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TANJONG KATONG SECONDARY SCHOOL
Preliminary Examination 2017
Secondary 4

CANDIDATE
NAME

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CLASS

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INDEX NUMBER

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MATHEMATICS

4048/01

Paper 1

Friday 18 August 2017

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.

Write in dark blue or black pen.

You may use a 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.

You are expected to use a scientific calculator to evaluate explicit numerical expressions.

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 .

At the end of the examination, fasten all your work securely together.

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

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This document consists of 16 printed pages.

[Turn over

*Mathematical Formulae**Compound Interest*

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

Mensuration

$$\text{Curved surface area of a cone} = \pi r \ell$$

$$\text{Curved surface area of a sphere} = 4\pi r^2$$

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

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

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

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

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

Trigonometry

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

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

Statistics

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

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

Answer all the questions.

1 Calculate $\sqrt[3]{(-3.01)^2 + 2.8}$.

(a) Write down the first five digits on your calculator display.

Answer (a) _____ [1]

(b) Write your answer to part (a) correct to 3 decimal places.

Answer (b) _____ [1]

2 These are the first four terms of a sequence.

42 34 26 18

(a) Write down the eighth term in the sequence.

Answer (a) _____ [1]

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

Answer (b) _____ [1]

3 Given that $81 \div 27^{\frac{n}{3}} = 9$, find n .

Answer _____ [2]

- 4 (a) Two integers, 12 and x , are related such that their highest common factor is 6 and their lowest common multiple is 60.
Find the value of integer x .

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

- (b) Andy bought an external hard drive with storage of 1×10^{12} bytes.
A 5-minute-long high definition video takes up 7.2×10^9 bytes.

Assuming he continues to record all his videos in high definition, what would be the total duration that can be stored in the external hard drive?
Give your answer to the nearest minute.

Answer (b) _____ minutes

[1]

- 5 The angle, in degrees, of a quadrilateral $EFGH$ are represented by these expressions:
Angle $E = 40 + 2x$, angle $F = 100 - x$, angle $G = 60 + 6x$ and angle $H = 70 + 2x$.

(a) Calculate the value of x .

Answer (a) _____ [2]

(b) What is the name of the quadrilateral?

Answer (b) _____ [1]

- 6 The value of 200 homes at Mount Ace estate is shown below.

Value of homes (\$ x)	Number of homes
$200\,000 < x \leq 300\,000$	24
$300\,000 < x \leq 400\,000$	16
$400\,000 < x \leq 500\,000$	85
$500\,000 < x \leq 600\,000$	67
$600\,000 < x \leq 3\,000\,000$	8

The mean value for the homes at Mount Ace estate is \$505 500.

Explain if the mean value is a fair representation for the value of homes at Mount Ace estate. Give your reason.

Answer _____

_____ [2]

- 7 (a) Factorise completely $8y^2z - 18z + 4x^2y^2 - 9x^2$.

Answer (a) _____ [2]

- (b) Simplify $(-ab^{-1})^3 \div \frac{1}{2}a^3b^{-2}$, expressing your answer in positive index form.

Answer (b) _____ [3]

- 8 $\xi = \{\text{integers } x : 1 \leq x \leq 20\}$
 $P = \{x : \text{prime numbers}\}$
 $Q = \{x : 1 + 3x < 18\}$

- (a) List the elements in
(i) Q ,

Answer(a)(i) _____ [1]

- (ii) $P \cap Q$.

Answer(a)(ii) _____ [1]

- (b) Show that $P' \cap Q \neq \phi$.

Answer (b) _____
_____ [1]

- 9 Two geometrically similar bottles A and B have base areas of 27 cm^2 and 75 cm^2 respectively.
Given that the capacity of bottle A is 0.21 litres, find the capacity of bottle B .

Answer _____ [3]

- 10 A group of 15 students took a Science test and their results are represented in the stem-and-leaf diagram below.

Stem	Leaf
5	3 4 6 7
6	2 2 4 9 9
7	1 3 7
8	0 2 x

5 | 3 represents 53 marks

- (a) Given that the range of the Science test results is 32, find the value of x .

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

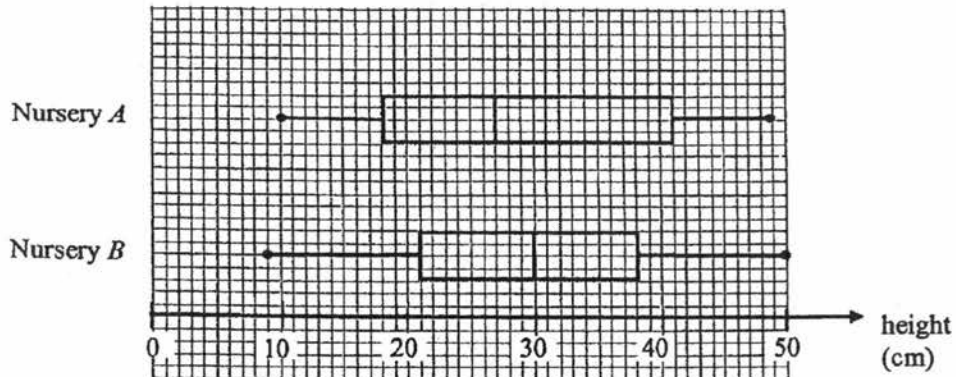
- (b) The passing mark for the Science test is 55. A student from this group is chosen at random. Find the probability that this student failed the test.

Answer (b) _____ [1]

- (c) Find the percentage of students who scored more than 75 marks.

Answer (c) _____ % [1]

- 11 The box plots below show the distribution of plants grown in two nurseries, *A* and *B*.



- (a) Find the interquartile range for Nursery *A*.

Answer (a) _____ [1]

- (b) For each of the statements below, write whether you agree or disagree. Give a reason for each answer, stating clearly which statistics you use to make your decision.

- (i) On average, the plants in Nursery *A* grows taller than in Nursery *B*.

Answer _____ because _____
[1]

- (ii) A greater proportion of the plants grow above the height of 40 cm in Nursery *B* than do in Nursery *A*.

Answer _____ because _____
[1]

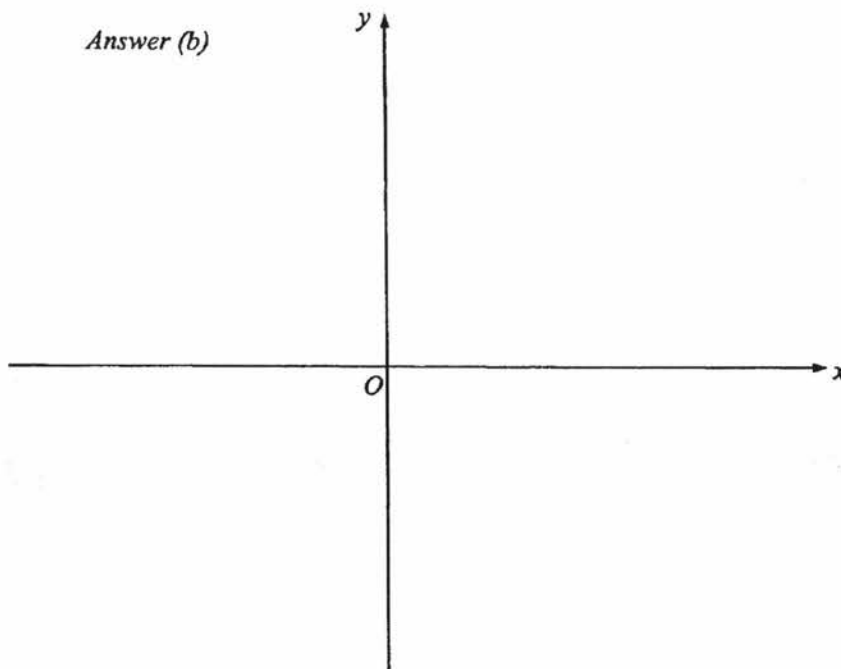
- 12 (a) Express $x^2 - 6x + 4$ in the form $(x - a)^2 + b$.

Answer (a) _____ [1]

- (b) Sketch the graph of $y = x^2 - 6x + 4$.

Answer (b)

[2]



- (c) The graph of $y = x^2 - 6x + 4$ is reflected in the y -axis. Write down the equation of the line of symmetry for the new graph.

Answer (c) _____ [1]

- 13 Mr Toh needs to tile his office floor which has an area of 60 square metres (sqm). Which company will offer a cheaper deal for Mr Toh? Justify your answers with calculations.

<u>TIMBRE WORKS</u> \$35 per sqm (for first 40 sqm) 30% discount thereafter	<u>TILE KING</u> FLAT RATE \$25 per sqm
---	---

Answer _____ [3]

- 14 Water is pumped into a cylindrical container at a constant rate such that x litres is pumped in t minutes. 144 litres of water is collected in the cylindrical container after 3 hours.

Find

- (a) an equation for x in terms of t ,

Answer (a) _____ [2]

- (b) the time taken, in hours and minutes to fill a volume of 400 litres.

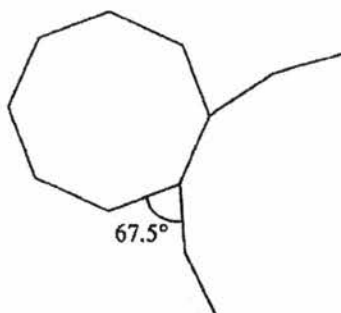
_____ hours _____ minutes [2]

- 15 (a) Explain whether it is possible to form a regular polygon with an interior angle of 125° .

Answer (a) _____

[2]

- (b) The diagram shows a sketch of a n -sided regular polygon and a regular octagon. Calculate n .



Answer (b) $n =$ _____ [3]

- 16 Bag *A* contains three balls numbered 2, 3 and 4 respectively.
Bag *B* contains four balls numbered 1, 3, 5 and 7 respectively.
A ball is taken at random from each bag and their respective numbers *f* and *g* are recorded.

- (a) Complete the table to show the possible outcomes for the sum of the two numbers *f* and *g*, on the balls selected.

		<i>f</i> , number on ball from Bag <i>A</i>		
		2	3	4
<i>g</i> , number on ball from Bag <i>B</i>	1			
	3			
	5			
	7			

[1]

- (b) Find the probability that

(i) $f + g < 7$,

Answer (b)(i) _____ [1]

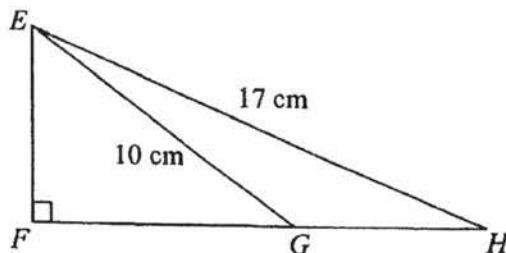
(ii) $f + g$ is an odd number,

Answer (b)(ii) _____ [1]

(iii) $f > g$.

Answer (b)(iii) _____ [1]

- 17 The figure shows triangle EFH where $EH = 17$ cm and $\angle EFH = 90^\circ$.
 G is a point on FH such that $EG = 10$ cm.



- (a) Given that $\sin \angle EGH = \frac{3}{5}$, find

(i) EF ,

Answer (a)(i) _____ cm [1]

(ii) $\tan \angle EGH$.

Answer (a)(ii) _____ [2]

- (b) Find the shortest distance from F to EH .

Answer (b) _____ cm [3]

- (c) A circle C_1 is drawn passing through E , F and G .
 A second circle C_2 is drawn passing through E , F and H .
 Find the ratio of the circumference of C_1 to circumference of C_2 ,

Answer (c) _____ : _____ [1]

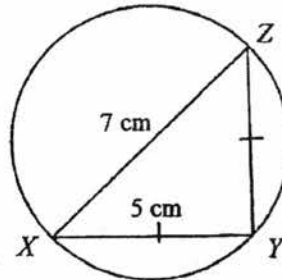
- 18 The mean, median and mode of the distribution of heights for 9 athletes are all equal to 165 cm.

Three of the athletes have a height of 165 cm and the tallest athlete is 170 cm.

Given that the heights of the athletes are integers, find the least possible height of the shortest athlete.

Answer _____ cm [3]

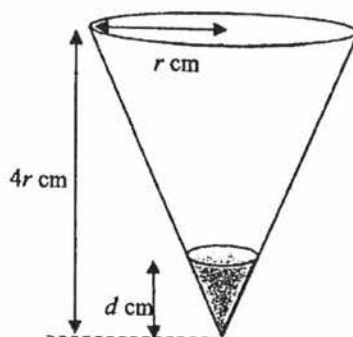
- 19 The diagram shows an isosceles triangle inscribed in a circle where $XZ = 7$ cm and $XY = YZ = 5$ cm. Determine whether XZ is a diameter of the circle. Explain your answer.



Answer _____

[2]

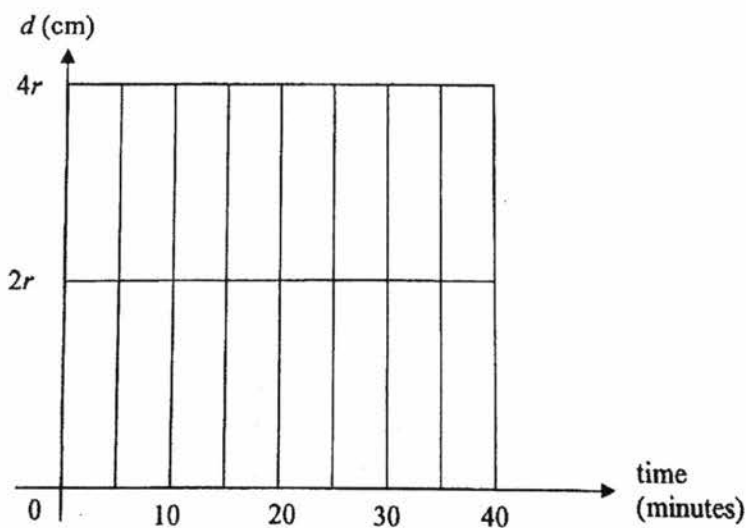
- 20 A container in the shape of an inverted cone has a top radius of r cm and a height of $4r$ cm. Water is poured into the container at a constant rate. It takes 40 minutes to fill the container completely with water.



- (a) Calculate the time taken to fill the container to a height of $2r$ cm.

Answer (a) _____ minutes [2]

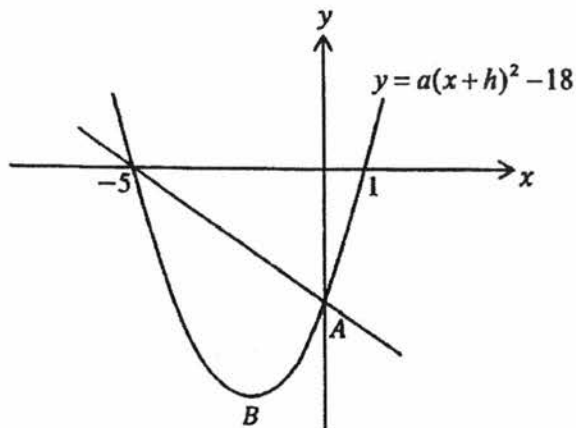
- (b) A graph is drawn to show the relationship between the depth of the water, d cm, and the time taken, t minutes, as the container is filled. Complete the graph to represent how the depth of water changes with time.



[2]

[Turn over

- 21 The diagram below shows a curve of $y = a(x+h)^2 - 18$.
The curve cuts the x -axis at -5 and 1 and the y -axis at A .
 B is the minimum point on the curve.



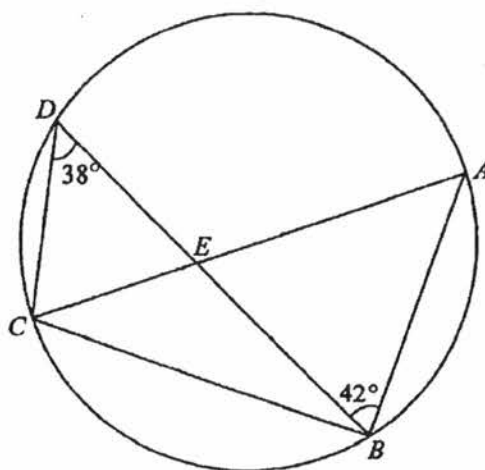
- (a) Express the equation of the curve in the form of $y = a(x+h)^2 - 18$,
where a and h are constants.

Answer (a) $y =$ _____ [3]

- (b) A straight line cuts the curve at $x = -5$ and point A .
Find the equation of the straight line.

_____ [2]

- 22 The points A, B, C , and D lie on the circumference of a circle such that $\angle BDC = 38^\circ$, $\angle ABD = 42^\circ$ and $\angle ABC = 90^\circ$. Chords AC and BD intersect at E .



- (a) (i) Giving your reason, find angle ACD .

Answer (a)(i) _____ [1]

- (ii) State whether EC is longer than ED . Give your reason clearly.

Answer (a)(ii) _____ [1]

- (b) Describe where the centre of the circle is.

Answer (b) _____ [1]

- 23 The scale drawing shows the positions of two train stations, P and Q .
The scale is 1 cm to 10 km.

A third train station, R is 80 km from P on a bearing of 150° .

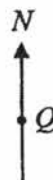
- (a) Mark and label on the diagram the position of train station R .

[1]

A train, T travels along a path which is equidistant from PR and RQ .

- (b) Using ruler and compasses only, mark and label the path in which train T moves.

[1]



- (c) At a particular instant, the position of train T is such that it is equidistant from train stations P and Q . Using ruler and compasses only, mark and label the position of train T at that instant.

[2]

- (d) Train T approaches train station R at an average speed of 95 km/h. Calculate the time taken from its position in (c) to arrive at R . Give your answer in minutes.

Answer (d) _____ minutes [2]

END OF PAPER

4048/1/2017Sec4Prelims

[Turn over



TANJONG KATONG SECONDARY SCHOOL
Preliminary Examination 2017
Secondary 4

CANDIDATE
NAME

CLASS

INDEX NUMBER

MATHEMATICS

4048/02

Paper 2

Wednesday 23 August 2017

2 hours 30 minutes

Additional Materials: Writing Paper
Graph Paper

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in dark blue or black pen.
You may use a 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.

You are expected to use a scientific calculator to evaluate explicit numerical expressions.

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 .

At the end of the examination, fasten all your work securely together.

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 100.

- 1 A soccer club offers annual memberships for both adults and juniors.
The adult annual membership fee is \$150.
Junior members need to pay 80% of the adult annual membership fee.

(a) Calculate the discount each junior member receives. [1]

If an adult member does not pay the membership fee by the due date, the club will charge a penalty of 5% per month until the fee is paid.
Simon paid the \$150 membership fee exactly two months after the due date.

(b) Calculate the penalty that Simon will be charged. [1]

The soccer club received a statement of the transactions in its saving account for the month of January 2017.

Date	Details	Deposit	Withdrawal	Balance
01 Jan 2017	Brought Forward			\$63950.00
09 Jan 2017	Match Fees	\$750.00		\$64700.00
15 Jan 2017	Withdrawal			\$42700.00
23 Jan 2017	Membership Fees	\$3800.00		\$46500.00
31 Jan 2017	Interest	\$124.54		\$46624.54

(c) (i) Calculate the withdrawal amount on 15 Jan 2017. [1]

(ii) Interest on the account is calculated on the minimum balance for the month and added to the account on the last day of the month.

What is the annual rate of interest for this account?

Write your answer, correct to one decimal place. [2]

(d) The soccer club plans to invest \$120 000 in an account which pays compound interest at the rate of 2% per annum, compounded monthly.
Find the total amount that can be withdrawn at the end of 4 years. [2]

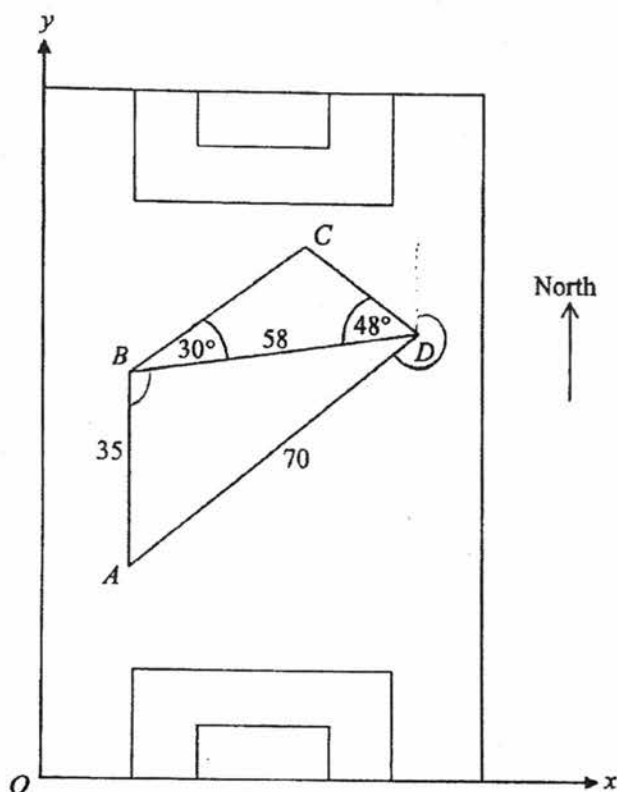
- 2 A toothpaste firm supplies tubes of toothpaste to 2 different stores. The number of tubes of toothpaste supplied per delivery to each store, the sizes of the tubes and the number of deliveries made to each store over a year are shown below. [Turn over

Size of tube		Number of tubes per delivery			Number of deliveries over a year
		50 ml	75 ml	100 ml	
Name of store	Econ	400	300	400	2
	Prime	-	200	600	4

- (i) Given that $T = \begin{pmatrix} 400 & 300 & 400 \\ 0 & 200 & 600 \end{pmatrix}$, find the matrix product $S = T \begin{pmatrix} 50 \\ 75 \\ 100 \end{pmatrix}$. [1]
- (ii) Describe what the elements in S represent. [1]
- (iii) Write down two matrices such that the elements of their product under matrix multiplication would give the total number of tubes of toothpaste of each size supplied by the firm over a year. Find this product. [2]

- 3 (a) Solve the inequality $\frac{2p-1}{5} \leq \frac{3+p}{2}$. [2]
- (b) Simplify $\frac{12x^2}{4y} \div \frac{6x^3}{y^4}$. [2]
- (c) Simplify the expression $\frac{4w^2-36}{2w^2+7w+3}$. [3]
- (d) (i) Express as a single fraction in its simplest form $\frac{2}{y+3} - \frac{3}{y-1}$. [2]
- (ii) Solve the equation $\frac{2}{y+3} - \frac{3}{y-1} = 5$. [3]

- 4 (a) (i) Express 4536 as the product of its prime factors. [1]
- (ii) Given that $\frac{4536}{k} = p^3$, where k and p are integers and p is as large as possible, find the values of k and of p . [1]
- (iii) The lowest common multiple of two numbers is 4536.
The highest common factor of these two numbers is 126.
Both numbers are greater than 126.
Find the two numbers. [2]
- (b) When n is a positive integer, $2n + 3$ is an odd number.
- (i) Write down an expression for the next odd number greater than $2n + 3$. [1]
- (ii) Find and simplify an expression for the difference between the squares of these two odd numbers. [2]
- (iii) Hence explain why the difference between the squares of two consecutive odd numbers is always a multiple of 8. [1]



- (a) During a soccer match a ball is passed from A to B and then from B to D as shown in the diagram. B is due north of A .
 $AB = 35$ m, $BD = 58$ m and $AD = 70$ m.

(i) Show that angle $DAB = 55.7^\circ$.

[1]

(ii) Find the bearing of A from D .

[1]

(iii) Calculate the area of triangle DAB .

[2]

- (b) Another player is standing at C .
 Angle $CBD = 30^\circ$ and angle $BDC = 48^\circ$.
 Calculate the length CD .

[2]

- (c) The x - and y - axes are shown in the diagram.

$\vec{AD} = \begin{pmatrix} p \\ q \end{pmatrix}$, where p and q are measured in metres.

(i) Show that $p = 57.8$.

[1]

(ii) Find the value of q .

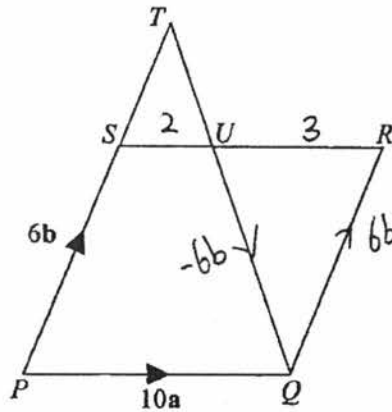
[2]

- 6 (a) A has coordinates $(-3, 5)$ and $\overrightarrow{AB}$ is given by $\begin{pmatrix} -7 \\ -4 \end{pmatrix}$.

Find

- (i) $|\overrightarrow{AB}|$, [1]
 (ii) the position vector of B . [1]
 (iii) Given that $\overrightarrow{CD}$ is parallel to $\overrightarrow{AB}$, and $\overrightarrow{CD} = \begin{pmatrix} k \\ 16 \end{pmatrix}$, find the value of k . [2]

(b)



$PQRS$ is a parallelogram.
 $\overrightarrow{PS} = 6\mathbf{b}$ and $\overrightarrow{PQ} = 10\mathbf{a}$.

U is the point on SR such that $SU : SR = 2 : 5$.
 When produced, PS and QU meet at T .

- (i) Express each of the following, as simply as possible, in terms of $\mathbf{a}$ and/or $\mathbf{b}$,
- (a) $\overrightarrow{PR}$, [1]
 (b) $\overrightarrow{SU}$, [1]
 (c) $\overrightarrow{TU}$. [2]
- (ii) Calculate the value of
- (a) $\frac{\text{area of triangle } QRU}{\text{area of triangle } QUS}$, [1]
 (b) $\frac{\text{area of triangle } SUT}{\text{area of triangle } PQT}$. [1]

- 7 Answer the whole of this question on a sheet of graph paper.

An open rectangular tank has a square base of side x metres.
The volume of the tank is 9 m^3 .

- (a) (i) Find an expression, in terms of x , for the height of the tank. [1]
(ii) Hence show that the total external surface area of the tank, A square metres, is given by

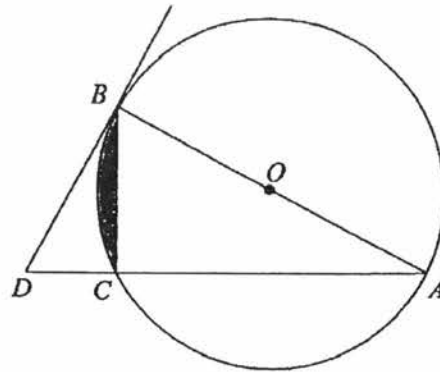
$$A = x^2 + \frac{36}{x}. \quad [1]$$

- (b) The table below shows some values of x and the corresponding values of A .

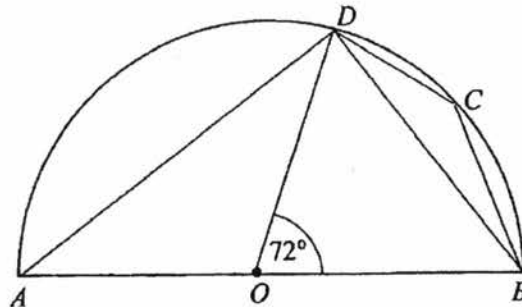
x	2	2.5	3	4	5	6	7	8
A	22	20.7	21	25	32.2	42	54.1	p

- (i) Find the value of p . [1]
(ii) Using a scale of 2 cm to represent 1 unit, draw a horizontal x -axis for $2 \leq x \leq 8$.
Using a scale of 2 cm to represent 10 m^2 , draw a vertical A -axis for $20 \leq A \leq 80$.
On your axes, plot the points given in the table and join them with a smooth curve. [3]
(iii) By drawing a tangent, find the gradient of the curve at the point where $x = 4$. [2]
(iv) Use your graph to find
(a) the value of x for which the surface area is 50 m^2 . [1]
(b) the dimensions of the tank which has the least possible surface area. [2]

- 8 The diagram shows a circle, ABC , centre O .
 BD is a tangent to the circle and it meets AC produced at D .



- (a) Show that triangles ABD and BCD are similar. [2]
- (b) Given that ratio area of triangle ABD : area of triangle $BCD = 4 : 1$ and the radius of the circle is 7.5 cm,
- (i) show that angle $BAC = \frac{\pi}{6}$ radian, [2]
- (ii) find the perimeter of the shaded region. [3]
- (c) In the diagram, A, B, C and D are points on the circumference of a semi-circle, centre O .



- (a) Calculate, stating your reasons clearly,
- (i) angle DAB , [1]
- (ii) angle ABD , [1]
- (iii) reflex angle BCD . [2]
- (b) Given that $OB = 3.5$ cm, find the area of the segment BCD . [3]

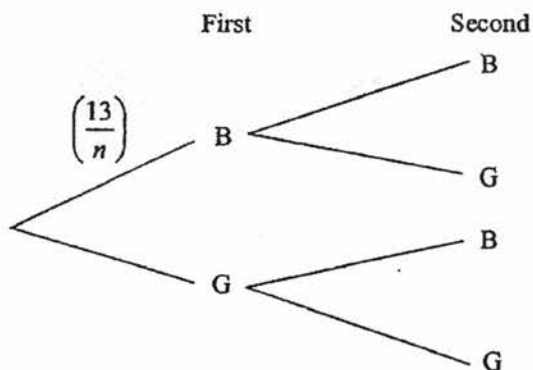
- 9 (a) The table shows the sizes of 50 pairs of ladies' shoes sold one day in a shoe shop.

Shoe sizes	5	6	7	7.5	8	8.5	9
Number of pairs of shoes sold	4	18	3	5	8	7	5

- (i) Find the median shoe size. [1]
- (ii) Find the modal shoe size. [1]
- (iii) Explain which central measure would be the most appropriate and useful to the manager when she is ordering stock. [2]
- (iv) Find the standard deviation of the shoe sizes. [1]
- (v) The standard deviation of the shoe sizes of mens' shoes sold on the same day was 1.52.

Use this information to comment on one difference between the two distributions. [1]

- (b) In a class of n students, 13 of them are boys and the rest are girls.
Two students are selected at random to represent the class at a conference.
The tree diagram shows the possible outcomes and their probabilities.



- (i) Copy and complete the tree diagram. [2]
- (ii) Find, as a single fraction in terms of n , the probability that
- (a) the first student selected is a girl, [1]
- (b) two boys are selected. [2]
- (iii) The probability that two girls selected is $\frac{5}{18}$.

Find the total number of students in the class. [4]

- 10 Amos makes cookies.

The amount of dough needed to make one cookie is 8 grammes.

The density of the dough is 0.5333 g/cm^3 .

- (i) Find the volume of dough needed for each cookie.

[1]

The dough is rolled into a sphere before baking.

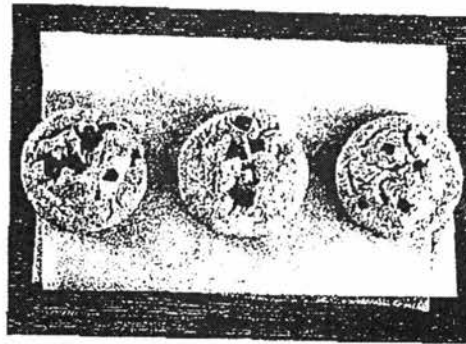
- (ii) Calculate the radius of the sphere.

[2]

When each cookie is baked, it forms a shape as shown.

The cookie can be modelled as a cylinder of radius 3 cm and a height of 0.7 cm.

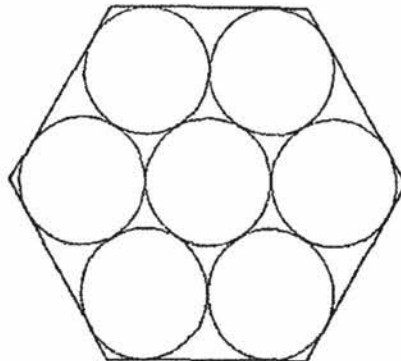
The increase in volume is due to air trapped in the cookie.



- (iii) Calculate the volume of air trapped in the cookie.

[2]

A regular hexagonal box is designed to hold 7 such cookies per layer, as shown.



- (iv) Find the volume of the box if it is to hold five layers of cookies.

[5]

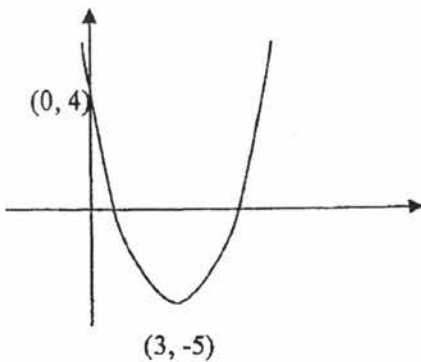
End of Paper

5	ai	$\cos \hat{DAB} = \frac{35^2 + 70^2 - 58^2}{2(35)(70)}$		bi	$\left(\frac{13}{n}\right)$ B $\left(\frac{n-13}{n}\right)$ G First B G B G $\left(\frac{12}{n-1}\right)$ B $\left(\frac{n-13}{n-1}\right)$ G $\left(\frac{13}{n-1}\right)$ B $\left(\frac{n-14}{n-1}\right)$ G Second
	aii	235.7°		biia	$\frac{n-13}{n}$
	aiii	1011.97 m^2		biib	$\frac{156}{n(n-1)}$
	b	$CD = 29.6$		biia	$n = 28 \text{ or } n = 9 \text{ (rej)}$
	ci	$\cos(90^\circ - 55.7^\circ) = \frac{p}{70}$	10	i	15.0 cm^3
	cii	$q = 39.4$		ii	$r = 1.53 \text{ cm}$
6	ai	8.06		iii	4.80 cm^3
	aii	$\begin{pmatrix} -10 \\ 1 \end{pmatrix}$		iv	814.4745 cm^3
	aiii	$k = 28$			
	bia	$\vec{PR} = 10\mathbf{a} + 6\mathbf{b}$			
	bib	$\vec{SU} = 4\mathbf{a}$			
	bic	$\vec{TU} = -4\mathbf{b} + 4\mathbf{a}$			
	biia	$\frac{3}{2}$			
	biib	$\frac{4}{25}$			

1	a	\$30	7	ai	$\frac{9}{x^2}$
	b	\$15		all	$4x\left(\frac{9}{x^2}\right)$
	ci	\$22 000		bi	$p = 68.5$
	cii	3.5%		bii	All points correctly plotted Smooth curve drawn
	d	129985.79		biii	Draw tangent at $x = 4$ Grad = 6.38
2	i	$\begin{pmatrix} 82500 \\ 75000 \end{pmatrix}$		biva	$x = 6.8$
	ii	The element in S represent the total <u>volume</u> of toothpaste (in ml) <u>supplied to Econ and Prime respectively.</u>		bivb	Dimensions = $2.5 \text{ m} \times 2.5 \text{ m} \times 1.44 \text{ m}$
	iii	$\begin{pmatrix} 2 & 4 & \begin{pmatrix} 400 & 300 & 400 \\ 0 & 200 & 600 \end{pmatrix} \\ (800 & 1400 & 3200) \end{pmatrix}$	8	a	$\angle BCD = 90^\circ$ (angles in semi-circle) $\angle ABD = 90^\circ$ (tangent perpen. radius) $\therefore \angle ABC = \angle BCD$ $\angle BDC$ is common angle $\therefore \triangle ABD$ and $\triangle BCD$ are similar
3	a	$p \geq -17$		bi	$\frac{BD}{CD} = \frac{2}{1} \Rightarrow \frac{AB}{BC} = \frac{2}{1}$ Since radius = 7.5 cm $AB = 15$ and $BC = 7.5$ cm $\sin \hat{BAC} = \frac{1}{2}$ $\hat{BAC} = \frac{\pi}{6}$ (shown)
	b	$\frac{y^3}{2x}$		bii	15.4 cm
	c	$\frac{4(w-3)}{2w+1}$		cai	$\angle DAB = 36^\circ$ ($\angle$ at centre = $2 \angle$ at circumference)
	di	$\frac{-y-11}{(y+3)(y-1)}$		caii	$\angle ABD = \frac{180-72}{2}$ (base $\angle$ of isos. $\triangle$) $= 54^\circ$
	dii	$y = 0.318$ or -2.52		calii	216°
4	ai	$2^3 \times 3^4 \times 7$		cb	1.87 cm^2
	aii	$k=21$ $p=6$	9	a i	7.25
	aiii	504 and 1134		ii	6
	4bi	$2n+5$		iii	Mode will be the most appropriate and useful as the manager can stock up more shoes of size 6.
	4bii	$8n+16$		iv	1.25
	4biii	$8(n+2)$ is a multiple of 8 for n is a positive integer		v	The shoe sizes of ladies are more consistent than the men's shoe sizes.

[Turn over

Qn No.	Solutions
b(i)	$\frac{5}{12}$
b(ii)	$\frac{2}{3}$
b(iii)	$\frac{1}{3}$
17	
a(i)	EF = 6 cm
a(ii)	$\tan \angle EGH = -\frac{6}{8} = -\frac{3}{4}$
b	5.61cm
c	10 : 17
18	
	Least possible height = 150 cm
19	
	$XY^2 + YZ^2 = 5^2 + 5^2 = 50$ $XZ^2 = 7^2 = 49$ Since $XY^2 + YZ^2 \neq XZ^2$, XZY is not a right-angled triangle. Hence, XZ is not a diameter (Angle in semicircle).
20	
a	Time taken = $40 \div 2^3$ = 5 mins
b	
21	
a	$y = 2(x+2)^2 - 18$
b	Eqn: $y = -2x - 10$
22	
a(i)	$\angle ACD = 42^\circ$ (angles in same segment)
a(ii)	$\frac{EC}{\sin 38^\circ} = \frac{ED}{\sin 42^\circ}$ Since $42^\circ > 38^\circ$, ED is longer than EC
b	Given angle ABC = 90° , AC is a diameter of the circle (angle in semicircle) Centre is at midpoint of AC.

Qn No.	Solutions																										
	b																										
	c	$x = -3$																									
13		Price for Timbre works $= (40)(35) + 0.7(35)(20)$ $= \\$1890$ Price for Tile King $= 25(60)$ $= \\$1500$ Tile king is cheaper																									
14	a	$x = \frac{144}{180}t$ $x = \frac{4}{5}t$																									
	b	$t = 8h\ 20\text{ min}$																									
15	a	Ext angle of polygon $= 180^\circ - 125^\circ = 55^\circ$ No of sides of polygon $= \frac{360}{55} = 6.545$ Since number of sides is not an integer, it is not possible to form a polygon with interior angle 125°.																									
	b	16 sides																									
16	a	<table><tr><th colspan="2" rowspan="2"></th><th colspan="3">f, number on ball from Bag A</th></tr><tr><th>2</th><th>3</th><th>4</th></tr><tr><th rowspan="4">g, number on ball from Bag B</th><th>1</th><td>3</td><td>4</td><td>5</td></tr><tr><th>3</th><td>5</td><td>6</td><td>7</td></tr><tr><th>5</th><td>7</td><td>8</td><td>9</td></tr><tr><th>7</th><td>9</td><td>10</td><td>11</td></tr></table>			f, number on ball from Bag A			2	3	4	g, number on ball from Bag B	1	3	4	5	3	5	6	7	5	7	8	9	7	9	10	11
		f, number on ball from Bag A																									
		2	3	4																							
g, number on ball from Bag B	1	3	4	5																							
	3	5	6	7																							
	5	7	8	9																							
	7	9	10	11																							

Answer Key:

Qn No.		Solutions
1	a	2.2804
	b	2.280
2	a	-14
	b	$-8n + 50$
3		$3^{4-n} = 3^2$ $n = 2$
4	a	$x = 2 \times 3 \times 5 = 30$
	b	694 min
5	a	$x = 10^\circ$
	b	Kite
6		It is not a fair representation as - only 37.5% of the homes are valued above \$500,000 (majority of homes are valued less than \$505500) - the mean value is skewed by extreme values in the \$600,000 < x < \$3,000,000 group.
7	a	$(2z + x^2)(2y + 3)(2y - 3)$
	b	$\frac{-2}{b}$
8	a(i)	1, 2, 3, 4, 5
	a(ii)	2, 3, 5
	b	P' are not prime numbers. Since Q contains elements that are not prime, $P' \cap Q$ is not a null set. OR $P' \cap Q = \{1, 4\}$ Hence, $P' \cap Q \neq \phi$
9		$V_{big} = 0.9721$
10	a	5
	b	$\frac{2}{15}$
	c	26.7%
11	a	23
	b(i)	Disagree because the <u>median</u> height in A is lesser than in B.
	b(ii)	Disagree because <u>more than 25%</u> of the plants in A grow to height greater than 40cm.
12	a	$(x - 3)^2 - 5$