TMUA

COMMUNITY PAPERS

OxbridgeMind TMUA Paper 1

Recommended time: 75 minutes

Calculators: not permitted

Format: 15 multiple-choice questions

This community paper is presented in a clean, print-ready format. The wording, mathematics, answer choices, and diagrams are preserved from the source paper.

Paper guidance

- Attempt every question. Select the best answer from the choices given.
- If a diagram is shown, it is reproduced from the source material and may not be drawn to scale.
- This question paper does not include worked solutions or a marked answer key.

Best of luck, and enjoy the challenge!

Source credit: OxbridgeMind

tmua.me editorial edition: corrections applied; original question numbering retained.
14 active questions. Withdrawn question(s): 9.
Credit remains with the original author. Editorial history: model-answers/ALTERED-QUESTIONS.md in the repository.

Question 1

Given that $\dfrac{a^x b^{3x}}{c^{2x}} = 5$ where a, b and c are positive real number then $x =$

A $\dfrac{\ln 5}{\ln a + 3\ln b - 2\ln c}$

B $\dfrac{1}{a + 3b + 2c}$

C $\dfrac{2c}{a + 3b}$

D $a + 3b + 2c$

E $(a \times 3b)^{2c}$

This page contains an editorial correction to the supplied paper. The source paper is credited to its original author. Question IDs on this page: p058-q001.

Question 2

It is known that $x+3$ is a factor of $f(x) = x^3 + 2kx^2 + (k+1)^2x + 21$. The sum of the possible values of k is

A 2

B 3

C 4

D 5

E 6

Question 3

The complete set of values of x for which $(x^4 - 1)(x + 3) > 0$ are:

A $0 < x < 1$, $-3 < x < -1$

B $-3 < x < -1$, $x > 1$

C $x < -3$, $-1 < x < 1$

D $-3 < x < 1$

E $x > 1$, $x < -3$

Question 4

The perpendicular bisector of the line segment joining the point $(-2, 15)$ and $(4, 1)$ cuts the y-axis at the y-coordinate

A $-\frac{51}{7}$

B $-\frac{53}{3}$

C 8

D $\frac{59}{7}$

E $\frac{53}{7}$

Question 5

Find the number of real solutions in the interval $0 < \theta < \frac{5\pi}{2}$ of the equation $\cos^2\theta + 7\sin\theta = 7$

A 0

B 1

C 2

D 3

E 4

Question 6

Consider the simultaneous equations:

$$3x^2 + 15y = 6$$

$$2x + 5y = 3$$

the sum $x + y$ therefore equals

A $\frac{6}{5}$

B $\frac{4}{5}$

C $-\frac{4}{5}$

D 0

E Equations are not consistent

Question 7

Five students took a math's test and got scores A, B, C, D, E with $E > D$, $C > B$, $B > D$ and $A > D$.

How many ways could the candidates be ranked?

A 12

B 9

C 16

D 8

E 20

Question 8

Let $F_k = F_{k-1} + F_{k-2}$ where $F_0 = 0$, $F_1 = 1$. Define the series $s(x) = \sum_{k=1}^{\infty} \frac{F_k}{x^k}$ for $x > 2$. What is the value of $s(x)$

A $\frac{x^2}{x^2-x-1}$

B $\frac{x}{x^2-x-1}$

C $\frac{1}{x^2-x-1}$

D $x - 1$

E $\frac{x^2-1}{x}$

Question 10

A runner leaves their home and reaches their destination after an hour. The velocity of the runner varies according to the function $v(t) = \cos\left(\frac{t\pi}{2}\right)$ where t is the time in hours. Find the time where the runner reaches halfway in distance

A 10 minutes

B 15 minutes

C 20 minutes

D 30 minutes

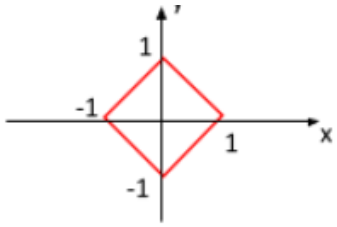
E 40 minutes

Question 11

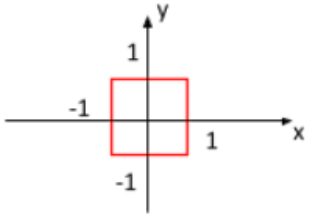
Which sketch represents

$$|x|^3 + |y|^3 = 1?$$

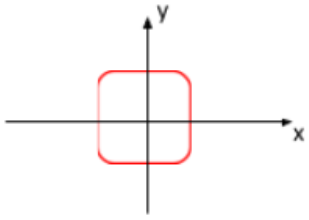
A A



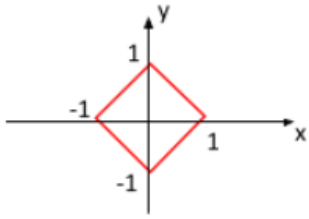
B B



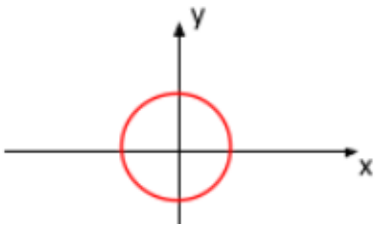
C C



D D



E E



Question 12

What is the largest integer n such that $n+3$ perfectly divides n^2+27?

A 33

B 15

C 6

D 3

E 60

Question 13

For $k > 0$, the function

$$f(x) = \left(k + \frac{5}{2}\right) x^2 + 3k^2 x + 6k$$

has its minimum at $x = -1$. Find k.

A $\frac{2}{3}$

B -1

C $\frac{5}{3}$

D 3

E 1

Question 14

a, b, c and d are positive integers such that

$$a + \cfrac{1}{b + \cfrac{1}{c + \cfrac{1}{d}}} = \frac{15}{11}$$

Which one of the four integer is largest

A a

B b

C c

D d

E all are same

Question 15

The real roots of the equation

$$4^{2x} + 3 = 2^{2x+2}$$

are p and q where $p > q$. The value of $p - q$ can be expressed as:

A 3

B 2

C $\frac{1}{2}\log_2 2$

D $\frac{1}{2}\log_2 3$

E 0