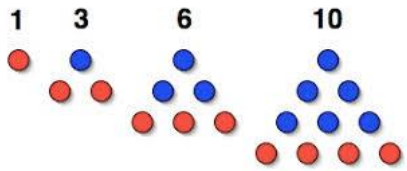
Kettering Science Academy Maths

Year 8 Mathematics Developing HT 5

Sequences

1.	Linear Sequence	A number pattern with a **common difference**. 2, 5, 8, 11… is a linear sequence
2.	Term	**Each value** in a sequence is called a term In the sequence 2, 5, 8, 11…, 8 is the third term of the sequence.
3.	Term-to-term rule	A rule which allows you to **find the next term** in a sequence if you **know the previous term**. First term is 2. Term-to-term rule is 'add 3' Sequence is: 2, 5, 8, 11…
4.	nth term	A rule which allows you to **calculate the term** that is in the **nth position** of the sequence. Also known as the 'position-to-term' rule. **n** refers to the **position** of a term in a sequence. nth term is $3n - 1$ The 100th term is $3 \times 100 - 1 = 299$
5.	Finding the nth term of a linear sequence	1. Find the **difference**. 2. **Multiply that by** n. 3. Substitute $n = 1$ to **find out what number you need to add or subtract to get the first number in the sequence**. Find the nth term of: 3, 7, 11, 15… 1. Difference is +4 2. Start with $4n$ 3. $4 \times 1 = 4$, so we need to subtract 1 to get 3. nth term = $4n - 1$

6.	Fibonacci type sequences	A sequence where the next number is found by **adding up the previous two terms.** **The Fibonacci sequence is:** $1, 1, 2, 3, 5, 8, 13, 21, 34 \ldots$ **An example of a Fibonacci-type sequence is:** $4, 7, 11, 18, 29 \ldots$
7.	Triangular numbers	The sequence which comes from a pattern of dots that form a triangle. $1, 3, 6, 10, 15, 21 \ldots$ 
Fractions and percentages		
1.	Fraction	A mathematical expression representing the **division** of one integer by another. Fractions are written as **two numbers separated by a horizontal line**. $\frac{2}{7}$ is a 'proper' fraction. $\frac{9}{4}$ is an 'improper' or 'top-heavy' fraction.
2.	Numerator	The **top** number of a fraction. In the fraction $\frac{3}{5}$, 3 is the numerator.
3.	Denominator	The **bottom** number of a fraction. In the fraction $\frac{3}{5}$, 5 is the denominator.
4.	Mixed Number	A number formed of both an **integer part** and a **fraction part**.

		$3\frac{2}{5}$ is an example of a mixed number.
5.	Simplifying Fractions	**Divide the numerator and denominator by the highest common factor**. $\frac{20}{45} = \frac{4}{9}$
6.	Equivalent Fractions	Fractions which represent the **same value**. $\frac{2}{5} = \frac{4}{10} = \frac{20}{50} = \frac{60}{150}\ etc.$
7.	Comparing Fractions	To compare fractions, they each need to be rewritten so that they have a **common denominator**. **Ascending** means **smallest to biggest**. **Descending** means **biggest to smallest**. Put in to ascending order : $\frac{3}{4}, \frac{2}{3}, \frac{5}{6}, \frac{1}{2}$. Equivalent: $\frac{9}{12}, \frac{8}{12}, \frac{10}{12}, \frac{6}{12}$ Correct order: $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{5}{6}$
8.	Adding or Subtracting Fractions	Find the **LCM of the denominators** to find a common denominator. Use equivalent fractions to change each fraction to the **common denominator**. $\frac{2}{3} + \frac{4}{5}$ Multiples of 3: 3, 6, 9, 12, **15**.. Multiples of 5: 5, 10, **15**.. LCM of 3 and 5 = 15 Then just **add or subtract the numerators** and keep the **denominator the same**. $\frac{2}{3} = \frac{10}{15}$

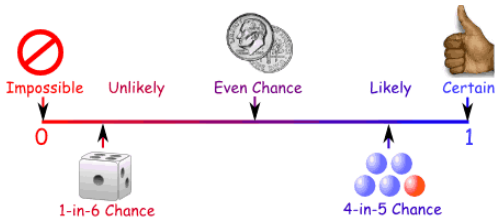
		$$\frac{4}{5}=\frac{12}{15}$$ $$\frac{10}{15}+\frac{12}{15}=\frac{22}{15}=1\frac{7}{15}$$
9.	Multiplying Fractions	**Multiply** the **numerators** together and **multiply** the **denominators** together. $$\frac{3}{8}\times\frac{2}{9}=\frac{6}{72}=\frac{1}{12}$$
10.	Dividing Fractions	**'Keep it, Flip it, Change it – KFC'** Keep the first fraction the same Flip the second fraction upside down Change the divide to a multiply Multiply by the reciprocal of the second fraction. $$\frac{3}{4}\div\frac{5}{6}=\frac{3}{4}\times\frac{6}{5}=\frac{18}{20}=\frac{9}{10}$$
11.	Unit Fraction	A fraction where the **numerator is one** and the denominator is a positive integer. $\frac{1}{2},\frac{1}{3},\frac{1}{4}\ etc.$ are examples of unit fractions.
12.	Percentage	**Number of parts per 100.** 31% means $\frac{31}{100}$
13.	Finding 10%	To find **10%, divide by 10** 10% of £36 = 36÷10=£3.60
1.	Finding 1%	To find **1%, divide by 100** 1% of £8 = 8÷100 = £0.08
15.	Percentages to Fractions	Percentage is just a fraction out of 100. **Write the percentage over 100** and simplify

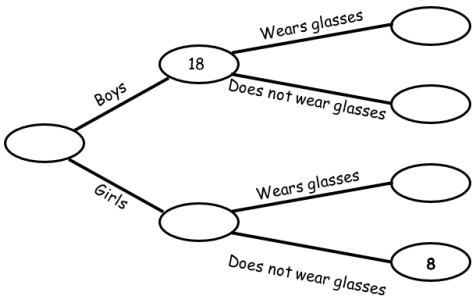
		$14\% = \frac{14}{100} = \frac{7}{50}$
16.	Percentages to Decimals	**Divide by 100** $\mathbf{8\% = 8 \div 100 = 0.08}$
17.	Decimals to Percentages	**Multiply by 100** $\mathbf{0.4 = 0.4 \times 100\% = 40\%}$
18.	Increase or Decrease by a Percentage	Non-calculator: **Find the percentage** and **add** or **subtract** it from the **original** amount. Calculator: Find the **percentage multiplier** and multiply. <u>Increase 500 by 20% (Non Calc):</u> 10% of 500 = 50 so 20% of 500 = 100 500 + 100 = 600 <u>Decrease 800 by 17% (Calc):</u> 100%-17%=83% 83% ÷ 100 = 0.83 0.83 x 800 = 664
19.	Percentage Multiplier	The **number** you **multiply** a quantity by to **increase or decrease** it by a **percentage**. The multiplier for increasing by 12% is 1.12 The multiplier for decreasing by 12% is 0.88
20.	Simple Interest	Interest calculated as a **percentage of the original** amount. £1000 invested for 3 years at 10% simple interest. 10% of £1000 = £100 Interest = $3 \times £100 = £300$

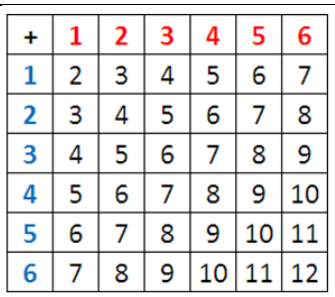
Kettering Science Academy Maths

Year 8 Mathematics Developing HT 6

Probability

1.	Probability	The **likelihood/chance** of something happening. Is expressed as a number **between 0 (impossible) and 1 (certain)**. Can be expressed as a fraction, decimal, percentage or in words (likely, unlikely, even chance etc.) 
2.	Probability Notation	**P(A)** refers to the **probability that event A will occur**. P(Red Queen) refers to the probability of picking a Red Queen from a pack of cards.
3.	Theoretical Probability	$$\frac{Number\ of\ Favourable\ Outcomes}{Total\ Number\ of\ Possible\ Outcomes}$$ Probability of rolling a 4 on a fair 6-sided die = $\frac{1}{6}$
4.	Relative Frequency	$$\frac{Number\ of\ Successful\ Trials}{Total\ Number\ of\ Trials}$$ A coin is flipped 50 times and lands on Tails 29 times. The relative frequency of getting Tails = $\frac{29}{50}$
5.	Expected Outcomes	To find the number of expected outcomes, **multiply** the **probability** by the **number of trials**. The probability that a football team wins is 0.2 How many games would you expect them to win out of 40? $$0.2 \times 40 = 8\ games$$

6.	Exhaustive	Outcomes are **exhaustive** if they **cover the entire range of possible outcomes**. The **probabilities** of an **exhaustive** set of outcomes **adds up to 1**. When rolling a six-sided die, the outcomes 1, 2, 3, 4, 5 and 6 are exhaustive, because they cover all the possible outcomes.
7.	Mutually Exclusive	Events are mutually exclusive if they **cannot happen at the same time**. The **probabilities** of an exhaustive set of **mutually exclusive** events **adds up to 1**. Examples of mutually exclusive events: - Turning left and right - Heads and Tails on a coin Examples of non mutually exclusive events: - King and Hearts from a deck of cards, because you can pick the King of Hearts
8.	Frequency Tree	A diagram showing how information is categorised into various categories. The **numbers** at the ends of branches tells us how often something happened (**frequency**). The **lines** connected the numbers are called **branches**. 
9.	Sample Space	The **set of all possible outcomes** of an experiment.

		
10.	Sample	A **sample** is a small selection of items from a population. A sample is **biased** if individuals or groups from the population are not represented in the sample. A sample could be selecting 10 students from a year group at school.
11.	Sample Size	The larger a sample size, the closer those probabilities will be to the true probability. A sample size of 100 gives a more reliable result than a sample size of 10.