Core Maths

AQA Level 3 Certificate in Mathematical Studies

Books you will be provided with:
AQA Advanced Maths: Mathematical Studies ISBN 978-0-19-836593-8
Blank exercise book

You will need a Casio scientific calculator.

This booklet contains questions which are assumed knowledge for the course.

You must complete all of these questions and show all of your working out. You can use the blank page at the end of the booklet or other paper if you need more space.

Your work will be marked in the first lesson back and so it must be completed and brought with you. This is the first impression your teacher will get of you so make sure you have completed the work to a high standard.

Within the first few weeks of term you will complete an assessment, there will be at least one question from every section. You will be expected to score a high mark in this assessment.

If you get stuck, you can go to https://corbettmaths.com/contents/ and watch the relevant videos.

What to bring with you to the first lesson in September:
This completed booklet
Your scientific calculator

Any questions? Please email prattk@wallingfordschool.com before 24th July or after 1st September.

Standard form conversions

Write the following in standard form:

a) 320000 b) 421000 c) 0.0329 d) 0.000012

e) 12.4×10^{5} f) 0.98×10^{8} d) 4.35×10^{-6} h) 0.03×10^{-3}

Standard form calculations

a) $(2 \times 10^{14}) \div (5 \times 10^{9})$ b) $(5 \times 10^{15}) \div (5 \times 10^{4})$ c) $(1.43 \times 10^{22}) \div (1.3 \times 10^{14})$

d) $(1.21 \times 10^{25}) \div (1.1 \times 10^{13})$ e) $(1.04 \times 10^{14}) \div (8 \times 10^{10})$ f) $(8.4 \times 10^{19}) \div (1.2 \times 10^{8})$

g) $(8 \times 10^{11}) \times (1 \times 10^{3})$ h) $(1.2 \times 10^{16}) \times (3 \times 10^{12})$ i) $(1.3 \times 10^{20}) \times (7 \times 10^{10})$

j) $(2 \times 10^{-25}) \times (2 \times 10^{10})$ k) $(1.4 \times 10^{13}) \times (9 \times 10^{6})$ l) $(5 \times 10^{16}) \times (1.6 \times 10^{14})$

a) $(1.2 \times 10^{7})+(1.1 \times 10^{5})$ b) $(4 \times 10^{6})+(1.1 \times 10^{5})$ c)$(1 \times 10^{9})+(1.4 \times 10^{5})$

d) $(1.2 \times 10^{5})+(3 \times 10^{3})$ e) $(3 \times 10^{10})+(6 \times 10^{7})$ f) $(4 \times 10^{-4})+(7 \times 10^{3})$

a) $(9 \times 10^{7})-(3 \times 10^{6})$ b) $(8 \times 10^{9})-(1 \times 10^{8})$ c) $(8 \times 10^{7})-(8 \times 10^{3})$

d) $(1.5 \times 10^{15})-(7 \times 10^{8})$ e) $(5 \times 10^{5})-(7 \times 10^{1})$ f) $(5 \times 10^{6})-(5 \times 10^{4})$

Percentages

a) Increase 65 by 35%

b) Increase 23.2 by 300%

c) Decrease 134 by 57%

d) Express 34 out of 131 as a percentage

e) Express 71.5 out of 75 as a percentage

f) My hourly pay increases from £17.50 to £19. What is the percentage increase?

g) A plant is 1.1m high. It grows by 8cm. What is the percentage increase?

h) I run 5km in 22minutes 30 seconds. If I want to run the same distance in 20 minutes, what is the percentage reduction in time?

Unit conversions

a) Convert 110000 mg to g

b) Convert 2 km to m

c) Convert 13 m to cm

d) Convert 20 kg to tonnes

e) Convert 80000 mg to g

f) Convert 5.1 kg to g

g) Convert 70 m to km

h) Convert 31 mm to cm

i) Convert 78 cm to m

j) Convert 34 kg to tonnes

k) Convert 97 mm to cm

l) Convert 3.1 m to cm

m) Convert 3.2 km to cm

n) Convert 7.3 km to cm

o) Convert 3600 g to tonnes

For questions p to u use the following £1 = $1.15 1 Euro = $1.07 1 gallon = 4.54 litre

p) Convert $47 to £

q) Convert 17 Euro to $

q) Convert 72 Euro to £

r) Convert 5000 pence to $

t) Convert £5/gallon to £/litre

t) If petrol costs $6.10 per gallon what is the equivalent price in £/litre

Probability

a) There are 8 counters in a box numbered 1, 2, 3, 4, 5, 6, 7 and 8. If one counter is drawn out at random, what is the probability that it is a counter:
i). with an odd number ii). with an even number,

iii). with a square number iv). that is greater than or equal to 6?

b) I have a pack of playing cards, containing 52 cards. I pick a card at random. What is the probability that the card I select is:
` i). a King ii). a diamond iii) a black card iv) the Jack of clubs?

c) There are four different coloured writing pads. In a pack there are 3 blue, 8 red, 1 white and 4 green. What is the probability when I open a new pack I randomly pick a:
i) blue pad ii) red pad iii). white pad

iv). green pad v). yellow pad vi). red or green pad?

d) Arrange these events in order of which is "most likely" down to which is "least likely":
i). Throwing a dice and getting a "1".
ii). Being born on a day with "y" in it.
iii). Spinning a coin and it landing "tails".
iv). Somebody having their birthday on New Year's day.

e) Arrange these events in order of which is "most likely" down to which is "least likely":
i). Picking a red card from a pack of cards.
ii). A fair 4 sided spinner labelled 1, 2, 3 and 4 landing on 4.
iii). Eating a meal some time this month.
iv) Winning the jackpot of the National Lottery.

f) A **biased** coin has a probability of landing on heads of 0.6. What is the probability of landing on tails?

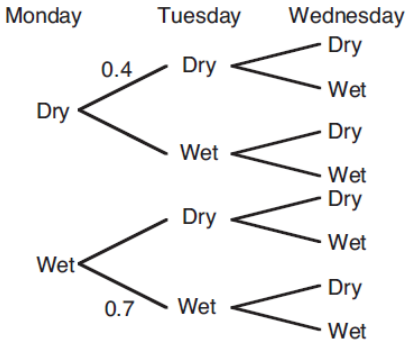
g) Another **biased** coin has a probability of landing on tails of 0.35. What is the probability of landing on heads?

h) Year 9 and Year 10 boys play a football match with a penalty shoot-out, so the teams cannot draw. The probability of Year 9 winning is 0.42, what is the probability of Year 10 boys winning?

Tree diagrams

a) Assume that days are wet or dry. If it is dry on a particular day, the probability that it will be dry the next day is 0.4. If it is wet on a particular day, the probability that it will be wet the next day is 0.7.

i). Copy the tree diagram and write in the missing probabilities.



ii). When Monday is dry, what is the probability that both Tuesday and Wednesday will be dry?

iii). When Monday is wet, what is the probability that Wednesday will be dry?

b) Bob has four possible ways home from school.
From school he takes either a bus or a train.
The probability that he will go by train is 1/4.
If he goes by train, he completes the journey by walking or by getting a lift.
The probability that he gets a lift is $\frac{3}{5}$
If he catches the bus, the second part of his journey can be completed by catching another bus or he can walk.
The probability that he will walk is $\frac{7}{8}$. What is the probability that Bob
i). catches a bus from school and then walks,
ii). walks for part of his journey home?

c) Game A: To win, pick a red card from a normal pack of 52 cards followed by rolling a fair dice and getting a prime number.
Game B: To win, pick a Royal card from a normal pack of cards followed by rolling a fair dice and getting less than a 5.
Which of the two games would you rather be playing to win? Give reasons.

Stem and leaf

Draw a stem and leaf diagram for each of the following sets of data. For each one find
a). the mode, b). the median, c). the mean, d). the range.

i). 18, 9, 23, 37, 16, 33, 18, 29, 3, 7, 19, 21.

ii). 88, 96, 74, 107, 78, 91, 100, 91, 74, 106, 97, 85.

iii). 142, 157, 136, 149, 163, 139, 140, 158, 139, 151, 132, 148, 143.

iv). 287, 310, 298, 306, 294, 283, 315, 300 289, 301, 294, 286, 291.

Compound interest and depreciation

a) Paul leaves £4000 in the bank for two years. It earns compound interest of 5% per year. Calculate the total amount Paul has in the bank at the end of the two years.

b) The value of a car decreases by 5% each year. Sophie bought a car two years ago for £10000. Work out the value now.

c) Sam invests £1800 in the bank for four years. It earns compound interest of 4% each year. Calculate the total amount Sam has in the bank at the end of four years.

d) Carrie invests £800 for 4 years at 3% interest per year. How much interest does she earn?

e) A house was bought for £100,000 Its value appreciates by 7.5% each year for the Nirst three years. What was its value at the end of the three years?

f) The number of people living on a remote island decreases by 9% every 10 years. In 1950 there were 18000 living on the island. Calculate how many less people will be living on the island in 2020.

g) The value of a motorcycle was £14000 on 1st April 2014. Every three months the value of the motorcycle decreases by 2% of its value at the start of that three months. What was the value of the motorcycle on 1st April 2016?

Averages and spread

Calculate the mean, median, mode and range of the below sets of data.

a) 9, 1, 3, 6, 7, 8, 9

b) 6, 4, 7, 1, 3, 8, 1, 10

c) 6.2, 6.8, 6.6, 7.2, 6.4, 7.4, 5.8

d) 1.4, 2.8, 2.4, 2.5, 2.8, 3.1, 1.1

Mean from tables

a) Thirty students were asked how many cats they owned. The results are shown in the table below. Find the mean number of cats owned per child.

Number of cats	Number of children
0	6
1	13
2	7
3	3
4	1

b) Timothy asked 30 people how long it takes them to get to school. The table shows some information about his results. Work out an estimate for the mean time taken.

Time (t mins)	Frequency
$0 < t \leq 10$	2
$10 < t \leq 20$	8
$20 < t \leq 30$	12
$30 < t \leq 40$	7
$40 < t \leq 50$	1

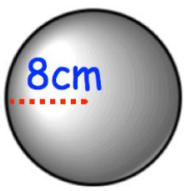
c) The table shows information about the ages of footballers in a squad. Work out the mean age. Give your answer to 3 significant figure.

Age, y years	Frequency
$16 < y \leq 20$	6
$20 < y \leq 24$	10
$24 < y \leq 28$	11
$28 < y \leq 32$	13
$32 < y \leq 36$	4

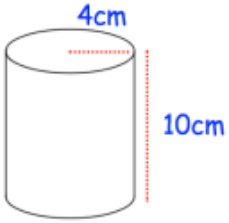
Volume and surface area

Find the volume and surface area of the shapes below.

a)



b)



c)