PEICAI SECONDARY SCHOOL
SECONDARY 2 EXPRESS
END-OF-YEAR EXAMINATION 2018

CANDIDATE NAME

CLASS | REGISTER NUMBER

MATHEMATICS **4048/01**

Paper 1 **9 October 2018**

1 hours 30 minutes

Candidates answer on Question Paper

READ THESE INSTRUCTIONS FIRST

Write your register number, class and name on all the work you hand in.
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Answer **all** questions.
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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 60.

	ANnotations	**AC**curacy	**U**nits
Marks Deducted	3	1	1

For Examiner's Use

This document consists of **16** printed pages.

Setter: Mrs Ho Thuk Lan

[Turn over

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 = $\frac{1}{3}\pi r^2 h$

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Answer **all** questions

1 **(a)** Simplify $7(3x-2)+4$.

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

(b) Factorise $9x-3xy$.

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

---

2 Factorise completely $5pm+15qr-25pr-3qm$.

Answer ..... [2]

[Turn over

3 Simplify $\frac{7x}{2} - \frac{3(4-2x)}{5}$.

Answer ..... [2]

---

4 Lai Peng bought a watch for \$138.
She sold it for a profit of 140% of the cost price.
Calculate the selling price.

Answer \$..... [2]

---

5 4, 9, 14, 19, 24

(a) Find an algebraic expression for the nth term in the sequence.

Answer ..... [1]

(b) Show that 649 is a term in the sequence.

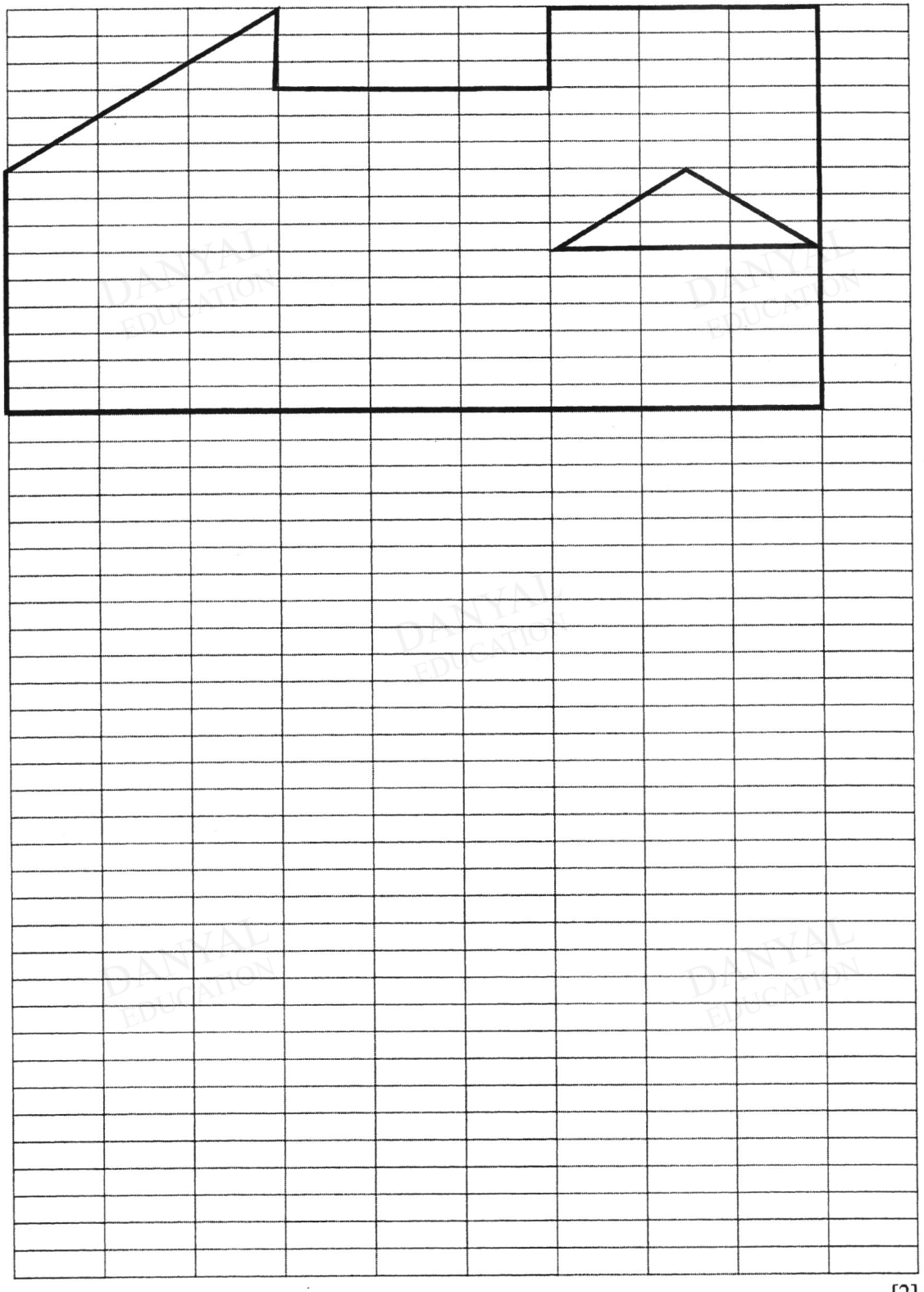
Answer

[1]

[Turn over

6 The digram shows a sketch of the side view of a house.

Using a scale factor of $\frac{1}{3}$, draw the reduction of the sketch in the grid below.



[2]

7 y is inversely proportional to $(x+2)$.

(a) It is given that $y = 4$ when $x = 3$, find the formula connecting y and x.

Answer ..... [2]

(b) Hence find the value of x when $y = 5$.

Answer x = ... [1]

8 Written as a product of its prime factors, $360 = 2^3 \times 3^2 \times 5$.

(a) Write 108 as the product of its prime factors.

Answer ..... [1]

(b) Find the lowest common multiple of 108 and 360.
Give your answer as the product of its prime factors.

Answer ..... [1]

(c) Find the smallest integer k such that $360k$ is a cube number.

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

9 Mr Koh is using a ladder which is 6m long.

He puts it against a wall so that the bottom of the ladder is 1.1m from the wall.

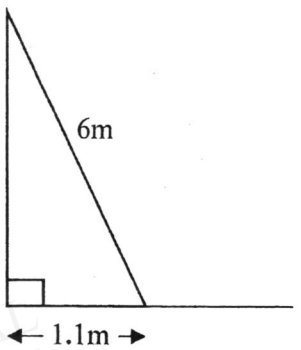


Diagram not drawn to scale

The safe working angle for a ladder is between 74° to 77° to the horizontal.

Is the ladder in a safe position for Mr Koh to use?

Show your working on which you base your decision.

Answer

[3]

10 A box contains 22 pens, n of which are red, $(n - 1)$ are blue and the rest are green.

A pen is chosen at random from the box.

(a) Write down, in terms of n, the probability that the pen is green.

Answer ..... [2]

(b) If the probability of choosing a green pen is $\frac{1}{2}$, find the number of blue pens.

Answer ..... [2]

11 (a) On the grid, draw and label the line of

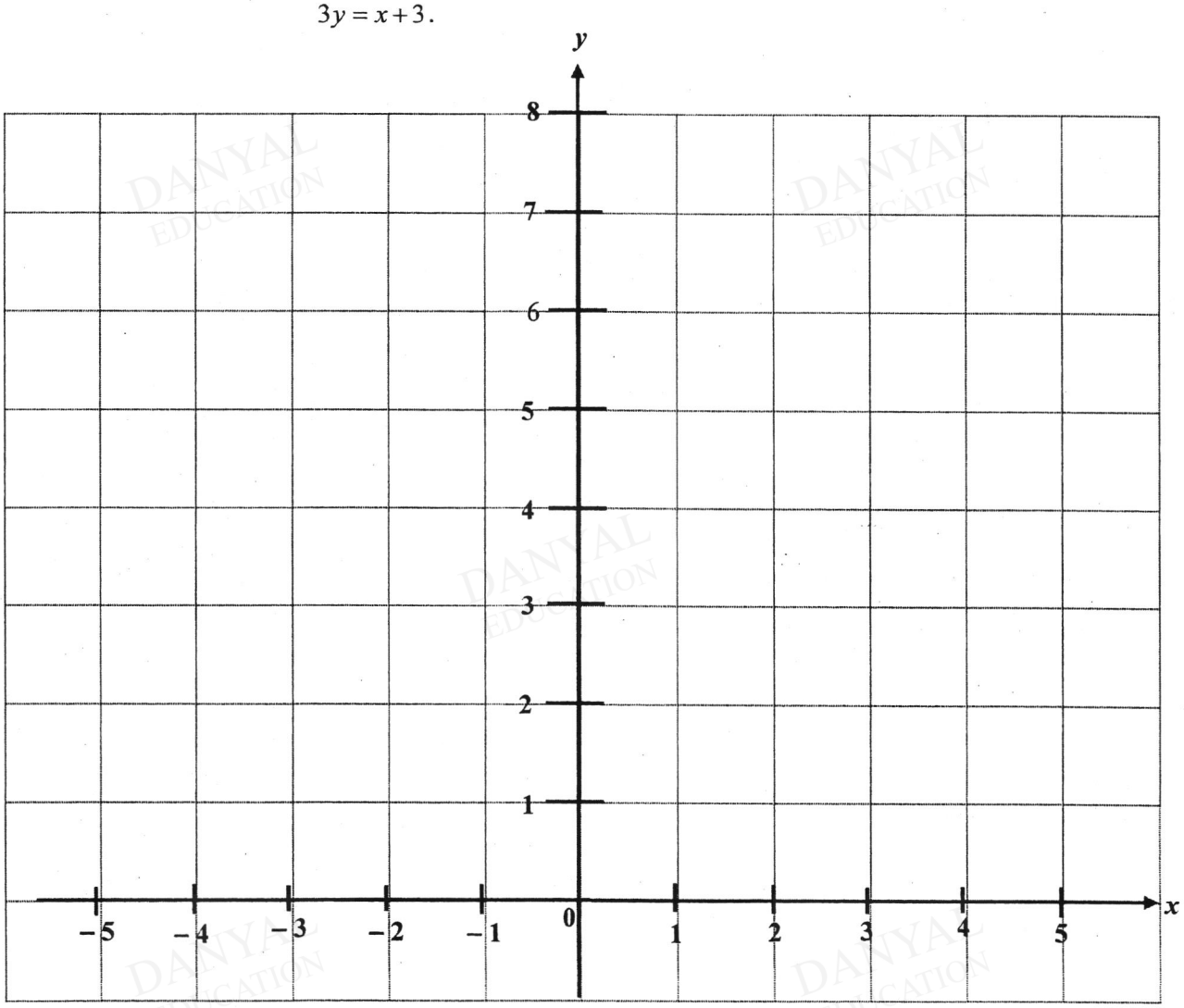
(i) $y+2x=8$, [1]

(ii) $3y=x+3$. [1]

(b) Hence, solve the simultaneous equations

$y+2x=8$,

$3y=x+3$.



Answer x = ... [1]

y = ... [1]

12 The stem-and-leaf diagram shows the heights, in cm, of a group of students.

9	1	3	5	6	8	
10	0	0	4	5	8	9
11	2	2	2	6	7	
12	0	1				
13	5	9				

Key: 13 | 5 Represents 135 cm

For the heights, find

(a) the modal height,

Answer ..... cm [1]

(b) the range,

Answer ..... cm [1]

(c) the median height,

Answer ..... cm [1]

(d) the mean height.

Answer ..... cm [2]

13 **(a)** Miss Loh has a map drawn to a scale 1: 150 000.
The distance on the map between Changi international airport and the city centre is 5.5 cm.
Calculate the actual distance, in kilometres, between Change international airport and the city.

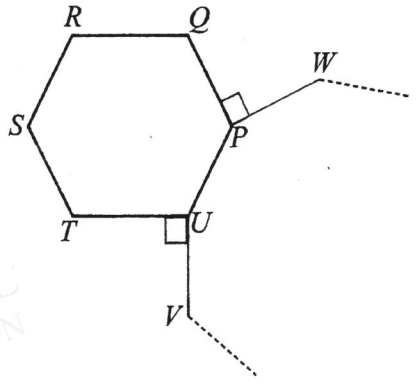
Answer ..... km [2]

(b) Changi internal airport covers an area of 15 km^2.
Calculate the area, in square centimetres, covered by the airport on the map.

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

14 The diagram shows a regular hexagon, *PQRSTU*, and three of the sides, *WP*, *PU* and *UV*, of a second regular polygon.

Angle *TUV* and angle *QPW* are right angles.



Find

(a) angle *PUT*,

Answer ..... ° [2]

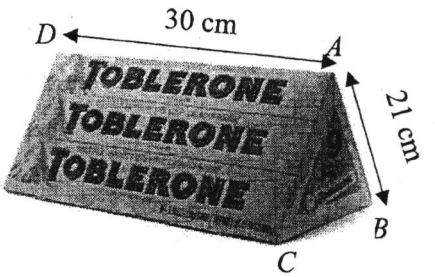
(b) the interior angle of the second regular polygon,

Answer ..... ° [2]

(c) the number of sides in the second regular polygon.

Answer ..... [3]

15 The diagram shows a toblerone box whose cross-section is an equilateral triangle. $AB = AC = BC = 21$ cm and $AD = 30$ cm.



Calculate the

(a) height of the equilateral triangle,

Answer .....cm [2]

(b) volume of the toblerone box,

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

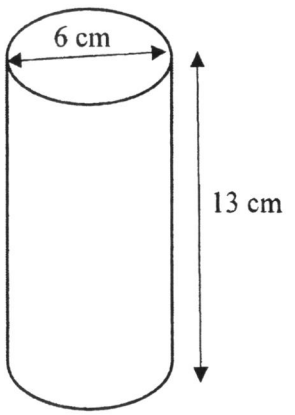
(c) volume of **one** bar of toblerone chocolate,

Answer ..... cm^3 [1]

(d) total surface area of the toblerone box.

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

16 The diagram shows a candle in the shape of a cylinder.
The candle has a diameter of 6 cm and a height of 13 cm.



(a) Calculate the volume of the candle.
Leave your answer in terms of π.

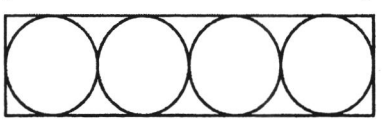
Answer ..... cm^2 [2]

The cylindrical candle is melted and made into the shape of a sphere.

(b) Find the radius of the sphere.

Answer .....cm [2]

The diagram shows the plan view of a box holding four of the spherical candles.
The box is in the shape of a cuboid and the candles just fit into the box.



(c) Calculate the volume of the empty space in the box.

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

End of Paper 1

PEICAI SECONDARY SCHOOL
SECONDARY 2 EXPRESS
END-OF-YEAR EXAMINATION 2018

CANDIDATE NAME			
CLASS		REGISTER NUMBER	

MATHEMATICS **4048/02**

Paper 2 **10 October 2018**

2 hours

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Setter: Mr Mohd Sharizan

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Answer **all** questions.

1 (a) Solve the inequality $\frac{x-1}{2} \leq \frac{x+3}{4}$. [2]

(b) Express as a single fraction in its simplest form $\frac{4x}{x+3} - \frac{2x}{(x+3)^2}$. [2]

(c) Simplify $\frac{27y^3}{8z} \div \frac{3y^2z^2}{4}$. [2]

(d) Solve the equation $x+3 = \frac{10}{x}$. [2]

---

2 (a) It is given that $y = \frac{3x+2z}{9x-z}$.

(i) Find y when $x = 2$ and $z = 3$. [1]

(ii) Express x in terms of y and z. [3]

(b) Simplify $\frac{4x^2-16}{x^2+4x+4}$. [3]

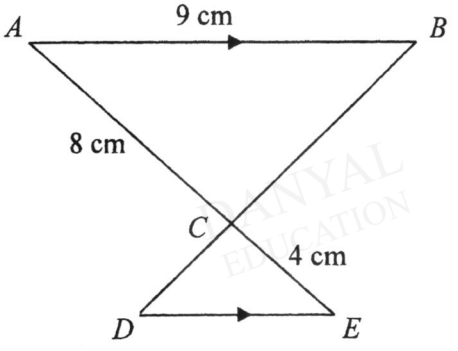
---

3 In the diagram below, triangle ABC is similar to triangle EDC.

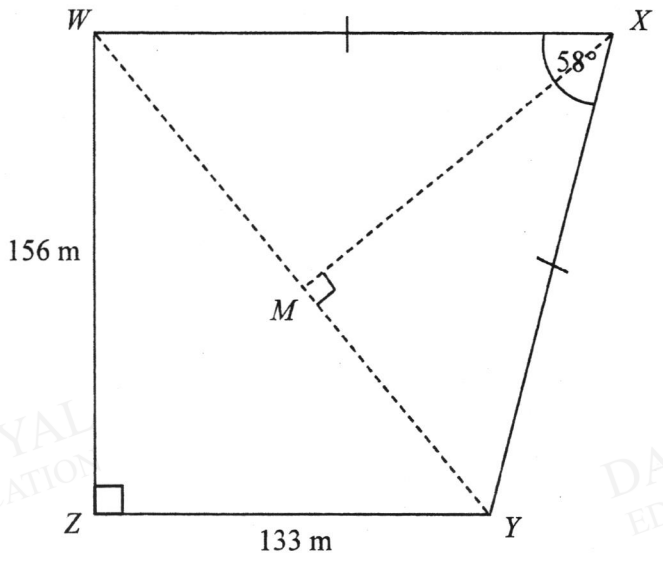
Given that $AB = 9$ cm, $AC = 8$ cm and $CE = 4$ cm, find

(a) the length of DE, [2]

(b) the ratio of $DC : DB$. [2]



4



The diagram shows a park $WXYZ$ on a horizontal ground, crossed by a path WY. M is the midpoint of WY. $WZ = 156$ m, $ZY = 133$ m and $XW = XY$. $\angle XMY = 90°$, $\angle WZY = 90°$ and $\angle WXY = 58°$.

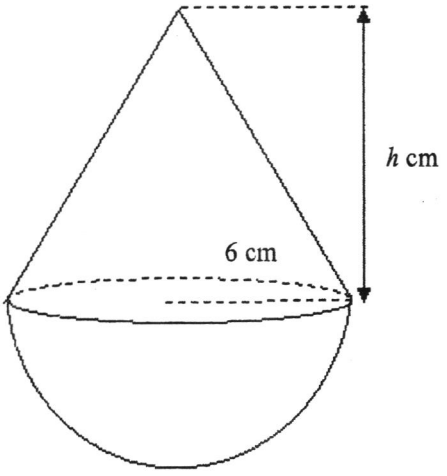
(a) Show that $\angle XYZ = 110.6°$, correct to 1 decimal place [3]

(b) Find (i) WY, [2]
(ii) XY. [2]

(c) The price of the land is \$55 000 per hectare.
Given that 1 hectare = 10 000 square metres, calculate the cost of the park. [4]

---

5 The container below consists of a hollow cone of height h cm glued to a hollow hemispherical base of radius 6 cm.



(a) Express the volume of the container in terms of h and π. [2]

The volume of the entire container is 504π cm^3.

(b) Show that the value of h is 30. [3]

(c) Find the external curved surface area of the cone, giving your answer to the nearest square centimeters. [2]

(d) Initially the container is completely filled with water, but the water leaks from the container at a constant rate of 0.3 litres per second. Calculate the time taken, in seconds, to empty the container of water. [1 litre = 1000 cm^3] [3]

---

6 A six-faced fair die was thrown 16 times. The table shows the number of times that each possible score occurred.

Score	1	2	3	4	5	6
Frequency	2	x	1	3	y	2

(a) Show that $x+y=8$. [1]

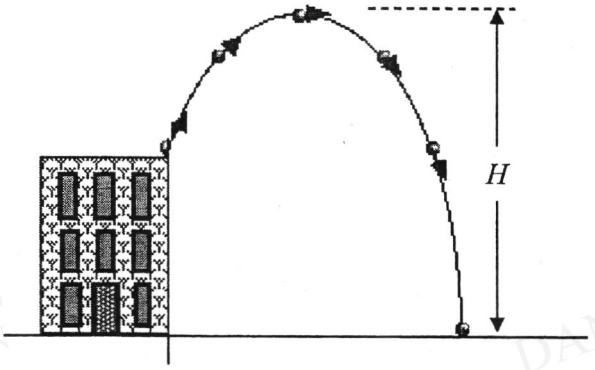
(b) If the mean score is 3.375, show that $2x+5y=25$. [3]

(c) Using (a) and (b), find the values of x and y. [3]

(d) Calculate (i) the mode, [1]
(ii) the median. [2]

---

7 A ball is thrown from the top of a building. Its vertical height, H m, above the ground at time, t seconds, during the flight is given by the formula $H = 90 + 15t - 5t^2$.



(a) Find the height of the building. [2]

(b) Find the value of t when the ball is again at the same level as the top of the building. [2]

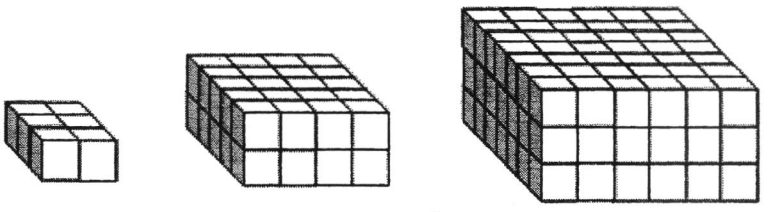
(c) (i) Factorise completely $90 + 15t - 5t^2$. [1]
(ii) Hence find the time of flight of the ball. [1]

(d) Some of the corresponding values of H and t in the equation $H = 90 + 15t - 5t^2$ are given in the table below.

t	0	1	2	3	4	5	6
H	90	100	100	x	70	40	0

(i) Find the value of x. [1]
(ii) Using a scale of 2 cm to represent 1 unit, draw a horizontal x-axis for $0 \leq t \leq 6$. Using a scale of 1 cm to represent 10 units, draw a vertical y-axis for $0 \leq H \leq 140$. On your axes, plot the points given in the table and join them with a smooth curve. [3]
(ii) Using the graph in part (d)(i), what is the maximum height the ball can reach above the ground? [1]

8



Day 1 Day 2 Day 3

John learned to stack plastic cubes in his play centre. On day 1, he formed a rectangular block with 6 plastic cubes. On day 2, he enlarged his rectangular block by adding plastic cubes to the previous day's block as shown in the diagram above, and likewise after day 3.

Day	No. of plastic cubes, N	No. of plastic cubes added, A
1	$1\times2\times3=6$	6
2	$2\times4\times5=40$	34
3	$3\times6\times7=126$	86
⋮	⋮	⋮
N	x	⋮
⋮	⋮	⋮

(a) Find the number of
(i) plastic cubes on day 5, [2]
(ii) plastic cubes added in the rectangular block on day 5. [2]

(b) Give a single reason why 1253 could not appear in column A. [1]

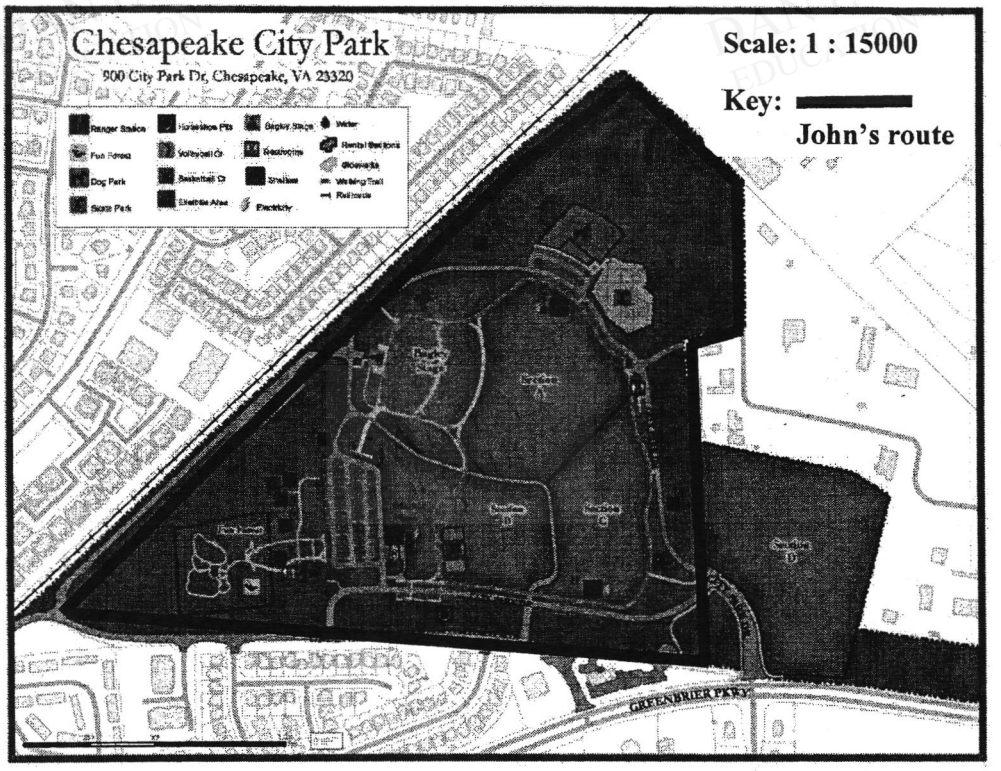
(c) Find x in terms of N. [2]

(d) What is the total number of plastic cubes that Andy will be stacking by 28 days? [2]

9 John is planning a weekly exercise routine. He has read the following health advice.

> **Time:** For best results, aim to achieve 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic activity each week.
>
> 1 minute of vigorous-intensity aerobic activity = 2 minutes of moderate-intensity aerobic activity, e.g 20 minutes of jogging = 40 minutes of brisk walking.

He plans to go for four brisk walks each week. The map shows his planned route around a park near his home.



(a) Find the actual length of John's route in km. [2]

(b) John plans to do brisk walking at a speed of 5.5 km/h.
Does John meet the weekly time target recommended in the health advice if he plans to brisk walk at that speed? Show how you decide. [2]

(c) To use more calories during an activity, John decides to jog the same route three times a week instead of walking. John weighs 80 kg and he estimates that he can jog at a speed of 9.7 km/h. He finds the following information on the internet.

Activity	**Time (15 min)**	**Time (60 min)**
Brisk walking	85 Cal	340 Cal
Jogging	102 Cal	408 Cal
Running	153 Cal	612 Cal

John thinks if he jogs as compared to brisk walking, he will use more than double the amount of calories.

Is John correct?
Justify your decision with calculations. [6]

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CLASS | | | | REGISTER NUMBER | | |

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Answer **all** questions

1 **(a)** Simplify $7(3x-2)+4$.

$7(3x-2)+4$
$= 21x-14+4$
$= 21x-10$ B1

Answer **(a)** ..... $21x-10$ ..... [1]

(b) Factorise $9x-3xy$.

$9x-3xy$
$= 3x(3-y)$ B1

Answer **(b)** ..... $3x(3-y)$ ..... [1]

---

2 Factorise completely $5pm+15qr-25pr-3qm$.

$5pm+15qr-25pr-3qm$
$= 5pm-3qm+15qr-25pr$ or $5pm-25pr+15qr-3qm$
$= m(5p-3q)+5r(3q-5p)$ $=5p(m-5r)+3q(5r-m)$ M1
$= m(5p-3q)-5r(5p-3q)$ $=5p(m-5r)-3q(m-5r)$
$= (5p-3q)(m-5r)$ $=(5p-3q)(m-5r)$ A1

Answer ..... $(5p-3q)(m-5r)$ ..... [2]

---

3 Simplify $\frac{7x}{2}-\frac{3(4-2x)}{5}$.

$\frac{7x}{2}-\frac{3(4-2x)}{5}$
$= \frac{7x}{2}\times\frac{5}{5}-\frac{3(4-2x)}{5}\times\frac{2}{2}$ M1
$= \frac{35x}{10}-\frac{6(4-2x)}{10}$
$= \frac{35x-6(4-2x)}{10}$
$= \frac{35x-24+12x}{10}$
$= \frac{47x-24}{10}$ A1

Answer ..... $\frac{47x-24}{10}$ ..... [2]

---

4 Lai Peng bought a watch for $138.
She sold it for a profit of 140% of the cost price.
Calculate the selling price.

Selling price $= (100+140)\% \times 138$
$= 240\% \times 138$ M1
$= 331.20$ A1

Answer $...331.20..... [2]

---

5 4, 9, 14, 19, 24

(a) Find an algebraic expression for the nth term in the sequence.

Answer $5n - 1$ [1]

(b) Show that 649 is a term in the sequence.
Answer

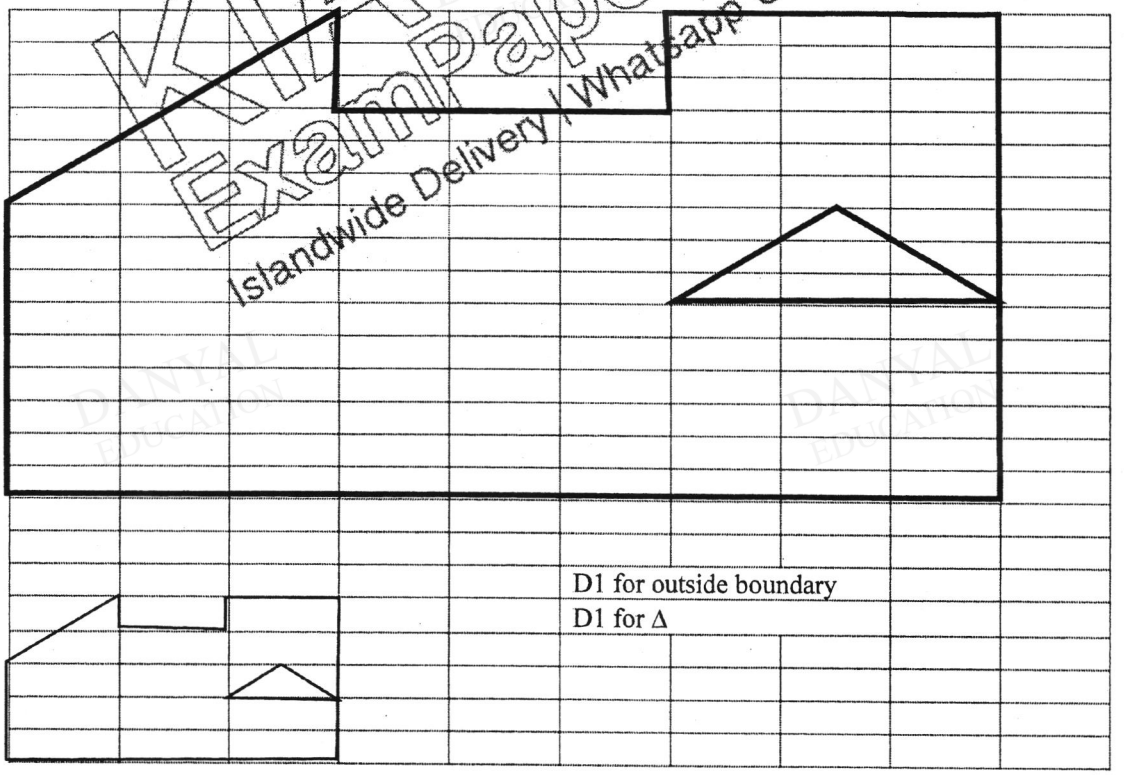
$5n - 1 = 649$
$5n = 650$ M1
$n = 130$

Therefore 649 is the 130th term of the sequence. A1 [1]

---

6 The digram shows a sketch of a house.

Using a scale factor of $\frac{1}{3}$, draw the reduction of the sketch in the grid below.



D1 for outside boundary
D1 for Δ

[2]

7 y is inversely proportional to $(x+2)$.

(a) It is given that $y = 4$ when $x = 3$, find the formula connecting y and x.

$y(x+2) = k$ M1

$4(3+2) = k$

$k = 20$

$y(x+2) = 20$ A1

Answer ..... $y(x+2) = 20$ ..... [2]

(b) Hence find the value of x when $y = 5$.

$5(x+2) = 20$

$x = 2$ B1

Answer x = ...2..... [1]

---

8 Written as a product of its prime factors, $360 = 2^3 \times 3^2 \times 5$.

(a) Write 108 as the product of its prime factors.

2	108
2	54
3	27
3	9
3	3
	1

$108 = 2^2 \times 3^3$ B1

Answer ..... $2^2 \times 3^3$ ..... [1]

(b) Find the lowest common multiple of 108 and 360.
Give your answer as the product of its prime factors.

$360 = 2^3 \times 3^2 \times 5$

$108 = 2^2 \times 3^3$

LCM $= 2^3 \times 3^3 \times 5$ B1

Answer ..... $2^3 \times 3^3 \times 5$ ..... [1]

(c) Find the smallest integer k such that $360k$ is a cube number.

$360 = 2^3 \times 3^2 \times 5$

$360k = 2^3 \times 3^2 \times 5 \times (3 \times 5^2)$

$k = 3 \times 5^2$

$k = 75$

Answer $k = 75$..... [1]

---

9 Mr Koh is using a ladder which is 6m long.
He puts it against a wall so that the bottom of the ladder is 1.1m from the wall.

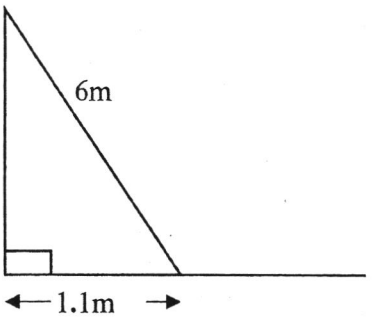


Diagram not drawn to scale

The safe working angle for a ladder is between 74° to 77° to the horizontal.
Is the ladder in a safe position for Mr Koh to use?
Show your working on which you base your decision.
Answer

$\cos\theta = \frac{1.1}{6}$ M1

$\theta = \cos^{-1}\frac{1.1}{6}$

$\theta = 79.4°$ **A1**

Since the angle is **not between 74° to 77°** (accept answer: more than 77°), the ladder **is not** in a safe position for Mr Koh to use. A1 [3]

10 A box contains 22 pens, n of which are red, $(n-1)$ are blue and the rest are green.

A pen is chosen at random from the box.

(a) Write down, in terms of n, the probability that the pen is green.

Number of green pens $= 22 - n - (n-1)$ M1

$= 22 - n - n + 1$

$= 23 - 2n$

P(green pen) $= \frac{23-2n}{22}$ A1

Answer $\frac{23-2n}{22}$ [2]

(b) If the probability of choosing a green pen is $\frac{1}{2}$, find the number of blue pens.

$\frac{23-2n}{22} = \frac{1}{2}$

$\frac{23-2n}{22} \times \frac{22}{1} = \frac{1}{2} \times \frac{22}{1}$

$23 - 2n = 11$ M1

$2n = 12$

$n = 6$

Number of blue pens = 5 A1

P(green) $= \frac{1}{2} = \frac{11}{22}$

No of green pens = 11

No of blue & red pens = $n + (n\text{-}1)$

$= 2n - 1$

$2n - 1 = 11$

$n = 6$

Answer .....5..... [2]

11 (a) On the grid, draw and label the line of

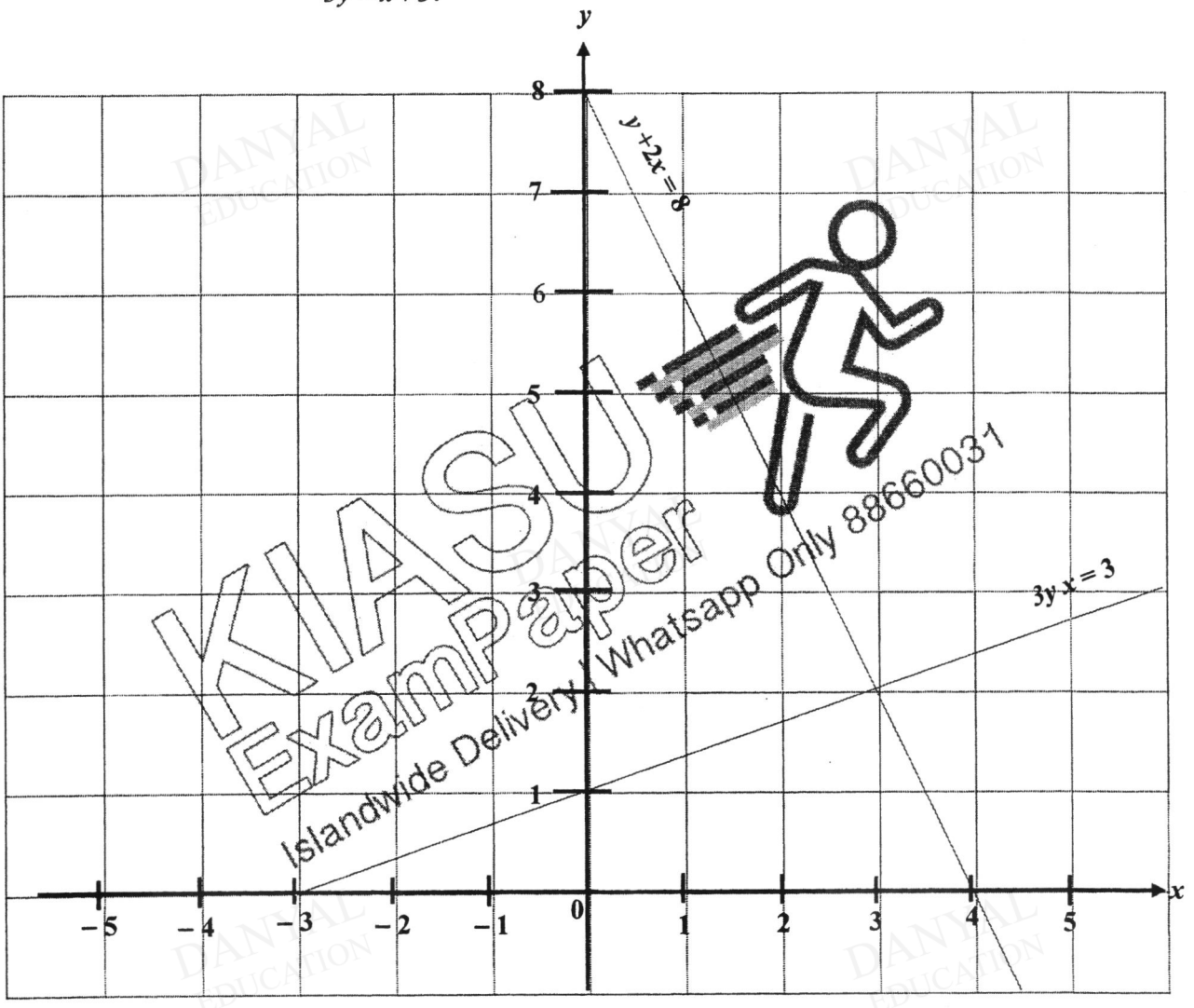
(i) $y+2x=8$, [1]

(ii) $3y=x+3$. [1]

(b) Hence, solve the simultaneous equations

$y+2x=8$,

$3y=x+3$.



Answer x = ...3..... [1]

y = ...2..... [1]

---

12 The stem-and-leaf diagram shows the heights, in cm, of a group of students.

9	1	3	5	6	8	
10	0	0	4	5	8	9
11	2	2	2	6	7	
12	0	1				
13	5	9				

Key: 13 | 5 Represents 135 cm

For the heights, find

(a) the modal height,

Answer ..... 112 ..... cm [1]

(b) the range,

Range = 139 – 91 cm
= 48 cm

Answer ..... 48 ..... cm [1]

(c) the median height,

Median height = $\frac{108+109}{2}$ = 108.5 cm

Answer 108.5 cm [1]

(d) the mean height.

Mean height = $\frac{2183}{20}$ M1
= 109.15 cm A1

Answer 109.15 cm [2]

---

13 **(a)** Miss Loh has a map drawn to a scale 1: 150 000.
The distance on the map between Changi international airport and the city centre is 5.5 cm.
Calculate the actual distance, in kilometres, between Change international airport and the city.

1 : 150 000
1 cm : 150 000 ÷ 100 000
1 cm : 1.5 km M1
5.5 cm = 1.5 × 5.5 km
= 8.25 km A1

Answer 8.25 km [2]

(b) Changi internal airport covers an area of 15 km^2.
Calculate the area, in square centimetres, covered by the airport on the map.

$(1cm)^2 : (1.5km)^2$ M1

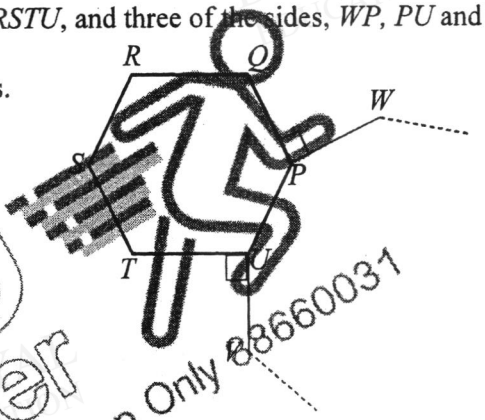
$1cm^2 : 2.25km^2$

$15km^2 : \frac{15}{2.25} cm^2$

Area (map) $= \frac{20}{3} = 6\frac{2}{3} cm^2$ A1

Answer $6\frac{2}{3}$ cm^2 [2]

11 The diagram shows a regular hexagon, *PQRSTU*, and three of the sides, *WP*, *PU* and *UV*, of a second regular polygon.
Angle *TUV* and angle *QPW* are right angles.



Find

(a) angle *PUT*,

$\angle PUT = \frac{(6-2)\times 180}{6}$ M1

$= 120°$ A1

Answer .....120..... ° [2]

(b) the interior angle of the second regular polygon,

$\angle PUV = 360° - 120° - 90°$ ($\angle$s at a point) M1

$= 150°$ A1

Answer .....150..... ° [2]

(c) the number of sides in the second regular polygon.

Exterior angle $= 180° - 150°$ M1

$= 30°$ M1

Number of sides $= \frac{360°}{30°}$ M1

$= 12$ A1

or $\frac{(n-2)\times 180}{n} = 150$ M1

$180n - 360 = 150n$

$30n = 360$ M1

$n = 12$ A1

Answer .....12..... [3]

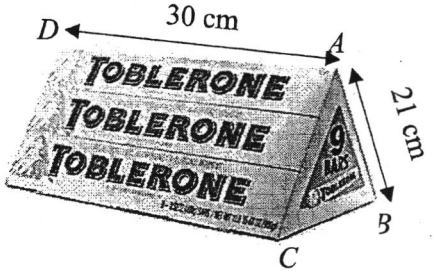
---

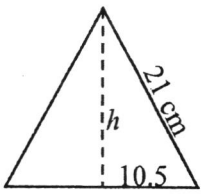
12 The diagram shows a toblerone box whose cross-section is an equilateral triangle.

$AB = AC = BC = 21$ cm and $AD = 30$ cm.

Calculate the

(a) height of the equilateral triangle,





$h^2 + 10.5^2 = 21^2$ M1

$h^2 = 330.75$

$h = 18.1865$

$h = 18.2$ A1

Answer .....18.2.....cm [2]

(b) volume of the toblerone box,

$\text{Volume} = \left(\frac{1}{2} \times 21 \times \sqrt{330.75}\right) \times 30$ M1

Volume = 5728.75 = 5730 (3 SF) A1

Answer .....5730..... cm^3 [2]

(c) volume of **one** bar of toblerone chocolate.

$\text{Volume} = \frac{5728.758046}{9}$ M1

= 636.5286718

= 637 (3SF)

Answer .....637..... cm^3 [1]

(d) total surface area of the toblerone box.

$\text{TSA} = 2\left(\frac{1}{2} \times 21 \times \sqrt{330.75}\right) + 3(21 \times 30)$ M1

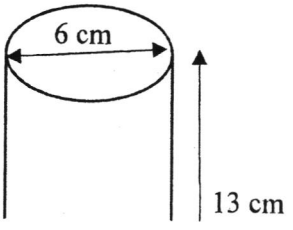
= 2270.9172

= 2270 (3SF) A1

Answer .....2270..... cm^2 [2]

---

13 The diagram shows a candle in the shape of a cylinder.



The candle has a diameter of 6 cm and a height of 13 cm.

(a) Calculate the volume of the candle.
Leave your answer in terms of π.

Volume $= \pi(3^2)\times 13$ M1

$= 117\pi$ A1

Answer .....117π..... cm^2 [2]

The cylindrical candle is melted and made into the shape of a sphere.

(b) Find the radius of the sphere.

$\frac{4}{3}\pi(r^3) = 117\pi$ M1

$r^3 = \frac{117\times 3}{4}$

$r = \sqrt[3]{\frac{351}{4}}$

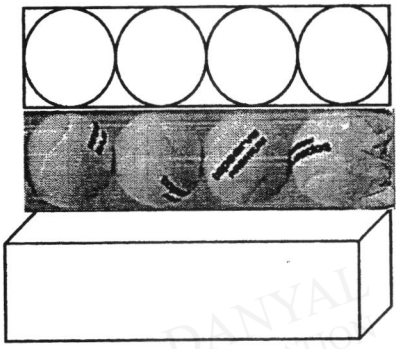
$r = 4.4437$

$r = 4.44$ (3SF) A1

Answer 4.44 cm [2]

The diagram shows the plan view of a box holding four of the spherical candles.
The box is in the shape of a cuboid and the candles just fit into the box.

(c) Calculate the volume of the empty space in the box.



Volume of 4 candles = 4(117π)

$= 468\pi$ M1

Volume of box

$= 2\sqrt[3]{\frac{351}{4}} \times 2\sqrt[3]{\frac{351}{4}} \times 4\times 2\times \sqrt[3]{\frac{351}{4}}$ M1

$= 32\times\frac{351}{4}$

$= 2808$

Volume of space = 2808 - 468π

= 1337.7346

= 1340 (3SF) A1

Answer .....1340..... cm^3 [3]

End of Paper 1

2Exp Math EOY Paper 2)

1a) $\frac{x-1}{2} \leq \frac{x+3}{4}$

$\times 4,\ 2(x-1) \leq x+3$ — [M1]

$2x-2 \leq x+3$

$x \leq 5$ — [A1]

b) $\frac{4x}{x+3} - \frac{2x}{(x+3)^2}$

$= \frac{4x(x+3)-2x}{(x+3)^2}$ — [M1]

$= \frac{4x^2+12x-2x}{(x+3)^2}$

$= \frac{4x^2+10x}{(x+3)^2}$

$= \frac{2x(2x+5)}{(x+3)^2}$

either one of the step is [A1]

c) $\frac{27y^3}{8z} \div \frac{3y^2}{4z^2}$

$= \frac{27y^3}{8z} \times \frac{4z^2}{3y^2}$ [M1]

$= \frac{9 \cancel{27} \cancel{108} y^{\cancel{3}}}{\cancel{24} \cancel{y^2} z^{\cancel{3}}}$

$= \frac{9y}{2z^2}$ — [A1]

d) $x+3 = \frac{10}{x}$

$x(x+3) = 10$

$x^2+3x-10=0$ — [M1]

$(x+5)(x-2)=0$

$x = -5$ or 2 — [A1]

2a) (i) $y = \frac{3x+2z}{9x-z}$

$= \frac{3(1)+2(1)}{9(1)-3}$

$= \frac{4}{5}$ — [A1]

(ii) $9xy - yz = 3x + 2z$ [M1]

$9xy - 3x = 2z + yz$

$x(9y-3) = 2z+yz$ [M1]

$\therefore x = \frac{2z+yz}{9y-3}$ — [A1]

$\frac{4x^2-16}{x^2+x-2} = \frac{4(x^2-4)}{(x+2)(x-2)}$ [M1]

$= \frac{4(x+2)(x-2)}{(x+2)(x-1)}$ — [M1]

$= \frac{4(x-2)}{(x-1)}$ — [A1]

3a) $\frac{DE}{BA} = \frac{EC}{AC}$

$\frac{DE}{9} = \frac{4}{8}$

$DE = \frac{1}{2} \times 9$ — [M1]

$= 4.5\text{cm}$ — [A1]

b) $DC : DB$

$= DC : DC + CB$ [M1]

$= 1\text{part} : 1\text{part} + 2\text{parts}$

$= 1\text{parts} : 3\text{parts}$

$= 1 : 3$ — [A1]

4a) $\angle XYW = \frac{180 - 58}{2}$

$= 61^\circ$ (isos $\triangle$) — [M1]

$\tan \angle WYZ = \frac{156}{133}$

$\angle WYZ = \tan^{-1}\left(\frac{156}{133}\right)$

$= 49.5503^\circ$ — [M1]

$\therefore \angle XYZ = 49.5503 + 61$

$= 110.6^\circ$ (shown) — [A1]

b) (i) By Pythagoras' Thm,

$WY^2 = 156^2 + 133^2$ — [M1]

$WY^2 = 42025$

$\therefore WY = 205\ m$ — [A1]

(ii) $\sin 29^\circ = \frac{205 + 2}{XY}$ — [M1]

$\sin 29^\circ = \frac{102.5}{XY}$

$\therefore XY = \frac{102.5}{\sin 29^\circ}$

$XY = 211.4$

$\approx 211\ m$ — [A1]

c) Area of $WXYZ$

$= \frac{1}{2} \times (211.4 + 133) \times 156$

$= 26863.2\ m^2$ — [M1]

$10000\ m^2 \rightarrow 1$ hectare

$\therefore 26863.2\ m^2 \rightarrow \frac{26863.2}{10000}$

$= 2.68632$ hectare — [M1]

$\therefore$ Cost of park $= 2.68632 \times 55000$ — [M1]

$= \$147747.60$ — [A1]

5a) Vol. of ~~hemisphere~~ container

$= \left[\frac{1}{2} \times \frac{4}{3} \times \pi \times r^3\right] + \frac{1}{3}\pi r^2 h$

$= \left(\frac{2}{3} \times \pi \times 6^3\right) + \left(\frac{1}{3} \times \pi \times 6^2 \times h\right)$ — [M1]

$= 144\pi + 12\pi h$ — [A1]

b) $144\pi + 12\pi h = 504\pi$ — [M1]

$12\pi h = 360\pi$ — [M1]

$h = 30$ (shown) — [A1]

c) Let slanted ht of cone be x

$\therefore$ By Pythagoras' Thm,

$x^2 = 6^2 + 30^2$

$x^2 = 936$

$x = 30.594$ cm — [M1]

~~$x = 30.6$ cm~~

$\therefore$ Curved surface area of cone

$= \pi r l$

$= \pi(6)(30.594)$

$= 576.68$

$\approx 577\ cm^2$ — [A1]

d) $1000\ cm^3 \rightarrow 1\ l$

$504\pi\ cm^3 \rightarrow \frac{504\pi}{1000}$

$= 1.5834\ l$ — [M1]

Time taken $= \frac{1.5834}{0.3}$ — [M1]

$= 5.285$ — [A1]

6a) $2+x+1+3+y+2 = 16$

$x+y+8 = 16$

$\therefore x+y = 8$ (shown) — [B1]

b) $\frac{2(1)+2x+3(1)+4(3)+5y+6(2)}{16} = 3.375$ — [M1]

$\frac{2x+5y+29}{16} = 3.375$

$2x+5y+29 = 54$ — [M1]

$2x+5y = 25$ (shown) — [A1]

c) $x+y = 8$ — ①

$2x+5y = 25$ — ②

① x 2: $2x+2y = 16$ — ③ — [M1]

② − ③: $3y = 9$

$y = 3$ — [A1]

Subst $y=3$ in ①:

$x+3 = 8$

$x = 5$ — [A1]

d) (i) Mode = 2 — [B1]

(ii) Median position = $\frac{16+1}{2}$

$= 8.5$

= bet. 8 & 9 position — [M1]

$\therefore$ Median = $\frac{3+4}{2}$

$= 3.5$ — [A1]

7a) $H = 90 + 15t - 5t^2$

at $t = 0$,

$H = 90$ m — [A2]

b) when $H = 90$,

$90 + 15t - 5t^2 = 90$ — [M1]

$15t - 5t^2 = 0$

$(5t)(3 - t) = 0$

$t = 0$ or $3 - t = 0$

$t = 3$

$\therefore t = 3$ s — [A1]

c) (i) $90 + 15t - 5t^2$

$= 5(18 + 3t - t^2)$

$= 5(6 - t)(3 + t)$ — [A1]

(ii) When $H = 0$,

$5(6 - t)(3 + t) = 0$ — [M1]

$6 - t = 0$ or $3 + t = 0$

$t = 6$ or $t = -3$ (rej)

$\therefore t = 6$ s — [A1]

d) Refer to graph.

Name _____ Index No. _____

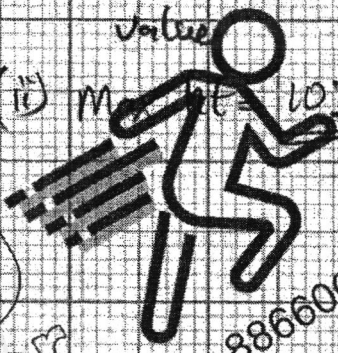
7d) Subject _____ Class _____ Date _____

$H = 90 + 15t - 5t^2$

t	0	1	2	3	4	5	6
H	90	100	100	90	70	40	0

d)(i)
- Correct scale — [B1]
- Smooth curve — [B1]
- Table correctly drawn w correct values — [B1]

(ii) Max height = 100 m — [B1]



8 a) (i) $5 \times 10 \times 11$ — [M0]

$= 550$ — [A0]

(ii) Day 4 : $4 \times 8 \times 9$

$= 288$ — [M1]

$\therefore$ Ans $= 550 - 288$

$= 262$ — [A0]

b) 1253 is not an even no — [B1]

c) $x = N \times 2N \times (2N+1)$ — [M1]

$x = 2N^2(2N+1)$

$x = 4N^3 + 2N^2$ — [A0]

d) ~~$28 \times 56 \times 57$~~

$= 4(28)^3 + 2(28)^2$ — [M1]

$= 89376$ — [A0]

9a) 1 cm : 150000 cm

$30.2\text{cm} = 0.002 \times 150000$ — [M1]

$= 453000\ \text{cm}$

$= 4.53\ \text{km}$ — [A0]

b) Time taken (brisk walk)

$= \frac{4.53}{5.5}$

$= 0.8236\ \text{hr}$

$= 49.4\ \text{min}$ — [M1]

$\therefore$ Total time (4 brisk walk)

$= 49.4 \times 4$

$= 197.6\ \text{min}$

Hence, John meets the weekly time target of at least 150m (known) — [A0]

(c) Time taken (jog)

$= \frac{4.53}{9.7}$

$= 0.4670\ \text{hr}$

$= 28.02\ \text{min}$ — [M1]

Time taken (in a wk)

$= 28.02 \times 3$

$= 84.062$

$\approx 84.1\ \text{min}$ — [M0]

Amount of calories used up (jog)

$= 4.1631 \approx 102$

$= 572$ cal — [M1]

Amount of calories used up (brisk walk)

$= \frac{197.6}{15} \times 85$

$= 1119.7\ \text{Cal}$ — [M1]

Comparing the amount of Cal used up between brisk walking & jogging, John used up more Cal for brisk walking. — [M1].

$\therefore$ John is not correct in the statement — [A1]