Name:_____

Teacher:_____

The Scots College
Year 10 5.3 Mathematics
7 November 2019
Yearly Examination
Weighting: 40%
2 hours plus 5 minutes reading time

Instructions:

- Show all necessary working
- Approved non-programmable calculators can be used
- **Begin a new labelled booklet for each question**

Question		Maximum Mark	Mark
MULTIPLE CHOICE		20	
1		20	
2		20	
3		20	
4		20	
5		20	
TOTAL		120	
PERCENTAGE			

PART 1: MULTIPLE CHOICE (20 MARKS – 1 mark each)

On the multiple choice answer sheet provided, shade in the most correct answer

1. The expanded form of $2\sqrt{3}(3-2\sqrt{5})$ is:

A. $2\sqrt{9}-4\sqrt{15}$ **B.** $6\sqrt{3}-6\sqrt{15}$ **C.** $6\sqrt{3}-4\sqrt{15}$ **D.** $2\sqrt{9}-6\sqrt{15}$

2. The simplified form of $\frac{(a^2\times a^8)^{\frac{1}{2}}}{a^2\times a^0}$ is:

A. $3a^3$ **B.** $\boldsymbol{a^2}$ **C.** a^5 **D.** a^3

3. $\frac{1}{x}-\frac{1}{x+1}$ simplifies to

A. $\frac{-1}{x(x+1)}$ **B.** $\frac{x}{x(x+1)}$ **C.** $\frac{1}{x(x+1)}$ **D.** $\frac{x-2}{x(x+1)}$

4. The point (3, -1) lies on the line $y=3x+c$. The value of *c* is:

A. -8 **B.** 8 **C.** 6 **D.** -10

5. The term that needs to be added to make x^2-6x a perfect square is:

A. - 9 **B.** 9 **C.** 3 **D.** - 3

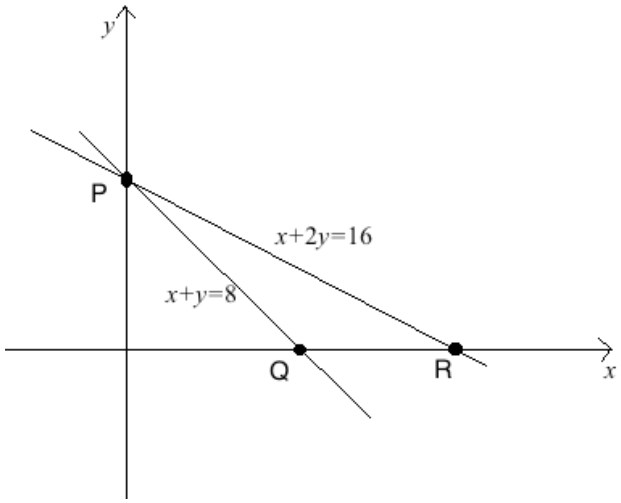
6. The quadratic $3x^2-2x-4$ has how many solutions?

A. No solutions **B.** 1 solution **C.** 2 solutions **D.** 3 solutions

7. The coordinates and type of turning point of $y=-(x+3)^2-2$ is:

A. a minimum at $(-3,-2)$ **B.** a maximum at $(3,-2)$ **C.** a minimum at $(3,-2)$ **D.** a maximum at $(-3,-2)$

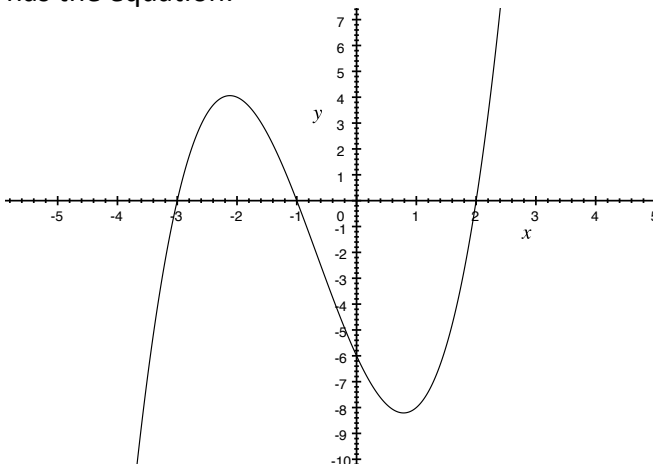
8. The triangle PQR is bounded by the x – axis and the lines $x + 2y = 16$ and $x + y = 8$.



The area in square units of triangle PQR is:

A. 8 **B.** 16 **C.** 32 **D.** 64

9. The graph below has the equation:



A. $y = (x + 1)(x + 2)(x + 3)$ **C.** $y = (x - 1)(x + 2)(x + 3)$

B. $y = (x + 1)(x - 2)(x + 3)$ **D.** $y = (x - 1)(x + 2)(x - 3)$

10. The monic polynomial P(x) with degree 2, constant term of 3 and P(-1) = 1 is:

A. $3x^2 + 2x + 1$ **B.** $x^2 - 5x + 3$ **C.** $x^2 + 3x + 3$ **D.** $-x^2 - x + 3$

11. If $f(x) = x^2 - x + 1$, the value of $f(-2)$ is:

A. -5 **B.** -1 **C.** 7 **D.** 2

12. y varies directly as x and when $y = 2$, $x = \frac{1}{4}$. When $x = 2$, y equals:

A. 8 **B.** 16 **C.** $\frac{1}{2}$ **D.** 1

13. The circle with equation $(x+1)^2 + (y-3)^2 = 16$ has centre coordinates and radius:

A. $(-1, 3), r = 4$ **B.** $(1, -3), r = 16$ **C.** $(1, -3), r = 4$ **D.** $(-1, 3), r = 16$

14. Which of the following is NOT a measure of spread?

A. Range **B.** Mean **C.** Standard Deviation **D.** Interquartile range

15. The mean of 13, 15, 16, 19, 21 and x is 17. The value of x is:

A. 16 **B.** 16.8 **C.** 84 **D.** 18

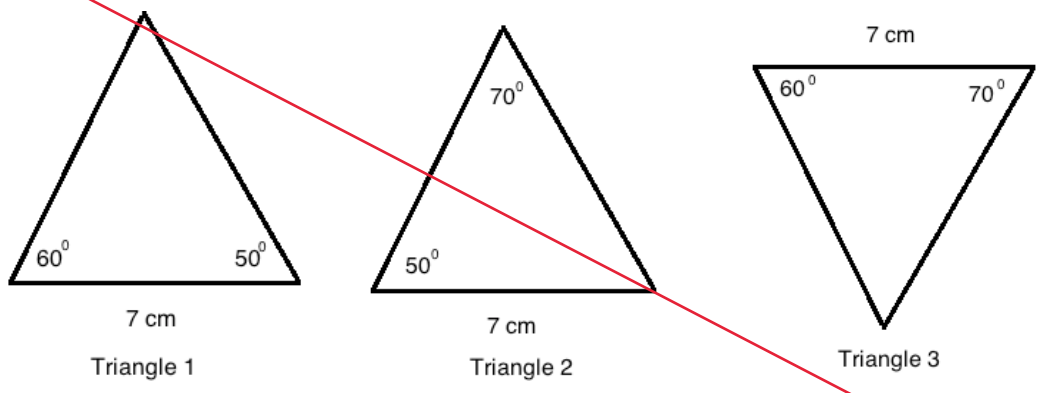
16. The probability of obtaining **HTHT** when a coin is tossed four times is:

A. $\frac{1}{2}$ **B.** $\frac{1}{4}$ **C.** $\frac{1}{8}$ **D.** $\frac{1}{16}$

17. The solution to $5 - 2x \leq 11 + 3x$ is:

A. $x \geq 16$ **B.** $x \geq -\frac{16}{5}$ **C.** $x \geq -\frac{6}{5}$ **D.** $x \geq -\frac{4}{5}$

18. Which triangles are congruent?



A. 1 and 2 **B.** 2 and 3 **C.** 1 and 3 **D.** 1, 2 and 3

19. The obtuse angle θ such that cos θ = $-$ cos 65^0 is:

A. $\theta = 115^0$ **B.** $\theta = 135^0$ **C.** $\theta = 65^0$ **D.** $\theta = -115^0$

20. A yacht is sailed from A to B on a bearing of 118^0 . To sail from B directly back to A, the bearing would be:

A. 028^0 **B.** 298^0 **C.** 062^0 **D.** 118^0

END OF MULTIPLE CHOICE

Exam continues over the page

SHOW ALL WORKING – EACH QUESTION MUST BE DONE IN A NEW BOOKLET

Question 1 (20 marks) **Begin in a new booklet**

a. The lines $px - 2y + 7 = 0$ and $3x - y - 4 = 0$ are parallel. Find the value of p. **2**

b. Factorise fully:

I. $9s^2 - p^2$ **1**

II. $m^2n - m^2p + 3mn - 3pm$ **2**

III. $j^2 + j - 6$ **2**

c. Solve for the variable, using the most appropriate method. Give the solutions correct to 2 decimal places where necessary:

I. $2x^2 + 7x = 5 - 3x - x^2$ **2**

II. $\frac{2x+1}{5} - \frac{x+4}{2} = -3$ **2**

III. $3x^4 - x^2 - 2 = 0$ **3**

d. Find the radius and coordinates of the centre of the circle with equation

$$x^2 + y^2 - 10x - 24y = 0$$ **3**

e. Find two consecutive positive integers such that the sum of their squares is 61. **3**

Question 2 over the page.

Question 2 (20 marks) **Begin in a new booklet**

a. I. If $\cos\theta < 0$ and $\sin\theta > 0$ and $0^0 < \theta < 180^0$, state in which quadrant θ lies. **1**

II. What is the exact value of $\tan 300^0$. **1**

III. What is the exact value of $\tan 30^0 + \sin 60^0$ **2**

IV. Find all values of θ, if $\cos\theta = -\frac{\sqrt{3}}{2}$ and $0^0 \leq \theta \leq 360^0$. **2**

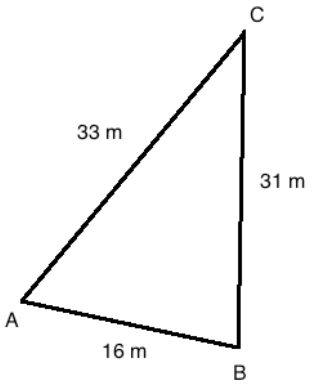
b. A plane travels on a bearing of 218^0T for a distance of 550km. The pilot then turns the plane to a bearing of 137^0T and travels another 380km.

I. Draw a diagram showing all given distances and angles. **2**

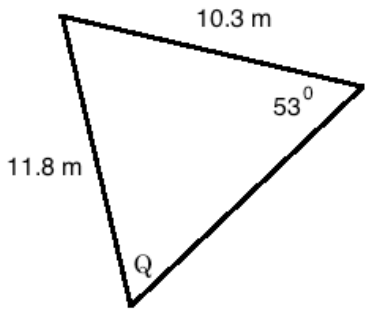
II. How far is the plane from its starting position, to 1dp? **2**

III. What is the bearing from plane to where it started, to the nearest degree? **2**

c. Find the size of $\angle ABC$, correct to the nearest minute. **3**



d. I. Find the size of Q in the diagram below, correct to the nearest minute. **2**



II. Find the area of the above triangle, correct to 4 significant figures. **3**

Question 3 over the page

Question 3 (20 marks) **Begin in a new booklet**

a. If $f(x) = \begin{cases} x^2 & if\ x > 0 \\ 3x - 1 & if\ x \leq 0 \end{cases}$ find $f(4) + f(-2) + f(0)$ **2**

b. Find the inverse of $y = \frac{x}{2} + 3$ **2**

c. Solve the following, answers to 2 decimal places as required:

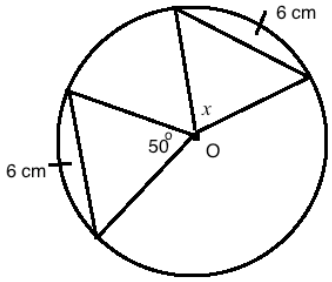
I. $5^{2x-6} = 1$ **2**

II. $\log_2 x = -3$ **2**

III. $3^x = 5$ **3**

d. Simplify fully: $3\log x^4 - 2\log x^5$ **2**

e. Find the value of x, giving reasons, in the diagram below.

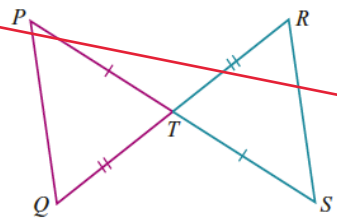


2

f. A chord 8 cm long is drawn in a circle of radius 6 cm.

What is the shortest distance of the chord from the centre, in simplified surd form? **2**

g. Prove $\Delta PTQ \equiv \Delta STR$

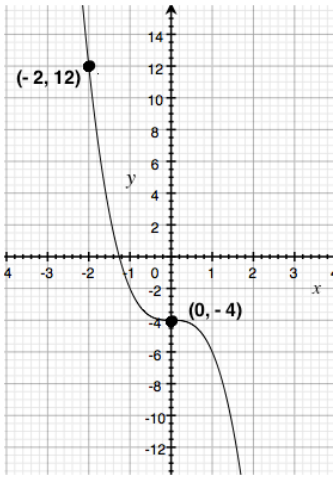


3

Question 4 over the page.

Question 4 (20 marks) **Begin a new booklet**

a. The graph below is of the form $y = ax^3 + d$. Find its equation. **3**



b. Discuss the similarities and differences between the graphs of **2**
y = P(x) and y = P(x) + 3.

c. For the polynomial function $P(x) = x^3 + x^2 - 14x - 24$

I. Show $x = 4$ is a zero of $P(x)$. **1**

II. By finding all the other zeros of $P(x)$, express the polynomial in its fully factorised form. **4**

III. Sketch $P(x)$ labelling all important points. **2**

d. Ross throws a stone vertically upward and after t seconds its height h metres above the ground is given by the formula $h = 80t - 16t^2$.

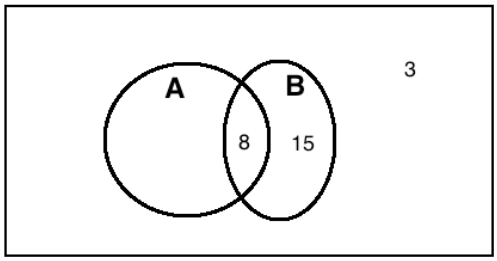
I. At what time(s) will the stone be 96 metres above the ground? **2**

II. After how many seconds will the stone hit the ground? **2**

III. Can the stone ever reach a height of 128 metres? Explain. **1**

Question 5 (20 marks) **Begin a new booklet**

a. The Venn diagram below contains a total of 35 elements.



I. Find the total number of elements in set A. **1**

II. Find $P(A)$ **1**

III. Find $P(\bar{A})$ (also known as $P(A')$). **1**

IV. Find $P(A|B)$ **1**

b. A bag contains 4 red (R) and 2 white (W) marbles, and two marbles are selected **without** replacement.

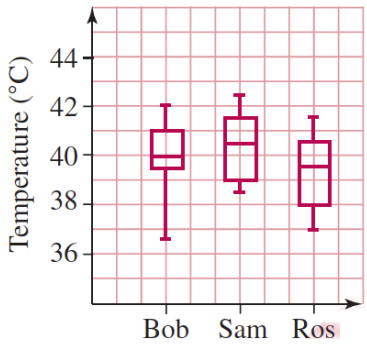
I. Draw a tree diagram showing all outcomes and probabilities. **2**

II. Find the probability of selecting:

1) A red marble followed by a white marble (R, W) **1**

2) At least 1 red marble **2**

c. Three patients in hospital had their temperatures taken every 4 hours over a period of 3 days.



Which patient had:

I. The lowest median temperature? What was it? **1**

II. The greatest temperature range? What was it? **1**