

21. A sheet of metal measuring 8 cm by 10 cm has four squares, each of length x cut out from each corner. The four sides are then folded to make an open box. The formula for the volume of the box is

- A. $V = 4x^3 - 36x^2 - 80x$ B. $V = 4x^3 + 36x^2 - 80x$ C. $V = -4x^3 - 36x^2 + 80x$
D. $V = -4x^3 - 36x^2 - 80x$ E. $V = 4x^3 - 36x^2 + 80x$

22. Which of the following is true about the polynomial function $f(x) = x(x+1)^3(x-2)^2$

- A. A point of inflexion exists at (-1,0)
B. The graph of f(x) has a y intercept of (0,4)
C. f(0)=1
D. The graph of f(x) has only one x-intercept
E. none of the above

23. The value of $\lim_{x \rightarrow -1} \frac{3x-3x^3}{x+1}$ is

- A. 3 B. -3 C. -6 D. 6 E. does not exist

24. Find $\int \frac{2}{x} dx$

- A. $\frac{-1}{x^2}$ B. $\frac{-2}{x^2}$ C. $2 \ln x$ D. $2 \ln 2x$ E. $\ln 2x$

25. According to a headline, ‘Glaciers in the French Alps have lost a quarter of their area in the past 40 years’. What is the approximate percentage reduction in the length of the side of a square when it loses one quarter of its area, thereby becoming a smaller square?

- A. 13% B. 25% C. 38% D. 50% E. 65%

26. Frank's teacher asks him to write down five integers such that the median is one more than the mean, and the mode is one greater than the median. Frank is also told that the median is 10. What is the smallest possible integer that he could include in his list?

- A. 3 B. 4 C. 5 D. 6 E. 7

27. Find the gradient of the normal to the curve $y = (x - 2)^2$ at the point where $X = 3$.

- A. $\frac{-1}{3}$ B. $\frac{1}{3}$ C. 2 D. 6 E. $\frac{-1}{2}$

28. In how many different ways can two students be chosen from a group of ten students?

- A. 10 B. 15 C. 45 D. 90 E. 30

29. Evaluate the sum $\sum_{n=1}^{15} \sqrt{n+1} - \sqrt{n}$

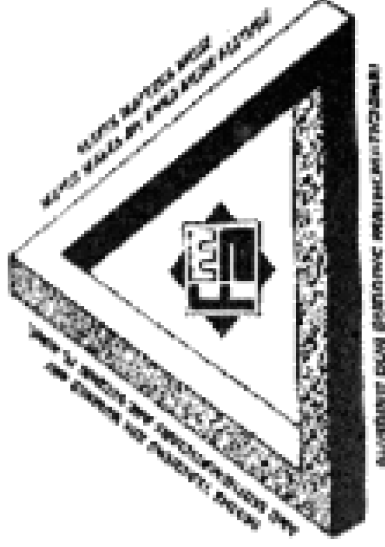
- A. $\sqrt{15}$ B. $\sqrt{15} - 1$ C. $4 - \sqrt{2}$ D. 3 E. 15

30. The equation for the oblique asymptote for the graph of $f(x) = \frac{(x+3)(x+1)}{(x-2)}$ is:

- A. $y = x + 2$ B. $y = x - 2$ C. $y = x + 3$

- D. $y = x - 6$ E. $y = x + 6$

FIJI MATHEMATICS ASSOCIATION



FIJI MATHEMATICS COMPETITION (FMC)

YEAR 13

Thursday 10th July 2014

Time Allowed: 1 Hour 15 minutes

Note:

Calculators are NOT permitted.

Diagrams are NOT drawn to scale.

Instructions:

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

1. $1200 \times 1.2 \times 0.0001$ equals
A. 0.000144 B. 0.0144 C. 0.144 D. 1.44 E. 144 000
2. Which of the following is the smallest fraction?
A. $\frac{3}{4}$ B. $\frac{6}{7}$ C. $\frac{4}{5}$ D. $\frac{7}{9}$ E. $\frac{5}{7}$
3. $(\sqrt[8]{64})^4$ when simplified is equal to
A. 16 B. 4 C. 8 D. 2 E. 0.125
4. The argument of the complex number $-2i$ is
A. 0 B. $\frac{\pi}{2}$ C. $-\pi$ D. π E. $-\frac{\pi}{2}$
5. If $\sin\beta = \frac{2}{3}$, then what is the value of $\cot\beta$?
A. $\frac{\sqrt{5}}{3}$ B. $\frac{3}{\sqrt{5}}$ C. $\frac{\sqrt{5}}{2}$ D. $\frac{2}{\sqrt{5}}$ E. $\frac{3}{2}$
6. Given $f(x) = x^2 + 2$ and $g(x) = \sqrt{x - 3}$, $f \circ g(x)$ will be:
A. $x - 1$ B. $\sqrt{x^2 - 1}$ C. $\sqrt{x - 1}$ D. $x + 1$ E. $\sqrt{x - 3} + 2$
7. Simplify $\frac{31!}{29!}$. (Note: ! symbol denotes factorial)
A. $\frac{31}{29}$ B. 30 C. 31 D. 930 E. 2

Use the piecewise function given below to answer questions 8 and 9

$$\text{If } f(x) = \begin{cases} 4, & x < -2 \\ x^2, & -2 \leq x \leq 2 \\ x + 3, & x \geq 2 \end{cases}$$

8. What is the value of $f(-3)$?
A. -2 B. -1 C. -4 D. 4 E. 1
9. Find $\lim_{x \rightarrow -2} f(x)$
A. -2 B. -1 C. -4 D. 4 E. does not exist
10. The value of $8\sin^2 45^0$ is
A. $\frac{1}{2}$ B. $\frac{1}{4}$ C. 8 D. 4 E. 1

11. The probability of getting a tail on a coin is $\frac{2}{5}$. If the coin is tossed three times what is the probability of getting heads in all three tosses?
A. $\frac{1}{8}$ B. $\frac{8}{125}$ C. $\frac{27}{125}$ D. $\frac{7}{8}$ E. $\frac{9}{25}$
12. $8^{k+1} - 5(2^{3k})$ when simplified is
A. $5(2^{k+1})$ B. $\frac{8}{5}(2^{k+1})$ C. $3(2^{k+1})$ D. 3^{k+1} E. $3(2^{3k})$
13. The value of $\frac{1001^2 - 999^2}{101^2 - 99^2}$
A. 1 B. 10 C. 20 D. 100 E. 25
14. In a crazy town people are really strange. Ten percent of the men think they are women and ten percent of the women think they are men. All the other men and women are perfectly normal. One day a psychiatrist tested all the men and women in the town and found that 20% of them thought that they were women. What percentage of them really were women?
A. 12.5 B. 20 C. 22 D. 22.5 E. 23
15. The ratio of two positive numbers equals the ratio of their sum to their difference. What is this ratio?
A. $(1 + \sqrt{3}):2$ B. $\sqrt{2} : 1$ C. $(1 + \sqrt{5}):2$ D. $(2 + \sqrt{2}):1$ E. $(1 + \sqrt{2}):1$
16. $f(x) = 3x - 2$ and $h(x) = x^2 - 1$. $f(h(1))$ has value
A. -2 B. 2 C. -1 D. 1 E. 0
17. If $y = e^{\sin 2x}$, then $\frac{dy}{dx}$ is: (Note: $\frac{d(\sin x)}{dx} = \cos x$)
A. $-\cos 2x e^{\sin 2x}$ B. $\cos 2x e^{\sin 2x}$ C. $2 e^{\sin 2x}$
D. $2 \sin x e^{\cos 2x}$ E. $2 \cos 2x e^{\sin 2x}$
18. The numbers 2, 3, 12, 14, 15, 20, 21 may be divided into two sets so that the product of the numbers in each set is the same. What is this product?
A. 420 B. 1260 C. 2520 D. 6720 E. 6350400

Use the sequence described below to answer 19 and 20.

$$a_{n=\frac{2n+4}{4n+3}}$$

19. What of the following can be a lower bound of the sequence given above?
A. $\frac{8}{9}$ B. $\frac{1}{3}$ C. $\frac{9}{10}$ D. $\frac{6}{7}$ E. $\frac{3}{5}$
20. Find 3rd tern in the sequence of partial sums
A. $\frac{10}{15}$ B. $\frac{122}{77}$ C. $\frac{8}{11}$ D. $\frac{520}{231}$ E. $\frac{1}{2}$