

Higher GCSE Mathematics Revision Pack

NUMBER – CALC

Q1. Work out $\frac{4.6 + 3.85}{3.2^2 - 6.51}$

Write down all the numbers on your calculator display.

.....

(Total 2 marks)

Q2. Work out $(3 \times 10^6) \times (5 \times 10^{-4})$.

Give your answer in standard form.

.....

(Total 2 marks)

Q3. Tarish says,

‘The sum of two prime numbers is always an even number’.

He is **wrong**.
Explain why.

.....

.....

(Total 2 marks)

Q4. Work out $(6.4 \times 10^5) \times (5 \times 10^4)$.

Give your answer in standard form.

.....

(Total 2 marks)

Q5. Julie buys 19 identical calculators.
The total cost is £143.64

Work out the total cost of 31 of these calculators.

£

(Total 3 marks)

- Q6.** Work out $(8 \times 10^6) \div (2 \times 10^{18})$.
Give your answer in standard form.

.....

(Total 2 marks)

- Q7.** A shop sells freezers and cookers.

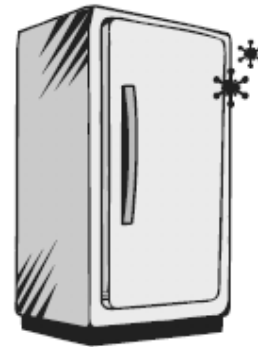
The ratio of the number of freezers sold to the number of cookers sold is 5 : 2.
The shop sells a total of 140 freezers and cookers in one week.

- (a) Work out the number of freezers and the number of cookers sold that week.

(3)

Jake buys this freezer in a sale.
The price of the freezer is reduced by 20%.

- (b) Work out how much Jake saves.



£

(2)

(Total 5 marks)

- Q8.** The number of atoms in one kilogram of helium is 1.51×10^{26}

Calculate the number of atoms in 20 kilograms of helium.
Give your answer in standard form.

.....

(Total 2 marks)

- Q9.** The value of a car depreciates by 35% each year.

At the end of 2007 the value of the car was £5460

Work out the value of the car at the end of 2006

£

(Total 3 marks)

Q10. Here is a rectangle.

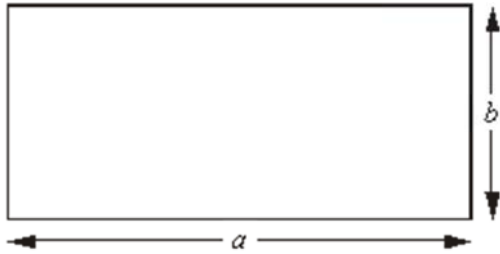


Diagram **NOT** accurately drawn

$a = 8.3$ cm correct to 1 decimal place.

$b = 3.6$ cm correct to 1 decimal place.

- (a) Calculate the upper bound of the area of this rectangle.
Write down all the figures on your calculator.

..... cm²

(2)

- (b) Find the area of this rectangle correct to an appropriate number of significant figures.

..... cm²

(2)

(Total 4 marks)

-
- Q11.** Katy drove for 238 miles, correct to the nearest mile.
She used 27.3 litres of petrol, to the nearest tenth of a litre.

$\text{Petrol consumption} = \frac{\text{Number of miles travelled}}{\text{Number of litres of petrol used}}$

Work out the upper bound for the petrol consumption for Katy's journey.
Give your answer correct to 2 decimal places.

..... miles per litre

(Total 3 marks)

-
- Q12.** D is proportional to S^2 .

$D = 900$ when $S = 20$

Calculate the value of D when $S = 25$

$D =$

(Total 4 marks)

Q13. q is inversely proportional to the square of t .

When $t = 4$, $q = 8.5$

(a) Find a formula for q in terms of t .

$q = \dots\dots\dots$ (3)

(b) Calculate the value of q when $t = 5$

$\dots\dots\dots$ (1)
(Total 4 marks)

Q14.



Ben's Tyre Shop

Mini prices for Tyres

Tyres for Minis	Price
Goodweek	£65
Dunlap	£62
Bridgearth	£75
Pirello	£69
Valves	50p per tyre
Balancing	£1 per tyre

Des buys two Dunlap tyres with valves and balancing and has to pay VAT at 15%.

(a) Work out the total amount Des pays for the tyres.

£ $\dots\dots\dots$ (3)

Ben sees Dunlap tyres offered for sale in a different garage.
He wants to compare the prices before VAT was added.

- (b) What is the price of these tyres before VAT was added?

<p style="text-align: center;">Tyre Sale</p> <p style="text-align: center;">Dunlap tyres for Minis (including valves and balancing)</p> <p style="text-align: center;">£71.30 including VAT at 15%</p>

£

(2)

In 2010 the VAT rate is to be increased from 15% to 17½%.

- (c) By what number will Ben have to multiply the old prices by to give the new prices including VAT?

£

(2)

(Total 7 marks)

Q15. P is inversely proportional to d^2 .

$P = 10\,000$ when $d = 0.4$.

Find the value of P when $d = 0.8$.

$P =$

(Total 3 marks)

Q16. Toby invested £4500 for 2 years in a savings account.
He was paid 4% per annum compound interest.

- (a) How much did Toby have in his savings account after 2 years?

£

(3)

Jaspir invested £2400 for n years in a savings account.
He was paid 7.5% per annum compound interest.

At the end of the n years he had £3445.51 in the savings account.

(b) Work out the value of n .

.....
(2)
(Total 5 marks)

Q17. Jon and Alice are planning a holiday.
They are going to stay at a hotel.

The table shows information about prices at the hotel.

	Price per person per night (£)		Dinner (£)
	Double room	Single room	per person per day
01 Nov – 29 April	59.75	118.00	31.75
30 April – 08 July	74.25	147.00	31.00
09 July – 29 Aug	81.75	161.75	31.00
30 Aug – 31 Oct	74.25	147.00	31.00
Saver Prices 5 nights for the price of 4 nights from 1st May to 4th July. 3 nights for the price of 2 nights in November.			

Jon and Alice will stay in a double room.
They will eat dinner at the hotel every day.

They can stay at the hotel for 3 nights in June or 4 nights in November.

Which of these holidays is cheaper?

(Total 5 marks)

- Q18.** A company sends every item of mail by second class post.
Each item of mail is either a letter or a packet.

The tables show information about the cost of sending a letter by second class post and the cost of sending a packet by second class post.

Letter

Weight range	Second Class
0–100g	32p

Packet

Weight range	Second Class
0–100g	£1.17
101–250g	£1.51
251–500g	£1.95
501–750g	£2.36
751–1000g	£2.84

The company sent 420 items by second class post.

The ratio of the number of letters sent to the number of packets sent was 5 : 2.

$\frac{2}{3}$ of the packets sent were in the weight range 0 – 100 g.

The other packets sent were in the weight range 101 – 250 g.

Work out the total cost of sending the 420 items by second class post.

£

(Total 5 marks)

- Q19.** Kylie wants to invest £20 000 for 3 years.
She considers two investments, Investment A and Investment B.

<p>Investment A</p> <p>£20 000</p> <p>Earns 3.02% interest per annum</p> <p>Interest paid yearly by cheque</p>	<p>Investment B</p> <p>£20 000</p> <p>Earns 2.98% compound interest per annum</p>
---	--

Kylie wants to get the greatest return on her investment.

Which of these investments should she choose?

.....

(Total 6 marks)

- Q20.** Aminata invested £2500 for n years in a savings account.
She was paid 3% per annum compound interest.

At the end of n years, Aminata has £2813.77 in the savings account.

Work out the value of n .

.....

(Total 2 marks)

- Q21.** A ball is thrown vertically upwards with a speed V metres per second.

The height, H metres, to which it rises is given by

$$H = \frac{V^2}{2g}$$

where g m/s² is the acceleration due to gravity.

$V = 24.4$ correct to 3 significant figures.

$g = 9.8$ correct to 2 significant figures.

- (i) Write down the lower bound of g .

.....

- (ii) Calculate the upper bound of H .
Give your answer correct to 3 significant figures.

.....

(Total 3 marks)

- Q22.** The time, T seconds, for a hot sphere to cool is proportional to the square root of the surface area, A m², of the sphere.

When $A = 100$, $T = 40$.

Find the value of T when $A = 60$.

Give your answer correct to 3 significant figures.

..... seconds

(Total 4 marks)

Q23. Gerry has an ingot of steel that he is going to turn into ball bearings.

The ingot is in the shape of a cuboid and it cost him £50.



The dimensions of the cuboid are 30 cm by 15 cm by 8 cm to the nearest mm.
The ball bearings are spheres of diameter 5 mm to the nearest tenth of a millimetre.

Gerry melts the ingot and recasts the metal without losing any of the steel.
He sells all the ball bearings he makes at 10 ball bearings for 1 pence.

Work out the least profit Gerry could make if he sells all of the ball bearings.

£

(Total 6 marks)

HIGHER CALCULATOR – NUMBER

SOLUTIONS

M1.

Working	Answer	Mark	Additional Guidance
$4.6 + 3.85 = 8.45$ $3.2^2 - 6.51 = 3.73$ $8.45 \ 3.73 =$	2.26541555	2	$\frac{169}{20}$ or $\frac{256}{25}$ or $\frac{373}{100}$ or 3.73 or 10.24 or 8.45 seen A1 for 2.265(41555); accept $\frac{845}{373}$
Total for Question: 2 marks			

M2.

Answer	Mark	Additional Guidance
1.5×10^3	2	B2 for 1.5×10^3 cao (B1 for $a \times 10^3$, $a \neq 1.5$ or 1.5×10^b , $b \neq 3$ or 15×10^2 or 1500)
Total for Question: 2 marks		

M3.

Answer	Mark	Additional Guidance
2 + 'prime number' is odd	2	M1 for a counter example showing intent to add 2 and another prime number; ignore incorrect examples A1 for a correctly evaluated counter example with no examples given that involve either non-primes or incorrect evaluation Alternative method B2 for fully correct explanation '2 is a prime number, odd + even (or 2) = odd' oe with no accompanying incorrect statements or examples (B1 for '2 is a prime number' or recognition that not all prime numbers are odd or odd + even (or 2) = odd; ignore incorrect examples or statements)
Total for Question: 2 marks		

M4.

Answer	Mark	Additional Guidance
3.2×10^{10}	2	B2 cao (B1 3.2×10^{10} , n an integer $\neq 10$, or 32×10^9 or 32 000 000 000 or $3.2 \exp 10$ or 3.2×10^{16} seen)
Total for Question: 2 marks		

M5.

Working	Answer	Mark	Additional Guidance
$143.64 \div 19 = 7.56$	234.36	3	M1 for $143.64 \div 19$ (or 7.56 seen) or 143.64×31 (or 4452.84 seen) M1(dep) for '7.56' $\times 31$ or '4452.84' $\div 19$ or $143.64 + 12 \times '7.56'$

$7.56 \times 31 =$			A1 for 234.36 cao accept 234.36p Alternative method: M1 for (or 1.63(1...) seen) M1 (dep) '1.63...' \times 143.64 A1 for 234.36 cao accept 234.36p
Total for Question: 3 marks			

M6.

Working	Answer	Mark	Additional Guidance
$8 \div 2 = 4$ $10^6 \div 10^{18} = 10^{-12}$	4×10^{-12}	2	B2 for 4×10^{-12} (B1 for sight of 4×10^n or $n \times 10^{-12}$)
Total for Question: 2 marks			

M7.

	Working	Answer	Mark	Additional Guidance
(a)	$140 \times 5 \div 7$ $140 \times 2 \div 7$	100 4	3	M1 for $140 \times 5 \div 7$ or $140 \times 2 \div 7$ or $140 \div ("2 + 5") \times 2$ or $140 \div ("2 + 5") \times 5$ A1 for 100 and 40 cao C1 for linking "cooker(s)" and "freezer(s)" correctly to final answers.
(b)	$145 \times \frac{20}{100}$	29	2	M1 for 145×0.2 or $145 \times \frac{20}{100}$ or 14.5×2 or $145 \div 10 \times 2$ A1 for 29 SC B1 for 116 if no other marks have been awarded.
Total for Question: 5 marks				

M8.

Working	Answer	Mark	Additional Guidance
$20 \times 1.51 \times 10^{26}$	3.02×10^{27}	2	M1 $20 \times 1.51 \times 10^{26}$ or 3.02×10^n or 30.2×10^{26} where n is a positive integer A1 cao
Total for Question: 2 marks			

M9.

Working	Answer	Mark	Additional Guidance
65% of orig value = £5460 $\frac{£5460}{65}$ 1% of orig value = $\frac{£5460}{65} \times 100$ Orig value =	£8400	3	M1 65% (of orig value) = £5460 or $(100\% - 35\%) \times \text{orig price} = 5460$ or 0.65 or 65% seen $\frac{£5460}{65} \times 100$ or $\frac{5460}{0.65}$ M1 A1 £8400
Total for Question: 3 marks			

M10.

	Working	Answer	Mark	Additional Guidance
(a)	UB $8.35 \times 3.65 = 30.4775$	30.4775	2	M1 sight of 8.35 or 3.65 A1 30.7445
(b)	LB $8.25 \times 3.55 = 29.2875$	30	2	M1 8.25×3.55 A1 30 (dep on 8.25×3.55)
Total for Question: 4 marks				

M11.

Working	Answer	Mark	Additional Guidance
238 has an UB 238.5, a LB of 237.5 27.3 has an UB of 27.35, a LB of 27.25 Upper: $\frac{238.5}{27.25} = 8.75229$	8.75	3	B1 for one of 238.5, 237.5, 27.35, 27.25, 238.49, 27.349 seen M1 for 'UB no of miles'÷'LB no of litres' Where $238 < \text{'UB no of miles'} \leq 238.5$ and $27.25 \leq \text{'LB no of litres'} < 27.3$ A1 8.75 or 8.752 or 8.7522 or 8.7523 or better SC $238.4 \div 27.25$ which leads to 8.748... B1 M1 A0
Total for Question: 3 marks			

M12.

Working	Answer	Mark	Additional Guidance
$D = kS^2$ $900 - k \times 20^2$ $k = \frac{900}{400}$ $D = \frac{900}{400} \times 25^2 = 1406.25$	1406.25	4	M1 $D = kS^2$ M1 $900 - k \times 20^2$ (can imply first M1) $k = \frac{900}{20^2} (= 2.25)$ A1 $k = \frac{5625}{4}$ A1 for 1406.25 or $\frac{5625}{4}$
Total for Question: 4 marks			

M13.

	Working	Answer	Mark	Additional Guidance
(a)	$q = \frac{k}{t^2}$; $8.5 = \frac{k}{4^2}$ $k = 8.5 \times 4^2$; $k = 136$	$q = \frac{136}{t^2}$	3	M1 $q = \frac{k}{t^2}$, ($k \neq 1$) M1 $8.5 = \frac{k}{4^2}$ A1 cao NB $q = \frac{k}{t^2}$ in the answer line followed by k being found correctly anywhere in (a) or (b) earns all 3 marks

(b)	$q = "136" \div 5^2$ $= "136" \div 25$	5.44	1	B1 ft for $\frac{'136'}{25}$ oe
Total for Question: 4 marks				

M14.

		Working	Answer	Mark	Additional Guidance
FE	(a)	$2 \times (62 + 0.50 + 1)$ "127" \times 1.15	£146.05	3	M2 for attempt to find cost including VAT e.g. "127" \times 1.15 (M1 for VAT = "127" \times 0.175 or $\frac{15}{100} \times 127$ or 12.70 + 6.35) A1 cao
	(b)	$71.30 \div 1.15$	£62	2	M1 for $71.30 \div 1.15$ or $71.30 \div 115 \times 100$ A1 cao
	(c)		1.02(173 913)	2	M1 for $\div 1.15$ or $\times 1.175$ A1 for 1.02(173913)
Total for Question: 7 marks					

M15.

Working	Answer	Mark	Additional Guidance
$P = \frac{k}{d^2}$ $k = Pd^2 = 10000 \times 0.4^2$ $= 1600$ when $d = 0.8$, $P = \frac{1600}{0.8^2}$	2500	3	M1 $P = \frac{k}{d^2}$ or $P \propto \frac{1}{d^2}$ M1 $k = 10000 \times 0.4^2$ A1 2500 cao OR M1 $\frac{x}{10000} = \frac{0.4^2}{0.8^2}$ M1 $\frac{0.4^2}{0.8^2} \times 10000$ A1 2500 cao
Total for Question: 3 marks			

M16.

	Working	Answer	Mark	Additional Guidance
(a)	4500×1.04^2	4867.20	3	M1 for 4500×1.04 or for $4500 + 0.04 \times 4500$ or for 4680 or 180 or 360 or 4860 M1 (dep) '4680' \times 1.04 or for '4680' + 0.04 \times '4680' A1 for 4867.2(0) cao (If correct answer seen then ignore any extra years) Alternative method M2 for 4500×1.04^2 or 4500×1.04^3 A1 for 4867.2(0) cao [SC: 367.2(0) seen B2]

(b)	2400×1.075^n 2580 2773.5 2981.5125 3205.12... 3445.51...	5	2	M1 for an attempt to evaluate 2400×1.075^n for at least one value of n (not equal to 1) or $3445.51 \div 1.075^n$ ($n \geq 2$) $\frac{3445.51}{2400}$ or $\frac{3445.51}{2400}$ ($= 1.4356...$) and 1.075 evaluated, $n \geq 2$ A1 for 5 cao
Total for Question: 5 marks				

M17.

Working	Answer	Mark	Additional Guidance
$3 \times 2 \times 74.25$ $+ 3 \times 2 \times 31$ $3 \times 2 \times 59.75$ $+ 4 \times 2 \times 31.75$	631.50, 612.50 so November cheapest with reason given	5	M1 for at least one correct dinner cost calculation $3 \times 2 \times 31$ or $4 \times 2 \times 31.75$ M1 for at least one correct room cost calculation $3 \times 2 \times 74.25$ or $3 \times 2 \times 59.75$ OR M2 for at least one combined room and dinner calculation $2 \times 3 \times (31 + 74.25)$ or $2(3 \times 59.75 + 4 \times 31.75)$ AND A1 for 631.5(0) A1 for 612.5(0) C1 ft holiday identified QWC: Decision must be stated and total costs must be attributable from both calculations consistent for 2 people. Alternative M1 for at least one correct dinner cost calculation 3×31 or 4×31.75 M1 for at least one correct room cost calculation 3×74.25 or 3×59.75 OR M2 for at least one combined room and dinner calculation $3 \times (31 + 74.25)$ or $(3 \times 59.75 + 4 \times 31.75)$ AND A1 for 315.75 A1 for 306.25 C1 ft holiday identified QWC: Decision must be stated and total costs must be attributable from both calculations consistent for 1 person.
Total for Question: 5 marks			

M18.

Working	Answer	Mark	Additional Guidance
$420 \div 7 = 60$ $5 \times 60 = 300$ $2 \times 60 = 120$ $120 \div 3 \times 2 = 80$ $0.32 \times 300 + 1.17 \times 80 + 1.51 \times 40$ $96 \times 93.60 + 60.40$	250	5	M1 for $420 \div (5 + 2)$ or 60 seen M1 (dep)for $5 \times '60'$ or $2 \times '60'$ or 300 or 120 seen M1 for $'120' \div 3 \times 2$ oe M1 for $32p \times '300' + £1.17 \times '80' + £1.51 \times '40'$ A1 for 250.00 or 250 SC B1 for £539
Total for Question: 5 marks			

M19.

	Working	Answer	Mark	Additional Guidance
QWC (ii, iii)	$3.02/100 \times 20000 \times 3$	(£)1812	6	M1 for a complete process, e.g. $3.02/100 \times 20000 \times 3$ or $1.0302 \times 20000 \times 3$ A1 for 1812 or 21812
FE	$20000 \times (1.0298)^3$	(£)1841.81 Investment B		M2 for a complete process, e.g. $(1.0298)^3 \times 20000$ (M1 for 1.0298×20000 or 20596 seen) A1 for 1841.81 or 21841.81 seen C1 for selecting the greater of '1812' and '1841.81' or '21812' and '21841.81' QWC: Decision must be stated with all calculations attributable
Total for Question: 6 marks				

M20.

Answer	Mark	Additional Guidance
4	2	M1 for an attempt to evaluate 2500×1.03^n for at least one value of n (not equal to 1) $\frac{2813.77}{2500}$ Or $\frac{2813.77}{2500}$ (= 1.1255...) and 1.03^n evaluated, $n \geq 2$ Or finding at least two correct interest payments. ie 75 and 77.25 A1 for 4 cao
Total for Question: 2 marks		

M21.

	Working	Answer	Mark	Additional Guidance
(i)		9.75	3	B1 cao $\frac{V_{UB}^2}{2 \times g_{LB}}$ M1 for $\frac{V_{UB}^2}{2 \times g_{LB}}$ where $24.4 < V_{UB} \leq 24.45$ and $9.75 \leq g < 9.8$ or $\frac{V_{UB}^2}{2 \times 9.75}$ (= 30.6565...) A1 for 30.7 or 30.66 or 30.657 or 30.6565 or 30.65654 or better coming from 30.6565384...
(ii)	$\frac{24.45^2}{2 \times 9.75}$ $\frac{597.8025}{19.5}$ = 30.6565 ...	30.7		
Total for Question: 3 marks				

M22.

Working	Answer	Mark	Additional Guidance
$T = k\sqrt{A}; 40 = k\sqrt{100}$ $k = 4$ $T = 4\sqrt{A}$ $T = 4\sqrt{60}$	31.0	4	<p>M1 $T = k\sqrt{A}$</p> <p>M1 $40 = k\sqrt{100}$</p> <p>A1 $T = 4\sqrt{A}$</p> <p>A1 for 30.98... or 31(.0)</p> <p>OR</p> <p>M2 for $\frac{T}{40} = \sqrt{\frac{60}{100}}$ oe</p> <p>M1 for $T = 40 \times \sqrt{\frac{60}{100}}$ oe</p> <p>A1 for 30.98... or 31(.0)</p>
Total for Question: 4 marks			

M23.

	Working	Answer	Mark	Additional Guidance
FE	$\frac{(29.95 \times 14.95 \times 7.95)^3}{\frac{4}{3}\pi(0.255)^3}$ $= \frac{3559.632375}{0.0694559011 \quad 8}$	£462.25	6	<p>B1 for using the least value of 1 dimension of the cuboid</p> <p>M1 for $29.95 \times 14.95 \times 7.95$ oe</p> <p>B1 for using greatest radius of sphere as 0.25cm + 0.005 cm</p> <p>M1 for dividing least volume of lead “3559.632375” by greatest volume of sphere “0.0694559”</p> <p>A1 for 51250 or Selling price = £51.25</p> <p>A1 for Profit = £1.25 cao</p>
Total for Question: 6 marks				