} \text{ kg} \times R35/\text{kg} = R17,50$
 c) $0,4 \text{ kg} \times R35/\text{kg} = R14,00$
 d) $0,6 \text{ kg} \times R35/\text{kg} = R21,00$
 10a) R3,50 for a 200 ml can: $R3,50 \times 5 = R17,50$ per litre.
 R4,50 for a 340 ml can: $R4,50 \times \frac{1\,000}{340} = R13,23$ per litre.
 R6,90 for a 500 ml bottle: $R6,90 \times 2 = R13,80$ per litre.
 R12 for a 2 litre bottle: R6 per litre
 b) The 2 litre bottle is the cheapest at R6 per litre.
 11. Andile: $532 \div 5 = 106,4 \text{ km/h}$,
 Bongani: $392 \div 3 = 130,7 \text{ km/h}$
 Chris: $200 \div 2 = 100 \text{ km/h}$. Bongani is the fastest.
 12. $1 : 30\,000$ means 1 cm on the map represents 30 000 cm on the ground.
 So 5 cm represents 150 000 cm.
 $150\,000 \text{ cm} = 1\,500 \text{ metres} = 1,5 \text{ km}$
 13. 8 cakes cost R92, so 1 cake costs $92 \div 8 = 11,5$.
 10 cakes cost $11,5 \times 10 = R115,00$.

Grade 9 only

- 14a) x and y are directly proportional because $3x = y$
 b) x and y are indirectly proportional because $x \times y = 36$
 c) x and y are not in proportion.
 d) x and y are directly proportional because $1,2x = y$

15a) $5 \times 2 = 10$, so $12,5 \times 2 = p$ so $p = 25$ and

$$q \times 2 = 2 \text{ so } q = 1$$

x	5	12,5	q
y	10	p	2

b) $5 \times 10 = 50$, so $12,5 \times p = 50$, so $p = \frac{50}{12,5} = 4$

$$q \times 2 = 50, \text{ so } q = 25$$

Unit 1.9: Integers

Grade 7, 8 & 9

- 1a) -2 b) -7 c) -11 d) -23 e) -22
 2a) -7 b) -4 c) 2 d) -27 e) -18
 3a) 9 b) -4 c) 14 d) 12 e) -4
 4a) 6 b) 16 c) 35 d) 51 e) 3
 5a) 285 b) -78 c) 111 d) -41 e) -46
 6a) 5 b) 0 c) 8 d) -32
- 7a) $5 + 7 = 12$ b) $-7 + (-5) = -12$
 c) $7 - (-7) = 14$ d) $-7 - (7) = -14$
8. $7 - 9 + 18 = 16^\circ\text{C}$. $16 - 7 = 9^\circ\text{C}$. It was 9°C warmer.
9. It is not correct. If you add two negative numbers, your answer is smaller.

Example: $-7 + (-8) = -15$, but $-7 - (-8) = 1$ and $1 > -15$

Grade 8 & 9

- 10a) -18 b) -35 c) 40 d) -14 e) 48
 11a) -6 b) -4 c) 7 d) 4 e) 8
 12a) $8 + 3(-2) = 2$
 b) $24 \div (-3) + 3 \times (-2) = -8 - 6 = -14$
 c) $(23 + 4) \div 9 - 6 = 27 \div 9 - 6 = 3 - 6 = -3$
 13a) $\frac{-12}{9} \times \frac{6}{4} = \frac{-3}{3} \times \frac{2}{1} = -2$
 b) $\frac{-15}{-5} + 3(7 - 9) = 3 + 3(-2) = 3 - 6 = -3$
 c) $\frac{9+6}{-6} - \frac{1}{2} = \frac{15}{-6} - \frac{1}{2} = \frac{15+3}{-6} = \frac{18}{-6} = -3$
 14a) $-3 \times -3 = 9$ b) $-3^2 = -3 \times 3 = -9$
 c) $-3^2 - (-3)^2 = -9 - 3 = -12$
 15a) $15 + (-3) = 12$ b) $15 + (-9) = 6$
 c) $15 - 9 = 6$ d) $-8 - (-7) = -1$
 e) $4 - (-5) = 9$ f) $235 + (-46) = 189$
 g) $-136 - (-72) = -64$ h) $145 - 9 = 136$
 i) $35 + (-13) = 22$ j) $-3 \times (-5) = 15$
 k) $2 \times 5 = 10$ l) $7 \times 3 = 21$
 m) $-3 \times 4 = -12$ n) $-120 \div -6 = 20$
 p) $-7 \times (-12) = 84$
 16a) $2(-2)(7) = -28$ b) $7 - (-2) = 9$
 c) $-2 + 7 - (-2) = 7$ d) $(-2 - 7) - 7 = -16$
 e) $10(-1)^2 \div -2 = 10 \div -2 = -5$ f) $(7)^2 - (-2)(7) = 63$
 g) $\frac{1}{2}(7)(-2) - (-1) = -7 + 1 = -6$
 h) $3(-2) + 2(7) = -6 + 14 = 8$
 i) $[(-2)(7)(-1) - (-2)^2(7)^3(-1)^4]^0 = 1$

17. Let the numbers be x and y .

$$\text{So } x + y = -6 \text{ and } xy = -16.$$

One method is to test different numbers.

Example: 1 and -16; 2 and -8; 4 and -4 work for $xy = -16$.

Of these, 2 and -8 also works for $x + y = -6$.

So $x = 2$ and $y = -8$ is a solution.

Note that $x = -2$ and $y = 8$ doesn't work.

18. Let the numbers be x and y .

$$\text{So } x + y = -17 \text{ and } xy = 72.$$

2 and 36, 3 and 24, 6 and 12, 9 and 8 give a product of 72.

9 and 8 give a sum of 17, so $-9 + (-8) = -17$.

So $x = -9$ and $y = -8$, or $x = -8$ and $y = -9$.

19. Let the numbers be x and y , so that $\frac{x}{y} = 3$ and $xy = 12$.

1 and 12, 2 and 6, 3 and 4 all make a product of 12.

$$\frac{6}{2} = 3, \text{ so } x = 6 \text{ and } y = 2 \text{ is a solution.}$$

$x = -6$ and $y = -2$ is also a solution.

Unit 1.10: Exponents

Grade 7, 8 & 9

- 1a) $3 + 36 \div 2 = 3 + 18 = 21$
 b) $27 \div 3^2 = 27 \div 9 = 3$
 c) $\sqrt{16} \times 2 = 4 \times 2 = 8$
 d) $3 + 3 \times 4 = 3 + 12 = 15$
 e) $(4 - 1 + 1) \times 5 = 4 \times 5 = 20$
 f) $2^3 \div 4 = 8 \div 4 = 2$
 2a) $3^7 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$
 b) $6^2 \cdot 7^4 = 6 \times 6 \times 7 \times 7 \times 7 \times 7$
 c) $\left(\frac{1}{2}\right)^5 = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$
 3a) 3^4 b) $4^3 \cdot 6^4$ c) $\left(\frac{2}{3}\right)^5$ d) $(0,1)^4$

4. Learner A is correct. Using BEDMAS, we need to work out the exponent first, then the multiplication and then add. Learner B multiplies before working out the exponent and gets the answer wrong.

5. B is a better offer.

$$2, 4, 8, 16 \dots = 2^1, 2^2, 2^3, 2^4 \dots$$

So the amount on day 30 will be $2^{30} = \text{R}10\,737\,418,24$

Grade 8 & 9

- 6a) $-4 + (-3)2 = -4 + 9 = 5$
 b) $1 - \sqrt{25} \times 3 + 3^2 = 1 - 5 \times 3 + 9$
 $= 1 - 15 + 9 = -5$
 c) $2 \times 4 \div (-4) = -2$
 d) $-125 \div 5 = -25$
 7a) $(-4)^6 = -4 \times -4 \times -4 \times -4 \times -4 \times -4$
 b) $(-2)^7 \cdot 7^2 = -2 \times -2 \times -2 \times -2 \times -2 \times -2 \times -2 \times 7 \times 7$
 c) $x^4 y^3 = x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y$
 8a) 5^6 b) $(-2)^3$
 9a) $1\,260\,000 = 1,26 \times 10^6$
 b) $2,32 \times 10^{12}$
 c) $103,2 = 1,032 \times 10^2$
 d) $216,67 \times 10^4 = 2,1667 \times 10^6$
 10a) $6a^5$ b) $4a^6$ c) $4x^6$ d) $\frac{a^2}{4m}$
 e) $\frac{2(6xy^3)^2}{3y^3} = \frac{2(36x^2y^6)}{3y^3} = 24x^2y^3$
 11a) x^{2n+5} b) $9x^6y^2$
 c) $\frac{2xy^2}{16x^4y^6} \times 8x^4y^5 = \frac{1}{8x^3y^4} \times 8x^4y^5 = xy$
 d) $\frac{(4p^2q)q^2}{1} = 4p^2q^3$ e) 1
 f) $\frac{a^4m^6 \cdot am^4}{a^3m^4} = a^2m^6$

- 12a) x^4y^5 b) $a^5b^5c^4$
 13a) $7,86 \times 10^{-8}$ b) 6×10^{-2}
 c) $2,88 \times 10^{-10}$ d) $3,0 \times 10^{-6}$
 14a) $27x^{-3}$ b) $\frac{-3a^0}{a^2} = \frac{-3}{a^2}$
 c) $\left(\frac{4}{5}\right)^{-2} = \left(\frac{5}{4}\right)^2 = \frac{25}{16}$ d) $\frac{4a^3b^5}{(2ab^3)^2} = \frac{4a^3b^5}{4a^2b^6} = \frac{a}{b}$
 15. 1 year = 365 days = $365 \times 24 \times 60 \times 60$ seconds.
 $\text{speed} = \frac{\text{distance}}{\text{time}}$ so distance = speed $\times$ time
 distance = $299\,800 \times 31\,536\,000$
 $= 9,454 \times 10^{12}$ km/s
 16. 1 micrometre = 0,000001 m
 so 6 micrometres = 0,000006 m = $0,6 \times 10^{-5}$
 17. a) 1 nm = 10^{-9} m So 100 nm = 10^{-7} m
 b) 1 cm = 10^{-2} m and $\frac{10^{-2}}{10^{-7}} = \frac{10^7}{10^2} = 10^5$
 So 10^5 viruses can fit along a 1 cm line.
 18a) $2^x = 2^3$ so $x = 3$ b) $3^x = \frac{1}{3^4} = 3^{-4}$ so $x = -4$
 c) $6^{x+1} = 6^0$ so $x + 1 = 0$ and $x = -1$
 d) $2^x 2^{3x} = 2^4$ so $4x = 4$ and $x = 1$

ALGEBRA**Unit 2.1: Algebraic expressions****Grade 7, 8 & 9**

1.	variable	coefficient	constant
a) $5x - 8$	x	5	-8
b) $2a + 9$	a	2	9
c) $6 - 3b$	b	-3	6
d) $2x + 8$	x	2	8

- 2a) $x + 5$ b) $x - 5$
 c) $2x$ d) $\frac{1}{2}x$
 3a) $24d$ b) $12x$
 c) $0,50m + 10$
 d) One side of square is $\frac{p}{4}$, so area = $\left(\frac{p}{4}\right)^2 = \frac{p^2}{16}$
 4a) $2(2)^2 + 7 = 15$ b) $2(2)^3 - 7 = 9$
 c) $(2)(7) - 3(2) = 8$ d) $(2) - 3(2)(7) = -40$
 e) $\frac{7}{3} + 2 = 4\frac{1}{3}$ f) $\frac{2}{3} + 7 = 7\frac{2}{3}$

Grade 8 and 9

- 5a) i) 3 ii) -1 b) i) -1 ii) $\frac{1}{2}$
 c) i) 1 ii) 0,2
 6a) 4 terms b) 2 terms c) 1 term
 d) 2 terms e) 1 term
 7a) $2p + p^2$ b) $8x^2 + 2x + 4$
 c) $xy^2 + xy - 2y^2$
 d) $5xy$ e) $p^3q + 2pq + p^2q$
 f) $a^3 + 2a^2$
 8a) $(-1)^3 = -1$
 b) $3(-1)^3 - 6(3) = -21$
 c) $3(-1)(3)^2 = -27$
 d) $(3 - 1,3)^2 = (-9)^2 = 81$

9.

$5a + 28b + 13c$				
$5a + 18b + 3c$			$10b + 10c$	
$5a + 10b$		$8b + 3c$	$2b + 7c$	
$5a + 4b$	$6b$	$2b + 3c$	$4c$	
$5a$	$4b$	$2b$	$3c$	c

Unit 2.2: Calculating with algebraic expressions**Grade 8 and 9**

- 1a) $-x^2 - 7x - 4$ b) $-2m^2n + 6mn + mn^2$
 c) $2b^6 + b^2 + b - 3$ d) $-6pq + 2p + 2q$
 e) $-2a^4b^6c^3$ f) $2y^3 + 8y^2$
 g) $2m^3 + 2m^2$ h) $-m^3n - 3m^2n - 4mn^2$
 i) $12x + 8 + 5x + 5$
 j) $2x^2y + 3xy^2 + 5x^2y - 5xy^2 = 7x^2y - 2xy^2$
 k) $10x^2 - 5x^2 - 2x + 3x - 3 = 5x^2 + x - 3$
 l) $-a + 3 - 3 + a = 0$
 m) $-2x^2 - 2xy + 3x^2 - 3xy = x^2 - 5xy$
 n) $3x - 2 + 3x + 4 = 6x + 2$
 o) $\frac{xy^2}{3}$ p) $\frac{5a^3b^2c}{15a^2b} - \frac{3a^2b}{15a^2b} = \frac{abc}{3} - \frac{1}{5}$
 q) $x^2 - 2y + 3$ r) $7p^8$
 s) x^3y t) $\sqrt{16a^4b^8} = 4a^2b^4$
 u) $-125x$
 v) $\frac{8a^2b}{2ab} + \frac{14ab^2}{2ab} + \frac{3a^2b^3}{2ab} = 4a + 7b + \frac{3ab^2}{2}$

$$2. \text{Area } \Delta = \frac{1}{2} \cdot b \cdot h = \frac{1}{2} \cdot 2x(x + 1) = x^2 + x$$

Grade 9

- 3a) $2a^2 + 9a + 4$
 b) $2x^2 - 5xy - 3y^2$
 c) $3m^2 + 3m + 3mn + 3n$
 d) $y^2 + 6y + 9$
 e) $b^2 - 4bc + 4c^2$
 f) $x^2 - 9$
 g) $4a^2 - 9b^2$
 h) $\frac{1}{2}x^2 + 5x - 2x - 12 = \frac{1}{2}x^2 + 3x - 12$
 i) $2(x^2 - 25) = 2x^2 - 50$
 j) $-(x^2 + 2x - 15) = -x^2 - 2x + 15$
 k) $49 - 42x + 9x^2$
 l) $(x^2 + x - 6) - (x^2 + 3x + 2) = -2x - 8$
 m) $(3x^2 + x - 4) - (x^2 + 2x + 1) = 2x^2 - x - 5$
 n) $-0,1(10x^2 + 320x + 600) = -1x^2 - 32x - 60$
 4. One of the factors, $x - x = 0$, so the answer to the whole product is 0.

Unit 2.3: Factorising algebraic expressions**Grade 9**

1. $3(x - 3)$
 2. $a(3a^3 - 4)$
 3. $11ax(a - 2ax + 5)$
 4. $(p - 3q)(m - 4)$
 5. $a(b - c)$
 6. $2a(a - 3b)$
 7. $x^2(x - 1)$
 8. $3p^2(1 + 2p + 3p^4)$

9. $(2x + 5)(4x - 1)$
10. $(1 + 4a)(1 - 4a)$
11. $(3x + 2)(x + 5)$
12. $2(x - y) - 3(x - y) = -(x - y) = y - x$
13. $-7(2a - b) + 3(2a - b)$
 $= -4(2a - b) = 4(b - 2a)$
14. $(x + 8)(x - 3)$
15. $(x + 2)(x + 4)$
16. $5(x^2 - 6x + 9) = 5(x - 3)(x - 3)$
17. $(\frac{1}{2}x + 2)(x + 2)$
18. $2(y^2 + 6y + 9) = 2(y + 3)(y + 3)$
19. $2(x^2 + 4x - 21) = 2(x + 7)(x - 3)$
20. $(y^2 + 1)^2$
21. $(5k + 3m^2)(5k - 3m^2)$
22. $(x + 7)(x + 2)$
23. $(x - 8)(x - 6)$
24. $(x - 2)(x + 1)$
25. $(x + 9)(x - 5)$
26. $2(x^2 - 9y^2) = 2(x - 3y)(x + 3y)$
27. $4x(x^2 + 7x - 8) = 4x(x - 1)(x + 8)$
28. $5(x^2 - y^2) = 5(x - y)(x + y)$
29. $2y(16x^2 - 25y^2) = 2y(4x - 5y)(4x + 5y)$
30. $b(x^2 - y^2) = b(x - y)(x + y)$
31. $(7y^3 - \frac{1}{3}x)(7y^3 + \frac{1}{3}x)$
32. $x^2 + 2x + 1 = (x + 1)(x + 1) = (x + 1)^2$
 So the sides of the square are all $x + 1$ units long.
33. $\frac{2m^2 + 4m}{m^2 - 4} = \frac{2m(m+2)}{(m-2)(m+2)} = \frac{2m}{m-2}$
34. $\frac{a(a+1)}{a+1} = a$
35. $\frac{(x+5)(x-5)}{(x-5)(x+2)} = \frac{x+5}{x+2}$
36. $\frac{x^2+2x+1}{x^2-1} = \frac{(x+1)(x+1)}{(x+1)(x-1)} = \frac{(x+1)}{(x-1)}$
37. $\frac{a(a-1)}{(a-1)(a-1)} \times \frac{3(a-1)}{a} = 3$
38. $\frac{2(x^2+3x+2)}{x^2+5x+6} = \frac{2(x+2)(x+1)}{(x+2)(x+3)} = \frac{2(x+1)}{x+3} = \frac{2x+2}{x+3}$
39. $\frac{x^4-81x^2}{2x} \times \frac{6}{x^2-9x} = \frac{x^2(x^2-81)}{2x} \times \frac{6}{x(x-9)}$
 $= \frac{x^2(x+9)(x-9)}{2x} \times \frac{6}{x(x-9)} = 3(x+9) = 3x + 27$
40. $\frac{x^4-1}{x^2+1} = \frac{(x^2+1)(x^2-1)}{x^2+1} = x^2 - 1$
 $= (x - 1)(x + 1) = x^2 - 1$

Unit 2.4: Algebraic equations

Grade 7, 8 & 9

1. The smaller number be x . So the other number is $x + 2$.
 $x + (x + 2) = 82$
 $2x + 2 = 82$
 $2x = 80$
 $x = 40$
 The smaller number is 40 and the other is 42.
2. $4y + 5 = 25$ (rand)
 $4y = 20$
 $y = 5$ So a pencil costs R5.

3. $5(x + 4) = 60$ pieces
 $5x = 60 - 20$
 $5x = 40$
 $x = 8$

The consumer studies class bakes 8 apple pies.

4. Sihle's number: $6x$
 John's number: $3x + 9$
 $6x = 3x + 9$
 $3x = 9$ so $x = 3$ Jabulani's number is 3.

- 5a) $y = 2$ $z = 4$
- b) $m = 4$
- c) $2z = 8$ so $z = 4$
- d) $2a = 2$ so $a = 1$
- e) $2r = 10$ so $r = 5$
- f) $x = 4 - \frac{1}{2} = 3\frac{1}{2} = \frac{7}{2}$
- g) $p = 8 \times 3 = 24$
- h) $x = 3 \times 2 = 6$
- i) $y = 3 \div 0,1 = 3 \times 10 = 30$
- j) $\frac{1}{3}x = 2$ so $x = 6$
- k) $x = \frac{-6}{-2} = 3$
- l) $x = \frac{10}{-2} = -5$

6. $(3)^2 + 2(3) = 9 + 6 = 15$
 So $x = 3$ is a solution of the equation.
7. $(4)^2 + \sqrt{4} = 16 + 2 = 18$.
 So $x = 4$ is not a solution of the equation.
8. Let Thando's number be x .
 Ayanda's number: $8x$
 Zelethu's number: $6x + 14$
 $8x = 6x + 14$
 $2x = 14$ so $x = 7$ Thando's number is 7.

Grade 8 & 9

- 9a) $\frac{4}{3} \times \frac{3x}{4} = 2 \times \frac{4}{3}$ so $x = \frac{8}{3}$
- b) $-x = 1$ so $x = -1$
- c) $3y = 12$ so $y = 4$
- d) $3a - 6 = 6$ so $3a = 12$ and $a = 4$
- e) $3b = 2b - 2$
 so $b = -2$
- f) $\frac{y}{3} \times 6 - \frac{y}{2} \times 6 = 4 \times 6$
 $2y - 3y = 24$
 $-y = 24$ and $y = -24$
- g) $z - 1 = 12$
 $z = 13$
- h) $\frac{3}{x} = 6$ so $3 = 6x$ $x = \frac{3}{6} = \frac{1}{2}$
- i) $3x - 15 - 2x + 2 = 7$
 $x - 13 = 7$ so $x = 20$
- j) $5x + 5 - x - 2 = -x + 3$
 $5x = 0$ so $x = 0$
- k) $1 - x + 2x - 1 - 4 = 0$
 $1 - x + 2x - 1 - 4 = 0$
 $x - 4 = 0$ so $x = 4$

l) $3x + 3 - 2x - 6 = 5$

$x - 3 = 5$ so $x = 8$

m) $6x - 3x = -9 - 2$

$3x = -11$ so $x = \frac{-11}{3}$

n) $5x + 10 - 2x + 18 = 3x + 6 + x$

$3x + 28 = 4x + 6$

$-x = -22$ so $x = 22$

o) $12 \times \frac{x}{4} + 12 \times \frac{x}{3} = 7 \times 12$

$3x + 4x = 84$

$7x = 84$ so $x = 12$

10. Let the number of biscuits be x .

$2x + 8 = 20$

$2x = 12$ so $x = 6$ I buy 6 biscuits.

11. Let the number be x .

$x - 1 = (x + 3) \times 2$

$x - 1 = 2x + 6$

$x = -7$

12. $(x + 1) \times 3 = 2x - 3$

$3x + 3 = 2x - 3$

$x = -6$

13. Let the length of the field be x metres.Then the breadth is $(x - 10)$ metres.

Perimeter = $100 = 2x + 2(x - 10)$

$100 = 2x + 2x - 20$

$120 = 4x$

$30 = x$ The length of the field is 30 metres.

14. Let x be the kilometres run on Monday.Then on Wednesday, I run $(x + 4)$ km and on Saturday, I run $2x$ km. So $x + (x + 4) + 2x = 40$.

$4x + 4 = 40$ So $x = 9$ km. I ran 9 km on Monday.

15. $3(x + 1) = 2x - 3$

$3x + 3 = 2x - 3$

$x = -6$

Grade 9

16a) Multiply through by 45

$15a - 9a = 5$

$6a = 5$

$a = \frac{5}{6}$

b) $\frac{x}{5} - \frac{x}{3} = -8$

Multiply through by 15

$3x - 5x = -8 \times 15$

$-2x = -120$

$x = 60$

c) Multiply through by 30

$3y + 10(y - 6) = 270$

$3y + 10y - 60 = 270$

$13y = 330$

$y = \frac{330}{13} = 25 \frac{5}{13}$

d) Multiply through by 36

$9b + 4(b - 3) = 324$

$9b + 4b - 12 = 324$

$13b = 312$

$b = 24$

e) $\frac{3a}{7} - 7 = \frac{a-2}{8}$

Multiply through by 56

$24a - 392 = 7(a - 2)$

$24a - 392 = 7a - 14$

$17a = 378$

$a = 22 \frac{4}{378}$

f) $x^2 = 64$

$(x - 8)(x + 8) = 64$

$x = 8$ or $x = -8$

g) $x = 0$ or $x - 3 = 0$

$x = 0$ or $x = 3$

h) $(a + 4)(a - 4) = 0$

$a = -4$ or $a = 4$

i) $b^2 - 3b - 40 = 0$

$(b - 8)(b + 5) = 0$

$b = 8$ or $b = -5$

j) $2y(y + 3) = 0$

$2y = 0$ or $y = -3$

k) $(x + 2)(x + 5) = 0$

$x = -2$ or $x = -5$

l) $k^2 + 4k + 4 = 0$

$(k + 2)(k + 2) = 0$

$k = -2$

m) $3k^2 - 33k + 72 = 0$

$3(k^2 - 11k + 24) = 0$

$3(k - 8)(k - 3) = 0$

$k = 8$ or $k = 3$

n) $a^2 + 20a + 100 = 0$

$(a + 10)(a + 10) = 0$

$a = -10$

17a) $9x^2 + 36x + 35 = 24x + 31$

$9x^2 + 12x + 4 = 0$

$(3x + 2)(3x + 2) = 0$

$3x = -2$

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

b) $\frac{p+2}{p-6} = \frac{p+9}{p+5}$

$(p + 2)(p + 5) = (p - 6)(p + 9)$

$p^2 + 7p + 10 = p^2 + 3p - 54$

$4p - 44 = 0$

$4(p - 11) = 0$

$p = 11$

c) $(x - 5)(x - 5) = (x - 9)(x - 10)$

$x^2 - 10x + 25 = x^2 - 19x + 90$

$9x - 115 = 0$

$9x = 115$

$x = \frac{115}{9}$

d) $x^2 - 2x - 3 = 0$

$(x - 3)(x + 1) = 0$

$x = 3$ or $x = -1$

e) $5x^2 - 10x + 5 = 0$

$5(x^2 - 2x + 1) = 0$

$5(x - 1)(x - 1) = 0$

$x = 1$

f) $x^2 - x - 6 = 0$

$(x - 3)(x + 2) = 0$

$x = 3$ or $x = -2$

g) $3(x - 2) - 5(2x + 1) = -30$

$3x - 6 - 10x - 5 = -30$

$-7x + 19 = 0$

$-7x = -19$

$x = \frac{19}{7}$

h) Multiply through by 6

$10(x + 1) - 6x = 3(x - 1)$

$10x + 10 - 6x = 3x - 3$

$x = -13$

i) Multiply through by 4

$2(x - 1) - 12x = 4x - 4$

$2x - 2 - 12x = 4x - 4$

$-14x = -2$

$x = 7$

$$j) \frac{(x+1)(x+1)}{3(x+1)} + \frac{2x+1}{5} = 1$$

Multiply through by $15(x+1)$

$$5(x+1)(x+1) + 3(x+1)(2x+1) = 15(x+1)$$

$$5x^2 + 10x + 5 + 6x^2 + 9x + 3 = 15x + 15$$

$$11x^2 + 19x + 8 = 15x + 15$$

$$11x^2 + 4x - 7 = 0$$

$$(11x - 7)(x + 1) = 0$$

$$x = \frac{7}{11} \text{ or } x = -1$$

18. Let the number be x . The other number is $x + 5$.

$$x(x + 5) = 36$$

$$x^2 + 5x - 36 = 0$$

$$(x + 9)(x - 4) = 0$$

$$x = -9 \text{ or } x = -4$$

Unit 2.5: Patterns and algebra

Grade 7, 8 & 9

1a) 1; 4; 7; 10; 13; 16; 19.

Start at 1 and add 3 for each new term.

$$T_n = 3n - 2$$

b) 20; 15; 10; 5; 0; -5; -10.

Start at 20 and subtract 5 for each new term.

$$T_n = -5n + 25$$

c) ...; 48; 96; 192

b) Start with 3 and multiply by 2

d) ... 50; 72; 98

b) Square the position and multiply by 2

e) ... 27; 9; 3

b) Start with 2 187 and divide by 3

2a) 4 tiles

c) The 10th pattern number

b) 24 tiles

$$d) T_n = 4n$$

3a)

Number of cars (n)	1	2	3	4	5
Number of wheels T_n	4	8	12	16	20

b) Multiply number of cars by 4.

c) 400 wheels

$$d) T_n = 4n$$

4a) rows

b) sum of row

1	1
121	4
12321	9
1 234321	16
1 23454321	25
1 2345654321	36
1 234567654321	49
1 23456787654321	64

c) The sum of each row is a square number.

d) n^2 where n is the position number of the row.

e) for 40th row, $n^2 = 40 \times 40 = 1\,600$

5a)

Tins at base of display (n)	1	2	3	4	5	6
Tins in step of display T_n	1	3	1+2+3=6	1+2+3+4=10	15	21

b) Start with one tin and add a row each time. The added row has one more tin each time.

Grade 8 & 9

6a) 5; 9; 13; 17; 21; 25.

$$b) T_n = 4n + 1$$

c) 12 pentagons: $4(12) + 1 = 49$ matches

$$93 \text{ matches: } 93 = 4n + 1$$

$$92 = 4n \text{ so } n = 23$$

93 matches make 23 pentagons

7. Pattern is 1; 5; 9; ...

$$\text{General rule is } T_n = 4n - 3$$

$$T_n = 241 = 4n - 3$$

$$244 = 4n \text{ so } n = 61$$

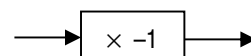
Unit 2.6: Functions

Grade 7, 8 & 9

1a) The output number must be double the input number.

b) The output number must be double the input number, then 1 must be subtracted.

2a)



3. Some examples:

a) Input: 6 Output: -6

b) Input: 6 Output: 2

c) Input: 6 Output: 9

d) Input: 6 Output: 22

$$4a) y = x + 6 \quad b) y = -4x - 2$$

$$c) y = \frac{x}{2} + 3 \quad d) y = \frac{1}{2}x$$

$$e) y = -4x + 6 \quad f) y = \frac{-2x}{3}$$

$$g) y = 5x - 8 \quad h) y = x$$

5a)

x	-2	-1	0	1	2
b) y	4	5	6	7	8
c) y	6	2	-2	-6	-10
d) y	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4
e) y	-1	$-\frac{1}{2}$	0	$\frac{1}{2}$	1
f) y	14	10	6	2	-2
g) y	$\frac{4}{3}$	$\frac{2}{3}$	0	$-\frac{2}{3}$	$-\frac{4}{3}$
h) y	-18	-13	-8	-3	2
i) y	-2	-1	0	1	2

6a)

x	-1	0	1
$y = x + 1$	0	1	2
b) $y = 2x - 3$	-5	-3	-1
c) $y = \frac{1}{2}x - 1$	$-\frac{1}{2}$	-1	$-\frac{1}{2}$
d) $y = -x + 1$	2	1	0
e) $y = -2x - 3$	-1	-3	-5
f) $y = -\frac{1}{2}x - 1$	$-\frac{1}{2}$	-1	$-\frac{3}{2}$

7a) Missing input value: 4 Missing output value: 1

b) Missing rule: $\times 3 + 2$

Grade 8 & 9

8.	x	1	2	3	4	6	7	8	9	10	11
	y	11	10	9	8	6	5	4	3	2	1

$2(x + y) = 24$ so $x + y = 12$. When $y = 5$, $x = 7$.

9.	Number of sides (n)	3	4	5	6	10
	angle size (b)	60	90	108	120	144

$$b = 180^\circ - \frac{360^\circ}{3} = 60^\circ$$

b) 20 sides: $180^\circ - \frac{360^\circ}{20} = 162^\circ$

120 sides: $180^\circ - \frac{360^\circ}{120} = 177^\circ$

c) Angles of 150° : $180^\circ - \frac{360^\circ}{n} = 150^\circ$

$$30^\circ = \frac{360^\circ}{n} \text{ so } 30n = 360 \text{ so } n = 12$$

10a) $y = 1,14(38) = R43,32$

b) $y = 1,14(50) = R57,00$

c)	x rands	1	2	3	4
	y rands	1,14	2,28	3,42	4,56

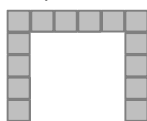
5	6	7	8	9
5,70	6,84	7,98	9,12	10,26

d) Using pattern from c), then R10 will be R11,40 with VAT included. So the price was R10 before VAT was added.

e) Using pattern from c), R3 will be R3,42 with VAT, so R300 will be $R3,42 \times 100 = R342$.

So the price was R300 before VAT was added.

11a)

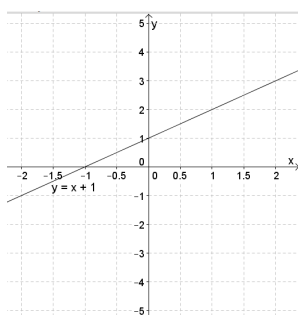


b) The rule is $3x + 2$

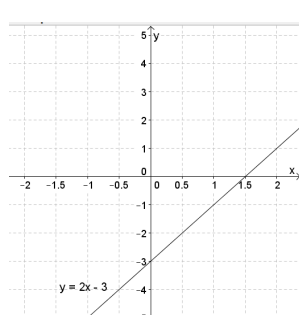
Check: $3(1) + 2 = 5$

$3(17) + 2 = 53$

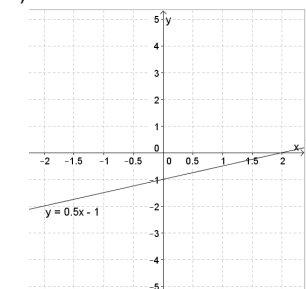
12a)



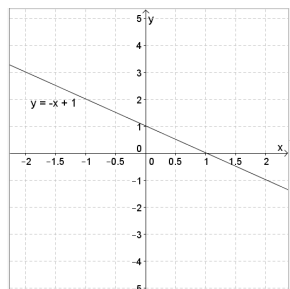
b)



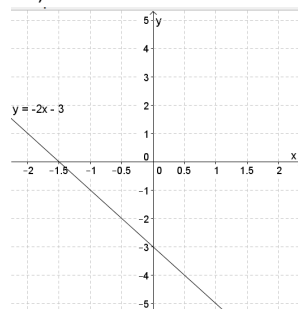
c)



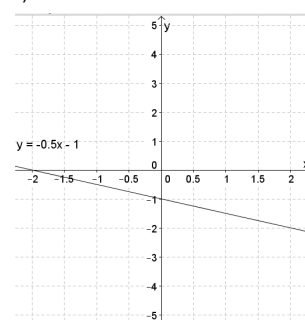
d)



e)



f)

**Unit 2.7: Graphs****Grade 7, 8 & 9**

1a) linear b) non-linear c) non-linear

2a) decreasing b) constant c) decreasing

d) increasing e) increasing f) constant

3a) Learner B (Bob) b) Learner D (Dineo)

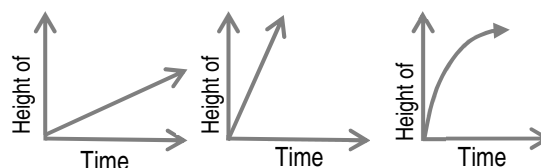
c) Anna studied for 2 hours and she got 5 out of 10 marks.

d) Bob (10 hours) and Dineo (6 hours)

e) Anna, Cam and Bob

4. All three athletes completed the 400 m race. B was the fastest and C was the slowest. Athlete A started fast but decreased his pace gradually. Athlete B started slowly and increased his pace gradually. Athlete C started well, but stopped after a few seconds. When he started again, he kept increasing his pace, but his time was still slower than the other two athletes.

5.

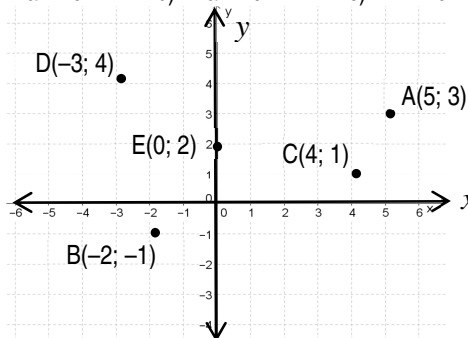


A: The height of water increases slowly and at a constant rate. **B:** The height of water increases quickly and at a constant rate. **C:** The height of water increases quickly and then slows down.

Grade 8 & 9

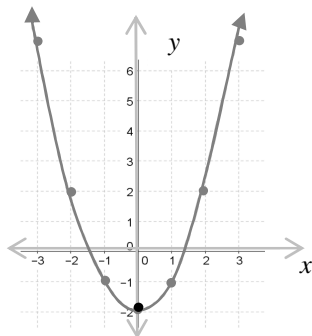
6a) maximum b) maximum c) minimum

7.



8a)

x	-3	-2	-1	0	1	2	3
$y = x^2 - 2$	7	2	-1	-2	-1	2	7

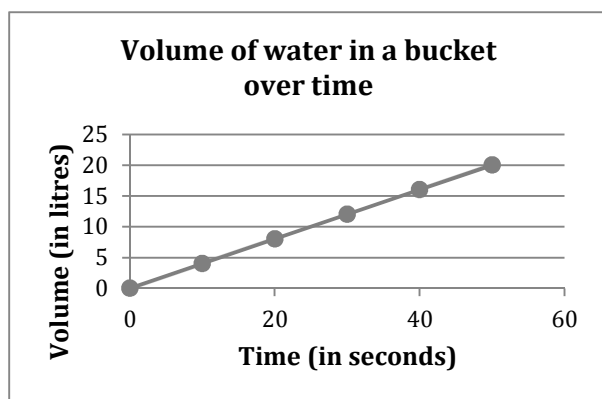


d) The minimum value is -2 at $(0; -2)$.

Unit 2.8: Straight line graphs

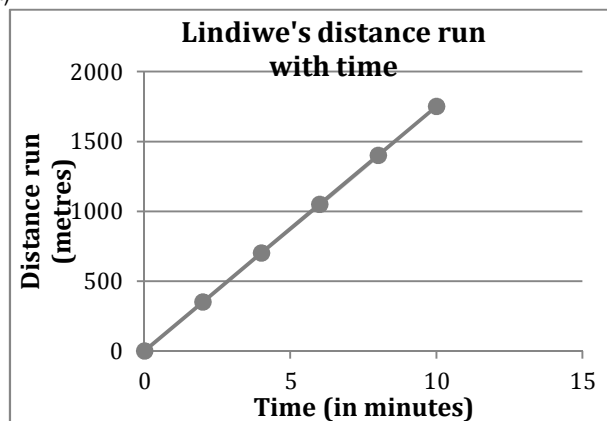
Grade 7, 8 & 9

1a)



b) No, the time can't be less than 0 to extend the graph to the left. Once the bucket has reached 20 litres it is full, so it can't be extended to the right either.

2a)



b) No. It is difficult to keep the same running rate over a longer time.

c) As Lindiwe slows down, the graph will be less steep.

3a) $\frac{3-1}{5-1} = \frac{2}{4} = \frac{1}{2}$

b) $\frac{3-2}{5-0} = \frac{1}{5}$

c) $\frac{2-(-2)}{-1-(-5)} = \frac{4}{4} = 1$

d) $\frac{0-3}{1-(-2)} = \frac{-3}{3} = -1$

4a) Using $(-1; 0)$ and $(3; 8)$

$$\frac{8-0}{3-(-1)} = \frac{8}{4} = 2$$

b) Using $(2; 5)$ and $(3; 15)$

$$\frac{15-5}{3-2} = \frac{10}{1} = 10$$

5a) $x + y - 2 = 0$

$$y = -x + 2$$

$$m = -1 \text{ and } c = 2$$

b) $y - x + 2 = 0$

$$y = x - 2$$

$$m = 1 \text{ and } c = -2$$

c) $3x - 5y = -15$

$$-5y = -3x - 15$$

$$y = \frac{-3x}{-5} + \frac{15}{5}$$

$$y = \frac{3x}{5} + 3$$

$$m = \frac{3}{5} \text{ and } c = 3$$

d) $2y - 2 = -2x$

$$2y = -2x + 2$$

$$y = -x + 1$$

$$m = -1 \text{ and } c = 1$$

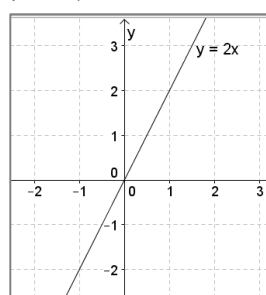
6a)

x	-1	0	1
$y = 2x$	-2	0	2

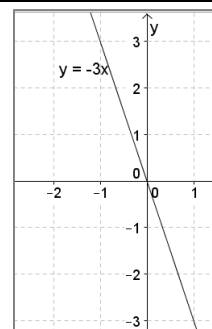
b)

x	-1	0	1
$y = -3x$	3	0	-3

Graphs: a)



b)



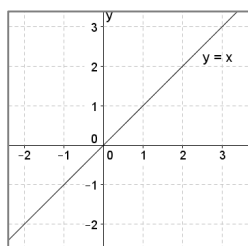
c)

x	-1	0	1
$y = x$	-1	0	1

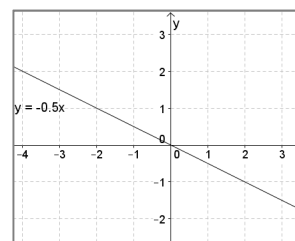
d)

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

Graphs: c)



d)

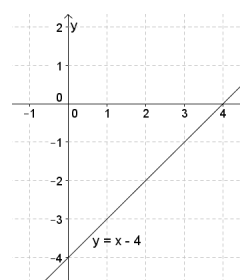


7a) $y = x - 4$

When $x = 0$, $y = -4$

When $y = 0$, $x = 4$

$(0; -4)$ and $(4; 0)$



b) $y = -2x + 3$

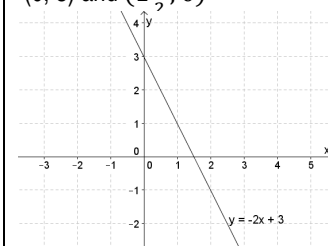
When $x = 0$, $y = 3$

When $y = 0$,

$0 = -2x + 3$

$2x = 3$ and $x = \frac{3}{2}$

$(0; 3)$ and $(1\frac{1}{2}; 0)$



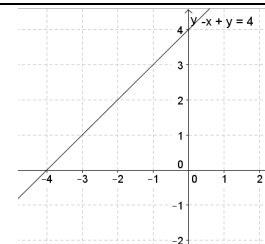
c) $2y = 2x + 8$

When $x = 0$, $2y = 8$

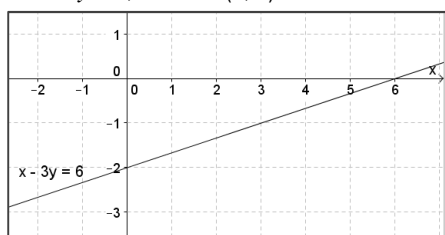
So $y = 4$

When $y = 0$, $x = -4$

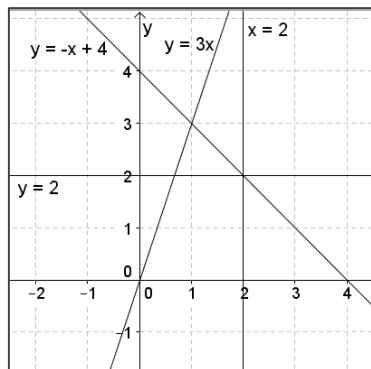
$(0; 4)$ and $(-4; 0)$



d) $2x - 6y = 12$

When $x = 0$, $y = -2$ (0; -2)When $y = 0$, $x = 6$ (6; 0)

8.



9a) $y = mx + c$

$$m = \frac{2}{1} = 2 \text{ and } c = -2$$

So $y = 2x - 2$

b) $m = \frac{4}{-3}$ and $c = -4$

So $y = -\frac{4}{3}x - 4$

c) $m = 0$ and there is no y -intercept.

The equation of the line is $x = 2$.

d) $m = 6$ and $c = 3$

So $y = 6x + 3$

e) m cannot be defined.

The equation of the line is $y = -3$

f) $m = \frac{-2-1}{5-0} = -\frac{3}{5}$ and $c = 1$

So $y = -\frac{3}{5}x + 1$

10a) These points lie on a straight line.

$$m = \frac{7-5}{1-0} = 2 \text{ and } c = 5$$

So $y = 2x + 5$

b) These points can't lie on a straight line.

Each pair of points give different gradients.

c) These points can't lie on a straight line.

Each pair of points give different gradients.

d) These points lie on a straight line.

$$m = \frac{6-9}{0-(-1)} = \frac{3-6}{1-0} = -3 \text{ and } c = 6$$

So $y = -3x + 6$

11a) From the graph, when $y = 8$, $x = 2$

b) $3x + 2 = 8$, so $3x = 6$ and $x = 2$

c) At A, $y = 0$, so $3x + 2 = 0$

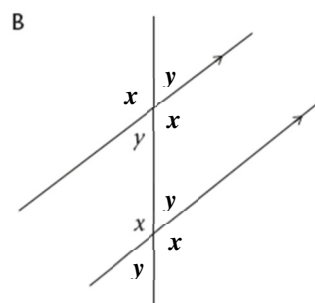
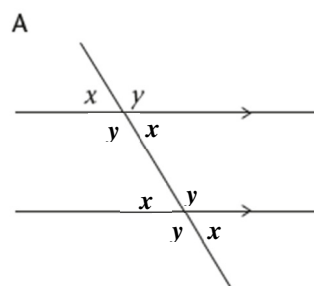
$$x = -\frac{2}{3} \text{ So A is } (-\frac{2}{3}; 0)$$

12. Graph A has the equation $y = x$.Graph B has the equation $y = 3x$.**GEOMETRY****Unit 3.1: Straight line geometry****Grade 7, 8 & 9**

- 1a) parallel lines b) perpendicular lines
- c) vertex 2. PQ is a ray
3. BC is a line segment. AD is not a line segment; it is a line.
- 4a) BD is a line. b) AC is a line segment.
- c) AE is a ray.
5. There are 360 degrees in a revolution.
6. Adjacent angles
- 7a) acute angle b) straight angle c) reflex angle
- d) obtuse angle e) obtuse angle f) acute angle
- g) reflex angle h) right angle
8. obtuse angle 9. 180° and 360°
10. 180° ; half a revolution 11. 90°
12. The point where the two arms of an angle meet.
13. ... stay the same distance apart (equidistant).
14. 90° 15. Perpendicular lines 16. Parallel lines

Grade 8 & 9

1. False. Example: 30° and 60° are acute and make a right angle; 15° and 45° make an acute angle.
- 2a) $x + 3x + 2x = 180^\circ$
 $6x = 180^\circ$ so $x = 30^\circ$
- b) $\widehat{ECB} = 2x = 60^\circ$
- 3a) $2p - 55^\circ + 3p + 70^\circ = 180^\circ$
 $5p + 15^\circ = 180^\circ$
 $5p = 165^\circ$ so $p = 33^\circ$
- b) $\widehat{JKR} = 2(33^\circ) - 55^\circ = 11^\circ$
4. $j = 64^\circ$ (vert opp $\angle$ s)
 $j + k = 180^\circ$ ($\angle$ s on a str line)
 $\therefore k = 180^\circ - 64^\circ = 116^\circ$
 $l = 116^\circ$ (vert opp $\angle$ s)
5. $a = 88^\circ$ (vert opp $\angle$ s)
 $b = 62^\circ$ (vert opp $\angle$ s)
 $62^\circ + 88^\circ + c = 180^\circ$ (adj $\angle$ s on a str line)
 $\therefore c = 180^\circ - (88^\circ + 62^\circ) = 30^\circ$
 $\therefore d = 30^\circ$ (vert opp $\angle$ s)
6. $102^\circ - 2y = 78^\circ$ (vert opp $\angle$ s)
 $24^\circ = 2y$
 $\therefore y = 12^\circ$
- 7.



8. $x = 105^\circ$

Use adj $\angle$ s on str line and corres $\angle$ s on parallel lines.

$y = 165^\circ$ (corres $\angle$ s on parallel lines)

9. $b = 140^\circ$ $c = 40^\circ$ $d = 140^\circ$

10. $\hat{A}F = 50^\circ$ and $\hat{C}RE = 130^\circ$

11. $\hat{D} = 33^\circ$

$\therefore z = 33^\circ$ (alternate $\angle$ s on parallel lines)

$\therefore x = 147^\circ$ (adjacent $\angle$ s on a straight line)

$\hat{B} = 21^\circ$

$\therefore y = 21^\circ$ (alternate $\angle$ s on parallel lines)

12. $a = 26^\circ$ (cointerior $\angle$ s on parallel lines)

$c = 26^\circ$ (alternate $\angle$ s on parallel lines)

$b = 48^\circ$ (corresponding $\angle$ s on parallel lines)

$d = 180^\circ - (26^\circ + 48^\circ) = 106^\circ$ (adj $\angle$ s on str line)

13. $\hat{B}MF = 100^\circ$ and $\hat{N}MK = 100^\circ$ (adj $\angle$ s on str line)

$\hat{L}MK = 80^\circ$ (vert opp $\angle$ s)

$\hat{M}LD = 80^\circ$ (corres $\angle$ s on parallel lines)

$\hat{H}LF = 80^\circ$ (vert opp $\angle$ s)

$\hat{D}LJ = 60^\circ$ (adj $\angle$ s on str line)

$\hat{K}LH = 60^\circ$ (vert opp $\angle$ s)

$\hat{M}LK = 40^\circ$ (vert opp $\angle$ s)

$\hat{L}FH = 40^\circ$ (alt $\angle$ s on parallel lines)

$\hat{L}HF = 60^\circ$ ($\angle$ s of $\triangle HLF$)

$\hat{L}HG = 120^\circ$ (adj $\angle$ s on str line)

$\hat{K}GE, \hat{AGH}, \hat{IRM}, \hat{GRL} = 120^\circ$

$\hat{K}GH, \hat{EGA}, \hat{IRG}, \hat{MRL} = 60^\circ$

Unit 3.2: Triangles**Grade 7, 8 & 9**

- 1a)
- Note:
- Accept side measurements 2 – 3 mm longer or shorter and 2 – 3 degrees bigger or smaller for angles.

Anti-clockwise from top (or top-left in E and F) vertex:

Triangle A: sides 22 mm; 25 mm and 34 mm.

angles 47° ; 90° ; 43°

Triangle B: sides 28 mm; 22 mm and 28 mm

angles 46° ; 67° ; 67°

Triangle C: sides 30 mm; 21 mm; 46 mm

angles 23° ; 124° ; 33°

Triangle D: sides 30 mm; 36 mm; 19 mm

angles 93° ; 32° ; 55°

Triangle E: sides 26 mm; 25 mm; 26 mm

angles 61° ; 61° ; 58°

Triangle F: 31 mm; 31 mm; 59 mm

angles 138° ; 21° ; 21°

- b) A is right-angled; B is acute-angled; C is obtuse-angled;
-
- D is obtuse-angled; E is acute-angled; F is obtuse-angled
-
- c) A is scalene; B is isosceles; C is scalene; D is scalene;
-
- E is isosceles; F is isosceles.

- 2a) acute-angled and equilateral

- b) acute-angled and scalene

- c) right-angled and scalene

- d) obtuse-angled and isosceles

- e) acute-angled and isosceles

- f) right-angled and isosceles

- 3a) obtuse-angled and scalene

- b) acute-angled and isosceles

- c) right-angled and scalene

- d) acute-angled and scalene

- e) obtuse-angled and isosceles

- f) right-angled and isosceles

- 4a) See 3b).

- b) see 3c)

- c) see 3f)

- d) not possible

- e) see 3d)

- f) see 3a)

- f) not possible

- h) see 2a)

Grade 8 & 9

5. $\hat{DEB} = 70^\circ$ ($\angle$ s of $\triangle DEB$)

$\therefore \hat{ACB} = 70^\circ$ (corres $\angle$ s on parallel lines)

6. $p = 70^\circ$ ($\angle$ s of $\triangle ABC$)

$\therefore \hat{DAC} = 70^\circ$ (alt $\angle$ s on parallel lines)

$\therefore q = 80^\circ$ ($\angle$ s of $\triangle ADC$)

7. $\hat{D}_1 = 48^\circ$ (adjacent $\angle$ s on a straight line)

$\hat{D}_2 = 48^\circ$ (vert opp $\angle$ s)

$\hat{D}_3 + \hat{D}_4 = 132^\circ$ (vert opp $\angle$ s)

$\hat{A}_6 = 48^\circ$ (alternate $\angle$ s on parallel lines)

$\therefore \hat{B}_5 = 48^\circ$ (isos $\triangle ABD$)

$\therefore \hat{D}_3 = 180^\circ - 96^\circ = 84^\circ$ ($\angle$ s of $\triangle ABD$)

$\therefore \hat{D}_4 = 132^\circ - 84^\circ = 48^\circ$

8. $\hat{FHG} = 53^\circ$ (vert opp $\angle$ s)

$\hat{F} = 180 - (90^\circ + 53^\circ) = 37^\circ$

$\hat{H}ID = 53^\circ$ (alternate $\angle$ s on parallel lines)

$\therefore \hat{E}IC = 53^\circ$ (vert opp $\angle$ s)

$\therefore \hat{C} = 180^\circ - (85^\circ + 53^\circ) = 42^\circ$

$\hat{D} = 110^\circ$ (alternate $\angle$ s on parallel lines)

9. a) isosceles triangles

- b) obtuse-angled triangles

- c) isosceles triangles

- d) equilateral triangles

- e) all triangles

- f) all triangles

- g) all triangles

10. $a = 180^\circ - (52^\circ + 79^\circ) = 49^\circ$ ($\angle$ s of $\triangle DEF$)

$b = 180^\circ - (40^\circ + 35^\circ) = 105^\circ$ ($\angle$ s of $\triangle IJC$)

$c = 75^\circ$ (adj $\angle$ s on straight line)

(ext $\angle$ equals sum of opp interior $\angle$ s)

11. $4y + 5y = 180^\circ$

$9y = 180^\circ$ so $y = 20^\circ$

$\hat{ABC} + \hat{ACB} = 3y + 4y = 7y = 140^\circ$

$\therefore \hat{BAC} = 40^\circ$

Unit 3.3: Quadrilaterals**Grade 7, 8 & 9**

- 1a) parallelogram b) trapezium c) rectangle

- d) kite e) quadrilateral f) rhombus g) rectangle

2a) $AB = 45$ mm; $BC = 45$ mm; $AD = 45$ mm

$\hat{A} = 90^\circ$; $\hat{B} = 90^\circ$; $\hat{C} = 90^\circ$; $\hat{D} = 90^\circ$

b) $KN = 4$ cm; $NM = 4$ cm;

$\hat{L}_1 = 45^\circ$; $\hat{L}_2 = 45^\circ$; $\hat{N}_1 = 45^\circ$; $\hat{N}_2 = 45^\circ$

c) $EH = 8$ cm; $GH = 12$ cm

Grade 8 & 9

- 3a) rhombus b) parallelogram c) kite

- d) quadrilateral e) regular trapezium

4a) $PS = 40$ mm; $RS = 90$ mm;

$\hat{P} = 90^\circ$; $\hat{Q} = 90^\circ$; $\hat{R} = 90^\circ$; $\hat{S} = 90^\circ$

b) $\hat{L} = 100^\circ$; $\hat{M} = 80^\circ$; $\hat{N} = 100^\circ$

5.	parallel- ogram	rectangle	square	rhombus	trapezi- um	kite
diagonals bisect each other	✓	✓	✓	✓		
diagonals cut at right angles			✓	✓		✓

- 6a) $WX = 7 \text{ cm}$; $WZ = 7 \text{ cm}$;
 $\hat{X}_1 = 45^\circ$; $\hat{X}_2 = 45^\circ$; $\hat{Y}_1 = 45^\circ$; $\hat{Z}_1 = 45^\circ$
 b) $BC = 15 \text{ mm}$; $\hat{C}_2 = 60^\circ$; $\hat{A}_1 = 60^\circ$; $\hat{A}_2 = 30^\circ$
 c) $x = 90^\circ$; $y = 30^\circ$; $z = 30^\circ$; $a = 30^\circ$;
 $b = 90^\circ$; $c = 60^\circ$.
 7a) $a = 90^\circ$ (given); $b = 45^\circ$ (isos Δ);
 reflex $\angle = 267^\circ$ so inside $\angle = 360^\circ - 267^\circ = 93^\circ$
 $\therefore c = 360^\circ - (63^\circ + 59^\circ + 93^\circ) = 145^\circ$ ($\angle$ s of quad
 add up to 360°); $d = 45^\circ$ (opp $\angle$ s of parm equal);
 $e = 135^\circ$ (coint $\angle$ s on parallel lines).

Unit 3.4: Congruency and similarity

Grade 7, 8 & 9

- 1a) Shape H is congruent to B.
 b) Shapes A, D and H are similar to B.
 2a) parallelogram (2 pairs of opp sides equal and parallel)
 b) Yes, it is.
 c) $\hat{L} = 115^\circ$ (opp $\angle$ s of parallelogram)
 OR (co-int. $\angle$ s KJ || LM)
 d) $\hat{M} = 65^\circ$ (opp $\angle$ s of parallelogram)
 OR (co-int. $\angle$ s KJ || LM)
 $\therefore \hat{S} = 65^\circ$ (JKLM || PQRS)
 e) KL = 6 cm (opp sides parallelogram)
 3a) True b) False
 c) False d) True
 e) False f) False
 g) False h) False
 h) True j) True

Grade 9

- 4a) Triangles are not congruent or similar. Equal angles
 and sides are not in corresponding positions.
 b) $\Delta FGH \equiv \Delta TKL$ (RHS)
 c) Triangles are not congruent or similar.
 d) $\Delta FUN \equiv \Delta DEA$ (SAA)
 e) $\Delta ABC \equiv \Delta DCB$ (SSS)
 f) $\Delta ABC \equiv \Delta ONM$ (SSS)
 5a) False. b) False
 c) True d) False
 6. In ΔABC and ΔADC
 $AB = AD$ (adj sides of kite)
 $BC = DC$ (adj sides of kite)
 AC is common
 $\therefore \Delta ABC \equiv \Delta ADC$ (SSS)
 7. In ΔABD and ΔACD
 $AB = AC$ (given)
 $BD = CD$ (given)
 AD is common
 $\therefore \Delta ABD \equiv \Delta ACD$ (SSS)
 8. In ΔABD and ΔCDB
 $\hat{BAD} = \hat{DCB} = 90^\circ$ (given)
 $AD = CB$ (given)
 BD is common
 $\therefore \Delta ABD \equiv \Delta CDB$ (RHS)
 9. a) ABCD is a parallelogram
 $\therefore \hat{B}_1 + \hat{B}_2 + \hat{C}_1 + \hat{C}_2 = 180^\circ$ (coint $\angle$ s AB || CD)
 $\hat{B}_1 = \hat{B}_2$ (TB bisects $\hat{B}$)
 $\hat{C}_1 = \hat{C}_2$ (TC bisects $\hat{C}$)
 $\therefore 2\hat{B}_1 + 2\hat{C}_1 = 180^\circ$
 $\therefore \hat{B}_1 + \hat{C}_1 = 90^\circ$
 $\hat{B}_1 + \hat{C}_1 + \hat{T}_2 = 180^\circ$ ($\angle$ s of ΔBTC)
 $\therefore \hat{T}_2 = 90^\circ$

- 9 b) ΔTCP c) $BT = 4 \text{ cm} \times 2 = 8 \text{ cm}$

10. ST and UV vertical, so $ST \perp TW$ and $UV \perp VW$.
 $ST \parallel UV$.
 In ΔUVW and ΔSTW
 $\hat{W}$ is common
 $\hat{V}W = \hat{T}SW$ (corres $\angle$ s $ST \parallel UV$)
 $\hat{U}W = \hat{T}U = 90^\circ$ ($ST \perp TW$ and $UV \perp VW$)
 $\therefore \Delta UVW \equiv \Delta STW$
 $\therefore UV : VW = ST : TW$
 $1 : 1,7 = ST : 5,1$
 $\frac{1}{1,7} = \frac{ST}{5,1}$ so $ST = \frac{5,1 \times 1}{1,7} = 3 \text{ metres}$

- 11a) Angle A is common to both triangles, $\hat{ABF} = \hat{C}$ and
 $\hat{AFB} = \hat{D}$ because they are corresponding angles on
 parallel lines. So $\Delta ABF \equiv \Delta ACD$.

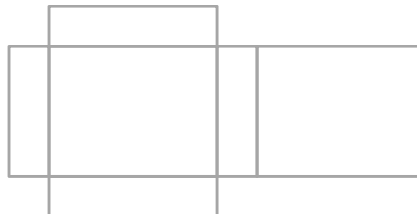
- b) $\frac{AB}{AC} = \frac{AF}{AD} = \frac{BF}{CD}$ (similar triangles)
 $\frac{5}{8} = \frac{4}{4+y} = \frac{x}{9}$
 To find x : $\frac{5}{8} = \frac{x}{9}$ so $8x = 45$ $x = 5,6 \text{ cm}$
 To find y : $\frac{5}{8} = \frac{4}{4+y}$ so $5(4+y) = 32$
 $20 + 5y = 32$
 $5y = 12$ so $y = 2,4 \text{ cm}$

12. Hints:
 Outline the congruent triangles and mark all equal
 angles and sides. They are, so you can use the pairs
 of equal angles to show that $ED \parallel GF$.
 $\Delta CDE \equiv \Delta FCG$ (given)
 $\therefore \hat{CED} = \hat{CFG}$ (corres rem $\angle$ s)
 $\therefore ED \parallel GF$ (corres $\angle$ s equal)

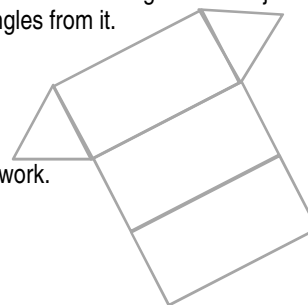
Unit 3.5: Congruency and similarity

Grade 7, 8 & 9 (pyramids Grade 8 & 9 only)

1. cube, right hexagon-based pyramid; right pentagonal
 prism; square-based pyramid; right triangular prism.
 2a) 5 faces; 9 edges; 6 vertices
 b) 10 faces; 24 edges; 16 vertices
 c) 6 faces; 12 edges; 8 vertices
 3a) triangular prism b) square-based pyramid
 c) can't be folded to make a 3D object
 d) triangular prism
 4a) Hint: Copy the size of the front rectangle of the object
 and estimate the sizes of the other rectangles from it.



- b) Hint: Copy the size of the front triangle of the object
 and build the rectangles from it.

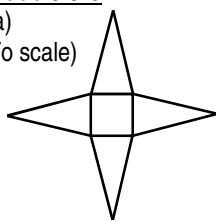


5. Only c), f) and h) will work.

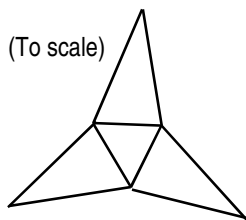
Grade 8 & 9

6a)

(To scale)



b) (To scale)



7. A, D, F, H and I are made of identical regular polygons, so they are Platonic solids.

Grade 9

8a) cube

b) rectangular prism

c) square based pyramid

d) tetrahedron

e) octahedron

f) sphere

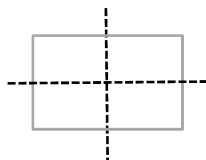
g) dodecahedron

Unit 3.6: Transformation Geometry

Grade 7, 8 & 9

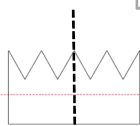
1a) yes

b) no. There are 2 lines of symmetry:



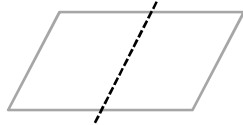
c) yes

d) no. There is one line of symmetry:

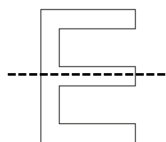


e) No, there are no lines of symmetry for this shape.

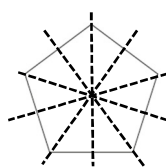
f) No. There is only one line of symmetry:



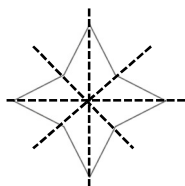
2a)



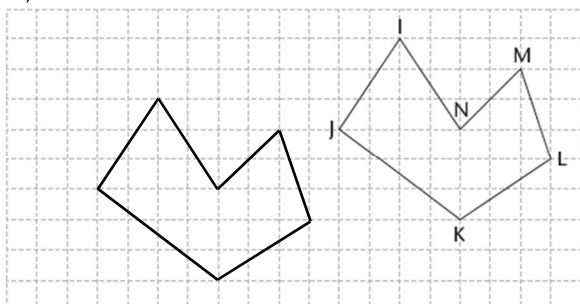
b)



c)

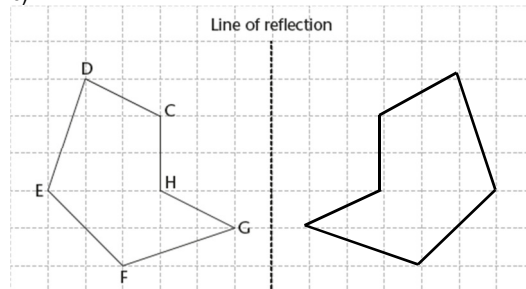


3a)

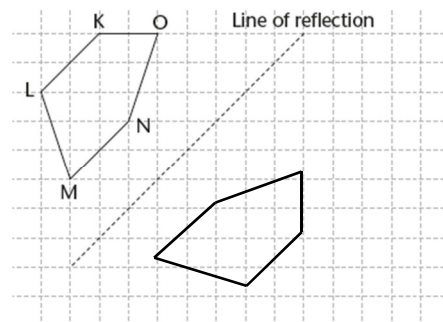


b) ABCD is translated up 3 units and 7 units to the right.

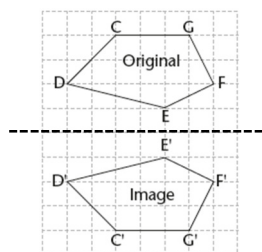
c)



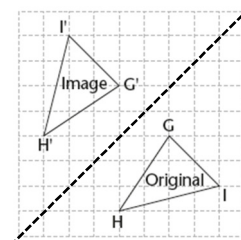
d)



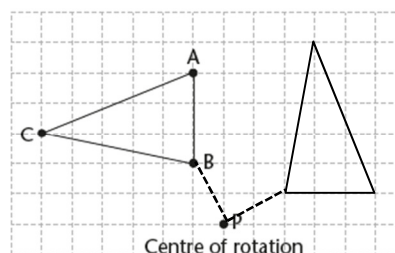
4a)



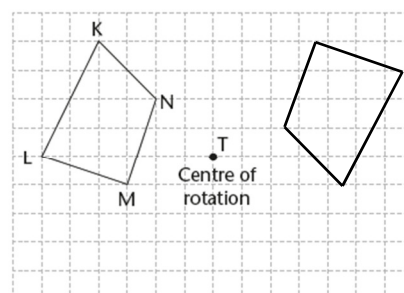
b)



5a)

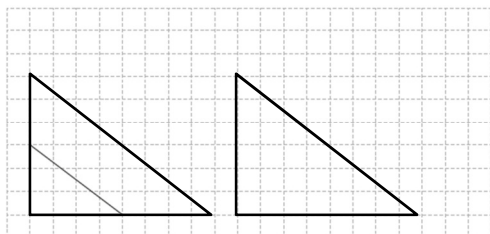


b)

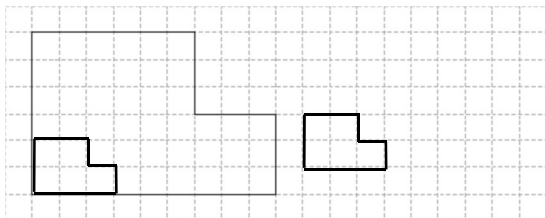


6a) FG is double (2×) the length of BC.
EF is double (2×) the length of AB.
EG is double (2×) the length of AC.

- b) JK is half the length of BC.
IJ is half the length of AB.
IK is half the length of AC.
- c) $\triangle EFG$ is an enlargement of $\triangle ABC$ by a scale factor of 2 because all the sides of the lengths are doubled in the same proportions.
- d) $\triangle IJK$ is a reduction of $\triangle ABC$ by a scale factor of $\frac{1}{2}$ because all the sides of the lengths are halved in the same proportions.
- 7a) The enlargement can be positioned in different ways on the grid. Here are two examples.



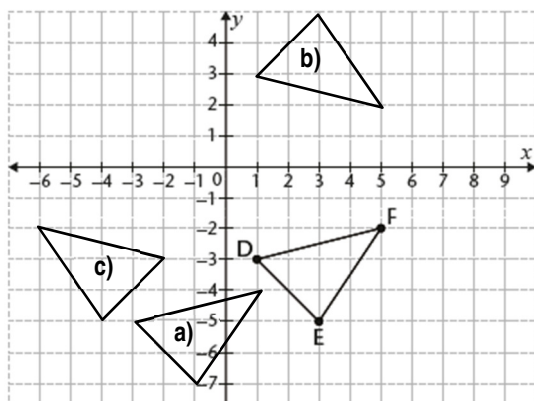
- b) The reduction can be positioned in different ways on the grid. Here are two examples.



8. Image 1 is a rotation of 90° clockwise with the centre of rotation at the bottom right corner of Figure 1.
Image 2 is reflection of Figure 1 with the line of symmetry on the bottom length of Figure 1.
Image 3 is a translation of Figure 1. It has moved 7 units to the right and 2 units up on the grid.

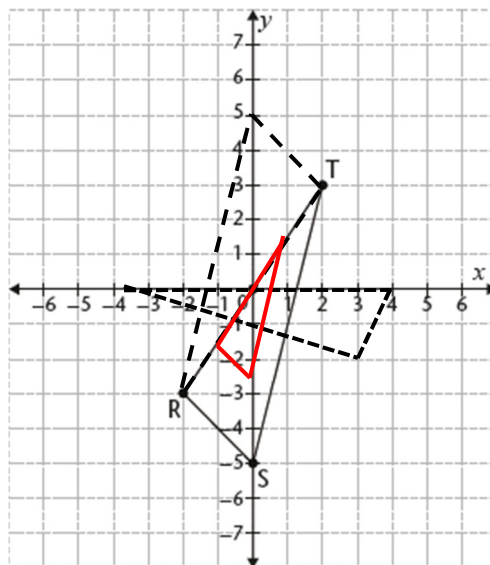
Grade 8 & 9

9.



- a) $\triangle D'E'F'$ has vertices $D'(-3; -5)$; $E'(-1; -7)$; $F'(1; -4)$
 b) $\triangle D''E''F''$ has vertices $D''(1; 3)$; $E''(3; 5)$; $F''(5; 2)$
 c) $\triangle D'''E'''F'''$ has vertices $D'''(-2; -3)$; $E'''(-4; -5)$; $F'''(-6; -2)$

- 10a) $R'(2; 3)$; $S'(0; 5)$; $T'(-2; -3)$
 b) $R''(3; -2)$; $S''(4; 0)$; $T''(-4; 0)$
 c) $R'''(-1; -1\frac{1}{2})$; $S'''(0; -2\frac{1}{2})$; $T'''(1; 1\frac{1}{2})$.



11. $\triangle ABC$ has vertices $A(-1; -5)$, $B(-3; 2)$ and $C(2; 1)$.
- $\triangle ABC$ has been translated 1 unit to the right and 1 unit down to create $\triangle A'B'C'$.
 - $\triangle ABC$ has been rotated 180° about the origin to create $\triangle A'B'C'$.
 - $\triangle ABC$ has been enlarged by a scale factor of 3 to create $\triangle A'B'C'$.
 - $\triangle ABC$ has been reflected in the y -axis to create $\triangle A'B'C'$.
 - $\triangle ABC$ has been translated 2 units to the right to create $\triangle A'B'C'$.
 - $\triangle ABC$ has been rotated 90° anti-clockwise about the origin to create $\triangle A'B'C'$.
 - $\triangle ABC$ has been reflected in the line $y = x$ to create $\triangle A'B'C'$.
- 12a) The rectangle has been enlarged by a scale factor of $2\frac{1}{2}$. $4 \text{ cm} \times 2\frac{1}{2} = 10 \text{ cm}$ and $6 \text{ cm} \times 2\frac{1}{2} = 15 \text{ cm}$
 b) Area of original rectangle = $4 \times 6 = 24 \text{ cm}^2$
 Area of enlarged rectangle = $10 \times 15 = 150 \text{ cm}^2$
 $150 \div 24 = 6,25$ so the area has been enlarged by $6,25 \text{ cm}^2$.

Grade 9 only

13.	Translation 4 units up and 3 units to the left	Rotated about the origin through 90° clockwise	Reflected in the line $y = x$
A $(-2; 1)$	$(-5; 5)$	$(1; 2)$	$(1; -2)$
B $(3; 4)$	$(0; 8)$	$(4; -3)$	$(4; 3)$
C $(5; -2)$	$(2; 2)$	$(-2; -5)$	$(-2; 5)$

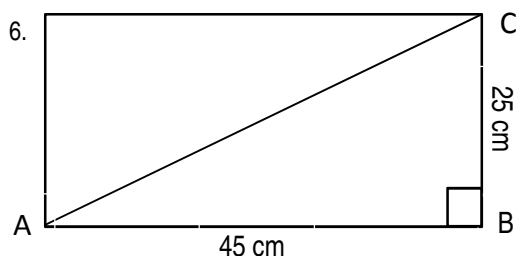
14. To work this out, start with $(x; y)$

$(x; y) \rightarrow$ reflected in line $y = x \rightarrow (y; x)$
 $(y; x) \rightarrow$ 1 down, 3 right $\rightarrow (y - 1; x + 3)$
 $(y - 1; x + 3) \rightarrow$ enlarged by factor of 5 $\rightarrow$
 $(5(y - 1); 5(x + 3)) = (5y - 5; 5x + 15)$

A $(-1; -5) \rightarrow A'(5(-5) - 5; 5(-1) + 15) = A'(-30; 10)$
 B $(-3; 2) \rightarrow B'(5(2) - 5; 5(-3) + 15) = B'(5; 0)$ and C $(2; 1) \rightarrow C'(5(1) - 5; 5(2) + 15) = C'(0; 20)$

MEASUREMENT**Unit 4.1: Straight line geometry****Grade 8 and 9**

- 1a) right-angled b) hypotenuse
 c) hypotenuse d) QP
 e) No, because a triangle has 3 angles which add up to 180° and 2 right angles added together is $90^\circ + 90^\circ$ which adds up to 180° leaving no space for a third angle.
 f) 3; 4; 5 g) 5; 12; 13 h) 6; 8; 10
 2 a) $a^2 + b^2 = c^2$ b) $c^2 - a^2 = b^2$
 c) $a^2 = c^2 - b^2$ d) $c^2 = a^2 + b^2$
 3. $QR^2 = PQ^2 + PR^2$
 $PR^2 = QR^2 - PQ^2$
 $PR^2 = 13^2 - 5^2$
 $PR^2 = 144$
 $PR = \sqrt{144}$
 $PR = 12 \text{ mm}$
 4. In $\triangle MNR$, $RN^2 = MN^2 - MR^2$
 $RN^2 = 102^2 - 62^2$
 $RN^2 = 6\,560$
 $RN = \sqrt{6\,560}$ (use in this form without rounding off)
 In $\triangle TRN$,
 $TR^2 = RN^2 + NT^2$
 $TR^2 = 48^2 + (\sqrt{6\,560})^2$
 $TR^2 = 8\,864$
 $TR = \sqrt{8\,864}$
 $TR = 94,15 \text{ km}$
 5. In $\triangle ABD$, $BD^2 = AB^2 - AD^2$
 $BD^2 = 25^2 - 8^2$
 $BD^2 = 561$
 $BD = \sqrt{561}$
 In $\triangle ACD$, $CD^2 = AC^2 - AD^2$
 $CD^2 = 8,54^2 - 8^2 = 8,9316$
 $CD = 2,988 \dots$
 $BC = BD - CD$
 $BC = 23,685 \dots \approx 24 \text{ cm}$



$$AC^2 = AB^2 + BC^2$$

$$AC^2 = 45^2 + 25^2$$

$$AC^2 = 2\,650$$

$$AC = \sqrt{2\,650}$$

$$AC = 51,48 \text{ cm}$$

$$7. 3^2 + 3^2 = 18; 5^2 = 25$$

The diagonal of the square is $\sqrt{18} \neq 5$

By Pythagoras theorem, it is not possible.

$$8. a) CH^2 = HG^2 + CG^2$$

$$CH^2 = 16^2 + 8^2$$

$$CH^2 = 320$$

$$CH = \sqrt{320}$$

$$AC^2 = AB^2 + BC^2$$

$$AC^2 = 16^2 + 10^2$$

$$AC^2 = 356$$

$$AC = \sqrt{356}$$

$$AH^2 = AE^2 + EH^2$$

$$AH^2 = 8^2 + 10^2$$

$$AH^2 = 164$$

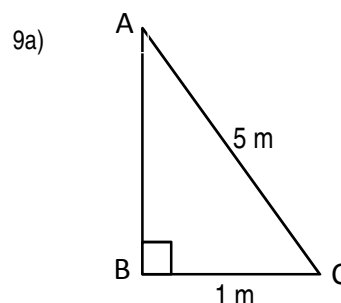
$$AH = \sqrt{164}$$

$$b) AH^2 + CH^2 = 164 + 320 = 484$$

$$AC^2 = 356$$

$$\text{So } AC^2 \neq AH^2 + CH^2$$

So $\triangle ACH$ is not right-angled.



$$AB^2 = AC^2 - BC^2 = 5^2 - 1^2$$

$$AB^2 = 24$$

$$AB = \sqrt{24} = 4,8989 \dots \approx 4,90 \text{ m}$$

The ladder reaches 4,90 m up the wall.

$$b) BC^2 = AC^2 - AB^2$$

$$BC^2 = 5^2 - 4,5^2 = 4,75$$

$$BC = \sqrt{4,75} = 2,18 \text{ m away from wall}$$

$$10. a) QD = DC - CQ$$

$$QD = 4 - 1,5$$

$$QD = 2,5 \text{ cm}$$

$$b) PQ^2 = CP^2 + CQ^2$$

$$PQ^2 = 4,2^2 + 1,5^2$$

$$PQ^2 = 19,89$$

$$PQ = \sqrt{19,89} = 4,46 \text{ cm}$$

Unit 4.2: Perimeter and area**Grade 7, 8 and 9**

$$1a) 90 \text{ cm}$$

$$b) 7\,000 \text{ m}$$

$$c) 760 \text{ cm}$$

$$d) 132\,000 \text{ cm}$$

$$e) 943,217 \text{ km}$$

$$2a) 5 \times (10 \text{ mm})^2 = 500 \text{ mm}^2$$

$$b) 8,25 \times (100 \text{ cm})^2 = 82\,500 \text{ cm}^2$$

$$c) 245\,000\,000 \div (1\,000 \text{ km})^2 = 245 \text{ km}^2$$

$$d) 5,32 \times (1\,000 \text{ km})^2 = 5\,320\,000 \text{ m}^2$$

$$e) 347\,012 \div (10 \text{ mm})^2 = 3\,470,12 \text{ cm}^2$$

$$3. \text{Area} = 4,7 \text{ m} \times 2,3 \text{ m} = 10,81 \text{ m}^2$$

4. Perimeter = $15,3 \text{ cm} \times 2 + 19,2 \text{ cm} \times 2$

= $30,6 \text{ cm} + 38,4 \text{ cm} = 69 \text{ cm}$

5. Area = length $\times$ breadth

$13,23 \text{ cm}^2 = 6,3 \text{ cm} \times \text{breadth}$

breadth = $13,23 \text{ cm}^2 \div 6,3 \text{ cm} = 2,1 \text{ cm}$

6. Area = $\frac{1}{2} \times b \times h$

$17,5 \text{ m}^2 = \frac{1}{2} \times 5 \text{ m} \times h$

$h = 17,5 \text{ m}^2 \times 2 \div 5 \text{ m} = 7 \text{ m}$

7a) Perimeter = $8 \text{ cm} + 20 \text{ cm} + 13 \text{ cm} = 41 \text{ cm}$

b) Area = $\frac{1}{2} \times \text{base} \times \perp \text{ height}$

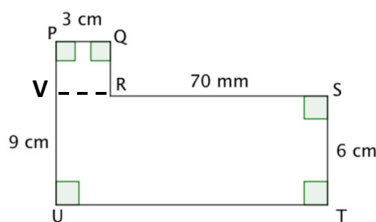
Area = $\frac{1}{2} \times 20 \times 5 = 50 \text{ cm}^2$

8a) QR = $9 \text{ cm} - 6 \text{ cm} = 3 \text{ cm}$; $70 \text{ mm} = 7 \text{ cm}$

TU = $3 \text{ cm} + 7 \text{ cm} = 10 \text{ cm}$

P = $9 + 3 + 3 + 7 + 6 + 10 = 38 \text{ cm}$

b) Join VR:



Area of PQRV = $3 \text{ cm} \times 3 \text{ cm} = 9 \text{ cm}^2$

Area of VSTU = $10 \text{ cm} \times 6 \text{ cm} = 60 \text{ cm}^2$

$\therefore$ Area of PQRSTU = $9 \text{ cm}^2 + 60 \text{ cm}^2 = 69 \text{ cm}^2$

Grade 8 and 9

9a) Area of $\triangle ABC = \frac{1}{2} \times 27,9 \text{ mm} \times 14,8 \text{ mm}$

= $206,46 \text{ mm}^2 = 2,06 \text{ cm}^2$

b) Find AC first.

$AC^2 = AB^2 + BC^2$

$AC^2 = (27,9)^2 + (14,8)^2$

$AC^2 = 997,45 \text{ mm}^2$

$\therefore AC = 31,6 \text{ mm}$

$\therefore$ Perimeter = $27,9 + 14,8 + 31,6 = 74,3 \text{ mm}$

$74,3 \text{ mm} = 7,43 \text{ cm}$

10a) c) To find BD:

$BD^2 = AB^2 - AD^2$

$BD^2 = 8^2 - 5^2$

$BD^2 = 39$

$BD = \sqrt{39} \approx 6,24 \text{ cm}$

Area of $\triangle ABD = \frac{1}{2} \times BD \times AD$

Area of $\triangle ABD = \frac{1}{2} \times 6,24 \times 5 = 15,6 \text{ cm}^2$

11a) Area = $\pi r^2 = \pi \times 7^2 = 153,94 \text{ cm}^2$

b) Circumference = $2\pi r = 2 \times \pi \times 7 = 43,98 \text{ cm}$

12a) Area = $\pi r^2 = \pi \times (36 \div 2)^2$
 $= \pi \times 18^2 = 1017,88 \text{ m}^2$

b) Circumference = $2\pi r = 2 \times \pi \times 18 = 113,1 \text{ m}$

13a) Area = $\pi r^2 = 50,27 = \pi \times r^2$

$r^2 = 50,27 \div \pi = 16$

$r = \sqrt{50,27 \div \pi}$

$\therefore r = 4 \text{ cm}$

b) Diameter = $r \times 2 = 4 \text{ cm} \times 2 = 8 \text{ cm}$

c) Circumference = $2\pi r = 2 \times \pi \times 4 = 25,13 \text{ cm}$

14a) $\frac{3}{4}$ of the circle is left

b) Area = $\pi r^2 \times \frac{3}{4}$

= $\pi \times (16 \div 2)^2 \times \frac{3}{4}$

= $150,8 \text{ m}^2$

c) Perimeter = $\frac{3}{4} \times 2\pi r + 2r$

= $(\frac{3}{4} \times 2 \times \pi \times 8) + (2 \times 8) = 53,7 \text{ m}$

15. Area = *big circle area* – *smaller circle area*

Area = $\pi \times (3)^2 - \pi \times (2,1)^2$

Area = $9\pi - 4,41\pi = 14,42 \text{ mm}^2$

Grade 9

16a) Area = $10 \text{ cm} \times 4 \text{ cm} = 40 \text{ cm}^2$

To find lengths of sides: $(\text{side})^2 = 3^2 + 4^2 = 25$

$\therefore$ side = 5 cm

Perimeter = $2(10) + 2(5) = 30 \text{ cm}$

b) BC = CD = 5 cm

$\therefore$ BD = $5 \text{ cm} + 5 \text{ cm} = 10 \text{ cm}$

$CE^2 = 13^2 - 5^2 = 144$

CE = $\sqrt{144} = 12 \text{ cm}$

AE = $5 \text{ cm} + 12 \text{ cm} = 17 \text{ cm}$

Area = $(\frac{1}{2} \times 10 \text{ cm}) \times (\frac{1}{2} \times 17 \text{ cm}) = 42,5 \text{ cm}^2$

To find perimeter, first find AB.

$AB^2 = AC^2 + BC^2 = 5^2 + 5^2 = 50$

$\therefore AB = \sqrt{50}$

$\therefore$ Perimeter = $2(13) + 2(\sqrt{50}) = 40,14 \text{ cm}$

17a) Perimeter of new rectangle = $30 \text{ m} \times 2 = 60 \text{ m}$

b) Area of new rectangle = $36 \text{ m}^2 \times 4 = 144 \text{ m}^2$

18a) The circumference of the circle will be doubled.

b) The area of the circle will be 4 times its original size.

19a) CE = 3 cm (Pythagoras on $\triangle CDE$)

Area trapezium = area rectangle + area $\triangle$

= $12 \text{ cm} \times 4 \text{ cm} + (\frac{1}{2} \times 3 \times 4) = 54 \text{ cm}^2$

Perimeter = $12 + 4 + 3 + 12 + 5 = 36 \text{ cm}$

b) Area QRSY = $\frac{1}{2} \times 6 \text{ m} \times (12 \text{ m} + 10 \text{ m}) = 66 \text{ m}^2$

Area STXY = $7 \text{ m} \times 6 \text{ m} = 42 \text{ m}^2$

Total area = $66 \text{ m}^2 + 42 \text{ m}^2$

= 108 m^2

For perimeter, PQ = $12 - 10 = 2 \text{ m}$

$QR^2 = PQ^2 + PR^2 = 2^2 + 6^2 = 40$

QR = $\sqrt{40} = 6,3 \text{ m}$

Perimeter = $12 + 7 + 7 + 7 + 10 + 6,3$

= $49,3 \text{ m}$

c) Area = $\frac{1}{2} \text{ LN} \times \frac{1}{2} \text{ PM}$

To find LN:

$ON^2 = 13^2 - 5^2 = 144$

ON = $\sqrt{144} = 12 \text{ cm}$

$LO^2 = 20^2 - 5^2 = 375$

LO = $\sqrt{375} = 19,36 \text{ cm}$

$\therefore$ LN = $12 + 19,36 = 31,36 \text{ cm}$

PO = OM (diag PM bisected by LN)

$$\therefore PM = 5 + 5 = 10 \text{ cm}$$

$$\text{Area} = \frac{1}{2} (LN \times PM)$$

$$= \frac{1}{2} (31,36 \text{ cm} \times 10 \text{ cm}) = 156,8 \text{ m}^2$$

$$\text{Perimeter} = 20 \text{ cm} \times 2 + 13 \text{ cm} \times 2 = 66 \text{ cm}$$

d) To find height of parallelogram FGJK, find OF.

$$OF^2 = 10^2 - 6^2 \text{ (Pythagoras)}$$

$$OF^2 = 64$$

$$OF = \sqrt{64} = 8$$

$$\text{Area of FGJK} = 18 \times 8 = 144 \text{ m}^2$$

To find height of trapezium GHIL,

$$OH^2 = 8^2 - 6^2 = 28$$

$$OH = \sqrt{28} = 5,29 \text{ m}$$

$$\text{Area of trapezium} = \frac{1}{2} \times (9 + 18) \times 5,29$$

$$= 71,42 \text{ m}^2$$

$$\text{Total area} = 144 \text{ m}^2 + 71,42 \text{ m}^2$$

$$= 215,42 \text{ m}^2$$

Perimeter of FGHILK:

Draw perpendicular from I to GJ meeting GJ at L

$$JL = 18 \text{ cm} - 6 \text{ cm} - 9 \text{ cm} = 3 \text{ cm}$$

$$IJ^2 = 5,29^2 + 3^2$$

$$IJ = 6,08 \text{ m}$$

$$\text{Perimeter} = 10 + 18 + 10 + 6,08 + 9 + 8 = 61,08 \text{ m}$$

Unit 4.3: 3D shapes and volume

Grade 7,8 and 9

1a) Volume = $400 \text{ mm} \times 300 \text{ mm} \times 200 \text{ mm}$

$$= 24\,000\,000 \text{ mm}^3$$

b) $24\,000\,000 \text{ mm}^3 \div 1\,000 = 24\,000 \text{ cm}^3$

c) Total surface area

$$= 2(400 \times 200) + 2(400 \times 300) + 2(200 \times 300)$$

$$= 520\,000 \text{ mm}^2$$

2a) Volume = $50 \text{ mm} \times 50 \text{ mm} \times 50 \text{ mm}$

$$= 125\,000 \text{ mm}^3 = 125 \text{ cm}^3$$

b) Total surface area = $6(50 \text{ mm} \times 50 \text{ mm})$

$$= 15\,000 \text{ mm}^2 = 150 \text{ cm}^2$$

3. Total surface area

$$= 4(1 \times 2) + 2(1 \times 1) + 3(5 \times 1) + (3 \times 1)$$

$$= 28 \text{ m}^2$$

4a) Volume = $3 \text{ m} \times 2 \text{ m} \times 1 \text{ m} = 6 \text{ m}^3$

b) $6 \text{ m}^3 = 6\,000\,000 \text{ cm}^3 = 6\,000 \text{ l} = 6 \text{ kl}$

5a) $\sqrt[3]{25,625 \text{ cm}^3} = 2,95 \text{ cm}$

b) Volume = $(5 \text{ cm})^3 = 125 \text{ cm}^3$

6a) Vol = $(1 \times 10 \times 5) + (1 \times 3 \times 10) = 80 \text{ cm}^3$

b) Total surface area = $(5 \text{ cm} \times 10 \text{ cm}) + 3(1 \text{ cm} \times 10 \text{ cm}) + 2(1 \text{ cm} \times 5 \text{ cm}) + 2(3 \text{ cm} \times 1 \text{ cm}) + 2(2 \text{ cm} \times 10 \text{ cm}) + 2(3 \text{ cm} \times 10 \text{ cm})$

$$= 196 \text{ cm}^2$$

Grade 8 and 9

7a) $h^2 = 5^2 - 3^2$

$$h^2 = 16$$

$$h = \sqrt{16} \quad h = 4 \text{ cm}$$

b) i) Volume = $\frac{1}{2}bhH$

$$= \frac{1}{2} \times 6 \text{ cm} \times 4 \text{ cm} \times 20 \text{ cm}$$

$$= 240 \text{ cm}^3$$

ii) Total surface area = $bh + (s_1 + s_2 + b) \times H$

$$= (6 \text{ cm} \times 4 \text{ cm}) + (5 \text{ cm} + 5 \text{ cm} + 6 \text{ cm}) \times 20 \text{ cm}$$

$$= 344 \text{ cm}^2$$

8a) Total surface area = $5(4 \text{ m} \times 4 \text{ m}) = 80 \text{ m}^2$

b) $80 \div 2 = 40 \text{ l}$

9a) $h^2 = 6^2 - 3^2$

$$h^2 = 27$$

$$h = \sqrt{27}$$

$$h = 5,2 \text{ cm}$$

$$\text{Volume} = \frac{1}{2}bhH$$

$$= \frac{1}{2} \times 6 \text{ cm} \times 5,2 \text{ cm} \times 12 \text{ cm} = 187,2 \text{ cm}^3$$

b) Total surface area = $bh + (s_1 + s_2 + b) \times H$

$$= (6 \text{ cm} \times 5,2 \text{ cm}) + (6 \text{ cm} + 6 \text{ cm} + 6 \text{ cm}) \times 12 \text{ cm}$$

$$= 247,2 \text{ cm}^2$$

10a) Volume = $5,8 \text{ m} \times 2,3 \text{ m} \times 2,3 \text{ m}$

$$= 30,68 \text{ m}^3$$

b) $90 \div 30,68 = 2,93 \approx 3 \text{ containers}$

$$3 \times R40\,000 = R120\,000$$

11. Surface area of bottom part

$$= 2(1 \text{ m} \times 2,5 \text{ m}) + 2(2,5 \text{ m} \times 2 \text{ m}) = 15 \text{ m}^2$$

To find side length of roof:

$$s^2 = 1,5^2 + 0,5^2 = 2,5$$

$$s = \sqrt{2,5} = 1,58 \text{ m}$$

$$\text{Surface area of top part} = 2\left(\frac{1}{2} \times 1 \times 1,5\right) +$$

$$2(1,58 \text{ m} \times 2 \text{ m}) = 7,82 \text{ m}^2$$

$$\text{Total surface area} = 15 \text{ m}^2 + 7,82 \text{ m}^2 = 22,82 \text{ m}^2$$

Grade 9

12a) Volume = $\pi r^2 h$

$$= \pi \times (1 \text{ m})^2 \times 5 \text{ m}$$

$$= 15,71 \text{ m}^3$$

b) Area = $2\pi r^2 + 2\pi rh$

$$= 2\pi(1)^2 + 2\pi(1)(5)$$

$$= 37,7 \text{ m}^2$$

13a) Volume = $5 \text{ m} \times 2 \text{ m} \times 3 \text{ m} = 30 \text{ m}^3$

b) Volume = $10 \text{ m} \times 4 \text{ m} \times 6 \text{ m} = 240 \text{ m}^3$

14a) Volume = $\pi r^2 h \times \frac{3}{4}$

$$= \pi \times 4^2 \times 10 \times \frac{3}{4}$$

$$= 376,99 \text{ cm}^3$$

b) Volume = $2 \text{ cm} \times 2 \text{ cm} \times 2 \text{ cm}$

$$= 8 \text{ cm}^3$$

$$2 \text{ ice cubes} = 2(8) = 16 \text{ cm}^3$$

$$\text{Total volume} = \pi r^2 h$$

$$= \pi \times 4^2 \times 10$$

$$= 502,65 \text{ cm}^3$$

$$502,65 - 376,99 = 125,66 \text{ cm}^3$$

Therefore the water in the glass will not overflow as $125,66 \text{ cm}^3 > 16 \text{ cm}^3$.

DATA HANDLING & PROBABILITY**Unit 5.1: Collect, organise and summarise data****Grade 7, 8 and 9**

- 1a) 10; 14; 15; 23; 27; 38; 44; 44; 47; 47; 47; 47; 60; 72; 83; 84; 84; 87; 91; 93

$$\text{Mean} = \frac{\text{total}}{20} = \frac{1\,057}{20} = 52,85$$

Median: 47

Mode: 47

Range: $93 - 10 = 83$

- b) 13; 20; 24; 25; 26; 26; 29; 29; 31; 36; 60; 69; 79; 79; 84; 84; 84; 86; 89; 95

$$\text{Mean} = \frac{\text{total}}{20} = \frac{1\,068}{20} = 53,4$$

$$\text{Median} = \frac{36+60}{2} = 48$$

Mode = 84

Range = $95 - 13 = 82$

- c) 10; 27; 28; 36; 42; 45; 45; 47; 59; 69; 73; 73; 79; 82; 97

$$\text{Mean} = \frac{\text{total}}{20} = \frac{812}{15} = 54,13$$

Median = 47

Mode = 45 and 73

Range = $97 - 10 = 87$

- d) 8; 8; 16; 18; 19; 23; 23; 52; 57; 57; 59; 59; 71; 71; 76

$$\text{Mean} = \frac{\text{total}}{15} = \frac{617}{15} = 41,13$$

Median = 52

Mode = 8, 23, 57 and 71

Range = $76 - 8 = 68$

2a)

Stem	Leaf
0	
1	8 9
2	0 2 2 2 4 5 6 6 7 9
3	1 1 2

- b) i) Range = $32 - 18 = 14$

ii) Median = 25

iii) Mean = $\frac{\text{total}}{15} = \frac{374}{15} = 24,93 = 24,9$ brownies

iv) Mode = 22

- c) Looking at the mean and median, he sells an average of 25 brownies a day with a range of 14 between his highest and lowest sales which means there was quite a big difference between the most brownies sold and the least brownies sold in a day.

3. a)

Interval	Frequency
less than 1,0 km	25
1,0 – 5,9 km	22
6,0 – 9,9 km	7
10 km or further	6

b) 25 out of 60 learners = $\frac{25}{60} \times \frac{100}{1} = 41,7\%$

4. a)

Interval	Weights
$55 \text{ kg} \leq x < 60 \text{ kg}$	55,2; 56,1; 58,4; 59,3.
$60 \text{ kg} \leq x < 65 \text{ kg}$	60,6; 61,2; 61,7; 63,4; 63,2; 64,2.
$65 \text{ kg} \leq x < 70 \text{ kg}$	65,9; 66,5; 66,7; 67,3; 67,8; 68,0.
$70 \text{ kg} \leq x < 75 \text{ kg}$	70,5; 72,9; 73,4; 74,1; 74,8.
$75 \text{ kg} \leq x < 80 \text{ kg}$	75, 9; 76,7; 78,7.

b)

Body weights of athletes	Tally	Frequency
$55 \text{ kg} \leq x < 60 \text{ kg}$	IIII	4
$60 \text{ kg} \leq x < 65 \text{ kg}$	IIII I	6
$65 \text{ kg} \leq x < 70 \text{ kg}$	IIII I	6
$70 \text{ kg} \leq x < 75 \text{ kg}$	IIII	5
$75 \text{ kg} \leq x < 80 \text{ kg}$	III	3

- c) $60 \text{ kg} \leq x < 65 \text{ kg}$ and $65 \text{ kg} \leq x < 70 \text{ kg}$

5a) 340 g

b) 411 g

c) 378,5 g

6. 3; 4; 5; 6; 7; 7; 7; 7; 7; 8; 8; 9; 9; 10; 11; 13; 15; 19; 23; 25.

Median = 8

Therefore Bongile can claim that his mark is in the top half of the class because his mark (9) is above the median (8) of the class's mark.

7.

- a) Yes, there are more shops in City A where the price of white bread is cheaper than the price of white bread in the shops in City B.

b) City A: Mean = $\frac{\text{total}}{10} = \frac{8\,909}{10} = 890,9$ cents

City B: Mean = $\frac{\text{total}}{10} = \frac{9\,099}{10} = 909,9$ cents

c) City A:

831; 861; 880; 885; 888; 889; 899; 904; 927; 937

$$\text{Median} = \frac{888+899}{2} = 888,5 \text{ cents}$$

City B:

872; 872; 890; 900; 908; 910; 924; 933; 942; 948

$$\text{Median} = \frac{908+910}{2} = 909 \text{ cents}$$

8. The median will give a better representation of the average of the data as the outlier 59 distorts the mean.

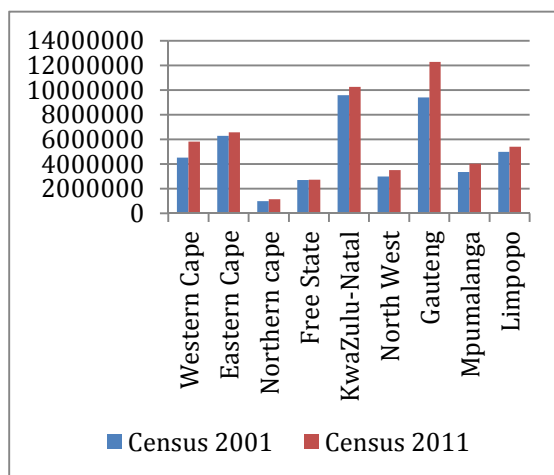
Unit 5.2: Represent Data with Graphs**Grade 7, 8 and 9**

1a) Northern Cape

b) $\frac{10,6}{100} \times 360^\circ = 38,16^\circ$

c) $\frac{10,3}{100} \times 1\,213\,090 = 124\,948,27 \text{ km}^2$

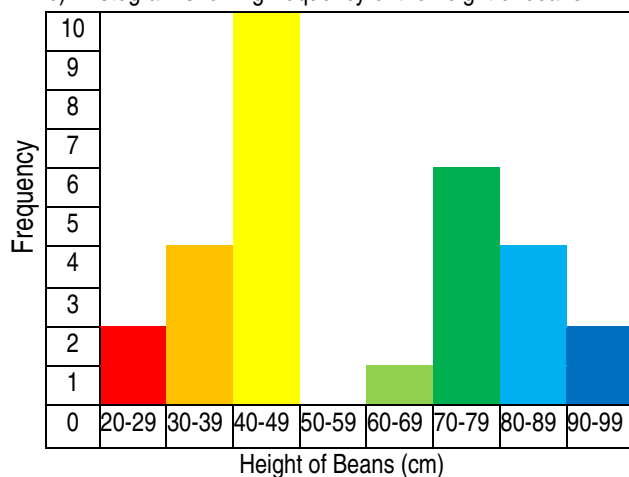
2a)



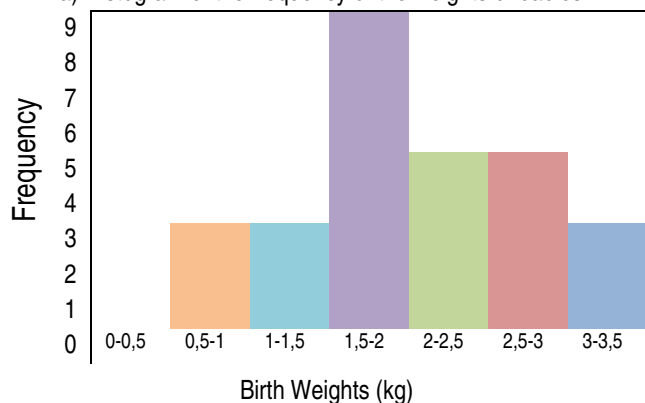
b) Gauteng

3a) Height of bean plants (cm)	Tally	Frequency
20 – 29		2
30 – 39		4
40 – 49		10
50 – 59		0
60 – 69		1
70 – 79		6
80 – 89		4
90 – 99		2
Total		29

b) Histogram showing frequency of the height of beans



4a) Histogram of the frequency of the weights of babies



b) Mean = 2,0475 kg

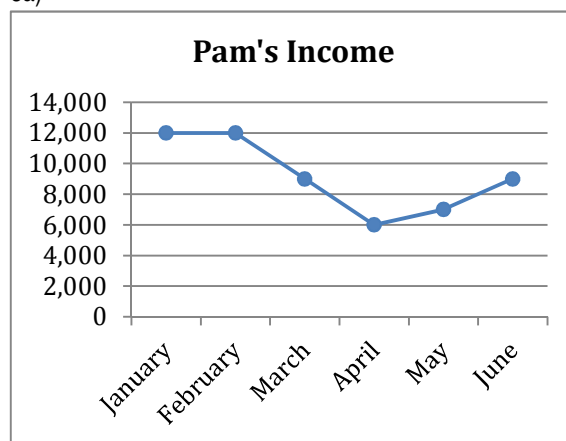
Median = 1,95 kg

c) The mean of baby weights from the clinic is over 1 kg less than the average of the country.

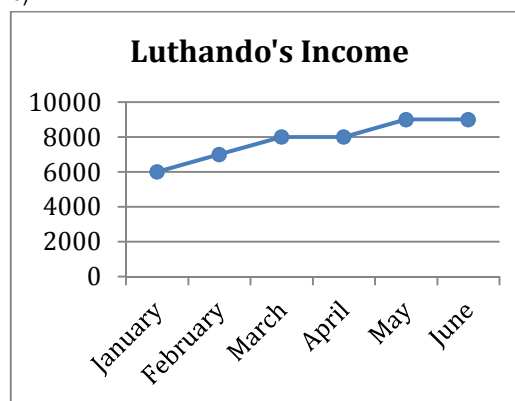
The maximum weight of babies born at this clinic is 2,2 kg lower than that for the rest of the country.

The median is also quite low. From the graph we can see that a large number of babies at this clinic weigh between 1,5 kg and 2 kg at birth. This is well below the average birth weight for babies in the country generally.

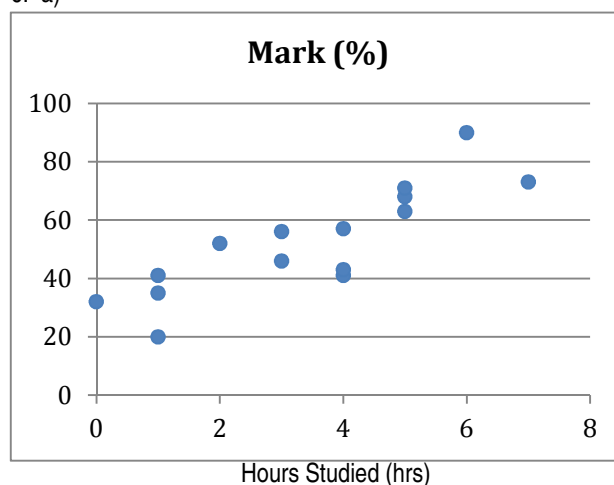
5a)



b)

**Grade 9**

6. a)



b) Yes, the trend suggests the more hours studied, the better the marks.

c) Luthando's income

Unit 5.3: Bias and error in data**Grade 7, 8 & 9**

1a) Burger A

b) Yes, this is true.

2a) No

b) Any of the statistics except the mode can give us a better picture. For example, if the range is small, this might show that there are small differences between the salaries of the employees. The median would show what the highest pay of the bottom half of the earners at the company is. If it is a lot smaller than the mean, it probably indicates that there are some large salaries at the upper end that are 'pulling up' the mean.

This information can be misleading. We assume that most staff earn something close to the mean (around R13 731). This is probably not true. It is more likely that a few staff members earn a very large salary compared to many staff members who earn a relatively small salary.

Grade 8 & 9

3a) Two blocks on this graph represent 2,5%.

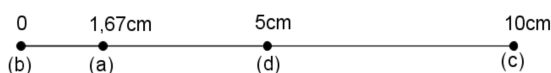
The graph is accurate and the scale is clearly shown on the vertical axis. However, the vertical axis begins at 82,5 and ends at 10% more than this. So it stretches the data and it appears that the increases in access to water are huge, but the actual increase is just over 5% in 10 years.

b) You can increase the scale on the vertical axis (2 blocks for 1%) to stretch the graph and make it steeper so the increases are more noticeable.

c) You can reduce the scale on the vertical axis (2 blocks for 5%) to make the graph smaller and flatter so making the increases are very slight.

Unit 5.4: Probability**Grade 7, 8 and 9**

- $\frac{1}{6}$
 - $\frac{3}{6} = \frac{1}{2}$
 - $\frac{3}{6} = \frac{1}{2}$
 - $\frac{4}{6} = \frac{2}{3}$
- $\frac{13}{52} = \frac{1}{4}$
 - $\frac{26}{52} = \frac{1}{2}$
 - $\frac{12}{52} = \frac{3}{13}$
 - $\frac{4}{52} = \frac{1}{13}$
- $\frac{6}{19}$
 - $\frac{10}{19}$
 - $\frac{9}{19}$
 - $\frac{9}{19}$
- $\frac{2}{8} = \frac{1}{4}$
 - $\frac{1}{8}$
 - $\frac{3}{8}$
- $\frac{5}{725} = \frac{1}{145}$
 - $\frac{10}{725} = \frac{2}{145}$
 - $\frac{2}{725}$
- $\frac{1}{6} = 16,7\% = 1,67\text{ cm}$
 - no chance: 0
 - It has to happen: 100%
 - 50% chance

**Grade 8 and 9**

7. a) $\frac{1}{6} \times 300 = 50$

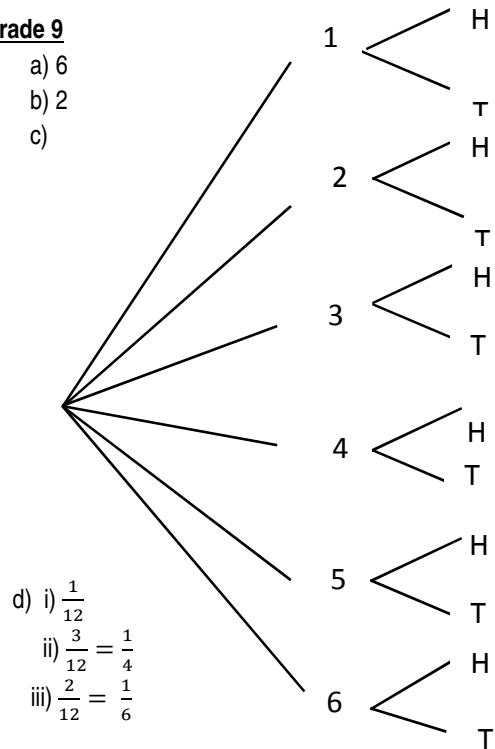
b) $\frac{3}{6} \times 300 = 150$

c) 0

8. $\frac{1}{6} \times 30 = 5$ Therefore it isn't what would be expected. It would be expected to roll a six 5 times out of thirty.

Grade 9

9. a) 6
b) 2
c)



- d) i) $\frac{1}{12}$
ii) $\frac{3}{12} = \frac{1}{4}$
iii) $\frac{2}{12} = \frac{1}{6}$

a)	Second spinner				
		1	1	2	3
First spinner	2	3	3	4	5
	3	4	4	5	6
	4	5	5	6	7
	5	6	6	7	8

b) 5 and 6

c) $\frac{2}{16} = \frac{1}{8}$



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