

FIJI MATHEMATICS ASSOCIATION



FIJI MATHEMATICS COMPETITION (FMC) YEAR 12

Thursday 1st September 2016

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. If $x @ y = 2(x^2 - y)$, then $2 @ -3$ is :

- A. 2 B. 7 C. 10 D. -22 E. 14

2. When the function $g(x)$ is divided by $(x - 3)$, the remainder is 2. Which of the following is true?

- A. $g(0) = 2$ B. $g(2) = -3$ C. $g(3) = 2$ D. $g(-3) = 2$ E. $g(-3) = -2$

3. $\frac{\log x^8 - \log x^5}{\log x}$ in its simplest form is equal to :

- A. $\log x^3$ B. $\log x^2$ C. $\log x$ D. 2 E. 3

4. If $\frac{1}{2}p = \frac{n}{2}(3n - 1)$ and $n = 7$ then the value of p is:

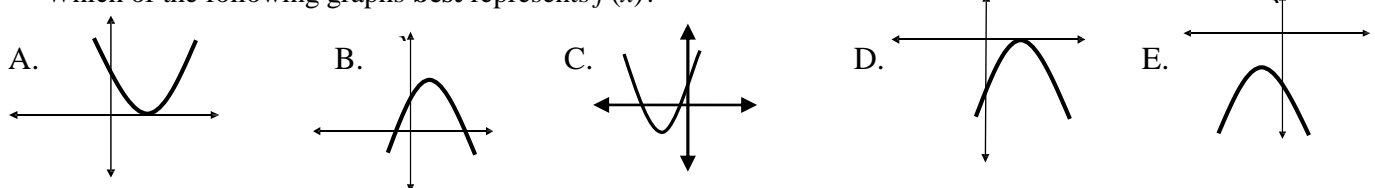
- A. 280 B. 14 C. 70 D. 35 E. 140

5. The value of $\sum_{r=1}^3 (2^r - 1)$ is :

- A. 17 B. 15 C. 11 D. 9 E. 21

6. The quadratic equation $f(x) = px^2 + qx + r$ has $q^2 - 4pr = 0$ and $p < 0$.

Which of the following graphs **best** represents $f(x)$?



7. The line joining the points $(1, 2)$ and $(3, k)$ is parallel to the line $3x - 2y + 8 = 0$. What is the value of k ?

- A. 1 B. $\frac{3}{10}$ C. 3 D. 8 E. 5

8. An arithmetic sequence is defined by $T(n) = 4n - 1$.

What is $\sum_{n=1}^{24} T(n)$ equal to ?

A. 1176 B. 1124 C. 300
D. 95 E. 24

9. If points $P(3, -2)$, $Q(4, 2)$ and $R(x, 6)$ are **collinear**, then the value of x is

- A. 2 B. 3 C. 4 D. 5 E. 6

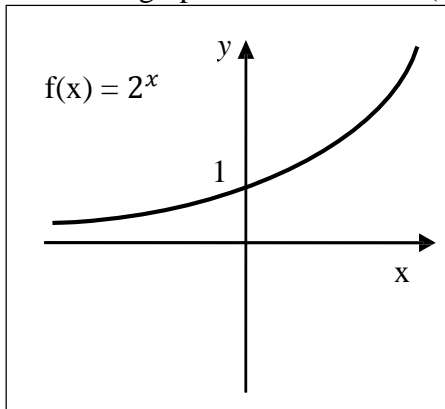
10. The vertex of the graph represented by the equation $y = -(x + 2)^2 - 1$ is:

- A. $(-2, -1)$ B. $(-2, 1)$ C. $(2, -1)$ D. $(2, 1)$ E. $(-1, -2)$

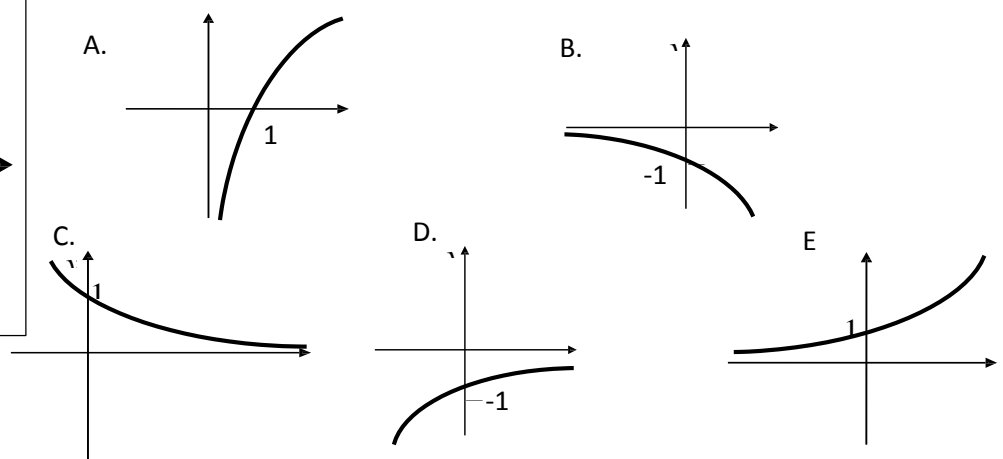
11. How many multiples of 5 are between 293 and 928?

- A. 244 B. 185 C. 58 D. 120 E. 127

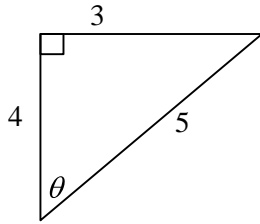
12. The graph of the function $f(x) = 2^x$ is shown below.



The graph of the function $y = -f(x)$ is **best** represented by



13. In the right angle triangle given below, the value of $\cot \theta$ is equal to



A. $\frac{3}{5}$

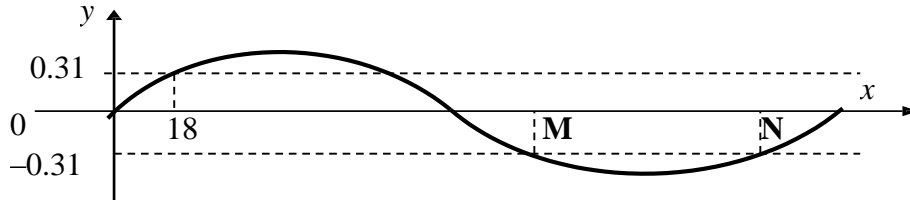
B. $\frac{4}{5}$

C. $\frac{3}{4}$

D. $\frac{4}{3}$

E. $\frac{5}{3}$

14. In the diagram below, two horizontal lines intersect the graph of $y = \sin x$



One of the solutions (in degrees) is given. Using symmetry property or otherwise, the **best** solution for M and N is

A. $M = 198^\circ$ and $N = 252^\circ$

B. $M = -198^\circ$ and $N = 342^\circ$

C. $M = 198^\circ$ and $N = -342^\circ$

D. $M = 198^\circ$ and $N = 342^\circ$

E. $M = -198^\circ$ and $N = 252^\circ$

15. The matrix that represents a reflection in the x axis is

A. $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

B. $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$

C. $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

D. $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$

E. $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$

16. A function is defined as $g(x) = \frac{10}{x-2} + 3$. Which of the equations given below is the equation of the horizontal asymptote of $g(x)$.

A. $y = 3$

B. $x = 2$

C. $y = 2$

D. $x = 2$

E. $y = -2$

17. The equation of a line which is perpendicular to the line $y = 2 - \frac{1}{2}x$ and passes through (0,1) is

A. $y + x - 2 = 0$

B. $y + 2x - 1 = 0$

C. $2y - x + 2 = 0$

D. $y - 2x + 1 = 0$

E. $y + 2x - 1 = 0$

18. The line $y = 3 - x$ intersects the parabola $y = 3x - x^2$ in two points (x_1, y_1) and (x_2, y_2) . What is $y_1 + y_2$.

A. 1

B. 3

C. 4

D. 0

E. 2

19. In form 601, the probability that Alpana has a handkerchief is 0.54 and the probability that she has a home-made lunch is 0.68. The probability that she has both a handkerchief and a home made lunch is 0.25. What is the probability that Alpana will have either a handkerchief or a home-made lunch?

A. 0.03

B. 0.29

C. 0.43

D. 0.97

E. 0.68

20. $\frac{1}{\sqrt{2}}$ when expressed as power of 8 is:

A. $\frac{1}{\sqrt{2}} = 8^{-\frac{1}{3}}$

B. $\frac{1}{\sqrt{2}} = 8^{-\frac{1}{2}}$

C. $\frac{1}{\sqrt{2}} = 8^{\frac{1}{3}}$

D. $\frac{1}{\sqrt{2}} = 8^{\frac{1}{6}}$

E. $\frac{1}{\sqrt{2}} = 8^{-\frac{1}{6}}$

21. The table below shows the number of left-handed students in a school.

Form	I	II	II	I	V	V
Number of left-handed students	2	3	4	4	5	4

The **mean** and **standard deviation** of the number of left handed students in the school are

A. $\bar{x} = 0.94$; $s = 3.67$

B. $\bar{x} = 3.67$; $s = 0.94$

C. $\bar{x} = 3$; $s = 4$

D. $\bar{x} = 4$; $s = 5$

E. $\bar{x} = 3.67$; $s = 4$

22. The area of a regular Octagon inscribed in a circle of radius 4 cm is close to

A. 6.28 cm^2

B. 50.24 cm^2

C. 48.25 cm^2

D. 12.56 cm^2

E. 45.25 cm^2

23. \overline{AB} is the diameter of a circle with the centre at (2, 0). If point A is at (-3, 2), then the coordinates of B are

A. (-7, 2)

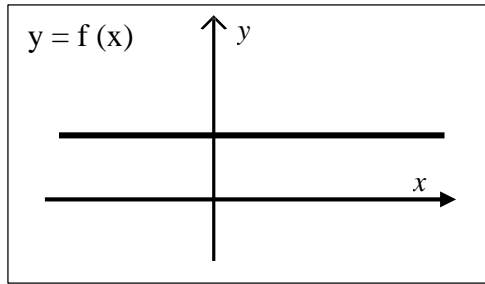
B. (-2, 7)

C. (7, 2)

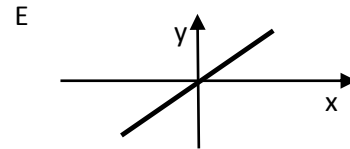
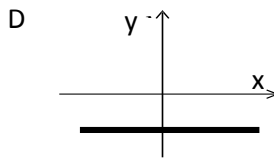
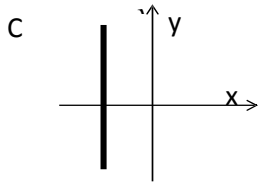
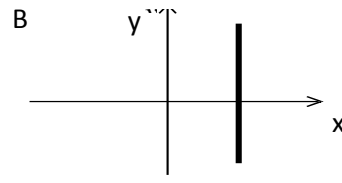
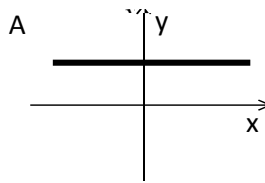
D. (-2, -7)

E. (7, -2)

24. The graph of $y = f(x)$ is shown below.



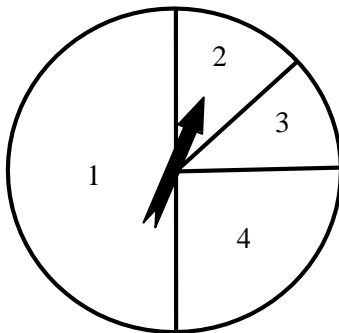
The graph which represents the inverse function, $y = f^{-1}(x)$ is:



25. Out of a group of dogs, $\frac{7}{2}$ times the square root of the number are playing by the road side. The remaining two are fighting on the road. What is the total number of dogs?

- A. 12 B. 14 C. 10 D. 18 E. 16

26. A spinner is made by dividing a circular board into four sectors as shown below.



When rotated 40 times, how many times the pointer is expected to stop on the sector labelled 2?

- A. 5 B. 10 C. 15
D. 20 E. 25

27. An athlete competes in the girls discus event at school. She needs a mean distance of at least 39m to qualify for the finals. Her first five throws have given her a mean distance of 38 m. What is the minimum distance she will need on her final throw (throw 6) to qualify?

- A. 39m B. 40m C. 42m D. 43m E. 44m

28. A derived function is given by $f^1(x) = 3x^2 - 5$. Which of the following is the **most** likely to be the expression for $f(x)$?

- A. $6x$ B. $3x^2 - 5$ C. $x^3 - 5x + 2$ D. $x^3 - 5x^2$ E. $x^3 - 5x^2 - 5x$

29. The volume of a spherical ball is given as $V(r) = \frac{4}{3}\pi r^3$, where 'r' is the radius. When air is pumped into the ball, its volume increases. The rate of change of volume with respect to the radius is given by the expression.

- A. $4\pi r^2$ B. $\frac{4\pi r^2}{3}$ C. $\frac{1\pi r^2}{3}$ D. $\frac{1\pi r^4}{3}$ E. $\frac{4\pi r^4}{3}$

30. A pile driver drives a 10 m pole into the ground. Each time it strikes the pole, the pole is driven $\frac{5}{8}$ the distance it last moved. If the first strike drives the pole 3 m into the ground, then determine the length of the pole that will be left above the ground no matter how many strikes are made by the pile driver.

- A. 1m B. 5m C. 4m D. 3m E. 2 m