

### Essential knowledge

- Understand direct proportion
- How to share into a ratio
- Convert between common fractions, decimals and %
- Calculate simple & compound interest
- Calculate probability
- Understand dependent and independent events

### Key Vocabulary

- Direct proportion:** two values are in direct proportion when one is a multiple of the other.
- Ratio:** shows how much of one thing there is compared to another.
- Theoretical probability:** number of times we expect something to happen.
- Relative frequency:** the number of times an event happens divided by the number of outcomes that took place.
- Dependent events:** in probability theory, the probability of a dependent event is affected by previous events.

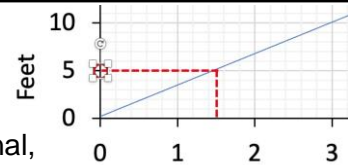
### Prior learning links

- Ratio & scale (Y8)
- Fractions & percentages (Y8)
- Probability (Y9)
- Solving ratio & proportion problems (Y9)

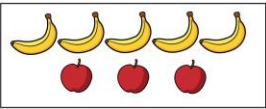
### Direct Proportion

Here is a conversion graph between meters and feet.

These are directly proportional, i.e. 5 feet  $\approx$  1.5m, 10 feet  $\approx$  3m, 15 feet  $\approx$  4.5m

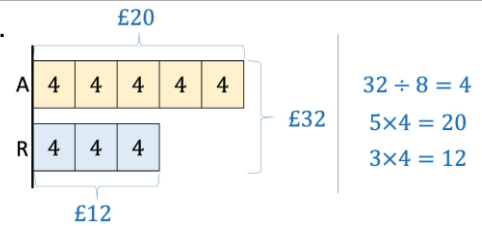


### Ratios (show how much of one thing there is compared to another).



The ratio of apples to bananas is 3 : 5

The bar model illustrates how to share £32 in the ratio 5 : 3



### Percentages, decimals & fractions

1%	0.01	$\frac{1}{100}$
5%	0.05	$\frac{1}{20}$
10%	0.1	$\frac{1}{10}$
20%	0.2	$\frac{1}{5}$
25%	0.25	$\frac{1}{4}$
50%	0.5	$\frac{1}{2}$
75%	0.75	$\frac{3}{4}$

To find a percentage of an amount, multiply the amount by the decimal equivalent, e.g.  
 10% of 50 ( $0.1 \times 50 = 5$ )  
 20% of 48 ( $0.2 \times 48 = 9.6$ )

A percentage decrease reduces an amount, e.g.  
 10% off £90, is:  
 $90 - 9 = 81$

### Percentage and interest

**Simple interest** is calculated by finding a % of an amount & multiplying by the time period.

£400 at 3% simple interest for 3 years

$$\text{Interest} = 400 \times 0.03 \times 3 = 36$$

$$\text{Original amount} + \text{interest} = 400 + 36 = 436$$

**Compound interest** means each time interest is paid onto an amount, the added interest also receives interest from then on.

£400 at 3% compound interest for 3 years

$$400 \times 1.03 \times 1.03 \times 1.03 = 437.09$$

$$400 \times 1.03^3 = 437.09$$

### Probability (1)



**Theoretical probability** refers to the number of times we **expect** something to happen, e.g. if we roll a dice 60 times we would **expect** to get 10 ones, 10 twos etc.

**Experimental probability** refers to the times something **actually happens**, e.g. if we roll a dice 60 times we might get 8 ones, 12 twos etc.

**Relative frequency** is the number of times an event happens divided by the total number of outcomes that took place. The more times an experiment is carried out, the closer the relative frequency will be to the theoretical probability.

### Probability (2)

**Independent events** are not affected by the other events (e.g. repeatedly tossing a coin).

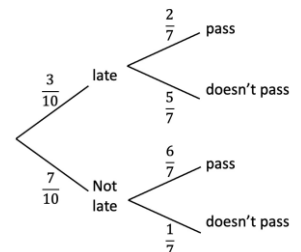
**Dependent events** are those which depend upon what happened previously, e.g. Alex's arrival time at school **will affect** how she performs on a test.

P (late and passes her test)

$$\frac{3}{10} \times \frac{2}{7} = \frac{6}{70}$$

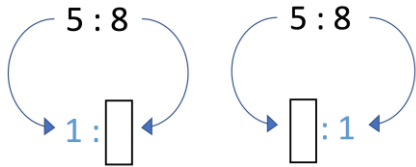
P (on time and passes)

$$\frac{7}{10} \times \frac{6}{7} = \frac{42}{70}$$

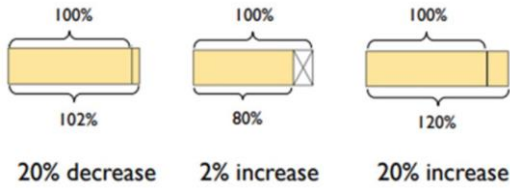


## Prior learning links

Write the ratios in the form  $1 : n$  and  $n : 1$



Match the bar model to the percentage increase or decrease.



## Key Vocabulary

Use cover, look, write, check to write the definitions ...

**Direct proportion:**

**Ratio:**

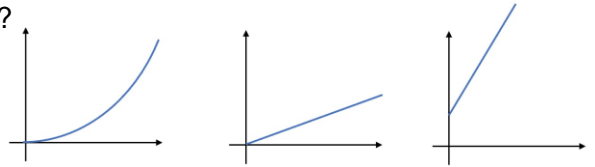
**Theoretical probability:**

**Relative frequency:**

**Dependent events:**

**Direct proportion** Which of these graphs shows direct proportion?

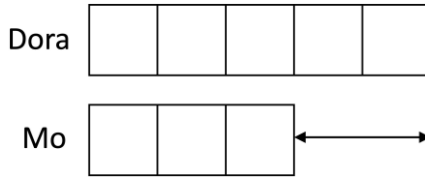
Explain your answer



## Ratios

Use bar models to share the numbers in the given ratios.

- Share 150 in the ratio 3 : 2
- Share 75 in the ratio 2 : 3
- Share 96 in the ratio 7 : 1 : 4



Dora and Mo share some money in the ratio 5 : 3  
If Dora gets £120 more than Mo, how much money did they share?  
Use the bar model to help you answer the question.

## Percentages, decimals & fractions

Complete the table

Calculate:

- 10% of 48
- 36% of 780

Decrease 120 by:

- 10%
- 25%

State the % multiplier for:

- 40%
- 3%
- A 25% increase

1%	0.01	
		$\frac{1}{20}$
	0.1	
	0.2	
		$\frac{1}{4}$
75%		

## Percentage and interest

- Dora invests £2,000 at 4% simple interest per annum. How much interest would she earn after 5 years?
- Rosie invests £6,000 at 2.5% compound interest per annum. What is her investment worth after 7 years?
- Which investment, A or B, will give the greater amount of interest after:
  - A Invest £4,000 at 3% simple interest per annum
  - B Invest £5,000 at 2.5% simple interest per annum

## Probability (1)

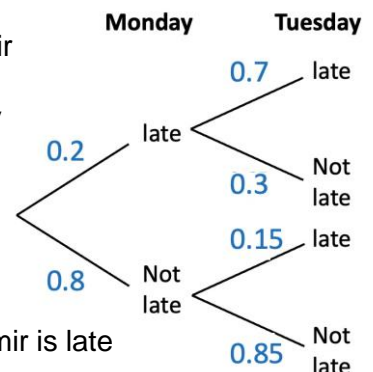
Complete the relative frequency table.

Number of trials	Number of sixes	Relative frequency
1	0	
10	3	
600	105	

- A dice is rolled 54 times. How many fives would you expect to roll?
- What is the theoretical probability that you flip three heads in a row?
- Two dice are rolled. What is the theoretical probability that the total of both dice is 12?

## Probability (2)

The probability of Amir being late for work on Monday and Tuesday is shown in the tree diagram.



Calculate:

- The probability Amir is late on both days.
- The probability that he is late on at least one day.