1MA0/4H

Edexcel GCSE

Mathematics (Linear) – 1MA0

Practice Paper 4H (Calculator)
Set B

Higher Tier

Time: 1 hour 45 minutes

Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Items included with question papers
Nil

Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may be used.

Information

The total mark for this paper is 100.
The marks for each question are shown in brackets – use this as a guide as to how much time to spend on **each** question.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

Advice

Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
Check your answers if you have time at the end.

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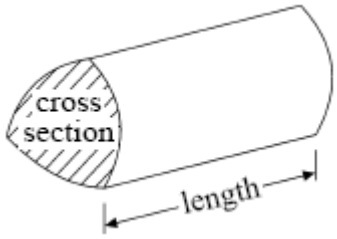
GCSE Mathematics (Linear) 1MA0

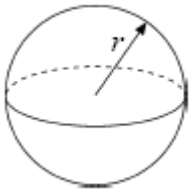
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

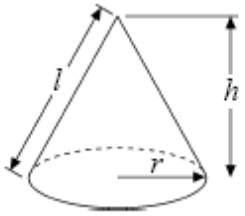
Volume of prism = area of cross section × length



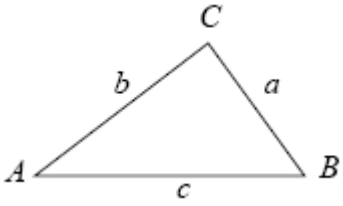
Volume of sphere $\frac{4}{3}\pi r^3$
Surface area of sphere $= 4\pi r^2$



Volume of cone $\frac{1}{3}\pi r^2 h$
Curved surface area of cone $= \pi r l$



In any triangle ABC



The Quadratic Equation
The solutions of $ax2+ bx + c = 0$
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2} ab \sin C$

Answer ALL TWENTY TWO questions

Write your answers in the spaces provided.

You may use a calculator in this paper.

You must write down all the stages in your working.

1. Here are the times, in minutes, taken to solve a puzzle.

5	10	15	12	8	7	20	35	24	15
20	33	15	24	10	8	10	20	16	10

(a) In the space below, draw a stem and leaf diagram to show these times.

(3)

(b) Find the median time to solve this puzzle.

…… mins

(1)

(Total 4 marks)

2. Mr and Mrs Ledger took their grandson Harry to Chic's Diner.

Chic's Diner
Menu

Starters		**Deserts**	
Prawn Cocktail	£4.50	Ice cream	£2.80
Pate and toast	£4.95	Apple pie	£3.20
Soup of the day	£3.50	Cheesecake	£3.50
Melon	£2.90		
		Drinks	
Main course		White wine	£11.50 per
Fish and chips	£7.85	bottle	
Steak and chips	£12.25	Red wine	£12.25 per
Gammon and chips	£9.75	bottle	
		Fruit juices	£2.10 per

Add 10% service charge

Mr Ledger started with soup.
He had steak and chips for his main course and ice cream for desert.

Mrs Ledger started with a prawn cocktail and a main course of fish and chips.
She did not have a desert.

Harry didn't have a starter.
He had a main course of fish and chips and ice cream for desert.

Mr and Mrs Ledger shared a bottle of red wine.
Harry had a glass of fruit juice.

(a) Work out the total bill including the service charge.

£ …….

(4)

Chic has now increased all of his prices by 6%.

(b) Work out the new price of fish and chips.

£ .....

(3)

(Total 7 marks)

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3. Here are the first five terms of an arithmetic sequence.

−2 1 4 7 10

(a) Find the 12th term of this sequence.

.....

(1)

(b) Write down, in terms of n, an expression for the nth term of this sequence.

.....

(2)

*(c) Prove that the number 432 is not a term in this sequence.

(2)

(Total 5 marks)

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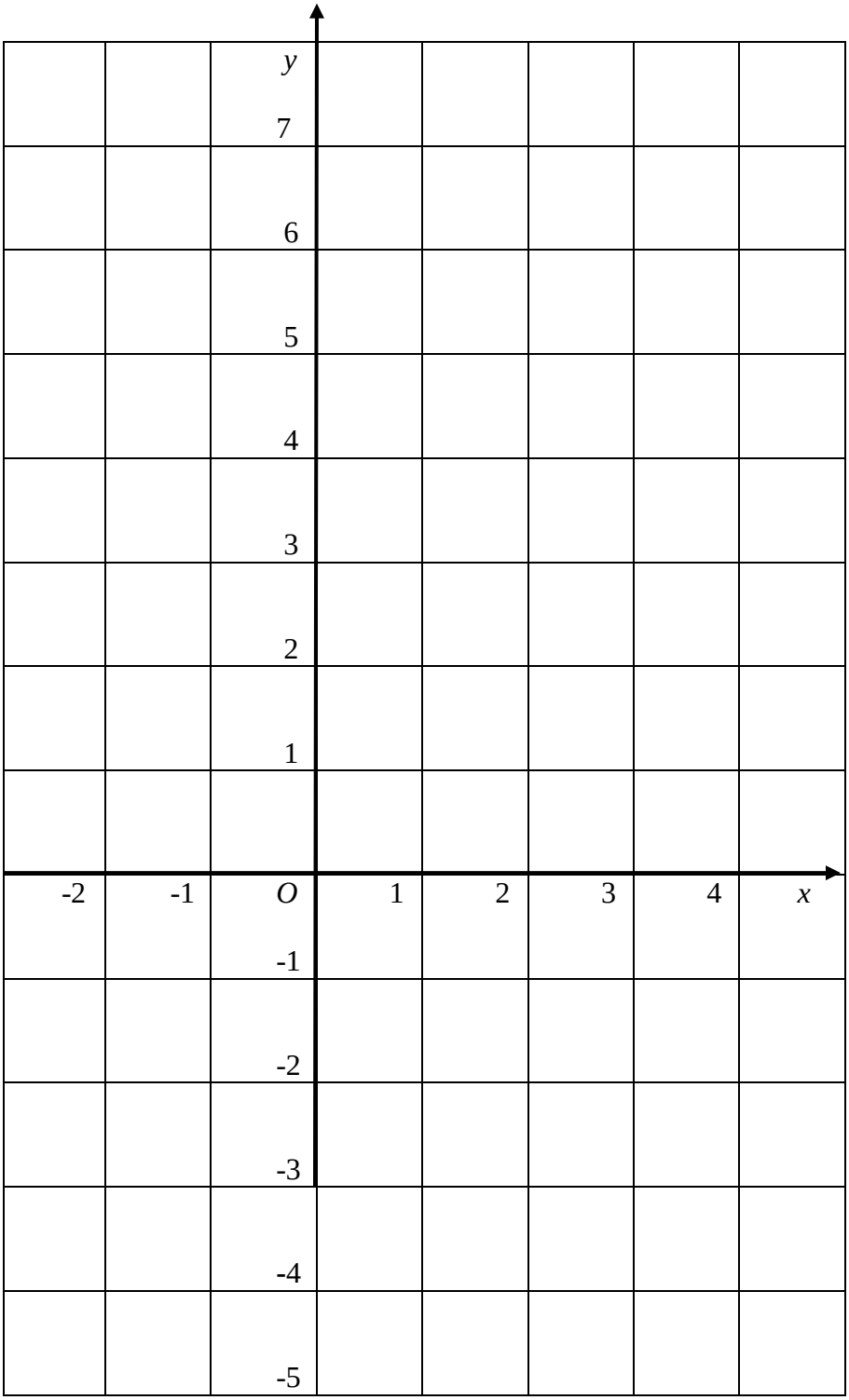
4. On the grid, draw the graph of $y = 3 - 2x$ from $x = -2$ to $x = 4$



(Total 3 marks)

***5.** T-shirts normally cost £12 each.

Two shops have a special offer on these T-shirts.

T-Shirts-R-Us

Special offer
Pay for two T-shirts and get one free.
Pay for five T-shirts and get three free

Budget Shirt Company

Special offer

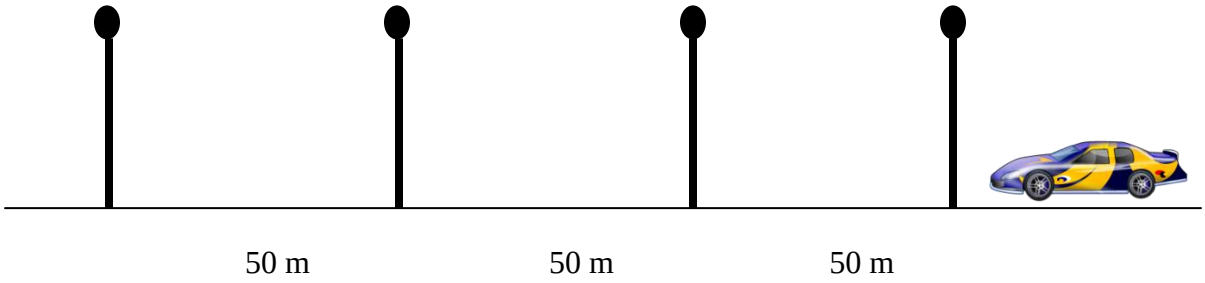
$\frac{1}{3}$ off normal price

Stephen wants to buy 30 T-shirts.

Work out at which shop, Stephen will get the better deal.
You must show clearly how you got your answer.

(Total 5 marks)

***6.** Roger lives in the village of Hawkshaw.
He wants to find out if cars break the speed limit through the village.



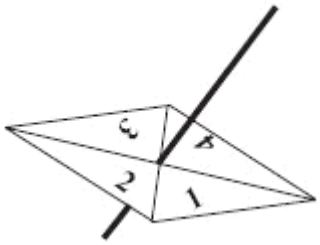
Roger times each car as it goes between four lampposts.
The distance between each lamppost is 50 m.

The speed limit through the village is 30 mph.
The first car Roger times takes 12 seconds to go between the four lampposts.

Is this car breaking the speed limit?
You must show all of your working.

(Total 5 marks)

7. Here is a 4-sided spinner.



The sides of the spinner are labelled 1, 2, 3 and 4.

The spinner is biased.

The probability that the spinner will land on each of the numbers 2 and 3 is given in the table. The probability that the spinner will land on 1 is equal to the probability that it will land on 4.

Number	1	2	3	4
Probability	x	0.46	0.28	x

Sarah is going to spin the spinner 500 times.

Work out an estimate for the number of times it will land on 4

.....

(Total 4 marks)

8. Dan can put up 30 tiles in one hour.
He always works at the same speed.

He tiles a wall that needs 140 tiles.

He starts work at 7.30 a.m.

He has a 20 minute break in the morning and 45 minutes for lunch.

Work out the time that Dan should finish tiling the wall

(Total 4 marks)

9. On a farm, wheat grain is stored in a cylindrical tank.
The cylindrical tank has an internal diameter of 4.8 m and a height of 8.5 m.

$1\ m^3$ of grain weighs 0.766 tonnes.

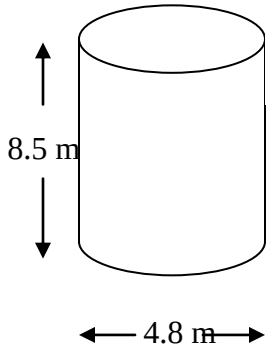


Diagram **NOT** accurately drawn

Calculate the weight, in tonnes, of wheat in the storage tank when it is full.
Give your answer correct to 1 decimal place.

…….. tonnes
(Total 3 marks)

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10. Simon spent $\frac{1}{4}$ of his wages on rent.

He spent 20% of his wages on food.

He spent 0.15 of his wages on clothes

Work out the fraction of his wages that he had left.

.....
(Total 3 marks)

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11. The equation

$$x^3 + 2x = 42$$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show **ALL** your working.

x = ...
(Total 4 marks)

---

12. (a) Solve $5x + 12 = 70$

x = ...
(2)

(b) Solve $p + 9 = 2(5 - p)$

p = ...
(3)
(Total 5 marks)

---

13. The time taken for light to reach Earth from the edge of the known universe is 14 000 000 000 years.

Light travels at the speed of 9.46×10^{12} km/year.

Work out the distance, in kilometres, from the edge of the known universe to Earth.
Give your answer in standard form.

…… km
(Total 3 marks)

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14. Simplify fully

(a) $p^2 \times p^7$

……

(1)

(b) $\dfrac{3q^4 \times 2q^5}{q^3}$

.....

(2)

(c) $(2xy^3)^5$

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

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15. Jenny recorded the heights, in centimetres, of the boys in her class.

She put the heights in order.

138	144	149	152	158	164	165	167
170	170	176	179	183	185	186	

(a) Find

(i) the lower quartile,

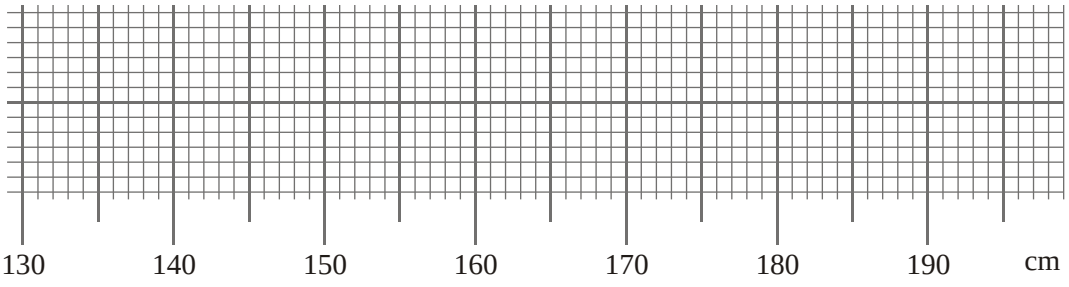
..... cm

(ii) the upper quartile.

..... cm

(2)

(b) On the grid, draw a box plot for this data.



(3)

(Total 5 marks)

16.

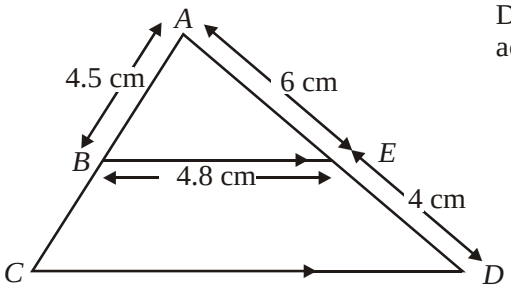


Diagram **NOT** accurately drawn

BE is parallel to *CD*.

AE = 6 cm, *ED* = 4 cm, *AB* = 4.5 cm, *BE* = 4.8 cm.

(a) Calculate the length of *CD*.

.....cm
(2)

(b) Calculate the perimeter of the trapezium *EBCD*.

.....cm
(2)
(Total 4 marks)

17.

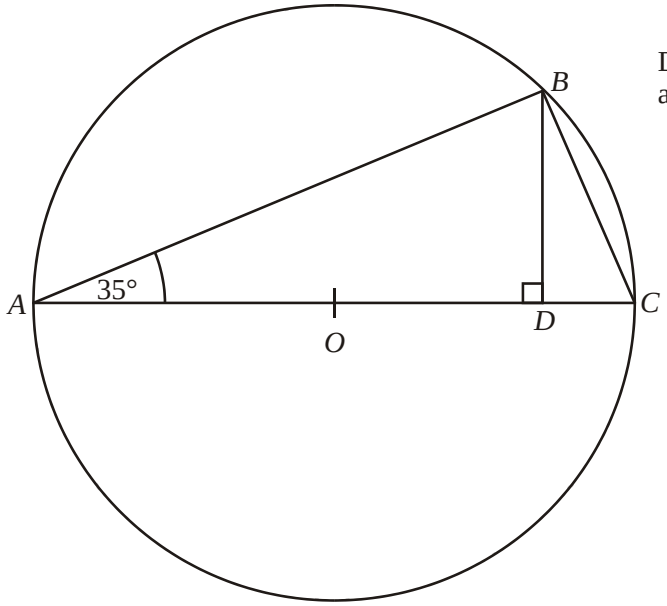


Diagram **NOT** accurately drawn

The diagram shows a circle, centre *O*.

AC is a diameter.
Angle *BAC* = 35°.
D is the point on *AC* such that angle *BDA* is a right angle.

(a) Work out the size of angle *BCA*.

Give reasons for your answer.

.....°
(2)

(b) Calculate the size of angle *BOA*.

.....°
(2)
(Total 4 marks)

18.

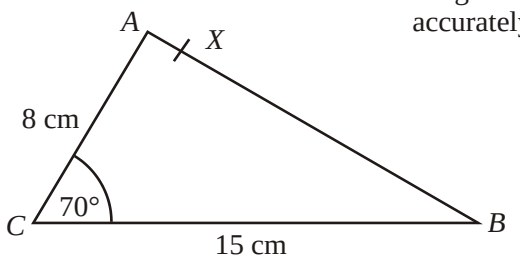


Diagram **NOT** accurately drawn

In triangle *ABC*,
AC = 8 cm,
CB = 15 cm,
Angle *ACB* = 70°.

(a) Calculate the area of triangle *ABC*.
Give your answer correct to 3 significant figures.

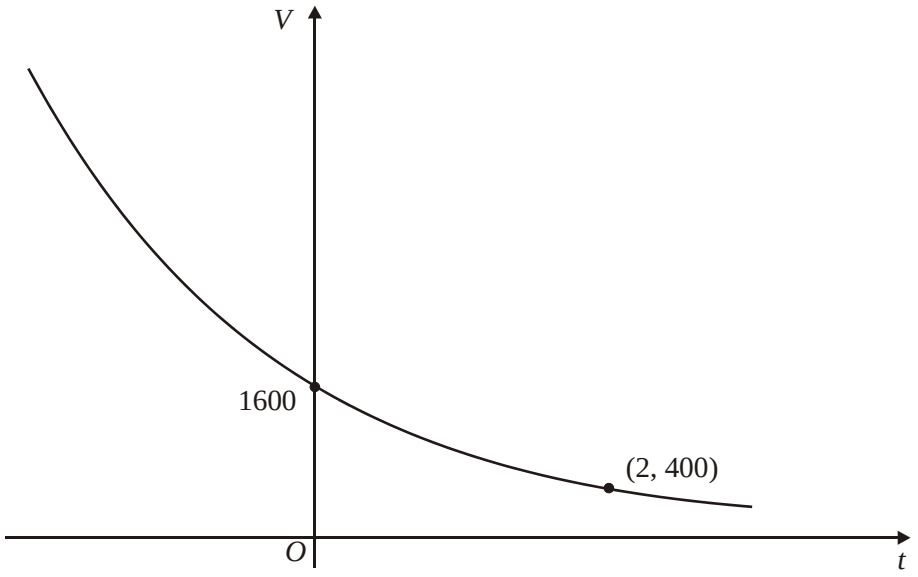
..... cm^2
(2)

X is the point on *AB* such that angle *CXB* = 90°.

(b) Calculate the length of *CX*.
Give your answer correct to 3 significant figures.

..... cm
(4)
(Total 6 marks)

19. Mr Patel has a car.



The value of the car on January 1st 2000 was £1600

The value of the car on January 1st 2002 was £400

The sketch graph shows how the value, £V, of the car changes with time.

The equation of the sketch graph is

$$V = pq^t$$

where t is the number of years after January 1st 2000.
p and q are positive constants.

(a) Use the information on the graph to find the value of p and the value of q.

p = ... q = ...

(3)

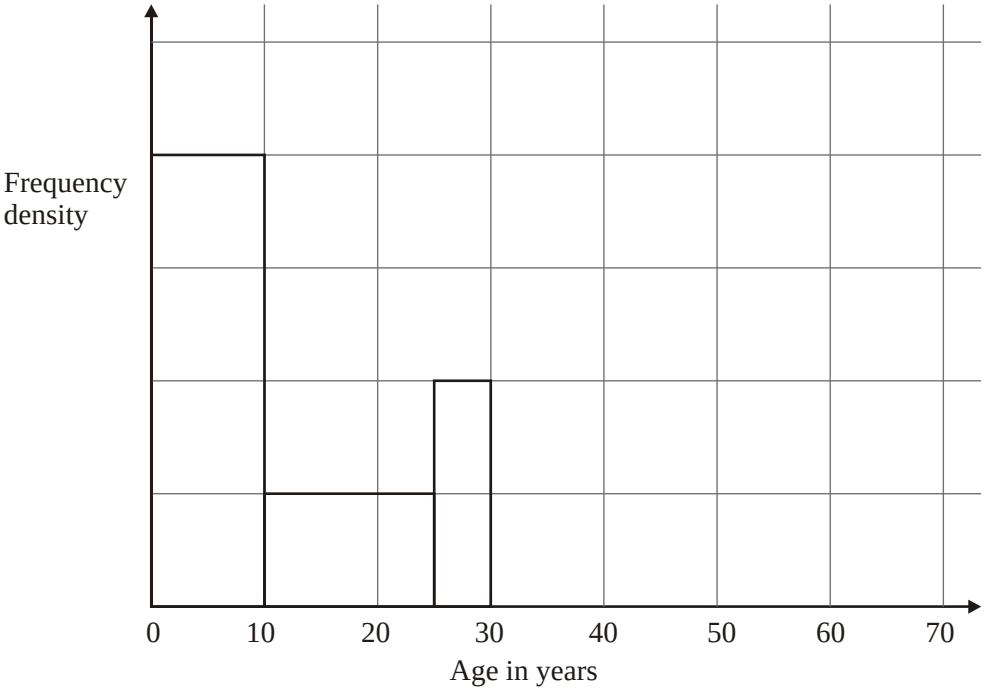
(b) Using your values of p and q in the formula $V = pq^t$ find the value of the car on January 1st 1998.

£ .....

(2)

(Total 5 marks)

20. The incomplete table and histogram give some information about the ages of the people who live in a village.



(a) Use the information in the histogram to complete the frequency table below.

Age (x) in years	Frequency
$0 < x \leq 10$	160
$10 < x \leq 25$	
$25 < x \leq 30$	
$30 < x \leq 40$	100
$40 < x \leq 70$	120

(2)

(b) Complete the histogram.

(2)
(Total 4 marks)

21. A bag contains 6 black beads, 10 red beads and 4 green beads.
Helen takes a bead at random from the bag, records its colour and replaces it.
She does this two more times.

Work out the probability that, of the three beads Helen takes, exactly two will be the same colour.

.....

(Total 5 marks)

22. (a) Factorise fully $4m^2 - 12mn$

……

(2)

(b) Factorise $9x^2 - 6x + 1$

……

(2)

(c) Solve $x^2 + 4x - 10 = 0$

Give your solutions correct to 2 decimal places.

.....

(3)
(Total 7 marks)

TOTAL FOR PAPER: 100 MARKS

END

Question		Working	Answer	Mark	Notes
1(a)			0 | 5 7 8 8 1 | 0 0 0 0 2 4 5 5 6 2 | 0 0 0 4 5 3 | 3 5 Key: 3 | 5 = 35	3	B2 for fully correct diagram [B1 for ordered leaves with one error or omission or a complete unordered diagram] B1 for a correct key
1 (b)		(14+15)/2	14.5	1	B1 cao
2(a)		3.50+12.25+2.8+4.50+7.85+7.85+2.80+12.25+2.10 = 55.90 55.90 + 5.59	61.49	4	M1 for 3.50+12.25+2.8+4.50+7.85+7.85+2.80+12.25+2.10 M1 for '55.90' x 0.1 oe A1 for 5.59 A1 cao
2(b)		7.85 x 1.06	8.32	3	M2 for 7.85 x 1.06 [M1 for 7.85 x 6/100] A1 for 8.32 or 8.33
3(a)			31	1	B1 cao
3(b)			$3n - 5$	2	B2 for $3n - 5$ [B1 for $3n \pm k$, where $k \neq -5$]
3(c)		$3n - 5 = 432$ $3n = 437$	437 is not divisible by 3	2	M1 for $3n - 5 = 432$ C1 for 437 is not divisible by 3 oe
4			Straight line from (-2, 7) to (4, -5)	3	B3 for a line drawn from (-2, 7) to (4, -5) [B2 for a single line of gradient -2 or passing through (0, 3) or for 6/7 correctly plotted points OR B1 for 2 or 3 correctly plotted points]

Question		Working	Answer	Mark	Notes
5		**T-Shirts-R-Us** 3 lots of 8 @ 12 x 5 per lot + 2 lots of 3 @ 12 x 2 per lot = 60x3 + 24x2 = 180 + 48 = 228 **Budget Shirt Co** 12 x 1/3 = 4 12 – 4 = 8 30 x 8 = 240	T-Shirts-R-Us since 228 < 240	5	M1 for 30 = 3x8 + 2x3 oe M1 for 60x3 + 24x2 (= 228) M1 for 12x2/3 x 30 oe A1 for 228 and 240 C1 for T-Shirts-R-Us since 228 < 240 oe
6		30 mph = 30x8/5 = 48 km/h Speed of car = 150/12=12.5 m/s 12.5 x 3600/1000 = 45 km/h OR Speed of car = 150/12=12.5 m/s 12.5 x 3600/1000 = 45 km/h 45 x 5/8 = 28.125 mph	No, since 45 < 48 OR No, since 28.125 < 30	5	M1 for 30 x 8/5 (= 48) M1 for 150/12 M1 for '12.5' x 3600/1000 A1 for 48 and 45 C1 for 'No, since 45 < 48' OR M1 for 150/12 M1 for '12.5' x 3600/1000 M1 for '45' x 5/8 A1 for 48 and 45 C1 for 'No, since 28.125 < 30'
7		(1 – 0.46 – 0.28) ÷ 2 × 500	65	4	M1 for 1 – 0.46 – 0.28 A1 for x = 0.13 M1 for 0.13 x 500 A1 cao

Question		Working	Answer	Mark	Notes
8		140 ÷ 30 = 4.66…hours = 4 hours 40 mins 7 30 + 4 40 + 0 20 + 0 45	13 15 (1.15 pm)	4	M1 for 140 ÷ 30 A1 for 4 hours 40 mins M1 for 7 30 + 4 40 + 0 20 + 0 45 A1 for 13 15 oe
9		$\Pi \times 2.4^2 \times 8.5 \times 0.766$	117.8	3	M1 for $\Pi \times 2.4^2 \times 8.5$ M1 for $\Pi \times 2.4^2 \times 8.5 \times 0.766$ A1 for 117.8 or better
10		¼ = 25% 0.15 = 15% 100 – 25 – 20 – 15 = 40% 40/100	2/5	3	M1 for attempting to change to a common type M1 for 100 – 25 – 20 – 15 or 1 – 0.25 – 0.2 – 0.15 or 1 – ¼ - 20/100 – 15/100 oe A1 for 40/100 or better
11		Try $x = 3.5$; $3.5^3 + 7 = 49.875$ Try $x = 3.4$; $3.4^3 + 6.8 = 46.104$ Try $x = 3.3$; $3.3^3 + 6.6 = 42.537$ Try $x = 3.2$; $3.2^3 + 6.4 = 39.168$ Try $x = 3.25$; $3.25^3 + 6.5 =$ 40.828..	3.3	4	B2 for a correct trial between 3 and 4 [B1 for trial of 3 or 4] B1 for a correct trial between 3.2 and 3.3 B1 cao
12(a)		(70 – 12) ÷ 5	11.6	2	M1 for $5x = 70 – 12$ A1 cao
12(b)		$p + 9 = 10 – 2p$ $3p = 10 – 9$	1/3	3	M1 for $10 – 2p$ seen M1 (indep) for $3p = 10 – 9$ A1 for 1/3 oe
13		$9.46 \times 10^{12} \times 1.4 \times 10^{10}$ 13.244×10^{22}	1.3244×10^{23}	3	M1 for $9.46 \times 10^{12} \times 1.4 \times 10^{10}$ oe A1 for 13.244×10^{22} oe A1 cao

Question		Working	Answer	Mark	Notes
14 (a)			p^9	1	B1 cao
14 (b)			$6q^6$	2	B2 cao [B1 for $6q^9/q^3$ or $6q^1\times q^3$ or $6q^4\times q^2$ or q^6]
14 (c)			$32x^5y^{15}$	2	B2 cao [B1 for 2 of the 3 terms correct]
15(a)(i)			152	2	B1 cao
(ii)			179		B1 cao
15(b)			Box plot	3	B3 for a fully correct box plot [B2 for 2 correct of the following aspects: Median at 167 Quartiles at 152 and 179 Limits at 138 and 186 B1 for just 1 aspect] Note: in all cases a box must be drawn or no marks awarded
16(a)		4.8 × 10/6	8	2	M1 for 10/6 oe seen A1 cao
16(b)		BC = 4.5 × 2/3 = 3 3 + 4.5 + 6 + 4 + 8	25.5	2	M1 for 4.5 × 2/3 oe A1 cao

Question		Working	Answer	Mark	Notes
17(a)		90 – 35	55 Angles in a semicircle = 90	2	B1 for 55 B1 for 'angles in a semicircle = 90' oe
17(b)		55 x 2	110	2	M1 ft for '55' x 2 oe A1 for '55 x 2'
18(a)		½ × 8 × 15 × sin 70	56.4	2	M1 for ½ × 8 × 15 × sin 70 A1 for 56.4 or better
18(b)		$AB^2 = 8^2 + 15^2 – 2 . 8 . 15\cos70$ AB = 14.4 ½ × 14.4 × CX = 56.4 56.4 x 2/14.4	7.83	4	M1 for $AB^2 = 8^2 + 15^2 – 2 . 8 . 15\cos70$ oe A1 for AB = 14.4 M1 for '56.4' x 2/'14.4' A1 ft for 7.83 or better
19(a)		$1600 = pq^0$ $400 = 1600q^2$	$p = 1600$, $q = ½$	3	M1 for $1600 = pq^0$ M1 for $400 = 1600q^2$ A1 for $p = 1600$ and $q = ½$
19(b)		$T = -2$ $V = 1600 \times (1/2)^{-2}$	6400	2	M1 for $V = 1600 \times (1/2)^{-2}$ A1 cao
20(a)		5 x 15, 8 x 5 OR 1 sq = 40, so 40 x 1.5, 40 x 2 x 0.5	60 40	2	B1 cao B1 cao
20(b)			2.5 sqs or bar of ht 10 3 sqs or bar at ht 12	2	B1 cao B1 cao

Question		Working	Answer	Mark	Notes
21		3xB = 0.3^3 3xR = 0.5^3 3xG = 0.2^3 6xBRG = 6 x 0.3 x 0.5 x 0.2 1 – 0.027 – 0.125 – 0.008 – 0.18	0.66	5	M1 for one correct triple M1 for all 4 c0rrect triples oe M1 for summing any pair M1 for 1 – 0.027 – 0.125 – 0.008 – 0.18 oe A1 cao
22(a)			$4m(m - 3n)$	2	B2 cao [B1 for any correct partial factorization]
22(b)			$(3x - 1)^2$	2	B2 cao [B1 for $(3x \pm 1)(3x \pm 1)$]
22(c)		$(-4 \pm \sqrt{(16 - - 40)})/2$ $(-4 \pm \sqrt{56})/2$ $(-4 \pm 7.483..)/2$	1.74, -5.74	3	M1 for $(-4 \pm \sqrt{(16 - - 40)})/2$; condone one sign error M1 for $(-4 \pm \sqrt{56})/2$ A1 for 1.74 and -5.74