Carlingford High School

Mathematics

Year 9 Term 2 Examination

5.3 Course

2017

Name: Solution **Class: 5.3**_____

Circle your teacher's name: Mrs Lobejko Mrs Lego Mr Jiang

Time allowed: 55 minutes

- Board approved calculators may be used.
- Show all necessary working.
- Marks may be deducted for careless or untidy work.
- Questions marked with an asterisk * are extension level questions.
- Complete the examination in blue or black pen.

Topic	Algebraic Technique	Area, Surface Area and Volume	Linear Relationships	Total
Mark	/19	/14	/30	/63
Extension*	/5	/3	/3	/11
Total	/24	/17	/33	/74

Part A – Algebraic Techniques (24 marks)

1. Which of the following mathematical statements is *true*? (1 mark)

A $(a-b)^2 = a^2 + 2ab - b^2$

B $(a-b)(a+b) = a^2 - 2ab + b^2$

C $(a+b)(a-b) = a^2 + b^2$

D $(a+b)^2 = a^2 + 2ab + b^2$

2. Simplify each of the following. (7 × 1 = 7 marks)

a $8 - 3w + 7 - 2w$

$= 15 - 5w$

b $-6w \times 3w \times 2$

$= -36w^2$

c $27cf \div (-3fc)$

$= -9$

d $9b - 12b^2 + 6b^2 - 16b$

$= -7b - 6b^2$

e $\frac{x}{3} + \frac{2x}{5}$

$= \frac{5x + 6x}{15}$

$= \frac{11x}{15}$

f $\frac{8y}{5} \times \frac{3}{32y^2}$

$= \frac{3}{20y}$

g $\frac{7}{10pt} \div \frac{28}{5pt}$

$= \frac{7}{10pt} \times \frac{5pt}{28}$

$= \frac{1}{8}$

3. Expand and simplify each of the following. (5 × 1 + 2 × 3 = 11 marks)

a $3g(h-2)$

$= 3gh - 6g$

b $-(y-7)$

$= -y + 7$

c $(x+8)^2$

$= x^2 + 16x + 64$

d $(x+6)(x-6)$

$= x^2 - 36$

e $(2x-9)(2x+9)$

$= 4x^2 - 81$

f $7(n-3) + n(n-1)$

$= 7n - 21 + n^2 - n$

$= 6n - 21 + n^2$

g $(4x-5)(2x+1)$

$= 8x^2 - 10x + 4x - 5$

$= 8x^2 - 6x - 5$

h $(n+1)^2 + 2n - 3$

$= n^2 + 2n + 1 + 2n - 3$

$= n^2 + 4n - 2$

4. *Expand and simplify each algebraic expression. (2 + 3 = 5 marks)

a $\frac{21cf}{q} \div \frac{5}{qf} \div \frac{7c}{a}$

$= \left(\frac{21cf}{q} \times \frac{qf}{5}\right) \div \frac{7c}{a}$

$= \frac{21cf^2}{5} \times \frac{a}{7c}$

$= \frac{3f^2a}{5} \quad \left(\frac{3af^2}{5}\right)$

b $(x-3)(x+3) - (x+3)^2 - (x-3)^2$

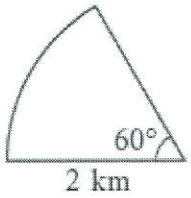
$= x^2 - 9 - (x^2 + 6x + 9) - (x^2 - 6x + 9)$

$= x^2 - 9 - x^2 - 6x - 9 - x^2 + 6x - 9$

$= -x^2 - 27$

Part B – Area Surface Area and Volume (17 marks)

1. Find the perimeter of this sector correct to two decimal places. (2 marks)

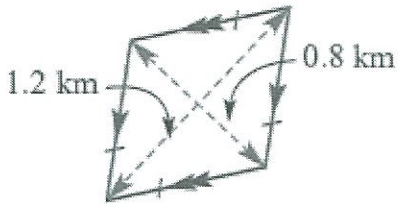


$P = \left(\frac{60}{360} \times 2 \times \pi \times 2\right) + 4$

$= 6.09\ km$

2. Find the area of the figures correct to two decimal places when necessary. (1 + 2= 3 marks)

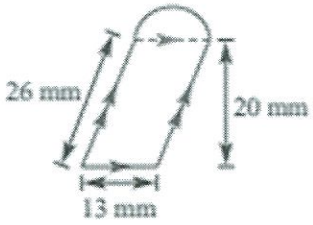
a



$A = \frac{1}{2} \times 1.2 \times 0.8$

$= 0.48\ km^2$

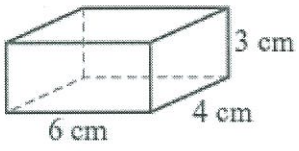
b



$A = (13 \times 20) + \left(\frac{1}{2} \times \pi \times 6.5^2\right)$

$= 326.37\ mm^2$

~~4~~ **3.** Find the surface area of ~~each of~~ the following solid objects, rounding your answer to two decimal places ~~when necessary~~. (2 marks)

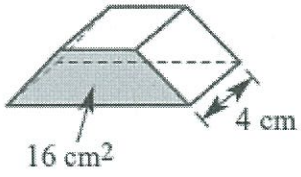


$SA = (2 \times 6 \times 4) + (2 \times 4 \times 3) + (2 \times 3 \times 6)$

$= 108\ cm^2$

4. Find the volume of each of the following three-dimensional objects, rounding your answer to two decimal places when necessary. (1 + 2 = 3 marks)

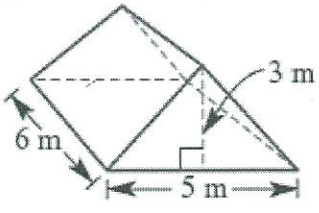
a



$V = 16 \times 4$

$= 64\ cm^3$

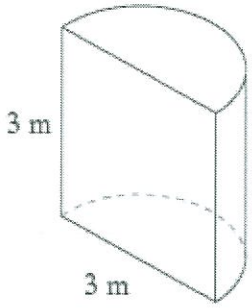
b



$V = \left(\frac{1}{2} \times 5 \times 3\right) \times 6$

$= 45\ m^3$

5. Joel is building a semi-cylindrical water tank that is to be positioned against a wall outside his house to catch rainwater. The water tank is 3 metres tall and 3 metres in diameter. It is to be fully enclosed; that is, have a base, a lid, one side that consists of a flat surface and the other side a curved surface, as shown in the given diagram. (2 + 1 + 3 + 1 = 7 marks)



a Find the volume of the water tank in cubic metres, correct to three decimal places.

$V = \frac{1}{2} \times \pi \times 1.5^2 \times 3$

$= 10.603\ m^3$

b Hence, find the capacity of the water tank to the nearest litre.
(Remember 1 L = 1000 cm3 and 1 m3 = 1000 L.)

cm^3 m^3 $10.603\ m^3 = 10603\ L$

c * The water tank is to be made from flat sheets of steel. Find how much steel sheeting is required to build the water tank ~~by finding its total surface area~~, correct to two decimal places.

$SA = (3 \times 3) + \left(\frac{1}{2} \times 2 \times \pi \times 1.5 \times 3\right) + \left(\pi \times 1.5^2\right)$

$= 30.21\ m^2$

d Steel sheeting costs $50 per square metre. ~~Including its lid~~, how much will the tank cost to build to the nearest dollar?

$Cost = \$50 \times 30.21$

$= \$1510.50$

$= \$1511$

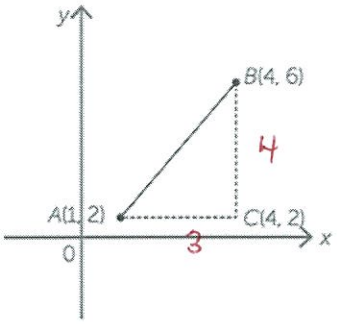
Part C – Linear Relationships: (33 Marks)

1. Which of the following lines contains the point $(3, -1)$? (1 mark)

A. $y = 3x - 8$ B. $y = -3x - 3$

C. $y = 4x - 13$ D. $y = -4x - 11$

2. Find the slope of the line drawn below

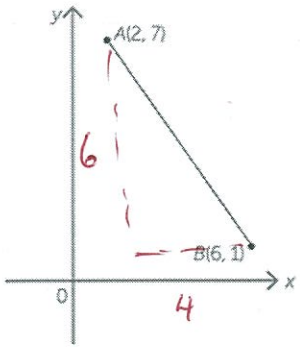


(1 mark)

A. $-\frac{4}{3}$ B. $\frac{3}{4}$

C. $-\frac{3}{4}$ D. $\frac{4}{3}$

3. Use Pythagoras's theorem to find the length of the interval AB, correct to one decimal place. (2 marks)



$\sqrt{6^2 + 4^2}$

$= \sqrt{36 + 16}$

$= \sqrt{52}$

$= 7.2$ units

4. Write the equation $3x - 4y + 3 = 0$ in gradient-intercept form. (2 marks)

$4y = 3x + 3$

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

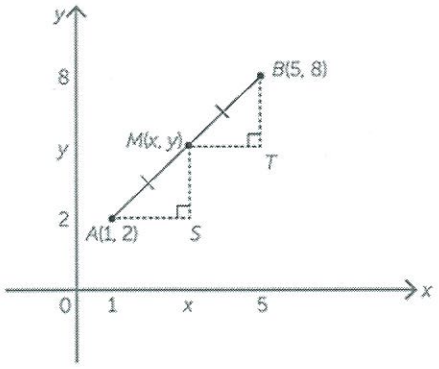
5. A circle with centre $(3, 2)$ passes through the point $(-5, 7)$. Find the length of the radius, leaving your answer In exact form. (2 marks)

$r = \sqrt{(7-2)^2 + (-5-3)^2}$

$= \sqrt{25 + 64}$

$= \sqrt{89}$

6. Find the co-ordinates of M, given that M is the midpoint of AB. (2 marks)



$M = \left(\frac{5+1}{2}, \frac{2+8}{2}\right)$

$= (3, 5)$

7. What are the gradient and y-intercept of the lines below? (4 marks)

a. $y = 9x + 6$

$m =$ 9 $\quad b =$ 6

b. $y = 4 - \frac{1}{3}x$

$m =$ $-\frac{1}{3}$ $\quad b =$ 4

8. The lines $x = 3$ and $y = -6$ intersect at R while the lines $x = -2$ and $y = 4$ intersect at S. Find the gradient of the line RS. (2 marks)

$m = \frac{4+6}{-2-3}$

$= -2$

9. Find the equation of the line that is parallel to $y = 5x + 6$ and passes through the origin. (1 marks)

$m_1 = m_2 = 5$

$y = 5x$

10. A straight line passes through the point $(-2, 5)$ with a gradient of 2.

a. Find the equation of the line in the form $y = mx + b$. (2 marks)

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

$y = 2x + 9$

b. Express this equation in general form. (1 mark)

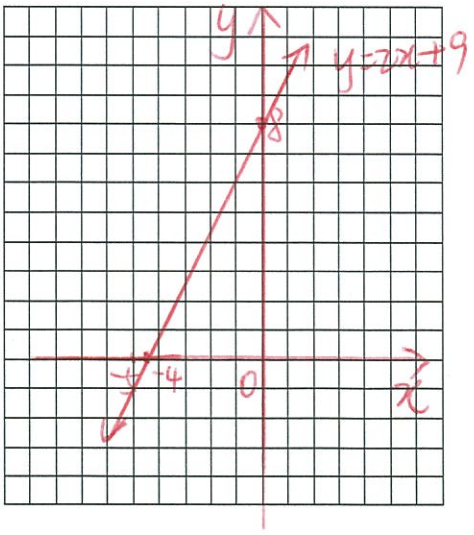
$2x - y + 9 = 0$

c. Find the x and y intercepts of the line. (2 marks)

x-intercept $\quad x = -4.5$

y-intercept $\quad y = 9$

d. Graph the line on the number plane below, clearly showing the intercepts. (2 marks)



11. Find the equation of the line that passes through the points $(2, 4)$ and $(6, 8)$. Express your answer in general form. (3 marks).

$m = \frac{8-4}{6-2}$

$= 1$

$y - 4 = x - 2$

$x - y + 2 = 0$

12. * Find the equation of the line that is perpendicular to $y = \frac{1}{5}x + 7$ and passes through the point $(4, -2)$. (3 marks).

$m_1 = \frac{1}{5}$

$m_2 = -1 \div \frac{1}{5}$

$= -5$

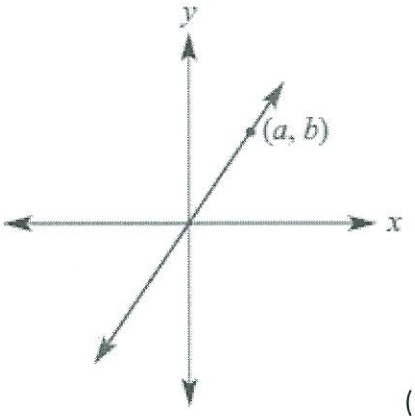
$y + 2 = -5(x - 4)$

$y + 2 = -5x + 20$

$5x + y - 18 = 0$

13. * Find the equation of the following linear relations.

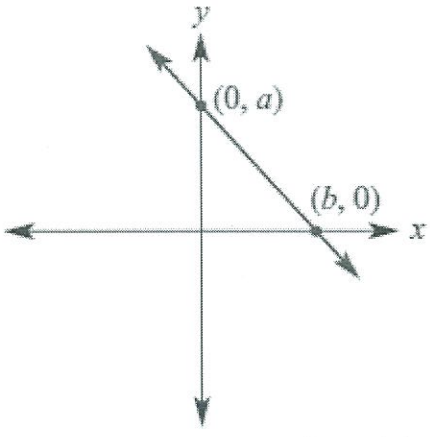
a.



(1 mark)

$y = \frac{b}{a}x$

b.



(2 marks)

$m = -\frac{a}{b}$

$y = -\frac{a}{b}(x - b)$

$y = -\frac{a}{b}x + a$

End of Paper