Girraween High School
Year 10 Mathematics
Test 4 (Yearly) 2022
Part A Answer Sheet

Name: _____

Teacher: _____

Select the alternative A, B, C or D that best answers the question.

									NA	MG	SP
1.	A	○	B	○	C	○	D	○			
2.	A	○	B	○	C	○	D	○			
3.	A	○	B	○	C	○	D	○			
4.	A	○	B	○	C	○	D	○			
5.	A	○	B	○	C	○	D	○			
6.	A	○	B	○	C	○	D	○			
7.	A	○	B	○	C	○	D	○			
8.	A	○	B	○	C	○	D	○			
9.	A	○	B	○	C	○	D	○			
10.	A	○	B	○	C	○	D	○			
11.	A	○	B	○	C	○	D	○			
12.	A	○	B	○	C	○	D	○			
13.	A	○	B	○	C	○	D	○			
14.	A	○	B	○	C	○	D	○			
15.	A	○	B	○	C	○	D	○			
16.	A	○	B	○	C	○	D	○			
17.	A	○	B	○	C	○	D	○			
18.	A	○	B	○	C	○	D	○			
19.	A	○	B	○	C	○	D	○			
20.	A	○	B	○	C	○	D	○			
									/10	/5	/5

Girraween High School
Year 10 Mathematics

Test 4 (Yearly) 2022

Marking sheet for examiners' use only

Total Marks (Percentage)

Name:_____ **Teacher**_____.

Examiner's use only

Question	Number & Algebra (N&A)	Measurement & Geometry (M&G)	Statistics & Probability (S&P)	TOTAL
Mentals	/20			
Part A	1- 10 /10	11 - 15 /5	16 - 20 /5	/20
PART B Q21	a - g /7	h - k /4	l - o /4	/15
Q22			/28	/28
Q23	/26			/26
Q24	/26			/26
Q25		/24		/24
TOTAL	**/89**	**/33**	**/37**	**/139**

GIRRAWEEN HIGH SCHOOL

YEAR 10 YEARLY EXAMINATION

MATHEMATICS

2022

Time allowed: Two hours

Reading Time: 5 minutes

Name: _____

Teacher: _____

INSTRUCTIONS TO STUDENTS

- You should attempt all questions in Part A and Part B.
- The answers to all questions in Part A must be recorded in blue or black pen on the separate Multiple Choice answer sheet.
- Approved scientific calculators may be used in all parts of the examination.
- Diagrams are not drawn to scale unless otherwise stated.

Girraween High School

MATHEMATICS

Test 4 Part A **2022**

Year 10 **Time allowed: 2 hours**

Name:_____ **Teacher:**_____

Instructions: Fill in the circle corresponding to the correct answer on the **Multiple Choice Answer Sheet.**

Part A (20 marks)

---

1. Simplify: $\frac{p-2}{28} \div \frac{2-p}{4}$

(A) 7 **(B)** -7 **(C)** $\frac{1}{7}$ **(D)** $-\frac{1}{7}$

---

2. The solution to $7-3x<1$ is

(A) $x<2$ **(B)** $x<-2$ **(C)** $x>2$ **(D)** $x>-2$

---

3. The graphs of $y=5^x$ and $y=\frac{1}{5}$ intersect at the point

(A) (1, 5) **(B)** (-1, 5) **(C)** $(1,\frac{1}{5})$ **(D)** $(-1,\frac{1}{5})$

---

4. Write the reciprocal of $4-\sqrt{2}$ with a rational denominator

(A) $\frac{4+\sqrt{2}}{14}$ **(B)** $\frac{4-\sqrt{2}}{14}$ **(C)** $\frac{4+\sqrt{2}}{7}$ **(D)** $\frac{4-\sqrt{2}}{7}$

---

5. Express with a positive index: $\left(7y^{-5}\right)^2$

(A) $7y^{10}$ **(B)** $49y^{10}$ **(C)** $\frac{7}{y^{10}}$ **(D)** $\frac{49}{y^{10}}$

---

6. Solve: $\frac{2x-5}{x}=\frac{2}{3}$

(A) $x=\frac{15}{8}$ **(B)** $x=\frac{17}{6}$ **(C)** $x=\frac{15}{4}$ **(D)** $x=\frac{5}{4}$

---

7. When 0.028754 is written in scientific notation, correct to 3 significant figures, the result is

(A) 2.87×10^{-2} **(B)** 2.88×10^{-2} **(C)** 2.87×10^{-3} **(D)** 2.88×10^{-3}

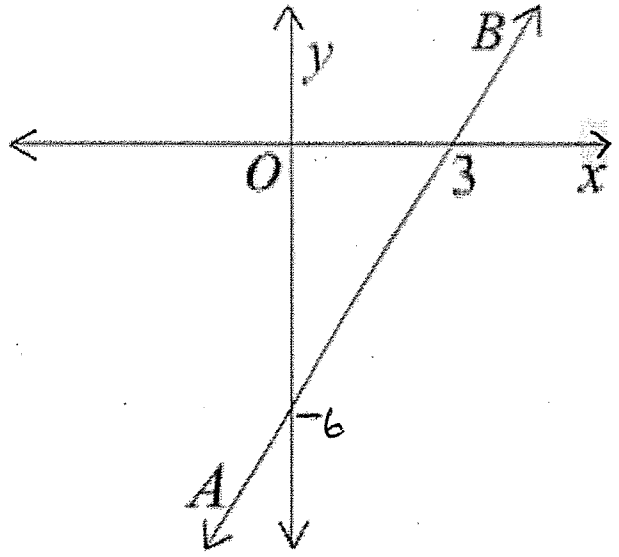
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8. The gradient of the line $3y+x=\frac{1}{3}$ is

(A) $\frac{1}{3}$ **(B)** $-\frac{1}{3}$ **(C)** -1 **(D)** 1

---

9. What is the equation of the line AB?



(A) $y=2x+6$ **(B)** $y=2x-6$

(C) $y=\frac{1}{2}x+6$ **(D)** $y=-\frac{1}{2}x-6$

---

10. Which of the following statements is NOT true?

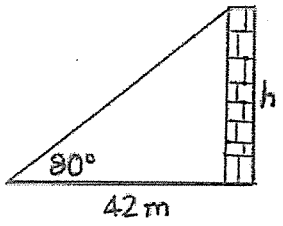
I. The parabola $y = \frac{1}{6}x^2$ is steeper than the parabola $y = x^2$.

II. The parabola $y = -8x^2$ is steeper than $y = -\frac{1}{2}x^2$.

(A) I only **(B)** II only **(C)** both **(D)** neither

---

11. The angle of elevation of the top of a building is $80°$ from a point $42\ m$ from the base of the building. The height of the building correct to 1 decimal place is



(A) $235.2m$ **(B)** $238.2m$ **(C)** $240.1m$ **(D)** $242.3m$

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12. The obtuse angle θ such that $\tan\theta = -\tan 50°$ is

(A) $\theta = 130°$ **(B)** $\theta = 140°$ **(C)** $\theta = 145°$ **(D)** $\theta = 155°$

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13. The incorrect statement below is

(A) $\cos\theta > 0, \sin\theta < 0 \Rightarrow \theta$ is in the fourth quadrant.

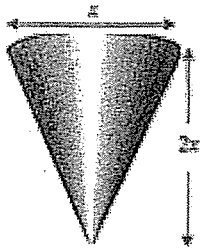
(B) $\cos\theta > 0, \tan\theta > 0 \Rightarrow \theta$ is in the third quadrant.

(C) $\tan\theta < 0, \cos\theta < 0 \Rightarrow \theta$ is in the second quadrant.

(D) $\sin\theta > 0, \tan\theta > 0 \Rightarrow \theta$ is in the first quadrant.

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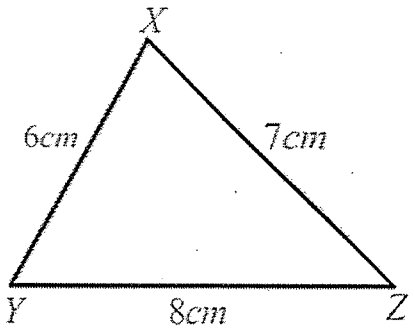
14. The height of this cone is twice the length of its diameter. Which expression gives the volume of the cone?



(A) $\frac{\pi x^2}{12}$ **(B)** $\frac{2\pi x^3}{3}$ **(C)** $\frac{\pi x^3}{6}$ **(D)** $\frac{2\pi x^4}{3}$

---

15. In ΔXYZ shown, the value of $\cos \angle YXZ$ is:



(A) $\frac{1}{8}$ **(B)** $\frac{1}{4}$ **(C)** $\frac{1}{2}$ **(D)** $\frac{17}{32}$

Questions 16 and 17 refer to the data given below.

85, 90, 69, 95, 78, 71, 70, 81, 83, 92, 82

---

16. The mean of the above data is

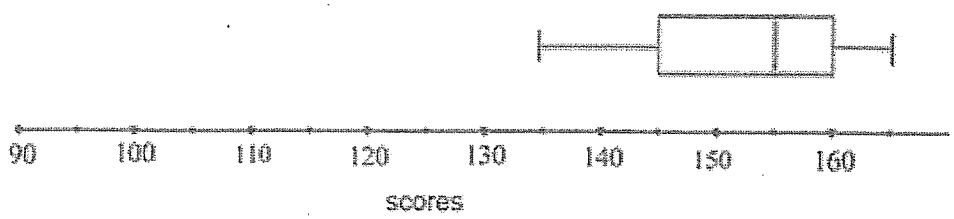
(A) 81.43 **(B)** 81.44 **(C)** 81.45 **(D)** 81.46

---

17. The standard deviation of the above data is

(A) 8.1 **(B)** 8.5 **(C)** 8.7 **(D)** 8.9

Questions 18, 19 and 20 refer to the box and whisker plot given below.



18. The first quartile is

(A) 150 **(B)** 155 **(C)** 160 **(D)** 145

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19. The range is

(A) 10 **(B)** 20 **(C)** 30 **(D)** 40

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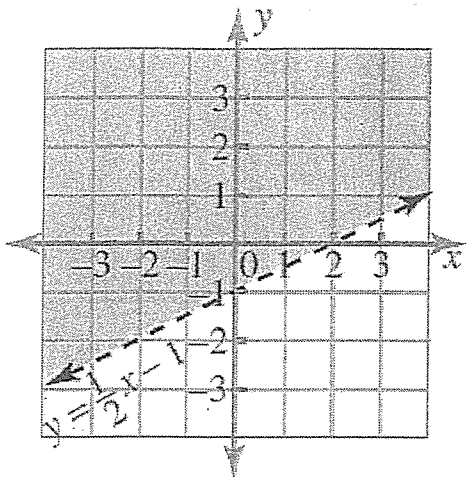
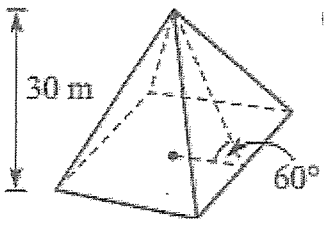
20. The interquartile range is

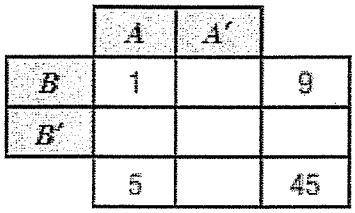
(A)10 **(B)**15 **(C)** 20 **(D)** 25

PART B

Question 21 (1 mark each – write answers in the spaces provided)

(a)	Expand: $(3x-4)^2$	
(b)	Find the exact distance between (-7, -1) and (4, -3)	
(c)	Find the midpoint of the interval joining (-6, -7) and (5, -11)	
(d)	Find the gradient of the line joining (-5,5) and (2, -3)	
(e)	If $f(x)=x^2-3x+7$, find $f\left(\sqrt{3}\right)$	
(f)	Make x the subject: $y=\sqrt{225-x^2}$	

(g)	Write the inequality satisfied by the shaded region.  	
(h)	Find the exact value of $\cos 330°$.	
(i)	Calculate the surface area of a sphere with radius 8.2 cm correct to 2 decimal place.	
(j)	Convert 0.000001 km^3 to m^3.	
(k)	A right square pyramid of height 30 m is drawn below.  Calculate the length of one side of the base. Write the answer in simplified exact form.	

(l)	A letter is chosen from each of the words AID and ROOF. Find the probability that the pair of letters will not have an O.	
(m)	For this two-way table, find $P(A' \cap B')$  	
(n)	The mean test result of a group of 25 students in class A is 82.5%. The mean test result of a group of 20 students in class B on the same test is 86%. What is the mean test result of the classes combined correct to 2 decimal places?	
(o)	A bag contains $(n-2)$ black, $(n+1)$ white and n red balls. If the probability of drawing a black ball from the bag is $\frac{1}{4}$, find the value of n.	

Question 22(28 marks)

(a) In a class of 40 students, 23 have dark hair, 18 have brown eyes, and 26 have either dark hair, brown eyes or both.

(i) Draw a Venn diagram to show the above information and hence find the number of students with dark hair and brown eyes. 2

A student is selected at random. Find the probability that the student has

(ii) dark hair and brown eyes. 1

(iii) neither dark hair nor brown eyes. 1

(iv) dark hair but not brown eyes. 1

(v) brown eyes given that the student has dark hair. 1

(b) In a bag, there are 5 black discs and 3 white discs. Two discs are drawn in succession from the bag, the first disc is not replaced before the second disc is drawn.

(i) Draw a probability tree diagram to show the outcomes. 4

(ii) Hence find the probability that the discs drawn are:

(I) both black **(II)** both the same colour 5

(III) of different colours.

(c) A and B are two events such that $P(A) = 0.6$, $P(B) = 0.4$ and $P(A \cup B) = 0.7$

Calculate:

(i) $P(A \cap B)$ 2

(ii) $P(B \mid A)$ 2

(iii) $P(A' \mid B')$ (Hint: $(A \cup B)' = A' \cap B'$) 2

(d) Two fair dice are rolled. Let A be the event of getting a 5 on the first die and B be the event that the sum of the numbers on the two dice is greater than 10.

(i) List the outcomes for event A and event B. 2

(ii) Find $P(A)$ 1

(iii) Find $P(B)$ 1

(iv) Find $P(A \cap B)$ 1

(iv) Determine whether A and B are independent. 2

Question 23 (26 marks)

(a) Solve $6x^2 + 4x = 3$ using the quadratic formula. 3

(b) Determine for which values of k the line $y = 4x + k$ intersects the parabola $y = x^2 + 5$ at two points. 3

(c) For the quadratic equation $y = 2x^2 - 5x + 3$,

(i) find the $y-$intercept **(ii)** find the $x-$intercepts 3

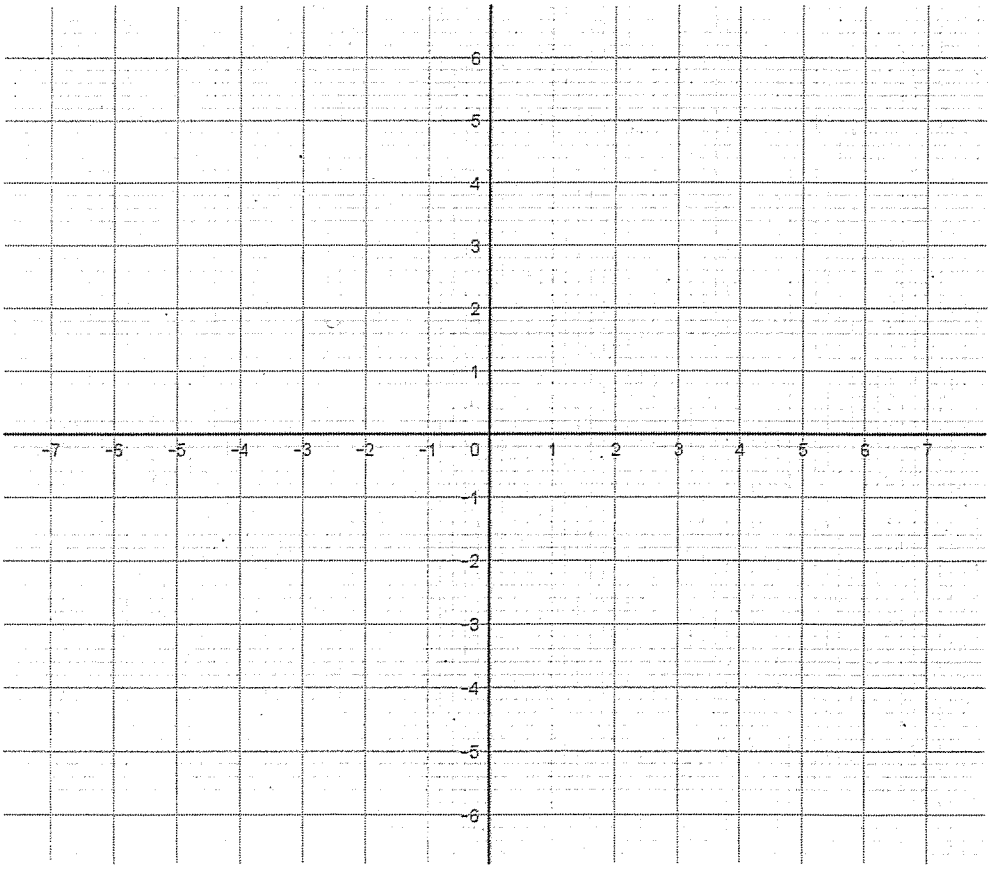
(iii) find the equation axis of symmetry **(iv)** find the vertex 4

(v) sketch the graph clearly showing all the above features. 5

(d) (i) Find the coordinates of the points where $x^2 + y^2 = 25$ intersects the line

$y = \frac{3}{4}x.$ 4

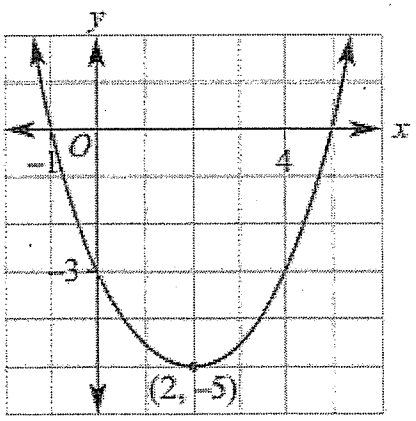
(ii) Sketch a graph showing the exact intersection points. 4



Question 24 (26 marks)

(a) Sketch the graph of $y = x^2 + 8x + 7$ by completing the square. Show vertex and intercepts with the axes. 5

(b) Determine the equation of the parabola in factored form. 3



(c) Write down the permissible x (domain) and y (range) values for each of these functions.

(i) $y = 2x - 3$ 2

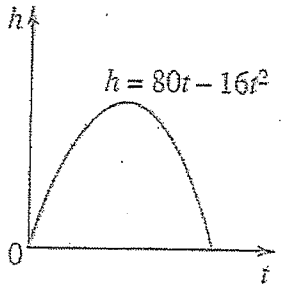
(ii) $y = 4 - x^2$ 2

(iii) $x^2 + y^2 = 121$ 2

(d) Sketch the graph of the following showing all the features. Also indicate **two** points on each graph.

(i) $y = 5^x$ (ii) $y = \frac{4}{x}$ 4

(e) Daniel throws a stone vertically upwards and after t seconds its height h meters above the ground is given by the formula $h = 80t - 16t^2$.

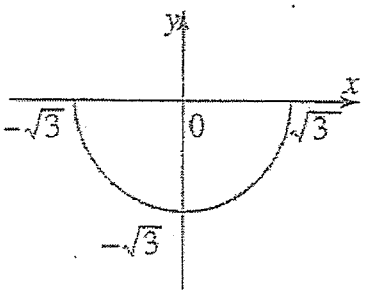


(i) At what times will the stone be 96 meters above the ground? 2

(ii) After how many seconds will the stone hit the ground? 2

(iii) Can the stone ever reach a height of 128 meters? 2

(f) Write the equation of the semicircle. 2



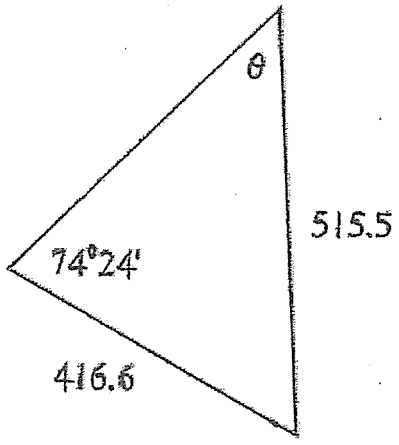
Question 25 (24 marks)

(a) Find all the possible values of θ, where $0° \leq \theta \leq 360°$. Give answers correct to the nearest degree.

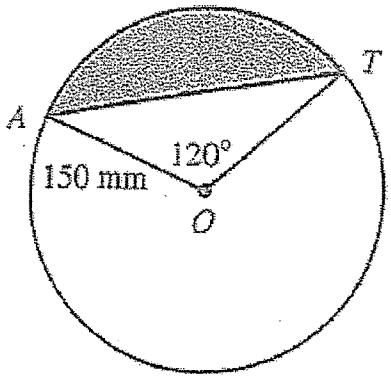
(i) $\sin\theta = 0.416$

(ii) $\cos\theta = -0.302$ 4

(b) Find the size of angle θ. Give answer correct to the nearest minute. 3



(c) O is the center of a circle, radius 150 cm, $\angle AOT = 120°$.



Calculate, correct to 1 decimal place, the area of :

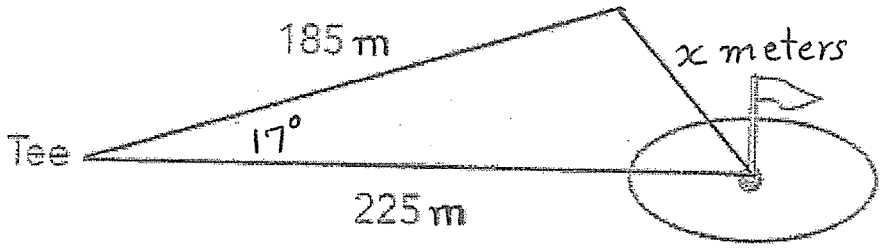
(i) the circle 2

(ii) the sector OAT. 2

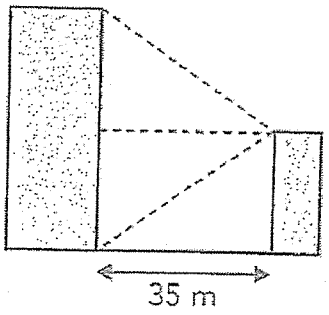
(iii) the triangle OAT. 2

(iv) the shaded segment. 2

(d) Harriet hits a golf ball at an angle of 17°. The ball lands 185 *m* from the Tee. If the distance from Tee to the hole is 225 meters, find the distance between the hole and the landing position of the ball (*x* meters). 2



(e) Two buildings are 35 meters apart. From the top of the smaller building, the angle of depression to the base of the taller building is 40° and the angle of elevation to the top of the building is 25°. How high is the taller building? 3



(f) A steeple (S) is 2.6 *km* due east of a marker (M). A tower (T) is due south of the same marker and 1.7 *km* from it. Calculate the bearing of the tower from the steeple. You must draw a bearing diagram. 4

END OF EXAMINATION

Girraween High School

MATHEMATICS

Test 4 Part A **2022**

Year 10 **Time allowed: 2 hours**

Name: Solutions **Teacher:**_____

Instructions: Fill in the circle corresponding to the correct answer on the **Multiple Choice Answer Sheet.**

Part A (20 marks)

---

1. Simplify: $\frac{p-2}{28} \div \frac{2-p}{4}$

(A) 7 (B) -7 (C) $\frac{1}{7}$ (D) $-\frac{1}{7}$

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2. The solution to $7-3x<1$ is

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3. The graphs of $y=5^x$ and $y=\frac{1}{5}$ intersect at the point

(A) (1, 5) (B) (-1, 5) (C) $(1,\frac{1}{5})$ (D) $(-1,\frac{1}{5})$

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4. Write the reciprocal of $4-\sqrt{2}$ with a rational denominator

(A) $\frac{4+\sqrt{2}}{14}$ (B) $\frac{4-\sqrt{2}}{14}$ (C) $\frac{4+\sqrt{2}}{7}$ (D) $\frac{4-\sqrt{2}}{7}$

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5. Express with a positive index: $(7y^{-5})^2$

(A) $7y^{10}$ (B) $49y^{10}$ (C) $\frac{7}{y^{10}}$ (D) $\frac{49}{y^{10}}$

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6. Solve: $\frac{2x-5}{x}=\frac{2}{3}$

(A) $x=\frac{15}{8}$ (B) $x=\frac{17}{6}$ (C) $x=\frac{15}{4}$ (D) $x=\frac{5}{4}$

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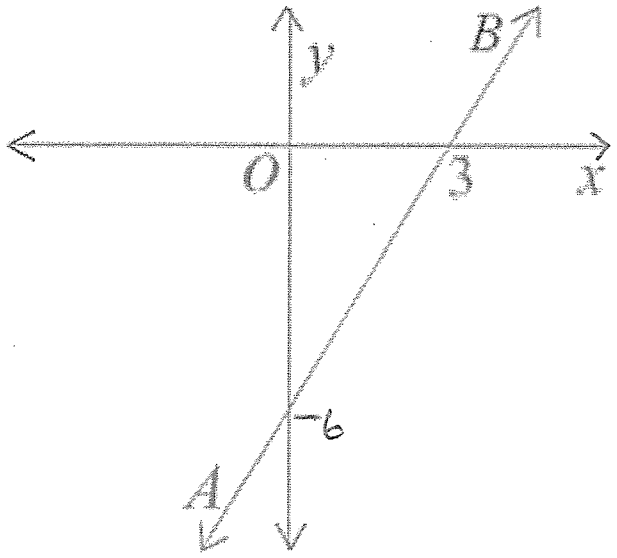
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8. The gradient of the line $3y+x=\frac{1}{3}$ is

(A) $\frac{1}{3}$ (B) $-\frac{1}{3}$ (C) -1 (D) 1

---

9. What is the equation of the line AB?



(A) $y=2x+6$ (B) $y=2x-6$

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10. Which of the following statements is NOT true?

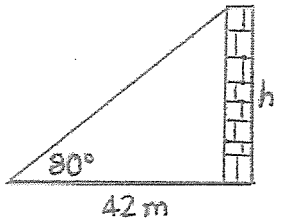
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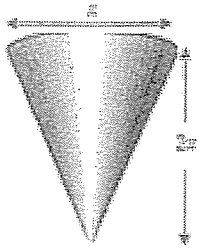
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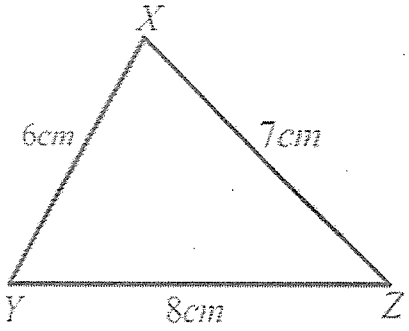
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15. In ΔXYZ shown, the value of $\cos \angle YXZ$ is:



(A) $\frac{1}{8}$ (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) $\frac{17}{32}$

Questions 16 and 17 refer to the data given below.

85, 90, 69, 95, 78, 71, 70, 81, 83, 92, 82

---

16. The mean of the above data is

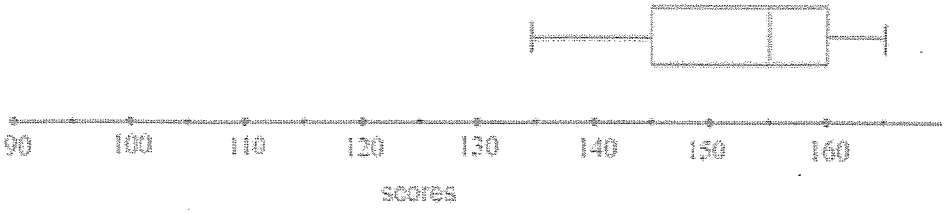
(A) 81.43 (B) 81.44 (C) 81.45 (D) 81.46

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17. The standard deviation of the above data is

(A) 8.1 (B) 8.5 (C) 8.7 (D) 8.9

Questions 18, 19 and 20 refer to the box and whisker plot given below.



18. The first quartile is

(A) 150 (B) 155 (C) 160 (D) 145

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19. The range is

(A) 10 (B) 20 (C) 30 (D) 40

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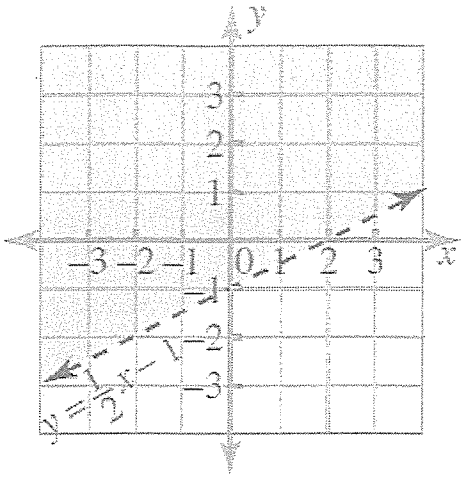
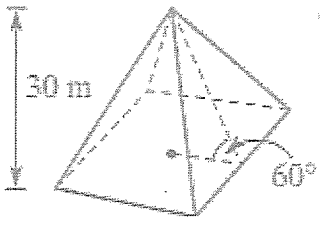
20. The interquartile range is

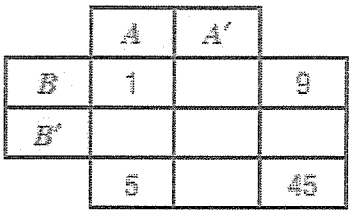
(A) 10 (B) 15 (C) 20 (D) 25

PART B

Question 21 (1 mark each – write answers in the spaces provided)

(a)	Expand: $(3x-4)^2$	$9x^2-24x+16$
(b)	Find the exact distance between (-7, -1) and (4, -3)	$\sqrt{125}$ or $5\sqrt{5}$
(c)	Find the midpoint of the interval joining (-6, -7) and (5, -11)	$\left(-\frac{1}{2}, -9\right)$
(d)	Find the gradient of the line joining (-5,5) and (2, -3)	$-\frac{8}{7}$
(e)	If $f(x)=x^2-3x+7$, find $f(\sqrt{3})$	$10-3\sqrt{3}$
(f)	Make x the subject: $y=\sqrt{225-x^2}$	$\pm\sqrt{225-y^2}$

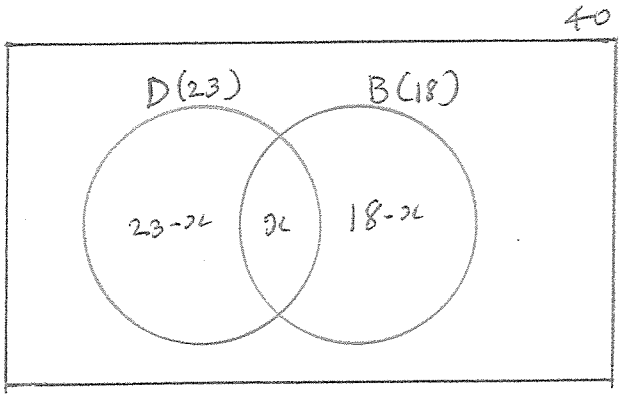
(g)	Write the inequality satisfied by the shaded region.  	$y > \frac{1}{2}x - 1$
(h)	Find the exact value of $\cos 330°$.	$\frac{\sqrt{3}}{2}$
(i)	Calculate the surface area of a sphere with radius 8.2 *cm* correct to 2 decimal place.	$844.96\ cm^2$
(j)	Convert $0.000001\ km^3$ to m^3.	$1000\ m^3$
(k)	A right square pyramid of height 30 m is drawn below.  Calculate the length of one side of the base. Write the answer in simplified exact form.	$20\sqrt{3}\ m$

(l)	A letter is chosen from each of the words AID and ROOF. Find the probability that the pair of letters will not have an O.	$\frac{1}{2}$
(m)	For this two-way table, find $P(A' \cap B')$  	$\frac{32}{45}$
(n)	The mean test result of a group of 25 students in class A is 82.5%. The mean test result of a group of 20 students in class B on the same test is 86%. What is the mean test result of the classes combined correct to 2 decimal places?	84.06
(o)	A bag contains $(n-2)$ black, $(n+1)$ white and n red balls. If the probability of drawing a black ball from the bag is $\frac{1}{4}$, find the value of n.	$n=7$

Question 22(28 marks)

(a) In a class of 40 students, 23 have dark hair, 18 have brown eyes, and 26 have either dark hair, brown eyes or both.

(i) Draw a Venn diagram to show the above information and hence find the number of students with dark hair and brown eyes. 2



$23 - x + x + 18 - x = 26$

$x = 15$

A student is selected at random. Find the probability that the student has

(ii) dark hair and brown eyes. 1

$= \frac{15}{40} = \frac{3}{8}$

(iii) neither dark hair nor brown eyes. 1

$= \frac{14}{40} = \frac{7}{20}$

(iv) dark hair but not brown eyes. 1

$= \frac{8}{40} = \frac{1}{5}$

(v) brown eyes given that the student has dark hair. 1

$= \frac{15}{23}$

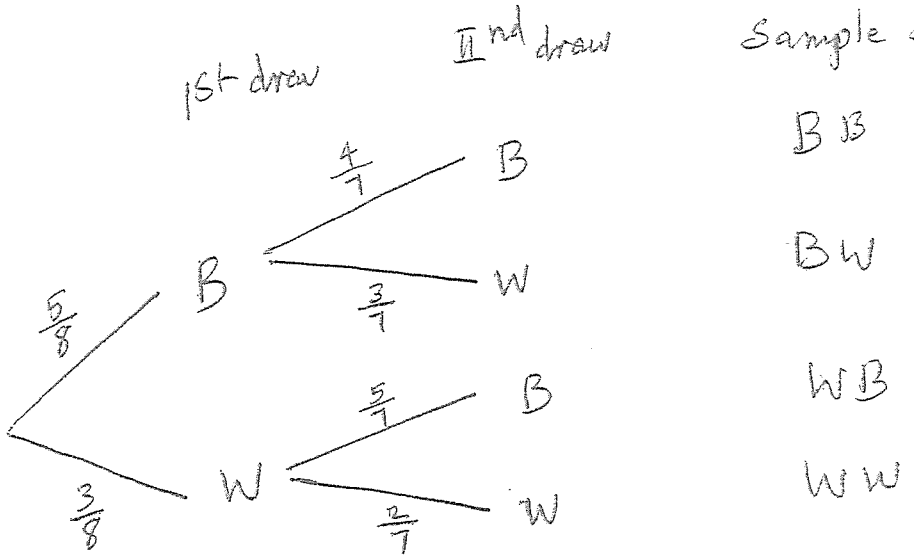
(b) In a bag, there are 5 black discs and 3 white discs. Two discs are drawn in succession from the bag, the first disc is not replaced before the second disc is drawn.

(i) Draw a probability tree diagram to show the outcomes. 4

(ii) Hence find the probability that the discs drawn are:

(I) both black (II) both the same colour 5

(III) of different colours.



(I) $P(BB) = \frac{5}{8} \times \frac{4}{7} = \frac{20}{56} = \frac{5}{14}$

(III) $P(BW) + P(WB)$

$= \left(\frac{5}{8} \times \frac{3}{7}\right) + \left(\frac{3}{8} \times \frac{5}{7}\right) = \frac{15}{28}$

(II) $P(BB) + P(WW) = \frac{20}{56} + \frac{3}{8} \times \frac{2}{7}$

$= \frac{20}{56} + \frac{6}{56}$

$= \frac{26}{56} = \frac{13}{28}$

(c) A and B are two events such that $P(A) = 0.6$, $P(B) = 0.4$ and $P(A \cup B) = 0.7$

Calculate:

(i) $P(A \cap B)$ 2

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$0.7 = 0.6 + 0.4 - P(A \cap B)$$

$$P(A \cap B) = 0.3$$

(ii) $P(B \mid A)$ 2

$$= \frac{P(A \cap B)}{P(A)}$$

$$= \frac{0.3}{0.6}$$

$$= \frac{1}{2}$$

(iii) $P(A' \mid B')$ (Hint: $(A \cup B)' = A' \cap B'$) 2

$$= \frac{P(A' \cap B')}{P(B')}$$

$$= \frac{P((A \cup B)')}{1 - P(B)}$$

$$= \frac{1 - P(A \cup B)}{1 - P(B)}$$

$$= \frac{1 - 0.7}{1 - 0.4} = \frac{1}{2}$$

(d) Two fair dice are rolled. Let A be the event of getting a 5 on the first die and B be the event that the sum of the numbers on the two dice is greater than 10.

(i) List the outcomes for event A and event B. 2

$A = \{(5,1), (5,2), (5,3), (5,4), (5,5), (5,6)\}$

$B = \{(5,6), (6,5), (6,6)\}$

(ii) Find $P(A)$ 1

$= \frac{6}{36} = \frac{1}{6}$

(iii) Find $P(B)$ 1

$= \frac{3}{36} = \frac{1}{12}$

(iv) Find $P(A \cap B)$ 1

$= \frac{1}{36}$

(iv) Determine whether A and B are independent. 2

If A and B are independent,

$P(A \cap B) = P(A) \times P(B)$

$P(A) \times P(B) = \frac{1}{6} \times \frac{1}{12} = \frac{1}{72} \neq P(A \cap B)$

$\therefore$ A and B are not independent.

Question 23 (26 marks)

(a) Solve $6x^2 + 4x = 3$ using the quadratic formula. 3

$6x^2 + 4x - 3 = 0$

$x = \dfrac{-4 \pm \sqrt{16 - 4 \times 6 \times -3}}{12}$

$= \dfrac{-4 \pm \sqrt{88}}{12}$

$= \dfrac{-4 \pm 2\sqrt{22}}{12}$

$= \dfrac{2(-2 \pm \sqrt{22})}{12} = \dfrac{-2 \pm \sqrt{22}}{6}$

(b) Determine for which values of k the line $y = 4x + k$ intersects the parabola $y = x^2 + 5$ at two points. 3

$x^2 + 5 = 4x + k$

$x^2 - 4x + 5 - k = 0$

$\Delta = b^2 - 4ac$

$= (-4)^2 - 4 \times 1 \times (5 - k)$

$= 16 - 4(5 - k)$

$= 4k - 4$

For two points of intersection, $\Delta > 0$

$4k - 4 > 0$

$4k > 4$

$k > 1$

(c) For the quadratic equation $y = 2x^2 - 5x + 3$,

(i) find the y – intercept (ii) find the x – intercepts 3

(iii) find the equation axis of symmetry (iv) find the vertex 4

(v) sketch the graph clearly showing all the above features. 5

(i) y intercept $(0,3)$

(ii) substitute $y = 0$

$2x^2 - 5x + 3 = 0$

$pq = 6$

$-3, -2$ $p + q = -5$

$2x^2 - 2x - 3x + 3 = 0$

$2x(x-1) - 3(x-1) = 0$

$(x-1)(2x-3) = 0$

$x = 1$ or $x = \frac{3}{2}$

$(1,0)$ $(\frac{3}{2},0)$

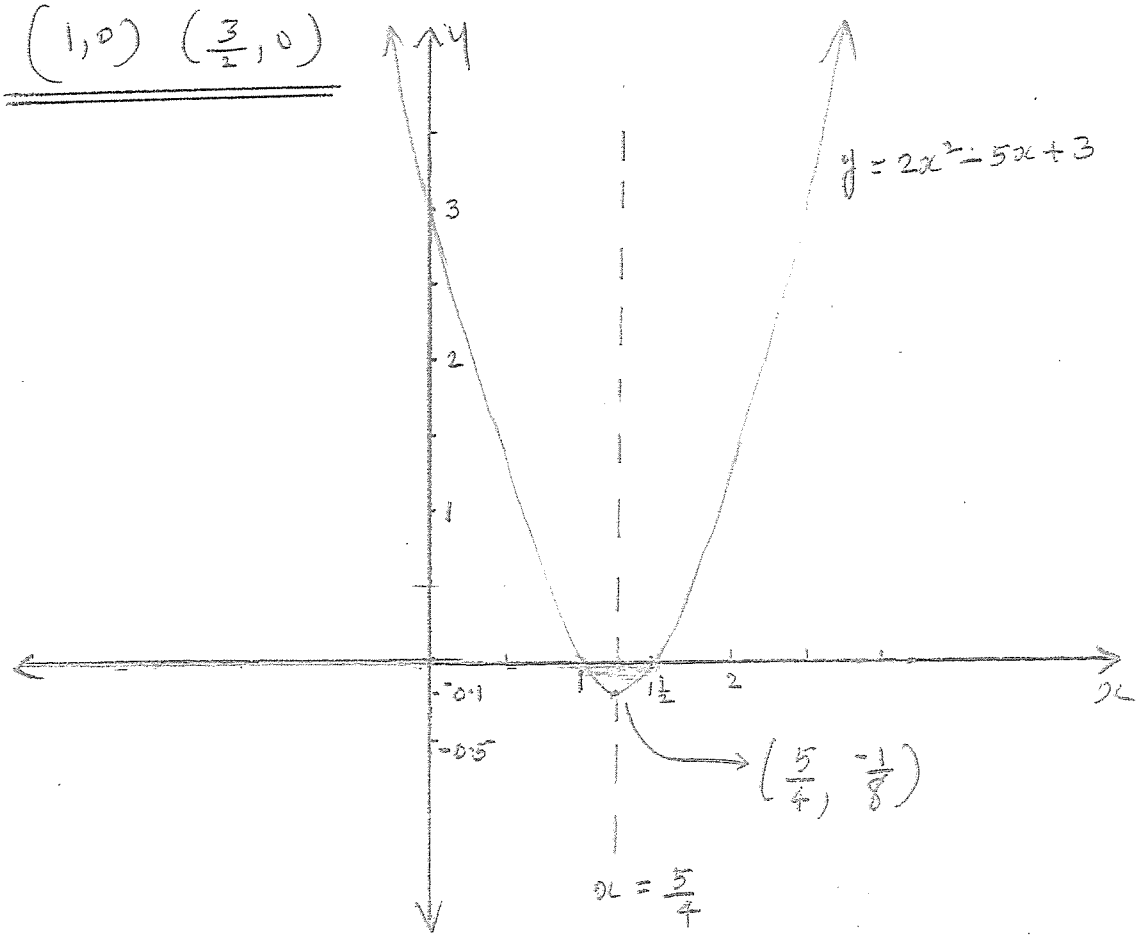
(iii) axis of symmetry

$$x = \frac{1 + \frac{3}{2}}{2} = \frac{5}{4}$$

(iv) when $x = \frac{5}{4}$, $y = 2\left(\frac{5}{4}\right)^2 - 5 \times \frac{5}{4} + 3$

$$= -\frac{1}{8}$$

Vertex $\left(\frac{5}{4}, -\frac{1}{8}\right) = (1.25, -0.13)$



(d) (i) Find the coordinates of the points where $x^2 + y^2 = 25$ intersects the line

$y = \frac{3}{4}x$. 4

$x^2 + y^2 = 25$

$x^2 + \frac{9x^2}{16} = 25$

$\frac{25x^2}{16} = 25$

$25x^2 = 400$

$x^2 = 16$

$x = \pm 4$

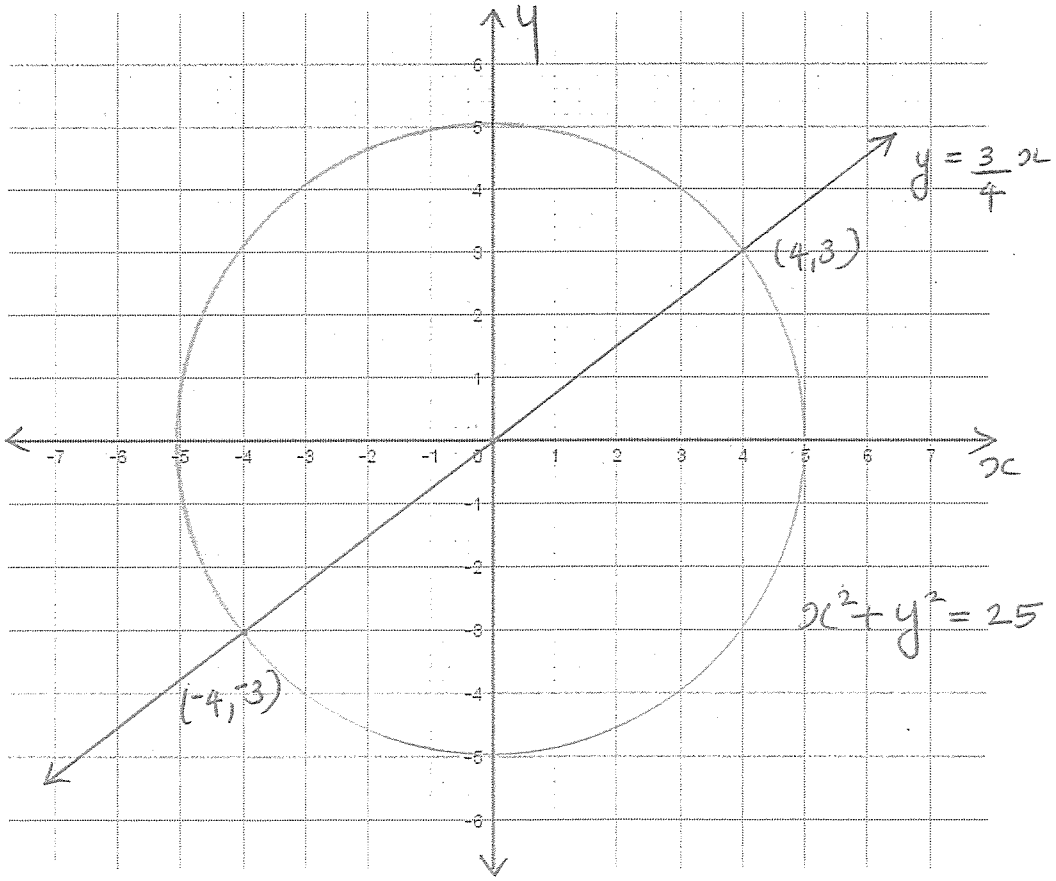
when $x = 4$, $y = 3$

when $x = -4$, $y = -3$

Points of intersection are

(4,3) and (−4,−3)

(ii) Sketch a graph showing the exact intersection points. 4



Question 24 (26 marks)

(a) Sketch the graph of $y = x^2 + 8x + 7$ by completing the square. Show vertex and intercepts with the axes. 5

$y = x^2 + 8x + 16 - 16 + 7$

$= (x+4)^2 - 9$

Vertex $= (-4, -9)$

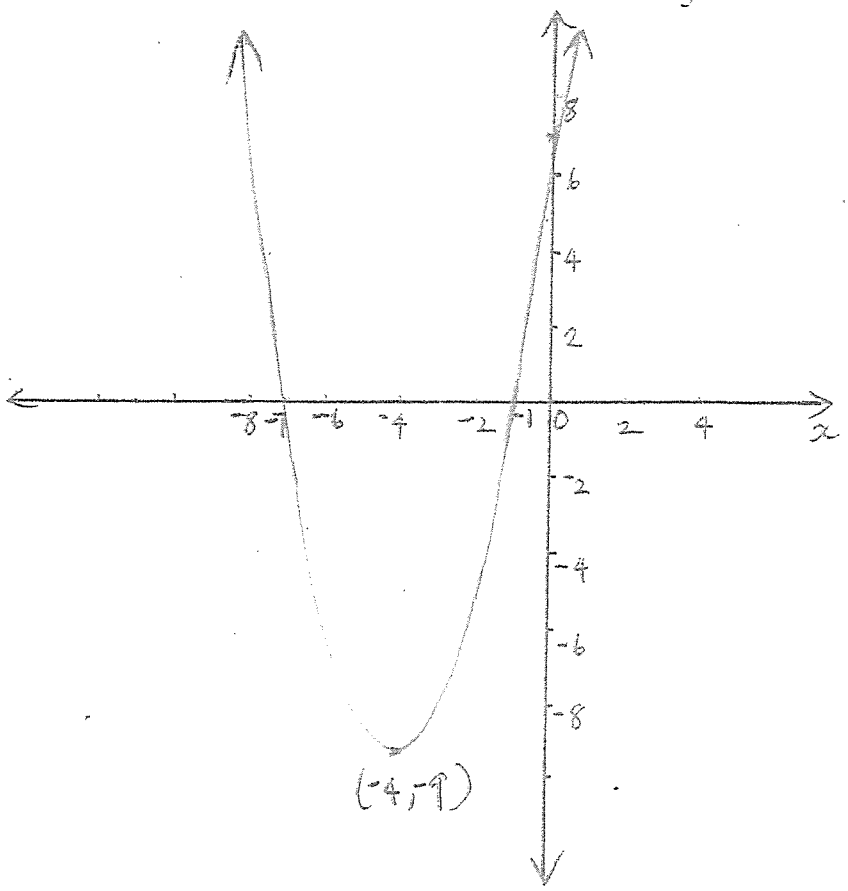
$y = 0 \Rightarrow (x+4)^2 - 9 = 0$

$(x+4)^2 = 9$

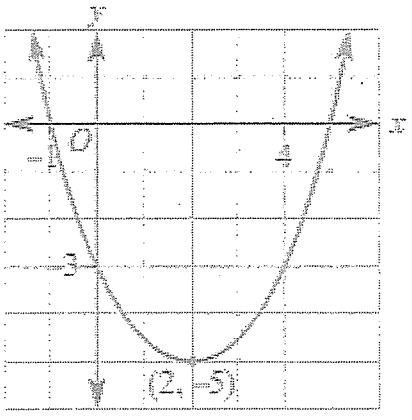
$x + 4 = \pm 3$

$x = -1$ or $x = -7$

$x = 0 \Rightarrow y = 7$



(b) Determine the equation of the parabola in factored form. 3



$y = k(x-5)(x+1)$ where k is a constant

Substitute $(2, -5)$

$-5 = k(2-5)(2+1)$

$-5 = k \times -3 \times 3$

$-9k = -5$

$k = \frac{5}{9}$

$\therefore y = \frac{5}{9}(x-5)(x+1)$

(c) Write down the permissible x (domain) and y (range) values for each of these functions.

(i) $y = 2x - 3$ 2

D : all real x

R : all real y

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

D : all real x

R : $y \leq 4$

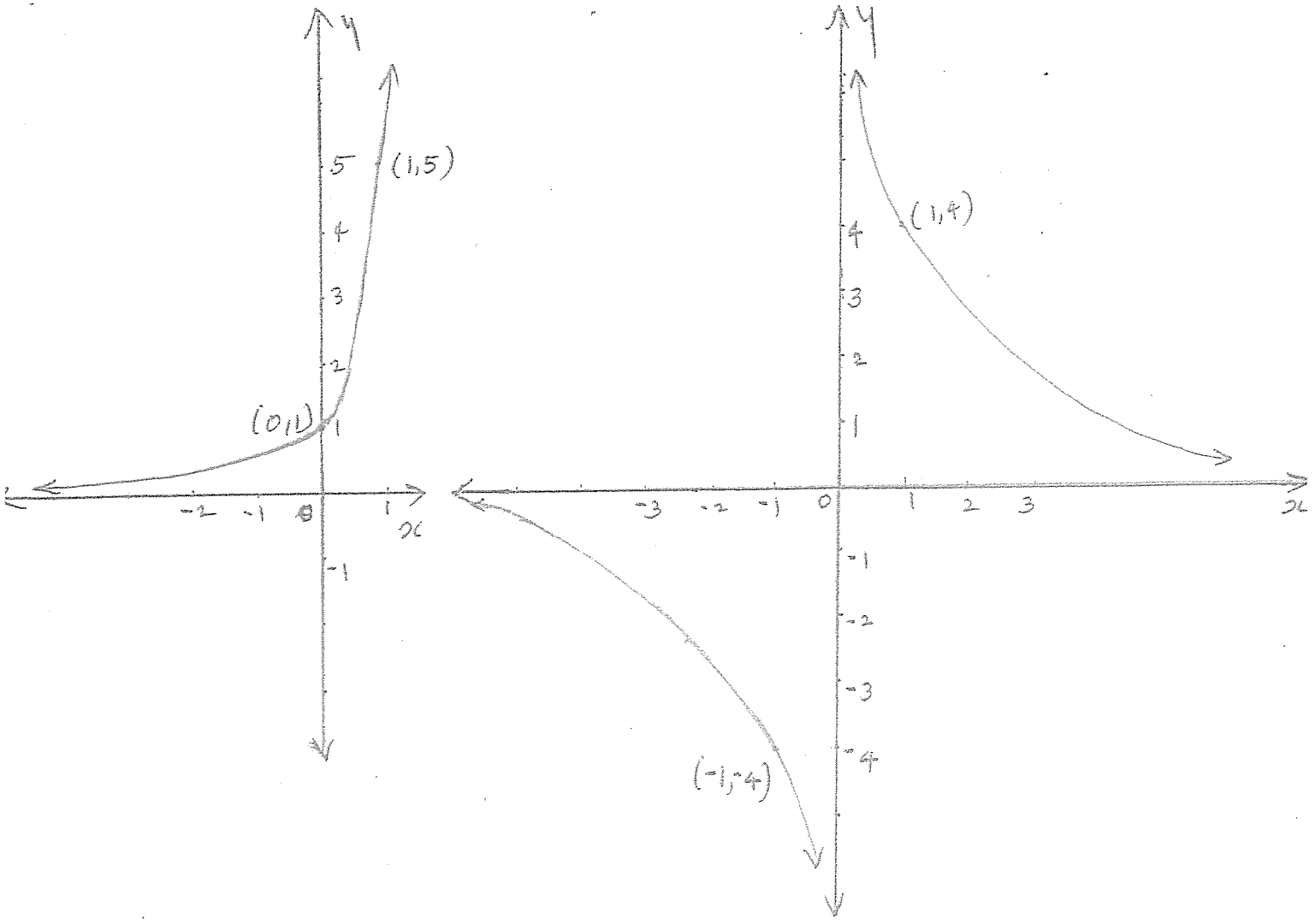
(iii) $x^2 + y^2 = 121$ 2

D : $-11 \leq x \leq 11$

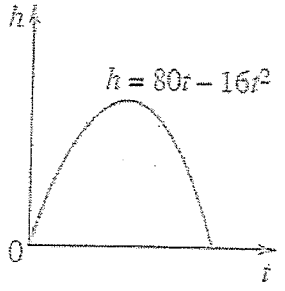
R : $-11 \leq x \leq 11$

(d) Sketch the graph of the following showing all the features. Also indicate two points on each graph.

(i) $y = 5^x$ (ii) $y = \frac{4}{x}$ 4



(e) Daniel throws a stone vertically upwards and after t seconds its height h meters above the ground is given by the formula $h = 80t - 16t^2$.



(i) At what times will the stone be 96 meters above the ground? 2

$96 = 80t - 16t^2$

$16t^2 - 80t + 96 = 0$

$t^2 - 5t + 6 = 0$

$(t-3)(t+2) = 0$

$t = 3$ or $t = 2$ seconds

(ii) After how many seconds will the stone hit the ground? 2

$80t - 16t^2 = 0$

$16t(5-t) = 0$

$t = 0$ or $t = 5$

The stone will hit the ground after 5 seconds

(iii) Can the stone ever reach a height of 128 meters? 2

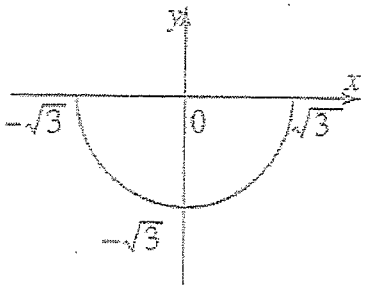
axis of symmetry $t = 2.5$

When $t = 2.5$

$h = 80 \times 2.5 - 16 \times (2.5)^2 = 100$

∴ the stone never reaches a height of 128 metres

(f) Write the equation of the semicircle. 2



$y = -\sqrt{3 - x^2}$

Question 25 (24 marks)

(a) Find all the possible values of θ, where $0° \le \theta \le 360°$. Give answers correct to the nearest degree.

(i) $\sin\theta = 0.416$

acute $\angle = 25°$

IInd quadrant $\angle$

$= 180° - 25°$

$= 155°$

$\theta = 25°, 155°$

(ii) $\cos\theta = -0.302$ 4

acute $\angle = \cos^{-1}(0.302)$

$= 72°$

IInd quadrant $\angle = 180° - 72°$

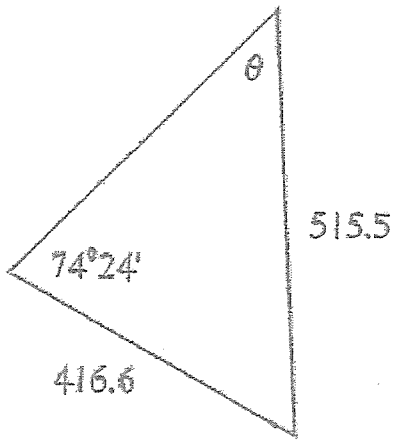
$= 108°$

IIIrd quadrant $\angle = 180° + 72°$

$= 252°$

$\theta = 108°, 252°$

(b) Find the size of angle θ. Give answer correct to the nearest minute. 3

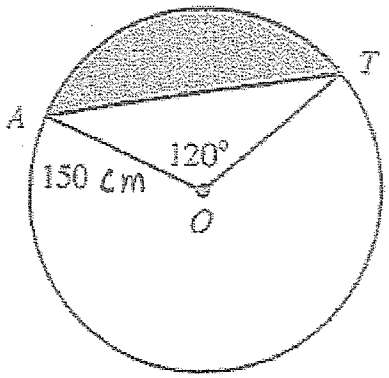


$$\frac{416.6}{\sin\theta} = \frac{515.5}{\sin 74°24'}$$

$$\sin\theta = \frac{416.6 \times \sin 74°24'}{515.5}$$

$\theta = 51°7'$

(c) O is the center of a circle, radius 150 cm, $\angle AOT = 120°$.



Calculate, correct to 1 decimal place, the area of :

(i) the circle 2

$A = \pi r^2$

$= \pi \times 150 \times 150$

$= \underline{70685.8 \text{ cm}^2}$

(ii) the sector OAT. 2

$= \frac{1}{3} \pi \times 150 \times 150$

$= \underline{23561.9 \text{ cm}^2}$

(iii) the triangle OAT. 2

$= \frac{1}{2} \times 150 \times 150 \times \sin 120°$

$= \underline{9742.8 \text{ cm}^2}$

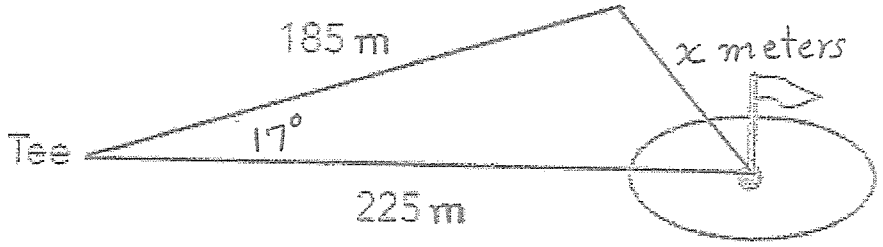
(iv) the shaded segment. 2

= area of sector OAT − area of ΔOAT

$= 23561.9 - 9742.8$

$= \underline{13819.1 \text{ cm}^2}$

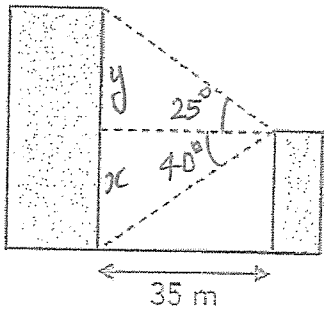
(d) Harriet hits a golf ball at an angle of 17°. The ball lands 185 m from the Tee. If the distance from Tee to the hole is 225 meters, find the distance between the hole and the landing position of the ball (x meters). 2



$x^2 = 225^2 + 185^2 - 2 \times 225 \times 185 \times \cos 17^\circ$

$x = 72\ m$

(e) Two buildings are 35 meters apart. From the top of the smaller building, the angle of depression to the base of the taller building is 40° and the angle of elevation to the top of the building is 25°. How high is the taller building? 3



$\tan 40 = \frac{x}{35}$

$x = 35 \times \tan 40^\circ$

$\tan 25 = \frac{y}{35}$

$y = 35 \times \tan 25^\circ$

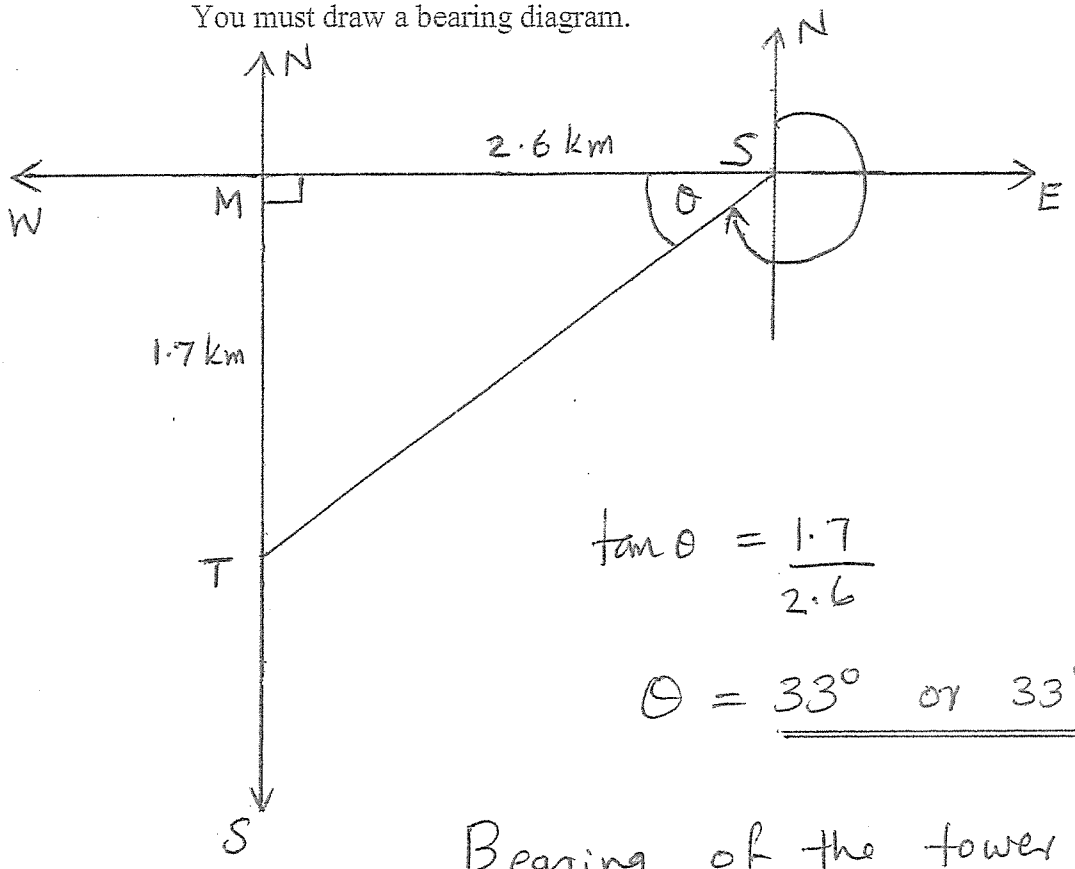
Height of the taller building

$= x + y$

$= 35 \tan 40 + 35 \tan 25$

$= 46\ m$

(f) A steeple (S) is 2.6 *km* due east of a marker (M). A tower (T) is due south of the same marker and 1.7 *km* from it. Calculate the bearing of the tower from the steeple. You must draw a bearing diagram. 4



$\tan\theta = \frac{1.7}{2.6}$

$\theta = 33^\circ$ or $33^\circ 11'$

Bearing of the tower from the steeple $= 270^\circ - 33^\circ$

$= 237^\circ$

OR

$270^\circ - 33^\circ 11'$

$= 236^\circ 49'$

END OF EXAMINATION