

GC INTERNATIONAL MATHEMATICS OLYMPIAD - LEVEL FOUR SAMPLE PAPER

Question 1

The minute hand of a clock is 7 cm long. Find the area traced out by the minute hand of the clock between 4.15 PM to 4.35 PM on a day.

- A. $51\frac{1}{3} \text{ cm}^2$
- B. $53\frac{2}{3} \text{ cm}^2$
- C. $45\frac{2}{3} \text{ cm}^2$
- D. $51\frac{2}{3} \text{ cm}^2$

Key: A

Question 2

Find the probability of getting a composite number in a throw of a die

- A. $1/6$
- B. $2/5$
- C. $1/3$
- D. $4/5$

Key: C

Question 3

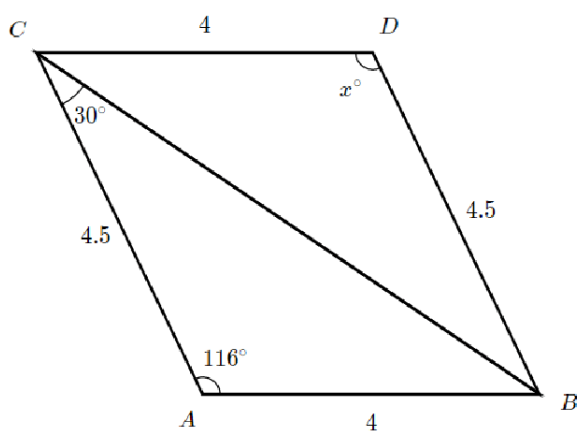
If $\frac{(a+ib)^2}{a-ib} - \frac{(a-ib)^2}{a+ib} = x+iy$, then the value of x is

- A. 0
- B. $\frac{6a^2b}{(a^2+b^2)^2}$
- C. $\frac{-2b^3}{(a^2+b^2)^2}$
- D. None of the above

Key: A

Question 4

What is the value of x in the figure shown below?



- A. 120°
- B. 116°
- C. 145°
- D. 132°

Key: B

Question 5

$$4 < \frac{7 - x}{3}$$

Quantity A

Maximum value of $-(5 - x)$

Quantity B

Maximum value of $2x$

- A. Quantity A is Greater
- B. Quantity B is Greater
- C. The quantities are equal
- D. Insufficient Data

Key: A

Question 6

The value of $99^2 - 98^2$ is:

- A. 1
- B. 197
- C. 187
- D. 207

Key: B

Question 7

The perimeter of a circular and square fields are equal. If the area of the square field is 484 m^2 then the diameter of the circular field is

- A. 14 m
- B. 21 m
- C. 28 m
- D. 7 m

Key: C

Question 8

Someone is asked to pick a number from 1 to 100. The probability that it is a prime is:

- A. $1/5$
- B. $6/25$
- C. $1/4$
- D. $13/50$

Key: C

Question 9

It is required to seat 5 men and 4 women in a row so that the women occupy the even places. The number of ways such arrangements are possible are:

- A. 8820
- B. 2880
- C. 2088
- D. 2808

Key: B

Question 10

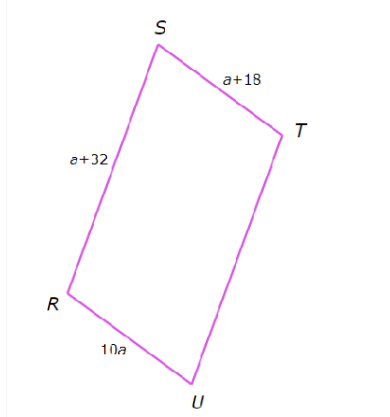
$$(a^3b^{-1/4})^{2/3} =$$

- A. $a^2/b^{1/6}$ B. $a^2/b^{-1/6}$ C. $-a^2/b^{1/6}$ D. $a^{-2}/b^{1/6}$

Key: A

Question 11

Find the value of a in parallelogram $RSTU$.



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

Key: A

Question 12

$$(3m - 4n + 2)(3m - 4n - 2) =$$

- A. $9m^2 - 24mn + 16n^2 - 4$ B. $9m^3 - 24mn^2 + 16n^2 - 4$
C. $9m^2 - 24m^2n + 16n^3 - 4$ D. $9m^3 - 24m^2n^2 + 16n^2 - 4$

Key: A

Question 13

What is the value of the expression: $-4\sqrt{25} + 4^3$?

- A. 32 B. 44 C. 84 D. 112

Key: A

Question 14

What is the value of $(\frac{1}{2})^{-2}$?

- A. -4 B. $-\frac{1}{4}$ C. $\frac{1}{4}$ D. 4

Key: D

Question 15

Line l and line k are perpendicular. Line l has a slope of 3. Line k contains the points $(5, 8)$ and $(2, y)$. What is the value of y ?

- A. -1 B. 7 C. 9 D. 17

Key: C

Question 16

Given a $\triangle ABC$ in which $\angle B = 90^\circ$ and $AB = \sqrt{3}BC$, then $\angle C$ is

- A. 45° B. 60° C. 90° D. 120°

Key: B

Question 17

Mid point of the points $(2, 2)$ and $(0, 0)$ should be

- A. $(1, -1)$
B. $(-1, -1)$
C. $(1, 1)$
D. $(0, 0)$

Key: C

Question 18

Aaron is staying at a hotel that charges \$99.95 per night plus tax for a room. A tax of 8% is applied to the room rate, and an additional onetime untaxed fee of \$5.00 is charged by the hotel. Which of the following represents Aaron's total charge, in dollars, for staying x nights?

- A. $(99.5 + 0.08x) + 5$
B. $1.08(99.95x) + 5$
C. $1.08(99.95x + 5)$
D. $1.08(99.95 + 5)x$

Key: B

Question 19

Which expressions have positive values?

i) $\left[(-7)^6\right]^7$

ii) $\left[-(-7)^6\right]^7$

iii) $- \left(7^6\right)^7$

iv) $- \left[-(-7)^6\right]^7$

- A. ii & iv B. i & iv C. i & ii D. ii & iii

Key: B

Question 20

Evaluate: $(-2)^4 \times (-2)^2 + (-2)^0$

- A. -32 B. 64 C. 256 D. -64

Key: B

Question 21

A fraction $\frac{p}{q}$ can be expressed as a terminating decimal, if "Q" has no prime factors other than:

A. 2, 5

B. 2, 3

C. 3, 7

D. 3, 7, 5

Key: A

Question 22

The production of washing machines in a factory increases uniformly by a fixed number every year. The factory produced 3041 washing machines in the 3rd year and 5301 washing machines in the 7th year. Find the production of washing machines in the first 5 years.

A. 15705

B. 15205

C. 16205

D. 17205

Key: B

Question 23

Find m and n such that the numbers 69,m,221,n form an AP.

- A. m=145 and n=296 B. m=146 and n=297
C. m=145 and n=297 D. m=145 and n=298

Key: C

Question 24



The square is rotated a full turn about the line Which of the following describes the three dimensional object generated?

- A. A cylinder with another cylinder cut from its center.
B. A complete cylinder.
C. Two cylinders joined together.
D. A cylinder with a cone cut from its center.

Key: A

Question 25

Kate and Levi both sat a multi-choice math test.

Kate got 75% of the questions correct, and Levi got 55% of the questions correct.

What is the probability that at least one of them correctly solved a question selected at random from the test?

- A. $\frac{9}{80}$ B. $\frac{33}{80}$ C. $\frac{47}{80}$ D. $\frac{71}{80}$

Key: D

Question 26

The numbers 1, 2, 3, 4, 5 and 6 have weights 0.5, 0.1, 0.1, 0.1, 0.1 and 0.1 respectively.
What is the weighted mean?

- A. 2.5 B. 2.8 C. 3.0 D. 3.5

Key: A

Question 27

Alex thinks of a number, doubles it, adds seven, and then divides by three.

The answer is less than nine.

What is always true about the number Alex first thought of?

- A. It is less than 3
B. It is less than 9
C. It is less than 10
D. It is greater than 10

Key: C

Question 28

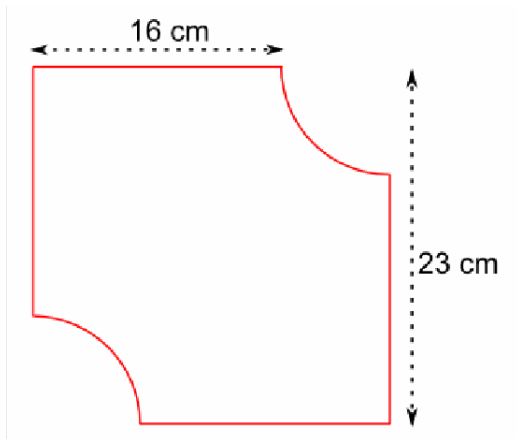
The area of a circle is increased by 22 cm^2 when its radius is increased by 1 cm. What is the original radius of the circle?

Use $(22/7)$ as an approximation for π

- A. 6 cm B. 3.2 cm C. 3 cm D. 3.5 cm

Key: C

Question 29



The shape is a square with two quarter circles cut from opposite corners.

What is the perimeter of the shape?

Use $22/7$ as an approximation for π

- A. 75 cm B. 78 cm C. 86 cm D. 92 cm

Key: C

Question 30

It was Sunday on Jan 1, 2006. What was the day of the week Jan 1, 2010?

- A. Sunday
B. Saturday
C. Friday
D. Wednesday

Key: C

Question 31

From a point P on a level ground, the angle of elevation of the top tower is 30° . If the tower is 100 m high, the distance of point P from the foot of the tower is:

- A. 149 m
B. 156 m
C. 173 m
D. 200 m

Key: C

Question 32

How much time will it take for an amount of \$ 450 to yield \$ 81 as interest at 4.5% per annum of simple interest?

- A. 3.5 years
- B. 4 years
- C. 4.5 years
- D. 5 years

Key: B

Question 33

Find the next number in the series

8, 7, 11, 12, 14, 17, 17, 22, (....)

- A. 27
- B. 20
- C. 22
- D. 24

Key: B

Question 34

Find the wrong number in the series

1, 2, 6, 15, 31, 56, 91

- A. 31
- B. 91
- C. 56
- D. 15

Key: B

Question 35

If $a - b = 3$ and $a^2 + b^2 = 29$, find the value of ab .

- A. 10
- B. 12
- C. 15
- D. 18

Key: A

Question 36

A fires 5 shots to B's 3 but A kills only once in 3 shots while B kills once in 2 shots. When B has missed 27 times, A has killed:

- A. 30 birds
- B. 60 birds
- C. 72 birds
- D. 90 birds

Key: A

Question 37

To fill a tank, 25 buckets of water is required. How many buckets of water will be required to fill the same tank if the capacity of the bucket is reduced to two-fifth of its present ?

- A. 10
- B. 35
- C. 62.5
- D. Cannot be determined

Key: C

Question 38

A large cube is formed from the material obtained by melting three smaller cubes of 3, 4 and 5 cm side. What is the ratio of the total surface areas of the smaller cubes and the large cube?

- A. 2 : 1
- B. 3 : 2
- C. 25 : 18
- D. 27 : 20

Key: C

Question 39

The slant height of a right circular cone is 10 m and its height is 8 m. Find the area of its curved surface.

- A. 30π m²
- B. 40π m²
- C. 60π m²
- D. 80π m²

Key: C

Question 40

X and Y can do a piece of work in 20 days and 12 days respectively. X started the work alone and then after 4 days Y joined him till the completion of the work. How long did the work last?

- A. 6 days
- B. 10 days
- C. 15 days
- D. 20 days

Key: B

Question 41

Q is as much younger than R as he is older than T. If the sum of the ages of R and T is 50 years, what is definitely the difference between R and Q's age?

- A. 1 year
- B. 2 years
- C. 25 years
- D. Data inadequate

Key: D

Question 42

A, B and C start at the same time in the same direction to run around a circular stadium. A completes a round in 252 seconds, B in 308 seconds and c in 198 seconds, all starting at the same point. After what time will they again at the starting point ?

- A. 26 minutes and 18 seconds
- B. 42 minutes and 36 seconds
- C. 45 minutes
- D. 46 minutes and 12 seconds

Key: D

Question 43

A can contains a mixture of two liquids A and B in the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A was contained by the can initially?

- A. 10
- B. 20
- C. 21
- D. 25

Key: C

Question 44

What is the probability of getting a sum 9 from two throws of a dice?

- A. $\frac{1}{6}$
- B. $\frac{1}{8}$
- C. $\frac{1}{9}$
- D. $\frac{1}{12}$

Key: C

Question 45

The length of a rectangle is halved, while its breadth is tripled. What is the percentage change in area?

- A. 25% increase
- B. 50% increase
- C. 50% decrease
- D. 75% decrease

Key: B

Question 46

The area of the triangle whose vertices are A(1, 2), B(-2, 3) and C(-3, -4) is

- A. 11
- B. 22
- C. 33
- D. 21

Key: A

Question 47

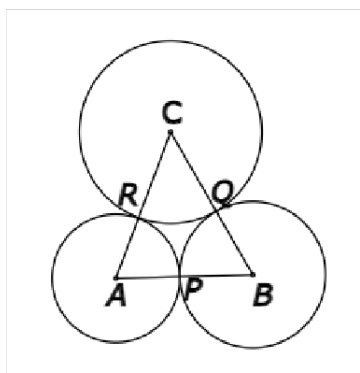
If at some time, the length of the shadow of a tower is $\sqrt{3}$ times its height, then the angle of elevation of the sun, at that time is:

- A. 15°
- B. 30°
- C. 45°
- D. 60°

Key: B

Question 48

In the given figure, three circles with centers A, B, and C touch each other externally. If $AB = 6$ cm, $BC = 8$ cm and $AC = 5$ cm. What is the radius of the circle with center B ?



- A. 3.5 cm
- B. 1.5 cm
- C. 4.5 cm
- D. 0.5 cm

Key: C

Question 49

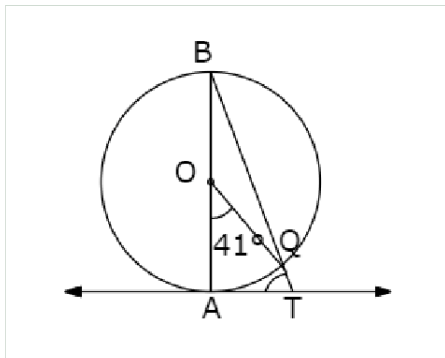
If the lengths of tangents drawn from an external point A to a point P and Q on the circle are equal then AP is equal to:

- A. OA
- B. AQ
- C. OP
- D. OQ

Key: B

Question 50

In the given figure, AB is the diameter of a circle with center O and AT is a tangent. If $\angle AOQ = 41^\circ$, $\angle ATQ$ is



- A. 41.5 degrees B. 75 degrees C. 31.5 degrees D. 69.5 degrees

Key: D

Question 51

Find the sum of all possible values of a such that the following equation has real root in x :
 $(x - a)^2 + (x^2 - 5x + 6)^2 = 0$

- A. 3 B. 8 C. 5 D. 2

Key: C

Question 52

A natural number, when increased by 2, equals 143 times its reciprocal. Find the number.

- A. 7 B. 12 C. 9 D. 11

Key: D

Question 53

The minute hand rotates through an angle of _____ in one minute.

- A. 6° B. 30° C. 60° D. 1°

Key: A

Question 54

A circular wire of radius 7 cm is cut and bend again into an arc of a circle of radius 12 cm. The angle subtended by the arc at the centre is

- A. 50° B. 210° C. 100° D. 60°

Key: B

Question 55

The ratio of the interior angle of first polygon to that of the second polygon is 3 : 2 and the number of sides in first are twice that in the second. The number of sides of the two polygons are

- A. 3, 6 B. 8, 4 C. 2, 4 D. 6, 12

Key: B

Question 56

The table below classifies 103 elements as metal, metalloid, or nonmetal and as solid, liquid, or gas at standard temperature and pressure.

	Solids	Liquids	Gases	Total
Metals	77	1	0	78
Metalloids	7	0	0	7
Nonmetals	6	1	11	18
Total	90	2	11	103

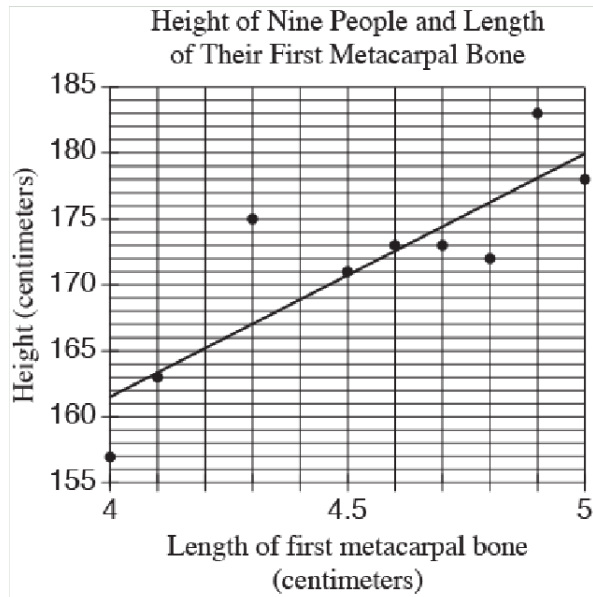
What fraction of all solids and liquids in the table are metalloids?

- A. $\frac{7}{92}$ B. $\frac{5}{92}$ C. $\frac{9}{92}$ D. $\frac{11}{92}$

Key: A

Question 57

The first metacarpal bone is located in the wrist. The scatterplot below shows the relationship between the length of the first metacarpal bone and height for 9 people. The line of best fit is also shown.



How many of the nine people have an actual height that differs by more than 3 centimeters from the height predicted by the line of best fit?

- A. 2 B. 4 C. 6 D. 9

Key: B

Question 58

At a primate reserve, the mean age of all the male primates is 15 years, and the mean age of all female primates is 19 years. Which of the following must be true about the mean age m of the combined group of male and female primates at the primate reserve?

- A. $m = 17$ B. $m > 17$ C. $m < 17$ D. $15 < m < 19$

Key: D

Question 59

A pool can be filled with water by a large pipe within 6 hours. A smaller pipe will take 9 hours to fill the pool. How long will it take to fill the pool if the two pipes operate together?

- A. 1.8 hours B. 3.6 hours C. 4.2 hours D. 7.5 hours

Key: B

Question 60

A typical image taken of the surface of Mars by a camera is 11.2 gigabits in size. A tracking station on Earth can receive data from the spacecraft at a data rate of 3 megabits per second for a maximum of 11 hours each day. If 1 gigabit equals 1,024 megabits, what is the maximum number of typical images that the tracking station could receive from the camera each day?

- A. 3 B. 10 C. 56 D. 144

Key: B