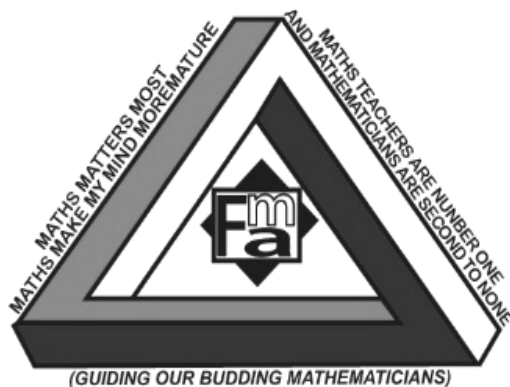


FIJI MATHEMATICS ASSOCIATION



FIJI MATHEMATICS COMPETITION (FMC) YEAR 12

Thursday 6th September 2018

Time Allowed: 1 Hour 15 minutes

Note:

Calculators are NOT permitted.

Diagrams are NOT drawn to scale.

Instructions:

1. Print your **Name** in the space provided and Shade the circle corresponding to your **Year** on the answer sheet.
2. Shade the circle corresponding to your answer with dark pencil on the answer sheet provided.
3. Multiple answers **will not be** accepted.

Year 12

1. A washing machine costs \$3800. Renuka pays a deposit of \$800 and takes a loan to settle the balance over 3 years in 36 equal instalments. The interest on the loan is 12% per annum simple interest on a hire purchase loan. Renuka is also required to insure the machine at 2% per annum of the purchase price, which is added to the loan amount. What is the total loan amount?

A. \$228 B. \$3228 C. \$ 4390.10 D. \$ 5190.10 E. \$ 1390.10

2. A set $S = \{0, 1, 2, 3, 4, 5\}$ is given under the operation 'addition \oplus ' modulo 6'.

| \oplus | 0 | 1 | 2 | 3 | 4 | 5 |
|----------|---|---|---|---|---|---|
| 0 | 0 | 1 | 2 | 3 | 4 | 5 |
| 1 | 1 | 2 | 3 | 4 | 5 | 0 |
| 2 | 2 | 3 | 4 | 5 | 0 | 1 |
| 3 | 3 | 4 | 5 | 0 | 1 | 2 |
| 4 | 4 | 5 | 0 | 1 | 2 | 3 |
| 5 | 5 | 0 | 1 | 2 | 3 | 4 |

The value of $4 \oplus 4^{-1}$ is:

- A. 0
B. 1
C. 2
D. 3
E. 4

3. The base – index form of the equation; $\log_k m = R$ is :

A. $k^m = R$ B. $k^R = m$ C. $R^k = m$ D. $m^k = R$ E. $R^m = k$

4. Which of the following is incorrect about surds

A. $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$ B. $\sqrt{a} \times \sqrt{b} = \sqrt{ab}$ C. $\sqrt{a} + \sqrt{b} = \sqrt{a+b}$

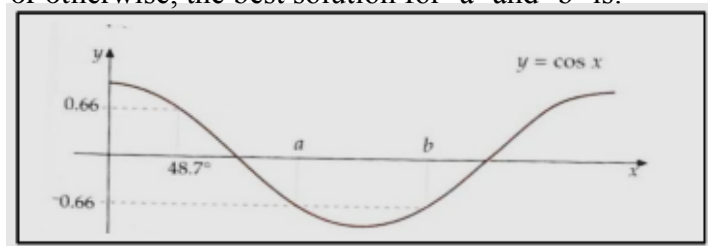
D. $\sqrt{a} + \sqrt{b} \neq \sqrt{a+b}$ E. $\sqrt{a} - \sqrt{b} \neq \sqrt{a-b}$

5. In an attempt to factorise $f(x) = x^4 + 5x^3 + 2x^2 - 8x$, a student obtained the factors $x(x-1)(x+2)(x-4)$. The factor which is not correct is:

A. x B. $(x-1)$ C. $(x+2)$ D. $(x-4)$ E. all the factors are correct

6. In the diagram below, two horizontal lines intersect the graph of $y = \cos x$. One of the solutions (in degrees) is given. Using symmetry property or otherwise, the best solution for 'a' and 'b' is:

- A. $a = 138.7^\circ$ and $b = 221.3^\circ$
B. $a = 131.3^\circ$ and $b = 221.3^\circ$
C. $a = 138.7^\circ$ and $b = 228.7^\circ$
D. $a = 131.3^\circ$ and $b = 228.7^\circ$
E. $a = 97.4^\circ$ and $b = 194.8^\circ$



7. Given that $a \neq b \neq 0$, which of the following matrix is not invertible.

A. $\begin{pmatrix} a & b \\ b & a \end{pmatrix}$ B. $\begin{pmatrix} a & b \\ a & b \end{pmatrix}$ C. $\begin{pmatrix} a & a \\ b & a \end{pmatrix}$ D. $\begin{pmatrix} b & b \\ b & a \end{pmatrix}$ E. $\begin{pmatrix} a & b \\ b & b \end{pmatrix}$

8. The geometric sequence: a, ar, ar^2, \dots will always have a limiting sum provided :

A. $-1 < r < 1$ B. $r > 1$ C. $r < 0$ D. $-1 < a < 1$ E. $a > 0$

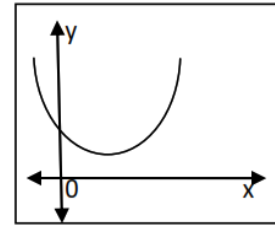
9. Which of the following best represents the correct value, when solved for 'x' in $2^{3x-1} = 16\sqrt{2}$.

A. $\frac{106}{25}$ B. $\frac{41}{10}$ C. $\frac{5}{3}$ D. $\frac{10}{41}$ E. $\frac{11}{6}$

10. The solution set of the trigonometric equation $2 \sin^2 \theta = \frac{1}{2}$ where $0^\circ \leq \theta \leq 90^\circ$ is:

$\theta = 14.48^\circ$ B. $\theta = 30^\circ$ C. $\theta = 44.48^\circ$ D. $\theta = 45^\circ$ E. $\theta = 60^\circ$

Year 12

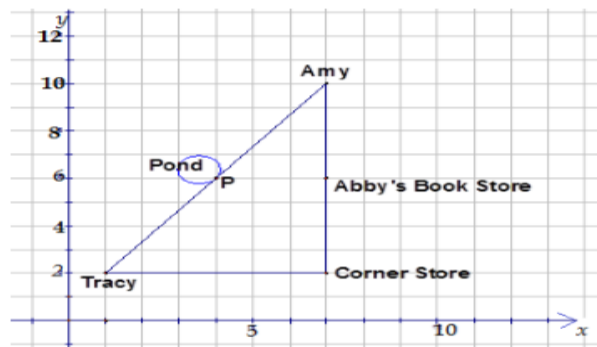
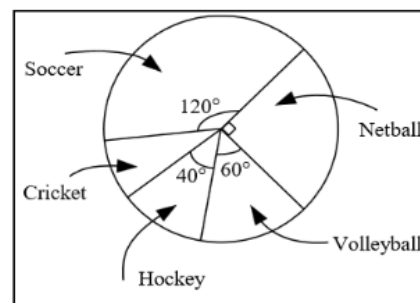


11. The figure on the right shows the graph of : $y = (x-2)^2 + 3$.
The domain of the function is \mathbb{R} . The range of the function is:
A. \mathbb{R} B. $x \geq 0$ C. $x \geq 2$ D. $y \geq 3$ E. $y \geq 7$
12. The value of 'k' for which the equation $x^2 + 5kx + 16 = 0$ has no real roots is:
A. $k = \frac{-8}{5}$ B. $k = \frac{8}{5}$ C. $\frac{-8}{5} < k < \frac{8}{5}$ D. $\frac{8}{5} < k < \frac{-8}{5}$ E. $\frac{-5}{8} < k < \frac{5}{8}$
13. The graph of $y = -f(x)$ is obtained by reflecting the graph of $y = f(x)$ in the
A. y - axis. B. x - axis. C. line $y = x$. D. line $y = -x$. E. line $y = 0$
14. The determinant of 2×2 transformation matrices which represent enlargements give the scale factor for the
A. Width B. Length. C. Volume. D. Perimeter. E. Area.
15. If $\cos \theta = \frac{-12}{13}$ and $\pi < \theta < \frac{3\pi}{2}$ then the value of $\sin \theta$ is:
A. $\frac{5}{13}$ B. $\frac{5}{12}$ C. $\frac{-13}{12}$ D. $\frac{-5}{12}$ E. $\frac{-5}{13}$
16. When divided by $x+2$, the expressions $x^3 + ax^2 + ax - a$ and $3x^3 + 6x^2 - ax + a$ give the same remainder. The value of 'a' is:
A. 4 B. 2 C. -4 D. -2 E. 1
17. Which of the following is incorrect about matrix transformation?
A. Area is invariant under a shear. B. Area is invariant under rotation.
C. Area is invariant under a reflection. D. Area is invariant under an enlargement.
E. Angle size is invariant under an enlargement.
18. The $\lim_{x \rightarrow -2} \frac{x^2 - 4}{x^2 - x - 6}$ is:
A. Limit does not exist B. 0 C. 2 D. $\frac{4}{5}$ E. $\frac{-4}{5}$
19. A die is rolled 3 times. The probability of getting exactly 2 five's is:
A. $\frac{1}{125}$ B. $\frac{3}{5}$ C. $\frac{3}{125}$ D. $\frac{5}{72}$ E. $\frac{6}{125}$
20. What is the value of $\sum_{n=1}^{20} \log 2^n$?
A. $\log 2$ B. $\log 2^{20}$ C. $20 \log 2$ D. $210 \log 2$ E. $20 \log 2^n$
21. A man repays a loan of \$3250 by paying \$20 in the first month and then increases the payment by \$15 every month. How long will it take him to clear the loan?
A. 24 months B. 11 months C. 10 months D. 20 months E. 12 months
22. A function $\mathbf{F(x)}$ is given by: $\mathbf{F(x) = x^3 - 3x}$. The local minimum point on the graph is:
A. (-2,1) B. (-1,2) C. (2,-1) D. (1, -2) E. (-1,1)
23. If the price of a book is reduced by \$5, a person can buy 5 more books for \$300. The original list price of the book is:
A. \$30 B. \$12 C. \$20 D. \$55 E. \$15
24. The most accurate solution set for $\frac{x+3}{x-2} \leq 2$ is:
A. $x \geq 7$ B. $x \leq 7$ C. $x \in (-\infty, 2) \cup (7, \infty)$ D. $x \in (-\infty, 7) \cup (2, \infty)$ E. $x \leq 2$

Year 12

25. The pie chart on the right shows the sports interests shown by a group of 200 students. The number of students that like cricket is:

A. 50 B. 25 C. 30 D. 28 E. 27



Use the information on the left to answer question 26

Tracy wants to visit Amy for her birthday. She decides to walk to the Corner Store way in order to purchase a gift, passing Abby's Book Store to present the gift. On returning home, she will take the shortcut through the park and past the pond. As Tracy is walking home through the field, she stops to dangle her feet in the pond that is exactly half way between Amy and Tracy's house.

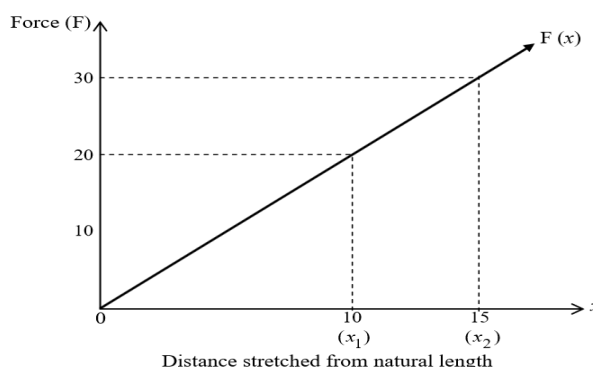
26. If each unit on the grid represents 200m, then the distance from the pond to Tracy's home is:

A. 5 km B. 7.2 km C. 6 km D. 4km E. 1 km

27. The angle which the line joining points $(-3, 7)$ and $(-1, 9)$ makes with the positive direction of x - axis is:

A. 30° B. 45° C. 50° D. 60° E. 65°

28. The work done W , in stretching a spring x_1 units from its natural length to x_2 units from its natural length is given as $W = \int_{x_1}^{x_2} F \cdot dx$ where F is the force required to stretch the spring. The graph below shows how the force varies with the distance the spring is stretched.



The work done to stretch the spring 10 cm from its natural length to 15 cm from its natural length is

A. 62.5 B. 100 C. 125 D. 150 E. 200

29. After striking the floor a ball rebounds $\frac{4}{5}$ th of the height from which it has fallen. Find the total distance that it travels before coming to rest, if it is gently dropped from a height of 120m.

A. 600m B. 480 m C. 1080m D. 1200m E. 1280m

30. The diagram on the right shows the graph of $y = x^3$.

The area of the shaded region is:

A. 4 unit²
B. 8 unit²
C. 12 unit²
D. 16 unit²
E. 20 unit²

