

# Numbers & Accuracy

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Numbers & Accuracy
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 36 minutes

**Score:** /28

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

### Question 1

~~Assembled by AS~~



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$$\sqrt{5} \quad -7 \quad 343 \quad -11 \quad 0.4 \quad 2.5 \quad \frac{1}{3}$$

From this list of numbers, write down

- (a) a cube number,

[1]

**343**

- (b) the smallest number,

[1]

**-11**

- (c) a natural number.

[1]

**343**

## Question 2

One day, at noon, in Maseru, the temperature was  $17^{\circ}\text{C}$ .  
At midnight the temperature was  $20^{\circ}\text{C}$  lower.

Work out the temperature at midnight.

[1]

$$17 - 20$$

$$= -3$$

### Question 3

(a) 1 and 12 are factors of 12.

Write down all the other factors of 12.

[1]

**2, 3, 4, 6**

(b) Write down the multiples of 9 between 20 and 40.

[1]

**27, 36**

## Question 4

Write 23.4571 correct to

- (a) 4 significant figures,

[1]

**23.46**

- (b) the nearest 10.

[1]

**20**

## Question 5

The table shows the temperatures in five places at 10 am one day in January.

Place	Temperature (°C)
Helsinki	- 7
Chicago	- 10
London	3
Moscow	- 4
Bangkok	26

(a) Which place was the coldest?

[1]

**Chicago**

(b) At 2 pm the temperature in Helsinki had increased by 4°C.

[1]

Write down the temperature in Helsinki at 2pm.

$$-7 + 4$$

$$= -3$$

## Question 6

Write 0.071 64 correct to 2 significant figures.

[1]

**0.072**

## Question 7

Write down the temperature which is 5 °C below –2 °C.

[1]

Need to subtract -2 from 5.

**Temperature =  $-2 - 5$  “take away 2, take away another 5”**

**Temperature =  $-7^{\circ}\text{C}$**

## Question 8

Write 0.0401907 correct to

- (a) 3 significant figures,

[1]

For Significant Figures start counting at the first non-zero number.

Look at 4<sup>th</sup> figure: 9 is 5 or bigger so we round up the 3<sup>rd</sup> figure.

$$\mathbf{0.0401907 = 0.0402 \text{ (to 3 significant figures)}}$$

- (b) 3 decimal places.

[1]

For Decimal Places start counting at the Decimal Point.

Look at 4<sup>th</sup> decimal place: 1 is 4 or smaller so we leave the 3<sup>rd</sup> figure as it is.

$$\mathbf{0.0401907 = 0.040 \text{ (to 3 decimal places)}}$$

## Question 9

Simplify.

$$n^2 \times n^5$$

[1]

Use the relevant Law of Indices:

$$n^2 \times n^5 = n^{2+5}$$

$$= n^7$$

Law of Indices:

$$a^p \times a^q = a^{p+q}$$

## Question 10

Find the lowest common multiple (LCM) of 36 and 48.

[2]

We can do this by writing out all of the multiples of the two numbers. The multiples of 36 are:

36, 72, 108, 144, 180, ...

The multiples of 48 are

48, 96, 144, 192, ...

We can see that the lowest common multiple is:

144

## Question 11

Write 3.5897 correct to 4 significant figures.

[1]

4 significant figures means the first four digits of the number remembering that the first one cannot be a zero. Here this is rounded up to

3.5897

= **3.590 (4 SF)**

## Question 12

8      9      10      11      12      13      14      15      16

From the list of numbers, write down

- (a) the square numbers,

[1]

The square numbers are

**9, 16**

- (b) a prime factor of 99.

[1]

9 and 11 are factors of 99 but only 11 is prime. Therefore

**11**

### Question 13

Write 71496 correct to 2 significant figures.

[1]

2 significant figures is the first two non-zero figures (rounded)

**71 000**

## Question 14

Find the highest common factor (HCF) of 56 and 70. [2]

The factors of the two numbers are as follows

56: 2, 4, 7, 8, 14, 28

70: 2, 7, 10, 14, 35

The HCF is therefore

**14**

## Question 15

(a) Write 2016 as the product of prime factors.

[3]

To work out the product of prime factors, divide 2016 by what is initially the smallest possible prime factor which is 2. Continue divide the ensuing numbers 5 times and it can no longer be divided by 2 to produce a whole number integer. Then try the next largest prime factor which is 3 and see how many times that will then divide which you'll get as 2. Continue this process with 7 as the divisor until you get down to 1. The product of prime factors is all the prime factors multiplied together, in this case

$$2^5 \times 3^2 \times 7,$$

which should equal 2016 (the original number).

(b) Write 2016 in standard form.

[1]

$$2016 = 2.016 \times 1000$$

$$= 2.016 \times 10^3$$

## Question 16

At midnight the temperature in Newtown was  $-8^{\circ}\text{C}$ .  
At noon the next day the temperature in Newtown was  $9^{\circ}\text{C}$ .

Work out the rise in temperature from midnight to noon.

[1]

**Subtract the temperature readings to get the temperature difference:**

$$\text{difference} = \text{noon} - \text{midnight} = 9 - (-8)$$

$$\text{difference} = 17$$

# Numbers & Accuracy

## Difficulty: Easy

### Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Numbers & Accuracy
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 2

**Time allowed:** 35 minutes

**Score:** /27

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

By writing each number correct to 1 significant figure, estimate the value of  $\frac{\sqrt{3.9} \times 29.3}{8.9 - 2.7}$ .

Show all your working.

[2]

Write all numbers correct to one significant figure:

$$\frac{\sqrt{4} \times 30}{9 - 3}$$

Do the calculations.

$$\frac{2 \times 30}{6} = \frac{60}{6}$$

We get the final answer:

**10**

## Question 2

Work out the highest common factor (HCF) of 36 and 90.

[2]

Prime factorization of 36 and 90:

$$36 = 2 \times 2 \times 3 \times 3$$

$$90 = 2 \times 3 \times 3 \times 5$$

Both numbers contain numbers 2 least once and three at least twice.

The highest common factor is the product of these prime numbers

$$HCF = 2 \times 3 \times 3 = 18$$

### Question 3

Write down the difference in temperature between  $8^{\circ}\text{C}$  and  $-9^{\circ}\text{C}$ .

[1]

Subtract the temperature readings to get the temperature difference:

$$\text{difference} = 9^{\circ}\text{C} - (-8^{\circ}\text{C})$$

$$\text{difference}$$

$$= 17^{\circ}\text{C}$$

## Question 4

Write 168.9 correct to 2 significant figures.

[1]

The third significant figure (8) is greater than 4, so we need to round up.

The number correct to 2 significant figures is

**170.**

## Question 5

11            12            13            14            15            16

From the list of numbers, write down

- (a) the factors of 60, [1]

There are two factors of 60.

$$\frac{60}{12} = 5 \text{ and } \frac{60}{15} = 4$$

Therefore **12 and 15**.

- (b) the prime numbers. [1]

There are two prime numbers

**11 and 13.**

Other number are not prime:

$$12 = 3 \times 4 ; 14 = 2 \times 7 ; 15 = 3 \times 5 ; 16 = 4 \times 4$$

## Question 6

At noon the temperature was  $4^{\circ}\text{C}$ .  
At midnight the temperature was  $-5.5^{\circ}\text{C}$ .

Work out the difference in temperature between noon and midnight.

[1]

**Subtract the temperature readings to get the temperature difference:**

$$\text{difference} = \text{noon} - \text{midnight} = 4 - (-5.5)$$

$$\text{difference} = 9.5$$

## Question 7

(a) Write 30 as a product of its prime factors.

[2]

Number 30 is divisible by 2 (2 is a prime number).

$$30/2 = 15$$

We are left with number 15. This number can be easily split into a product of two prime numbers.

$$15 = 3 \times 5$$

Therefore:

$$30 = 2 \times 3 \times 5$$

(b) Find the lowest common multiple (LCM) of 30 and 45.

[2]

Prime factorization of 30 and 45:

$$30 = 2 \times 3 \times 5$$

$$45 = 3 \times 3 \times 5$$

Both numbers contain numbers 3 and 5 at least once (red).

The number 30 contains one extra number 2 (green) and the number 45 contains number 3 one more time (blue). The LCM is therefore

$$LCM = 3 \times 5 \times 2 \times 3$$

$$= 90$$

## Question 8

Find the lowest common multiple (LCM) of 24 and 32.

[2]

Prime factorization of 24 and 32:

$$24 = 2 \times 2 \times 2 \times 3$$

$$32 = 2 \times 2 \times 2 \times 2 \times 2$$

Both numbers contain number 2 at least three times (red).

The number 24 contains one extra number 3 (green) and the number 32 contains number 2 two more times (blue). The LCM is therefore

$$LCM = 2 \times 2 \times 2 \times 3 \times 2 \times 2 = 96$$

$$\textcolor{green}{LCM = 96}$$

## Question 9

Write 15.0782 correct to

- (a) one decimal place, [1]

We can round 15.0782 to 1 decimal place like this:

Looking at 15.0782 it's either going to round to 15.0 or 15.1 – the rule regarding this is that if the next digit is 5 or above, it'll round up (to 1), and if it's below 5 then it'll round down (to 0)

**So the answer is 15.1.**

- (b) the nearest 10. [1]

We can round 15.0782 to the nearest 10 like this:

Any number above 15 will round to 20, and anything below 15 will round to 10

$15.0782 > 15$

**so we round it to 20.**

## Question 10

Insert **one pair** of brackets only to make the following statement correct.

$$6 + 5 \times 10 - 8 = 16$$

[1]

$$\mathbf{6 + 5 \times (10 - 8)}$$

$$\mathbf{= 16}$$

## Question 11

(a) Write 90 as a product of prime factors.

[2]

$$90 = 2 \times 45$$

$$= 2 \times 3 \times 15$$

$$= 2 \times 3 \times 3 \times 5$$

(b) Find the lowest common multiple of 90 and 105.

[2]

Multiples of 90 are:

90, 180, 270, 360, 450, 540, 630, 720, ...

Multiples of 105 are:

105, 210, 315, 420, 525, 630, ...

We can see that the LCM is:

**630**

## Question 12

$$p = \frac{4.8 \times 1.98276}{16.83}$$

- (a) In the spaces provided, write each number in this calculation correct to 1 significant figure. [1]

$$\mathbf{p} = \frac{5 \times 2}{20}$$

For 4.8, we look at its decimal place and see that it is greater than or equal to 5.

$$(8 \geq 5)$$

Therefore, we can approximate 4.8 to 5, the next digit after 4, to give 1 significant figure.

- (b) Use your answer to **part (a)** to estimate the value of  $p$ . [1]

$$\mathbf{p} = \frac{10}{20}$$

This fraction can be simplified to estimate:

$$\mathbf{p = 0.5 = \frac{1}{2}}$$

### Question 13

(a) Write 569000 correct to 2 significant figures.

[1]

**570 000**

(b) Write 569 000 in standard form.

[1]

**$5.69 \times 10^5$**

## Question 14

In March 2011, the average temperature in Kiev was 3°C.

In March 2012, the average temperature in Kiev was 19°C lower than in March 2011.

Write down the average temperature in Kiev in March 2012.

[1]

$$3 - 19$$

$$= -16$$

# Numbers & Accuracy

## Difficulty: Easy

### Model Answers 3

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Numbers & Accuracy
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 3

**Time allowed:** 43 minutes

**Score:** /33

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Calculate  $\frac{5.27 - 0.93}{4.89 - 4.07}$ .

Give your answer correct to 4 significant figures.

[2]

Enter the calculation into a calculator:

$$\frac{5.27 - 0.93}{4.89 - 4.07}$$

$$= \frac{4.34}{0.82}$$

$$= 5.293$$

## Question 2

One January day in Munich, the temperature at noon was  $3^{\circ}\text{C}$ .  
At midnight the temperature was  $-8^{\circ}\text{C}$ .

Write down the difference between these two temperatures.

[1]

Here we need to find the difference between two numbers – to do this we just have to take one away from the other.

$$3 - (-8) = 3 + 8 = 11$$

OR

$$(-8) - 3 = -11$$

Hence the difference is  $\pm 11$ .

### Question 3

The sum of the prime numbers less than 8 is equal to 17.

- (a) Find the sum of the prime numbers less than 21.

[2]

The prime numbers between 8 and 21 are: 11, 13, 17, 19

The sum of those numbers =  $11 + 13 + 17 + 19 = 60$

Therefore, the sum of all prime numbers under 21

$$= 17 + 60 = 77$$

- (b) The sum of the prime numbers less than  $x$  is 58.

Find an integer value for  $x$ .

[2]

The prime numbers up to 17 add up to 58 . Therefore,  $x$  must be a number higher

than 17 but lower than or equal to the next prime number, 19

$$x = 18 \text{ or } 19 \text{ or both}$$

## Question 4

On a mountain, the temperature decreases by  $6.5^{\circ}\text{C}$  for every 1000 metres increase in height.  
At 2000 metres the temperature is  $10^{\circ}\text{C}$ .

Find the temperature at 6000 metres.

[2]

The difference in height is 4000m.

We take away  $6.5^{\circ}\text{C}$  for each 1000m.

$$10 - 4 \times 6.5$$

$$= -16^{\circ}\text{C}$$

## Question 5

Write the following numbers correct to one significant figure.

- (a) 7682 [1]

**8000**

- (b) 0.07682 [1]

**0.08**

## Question 6

Write each number correct to 1 significant figure and estimate the value of the calculation.  
You must show your working.

$$2.65 \times 4.1758 + 7.917$$

[2]

$$.2.65 \times 4.1758 + 7.917$$

$$= 3 \times 4 + 8$$

$$= 20$$

## Question 7

$p$  is the largest prime number between 50 and 100.

$q$  is the smallest prime number between 50 and 100.

Calculate the value of  $p - q$ .

[2]

The prime number that is closest to 100 (and less than 100) is 97.

The prime number closest to 50 (and larger than 50) is 53.

$$p = 97$$

$$q = 53$$

$$\rightarrow p - q$$

$$= 44$$

## Question 8

Write down the next two prime numbers after 43.

[2]

By using the definition of prime numbers – “Prime numbers are numbers that have two and only two factors,” we can see that the next two prime numbers after 43 are:

**47 and 53**

## Question 9

Write down the next two prime numbers after 47.

[2]

**53,      59**

## Question 10

Write the number 1045.2781 correct to

- (a) 2 decimal places,

[1]

**1045.28**

- (b) 2 significant figures.

[1]

**1000**

## Question 11

Write down

- (a) an irrational number,

[1]

$\sqrt{2}$

- (b) a prime number between 60 and 70.

[1]

**61**

A prime number is a number which has exactly two factors.

## Question 12

Write down the next prime number after 89.

[1]

97.

A prime number is a number which has exactly two factors.

## Question 13

The table gives the average surface temperature ( $^{\circ}\text{C}$ ) on the following planets.

Planet	Earth	Mercury	Neptune	Pluto	Saturn	Uranus
Average temperature	15	350	-220	-240	-180	-200

- (a) Calculate the range of these temperatures.

[1]

The range of temperatures is the difference between the highest one,

350C and the lowest one, -240C.

$$\text{Range} = 350\text{C} - (-240)\text{C}$$

$$\text{Range} = 590\text{C}$$

- (b) Which planet has a temperature 20  $^{\circ}\text{C}$  lower than that of Uranus?

[1]

$$\text{Uranus temperature} = -200\text{C}$$

$$-200\text{C} - 20\text{C} = -220\text{C}$$

The answer is:

**Neptune**

## Question 14

Write the number 2381.597 correct to

- (a) 3 significant figures, [1]

**The number correct to 3 significant figures is: 2380.**

To correct to 3 significant figures, we count 3 digits from left to right in the number 2381.597.

The 3 digits are: 2, 3 and 8. The following digits after 8 is 1, which is not equal to 5 or greater, therefore we keep the third digit as 8. We replace the following digits with 0.

- (b) 2 decimal places, [1]

**The number correct to 2 decimal places is: 2381.60**

In the number 2381.597, the second decimal place is 9. This digit is greater than 5, so we increase the preceding decimal by 1 and replace the rest of the decimal places with 0.

- (c) the nearest hundred. [1]

**The number correct to the nearest hundred is: 2400**

The digit in the hundredths place in the number 2381.597 is 8. This digit is greater than 5, so we increase the preceding digit by 1 and replace the rest of the digits with 0.

## Question 15

From the list of numbers  $\frac{22}{7}$ ,  $\pi$ ,  $\sqrt{14}$ ,  $\sqrt{16}$ , 27.4,  $\frac{65}{13}$  write down

- (a) one integer,

[1]

**From the list,  $\sqrt{16} = 4$ , an integer.**

**Similarly,  $\frac{65}{13} = 5$ , an integer.**

- (b) one irrational number.

[1]

Rational numbers represent all the numbers which may be represented as fractions of two integers.

Irrational numbers represent all the real numbers which are not rational.

In our case, **an irrational number would be**

**$\pi$  or  $\sqrt{14}$ .**

## Question 16

The table shows the maximum daily temperatures during one week in Punta Arenas.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
2°C	3°C	1°C	2.5°C	-1.5°C	1°C	2°C

- (a) By how many degrees did the maximum temperature change between Thursday and Friday? [1]

$$\text{Temperature difference} = 2.5 - (-1.5)$$

$$= 4 \text{ degrees.}$$

- (b) What is the difference between the greatest and the least of these temperatures? [1]

$$\text{Greatest temp} = 3, \text{ lowest temp} = -1.5$$

$$\text{Temperature difference} = 3 - (-1.5)$$

$$= 4.5 \text{ degrees}$$

# Numbers & Accuracy

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Numbers & Accuracy
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 35 minutes

**Score:** /27

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

*Assembled by AFS*

## Question 1

Find the lowest common multiple (LCM) of 20 and 24.

[2]

Multiples of 20

20, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240, ...

Multiples of 24

24, 48, 72, 96, 120, ...

We can see that the LCM is

= **120**

## Question 2

**Without using your calculator** and by rounding each number correct to 1 significant figure, estimate the value of

$$\frac{10.3 \times 19.5}{88.9 - 43.2}$$

You must show all your working.

[2]

To find an approximation, we can round all of these numbers to the nearest 10 (to 1 significant figure).

$$\frac{10.3 \times 19.5}{88.9 - 43.2}$$

$$\approx \frac{10 \times 20}{90 - 40}$$

$$\approx \frac{200}{50}$$

$\approx 4$

### Question 3

Write these in order of size, smallest first.

$$0.6^3 \quad 0.22 \quad \sqrt{0.09} \quad 0.4^2 \quad [2]$$

Work them out:    0.216    0.22    0.3    0.16

In order:    **0.4<sup>2</sup>, 0.6<sup>3</sup>, 0.22, √0.09**

## Question 4

The probability that it will rain on any day is  $\frac{1}{5}$ .

Calculate an estimate of the number of days it will rain in a month with 30 days. [1]

To get the estimate, multiply the number of days in a month by the probability that is will rain on any given day.

$$30 \text{ days} \times \frac{1}{5}$$

$$= 6 \text{ days}$$

## Question 5

A lake has an area of 63 800 000 000 square metres.

Write this area in square kilometres, correct to 2 significant figures.

[2]

In standard form

$$63\ 800\ 000\ 000 = 6.38 \times 10^{10}$$

Convert to *km*

$$6.38 \times 10^{10} \div 1000^2$$

$$= 6.38 \times 10^8 \div 10^6$$

$$= \mathbf{6.4 \times 10^4}$$

## Question 6

210      211      212      213      214      215      216

From the list of numbers, find

- (a) a prime number, [1]

A prime number is a number which is only divisible by 1 or itself.

To work out a prime number, we first exclude all the even numbers

from the list since they are divisible by 2.

The rest of the numbers are: 211, 213, 215

Out of these numbers, 215 is divisible by 5 and 213 is divisible by 3.

**Therefore, the prime number is 211.**

- (b) a cube number. [1]

To work out if a number is a cube number, we can calculate its cube root

and see if it is an integer.

$$\sqrt[3]{210} = 5.94$$

$$\sqrt[3]{211} = 5.95$$

$$\sqrt[3]{212} = 6.96$$

$$\sqrt[3]{213} = 5.97$$

$$\sqrt[3]{214} = 5.98$$

$$\sqrt[3]{215} = 5.99$$

$$\sqrt[3]{216} = 6$$

**Therefore, the cube number is 216.**

## Question 7

Which of the following numbers are irrational?

$$\frac{2}{3} \quad \sqrt{36} \quad \sqrt{3} + \sqrt{6} \quad \pi \quad 0.75 \quad 48\% \quad 8^{\frac{1}{3}} \quad [2]$$

A rational number can be expressed as a fraction of two integers.

Numbers which are not rational are irrational.

Hence we can see that the following numbers are rational:

$$\frac{2}{3}$$

$$0.75 = \frac{3}{4}$$

$$48\% = 0.48 = \frac{48}{100} = \frac{12}{25}$$

If we take the roots of the next numbers, we can also see

that they are rational:

$$\sqrt{36} = 6 = \frac{6}{1}$$

$$8^{\frac{1}{3}} = 2 = \frac{2}{1}$$

However certain numbers cannot be expressed as a

fraction of two integers:

$$\pi = 3.14159 \dots$$

$$\sqrt{3} = 1.73205 \dots$$

Hence the irrational numbers:

$$\pi \quad \text{and} \quad \sqrt{3} + \sqrt{6}$$

## Question 8

Write 0.00658

(a) in standard form,

[1]

**6.58 × 10<sup>-3</sup>**

(b) correct to 2 significant figures.

[1]

**0.0066**

## Question 9

$$p = \frac{0.002751 \times 3400}{(9.8923 + 24.7777)^2}.$$

- (a) In the spaces provided, write each number in this calculation correct to 1 significant figure. [1]

$$\frac{0.003 \times 3000}{(10 + 20)^2}$$

- (b) Use your answer to part (a) to estimate the value of  $p$ . [1]

$$p \approx 0.01$$

## Question 10



The picture shows the Sky Tower in Auckland.  
Alongside the tower is a boat. The boat is 33 metres long.  
Use the length of the boat to estimate the height of the Sky Tower.

[2]

Using a ruler, we can estimate the height of the tour as approximately

**=330 m.**

## Question 11

The area of a small country is 78 133 square kilometres.

- (a) Write this area correct to 1 significant figure. [1]

To round to 1 significant figure, look at the second (in this case 8) and round the 1<sup>st</sup> significant figure up if the 2<sup>nd</sup> is 5 or greater.

In this case we will need several “place-holder” zeroes to keep the number the right size (these zeroes are NOT significant).

So: 78133

= 80000 square kilometres

- (b) Write your answer to part (a) in standard form. [1]

To write in Standard Form put a decimal point after the first non-zero number and multiply by  $10^n$  where  $n$  is the number of times you have to move the decimal point. For small numbers ( $< 1$ )  $n$  is negative, for large numbers ( $> 1$ )  $n$  is positive.

In this case the first (and only) non-zero number is 8 and the decimal point is moved 4 places. The number is  $> 1$  so we use +4 as the power of 10.

80000

=  $8 \times 10^4$

## Question 12

The altitude of Death Valley is 086 metres.

The altitude of Mount Whitney is 4418 metres.

Calculate the difference between these two altitudes.

[1]

**The difference is:**

$$4418 - (-86)$$

$$= 4504$$

## Question 13

$$\mathcal{E} = \{-2\frac{1}{2}, -1, \sqrt{2}, 3.5, \sqrt{30}, \sqrt{36}\}$$

$X = \{\text{integers}\}$

$Y = \{\text{irrational numbers}\}$

List the members of

- (a)  $X$ , [1]

**X = {integers = -1, }  $\sqrt{36} = 6\}$**

- (b)  $Y$ . [1]

**Y = {irrational numbers = }  $\sqrt{2}, \sqrt{30}\}$**

## Question 14

Complete this table of squares and cubes.

The numbers are not in sequence.

[3]

Number	Square	Cube
3	9	27
.....	121	.....
.....	.....	2744
.....	.....	0343

$$\sqrt{121} = \pm 11,$$

$$11^3 = \pm 1331$$

$$\sqrt[3]{2744} = 14,$$

$$14^2 = 196$$

$$\sqrt[3]{(-343)} = -7,$$

$$(-7)^2 = 49$$

# Sets & Venn Diagrams

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Sets & Venn Diagrams
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 34 minutes

**Score:** /26

**Percentage:** /100

#### Grade Boundaries:

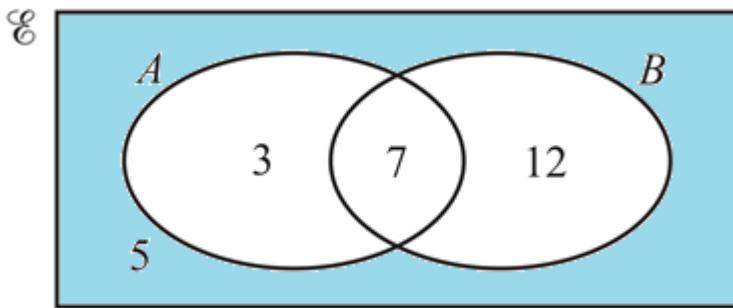
##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1



The Venn diagram shows the numbers of elements in each region.

- (a) Find  $n(A \cap B')$ . [1]

**B'** refers to elements not in B, i.e. 3 and 5.

**A  $\cap$  B'** is whatever elements are common to both A and B'.

$n(A \cap B')$  is the number of elements that are common to both A and B', which here is

**3**

- (b) An element is chosen at random.

Find the probability that this element is in set B. [1]

There are 27 elements in total here and 19 of them are in B, therefore the probability that an element chosen is in B is

**19/27**

- (c) An element is chosen at random from set A.

Find the probability that this element is also a member of set B. [1]

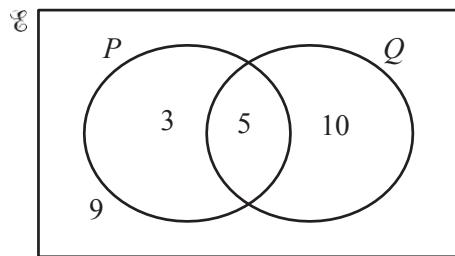
There are 10 elements in set A and 7 of them is also in set B therefore the probability that the element chosen is in set B is

**7/10**

- (d) On the Venn diagram, shade the region  $(A \cup B)'$ . [1]

**$(A \cup B)'$**  is the area that is not the union of A added with B.

## Question 2



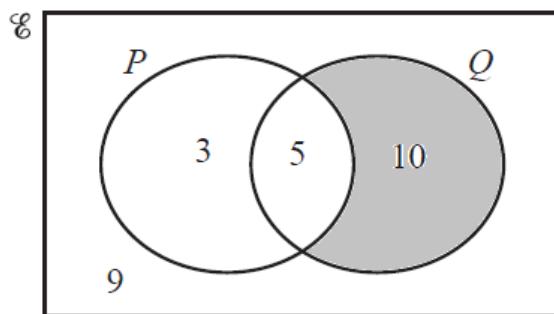
The Venn diagram shows the number of elements in each set.

- (a) Find  $n(P' \cap Q)$ .

[1]

We are looking for a region, which is the intersection of Q and not P.

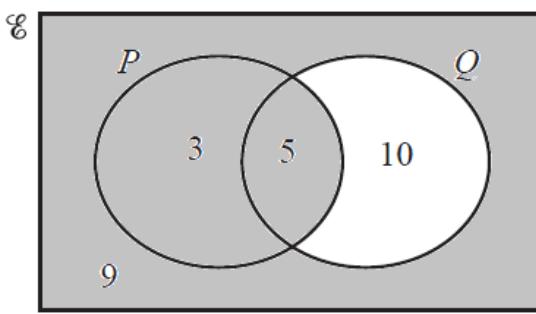
This must be the region, which belongs to Q only.



$$n(P' \cap Q) = 10$$

- (b) Complete the statement  $n(\dots) = 17$ . [1]

We can get 17 by summing the regions of only P, intersection of P and Q and neither P or Q.



This is the region: either belongs to P or does not belong to Q.

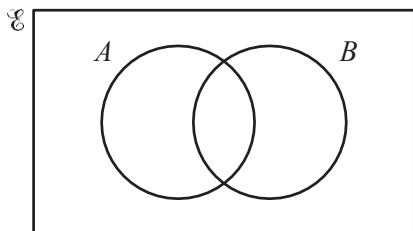
Therefore:

$$n(P \cup Q') = 17$$

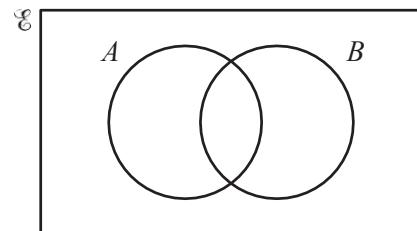
### Question 3

Shade the region required in each Venn diagram.

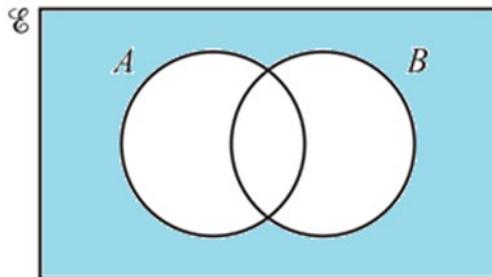
[2]



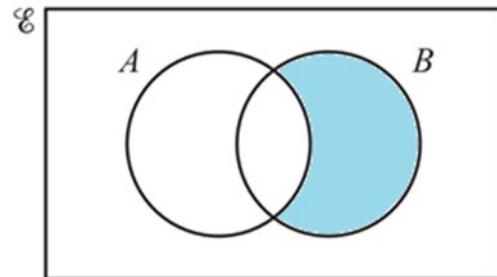
$$(A \cup B)'$$



$$A' \cap B$$



$$(A \cup B)'$$



$$A' \cap B$$

## Question 4

The lights and brakes of 30 bicycles are tested.  
The table shows the results.

	Lights	Brakes
Fail test	3	9
Pass test	27	21

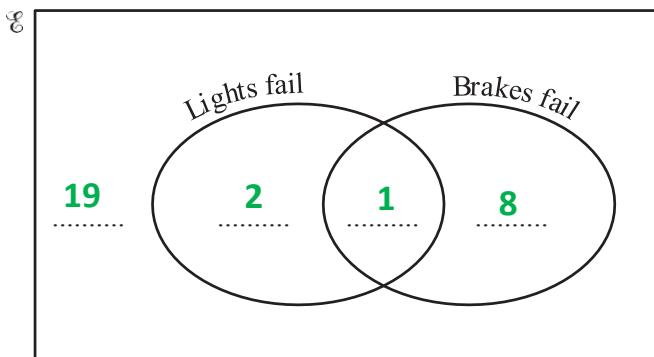
The lights and brakes both failed on one bicycle only.

$$\mathcal{E} = \{30 \text{ bicycles}\}$$

Complete the Venn diagrams.

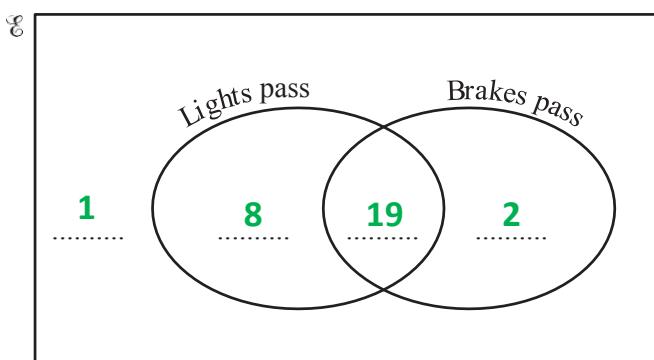
(a)

[2]

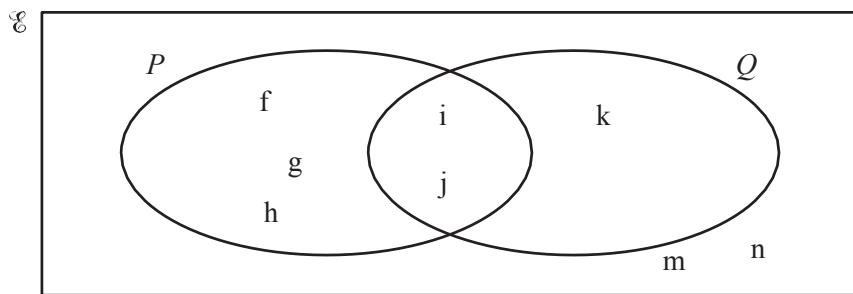


(b)

[2]



## Question 5



(a) Use the information in the Venn diagram to complete the following.

(i)  $P \cap Q = \{i, j\}$  [1]

(ii)  $P' \cup Q = \{i, j, k, m, n\}$  [1]

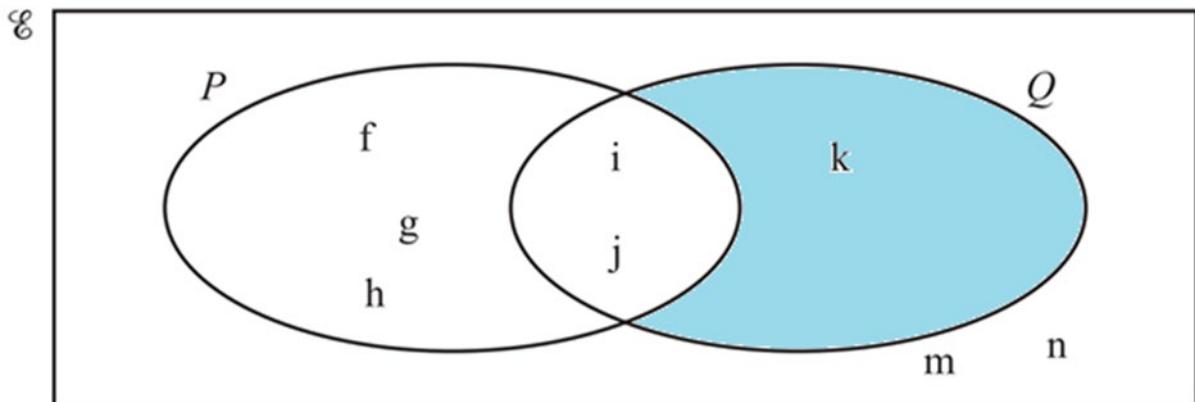
(iii)  $n(P \cup Q)' = 2$  [1]

(b) A letter is chosen at random from the set  $Q$ .

Find the probability that it is also in the set  $P$ . [1]

$$\frac{2}{3}$$

(c) On the Venn diagram shade the region  $P' \cap Q$ . [1]



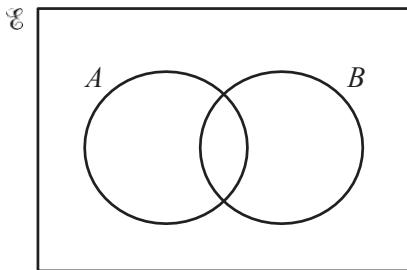
(d) Use a set notation symbol to complete the statement. [1]

$$\{f, g, h\} \subset P$$

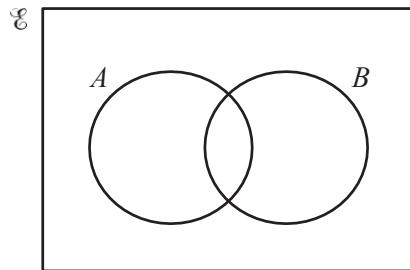
## Question 6

Shade the required region on each Venn diagram.

[2]



$$A' \cup B$$



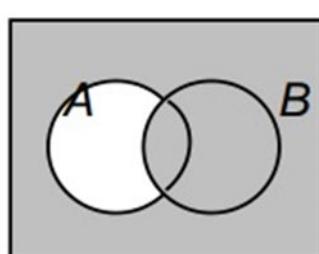
$$A' \cap B'$$

Venn diagrams notations:

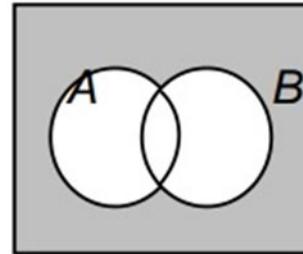
$A'$  = complement of A – the elements that are not in Set A

$A \cup B$  = the union of Set A and Set B – the elements that are in either Set A or Set B

$A \cap B$  = the intersection of Set A and Set B – this represents the elements that are both in Set A and in Set B



$$A' \cup B$$

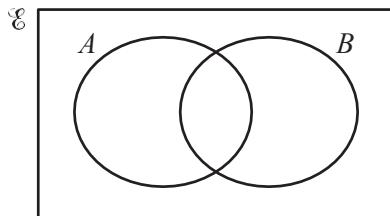


$$A' \cap B'$$

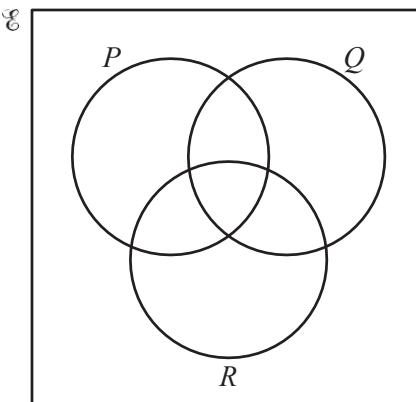
## Question 7

Shade the required region in each of the Venn diagrams.

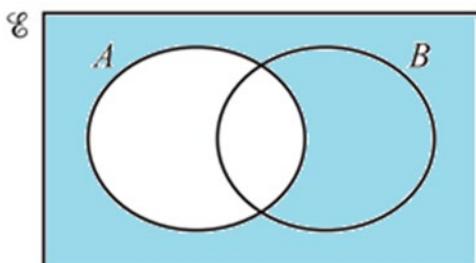
[2]



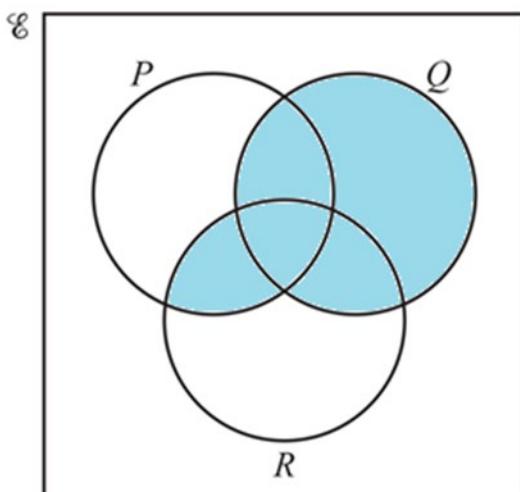
$A'$



$(P \cap R) \cup Q$



$A'$

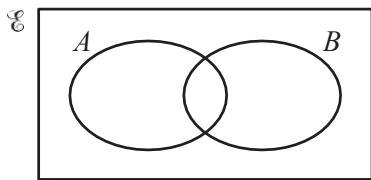


$(P \cap R) \cup Q$

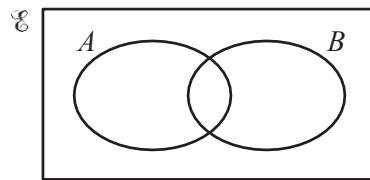
## Question 8

Shade the required region on each Venn diagram.

[2]

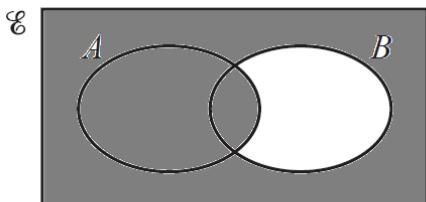


$$A \cup B'$$



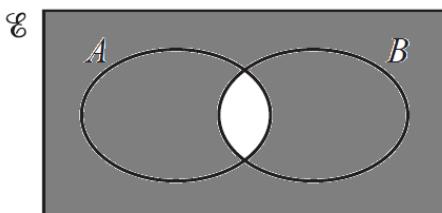
$$(A \cap B)'$$

$A \cup B'$  is a region which belongs to either A or does not belong to B.



$$A \cup B'$$

$(A \cap B)'$  is a region which does not belong to the intersection of A and B.

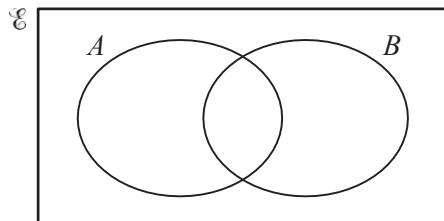


$$(A \cap B)'$$

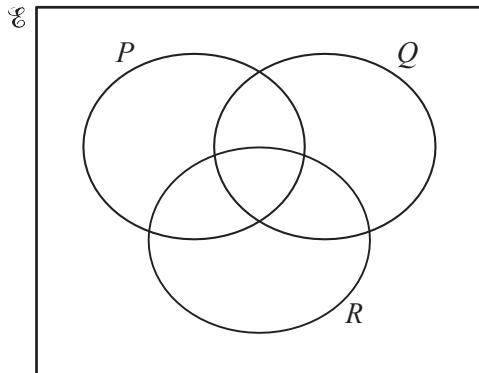
## Question 9

Shade the required region on each Venn diagram.

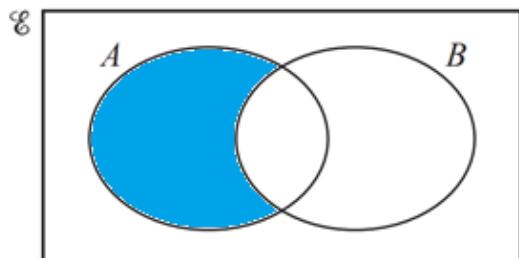
[2]



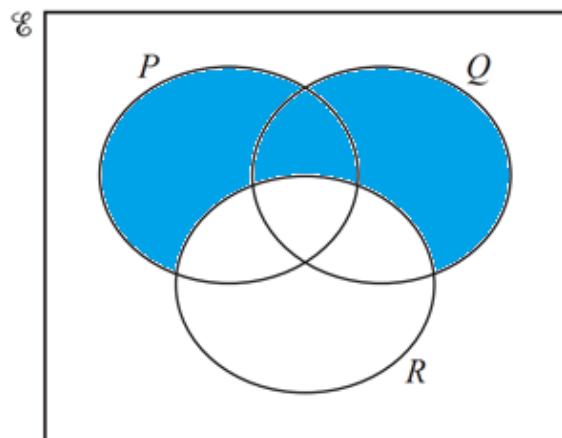
$$A \cap B'$$



$$(P \cup Q) \cap R'$$



$$A \cap B'$$



$$(P \cup Q) \cap R'$$

# Sets & Venn Diagrams

## Difficulty: Easy

### Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Sets & Venn Diagrams
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 2

**Time allowed:** 30 minutes

**Score:** /23

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

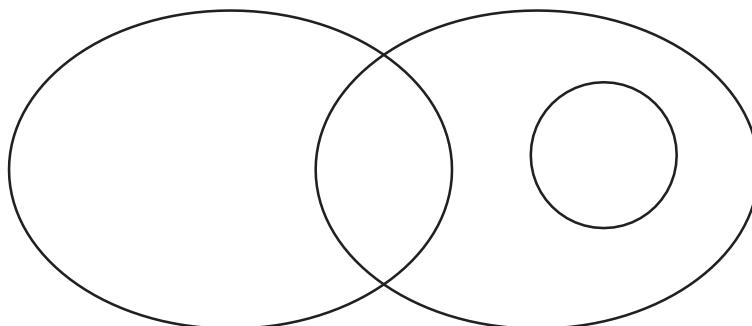
##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

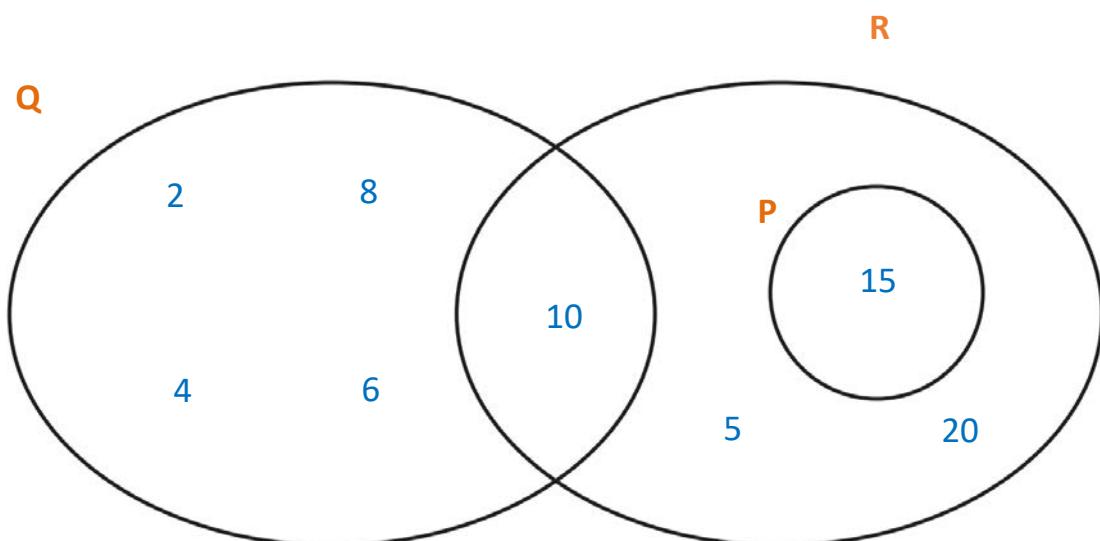
## Question 1

$Q = \{2, 4, 6, 8, 10\}$  and  $R = \{5, 10, 15, 20\}$ .  
 $15 \in P$ ,  $n(P) = 1$  and  $P \cap Q = \emptyset$ .

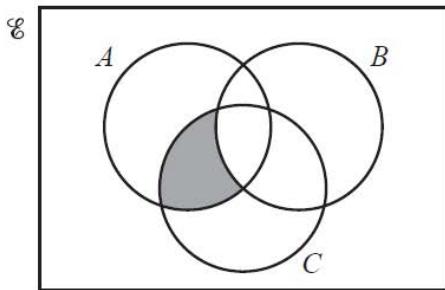
Label each set and complete the Venn diagram to show this information.



[3]

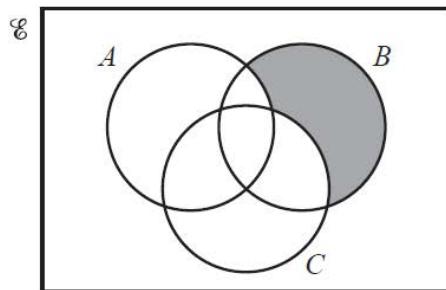
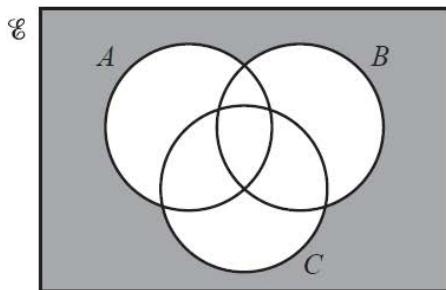


## Question 2

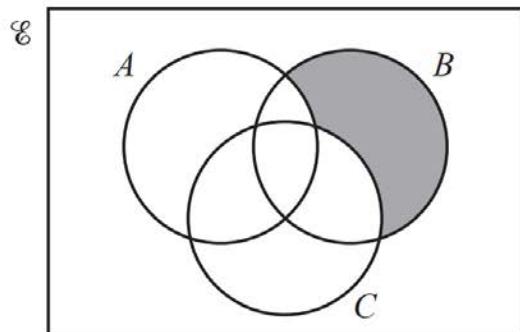
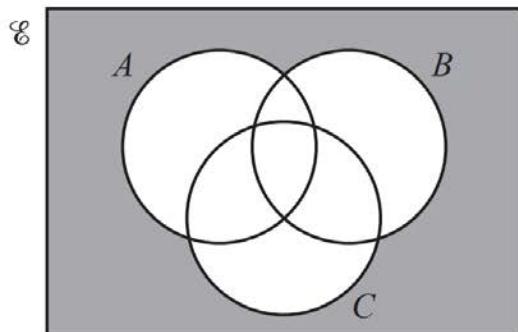


The shaded area in the diagram shows the set  $(A \cap C) \cap B'$ .

Write down the set shown by the shaded area in each diagram below.



[2]

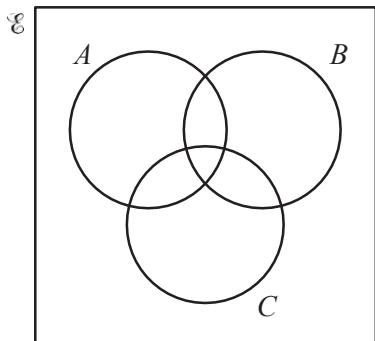


.....  **$(A \cup B \cup C)'$**  .....

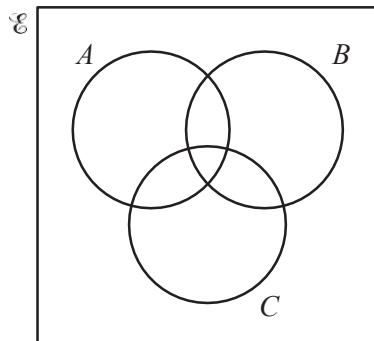
.....  **$B \cap (A \cup C)'$**  .....

### Question 3

Shade the required regions in the Venn diagrams below.

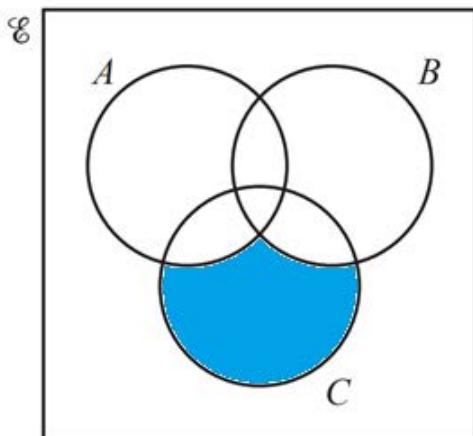


$$(A \cup B)' \cap C$$

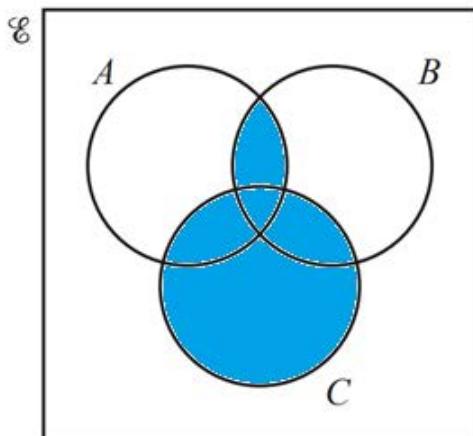


$$(A \cap B) \cup C$$

[2]



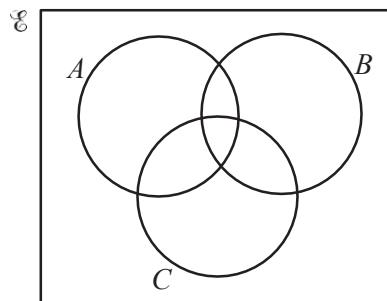
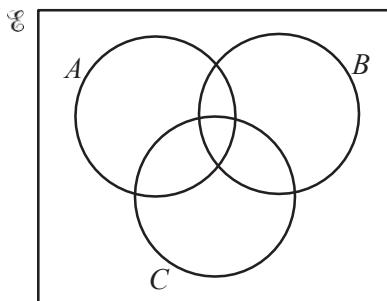
$$(A \cup B)' \cap C$$



$$(A \cap B) \cup C$$

## Question 4

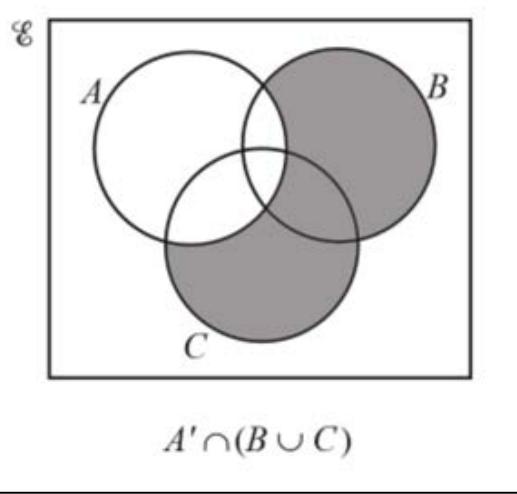
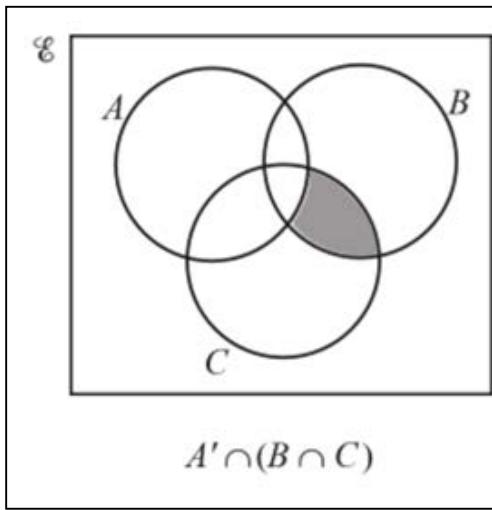
Shade the region required in each Venn Diagram.



[2]

To answer this question we first need to understand set notation:

- $A' = \text{Everything } \underline{\text{not}} \text{ in } A$
- $A \cap B = \text{Everything in both } A \text{ and } B$
- $A \cup B = \text{Everything in } A \text{ or } B$



## Question 5

$$\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 9, 11, 16\}$$

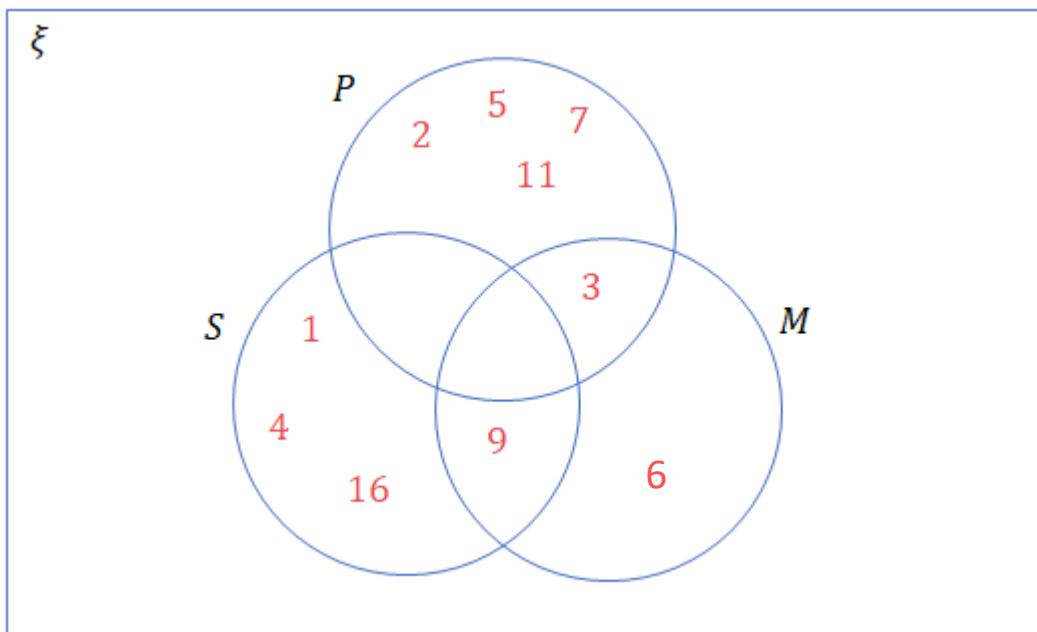
$$P = \{2, 3, 5, 7, 11\}$$

$$S = \{1, 4, 9, 16\}$$

$$M = \{3, 6, 9\}$$

(a) Draw a Venn diagram to show this information.

[2]



(b) Write down the value of  $n(M' \cap P)$ .

[1]

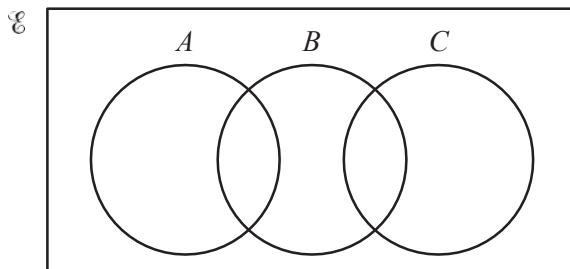
4

## Question 6

On the Venn diagrams shade the regions

(a)  $A' \cap C'$ ,

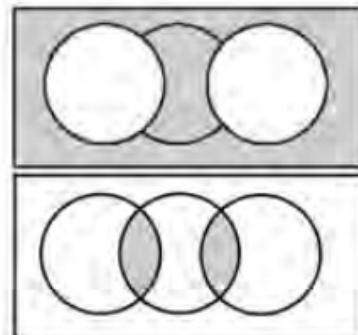
[1]



$A'$  represents the elements which are NOT in A.

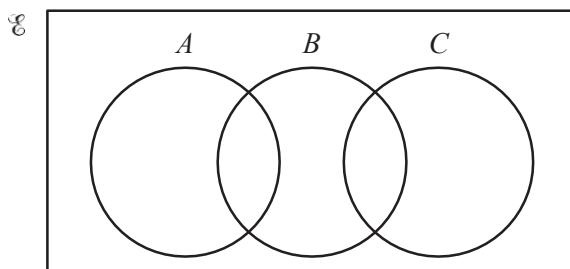
Similarly,  $C'$  represents the elements which are NOT in C.

The intersection of the 2 represents all the elements, except the ones which are in Set A or Set C.



(b)  $(A \cup C) \cap B$ .

[1]



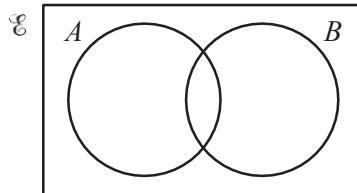
The union of Sets A and C represents all the elements in both sets.

The intersection with Set B represents the elements in both Sets A and C which are also in Set B.

Therefore, we shade only the intersections of Set A and Set B and Set C and Set B.

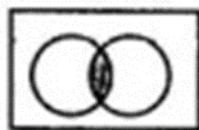
## Question 7

(a) Shade the region  $A \cap B$ .

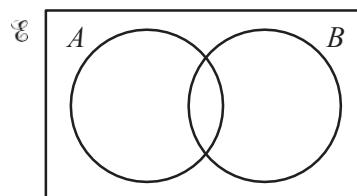


[1]

A  $\cap$  B represents the area common to both Set A and B.



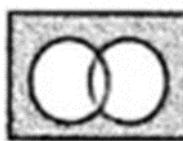
(b) Shade the region  $(A \cup B)'$ .



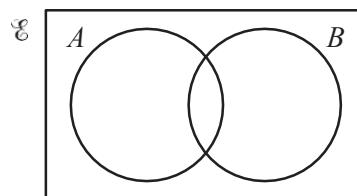
[1]

The reunion of 2 Sets represents all the elements in both Set A and B. The

complement of this reunion would be any area which is not Set A or Set B.

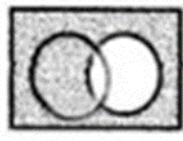


(c) Shade the complement of set B.



[1]

The complement of B represents all regions except Set B.

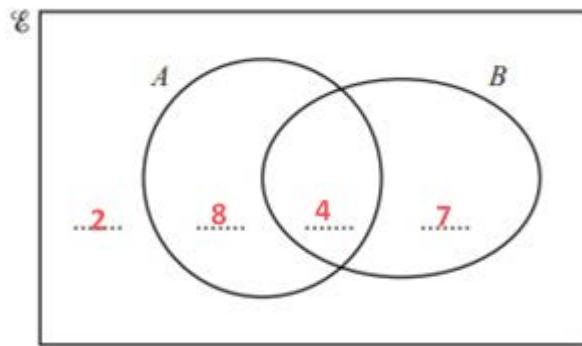


## Question 8

$n(\mathcal{E}) = 21$ ,  $n(A \cup B) = 19$ ,  $n(A \cap B') = 8$  and  $n(A) = 12$ .

Complete the Venn diagram to show this information.

[3]



Venn diagrams notations:

$A'$  = complement of A – the elements that are not in Set A

$A \cup B$  = the union of Set A and Set B – the elements that are in either Set A

or Set B

$A \cap B$  = the intersection of Set A and Set B – this represents the elements that are both in Set A and in Set B

To calculate the numbers on the result above:

$n(\mathcal{E}) = 21$ , so the total number of elements is 21.

$n(A \cup B) = 19$

From these 2 conditions we understand that the reunion of A and B is 19 elements so the last 2 elements are outside the reunion.

$n(A) = 12$ , so the total number of elements in diagram A is 12.

$n(A \cap B') = 8$ , so the intersection of the elements that are in A with the elements that are not in B is 8. This means that there are 8 elements in A which are not in B.

By subtracting  $12 - 8 = 4$  we deduce that there are 4 elements which are common to both Set A and Set B.

The rest of the elements until the total number of 21 are the elements which are only in Set B:  $21 - (2 + 4 + 8) = 7$

## Question 9

$$\mathcal{E} = \{40, 41, 42, 43, 44, 45, 46, 47, 48, 49\}$$

$A = \{\text{prime numbers}\}$

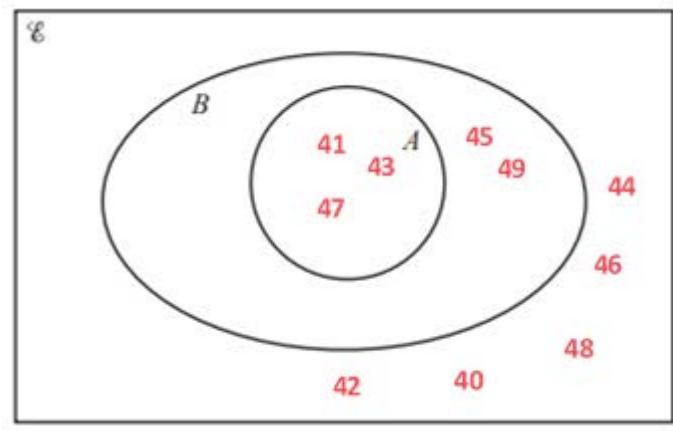
$B = \{\text{odd numbers}\}$

- (a) Place the 10 numbers in the correct places on the Venn diagram.

[2]

The prime numbers from the list are: 41, 43, 47

The odd numbers are: 41, 43, 45, 47, 49



- (b) State the value of  $n(B \cap A')$ .

[1]

Venn diagrams notation is as follows:

$A'$  = complement of A – the elements that are not in Set A

$A \cap B$  = the intersection of Set A and Set B – this represents the elements

that are both in Set A and in Set B

$n(B \cap A')$  means the number of elements which are in B and are not in A

$$n(B \cap A') = 2$$

# Sets & Venn Diagrams

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Sets & Venn Diagrams
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 32 minutes

**Score:** /25

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

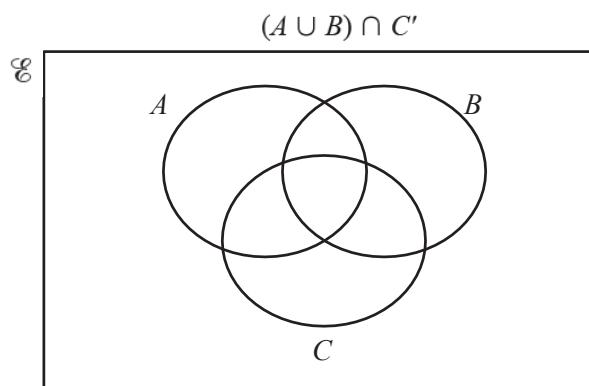
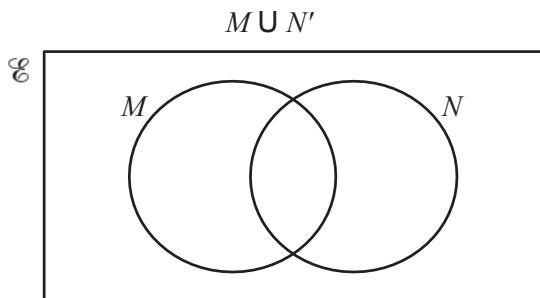
(a)  $Q = \{1, 2, 3, 4, 5, 6\}$

Write down a set  $P$  where  $P \subset Q$ .

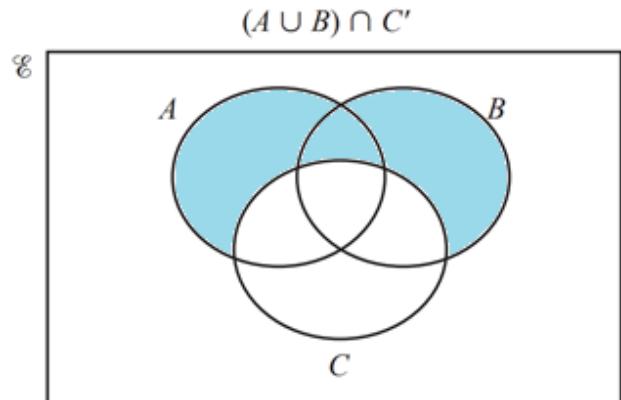
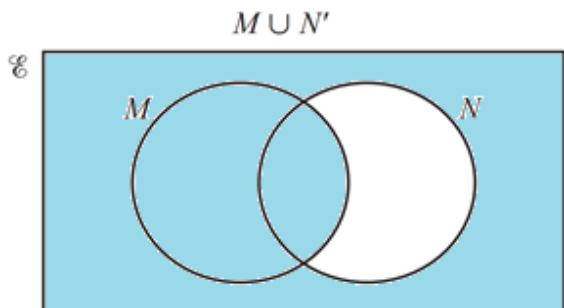
[1]

**$P = \{1, 2\}$**

(b) Shade these regions in the Venn diagrams.



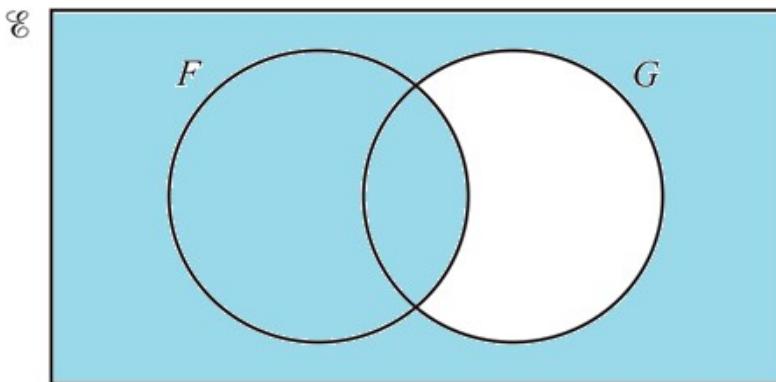
[2]



## Question 2

- (a) In this Venn diagram, shade the region  $F \cup G'$ .

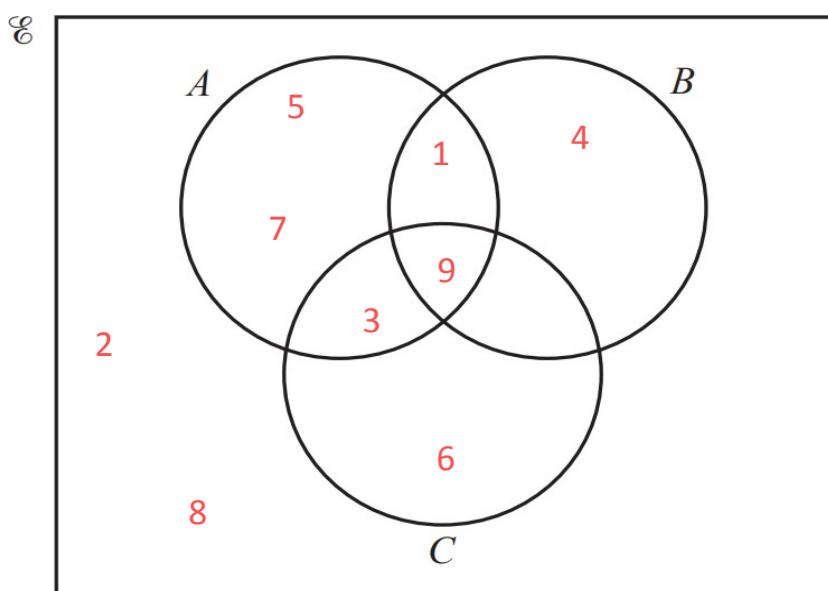
[1]



- (b)  $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$   
 $A = \{x: x \text{ is an odd number}\}$   
 $B = \{x: x \text{ is a square number}\}$   
 $C = \{x: x \text{ is a multiple of 3}\}$

- (i) Write all the elements of  $\mathcal{E}$  in the Venn diagram below.

[2]



- (ii) Another number is included in the set  $\mathcal{E}$ .  
This number is in the region  $A' \cap B \cap C$ .

Write down a possible value for this number.

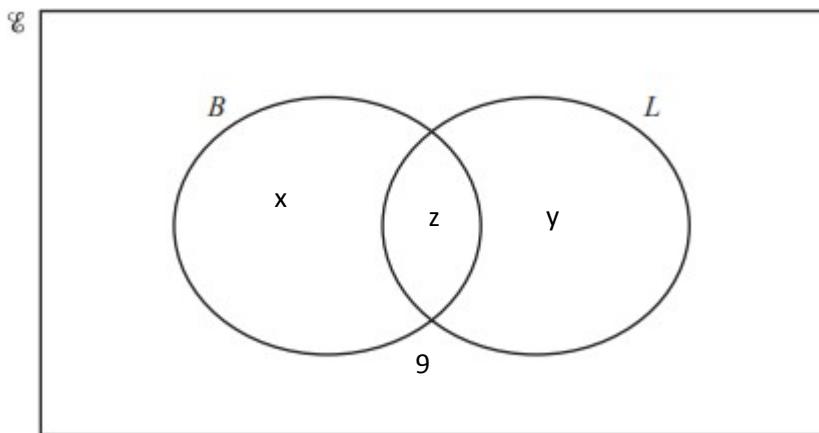
[1]

It must be an even multiple of 3 that is also a square number.

### Question 3

(a) A total of 20 trucks were tested at a checkpoint.

- 6 trucks failed the test for brakes ( $B$ )
- 7 trucks failed the test for lights ( $L$ )
- 9 trucks passed the tests for both brakes and lights.



(i) Complete the Venn diagram.

[2]

- 6 trucks failed the test for brakes ( $B$ ), which means there are 6 trucks inside the

circle for  $B$

- 7 trucks failed the test for lights ( $L$ ), which means there are 7 trucks inside the

circle for  $L$

- 9 trucks passed both tests, which means there are 9 trucks outside of  $B$  and  $L$

- 20 trucks in total were tested, so all the numbers add up to 20.

We can make some equations for this:

$$z + x = 6$$

$$z + y = 7$$

$$x + y + z + 9 = 20$$

We can substitute equation 2 into equation 3:

$$x + 7 + 9 = 20$$

$$x = 4$$

This allows us to find z:

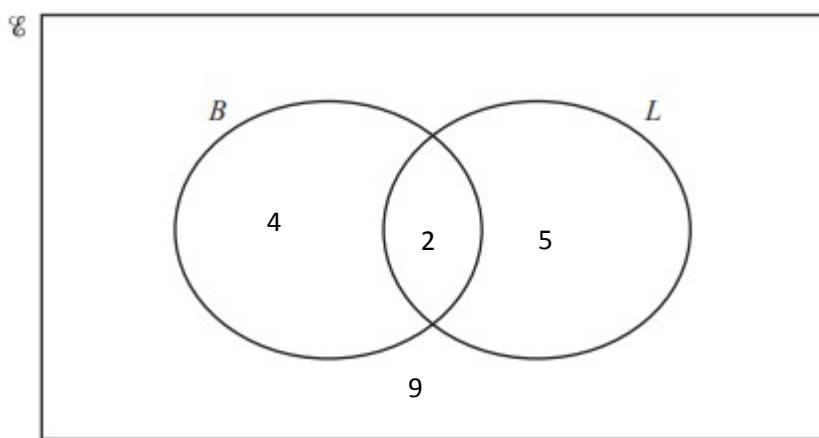
$$z + 4 = 6$$

$$z = 2$$

And finally y:

$$2 + y = 7$$

$$y = 5$$



- (ii) Find  $n(B' \cap L')$ .

[1]

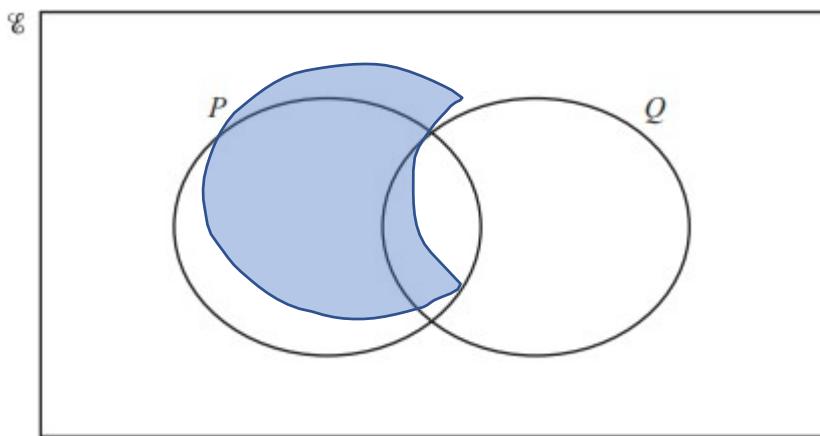
$n(B' \cap L')$  is the intersection of everything outside circle B, with everything outside circle L. This is everything outside of both circles. In this case, this is

**n = 9.**

- (b) In the Venn diagram below, shade the region  $(P \cup Q) \cap Q'$ .

[1]

$(P \cup Q) \cap Q'$  is the intersection of (everything in P and Q) with (everything not in Q). This looks like this:



## Question 4

(a)  $\mathcal{E} = \left\{ 7, 9.3, \pi, \frac{5}{9}, 2\sqrt{8} \right\}$

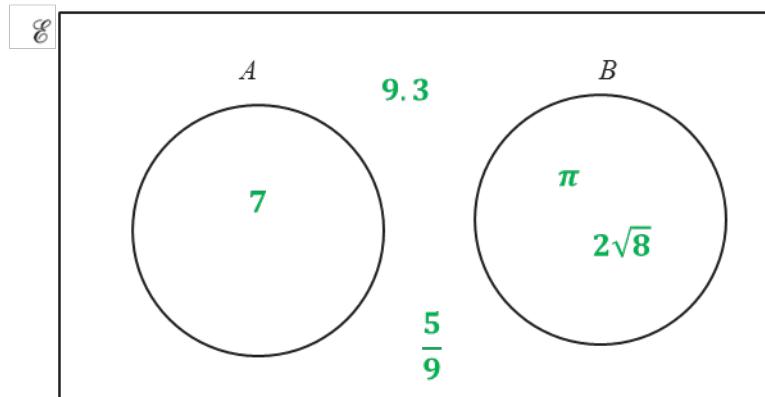
$A = \{\text{integers}\}$

$B = \{\text{irrational numbers}\}$

7 is the only integer,  $\pi$  and  $2\sqrt{8}$  are irrational but 9.3 and  $\frac{5}{9}$

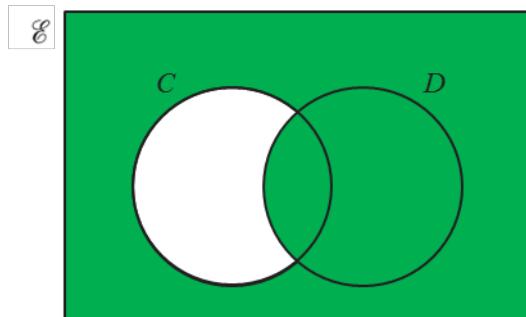
are neither (they are rational but not integers)

Write all the elements of  $\mathcal{E}$  in their correct place on the Venn diagram.

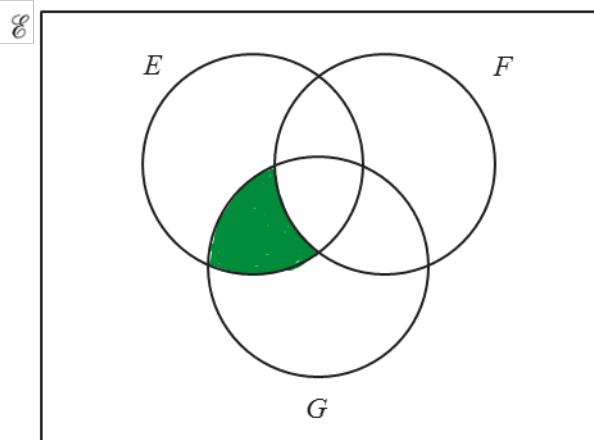


[2]

(b) Shade the region in each of the Venn diagrams below.



$C' \cup D$



$E \cap F' \cap G$

[2]

## Question 5

(a)  $\mathcal{E} = \{x: 2 \leq x \leq 16, x \text{ is an integer}\}$

$M = \{\text{even numbers}\}$

$P = \{\text{prime numbers}\}$

- (i) Find  $n(M)$ .

[1]

$n(M)$  is the number of elements in set M. M is all the even numbers between 2 and 16

inclusive which is

8

- (ii) Write down the set  $(P \cup M)'$ .

[1]

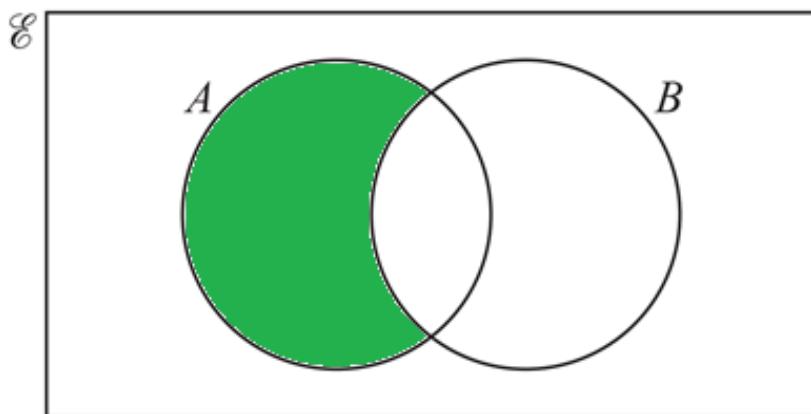
$(P \cup M)'$  are the elements not in the union of sets P and M.

$$(P \cup M) = \{2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 16\}$$

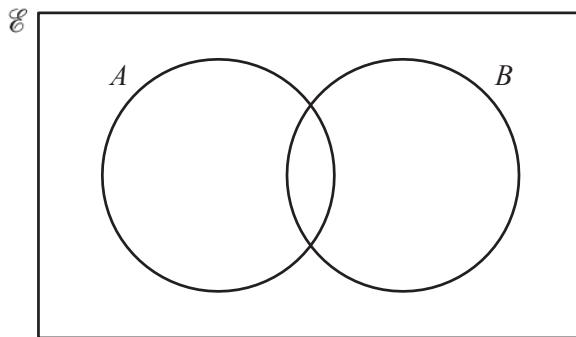
$$(P \cup M)' = \{9, 15\}$$

- (b) On the Venn diagram, shade  $A \cap B'$ .

[1]



## Question 6

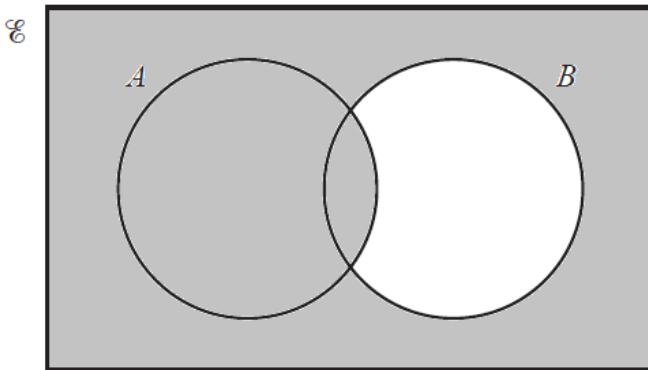


In the Venn diagram shade the region  $A \cup B'$ .

[1]

We want to shade a region, which lies either in  $A$  or does not lie in the  $B$ .

Therefore the only unshaded region will be the one, which lies only in  $B$ .

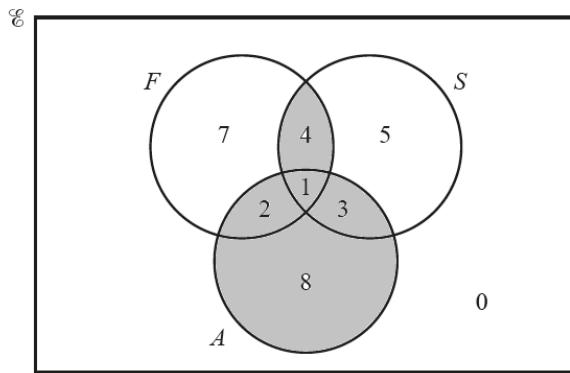


## Question 7

The Venn diagram shows the number of students who study French ( $F$ ), Spanish ( $S$ ) and Arabic ( $A$ ).

- (a) Find  $n(A \cup (F \cap S))$ . [1]

We want a region, which is either in  $A$  or at the intersection of  $F$  and  $S$



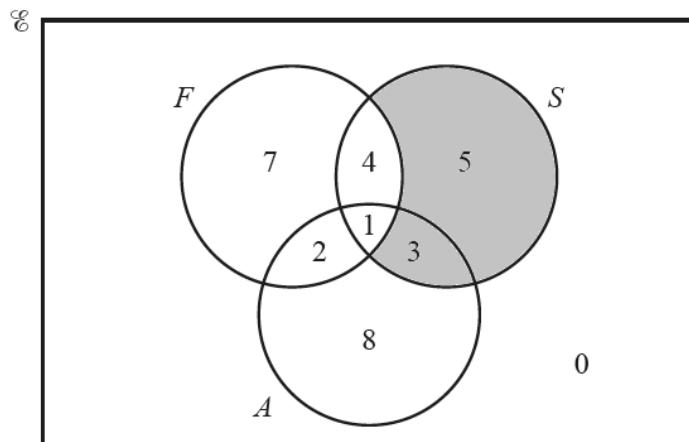
$$\text{Therefore } n(A \cup (F \cap S)) = 4 + 2 + 1 + 3 + 8$$

$$= 18$$

- (b) On the Venn diagram, shade the region  $F' \cap S$ . [1]

We are looking for a region, which is both  $S$  and not  $F$ .

This is the region of  $S$ , which does not also belong to  $F$ .



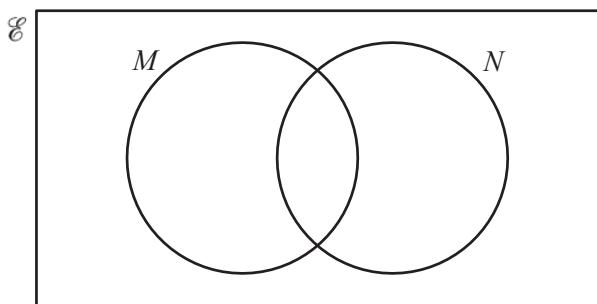
## Question 8

(a) You may use this Venn diagram to help you answer **part (a)**.

$$\mathcal{E} = \{x : 1 \leq x \leq 12, x \text{ is an integer}\}$$

$$M = \{\text{odd numbers}\}$$

$$N = \{\text{multiples of 3}\}$$



(i) Find  $n(N)$ .

[1]

We want to work out how many numbers between 1 and 12 are multiples of 3.

Such numbers are 3, 6, 9, 12. There are 4 such numbers.

$$\mathbf{n(N) = 4}$$

(ii) Write down the set  $M \cap N$ .

[1]

$M \cap N$  represents the intersection of these two sets, so the numbers, which are both

odd and multiples of 3 (from 1 to 12). There are two such numbers: 3 and 9.

$$\mathbf{M \cap N = \{3, 9\}}$$

(iii) Write down a set  $P$  where  $P \subset M$ .

[1]

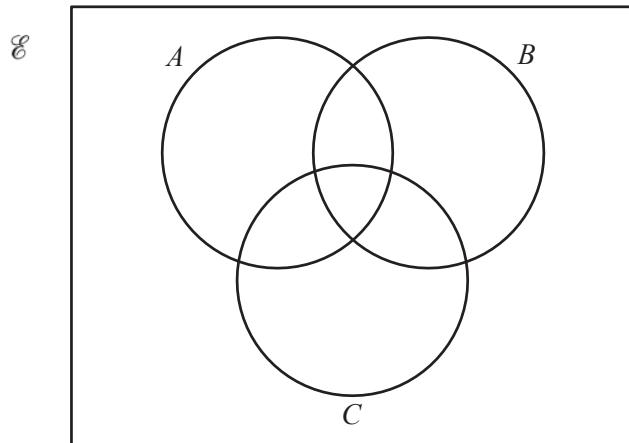
$P$  is a subset of  $M$  (odd numbers between 1 and 12). Therefore we can pick at most 5

numbers (picking non is a valid option) from the set  $\{1, 3, 5, 7, 9, 11\}$ .

For example:  $\{5, 9\}$

(b) Shade  $(A \cup C) \cap B'$  in the Venn diagram below.

[1]



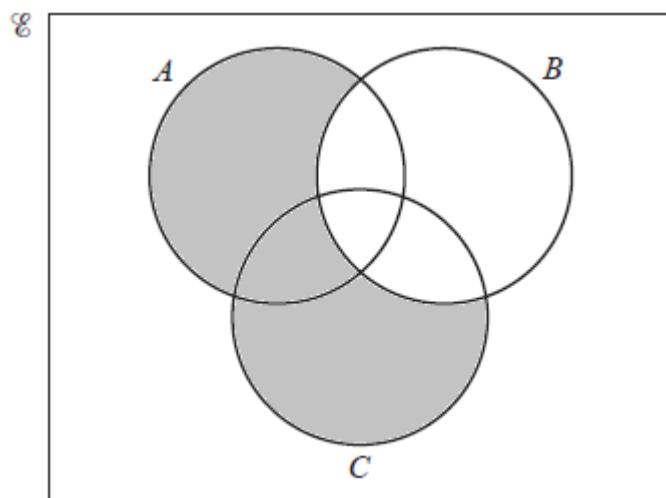
We are looking for a region, which is the intersection of  $A \cup C$  and  $B'$ .

$A \cup C$  - union of A and C

$B'$  - not B

The region is the overlap of the union of (A and C) and (not B).

Shade the region, which is either A or C, but not B.



# Sets & Venn Diagrams

## Difficulty: Hard

### Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Sets & Venn Diagrams
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 2

**Time allowed:** 45 minutes

**Score:** /35

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

**Question 1**

*Assembled by A/S.*

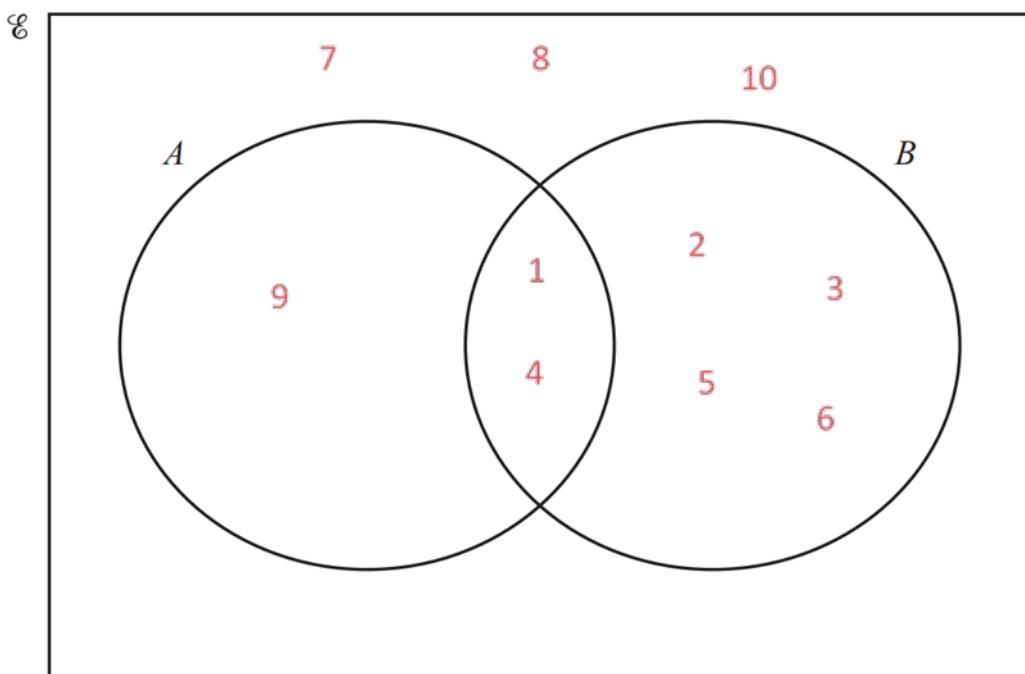
$$\mathcal{E} = \{x : 1 \leq x \leq 10, \text{ where } x \text{ is an integer}\}$$

$$A = \{\text{square numbers}\}$$

$$B = \{1, 2, 3, 4, 5, 6\}$$

- (a) Write all the elements of  $\mathcal{E}$  in their correct place in the Venn diagram.

[2]



- (b) List the elements of  $(A \cup B)'$ .

[1]

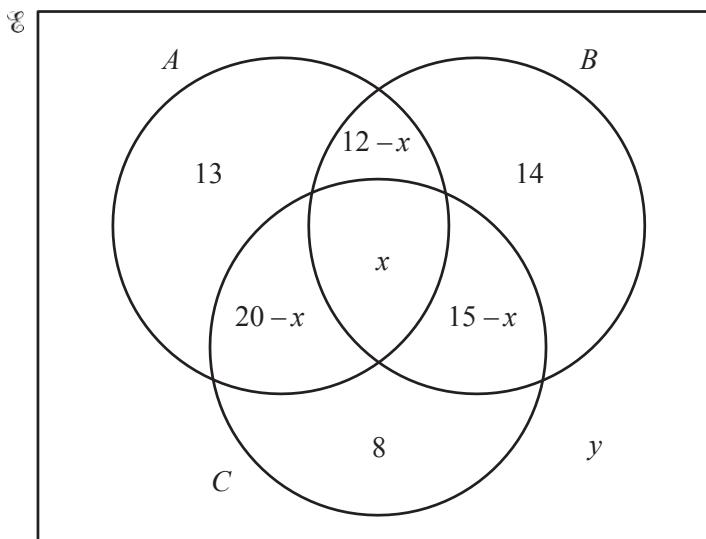
$$\{7, 8, 10\}$$

- (c) Find  $n(A \cap B')$ .

[1]

1

## Question 2



The Venn diagram shows the number of elements in sets  $A$ ,  $B$  and  $C$ .

(a)  $n(A \cup B \cup C) = 74$

Find  $x$ .

[2]

$n(A \cup B \cup C)$  is the sum of all elements in the sets  $A$ ,  $B$  and  $C$ .

$$13 + 14 + 8 + 12 - x + 20 - x + 15 - x + x = 74$$

$$82 - 2x = 74$$

$$2x = 8$$

$$\mathbf{x = 4}$$

(b)  $n(E) = 100$

Find  $y$ .

[1]

$n(\xi)$  is the sum of all elements in and outside of the sets.

$$y + 74 = 100$$

$$\mathbf{y = 26}$$

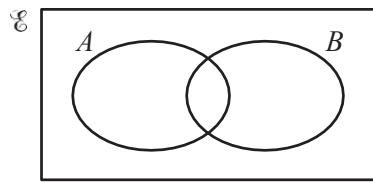
(c) Find the value of  $n((A \cup B)' \cap C)$ . [1]

$n((A \cup B)' \cap C)$  describes the elements outside the union of A and B which intersect with C

$$n((A \cup B)' \cap C) = 8$$

### Question 3

(a)

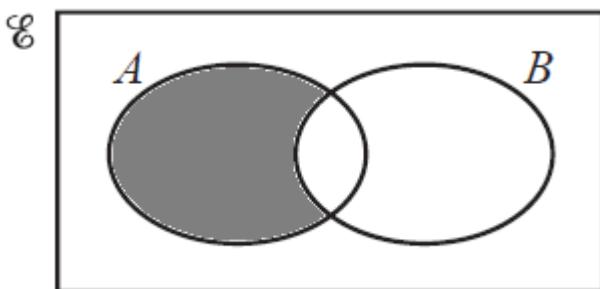


Shade the region  $A \cap B'$ .

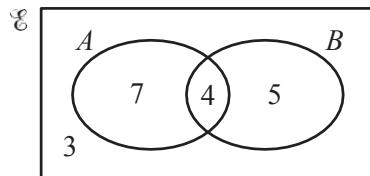
[1]

$A \cap B'$  is a region which belongs both to A and does not belong to B.

(It belongs strictly only to A)



(b)

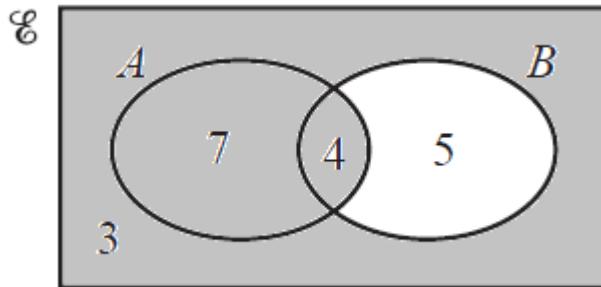


This Venn diagram shows the number of elements in each region.

Write down the value of  $n(A \cup B')$ .

[1]

$A \cup B'$  is a region which belongs to either A or does not belong to B.



By summing the elements in the shaded regions:

$$n(A \cup B') = 3 + 7 + 4$$

$$\mathbf{n(A \cup B') = 14}$$

## Question 4

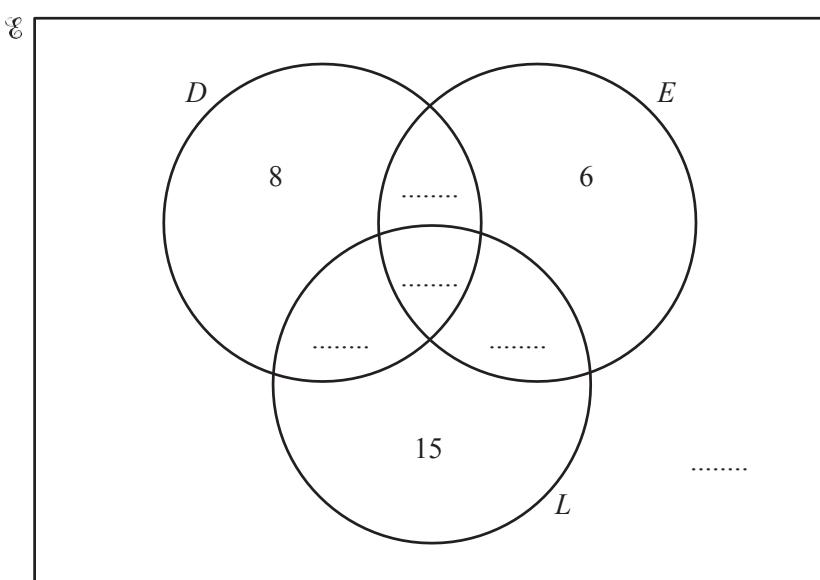
In a survey of 60 cars, 25 use diesel, 20 use liquid hydrogen and 22 use electricity.

No cars use all three fuels and 14 cars use both diesel and electricity.

There are 8 cars which use diesel only, 15 cars which use liquid hydrogen only and 6 cars which use electricity only.

In the Venn diagram below

$\mathcal{E} = \{\text{cars in the survey}\}$ ,  
 $D = \{\text{cars which use diesel}\}$ ,  
 $L = \{\text{cars which use liquid hydrogen}\}$ ,  
 $E = \{\text{cars which use electricity}\}$ .



(a) Use the information above to fill in the five missing numbers in the Venn diagram.

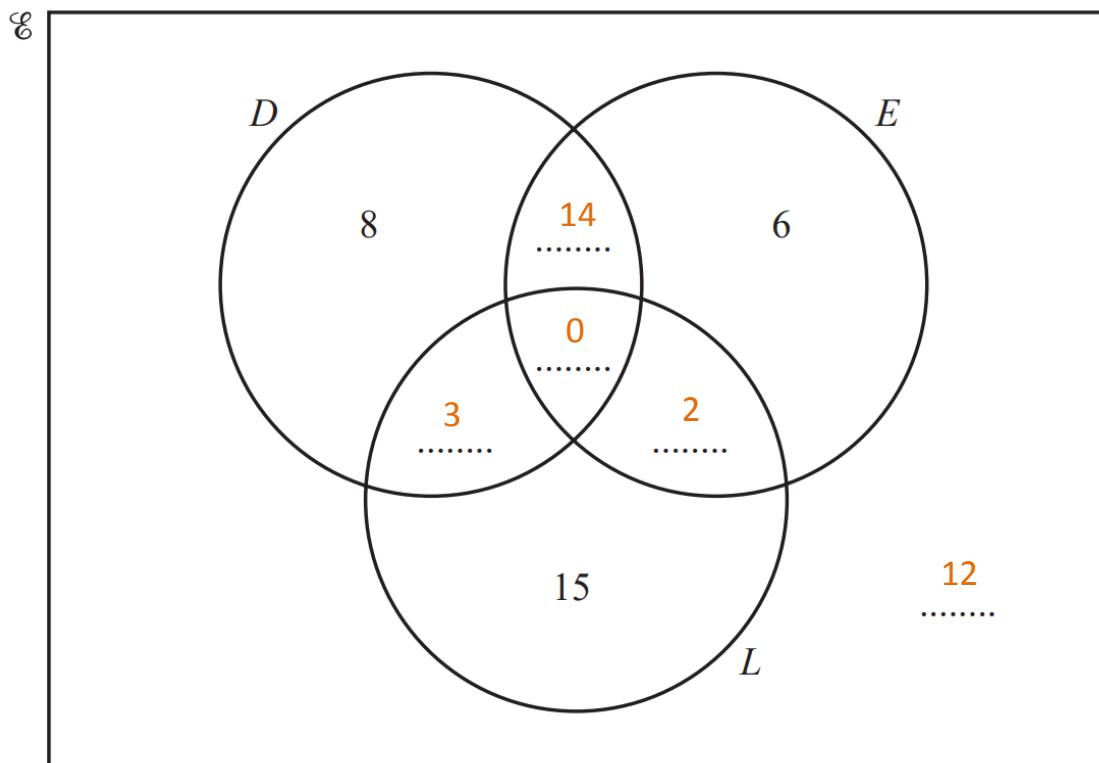
[4]

60 elements in total.

25 in D total, 20 in L total, 22 in E total.

14 in  $D \cap E$  and 0 in  $D \cap E \cap L$ .

48 in the Venn diagram, so 12 outside it.



(b) Find the number of cars which use diesel but not electricity.

[1]

$$8 + 3$$

$$= 11$$

(c) Find  $n(D' \cap (E \cup L))$ .

[1]

The number of elements in the intersection of the union of E and L with the elements *not* in D.

$$n(D' \cap (E \cup L)) = 23$$

## Question 5

In a group of 30 students, 18 have visited Australia, 15 have visited Botswana and 5 have not visited either country.

Work out the number of students who have visited Australia but not Botswana.

[2]

We have an overlap of

$$(18 + 15) - (30 - 5)$$

$$= 8$$

Hence, 8 students have visited both countries.

So, we have

$$18 - 8$$

$$= 10$$

students who visited only Australia.

## Question 6

In a group of 24 students, 21 like football and 15 like swimming.  
One student does **not** like football and does **not** like swimming.  
Find the number of students who like **both** football and swimming.

[2]

We have

$$24 - 1 = 23$$

students that like either one or the other or both.

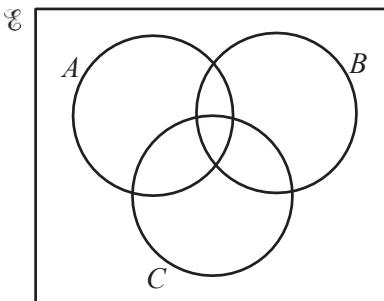
We have an overlap of

$$(21 + 15) - 23$$

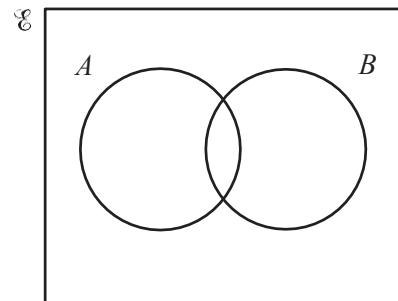
$$= 13$$

## Question 7

Shade the region required in each Venn Diagram.

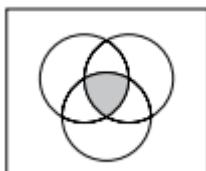


$$A \cap B \cap C$$

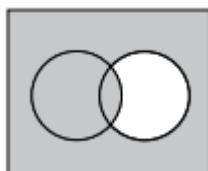


$$A \cup B'$$

[2]



We shade the intersection of all 3 Sets A, B and C, therefore, the area which is common to all 3 sets.



B' – the complement of B, represents all the elements which are not in Set B.

For the reunion of B' with Set A, we shade therefore every region except Set B, including the intersection between Set A and B since that is considered Set A.

## Question 8

$A$  and  $B$  are sets.

Write the following sets in their simplest form.

- (a)  $A \cap A'$ .

[1]

$\emptyset$  - the empty set

- (b)  $A \cup A'$ .

[1]

$\xi$  – all the elements

- (c)  $(A \cap B) \cup (A \cap B')$ .

[1]

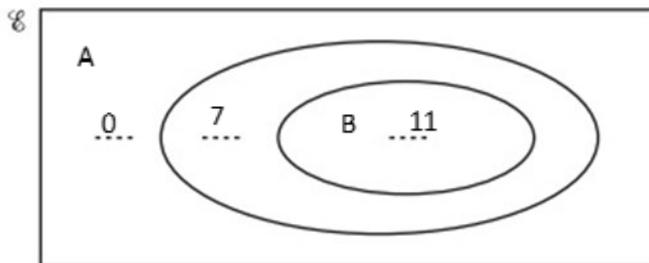
A

## Question 9

$n(A) = 18$ ,  $n(B) = 11$  and  $n(A \cup B)' = 0$ .

- (a) Label the Venn diagram to show the sets  $A$  and  $B$  where  $n(A \cup B) = 18$ .  
Write down the number of elements in each region.

[2]



The union of  $A$  and  $B$  is 18.

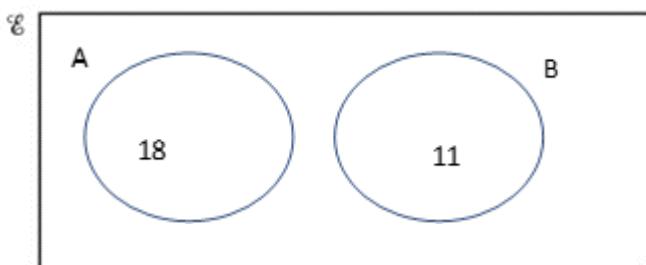
This represents all the elements which are either in Set  $A$ ,  $B$  and both.

The complement of their union is 0, meaning that there are no

elements which are not in either Set  $A$ ,  $B$  and both.

- (b) Draw another Venn diagram to show the sets  $A$  and  $B$  where  $n(A \cup B) = 29$ .  
Write down the number of elements in each region.

[2]



The union of the 2 sets needs to be 29.

We know that  $n(A) = 18$  and  $n(B) = 11$ , summing up 29.

Their union is the number of elements in  $A$ ,  $B$  and both.

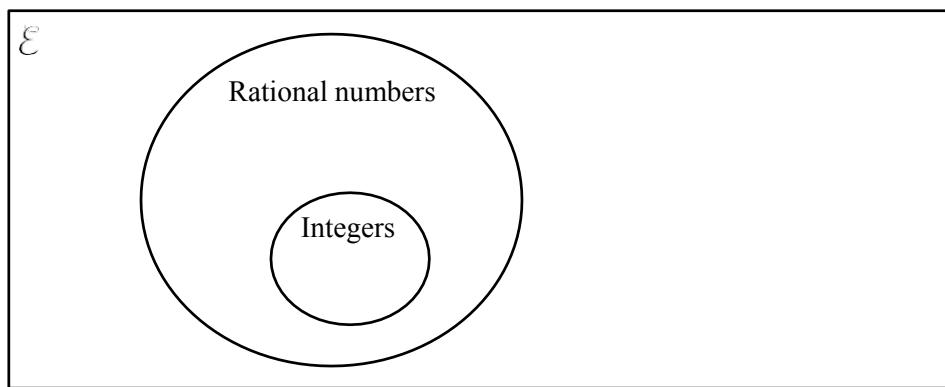
In this case, the number of elements in  $A$  and  $B$  already add up to 29, so there are no elements in their intersection.

## Question 10

Write each of these four numbers in the correct place in the Venn Diagram below.

$$2.6, \quad \frac{4}{17}, \quad \sqrt{12}, \quad \sqrt{\frac{112}{7}}$$

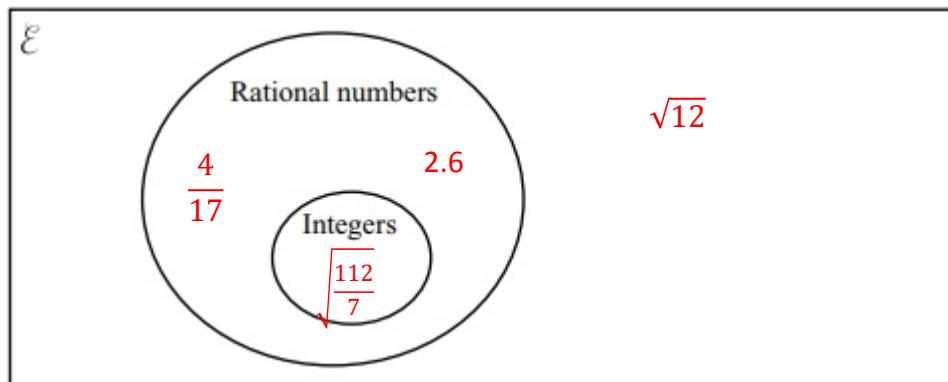
[4]



$\sqrt{12}$  – irrational number (non-ending, non-recurring decimal)

$$\sqrt{\frac{112}{7}} = 4 \text{ -- integer}$$

$$\frac{4}{17} = 0.23 \text{ and } 2.6 \text{ -- rational numbers}$$



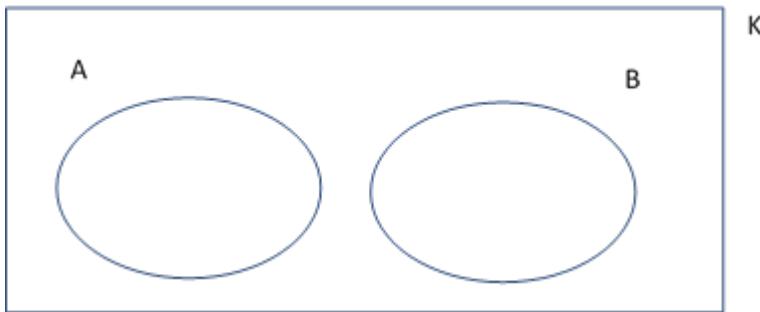
## Question 11

Three sets  $A$ ,  $B$  and  $K$  are such that  $A \subset K$ ,  $B \subset K$  and  $A \cap B = \emptyset$ .  
Draw a Venn diagram to show this information.

[2]

We know that both Set A and B need to be in K. There is

no intersection between the Set A and Set B.



# Conversion

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Conversion
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 22 minutes

**Score:** /17

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Write the recurring decimal  $0.\dot{4}\dot{8}$  as a fraction.  
Show all your working.

[2]

$$48.\dot{4}\dot{8} - 0.\dot{4}\dot{8}$$

$$= 48$$

We can also factorise out the recurring decimal, making it  
equal to

$$0.\dot{4}\dot{8}(100 - 1)$$

$$= 99 \times 0.\dot{4}\dot{8}$$

Hence

$$99 \times 0.\dot{4}\dot{8} = 48$$

$$\rightarrow 0.\dot{4}\dot{8} = \frac{48}{99}$$

$$= \frac{16}{33}$$

## Question 2

Change 6200 cm<sup>2</sup> into m<sup>2</sup>.

[1]

$$6200 \div 100^2$$

$$= 0.62$$

### Question 3

Write the recurring decimal  $0.\dot{2}$  as a fraction.  
[ $0.\dot{2}$  means 0.222...]

[2]

Give it a name:

$$f = 0.222222 \dots$$

Multiply by 10 until the

$$10f = 2.222222 \dots$$

decimal parts are the same:

$$10f - f = 2.222222 \dots - 0.222222 \dots$$

Subtract to get rid of the

$$9f = 2$$

decimal part:

$$f = \frac{2}{9}$$

And simplify:

## Question 4

Write the recurring decimal  $0.\dot{3}\dot{6}$  as a fraction.

Give your answer in its simplest form.

[ $0.\dot{3}\dot{6}$  means  $0.3666\dots$ ]

[3]

We have that

$$100 \times 0.\dot{3}\dot{6} = 36.\dot{6}$$

$$10 \times 0.\dot{3}\dot{6} = 3.\dot{6}$$

Subtracting these we get

$$\rightarrow 100(0.\dot{3}\dot{6}) - 10(0.\dot{3}\dot{6}) = 33$$

$$\rightarrow 90 \times 0.\dot{3}\dot{6} = 33$$

$$\rightarrow 0.\dot{3}\dot{6} = \frac{33}{90}$$

$$= \frac{\mathbf{11}}{\mathbf{30}}$$

## Question 5

Write the recurring decimal  $0.\dot{3}\dot{2}$  as a fraction.

[ $0.\dot{3}\dot{2}$  means  $0.3222\dots$ ] [2]

We need to get rid of the recurring decimal by doing the following

$$100 \times 0.\dot{3}\dot{2} = 32.\dot{2}\dot{2}$$

$$10 \times 0.\dot{3}\dot{2} = 3.\dot{2}\dot{2}$$

$$100 \times 0.\dot{3}\dot{2} - 10 \times 0.\dot{3}\dot{2} = 90 \times 0.\dot{3}\dot{2}$$

$$= 32.\dot{2}\dot{2} - 3.\dot{2}\dot{2}$$

$$\rightarrow 90 \times 0.\dot{3}\dot{2} = 29$$

Now divide by 90

$$0.\dot{3}\dot{2} = \frac{29}{90}$$

## Question 6

Write the recurring decimal  $0.\dot{4}$  as a fraction.

[ $0.\dot{4}$  means  $0.444\dots$ ]

[2]

Set  $x = 0.444\dots$

$$10x = 4.444\dots$$

$$10x - x = 4.444\dots - 0.444\dots$$

$$9x = 4$$

$$x = \frac{4}{9}$$

## Question 7

Write the recurring decimal  $0.\dot{1}\dot{5}$  as a fraction.

[ $0.\dot{1}\dot{5}$  means  $0.1555\dots$ ] [2]

Multiply the number by 10 to “shift it” by one repeating cycle.

$$10 \times 0.\dot{1}\dot{5} = 1.5\dot{5}$$

Subtract the number with recurring decimal from both sides.

$$9 \times 0.\dot{1}\dot{5} = 1.5\dot{5} - 0.\dot{1}\dot{5}$$

$$9 \times 0.\dot{1}\dot{5} = 1.4$$

Divide both sides of the equation by 9.

$$0.\dot{1}\dot{5} = \frac{1.4}{9}$$

Multiply the denominator and the numerator of the fraction by 10

$$0.\dot{1}\dot{5} = \frac{14}{90}$$

## Question 8

Jason receives some money for his birthday.

He spends  $\frac{11}{15}$  of the money and has \$14.40 left.

Calculate how much money he received for his birthday.

[3]

Since Jason spent  $11/15$  of this money, this means that he has  $4/15$  left ( $=1 - 11/15$ ).

The amount 14.40 represents  $4/15$  of the money he received.

Divide the amount he has left by this fraction to get the amount of money he received.

$$\begin{array}{r} \$14.40 \\ \hline 4/15 \end{array}$$

$$= \$54$$

# Conversion

## Difficulty: Easy

### Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Conversion
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 2

**Time allowed:** 23 minutes

**Score:** /18

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Write the recurring decimal  $0.\dot{2}\dot{5}$  as a fraction.

[ $0.\dot{2}\dot{5}$  means  $0.2555\dots$ ]

[2]

Multiply the number by 10 to “shift it” by one repeating cycle.

$$10 \times 0.\dot{2}\dot{5} = 2.5\dot{5}$$

Subtract the number with recurring decimal from both sides.

$$9 \times 0.\dot{2}\dot{5} = 2.5\dot{5} - 0.\dot{2}\dot{5}$$

$$9 \times 0.\dot{2}\dot{5} = 2.3$$

Divide both sides of the equation by 9.

$$0.\dot{2}\dot{5} = \frac{2.3}{9}$$

Multiply the denominator and the numerator of the fraction by 10

$$0.\dot{2}\dot{5} = \frac{23}{90}$$

## Question 2

At the beginning of July, Kim had a mass of 63kg.  
At the end of July, his mass was 61kg.

Calculate the percentage loss in Kim's mass.

[3]

Loss of 2kg

$$\frac{2}{63} \times 100$$

$$= 3.17$$

### Question 3

Work out 72 cents as a percentage of 83 cents.

[1]

The percentage can be worked out as follows:

$$\frac{72}{83} \times 100\%$$

$$= 0.8674698 \dots \times 100\%$$

$$= \mathbf{86.7\%}$$

## Question 4

Write

- (a) 60 square metres in square centimetres,

[1]

$$60 \text{ m}^2 = ?? \text{ cm}^2$$

We know 1m is 100cm, we have to square this to match  
the units as follows:

$$1 \text{ m}^2 = 100^2 \text{ cm}^2 = 10000 \text{ cm}^2$$

Hence

$$\mathbf{60 \text{ m}^2 = 600000 \text{ cm}^2}$$

- (b) 22 metres per second in kilometres per hour.

[2]

Applying the same principle, but for metres to kilometres:

$$22 \frac{\text{m}}{\text{s}} = ?? \frac{\text{km}}{\text{h}}$$

$$\text{Since } 1000\text{m is } 1\text{km}, \quad 22 \frac{\text{m}}{\text{s}} = 0.022 \frac{\text{km}}{\text{s}}$$

$$\text{Since } 3600\text{s is } 1\text{ hr},$$

$$0.022 \frac{\text{km}}{\text{s}} = 0.022 \frac{\text{km}}{\text{s}} \times 3600 \frac{\text{s}}{\text{hr}}$$

$$= \mathbf{79.2 \frac{\text{km}}{\text{hr}}}$$

## Question 5

A cruise ship travels at 22 knots.

[1 knot is 1.852 kilometres per hour.]

Convert this speed into metres per second.

[3]

$$1 \text{ knot} = 1.852 \text{ km/h}$$

$$22 \text{ knots} = 22 \times 1.852 \text{ km/h}$$

$$22 \text{ knots} = 40.744 \text{ km/h}$$

$$1 \text{ km} = 1000 \text{ m}$$

$$1 \text{ hour} = 3600 \text{ seconds}$$

We will first convert the speed from km/h into m/h.

$$40.744 \text{ km/h} \times 1000 \text{ m/km} = 40477 \text{ m/h}$$

Now, we convert the speed from m/h into m/s.

To do this, we divide the speed by 3600s/h.

$$\frac{40477 \text{ m/h}}{3600 \text{ s/h}}$$

$$= 11.3 \text{ m/s}$$

## Question 6

The maximum speed of a car is 252 km/h.

Change this speed into metres per second.

[2]

- . Multiply by  $10^3$  to get m/h

$$252\ 000 \text{ m h}^{-1}$$

Now divide by  $60^2$  to get per second

$$252000 \div 60^2$$

$$= 70$$

## Question 7

Lin scored 18 marks in a test and Jon scored 12 marks.  
Calculate Lin's mark as a percentage of Jon's mark.

[2]

$$(18 \div 12) \times 100$$

$$= 150\%$$

## Question 8

Calculate

$$\frac{5^2}{2^5}$$

$$\frac{5^2}{2^5} = \frac{25}{32}$$

- (a) giving your answer as a fraction, [1]

The answer as a fraction is:  $\frac{25}{32}$

- (b) giving your answer as a decimal. [1]

The answer as a decimal is: **0.781**

# Conversion

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Conversion
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 27 minutes

**Score:** /21

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Write the recurring decimal  $0.\dot{6}\dot{3}$  as a fraction in its lowest terms.  
You must show all your working.

[3]

$$100 \times 0.\dot{6}\dot{3} - 0.\dot{6}\dot{3} = 63$$

$$= (100 - 1)0.\dot{6}\dot{3} = 99 \times 0.\dot{6}\dot{3}$$

$$\rightarrow 99 \times 0.\dot{6}\dot{3} = 63$$

Now divide through by 99

$$\rightarrow 0.\dot{6}\dot{3} = \frac{63}{99}$$

Cancel out 9 top and bottom

$$= \frac{7}{11}$$

## Question 2

Write the recurring decimal  $0.\dot{1}\dot{7}$  as a fraction.  
Show all your working.

[2]

To do this, we can do a trick:

$$x = 0.\dot{1}\dot{7} = 0.1777777 \dots$$

$$10x = 1.\dot{7} = 1.777777 \dots$$

We now can subtract one from the other, and get rid of the long string of numbers at the end:

$$10x - x = 9x = 1.77777 \dots - 0.1777777 \dots$$

$$9x = 1.6$$

$$x = \frac{1.6}{9}$$

$$x = \frac{8}{45}$$

### Question 3

- (a) Write \$0.70 as a fraction of \$5.60, giving your answer in its lowest terms. [1]

$$\frac{0.70}{5.60} \times \frac{10}{10} = \frac{7}{56} = \frac{7 \times 1}{7 \times 8}$$

$$= \frac{1}{8}$$

- (b) Write the recurring decimal  $0.\dot{1}\dot{8}$  as a fraction in its lowest terms. [2]  
[ $0.\dot{1}\dot{8}$  means  $0.181818\dots$ ]

Give it a name:

$$f = 0.181818\dots$$

Multiply by 10 until the decimal parts are the same:

$$10f = 1.818181\dots$$

$$100f = 18.181818\dots$$

Subtract to get rid of the decimal part:

$$100f - f = 18.181818\dots - 0.181818\dots$$

And simplify:

$$99f = 18$$

$$f = \frac{18}{99}$$

$$f = \frac{9 \times 2}{9 \times 11}$$

$$f = \frac{2}{11}$$

## Question 4

$$\frac{3}{5} < p < \frac{2}{3}$$

Which of the following could be a value of  $p$ ?

[2]

$$\frac{16}{27} \quad 0.67 \quad 60\% \quad (0.8)^2 \quad \sqrt{\frac{4}{9}}$$

The easiest way to find a suitable value of  $p$  is to convert numbers into decimals.

Our two limits are:

$$\frac{3}{5} = 0.6$$

$$\frac{2}{3} = 0.\dot{6}$$

And the potential candidates for  $p$  are:

$$\frac{16}{27} = 0.941\dots$$

$$0.67$$

$$60\% = 0.6$$

$$(0.8)^2 = 0.64$$

$$\sqrt{\frac{4}{9}} = 0.\dot{6}$$

Two of these numbers are equal to our boundaries, however strict equality is not allowed

for  $p$ , hence we can see that there is only one number between  $\frac{3}{5} = 0.6$  and  $\frac{2}{3} =$

$0.\dot{6}$  which is 0.64.

$$p = (0.8)^2$$

## Question 5

A tin of soup has the following information on the label.

200 grams of soup contains		
Protein	Carbohydrate	Fat
4 g	8.7 g	5.8 g

(a) What fraction of the soup is Protein? Give your answer in its simplest form.

[1]

$$\text{Protein fraction} = \frac{4 \text{ g}}{200 \text{ g}} = \frac{1}{50}$$

(b) What percentage of the soup is Carbohydrate?

[1]

The total amount of soup is 200g, amount which corresponds to a percentage of 100%.

The amount of carbohydrate is 8.7g. As a percentage we can write it as:

$$\% \text{carbohydrate} = \frac{8.7 \text{ g} \times 100}{200 \text{ g}} = 4.35\%$$

## Question 6

Sima drinks 2.5 litres of water each day.

A full glass holds 125 millilitres of water.

How many full glasses of water does Sima drink each day?

[2]

We need to convert millilitres to litres so we can have the

same unit for both amounts.

$$125 \text{ millilitres} = 0.125 \text{ litres}$$

$$\frac{2.5 \text{ litres}}{0.125 \text{ litres/glass}}$$

$$= 20 \text{ glasses}$$

## Question 7

The population of Europe is 580 000 000 people.  
The land area of Europe is 5 900 000 squarekilometres.

- (a) Write 580 000 000 in standard form. [1]

A number in standard form takes up the form:  $a \times 10^n$  where n is an integer  
and  $0 < a < 10$ .

$$580\ 000\ 000 = 5.8 \times 10^8$$

Where n = 8 and a = 5.8,  $0 < 5.8 < 10$ .

- (b) Calculate the number of people per square kilometre, to the nearest whole number. [2]

$$\text{people/ square km} = \frac{580\ 000\ 000}{5\ 900\ 000}$$

$$\text{people/ square km} = 98.3$$

**The nearest whole number is 98. (3 < 5)**

- (c) Calculate the number of square **metres** per person. [2]

We need to convert square km in square m.

$$5\ 900\ 000 \text{ km}^2 = 5\ 900\ 000 \times 10^6 \text{ m}^2$$

$$\text{square m/people} = \frac{5\ 900\ 000 \times 10^6}{580\ 000\ 000}$$

$$\text{square m/people} = 0.0102 \times 10^6$$

$$= 10200$$

## Question 8

The top speed of a car is 54 metres per second.  
Change this speed into kilometres per hour.

[2]

$$54 \text{ m/s} = 0.054 \text{ km/s}$$

$$1 \text{ hours} = 3600 \text{ s}$$

$$\text{Speed} = 0.054 \text{ km/s} \times 3600 \text{ s/h}$$

$$\text{Speed} = 194.4 \text{ km/h}$$

# Order by Size

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Order by Size
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 39 minutes

**Score:** /30

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Write the following in order of size, smallest first.

$$\pi \qquad \qquad 3.14 \qquad \qquad \frac{22}{7} \qquad \qquad 3.142 \qquad \qquad 3 \quad [2]$$

The order of size can be found by writing all of these numbers out to the same number of decimal places, and then comparing. In order to do this, Put each of the values into the same format (decimals) using the 'S $\Leftrightarrow$ D' button (located above 'DEL') on your calculator

$$\pi = 3.14159 \text{ (5. d. p)}$$

$$3.14 = 3.14000 \text{ (5. d. p)}$$

$$\frac{22}{7} = 3.14286 \text{ (5. d. p)}$$

$$3.142 = 3.14200 \text{ (5. d. p)}$$

$$3 = 3.00000 \text{ (5. d. p)}$$

Therefore, the order we get (smallest to largest) is:

$$3 < 3.14 < \pi < 3.142 < \frac{22}{7}$$

## Question 2

Write the following in order of size, smallest first.

$$0.34 \quad 0.6 \quad 0.6^2 \quad 0.7^3 \quad [2]$$

Write values in decimal form

$$\sqrt{0.6} = 0.7745966692$$

$$0.6^2 = 0.36$$

$$0.7^3 = 0.343$$

Hence

$$0.34 < 0.7^3 < 0.6^2 < \sqrt{0.6}$$

### Question 3

Write the following in order of size, smallest first.

[2]

$$0.5^2 \quad 0.5 \quad 0.5^3 \quad \sqrt[3]{0.5}$$

$$0.5^2 = 0.25$$

$$0.5$$

$$0.5^3 = 0.125$$

$$\sqrt[3]{0.5} = 0.793$$

The order, starting from the smallest is:

$$0.125 < 0.25 < 0.5 < 0.793$$

The equivalent of:

$$0.5^3 < 0.5^2 < 0.5 < \sqrt[3]{0.5}$$

## Question 4

Write the following in order, smallest first.

$$\sqrt{0.1} \quad \frac{43}{201} \quad 2\frac{1}{2}\% \quad 0. \quad [2]$$

Write each in decimal form

$$\sqrt{0.1} = 0.3162$$

$$\frac{43}{201} = 0.2139$$

$$2\frac{1}{2}\% = 0.025$$

Hence

$$2\frac{1}{2}\% < 0.2 < \frac{43}{201} < \sqrt{0.1}$$

## Question 5

Write the following in order of size, largest first.

$$\sin 158^\circ \quad \cos 158^\circ \quad \cos 38^\circ \quad \sin 38^\circ \quad [2]$$

$$\sin 158^\circ = 0.795$$

$$\cos 158^\circ = 0.605$$

$$\sin 38^\circ = 0.296$$

$$\cos 38^\circ = 0.955$$

The number in order, starting from the largest one, are:

$$0.955 > 0.795 > 0.605 > 0.296$$

Equivalent with:

$$\cos 38^\circ > \sin 158^\circ > \cos 158^\circ > \sin 38^\circ$$

## Question 6

Write the following in order of size, **smallest** first.

$$\sqrt{0.9} \quad \sqrt[3]{0.9} \quad 0.9^2 \quad 0.9^3 \quad [2]$$

$$0.9^3 < 0.9^2 < \sqrt{0.9} < \sqrt[3]{0.9}$$

## Question 7

Write the following in order of size, **smallest** first.

$$\frac{20}{41} \quad \frac{80}{161} \quad 0.492 \quad 4.93\% \quad [2]$$

$$4.93\% = 0.0493$$

$$\frac{20}{41} = 0.4878$$

$$\frac{80}{161} = 0.4969$$

So

$$4.93\% < \frac{20}{41} < 0.492 < \frac{80}{161}$$

## Question 8

Write the numbers in order of size with the **smallest** first.

$$\sqrt{10} \quad 3.14 \quad \frac{22}{7} \quad \pi \quad [2]$$

Write each value in decimal form

$$\sqrt{10} = 3.16227766$$

$$\frac{22}{7} = 3.142857$$

$$\pi = 3.14159$$

Hence

$$3.14 < \pi < \frac{22}{7} < \sqrt{10}$$

### Question 9

Assembled by AS

Write the following in order of size, smallest first.

$$\sqrt{\frac{9}{17}}$$

$$\frac{5}{7}$$

72%

$$\left(\frac{4}{3}\right)^{-1}$$

[2]

$$\sqrt{\frac{9}{17}} = 0.727$$

$$\frac{5}{7} = 0.714$$

$$72\% = \frac{72}{100} = 0.72$$

$$\left(\frac{4}{3}\right)^{-1} = \frac{3}{4} = 0.75$$

The order, starting from the smallest is:

$$\frac{5}{7} < 72\% < \sqrt{\frac{9}{17}} < \left(\frac{4}{3}\right)^{-1}$$

## Question 10

Write the following in order of size, smallest first.

$$\frac{399}{401}$$

$$\frac{698}{701}$$

$$\frac{598}{601}$$

[2]

Write the fractions in decimal form:

$$\frac{399}{401} = 0.995012$$

$$\frac{698}{701} = 0.995720$$

$$\frac{598}{601} = 0.995008$$

Hence:

$$\frac{598}{601} < \frac{399}{401} < \frac{698}{701}$$

## Question 11

Write the following in order of size, **smallest** first.

$\cos 100^\circ$        $\sin 100^\circ$        $\tan 100^\circ$       [2]

$$\cos 100^\circ = -0.173$$

$$\sin 100^\circ = 0.984$$

$$\tan 100^\circ = -5.671$$

Order starting from the smallest:

$$\tan 100^\circ < \cos 100^\circ < \sin 100^\circ$$

## Question 12

$$(0.8)^{\frac{1}{2}}, \quad 0.8, \quad \sqrt{0.8}, \quad (0.8)^{-1}, \quad (0.8)^2.$$

From the numbers above, write down

To compare them, we need to have the number written in the same form. In this case, the easiest is to write them as 0.8 raised to a power.

The numbers we will compare are:

$$(0.8)^{1/2}$$

$$0.8 = 0.8^1$$

$$\sqrt{0.8} = 0.8^{1/2}$$

$$0.8^{-1}$$

$$0.8^2$$

Since 0.8 is a number in decimal form, the largest number is 0.8 raised to the lowest power, while the smallest number is 0.8 raised to the highest power.

(a) the smallest,

[1]

**The smallest number:  $0.8^2 = 0.64$**

(b) the largest.

[1]

**The largest number:  $0.8^{-1} = 1.25$**

## Question 13

Write the numbers  $0.5^2$ ,  $\sqrt{0.5}$ ,  $0.5^3$  in order with the smallest first. [2]

When you square a number between 0 and 1 it gets smaller and when you cube it it gets smaller still.

Squaring rooting is the opposite of squaring so a number between 0 and 1 will get bigger when square rooted.

so:

$$0.5^3 < 0.5^2 < \sqrt{0.5}$$

(“<” signs are optional as the question just requires a list.)

## Question 14

Write in order of size, smallest first,

$$\frac{5}{98}, \quad 0.049, \quad 5\%. \quad [2]$$

$$\frac{5}{98} = 0.051$$

$$0.049$$

$$5\% = \frac{5}{100} = 0.05$$

The order, starting from the smallest is:

$$0.049 < 5\% < \frac{5}{98}$$

## Question 15

Write the four values in order, smallest first.

$$\frac{1}{1000}, \quad \frac{11}{1000}, \quad 0.11\%, \quad 0.0108.$$

[2]

$$\frac{1}{1000} = 0.001$$

$$\frac{11}{1000} = 0.011$$

$$0.11\% = \frac{0.11}{100} = 0.0011$$

$$0.0108$$

The order, starting with the smallest is:

$$\frac{1}{1000} < 0.11\% < 0.0108 < \frac{11}{1000}$$

# Order by Size

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Order by Size
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 26 minutes

**Score:** /20

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Write the following in order of size, smallest first.

$$19\% \quad \frac{1}{5} \quad \sqrt{0.038} \quad \sin 11.4^\circ \quad 0.719^5 \quad [2]$$

Sort all values out to decimals:

$$19\% = 0.19$$

$$\frac{1}{5} = 0.2$$

$$\sqrt{0.038} = 0.195$$

$$\sin(11.4^\circ) = 0.198$$

$$0.719^5 = 0.192$$

With these values, we can now rank them in order from smallest to largest,

$$19\% < 0.719^5 < \sqrt{0.038} < \sin(11.4^\circ) < \frac{1}{5}$$

## Question 2

Write the following in order of size, smallest first.

$$\cos 100^\circ \quad \tan 100^\circ \quad \frac{1}{100} \quad 100^{-0.1} \quad [2]$$

Manually calculate each of the 4 terms,

$$\cos(100) = -0.17$$

$$\tan(100) = -5.67$$

$$\frac{1}{100} = 0.01$$

$$100^{-0.1} = 0.63$$

Therefore,

$$\tan(100) < \cos(100) < \frac{1}{100} < 100^{-0.1}$$

### Question 3

Write the following in order of size, **smallest** first.

$$(1.5)^{\frac{2}{3}} \quad \left(\frac{2}{3}\right)^{1.5} \quad \left(\frac{2}{3}\right)^{-1.5} \quad \left(-\frac{2}{3}\right)^{\frac{2}{3}} \quad [2]$$

Use a calculator to calculate each:

$$(1.5)^{\frac{2}{3}} = 1.31$$

$$\left(\frac{2}{3}\right)^{1.5} = 0.544$$

$$\left(\frac{2}{3}\right)^{-1.5} = 1.84$$

$$\left(-\frac{2}{3}\right)^{\frac{2}{3}} = 0.763$$

$$\left(\frac{2}{3}\right)^{1.5} < \left(-\frac{2}{3}\right)^{\frac{2}{3}} < (1.5)^{\frac{2}{3}} < \left(\frac{2}{3}\right)^{-1.5}$$

## Question 4

Write the following in order of size, **smallest** first.

$$0.47 \quad \frac{8}{17} \quad \sqrt{0.22} \quad \tan 25^\circ \quad [2]$$

Write everything in decimal form

$$\frac{8}{17} = 0.470588 \dots$$

$$\sqrt{0.22} = 0.469041 \dots$$

$$\tan 25 = 0.466307 \dots$$

Hence

$$\tan 25 < \sqrt{0.22} < 0.47 < \frac{8}{17}$$

## Question 5

For this question,  $1 < x < 2$ .

Write the following in order of size, **smallest first**.

$$\frac{5}{x} \quad 5x \quad \frac{x}{5} \quad x - 5 \quad [2]$$

Write each as an inequality

$$2.5 < \frac{5}{x} < 5$$

$$5 < 5x < 10$$

$$0.2 < \frac{x}{5} < 0.4$$

$$-4 < x < -3$$

Hence

$$x - 5 < \frac{x}{5} < \frac{5}{x} < 5x$$

## Question 6

Write the following in order of size, **smallest** first.

$$\frac{2}{\sqrt{3}} \quad 2 - \sqrt{3} \quad \sqrt{3} \quad 2 - \frac{\sqrt{3}}{2} \quad [2]$$

$$\frac{2}{\sqrt{3}} = 1.1547$$

$$2 - \sqrt{3} = 0.26795$$

$$\sqrt{3} = 1.73205$$

$$2 - \frac{\sqrt{3}}{2} = 1.133975$$

$$\rightarrow 2 - \sqrt{3} < 2 - \frac{\sqrt{3}}{2} < \frac{2}{\sqrt{3}} < \sqrt{3}$$

## Question 7

When  $0 < x < 0.9$ , write the following in order of size with the smallest first.

$$\cos x^\circ \quad x^2 \quad x^{-1} \quad [2]$$

For this domain, we have

$$0.999 < \cos x < 1$$

$$0 < x^2 < 0.81$$

$$1.11 < x^{-1} < \infty$$

Hence

$$x^2 < \cos x < x^{-1}$$

## Question 8

$$0.0008 \quad 8 \times 10^{-5} \quad 0.8\% \quad \frac{1}{125000}$$

Write the numbers above in order, smallest first.

[2]

$$\frac{1}{125000} = 0.000008$$

$$8 \times 10^{-5} = 8 \times \frac{1}{100000} = 0.00008$$

$$0.8\% = \frac{0.8}{100} = 0.008$$

The order is, starting from the smallest:

$$\frac{1}{125000} < 8 \times 10^{-5} < 0.0008 < 0.8\%$$

## Question 9

Write the following in order of size, smallest first.

$$\frac{\pi}{4} \quad \frac{1}{\sqrt{2}} \quad \frac{3}{4} \quad \sin 47^\circ \quad [2]$$

$$\frac{\pi}{4} =$$

$$0.785$$

$$\frac{1}{\sqrt{2}} = 0.707$$

$$\frac{3}{4} = 0.75$$

$$\sin 47^\circ = 0.731$$

The order is, starting with the smallest:

$$\frac{1}{\sqrt{2}} < \sin 47^\circ < \frac{3}{4} < \frac{\pi}{4}$$

## Question 10

Rearrange the quantities in order with the smallest first.

$$\frac{1}{8}\% , \quad \frac{3}{2500} , \quad 0.00126$$

[2]

$$\frac{1}{8}\% = \frac{0.125}{100} = 0.00125$$

$$\frac{3}{2500} = 0.0012$$

0.00126

The order, starting from the smaller is:

$$\frac{3}{2500} < \frac{1}{8}\% < 0.00126$$

# Standard Form

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Standard Form
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 30 minutes

**Score:** /23

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Write  $5.17 \times 10^{-3}$  as an ordinary number.

[1]

**0.00517**

## Question 2

Work out, giving your answer in standard form.

$$1.2 \times 10^{40} + 1.2 \times 10^{41}$$

[2]

$$1.2 \times 10^{40} + 12 \times 10^{40}$$

$$= 13.2 \times 10^{40}$$

$$= \mathbf{1.32 \times 10^{41}}$$

### Question 3

(a) Write 14 835 correct to the nearest thousand. [1]

For “nearest thousand” look at the 100s column.

Look at 100s column : 8 is 5 or bigger so we round up the thousands figure.

$$\mathbf{14835 = 15000} \text{ (to the nearest thousand)}$$

(b) Write your answer to **part (a)** in standard form. [1]

To write in Standard Form put a decimal point after the first non-zero number and multiply by  $10^n$  where  $n$  is the number of times you have to move the decimal point. For small numbers ( $< 1$ )  $n$  is negative, for large numbers ( $> 1$ )  $n$  is positive.

In this case the first non-zero number is 1 and the decimal point is moved 4 places.

The number is  $> 1$  so we use  $+4$  as the power of 10.

$$\mathbf{15000 = 1.5 \times 10^4}$$

## Question 4

Write in standard form.

(a) 2 470 000

[1]

To write in Standard Form put a decimal point after the first non-zero number and multiply by  $10^n$  where  $n$  is the number of times you have to move the decimal point. For small numbers ( $< 1$ )  $n$  is negative, for large numbers ( $> 1$ )  $n$  is positive.

In this case the first non-zero number is 2 and the decimal point is moved 6 places.

The number is  $> 1$  so we use 6 as the power of 10.

$$\mathbf{2470000 = 2.47 \times 10^6}$$

(b) 0.0079

[1]

In this case the first non-zero number is 7 and the decimal point is moved 3 places.

The number is  $< 1$  so we use  $-3$  as the power of 10.

$$\mathbf{0.0079 = 7.9 \times 10^{-3}}$$

## Question 5

Write  $1.27 \times 10^{-3}$  as an ordinary number.

[1]

We `move' the decimal point 3 places to the left like this

$$1.27 \times 10^{-3} = 0.00127$$

## Question 6

Write 0.0000574 in standard form.

[1]

Standard form of a decimal number is

$$5.74 \times 10^{-n}$$

Where n is the number of spaces that the 5 moves to the left, or, the number of 0's before the 5. Here we have

$$0.0000574$$

$$= 5.74 \times 10^{-5}$$

## Question 7

Write  $1.7 \times 10^{-4}$  as an ordinary number.

[1]

The number 10 is to the power -4, so the decimal place must “move” by 4 units to the right.

$$1.7 \times 10^{-4}$$

$$= 0.00017$$

## Question 8

Write 270000 in standard form.

[1]

In order to rewrite this into a standard form, we need to realize that there are five digits in after the first digit 2 (this will be the exponent of 10).

Therefore the standard form is

**2.7 x 10<sup>5</sup>.**

## Question 9

Write 53400000 in standard form.

[1]

In order to rewrite this into a standard form, we need to realize that there are seven digits in after the first digit 5. Therefore the standard form is

**5.34 x 10<sup>7</sup>.**

## Question 10

(a) Write  $2.8 \times 10^2$  as an ordinary number.

[1]

We can write  $2.8 \times 10^2$  as an ordinary number like this:

$2.8 \times 10^2$  simply means  $2.8 \times 100$

$$\mathbf{2.8 \times 100 = 280}$$

(b) Work out  $2.5 \times 10^8 \times 2 \times 10^{-2}$ .  
Give your answer in standard form.

[2]

We can solve the equation 'like this:

$$2.5 \times 10^8 \times 2 \times 10^{-2} = 2.5 \times 2 \times 10^8 \times 10^{-2}$$

$$= 5 \times 10^{8-2}$$

$$= 5 \times 10^6$$

## Question 11

Work out  $4 \times 10^{-5} \times 6 \times 10^{12}$ .

Give your answer in standard form.

[2]

$$4 \times 6 \times 10^{12-5}$$

$$= 24 \times 10^7$$

$$= \mathbf{2.4 \times 10^8}$$

## Question 12

$$p = 4 \times 10^5 \quad q = 5 \times 10^4$$

Find, giving your answer in standard form,

(a)  $pq$ ,

[2]

The result needs to be in standard form, therefore, we keep p and q in standard form throughout the calculation.

To multiply 2 numbers in standard form, we use:

$$(a \times 10^n) \times (b \times 10^m) = ab \times 10^{n+m}$$

In our case:

$$pq = 4 \times 10^5 \times 5 \times 10^4$$

$$pq = 20 \times 10^9$$

For a number in standard form  $a \times 10^n$ , the number 'a' needs to be bigger than or equal to 1 and less than 10.

Therefore, we rewrite the result obtained:

$$pq = 2 \times 10 \times 10^9$$

$$\text{pq} = 2 \times 10^{10}$$

with  $1 \leq 2 < 10$

(b)  $\frac{q}{p}$ .

[2]

The result needs to be in standard form, therefore, we keep p and q in standard form throughout the calculation.

To divide 2 numbers in standard form, we use:

$$\frac{a \times 10^n}{b \times 10^m} = \frac{a}{b} \times 10^{n-m}$$

In our case:

$$\frac{q}{p} = \frac{5 \times 10^4}{4 \times 10^5}$$

$$\frac{q}{p} = \frac{5}{4} \times 10^{4-5}$$

$$\frac{q}{p} = 1.25 \times 10^{-1}$$

With  $1 \leq 1.25 < 10$

### Question 13

The price of a ticket for a football match is \$124.

- (a) Calculate the amount received when 76 500 tickets are sold.

[1]

$$76\,500 \times \$124$$

$$= \$9\,486\,000$$

- (b) Write your answer to **part (a)** in standard form.

[1]

$$9.486 \times 10^6$$

# Standard Form

## Difficulty: Easy

### Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Standard Form
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 2

**Time allowed:** 32 minutes

**Score:** /25

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

A hummingbird beats its wings 24 times per second.

- (a) Calculate the number of times the hummingbird beats its wings in one hour.

[1]

There are 60 seconds in a minute, so multiply by 60 to get beats per minute.

$$24 \times 60 = 1440 \text{ beats per minute}$$

There are 60 minutes in an hour, so multiply by 60 to get beats per hour.

$$1440 \times 60 = 86400 \text{ hummingbird beats in one hour}$$

- (b) Write your answer to part (a) in standard form.

[1]

There are 4 digits after the leading 8 in the number 86400, hence in the standard form, we must use  $10$  to the power of 4.

$$86400 = 8.64 \times 10^4$$

## Question 2

- (a) Write 16 460 000 in standard form.

[1]

The leading (first) digit in 16 460 000 is 1. We place the decimal point behind this digit.

There are 7 digits behind it, so this will be the exponent of 10.

$$1.6460000 \times 10^7$$

Discard the zeroes at the end and get the number is a standard form:

$$\mathbf{1.646 \times 10^7}$$

- (b) Calculate  $7.85 \div (2.366 \times 10^2)$ , giving your answer in standard form.

[2]

We write the number as a fraction:

$$\frac{7.85}{2.366 \times 10^2}$$

The numbers 7.85 and 2.366 will divide as usual (use calculator).

For the  $10^2$ , we simply use the fact that when moving a power between denominator and numerator, we must change its sign.

$$\frac{7.85}{2.366} \times 10^{-2}$$

Hence we have the final answer:

$$\mathbf{3.32 \times 10^{-2}}$$

### Question 3

Work out  $\frac{240^2}{5 \times 10^6}$ .

Give your answer in standard form.

[2]

$$\frac{240^2}{5 \times 10^6}$$

$$= \frac{240^2}{5} \times 10^{-6}$$

$$= 11520 \times 10^{-6}$$

$$= \mathbf{1.152 \times 10^{-2}}$$

## Question 4

Calculate the value of  $5(6 \times 10^3 + 400)$ , giving your answer in standard form. [2]

$$\therefore 5(6 \times 10^3 + 400)$$

$$= 5(6 \times 10^3 + 0.4 \times 10^3)$$

$$= 5 \times 6.4 \times 10^3$$

$$= 32 \times 10^3$$

$$= \mathbf{3.2 \times 10^4}$$

## Question 5

Change 64 square metres into square millimetres.  
Give your answer in standard form.

[2]

Multiply by 1000 squared

$$64 \times 1000^2$$

$$= 64 \times (10^3)^2$$

$$= 64 \times 10^6$$

$$= \mathbf{6.4 \times 10^7}$$

## Question 6

$$\sqrt{23}$$

48%

4.80

$$\frac{53}{11}$$

Write the numbers in order of size with the **largest** first.

[2]

Write each in decimal form

$$\sqrt{23} = 4.79583$$

$$48\% = 0.48$$

$$\frac{53}{11} = 4.\dot{8}\dot{1}$$

Hence

$$\frac{53}{11} > 4.80 > \sqrt{23} > 48\%$$

## Question 7

1 second =  $10^6$  microseconds.

Change  $3 \times 10^{13}$  microseconds into minutes. Give your answer in standard form.

[2]

Divide through by 'exchange rate' to get time in seconds

$$(3 \times 10^{13}) \div 10^6$$

$$= 30\,000\,000$$

Now divide by 60 to get minutes

$$30\,000\,000 \div 60$$

$$= 500\,000$$

Write in standard form

$$5 \times 10^5$$

## Question 8

A light on a computer comes on for 26 700 microseconds.

One microsecond is  $10^{-6}$  seconds.

Work out the length of time, in seconds, that the light is on

(a) in standard form,

[1]

$$26\ 700 \times 10^{-6}$$

$$= 2.67 \times 10^{-2}$$

(b) as a decimal.

[1]

$$0.0267$$

## Question 9

Use the formula

$$P = \frac{V^2}{R}$$

to calculate the value of  $P$  when  $V = 6 \times 10^6$  and  $R = 7.2 \times 10^8$ . [2]

$$P = \frac{(6 \times 10^6)^2}{7.2 \times 10^8}$$

$$= \frac{36}{7.2} \times \frac{10^{12}}{10^8}$$

$$= 5 \times 10^4$$

$$= \mathbf{50\,000}$$

## Question 10

The planet Neptune is 4496000 000 kilometres from the Sun.

Write this distance in standard form.

[1]

Standard form:  $a \times 10^n$  where  $0 < a < 1$  and  $n$  is an integer.

$$4496000000 = 4.496 \times 10^9$$

$$0 < 4.496 < 1$$

## Question 11

The mass of the Earth is  $\frac{1}{95}$  of the mass of the planet Saturn.

The mass of the Earth is  $5.97 \times 10^{24}$  kilograms.

Calculate the mass of the planet Saturn, giving your answer in standard form, correct to 2 significant figures.

[3]

$$\text{The mass of Saturn} \times \frac{1}{95} = 5.97 \times 10^{24} \text{ kg}$$

$$\text{The mass of Saturn} = 95 \times 5.97 \times 10^{24} \text{ kg}$$

$$\text{Using a calculator, we work out that } 95 \times 5.97 = 567.15$$

Keeping the answer in standard form and correct to 2 decimal places, we work out

that:

**The mass of Saturn =**

$$5.6715 \times 10^{26} \approx 5.7 \times 10^{26}$$

## Question 12

A block of cheese, of mass 8 kilograms, is cut by a machine into 500 equal slices.

- (a) Calculate the mass of one slice of cheese in kilograms.

[1]

To work out the mass of one slice of cheese we divide the total mass

in kg by the total number of slices.

$$\text{Mass of one slice} = \frac{8 \text{ kg}}{500 \text{ slices}}$$

**Mass of one slice = 0.016 kg**

- (b) Write your answer to part (a) in standard form.

[1]

From a), we know that the mass of one slice is 0.016 kg.

A number in standard form is written as:  $a \times 10^n$ , where  $1 \leq a < 10$  and n is a whole number.

In our case, 0.016

$$= 1.6 \times 10^{-2}$$

# Standard Form

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Standard Form
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 27 minutes

**Score:** /21

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

(a) Write 0.0605 in standard form.

[1]

**6.05 × 10<sup>-2</sup>**

(b) Calculate  $0.1 \times 5.1 \times 10^4$ , giving your answer in standard form.

[1]

**$10^{-1} \times 5.1 \times 10^4$**

**= 5.1 × 10<sup>3</sup>**

## Question 2

Write the answer to the following calculations in standard form.

(a)  $600 \div 8000$

[2]

Remember to use the calculator to double check!

$$\frac{600}{8000} = 0.075$$

$$= 7.5 \times 10^{-2}$$

(b)  $10^8 - 7 \times 10^6$

[2]

Remember to work the multiplication first:

$$10^8 - (7 \times 10^6) = 93000000$$

$$= 9.3 \times 10^7$$

### Question 3

Calculate  $(4.3 \times 10^8) + (2.5 \times 10^7)$ .

Give your answer in standard form.

[2]

A number in standard form represents a number written in the form:  $a \times 10^n$

where  $1 \leq a < 10$  and  $n$  is a whole number.

To add up 2 numbers in standard form they need to have 10 raised to the same power.

$$a \times 10^n + b \times 10^n = (a + b) \times 10^n$$

In our case, we can write  $10^8$  as  $10^7 \times 10$ :

$$(4.3 \times 10^8) + (2.5 \times 10^7) = (4.3 \times 10^7) \times 10 + (2.5 \times 10^7)$$

$$(4.3 \times 10^8) + (2.5 \times 10^7) = (43 \times 10^7) + (2.5 \times 10^7)$$

$$(4.3 \times 10^8) + (2.5 \times 10^7) = 45.5 \times 10^7$$

$$(4.3 \times 10^8) + (2.5 \times 10^7) = 4.55 \times 10^8$$

$$= 4.55 \times 10^8$$

**Question 4**

~~Assembled by A/S~~

Calculate, giving your answers in standard form,

(a)  $2 \times (5.5 \times 10^4)$ ,

[2]

$$2 \times 5.5 \times 10^4 = 11 \times 10^4 = 1.1 \times 10 \times 10^4$$

$$= \mathbf{1.1 \times 10^5}$$

(b)  $(5.5 \times 10^4) - (5 \times 10^4)$ .

[2]

$$5.5 \times 10^4) - (5 \times 10^4) = 0.5 \times 10^4$$

$$= 0.5 \times 10 \times 10^3$$

$$= \mathbf{5 \times 10^3}$$

## Question 5

Work out  $2(3 \times 10^8 - 4 \times 10^6)$ , giving your answer in standard form.

[2]

To subtract 2 numbers in standard form we need to have them both at the same power of 10.

We can rewrite the number as:

$$2(3 \times 10^8 - 4 \times 10^6) = 2(3 \times 10^6 \times 10^2 - 4 \times 10^6)$$

The common factor within the bracket is  $10^6$ .

$$2(3 \times 10^8 - 4 \times 10^6) = 2((3 \times 10^2 - 4) \times 10^6)$$

$$2(3 \times 10^8 - 4 \times 10^6) = 2(296 \times 10^6)$$

$$2(3 \times 10^8 - 4 \times 10^6) = 592 \times 10^6$$

For a number in standard form  $a \times 10^n$ , the number 'a' needs to be

bigger than or equal to 1 and less than 10. Therefore, we rewrite the

result obtained:

$$592 \times 10^6 = 5.92 \times 10^2 \times 10^6$$

$$592 \times 10^6 = \mathbf{5.92 \times 10^8}$$

With  $1 \leq 5.92 < 10$

## Question 6

Solve the equation  $4x + 6 \times 10^3 = 8 \times 10^4$ .

Give your answer in standard form.

[3]

On the right hand side, factorize out one 10 out of the  $10^4$  in order to have the same exponent on both sides of the equation (3).

$$4x + 6 \times 10^3 = 8 \times 10^4 = 80 \times 10^3$$

Subtract  $6 \times 10^3$  from both sides. This is easier now that we have the same exponent on 10.

$$4x = 80 \times 10^3 - 6 \times 10^3$$

$$4x = 74 \times 10^3$$

Divide both sides by 4.

$$x = \frac{74}{4} \times 10^3$$

Write the fraction as a decimal number.

$$x = 18.5 \times 10^3$$

To write in standard form, we “move” power from the factor (move decimal space) to the exponent.

$$x = 18.5 \times 10^3 = 1.85 \times 10 \times 10^3$$

$$\mathbf{x = 1.85 \times 10^4}$$

## Question 7

(a) There are  $10^9$  nanoseconds in 1 second.

Find the number of nanoseconds in 5 minutes, giving your answer in standard form.

[2]

$$1 \text{ minute} = 60 \text{ seconds}$$

For 5 minutes:

$$60 \text{ seconds/minute} \times 5 \text{ minutes} = 300 \text{ seconds}$$

The number of nanoseconds in 300 seconds would be:

$$300 \text{ seconds} \times 10^9 \text{ nanoseconds/second} = 300 \times 10^9 \text{ nanoseconds.}$$

A number in standard form takes up the form  $a \times 10^n$  where  $n$  is an integer

and  $0 < a < 10$ :

$$\text{In our case, } 300 \times 10^9$$

$$= 3 \times 10^{11}$$

(b) Solve the equation  $5(x + 3 \times 10^6) = 4 \times 10^7$ .

[2]

$$5(x + 3 \times 10^6) = 4 \times 10^7$$

$$x + 3 \times 10^6 = 0.8 \times 10^7$$

$$x = 0.8 \times 10^7 - 3 \times 10^6$$

$$x = 8 \times 10^6 - 3 \times 10^6$$

$$\mathbf{x = 5 \times 10^6}$$

# Working with Fractions

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Working with Fractions
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 43 minutes

**Score:** /33

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

**Without using a calculator**, work out  $\frac{5}{6} - \frac{1}{2}$

Show all the steps of your working and give your answer as a fraction in its simplest form. [2]

Convert  $\frac{1}{2}$  into 6ths

$$\frac{1}{2} = \frac{3}{6}$$

Hence

$$\frac{5}{6} - \frac{3}{6}$$

$$= \frac{2}{6}$$

$$= \frac{1}{3}$$

## Question 2

Work out  $\frac{2}{3} - \frac{1}{4}$ , giving your answer as a fraction in its lowest terms.

Do not use a calculator and show all the steps of your working.

[2]

When adding/subtracting fractions first find a common denominator:

(The easiest thing to do is multiply the two bottoms together)

Multiply the tops by the same as the bottoms:  $\frac{2}{3} - \frac{1}{4} = \frac{2 \times 4}{3 \times 4} - \frac{1 \times 3}{4 \times 3}$

Simplify...

$$= \frac{8}{12} - \frac{3}{12}$$

...and subtract the tops

$$\frac{2}{3} - \frac{1}{4} = \frac{5}{12}$$

### Question 3

**Without using your calculator,** work out  $\frac{3}{4} + \frac{2}{3} - \frac{1}{8}$ .

You must show all your working and give your answer as a mixed number in its simplest form.

[4]

When adding/subtracting fractions first find a common denominator:

(The easiest thing to do is multiply the bottoms together – although you could find the LCM)

Multiply the tops by the same as the bottoms:  $\frac{3}{4} + \frac{2}{3} - \frac{1}{8} = \frac{3 \times 3 \times 8}{4 \times 3 \times 8} + \frac{2 \times 4 \times 8}{3 \times 4 \times 8} - \frac{1 \times 4 \times 3}{8 \times 4 \times 3}$

Simplify...  $= \frac{72}{96} + \frac{64}{96} - \frac{12}{96}$

...and combine the tops  $= \frac{124}{96}$

Cancel a factor of 4 from top and bottom  $= \frac{31}{24}$

...and write as a mixed number  $\frac{24+7}{24}$

$$= 1\frac{7}{24}$$

## Question 4

**Without using a calculator**, work out  $\frac{3}{5} + \frac{1}{6}$

Write down all the steps of your working and give your answer as a fraction in its simplest form.

[2]

When adding/subtracting fractions first find a common denominator:

(The easiest thing to do is multiply the two bottoms together)

Multiply the tops by the same as the bottoms:  $\frac{3}{5} + \frac{1}{6} = \frac{3 \times 6}{5 \times 6} + \frac{1 \times 5}{6 \times 5}$

Simplify...  $= \frac{18}{30} + \frac{5}{30}$

...and add the tops  $= \frac{23}{30}$

## Question 5

**Without using a calculator**, work out  $2\frac{5}{8} \times \frac{3}{7}$ .

Show all your working and give your answer as a mixed number in its lowest terms.

[3]

Write the mixed number as an improper (top heavy) fraction

$$2\frac{5}{8} = \frac{16}{8} + \frac{5}{8}$$

$$= \frac{21}{8}$$

The product of the fractions is then

$$\frac{21 \times 3}{8 \times 7}$$

Note that we can cancel the 7 and the 21 like so

$$\frac{7 \times 3 \times 3}{8 \times 7} = \frac{9}{8}$$

Writing as a mixed number

$$= 1\frac{1}{8}$$

## Question 6

**Without using a calculator**, work out  $\frac{1}{12} \times 1\frac{1}{5}$ .

Show all your working and give your answer as a fraction in its lowest terms.

[2]

Convert the mixed number into a top-heavy (improper) fraction

$$1\frac{1}{5} = \frac{5}{5} + \frac{1}{5}$$

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

Now multiply

$$\frac{1}{12} \times \frac{6}{5}$$

Cancel the 12 on the bottom with the 6 on the top:

$$\frac{1}{2} \times \frac{1}{5}$$

$$= \frac{1}{10}$$

## Question 7

**Without using your calculator**, work out  $1\frac{7}{12} + \frac{13}{20}$ .

You must show all your working and give your answer as a mixed number in its simplest form. [3]

*Converting to top heavy:*

$$1\frac{7}{12} = \frac{19}{12}$$

The lowest common denominator of 12 and 20 is 60.

Therefore, multiply  $\frac{19}{12}$  by 5:

$$\frac{19 \times 5}{12 \times 5} = \frac{95}{60}$$

and  $\frac{13}{20}$  by 3:

$$\frac{13 \times 3}{20 \times 3} = \frac{39}{60}$$

This gives

$$\frac{95}{60} + \frac{39}{60} = \frac{134}{60}$$

This can be cancelled down by dividing top and bottom by 2, giving  $\frac{67}{30}$

To convert this improper (top heavy) fraction to a mixed fraction, see how many times

67 can be divided by 30 which is two times giving:

$$2\frac{7}{30}$$

## Question 8

Without using your calculator, work out  $2\frac{1}{4} - \frac{11}{12}$ .

You must show all your working and give your answer as a fraction in its lowest terms.

[3]

We convert from mixed number to simple fraction

$$2\frac{1}{4} = \frac{8}{4} + \frac{1}{4} = \frac{9}{4}$$

The fractions must have the same denominator in order to subtract them. To achieve this, we multiply both top and bottom of the first fraction by 3 (to get a common denominator 12).

$$\frac{9 \times 3}{4 \times 3} - \frac{11}{12} = \frac{27}{12} - \frac{11}{12}$$

Subtract the two fractions.

$$\frac{27 - 11}{12} = \frac{16}{12}$$

Numbers 16 and 12 have a common factor 4, therefore we can simplify the fraction further.

$$\frac{16}{12} = \frac{4}{3}$$

Hence we have the final answer:

$$2\frac{1}{4} - \frac{11}{12}$$

$$= \frac{4}{3}$$

## Question 9

Calculate  $\frac{2.07 - 1.89}{5.71 - 3.92}$ . [1]

Use your calculator.

$$\frac{2.07 - 1.89}{5.71 - 3.92} = \frac{0.18}{1.79}$$

$$= 0.1006$$

## Question 10

Write the following as single fractions.

(a)  $x + \frac{x}{2}$  [1]

Writing  $\frac{x}{1}$  is the same as writing just  $x$ .

$$\frac{x}{1} + \frac{x}{2}$$

Multiply the top and bottom of the first fraction by 2 to get the number to the same denominator.

$$\frac{x \times 2}{1 \times 2} + \frac{x}{2} = \frac{2x}{2} + \frac{x}{2}$$

Add the fractions together.

$$\frac{2x}{2} + \frac{x}{2}$$

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

$$(b) x + \frac{2}{x} \quad [1]$$

Write  $x$  as  $\frac{x}{1}$

$$\frac{x}{1} + \frac{2}{x}$$

Multiply the top and the bottom of the first fraction by  $x$  to get the same denominator.

$$\frac{x \times x}{1 \times x} + \frac{2}{x} = \frac{x^2}{x} + \frac{2}{x}$$

Add the fraction together

$$\frac{x^2}{x} + \frac{2}{x}$$

$$= \frac{x^2 + 2}{x}$$

## Question 11

Work out  $\frac{2}{3} + \frac{1}{6} - \frac{1}{4}$ , giving your answer as a fraction in its lowest terms.

Do not use a calculator and show all the steps of your working.

[3]

The lowest common multiply of numbers 3, 6 and 4 is 12. This will be the common denominator of the three fractions.

Multiply the top and bottoms of the fractions so that the denominator is 12.

$$\frac{2 \times 4}{3 \times 4} + \frac{1 \times 2}{6 \times 2} - \frac{1 \times 3}{4 \times 3} = \frac{8}{12} + \frac{2}{12} - \frac{3}{12}$$

Add/subtract the fractions.

$$\frac{8 + 2 - 3}{12}$$

$$= \frac{7}{12}$$

## Question 12

**Without using a calculator**, work out  $1\frac{4}{5} \div \frac{3}{7}$ .

Show all your working and give your answer as a fraction in its lowest terms. [3]

We convert from mixed number to simple fraction

$$1\frac{4}{5} = \frac{5}{5} + \frac{4}{5} = \frac{9}{5}$$

To divide by a fraction is the same as to multiply by the inverse of the fraction (flip the denominator and the numerator). Transform the division into a multiplication.

Now we are left with fraction multiplication:

$$\frac{9}{5} \times \frac{7}{3}$$

Numbers 9 and 3 have a common factor 3, therefore we can simplify the multiplication

$$\frac{3}{5} \times \frac{7}{1} = \frac{21}{5}$$

This gives us the final answer

$$\frac{21}{5}$$

### Question 13

Without using a calculator, work out  $\frac{4}{5} \div 2\frac{2}{3}$ .

Write down all the steps of your working and give your answer as a fraction in its simplest form. [3]

We convert from mixed number to simple fraction

$$2\frac{2}{3} = \frac{6}{3} + \frac{2}{3} = \frac{8}{3}$$

To divide by a fraction is the same as to multiply by the inverse of the fraction (flip the denominator and the numerator).

Now we are left with fraction multiplication:

$$\frac{4}{5} \times \frac{3}{8}$$

Numbers 4 and 8 have a common factor 4, therefore we can simplify the multiplication

$$\frac{1}{5} \times \frac{3}{2} = \frac{3}{10}$$

This gives us the final answer

$$\frac{3}{10}$$

# Working with Fractions

## Difficulty: Easy

### Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Working with Fractions
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 2

**Time allowed:** 46 minutes

**Score:** /36

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

**Without using a calculator**, work out  $1\frac{7}{8} \div \frac{5}{9}$ .

Show all your working and give your answer as a fraction in its lowest terms.

[3]

We convert from mixed number to simple fraction

$$1\frac{7}{8} = \frac{8}{8} + \frac{7}{8} = \frac{15}{8}$$

To divide by a fraction is the same as to multiply by the inverse of the fraction (flip the denominator and the numerator).

Now we are left with fraction multiplication:

$$\frac{15}{8} \times \frac{9}{5}$$

Numbers 15 and 5 have a common factor 5, therefore we can simplify the multiplication

$$\frac{3}{8} \times \frac{9}{1} = \frac{27}{8}$$

This gives us the final answer

$$\frac{27}{8}$$

## Question 2

**Without using your calculator,** work out  $2\frac{7}{9} \div \frac{5}{6}$ .

Give your answer as a fraction in its lowest terms.  
You must show each step of your working.

[4]

First, we convert the mixed number into a simple fraction.

$$2\frac{7}{9} = \frac{2 \times 9 + 7}{9} = \frac{25}{9}$$

Second, we note that dividing by a number, is the same as multiplying by its reciprocal or multiplicative inverse, (for example, dividing by 3 is the same as multiplying by 1/3).

To get the reciprocal of a fraction, we simply flip the fraction.

This allows us to write the expression as:

$$\frac{25}{9} \div \frac{5}{6} = \frac{25}{9} \times \frac{6}{5} = \frac{25 \times 6}{9 \times 5}$$

Numbers 25 and 5 have a common factor 5 and numbers 9 and 6 have a common factor 3.

Therefore we can simplify the fraction.

$$\frac{25 \times 6}{9 \times 5} = \frac{5}{5} \times \frac{3}{3} \times \frac{10}{3} = \frac{10}{3}$$

We get the final answer:

$$2\frac{7}{9} \div \frac{5}{6}$$

$$= \frac{10}{3}$$

### Question 3

Without using a calculator, work out  $\frac{1}{4} + \frac{1}{6}$ .

Write down all the steps in your working and give your answer as a fraction in its simplest form.

[2]

We can solve the equation  $\frac{1}{4} + \frac{1}{6}$  like this:

First, we need to make the denominators (the numbers on the bottom of the fractions) the same

To do this, we need to find the lowest common multiple (LCM) of the numbers 4 and 6 – this is 12.

To make both fractions have a denominator of 12, we need to multiply the top and bottom of both of the fractions like this

$$\frac{1}{4} + \frac{1}{6} = \frac{1}{4} \left( \frac{3}{3} \right) + \frac{1}{6} \left( \frac{2}{2} \right)$$

$$\frac{1}{4} + \frac{1}{6} = \frac{3}{12} + \frac{2}{12}$$

$$\frac{1}{4} + \frac{1}{6} = \frac{5}{12}$$

## Question 4

**Without using a calculator**, work out  $1\frac{1}{6} \div \frac{7}{8}$ .

Show all your working and give your answer as a fraction in its lowest terms.

[3]

Convert into whole numbers:

$$\frac{7}{6} \div \frac{7}{8}$$

Flip the fraction and change the divide to multiply:

$$\frac{7}{6} \times \frac{8}{7}$$

Cancel the sevens:

$$= \frac{8}{6}$$

$$= \frac{4}{3} = 1\frac{1}{3}$$

## Question 5

Without using your calculator, work out  $\frac{5}{6} - \left( \frac{1}{2} \times 1\frac{1}{2} \right)$ .

Write down all the steps of your working.

[3]

Convert all numbers to fractions (not mixed numbers)

$$\frac{5}{6} - \left( \frac{1}{2} \times \frac{3}{2} \right)$$

$$= \frac{5}{6} - \frac{3}{4}$$

Convert to common denominator

$$\frac{10}{12} - \frac{9}{12}$$

$$\frac{1}{12}$$

## Question 6

Without using a calculator, work out  $1\frac{1}{4} - \frac{7}{9}$ .

Write down all the steps in your working.

[3]

Convert to fractions

$$\frac{5}{4} - \frac{7}{9}$$

Cross multiply

$$\frac{5 \times 9 - 7 \times 4}{4 \times 9} = \frac{17}{36}$$

$$\frac{17}{36}$$

## Question 7

**Do not use a calculator in this question and show all the steps of your working.**

Give each answer as a fraction in its lowest terms.

Work out.

(a)  $\frac{3}{4} - \frac{1}{12}$  [2]

$$\frac{3}{4} - \frac{1}{12}$$

Create a common denominator by multiplying  $\frac{3}{4}$  by  $\frac{3}{3}$ :

$$\frac{9}{12} - \frac{1}{12}$$

$$= \frac{9 - 1}{12}$$

$$= \frac{8}{12}$$

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

(b)  $2\frac{1}{2} \times \frac{4}{25}$  [2]

$$2\frac{1}{2} \times \frac{4}{25}$$

Convert  $2\frac{1}{2}$  to a top-heavy fraction:

$$\frac{5}{2} \times \frac{4}{25}$$

Multiply the top and bottom of the fractions:

$$= \frac{20}{50}$$

$$= \frac{2}{5}$$

## Question 8

Show that  $1\frac{1}{2} \div \frac{3}{16} = 8$ .

Do not use a calculator and show all the steps of your working.

[2]

This question is most simply done by converting everything to proper fractions. We

want to change  $1\frac{1}{2}$  into a proper fraction, which can be done as shown.

$$1\frac{1}{2} \rightarrow 1 + \frac{1}{2} \rightarrow \frac{2}{2} + \frac{1}{2} \rightarrow \frac{3}{2}$$

Our problem then becomes

$$\frac{3}{2} \div \frac{3}{16}$$

We can use 'Keep-Change-Flip' to change this to a multiplication problem. We keep

$\frac{3}{2}$ , change  $\div$  into  $\times$ , and flip  $\frac{3}{16}$  to  $\frac{16}{3}$ .

$$\frac{3}{2} \times \frac{16}{3}$$

We now can multiply the numerators and denominators.

$$\frac{3 \times 16}{2 \times 3} = \frac{48}{6} = 8$$

Hence  $1\frac{1}{2} \div \frac{3}{16} = 8$ .

## Question 9

Without using a calculator, work out  $\frac{6}{7} \div 1\frac{2}{3}$ .

Write down all the steps in your working.

[3]

To do the calculation, we first need to write the mixed number,  $1\frac{2}{3}$ , as an improper fraction.

To do that, we write the whole number, 1, as a fraction using the denominator of the mixed number.

$$1\frac{2}{3} = \frac{3}{3} + \frac{2}{3}$$

$$1\frac{2}{3} = \frac{5}{3}$$

We use this fraction in the initial calculation:

$$\frac{6}{7} \div \frac{5}{3} = \frac{6}{7} \times \frac{3}{5} = \frac{18}{35}$$

$$\frac{6}{7} \div \frac{5}{3} = \frac{18}{35}$$

$$= \frac{18}{35}$$

## Question 10

Write down all your working to show that the following statement is correct.

$$\frac{1 + \frac{8}{9}}{2 + \frac{1}{2}} = \frac{34}{45} \quad [2]$$

Dealing with the numerator first.

Converting everything into fractions:

$$1 + \frac{8}{9}$$

$$= \frac{9}{9} + \frac{8}{9}$$

$$= \frac{17}{9}$$

Now dealing with the denominator

$$2 + \frac{1}{2}$$

$$= \frac{4}{2} + \frac{1}{2}$$

$$= \frac{5}{2}$$

We have

$$\begin{array}{r} \frac{17}{9} \\ \underline{\times} \\ \frac{5}{2} \end{array}$$
$$= \frac{17}{9} \div \frac{5}{2}$$

$$= \frac{17}{9} \times \frac{2}{5}$$

$$= \frac{34}{45}$$

## Question 11

Show that  $\left(\frac{1}{10}\right)^2 + \left(\frac{2}{5}\right)^2 = 0.17$ .

Write down all the steps in your working.

[2]

Apply the power outside the brackets to everything inside the brackets

$$\left(\frac{1}{10}\right)^2 + \left(\frac{2}{5}\right)^2$$

$$= \frac{1}{10^2} + \frac{2^2}{5^2}$$

$$= \frac{1}{100} + \frac{4}{25}$$

Convert the second fraction so it has the same denominator

$$= \frac{1}{100} + \frac{16}{100}$$

$$= \frac{17}{100}$$

$$= 0.17$$

## Question 12

Without using your calculator, work out  $1\frac{5}{6} + \frac{9}{10}$ .

You must show your working and give your answer as a mixed number in its simplest form.

[3]

Convert everything into top-heavy fractions

$$\frac{11}{6} + \frac{9}{10}$$

Cross multiply

$$= \frac{110}{60} + \frac{54}{60}$$

$$= \frac{164}{60}$$

$$= \frac{41}{15}$$

$$= 2\frac{11}{15}$$

### Question 13

$$1\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{p}{12}$$

Work out the value of  $p$ .

**Show all your working.**

[2]

Write as top-heavy fractions

$$\frac{3}{2} + \frac{1}{3} + \frac{1}{4}$$

Convert all to twelfths

$$\frac{18}{12} + \frac{4}{12} + \frac{3}{12}$$

$$= \frac{25}{12}$$

$$\rightarrow p = 25$$

# Working with Fractions

## Difficulty: Easy

### Model Answers 3

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Working with Fractions
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 3

**Time allowed:** 36 minutes

**Score:** /28

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Without using your calculator, work out the following.

Show all the steps of your working and give each answer as a fraction in its simplest form.

(a)  $\frac{11}{12} - \frac{1}{3}$

[2]

Convert everything to twelfths

$$\frac{11}{12} - \frac{1}{3} \times \frac{4}{4}$$

$$= \frac{11}{12} - \frac{4}{12}$$

$$= \frac{7}{12}$$

(b)  $\frac{1}{4} \div \frac{11}{13}$

[2]

Flip the fraction

$$\frac{1}{4} \times \frac{13}{11}$$

$$= \frac{13}{44}$$

## Question 2

Write down all the working to show that  $\frac{\frac{3}{5} + \frac{2}{3}}{\frac{3}{5} \times \frac{2}{3}} = 3\frac{1}{6}$  [3]

To add up 2 fractions, we need them to have the denominator. In our case, to obtain that, we can multiply the first fraction by 3 and the second fraction by 5. The common denominator of both fractions will be 15.

To multiply 2 fractions we multiply the numerators and the denominators obtaining a new fraction:

$$\frac{\frac{3}{5} + \frac{2}{3}}{\frac{3}{5} \times \frac{2}{3}} = \frac{\frac{9}{15} + \frac{10}{15}}{\frac{6}{15}}$$

$$\frac{\frac{3}{5} + \frac{2}{3}}{\frac{3}{5} \times \frac{2}{3}} = \frac{\frac{19}{15}}{\frac{6}{15}}$$

$$\frac{\frac{3}{5} + \frac{2}{3}}{\frac{3}{5} \times \frac{2}{3}} = \frac{19}{6}$$

$$\frac{19}{6} = \frac{6 \times 3 + 1}{6}$$

$$\frac{19}{6}$$

$$= 18\frac{1}{6}$$

### Question 3

Jiwan incorrectly wrote  $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} = 1\frac{3}{9}$ .

Show the correct working and write down the answer as a mixed number.

[3]

To add up fractions, we need to have all of them with the same denominator.

To obtain that, we multiply  $\frac{1}{2}$  by 6,  $\frac{1}{3}$  by 4 and  $\frac{1}{4}$  by 3, resulting in the common denominator 12. We also multiply the first term by 12 to have all numbers in the same form.

$$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{12}{12} + \frac{6}{12} + \frac{4}{12} + \frac{3}{12}$$

$$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{12+6+4+3}{12}$$

$$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{25}{12}$$

$$= 2\frac{1}{12}$$

$$(2 \times 12 + 1 = 25)$$

## Question 4

Show that  $3^{-2} + 2^{-2} = \frac{13}{36}$ .

Write down all the steps of your working.

[2]

$$3^{-2} + 2^{-2} = \frac{13}{36}$$

$$3^{-1 \times 2} + 2^{-1 \times 2} = \frac{13}{36}$$

To raise a fraction to the power of -1:

$$\left(\frac{a}{b}\right)^{-1} = \frac{b}{a}$$

In our case:

$$3^{-1 \times 2} = \left(\frac{1}{3}\right)^2$$

And

$$2^{-1 \times 2} = \left(\frac{1}{2}\right)^2$$

$$\frac{1}{9} + \frac{1}{4} = \frac{13}{36}$$

To add up 2 fractions, we need both of them to have the same denominator.

To obtain that, we multiply the first fraction by 4 and the second one by 9.

$$\frac{4}{9 \times 4} + \frac{9}{4 \times 9} = \frac{13}{36}$$

$$\frac{4}{36} + \frac{9}{36} = \frac{13}{36}$$

$$\frac{13}{36} = \frac{13}{36}$$

## Question 5

Show that

$$1\frac{5}{9} \div 1\frac{7}{9} = \frac{7}{8}$$

Write down all the steps in your working.

[2]

We convert from mixed number to simple fraction

$$1\frac{5}{9} = \frac{9}{9} + \frac{5}{9} = \frac{14}{9}$$

$$1\frac{7}{9} = \frac{9}{9} + \frac{7}{9} = \frac{16}{9}$$

Dividing two fractions is identical to multiplying them with the second fraction flipped (swap numerator and denominator.)

$$\frac{14}{9} \div \frac{16}{9} = \frac{14}{9} \times \frac{9}{16}$$

Cancel out the common factor of 9.

$$1\frac{5}{9} \div 1\frac{7}{9} = \frac{14}{16}$$

Numbers 14 and 16 have a common factor 2, therefore we can simplify the fraction further.

$$1\frac{5}{9} \div 1\frac{7}{9} = \frac{14}{16} = \frac{7 \times 2}{8 \times 2}$$

Hence we have the final answer.

$$1\frac{5}{9} \div 1\frac{7}{9} = \frac{7}{8}$$

## Question 6

(a) Find the value of  $x$  when  $\frac{18}{24} = \frac{27}{x}$ . [1]

Write the original equation:

$$\frac{18}{24} = \frac{27}{x}$$

Multiply both sides by  $x$ .

$$\frac{18x}{24} = 27$$

Multiply both sides by  $24/18$ .

$$x = 27 \times \frac{24}{18}$$

Calculate the value of  $x$ .

$$x = 36$$

(b) Show that  $\frac{2}{3} \div 1\frac{1}{6} = \frac{4}{7}$ .

Write down all the steps in your working.

[2]

Write the original equation:

$$\frac{2}{3} \div 1\frac{1}{6}$$

We convert from mixed number to simple fraction

$$1\frac{1}{6} = \frac{6}{6} + \frac{1}{6} = \frac{7}{6}$$

Dividing two fractions is identical to multiplying them with the second fraction flipped  
(swap numerator and denominator.)

$$\frac{2}{3} \div \frac{7}{6} = \frac{2}{3} \times \frac{6}{7}$$

Cancel out the common factor of 3.

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

$$\frac{2}{3} \times \frac{6}{7} = \frac{4}{7}$$

This equals the right hand side, therefore we have the final answer:

$$\frac{2}{3} \div 1\frac{1}{6} = \frac{4}{7}$$

## Question 7

Show that  $\frac{7}{27} + 1\frac{7}{9} = 2\frac{1}{27}$ .

Write down all the steps in your working.

[2]

Convert everything to just fractions, no mixed numbers

$$\frac{7}{27} + \frac{16}{9} = \frac{55}{27}$$

Multiply top and bottom of middle fraction (16/9) by 3 so

all denominators are the same

$$\frac{7}{27} + \frac{48}{27}$$

$$= \frac{7 + 48}{27}$$

$$= \frac{55}{27}$$

## Question 8

Write down the number which is 3.6 less than  $-4.7$ .

[1]

.  $-4.7 - 3.6$

$= -8.3$

## Question 9

Show that  $3\frac{3}{4} + 1\frac{1}{3} = 5\frac{1}{12}$ .

Write down all the steps in your working.

[2]

Convert everything to fractions, not mixed numbers

$$\frac{15}{4} + \frac{4}{3} = \frac{61}{12}$$

Cross multiplying the LHS

$$\frac{45}{12} + \frac{16}{12}$$

$$= \frac{61}{12}$$

## Question 10

Write as a single fraction  $\frac{3a}{8} + \frac{4}{5}$ . [2]

Cross multiply

$$\frac{5 \times 3a + 8 \times 4}{8 \times 5}$$

$$= \frac{15a + 32}{40}$$

## Question 11

(a)  $\frac{2}{3} + \frac{5}{6} = \frac{x}{2}$ .

Find the value of  $x$ .

[1]

$$\frac{2}{3} + \frac{5}{6} = \frac{x}{2}$$

To sum up the 2 fractions they need to have the same denominator. We multiply the first one by 6 and the second one by 3. We also multiply the other side of the equality by 9 to obtain the same denominator, 18.

$$\frac{12}{18} + \frac{15}{18} = \frac{9x}{18}$$

$$9x = 27$$

$$x = 3$$

(b)  $\frac{5}{3} \div \frac{3}{y} = \frac{40}{9}$ .

[1]

Find the value of  $y$ .

$$\frac{5}{3} \div \frac{3}{y} = \frac{40}{9}$$

$$\frac{5}{3} \times \frac{y}{3} = \frac{5y}{9} = \frac{40}{9}$$

$$5y = 40$$

$$y = 8$$

## Question 12

Work out the value of

$$\frac{-\frac{1}{2} - \frac{3}{8}}{-\frac{1}{2} + \frac{3}{8}}. \quad [2]$$

Rather than simplify the top and simplify the bottom it is easier to get rid of the

little fractions by multiplying every term on the top and the bottom by 8:

(This doesn't change the fraction as we are essentially multiplying the whole thing by  $\frac{8}{8} = 1$ )

$$\frac{-\frac{1}{2} - \frac{3}{8}}{-\frac{1}{2} + \frac{3}{8}} = \frac{-\frac{1}{2} \times 8 - \frac{3}{8} \times 8}{-\frac{1}{2} \times 8 + \frac{3}{8} \times 8}$$

$$= \frac{-4 - 3}{-4 + 3}$$

$$= \frac{-7}{-1}$$

$$= 7$$

# Working with Fractions

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Working with Fractions
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 36 minutes

**Score:** /28

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

**Without using a calculator,** work out  $1\frac{2}{3} - \frac{11}{15}$ .

Write down all the steps of your working and give your answer as a fraction in its lowest terms.

[3]

Convert to top heavy fractions

$$\frac{5}{3} - \frac{11}{15}$$

$$= \frac{25}{15} - \frac{11}{15}$$

$$= \frac{14}{15}$$

**Question 2**~~Assembled by AS.~~

- (a) Write  $\frac{11}{3}$  as a mixed number.

[1]

$$3\frac{2}{3}$$

- (b) **Without using a calculator**, work out  $\frac{1}{4} + \frac{5}{12}$ .

Show all the steps of your working and give your answer as a fraction in its lowest terms.

[2]

$$\begin{aligned}\frac{1}{4} \times \frac{3}{3} + \frac{5}{12} \\&= \frac{3}{12} + \frac{5}{12} \\&= \frac{8}{12} \\&= \frac{2}{3}\end{aligned}$$

### Question 3

**Without using a calculator**, work out  $1\frac{2}{3} + \frac{5}{7}$ .

Write down all the steps of your working and give your answer as a mixed number in its simplest form. [3]

Convert mixed number into top heavy fraction

$$\begin{aligned}1\frac{2}{3} &= \frac{3}{3} + \frac{2}{3} \\&= \frac{5}{3}\end{aligned}$$

The sum is now

$$\frac{5}{3} + \frac{5}{7}$$

Cross multiply to get the same denominator

$$\begin{aligned}&\frac{5 \times 7 + 5 \times 3}{3 \times 7} \\&= \frac{50}{21} \\&= 2\frac{8}{21}\end{aligned}$$

## Question 4

**Without using your calculator,** work out  $\frac{11}{12} - \left( \frac{3}{4} - \frac{2}{3} \right)$ .

You must show all your working and give your answer as a fraction in its simplest form.

[4]

Convert everything to 12ths

$$\frac{11}{12} - \left( \frac{9}{12} - \frac{8}{12} \right)$$

$$= \frac{11}{12} - \left( \frac{1}{12} \right)$$

$$= \frac{10}{12}$$

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

## Question 5

**Without using your calculator,** work out  $3\frac{1}{3} \div 2\frac{1}{2}$ .

You must show all your working and give your answer as a mixed number in its simplest form.

[3]

First of all we should turn these mixed fractions into top heavy fractions:

$$3\frac{1}{3} \div 2\frac{1}{2} = \frac{10}{3} \div \frac{5}{2}$$

Now we can swap from division to multiplication, by flipping the second fraction.

$$= \frac{10}{3} \times \frac{2}{5}$$

Then we can cross-cancel the 5 and the 10:

$$= \frac{2}{3} \times \frac{2}{1}$$

Which gives us finally:

$$= \frac{4}{3}$$

$$= 1\frac{1}{3}$$

## Question 6

Without using a calculator, work out  $\frac{6}{7} \div 1\frac{2}{3}$ .

Show all your working and give your answer as a fraction in its lowest terms. [3]

We should first write the mixed number as a top-heavy fraction

$$\begin{aligned}1\frac{2}{3} &= \frac{3}{3} + \frac{2}{3} \\&= \frac{5}{3}\end{aligned}$$

Dividing by a fraction is simplified by swapping the top and bottom and multiplying, like so

$$\begin{aligned}\frac{6}{7} \div \frac{5}{3} &= \frac{6}{7} \times \frac{3}{5} \\&= \frac{3 \times 6}{7 \times 5} \\&= \frac{\mathbf{18}}{35}\end{aligned}$$

## Question 7

Without using a calculator, show that  $\left(\frac{49}{16}\right)^{-\frac{3}{2}} = \frac{64}{343}$ .

Write down all the steps in your working.

[2]

Apply the power outside the brackets to everything inside the bracket

$$\left(\frac{49}{16}\right)^{-\frac{3}{2}} = \frac{49^{-\frac{3}{2}}}{16^{-\frac{3}{2}}}$$

The power  $\frac{1}{2}$  means take the square root

$$= \frac{(\sqrt{49})^{-3}}{(\sqrt{16})^{-3}} = \frac{7^{-3}}{4^{-3}}$$

Negative power means take the inverse

$$= \frac{4^3}{7^3}$$

$$= \frac{\mathbf{64}}{\mathbf{343}}$$

## Question 8

Write  $\frac{1}{c} + \frac{1}{d} - \frac{c-d}{cd}$  as a single fraction in its simplest form. [3]

We multiply the first fraction by d and the second one by c to obtain the same denominator, cd.

$$\frac{1}{c} + \frac{1}{d} - \frac{c-d}{cd} = \frac{d}{cd} + \frac{c}{cd} - \frac{c-d}{cd}$$

$$\frac{1}{c} + \frac{1}{d} - \frac{c-d}{cd} = \frac{d+c-c+d}{cd}$$

$$\frac{1}{c} + \frac{1}{d} - \frac{c-d}{cd} = \frac{2d}{cd} = \frac{2}{c}$$

## Question 9

Work out the value of  $1 + \frac{2}{3 + \frac{4}{5+6}}$ . [2]

Work out the lower fractions first

$$\frac{4}{5+6} = \frac{4}{11}$$

$$\rightarrow 3 + \frac{4}{5+6}$$

$$= 3 + \frac{4}{11}$$

$$= \frac{37}{11}$$

Hence the fraction is

$$1 + 2 \times \frac{11}{37}$$

$$= \frac{37}{37} + \frac{22}{37}$$

$$= \frac{59}{37} = 1\frac{22}{37}$$

## Question 10

$$\frac{4c}{5} - \frac{3c}{35} = \frac{10}{7}. \quad \text{Find } c. \quad [2]$$

Put everything over 35. (ie. common denominator.)

$$\frac{7 \times 4c}{35} - \frac{3c}{35} = 5 \times \frac{10}{35}$$

$$\rightarrow \frac{25c}{35} = \frac{50}{35}$$

$$\rightarrow 25c = 50$$

$$\rightarrow c = 2$$

# Bounds

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Bounds
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 37 minutes

**Score:** /29

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

The length of a car is 4.2 m, correct to 1 decimal place.

Write down the upper bound and the lower bound of the length of this car.

[2]

Bounds: “Half Down, Half Up”

Look at the last figure and apply this rule to the 2:

Bounds for the car length: **LB = 4.15, UB = 4.25**

## Question 2

The sides of an equilateral triangle are 9.4 cm, correct to the nearest millimetre.

Work out the upper bound of the perimeter of this triangle.

[2]

The sides, written in millimetres, are

$$9.4\text{cm}=94\text{mm}$$

These are correct to the nearest millimetre, so this means the sides could be as large as

$$94.5\text{mm}$$

The upper bound of the perimeter is worked out by taking the maximum possible side length, and multiplying it by 3. This is:

$$3 \times 94.5\text{cm}$$

$$P=28.35\text{cm}$$

### Question 3

A metal pole is 500cm long, correct to the nearest centimetre.

The pole is cut into rods each of length 5.8 cm, correct to the nearest millimetre.

Calculate the largest number of rods that the pole can be cut into.

[3]

The number of rods is equal to the total length of the metal pole divided by the length

of the individual rods. To achieve the maximum value of this fraction, consider the

rounding of each length. 500cm is correct to the nearest cm, therefore it can be said

that the maximum possible length of the metal pole will be  $500.49999\text{cm} \approx 500.5\text{cm}$ .

The individual rod length should be the minimum, as it is the denominator of the fraction, and so the minimum possible value considering the rounding accuracy to the nearest mm, is 5.75cm.

Dividing these values will give:

$$500.5 \div 5.75$$

$$= 87.04 \approx 87$$

## Question 4

A rectangle has length 5.8cm and width 2.4cm, both correct to 1 decimal place.

Calculate the lower bound and the upper bound of the perimeter of this rectangle. [3]

The perimeter of a rectangle can be calculated by summing twice the length and twice the width of the rectangle.

The length of the rectangle is 5.8cm, correct to 1 decimal place, which means:

- the upper bound is 5.85cm
- the lower bound is 5.75cm.

The width of the rectangle is 2.4cm, correct to 1 decimal place, which means:

- the upper bound is 2.45cm
- the lower bound is 2.35cm.

In order to get the lower bound, we sum the lower bounds of the length and width.

$$\text{lower bound} = 2 \times 5.75\text{cm} + 2 \times 2.35\text{cm}$$

$$\text{lower bound} = \mathbf{16.2\text{ cm}}$$

Similarly, to get the upper bound, we sum the upper bounds.

$$\text{upper bound} = 2 \times 5.85\text{cm} + 2 \times 2.45\text{cm}$$

$$\text{upper bound} = \mathbf{16.6\text{ cm}}$$

## Question 5

One year ago Ahmed's height was 114 cm.  
Today his height is 120 cm.  
Both measurements are correct to the nearest centimetre.

Work out the upper bound for the increase in Ahmed's height. [2]

The increase in Ahmed's height is:

$$\text{today height} - \text{one year ago}$$

To get the greatest possible difference (upper bound), we need the first number to be as big as possible (upper bound) and the second number to be as small as possible (lower bound).

The height a year ago is 114 cm, correct to the nearest centimetre, so the lower bound is 113.5 cm

The height today is 120 cm, correct to the nearest centimetre, so the upper bound is 120.5 cm

The upper bound on the increase:

$$\begin{aligned} & 120.5\text{cm} - 113.5\text{cm} \\ & = 7\text{cm} \end{aligned}$$

## Question 6

The length,  $l$  metres, of a football pitch is 96m, correct to the nearest metre.

Complete the statement about the length of this football pitch.

[2]

**95.5  $\leq l < 96.5$**

## Question 7

The length,  $p$  cm, of a car is 440 cm, correct to the nearest 10 cm.

Complete the statement about  $p$ .

[2]

The length,  $p$ , must be greater than or equal to 435 as all numbers between that and 440 will round up to 440.

$p$  must be less than 445 as numbers lower than 445, and above 440, will round to 440.

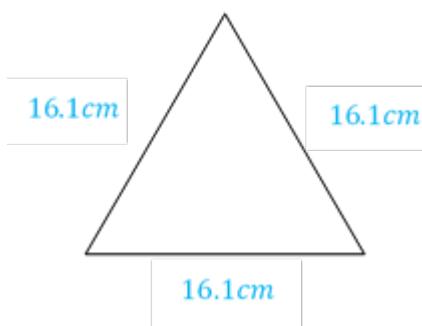
$$435 \leq p < 445$$

## Question 8

An equilateral triangle has sides of length 16.1cm, correct to the nearest millimetre.

Find the lower and upper bounds of the perimeter of the triangle.

[2]



An equilateral triangle has all sides and angles equal.

We know that each side is 16.1cm to the nearest mm. This means that, each side could be between 16.15cm and 16.05cm.

We can therefore calculate:

The minimum perimeter is:

$$16.05 + 16.05 + 16.05$$

$$= 48.15\text{cm}$$

And the maximum perimeter is:

$$16.15 + 16.15 + 16.15$$

$$= 48.45\text{cm}$$

## Question 9

A large water bottle holds 25 litres of water correct to the nearest litre.  
A drinking glass holds 0.3 litres correct to the nearest 0.1 litre.

Calculate the lower bound for the number of glasses of water which can be filled from the bottle. [3]

We need the smallest possible number of glasses of water.

This means we need the large water bottle to be holding the smallest possible amount and for each glass to be holding the largest possible amount.

$$\text{bottle} = 24.5l$$

$$\text{glass} = 0.35l$$

Now divide

$$24.5 \div 0.35$$

$$= 70$$

## Question 10

A carton contains 250 ml of juice, correct to the nearest millilitre.

Complete the statement about the amount of juice,  $j$  ml, in the carton.

[2]

**249.5 ≤  $j$  < 250.5**

## Question 11

The sides of a rectangle are 6.3 cm and 4.8cm, each correct to 1 decimal place.

Calculate the upper bound for the area of the rectangle.

[2]

Upper bound of the sides are

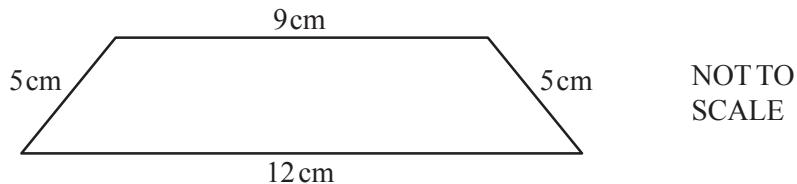
$$6.35, \quad 4.85$$

Hence the upper bound for the area is

$$A_{ub} = 6.35 \times 4.85$$

$$= 30.7975$$

## Question 12



The diagram shows a quadrilateral.

The lengths of the sides are given to the nearest centimetre.

Calculate the upper bound of the perimeter of the quadrilateral.

[2]

The upper bound of all the sides are

$$5.5, 12.5, 9.5, 5.5$$

Hence the upper bound for the perimeter is

$$12.5 + 5.5 + 5.5 + 9.5$$

$$= 33$$

## Question 13

The cost of making a chair is \$28 correct to the nearest dollar.

Calculate the lower and upper bounds for the cost of making 450 chairs.

[2]

We represent the cost for one chair with the unknown  $x$ , with its real value in the interval.

The lower bound is the smallest value that would round up to the estimated value, in this case, \$27.5 is the smallest value which can be approximated to \$28.

The upper bound is the smallest value that would round up to the next estimated value, in this case, \$28.5 is the smallest value which can be approximated to \$29.

$$\$27.5 \leq x < \$28.5$$

We work out the cost interval for 450 chairs =  $450x$

$$450 \times \$27.5 \leq 450x < 450 \times \$28.5$$

$$\$12375 \leq 450x < \$12825$$

**Lower bound: \$12375**

**Upper bound: \$12825**

# Bounds

## Difficulty: Easy

### Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Bounds
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 2

**Time allowed:** 40 minutes

**Score:** /31

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

The population of a city is 128 000, correct to the nearest thousand.

- (a) Write 128 000 in standard form.

[1]

A number in standard form is represented as:

$a \times 10^n$  where  $n$  is an integer and  $1 \leq a < 10$ .

For 128000 we can write is as:

**128000**

**=  $1.28 \times 10^5$**

For which  $a = 1.28$ ,  $1 \leq 1.28 < 10$  and  $n = 5$ .

- (b) Write down the upper bound of the population.

[1]

The upper bound represents the smallest number that would round up to the next estimated value.

For 128000 the upper bound would be

**128500,**

the smallest number which can be round up to 129000.

## Question 2

Helen measures a rectangular sheet of paper as 197 mm by 210 mm, each correct to the nearest millimetre.

Calculate the upper bound for the perimeter of the sheet of paper.

[2]

The upper bound is found by adding half of the precision to the measured value.

In our case, the values are measured to the nearest millimetre, so to get the

upper bounds, we are adding 0.5mm.

$$a = 197\text{mm} + 0.5\text{mm} = 197.5\text{mm}$$

$$b = 210\text{mm} + 0.5\text{mm} = 210.5\text{mm}$$

Perimeter of a rectangle with sides  $a$  and  $b$  is given by:

$$\text{perimeter} = 2(a + b)$$

The upper bound of the perimeter:

$$\text{perimeter (upper bound)} = 2(197.5\text{mm} + 210.5\text{mm})$$

$$\text{perimeter (upper bound)} = \mathbf{816\text{mm}}$$

### Question 3

The length of a side of a regular hexagon is 6.8 cm, correct to one decimal place.

Find the smallest possible perimeter of the hexagon.

[2]

The smallest the length of one side could be is 6.75 cm.

It's a regular hexagon so the perimeter is

$$6 \times 6.75$$

$$= 40.5$$

## Question 4

A fence is made from 32 identical pieces of wood, each of length 2 metres correct to the nearest centimetre.

Calculate the lower bound for the total length of the wood used to make this fence.

Write down your full calculator display.

[3]

. Lower bound for one piece

$$199.5 \text{ cm}$$

$$= 1.995 \text{ m}$$

Hence total lower bound is

$$32 \times 1.995$$

$$= 63.84 \text{ m}$$

## Question 5

The length of each side of an equilateral triangle is 74 mm, correct to the nearest millimetre.

Calculate the smallest possible perimeter of the triangle.

[2]

Minimum length of each side

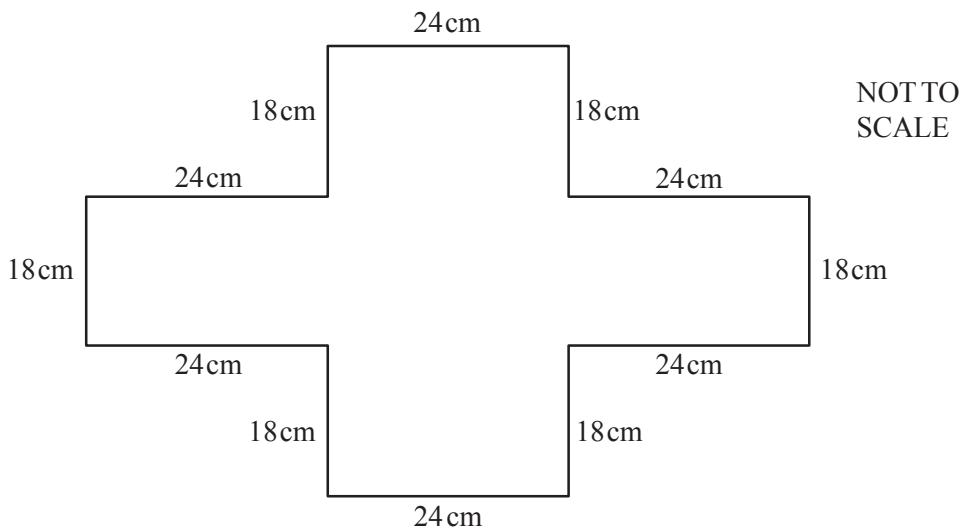
$$l = 73.5 \text{ mm}$$

Hence minimum perimeter is

$$3 \times 73.5$$

$$= 220.5$$

## Question 6



Each of the lengths 24 cm and 18 cm is measured correct to the nearest centimetre.  
Calculate the upper bound for the perimeter of the shape.

[3]

To calculate the upper bound for the perimeter of the whole shape, we must sum the upper bound of each side length. The upper bounds for the lengths are as follows:

Upper bound of 24 = 24.5

Upper bound of 18 = 18.5

The upper bound for the perimter is then  $6 \times 24.5 + 6 \times$

$$18.5 = 6 \times (24.5 + 18.5) = 6(43)$$

Hence the answer is:

**258 cm**

## Question 7

In 2005 there were 9 million bicycles in Beijing, correct to the nearest million.

The average distance travelled by each bicycle in one day was 6.5 km correct to one decimal place.

Work out the upper bound for the **total** distance travelled by all the bicycles in one day.

[2]

The lengths are measured correct to the nearest million, giving 9 million and 6.5 km,

correct to the nearest decimal place. The actual numbers are:

$$8\ 500\ 000 \leq 9\ 000\ 000 < 9\ 500\ 000$$

$$6.45 \text{ km} \leq 6.5 \text{ km} < 6.55 \text{ km}$$

The upper bound of a value represents the first value which is not rounded up to that value.

For example, for our values, 9 500 000 and 6.55 km

The upper bound of the distance is calculated using the upper bound of the numbers above:

$$P = 6.55 \text{ km} \times 9\ 500\ 000$$

$$\mathbf{P = 62\ 225\ 000}$$

## Question 8

Angharad sleeps for 8 hours each night, correct to the nearest 10 minutes.  
The total time she sleeps in the month of November (30 nights) is  $T$  hours.  
Between what limits does  $T$  lie?

[2]

8 hours correct to the nearest 10 minutes represent the

interval:

$$7.55 \text{ hours} \leq 8 \text{ hours} < 8.05 \text{ hours}$$

We multiply by 30 to obtain T for 30 nights.

$$237.5 \text{ hours} \leq 240 \text{ hours} < 242.5 \text{ hours}$$

## Question 9

To raise money for charity, Jalaj walks 22 km, correct to the nearest kilometre, every day for 5 days.

- (a) Complete the statement in the answer space for the distance,  $d$  km, he walks in one day. [2]

To correct the distance to the nearest km to 22 km, the initial value,  $d$ , needs to be included in the following interval:

$$21.5 \text{ km} \leq d < 22.5 \text{ km}$$

- (b) He raises \$1.60 for every kilometre that he walks.

Calculate the least amount of money that he raises at the end of the 5 days. [1]

To calculate the least amount of money that he earns, we assume that everyday he walks the least amount of km which can still be correct to 22 km.

This value is 21.5 km.

At the end of the 5 days, the distance he walks is:

$$21.5 \text{ km} \times 5 = 107.5 \text{ km}$$

Using this value, the least amount of money earned is:

$$107.5 \text{ km} \times \$1.60/\text{km}$$

$$= \$172$$

## Question 10

A square has sides of length  $d$  metres.  
This length is 120 metres, correct to the nearest 10 metres.

- (a) Complete the statement in the answer space.

[1]

The interval represents the smallest and largest number possible which still can  
be correct to the nearest 10 m to 120 m.

$$115 \leq d < 125$$

- (b) Calculate the difference between the largest and the smallest possible areas of the square. [2]

The area of a square is  $A = \text{side}^2$ .

For the largest possible area of the square we need to assume that the side is the  
largest possible while still being correct to the nearest 10 meters to 120 m.

For side = 115 m,

$$A = 115^2 \text{ m}^2$$

$$A = 13225 \text{ m}^2$$

For side = 125 m,

$$A = 125^2 \text{ m}^2$$

$$A = 15625 \text{ m}^2$$

The difference between them is:

$$15625 \text{ m}^2 - 13225 \text{ m}^2$$

$$= 2400 \text{ m}^2$$

## Question 11

The population,  $P$ , of a small island was 6380, correct to the nearest 10.  
Complete the statement about the limits of  $P$ .

To find the limits (bounds) of  $P$  we go “half down, half up” (half of 10)

[2]

so

$$6380 - 5 < P < 6380 + 5$$

$$\mathbf{6375 < P < 6385}$$

## Question 12

- (a) 32 493 people were at a football match.  
Write this number to the nearest thousand.

[1]

493 < 500, therefore, the nearest thousand would be

**3200.**

- (b) At another match there were 25 500 people, to the nearest hundred.  
Complete the inequality about  $n$ , the number of people at this match.

[2]

To have 500 as the nearest hundred, the last 3 digits of  
the number need to be higher than or equal to 450 and  
strictly lower than 550.

**$25\ 450 \leq n < 25\ 550$**

## Question 13

A rectangular field is 18 metres long and 12 metres wide.

Both measurements are correct to the nearest metre.

Work out exactly the smallest possible area of the field.

[2]

Correct to the nearest meter:

$$17.5 \text{ m} \leq 18 \text{ m} < 18.5 \text{ m}$$

$$11.5 \text{ m} \leq 12 \text{ m} < 12.5 \text{ m}$$

The smallest area is worked out by using the smallest measurements within the 2

intervals.

$$A = 11.5 \text{ m} \times 17.5 \text{ m}$$

$$\mathbf{A = 201.25 \text{ m}^2}$$

# Bounds

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Bounds
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 37 minutes

**Score:** /29

**Percentage:** /100

#### Grade Boundaries:

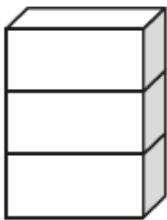
##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1



NOT TO  
SCALE

The diagram shows three identical cuboids in a tower.  
The height of one cuboid is 6.5 cm, correct to the nearest millimetre.

Work out the upper bound of the height of the tower.

[2]

Upper bound of the height of one block = 6.55 cm

Hence, height of tower is

$$3 \times 6.55$$

$$= 19.65$$

## Question 2

The sides of a triangle are 5.2 cm, 6.3 cm and 9.4 cm, each correct to the nearest millimetre.

Calculate the lower bound of the perimeter of the triangle.

[2]

Lower bound of each side is

5.15, 6.25, 9.35

Hence

$$P_{lb} = 5.15 + 6.25 + 9.35$$

$$= 20.75$$

### Question 3

A rectangle has length 62 mm and width 47 mm, both correct to the nearest millimetre.  
The area of this rectangle is  $A$  mm<sup>2</sup>.

Complete the statement about the value of  $A$ .

[3]

Lower bounds are

$$\text{width} = 46.5$$

$$\text{length} = 61.5$$

$$\text{area} = 2859.75$$

Upper bounds are

$$\text{width} = 47.5$$

$$\text{length} = 62.5$$

$$\text{area} = 2968.75$$

Hence

$$\mathbf{2859.75 \leq A < 2968.75}$$

## Question 4

The length of a rectangle is 9.3cm, correct to 1 decimal place.  
Its width is 7.7 cm, correct to 1 decimal place.

Write down the lower bound and the upper bound for the area of the rectangle.

[3]

$$\text{length} = 9.3\text{cm} \text{ (1. d. p)}$$

So length could vary from 9.25cm to 9.35cm, and still round to 9.3cm.

$$\text{width} = 7.7\text{cm} \text{ (1. d. p)}$$

So width could vary from 7.65cm to 7.75cm, and still round to 7.7cm.

To find the upper bound on area, we need to use the biggest values possible:

$$\text{maximum area} = 9.35\text{cm} \times 7.75\text{cm}$$

$$\text{maximum area} = 72.4625\text{cm}^2$$

To find the lower bound on area, we need to use the lowest possible values:

$$\text{minimum area} = 9.25\text{cm} \times 7.65\text{cm}$$

$$\text{minimum area} = 70.7625\text{cm}^2$$

## Question 5

The sides of a square are 8 cm, correct to the nearest centimetre.

Calculate the upper bound for the area of the square.

[2]

Bounds: “Half Down, Half Up”

Always find bounds before doing calculations.

Bounds for the side length: LB = 7.5, UB = 8.5

$$\text{UB for Area} = (\text{UB for Side}) \times (\text{UB for Side})$$

$$= 8.5 \times 8.5$$

$$= 72.25 \text{ cm}^2$$

## Question 6

(a)  $V = IR$

In an experiment  $I$  and  $R$  are both measured correct to 1 decimal place.

When  $I = 4.0$  and  $R = 2.7$ , find the **lower** bound for  $V$ .

[2]

The lower bound for  $V$  means we want  $I$  and  $R$  to be as low as possible. This means they can be

$$I = 3.95$$

$$R = 2.65$$

Hence

$$V = 3.95 \times 2.65$$

$$= 10.4675$$

(b)  $S = \frac{D}{T}$

In an experiment  $D$  and  $T$  are both measured correct to 2 significant figures.

When  $D = 7.6$  and  $T = 0.23$ , find the **upper** bound for  $S$ .

[2]

For the upper bound for  $S$  we want  $D$  to be as large as possible and  $T$  to be as small as possible. This means they can be

$$D = 7.65$$

$$T = 0.225$$

Hence

$$S = 7.65 \div 0.225$$

$$= 34$$

## Question 7

The volume of a cuboid is  $878 \text{ cm}^3$ , correct to the nearest cubic centimetre.  
The length of the base of the cuboid is  $7 \text{ cm}$ , correct to the nearest centimetre.  
The width of the base of the cuboid is  $6\text{cm}$ , correct to the nearest centimetre.

Calculate the lower bound for the height of the cuboid.

[3]

The volume of a cuboid is given as a product of its sides.

$$V = a \times b \times c$$

Where  $V$  is the volume and  $a,b,c$  are the sides.

Let  $c$  be the unknown height.

Divide both sides of the equation by  $ab$ .

$$c = \frac{V}{a \times b}$$

In order to find the lower bound of the height, the numerator must be as small as possible (lower bound) and the denominator as large as possible (upper bound).

The volume  $V$  is  $878\text{cm}^3$ , correct to the nearest centimetre, so the lower bound is  $877.5\text{cm}^3$ .

The length  $a$  is  $7 \text{ cm}$ , correct to the nearest centimetre. The upper bound is  $a=7.5\text{cm}$ .

The width  $b$  is  $6 \text{ cm}$ , correct to the nearest centimetre. The upper bound is  $b=6.5\text{cm}$ .

Use the previous formula to calculate the lower bound for the height.

$$c = \frac{V}{a \times b} = \frac{877.5}{7.5 \times 6.5} \text{ cm}$$

$$\mathbf{c = 18\text{cm}}$$

## Question 8

Rice is sold in 75 gram packs and 120 gram packs.

The masses of both packs are given correct to the nearest gram.

Calculate the lower bound for the difference in mass between the two packs.

[2]

The difference in mass is:

$$\text{mass of large pack} - \text{mass of small pack}$$

To get the smallest possible difference (lower bound), we need the first number to be as small as possible (lower bound) and the second number to be as big as possible (upper bound).

The mass of the large pack is 120g, correct to the nearest gram, so the lower bound is 119.5g

The mass of the small pack is 75g, correct to the nearest gram, so the upper bound is 75.5g

The lower bound on the difference:

$$119.5g - 75.5g$$

$$= 44g$$

## Question 9

The mass of 1 cm<sup>3</sup> of copper is 8.5 grams, correct to 1 decimal place.

Complete the statement about the total mass,  $T$  grams, of 12cm<sup>3</sup> of copper. [2]

*lower limit = 8.45*

*upper limit = 8.55*

Hence for 12cm<sup>3</sup> we have (multiply the limits of 1cm<sup>3</sup> by

12)

$$\mathbf{101.4 \leq T < 102.6}$$

## Question 10

A rectangle has length 127.3 cm and width 86.5 cm, both correct to 1 decimal place.

Calculate the upper bound and the lower bound for the perimeter of the rectangle.

[3]

**Lower bounds for length and width**

$$w_{lb} = 86.45$$

$$l_{lb} = 127.25$$

**Upper bounds are**

$$w_{ub} = 86.55$$

$$l_{ub} = 127.35$$

**Hence for the perimeter, we have**

$$P_{ub} = 2 \times 86.55 + 2 \times 127.35 = 427.8$$

$$P_{lb} = 2 \times 86.45 + 2 \times 127.25 = 427.4$$

$$P_{ub} = 427.8$$

$$P_{lb} = 427.4$$

## Question 11

A circle has a radius of 8.5 cm correct to the nearest 0.1 cm.

The lower bound for the area of the circle is  $p\pi\text{cm}^2$ .

The upper bound for the area of the circle is  $q\pi\text{cm}^2$ .

Find the value of  $p$  and the value of  $q$ .

[3]

**Area of circle:**

$$\text{Area} = \pi r^2$$

$$= \pi(8.5)^2$$

$$= 72.25\pi$$

We will only round to 8.5cm nearest 0.1cm if the value in cm is within the

range of **8.45 to 8.55**.

Take  $r = 0.845\text{cm}$ ,

$$\text{Area} = \pi(8.45^2)$$

$$= 71.4025\pi \text{ cm}^2$$

Now take  $r = 0.854\text{cm}$ ,

$$\text{Area} = \pi(8.55^2)$$

$$= 73.1025\pi \text{ cm}^2$$

Therefore,

$$\mathbf{p = 71.4025}$$

$$\mathbf{q = 73.1025}$$

# Bounds

## Difficulty: Hard

### Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Bounds
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 2

**Time allowed:** 35 minutes

**Score:** /27

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

### **Question 1**

~~Assembled by A/S~~

Joe measures the side of a square correct to 1 decimal place.  
He calculates the **upper** bound for the area of the square as  $37.8225 \text{ cm}^2$ .

Work out Joe's measurement for the side of the square.

[2]

The upper bound represents the smallest value that could be rounded up to the next estimated value. In this case, if the upper bound is  $37.8225$ , the estimated measurement can be between  $37.8215 \text{ cm}^2$  and  $37.8224 \text{ cm}^2$ .

The area of a square is equal to:

$$\text{Area} = \text{length of side}^2$$

Therefore, the measurement of the side is equal to the square root of the area.

$$\sqrt{37.8215} < \text{side} < \sqrt{37.8224}$$

$$\text{side} = 6.1499 \text{ cm}$$

The side is correct to 1 decimal place.

$$\text{side} = 6.1 \text{ cm}$$

## Question 2

The number of spectators at the 2010 World Cup match between Argentina and Mexico was 82 000 correct to the nearest thousand.  
If each spectator paid 2600 Rand ( $R$ ) to attend the game, what is the lower bound for the total amount paid?  
Write your answer in standard form. [3]

We need the lower band, so we need the number of spectators to be  
as small as possible.

$$\text{spectators} = 81500$$

$$\text{total} = 81500 \times 2600$$

$$= 211\,900\,000$$

$$= \mathbf{2.119 \times 10^8}$$

### Question 3

A rectangular photograph measures 23.3 cm by 19.7cm, each correct to 1 decimal place.  
Calculate the lower bound for

- (a) the perimeter, [2]

We want to find the lower bound. The lowest value which can be rounded up to 1dp as 23.3cm is 23.25cm (denoted asa). For 19.7cm, the lower bound is 19.65cm (denoted asb).

To find lower bound of the perimeter:

$$\text{perimeter} = 2a + 2b$$

$$\text{permieter} = 2 \times 23.25\text{cm} + 2 \times 19.65\text{cm}$$

$$\text{permieter} = 85.8 \text{ cm}$$

- (b) the area. [1]

To get the lower bound of the area, we multiply the two dimensions of the photograph.

$$\text{area} = a \times b$$

$$\text{area} = 23.25\text{cm} \times 19.65\text{cm}$$

$$\text{area} = 456.8625 \text{ cm}^2$$

## Question 4

Ashraf takes 1500 steps to walk  $d$  metres from his home to the station.  
Each step is 90 centimetres correct to the nearest 10 cm.

Find the lower bound and the upper bound for  $d$ .

[3]

It is useful to convert the steps into metres. Each step is 0.9m correct to  
nearest 0.1m.

To calculate the distance  $d$ , we multiply the number of steps and the  
length of a step.

$$d = \text{number of steps} \times \text{length of a step}$$

The upper bound of the length of a step is 0.95m

$$0.95m = 0.9m + \frac{0.1m}{2}$$

We use this in the calculation to find the upper bound on  $d$ .

$$d (\text{upper bound}) = 1500 \times 0.95m$$

$$\mathbf{d (\text{upper bound}) = 1425m}$$

Similarly, the lower bound of the length of a step is 0.85m

$$0.85m = 0.9m - \frac{0.1m}{2}$$

We use this in the calculation to find the lower bound on  $d$ .

$$d (\text{lower bound}) = 1500 \times 0.85m$$

$$\mathbf{d (\text{lower bound}) = 1275m}$$

## Question 5

When a car wheel turns once, the car travels 120 cm, correct to the nearest centimetre.

Calculate the lower and upper bounds for the distance travelled by the car when the wheel turns 20 times. [2]

The lower bound for one turn is 119.5 cm.

The upper bound is 120.5 cm.

For 20 turns we have

$$\text{lower bound} = 20 \times 119.5$$

$$= 2390 \text{ cm}$$

$$\text{upper bound} = 20 \times 120.5$$

$$= 2410 \text{ cm}$$

## Question 6

The side of a square is 6.3 cm, correct to the nearest millimetre.

The lower bound of the perimeter of the square is  $u$  cm and the upper bound of the perimeter is  $v$  cm.  
Calculate the value of

(a)  $u$ ,

[1]

Lower bound of one side is 6.25

$$u = 4 \times 6.25$$

$$= 25$$

(b)  $v - u$ .

[1]

Upper bound for one side is 6.35

$$v = 4 \times 6.35$$

$$= 25.4$$

$$\rightarrow v - u = 0.4$$

## Question 7

A rectangle has sides of length 6.1 cm and 8.1 cm correct to 1 decimal place.

Calculate the upper bound for the area of the rectangle as accurately as possible.

[2]

Upper bound on the side lengths are

6.15

8.15

Hence the upper bound on the area is

$$6.15 \times 8.15$$

$$= 50.1225$$

## Question 8

A rectangle has sides of length 6.1 cm and 8.1 cm correct to 1 decimal place.  
Complete the statement about the perimeter of the rectangle.

[3]

Lower bound for sides is

6.05

8.05

Upper bound for sides

6.15

8.15

Hence, we have the upper and lower bounds for the  
perimeter

$$2 \times 6.05 + 2 \times 8.05$$

$$= 28.2$$

$$2 \times 6.15 + 2 \times 8.15$$

$$= 28.6$$

$$\rightarrow 28.2 \leq \text{perimeter} < 28.6$$

## Question 9

Carmen spends 5 minutes, correct to the nearest minute, preparing one meal.  
She spends a total time of  $T$  minutes preparing 30 meals.  
Between what limits does  $T$  lie?

[2]

5 minutes correct to the nearest minute represent the range:

4.5 minutes  $\leq$  5 minutes  $<$  5.5 minutes

We multiply by 30 to obtain the T for 30 meals.

135 minutes  $\leq$  150 minutes  $<$  165 minutes

## Question 10

The distance between Singapore and Sydney is 6300 km correct to the nearest 100 km.  
A businessman travelled from Singapore to Sydney and then back to Singapore.  
He did this six times in a year.

Between what limits is the total distance he travelled?

[2]

The distance is 6300km correct to the nearest km. This represents

the interval:

6250 km < 6300 km < 6350 km

This distance is doubled by travelling there and back.

The distance for one complete trip is:

12500 km < 12600 km < 12700 km

This would happen 6 times a year, therefore, we multiply it by 6.

**75000 km < total distance travelled < 76200**

## Question 11

The length of a road is 380 m, correct to the nearest 10m .  
Maria runs along this road at an average speed of 3.9 m/s.  
This speed is correct to 1 decimal place.  
Calculate the greatest possible time taken by Maria.

[3]

**Speed = distance/time**

The greatest time would be in the case with the greatest  
distance to run and the lowest speed.

The distance is 380 m correct to the nearest 10 m.

$375 \text{ m} \leq 380 \text{ m} < 385 \text{ m}$

The speed is 3.9 m/s correct to 1 decimal place.

$3.85 \text{ m/s} \leq 3.9 \text{ m/s} < 3.95 \text{ m/s}$

The greatest time is obtained with 385 m distance and a  
speed of 3.85 m/s.

$$\text{Time} = \frac{385 \text{ m}}{3.85 \text{ m/s}}$$

**Time = 100 s**

# Ratios

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Ratios
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 37 minutes

**Score:** /29

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Ralf and Susie share \$57 in the ratio 2 : 1.

- (a) Calculate the amount Ralf receives.

[2]

When using ratios, create as many columns and rows as you

need and use Scale Factors to move between them:

Ralf : Susie : Total

$$\begin{array}{r:r:r} 2 & : & 1 & : & 3 \\ r & : & s & : & 57 \end{array}$$

Multiply by 19

$$r = 2 \times 19 \text{ [and } s = 1 \times 19]$$

$$\mathbf{r = \$38} \text{ [and } s = \$19]$$

- (b) Ralf gives \$2 to Susie.

Calculate the new ratio Ralf's money : Susie's money.

[2]

Give your answer in its simplest form.

Ralf : Susie

$$38 - 2 : 19 + 2$$

$$\begin{array}{r:r} 36 & : & 21 \\ 12 & : & 7 \end{array}$$

Divide both sides by 3

## Question 2

Pip and Ali share \$785 in the ratio Pip :Ali = 4 : 1.

Work out Pip's share.

[2]

The ratio 4:1 tells us that if we were to split 785 into 5 pieces (=4+1), Pip would get 4 pieces and Ali would get 1 piece. Therefore in order to work out the amount Pip receives, we divide the total by 5 and multiply by 4.

$$\frac{785}{5} \times 4$$

$$= 628$$

### Question 3

Ahmed and Babar share 240 g of sweets in the ratio 7:3.

Calculate the amount Ahmed receives.

[2]

The ratio 7:3 tells us that if we were to split 240g into 10 pieces (=7+3), Ahmed would get 7 pieces and Babar would get 3 pieces. Therefore in order to work out the amount Ahmed receives, we divide the total by 10 and multiply by 7.

$$\frac{240}{10} \times 3 = 168$$

Ahmed receives **168g** of sweets.

## Question 4

Ahmed, Batuk and Chand share \$1000 in the ratio 8:7:5.

Calculate the amount each receives.

[3]

The sum of the ratios is 20 (= 8+7+5). We divide the amount they share by this factor to

get the amount of “one unit”.

$$\frac{\$1000}{20} = \$50$$

In order to get the amount each of them receives, we simply multiply the “one unit” by the corresponding ration factor.

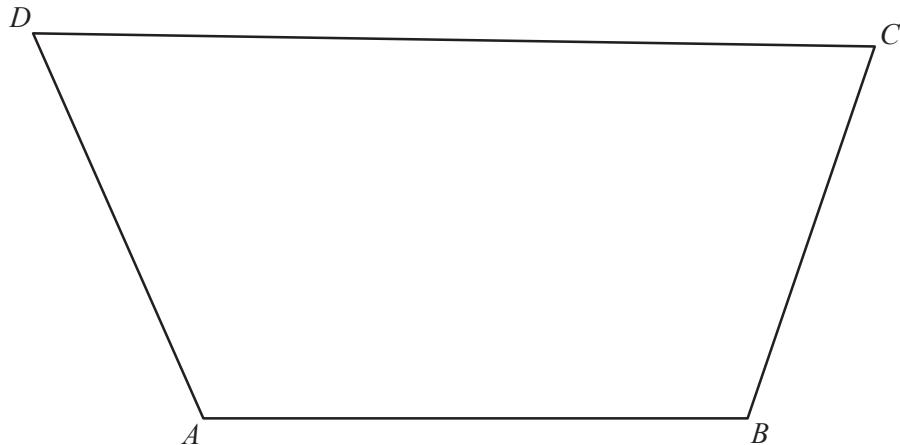
$$\text{Ahmed: } \$50 \times 8 = \mathbf{\$400}$$

$$\text{Batuk: } \$50 \times 7 = \mathbf{\$350}$$

$$\text{Chand: } \$50 \times 5 = \mathbf{\$250}$$

## Question 5

The diagram shows the plan,  $ABCD$ , of a park.  
The scale is 1 centimetre represents 20 metres.



Scale: 1 cm to 20 m

Find the actual distance  $BC$ .

[2]

Measure  $BC$  with a ruler as 5.2 cm.

Multiply by the scalar:

$$5.2 \times 20$$

$$= 104 \text{ m}$$

## Question 6

Hans draws a plan of a field using a scale of 1 centimetre to represent 15 metres.  
The actual area of the field is  $10\ 800\ m^2$ .

Calculate the area of the field on the plan.

[2]

1cm is 15 m therefore

$$1\ cm^2 = 15^2\ m^2$$

$$= 225\ m^2$$

So, the area of the plan is

$$10\ 800 \div 225$$

$$= 48\ cm^2$$

## Question 7

Pedro and Eva do their homework.

Pedro takes 84 minutes to do his homework.

The ratio Pedro's time : Eva's time = 7 : 6.

Work out the number of minutes Eva takes to do her homework.

[2]

We are given the time Pedro takes, and the ratio of Pedro's time to Eva's time.

To work out the time Eva takes to do her homework we have to divide Pedro's time

by Pedro's ratio, and then multiply that by Eva's ratio.

*Pedro : Eva*

*7 : 6*

*Pedro's Time = 84 mins*

*$84 \div 7 = 12$*

*$12 \times 6 = 72$*

**72 minutes**

**Hence Eva takes 72 minutes to do her homework.**

## Question 8

Jamie needs 300 g of flour to make 20 cakes.

[2]

How much flour does he need to make 12 cakes?

Divide by 20 for the flour needed for one cake and multiply by

12 for the flour requirement for 12 cakes

$$\frac{300}{20} \times 12$$

$$= 180$$

## Question 9

Martha divides \$240 between spending and saving in the ratio

spending : saving = 7 : 8.

Calculate the amount Martha has for spending.

[2]

Spending : saving = 7 : 8

A ratio represents the actual amount of money for each of the 2, divided by the highest common factor.

In this case, we represent the highest common factor with the unknown x.

The amount of money for spending =  $7x$

The amount of money for saving =  $8x$

The sum of the 2 needs to be \$240.

$$7x + 8x = \$40$$

$$15x = \$240$$

$$x = \$16$$

The amount of money for spending =  $7x$

The amount of money for spending =  $7 \times \$16$

**The amount of money for spending = \$112**

## Question 10

The scale on a map is 1: 20 000.

- (a) Calculate the actual distance between two points which are 2.7 cm apart on the map. Give your answer in kilometres.

[2]

Multiply the distance on the map by the scale factor to find the real distance in centimetres.

$$\text{distance} = 2.7 \text{ cm} \times 20\,000$$

$$\text{distance} = 54\,000 \text{ cm}$$

Divide the distance by 100 to get the distance in metres. (1m = 100cm)

$$\text{distance} = 540 \text{ m}$$

Divide the real distance in metres by 1000 to get the distance in kilometres (1km = 1000m)

$$\text{distance} = 0.54 \text{ km}$$

- (b) A field has an area of  $64\,400 \text{ m}^2$ .

Calculate the area of the field on the map in  $\text{cm}^2$ .

[2]

Multiply the area by 10 000 to get the area in square centimetres.

$$(1\text{m}^2 = 100\text{cm} \times 100\text{cm} = 10\,000 \text{ cm}^2)$$

$$\text{area} = 644\,000\,000 \text{ cm}^2$$

Divide by the scale factor  $20\,000^2$  to get the area on the map. (Note: Area scale factor is the square of the length scale factor)

$$\text{area on map} = \frac{644\,000\,000 \text{ cm}^2}{(20\,000)^2}$$

$$\text{area on map} = 1.61 \text{ cm}^2$$

## Question 11

The scale of a map is 1 : 250 000.

- (a) The actual distance between two cities is 80 km.

Calculate this distance on the map. Give your answer in centimetres. [2]

First, we convert from kilometres to centimetres.

There are 1000 metres in one kilometre and 100 centimetres in one metre.

$$1 \text{ kilometre} = 1000 \text{ metres} = 100 000 \text{ centimetres}$$

So the actual distance in centimetres:

$$80 \text{ km} \times 100 000 \text{ centimetres per metre} = 8 000 000 \text{ cm}$$

Divide the actual distance in centimetres by the scale to get the distance on the map:

$$\text{distance on the map} = \frac{\text{actual distance}}{\text{scale}}$$

Substitute known values.

$$\text{distance on the map} = \frac{8 000 000 \text{ cm}}{250 000}$$

$$\text{distance on the map} = 32 \text{ cm}$$

- (b) On the map a large forest has an area of  $6 \text{ cm}^2$ .

Calculate the actual area of the forest. Give your answer in square kilometres.

[2]

To convert area, we need to apply the scale twice (because scale is only a linear factor).

$$\text{area on the map} = \frac{\text{actual area}}{(\text{scale})^2}$$

$$\text{actual area} = 6 \text{ cm}^2 \times (250\,000)^2$$

We want the answer in kilometres squared, so we divide by the conversion factor between kilometres and centimetres (we already know that from previous party) twice – dealing with area!

$$\text{actual area} = \frac{6 \text{ cm}^2 \times (250\,000)^2}{(100\,000)^2}$$

Calculate the actual area of the forest in square kilometres:

$$\text{actual area} = 37.5 \text{ km}^2$$

# Ratios

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Ratios
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 32 minutes

**Score:** /25

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

A map is drawn to a scale of 1 : 1000 000.  
A forest on the map has an area of 4.6 cm<sup>2</sup>.

Calculate the actual area of the forest in square kilometres.

[2]

Using the scale we have that

$$1 \text{ cm on map} = 1\,000\,000 \text{ cm on the ground}$$

$$1\,000\,000 \text{ cm} = 10 \text{ km}$$

Therefore

$$1 \text{ cm}^2 : 10^2 \text{ km}^2$$

$$1 \text{ cm}^2 : 100 \text{ km}^2$$

Hence

$$4.6 \text{ cm}^2 : 460 \text{ km}^2$$

## Question 2

The scale on a map is 1 : 50 000.

The area of a field on the map is 1.2 square centimetres.

Calculate the actual area of the field in square kilometres.

[2]

First, the scale of the map is linear conversion (one dimensional), but area has two dimensions, so we multiply the area on the map by the square of this factor in order to get the actual area.

$$1.2 \text{ cm}^2 \times 50\,000^2 = 3\,000\,000\,000 \text{ cm}^2$$

Second, we convert the area from square centimetres to square metres.

$$1 \text{ km}^2 = 100\,000 \text{ cm} \times 100\,000 \text{ cm} = 10\,000\,000\,000 \text{ cm}^2$$

So the actual area of the field is:

$$\frac{3\,000\,000\,000 \text{ cm}^2}{10\,000\,000\,000 \text{ cm}^2 \text{ per km}^2}$$

$$= 0.3 \text{ km}^2$$

### Question 3

The volume of a child's model plane is 1200cm<sup>3</sup>.

The volume of the full size plane is 4050m<sup>3</sup>.

Find the scale of the model in the form 1 :  $n$ .

[3]

Convert cm<sup>3</sup> to m<sup>3</sup>:  $\frac{1200 \text{ cm}^3}{100^3 \frac{\text{cm}^3}{\text{m}^3}} = 0.0012 \text{ m}^3$

$$n = \frac{\sqrt[3]{4050}}{\sqrt[3]{0.0012}}$$

$$\mathbf{n = 150}$$

## Question 4

A model of a ship is made to a scale of 1 : 200.  
The surface area of the model is  $7500 \text{ cm}^2$ .

Calculate the surface area of the ship, giving your answer in square metres.

[3]

Scale implies that 1cm on the model is 200cm in real life, hence  $1\text{cm}^2$  on  
the model is  $200^2\text{cm}^2 = 40000\text{cm}^2$  in real life.

$$7500 \times 40000 = 300\ 000\ 000 \text{ cm}^2$$

Need to write in  $m^2$  so

$$300000000 \div 100^2$$

$$= 30\ 000 \text{ m}^2$$

## Question 5

The scale of a map is 1 : 500 000.

- (a) The actual distance between two towns is 172 km.

Calculate the distance, in centimetres, between the towns on the map.

[2]

Convert to centimetres

$$172 \text{ km} = 172 \times 10^3 \text{ m}$$

$$= 172 \times 10^3 \times 100 \text{ cm}$$

$$= 17\,200\,000 \text{ cm}$$

Now divide by scaling

$$\begin{array}{r} 17200000 \\ \hline 500000 \end{array}$$

$$= 34.4 \text{ cm}$$

- (b) The area of a lake on the map is 12 cm<sup>2</sup>

Calculate the actual area of the lake in km<sup>2</sup>.

[2]

The area scalar will be the length scalar squared.

Hence

$$12 \text{ cm}^2 \times 500000^2$$

$$= 3 \times 10^{12} \text{ cm}^2$$

Now convert to km<sup>2</sup>.

$$3 \times 10^{12} \div (10^5)^2$$

$$= 300 \text{ km}^2$$

## Question 6

A car company sells a scale model  $\frac{1}{10}$  of the size of one of its cars.

Complete the following table.

	Scale Model	Real Car
Area of windscreen (cm <sup>2</sup> )	135	
Volume of storage space (cm <sup>3</sup> )		408 000

[3]

	Scale Model	Real Car
Area of windscreen (cm <sup>2</sup> )	135	13 500
Volume of storage space (cm <sup>3</sup> )	408	408 000

## Question 7

A model of a car is made to a scale of 1 : 40.  
The volume of the model is 45 cm<sup>3</sup>.  
Calculate the volume of the car.  
Give your answer in m<sup>3</sup>. [3]

The length scale is 40, so the volume scale is 40<sup>3</sup>.

The volume of the car is

$$45 \times 40^3$$

$$= 2880000 \text{ cm}^3$$

Converting into m<sup>3</sup>

$$2880000 \div 100^3$$

$$= 2.88 \text{ m}^3$$

## Question 8

A company makes two models of television.

Model A has a rectangular screen that measures 44 cm by 32 cm.

Model B has a larger screen with these measurements increased in the ratio 5:4.

- (a) Work out the measurements of the larger screen.

[2]

The ratio 5:4 = 1.25

We need to multiply the measurements of Model A by

1.25 to obtain the measurements of Model B.

$$44 \text{ cm} \times 1.25 = 55 \text{ cm}$$

$$32 \text{ cm} \times 1.25$$

$$= 40 \text{ cm}$$

- (b) Find the fraction  $\frac{\text{model A screen area}}{\text{model B screen area}}$  in its simplest form.

[1]

The area of the screen is worked out by multiplying its 2 measurements:

$$\text{Area Model A} = 32 \text{ cm} \times 44 \text{ cm}$$

$$\text{Area Model B} = 55 \text{ cm} \times 40 \text{ cm}$$

$$\frac{\text{Area model A}}{\text{Area model B}} = \frac{32 \times 44}{55 \times 40}$$

$$\frac{\text{Area model A}}{\text{Area model B}} = \frac{16}{25}$$

## Question 9

The ratios of teachers : male students : female students in a school are 2 : 17 : 18.  
The total number of **students** is 665.

Find the number of **teachers**.

[2]

The ratio represents the actual number of students and teachers divided by the highest common factor.

We represent this common factor with the unknown  $x$ .

$$\text{Number of teachers} = 2x$$

$$\text{Number of male students} = 17x$$

$$\text{Number of female students} = 18x$$

$$17x + 18x = 665$$

$$x = 19$$

$$\text{The number of teachers} = 2x = 38$$

# Percentages

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Percentages
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 39 minutes

**Score:** /30

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Write 55 g as a percentage of 2.2 kg.

[2]

$$2.2 \text{kg} = 2200 \text{g}$$

$$\rightarrow \frac{55}{2200} \times 100\%$$

$$= 2.5\%$$

## Question 2

Work out 85 cents as a percentage of \$2.03 .

[1]

$$(0.85 \div 2.03) \times 100\%$$

$$= 41.9\%$$

### Question 3

From a sample of 80 batteries, 3 are faulty.

Work out the percentage of faulty batteries.

[1]

To find the percentage we divide the number of interest by the total and

multiply by 100% like this

$$3/80 \times 100\%$$

$$= 3.75\%$$

## Question 4

Jasjeet and her brother collect stamps.

When Jasjeet gives her brother 1% of her stamps, she has 2475 stamps left.

Calculate how many stamps Jasjeet had originally.

[3]

Since Jasjeet gives 1% to her brother; she has 99% of the stamps left.

The original amount of stamps can be found by dividing the remaining by 0.99  
=(99%/100%).

$$\frac{2475}{0.99}$$

$$= 2500$$

## Question 5

In a sale, the cost of a coat is reduced from \$85 to \$67.50 .

Calculate the percentage reduction in the cost of the coat.

[3]

The cost was reduced by \$17.5

$$17.5 = 85 - 67.5$$

To calculate the percentage reduction of the cost of the coat, we divide this amount by the original price and multiply by 100%.

$$\frac{\$17.5}{\$85} \times 100\% = 20.6\%$$

The cost of the coat was reduced by 20.6%.

## Question 6

The population of Dubai at the end of 2012 was 2.1 million.  
This was predicted to increase at a rate of 6% each year.

Calculate the predicted population of Dubai at the end of 2015.

[3]

We can find out the predicted population of Dubai at the end of 2015 like this:

$$\text{Value after } n \text{ years} = \text{original value} \times \left(1 \pm \frac{\text{percentage increase or decrease}}{100}\right)^n$$

$$\text{Predicted population 2015} = 2.1 \times \left(1 + \frac{6}{100}\right)^3$$

$$\text{Predicted population 2015} = 2.50 \text{ million}$$

## Question 7

Anita buys a computer for \$391 in a sale.  
The sale price is 15% less than the original price.

Calculate the original price of the computer.

[3]

$$391 \div 0.85$$

**460**

## Question 8

Calculate 17.5% of 44kg.

[2]

This can be calculated like this:

$$44 \text{ kg} \times \frac{17.5}{100}$$

$$= 7.7 \text{ kg}$$

## Question 9

Emily invests \$ $x$  at a rate of 3% per year simple interest.  
After 5 years she has \$20.10 interest.

Find the value of  $x$ .

[3]

The equation for simple interest is  $x + i = x \left(1 + \frac{R}{100} t\right)$

Where:  $x$  = Principal investment value

$i$  = Interest gained

$R$  = Interest rate (%)

$t$  = Investment time

$$x + 20.1 = x \left(1 + \frac{3 \times 5}{100}\right)$$

$$1 + \frac{20.1}{x} = 1 + 0.06$$

$$x = \frac{20.1}{0.06}$$

$$x = 134$$

## Question 10

In 2012 the cost of a ticket to an arts festival was \$30.

This was 20% more than the ticket cost in 2011.

Calculate the cost of the ticket in 2011.

[3]

**Take the cost in 2011 as the base:**

$$120\% \text{ of } 2011 \text{ price} = \$30$$

$$1\% \text{ of } 2011 \text{ price} = \frac{30}{120} = \$0.25$$

$$100\% \text{ of } 2011 \text{ price} = \$0.25 \times 100$$

$$= \$25.00$$

## Question 11

The Tiger Sky Tower in Singapore has a viewing capsule which holds 72 people. This number is 75% of the population of Singapore when it was founded in 1819. What was the population of Singapore in 1819? [2]

Let the population of Singapore be  $n$ . We have that

$$75\% \text{ of } n = 72$$

$$\rightarrow 0.75n = 72$$

Divide through by 0.75

$$n = \frac{72}{0.75}$$

$$= 96$$

## Question 12

Samantha invests \$600 at a rate of 2% per year simple interest.

Calculate the interest Samantha earns in 8 years.

[2]

Increase of 2% per year means multiply by 1.02 (102%).

$$600 \times 1.02$$

$$= 612$$

We have an interest of 12. After 8 years this is

$$8 \times 12$$

$$= 96$$

### Question 13

Maria pays \$84 rent.  
The rent is increased by 5%.

Calculate Maria's new rent.

[2]

Increase by 5% means multiply by 1.05 (105%)

$$84 \times 1.05$$

$$= 88.2$$

# Percentages

## Difficulty: Easy

### Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Percentages
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 2

**Time allowed:** 41 minutes

**Score:** /32

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Shania invests \$750 at a rate of  $2\frac{1}{2}\%$  per year simple interest.

Calculate the **total** amount Shania has after 5 years.

[3]

. Interest for one year is

$$750 \times 0.025$$

$$= 18.75$$

Hence for 5 years Shania has

$$750 + 5 \times 18.75$$

$$= 843.75$$

## Question 2

*Assembled by AS.*

The taxi fare in a city is \$3 **and** then \$0.40 for every kilometre travelled.

- (a) A taxi fare is \$9.

How far has the taxi travelled?

[2]

**Cost for the distance is**

$$9 - 3$$

$$= 6$$

**Divide by the rate**

$$6 \div 0.4$$

$$= 15 \text{ km}$$

- (b) Taxi fares cost 30 % more at night.

How much does a \$9 daytime journey cost at night?

[2]

$$9 \times 1.3$$

$$= 11.70$$

### Question 3

Hans invests \$750 for 8 years at a rate of 2% per year simple interest.

Calculate the interest Hans receives.

[2]

$$750 \times 0.02 \times 8$$

$$= 120$$

## Question 4

Maria decides to increase her homework time of 8 hours per week by 15%.

Calculate her new homework time.  
Give your answer in hours and minutes.

[3]

The increase will be by 15% of the current time, 8 hours.

$$\frac{15 \times 8 \text{ hours}}{100} + 8 \text{ hours} = 1.2 \text{ hours} + 8 \text{ hours} = 9.2 \text{ hours}$$

We need to convert the 0.2 hours into minutes.

If 1 hours has 60 minutes, then 0.2 hours will represent:

$$\frac{0.2 \text{ hours} \times 60 \text{ minutes}}{1 \text{ hours}} = 12 \text{ minutes.}$$

**The total time will be: 9 hours and 12 minutes.**

## Question 5

During a marathon race an athlete loses 2 % of his mass.  
At the end of the race his mass is 67.13 kg.

Calculate his mass before the race.

[3]

He will lose 2% of its initial mass, which we can represent with the unknown x.

$$x - \frac{2x}{100} = 67.13 \text{ kg}$$

$$\frac{98x}{100} = 67.13 \text{ kg}$$

$$98x = 6713 \text{ kg}$$

$$x = 68.5 \text{ kg}$$

## Question 6

A concert hall has 1540 seats.

Calculate the number of people in the hall when 55% of the seats are occupied.

[1]

Calculate the 55% of the total number of seats by

multiplication:

$$\text{Occupied} = \text{Total seats} \times 55\%$$

$$\text{Occupied} = 1540 \times 55\%$$

$$\text{Occupied} = 1540 \times 0.55$$

$$\text{Occupied seats (number of people)} = 847$$

## Question 7

In 1970 the population of China was  $8.2 \times 10^8$ .

In 2007 the population of China was  $1.322 \times 10^9$ .

Calculate the population in 2007 as a percentage of the population in 1970.

[2]

The population in 2007 as a percentage of the population in 1970 can be calculated by:

$$\frac{\text{Population in 2007}}{\text{Population in 1970}} \times 100,$$

Substituting in the values gives:

$$\frac{1.322 \times 10^9}{8.2 \times 10^8} \times 100 = 161.21951$$

The answer after rounding is:

**161%**

## Question 8

In 2004 Colin had a salary of \$7200.

- (a) This was an increase of 20% on his salary in 2002.  
Calculate his salary in 2002.

[2]

We represent his salary in 2002 with the unknown x.

$$x + \frac{20x}{100} = \$7200 \text{ (his salary in 2004)}$$

$$\frac{120x}{100} = \$7200$$

$$120x = \$720000$$

$$x = \$6000$$

- (b) In 2006 his salary increased to \$8100.  
Calculate the percentage increase from 2004 to 2006.

[2]

We represent the percentage increase with the unknown y.

$$\$7200 + \frac{y}{100} \times \$7200 = \$8100$$

$$\$72y = \$900$$

$$y = 12.5\%$$

## Question 9

Celine invests \$ 800 for 5 **months** at 3 % simple interest per year.

Calculate the interest she receives.

[2]

The amount invested initially is \$800.

If the rate of the simple interest for 12 months is 3 %, then the rate for 5 months will be:

$$\frac{5 \times 3}{12} = 1.25 \%$$

The interest she receives will be 1.25 % of what she initially invested.

$$\text{Interest} = \frac{1.25 \times \$800}{100}$$

$$\text{Interest} = \$10$$

## Question 10

Sara has \$3000 to invest for 2 years.

She invests the money in a bank which pays simple interest at the rate of 7.5 % per year.  
Calculate how much interest she will have at the end of the 2 years.

[2]

She will two lots of 7.5% of \$3000 in interest.

To find 7.5% multiply by 0.075 ( $= \frac{7.5}{100}$  remembering that “percent” means “ $\div 100$ ”)

So the total interest is given by:

$$2 \times 0.075 \times 3000$$

$$= \$450$$

## Question 11

In 1950, the population of Switzerland was 4 714 900.  
In 2000, the population was 7 087 000.

- (a) Work out the percentage increase in the population from 1950 to 2000. [2]

The population increased by:  $7\ 087\ 000 - 4\ 714\ 900 = 2\ 373\ 100$

We represent this amount as a percentage of 4 714 900, x.

$$x = \frac{2\ 373\ 100}{4\ 714\ 900} \times 100$$

$$\mathbf{x = 50.3\%}$$

- (b) (i) Write the 1950 population correct to 3 significant figures. [1]

$$\mathbf{4\ 714\ 900}$$

$\mathbf{= 4\ 710\ 000}$  correct to 3 significant figures.

- (ii) Write the 2000 population in standard form. [1]

A number in standard form takes up the form  $a \times 10^n$  where n is an integer and  $0 < a \leq 10$ .

$$\mathbf{7\ 087\ 000 = 7.087 \times 10^6}$$

## Question 12

Nyali paid \$62 for a bicycle. She sold it later for \$46.  
What was her percentage loss?

[2]

The amount she lost is:  $\$62 - \$46 = \$16$ .

We need to represent this amount as a percentage of \$62,  $x$ .

$$\frac{\$62x}{100} = \$16$$

$$x = 25.8\%$$

# Percentages

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Percentages
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 40 minutes

**Score:** /31

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Indira buys a television in a sale for \$924.  
This was a reduction of 12% on the original price.

Calculate the original price of the television.

[3]

The original price ( $x$ ) was reduced by 12%, to give \$924. We can represent this in an equation:

$$88\% \text{ of original price} = \$924$$

$$0.88x = 924$$

$$x = \frac{924}{0.88}$$

Therefore:

$$x = \$1050$$

## Question 2

Ahmed paid \$34 000 for a car.

His car decreased in value by 40% at the end of the first year.

The value at the end of the second year was 10% less than the value at the end of the first year.

Calculate the value of Ahmed's car after 2 years.

[2]

A good trick for percentage questions is to write down the statement

"After" is a percentage of "Before"

and translate that into an equation (remember "is" means "="):

Value at end of first year is 60% of \$34000

$$V_1 = \frac{60}{100} \times 34000$$

Remember: "percent" means "divided by 100"

$$V_1 = \$20400$$

Now repeat the process:

Value at end of second year is 90% of Value at end of first year

$$V_2 = \frac{90}{100} \times 20400$$

$$V_2 = \$18360$$

### Question 3

Hazel invests \$1800 for 7 years at a rate of 1.5% per year compound interest.

Calculate how much interest she will receive after the 7 years.

Give your answer correct to the nearest dollar.

[4]

The rate of 1.5% per year (compound interest) means that the amount of money next year will be  $1.015 (=1 + 1.5\%/100\%)$  times the previous amount.

We want to find out the amount after 7 years, so the initial amount has to be multiplied by the factor 1.015 seven times.

$$\$1800 \times 1.015^7 = \$1997.72$$

Subtract the initial investment to get the interest.

$$\$1997.72 - \$1800 = \$197.72$$

Round the number to the nearest dollar to get the interest he receives:

**\$198**

## Question 4

Robert buys a car for \$8000.

At the end of each year the value of the car has decreased by 10% of its value at the beginning of that year.

Calculate the value of the car at the end of 7 years.

[2]

The decrease of value by 10% per year means that the amount value next year will be 0.9

( $=1 - 10\% / 100\%$ ) times the value in the previous year.

We want to find out the value after 7 years, so the initial value has to be multiplied by the factor 0.9 seven times.

$$\$8000 \times 0.9^7$$

$$= \$3826$$

## Question 5

Georg invests \$5000 for 14 years at a rate of 2% per year compound interest.

Calculate the interest he receives.

Give your answer correct to the nearest dollar.

[4]

The rate of 2% per year (compound interest) means that the amount of money next year will be  $1.02 (=1 + 2\% / 100\%)$  times the previous amount.

We want to find out the amount after 14 years, so the initial amount has to be multiplied by the factor 1.02 fourteen times.

$$\$5000 \times 1.02^{14} = \$6597.4$$

Subtract the initial investment to get the interest.

$$\$6597.4 - \$5000 = \$1597.4$$

Round the number to the nearest dollar to get the interest he receives:

**\$1597**

## Question 6

Amalie makes a profit of 20% when she sells a shirt for \$21.60.

Calculate how much Amalie paid for the shirt.

[2]

The sell price is 20% more than the purchase price, i.e.

$$21.6 = 1.2 \times p$$

$$\rightarrow p = 21.6 \div 1.2$$

$$= 18$$

## Question 7

A student played a computer game 500 times and won 370 of these games.

He then won the next  $x$  games and lost none.

He has now won 75% of the games he has played.

Find the value of  $x$ .

[4]

We are given that

$$\frac{370 + x}{500 + x} = \frac{3}{4}$$

$$\rightarrow 370 + x = \frac{3}{4}(500 + x)$$

$$\rightarrow 370 + x = 375 + 0.75x$$

$$\rightarrow 0.25x = 5$$

$$\rightarrow x = 20$$

## Question 8

A house was built in 1985 and cost \$62 000.  
It was sold in 2003 for \$310 000.

- (a) Work out the 1985 price as a percentage of the 2003 price. [2]

We note with  $x$  the percentage we need to work out.

$$\frac{\$310000x}{100} = \$62000$$

$$\$310000x = \$6200000$$

$$x = 20$$

The answer is 20%.

- (b) Calculate the percentage increase in the price from 1985 to 2003. [2]

The difference in price between the 2 years is:

$$\$310000 - \$62000 = \$248000$$

The price has been increased by \$248 000 from 1985 to 2003.

We need to express this amount as a percentage of \$62 000.

We note this percentage with  $x$ .

$$\frac{x}{100} \times \$62000 = \$248000$$

$$\$62000x = \$24800000$$

$$x = 400\%$$

## Question 9

In 1997 the population of China was  $1.24 \times 10^9$ .

In 2002 the population of China was  $1.28 \times 10^9$ .

Calculate the percentage increase from 1997 to 2002.

[2]

The difference between the 2 amounts is:

$$(1.28 - 1.24) \times 10^9 = 0.04 \times 10^9$$

We need to express this amount as a percentage of  $1.24 \times 10^9$ , the population in 1997.

Percentage increase is given by

$$\frac{0.04 \times 10^9}{1.24 \times 10^9} \times 100 \\ = 3.23\%$$

## Question 10

Abdul invested \$240 when the rate of simple interest was  $r\%$  per year.

After  $m$  months the interest was  $I$ .

Write down and simplify an expression for  $I$ , in terms of  $m$  and  $r$ .

[2]

We represent the number of years as:  $\frac{m}{12}$ , the number of months over the number of months in a year.

$$\$240 \times \frac{m}{12} \times \frac{r}{100} = I$$

$$I = mr/5$$

## Question 11

A baby was born with a mass of 3.6 kg.

After three months this mass had increased to 6 kg.

Calculate the percentage increase in the mass of the baby.

[2]

The increase in mass is by:  $6 \text{ kg} - 3.6 = 2.4 \text{ kg}$

We need to represent this mass as a percentage of the initial mass.

$$\frac{2.4 \text{ kg}}{3.6 \text{ kg}} \times 100$$

= **66.7%**

# Using a Calculator

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Using a Calculator
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 34 minutes

**Score:** /26

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

$$V = 4p^2$$

Find  $V$  when  $p = 3$ .

[1]

Substitute  $p = 3$  into the formula to get:

$$V = 4 \times 3^2$$

Using a calculator (or a bit of mental arithmetic) gives:

$$\mathbf{V = 36}$$

## Question 2

Calculate  $(2.1 - 0.078)^{17}$ , giving your answer correct to 4 significant figures.

[2]

Using BIDMAS we know that we calculate the minus in the Brackets first, then the power (or the Index) second, like so

$$(2.1 - 0.078)^{17}$$

$$= 2.022^{17}$$

$$= 157,862.71631 \dots$$

Rounding up to 4 significant figures

$$= 157,900 \text{ (4.s.f)}$$

### Question 3

Calculate.

$$\frac{3.07 + 2^4}{5.03 - 1.79}$$

[1]

We simplify the top and bottom of the fraction like so

$$\frac{3.07 + 2^4}{5.03 - 1.79}$$

$$= \frac{3.07 + 16}{3.24}$$

$$= \frac{19.07}{3.24}$$

Now using our calculator

$$= 5.89$$

## Question 4

Use your calculator to work out  $\sqrt{10 + 0.6 \times (8.3^2 + 5)}$ . [1]

Use a calculator:

$$\sqrt{10 + 0.6 \times (8.3^2 + 5)}$$

$$\sqrt{10 + 44.334}$$

Take square root:

$$\sqrt{10 + 0.6 \times (8.3^2 + 5)}$$

$$= 7.37$$

## Question 5

Use your calculator to find the value of  $1.35^7$ .

Give your answer correct to 5 significant figures.

[2]

On a standard Casio scientific calculator, the value of  $1.35^7$  can be found like

this:



Type out '1.35'

Press the 'power' button (shown in the image above)

Press '7', and then '='

$$1.35^7 = 8.17215 \dots$$

$$1.35^7 = 8.1722 \text{ (5. sif)}$$

## Question 6

Calculate  $\frac{8.24 + 2.56}{1.26 - 0.72}$ . [1]

20

## Question 7

Use a calculator to work out the following.

(a)  $3(-4 \times 6^2 - 5)$  [1]

Always start from inside the brackets first, and then work the multiplication first:

$$3(-4 \times 6^2 - 5) = 3(-144 - 5)$$

$$= 3(-149)$$

$$= -447$$

(b)  $\sqrt{3} \times \tan 30^\circ + \sqrt{2} \times \sin 45^\circ$  [1]

Start by working on the left hand side multiplication, then the right hand side multiplication, then finally add them both:

$$\sqrt{3} \times \tan(30^\circ) + \sqrt{2} \times \sin(45^\circ) = 1 + \sqrt{2} \times \sin(45^\circ)$$

Now right hand side multiplication:

$$1 + \sqrt{2} \times \sin(45^\circ) = 1 + 1$$

$$= 2$$

## Question 8

- (a) Use your calculator to work out  $\sqrt{65} - 1.7^2$ .

Write down all the numbers displayed on your calculator.

[1]

Using a calculator, we work out that  $\sqrt{65} - 1.7^2$

= **5.1722577483**

- (b) Write your answer to **part (a)** correct to 2 significant figures.

[1]

By correcting to 2 significant figures we approximate the number obtained.

The answer to part (a) correct to 2 significant figures is 5.2.

**5.2**

## Question 9

Use your calculator to find the value of

$$\frac{8.1^2 + 6.2^2 - 4.3^2}{2 \times 8.1 \times 6.2} . \quad [2]$$

$$\frac{23}{27} = 0.852$$

$$= 0.852$$

## Question 10

Work out  $11.3139 - 2.28 \times \sqrt[3]{9^2}$ .

Give your answer correct to one decimal place.

[2]

$$11.3139 - 2.28 \times \sqrt[3]{9^2}$$

$$= 1.4$$

## Question 11

Find the value of  $\frac{7.2}{11.8 - 10.95}$ .

Give your answer correct to 4 significant figures.

[2]

Find the denominator first

$$11.8 - 10.95 = 0.85$$

$$\rightarrow \frac{7.2}{0.85} = \frac{720}{85}$$

$$= 8.47058823 \dots$$

$$= \mathbf{8.471} \text{ (4sf)}$$

## Question 12

(a) Calculate  $\sqrt[3]{7^{1.5} + 22^{0.9}}$  and write down your full calculator display. [1]

**3.260770655**

(b) Write your answer to **part (a)** correct to 4 significant figures. [1]

**3.261**

### Question 13

Use your calculator to find  $\sqrt{\frac{45 \times 5.75}{3.1 + 1.5}}$ . [2]

$$\sqrt{\frac{4.5 \times 5.75}{3.1+1.5}} = \sqrt{\frac{25.875}{4.6}}$$

=7.5

## Question 14

Use your calculator to find the value of

[1]

(a)  $3^0 \times 2.5^2$ ,

$3^0 \times 2.5^2$

Any number raised to the power of 0 equals 1.

$2.5^2 = 6.25$

**$3^0 \times 2.5^2 = 1 \times 6.25 = 6.25$**

(b)  $2.5^{-2}$ .

[1]

$2.5^{-2} = \frac{1}{2.5^2}$

$2.5^{-2} = \frac{1}{6.25}$

**$2.5^{-2} = 0.16$**

## Question 15

Find the value of  $\frac{\sqrt[3]{17.1 - 1.89}}{10.4 + \sqrt{8.36}}$ . [2]

Using a calculator, we work out the following result:

$$\frac{\sqrt[3]{17.1 - 1.89}}{10.4 + \sqrt{8.36}} = \frac{\sqrt[3]{15.21}}{10.4 + 2.89}$$

$$\frac{\sqrt[3]{17.1 - 1.89}}{10.4 + \sqrt{8.36}} = \frac{2.47}{13.29}$$

$$\frac{\sqrt[3]{17.1 - 1.89}}{10.4 + \sqrt{8.36}}$$

$$= 0.186$$

# Using a Calculator

## Difficulty: Easy

### Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Using a Calculator
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 2

**Time allowed:** 40 minutes

**Score:** /31

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Calculate  $81^{0.25} \div 4^{-2}$ . [2]

Power of 0.25 can be written as  $1/4$ . Using the rules of powers, this is the same as  $4^{\text{th}}$  root of the number. A negative power gives the reciprocal(one over) the number with a positive power.

$$81^{0.25} \div 4^{-2} = 81^{1/4} \div 1/4^2$$

$$81^{0.25} \div 4^{-2} = \sqrt[4]{81} \div 1/4^2$$

Evaluate the numbers

$$81^{0.25} \div 4^{-2} = 3 \div 1/16$$

$$81^{0.25} \div 4^{-2} = 3 \times 16$$

$$\mathbf{81^{0.25} \div 4^{-2} = 48}$$

## Question 2

Use your calculator to find the value of  $2^{\sqrt{3}}$ .

Give your answer correct to 4 significant figures.

[2]

First, find the value of the square root of three.

$$\sqrt{3} = 1.7321 \dots$$

Use 5 significant places at least, since we want to have a result correct to 4 significant figures (need at least one more figure in the working, but the more the better).

$$2^{\sqrt{3}} \cong 2^{1.7321} = 3.32211 \dots$$

Round your answer to 4 significant figures.

$$2^{\sqrt{3}} \cong 3.322$$

### Question 3

Use a calculator to work out the **exact** value of

$$1 + \frac{1}{5} + \left(\frac{1}{5}\right)^2 + \left(\frac{1}{5}\right)^3 + \left(\frac{1}{5}\right)^4. \quad [2]$$

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

$$= \frac{781}{625}$$

$$= 1.2496$$

## Question 4

Calculate  $\sqrt[3]{2.35^2 - 1.09^2}$ .  
Give your answer correct to 4 decimal places.

[2]

$$\sqrt[3]{5.5225 - 1.1881}$$

$$= \sqrt[3]{4.3344}$$

$$= \mathbf{1.6305}$$

## Question 5

Calculate the value of  $\frac{1}{2}\sqrt{\frac{1}{2}} + \frac{1}{2}\sqrt{\frac{1}{2}}$

(a) writing down all the figures in your calculator answer,

[1]

**0.4619397663**

(b) writing your answer correct to 4 significant figures.

[1]

**0.4619**

## Question 6

Use your calculator to find the value of  $\frac{(\cos 30^\circ)^2 - (\sin 30^\circ)^2}{2(\sin 120^\circ)(\cos 120^\circ)}$ . [2]

By inputting the values into your calculator, you get:

$$\frac{(\cos(30)) ^2 - (\sin(30)) ^2}{2(\sin(120)(\cos(120)))} = \frac{\frac{3}{4} - \frac{1}{4}}{2 \times \frac{\sqrt{3}}{2} \times \frac{-1}{2}} = \frac{0.5}{\frac{-\sqrt{3}}{2}} = \frac{-\sqrt{3}}{3}$$

So the answer is:

$$= \frac{-\sqrt{3}}{3}$$

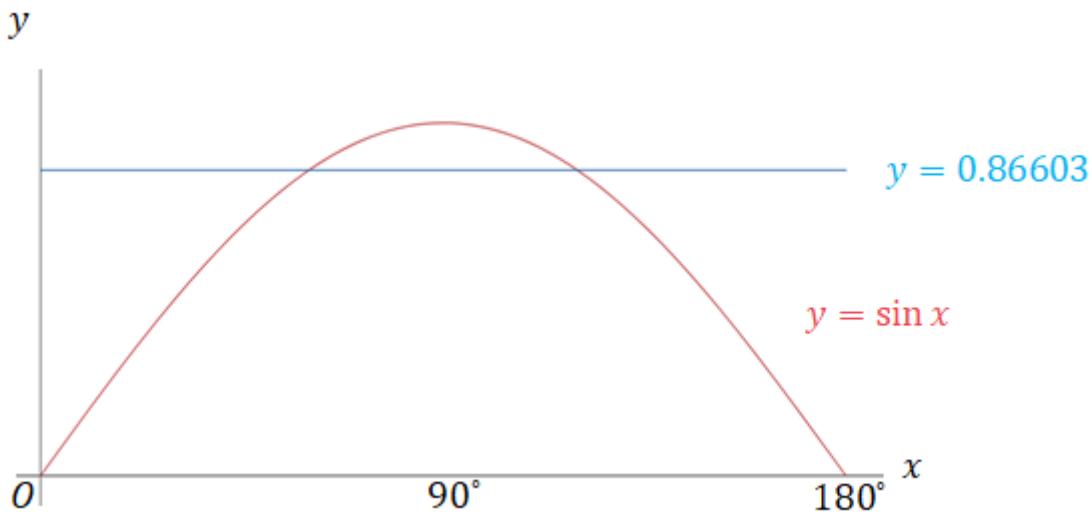
## Question 7

$$\sin x^\circ = 0.86603 \text{ and } 0^\circ \leq x \leq 180^\circ.$$

Find the two values of  $x$ .

[2]

The graph of sine in the limits looks like



And so, we can see that there are two solutions, reflected about the line  $x = 90^\circ$ .

Hence, we have

$$x = \sin^{-1} 0.86603$$

$$= 60.0, \quad 180 - 60.0$$

$$= \mathbf{60}, \quad \mathbf{120}$$

## Question 8

Use a calculator to find the value of  $\sqrt{(5.4(5.4 - 4.8)(5.4 - 3.4)(5.4 - 2.6))}$ .

- (a) Write down all the figures in your calculator display. [1]

**4.259577444**

- (b) Give your answer correct to 1 decimal place. [1]

**4.3**

## Question 9

(a) Use your calculator to work out

$$\frac{1 - (\tan 40^\circ)^2}{2(\tan 40^\circ)}.$$
 [1]

Using a calculator, we work out the result:

**0.176.**

(b) Write your answer to **part (a)** in standard form.

[1]

A number is standard form has the form  $a \times 10^n$  where  $n$  – integer and  $0 < a < 10$ .

In our case, we can write:

$$\mathbf{0.176 = 1.76 \times 10^{-1}}$$

## Question 10

Use your calculator to work out

(a)  $\sqrt{7 + 6 \times 243^{0.2}}$ , [1]

**± 5**

(b)  $2 - \tan 30^\circ \times \tan 60^\circ$ . [1]

**1**

Question 11  
ASSEMBLED by A/S

Work out

$$\frac{2\tan 30^\circ}{1 - (\tan 30^\circ)^2} \quad [2]$$

$$\tan 30^\circ = \frac{1}{\sqrt{3}}$$

$$\frac{2\tan 30^\circ}{1 - (\tan 30^\circ)^2} = \frac{\frac{2}{\sqrt{3}}}{1 - \frac{1}{3}}$$

$$\frac{2\tan 30^\circ}{1 - (\tan 30^\circ)^2} = \frac{\frac{2}{\sqrt{3}}}{\frac{2}{3}}$$

$$\frac{2\tan 30^\circ}{1 - (\tan 30^\circ)^2} = \frac{3}{\sqrt{3}} = \sqrt{3}$$

$$= 1.73$$

## Question 12

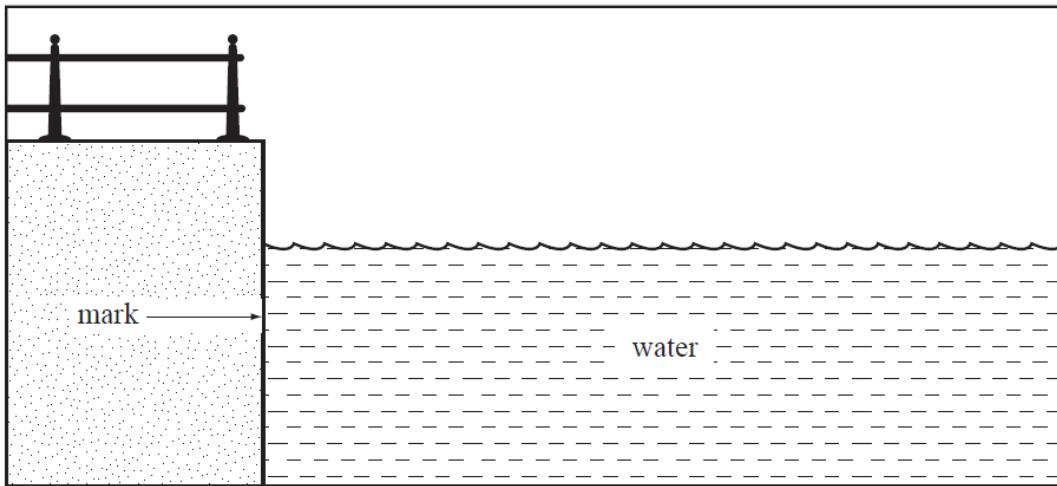
Calculate the value of  $2(\sin 15^\circ)(\cos 15^\circ)$ . [1]

Using a calculator

$$2(\sin 15^\circ)(\cos 15^\circ) = \frac{1}{2}$$

$$= 0.5$$

### Question 13



The height,  $h$  metres, of the water, above a mark on a harbour wall, changes with the tide.  
It is given by the equation

$$h = 3\sin(30t)^\circ$$

where  $t$  is the time in hours after midday.

- (a) Calculate the value of  $h$  at midday.

[1]

Since  $t$  is the number of hours after midday, at midday  $t = 0$ .

Using the formula given,  $h$  will be:

$$h = 3 \sin (30 \times 0)^\circ$$

$$h = 3 \sin 0^\circ$$

$$\mathbf{h = 0}$$

(b) Calculate the value of  $h$  at 19 00. [2]

19:00 is 7 hours after midday, therefore  $t = 7$ .

$$h = 3 \sin (30 \times 7)^\circ$$

$$h = 3 \sin 210^\circ$$

Using a calculator, we work out that  $\sin 210^\circ = -0.5$

$$h = 3 \times (-0.5)$$

$$\mathbf{h = -1.5}$$

(c) Explain the meaning of the negative sign in your answer. [1]

The minus sign in the answer for question b) means that the height is 1.5 units

below the height at midday, when  $h = 0$ , as shown in point a).

## Question 14

Calculate  $(3 + 3\sqrt{3})^3$  giving your answer correct to 1 decimal place. [2]

Using a calculator, we work out that:

$$(3 + 3\sqrt{3})^3 = 550.592$$

Correct to 1 decimal place: 550.6

## Question 15

Use your calculator to find the value of

$$\frac{6 \sin 50^\circ}{\sin 25^\circ}.$$

[1]

Just put this in a calculator in one go using templates (and remembering to close brackets)

to get:

$$\frac{6 \sin 50}{\sin 25} = 10.87569344$$

$$= \mathbf{10.9} \text{ (to 3 significant figures)}$$

Do NOT be tempted to “cancel” the 50 and the 25 – they are NOT Factors!

## Question 16

Work out  $\frac{2 + 12}{4 + 3 \times 8}$ . [1]

$$\frac{2+12}{4+3 \times 8} = \frac{14}{28}$$

$$= \frac{1}{2}$$

# Using a Calculator

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Using a Calculator
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 26 minutes

**Score:** /20

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

(a) Use a calculator to work out  $\frac{5^{0.4} - \sqrt{3}}{0.13 - 0.015}$ .

Write down all the digits in your calculator display.

[1]

**1.49220114**

(b) Write your answer to **part (a)** correct to 2 significant figures.

[1]

**1.5**

## Question 2

The thickness of one sheet of paper is  $8 \times 10^{-3}$  cm.

Work out the thickness of 250 sheets of paper.

[1]

$$250 \times 8 \times 10^{-3}$$

$$= 2$$

### Question 3

Calculate  $\sqrt{120} + 3.8^2 - 25$ . [1]

**0.394**

## Question 4

Calculate  $\sqrt{\frac{1}{2}(1 - \cos 48^\circ)}$ . [1]

**0.407**

## Question 5

Calculate.

$$(a) \quad 2^3 - \sqrt{10 + 4^2}$$

[1]

Type this in a calculator exactly as seen (use templates) to get:

$$2^3 - \sqrt{10 + 4^2} = 8 - \sqrt{26} \quad \text{If calculator says this}$$

$$= 2.900980486 \dots \quad \text{press the S}\leftrightarrow\text{D button to get this}$$

$$= \mathbf{2.90} \text{ (to 3 significant figures)}$$

$$(b) \quad \frac{2\sqrt{3} \times \tan 70^\circ}{3}$$

[1]

Type this in a calculator exactly as seen (use templates) to get:

$$\frac{2\sqrt{3} \times \tan 70}{3} = 3.172513655 \dots$$

$$= \mathbf{3.17} \text{ (to 3 significant figures)}$$

## Question 6

Find the cube root of 4913.

[1]

$$\sqrt[3]{4913}$$

$$= 17$$

## Question 7

Use your calculator to work out  $\sqrt{\frac{3}{4}} + 2^{-1}$ .

Give your answer correct to 2 decimal places.

[2]

Using a calculator, we work out the result to be: 1.36602

To approximate it to 2 decimal places, we look at the decimal in position

3. 6 > 5, therefore we will approximate the second decimal to the upper digit, 7.

**Answer: 1.37**

## Question 8

(a) Use your calculator to find the value of  $7.5^{-0.4} \div \sqrt{57}$ .

Write down your full calculator display.

[1]

**0.0591613488**

(b) Write your answer to **part (a)** in standard form.

[1]

**5.91613488 × 10<sup>-2</sup>**

## Question 9

- (a) Calculate  $\sqrt{5.7} - 1.03^2$ .

Write down all the numbers displayed on your calculator.

[1]

Solving this question requires inputting the equation into a calculator.

$$\sqrt{5.7} - 1.03^2$$

Calculating this will give the result

$$\sqrt{5.7} - 1.03^2$$

$$= 1.326567277 \dots$$

Make sure you write down the full number from your calculator display.

- (b) Write your answer to **part (a)** correct to 3 decimal places.

[1]

Here we need to round the number above,  $1.326567277 \dots$ , to 3

decimal places.

To four decimal places the number is 1.3265. As it ends in a 5 we round

up the decimal before to a 7. Hence, our rounded number becomes

$$\mathbf{1.327}$$

## Question 10

Use a calculator to find

(a)  $\sqrt{5\frac{5}{24}}$ , [1]

$$\sqrt{5\frac{5}{24}} = \pm 2.28$$

(b)  $\frac{\cos 40^\circ}{7}$ . [1]

$$\frac{\cos(40)}{7} = 0.109 \text{ (make sure your calculator is in degrees and not radians)}$$

## Question 11

$$m = \frac{1}{4} [ 3h^2 + 8ah + 3a^2 ]$$

Calculate the exact value of  $m$  when  $h = 20$  and  $a = -5$ .

[2]

Plugging in all our values gives us

$$m = \frac{1}{4} [ 3(20)^2 + 8(-5)(20) + 3(-5)^2 ]$$

$$= \frac{1}{4} (1200 - 800 + 75)$$

$$= \mathbf{118.75}$$

## Question 12

Calculate  $3\sin 120^\circ - 4(\sin 120^\circ)^3$ . [2]

$$\frac{3\sqrt{3}}{2} - 4 \left( \frac{\sqrt{3}}{2} \right)^3$$

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

$$= 0$$

# Time

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Time
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 48 minutes

**Score:** /37

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

A train leaves Zurich at 2240 and arrives in Vienna at 0732 the next day.

Work out the time taken.

[1]

We can count up the time it takes to get us to the Vienna. Add 20 minutes to take it to the next hour:

$$22:40 + 20\text{m} = 23:00$$

Add 1 hour to take it to the next day (24:00 is equivalent to midnight, or 00:00)

$$23:00 + 1\text{hr} = 24:00 = 00:00$$

Now add 7 hours and 32 minutes to get to the desired time

$$00:00 + 7\text{hr } 32\text{m} = 07:32$$

The time taken is all the hours and minutes added together like this

$$20\text{m} + 1\text{hr} + 7\text{hr } 32\text{m}$$

$$\text{Total time} = 8\text{hr } 52\text{m}$$

## Question 2

A doctor starts work at 2040 and finishes work at 0610 the next day.

How long is the doctor at work?

Give your answer in hours and minutes.

[1]

There are 3 hours and 20 minutes left until midnight.

Add this to 6 hours and 10 minutes he works on the next day (time after midnight).

**The doctor works 9 hours and 30 minutes.**

### Question 3

A bus company in Dubai has the following operating times.

Day	Starting time	Finishing time
Saturday	06 00	24 00
Sunday	06 00	24 00
Monday	06 00	24 00
Tuesday	06 00	24 00
Wednesday	06 00	24 00
Thursday	06 00	24 00
Friday	13 00	24 00

(a) Calculate the total number of hours that the bus company operates in one week.

[3]

From Saturday till Thursday, the bus company operates from 06:00 till 24:00.

This results in 18 hours of activity ( $24 - 6 = 18$ ).

On Friday, the company operates from 13:00 till 24:00

This results in 11 hours of activity ( $24 - 13 = 11$ )

Therefore, the company operates for:

$$\mathbf{18 \times 6 + 11 = 119}$$

(b) Write the starting time on Friday in the 12-hour clock.

[1]

The number of working hours on Friday is 11. Therefore, in a 12-hour clock, the starting time would be:

$$12:00 - 11$$

$$= \mathbf{1:00 \text{ pm}}$$

## Question 4

Christa had a music lesson every week for one year.  
Each of the 52 lessons lasted for 45 minutes.

Calculate the total time that Christa spent in music lessons.  
Give your time in hours.

[2]

There are 52 lessons, and each was 45 mins, and so multiplying them together will give the total time Christa spent in minutes.

Total time spent in a week in minutes

$$\text{Time spent} = 52 \times 45\text{mins}$$

$$= 2340 \text{ minutes}$$

$$= 39 \text{ hrs}$$

## Question 5

The time in Lisbon is the same as the time in Funchal.  
A plane left Lisbon at 0830 and arrived in Funchal at 1020.  
It then left Funchal at 1255 and returned to Lisbon.  
The return journey took 15 minutes more.

What time did the plane arrive in Lisbon?

[2]

First calculate the time taken for the first flight:

$$10:20 - 8:30 = 1 \text{ hour } 50 \text{ minutes}$$

The return journey is 15 minutes longer:

$$1 \text{ hour } 50 \text{ minutes} + 15 \text{ minutes} = 2 \text{ hours } 5 \text{ mins}$$

Calculate the time of arrival:

$$12:55 + 2 \text{ hours } 5 \text{ minutes} = 15:00 \text{ or } 3 \text{ pm}$$

$$= \mathbf{15:00 \text{ or } 3 \text{ pm}}$$

## Question 6

A shop is open during the following hours.

	Monday to Friday	Saturday	Sunday
Opening time	0645	0730	0845
Closing time	1730	1730	1200

- (a) Write the closing time on Saturday in the 12-hour clock time.

[1]

**5 : 30 pm**

- (b) Calculate the total number of hours the shop is open in one week.

[2]

On Monday to Friday the shop is open

$$6:45 \rightarrow 7:00 = 15m$$

$$7:00 \rightarrow 17:00 = 10h$$

$$17:00 \rightarrow 17:30 = 30m$$

$$= 15m + 10h + 30m$$

$$= 10h\ 45m$$

For one week this is

$$5 \times 10h\ 45m$$

$$= 50h\ 225m$$

$$= 53h\ 45m$$

On Saturday the shop is open

$$7:30 \rightarrow 8:00 = 30m$$

$$8:00 \rightarrow 17:00 = 9h$$

$$17:00 \rightarrow 17:30 = 30m$$

$$= 30m + 9h + 30m$$

$$= 10h$$

On Sunday the shop is open

$$8:45 \rightarrow 9:00 = 15m$$

$$9:00 \rightarrow 12:00 = 3h$$

$$= 15m + 3h$$

$$= 3h 15m$$

In total this is

$$53h 45m + 10h + 3h 15m$$

$$= 66h 60m$$

$$= \mathbf{67h}$$

## Question 7

The ferry from Helsinki to Travemunde leaves Helsinki at 1730 on a Tuesday.  
The journey takes 28 hours 45 minutes.

Work out the day and time that the ferry arrives in Travemunde.

[2]

First add 24 hours to just get to the day after

$$17\ 30\ (tues) + 24\ 00$$

$$= 17\ 30\ (wed)$$

This leaves us

$$28\ 45 - 24\ 00$$

$$= 04\ 45$$

journey time left

$$17\ 30 + 04\ 45$$

$$= 22\ 15$$

*Wednesday*

## Question 8

A bus leaves a port every 15 minutes, starting at 09 00.  
The last bus leaves at 17 30.

How many times does a bus leave the port during one day?

[2]

From 09:00 till 17:30 there are 8 hours and a half.

We convert this time only into minutes in order to divide it by 15  
minutes, the distance between 2 buses.

$$\text{Time} = 8 \times 60 \text{ minutes} + 30 \text{ minutes}$$

$$\text{Time} = 510 \text{ minutes}$$

$$\frac{510 \text{ minutes}}{15 \text{ minutes}} = 34 \text{ (the number of 15 minutes intervals in one day)}$$

The number of buses in one day will be:

$$\mathbf{34 + 1 = 35}$$

(we need to add 1 in order to include the bus which leaves at 09:00)

## Question 9

The table shows the opening and closing times of a café.

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Opening time	0600	0600	0600	0600	0600	(a)	0800
Closing time	2200	2200	2200	2200	2200	2200	1300

- (a) The café is open for a total of 100 hours each week.

Work out the opening time on Saturday.

[2]

We note that the cafe opens and closes on whole hours, which makes the

calculations easier (we simply ignore the last 00 and focus on hours only.)

Subtract the opening time from the closing time to get the number of hours for

which the cafe is opened on a particular day.

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Opening time	06	06	06	06	06	(a)	08
Closing time	22	22	22	22	22	22	13
close-open	16	16	16	16	16	22-a	5

We sum the hours. The sum must be equal to 100.

$$100 = 16 + 16 + 16 + 16 + 16 + 22 - a + 5$$

Hence we determine the value of  $a$ .

$$a = 7\text{am}$$

Therefore the cafe opens at 7am on Saturday.

- (b) The owner decides to close the café at a later time on Sunday. This increases the total number of hours the café is open by 4%.  
Work out the new closing time on Sunday. [1]

The cafe was opened for 100 hours per week. An increase by 4% means  
that it will be now opened for 104 hours.

$$100 + 4\% \times 100 = 104$$

Hence the cafe will be opened for 4 extra hours on Sunday, moving the  
**closing time to 1700** (as it was previously opened until 1300).

**5pm**

## Question 10

A plane took 1 hour and 10 minutes to fly from Riyadh to Jeddah.

The plane arrived in Jeddah at 23 05.

At what time did the plane depart from Riyadh?

[1]

$$23:05 - 1\text{ h }10m$$

$$= 22:55 - 1\text{ h}$$

$$= \mathbf{21:55}$$

## Question 11

A cyclist left Melbourne on Wednesday 21 May at 09 45 to travel to Sydney.  
The journey took 97 hours.

Write down the day, date and time that the cyclist arrived in Sydney. [3]

Convert into days and hours

$$97 \div 24$$

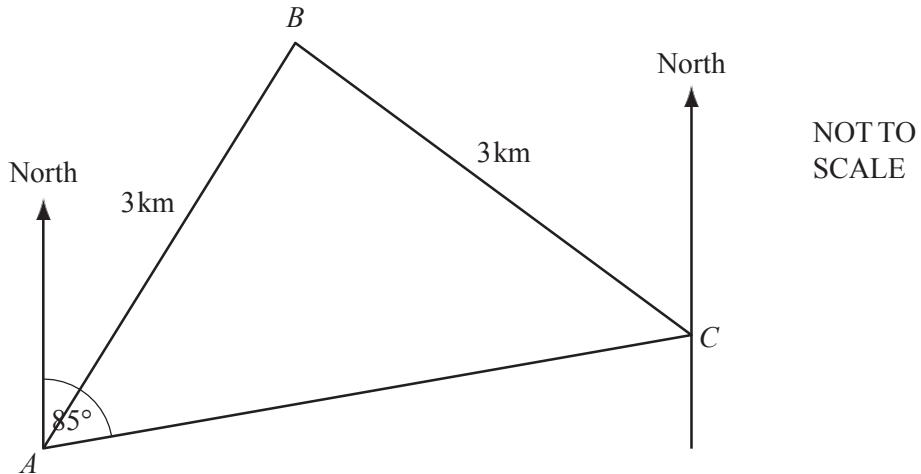
$$= 4 \text{ days } 1 \text{ hour}$$

Now add this to start time

*Wednesday 21st May 09:45 + 4 days 1 hour*

= **Sunday 25th May 10:45**

## Question 12



$A$ ,  $B$  and  $C$  are three places in a desert. Tom leaves  $A$  at 06 40 and takes 30 minutes to walk directly to  $B$ , a distance of 3 kilometres. He then takes an hour to walk directly from  $B$  to  $C$ , also a distance of 3 kilometres.

- (a) At what time did Tom arrive at  $C$ ? [1]

It takes Tom 30min to walk from  $A$  to  $B$ , and then a further 1hr to walk from  $B$  to  $C$ . Hence it takes

Tom:

1hr + 0.5hr = 1.5hr to walk from  $A$  to  $C$ . Tom starts his journey at 0640,

so he arrives at 06:40 + 90mins = 08:10

**Tom arrives at 08:10**

- (b) Calculate his average speed for the whole journey. [2]

To calculate his average speed we do the following:

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{3 + 3}{1 + 0.5} = 4$$

**Hence his average speed is 4 km/h**

(c) The bearing of  $C$  from  $A$  is  $085^\circ$ .

Find the bearing of  $A$  from  $C$ .

[1]

We are given that the bearing of  $A$  from  $C$  is  $085$ , hence to work

out the bearing of  $C$  from  $A$  we simply do

$$360 - 085 = 265$$

so the answer is:

**265**

## Question 13

At 05 06 Mr Ho bought 850 fish at a fish market for \$2.62 each.  
95 minutes later he sold them all to a supermarket for \$2.86 each.

- (a) What was the time when he sold the fish? [1]

**95 minutes = 1 hours and 35 minutes**

Starting from 5.06, the time when he sold it is:

**6.41**

- (b) Calculate his total profit. [1]

The profit he made for each fish is:

$$\$2.86 - \$2.62 = \$0.24$$

For 850 fish, his total profit is:

$$\$0.24 \times 850$$

$$= \$204$$

## Question 14

The Canadian Maple Leaf train timetable from Toronto to Buffalo is shown below.

Toronto	1030
Oakville	1052
Aldershot	1107
Grimsby	1141
St Catharines	1159
Niagra Falls	1224
Buffalo	1325

- (a) How long does the journey take from Toronto to Buffalo? [1]

**The journey takes 2 hours and 55 minutes.**

- (b) This journey is 154 kilometres. Calculate the average speed of the train. [2]

154 km takes 2 hours and 55 minutes

We convert the time in hours.

$$2 \text{ hours and } 55 \text{ minutes} = \frac{55 \text{ minutes} \times 1 \text{ hour}}{60 \text{ minutes}} + 2 \text{ hours} =$$

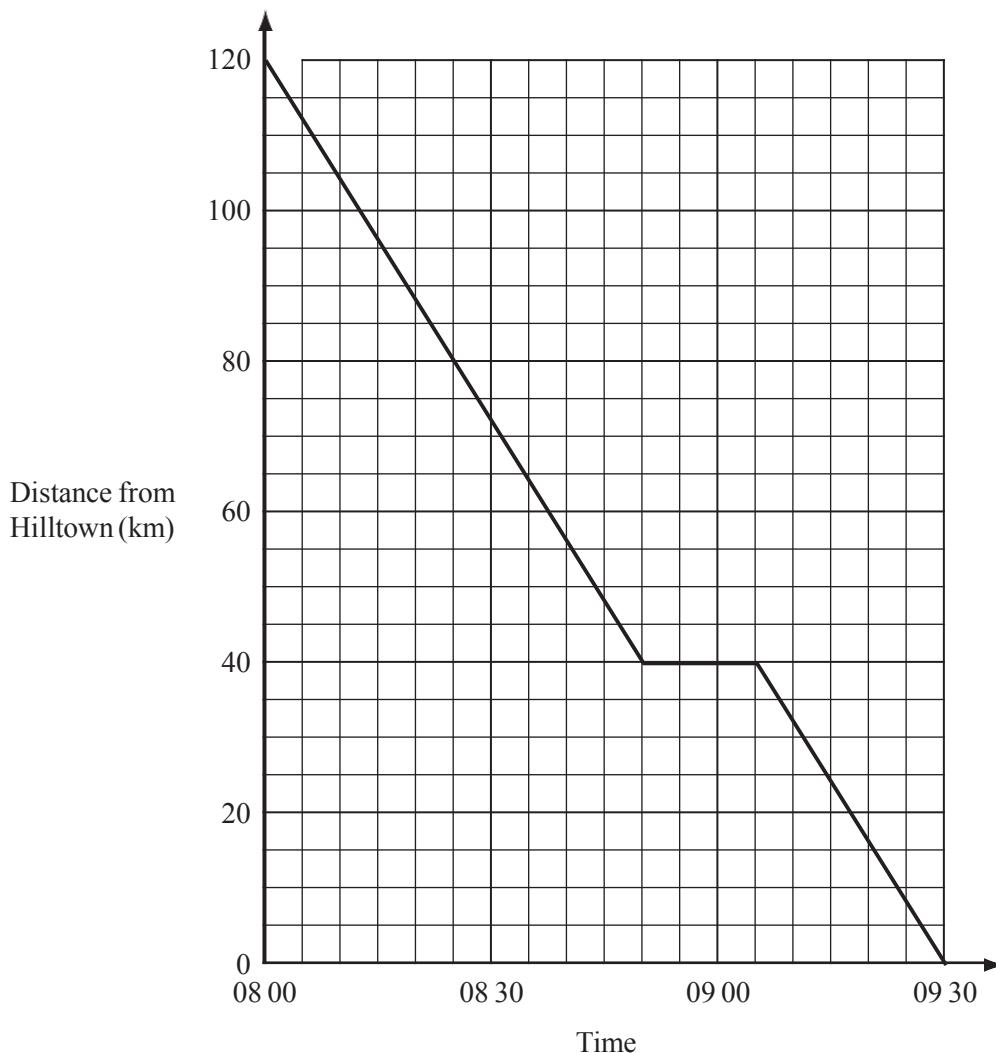
2.91 hours

Therefore, in one hour, the distance travelled is:

$$\text{Speed} = \frac{154 \text{ km}}{2.91 \text{ hours}}$$

**Speed = 52.8 km/h**

## Question 15



The graph shows the distance, in kilometres, of a train from Hilltown.

Find the speed of the train in kilometres per hour at

(a) 08 30,

[2]

By 8:30, the train has covered approximately 72 km in 45 minutes, considering that

the train stopped for approximately 15 minutes between 8:50 and 9:05.

45 minutes represent 0.75 hours.

Therefore, the speed in km per hour is: 96 km

(b) 09 00.

[1]

At 09:00, the distance from Hilltown remains constant over time, meaning that the train does not move, having a speed of 0 km/h.

**The answer is 0 km/h.**

## Question 16

A train left Sydney at 23 20 on December 18<sup>th</sup> and arrived in Brisbane at 02 40 on December 19<sup>th</sup>.  
How long, in hours and minutes, was the journey?

[1]

The easiest way to do this is to split the journey into two sections:

before midnight and after midnight.

Before midnight:

The train left Sydney at 2320 (11.20pm) which is 40 minutes before midnight.

After midnight:

The train arrived in Brisbane at 0240 (2.40am) which is 2 hours and 40 minutes after midnight.

Rather than convert into minutes just recognize that another 20 minutes (from the before midnight section) added to 2 hrs 40 mins (after midnight) makes 3 hours and there are 20 minutes left over from the before midnight part of the journey.

So the total time is **3 hrs 20 mins**.

# Currency

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Currency
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 36 minutes

**Score:** /28

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

The price of a toy is 12 euros (€) in Germany and 14 Swiss francs in Switzerland.  
1 Swiss franc = €0.905

Calculate the difference between these two prices.  
Give your answer in euros.

[2]

Use ratios for currency conversion questions:

Euros : Swiss Francs

$$\begin{matrix} 0.905 & : & 1 \\ ? & : & 14 \end{matrix} \quad \text{Multiply by 14}$$

So:  $? = 0.905 \times 14 = 12.67$

Difference =  $12.67 - 12$

**Difference = €0.67**

## Question 2

Omar changes 2000 Saudi Arabian riyals (SAR) into euros (€) when the exchange rate is €1 = 5.087 SAR.

Work out how much Omar receives, giving your answer correct to the nearest euro.

[2]

We divide the amount of money by the exchange rate like this

$$2000 \text{ (SAR)} \div 5.087$$

$$= €393.159 \dots$$

Round to the nearest euro

$$= €393.00$$

### Question 3

Carlos changed \$950 into euros (€) when the exchange rate was €1 = \$1.368.

Calculate how many euros Carlos received.

[2]

To convert from dollars to euros, divide the amount in dollars by the exchange rate of dollars per one euro.

$$\begin{array}{r} \$950 \\ \hline \$1.368 \text{ per } €1 \end{array}$$

$$= €694.4$$

## Question 4

James buys a drink for 2 euros (€).

Work out the cost of the drink in pounds (£) when £1 = €1.252 .

Give your answer correct to 2 decimal places.

[3]

The relation between euros and pounds is £1 = €1.252. By inverting this relation (dividing both sides of the equation by 1.252), we get that

$$\text{€}1 = \text{£} \frac{1}{1.252}$$

To convert from euros to pounds, we multiply the amount in euros by the exchange rate.

$$\text{€}2 \times \frac{1}{1.252} \text{£ per €} = \text{£}1.597$$

Rounding to 2 decimal places, we obtain that the drink costs

**£1.60.**

## Question 5

On a ship, the price of a gift is 24 euros (€) or \$30.

What is the difference in the price on a day when the exchange rate is €1 = \$1.2378?  
Give your answer in dollars, correct to the nearest cent.

[3]

We can find out the difference in price like this:

€24 needs to be converted into \$ - we are told that €1 = \$1.2378

The difference will be calculated by subtracting one from the other

$$\text{Difference} = 30 - (24 \times 1.2378)$$

$$\text{Difference} = 0.2928$$

$$\text{Difference} = \$0.29$$

## Question 6

\$1 = 8.2 rand

Change \$350 into rands.

[2]

Multiply by the exchange rate

$$350 \times 8.2$$

$$= 2870$$

## Question 7

Carlo changed 800 euros (€) into dollars for his holiday when the exchange rate was €1 = \$1.50 .

His holiday was then cancelled.

He changed all his dollars back into euros and he received €750.

Find the new exchange rate.

[3]

For the rate:

$$\text{€1} = \$1.50$$

The amount of dollars received for €800 is:

$$800 \times \$1.50/\text{€} = \$1200$$

After changing the dollars back into euros, the amount obtained is €750.

Therefore, we work out the new rate by dividing this amount by the amount

of euros obtained: €750

$$\frac{\$1200}{\text{€750}} = 1.6 \text{ } \$/\text{€}$$

$$\text{€1} = \$1.6$$

## Question 8

Chris changes \$1350 into euros (€) when €1 = \$1.313 .

Calculate how much he receives.

[2]

$$1350 \div 1.313$$

$$= 1028.18$$

### Question 9

~~Assembled by AS~~

Martina changed 200 Swiss francs (CHF) into euros (€).

The exchange rate was €1 = 1.14 CHF.

Calculate how much Martina received.

Give your answer correct to the nearest euro.

[3]

Here we know the ratio of Euros to CHF is 1 : 1.14

To convert from CHF to Euros we divide the CHF by its ratio and then multiply it by

Euros ratio.

$$200 \div 1.14 = 175.44 \dots$$

$$175.44 \times 1 = 175.44 \dots$$

rounding to the nearest Euro we get the answer

**175 Euros.**

## Question 10

George and his friend Jane buy copies of the same book on the internet.  
George pays \$16.95 and Jane pays £11.99 on a day when the exchange rate is \$1 = £0.626.

Calculate, in dollars, how much more Jane pays.

[2]

In order to change from Pounds to Dollars, we need to work out how many dollars represent a pound:

$$\$1 = \textcolor{red}{£0.626}$$

$$\textcolor{red}{£1} = \frac{\$1}{0.626}$$

$$\textcolor{red}{£1} = \$1.59$$

$$\textcolor{red}{£11.99} = \$1.59 \times 11.99$$

$$\textcolor{red}{£11.99} = \$19.15$$

Knowing the amount of money Jane pays, in dollars, we can work out how much more is she paying compared to George by subtracting the 2 amounts.

$$\textcolor{red}{\$19.15 - \$16.95 = \$2.2}$$

**Jane pays \$2.2 more.**

## Question 11

Sheila can pay her hotel bill in Euros (€) or Pounds (£).  
The bill was €425 or £365 when the exchange rate was £1 = €1.14 .

In which currency was the bill cheaper?  
Show all your working.

[2]

Convert the bill in pounds to euros in order to compare the two bills.

Converting the bill in pounds to euros: £365  $\times$  1.14 € per £ = €416.10

€416.10 < €425 therefore, the bill is **cheaper in pounds**

## Question 12

The train fare from Bangkok to Chiang Mai is 768 baht.  
The exchange rate is £1 = 48 baht.

Calculate the train fare in pounds (£).

[2]

Divide by the exchange rate.

$$768 \div 48$$

$$= \mathbf{\textcolor{green}{£16}}$$

# Currency

## Difficulty: Easy

### Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Currency
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 2

**Time allowed:** 39 minutes

**Score:** /30

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Gregor changes \$700 into euros (€) when the rate is €1 = \$1.4131 .

Calculate the amount he receives.

[2]

Divide by the exchange rate

$$700 \div 1.4131$$

$$= 495.36$$

## Question 2

Alberto changes 800 Argentine pesos (ARS) into dollars (\$) when the rate is \$1 = 3.8235 ARS. He spends \$150 and changes the remaining dollars back into pesos when the rate is \$1 = 3.8025 ARS.

Calculate the amount Alberto now has in pesos.

[3]

Exchange rate: \$1 = 3.8235 ARS

To work out the amount of dollars received for 800 pesos we need to divide 800 by 3.825 ARS, the equivalent of one dollar at this exchange rate.

$$\text{Amount of dollars} = \frac{800 \text{ ARS}}{3.8235 \text{ ARS}/\$} = \$209.23$$

If he spends \$150, the remaining amount is:

$$\$209.23 - \$150 = \$59.23$$

We need to change it back into pesos at the exchange rate: \$1 = 3.8025 ARS.

$$\text{Amount of pesos} = 3.8025 \text{ ARS}/\$ \times \$59.23$$

$$\text{Amount of pesos} = 225.22 \text{ ARS}$$

### Question 3

A meal on a boat costs 6 euros (€) or 11.5 Brunei dollars (\$).

In which currency does the meal cost less, on a day when the exchange rate is €1 = \$1.9037?  
Write down all the steps in your working.

[2]

To convert from Brunei dollars to euros, divide the amount in Brunei

dollars by the exchange rate of Brunei dollars per one euro.

$$\frac{\$11.5}{\$1.9037 \text{ per } €1} = €6.04$$

This is more than €6, therefore:

***Meal costs less in euros.***

## Question 4

Reina went on holiday to New Zealand.

- (a) She travelled the 65 km from Tokyo to Narita Airport by taxi.

The taxi journey cost 300 yen (¥) per kilometre plus a fixed charge of ¥ 700.

Calculate the cost of the taxi journey.

[2]

Multiply rate by distance and add the fixed cost

$$65 \times 300 + 700$$

$$= 20200$$

- (b) At Narita Airport, Reina changed ¥ 71 190 into New Zealand dollars (NZ\$).

The exchange rate was NZ\$1 = ¥56.5.

How many New Zealand dollars did she receive?

[2]

Divide the amount by the exchange rate

$$71190 \div 56.5$$

$$= 1260$$

## Question 5

The air fare from Singapore to Stockholm can be paid for in Singapore dollars (S\$) or Malaysian Ringitts (RM).

One day the fare was S\$740 or RM1900 and the exchange rate was S\$1 = RM2.448 .

How much less would it cost to pay in Singapore dollars?

Give your answer in Singapore dollars correct to the nearest Singapore dollar.

[3]

Divide by the exchange rate

$$\frac{\text{RM}1900}{\text{RM}2.448} = \text{S\$}776.14$$

We then have the difference

$$\text{S\$}776.14 - \text{S\$}740$$

$$= \text{S\$}36$$

## Question 6

In France, the cost of one kilogram of apricots is €3.38 .

In the UK, the cost of one kilogram of apricots is £4.39 .

£1 = €1.04.

Calculate the difference between these prices.

Give your answer in pounds (£).

[2]

Divide by the exchange rate to get the cost in pounds

$$\frac{3.38}{1.04} = \text{£}3.25$$

So, the difference is

$$4.39 - 3.25$$

$$= 1.14$$

## Question 7

Michel changed \$600 into pounds (£) when the exchange rate was £1 = \$2.40.  
He later changed all the pounds back into dollars when the exchange rate was £1 = \$2.60.

How many dollars did he receive? [2]

Divide by exchange rate

$$\$600 \div 2.40$$

$$= £250$$

Now multiply by new exchange rate

$$£250 \times 2.6$$

$$= \$650$$

## Question 8

Ricardo changed \$600 into pounds (£) when the exchange rate was \$1 = £0.60.  
He later changed all the pounds back into dollars when the exchange rate was \$1 = £0.72.

How many dollars did he receive?

[2]

Multiply initial dollar value by initial exchange rate to get

initial pound value

$$\$600 \times 0.6$$

$$= £360$$

Now divide by new exchange rate

$$£360 \div 0.72$$

$$= \$500$$

## Question 9

In January Sunanda changed £25 000 into dollars when the exchange rate was \$1.96 = £1.  
In June she changed the dollars back into pounds when the exchange rate was \$1.75 = £1.  
Calculate the profit she made, giving your answer in pounds (£).

[3]

The amount of dollars she made is:

$$\$1.96/\text{pound} \times 25\,000 \text{ pounds} = \$49\,000$$

When she changed it to pounds:

$$\$49\,000 / \$1.75/\text{pound} = 28\,000 \text{ pounds}$$

Her profit is:

$$\mathbf{\pounds 28\,000 - \pounds 25\,000 = \pounds 3\,000}$$

## Question 10

A holiday in Europe was advertised at a cost of €245.

The exchange rate was \$1 = €1.06.

Calculate the cost of the holiday in dollars, giving your answer correct to the nearest cent.

[2]

$$245 \div 1.06$$

$$= \$231.13$$

## Question 11

In April 2001, a bank gave the following exchange rates.

1 euro = 0.623 British pounds.

1 euro = 1936 Italian lire.

- (a) Calculate how much one pound was worth in lire. [2]

$$1 \text{ euro} = 1963 \text{ Italian lire}$$

$$1 \text{ euro} = 0.623 \text{ British pounds.}$$

Therefore, 0.623 pounds = 1963 lire.

The amount of lire represented by 1 British pound is

$$\frac{1 \text{ British pound} \times 1963 \text{ lire}}{0.623 \text{ pounds}}$$

$$= 3107.54 \approx 3110 \text{ Italian lire.}$$

- (b) Calculate how much one million lire was worth in pounds. [1]

$$1 \text{ pound} = 3110 \text{ lire}$$

We need to work out the amount of pounds represented

by a million lire is:

$$1\,000\,000 \text{ lire} / 3110 \text{ lire/pounds}$$

$$= 322$$

## Question 12

Alejandro goes to Europe for a holiday.

He changes 500 pesos into euros at an exchange rate of 1 euro = 0.975 pesos.

How much does he receive in euros? Give your answer correct to 2 decimal places.

[2]

$$1 \text{ euro} = 0.975 \text{ pesos}$$

$$\frac{500 \text{ pesos}}{0.975 \text{ pesos/euro}}$$

$$= 512.82 \text{ euros}$$

# Currency

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Currency
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 27 minutes

**Score:** /21

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

For her holiday, Alyssa changed 2800 Malaysian Ringgits (MYR) to US dollars (\$) when the exchange rate

was 1 MYR = \$0.325 .

At the end of her holiday she had \$210 left.

(a) How many dollars did she spend?

[2]

Multiply her starting amount by the exchange rate:

$$2800 \times 0.325$$

$$= 910$$

Subtract her final amount:

$$910 - 210$$

$$= 700$$

(b) She changed the \$210 for 750 MYR.

What was the exchange rate in dollars for 1 MYR?

[1]

Divide her amount in dollars by the amount in MYR:

$$210 \div 750$$

$$= 0.28$$

## Question 2

The table shows how the dollar to euro conversion rate changed during one day.

Time	1000	1100	1200	1300	1400	1500	1600
\$1	€1.3311	€1.3362	€1.3207	€1.3199	€1.3200	€1.3352	€1.3401

Khalil changed \$500 into euros (€).

How many more euros did Khalil receive if he changed his money at the highest rate compared to the lowest rate?

[3]

Identify the highest and lowest rates; note that Khalil is changing dollars to euros, and so he will want the largest number for euro per dollar changed.

Highest → €1.3401

Lowest → €1.3199

For a \$500 change, highest rate:

$$500 \times 1.3401 = €670.05$$

Lowest rate:

$$500 \times 1.3199 = €659.95$$

Difference:

$$€670.05 - €659.95 = €10.10$$

$$= €10.10$$

### Question 3

Pam wins the student of the year award in New Zealand.  
She sends three photographs of the award ceremony by post to her relatives.

- one of size 13 cm by 23 cm to her uncle in Australia
- one of size 15 cm by 23 cm to her sister in China
- one of size 23 cm by 35 cm to her mother in the UK

Maximum lengths	Australia	Rest of the world
13 cm by 23.5 cm	\$1.90	\$2.50
15.5 cm by 23.5 cm	\$2.40	\$2.90
23 cm by 32.5 cm	\$2.80	\$3.40
26 cm by 38.5 cm	\$3.60	\$5.20

The cost of postage is shown in the table above.

Use this information to calculate the total cost.

[3]

Uncle in Australia:

$$\text{Cost} = \$1.90$$

Sister in China

$$\text{Cost} = \$2.90$$

Mother in UK

$$\text{Cost} = \$5.20$$

Total:

$$\text{Total Cost} = \$1.90 + \$2.90 + \$5.20$$

$$= \$\mathbf{10.00}$$

## Question 4

Federico changed 400 euros (€) into New Zealand dollars (NZ\$) at a rate of  $\text{€}1 = \text{NZ\$ } 2.1$ .  
He spent  $x$  New Zealand dollars and changed the rest back into euros at a rate of  $\text{€}1 = \text{NZ\$ } d$ .

Find an expression, in terms of  $x$  and  $d$ , for the number of euros Federico received.

[3]

We will find the final expression step by step.

One euro is NZ\$ 2.1, so we multiply the original amount of euros by 2.1 to get  
NZ\$.

$$\text{€}400 \times 2.1 = \text{NZ\$ } 840$$

Federico then spent  $x$  of this New Zealand dollars, so he was left with:

$$\text{NZ\$ } 840 - x$$

When he exchanged the money back, one euro was NZ\$  $d$ . Now we divide by the exchange rate, because we are converting the other way.

$$\frac{\text{NZ\$ } 840 - \text{NZ\$ } x}{d \text{ NZ\$ per €}}$$

Hence Federico received:

$$\frac{840 - x}{d}$$

## Question 5

- (a) In 2007, a tourist changed 4000 Chinese Yuan into pounds (£) when the exchange rate was £1 = 15.2978 Chinese Yuan.  
Calculate the amount he received, giving your answer correct to 2 decimal places. [2]

In order to change from Chinese Yuan into pounds, we can do this:

$$1 \text{ Chinese Yuan} = \text{£}0.06537$$

$$4000 \text{ Chinese Yuan} = \text{£}0.06537 \times 4000$$

$$4000 \text{ Chinese Yuan} = \text{£}261.4755$$

But we need this to the nearest penny

$$\textbf{4000 Chinese Yuan} = \textbf{£261.48}$$

- (b) In 2006, the exchange rate was £1 = 15.9128 Chinese Yuan.  
Calculate the percentage decrease in the number of Chinese 2006 to £1 from 2007. [2]

to calculate the percentage decrease we need to do the following:

$$\frac{\text{change in amount of chinese yuan for each £1}}{\text{amount of chinese yuan for each £1 in 2006}} \times 100$$

$$\frac{15.9128 - 15.2978}{15.9128} \times 100 = 3.8648$$

Hence the percentage decrease is **3.865%**

## Question 6

(a) In October the cost of a car in euros was €20 000.

The cost of this car in pounds was £14 020.

Calculate the **exact** value of the exchange rate in October.

[1]

$$14\ 020 \div 20\ 000$$

$$= 0.701$$

(b) In November the car still cost €20 000 and the exchange rate was €1 = £0.6915.

Calculate the difference, in pounds, between the cost in October and November.

[2]

Cost in pound sterling is

$$20\ 000 \times 0.6915$$

$$= 13\ 830$$

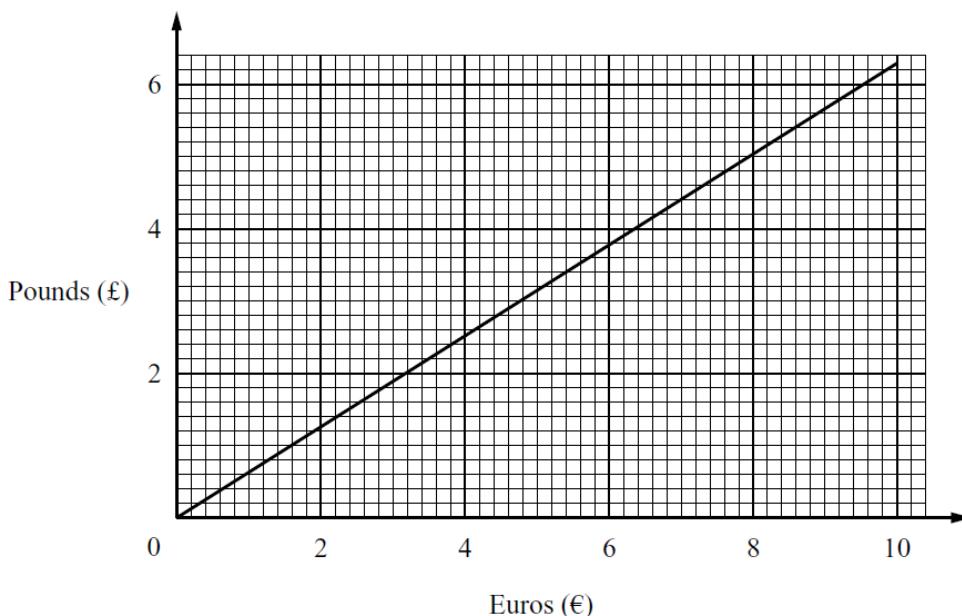
Hence, the difference is

$$14020 - 13830$$

$$= 190$$

## Question 7

The graph below can be used to convert between euros (e) and pounds (£).



- (a) Change £5 into euros.

[1]

We need to identify the x coordinate corresponding to  $y = 5$  pounds

**5 pounds = 7.85 euros.**

- (b) Change €90 into pounds.

[1]

If 7.85 euros represent 5 pounds, then 90 euros will be equal to:

$$\text{number of pounds} = \frac{90 \text{ euros} \times 5 \text{ pounds}}{7.85 \text{ euros}}$$

**number of pounds = 57.3**

# Exponential Growth

## Difficulty: Easy

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Exponential Growth
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

**Time allowed:** 46 minutes

**Score:** /36

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

The value of a motorbike is \$12400.

Each year, the value of the motorbike decreases exponentially by 15%.

Calculate the value of the motorbike after 3 years.

[2]

$$12400 \times 0.85^3$$

$$= 7615.15$$

## Question 2

The population of Olton is decreasing at a rate of 3% per year.  
In 2013, the population was 50000.

Calculate the population after 4 years.  
Give your answer correct to the nearest hundred.

[3]

In order to get the population in the next year, we multiply the current population by the factor 0.97.

This factor represents the 3% rate of decrease ( $0.97 = 1 - 3\% = 1 - 0.03$ ).

To get the population after 4 years, we multiply the population by the factor 4 times.

$$\text{after 4 years} = \text{current} \times 0.97^4$$

$$\text{after 4 years} = 50\,000 \times 0.97^4$$

$$\text{after 4 years} = 44\,264.64$$

Round the number to the nearest hundred.

$$\text{population after 4 years} = 44\,300$$

### Question 3

Alex invests \$200 for 2 years at a rate of 2% per year simple interest.  
Chris invests \$200 for 2 years at a rate of 2% per year compound interest.

Calculate how much more interest Chris has than Alex.

[4]

Alex earns

$$0.02 \times 200 \times 2$$

$$= 8$$

Chris earns

$$200 \times 1.02^2 - 200$$

$$= 8.08$$

The difference is

$$\mathbf{0.08}$$

## Question 4

Maryah borrows \$12 000 to start a business.  
The loan is for 3 years at a rate of 5% per year compound interest.  
The loan has to be paid back at the end of the 3 years.

Calculate the total amount to be paid back.

[3]

$$12000 \times 1.05^3$$

$$= 13891.50$$

## Question 5

Bruce invested \$420 at a rate of 4% per year compound interest.

Calculate the **total** amount Bruce has after 2 years.

Give your answer correct to 2 decimal places.

[3]

Each year Bruce's investment increases by 4% or alternatively multiplies by

$$1.04 = \left(1 + \frac{4}{100}\right).$$

This means after two years, Bruce's investment becomes

$$(420 \times 1.04) \times 1.04 = 420 \times 1.04^2 = \$454.27$$

$$= \$454.27$$

To two decimal places.

## Question 6

Carol invests \$6250 at a rate of 2% per year compound interest.

[3]

Calculate the **total** amount Carol has after 3 years.

We can calculate the interest in each of the 3 years:

Year 1:

$$\text{The amount of money} = \$6250 + \frac{2 \times \$6250}{100}$$

$$\text{The amount of money} = \$6250 + \$125$$

$$\text{The amount of money} = \$6375$$

This will be the amount of money used to calculate the interest in Year 2.

Year 2:

$$\text{The amount of money} = \$6375 + \frac{2 \times \$6375}{100}$$

$$\text{The amount of money} = \$6375 + \$127.5$$

$$\text{The amount of money} = \$6502.5$$

Year 3:

$$\text{The amount of money} = \$6502.5 + \frac{2 \times \$6502.5}{100}$$

$$\text{The amount of money} = \$6502.5 + \$130.05$$

**The amount of money = \$6632.55 after 3 years.**

Alternatively, we can use a multiplier in the following formula:

The amount of money after n years = initial amount + (1 + compound interest per year)<sup>n</sup>

In this case, the amount of money after 3 years = \$6250 + (1 +  $\frac{2}{100}$ )<sup>3</sup>

The amount of money after 3 years = \$6250 +  $(\frac{102}{100})^3$

The amount of money after 3 years = \$6250 + 1.02<sup>3</sup>

**The amount of money after 3 years = \$6632.55**

## Question 7

Acri invested \$500 for 3 years at a rate of 2.8% per year compound interest.

Calculate the final amount he has after 3 years.

[3]

The money increased by 2.8% per year so it is multiplied

by 1.028 per year.

After three years this is

$$500 \times 1.028^3$$

$$= 543.19$$

## Question 8

Pedro invested \$800 at a rate of 5% per year compound interest.  
Calculate the total amount he has after 2 years.

[2]

We can use the compound interest formula:

$$5\% = \frac{5}{100} = 0.05$$

$$\$800 \times (1 + 0.05)^2 = \$800 \times 1.1025$$

$$\$800 \times (1.05)^2 = \$882$$

## Question 9

Eva invests \$120 at a rate of 3% per year compound interest.

Calculate the total amount Eva has after 2 years.

Give your answer correct to 2 decimal places.

[3]

The rate of 3% per year (compound interest) means that the amount of money

next year will be 1.03  $1.03 = 1 + \frac{3\%}{100\%}$

times the previous amount.

We want to find out the amount after 2 years, so the initial amount has to be

multiplied by the factor 1.03 twice.

$$\$120 \times 1.03^2 = \$127.308$$

Round the number to 2 decimal places:

**\$127.31**

## Question 10

Johan invested \$600 for 3 years at 4% per year **compound** interest.

Calculate the final amount he had after three years.

[3]

. 4% compound interest means that the value in the bank is multiplied by 1.04 (104%) each year.

After 3 years we have

$$600 \times 1.04^3$$

$$= \$674.92$$

## Question 11

Nikhil invests \$200 for 2 years at 4% per year **compound** interest.  
Calculate the **exact** amount Nikhil has after 2 years.

[2]

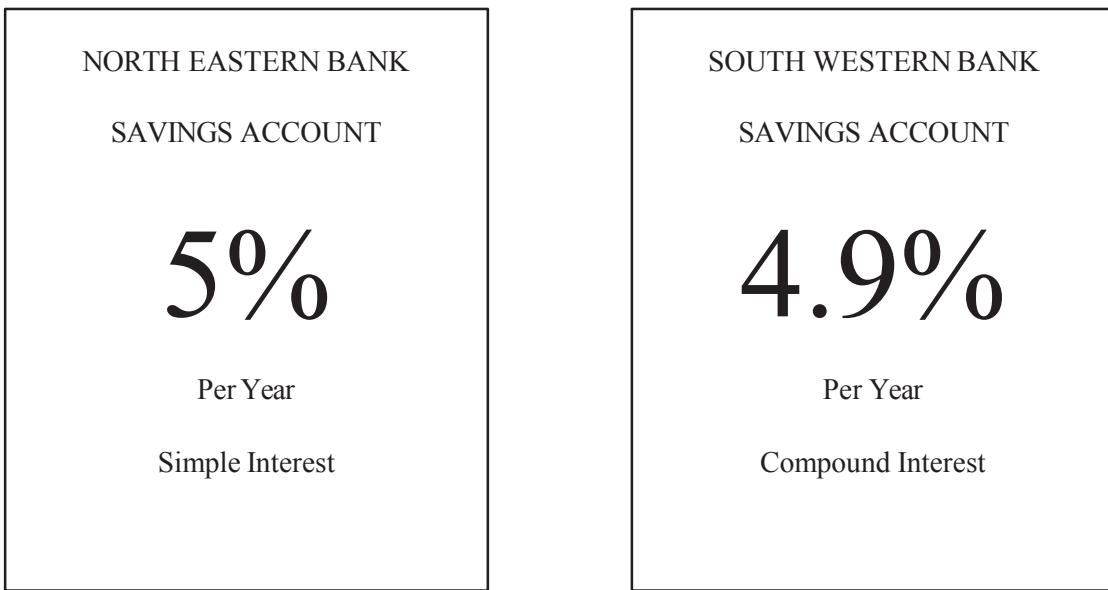
4% compound interest per year means we multiply the amount in the bank by 1.04 per year.

After 2 years this is

$$200 \times 1.04^2$$

$$= 216.32$$

## Question 12



Kalid and his brother have \$2000 each to invest for 3 years.

- (a) North Eastern Bank advertises savings with simple interest at 5% per year.

Kalid invests his money in this bank.

How much money will he have at the end of 3 years?

[2]

**For simple interest:**

$$\$2000 + \frac{3 \times 5 \times \$2000}{100}$$

$$= \$2300$$

- (b) South Western Bank advertises savings with compound interest at 4.9% per year.

Kalid's brother invests his money in this bank.

At the end of 3 years, how much more money will he have than Kalid?

[3]

**For compound interest:**

$$\$2000 \times (1 + \frac{4.9}{100})^3 = \$2308.64$$

**The difference between the 2 is:**

$$\$2308.64 - \$2300$$

$$= \$8.64$$

# Exponential Growth

## Difficulty: Hard

### Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Number
Sub-Topic	Exponential Growth
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

**Time allowed:** 28 minutes

**Score:** /22

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

## Question 1

Marcel invests \$2500 for 3 years at a rate of 1.6% per year simple interest.  
Jacques invests \$2000 for 3 years at a rate of  $x\%$  per year compound interest.  
At the end of the 3 years Marcel and Jacques receive the same amount of interest.

Calculate the value of  $x$  correct to 3 significant figures.

[5]

Marcel receives

$$0.016 \times 2500 \times 3$$

$$= 120$$

in interest.

Jacques receives

$$2000 \times \left(1 + \frac{x}{100}\right)^3 - 2000$$

In interest, which must be equal to the amount Marcel receives, hence

$$2000 \left(1 + \frac{x}{100}\right)^3 - 2000 = 120$$

$$\rightarrow \left(1 + \frac{x}{100}\right)^3 - 1 = \frac{3}{50}$$

$$\rightarrow \left(1 + \frac{x}{100}\right)^3 = \frac{53}{50}$$

$$\rightarrow 1 + \frac{x}{100} = 1.01961$$

$$\rightarrow \frac{x}{100} = 0.01961$$

$$\rightarrow x = 1.96\%$$

## Question 2

The population of the world grows exponentially at a rate of 1.1% per year.

Find the number of years it takes for the population to grow from 7 billion to 7.31 billion.  
Give your answer correct to the nearest whole number.

[2]

We know that the population increases at 1.1% every year, so we can cycle through multiplying until we reach the required number:

$$\text{Year 1: } 7 \times 1.011 = 7.077$$

$$\text{Year 2: } 7.077 \times 1.011 = 7.154847$$

$$\text{Year 3: } 7.154847 \times 1.011 = 7.23355 \dots$$

$$\text{Year 4: } 7.23355 \dots \times 1.011 = 7.31311 \dots$$

So it takes 4 years for the population to increase to 7.31bn.

### Question 3

It is estimated that the world's population is growing at a rate of 1.14% per year.  
On January 1st 2014 the population was 7.23 billion.

- (a) Find the expected population on January 1st 2020. [2]

An increase of 1.14% means we multiply by

$$1 + \frac{1.14}{100}$$

$$= 1.0114$$

Each year and we have a difference of 6 years, hence

$$7.23 b \times (1.0114)^6$$

$$= 7.74 \text{ billion}$$

- (b) Find the year when the population is expected to reach 10 billion. [2]

We need to solve

$$10 = 7.23 \times (1.0114)^n$$

Where n is the number of years that have passes since 2014. Rearranging this we have

$$\frac{10}{7.23} = 1.0114^n$$

$$= 1.383$$

Now we test numbers for n

$$1.0114^{30} = 1.405$$

$$1.0114^{29} = 1.389$$

$$1.0114^{28} = 1.374$$

$$1.0114^{27} = 1.358$$

We can see that  $n = 29$  exceeds the desired number, i.e. the population is greater than 10 billion for the year  $n = 29$ , hence the population must reach 10b in the year  $n = 28$ .

$$2014 + 28$$

$$= \mathbf{2042}$$

## Question 4

At the start of an experiment there are 20000 bacteria.  
The number of bacteria increases at a rate of 30% per hour.

- (a) Work out the number of bacteria after 4 hours.

[2]

After each hour we multiply the number of bacteria by 1.3 (multiplier for a 30% increase). Thus after four hours we have

$$20000 \times (1.3)^4$$

$$= 57122$$

- (b) After how many **whole** hours, from the start of the experiment, will the number of bacteria be greater than one million?

[2]

We need to solve

$$20000 \times 1.3^n = 1000000$$

Where if we round n up we will have the number of whole hours to reach above 1 million.

Divide both sides by 20000

$$1.3^n = 50$$

Trial and error

$$1.3^{14} = 39.37$$

$$1.3^{15} = 51.19$$

So

$$\mathbf{n = 15}$$

## Question 5

Boris invests \$280 for 2 years at a rate of 3% per year compound interest.

Calculate the interest Boris receives at the end of the 2 years.  
Give your answer correct to 2 decimal places.

[4]

**Boris, at the end of 2 years of compound interest, has**

$$280 \times 1.03^2$$

$$= 297.05$$

**Minus his initial amount to find the interest**

$$297.05 - 280$$

$$= \mathbf{17.05}$$

**Question 6**

~~Assembled by A.S.~~

Zainab borrows \$198 from a bank to pay for a new bed.  
The bank charges compound interest at 1.9 % per month.  
Calculate how much **interest** she owes at the end of 3 months.  
Give your answer correct to 2 decimal places.

[3]

To calculate how much interest she owes on \$198 at the end of the 3 months

we first must calculate the total amount after interest at the end of the 3 months. This is done as follows:

$198 \times \left(1 + \frac{r}{100}\right)^3$ , where  $r$  is the interest rate. As we know that the interest rate is 1.9%,

$r = \left(1 + \frac{1.9}{100}\right)^3 = 1.019$ , and hence the total amount after interest is:

$$198 \times 1.019^3 = \$209.50.$$

Hence Zainab owes the bank  $\$209.5 - \$198 = \$11.5$

So the answer is:

**\$11.5**