Student Name: _____

Teacher's Name: _____

Sydney Technical High School

Year 9

Mathematics

Assessment Task 4

November 2025

General Instructions

- Working time – **90 minutes**
- Write using black/blue pen
- NESA approved calculators may be used
- Marks for each question are indicated on the question.
- All necessary working out should be shown.
- Marks may **not** be awarded for careless setting out or illegible writing
- Write your answers in the answer booklet provided.
- Use the multiple choice answer sheet provided to fill in your answers.

Total marks:

<u>Section 1</u> – 10 marks

- Allow about 15 minutes for this section

<u>Section 2</u> – 70 marks

- Allow about 75 minutes for this section

Section I – Multiple Choice

10 marks
Attempt Questions 1-10
Allow about 15 minutes for this section

Each multiple choice question is worth 1 mark.
Clearly colour in each bubble of the correct answer on your multiple choice sheet in your answer booklet.

Question One

Which of the following does NOT simplify to a^8?

A. $a^{16} \div a^8$

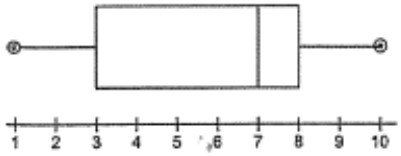
B. $(a^2)^4$

C. $a^7 \times a$

D. $a^{16} \div a^2$

Question Two

The box and whisker plot shows the scores in a talent quest. Which information cannot be read from the plot?



A. The mean

B. The median

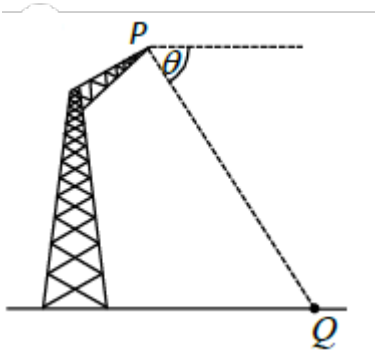
C. The range

D. The interquartile range

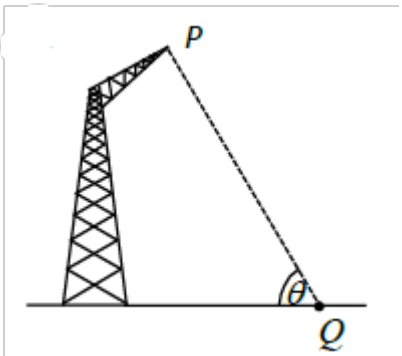
Question Three

Which diagram shows the angle of depression θ of Q from P?

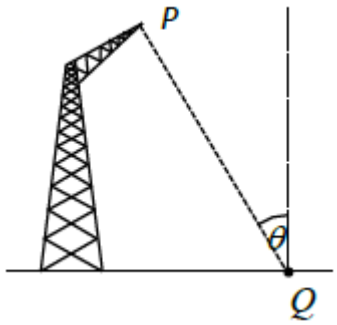
A.



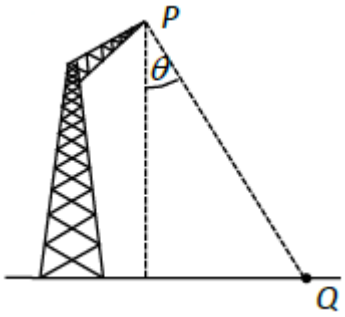
B.



C.



D.



Question Four

An experiment is conducted where a coin is flipped 5 times. If this experiment was represented in a tree diagram, how many branches would there be in the final stage?

A. Five

B. Ten

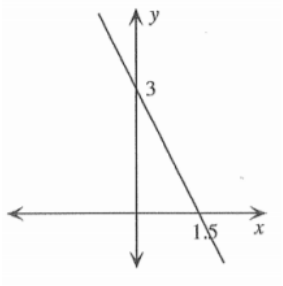
C. Thirty-Two

D. Sixty-Four

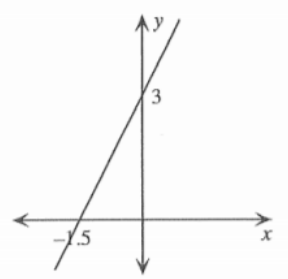
Question Five

Which of the following could be the graph of $y = 3 - 2x$?

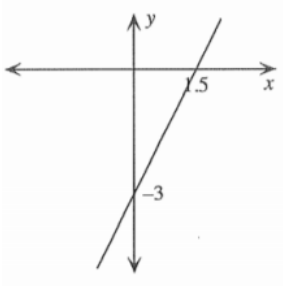
A.



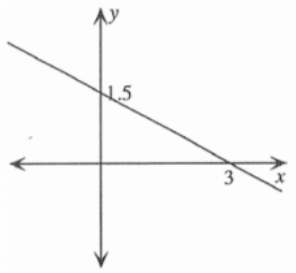
B.



C.

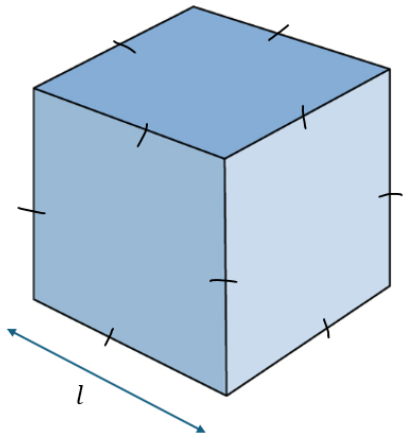


D.



Question Six

The surface area of a cube is 96 square centimetres.



Not to Scale

The side length (l) of the cube is:

A. 4 cm

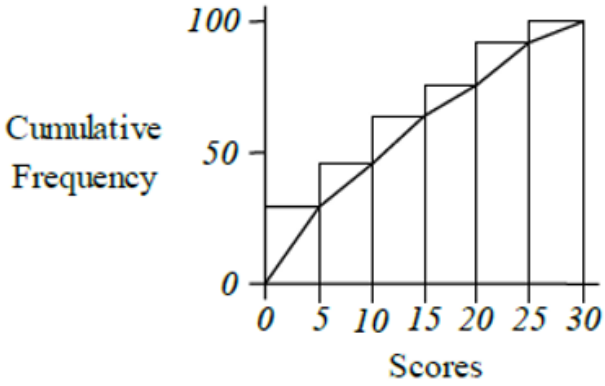
B. 8 cm

C. 16 cm

D. 32 cm

Question Seven

The graph shows a cumulative frequency histogram and polygon.



Which of the following is true?

A. The median is less than 15

B. The mode is 30

C. The range is 100

D. More than half of the scores are over 50.

Question Eight

If $(2, k)$ lies on the line $x + 2y = 8$, then the value of k is:

A. 2

B. 3

C. 4

D. 5

Question Nine

A multiple choice test contains 30 questions. Each correct answer is given 5 marks. Each incorrect answer loses 2 marks. Each question not attempted loses 2 marks.

A student scored 101 marks on the test. The student answered x questions correctly. Which of the following equations would give the correct solution for x?

A. $2(30 - x) - 5x = 101$

B. $5(30 - x) - 2x = 101$

C. $5x + 2(30 - x) = 101$

D. $5x - 2(30 - x) = 101$

Question Ten

Jim attempted to solve the inequality $\frac{x}{4} + 2 < -3$, but has made a mistake. His working is shown below:

Line 1: $\frac{x}{4} + 2 < -3$

Line 2: $\frac{x}{4} < -1$

Line 3: $x < -4$

What was Jim's mistake?

A. He incorrectly subtracted between Line 1 and 2

B. He incorrectly multiplied between Line 2 and 3

C. He should have reversed the inequality symbol after Line 1

D. He should have reversed the inequality symbol after Line 2

~This page has purposefully~
been left blank

Section II – Short Answer (70 marks)

Attempt Question 11-16.

Start each question at the top of a NEW PAGE in your answer booklet.

Allow about 75 minutes for this section.

In Section II, your responses should include all relevant mathematical reasoning and/or calculations.

Question 11 (12 Marks)

a) Solve the following equations

i. $4(3x + 1) = 11x - 3$ **1**

ii. $\frac{x-4}{3} + 4 = \frac{x+7}{2}$ **2**

b) The mean of three scores is 16. If two of the scores are 15 and 8, find the third score. **1**

c) Fully factorise:

i. $x^2 + 7x + 12$ **1**

ii. $4x^2 - y^2$ **1**

iii. $3x^2 - 11x + 6$ **2**

d) A bag contains 5 yellow marbles and 4 red marbles. Two draws are made without replacement. Calculate the probability of drawing:

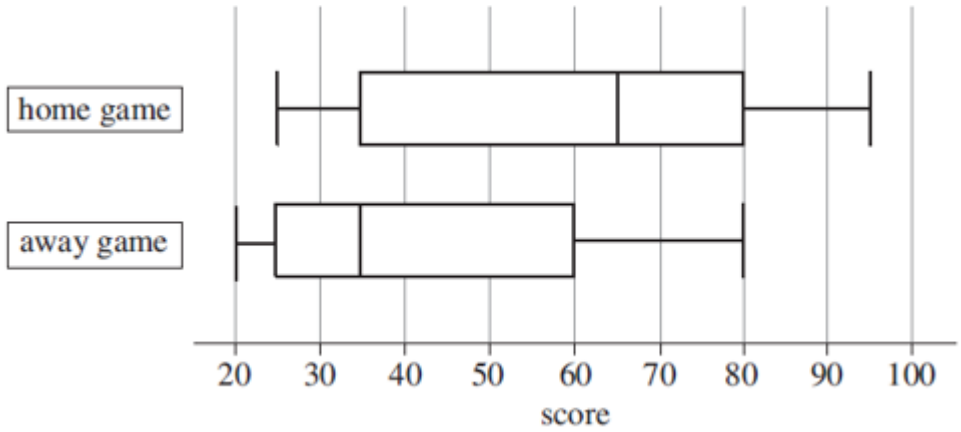
i. Two yellow marbles **1**

ii. A red marble and a yellow marble in any order **2**

iii. At most, one yellow marble **1**

Question Twelve (12 Marks)

a) The Gotham Knights basketball team played 23 home games and 23 away games. The scores from each set of games are represented in the two box and whisker plots below:



i. What was teams lowest home game score **1**

ii. Describe the skew of the away game scores **1**

iii. What percentage of the team's total games had a score of less than 35? **1**

b) A box of 50 Chattering Teeth was tested and three were found to be defective.



i. What was the relative frequency of a defective set of Chattering Teeth? **1**

ii. In a box of 500 Chattering Teeth, how many would you expect to be defective? **1**

c) Simplify, leaving your answer with positive indices **2**

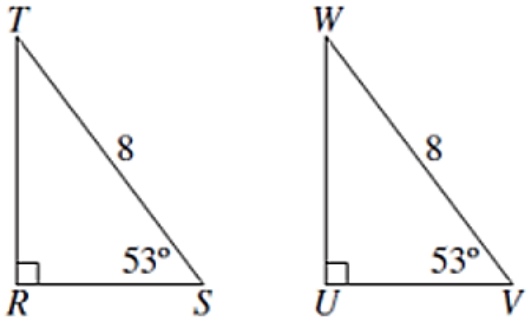
$$\frac{(a^2b^{-3})^4 \div ab^2}{(a^3b)^2 \times a^2b^3}$$

d) Consider the equation $x + 2y - 6 = 0$

i. Express the equation in gradient-intercept form. **1**

ii. Graph the line, showing all important features. **2**

e) When asked to show that the two triangles below were congruent, a student wrote $\Delta RST \equiv \Delta UVW$ (RHS).



i. Explain why the reason given is incorrect. **1**

ii. What would be the correct reason for proving congruency with these two triangles? **1**

Question Thirteen (12 Marks)

a) Alfred is considering changing the shape of his loaves of bread. The smaller the surface area, the longer the loaf takes to go stale. His two options are both have a length of 20cm with **3**

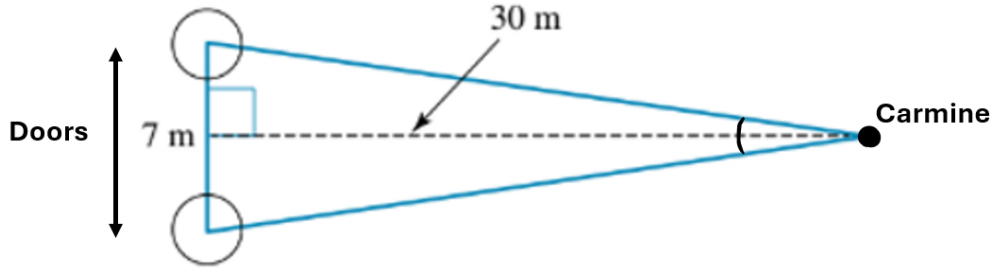
Loaf 1: Has a square end with a side length of 7cm
Loaf 2: Has a circular end with a diameter of 7cm

Which loaf should he make to stay fresh for longer? Justify your answer with appropriate mathematical calculations.

b) Fully factorise: **2**

$$x^3 + x^2y - x - y$$

c) Carmine has just robbed the Gotham National Bank and is standing 30m from the doors to escape. **2**



By considering the right-angled triangle formed, calculate, to the nearest degree, the angle within which he must run to get through the doors.

d) Express with a rational denominator **2**

$$\frac{4-2\sqrt{5}}{\sqrt{3}}$$

e) Crime Alley is 10.7km due east of Arkham Asylum. Wayne Tower is due south of Arkham Asylum and on a bearing of $257°T$ from Crime Alley.

i. Draw a diagram to represent this information **1**

ii. Find, correct to 3 significant figures, the distance between Wayne Tower and Crime Alley. **2**

Question Fourteen (12 Marks)

a) Make y the subject of the formula $2y = 1 - xy$ **2**

b) Simplify

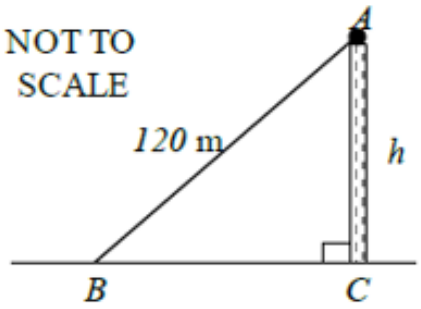
i. $\frac{4a-12}{5b^3} \times \frac{10}{a^2-9}$ **2**

ii. $\frac{4}{k^2+2k-3} + \frac{1}{k+3}$ **2**

Question Fourteen continues on the next page.

c) Oswald has been chased to the top of the Iceberg Lounge, and is about to travel down a zip line to escape to the street below.

The length of the zip line is 120m.



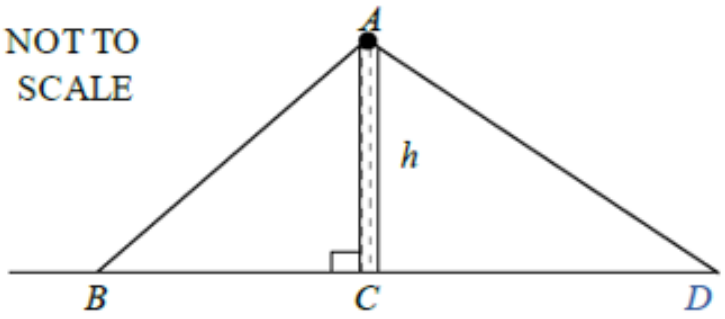
The angle of elevation of the top of the Lounge **A**, from **B**, is 50°.

i. Copy the diagram into your answer booklet and mark the angle of elevation. **1**

ii. Calculate the height of the Iceberg Lounge, ***h***, to the nearest metre. **2**

Oswald then realises he should be going the other way, and sends a second zipline to **D.**

The distance from **D** to **C** is twice the distance from **B** to **C**.

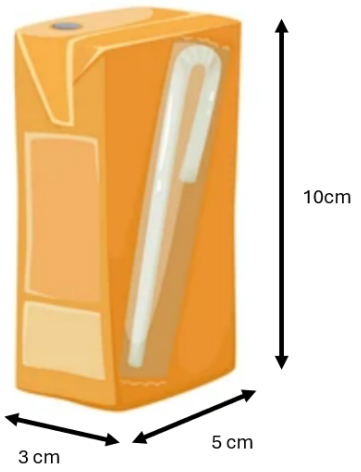


Oswald reasons that since the distance had doubled, the angle of elevation from **D** to **A** will be half of 50°.

iii. Do you agree with Oswald's reasoning? Justify your answer, showing mathematical calculations. **3**

Question Fifteen (11 Marks)

a) A juice box has the shape of a rectangular prism with dimensions 10cm by 5cm by 3cm.



i. Find, correct to one decimal place, the length of the longest straw that fits inside the container. **3**

ii. Correct to the nearest minute, what angle does the longest straw make with the vertical? **2**

b) Find the equation of the straight line passing through the point $(1, -3)$ and perpendicular to the line with equation $3x - 4y + 5 = 0$ **3**

c) A circle is drawn with its centre at $C(2,3)$. The point $A(-1, -5)$ lies on the circumference.

i. Calculate the exact radius of the circle. **1**

ii. If AB is the diameter of the circle, find the coordinates of B. **2**

Question Sixteen (11 Marks)

a) If $10^x = p$, write 10^{1-3x} in terms of p. **2**

b) On the same co-ordinate plane, shade the region where both **3**

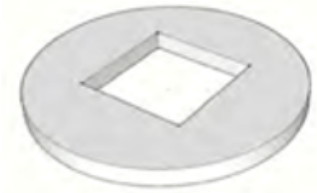
$$x - y + 2 \leq 0 \text{ AND } x + y - 2 < 0$$

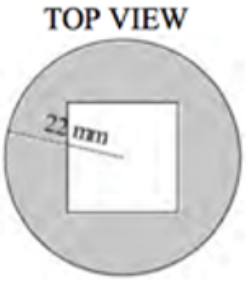
c) Ivy wants to ensure that the entire area of the Earth's surface that is occupied by **land** is covered in plants. **3**

Water covers approximately 70% of the Earth's surface, and we can assume the radius of the Earth to be 6400 km.

Calculate the approximate area of the Earth's surface that Ivy intends to have covered in plants. Leave your answer in scientific notation, correct to 1 decimal place.

d) A new coin is being produced, featuring a circular design with a square hole cut out of it. The coin has a radius of 22 mm and a thickness of 3 mm. **3**





To achieve the desired weight, the coin must have a volume of 4400 mm^3.

Calculate the length of the square that will result in this volume in millimetres, correct to 3 significant figures.

~End of Exam~

1

Year 9 Yearly Solutions 2025

Question 1

D

Question 2

A

Question 3

A

Question 4

C

Question 5

A

Question 6

A

Question 7

A

Question 8

$2+2|2| = 8 \quad |2| = 3 \quad B$

Question 9

D

Question 10

A

12

Question 11

a) i) $4(3x+1) = 11x - 3$

$12x + 4 = 11x - 3$

$x = -7$

ii) $\frac{x-4}{3} + 4 = \frac{x+7}{2}$

$2(x-4) + 24 = 3(x+7)$

$2x - 8 + 24 = 3x + 21$

$2x + 16 = 3x + 21$

$x = -5$

b) Let the third score be x.

$\frac{x+15+8}{3} = 16$

$x + 23 = 48$

$x = 25$

c) i) $x^2 + 7x + 12 = (x+3)(x+4)$

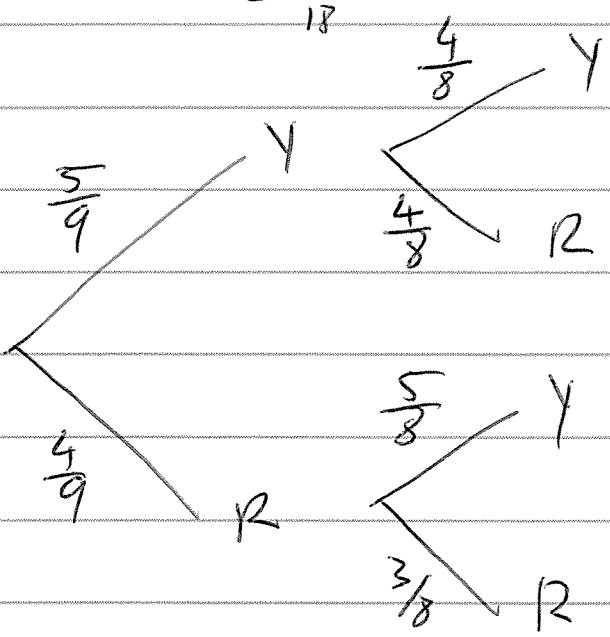
ii) $4x^2 - y^2 = (2x+y)(2x-y)$

iii) $3x^2 - 11x + 6 = (3x-2)(x-3)$

3

d) i) $P(YY) = \frac{5}{9} \times \frac{4}{8}$

$= \frac{5}{18}$



ii) $P(R, Y) = \left(\frac{5}{9} \times \frac{4}{8}\right) + \left(\frac{4}{9} \times \frac{5}{8}\right)$

$= \frac{5}{9}$

iii) $P(\text{Max 1 } Y) = 1 - P(YY)$

$= 1 - \frac{5}{18}$

$= \frac{13}{18}$

Question Twelve

/4

a) i) 25

ii) Positive Skew

iii) 3 parts of 8 or
→ 37.5%

b) i) $\frac{3}{50}$

ii) $500 \times \frac{3}{50} = 30$ defective

c) $\frac{(a^2b^{-3})^4 \div ab^2}{(a^3b)^2 \times a^2b^3} = \frac{a^8b^{-12} \div ab^2}{a^6b^2 \times a^2b^3}$

$= \frac{a^7b^{-14}}{a^8b^5}$

$= \frac{1}{ab^{19}}$

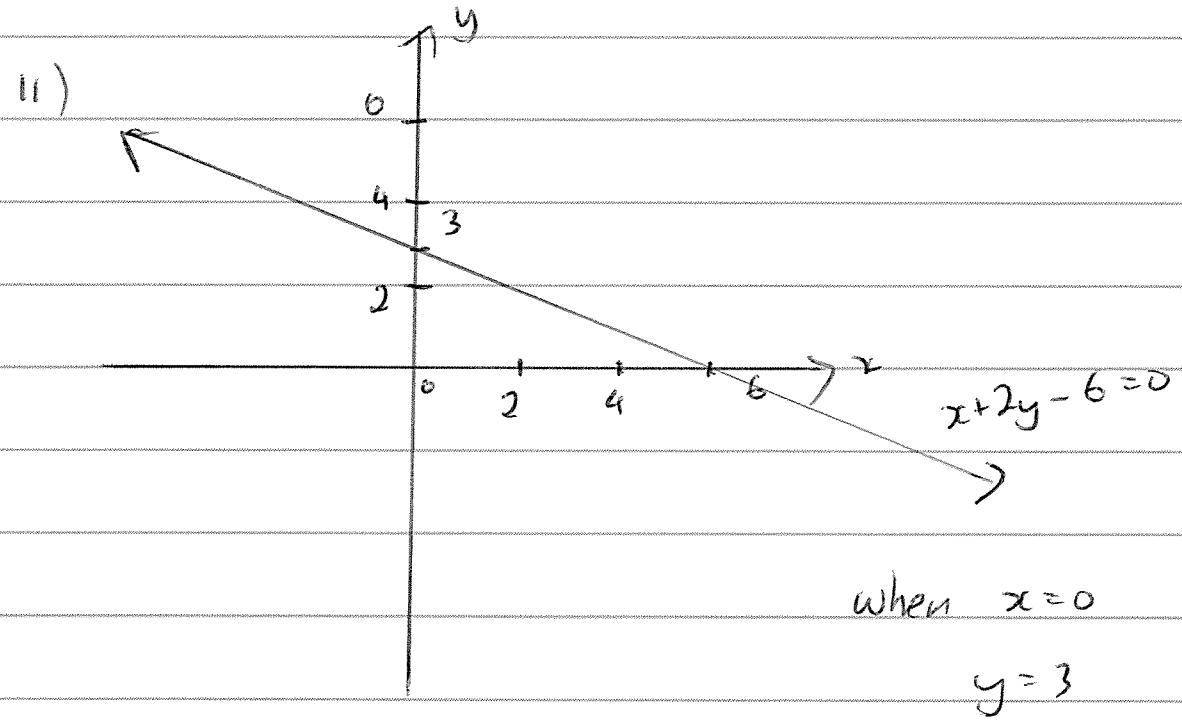
5

d) i) $x + 2y - 6 = 0$

$2y = -x + 6$

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

ii)



when $x = 0$

$y = 3$

when $y = 0$

$0 = \frac{-x}{2} + 3$

$0 = -x + 6$

$x = 6$

e) i) Only the hypotenuse is given, along with two angles, not another side

ii) AAS

Question Thirteen

/6

a) Loaf 1:

$$SA = 2(7\times7) + 4(7\times20)$$
$$= 98 + 560$$
$$= 658\ cm^2$$

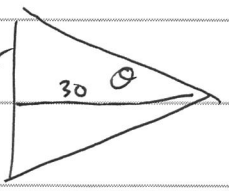
Loaf 2:

$$SA = 2(\pi \times 3.5^2) + (2\times\pi\times 3.5\times 20)$$
$$= 24.5\pi + 140\pi$$
$$= 516.79\ cm^2 \text{ (2dp)}$$

∴ Loaf 2 is the better option as it has the smaller surface area.

b) $x^3 + x^2y - x - y = x^2(x+y) - 1(x+y)$
$= (x^2-1)(x+y)$
$= (x+1)(x-1)(x+y)$

c)



$\tan\theta = \frac{3.5}{30}$

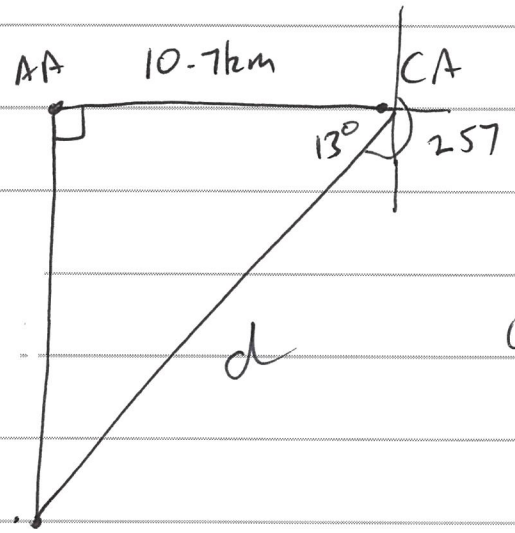
$\theta = 6.65...$

∴ Angle he must run $= 2\theta$
$= 13°$

17

d) $\frac{4-2\sqrt{5}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{3}-2\sqrt{15}}{3}$

e)



$\cos 13° = \frac{10.7}{d}$

$d = 10.7 / \cos 13°$

$= 10.98$

$\therefore$ 11.01 km.

8

Question 14

a) $2y = 1 - xy$

$2y + xy = 1$

$y(2+x) = 1$

$y = \frac{1}{2+x}$

b) i) $\frac{4(a-3)}{5b^3} \times \frac{16^2}{(a+3)(a-3)} = \frac{8}{b^3(a+3)}$

ii) $\frac{4}{k^2+2k-3} + \frac{1}{k+3} = \frac{4}{(k+3)(k-1)} + \frac{1}{(k+3)}$

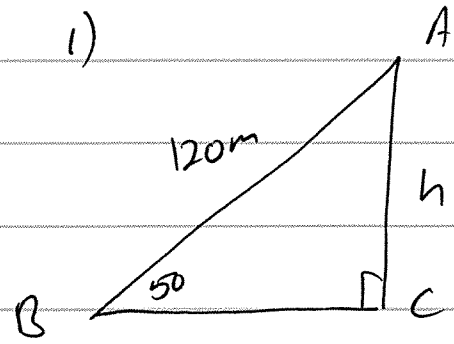
$= \frac{4 + k-1}{(k+3)(k-1)}$

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

$= \frac{1}{k-1}$

9

c) i)



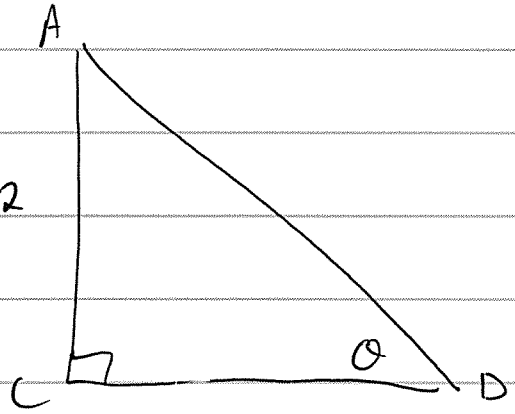
ii) $\sin 50 = \frac{h}{120}$

$h = 120 \sin 50$

$= 91.925...$

$= 92m$

iii)



$\cos 50 = \frac{BC}{120}$

$BC = 120 \cos 50$

$\approx 77.13m$ (2.d.p.)

∴ If $BC = 77.13m$

$CD = 2 \times 77.13...$

$= 154.269...$

$= 154m$

∴ Let $\angle ADC = \theta$

$\tan\theta = \frac{92}{154}$

$\theta = \tan^{-1}\left(\frac{92}{154}\right)$

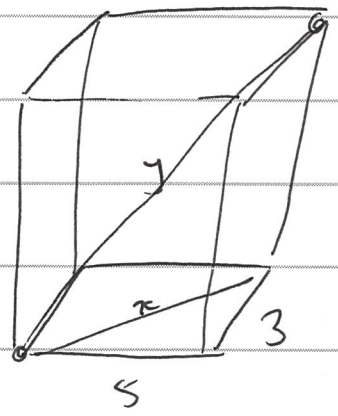
$\theta \approx 30.85$

as $50 \div 2 = 25$, Oswald is NOT correct.

Question 15

/10

a)



i) $x^2 = 3^2 + 5^2$

$x = \sqrt{9+25}$

$= \sqrt{34}$

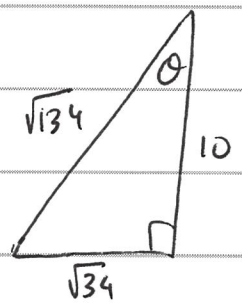
$y^2 = 10^2 + (\sqrt{34})^2$

$y = \sqrt{100+34}$

$= \sqrt{134}$

$= 11.6 \text{ cm}$

ii)



$\tan\theta = \frac{\sqrt{34}}{10}$

$\theta = \tan^{-1}\left(\frac{\sqrt{34}}{10}\right)$

$= 30°15'$

b) $(1, -3)$ $\quad 3x - 4y + 5 = 0$

$4y = 3x + 5$

$y = \frac{3x}{4} + \frac{5}{4}$

$\therefore m_1 = \frac{3}{4}$

$m_2 = -\frac{4}{3}$

$y - y_1 = m(x - x_1)$

$y - -3 = \frac{-4}{3}(x - 1)$

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

must be one

$y = \frac{-4x}{3} - \frac{5}{3}$ OR $4x + 3y + 5 = 0$

11

c) C (2, 3) A (-1, -5)

i) $r = \sqrt{(-5-3)^2 + (-1-2)^2}$

$= \sqrt{64 + 9}$

$= \sqrt{73}$ units

ii) $\frac{-1+x}{2} = 2$ $\frac{-5+y}{2} = 3$

$-1+x = 4$ $-5+y = 6$

$x = 5$ $y = 11$

$\therefore$ B (5, 11)

Question 16

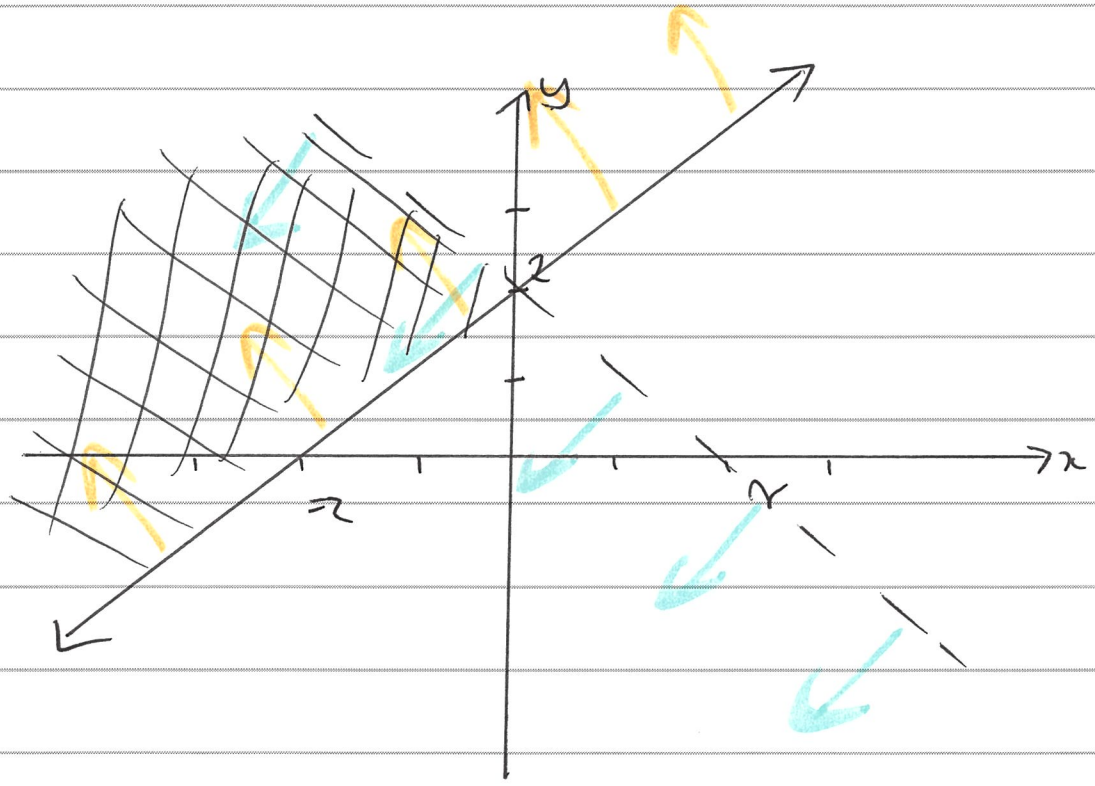
/12

a) $10^x = p$ $\qquad 10^{1-3x} = 10 \div 10^{3x}$

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

$$= \frac{10}{p^3}$$

b)



$x - y + 2 \leq 0$

$y = x + 2$

test $(0,0)$

$0 - 0 + 2 \leq 0$

$2 \nleq 0$

not true

$x + y - 2 < 0$

$y = -x + 2$

test $(0,0)$

$0 + 0 - 2 < 0$

$-2 < 0$ ✓

true

/13

c) SA of Earth $= 4\pi r^2$

$= 4\pi \times 6400^2$

$= 163840000\pi \text{ km}^2$

30% of Earth Surface $= 163840000\pi \times 0.3$

$= 154415562.1\ldots \text{ km}^2$

$= 1.5 \times 10^8 \text{ km}^2$

d) Volume of Coin $= (\pi \times 22^2 \times 3) - (x^2 \times 3)$

(where x is the side length of the square)

$= 1452\pi - 3x^2$

If volume is 4400

$4400 = 1452\pi - 3x^2$

$3x^2 = 1452\pi - 4400$

$x^2 = \dfrac{(1452\pi - 4400)}{3}$

$x = \sqrt{\dfrac{1452\pi - 4400}{3}}$

$= 7.339221871\ldots$

$= 7.34 \text{ mm}$