1 (a) Evaluate $\frac{1.85^2}{\sqrt{56.65} - 2.83}$ as a decimal. Write down all the figures shown on your calculator.

Answer (a) ..... [1]

(b) Give your answer to part (a) correct to two significant figures.

Answer (b) ..... [1]

---

2 The fractions shown on the number line are of equal distances apart.

Find the values of a and b. Give your answers in the simplest form.

Answer $a =$ .....,

$b =$ ..... [2]

---

3 The population of Mumbai is approximately 8.1 million.

The population of Africa is approximately 0.85 billion.

Calculate how many more people live in Africa than in Mumbai, leaving your answer in standard form

Answer ..... [2]

4 A bag contains 10 red balls, 9 green balls and 5 yellow balls.

A ball is chosen at random from the bag. Find the probability that the ball chosen is

(a) green,

Answer (a) ..... [1]

(b) is not red

Answer (a) ..... [1]

---

5 (a) Given that $x : 12 = 1 : 4$, find the value of x.

Answer $x =$ ..... [1]

(b) The ratio of John's weight to Mary's weight is 5 : 4. If Mary's weight is 48 kg, find John's weight.

Answer .....kg [1]

---

6 During the 28th SEA Games in Singapore, Singapore national swimmer Joseph Schooling set a new record of 22.47s in the 50 m freestyle event.

Find his speed in kilometres per hour.

Answer ..... km/h [2]

7 The table shows the exchange rates of two different currencies against the Singapore dollar on a particular day.

Currency	Unit	Singapore dollars (S$)
Thai Baht (฿)	100	3.99
Sterling pound (£)	1	2.10

(a) Find the cost, in Sterling pound, for a watch costing S$500.

Answer (a) £..... [1]

(b) James changed ฿1 300 into Singapore dollars. Calculate the amount of Singapore dollars he received.

Answer (b) S$..... [1]

---

8 **(a)** Make x the subject of the formula $y = 4 + 2x$.

Answer (a) x =..... [1]

(b) Simplify $\frac{3a^2}{5b} \div \frac{9a^3}{25b}$.

Answer (b) ..... [2]

9 Simplify $\frac{1}{x^2-1} - \frac{2}{x+1}$.

Answer ..... [3]

---

10 May scored x marks for a Mathematics test. Charles scored 7 marks less than May and Haikal scored 3 marks more than Charles.

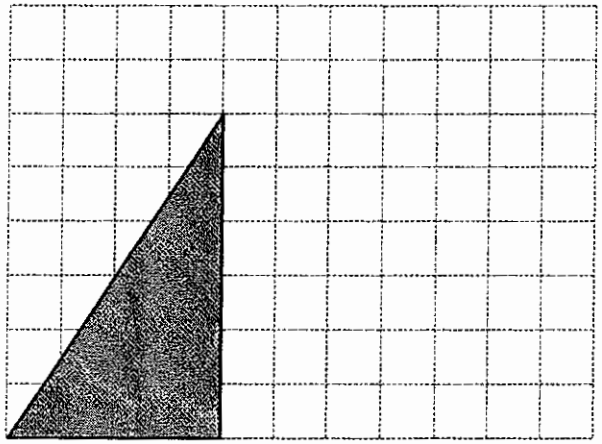
(a) Find an expression in its simplest form, in terms of x, for the total marks obtained by the three students.

Answer (a) ..... marks [2]

(b) If May scored 85 marks, find the mean mark of the three students.

Answer (b) ..... marks [1]

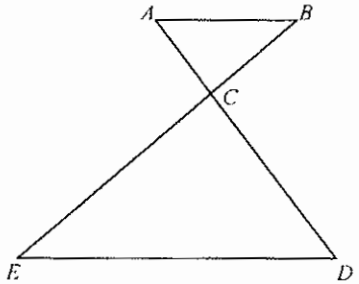
11 **(a)** Reduce the shaded figure in the grid below by scale factor $\frac{1}{2}$ and draw the reduced figure within the grid.



[2]

(b) ΔABC is similar to ΔDEC.

Given that $\frac{AC}{DC} = \frac{3}{5}$ and $BE = 24$ cm, find the length of EC.

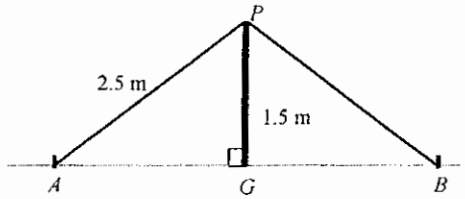


Answer (b) $EC =$ ..... cm [1]

12 A tent has a pole, GP, which is held vertically by two ropes, AP and BP.

Point G is the midpoint of AB.

The pole is 1.5 m long and the length of each rope is 2.5 m.



(a) Find the length of AB.

Answer (a) $AB =$ ..... m [2]

(b) Find $\cos A\hat{P}G$. Give your answer as a fraction in the simplest form

Answer (b) $\cos A\hat{P}G =$ ..... [1]

13 A craftsman makes a model of a house using a scale of 1 : 40.

(a) Given that the height of the roof of the model is 9 cm, find the height of the actual roof in metres.

Answer (a) ..... m [1]

(b) Given that the actual area of the house is 132 m^2, find the area of the model of the house in square centimetres.

Answer (b) ..... cm^2 [2]

14 Solve the simultaneous equations

$$2x - y = 0,$$
$$x + 2y = 15.$$

Answer $x =$ .....

$y =$ ..... [2]

---

15 Joan went to the supermarket to buy her favourite pizza. The pizzas come in two different diameters with the same thickness.

Medium size
Diameter = 18 cm
$12

Large size
Diameter = 24 cm
$20

Find which pizza size gives the better value.
You must show all your working.

Answer The ..... size pizza gives the better value. [3]

16 **(a)** Given that $729^x = 9$, find x.

Answer (a) $x =$ ..... [1]

(b) Given that $3^y = \frac{3^{-3} \times 3^5}{3^2}$, find y.

Answer (b) $y =$ ..... [1]

(c) Simplify $\left(5x^2\right)^2$

Answer (c) ..... [1]

---

17 The stem-and-leaf diagram shows the number of points scored by the Lion basketball team in the first 10 games of the season.

3	0	4	6	8
4	3	9		
5	1	5	7	9

Key : 3|5 means 35 points

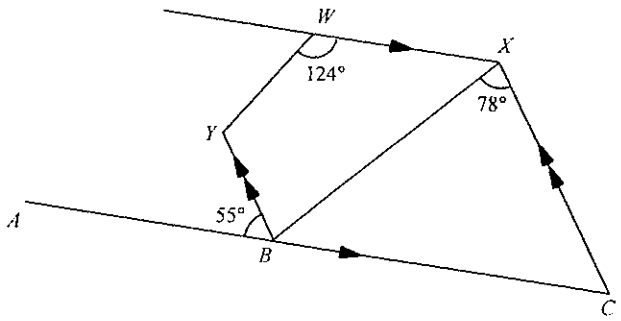
(a) Find the median number of points.

Answer (a) ..... [1]

(b) Calculate the percentage of games in which the team scored **less than** 50 points.

Answer (b) ..... % [2]

18 In the diagram, ABC is a straight line parallel to WX.
BY is parallel to CX.
Angle $ABY = 55°$, angle $XWY = 124°$ and angle $BXC = 78°$. Find



(a) angle XBY,

Answer (a) Angle XBY = ... [1]

(b) angle BCX,

Answer (b) Angle BCX = ... [1]

(c) angle BYW.

Answer (c) Angle BYW = ... [2]

19 **(a)** Find the smallest integer values of x and y such that $2^2 \times 3^x \times 5^y \times 7^3$ is a multiple of 90.

Answer (a) x = ...

y = ... [2]

(b) Express 1440 as the product of its prime factors.

Answer (b) 1440 = ... [1]

(c) Find the smallest integer p such that $\frac{1440}{p}$ is a perfect square.

Answer (c) p = ... [1]

20 A cup of coffee at 65°C is left to cool. The temperature of the coffee decreases at a rate of 3°C per minute.

Find

(a) the temperature of the coffee after 5 minutes,

Answer (a) ..... °C [1]

(b) the time taken for the temperature of the coffee to decrease to 35°C.

Answer (b) ..... minutes [2]

---

21 **(a)** Expand and simplify $(2x-5)^2$.

Answer (a) ..... [2]

(b) Solve $(2x-5)^2 = 25$.

Answer (b) $x =$ ..... or ..... [3]

22 **(a)** A shopkeeper bought a smart phone which cost $550.
He sold the smart phone at a profit of 120%.
Calculate the selling price of the smart phone.

Answer (a) $..... [2]

(b) An advertisement reads:

> Multi System Hi Fi Player
>
> Cash and carry
> was ~~**$3 500**~~
> now **$2 999**
>
> OR
>
> **$80** monthly instalments × **36 months**
> and **$300 deposit**!

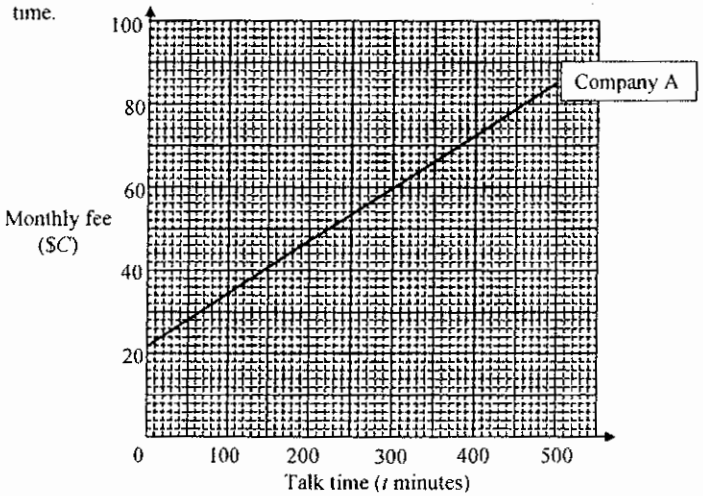
(i) Calculate the discount in the cash and carry price as a percentage of the original cash and carry price.

Answer (bi) ..... % [2]

(ii) Calculate the total amount paid for the Multi System Hi-Fi Player under the hire purchase scheme.

Answer (bii) $..... [1]

23 The graph below shows the monthly fee charged by company A under a mobile phone plan. The monthly fee consist of a fixed subscription fee, and $C for t minutes of talk time.



(a) Find the subscription fee.

Answer (a) $..... [1]

(b) Find the amount of talk time used if the monthly fee is $76.

Answer (b) ..... minutes [1]

(c) Find the monthly fee if the talk time is 190 minutes.

Answer (c) $..... [1]

(d) Company B charges a monthly fee comprising a subscription fee of $28 for the first 100 minutes of talk time, and 15 cents for each additional minute of talk time.

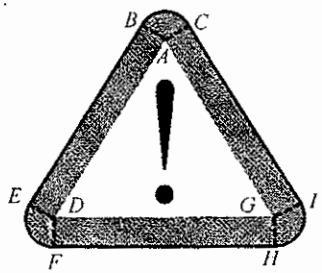
On the grid, draw a graph to show the monthly fee charged by company B for talk time up to 500 minutes. [1]

(e) Which company is cheaper for a talk time of 300 minutes and by how much?

Answer (e) Company ..... by $..... [1]

24 The diagram shows a warning sign.

$BE = FH = CI = 50$ cm.
BC, EF and HI are identical circular arcs with centres, A, D and G respectively of radius 9 cm.
Angle $BAC = 120°$.



Find, leaving all your answers in the form $p + q\pi$,

(a) the area of sector BAC,

Answer (a) ..... cm^2 [2]

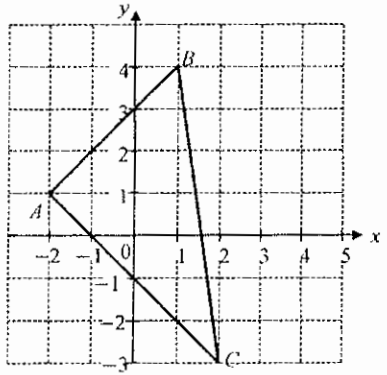
(b) the length of the arc BC,

Answer (b) ..... cm [2]

(c) the perimeter of the warning sign.

Answer (c) ..... cm [1]

25 The triangle ABC is shown on the grid.



(a) Find the gradient of the line AB.

Answer (a) ..... [2]

(b) Find the equation of the line AB.

Answer (b) ..... [1]

(c) Find the length of the line AC.

Answer (c) ..... units [2]

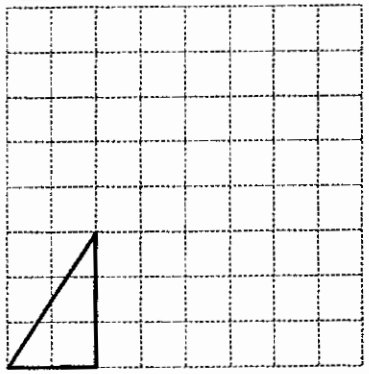
(d) Find the coordinates of point D such that $ABDC$ is a parallelogram.

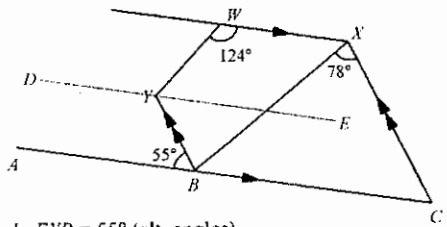
Answer (d) (..... , ...) [1]

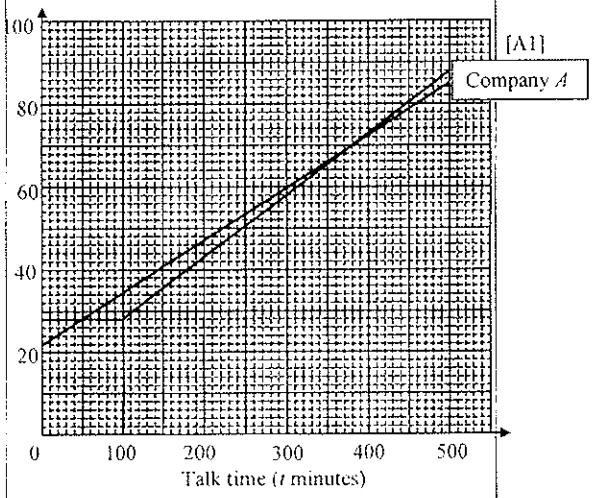
End of paper 1

Answer Scheme

1a	0.728715633	[A1]
1b	0.73	[A1]
2	$\left(\frac{2}{3}-\frac{1}{6}\right)\div 3=\frac{1}{6}$ $a=\frac{1}{3}$ $b=\frac{1}{2}$	[A1] [A1]
3	$0.85\times10^{9}-8.1\times10^{6}$ 8.419×10^{8}	[M1] [A1]
4a	$\frac{3}{8}$	[A1]
4b	$1-\frac{10}{24}$ $=\frac{7}{12}$	[A1]
5a	$x=3$	[A1]
5b	$\frac{48}{4}\times5$ $=60$	[A1]
6	$\frac{50}{1000}\div\frac{22.47}{3600}$ $=8.01$ or $8\frac{8}{749}$	[M1] [A1]
7a	$\frac{500}{2.1}$ $=$ £238.10	[M1]
7b	$\frac{3.99}{100}\times1300$ =S$51.87	[M1]
8a	$x=\frac{y-4}{2}$ or $x=\frac{1}{2}y-2$	[A1]
8b	$\frac{3a^2}{5b}\times\frac{25b}{9a^3}$ $\frac{5}{3a}$	[M1] [A1]

9	$\frac{1}{(x+1)(x-1)} \quad \frac{2(x-1)}{(x+1)(x-1)}$	[M1]
	$= \frac{1-2x+2}{(x+1)(x-1)}$	[M1]
	$= \frac{3-2x}{(x+1)(x-1)}$ or $\frac{3-2x}{x^2-1}$	[A1]
10a	$x+x-7+x-7+3$ $(3x-11)$ marks	[M1] [A1]
10b	$\frac{3(85)-11}{3}$ $= 81.3$ or $81\frac{1}{3}$ marks	[B1]
11a		All correct [A2] Every 1 error deduct 1 mark
11b	$\frac{5}{8} \times 24$ $= 15$ cm	[A1]
12a	$AB = 2 \times \sqrt{2.5^2 - 1.5^2}$ $= 4$ m	$\sqrt{2.5^2 - 1.5^2}$ [M1] [A1]
12b	$\frac{3}{5}$	[A1] 0.6 no mark
13a	9×0.4 $= 3.6$ m	[A1]
13b	$1\ \text{cm}^2 : 0.16\ \text{m}^2$ $\frac{132}{0.16} = 825\ \text{cm}^2$	[M1] [A1]
14	$y = 2x$ ---(3) $x + 2(2x) = 15$ $x = 3$ $y = 6$	[A1] [A1]

15	$\pi(9)^2 = \$12$ $1\pi = \frac{12}{81}$ $= \$0.148$ $\pi(12)^2 = \$20$ $1\pi = \frac{20}{144}$ $= \$0.139$ The large size pizza gives a better value	[M1] o.e. $\$12 \rightarrow 81\pi$ $\$1 \rightarrow 21.2$ [M1] $\$20 \rightarrow 144\pi$ $\$1 \rightarrow 22.6$ [A1]
16a	$(9^3)^x = 9^1$ $x = \frac{1}{3}$	[A1]
16b	$y = -3+5-2$ $= 0$	[A1]
16c	$25x^4$	[A1]
17a	Median $= \frac{43+49}{2}$ $= 46$	[A1]
17b	$\frac{6}{10} \times 100\%$ $= 60\%$	[M1] [A1]
18a	Angle $XBY = 78°$ (alternate angles, $XC \parallel YB$)	[A1]
18b	Angle $BCX = 55°$ (corresponding angles, $XC \parallel YB$)	[A1]
18c	Construct a line DE passes through Y parallel to the line ABC.  Angle $EYB = 55°$ (alt. angles) Angle $EYN = 180° - 124°$ (int. angles) Angle BYW $= 55° + 180° - 124°$ $= 111°$	[M1] [A1]
19a	$x = 2$ $y = 1$	[A1] [A1]
19b	$1440 = 2^5 \times 3^2 \times 5$	[A1]
19c	$p = 10$	[A1]
20a	$65 - 3 \times 5$ $= 50$	[A1]

20b	$65 - 35 = 30$ $\frac{1}{3} \times 30$ =10 minutes	[M1] [A1]
21a	$(2x)^2 - 2(2x)(5) + (5)^2$ or $4x^2 - 10x - 10x + 25$ $4x^2 - 20x + 25$	[M1] [A1
21b	$2x - 5 = 5$ or $2x - 5 = -5$ $x = 0$ or $x = 5$ Alternate method $4x^2 - 20x + 25 = 25$ $4x^2 - 20x = 0$ $4x(x - 5) = 0$ $x = 0$ or $x = 5$	[M1] [A2] [M1] [A2]
22a	$\frac{550}{100} \times 220\%$ $1210	[M1] [A1]
22bi	$\%\text{Discount} = \frac{3500 - 2999}{3500} \times 100\%$ $= 14.3\% \text{ or } 14\frac{11}{35}\%$ % discount = 14.3%	[M1] [A1]
22bii	$3180	[A1]
23a	$22	[A1]
23b	430 minutes	[A1]
23c	$46	[A1]
23d		[A1]
23e	Company **B** by $2	[A1]

24a	$\frac{120}{360} \times \pi(9)^2$ $= 27\pi$	[M1] [A1]
24b	$\frac{120}{360} \times 2\pi(9)$ $= 6\pi$	[M1] [A1]
24c	$150 + 18\pi$	[A1]
25a	$\frac{1-4}{-2-1}$ $= 1$	[M1] [A1]
25b	$y = x + 3$	[A1]
25c	$\sqrt{(-2-2)^2 + (1-(-3))^2}$ = 5.66 units	[M1] [A1]
25d	(5, 0)	[A1]

Section A (44 marks)

Answer **all** the questions in this section.

1 Solve the equation $\frac{x+3}{2} - 5 = 3x$. [3]

2 Mr Tan bought an antique watch on 1 January 2010 for $15 000.
Each year its value is increased by 5% of the value at the beginning of the year.
How much was the antique watch worth on 1 January 2015. [3]

3 A motorist travelled 130 km at 60 km/h. He then travelled at 80 km/h for the next 4 hours. Calculate

(a) the time taken for the first part of the journey in hours and minutes, [2]

(b) his average speed for the whole journey. [2]

4 Part of a pattern is shown in the table below.

	Column 1	Column 2	Column 3
Line 1	2 + 6	8	2×2^2
Line 2	2 + 6 + 10	18	2×3^2
Line 3	2 + 6 + 10 + 14	32	2×4^2
.	.	.	.
.	.	.	.
.	.	.	.
Line 6	a	b	c

(a) Write down the expressions for a, b and c in Line 6. [2]

(b) Write down a formula, in terms of n, for the number in Column 3 in Line n. [1]

(c) If a line in the pattern is given as $2 + 6 + 10 + 14 + \ldots + x = 722 = 2\times y^2$,
find the values of x and y. [2]

5 (a) Factorise $2x^2 - 9x + 9$. [2]

(b) Hence,

(i) solve $2x^2 - 9x + 9 = 0$, [1]

(ii) simplify $\frac{4x^2 - 9}{2x^2 - 9x + 9}$. [2]

6 **Answer the whole of this question on the plain paper provided.**
In this question, show all your construction lines.

ABC is a triangle.
AB = 5.5 cm, BC = 9 cm and AC = 12 cm.

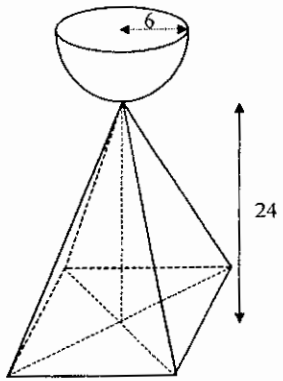
(a) Construct the triangle ABC. [2]

(b) Construct the bisector of angle BAC. [1]

(c) Construct the perpendicular bisector of AB. [1]

(d) Given that the two bisectors meet at P, measure AP. [1]

7 The diagram shows a solid formed by joining a square pyramid and a hemisphere.

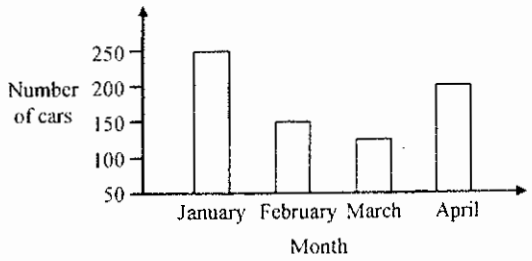


The hemisphere has a radius of 6 cm.
The square pyramid has a height of 24 cm and volume of 800 cm^3.

(a) Find the length of one side of the square base. [2]

(b) The solid is made of a material with density 0.62g/cm^3.
Calculate the mass of the solid, giving your answer correct to the nearest gram. [4]

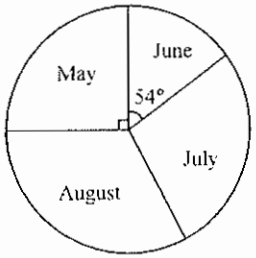
8 **(a)** The bar chart shows the number of cars sold by a company in the first four months of 2014.



The sales manager says, "The number of cars sold in February is half the number of cars sold in January."

Do you agree with the sales manager? Explain your answer. [1]

(b) The pie chart shows the number of cars sold by the company in the next four months of year 2014.



150 cars were sold in May.

(i) Calculate the number of cars sold in June. [2]

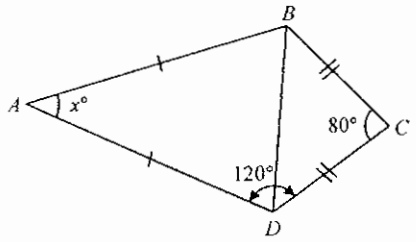
(ii) The number of cars sold in July was 30 less than the number of cars sold in August.

Find the number of cars sold in August. [3]

9 **(a)** In the diagram, $ABCD$ is a kite.

$AB = AD$ and $BC = DC$.

Angle $BCD = 80°$, angle $ADC = 120°$ and angle $BAD = x°$.

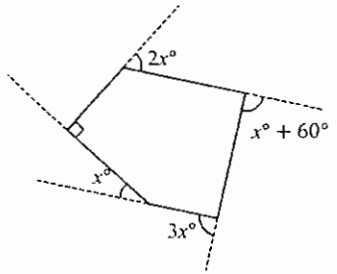


(i) Find the value of x. [2]

(ii) $BC = 3.75$ cm.

Calculate the area of triangle BCD. [2]

(b) The diagram shows a polygon.



(i) State the name of the polygon. [1]

(ii) Calculate the value of x. [2]

Section B (16 marks)

Answer any **two** questions in this section. Each question carries 8 marks.

10 **(a)** **Answer part (a) on lined paper.**

(i) **Sketch** the graph of $y = -(x+4)(x-2)$.

Do **not** make an accurate plot but show, on your sketch, the coordinates of the points where the graph crosses the axes. [2]

(ii) Write down the equation of the line of symmetry of the graph. [1]

(b) **Answer the whole of part (b) on a single sheet of graph paper.**

The table below is for $y = 2 \times 5^x$

x	0	0.5	1	1.5	2	2.5	3
y	a	4.5	10	b	50	111.8	250

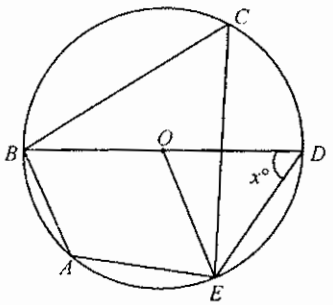
(i) Find the value of a and b. [2]

(ii) Draw the graph of $y = 2 \times 5^x$ for $0 \le x \le 3$.

Use a scale of 4 cm to represent 1 unit on the horizontal x-axis and 2 cm to represent 25 units on vertical y-axis. [2]

(iii) Use your graph to find the value of x when $y = 100$. [1]

11



The diagram shows a circle, centre O.

BD is a diameter.

Angle $BDE = x°$.

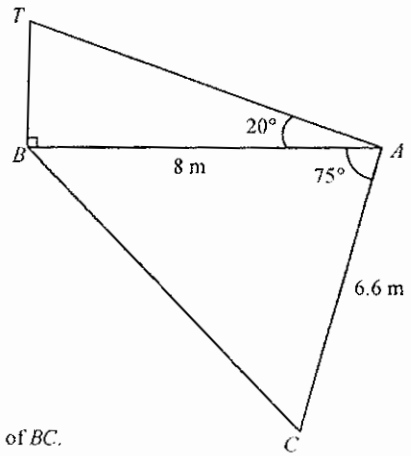
(a) Find, in term of x,

(i) angle BCE, [1]

(ii) angle BOE, [1]

(iii) angle BAE. [1]

(b) The diagram shows a triangular field ABC.
$AB = 8$ m and $AC = 6.6$ m.
Angle $BAC = 75°$



(i) Calculate the length of BC. [3]

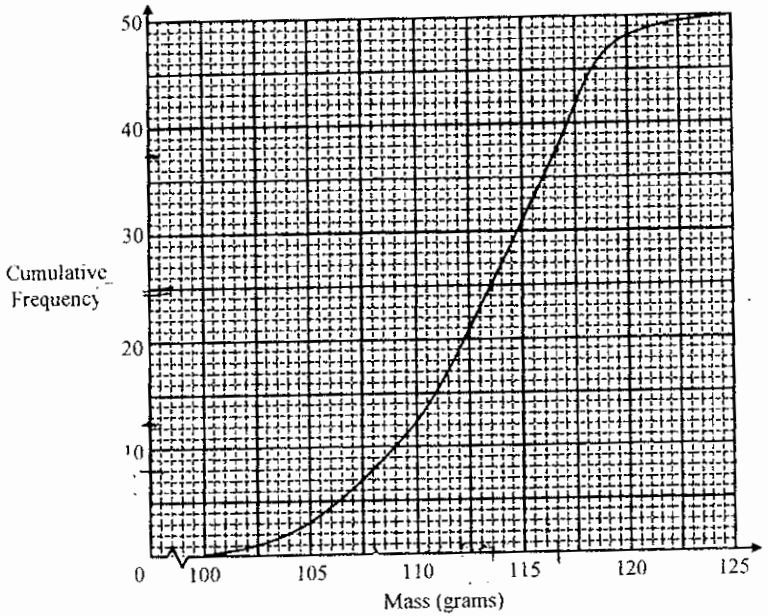
(ii) A vertical tree, BT, has its base at B.

The angle of elevation of the top of the tree from A is 20°

Calculate the height of the tree. [2]

12 (a) The mass, in grams, of 50 apples produced by tree A was measured.

The cummulative frequency graph summarises the results.



Use the graph to estimate

(i) the median mass, [1]

(ii) the interquartile range. [2]

(b) The mass, in grams, of 50 apples produced by tree B was measured.

The median mass was 116 g and the interqurtile range was 20 g.

(i) Which tree produced heavier apples on average?

Give your reasons. [1]

(ii) Which tree's apples were more consistent in mass?

Given your reasons. [1]

(c) Two apples are chosen at random from the 50 apples produced by tree A.

Calculate the probability that both apples have a mass of less than 108 g. [3]

***** END OF PAPER 2 *****

Answer Scheme

1	$\frac{x+3}{2}-5=3x$ $\frac{x+3-10}{2}=3x$ $x-7=6x$ $5x=-7$ $x=-1\frac{2}{5}$	[M1] [M1] [A1] o.e. -1.4
2	$T=2015-2010$ $=5$ Amount $=15000\left(1+\frac{5}{100}\right)^5$ $=\$19144.22$	[M1] [M1] [A1]
3	$\text{Time}=\frac{\text{Distance}}{\text{Speed}}$ $=\frac{130}{60}$ $=2\frac{1}{6}$ $=2$ h 10 min	[M1] [A1]
3b	Total Distance $=130+80\times4$ $=450$ km Average speed $=\frac{450}{2\frac{1}{6}+4}$ $=73.0$ km/h	[M1] [A1] o.e. $72\frac{36}{37}$
4a	$a=2+6+10+14+18+22+26$ $b=98$ $c=2\times7^2$	a, b and c all correct [A2] every one mistake deduct 1 mark, max. deduction 2 marks
4b	$2(n+1)^2$	[A1]
4c	$2y^2=722$ $y^2=361$ $y=19$ $x=2+4(18)$ $=74$	[A1] [A1]
5a	$2x \quad -3 \mid -3x$ $x \quad -3 \mid -6x$ $2x^2 \quad 9 \quad -9x$ $(2x-3)(x-3)$	[M1] [A1

5bi	$(2x-3)(x-3)=0$ $x=1\frac{1}{2}$ or $x=3$	 [A1]
5bii	$\frac{(2x-3)(2x+3)}{(2x-3)(x-3)}$ $\frac{2x+3}{x-3}$	[M1] [A1]
6a b c	Refer to solution attached	No marks if construction arcs are missing
6d	Length of AP = 2.9 ± 0.1 cm	[A1]
7a	$\frac{1}{3}$ × base area × 24 = 800 base area = 100 length = $\sqrt{100}$ length = 10 cm	[M1] [A1]
7b	Vol. of hemisphere = $\frac{2}{3}\times\pi\times6^3$ $= 144\pi$ cm^3 Total volume = $144\pi + 800$ cm^3 Mass = 0.62 × $(144\pi + 800)$ = 776.48 = 776 g	[M1] 452.38 cm^3 [M1] [M1]1252.8 cm^3 [A1]
8a	I do not agree with the sales manager because $\frac{\text{No. of Sales on Feb}}{\text{No. of Sales on Jan}}=\frac{150}{250}$ $=\frac{3}{5}$	 [A1]
8bi	90° → 150 cars 54° → $\frac{150}{9}\times54$ = 90 cars	[M1] [A1]
bii	Total cars $=\frac{150}{90}\times360$ $=600$ $x+x-30+150+90=600$ $2x=390$ $x=195$ cars	[M1] [M1 [A1]
9ai	$x=360°-80°-120°-120°$ $=40°$	[M1] [A1]

9aii	$=\frac{1}{2}\times3.75\times3.75\times\sin80°$ $=6.92$ cm^2	[M1] [M1]
bi	Pentagon	[B1]
bii	$90°+2x°+x°+60°+3x°+x°=360°$ $7x°=360°-90°-60°$ $x°=30°$	[M1] [A1]
10ai	Refer to sketch attached	B2, 1, 0 for (0, 8), (−4, 0), (2, 0) and shape.
aii	$x=-1$	[B1]
bi	$a=2$ $b=22.4$	[A1] [A1]
10bii	Refer to the graph attached	[P1] correct points [S1] smooth curve Wrong scale deduct 1 mark
biii	$x=2.45$ (accept 2.40 to 2.45)	[A1]
11ai	$\angle BCE=x°$ (angles in the same segment)	[B1]
11aii	$\angle BOE=2x°$ (angle at the centre = 2 angle at the circumference)	[B1]
11aiii	$\angle BAE=180°-x°$ (angles in the opposite segment)	[B1]
11bi	$BC^2=8^2+6.6^2-2(8)(6.6)\cos75°$ $=80.22870884$ $BC=8.96$ cm	[M1] [M1] [A1]
11bii	height $=8\tan20°$ $=2.91$ m	[M1] [A1]
12ai	113.5g	[B1]
12bii	IQR = 116.5 − 110 = 6.5 g	[M1] [A1]
12bi	On average **tree B** produced heavier apples than A because the **median mass** of apples produced by **tree B is higher** than the **median mass** of apples produced by **tree A**.	[B1]
12bii	**Tree A's** apples are **more consistent** in mass as **the interquartile range of the mass** of apples produced	[B1]

	by tree A is **smaller** than **the interquartile range of the mass** of apples produced by **Tree B**.	
12c	$\frac{8}{50} \times \frac{7}{49}$ $= \frac{4}{175}$	[M1] [A1]