The Scots College

Student Name: _____

Class Teacher: _____

2021 Year 10 Mathematics 5.3 Assessment Task 4

General Instructions

- Working time – 1 hour and 30 minutes
- Write using black pen
- Calculators approved by the College can be used.
- For Section II, show all relevant mathematical reasonings and/or calculations.

Total marks: 100

- **Section I – 7 marks**
  - Attempt Questions 1–7
  - Allow about 10 minutes for this section
- **Section II – 93 marks** (pages 4–17)
  - Attempt Questions 8–22
  - Allow about 1 hour and 20 minutes for this section
  - Show all working out in the relevant spaces.

Areas of Assessment	Section I Multiple Choice	Section II	Total
Number and Algebra	3, 4, 5	8, 9, 10, 11, 12, 13, 14, 15, 20	/ 45
Measurement and Geometry	1,	16, 17, 18, 19,	/ 22
Statistics and Probability	2, 6, 7	21, 22,	/ 33
		Total	/ 100
		Percentage	%

Section I - Multiple Choice

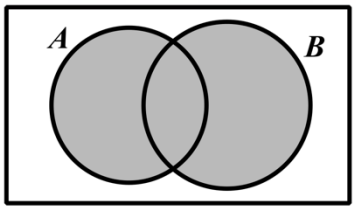
CIRCLE THE CORRECT ANSWER

1. Which of the following is equal to $\cos 210°$?

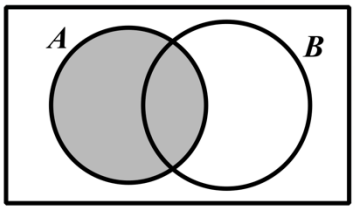
(A) $-\frac{1}{2}$ (B) $\frac{1}{2}$ (C) $-\frac{1}{\sqrt{2}}$ (D) $-\frac{\sqrt{3}}{2}$

2. Which of these Venn diagrams represent the shaded region of $A \cup B$?

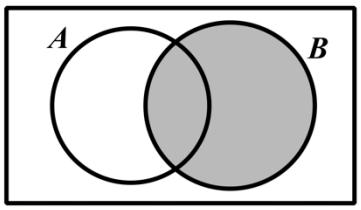
A :



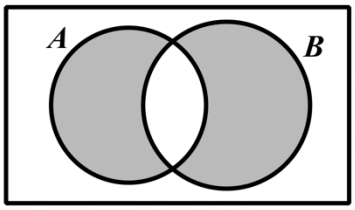
B :



C :



D :

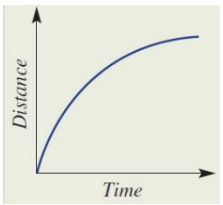


3. Which of the following is the closest to the distance between the points $A(3,5)$ and B$(-7,3)$?

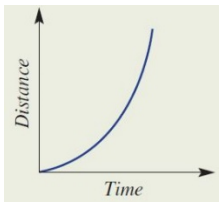
(A) -4 (B) 12 (C) 19.8 (D) 10.2

4. Which one of the graphs below represents the distance increasing at a decreasing rate?

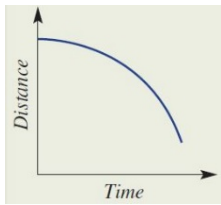
(A)



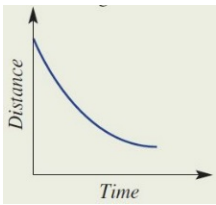
(B)



(C)



(D)



5. Make a the subject in the equation $s = u + at$

(A) $a = \frac{s-u}{t}$ (B) $a = \frac{s}{t} - u$ (C) $a = \frac{u-s}{t}$ (D) $a = u - \frac{s}{t}$

6. Two events, A and B, are such that $P(A) = 0.3$, and $P(B) = 0.9$ and $P(A \cup B) = 0.75$ Find the probability of $P(A \cap B)$.

(A) 1.95 (A) 0.6 (C) 0.15 (D) 0.45

7. A fair 6-sided die is rolled twice and the sample space is listed below.

		Roll 2					
		1	2	3	4	5	6
Roll 1	1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
	2	(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)
	3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
	4	(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)
	5	(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)
	6	(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)

Which of the following is the probability of obtaining a sum less than 5?

(A) $\frac{1}{6}$ (B) $\frac{4}{9}$ (C) $\frac{2}{9}$ (D) $\frac{11}{36}$

Part B: Extended Response Questions – show all working out. Marks

8. For each of the following, simplify fully:

(a) $5\sqrt{28} - \sqrt{147} + 2\sqrt{63}$ [2]

(b) $(5\sqrt{3} - 2)(2\sqrt{3} - 1)$ [2]

9. Rationalise the denominator, expand and simplify fully. [2]

$$\frac{\sqrt{2}+1}{2\sqrt{3}}$$

10. Simplify the following fully with positive powers. [3]

$$\left(\frac{4x}{3y^3}\right)^{-2} \div \left(\frac{9y}{8x^2}\right)^{2}$$

11. Solve this pair of equations simultaneously. [3]

$$3x - y = 2$$
$$2x - 3y = 20$$

12. **(a)** Solve for x given that $x^2 - 7x - 18 = 0$ [2]

(b) Solve the equation $2x^2 - 4x - 9 = 0$, leaving your answer in simplified surd form. [3]

13. Factorise fully and simplify where possible.

(a) $80x^2 - 5y^2$ [2]

(b) $x^3 + 4x^2 - 4x - 16$ [2]

(c) $\frac{x^2+5x+6}{x^2-16} \times \frac{x-4}{x+3}$ [3]

14. Consider the curve $y = -x^2 - 2x + 3$.

(a) Write down the y – intercept. [1]

(b) Find the x – intercepts. [2]

(c) Find the vertex of the parabola. [2]

(d) Hence sketch the parabola showing all intercepts and the vertex. [2]

15. Consider the function $f(x)$ where:

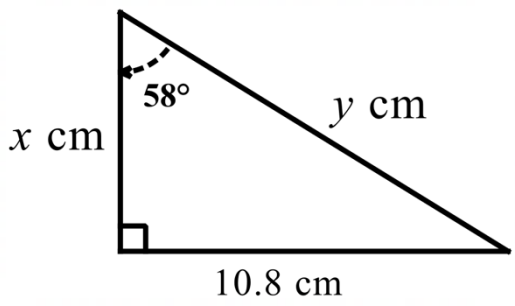
$$f(x) = \frac{1}{x-2} + 1.$$

(a) Write down the equation of the vertical and horizontal asymptotes [2]

(b) Sketch $y = f(x)$ showing x and y intercepts and the asymptotes. [4]

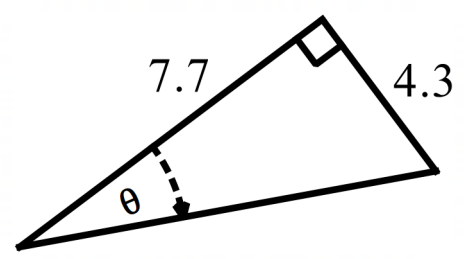
(c) Find an expression for the inverse function $f^{-1}(x)$. [2]

16. **(a)** Find the value of each pronumeral, rounding your answer to 2 decimal places. [4]



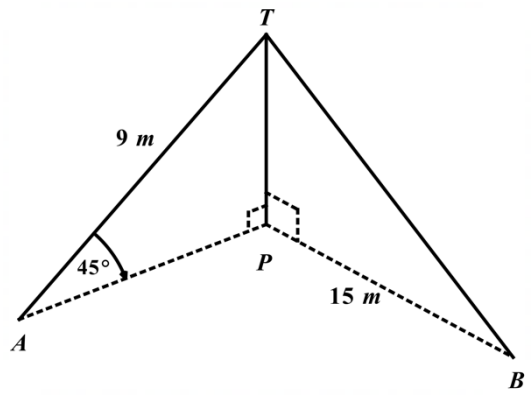
x = _____ y = _____

(b) Find the value of θ, to the nearest minute. [2]



17. A flag pole PT is being supported by two ropes, as shown. The rope to point A is 9 metres long and makes an angle of $45°$ with the ground. Point B is 15 metres from the base of the flag pole.

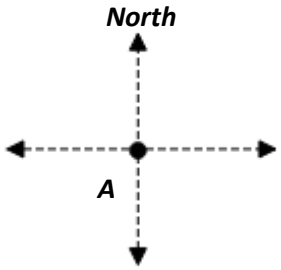
(a) Find the height of the flag pole. Leave your answer in surd form. [2]



(b) Find the angle of elevation from point B to the top of the flag pole to the nearest degree. [2]

18. A ship sails due south from point A to B for 160 km. It then sails on a bearing of $130°$ from B to C for 100 km.

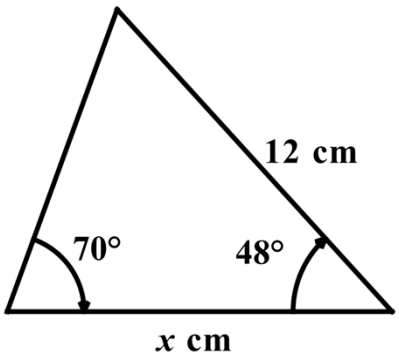
(a) Complete the diagram below, labelling all the information. [2]



(b) Find the distance of the ship from its original position, to the nearest kilometre. [2]

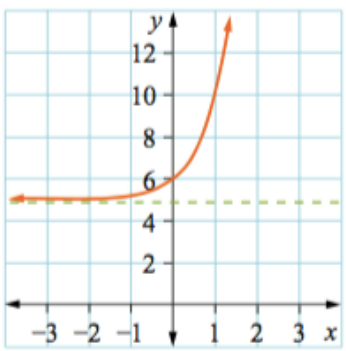
(c) What bearing must it sail on to return to the start location? [3]

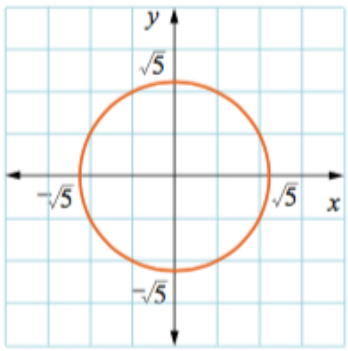
19. Consider the triangle below. By first finding the unknown side x, find the area of the triangle correct to one decimal place. [4]

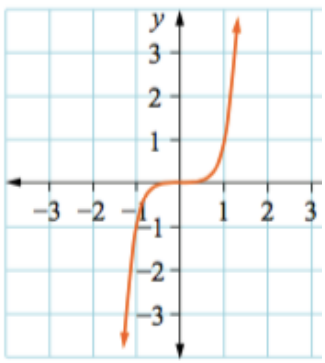


20. From the given equations, match it to the correct graph by drawing a line. [3]

A: $x^2 + y^2 = 5$ **B:** $y = 5^x + 5$ **C:** $y = x^5$







21. (a) Peter on his fishing catches and records the length of 10 fish. All measurements are in centimetres.

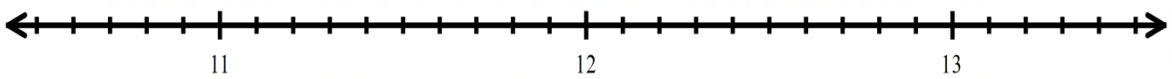
12.4, 10.7, 12.1, 12.8, 12.3, 12.6, 12.6, 11.9, 13.1, 12.2

i) Find the Range. [1]

ii) Write down the five-number summary. [5]

iv) Identify any outliers. [2]
You may use these formulae $Q_1 - 1.5 \times IQR$ and $Q_1 + 1.5 \times IQR$.

v) Draw a box and whisker plot. [2]



21. **(b)** A scatter plot was constructed on the $x - y$ coordinate plane and a line of best fit passes through the points $A\ (10, 110)$ and B $(190, 470)$.

i) Find the equation of the line of best fit. [2]

ii) Use your equation to estimate the value of x when $y = 300$. Answer to one decimal place. [2]

(c) Calculate the mean and standard deviation, using your calculator or otherwise, for the data set below. Round your answers to one decimal place. [2]

27, 28, 26, 21, 26, 32,

Mean = _____

Standard Deviation = _____

22. **(a)** From a group of 25 online gamers at a conference, 17 gamers owned a Play Station 5 (PS5), 10 gamers owned an XBox and 6 owned both consoles.

A gamer is chosen at random from the above group.

Let P be the event that "*the gamer owns a PS5*" and let X be the event that "*the gamer owns an XBox*".

i) Represent the information in a two-way table below. [2]

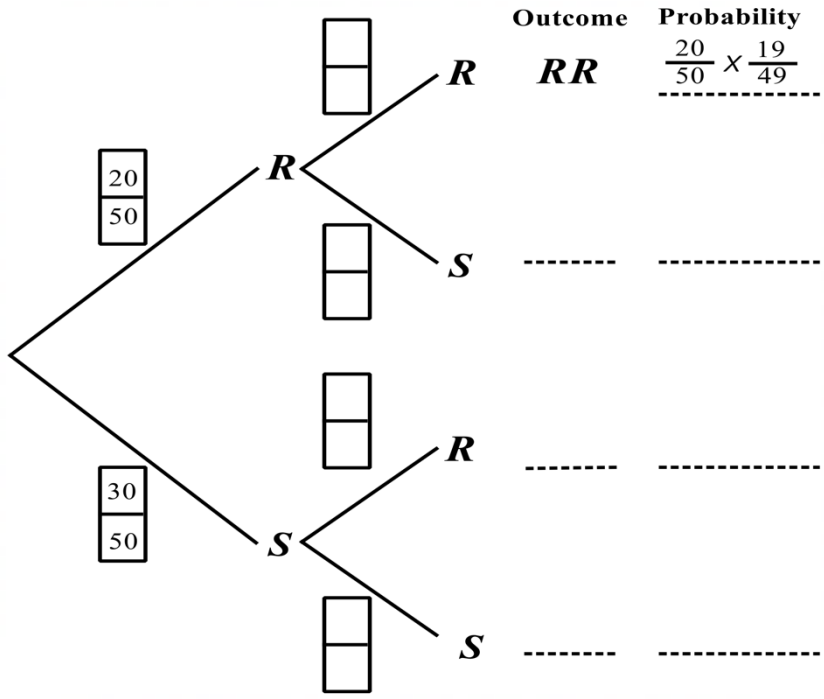
	P	$\overline{P}$	
X			
$\overline{X}$			
			25

ii) Find the probability that a gamer, chosen at random, only owns a PS5. [1]

iii) Find the probability that a gamer, chosen at random, owns a PS5 given that he owns an XBox. [2]

22. **(b)** Two prefects were to be selected in the second round of prefect selections from a pool of 50 students. It just happens by chance that 20 of these boys play rugby and the rest play soccer. Remember that the prefects are selected without replacement.

i) Complete the tree diagram below, **showing all** outcomes and probabilities. [5]



ii) Find the probability that the two prefects play different sport. [2]

iii) Find the probability at least 1 prefect plays rugby. [2]

End of Examination