



KINCOPPAL – ROSE BAY
SCHOOL OF THE SACRED HEART

2016
SEMESTER 2
EXAMINATION

8th NOVEMBER 2016

MATHEMATICS
YEAR 9
STAGE 5.3

STUDENT NAME:

TEACHER:

General Instructions

- Reading time – 5 minutes
- Working time – 1.5 hours
- Answer all parts in this booklet
- All necessary working must be shown
- All diagrams are not to scale
- Write using blue/black pen
- Calculators are allowed

| | | |
|-----------------------------|--|------|
| A. Multiple Choice | | /10 |
| B. Number & Algebra | | /52 |
| C. Measurement & Geometry | | /23 |
| D. Statistics & Probability | | /15 |
| Total | | /100 |

Section A: Multiple Choice (10 Marks)

Circle the correct answer

Allow about 15 minutes for this section.

- 1 What is the total value of \$9500 invested at 4% compounded annually for 7 years?
(A) \$2660 (B) \$12501.35 (C) \$3001.35 (D) \$12160
- 2 What is $(2x+3)(x-5)$ in expanded form?
 $2x^2 - 10x + 3x - 15$
(A) $2x^2 + 7x - 5$ (B) $2x^2 - 13x - 15$ (C) $2x^2 - 15$ (D) $2x^2 - 7x - 15$
- 3 What is the y-intercept of $4x + y - 7 = 0$?
(A) 4 (B) 7 (C) -4 (D) -7
- 4 What is $5a^0 - (3a)^0$ in simplest form?
(A) $2a$ (B) 4 (C) 2 (D) $4a$
- 5 What is the median of the scores: 4, 12, 16, 25, 29, 31, 31, 35?
(A) 27 (B) 31 (C) 25 (D) 23

Circle the correct answer

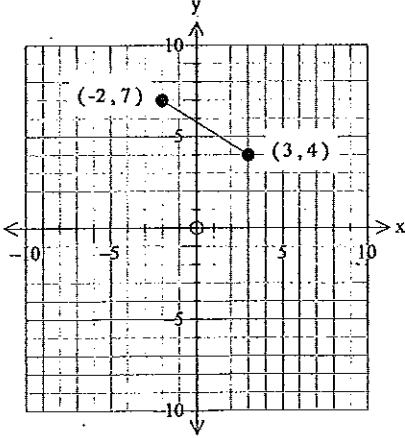
| | |
|-----|--|
| 6 | What is the solution to the equation $\frac{3p}{7} + 4 = 10$? |
| (A) | $p = \frac{98}{3}$ |
| (B) | $p = 22$ |
| (C) | $p = 14$ |
| (D) | $p = 42$ |
| 7 | What is $(9a^2b^6)^{\frac{1}{2}}$ in simplest form? |
| (A) | $3ab^3$ |
| (B) | $9a^4b^{12}$ |
| (C) | $3a^4b^{12}$ |
| (D) | $9ab^3$ |
| 8 | If $\sin \theta = \frac{4}{5}$, what is the value of θ to the nearest degree? |
| (A) | 45° |
| (B) | 13° |
| (C) | 53° |
| (D) | 28° |
| 9 | Which of the following is 13 4876 in scientific notation correct to three significant figures? |
| (A) | 1.34×10^5 |
| (B) | 135 |
| (C) | 135×10^3 |
| (D) | 1.35×10^5 |
| 10 | What is the surface area of a cube with side length 4 cm? |
| (A) | 16 cm^2 |
| (B) | 24 cm^2 |
| (C) | 64 cm^2 |
| (D) | 96 cm^2 |

End of Multiple Choice Section

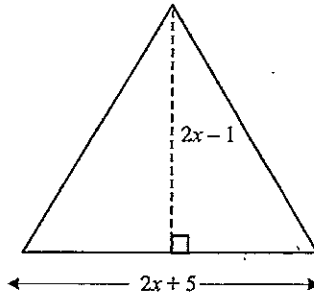
Section B: Number & Algebra (52 Marks)

| Show all necessary working. | | Marks |
|-----------------------------|--------------------------------|-------|
| 1. | Solve the following equations: | |
| | (a) $2x + 11 = 45$ | 1 |
| | (b) $\frac{a-4}{6} = 7$ | 2 |
| | (c) $3(2m+1) + 7m = 29$ | 3 |

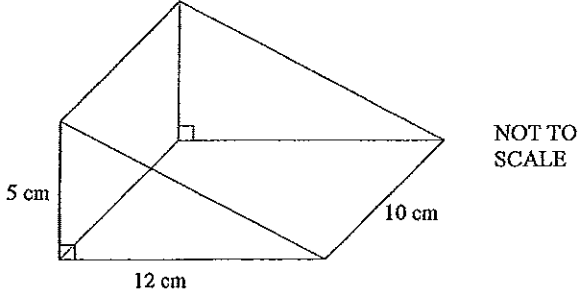
| | | |
|-----|---|----------------------------|
| 11. | <p>For the linear relationship $y = -2x - 6$:</p> <p>(i) State the gradient.</p> <p>(ii) Find the x- and y-intercepts.</p> <p>(iii) Graph the line on the Cartesian plane below, clearly labelling the intercepts.</p> | <p>1</p> <p>2</p> <p>2</p> |
|-----|---|----------------------------|

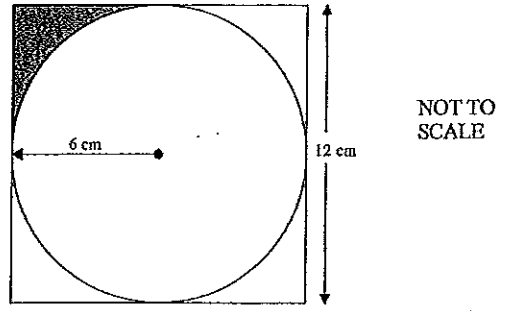
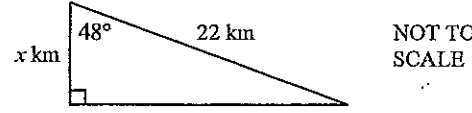
| | | |
|-----|---|---|
| 12. | <p>Write the equation of a line that has only one intercept.</p> | 1 |
| 13. | <p>Determine the equation of the line that has a gradient of 10 and passes through the point $(\frac{1}{2}, -7)$. Leave your answer in $y = mx + b$ form.</p> | 1 |
| 14. | <p>Find the midpoint of the line segment in the diagram below.</p>  | 2 |

| | | |
|-----|--|-----------------------------|
| 15. | Expand and simplify: (a) $(x-8)(x+7)$ (b) $(2a-1)(2a+1)$ (c) $(5+3p)^2$ | 1 1 2 |
| 16. | Factorise: (a) $w^2 - w - 20$ (b) $4m^2 - 25$ (c) $2y^2 - 11y + 9$ | 1 1 2 |

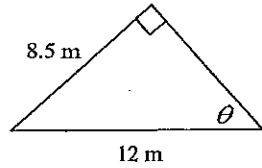
| | | |
|-----|---|---|
| 17. | Fully simplify $\frac{x^2 - 7x + 12}{2} \times \frac{4}{x^2 - 9}$ | 3 |
| 18. | The triangle below has a base length of $(2x+5)$ cm and a perpendicular height of $(2x-1)$ cm. Prove that the area of the triangle is $2x^2 + 4x - \frac{5}{2}$.  | 3 |

Section C: Measurement & Geometry (23 Marks)

| Show all necessary working | Marks |
|---|---|
| <p>I. For the triangular prism below,</p>  <p>(i) Calculate the total surface area.</p> <p>(ii) Find the volume.</p> | <p style="text-align: center;">3</p> <p style="text-align: center;">1</p> |

| | | |
|-----------|--|--------------------------------------|
| <p>2.</p> | <p>The diagram shows a circle drawn inside a square. The circle has a radius of 6 cm. The square has a side of length 12 cm. Calculate the shaded area. Give your answer correct to 1 decimal place.</p>  | <p style="text-align: center;">3</p> |
| <p>4.</p> | <p>Find the value of x correct to 1 decimal place.</p>  | <p style="text-align: center;">2</p> |

5. Find the value of θ correct to the nearest minute.

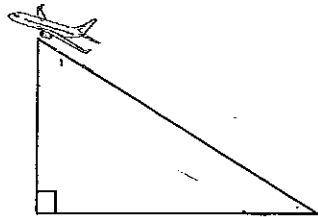


NOT TO
SCALE

2

6. An airplane climbs at an angle of elevation of 11° to an altitude of 600 m.

(i) Complete the diagram by adding in the information given.



NOT TO
SCALE

1

(ii) Find the ground distance the plane has covered, correct to 1 decimal place.

2

9. Theo leaves his campsite to go for a hike. He walks 8 km north, then turns and walks 6 km west to a lake.

(i) Draw a diagram to represent Theo's journey, include all relevant information.

1

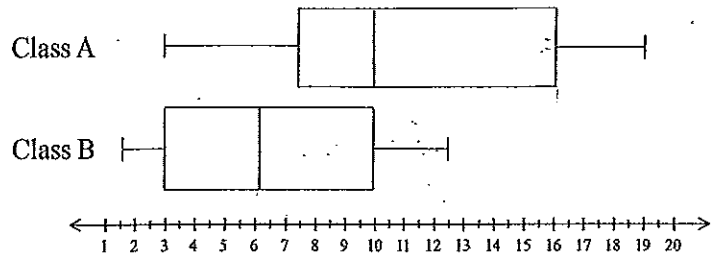
(ii) How far is Theo from the campsite?

1

(iii) Find the bearing of the campsite from the lake, correct to the nearest degree.

2

2. The test results of two classes are summarised in the double box-and-whisker plot below.



(a) State the overall minimum test score.

1

(b) The range for Class A is 16, determine the range for Class B.

1

(c) The interquartile range for Class B is 7, determine the interquartile range for Class A.

1

(d) Overall, what percentage of students scored 10 or higher?

2

(e) Which class has more consistent results? Justify your answer.

2

3. Eight numbers have a mean of 15. Seven of the numbers are 6, 11, 8, 12, 16, 23 and 20. Find the eighth number.

2

KINCOPPAL ROSE BAY

2016 SEMESTER 2 EXAM

YEAR 9 - STAGE 5.3

1. 9500×10^7
 $= 12501.35 \Rightarrow B$

$(2x+3)(x-5)$
 expanding
 $2x^2 - 10x + 3x - 15$
 $= 2x^2 - 7x - 15 \Rightarrow D$

$tx + ty - 7 = 0$
 intercept when $x=0$
 $y - 7 = 0, y = 7 \Rightarrow B$

$5a^0 - (3a)^0$
 $= 5(1) - (1) = 4 \Rightarrow B$

4. $12, 16, 25, 29, 31, 31, 35$
 $= \frac{25+29}{2} = 27 \Rightarrow A$

6. $\frac{3p}{7} + 4 = 10$

$3p + 28 = 70$

$3p = 70 - 28 = 42$

$3p = 42, p = \frac{42}{3} = 14$
 $\Rightarrow C$

7. $(9a^2b^6)^{\frac{1}{2}}$

$= 9^{\frac{1}{2}} a^{2 \cdot \frac{1}{2}} b^{6 \cdot \frac{1}{2}}$

$= 3ab^3 \Rightarrow A$

8. $\sin \theta = \frac{4}{5}$

$\therefore \theta = \sin^{-1} \frac{4}{5} \approx 53^\circ$
 $\Rightarrow C$

9. 134876
 rounded to 3 SF
 $= 135000$
 $= 1.35 \times 10^5$
 $\Rightarrow D$

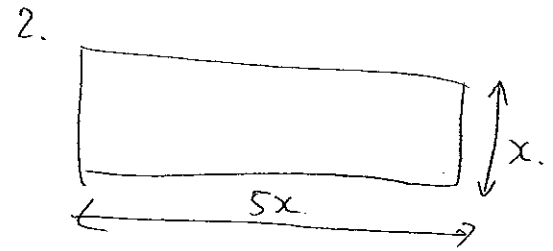
10. $4 \times 4 = 16$
 6 sides in a cube
 $16 \times 6 = 96$

Part B - Number and Algebra.

1. a) $2x + 11 = 45$
 $2x = 34$
 $x = 17$

b) $\frac{a-4}{6} = 7$
 $a-4 = 42$
 $a = 46$

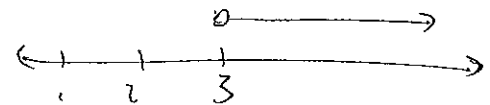
c) $3(2m+1) + 7m = 29$
 $6m + 3 + 7m = 29$
 $13m + 3 = 29$
 $13m = 26$
 $m = 2$



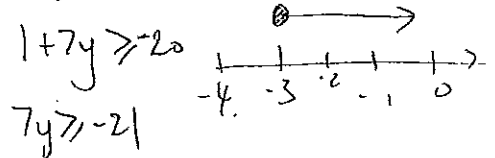
let the width be x .
 length will then be $5x$.
 perimeter = $2(5x) + 2(x)$
 $= 12x$.

ii) perimeter = 240m.
 so $240m = 12x$.
 $x = 20m$.
 ie the width is 20m.
 length is $5 \times 20m = 100m$.

3. a) $1 - 3x > -8$
 $-3x > -9$
 $x > 3$



b) $\frac{1+7y}{5} \geq 4$ $y \geq -3$



4. Normal Rate = \$21
 After 9pm → time and half.

Thursday and Friday =

\$21 For Four Hours

Saturday = \$21 for Four hours

and $(2 \times 1.5) \times 2$ For 2 hours

$$= 2(21 \times 4) + (21 \times 4) + (21 \times 1.5) \times 2$$

$$= \$315$$

5. $6000 \times 0.08 = 480$

$$480 + 1500 = \$1980$$

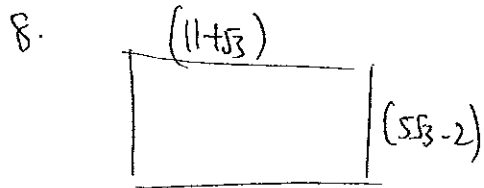
$$\text{Total Profit} = \$1980$$

6. $\frac{3500}{1000} \times 48$

$$= 3.5 \times 48 = \$168$$

7. a) $\left(\frac{6a^3}{c}\right)^2 = \frac{(6a^3)^2}{c^2} = \frac{36a^6}{c^2}$

b) $\frac{4w^2zy^5}{6wy} = \frac{12w^2yz^5}{6wy} = 2wyz^4$



Perimeter
 $= 2(11+5\sqrt{3}) + 2(5\sqrt{3}-2)$
 $= 22 + 10\sqrt{3} + 10\sqrt{3} - 4$
 $= 18 + 20\sqrt{3}$
 $= 6(2\sqrt{3} + 3)$

9. a) $3x^2y^6z^{-1}$

$$= \frac{3y^6}{x^2z}$$

b) $\left(\frac{5a^{-4}}{b}\right)^{-2} = \left(\frac{5}{a^4b}\right)^{-2}$
 $= \frac{a^8b^2}{25}$

10. Gradient Formula

$$\frac{7-k}{0-4} = -2$$

$$\frac{7-k}{-4} = -2$$

$$7-k = (-2)(-4) = 8$$

$$-k = 8 - 7 = 1$$

$$k = -1$$

11. $y = -2x - 6$

i) Gradient = -2

ii) X intercept.

$$0 = -2x - 6$$

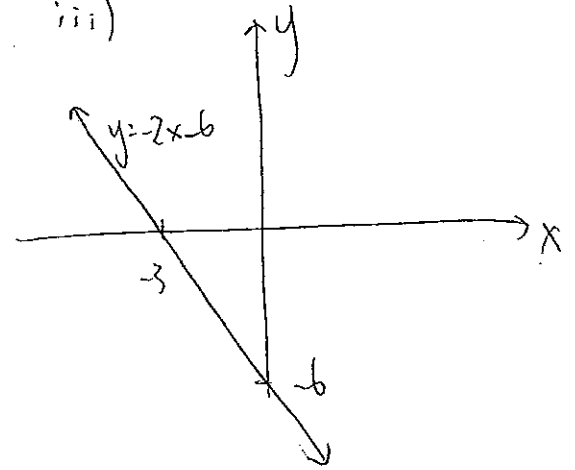
$$2x = -6$$

$$x = -3$$

Y intercept

$$y = -6$$

iii)



12. Anything with gradient 0 or ∞ is a horizontal or straight line.

ie $y = n$ ($n \in \mathbb{R}, n \neq 0$)

OR $x = n$ ($n \in \mathbb{R}, n \neq 0$)

13. $m = 10$

$$y = -7, x = \frac{1}{2}$$

$$-7 = 10\left(\frac{1}{2}\right) + b$$

$$-7 = 5 + b \rightarrow b = -7 - 5 = -12$$

$$\therefore y = 10x - 12$$

14. Mid point of a segment
points $(-2, 7)$, $(3, 4)$

$$\text{Midpoint} = \left(\frac{-2+3}{2}, \frac{7+4}{2} \right)$$

$$= \left(\frac{1}{2}, \frac{11}{2} \right)$$

$$= (0.5, 5.5)$$

15-a) $(x-8)(x+7)$

$$x^2 - 56 - 7x$$

b) $(2a-1)(2a+1)$

$$= 4a^2 - 1$$

c) $(5+3p)^2$

$$= (5+3p)(5+3p)$$

$$= 25 + 9p^2 + 30p$$

$$= 9p^2 + 30p + 25$$

16. a) $w^2 - w - 20$

$$= (w-5)(w+4)$$

b) $4m^2 - 25 = (2m+5)(2m-5)$

c) $(2y^2 - 11y + 9) = (2y-9)(y-1)$

17. $\frac{x^2 - 7x + 12}{2} \times \frac{4}{x^2 - 9}$

$$\frac{4(x^2 - 7x + 12)}{2(x^2 - 9)} = \frac{2(x^2 - 7x + 12)}{(x^2 - 9)}$$

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

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

18. Area = $\frac{1}{2}bh$

$$= \frac{1}{2}(2x+5)(2x-1)$$

$$= \frac{1}{2}(4x^2 - 5 + 8x)$$

$$= 2x^2 + 4x - \frac{5}{2}$$

Measurement & Geometry.

4. $\cos \theta = \frac{x}{22}$

$$= 14.7 \text{ km}$$

i) SA = $2(5 \times 12 \times \frac{1}{2}) + (12 \times 10) + (5 \times 10) + (10 \times 3)$

$$= 60 + 50 + 120 + 30$$

$$= 360 \text{ cm}^2$$

ii) Volume = $\frac{5 \times 12 \times 10}{2}$

$$= 300 \text{ cm}^3$$

2. $\frac{\text{Area of square} - \text{Area of circle}}{4}$

$$\text{Area of circle} = \pi r^2 = \pi 6^2$$

$$= 113.1$$

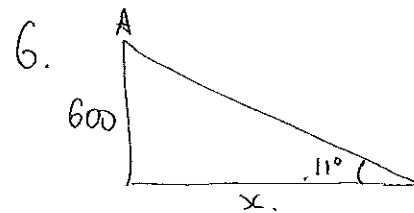
$$\text{Area of square} = 12 \times 12 = 144$$

$$144 - 113.1 = 30.9$$

$$\frac{30.9}{4} = 7.7 \text{ cm}^2$$

5. $\sin \theta = \frac{8.5}{12}$

$$\theta = \sin^{-1} \frac{8.5}{12} = 45^\circ 6'$$

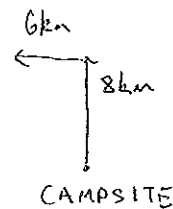


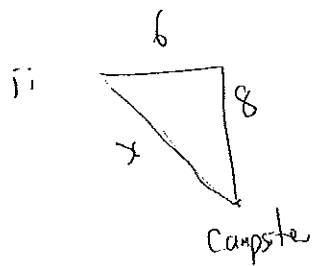
$$\frac{600}{x} = \tan 11^\circ$$

$$\frac{600}{\tan 11^\circ} = x$$

$$x = 3086.7 \text{ m (1dp)}$$

9. i)



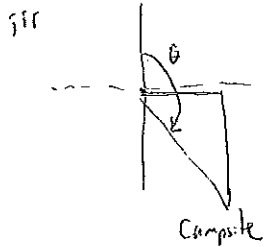


using Pythagoras theorem.

$$x^2 = 6^2 + 8^2$$

$$x^2 = 100$$

$$x = 10 \text{ cm}$$



we wish to find θ

ie $90^\circ + \text{the angle of the triangle}$

$$\text{angle} = \tan^{-1}\left(\frac{1.5}{2}\right) \approx 37^\circ$$

$$\text{So bearing} = 90^\circ + 37^\circ$$

$$= 127^\circ$$

i) In $\triangle ABC$ and $\triangle ADE$
 $\angle CAB = \angle EAD$ (common)
 $\angle DEC = \angle BCA$ (Corresponding angles)
 $\therefore \triangle ABC \sim \triangle ADE$ (equiangular)

ii) corresponding lengths of similar triangles are always in the

same ratio

$$\text{ie. } \frac{AB}{BC} = \frac{AD}{DE}$$

$$\frac{2}{1.5} = \frac{2+DB}{9}$$

$$18 = 1.5(2+DB)$$

$$18 = 3 + 1.5DB$$

$$15 = 1.5DB$$

$$DB = \frac{15}{1.5} = 10 \text{ cm}$$

D. Statistics

| T1 Leaf | STEM | T2 Leaf |
|------------|------|------------|
| 9, 8 | 0 | 7 |
| 9, 8, 7, 4 | 1 | |
| 5, 4, 3 | 2 | 0, 1, 4, 4 |
| 2 | 3 | 0, 5, 8 |
| 0 | 4 | 1, 6, 7, 9 |

ii) 24

iii) 48

iv) Team 1, because the bulk of their marks are less than Team 2

2. a) Minimum test score = 1.5

b) For class B

Range = Highest - Lowest

$$= 12.5 - 1.5 = 11$$

c) IQR

For class A

$$= 16 - 7.5 = 8.5$$

d) 25% of class B and 50% of class A

Assume same number of students in the same class

$$x(0.5) + (x(0.25))$$

$$= \frac{x(0.75)}{2x} \rightarrow \text{How many scored last}$$

\rightarrow Total number of students

$$\frac{0.75}{2} = 37.5\%$$

e) class B has more consistent results because of a smaller range and IQR

3.
$$\frac{6+11+8+12+16+23+20+x}{8} = 15$$

$$6+11+8+12+16+23+20+x = 120$$

$$x = 120 - \{6+11+8+12+16+23+20\}$$

$$x = 24$$