NAVAL BASE SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2024

O

Name _____ ( ) **Class** _____

MATHEMATICS **4052/01**

Paper 1 **21 August 2024**

Candidates answer on the Question Paper **2 hours 15 minutes**

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number 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, 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 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 **90**.

Item	*For examiner's use*
Presentation	
Accuracy	
Units	
Total	
Parent's Signature	

Downloaded from SingaKids.com

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 = $4\pi r^2$

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

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

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

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

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

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

Downloaded from SingaKids.com

Answer **all** the questions.

1 Calculate $\sqrt[4]{13.5^2 - \frac{6.56}{0.37}}$.

Answer ..... [1]

---

2 Simplify

(a) $3x^2 \times 4y^5$.

Answer ..... [1]

(b) $3(2x-1)-5$.

Answer ..... [1]

---

3 Factorise completely $2x^3 - 13x^2 + 6x$.

Answer ..... [2]

[Turn over

Downloaded from SingaKids.com

4 The sine of an angle is 0.6, find the two possible values for angle.

Answer $x =$ ..... ° or $x =$ ..... ° [2]

---

5 A class of 12 boys and 8 girls took a test.
The girl's marks were 3, 6, 7, 8, 9, 9, 10 and 10.

(a) Find the mean mark for the girls.

Answer .....mark [1]

(b) The mean mark for the boys were 8.0.

Find the mean mark for the whole class.

Answer .....mark [2]

Downloaded from SingaKids.com

6 **(a)** The number $12250 \times \frac{p}{q}$ is a perfect cube. p and q are prime numbers.

Find p and q.

Answer p = ...

q = ...[3]

(b) x is a number between 700 and 800.

The highest common factor of x and 12 250 is 250.

Find the smallest possible value of x.

Answer x = ... [1]

Downloaded from SingaKids.com

7 Given that $81^{2x} \times 9^{x} = 27$, find x.

Answer ..... [2]

---

8 Raj has 120 one-centimetre cubes.
He arranges all of the cubes into a cuboid.
The perimeter of the top of the cuboid is 20 cm.
Each side of the cuboid has a length greater than 3 cm.

Find the height of the cuboid.

Answer ..... cm [2]

Downloaded from SingaKids.com

9

$$T = 2\pi\sqrt{\frac{L}{g}}$$

Rearrange the formula to make g the subject.

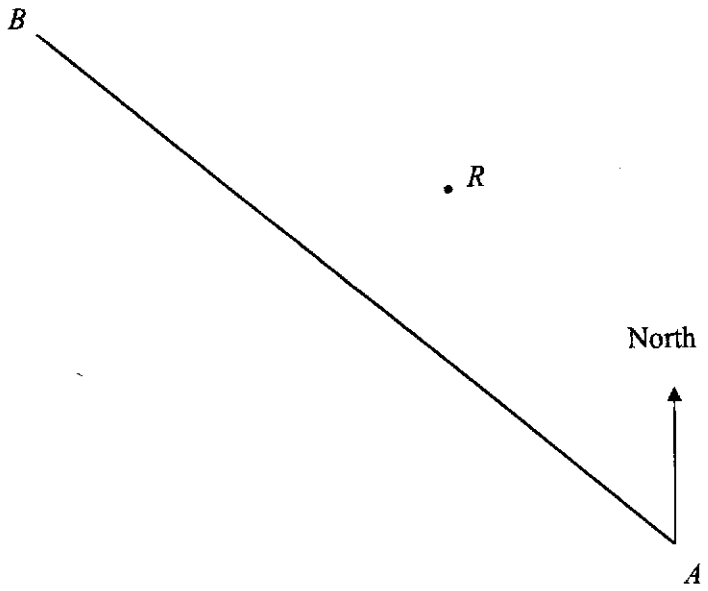
Answer g =..... [3]

[Turn over

Downloaded from SingaKids.com

10

Scale: 1 cm to 5 km



In the scale drawing, R is the centre of a rock bed, A is a ship and B is a port.
The line AB shows the ship's course.

(a) Measure the bearing of B from A.

Answer .....° [1]

(b) The rock bed covers a 25 km radius.

If the ship were to stay on course, state the distance at which the ship will first hit the rock bed.

Answer .....km [2]

Downloaded from SingaKids.com

11 The table below shows the amount of time spent playing online games by a group of children in one particular week.

Time (h hours)	Frequency
$0 < h \leq 2$	4
$2 < h \leq 4$	9
$4 < h \leq 6$	15
$6 < h \leq 8$	13
$8 < h \leq 10$	7
$10 < h \leq 12$	2

(a) **(i)** Calculate an estimate of the mean time spent playing online games that week.

Answer .....hours [1]

(ii) Explain why this is only an estimate of the mean time these children spent playing online games that week.

Answer ..... [1]

(b) Calculate an estimate of the standard deviation of the time spent playing online games that week.

Answer .....hours [2]

Downloaded from SingaKids.com

12 Solve the simultaneous equations.

$$\frac{x}{4} - \frac{y}{2} = 2$$
$$3x = 19 + 4y$$

You must show your working.

Answer $x =$ .....

$y =$ ..... [3]

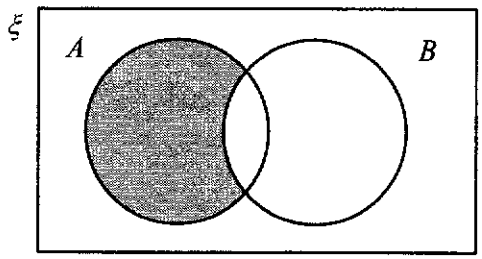
[Turn over

Downloaded from SingaKids.com

13 **(a)** Factorise $5xy - 20y$.

Answer ..... [1]

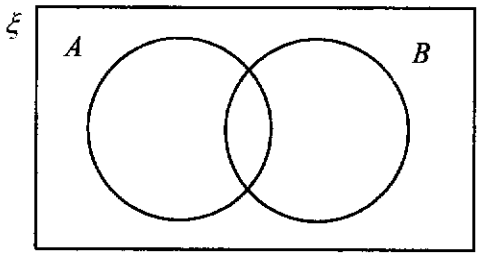
(b) **(i)** Use set notation to describe the shaded region.



Answer ..... [1]

(ii) On the Venn diagram, shade the region which represents $A \cup B'$.

Answer



[1]

Downloaded from SingaKids.com

14 **(a)** A bag contains black, blue and yellow balls.
A ball is picked at random from the bag.

The probability that the ball is blue is $\frac{5}{9}$.

The probability that the ball is yellow is $\frac{2}{15}$.

Find the probability that the ball is black.

Answer ..... [1]

(b) Another bag contains 10 red balls, 7 white balls and 8 blue balls.
A further n white balls are added to the bag.

The probability of picking a white ball is now $\frac{2}{5}$.

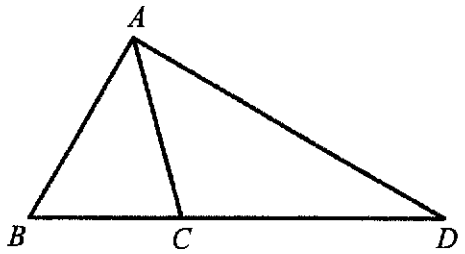
Find the value of n.

Answer n = ... [2]

[Turn over

Downloaded from SingaKids.com

15



In the diagram, BCD is a straight line and $BC : CD = 3 : 5$.

Calculate the area of triangle ABC as a percentage of the area of the triangle ABD.

Answer .....% [2]

---

16 x and y are related such that x is inversely proportional to the square of y.
If y is increased by 400%, find the percentage change in x.

Answer .....% [3]

[Turn over

Downloaded from SingaKids.com

17 The numbers 1 to 100 are arranged in a table as shown below.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
91	92	93	94	95	96	97	98	99	100

A ***L***-shaped shaded frame can be placed around various numbers throughout the table.

L_n is used to refer to the shaded frame that is drawn around a particular number.
For example, L_2 refers to the shaded frame shown above drawn around the number 2.

(a) State the largest L_n.

Answer n = ... [1]

(b) Write and simplify an expression, in terms of n, for the sum of the numbers in L_n.

Answer ..... [2]

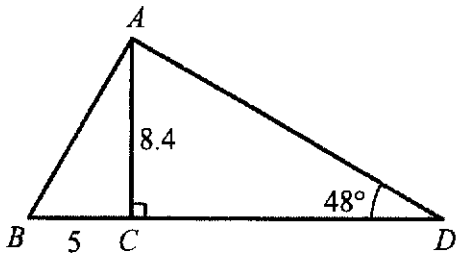
(c) Explain why the sum of the numbers is always a multiple of 3.

Answer .....

..... [1]

Downloaded from SingaKids.com

18



In the triangle ABD, AC is perpendicular to BD.
Angle $ADC = 48°$, $AC = 8.4$ cm and $BC = 5$ cm.

Calculate
(a) angle ABC,

Answer .....° [2]

(b) AD.

Answer .....cm [2]

[Turn over

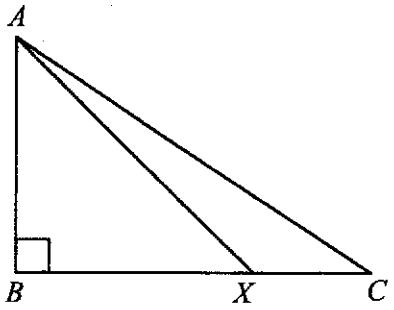
Downloaded from SingaKids.com

19 Solve the equation $x^2 + 5x - 16 = 0$ by completing the square.
Give your solutions correct to two decimal places.

Answer x = ... or ..... [4]

Downloaded from SingaKids.com

20



In triangle ABC, angle $ABC = 90°$, $BX = 2XC$ and $\sin \angle AXC = \frac{3}{5}$.

Express as a fraction in its lowest terms,

(a) $\tan \angle AXB$,

Answer ..... [2]

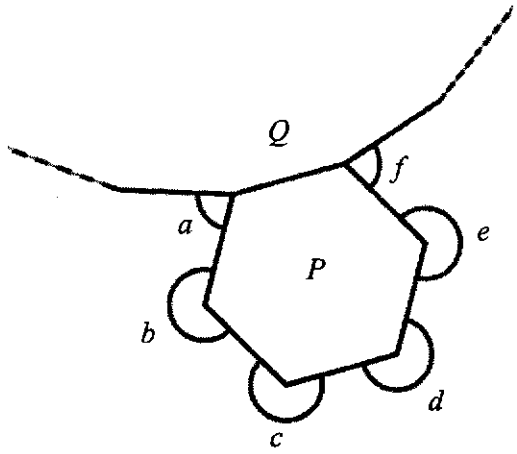
(b) $\tan \angle ACB$.

Answer ..... [2]

[Turn over

Downloaded from SingaKids.com

21 The diagram shows a regular hexagon P and a regular n-sided polygon Q.
Polygon Q has an exterior angle of 18°.

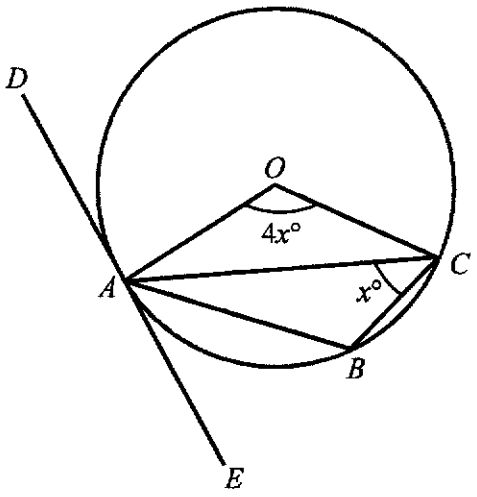


Find the sum of angles a, b, c, d, e and f.

Answer ..... ° [4]

Downloaded from SingaKids.com

22



A, B and C are points on the circle, centre O.
DE is a tangent to the circle at A.
Angle $AOC = 4x°$ and angle $ACB = x°$.

Find, in terms of x, the following.
Give a reason for each step of your answer.

(a) angle ABC,

Answer ..... ° [2]

(b) angle BAE.

Answer ..... ° [2]

[Turn over

Downloaded from SingaKids.com

23 A vaccine was introduced to a virus in an experiment.

The number, N, of virus t hours after being introduced to the vaccine is given by

$$N = v \times 0.9^{2t},$$

where v is the amount of vaccine introduced.

(a) After 1 hour, the number of virus has decreased to 81 000.

Find v.

Answer v = ... [1]

(b) Find in terms of k, the number of virus when $0.81^t = k$.

Answer N = ... [1]

(c) Find the decrease in the number of virus after 2 hours as a percentage of the number of virus at the beginning.

Answer .....% [2]

(d) Which of these diagrams represent the graph of N against t?

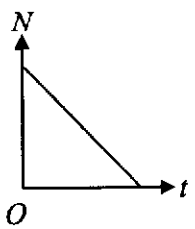


Diagram 1

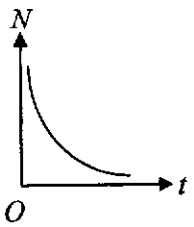


Diagram 2

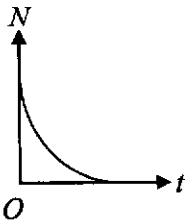


Diagram 3

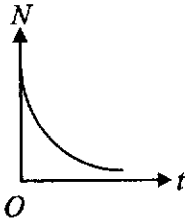


Diagram 4

Answer Diagram ..... [1]

[Turn over

Downloaded from SingaKids.com

24 **(a)** **Underline** the following ratios that are equivalent to the ratio $a : b$.

Answer

$\frac{1}{b} : \frac{1}{a}$ $\quad a^3 : b^3$ $\quad 3a : 3b$ $\quad a+1 : b+1$

[2]

(b) John and Sam each have an amount of money.
The ratio John's amount : Sam's amount = 6 : 2.

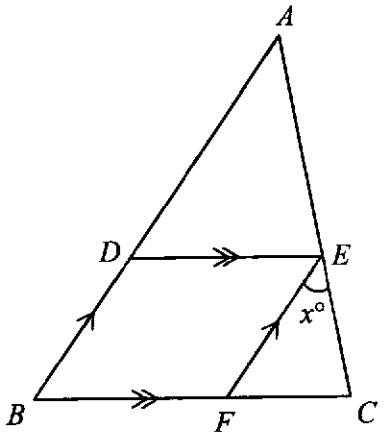
John gives Sam $13.
The new ratio John's amount : Sam's amount = 2 : 5.

Find how much money John has now.

Answer $ ..... [4]

Downloaded from SingaKids.com

25



The diagram shows triangle ABC and parallelogram $BDEF$.
FE bisects angle DEC and angle $FEC = x°$.

(a) Find angle ECF in terms of x.
Give a reason for each step of your answer.

Answer .....

.....

.....[2]

(b) Show that triangle AED is similar to triangle ECF.

Answer .....

.....

.....

.....[3]

(c) State another triangle that is similar to AED and ECF.

Answer Triangle ..... [1]

Downloaded from SingaKids.com

26 A baking school offers beginner, intermediate and advanced baking classes on weekdays and weekends in August this year.

The matrix **B** shows the number of participants attending the baking classes in August.

$$\mathbf{B} = \begin{array}{c} \begin{matrix} \text{beginner} & \text{intermediate} & \text{advanced} \end{matrix} \\ \begin{pmatrix} 22 & 20 & 9 \\ 8 & 10 & 11 \end{pmatrix} \end{array} \begin{matrix} \\ \text{weekdays} \\ \text{weekends} \end{matrix}$$

(a) The fees for the beginner, intermediate and advanced baking classes are \$30, \$40 and \$50 respectively.

Represent the class fees by a 3×1 matrix **F**.

Answer **F** = [1]

(b) Evaluate the matrix $\mathbf{C} = \mathbf{BF}$.

Answer **C** = [2]

(c) State what the elements of **C** represent.

Answer .....

.....[1]

[Turn over

Downloaded from SingaKids.com

(d) In September, there were a different number of participants attending baking classes.

The number of participants attending beginner classes decreased by 20%.
The number of participants attending intermediate classes increased by 10%.
The number of participants attending advanced classes tripled.

Calculate the percentage increase in the total amount of fees between the August and September classes.

Answer .....% [3]

-----End of Paper -----

Downloaded from SingaKids.com

NAVAL BASE SECONDARY SCHOOL
PRELIMINARY EXAMINATION, 2024

O

Name _____ ( ) **Class** _____

MATHEMATICS

4052/02

Paper 2

22 August 2024

Candidates answer on the Question Paper. **2 hour 15 minutes**

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number 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, glue or correction fluid.

Answer **all** questions.
The number of marks is given in brackets [ ] at the end of each question or part question.

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 total of the marks for this paper is **90**.

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.

Item	*For examiner's use*
Presentation	
Accuracy	
Units	
Total	
Parent's Signature	

This paper consists of **25** printed pages and **3** blank pages.

[Turn over

Downloaded from SingaKids.com

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 = $4\pi r^2$

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

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

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

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

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

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

Downloaded from SingaKids.com

Answer **all** the questions.

1 **(a)** Solve $\frac{x}{5}+\frac{2x-3}{4}=-6$.

Answer $x =$ ..... [2]

(b) Simplify $\frac{2(p-3q)}{10r} \div \frac{(3q-p)^2}{r}$.

Answer ..... [2]

[Turn over

Downloaded from SingaKids.com

(c) Solve the inequality $x+1 \leq \frac{7x-2}{4} < \frac{5x+19}{5}$.

Answer ..... [3]

(d) Simplify $\frac{2y^2+7y-9}{4y^2-81}$.

Answer ..... [3]

Downloaded from SingaKids.com

2 **(a)** Cheryl wants to open a fixed deposit account with either Bank *H* or Bank *L* for a period of 4 years.

The following are the promotions offered by the two banks.

Bank *H*	**Bank *L***
Fixed Deposit Account • Minimum deposit of $10 000. • For the first $10 000, earn 0.05% simple interest per annum. • For the subsequent amount, earn 0.95% simple interest per annum.	Fixed Deposit Account • No minimum amount required. • Compound interest at the rate of 0.8% per annum.

(i) Cheryl deposited $30 000 into Bank *H*.

Calculate the total amount in her account after 4 years.

Answer $..... [3]

[Turn over

Downloaded from SingaKids.com

(ii) Cheryl claimed that Bank *H* offers a better deal than Bank *L*.

Do you agree with Cheryl's claim?
Justify your conclusion with clear calculations.

Answer

.....

.....

..... [3]

(b) (i) The exchange rate between Singapore Dollars (S$) and Chinese Yuan (CNY) is S$1 = CNY5.33.

The exchange rate between Hong Kong dollars (HK$) and Singapore Dollars is HK$1 = S$0.17.

Tan is planning a trip to Hong Kong and Guangzhou.
He finds these hotel prices on a website.

Guangzhou Hotel	CNY825
Hong Kong Hotel	HK$825

By comparing the exchange rates, explain which hotel charges a cheaper rate per night.
Show your working clearly.

Answer

The ..... hotel charges a cheaper rate per night. [2]

[Turn over

Downloaded from SingaKids.com

(b) **(ii)** Tan books 4 nights in the Hong Kong hotel and 2 nights in the Guangzhou hotel. He pays using his credit card. The credit card company converts the prices to Singapore dollars and charges a fee of $k\%$ for the currency conversion.

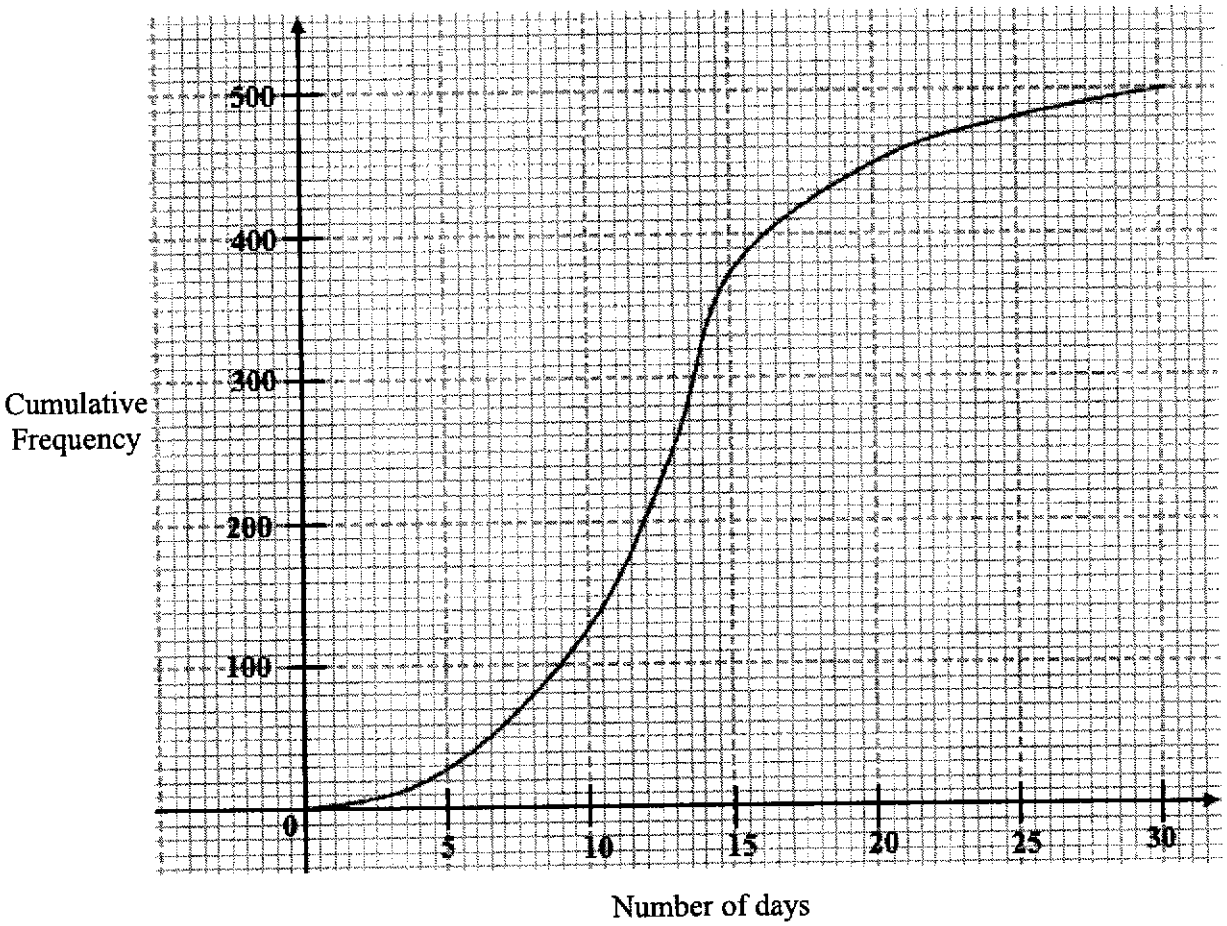
Given that the total amount Tan pays for the two hotels, including the credit card fee, is \$890, find the value of k.

Answer $k =$ ..... [4]

[Turn over

Downloaded from SingaKids.com

3 **(a)** In February 2021, a survey was carried out to find the number of days 500 patients stayed at a hospital. The graph shows the cumulative frequency curve for the data collected.



Use the curve to estimate

(i) the median number of days,

Answer ..... days [1]

(ii) the interquartile range of the number of days,

Answer ..... days [2]

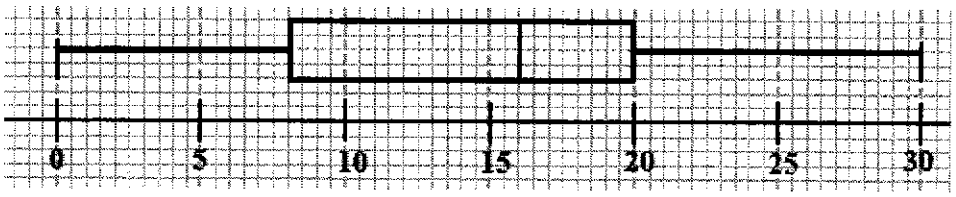
(iii) the percentage of patients who stayed more than 20 days in the hospital.

Answer ..... % [2]

[Turn over

Downloaded from SingaKids.com

(b) In February 2022, the same survey was carried out again on another 500 patients with the following result shown in the box-and-whisker plot below.



No. of days

Make two comments comparing the number of days stayed in the hospital in February 2021 and February 2022.
Use figures to support your answer.

Answer

1. .....

.....

2. .....

..... [3]

(c) One patient in **February 2021** was selected at random.

Find the probability that the patient stayed for at most 20 days.

Answer ..... [1]

(d) Two patients in **February 2022** were selected at random.

Find the probability that one of the patients stayed for at most 8 days while the other stayed for more than 8 days.

Answer ..... [2]

Downloaded from SingaKids.com

4 **(a)** Complete the table of values for $y = \frac{x^3}{5} - x^2 + 2$.

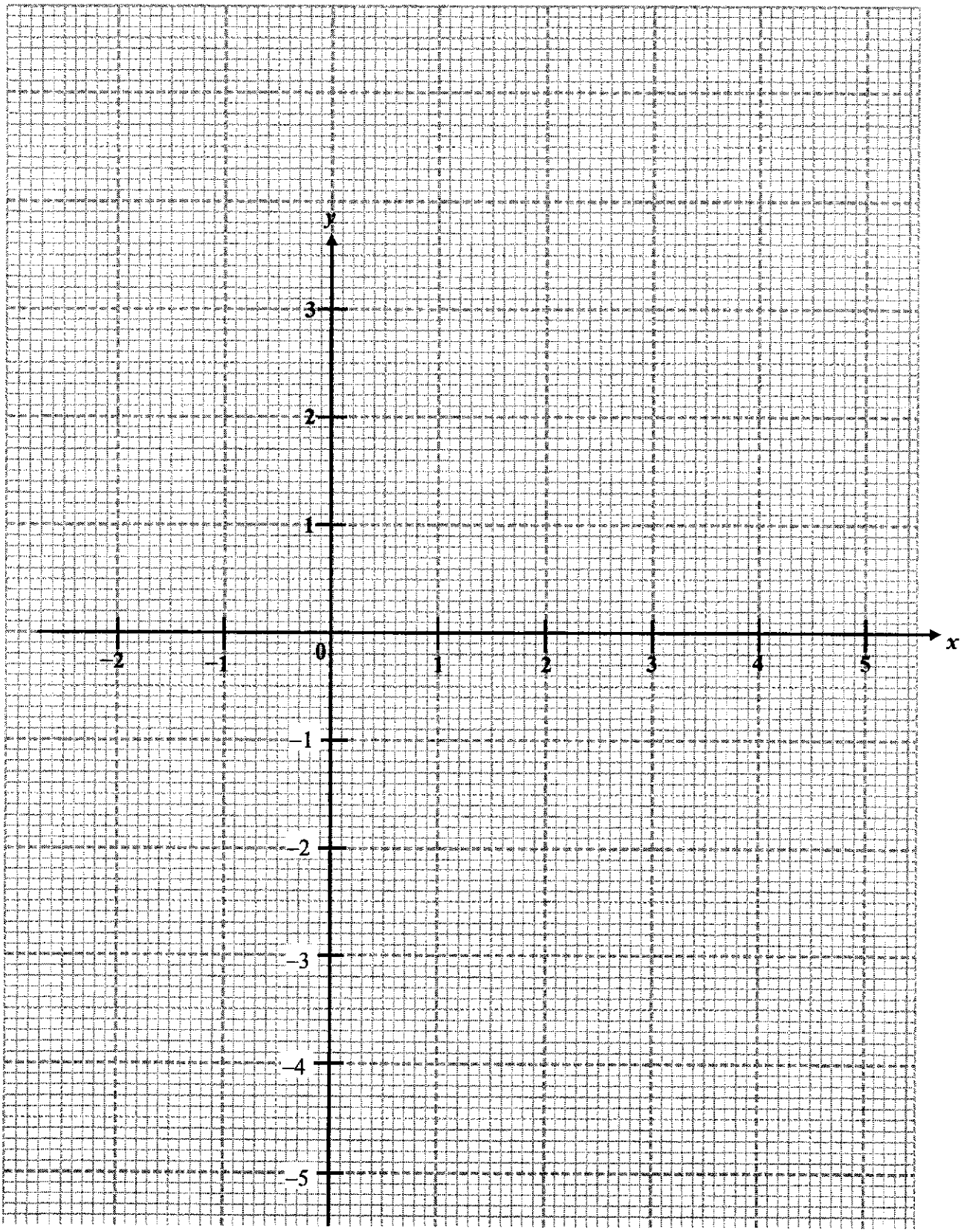
x	-2	-1	0	1	2	3	4	5
y	-3.6		2	1.2	-0.4	-1.6	-1.2	

[2]

(b) On the grid in the next page, draw the graph of $y = \frac{x^3}{5} - x^2 + 2$ for $-2 \leq x \leq 5$. [3]

Downloaded from SingaKids.com

Answer ***(b)***, ***(c)*** **and** ***(d)***



[Turn over

Downloaded from SingaKids.com

(c) By drawing a tangent, find the gradient of the curve at the point when $x = 4$.

Answer ..... [2]

(d) By drawing a suitable straight line on the grid, solve the equation $\frac{x^3}{5} - x^2 + 1 = 0$.

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

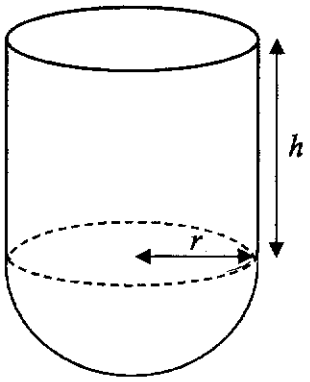
(e) "$y = k$ will always have exactly three intersections with $y = \frac{x^3}{5} - x^2 + 2$ when k is negative."

The above statement is false. Suggest a possible value of k.

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

Downloaded from SingaKids.com

5 **(a)** The diagram shows a container which consists of a cylinder of radius r cm and height h cm joined to a hemisphere of radius r cm.



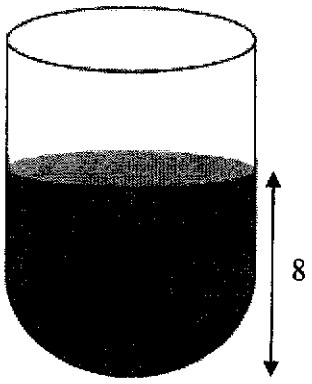
(i) Given that the ratio of the volume of the hemisphere to the volume of the cylinder is 1 : 3, show that $h = 2r$.

Answer

[2]

(ii) The container is filled with water to a depth of 8 cm.

Find an expression, in terms of π and r, for the surface area of the container that is in contact with the water.

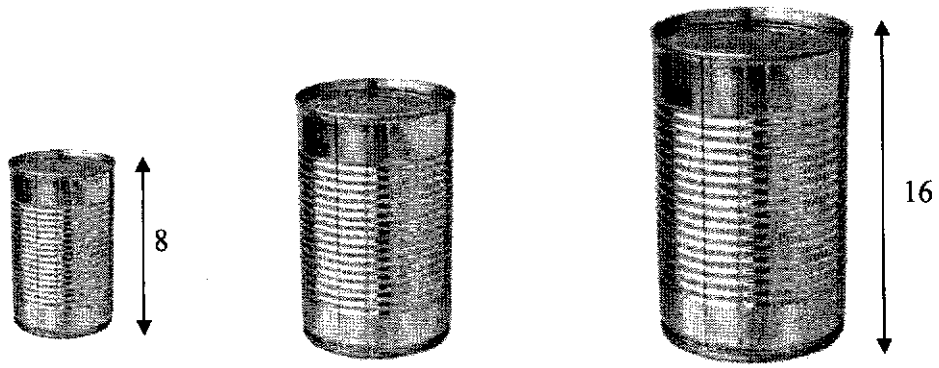


Answer ..... cm^2 [2]

[Turn over

Downloaded from SingaKids.com

(b) Three tin containers are geometrically similar.
The heights of tin container A and tin container C are 8 cm and 16 cm respectively.



Tin container ***A*** **Tin container** ***B*** **Tin container** ***C***

(i) The base area of tin container B is $\frac{25}{64}$ of the base area of tin container C.

Calculate the height of tin container B.

Answer ..... cm [2]

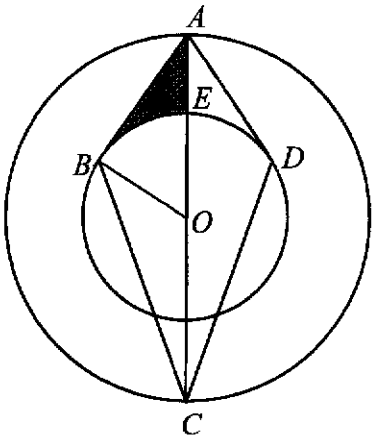
(ii) The weight of tin container C is 450 g.

Calculate the weight of tin container A.

Answer ..... g [2]

Downloaded from SingaKids.com

6 The diagram, not drawn to scale, shows two concentric circles, centre O.
AB and AD are tangents to the smaller circle at B and D respectively, centre O.
AC is the diameter of the larger circle.



(a) Show that triangle ABC is congruent to triangle ADC.
Give a reason for each statement you make.

.....

.....

.....

.....

..... [3]

(b) The radius of the larger circle is 8 cm and angle $BAO = 42.5°$.

(i) Calculate the area of triangle AOB.

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

[Turn over

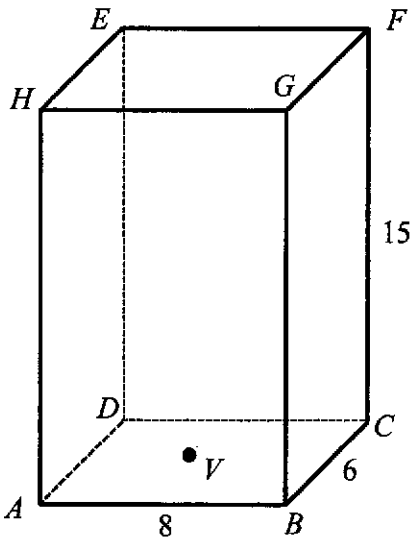
Downloaded from SingaKids.com

(ii) Calculate the area of the shaded region.

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

Downloaded from SingaKids.com

7



In the diagram, *ABCDEFGH* is a cuboid with dimensions 8 cm by 6 cm by 15 cm.
V is the centre of the rectangular base.

(a) Show that $EV = 15.8$ cm, correct to 3 significant figures.

Answer

[2]

Downloaded from SingaKids.com

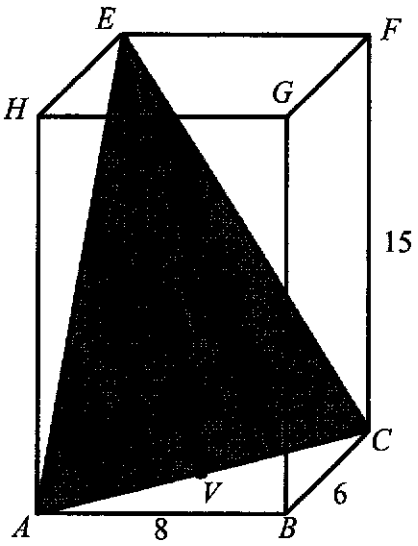
(b) Calculate angle *ACE*.

Answer ..... ° [4]

[Turn over

Downloaded from SingaKids.com

(c) A pyramid *EDAC* is cut out from the cuboid.



Find the remaining volume of the cuboid.

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

Downloaded from SingaKids.com

8 **(a)** A is the point $(1, -4)$ and B is the point $(-7, -2)$.

The point C is the result of the translation of point B by $\begin{pmatrix} 5 \\ 4 \end{pmatrix}$.

(i) Find the length of AB.

Answer ..... units [1]

(ii) Write down the column vector $\overrightarrow{AB}$.

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

(iii) Find the coordinates of point C.

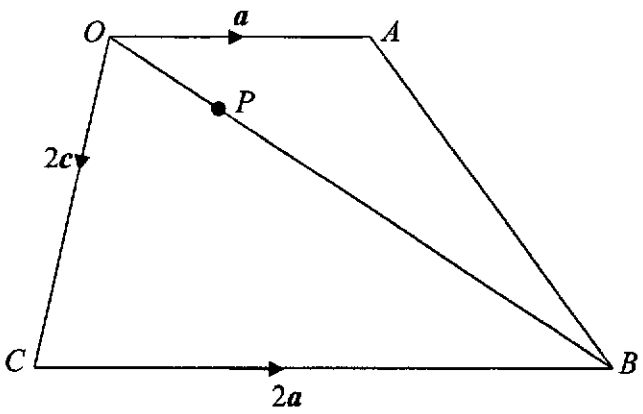
Answer (..... , ...) [1]

(iv) Find the equation of the line AC.

Answer ..... [3]

Downloaded from SingaKids.com

(b)



$OABC$ is a trapezium.
$\overrightarrow{OA} = \boldsymbol{a}$, $\overrightarrow{OC} = 2\boldsymbol{c}$ and $\overrightarrow{CB} = 2\boldsymbol{a}$.
$OP : PB = 1 : 3$.

(i) Express $\overrightarrow{OB}$ in terms of $\boldsymbol{a}$ and $\boldsymbol{c}$, as simply as possible.

Answer ..... [1]

(ii) Express $\overrightarrow{CP}$ in terms of $\boldsymbol{a}$ and $\boldsymbol{c}$, as simply as possible.

Answer ..... [2]

(iii) Explain why C, P and A do not lie on a straight line.

.....

.....

..... [2]

[Turn over

Downloaded from SingaKids.com

(iv) Write down the value of $\frac{\text{area of triangle } OBC}{\text{area of trapezium } OABC}$.

Answer ..... [1]

Downloaded from SingaKids.com

9 The table below shows the price board displayed at a petrol station on 12 April 2023.

Grade	Pump price (per litre)	Nett price (per litre)
Levo 98	\$3.41	x
Levo 95	\$2.92	\$2.77
Levo Diesel	\$2.69	\$2.55

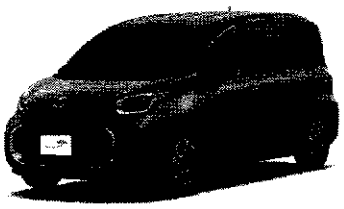
Pump price refers to the price before a discount is given, whereas nett price refers to the price after a discount is given. The discount given for the 3 grades is the same.

(a) Find the value of x.

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

Downloaded from SingaKids.com

(b) Mrs Ong always drives her car from her house in Singapore to Malacca to visit her parents.
Below is some information about her car.

Fuel tank capacity: 11.0952 gallon	
Fuel consumption: 47 miles per gallon (mpg)	

Fuel consumption is distance travelled per unit volume of fuel used.

1 mpg = 0.42554 km/ litres.
1 gallon = 3.7855 litres.

Mrs Ong decided to visit her parents during Labour Day.
She pumped a full tank of Levo 95 for the car and drove a distance of 244 km.
The tank was left with 70% of fuel in the end.

Mrs Ong made two claims:

"The fuel consumption was 47 mpg."

and

"The total discount she received would allow her to travel an extra distance of approximately 13.6 km."

Were her claims correct?
Justify your decisions and show your calculations clearly.

Answer

Downloaded from SingaKids.com

Answer

.....

..... [7]

End of Paper

Downloaded from SingaKids.com

BLANK PAGE

Downloaded from SingaKids.com

BLANK PAGE

Downloaded from SingaKids.com

28

BLANK PAGE

Downloaded from SingaKids.com

Answer Scheme
Sec 4E/5N Mathematics Preliminary Examination Paper 1, 2024

Qn	Answer	Marks	Remarks
1a	3.58	B1	
2a	$12x^2y^5$	B1	
2b	$6x-8$	B1	$3(2x-4)$ not accepted
3	$2x^3-13x^2+6x$ $=x(2x^2-13x+6)$ $=x(2x-1)(x-6)$	B1, B1	Fact. x or quadratic expression B1, B1
4	36.9° or 143.1°	B1, B1	
5a	7.75	B1	

Downloaded from SingaKids.com

BP~513

Qn	Answer	Marks	Remarks
5b	$\frac{(12\times 8)+(3+6+7+8+9+9+10+10)}{20}$ $=\frac{96+(62)}{20}$ $=\frac{158}{20}$ $=7.9$	M1 A1	
6a	$12250\times\frac{p}{q}$ $12250=2\times5^3\times7^2$ $p=7 \quad q=2$	 B1 B1, B1	
6b	$12250=2\times5^3\times 7^2$ $x=2\times5^3 \quad \times 3$ --- $\text{HCF}=250=2\times5^3$ $\therefore x=750$	 B1	
7	$81^{2x}\times9^x=27$ $(3^4)^{2x}\times(3^2)^x=3^3$ $8x+2x=3$ $x=\frac{3}{10}/0.3$ or $9^{4x}\times9^x=9^{1.5}$ $5x=1.5$ $x=0.3$ $x=\frac{3}{10}/0.3$	 M1 A1	See base 3 or base 9

Downloaded from SingaKids.com

<table>
<tr><th>Qn</th><th>Answer</th><th>Marks</th><th>Remarks</th></tr>
<tr><td>8</td><td>
Top
Perimeter = 20
length + breadth = 10
<table>
<tr><td>Paired No.</td><td>Area of top</td><td>Height</td></tr>
<tr><td>1, 9</td><td>Reject < 3</td><td></td></tr>
<tr><td>2, 8</td><td>Reject < 3</td><td></td></tr>
<tr><td>3, 7</td><td>Reject ≤ 3</td><td></td></tr>
<tr><td>4, 6</td><td>$4\times6=24$</td><td>$Height=\frac{120}{24}=5$</td></tr>
<tr><td>5, 5</td><td>Reject, cannot be same length = cube</td><td></td></tr>
</table>
Or
$120=2\times2\times2\times3\times5$
By trial and error,
Height = 5 cm
</td><td>M1

A1

M1

A1</td><td>

Prime factors</td></tr>
<tr><td>9</td><td>
$T=2\pi\sqrt{\frac{L}{g}}$
$\frac{T}{2\pi}=\sqrt{\frac{L}{g}}$
$\frac{L}{g}=\frac{T^2}{(2\pi)^2}$
$g=\frac{4\pi^2L}{T^2}$
</td><td>

M1

M1

A1</td><td>

Divide 2π

Square both sides</td></tr>
</table>

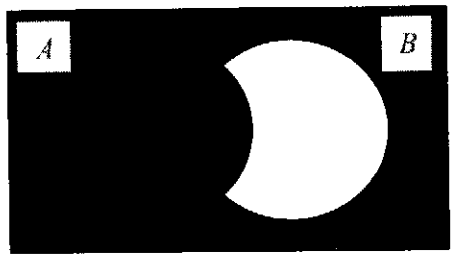
Downloaded from SingaKids.com

Qn	Answer	Marks	Remarks
10a	$310° \pm 1°$ $(309° - 311°)$	B1	
10b	See behind (Construct 5 cm radius) 4 / 4.5 / 5 *km* (Convert to km)	M1 A1	
11ai	$Mean = \frac{282}{50}$ $= 5.64$	B1	
11aii	- There is no exact data of each child's time spent on playing online games - The average for time spent on playing games is used in the calculation - The time spent is given as a range of values - The mid value average is used when calculating the mean	B1	
11b	$SD = \sqrt{\frac{1906}{50} - \left(\frac{282}{50}\right)^2}$ $= 2.51$	M1 (ecf mean) A1	Show correct substitution of each value in formula

Downloaded from SingaKids.com

Qn	Answer	Marks	Remarks
12	$\frac{x}{4}-\frac{y}{2}=2$ ---------(1) $3x=19+4y$ ---------(2) (1)×4 $x-2y=8$ $x=8+2y$ ---------(3) sub (3) into (2) $3(8+2y)=19+4y$ $24+6y=19+4y$ $y=-2.5$ $x=8+2(-2.5)$ $x=3$	M1 A1 A1	
13a	$5y(x-4)$	B1	
13bi	$A\cap B'$ $A'\cap B'$ $B'\cap(A\cup B)$	B1	

Downloaded from SingaKids.com

Qn	Answer	Marks	Remarks
13bii		B1	
14a	$1-\frac{5}{9}-\frac{2}{15}$ $=\frac{14}{45}$	B1	

Downloaded from SingaKids.com

Qn	Answer	Marks	Remarks
14b	$3\ parts --> 10+8\ balls$ $1\ part --> 6\ balls$ $2\ parts --> 12 balls$ $n = 12 - 7$ $n = 5\ balls$ **OR** $\frac{7+n}{10+7+8+n} = \frac{2}{5}$ $3n = 15$ $n = 5$ **OR** P(pick red and blue balls) $= \frac{3}{5}$ $3\ parts --> 10+8\ balls$ $1\ part --> 6\ balls$ $2\ parts --> 12 balls$ $n = 12 - 7$ $n = 5\ balls$	M1 A1	
15	$\frac{3}{5+3} \times 100\%$ $= 37.5\%$	M1 A1	

Downloaded from SingaKids.com

Qn	Answer	Marks	Remarks
16	**Method 1** $x = \frac{k}{y^2}$ $x_1 = \frac{k}{(5y)^2}$ $x_1 = \frac{k}{25y^2}$ $Percentaage\ change = \frac{\frac{k}{y^2} - \frac{k}{25y^2}}{\frac{k}{y^2}} \times 100\%$ $= \frac{1-0.04}{1} \times 100\%$ $= 96\ \%$	M1 M1 A1	

Downloaded from SingaKids.com

BP~520

Qn	Answer	Marks	Remarks
	Method 2 $k = xy^2$ $x_1 = \frac{xy^2}{(5y)^2}$ $x_1 = \frac{x}{25}$ $Percentaage\ change = \frac{x - \frac{x}{25}}{x} \times 100\%$ $= 96\ \%$	M1 M1 A1	
17a	90	B1	
17b	$L_n = (n-1) + (n-1) + 10 + n + 10$ $= 3n + 18$	B1 (See 3n) B1 (See 18)	
17c	$L_n = 3n + 18$ $= 3(n + 6)$ *shown*	B1 (no ecf)	
18a	$\tan \angle ABC = \frac{8.4}{5}$ $\angle ABC = 59.2°$ OR $AB = 9.77548$ $\angle ABC = \sin^{-1}(\frac{8.4}{9.77548})$ $\angle ABC = 59.2°$	M1 A1	

Downloaded from SingaKids.com

Qn	Answer	Marks	Remarks
18b	$\sin 48° = \frac{8.4}{AD}$ $AD = 11.3$	M1 A1	
19	$x^2 + 5x - 16 = 0$ $(x+2.5)^2 - (2.5)^2 = 16$ $(x+2.5)^2 = 6.25 + 16$ $(x+2.5)^2 = 22.25$ $x + 2.5 = \pm\sqrt{22.25}$ $x = -2.5 \pm \sqrt{22.25}$ $x = 2.22$ *or* -7.22	M1 M1 A1, A1	See completing the sq Sq rt
20a	$\sin \angle AXC = \frac{3}{5}$ $BX = 4$ $\tan \angle AXB = \frac{3}{4}$	M1 A1	
20b	$\tan \angle ACB = \frac{3}{4+2}$ $= \frac{1}{2}$	M1 A1	

Downloaded from SingaKids.com

Qn	Answer	Marks	Remarks
21	Polygon Q interior $\angle(Q) = 180° - 18°$ $= 162°$ sum of interior $\angle$ hexagon (P) $= (6-2) \times 180°$ $= 720°$ $162° + 162 + a + b + c + d + e + f + 720° = 360° \times 6$ $a + b + c + d + e + f + 1044° = 2160°$ $a + b + c + d + e + f = 1116°$	M1 M1 M1 A1	Int. angle for Q Int. angle for P
22a	Reflex $\angle AOC = 360° - 4x°$ (Angles at a point) $\angle ABC = \frac{360° - 4x°}{2}$ (Angle at centre = twice angle at circum) $= 180° - 2x°$	M1 A1	
22b	$\angle BAC = 180 - x° - (180° - 2x°)$ (Sum of angles in a tri.) $= x°$ $\angle BAE = 90° - (90° - 2x°) - x°$ (rad $\perp$ tan) $= x°$	M1 A1	
23a	$N = v \times 0.9^{2t}$ $81\,000 = v \times 0.9^2$ $v = 100\,000$	B1	

Downloaded from SingaKids.com

Qn	Answer	Marks	Remarks
23b	$N = v \times 0.9^{2t}$ $N = v \times 0.81^{t}$ $N = kv$ $k = \frac{N}{v}$ *or* $k = 100\,000k$	B1	
23c	At t = 2 hours $N = 100\,000 \times 0.9^{2(2)}$ $N = 65\,610$ Percentage decrease $= \frac{100\,000 - 65610}{100\,000} \times 100\%$ $= 34.39\%$	M1 A1	ecf 100 000
23d	Diagram **4**	B1	
24a	$\frac{1}{b} : \frac{1}{a}$ and $3a : 3b$	-1 (1 incorrect) -2 (2 or more incorrect)	

Downloaded from SingaKids.com

Qn	Answer	Marks	Remarks
24b	$J : S$ $6 : 2$ (multiple 7) $42 : 14$	M1	
	$J : S$ $2 : 5$ (multiple 8) $16 : 40$	M1	
	Difference in John's units $= 42 - 16$ $= 26$		
	26 *units* $\dashrightarrow$ \$13	M1	
	1 *unit* $\dashrightarrow$ \$0.5		
	16 *units* $\dashrightarrow 16 \times \$0.5 = \$8$	A1	
	OR		
	$\frac{6x-13}{2x+13} = \frac{2}{5}$ $x = 3.5$ $6x - 13$ $= 6(3.5) - 13$ $= 8$		

Downloaded from SingaKids.com

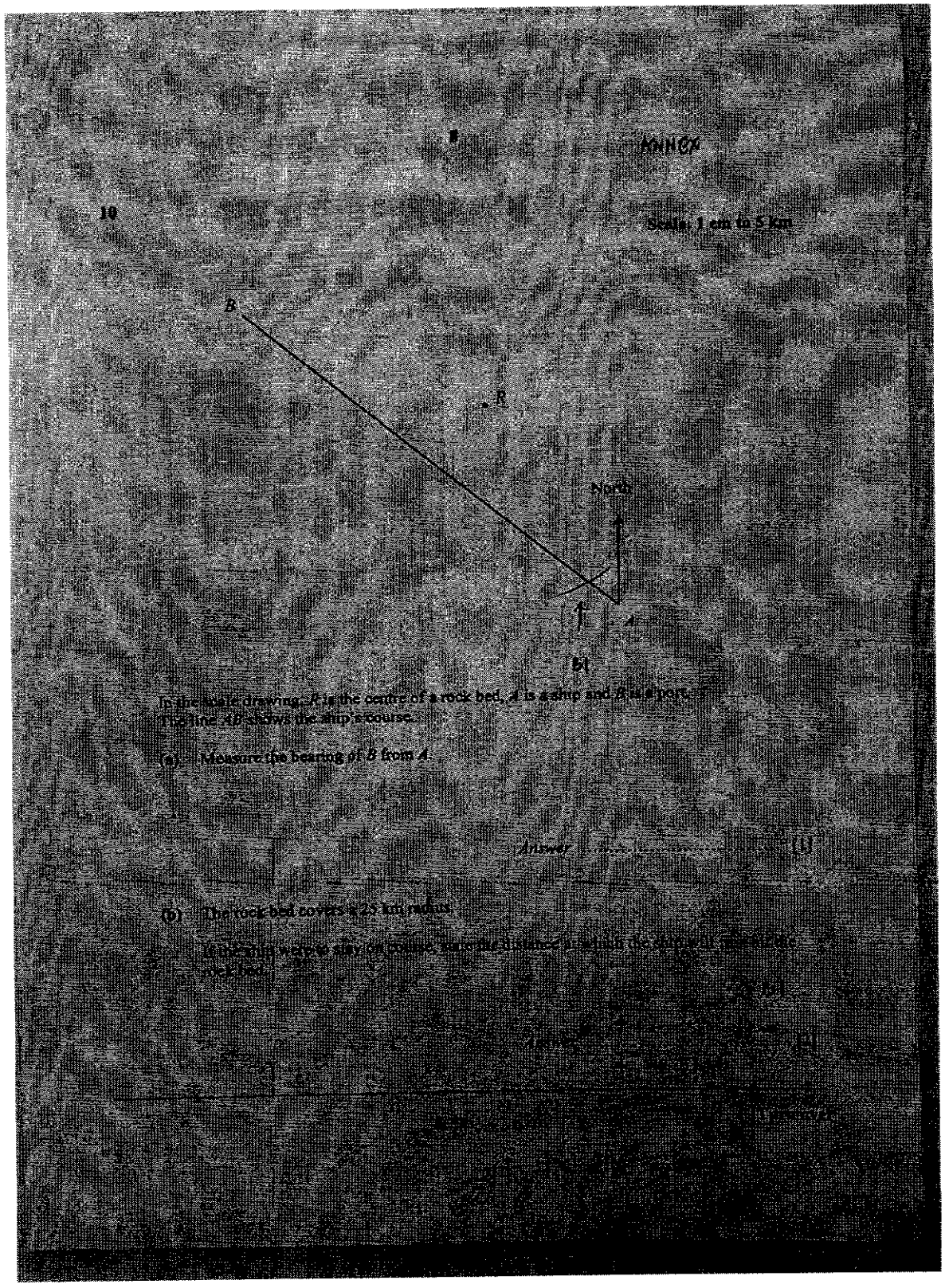
Qn	Answer	Marks	Remarks
25a	**Method 1** $\angle DEF = \angle FEC = x°$ (FE bisects $\angle DEC$) $\angle DEF = \angle EFC = x°$ (Alt $\angle$, DE // BC) $\angle ECF = 180° - x° - x°$ (Angles in a str. line) $= 180° - 2x°$	M1 A1	State angle EFC = x
	Method 2 $\angle DEF = \angle FEC = x°$ (FE bisects $\angle DEC$) $\angle ECF = 180° - 2x°$ (int. $\angle$, DE //BC)	M1 A1	State angle EFC = x
25b	$\angle DAE = \angle FEC = x°$ (Corresp. $\angle$, FE//DA) $\angle ABF = \angle ADE = \angle EFC = x°$ (Corresponding angle) $\angle AED = \angle ECF = 180° - 2x°$ (interior angle) Triangle $\angle AED$ is similar triangle $\angle ECF$ (AA similarity test)	M1, M1, A1	Any two reason stated State sim. test
	Additional Working $\angle AED = 180° - 2x°$ (Angles in a str. line) $\angle DEF = \angle DBF = x°$ (Opp. $\angle$,in a parallelogram) $\angle DBF = \angle ADE = x°$ (Corresp. $\angle$,DE//BF) $\angle DAE = \angle FEC = x°$ (Corresp. $\angle$,FE//DA)		
25c	**ACB**	B1	
26a	$\mathbf{F} = \begin{pmatrix} 30 \\ 40 \\ 50 \end{pmatrix}$	B1	

Downloaded from SingaKids.com

Qn	Answer	Marks	Remarks
26b	$C = \begin{pmatrix} 22 & 20 & 9 \\ 8 & 10 & 11 \end{pmatrix} \begin{pmatrix} 30 \\ 40 \\ 50 \end{pmatrix}$ $C = \begin{pmatrix} 1910 \\ 1190 \end{pmatrix}$	B1, B1	B1 for 1 correct element
26c	- **1910** represents the **total fees** for beginner, intermediate and advanced classes on **weekdays**. - **1190** represents the **total fees** for beginner, intermediate and advanced classes on **weekends**.	B1	
26d	Participants in September $Beginner = (22+8) \times 0.8 = 24$ $Intermediate = (20+10) \times 1.1 = 33$ $Advanced = (20) \times 3 = 60$ $Total\ fees\ for\ September = (24 \times 30) + (33 \times 40) + (60 \times 50)$ $= 5040$ $Perecentage\ increase = \frac{5040 - 3100}{3100} \times 100\%$ $= 62.6\%$ *or* $62\frac{18}{31}\%$	M1 M1 A1	See total fees for Sept
	Total	**90**	

Downloaded from SingaKids.com

19



In the scale drawing, R is the centre of a rock bed, A is a ship and B is a port. The line AB shows the ship's course.

(a) Measure the bearing of B from A.

Answer ..... [1]

(b) The rock bed covers a 2.5 km radius.

If the ship keeps stay on course, state the distance it will be from the centre of the rock bed.

Answer ..... [1]

Downloaded from SingaKids.com

NAVAL BASE SECONDARY SCHOOL
PRELIMINARY EXAMINATION, 2024
Paper 2
Marking Scheme

Qns	Solution	Marking Scheme	Remarks
1(a)	$\frac{x}{5}+\frac{2x-3}{4}=-6$ $\frac{4x+5(2x-3)}{20}=-6$ $4x+10x-15=-120$ $14x=-120+15$ $14x=-105$ $x=-7.5$	M1 A1	
1(b)	$\frac{2(p-3q)}{10r}\div\frac{(3q-p)^2}{r}$ $=\frac{2(p-3q)}{10r}\times\frac{r}{(3q-p)^2}$ $=\frac{2(p-3q)}{10r}\times\frac{r}{(p-3q)^2}$ $=\frac{1}{5(p-3q)}$ or $\frac{-1}{5(3q-p)}$ or $\frac{-1}{15q-5p}$	M1 A1	

Downloaded from SingaKids.com

BP~529

1(c)	**Method 1:** $x+1 \le \frac{7x-2}{4} < \frac{5x+19}{5}$ $x+1 \le \frac{7x-2}{4}$ and $\frac{7x-2}{4} < \frac{5x+19}{5}$ $4(x+1) \le 7x-2$ $\quad$ $5(7x-2) < 4(5x+19)$ $4x+4 \le 7x-2$ $\quad$ $35x-10 < 20x+76$ $-3x \le -6$ $\quad$ $35x-20x < 76+10$ $x \ge 2$ $\quad$ $15x < 86$ $x < 5\frac{11}{15}$ $\therefore 2 \le x < 5\frac{11}{15}$ or $2 \le x < \frac{86}{15}$ **OR**	M1 --- $x \ge 2$ M1 --- $x < 5\frac{11}{15}$ A1 --- $2 \le x < 5\frac{11}{15}$	Deduct 1m for $2 \le x < 5.73$ No marks given for $5\frac{11}{15} > x \ge 2$

Downloaded from SingaKids.com

BP~530

	Method 2: $x+1 \le \frac{7x-2}{4} < \frac{5x+19}{5}$ $20(x+1) \le 5(7x-2) < 4(5x+19)$ $20x+20 \le 35x-10 < 20x+76$ $20x+30 \le 35x < 20x+86$ $30 \le 15x < 86$ $2 \le x < 5\frac{11}{15}$ or $2 \le x < \frac{86}{15}$	M1 M1 A1	
1(d)	$\frac{2y^2+7y-9}{4y^2-81}$ $= \frac{(2y+9)(y-1)}{(2y+9)(2y-9)}$ $= \frac{y-1}{2y-9}$	M1 --- correct numerator M1 --- correct denominator A1 [10]	Deduct 1m for changing y to x: $\frac{(2x+9)(x-1)}{(2x+9)(2x-9)} = \frac{x-1}{2x-9}$
2(a)(i)	First \$10 000: Interest = $\frac{10000 \times 4 \times 0.05}{100}$ = \$20 Next \$20 000: Interest = $\frac{20000 \times 4 \times 0.95}{100}$ = \$760 Total amount = \$30 000 + \$20 + \$760 = \$30 780	M1 M1 A1	

Downloaded from SingaKids.com

2(a)(ii)	Bank L: Total amount $= 30000\left(1+\frac{0.8}{100}\right)^4$ $= \$30\,971.58$ Since the total amount in Bank L > total amount of Bank H after 4 years, I <u>disagree</u> with Cheryl's claim.	M1 A1 A1	If 2a(i) or 2a(ii) wrong, no marks given for correct conclusion.

Downloaded from SingaKids.com

2(b)(i)	**Hong Kong Hotel:** HK$1 = S$0.17 HK$825 = S$(825 x 0.17) = S$140.25 **Guangzhou Hotel:** S$1 = CNY$5.33 CNY$825 = $S\$\frac{825}{5.33}$ =S$154.78 The Hong Kong hotel charges a cheaper rate per night. **OR** HK$1 = S$0.17 S$1 = $HK\$\frac{1}{0.17}$ =HK$5.8823 Since S$1 can get HK$5.8823, by comparison with S$1 = CNY$5.33, CNY$ is stronger than HK$. Thus the Hong Kong hotel charges a cheaper rate per night.	M1 (either $140.25 or $154.78) A1 M1 A1	
2(b)(ii)	Total cost $= (4\times825\times0.17)+(2\times825\times\frac{1}{5.33})$ =561 + 309.5684 = S$870.5684 $k=\frac{890-870.5684}{870.5684}\times100$ $k=2.23\%(3s.f)$	M2 – Total cost in SGD M1 A1 [12]	
3(a)(i)	13	B1	

Downloaded from SingaKids.com

3(a)(ii)	Interquartile range $= 15 - 10$ $= 5$	M1 A1	
3(a) (iii)	Percentage $= \frac{500-450}{500} \times 100$ $= 10\%$	M1 A1	
3(b)	Median in February 2021 = 13 is less than median in February 2022 = 16. Hence, the patients generally **stayed longer in February 2022.** Interquartile range in Feb 2021 = 5 is less than interquartile range of Feb 2022 = 12. Hence, the **number of days stayed** in **February 2022 is generally less consistent/more wide spread**.	B1 B1 B1 – state the figures correctly	If IQR in 3a(ii) wrong, answer will be wrong. Need to state the figures on the answer line.
3(c)	$\frac{450}{500} = \frac{9}{10}$	B1	
3(d)	Probability $= \left(\frac{125}{500} \times \frac{500-125}{499}\right) + \left(\frac{500-125}{500} \times \frac{125}{499}\right)$ $= \frac{375}{998}$	M1 A1 [11]	1m given for either of the fractions is correct.
4(a)		B2 (B1 for each correct value)	

x	-2	-1	0	1	2	3	4	5
y	-3.6	**0.8**	2	1.2	-0.4	-1.6	-1.2	**2**

Downloaded from SingaKids.com

4(b)	Refer to the graph.	P2 - Plotting of correct points (P1 for at most 2 points plotted incorrectly). C1 - Smooth curve.	
4(c)	Refer to graph for tangent drawn. Using (3, – 2.8) and (5, 0.4), Gradient $= \frac{0.4-(-2.8)}{5-3}$ $= 1.6$ (Accept 1.1 to 2.2)	B1 – tangent drawn B1	
4(d)	$\frac{x^3}{5} - x^2 + 2 = 1$ Refer to graph for $y = 1$ drawn. Using the graph, $x = -0.9$ (accept – 0.8 to –1.0) or $x = 1.1$ (accept 1.0 to 1.2) or $x = 4.75$ (accept 4.6 to 4.9)	B1 - For drawing of $y = 1$. } B1 B1	
4(e)	True: 3 intersections - $-1.7 < k < 0$ False: $k < -1.7$ Accept all negative values	B1 [11]	
5(a)(i)	$3(\frac{2}{3}\pi r^3) = \pi r^2 h$ $2\pi r^3 = \pi r^2 h$ $2r = h$ (shown)	M1 A1	

Downloaded from SingaKids.com

BP~535

5(a) (ii)	$2\pi r^2 + 2\pi r(8-r)$ $= 2\pi r^2 + 16\pi r - 2\pi r^2$ $= 16\pi r$	M1 for either $2\pi r^2$ or $2\pi r(8-r)$ seen A1	
5(b)(i)	$\frac{h_B}{h_C} = \sqrt{\frac{25}{64}}$ $\frac{h_B}{16} = \frac{5}{8}$ $h_B = \frac{5}{8} \times 16$ $h_B = 10$	M1 – Square root A1	
5(b) (ii)	$\frac{V_A}{V_C} = \left(\frac{8}{16}\right)^3$ $\frac{V_A}{450} = \frac{1}{8}$ $V_A = \frac{1}{8} \times 450$ $V_A = 56.25g$	M1 - $\left(\frac{8}{16}\right)^3$ OR $\left(\frac{1}{2}\right)^3$ seen A1 [8]	
6(a)	$AB = AD$ (tangents drawn from ext. point) angle BAC = angle DAC (tangents drawn from ext. point) AC is a common side. $\Delta ABC \equiv \Delta ADC$ (SAS)	M1 (for only 1 condition) M2 (for all 3 conditions) A1	

Downloaded from SingaKids.com

6(b)(i)	$\angle ABO = 90^o$ $AB = 8\cos 42.5$ $AB = 5.8982186cm$ Area of triangle $= \frac{1}{2} \times 8 \times 5.8982186 \sin 42.5$ $= 15.93911$ $= 15.9$ cm^2 (3s.f) **OR** $OB = 8\sin 42.5$ $OB = 5.40472$ Area of triangle $= \frac{1}{2} \times AB \times OB$ $= \frac{1}{2} \times 5.8982186 \times 5.40472$ $= 15.9cm^2$	M1 (for either AB or OB) M1 A1 M1 (for either AB or OB) M1 A1	
6(b)(ii)	$\angle AOB = 180 - 90 - 42.5 = 47.5^o$ $\angle ABO = 90^o$ $OB = 8\sin 42.5$ $OB = 5.404721cm$ Area of sector OBE	**OR** $OB = \sqrt{8^2 - 5.8982186^2}$ $OB = 5.404721cm$ [M1] M1 (allow e.c.f)	

Downloaded from SingaKids.com

	$=\frac{47.5}{360}\times\pi\times5.404721^2$ $=12.10842$ $=12.1cm^2$ Area of shaded region = 15.93911 – 12.10842 = 3.83 cm^2 (3 s.f.)	M1 (allow e.c.f) A1 [9]	
7(a)	$DV = VB$ $=\frac{1}{2}\sqrt{6^2+8^2}$ $=5$ cm EV $=\sqrt{15^2+5^2}$ $=\sqrt{250}$ $=15.8113883008$ cm =15.8 cm (3s.f) (shown)	M1 A1	
7(b)	EC $=\sqrt{15^2+8^2}$ $=17$ cm **If EV = 15.8 cm** $\cos\angle ACE = \cos\angle VCE$	M1 M1	

Downloaded from SingaKids.com

7(b)	$15.8^2 = 17^2 + 5^2 - 2(17)(5)\cos\angle VCE$ $-64.36 = -170\cos\angle VCE$ $\angle VCE = \cos^{-1}\frac{64.36}{170}$ $\angle VCE = 67.75373$ $\angle VCE = 67.8^o$ (1d.p) **If $EV = \sqrt{250}$ cm** $\cos\angle ACE = \cos\angle VCE$ $\left(\sqrt{250}\right)^2 = 17^2 + 5^2 - 2(17)(5)\cos\angle VCE$ M1 $-64 = -170\cos\angle VCE$ $\angle VCE = \cos^{-1}\frac{64}{170}$ M1 $\angle VCE = 67.88476$ $\angle VCE = 67.9^o$ (1d.p) A1 **OR** In ΔAEC, $EC = \sqrt{15^2 + 8^2}$ $=17$ cm $AE = \sqrt{15^2 + 6^2}$ $=\sqrt{261}$ cm	M1 A1 M1 --- any 2 lengths correct (EC, AE or AC)	

Downloaded from SingaKids.com

BP~539

	$AC=\sqrt{8^2+6^2}$ $=10$ cm Using cosine rule, $\left(\sqrt{261}\right)^2=10^2+17^2-2(10)(17)\cos\angle ACE$ $\cos\angle ACE=\frac{128}{340}$ $\angle ACE=\cos^{-1}\left(\frac{128}{340}\right)$ $\angle ACE=67.88^o$ $\angle ACE=67.9^o$ (1d.p)	M1 M1 A1	
7(c)	Volume of cuboid $=8\times6\times15$ $=720cm^3$ Volume of pyramid $=\frac{1}{3}\times\left(\frac{1}{2}\times6\times8\right)\times15$ $=120cm^3$ Remaining volume of the cuboid $=720-120$ $=600$ cm^3	 M1 M1 A1	
8(a)(i)	Length of AB		

Downloaded from SingaKids.com

	$=\sqrt{(1-(-7))^2+(-4-(-2))^2}$ $=\sqrt{8^2+(-2)^2}$ $=8.25 units^2$ (3s.f)	B1	
8(a)(ii)	$\overrightarrow{OA}=\begin{pmatrix}1\\-4\end{pmatrix}, \overrightarrow{OB}=\begin{pmatrix}-7\\-2\end{pmatrix}$ $\overrightarrow{AB}=\overrightarrow{AO}+\overrightarrow{OB}$ $\overrightarrow{AB}=-\begin{pmatrix}1\\-4\end{pmatrix}+\begin{pmatrix}-7\\-2\end{pmatrix}$ $\overrightarrow{AB}=\begin{pmatrix}-8\\2\end{pmatrix}$	B1	
8(a)(iii)	$\overrightarrow{OC}=\begin{pmatrix}-7\\-2\end{pmatrix}+\begin{pmatrix}5\\4\end{pmatrix}$ $\overrightarrow{OC}=\begin{pmatrix}-2\\2\end{pmatrix}$ $C(-2, 2)$	B1	
8(a)(iv)	Gradient $=\frac{-4-2}{1-(-2)}$ $=-2$ Subst $(1, -4)$	M1 (allow e.c.f (a)(iii)) M1	

Downloaded from SingaKids.com

	$y=-2x+c$ $-4=-2(1)+c$ $c=-2$ Equation of line: $y=-2x-2$	A1	
8(b)(i)	$\overrightarrow{OB}=2\underset{\sim}{c}+2\underset{\sim}{a}$ **OR** $\overrightarrow{OB}=2\underset{\sim}{a}+2\underset{\sim}{c}$ **OR** $\overrightarrow{OB}=2(\underset{\sim}{a}+\underset{\sim}{c})$	B1	
8(b)(ii)	$\overrightarrow{OP}=\frac{1}{4}\overrightarrow{OB}$ $\overrightarrow{OP}=\frac{1}{4}(2\underset{\sim}{c}+2\underset{\sim}{a})$ $\overrightarrow{CP}=\overrightarrow{CO}+\overrightarrow{OP}$ $\overrightarrow{CP}=-2\underset{\sim}{c}+\frac{1}{4}(2\underset{\sim}{c}+2\underset{\sim}{a})$ $\overrightarrow{CP}=-\frac{3}{2}\underset{\sim}{c}+\frac{1}{2}\underset{\sim}{a}$ OR $\overrightarrow{CP}=\frac{1}{2}\underset{\sim}{a}-\frac{3}{2}\underset{\sim}{c}$ **OR** $\overrightarrow{CP}=\overrightarrow{CB}+\overrightarrow{BP}$ $\overrightarrow{CP}=2\underset{\sim}{a}-\frac{3}{4}(2\underset{\sim}{c}+2\underset{\sim}{a})$ $\overrightarrow{CP}=-\frac{3}{2}\underset{\sim}{c}+\frac{1}{2}\underset{\sim}{a}$	M1 A1 M1 A1	
8(b)(iii)	$\overrightarrow{CA}=-2\underset{\sim}{c}+\underset{\sim}{a}$ **OR** $\overrightarrow{PA}=\overrightarrow{PO}+\overrightarrow{OA}$ $\overrightarrow{PA}=-\frac{1}{2}\underset{\sim}{c}-\frac{1}{2}\underset{\sim}{a}+\underset{\sim}{a}$ $\overrightarrow{PA}=\frac{1}{2}\underset{\sim}{a}-\frac{1}{2}\underset{\sim}{c}=\frac{1}{2}(\underset{\sim}{a}-\underset{\sim}{c})$	M1	If $\overrightarrow{CP}$ is wrong, then no A1 mark.

Downloaded from SingaKids.com

	$\overrightarrow{CP} = -\frac{3}{2}\underset{\sim}{c} + \frac{1}{2}\underset{\sim}{a}$ $\overrightarrow{CP} = \frac{1}{2}(-3\underset{\sim}{c} + \underset{\sim}{a})$ Since $\overrightarrow{CA} \neq k\overrightarrow{CP}$, C, P and A do not lie on a straight line.	A1	
8(b)(iv)	$\frac{2}{3}$	B1 [12]	
9(a)	$x = \frac{3.41}{2.92} \times 2.77$ $= \$3.234$ $= \$3.23$ (2d.p) **OR** $x = \frac{3.41}{2.69} \times 2.55$ $= \$3.232$ $= \$3.23$ (2d.p)	B1	Accept 3.26 and 3.27 as answers.
9(b)	Fuel consumption of car $= 47 \times 0.42554$ $= 20.00038 km / l$ Fuel tank capacity	M1 (either fuel consumption of car or fuel tank capacity is correct)	

Downloaded from SingaKids.com

	$=11.0952\times3.7855$ $=42.0008796l$ Amount of fuel used $=30\%\times42.0008796$ $=12.60026388l$ Fuel consumption $=\frac{244}{12.60026388}$ $=19.364km/l$ $=19.4km/l$ (3s.f) $<20.00038km/l$ Since fuel consumption is lesser, Mrs Ong claim for fuel consumption was incorrect. Total discount $=(\$2.92-\$2.77)\times12.60026388$ $=\$1.890039582$ Extra amount of fuel $=\frac{1.890039582}{2.77}$ $=0.682324758l$ Extra distance **Alternative solution:** Fuel consumption $=\frac{19.364}{0.42554}$ $=45.5$ mpg <47mpg	M1 A1 M1 M1	

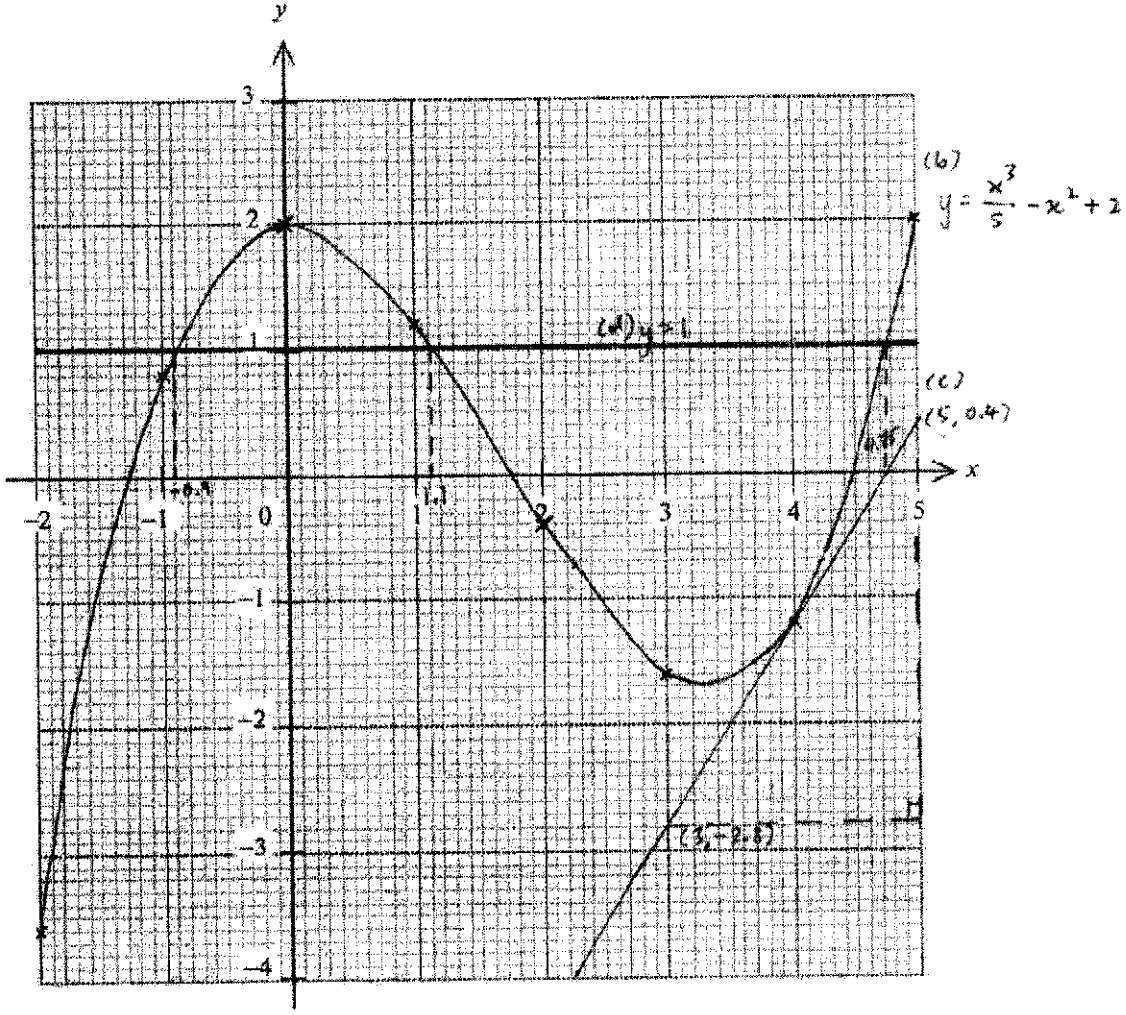
Downloaded from SingaKids.com

	$=20.00038\times0.682324758$ $=13.64675$ $=13.6km$ (3s.f) Mrs Ong claim for the extra distance was correct. **OR** Total discount $=(\$2.92-\$2.77)\times42.0008796$ $=\$6.30013194$ Extra amount of fuel $=\frac{6.30013194}{2.77}$ $=2.2744158l$ Extra distance $=20.00038\times2.2744158$ $=45.489$ $=45.5km$ (3s.f) Mrs Ong claim for the extra distance was incorrect.	M1 A1 [8] M1 M1 M1 A1	
	Total	**90 marks**	

Downloaded from SingaKids.com

NAVAL BASE SECONDARY SCHOOL
PRELIMINARY EXAMINATION, 2024
Paper 2
Marking Scheme

Q4(b)



Downloaded from SingaKids.com

BP~546