

Q1.

$$x = 0.7$$

Work out the value of $\frac{(x + 1)^2}{2x}$

Write down all the figures on your calculator display.

.....

(Total for Question is 2 marks)

Q1.

PAPER: IMA0 2H				
Question	Working	Answer	Mark	Notes
		2.064(285714...)	2	M1 for substitution of 0.7 into expression or 2.89 or 2.06 seen A1 for 2.064(285714...) or $\frac{289}{140}$

(Higher)

Q2.

Liam invests £6200 for 3 years in a savings account.
He gets 2.5% per annum compound interest.

How much money will Liam have in his savings account at the end of 3 years?

£

(Total for Question is 3 marks)

Q2.

Question	Working	Answer	Mark	Notes
	$6200 \times 1.025^3 =$ OR $6200 + \frac{2.5}{100} \times 6200$ $= 6355$ $6355 + \frac{2.5}{100} \times 6355$ $= 6513.875$ $6513.875 + \frac{2.5}{100} \times$ $6513.875 =$	6676.72	3	M2 for $6200 \times 1.025^3 (= 6676.72\dots)$ (M1 for $6200 \times 1.025^n, n \neq 3$) A1 for 6676.72, accept 6676.71 or 6676.73 OR M1 for 6200×1.025 or for $6200 + \frac{2.5}{100} \times 6200$ oe or for 6355 or 155 or 465 or 6665 M1 (dep) for a complete compound interest method shown for 3 years A1 for 6676.72, accept 6676.71 or 6676.73 [SC B2 for 476.71 or 476.72 or 476.73 seen]

Q3.

Use a calculator to work out

$$\frac{\sqrt{20.4}}{6.2 \times 0.48}$$

Write down all the figures on your calculator display.
Give your answer as a decimal.

(Total for Question is 2 marks)

Q3.

Question	Working	Answer	Mark	Notes
	$\frac{\sqrt{20.4}}{6.2 \times 0.48} = \frac{4.5166359}{2.976}$	1.5176(868)	2	B2 for 1.5176... (B1 for sight of 4.51(66359..) or 4.52 or 2.97(6) or 2.98 or 1.51 or 1.52 or 1.518 or 1.517 or 1.5177 or $\frac{\sqrt{510}}{5}$)

Q4.

160 cm of gold wire has a weight of 17.8 grams.

Work out the weight of 210 cm of the gold wire.

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(Total for Question is 3 marks)

Q4.

Question	Working	Answer	Mark	Notes
	$17.8 \div 160 \times 210 =$ $0.11125 \times 210 =$ 23.3625 g OR $210 \div 160 \times 17.8 =$ $1.3125 \times 17.8 =$ 23.3625 g OR $210 - 160 (=50)$ $\frac{17.8}{160} \times$ $'50' (=5.5625)$ $17.8 + 5.5625$	23.3(625)	3	<p>M1 $17.8 \div 160 (=0.11125)$ or $17.8 \times 210 (=3738)$ or $210 \div 160 (=1.3125)$ M1 (dep) '0.11125' $\times 210$ or '3738' $\div 160$ or '1.3125' $\times 17.8$ A1 for answer in range 23.3 - 23.4</p> <p>OR</p> <p>M1 for $\frac{17.8}{160} \times (210 - 160) (=5.5625)$ M1 (dep) for $17.8 + '5.5625'$ A1 for answer in range 23.3 - 23.4</p> <p>OR</p> <p>M1 for correct method to find weight of 2 cm or 5 cm or 10 cm M1 (dep) for complete method A1 for answer in range 23.3 - 23.4</p>

Q5.

- * In the UK, petrol cost £1.24 per litre.
In the USA, petrol cost 3.15 dollars per US gallon.

1 US gallon = 3.79 litres
£1 = 1.47 dollars

Was petrol cheaper in the UK or in the USA?

(Total for Question is 4 marks)

Q5.

Question	Working	Answer	Mark	Notes															
	<p>For example</p> <table border="1" data-bbox="225 226 660 349"> <thead> <tr> <th></th> <th>UK</th> <th>USA</th> </tr> </thead> <tbody> <tr> <td>\$ per US gal</td> <td>(\$6.90(8412))</td> <td>[\$3.15]</td> </tr> <tr> <td>£ per litre</td> <td>[£1.24]</td> <td>(£)0.56(53...)</td> </tr> <tr> <td>£ per US gal</td> <td>(£)4.69(96)</td> <td>(£)2.14(28...)</td> </tr> <tr> <td>\$ per litre</td> <td>(\$1.82(28))</td> <td>(\$0.83(11...))</td> </tr> </tbody> </table> <p>Cost in £ per US gal of UK fuel = $£1.24 \times 3.79$ = £4.6996</p> <p>Cost in \$ per US gal of UK fuel = $\\$1.47 \times 4.6996 = \\6.908412</p> <p>OR</p> <p>Cost in £ of 1 US gal of US fuel = $\\$3.15 \div 1.47$ = £2.14</p> <p>Cost in £ per litre of US fuel = $£2.14 \div 3.79$ =£0.56(5...)</p> <p>OR</p> <p>Cost in UK in £ per US gal = $£1.24 \times 3.79$ (=£4.6996)</p> <p>Cost in USA in £ per US gal = $£3.15 \div 1.47$ (=2.1428)</p> <p>OR</p> <p>Cost in UK is \$ per litre = $£1.24 \times 1.47$ (=1.8228)</p> <p>Cost in USA in \$ per litre = $3.15 \div 3.79$ (=0.8311...)</p>		UK	USA	\$ per US gal	(\$6.90(8412))	[\$3.15]	£ per litre	[£1.24]	(£)0.56(53...)	£ per US gal	(£)4.69(96)	(£)2.14(28...)	\$ per litre	(\$1.82(28))	(\$0.83(11...))	<p>Cheaper in US</p>	<p>4</p>	<p>M1 for 1.24×3.79 (= 4.6996) or 1.24×1.47 (=1.8228)</p> <p>M1 for $1.47 \times$ '4.6996' or $3.79 \times$ '1.8228'</p> <p>A1 for 6.90(8412) C1 (dep on M2) for '\$6.90(8412)' or '\$6.91' and reaching a conclusion consistent with their calculation</p> <p>OR</p> <p>M1 for $3.15 \div 1.47$ (=2.1428...) or $3.15 \div 3.79$ (=0.8311)</p> <p>M1 for '2.14' + 3.79 or '0.8311' + 1.47</p> <p>A1 for 0.56(53...) C1 (dep on M2) for £'0.56(53...)' or '£0.57' and reaching a conclusion consistent with their calculation</p> <p>OR</p> <p>M1 1.24×3.79 (= 4.6996) M1 $3.15 \div 1.47$ (=2.1428...) A1 4.69(96) and 2.14(28...) C1 (dep on M2) for £'4.69(96)' or £'4.70' AND £'2.14(28...)' and reaching a conclusion consistent with their calculation</p> <p>OR</p> <p>M1 for 1.24×1.47 (=1.8228) M1 for $3.15 \div 3.79$ (=0.8311...) A1 for 1.82(28) and 0.83(11...) C1 (dep on M2) for '\$1.82(28)' and '\$0.83(11...)' and reaching a conclusion consistent with their calculation</p> <p>NB: Throughout values can be rounded or truncated to 1 or more decimal places. In order to award the communication mark, correct currency must be shown with the calculated value(s) but these can still be rounded or truncated to one or more decimal places as they are being used for comparison.</p>
	UK	USA																	
\$ per US gal	(\$6.90(8412))	[\$3.15]																	
£ per litre	[£1.24]	(£)0.56(53...)																	
£ per US gal	(£)4.69(96)	(£)2.14(28...)																	
\$ per litre	(\$1.82(28))	(\$0.83(11...))																	

Q6.

Bill's weight decreases from 64.8 kg to 59.3 kg.

Calculate the percentage decrease in Bill's weight.
Give your answer correct to 3 significant figures.

(Total for Question is 3 marks)

Q6.

Question	Working	Answer	Mark	Notes
	$\frac{64.8 - 59.3}{64.8} \times 100 (=8.487\dots)$ <p>OR</p> $59.3/64.8 \times 100 = 91.512$ $100 - '91.512' = 8.487\dots$	8.49	3	<p>M1 64.8 – 59.3 (=5.5) M1 (dep) $5.5/64.8 \times 100$ oe A1 8.48 – 8.49</p> <p>OR</p> <p>M1 $59.3/64.8 \times 100$ oe (= 91.5(12...)) M1 (dep) 100 – '91.5' A1 8.48 – 8.49</p> <p>OR</p> <p>M1 $59.3/64.8$ (=0.915(12...)) M1 (dep) $100 \times (1 - '0.915')$ A1 8.48 – 8.49</p>

Q7.

Rob is learning about the planets.

Rob makes a model of the Sun.

He also makes a model of the planet Jupiter.

Rob is going to hang the two models in the school hall.

Rob wants a distance of 16 m between the two models.

The real distance between the planet Jupiter and the Sun is 8×10^8 km.

Work out the scale Rob should use.

Give your answer in the form $1 : n$

(Total for Question is 3 marks)

Q7.

Question	Working	Answer	Mark	Notes
	16 metres: 8×10^8 km. $16: 8 \times 10^8 \times 1000$ $16: 8 \times 10^{11}$ $1: 5 \times 10^{10}$ OR 2 m to 10^8 km 2m to 100 000 000 000m 1m to 50 000 000 000m	$1: 5 \times 10^{10}$	3	M1 (indep) correct method to convert to consistent units M1 $\frac{8 \times 10^8}{16}$ (units may not be consistent) or 5×10^{10} oe or 5×10^7 oe A1 $1: 5 \times 10^{10}$ or 1: 50 000 000 000 OR M1 (indep) correct method to convert to consistent units M1 $16 \frac{1}{8}$ to 10^8 A1 $1: 5 \times 10^{10}$ or 1: 50 000 000 000

(Higher)

Q8.

Calculate the value of $\sqrt{\frac{\tan 60^\circ + 1}{\tan 60^\circ - 1}}$

Write down all the figures on your calculator display.
You must give your answer as a decimal.

(Total for Question is 2 marks)

Q8.

	Working	Answer	Mark	Notes
	$\sqrt{\frac{2.73 \dots}{0.732 \dots}}$	1.931851...	2	M1 for 2.73... or 0.732... or 3.73... or 1.931 or 1.932 or 1.93 or $(1 + \sqrt{3})$ or $(\sqrt{3} - 1)$ or $(2 + \sqrt{3})$ or 1.65... or 0.855... A1 for 1.9318(5...) SC: B1 for 2.5127(17...)

(Higher)

Q9.

$$m = \frac{\sqrt{s}}{t}$$

$s = 3.47$ correct to 2 decimal places

$t = 8.132$ correct to 3 decimal places

By considering bounds, work out the value of m to a suitable degree of accuracy.

You must show all your working and give a reason for your final answer.

(Total for Question is 5 marks)

Q9.

	Working	Answer	Mark	Notes
*		0.229 because the LB and UB agree to that number of figures	5	B1 for 3.465 or 3.475 or 3.474999... B1 for 8.1315 or 8.1325 or 8.132499... M1 for as $\frac{\sqrt{3.475}}{8.1315}$ UB OR as $\frac{\sqrt{3.465}}{8.1325}$ LB C1 (dep on all previous marks) for 0.2292... and 0.2288... both values must clearly come from working with correct values C1 for 0.229 from 0.2292... and 0.2288... and 'both LB and UB round to 0.229'

Q10.

* Viv wants to invest £2000 for 2 years in the same bank.

<p>The International Bank</p> <p>Compound Interest</p> <p>4% for the first year 1% for each extra year</p>

<p>The Friendly Bank</p> <p>Compound Interest</p> <p>5% for the first year 0.5% for each extra year</p>
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At the end of 2 years, Viv wants to have as much money as possible.

Which bank should she invest her £2000 in?

(Total for Question is 4 marks)

Q10.

		Working	Answer	Mark	Notes
*			The Friendly Bank	4	<p>M1 for a correct method to find interest for the first year for either bank OR correct method to find the value of investment after one year for either bank OR use of the multiplier 1.04 or 1.05</p> <p>M1 for a correct full method to find the value of the investment (or the value of the total interest) at the end of 2 years in either bank</p> <p>A1 for 2100.8(0) and 2110.5(0) (accept 100.8(0) and 110.5(0))</p> <p>C1 (dep on M1) ft for a correct comparison of <i>their</i> total amounts, identifying the bank from their calculations</p> <p>OR</p> <p>M1 for either 1.04×1.01 or 1.05×1.005</p> <p>M1 for 1.04×1.01 and 1.05×1.005</p> <p>A1 for 1.0504 and 1.05525</p> <p>C1 (dep on M1) ft for a correct comparison of <i>their</i> total multiplying factors identifying the bank from their calculations</p>

Q11.

Dan does an experiment to find the value of π .

He measures the circumference and the diameter of a circle.

He measures the circumference, C , as 170 mm to the nearest millimetre.

He measures the diameter, d , as 54 mm to the nearest millimetre.

Dan uses $\pi = \frac{C}{d}$ to find the value of π .

Calculate the upper bound and the lower bound for Dan's value of π .

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(Total for Question is 4 marks)

Q11.

	Working	Answer	Mark	Notes
	<i>d</i> : UB = 54.5 (or 54.499), LB = 53.5 <i>C</i> : UB = 170.5 (or 170.499), LB = 169.5 $170.5 \div 53.5$ $169.5 \div 54.5$	3.19 3.11...	4	B1 for any one correct bound quoted M1 for $170.5 \div 53.5$ or $169.5 \div 54.5$ A1 for UB = answer in range 3.18 to 3.19 from correct working A1 for LB = 3.11.. from correct working

(Higher)

Q12.

Work out the value of $(7.5 \times 10^4) \times (2.5 \times 10^3)$
Give your answer in standard form.

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(Total for Question is 2 marks)

Q12.

PAPER: IMA0_2H				
Question	Working	Answer	Mark	Notes
		1.875×10^8	2	M1 for digits 1875 A1 cao

Q13.

Pavel and Katie share some sweets in the ratio 3 : 8

Katie gets 32 sweets.

(a) How many sweets does Pavel get?

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(2)

Katie also has a tin of chocolates.

There are 80 chocolates in the tin.

45% of the chocolates have toffee in the middle.

(b) Work out the number of chocolates that have toffee in the middle.

.....
(2)

(Total for Question is 4 marks)

Q13.

PAPER: 1MA0 2H				
Question	Working	Answer	Mark	Notes
(a)		12	2	M1 for $32 \div 8 (=4)$ or $\frac{3}{8} \times 32$ oe A1 for 12
(b)		36	2	M1 for correct method to find 45% of 80 A1 cao