Paper 2

Award marks in whole numbers only

Question	Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
1	A snail crawls 3 kilometres in 16 days. What is the average speed of the snail in metres per second? Give your answer **in scientific notation correct to 2 significant figures**. **Ans: $2{\cdot}2 \times 10^{-3}$**	**4**	
	•[1] evidence of correct formula with units		•[1] $\frac{3km}{16\,\text{days}}$
	•[2] correct conversion of units		•[2] $\frac{3000}{16\times 24\times 60\times 60}$
	•[3] unrounded solution		•[3] $0{\cdot}00217$
	•[4] correct rounding and scientific notation		•[4] $2{\cdot}2 \times 10^{-3}$
		(KU)	

Notes:

(i) for $2{\cdot}2 \times 10^{-3}$ with/without working — award 4/4

(ii) for $2{\cdot}17 \ldots \times 10^{-3}$, with or without working — award 3/4

(iii) for $\frac{3}{16}$, leading to $1{\cdot}9 \times 10^{-1}$ — award 1/4

(iv) for $\frac{3}{16}$, followed by $\frac{3000}{16\times 24\times 60\times 60}$ — award the first two marks

(v) for $\frac{3}{16}$, followed by a correct partial conversion — award the first mark

Question	Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
2	Solve the equation $2x^2 + 7x - 3 = 0$ Give your answers **correct to 1 decimal place**. **Ans: 0·4 or −3·9**	**4**	
	•[1] correct substitution into quadratic formula		•[1] $\frac{-7 \pm \sqrt{7^2 - 4 \times 2 \times -3}}{4}$
	•[2] correct discriminant		•[2] 73
	•[3] unrounded solution		•[3] 0·385, −3·885
	•[4] rounded solution	**(KU)**	•[4] 0·4, −3·9

Notes:

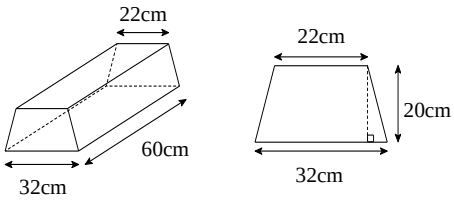
alternative evidence for 3rd and 4th marks

3rd mark (one solution and rounded) 0·385 → 0·4

4th mark (another solution and rounded) – 3·885 → 3·9

(i) only the first mark is available for candidates who process to a negative discriminant

(ii) candidates who do not give an unrounded number cannot be awarded the last 2 marks, **unless**
the final answer is 0·4, −3·9 where 3/4 may be awarded

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
3			A concrete block is in the shape of a prism.  The cross section of the prism is a trapezium with dimensions as shown.		
	a		Calculate the area of the cross section. **Ans: 540 cm^2**	**3**	
			•^{1} beginning process		•^{1} $2\times\frac{1}{2}\times5\times20+(22\times20)$ or $\frac{1}{2}\times20\times(22+32)$
			•^{2} processing		•^{2} 100 + 440 or 10 × 54
			•^{3} calculation	**(KU)**	•^{3} 540
3	**b**		Calculate the volume of the concrete block. **Ans: 32 400 cm^3**	**1**	
			•^{1} calculation	**(KU)**	•^{1} 32 400

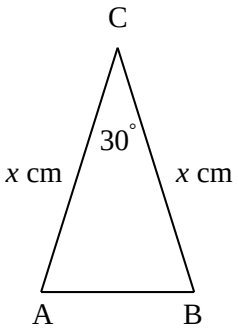
Question	Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
4	Last year, 1296 learner drivers from "Topflight" school of motoring passed their driving test. This was 72% of those who sat their driving test from Topflight. How many **failed** their driving test? **Ans: 504**	**3**	
	•[1] valid strategy		•[1] 72% = 1296
	•[2] processing		•[2] $1\% = \frac{1296}{72} = 18$
	•[3] solution	**(RE)**	•[3] $18 \times 28 = 504$

Notes:

(i) for 504, with/without working — award 3/3

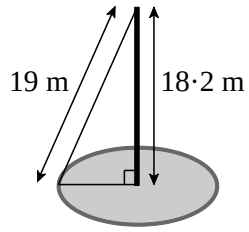
(ii) for candidates who calculate either 28% or 72% of 1296 — award 0/3

(iii) the final mark is for multiplying 1% by 28

Question	Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
5	ABC is an isosceles triangle with angle ACB = 30°. AC = BC = x centimetres.  The area of triangle ABC is 9 square centimetres. Calculate the value of x. **Ans: $x = 6$**	**3**	
	•[1] correct substitution into area formula		•[1] $9 = \frac{1}{2} \times x^2 \times \sin 30^\circ$
	•[2] processing		•[2] 36
	•[3] solution	**(RE)**	•[3] $x = 6$

Notes:

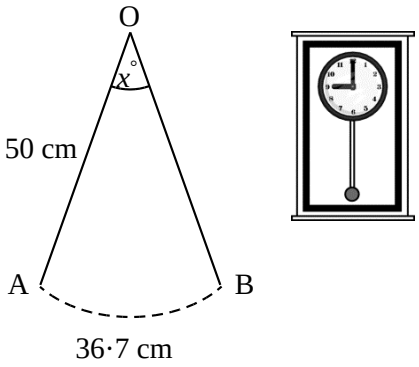
(i) accept $9 = \frac{1}{2} ab \sin 30^\circ$ for first mark

Question	Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
6	A mobile phone mast, 18·2 metres high, stands vertically in the centre of a circle. It is supported by a wire rope, 19 metres long, attached to the ground at a point on the circumference of the circle, as shown.  Calculate the circumference of the circle.		
	Ans: 34·3 m	**3**	
	•[1] correct use of Pythagoras		•[1] $r^2 = 19^2 - 18{\cdot}2^2$
	•[2] calculating radius		•[2] 5·455
	•[3] calculating circumference	**(KU)**	•[3] 34·3

Question	Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
7	Jack weighs 94 kilograms. On the 1st of January, he starts a diet which is designed to reduce his weight by 7% per month. During which month should he achieve his target weight of 73 kilograms? **Show all your working.** **Ans: during April** •[1] reduction factor •[2] processing •[3] continuation •[4] communication	**4** **(RE)**	•[1] 0·93 •[2] 0·93 × 94 = 87·42 •[3] … 75·6 •[4] During April or 4th month

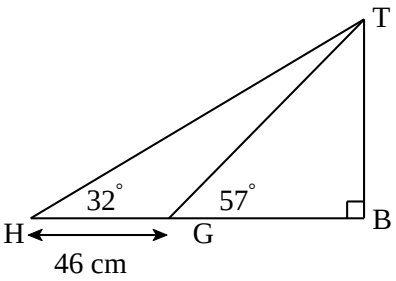
Notes:

(i) for use of a "simple interest" method only the first two marks are available

Question	Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
8	As the pendulum of a clock swings, its tip moves through an arc of a circle.  The length of the pendulum is 50 centimetres. The length of the arc is 36·7 centimetres. Calculate $x°$, the angle through which the pendulum swings. **Ans: 42°**	**3**	
	•[1] strategy		•[1] $\frac{x}{360}$
	•[2] strategy		•[2] $\frac{36\cdot7}{100\pi}$
	•[3] solution	**(RE)**	•[3] 42°

Notes:

(i) for use of $C = \pi r^2$, the 1st and 3rd marks are still available

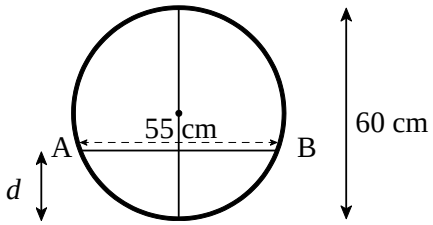
Question	Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
9	In triangle THB: • angle TBH = 90° • angle THB = 32° G is a point on HB. • angle TGB = 57° • GH = 46 metres.  Calculate the length of TB. **Ans: 48·4 m**	**4**	
	•[1] correct use of sine rule in triangle THG		•[1] $\frac{TG}{\sin 32^\circ} = \frac{46}{\sin 25^\circ}$
	•[2] calculation		•[2] TG = 57·679…
	•[3] appropriate trig ratio		•[3] $\sin 57^\circ = \frac{TB}{57\cdot679...}$
	•[4] solution	**(KU)**	•[4] TB = 48·37…

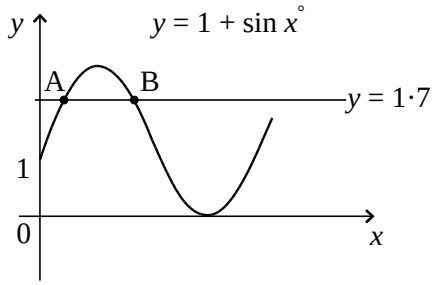
Notes:

(i) do not penalise early rounding

(ii) the 2nd and 4th marks are available only within a valid strategy

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
10	**a**		A function is given by the formula, $f(x) = 4 \times 2^x$. Evaluate $f(3)$. **Ans: 32** •[1] substitution •[2] calculation	**2** **(KU)**	•[1] 4×2^3 •[2] 32
10	**b**		Given that $f(m) = 4$, find the value of m. **Ans: $m = 0$** •[1] substitution •[2] solution	**2** **(RE)**	•[1] $4 = 4 \times 2^m$ •[2] $m = 0$

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
11			Water flows through a horizontal pipe of diameter 60 centimetres. The surface width, AB, of the water is 55 centimetres.  		
	a		Calculate the depth, *d*, of the water in the pipe. **Ans: 18·01 cm**	**4**	
			•[1] recognition of right angle		•[1] use of Pythagoras
			•[2] processing		•[2] $30^2 - 27{\cdot}5^2$
			•[3] processing		•[3] 11·99
			•[4] solution	**(KU)**	•[4] 18·01
Notes: (i) for one mark, the right angle may be stated or indicated on a diagram					
11	**b**		What other depth of water would give the same surface width? **Ans: 41·99 cm**	**1**	
			•[1] communication	**(RE)**	•[1] 41·99

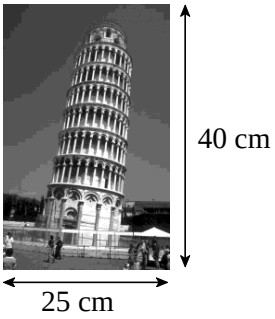
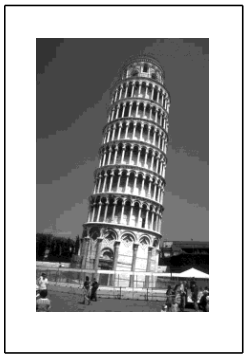
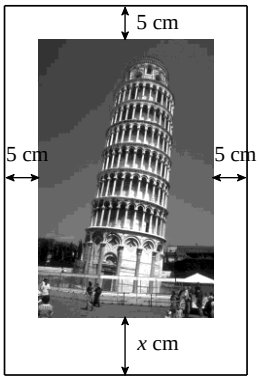
Question	Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
12	Part of the graph of $y = 1 + \sin x^\circ$ is shown in the diagram below.  The line $y = 1{\cdot}7$ is drawn. It cuts the graph of $y = 1 + \sin x^\circ$ at A and B as shown. Calculate the x-coordinates of A and B.		
	Ans: 44·4°, 135·6°	**4**	
	•[1] equating functions		•[1] $1 + \sin x^o = 1{\cdot}7$
	•[2] processing		•[2] $\sin x^o = 0{\cdot}7$
	•[3] first solution		•[3] $44{\cdot}4^\circ$
	•[4] second solution	**(RE)**	•[4] $135{\cdot}6^\circ$

Notes:

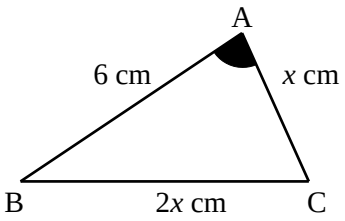
(i) candidates who obtain a negative value of sin x may still be awarded the last two marks for angles in the 3rd and 4th quadrants

(ii) candidates who give more than two answers **cannot** be awarded the last mark

(iii) **caution** $44{\cdot}4^\circ + 90^\circ = 134{\cdot}4^\circ$
this is close to the correct answer

Question	Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
13	Asim has a poster which is 25 centimetres wide and 40 centimetres high.  He decides to place it on a white card. The card and the poster are mathematically similar.  The border is 5 centimetres wide on three sides and x centimetres wide on the fourth side as shown.  Calculate the value of x.		

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
13			**Ans: $x = 11$** <u>Method 1</u> •[1] strategy •[2] applying scale factor •[3] processing •[4] solution	**4**	•[1] scale factor $= \frac{35}{25}$ •[2] $\left(\frac{7}{5}\right) \times 40$ •[3] 56 •[4] 11
			Ans: $x = 11$ <u>Method 2</u> •[1] strategy •[2] equating ratios •[3] cross multiplication •[4] solution	**(RE)**	•[1] $\frac{25}{40}$ or $\frac{35}{45+x}$ •[2] $\frac{25}{40} = \frac{35}{45+x}$ •[3] $25(45 + x) = 35 \times 40$ •[4] 11

Question	Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
14	In triangle ABC: • cos A = 0·5 • AB = 6 centimetres • BC = 2x centimetres • AC = x centimetres  Show that $x^2 + 2x - 12 = 0$ **Ans: $x^2 + 2x - 12 = 0$**	**3**	
	•[1] substitution into cosine rule		•[1] $(2x)^2 = x^2 + 6^2 - 2 \times x \times 6 \times 0{\cdot}5$
	•[2] processing		•[2] $4x^2 = x^2 - 6x + 36$
	•[3] completion of proof	**(RE)**	•[3] $x^2 + 2x - 12 = 0$

Notes:

(i) $2x^2$ is to be treated as bad form for the 1st mark

(ii) the final mark is given only for an explicit statement

KU 25
RE 27

OVERALL TOTAL MARKS
45 KU 45 RE

[END OF PAPER 2 MARKING INSTRUCTIONS]