SANDRINGHAM SCHOOL

MATHEMATICS DEPARTMENT

Introduction to Mathematical Studies

SUMMER WORK

What you need to know about Mathematical Studies

Mathematical Studies has been designed to maintain and develop real-life maths skills. What you will study can be applied on a day-to-day basis in work, study or life. It will also help with your A-level subjects – in particular Science, Geography, Business Studies, Psychology and Economics.

You will be following AQA specification, which is formally known as Level 3 Mathematical Studies (code 1350). It is equivalent to an AS course in terms of UCAS points.

How you will be assessed:

- Two formal examinations at the end of year 12 (usually mid to late May, one week apart).
- Each exam accounts for 50% of the final grade and is 1.5 hours long.
- End of unit internal assessments and mock examinations throughout the course.
- Calculators are allowed in both papers.

Each paper has preliminary material released before the examination and there are questions in the examination based upon this material.

What you will need in lessons:

- A scientific calculator – preferably the Casio fx-991.
- A folder containing all notes and materials in an organised fashion.
- You will need to purchase the course textbook.

Summer work:

The Summer work is included in this booklet. It is made up of four sections:

- Rounding and Estimation
- Percentages
- Data Handling
- Exchange Rates

All questions are based on GCSE level and these topics will be reviewed as part of the course. If you are unsure on any topics then please visit the Maths Genie website and look up these topics within their GCSE revision pages.

You can either print the booklet or work on paper. At the end of each section are the solutions. Make sure you mark all your work. Marked work is to be handed in on your first lesson in September.

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Mathematical Studies Rounding and Estimation Summer Work

Question 1

Round 212.29 to the nearest 10.

Question 2

Round 491.18 to the nearest whole.

Question 3

Round 3293.82 to the nearest 100.

Question 4

Round 372197.8 to the nearest 1000.

Question 5

Round 1.4478 to 1 decimal place.

Question 6

Round 335.22 to 1 decimal place.

Question 7

Round 139.56 to 1 decimal place.

Question 8

Round 48.517 to 2 decimal places.

Question 9

By rounding each number to 1 significant figure, estimate the answer to

$2791.21 - 930.4$

Question 10

By rounding each number to 1 significant figure, estimate the answer to

$10980.3 + 99.82$

Question 11

By rounding each number to 1 significant figure, estimate the answer to

$1365.01 - 54.6$

Question 12

By rounding each number to 1 significant figure, estimate the answer to

$5794.4 + 965.7$

Question 13

By rounding each number to 1 significant figure, estimate the answer to

$$\frac{64.7 - 26.7}{0.17}$$

Question 14

By rounding each number to 1 significant figure, estimate the answer to

$$\frac{60.1 \times 18.5}{0.24}$$

Question 15

By rounding each number to 1 significant figure, estimate the answer to

$$\frac{899 + 198.6}{0.23}$$

Question 16

By rounding each number to 1 significant figure, estimate the answer to

$$\frac{570 \times 16.36}{0.53}$$

Question 17

Round 18691.82 to 3 significant figures.

Question 18

Round 3376451 to 1 significant figure.

Question 19

Round 2.5155 to 2 significant figures.

Question 20

Round 434989.9 to 1 significant figure.

Answers to Estimation and Rounding questions

Question 1

210

Start by finding the digit in the tens place.2**1**2.29

Then look one place to the right: 21**2**.29

Given that 2 is less than 5, keep the **1** and replace all digits to the right of it by 0s.

The answer is therefore 210

Question 2

491

Start by finding the digit in the units place:49**1**.18

Then look one place to the right: 491.**1**8

Given that 1 is less than 5, keep the **1** and replace all digits to the right of it by 0s.

The answer is therefore 491

Question 3

3300

Start by finding the digit in the hundreds place.3**2**93.82

Then look one place to the right: 32**9**3.82

Given that 9 is 5 or more, round the **2** up and replace all digits to the right of it by 0s.

The answer is therefore 3300

Question 4

372000

Start by finding the digit in the thousands place.37**2**197.8

Then look one place to the right: 372**1**97.8

Given that 1 is less than 5, keep the **2** and replace all digits to the right of it by 0s.

The answer is therefore 372000

Question 5

1.4

Start by finding the digit in the tenth place:1.**4**478

Then look one place to the right: 1.4**4**78

Given that 4 is less than 5, keep the **4** and remove all the digits to the right of it.

The answer is therefore 1.4

Question 6

335.2

Start by finding the digit in the tenth place:335.**2**2

Then look one place to the right: 335.2**2**

Given that 2 is less than 5, keep the **2** and remove all the digits to the right of it.

The answer is therefore 335.2

Question 7

139.6

Start by finding the digit in the tenth place:139.**5**6

Then look one place to the right: 139.5**6**

Given that 6 is 5 or more, round the **5** up and remove all the digits to the right of it.

The answer is therefore 139.6

Question 8

48.52

Start by finding the digit in the hundredth place:48.5**1**7

Then look one place to the right: 48.517

Given that 7 is 5 or more, round the **1** up and remove all the digits to the right of it.

The answer is therefore 48.52

Question 9

2100

2791.21 rounds to 3000 to 1 significant figure. 930.4 rounds to 900 to 1 significant figure.

$$\begin{aligned} 2791.21 - 930.4 &\approx 3000 - 900 \\ &\approx 2100 \end{aligned}$$

Question 10

10100

10980.3 rounds to 10000 to 1 significant figure. 99.82 rounds to 100 to 1 significant figure.

$$\begin{aligned} 10980.3 + 99.82 &\approx 10000 + 100 \\ &\approx 10100 \end{aligned}$$

Question 11

950

1365.01 rounds to 1000 to 1 significant figure. 54.6 rounds to 50 to 1 significant figure.

$$\begin{aligned} 1365.01 - 54.6 &\approx 1000 - 50 \\ &\approx 950 \end{aligned}$$

Question 12

7000

5794.4 rounds to 6000 to 1 significant figure. 965.7 rounds to 1000 to 1 significant figure.

$$\begin{aligned} 5794.4 + 965.7 &\approx 6000 + 1000 \\ &\approx 7000 \end{aligned}$$

Question 13

150

64.7 rounds to 60 to 1 significant figure. 26.7 rounds to 30 to 1 significant figure.

$$\begin{aligned} \frac{64.7 - 26.7}{0.17} &\approx \frac{60 - 30}{0.2} \\ &\approx \frac{30}{0.2} \\ &\approx 150 \end{aligned}$$

Question 14

6000

60.1 rounds to 60 to 1 significant figure. 18.5 rounds to 20 to 1 significant figure.

$$\frac{60.1 \times 18.5}{0.24} \approx \frac{60 \times 20}{0.2}$$
$$\approx \frac{1200}{0.2}$$
$$\approx 6000$$

Question 15

5500

899 rounds to 900 to 1 significant figure. 198.6 rounds to 200 to 1 significant figure.

$$\frac{899 + 198.6}{0.23} \approx \frac{900 + 200}{0.2}$$
$$\approx \frac{1100}{0.2}$$
$$\approx 5500$$

Question 16

24000

570 rounds to 600 to 1 significant figure. 16.36 rounds to 20 to 1 significant figure.

$$\frac{570 \times 16.36}{0.53} \approx \frac{600 \times 20}{0.5}$$
$$\approx \frac{12000}{0.5}$$
$$\approx 24000$$

Question 17

18700

The number including the first 3 significant figures are 186. As the digit afterwards, 9, is greater than 5, you need to round 186 to 187. You can replace the remaining digits by placeholder zeros.

The answer is therefore 18700

Question 18

3000000

The number including the first significant figure is 3. As the digit afterwards, 3, is less than 5, no need to round up. You can replace the remaining digits by placeholder zeros.

The answer is therefore 3000000

Question 19

2.5

The number including the first 2 significant figures are 25. As the digit afterwards, 1, is less than 5, no need to round up.

The answer is therefore 2.5

Question 20

400000

The number including the first significant figure is 4. As the digit afterwards, 3, is less than 5, no need to round up. You can replace the remaining digits by placeholder zeros.

The answer is therefore 400000

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Mathematical Studies Percentages Summer Work

Question 1

There are 48 Year 7 pupils in a football club, out of a total of 111 pupils.

Write this proportion as a percentage.
Give your answer correct to 1 decimal place when appropriate.

..... %

Question 2

There are 39 Year 10 pupils in a football club, out of a total of 92 pupils.

Write this proportion as a percentage.
Give your answer correct to 1 decimal place when appropriate.

..... %

Question 3

There are 23 Year 13 pupils in a rugby club, out of a total of 60 pupils.

Write this proportion as a percentage.
Give your answer correct to 1 decimal place when appropriate.

..... %

Question 4

The price of a flat increases from £112869 to £142214.94

Find the percentage change.

..... % increase

Question 5

The price of a computer increases from £258 to £270.9

Find the percentage change.

..... % increase

Question 6

The price of a phone increases from £309 to £404.79

Determine the percentage change.

..... % increase

Question 7

Increase 41.3 by 5%

.....

Question 8

Decrease 213.3 by 31%

.....

Question 9

Decrease 3164 by 50%

.....

Question 10

Alfred invests £2870 into a savings account.
Alfred gets 4.25% per year simple interest.

Work out the total interest Alfred will get after 3 years.

£ .....

Question 11

Alfred puts £3695 into an bank account.
The account pays 4.25% simple interest each year.

Work out how much interest Alfred will get after 11 years.

£ .....

Question 12

Alex invests £2885 into an savings account.
Alex gets 0.25% per year simple interest.

Work out the total interest Alex will get after 15 years.

£ .....

Question 13

Amir invests £1485 into an account that pays 4.75% compound interest per annum.

Work out how much Amir will have in the account after 17 years.

£ .....

Question 14

Adam invests £425 into an account that pays 2.75% compound interest per year.

Work out how much Adam will have in the account after 20 years.

£ .....

Question 15

Alicia puts £3695 into an bank account.
The account pays 4.25% compound interest each year.

Work out how much Alicia will have in the account after 7 years.

£ .....

Question 16

Alicia buys a car for £17145 which depreciates in value at a rate of 0.5% per year.

Work out how much Alicia's car will be worth in 14 years.

£ .....

Question 17

Alice buys a car for £10815 which depreciates in value at a rate of 0.5% per year.

Work out how much Alice's car will be worth in 14 years.

£ .....

Question 18

Alexandra buys a car for £12335 which depreciates in value at a rate of 1.5% per year.

Work out how much Alexandra's car will be worth in 13 years.

£ .....

Percentages Answers

Question 1

43.2 %

You can write the proportion as a fraction, and convert it to a percentage.

$\frac{48}{111} \times 100 = 43.2\%$

Question 2

42.4 %

You can write the proportion as a fraction, and convert it to a percentage.

$\frac{39}{92} \times 100 = 42.4\%$

Question 3

38.3 %

You can write the proportion as a fraction, and convert it to a percentage.

$\frac{23}{60} \times 100 = 38.3\%$

Question 4

26 % increase

$$\begin{aligned}\text{multiplier} &= \frac{\text{final amount}}{\text{original amount}} \\ &= \frac{142214.94}{112869} \\ &= 1.26\end{aligned}$$

Therefore it is a 26% increase

Question 5

5 % increase

$$\begin{aligned}\text{multiplier} &= \frac{\text{final amount}}{\text{original amount}} \\ &= \frac{270.9}{258} \\ &= 1.05\end{aligned}$$

Therefore it is a 5% increase

Question 6

31 % increase

$$\begin{aligned}\text{multiplier} &= \frac{\text{final amount}}{\text{original amount}} \\ &= \frac{404.79}{309} \\ &= 1.31\end{aligned}$$

Therefore it is a 31% increase

Question 7

43.365

The percentage multiplier is $\frac{100+5}{100} = 1.05$

To increase 41.3 by 5% , the calculation is 1.05×41.3

Question 8

147.177

The percentage multiplier is $\frac{100-31}{100} = 0.69$

To decrease 213.3 by 31% , the calculation is 0.69×213.3

Question 9

1582

The percentage multiplier is $\frac{100-50}{100} = 0.5$

To decrease 3164 by 50% , the calculation is 0.5×3164

Question 10

£ 365.93

The multiplier is $\frac{4.25}{100} = 0.0425$

$2870 \times 0.0425 \times 3 = 365.93$

Question 11

£ 1727.41

The multiplier is $\frac{4.25}{100} = 0.0425$

$3695 \times 0.0425 \times 11 = 1727.41$

Question 12

£ 108.19

The multiplier is $\frac{0.25}{100} = 0.0025$

$2885 \times 0.0025 \times 15 = 108.19$

Question 13

£ 3268.47

The multiplier is $\frac{100 + 4.75}{100} = 1.0475$

$1485 \times 1.0475^{17} = 3268.47$

Question 14

£ 731.18

The multiplier is $\frac{100 + 2.75}{100} = 1.0275$

$425 \times 1.0275^{20} = 731.18$

Question 15

£ 4944.78

The multiplier is $\frac{100 + 4.25}{100} = 1.0425$

$3695 \times 1.0425^{7} = 4944.78$

Question 16

£ 15983.09

The multiplier is $\frac{100 - 0.5}{100} = 0.995$

$17145 \times 0.995^{14} = 15983.09$

Question 17

£ 10082.07

The multiplier is $\frac{100 - 0.5}{100} = 0.995$

$10815 \times 0.995^{14} = 10082.07$

Question 18

£ 10134.68

The multiplier is $\frac{100 - 1.5}{100} = 0.985$

$12335 \times 0.985^{13} = 10134.68$

Mathematical Studies Data Handling Summer Work

Question 1

Here are the times, in seconds, spent by some pupils to answer a question on DFM.

8 6 3 3 4

Find the mean time.
Give your answer correct to 1 decimal place where appropriate.

..... seconds

Question 2

Here are the masses, in grams, of some pencils.

2 9 8 1 4 4 8 6 1

Find the mean mass.
Give your answer correct to 1 decimal place where appropriate.

..... grams

Question 3

Here are the number of pens that some pupils own.

2 2 1 6 1 10 2 5 6

Find the mean number of pens.
Give your answer correct to 1 decimal place where appropriate.

..... pens

Question 4

Here is a set of data.

33 33 37 37 36 33 33 1 23 1 1

Find the mode of the data.

.....

Question 5

Here are the masses, in grams, of some pencils.

25 38 29 47 47 21 12 27 5 6 36 23

Find the mode of the data.

..... grams

Question 6

Here are the number of times some pupils have been late to school this term.

37 8 27 39 11 44 49 48 50 2 2 25 20 7

Find the mode of the data.

..... times

Question 7

Here is a set of data.

3 1 4 8 4 7 4 10 2 10

Find the median of the data.

.....

Question 8

Here is a set of data.

6 5 10 3 3 8 4 3 5 8 7 10

Find the median of the data.

.....

Question 9

Here are the number of times some pupils have been late to school this term.

5 8 3 9 8 4 5 10 6 4 4 9

Find the median number of times.

..... times

Question 10

Here are the number of texts some pupils sent yesterday.

24 3 47 20 3 18 42 8 36

Find the range of the data.

..... texts

Question 11

Here is a set of data.

40 46 12 17 23

Find the range of the data.

.....

Question 12

Here are the times, in seconds, spent by some pupils to answer a question on DFM.

49 5 2 27 26 48 26 47

Find the range of the data.

..... seconds

Question 13

Here are the masses, in grams, of 16 pencils.

Mass	Frequency
4	2
5	3
6	3
7	3
8	5

Find the mean of the data in the table.
Give your answer correct to 1 decimal place where appropriate.

..... grams

Question 14

Here are the lengths, in cm, of 27 pieces of paper.

Length	Frequency
3	5
4	8
5	3
6	3
7	8

Find the mean of the data in the table.
Give your answer correct to 1 decimal place where appropriate.

..... cm

Question 15

Here are the number of texts that 9 pupils sent yesterday.

Number of texts	Frequency
5	1
6	2
7	6

Find the mean of the data in the table.
Give your answer correct to 1 decimal place where appropriate.

..... texts

Question 16

Joana collects the heights of some flowers and records the data in the table below.

Height (z cm)	Frequency
$10 < z \leq 15$	8
$15 < z \leq 20$	8
$20 < z \leq 25$	6

Find the mean of the data in the table.
Give your answer correct to 1 decimal place where appropriate.

.....

Question 17

Jack collects the heights of some flowers and records the data in the table below.

Height (x cm)	Frequency
$10 < x \leq 15$	7
$15 < x \leq 20$	2
$20 < x \leq 25$	4
$25 < x \leq 30$	1
$30 < x \leq 35$	6

Find the mean of the data in the table.
Give your answer correct to 1 decimal place where appropriate.

.....

Question 18

James collects the running times of some athletes and records the data in the table below.

Time (z seconds)	Frequency
$0 < z \leq 5$	5
$5 < z \leq 10$	5
$10 < z \leq 15$	2
$15 < z \leq 20$	2

Find the mean of the data in the table.
Give your answer correct to 1 decimal place where appropriate.

.....

Data Handling Answers

Question 1

4.8 seconds

There are 5 values in total.
Add all these values together.

$8 + 6 + 3 + 3 + 4 = 24$

Therefore the mean is equal to $24 \div 5 = 4.8$

Question 2

4.8 grams

There are 9 values in total.
Add all these values together.

$2 + 9 + 8 + 1 + 4 + 4 + 8 + 6 + 1 = 43$

Therefore the mean is equal to $43 \div 9 = 4.8$

Question 3

3.9 pens

There are 9 values in total.
Add all these values together.

$2 + 2 + 1 + 6 + 1 + 10 + 2 + 5 + 6 = 35$

Therefore the mean is equal to $35 \div 9 = 3.9$

Question 4

33

The mode is the most common value.
To find it, it can be helpful to put the data in order:

1 1 1 23 33 33 33 33 36 37 37

The value 33 occurs 4 times, so the mode is 33

Question 5

47 grams

The mode is the most common value.
To find it, it can be helpful to put the data in order:

5 6 12 21 23 25 27 29 36 38 47 47

The value 47 occurs 2 times, so the mode is 47

Question 6

2 times

The mode is the most common value.
To find it, it can be helpful to put the data in order:

2 2 7 8 11 20 25 27 37 39 44 48 49 50

The value 2 occurs 2 times, so the mode is 2

Question 7

4

Put the data in order:

1 2 3 4 4 4 7 8 10 10

As there is an even number of values, you can split the data set in two:

1 2 3 4 4 4 7 8 10 10

The median is the mean of the 5th and 6th values

Median = $\frac{4+4}{2} = 4$

Question 8

5.5

Put the data in order:

3 3 3 4 5 5 6 7 8 8 10 10

As there is an even number of values, you can split the data set in two:

3 3 3 4 5 5 6 7 8 8 10 10

The median is the mean of the 6th and 7th values

Median = $\frac{5+6}{2} = 5.5$

Question 9

5.5 times

Put the data in order:

3 4 4 4 5 5 6 8 8 9 9 10

As there is an even number of values, you can split the data set in two:

3 4 4 4 5 5 | 6 8 8 9 9 10

The median is the mean of the 6th and 7th values

Median = $\frac{5+6}{2} = 5.5$

Question 10

44 texts

Put the data in order:

3 3 8 18 20 24 36 42 47

The range is the difference between the **maximum** and the **minimum** value, so $47 - 3 = 44$

Question 11

34

Put the data in order:

12 17 23 40 46

The range is the difference between the **maximum** and the **minimum** value, so $46 - 12 = 34$

Question 12

47 seconds

Put the data in order:

2 5 26 26 27 47 48 49

The range is the difference between the **maximum** and the **minimum** value, so $49 - 2 = 47$

Question 13

6.4 grams

Mass	Frequency	fx
4	2	$4 \times 2 = 8$
5	3	$5 \times 3 = 15$
6	3	$6 \times 3 = 18$
7	3	$7 \times 3 = 21$
8	5	$8 \times 5 = 40$
Total	16	102

Therefore the mean is $\frac{102}{16} = 6.4$

Question 14

5 cm

Length	Frequency	fx
3	5	$3 \times 5 = 15$
4	8	$4 \times 8 = 32$
5	3	$5 \times 3 = 15$
6	3	$6 \times 3 = 18$
7	8	$7 \times 8 = 56$
Total	27	136

Therefore the mean is $\frac{136}{27} = 5$

Question 15

6.6 texts

Number of texts	Frequency	fx
5	1	$5 \times 1 = 5$
6	2	$6 \times 2 = 12$
7	6	$7 \times 6 = 42$
Total	9	59

Therefore the mean is $\frac{59}{9} = 6.6$

Question 16

17

Height (z cm)	Frequency	fz
$10 < z \leq 15$	8	$12.5 \times 8 = 100$
$15 < z \leq 20$	8	$17.5 \times 8 = 140$
$20 < z \leq 25$	6	$22.5 \times 6 = 135$
Total	22	375

Therefore the mean is $\frac{375}{22} = 17$

Question 17

21.8

Height (x cm)	Frequency	fx
$10 < x \leq 15$	7	$12.5 \times 7 = 87.5$
$15 < x \leq 20$	2	$17.5 \times 2 = 35$
$20 < x \leq 25$	4	$22.5 \times 4 = 90$
$25 < x \leq 30$	1	$27.5 \times 1 = 27.5$
$30 < x \leq 35$	6	$32.5 \times 6 = 195$
Total	20	435

Therefore the mean is $\frac{435}{20} = 21.8$

Question 18

7.9

Time (z seconds)	Frequency	fz
$0 < z \leq 5$	5	$2.5 \times 5 = 12.5$
$5 < z \leq 10$	5	$7.5 \times 5 = 37.5$
$10 < z \leq 15$	2	$12.5 \times 2 = 25$
$15 < z \leq 20$	2	$17.5 \times 2 = 35$
Total	14	110

Therefore the mean is $\frac{110}{14} = 7.9$

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Mathematical Studies Exchange Rates Summer Work

Question 1

Last year a newspaper reported that Turkish football team Sarigol Municipality transferred four of its players in return for a fee of 225 sacks of cement, needed to repair their stadium.

At the same rate of exchange, how many sacks of cement would be the transfer fee for a full team of eleven players and one reserve?

..... sacks

Question 2

John changes £450 to euros.

The exchange rate is £1 = 1.16 euros.

Change £450 to euros.

..... euros

(2 marks)

Question 3

John changes some money to euros.
The exchange rate is £1 = 1.16 euros.

When in Amsterdam, John uses his credit card to pay for a ring costing 850 euros.

He has to pay a bank charge of £3.50 for using his credit card in addition to the cost of the ring.

Work out the total cost, in pounds (£), of the ring and the bank charge.

£ .....

(3 marks)

Question 4

In August 2008, Eddie hired a car in Italy. The cost of hiring the car was £620

The exchange rate was £1 = €1.25

Work out the cost of hiring the car in euros (€).

€ .....

(2 marks)

Question 5

Eddie bought some perfume in Italy.

The cost of the perfume in Italy was €50
The cost of the same perfume in London was £42

The exchange rate was £1 = €1.25

Work out the difference between the cost of the perfume in Italy and the cost of the perfume in London. Give your answer in pounds (£).

£ .....

(3 marks)

Exchange Rates Answers

Question 1

675 sacks

The transfer fee for a total of 12 players would be three times that for 4 players.

Question 2

522 euros

450 × 1.16 oe	522	2	M1 A1

Question 3

any value in the range £ 736 to £ 736.3

850 ÷ 1.16 oe (= 732.76) **or** 732 – 733		3	M1	M1 for 3.50 × 1.16 (=4.06)
"732.76" + 3.50			M1 (dep)	M1 (dep) for (850 + "4.06") ÷1.16 oe
	736.26		A1 Accept 736 – 736.3	

Question 4

€ 775

1.25×620	775	2	M1 for 1.25×620 oe A1 cao

Question 5

£ 2

50÷1.25 = 40 42 – 40	2	3	M1 for 50 ÷ 1.25 = (40) oe M1 dep for 42 − "40" or "40" – 42 A1 cao **Alternative** M1 for 42× 1.25 (= 52.50) oe M1 dep for "52.50" – 50 A1 cao A0 for €2.5(0) or £2.5(0) without any working **SC** B2 for –£2 without working