CEDAR GIRLS' SECONDARY SCHOOL
Preliminary Examination 2022
Secondary Four

CANDIDATE NAME

CLASS | | CLASS INDEX NUMBER | |

CENTRE/ INDEX NO | | | | | / | | | | |

MATHEMATICS
Paper 1

4048/01
29 August 2022
2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
The use of an approved scientific calculator is expected, where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 80.

For Examiner's Use
80

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Mathematical Formulae

Compound interest

$$\text{Total amount} = P\left(1+\frac{r}{100}\right)^n$$

Mensuration

Curved surface area of a cone = πrl

Surface area of a sphere = $4\pi r^2$

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Volume of a sphere = $\frac{4}{3}\pi r^3$

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

Arc length = $r\theta$, where θ is in radians

Sector area = $\frac{1}{2}r^2\theta$, where θ is in radians

Trigonometry

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

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

Statistics

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$\text{Standard deviation} = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \left(\frac{\Sigma fx}{\Sigma f}\right)^2}$$

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Answer **all** the questions.

1 Simplify $0.5p\times10^7+3\times10^6$, where $0<p<1$, leaving your answer in terms of p and in standard form.

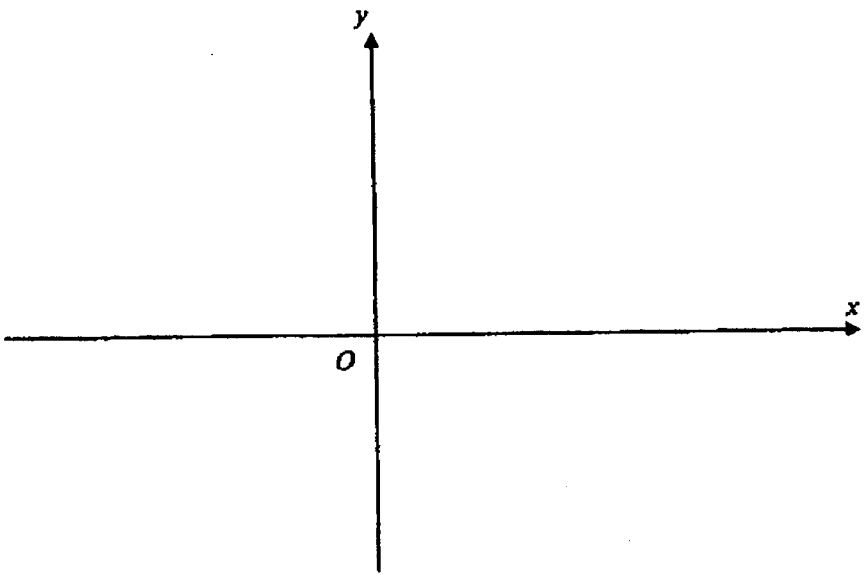
Answer _____ [1]

---

2 **(a)** Express $x^2-6x+18$ in the form $(x-p)^2+q$.

Answer _____ [1]

(b) Hence, sketch the graph of $y=x^2-6x+18$ on the axes below.
Indicate the turning point and any axial intercepts clearly.



[2]

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3 $y = 12 - 6x^3$

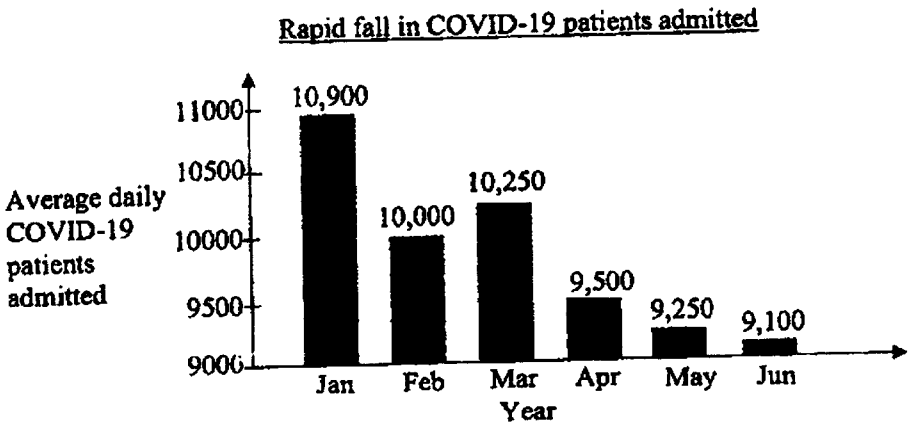
(a) Find y when $x = -1$.

Answer ..... [1]

(b) Rearrange the formula to make x the subject.

Answer ..... [1]

4 The graph shows the average daily number of COVID-19 patients admitted into a particular hospital over a period of 6 months.



(a) State one misleading feature of the graph.

[1]

(b) Explain how this feature affects the reader's interpretation of the graph.

[1]

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5 (a) Write 9^{2x+1} as a power of 3.

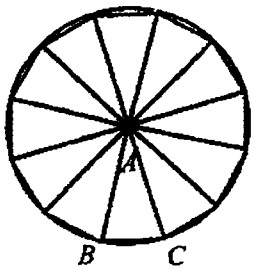
Answer ..... [1]

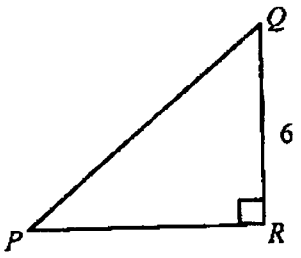
(b) Simplify $\frac{9a^3}{4b} \times \left(\frac{27a^{\frac{2}{3}}b}{6}\right)^{-1}$.

Answer ..... [2]

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6





The diagram shows a regular 12- sided polygon inscribed in a circle and a right-angled triangle PQR with length $QR = 6$ cm.

It is given that $\tan \angle QPR = \frac{3}{4}$.

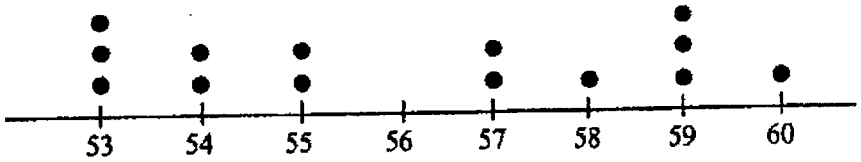
The ratio of the area of triangle ABC : triangle PQR is 1 : 6.

Find the radius of the circle.

Answer _____ cm [4]

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7 The weights (in kg) of 14 students are measured and illustrated in the dot diagram.



Find

(a) the range of the weights,

Answer _____ kg [1]

(b) the median weight,

Answer _____ kg [1]

(c) the interquartile range of the weights.

Answer _____ kg [2]

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8 These are the first four terms of a sequence.

4 12 36 108

(a) Write down the 6^{th} term of the sequence.

Answer _____ [1]

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

Answer _____ [1]

(c) Justify whether 16 211 is a term of the sequence.

Answer _____

_____

_____ [2]

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9 Javelle went to a café and ordered a slice of cake and a cup of tea.
Unfortunately, the receipt was stained and parts of it became unclear.
The receipt for her meal is shown below.

Cake	$ 5.80
Tea	$[redacted]
10% Service Charge	$ [redacted]
7% Goods & Services Tax	$ 0.65
Total	$[redacted]

Find the cost of the tea.

Answer $ _____ [3]

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10 Bernice invests \$700 at a rate of r % per year compound interest, compounded every 3 months.
At the end of 5 years the value of her investment is \$854.13, correct to 2 decimal places.

Calculate the value of r, correct to 3 significant figures.

Answer $r =$ _____ [3]

---

11 (a) $\xi = \{a, b, c, d, e, i, o, r, s, t, u, v\}$
$A = \{c, e, d, a, r\}$
$B = \{v, i, c, t, o, r, a\}$

Find

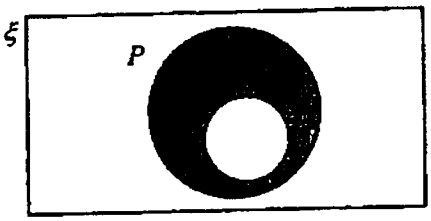
(i) $A \cap B$,

Answer _____ [1]

(ii) $A' \cap B'$.

Answer _____ [1]

(b) Use set notation to describe the shaded region.



Answer _____ [1]

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12 The area of a farm is represented on two maps, map *A* and map *B*.
The area of this farm on Map *A* is sixteen times that of the area represented on Map *B*.
Map *A* has a scale of 1:12 500.
Find the scale of Map *B* in the form $1:n$.

Answer _____ [3]

---

13 Catherine ordered a basket of fruits containing apples, oranges and pears only.
$\frac{5}{16}$ of the fruits are apples. 80% of the remaining fruits are oranges.
The other 11 fruits are pears.

Find the number of apples in the basket.

Answer _____ apples [3]

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14 (a) Express 7000 as a product of its prime factors, giving your answer in index form.

Answer _____ [2]

(b) Two integers, A and B, can be written as products of prime factors.

$$A = p \times q^r \times 7 \qquad B = p^3 \times q^{r+1} \times 7$$

The lowest common multiple (LCM) of A and B is 7000.

(i) Write down the value of p, q and r.

Answer $p =$ _____

$q =$ _____

$r =$ _____ [2]

(ii) Explain whether $H = 5^{2n+1} \times A$ is divisible by 125, where n is a whole number.

Answer _____

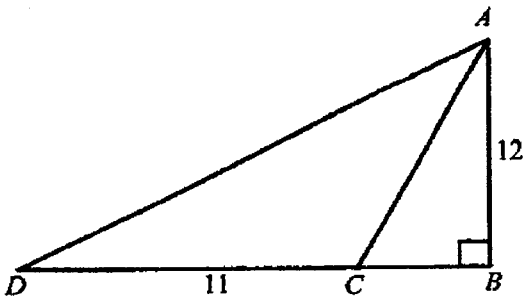
_____

_____ [2]

_____

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15



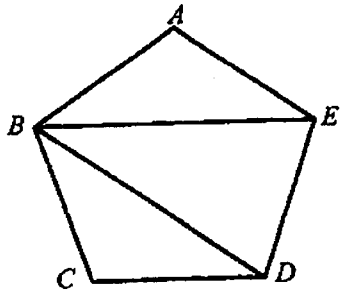
The diagram represents a tower, AB, build on horizontal ground.
The height of the tower is 12 m.
Point D is 11 m from C and DCB is a straight line.
It is given that $\sin \angle ACB = \frac{12}{13}$.

Calculate the angle of depression in degrees of point D from the top of the tower.

Answer _____ ° [4]

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16 In the diagram $ABCDE$ is a regular pentagon.
BE and BD are straight lines.



(a) Find, giving reasons for each answer,

(i) angle ABE,

Answer _____ ° [2]

(ii) angle EBD.

Answer _____ ° [1]

(b) Explain why BE is parallel to CD.

Answer _____

_____

_____ [1]

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(c) The sides AE and CD are produced to meet at X.

(i) Calculate angle DEX.

Answer _____ ° [1]

(ii) Explain why the quadrilateral $BDXE$ is a parallelogram.

Answer _____

_____ [3]

17 (a) Simplify $-9(5x+2y)-3(2x-y)$.

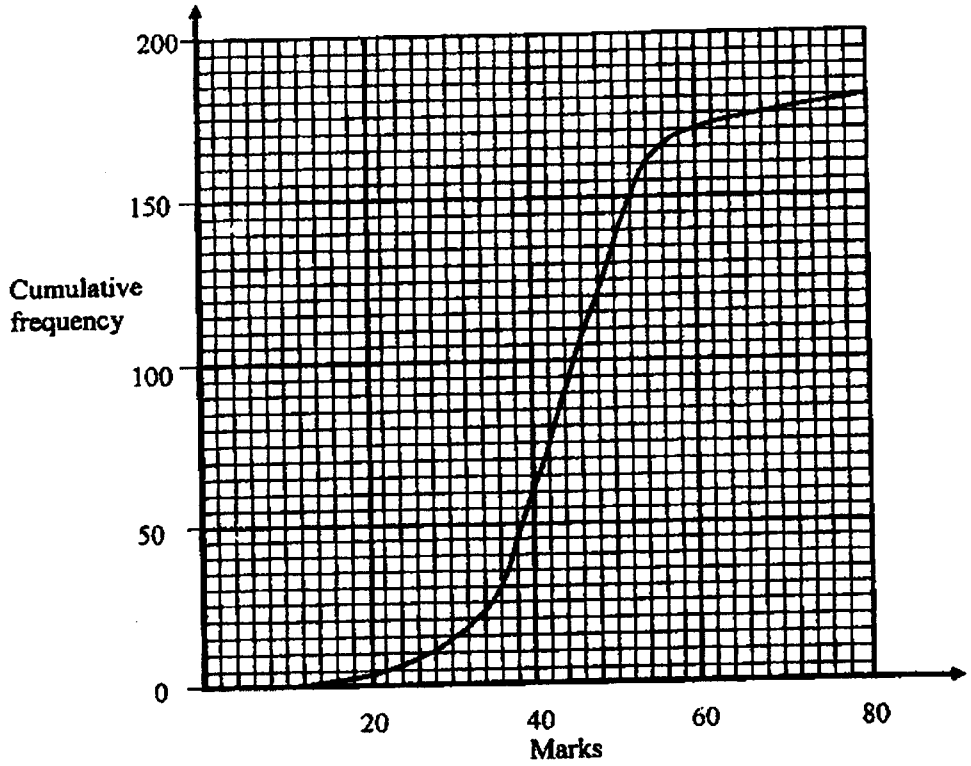
Answer _____ [2]

(b) Factorise completely $6ap+9aq-12bq-8bp$.

Answer _____ [2]

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18 The cumulative frequency curve shows the distribution of marks scored by 180 students in a Mathematics examination in 2021. The maximum possible mark is 80.



(a) $\frac{5}{6}$ of the students scored more than n marks in this exam.
Find n.

Answer _____ [2]

(b) To obtain the final mark of each student, the teacher divided the mark on the cumulative frequency curve by 2 and added the result by 15.
Find the number of students who had the final mark of 37 or less.

Answer _____ [2]

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(c) The marks scored by another group of 180 students in the same mathematics examination has the same median but a larger standard deviation.
Describe how the cumulative frequency curve for the new group of students will differ from that of the first group of students.

Answer _____

_____

_____ [1]

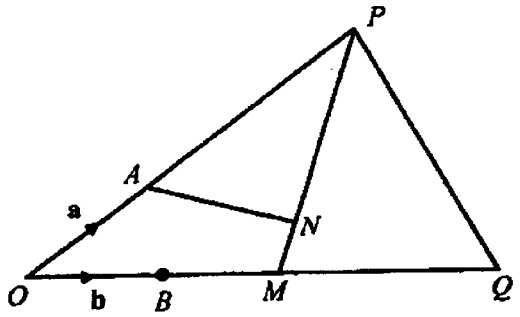
(d) Two of the students are chosen at random.
Find the probability that one of the students scored less than or equal to 60 marks while the other student scored more than 60 marks.

Answer _____ [2]

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19 In the diagram, $OA = \frac{1}{2}AP$ and $OB = \frac{1}{4}OQ$. M is the midpoint of OQ and $MN = \frac{1}{4}NP$. OAP, OMQ and PNM are straight lines.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.



(a) Express, as simply as possible, in terms of **a** and/or **b**,

(i) $\overrightarrow{PM}$,

Answer _____ [1]

(ii) $\overrightarrow{AN}$,

Answer _____ [1]

(iii) $\overrightarrow{AQ}$.

Answer _____ [1]

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(b) Show that A, N and Q will lie on a straight line.

Answer

[2]

(c) State the ratio $AN : NQ$.

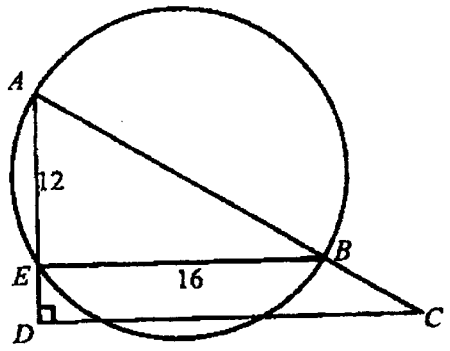
Answer _____ [1]

(d) Find the value of $\frac{\text{Area of triangle } OPM}{\text{Area of triangle } OPQ}$.

Answer _____ [1]

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20 In the diagram, AB is the diameter of the circle. AED and ABC are straight lines.
$AE = 12$ cm and $EB = 16$ cm.
$\angle ADC$ is a right angle.



(a) Prove that triangles AEB and ADC are similar.

Answer _____

_____ [2]

(b) Given that the ratio of area of triangle AEB : area of triangle ADC is 4 : 9, find the length of CD.

Answer _____ cm [2]

(c) Find the area of trapezium $BCDE$.

Answer _____ cm^2 [2]

End of Paper

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CEDAR GIRLS' SECONDARY SCHOOL
Preliminary Examination 2022
Secondary Four

CANDIDATE NAME

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CENTRE/ INDEX NO

MATHEMATICS
Paper 2

4048/02
30 August 2022

2 hours 30 minutes

Candidates answer on the Question Paper.

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For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 100.

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100

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Mathematical Formulae

Compound interest

$$\text{Total amount} = P\left(1+\frac{r}{100}\right)^n$$

Mensuration

Curved surface area of a cone = πrl

Surface area of a sphere = $4\pi r^2$

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$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

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

Arc length = $r\theta$, where θ is in radians

$$\text{Sector area} = \frac{1}{2}r^2\theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

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

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

Statistics

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$\text{Standard deviation} = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \left(\frac{\Sigma fx}{\Sigma f}\right)^2}$$

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Answer **all** the questions.

1 **(a)** Solve the inequality $\frac{x-5}{3}-\frac{2x-1}{2}\leq -1$.

Answer ..... [3]

(b) Express as a single fraction in its simplest form $\frac{1}{x^2-4}-\frac{1}{x^2-x-6}$.

Answer ..... [3]

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(c) Ally and Betty buy some pens and notebooks from the same shop.
Ally buys 3 pens and 2 notebooks for \$4.80.
Betty buys 5 pens and 4 notebooks for \$9.

(i) Form a pair of simultaneous equations to represent this information.

Answer

[1]

(ii) Solve the simultaneous equations to find the cost of a pen and the cost of a notebook.

Answer Cost of pen = \$ .....

Cost of notebook = \$ ..... [3]

(d) p is inversely proportional to q^3. When q is decreased by 50%, find the percentage change in p.

Answer .....% [3]

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2 A fruit juice stall sells regular, medium and large glasses of apple and orange juice. The number of glasses of each type of juice that was sold on a particular morning are summarised in the following table.

	Regular (R)	Medium (M)	Large(L)
Apple Juice	20	30	11
Orange Juice	14	36	8

(a) Represent the data in the table in a 2×3 matrix **J**.

Answer $\mathbf{J} = \begin{matrix} \text{R} & \text{M} & \text{L} \end{matrix}$ $\begin{pmatrix} & & \\ & & \end{pmatrix}$ Apple juice / Orange juice [1]

(b) The cost price of each regular, medium and large glass of juice is \$1.50, \$2 and \$3 respectively.

The information can be represented in a 3×1 matrix $\mathbf{C} = \begin{pmatrix} 1.5 \\ 2 \\ 3 \end{pmatrix}$.

(i) Evaluate the matrix $\mathbf{M} = \mathbf{JC}$.

Answer $\mathbf{M} =$ [2]

(ii) State what each element of matrix **M** represents.

.....

..... [1]

(c) The profit from the sale of each regular, medium and large glass of juice is 80% of its cost price.
Using matrix multiplication, evaluate the total sales of the apple and orange juice of the stall on that particular morning.

Answer ..... [3]

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3 The point A is $(0,7)$ and the point B is $(6,9)$.

(a) Express $\overrightarrow{AB}$ as a column vector.

Answer $\overrightarrow{AB} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) The equation of AB is $x + py + q = 0$.
Find the values of p and q.

Answer $p =$ ..... and $q =$ ..... [2]

(c) The point C is $(12,2)$.

(i) M is the point on BC produced such that $\overrightarrow{BM} = 3\overrightarrow{CM}$.
Find the coordinates of M.

Answer (..... , ...) [2]

(ii) Find the length of the line AC.

Answer ..... units [1]

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(d) The point D lies on the line AB produced.
The line CD is parallel to the y-axis.

(i) Find the coordinates of D.

Answer (....., ...) [2]

(ii) Express $\overrightarrow{AD}$ in terms of $\overrightarrow{AB}$.

Answer $\overrightarrow{AD}$ = ... [1]

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4 The distances travelled per litre of petrol of 50 cars manufactured in Factory X are shown in the table below.

Distance per litre (x km)	$20 < x \leq 21$	$21 < x \leq 22$	$22 < x \leq 23$	$23 < x \leq 24$
Number of cars	9	13	17	11

(a) Calculate an estimate of the mean of the data.

Answer ..... km [1]

(b) Calculate an estimate of the standard deviation of the data.

Answer ..... km [1]

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(c) The distances travelled per litre of petrol of 45 similar cars manufactured in Factory Y are tabulated in the same manner.
The estimated mean and the standard deviation of the data are 22.5 km and 0.985 km.

(i) Make two comparisons between the distance travelled of cars manufactured by Factory X and by Factory Y.

Answer

(1) .....

.....

(2) .....

..... [2]

(ii) Another batch of 5 cars manufactured in Factory Y travelled between 22 km to 23 km on a litre of petrol.
If this information is included in the data for the computation of the mean and standard deviation, state the effect on its

(a) mean,

Answer ..... [1]

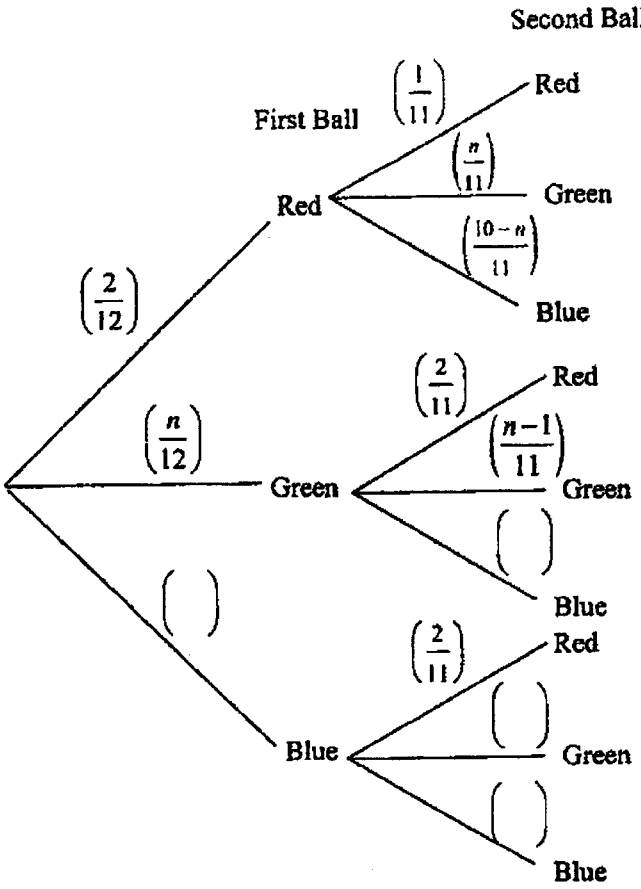
(b) standard deviation.

Answer ..... [1]

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5 A bag contains 12 balls.
2 of the balls are red, n are green balls and the rest are blue balls.
Eunice takes two balls from the bag, at random, without replacement.

(a) Complete the tree diagram.



[2]

(b) The probability that Eunice takes two blue balls is $\frac{5}{22}$.

Write down an equation to represent this information and show that it simplifies to

$$n^2 - 19n + 60 = 0 .$$

Answer

[3]

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(c) Solve the equation $n^2 - 19n + 60 = 0$.

Answer $n =$ ..... or ..... [3]

(d) Explain why one of the solutions in part (c) must be rejected.

.....

..... [1]

(e) Find, as a fraction, in its simplest form, the probability that Eunice takes balls of different colours.

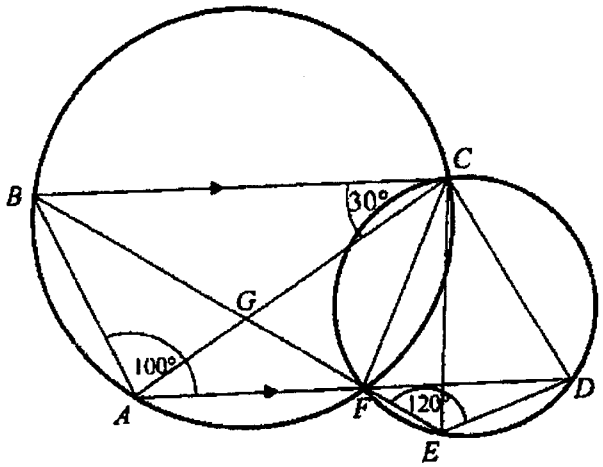
Answer ..... [2]

(f) In this round, Eunice takes two balls from the bag, at random, **with replacement**. Find, as a fraction, in its simplest form, the probability that she will take balls of the same colour.

Answer ..... [2]

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6 (a)



In the figure, circle $ABCF$ and circle $CDEF$ intersect at C and F.
AFD and BFE are straight lines and BC is parallel to AD.
Angle $ACB = 30°$, angle $BAF = 100°$ and angle $FED = 120°$.

(i) Find, giving reasons for each answer,

(a) angle ACD,

Answer .....° [3]

(b) angle CDA.

Answer .....° [2]

(ii) Prove that triangle BAG is congruent to triangle CFG.
Give a reason for each statement you make.

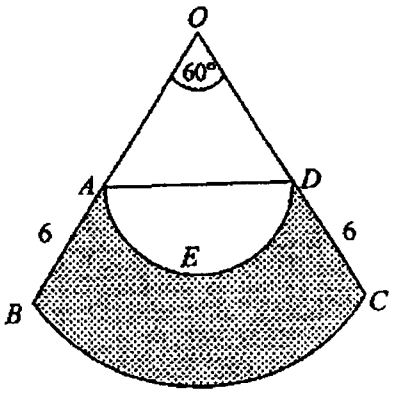
.....

.....

..... [3]

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(b)



In the diagram, OBC is the sector of a circle, centre O, and angle $BOC = 60°$.
A and D are the midpoints of OB and OC respectively, and $AB = DC = 6$ cm.
AED is a semicircle with AD as diameter.

(i) Find the length of the arc BC in the form of $n\pi$ centimetres.

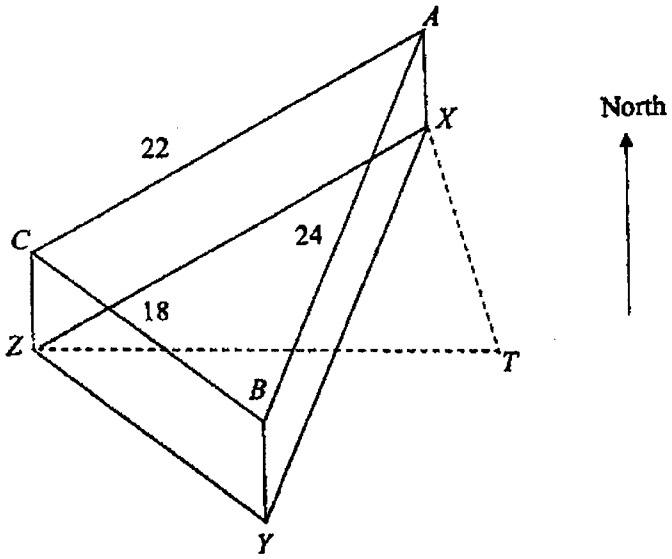
Answer ..... cm [2]

(ii) Find the area of the shaded region.

Answer ..... cm^2 [4]

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7



An aircraft waiting to land is flying around a triangular circuit ABC.
A, B and C are vertically above three beacons, X, Y and Z respectively.
T is the control tower at the airport, and T, X, Y and Z lie in a horizontal plane.
$BC = 18$ km, $CA = 22$ km and $AB = 24$ km.

(a) (i) The plane is flying at 200 km/h.
Calculate the time, in minutes and seconds, that the aircraft takes to complete one round of circuit ABC.

Answer ..... min ..... s [2]

(ii) Calculate the largest angle of triangle ABC.

Answer ..... ° [3]

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(b) Z is due west of T.
The bearing of X from Z is 042° and the bearing of X from T is 338°.

(i) Find angle ZXT.

Answer .....° [3]

(ii) Calculate the distance of TX.

Answer ..... km [2]

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8 The number of bacteria in a colony doubles every hour.
The colony starts with 50 bacteria.
The table below shows the number of bacteria in the colony after time t.

Time in hours (t)	0	1	2	3	4	5	6	7
Number of bacteria (n)	50	100	200	400	800	1 600	3 200	6 400

(a) On the grid opposite, draw the graph of n against t for $0 \leq t \leq 7$. [3]

(b) (i) By drawing a tangent, find the gradient of the curve at $t = 5.5$.

Answer ..... [2]

(ii) State briefly what this gradient represents.

.....

..... [1]

(c) The number of bacteria in another colony is given by the equation $n = 4\,000 - 500t$.

(i) On the grid in part (a), draw a graph to represent the number of bacteria in this colony for $0 \leq t \leq 7$. [2]

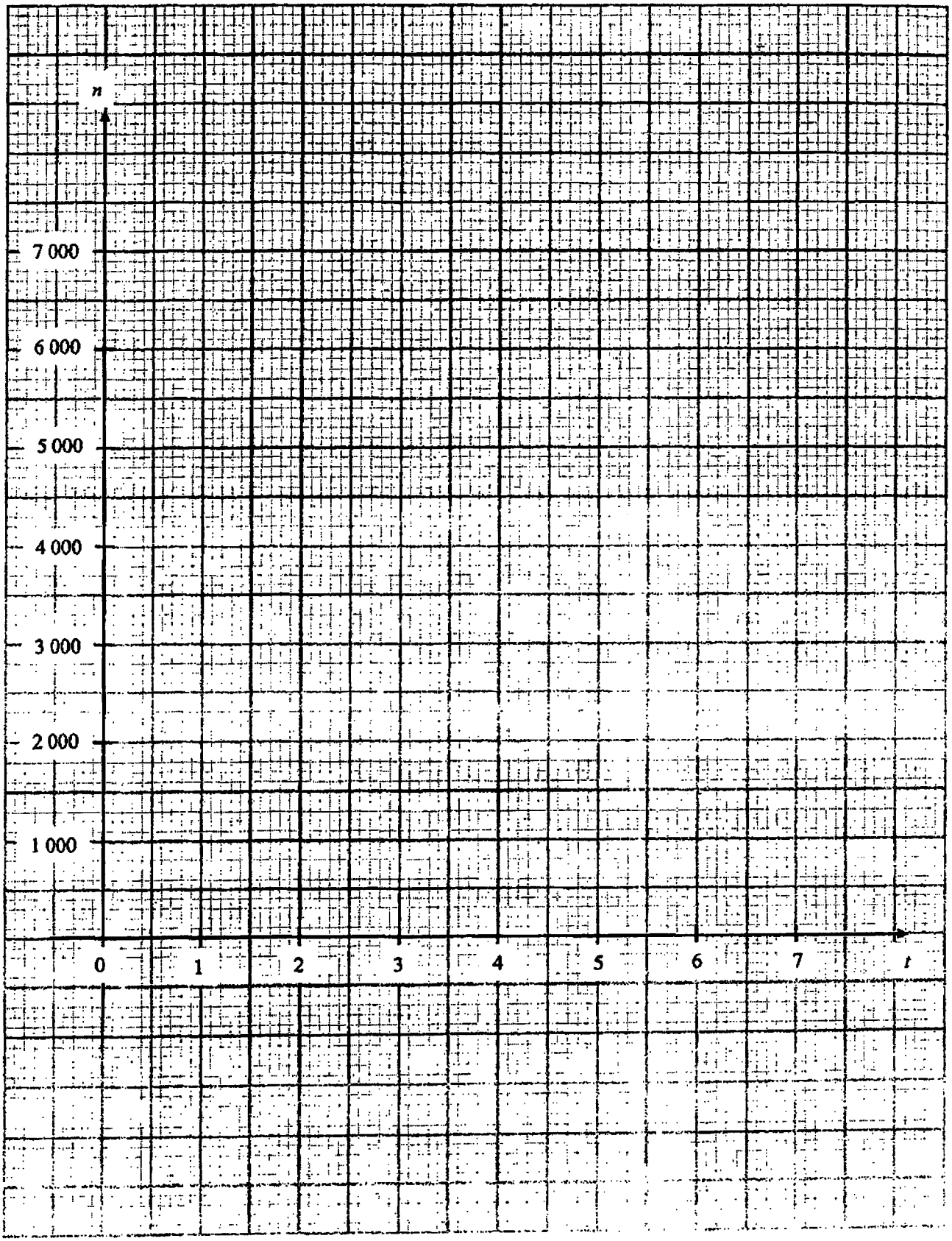
(ii) Find the value of t when the numbers in the colonies are equal.

Answer ..... [1]

(d) Given that the equation of the first graph is $n = k2^t$, find the value of k.

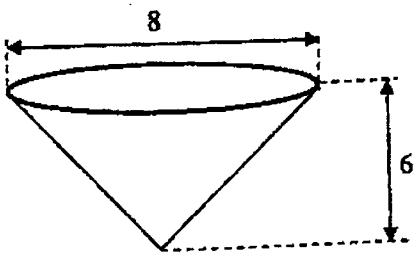
Answer $k =$ ..... [1]

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9

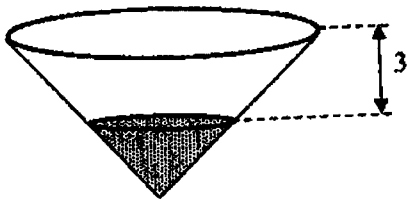


A paper cup is in the shape of an inverted cone.
The diameter of the top of the cup is 8 cm.
The height of the cone is 6 cm.
The thickness of the paper is negligible.

(a) Calculate the curved surface area of the inside of the paper cup.

Answer ..... cm^2 [3]

(b)



Farah pours water into the paper cup.
The surface of the water is 3 cm below the top of the paper cup.

(i) Farah thinks that the paper cup is filled to 50% of its total capacity.
Explain why she is wrong.

.....

..... [1]

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(ii) Calculate the percentage of the total capacity of the cup that is filled.

Answer ..... % [1]

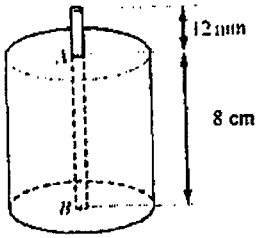
(iii) Farah pours the water from this conical cup and it fills a hemispherical bowl completely.
Calculate the diameter of the hemispherical bowl.

Answer ..... cm [3]

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10 Gillian wants to make cylindrical soy wax candles as farewell gifts for 50 classmates and friends in school.

The diagram below shows one of the cylindrical candles she intends to make.



A is the centre of the top of the candle and B is the centre of the base of the candle.
The cotton wick runs from B through A and extends 12 mm above A.

(a) How many of these candles can be made using a 10 m length of cotton wick?

Answer ..... [1]

(b) The cotton wick is in the form of a solid cylinder. It has a diameter of 4 mm.
Find the volume of the wick inside the candle from A to B.

Answer ..... cm^3 [2]

Gillian makes one soy wax candle by putting the wick into a cylindrical jar.
She will then pour the melted soy wax into the jar so that it surrounds the wick.
The cylindrical jar has an internal radius of 2.9 cm.

(c) Calculate the volume of soy wax needed to make each cylindrical candle.

Answer ..... cm^3 [2]

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Gillian's mum has the tools for candle-making and is willing to provide 50 cylindrical jars for her farewell gifts.

The following tables give online information that Gillian can use to buy the rest of the materials that she needs for making the 50 soy wax candles.

Cost of a box of soy wax	
Weight	Cost
250 g	$4.40
500 g	$8.25
1 kg	$16
5 kg	$64.73
Buy $45 or more to enjoy free shipping. Shipping fee is $1.49. Density of soy wax = 0.9 g/cm^3.	

Cost of 10 m length of cotton wick with a diameter of 4 mm (minimum length of purchase)	$6.32
Shipping fee	$1

Cost of 100 candle wick tab and sticker used to hold down the wick in the jar (fixed minimum number to purchase)	$1.20
Shipping fee	$1

Gillian's mum claims that each farewell gift will not cost Gillian more than $3.

(d) Is Gillian's mum claim correct?
Justify any decisions you make and show your calculations clearly.

.....

..... [5]

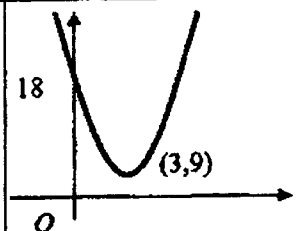
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CEDAR GIRLS' SECONDARY SCHOOL
SECONDARY 4 MATHEMATICS
Answer Key for 2022 Prelim Examination

PAPER 4048/1

1	$(5p+3)\times10^6$	13	25 apples
2a	$(x-3)^2+9$	14a	$7000=2^3\times5^3\times7$
2b		14bi	$p=2, q=5, r=2$
		14bii	$H=\left(14\times5^{2n}\right)\times125$ For all whole numbers of n, H is a multiple of 125. Hence, H is divisible by 125.(accepts other valid answers)
3a	18	3b	$x=\sqrt[3]{\frac{12-y}{6}}$
4a	The axis does not start from zero etc	15	36.9° (to 1 d.p)
4b	It exaggerates the difference between the months etc (accepts other valid answers)	16ai	$\angle ABE=36°$ 16aii $\angle EBD=36°$
5a	3^{4x+2}	16b	*By* Alternate angles, //lines *BE* is parallel to *CD*
5b	$\frac{a^{\frac{7}{3}}}{2b^2}$	16ci	$\angle DEX=72°$
6	$r=4$	16cii	*Since BE* is parallel to *CD and BD* is parallel to *EX*. There are 2 pairs of parallel lines. *BDXE* is a parallelogram
7a	7kg 7b 56kg 7c 5kg	17a	$-51x-15y$ 17b $(3a-4b)(3q+2p)$
8a	$T_6=972$	18a	$n=36$ 18b 90 Students
8b	$T_n=4(3)^{n-1}$	18c	Cumulative frequency curve will have a wider spread/ gentler gradient
8c	$T_n=4(3)^{n-1}=4w$ where w is an integer. Since the general term is an even number, 16 211 which is odd will not be a term of the sequence.	18d	$\frac{170}{1611}$
		19ai	2 b –3 a 19aii $\frac{8}{5}$ b $-\frac{2}{5}$ a
9	\$2.64 (to 2d.p)	19aiii	– a+4 b
10	$r=4.00\%$(to 3s.f)	19b	Since $\overrightarrow{AN}=\frac{2}{5}\overrightarrow{AQ}$, ANQ and A is a common point A, N and Q will lie on a straight line.
11ai	$A\cap B=\{a,c,r\}$	19c	2 : 3 19d $\frac{1}{2}$
11 a(ii)	$A'\cap B'=\{b,u,s\}$	20a	Since there are 2 pairs of equal and corresponding angles, By AA, triangles *AEB* and *ADC* are similar.
11b	$P\cap Q'$		
12	Scale of B =1:50,000		
		20b	$CD=24$ 20c 120 cm^2

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CEDAR GIRLS' SECONDARY SCHOOL
SECONDARY 4 MATHEMATICS
Answer Key for 2022 Preliminary Examination

PAPER 4048/02

1a	$x \geq -\frac{1}{4}$	1b	$\frac{-1}{(x+2)(x-2)(x-3)}$	7ai	19 min 12 s	7aii	73.0°
1c	$3p+2n=4.8$ and $5p+4n=9$ Cost of pen = \$ 0.60, Cost of notebook = \$ 1.50			7bi	64°	7bii	17.6 km
1d	700%			8bi	Accept 1270 to 1870	8bii	The growth rate of bacteria is 1570 per h when $t = 5.5$.
2a	$\mathbf{J} = \begin{pmatrix} 20 & 30 & 11 \\ 14 & 36 & 8 \end{pmatrix}$			8cii	Accept 4.8 to 5.2	8d	$k = 50$
2bi	$\mathbf{M} = \begin{pmatrix} 123 \\ 117 \end{pmatrix}$			9a	90.6 cm²	9bi	The volume of water in the cone is not proportional to the depth of water in the cone.
2bii	The cost price of apple juice and orange juice sold on a particular morning respectively.			9bii	12.5 %		
2c	$\begin{pmatrix} 1.8 & 1.8 \end{pmatrix}\begin{pmatrix} 123 \\ 117 \end{pmatrix} = \begin{pmatrix} 432 \end{pmatrix}$			9biii	3.63 cm		
3a	$\overrightarrow{AB} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$	3b	$p = -3$ and $q = 21$	10a	108		
3ci	(15, −1.5)	3cii	13 units	10b	1.01 cm³		
3di	(12, 11)	3dii	$\overrightarrow{AD} = 2\overrightarrow{AB}$	10c	210 cm³		
4a	22.1 km	4b	1.02 km	10d	Mass of wax		
4ci	As the mean distance$_X$ < mean distance$_Y$, the cars made in Factory Y travel a greater distance per litre of petrol.				= 210.36 × 0.9 × 50 = 9 466.2 g = 9.4662kg		
	As the Standard Deviation$_Y$ < Standard Deviation$_X$, there is less spread/variation in the distance travelled per litre of petrol by cars made by Factory Y.				Cost of soy wax = \$64.73 × 2 = \$129.46. No need for shipping fee as purchase >\$45		
4cii(a)	unchanged	4cii(b)	reduced		Cost of cotton wick = \$6.32 + \$1(for shipping fee) = \$7.32		
5a	$\left(\frac{10-n}{12}\right), \left(\frac{10-n}{11}\right), \left(\frac{n}{11}\right), \left(\frac{9-n}{11}\right)$				Cost of candle wick tab and sticker = \$1.20 +\$1(for shipping fee) = \$2.20 Total cost of materials bought by Gillian		
5b	$\frac{10-n}{12} \times \frac{9-n}{11} = \frac{5}{22}$				= \$129.46 + \$7.32 +\$2.20 = \$138.98 Cost per candle = \$138.98 ÷ 50 = \$2.78 < \$3 Gillian's mum claim is correct.		
5c	$n = 15$ or 4						
5d	As there are only 12 balls initially, n has to be less than 12, therefore $n = 4$.						
5e	$\frac{2}{3}$	5f	$\frac{7}{18}$				
6aia	110°	6aib	40°				
6aii	(1) $\angle BAG = \angle CFG$ or $\angle ABG = \angle FCG$ (Angles in the same segment) (2) $\angle BGA = \angle CGF$ (vert opp angles) (3) $AG = FG$ or $BG = GC$ (equal sides of isos ΔGAF or ΔGBC with proof) $\Delta BAG \equiv \Delta CFG$ (SAA/SAS/AAS/ASA)						
6bi	4π cm						
6bii	45.7 cm²						

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