Name:_____

Teacher:_____

The Scots College

Year 10 5.3 Mathematics Thursday 5th November 2020

Yearly Examination Weighting: 40% Time:90 Minutes

Instructions:

- Show all necessary working
- Approved non-programmable calculators can be used
- **Write your answers on the paper**

Questions	Code	Maximum Mark	Mark
MULTIPLE CHOICE	NA	5	
6	NA	7	
7	NA	5	
8	NA	10	
9	NA	8	
10	NA	11	
11	NA	8	
12	NA	5	
13	MG	10	
14	MG	5	
15	SP	8	
16	SP	3	
17	SP	15	
TOTAL		100	

MULTIPLE CHOICE - **Circle The answer of Your Choice** (1 Mark Each)

1. $(\sqrt{5}-\sqrt{2})^2$ is equal to

A: 3 B: 7 C: $7-2\sqrt{10}$ D: $3-2\sqrt{10}$

2. $3^{2x-1}=27^{x-3}$ the value of x is:

A) 5 B) 8 C) 2 D) 4

3. $\frac{x-3}{4}-\frac{2-3x}{3}$ expressed as a single fraction is equivalent to

A) $\frac{15x-17}{12}$ B) $\frac{-9x-17}{12}$ C) $\frac{6x-11}{12}$ D) $4x-5$

4. If $3x+y=9$
and $4x-y=19$ the value of y is:

A) 4 B) -3 C) 7 D) 5

5. The inverse of the expression $y=log_3(x+2)-4$ is

A) $y=3^{x-4}-2$ B) $y=3^{x+4}+2$

C) $y=3^{x+4}-2$ D) $y=3^{x-4}+2$

EXTENDED RESPONSE QUESTIONS – Show all working out. **Marks**

6. Simplify fully.

(a) $\sqrt{3} + 2\sqrt{5} - 3\sqrt{3} + 6\sqrt{5}$ (2)

(b) $2\sqrt{48} - 4\sqrt{75} - \sqrt{27}$ (2)

(c) Rationalise the denominator, expand and simplify your answer fully.

$\frac{(\sqrt{3}+\sqrt{2})}{(\sqrt{3}-\sqrt{2})}$ (3)

7. Simplify fully the expressions below with positive powers in the numerator and denominator.

(a) $\frac{x^2y^{-3}}{x^{-2}z}$ (2)

(b) $\left(\frac{2a}{3b^2}\right)^{-2} \times \left(\frac{2a}{b^3}\right)^3$ (3)

8. Factorise fully and simplify if possible.

(a) (i) $x^2 - 5x - 6$ (1)

(ii) $(2x - 1)^2 - (x + 2)^2$ (2)

(iii) $x^3 - 4x - x^2 + 4$ (3)

(b) $\frac{3x^2+10x-8}{x^2-16} \times \frac{2x-8}{6x^2+5x-6}$ (4)

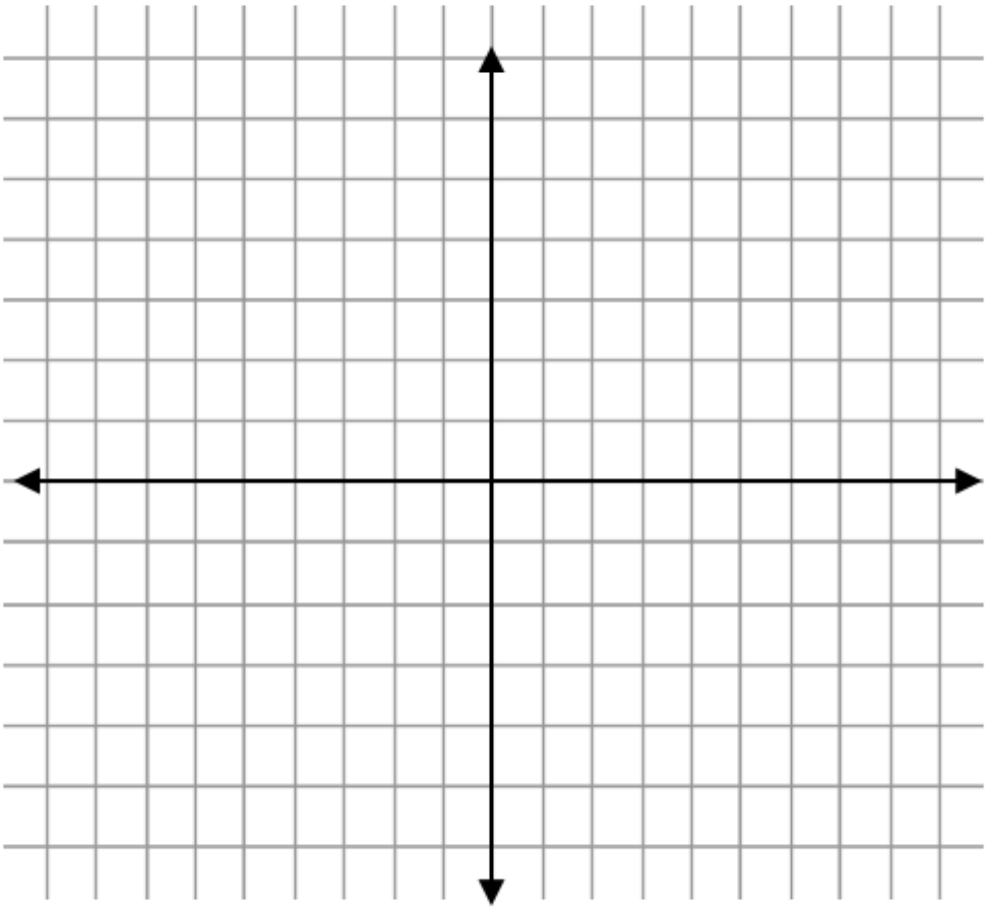
9. (a) Find the remainder when $P(x) = x^3 - 5x + 2$ is divided by $(x + 2)$. (1)

(b) Consider $P(x) = 6x^3 - 11x^2 - 4x + 4$.

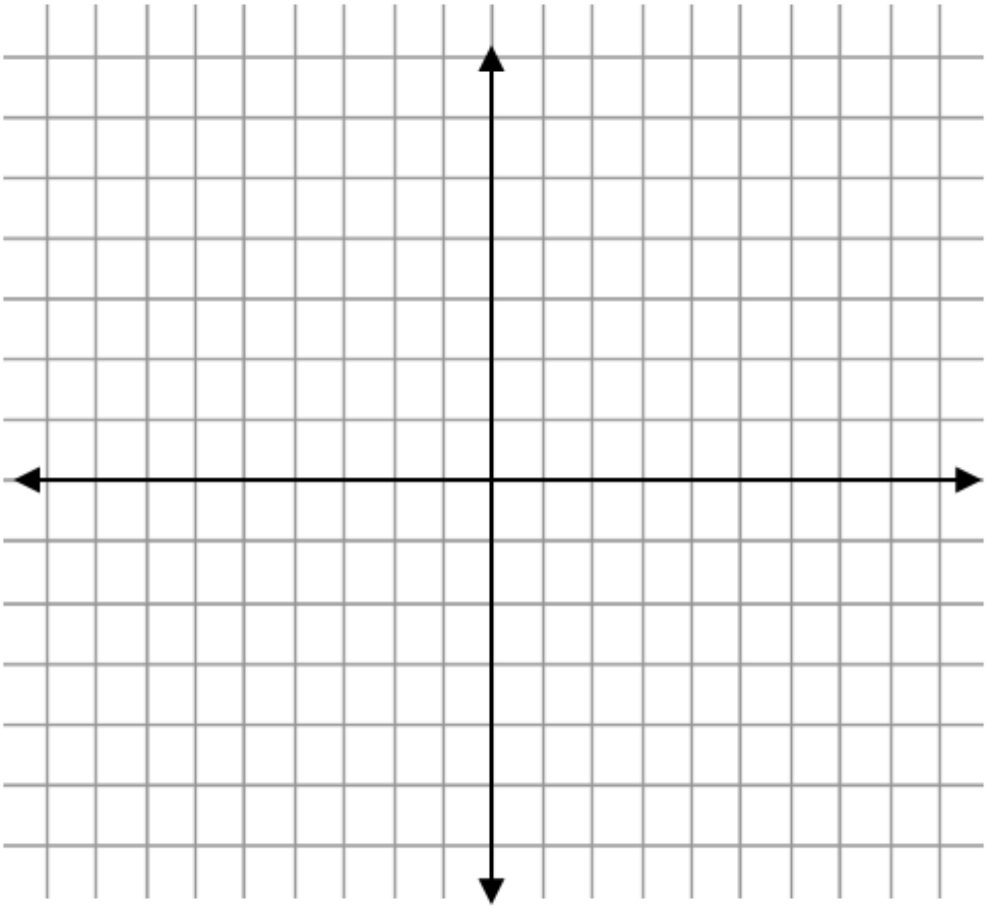
(i) Find the value of $P(1)\ and\ P(2)$, hence write down a factor of $P(x)$. (3)

ii) Express the polynomial $P(x) = 6x^3 - 11x^2 - 4x + 4$ in its fully factorised form and then solve the equation $P(x) = 0$. (4)

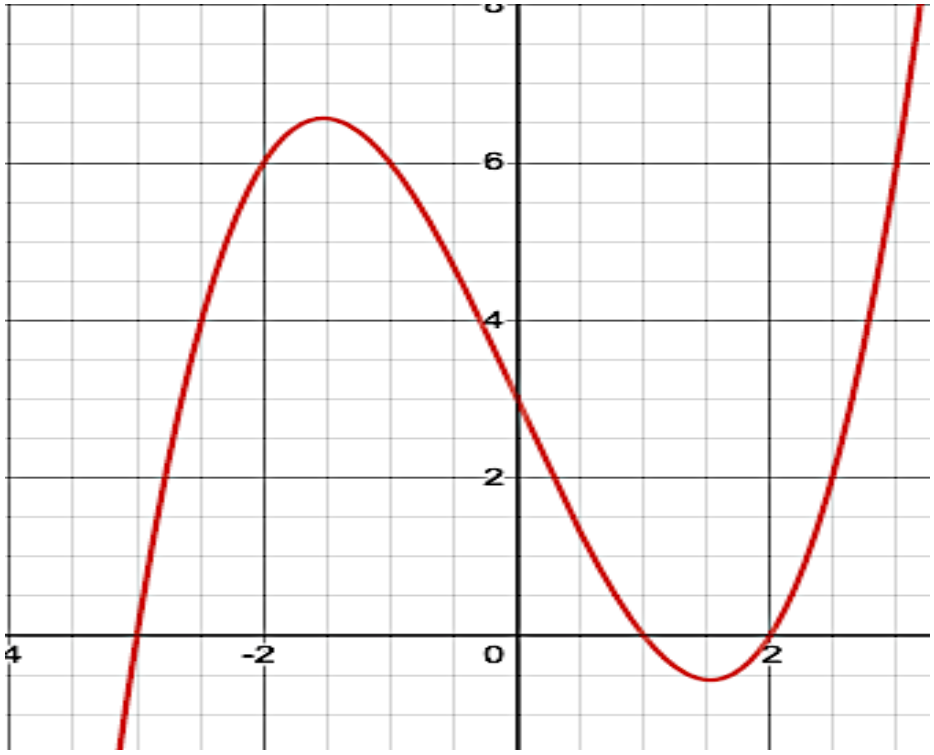
10. (a) Sketch the graph of $y = -(x + 3)^2 + 4$ on the cartesian plane below, clearly showing the turning point and the intercepts with both axes. (4)



(b) Sketch the graph of $y = \frac{1}{x-1}$, clearly showing the asymptotes and the intercept with the $y - axis$. (3)



(c) The graph below is of the form $y = a(x + b)(x + c)(x + d)$



Write down the values of $b, c \ and \ d$ and calculate the value of a. (4)

11. (a) Using logarithm laws evaluate the following:

(i) $\log_5 40 - \log_5 8$ (1)

(ii) $\log_2 32 + \log_2 \frac{1}{2}$ (2)

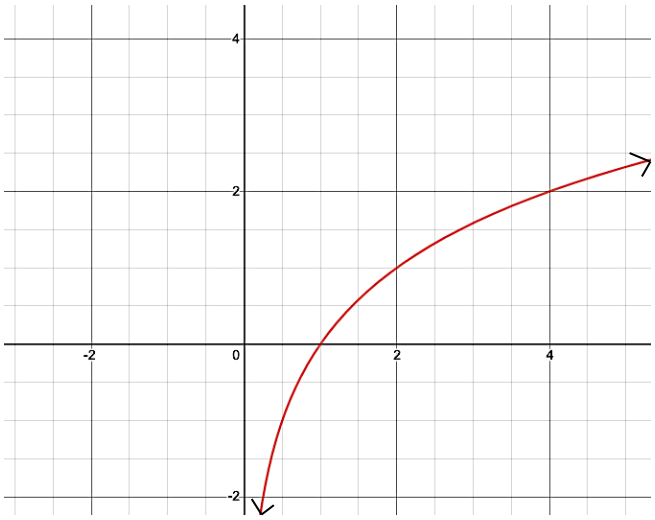
(b) Solve the following:

(i) $\log_{16} x = \frac{3}{2}$ (2)

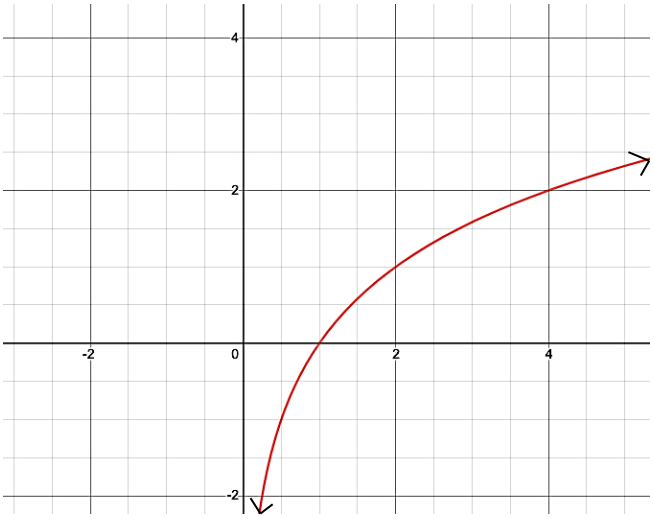
(ii) $\log_a(x+2) = \frac{1}{3}\log_a 8 + \log_a 3$ (3)

12. Below is the graph of $y = log_2 x$. On the diagrams sketch

(a) the inverse function (2)

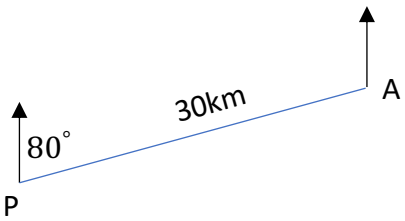


(b) Sketch the graph of $y = log_2(x + 2) + 1$ (3)



13. A ship sails from port P on a bearing of 080° for 30km to reach Buoy A. It then travels on a bearing of 150° for 40km to reach Buoy B.

(i) Complete the diagram below putting all relevant information on your diagram. (2)



(ii) Find the distance from B to P, (to 1 decimal place.) (3)

(iii) Find the bearing of P from B, to the nearest degree. (3)

iv) Calculate the area of triangle PAB, to 3 significant figures. (2)

14. (a) Find the exact value of $\cos 30° - \tan 135°$. (2)

(b) Find the values of θ, such that $\cos\theta = -\frac{1}{2}$, for $0 \leq \theta \leq 360^{\circ}$ (3)

15. (a) The mean mass of 40 dogs is 14.7kg, when another dog is included the mean is 15kg, what was the mass of the 41st dog? (2)

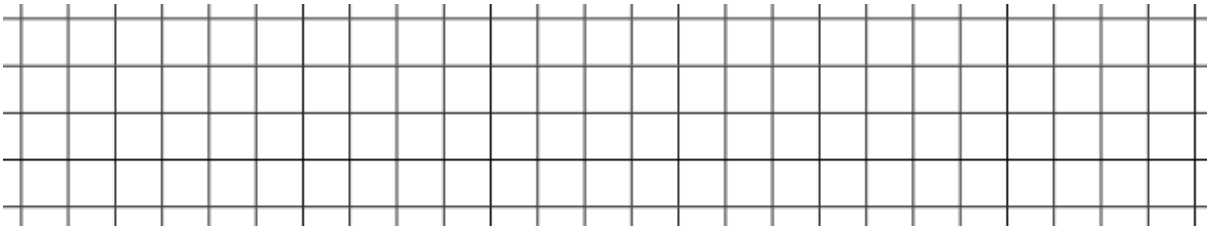
(b) Consider the following ages of 17 people attending a concert.

16, 23, 23, 28, 35, 36, 45, 45, 46, 48, 50, 50, 50, 55, 57, 59, 65

(i) Calculate the median, lower and upper quartiles. (3)

(ii) Calculate the IQR. (1)

(iii) Draw a box plot to represent the data. (2)



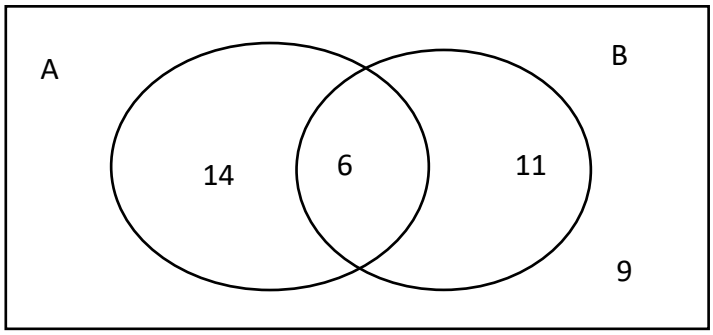
16. Consider the table below which looks at IQ vs Time taken to do a puzzle

x (IQ)	90	95	110	115	120
y (Time in seconds)	125	130	84	65	60

(i) Use your calculator to find the equation of the regression line in the form $y = A + Bx$. (2)

(ii) How would you describe the correlation between IQ and time taken to do the puzzle? (1)

17. (a)



Consider the Venn diagram above and calculate in simplified form. (6)

(i) $P(A \cap B)$ (ii) $P(A \cup B)$

(iii) $P(A|B)$ (iii) $P(\overline{A} \cup B)$

(iv) Are the events A and B independent, justify your answer. (2)

(b) An archer aims for the centre of the target (Gold). If it is windy when he fires his arrow, the probability that he hits Gold is 0.6. If it is not windy when he fires his arrow, the probability that he hits gold is 0.75.

The probability that it will be windy at any time is 0.8.

Draw a tree diagram to illustrate this information. (3)

(i) What is the probability that he hits Gold with any particular arrow?

(2)

(ii) If the arrow has landed in the Gold, what is the probability that it was windy when he fired his arrow?

(2)

END OF EXAMINATION