Year 9 Term 1 Homework

Student Name: _____	**Grade**: _____
Date: _____	**Score**: _____

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1 Year 9 Term 1 Week 1 Homework

1.1 Rational Number

A rational number is a number that can be written in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$.

1.1.1 Significant figures

A significant figure is a number that is correct within some stated degree of accuracy. The rule for significant figures are:

- All non-zero digits are significant.
- Zeros between non-zero digits are significant.
- Zeros at the end of a decimal are significant.
- Zeros before the first non-zero digit in a decimal are not significant.
- Zeros after the last non-zero digit in a whole number may or may not be significant.

Example 1.1.1 State the number of significant figures in each of these numbers:

1. *2.008*
   Solution: In 2.008, the two non-zero digits are significant and two zeros between these digits are also significant. ∴ the number has four significant figures.
2. *102.50*
   Solution: In 102.50, the three non-zero digits are significant and both the zero in between and at the end of the decimal are significant. ∴ The number has five significant figures.
3. *0.00125*
   Solution: In 0.00125, the three non-zero digits are significant; however, the three zeros at the beginning of the decimal are not significant. ∴ the number has only three significant figures.
4. *9000*
   Solution: In 9000, the non-zero digit is significant. Either some, all or none of the final zeros could possibly be significant. If we knew that the number had been rounded off correct to:
   (a) 1 significant figure, then only the 9 would be significant.
   (b) 2 significant figures, then only the 9 and the first zero would be significant.
   (c) 3 significant figures, then only the 9 and the first two zeros would be significant.
   (d) 4 significant figures, then all the digits would be significant.

Exercise 1.1.1 Round off 34.535 correct to:

1. *1 significant figure* _____
2. *2 significant figures* _____
3. *3 significant figures* _____
4. *4 significant figures* _____

Exercise 1.1.2 State the number of significant figures in each of the following:

1. *5002* _____
2. *0.48* _____
3. *3.40* _____
4. *12.0050* _____
5. *0.012003400* _____

Exercise 1.1.3 Round off each of the following correct to 1 significant figure:

1. *325* _____
2. *280* _____
3. *2180* _____
4. *12.56* _____
5. *99.45* _____

Exercise 1.1.4 Round off each of the following correct to 2 significant figures:

1. *8580* _____
2. *123003* _____
3. *8028* _____
4. *0.25349* _____
5. *194.95* _____

1.1.2 Estimation

- An estimate is an approximate answer that is worked out logically.
- It needs to be of the same order of magnitude.

Exercise 1.1.5 Estimate the answer, as an integer to each of these:

1. $9.6 + 19.3 + 12.2$ _____
2. $95.5 - 27.3 + 15.048$ _____
3. $12.2 \times 3.75 \times 5.4$ _____
4. $126.6 \div 9.81$ _____
5. $53.5 \div 6.12 \times 8.045$ _____

Exercise 1.1.6 Further applications

1. *Evaluate $\sqrt{4}$ and $\sqrt{9}$, find estimates for the following, correct to 1 decimal place.*
   (a) $\sqrt{5}$ _____
   (b) $\sqrt{8}$ _____
2. *Evaluate $\sqrt{121}$ and $\sqrt{144}$. Hence , find estimates for the following, correct to 1 decimal place.*
   (a) $\sqrt{125}$ _____
   (b) $\sqrt{145}$ _____
3. *John decided to re-carpet his lounge room using carpet squares of side length 40 cm. The lounge room is rectangular in shape and measure 4.8 m by 5.6 m.*
   (a) *Estimate the area of the room in square metres.*
   _____
   (b) *How many carpet squares are needed to cover an area of 2 m^2.*
   _____
   (c) *Estimate the number of carpet squares that are needed to cover the entire lounge room floor.*
   _____
   (d) *If the carpet squares are sold in packs of 50 at $280 per pack, estimate the total cost of the re-carpeting.*
   _____

1.1.3 Recurring decimals

- A recurring decimal has an infinite number of decimal places, with one or more of the digits repeating themselves indefinitely.
- Recurring decimals are written with a dot above the first and the last digits in the repeating sequence.
- Every recurring decimal can be expressed as a fraction, so recurring decimals are rational numbers.

Example 1.1.2

1. $0.333333... = 0.\dot{3}$
2. $0.166666... = 0.1\dot{6}$
3. $0.616161... = 0.\dot{6}\dot{1}$
4. $1.329329... = 1.\dot{3}2\dot{9}$

- To convert a fraction to a recurring decimal divide the numerator by the denominator.
- To convert a recurring decimal to a fraction:
  - let the decimal be x
  - multiply both sides by the smallest power of 10 so that the recurring part of the decimal becomes a whole number
  - subtract the first equation from the second and solve the resulting equation.

Example 1.1.3 Convert each of these recurring decimals to a fraction in its simplest form:

1. $0.\dot{6}$
   Solution: let $x = 0.\dot{6}$ .... *(1)*
   $\therefore 10x = 6.\dot{6}$ .... *(2)*
   subtract (1) from (2) we have 9x = 6.
   $\therefore x = \frac{6}{9} = \frac{2}{3}$
2. $0.\dot{1}2\dot{5}$
   Solution: let $x = 0.\dot{1}2\dot{5}$ ..... *(1)*
   $\therefore 1000x = 125.\dot{1}2\dot{5}$ .... *(2)*
   subtract (1) from (2) we have 999x = 125
   $\therefore x = \frac{125}{999}$

Exercise 1.1.7 Write each of these as a recurring decimal:

1. *0.6444 ...*
2. *0.31818 ...*
3. *0.3555 ...*
4. *0.919191 ...*
5. *0.484848 ...*
6. *0.030303 ...*
7. *0.029029 ...*
8. *13.95555 ...*

Exercise 1.1.8 Convert each of these recurring decimals to a fraction or a mixed numeral, in simplest form:

1. $0.\dot{3}\dot{5}$
2. $0.4\dot{8}$
3. $0.\dot{1}4\dot{6}$
4. $3.41\dot{6}$

1.1.4 Rates

- A rate is a comparison of two unlike quantities.
- A rate is a measure of how one quantity is changing with respect to another.
- To be in simplest form, a rate must be expressed as a quantity per one unit of another quantity.

Example 1.1.4 Express each of the following statements as a rate in simplest form.

1. *210 km in 3 hours = 70 km/h.*
2. *36 L in 9 min = 4 L/min.*
3. *\$180 in 4 hours = \$45/h.*

Exercise 1.1.9 Express each of the the following statements as a rate in simplest form:

1. *45 m in 3 seconds* _____
2. *260 km in 4 hours* _____
3. *\$18 for 8 kg* _____
4. *72 kL in 1.5 hours* _____
5. *26 km on 25 L* _____
6. *240 heart beats in* $2\frac{1}{2}$ *min* _____

Exercise 1.1.10 Complete the following equivalent rates:

1. *8 cm/s =* _____ *cm/min*
2. *15 g/min =* _____ *g/h*
3. *75 cm/s =* _____ *m/min*
4. *180 kg/h =* _____ *t/day*
5. *142 m/min =* _____ *km/h*
6. *72 km/h =* _____ *m/s*
7. *2.5¢/mm = \$* _____ */m*
8. *2.8 m/min =* _____ *km/day*

Exercise 1.1.11 Complete the following equivalent rates:

1. *25 m/s = _____ km/h*
2. *8 mm/min = _____ m/day*
3. *0.5 m/min = _____ km/day*
4. *11 m/mL = _____ km/L*
5. *125 m/min = _____ km/h*
6. *25 mL/s = _____ L/h*
7. *720 m/min = _____ m/s*
8. *14.6 t/day = _____ kg/day*

Exercise 1.1.12 Convert the following monthly interest rates to annual rates:

1. *0.65% per month* _____
2. *0.8% per month* _____
3. *1.25% per month* _____

Exercise 1.1.13 Convert the following annual interest rates to monthly rates:

1. *8% p.a.* _____
2. *18% p.a.* _____
3. *4.8% p.a.* _____

Exercise 1.1.14 Further applications

1. *Calculate the daily interest rate on a credit card if the annual rate is 17.8% p.a.*

   _____

2. *Convert $540/week to an equivalent monthly rate.*

   _____

3. *Convert $1014/month to an equivalent fortnightly rate.*

   _____

4. *Convert $461.50/quarter to an equivalent weekly rate.*

   _____

1.1.5 Solving problem with rates

Exercise 1.1.15

1. *George drove 15 km in 10 minutes. At the same speed, how far does he drive in 2 hours?*

2. *If it takes 3 hours to remove 72 t of sugar from a silo, how long it would take to remove 30 t?*

3. *A long distance runner completes a marathon of 42.2 kilometres in 2 hours 15 minutes. Calculate his average speed in km/h and m/s, correct to 2 decimal places.*

4. *The following currency conversions show the value of 1 Australian dollar (A$1) in US$, euro and NZ$.*

A$1 = US$0.6925	*A$1 = 0.5226 euro*	*A$1 = NZ$1.2171*

Use these currency conversions to convert:

(a) A$30 into US$ _____

(b) A$50 in euro _____

(c) A$500 into NZ$ _____

5. *Use the unitary method to answer the following questions:*

(a) David paid $4.95 for 3 kg of apples. How much would he paid for 8 kg?

(b) In a walking race, Peter took 20 minutes to walk 4 km. How long would it take him to walk 15 km?

(c) If chicken is being sold for $6.80 per kilogram, find the cost of purchasing 450 grams of chicken.

1.2 Miscellaneous Exercises

Exercise 1.2.1 Round off the following correct to 3 significant figures:

1. *99.38* _____
2. *194.63* _____
3. *499.682* _____

Exercise 1.2.2 Convert each of these recurring decimals to a fraction or mixed numeral, in simplest form:

1. $0.7\dot{3}$

2. $1.\dot{6}\dot{0}$

Exercise 1.2.3 Complete the following equivalent rates:

1. *25 ¢/*cm^2 *= $* _____ $/m^2$
2. *160* mL/m^2 *=* _____ L/km^2
3. *1.5* g/cm^3 *=* _____ t/m^3
4. *$120/L =* _____ ¢$/cm^3$

Exercise 1.2.4 Further applications

1. *At the 1896 Olympic Games, Australia's Edwin Flack won a gold medal in the 800 m in a time of 2 minutes 11 seconds.*

   (a) Find the average speed in m/s, correct to 1 decimal place.

   (b) Express this speed in km/h. _____

2. *On a property sold for $600,000, a real estate agent receives a commission of $12,000. At what rate is the commission calculated?*

Exercise 1.2.5 Simplify the following:

1. $\frac{(4x-y)^3+4x-y}{4x-y}$

2. $\frac{x^2+x-2}{x+2} \times \frac{x^2-3x}{x^2-4x+3}$

3. $\frac{3}{y^2+2y-8} - \frac{2}{y^2+y-6}$

4. $\frac{9x^2-4y^2}{6x-4y}$

5. $\frac{2x^2-18}{3x^2+9x}$

Exercise 1.2.6 Factorise the following:

1. $3x^2 - x - 4$

2. $y^4 - 256$

3. $x^2 - y^2 - x + y$

4. $3x - 6y + x^2 - 2xy$

5. $2x + y^2 + 2y + xy$

6. $6y^2 - 13y - 5$