

**Round 1****Babtha 1****Question 1**

Three of the following points lie on the same straight line.
Which point does **not** lie on this line?

(-2, 14)

(-1, 8)

(1, -1)

(2, -6)

Question 2

Express as a single logarithm

$$2 \log_a 6 - \log_a 3$$

**Round 2****Babtha 2****Question 1**

The sum of the first nine terms of a linear progression is 117.
The sum of the next four terms is 91. Find the first term of the progression.

Question 2

The equation of a curve is $y = (3 - 2x)^3 + 24x$.

Find $\frac{d^2y}{dx^2}$.

**Round 3****Babtha 3****Question 1**

The coordinates of the points A and B are $(-1, -2)$ and $(7, 4)$ respectively. Find the equation of the circle, c , for which AB is a diameter.

Answer in form $(x - h)^2 + (y - k)^2 = r^2$

Question 2

Find the number of different arrangements that can be made from the 9 letters of the word JEWELLERY in which the three Es are together and the two Ls are together.

**Round 4****Babtha 4****Question 1**

Find the area of the rectangle $ABCD$ with vertices $A(-7, -7)$, $B(8, -1)$, $C(4, 9)$ and $D(-11, 3)$.

Question 2

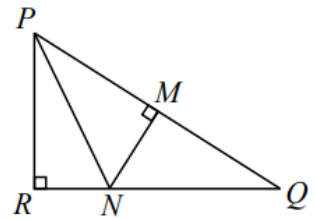
At the start of this month, Mathilde and Salah each had 100 coins. For Mathilde, this was 25% more coins than she had at the start of last month. For Salah, this was 20% fewer coins than he had at the start of last month. What was the total number of coins that they had at the start of last month?

**Round 5****Babtha 5****Question 1**

A rectangle has length 8 cm and width π cm. A semi-circle has the same area as the rectangle. What is its radius?

Question 2

In the diagram, $\triangle PQR$ is right-angled at R, $|PR| = 12$, and $|QR| = 16$. Also, M is the midpoint of PQ and N is the point on QR so that MN is perpendicular to PQ.

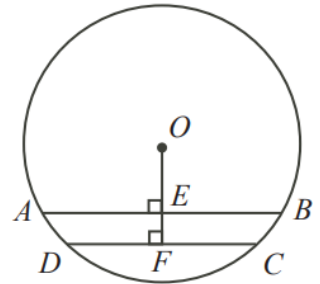


What is the area of $\triangle PRN$?

Round 6**Babtha 6****Question 1**

In the diagram, the circle has centre O .

OF is perpendicular to DC at F and OE is perpendicular to AB at E . If $|AB| = 8$, $|DC| = 6$ and $|EF| = 1$, determine the radius of the circle.

**Question 2**

A line with slope 3 and another line with slope -1 intersect at $P(3, 6)$. What is the distance between the x -intercepts of the two lines?

**Round 7****Babtha 7****Question 1**

Two fair dice each have four sides painted blue and two sides painted red. If the two dice are tossed, what is the probability that exactly seven of the blue faces will be visible (that is, not face down on the table)?

Question 2

The area of the triangle RQU is 28 units squared where $R(-1, -5)$, $Q(3, -1)$ and $U(-2k, 3k)$. Find the value of k , where $k \in R$ and $k > 0$.

Question 3

The mean of t^2 , $2t$ and 3 is 9. If $t < 0$, determine the value of t .

Question 4

If $Q(5, 3)$ is the midpoint of the line segment with endpoints $P(1, p)$ and $R(r, 5)$, what are the values of p and r ?

Round 8

Babtha 8

Question 1

Fionn wrote 4 consecutive integers on a whiteboard. Lexi came along and erased one of the integers. Fionn noticed that the sum of the remaining integers was 847. What integer did Lexi erase?

Question 2

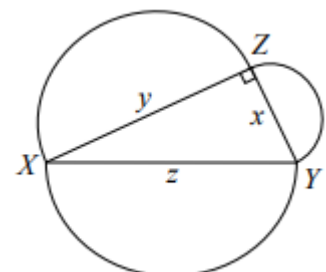
Suppose that $f(x) = x^2 + (2n - 1)x + (n^2 - 22)$ for some integer n . What is the smallest positive integer n for which $f(x)$ has no real roots?

Question 3

Determine all real numbers x for which $\frac{1}{\sqrt{x^2+7}} = \frac{1}{4}$.

Question 4

In the diagram, semi-circles are drawn on the sides of right-angled $\triangle XYZ$, as shown. If the area of the semi-circle with diameter YZ is 50π and the area of the semi-circle with diameter XZ is 288π , determine the area of the semi-circle with diameter XY .



Tie Break

1 Solve for x, y, z

$$\begin{aligned}3x - y + 3z &= 1 \\x + 2y - 2z &= -1 \\4x - y + 5z &= 4\end{aligned}$$

2 Simplify $\frac{-2+3i}{3+2i}$

3 The first three terms of a geometric sequence are $2x - 4, x + 1$ and $x - 3$. Find the two possible values of x .

4 Solve for x

$$2 \log_9 x = \frac{1}{2} + \log_9(5x + 18), x > 0.$$

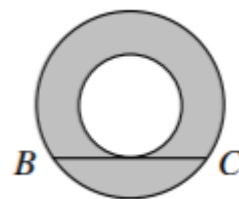
5 The equation of a circle is $x^2 + y^2 = 130$. Find the slope of the tangent to the circle at the point $(-7, 9)$.

6 The area of a sector of a circle is 27 cm^2 . The length of the radius of the circle is 6 cm. Find, in radians, the measure of the angle in the sector.

7 Find all the solutions of the equation $15\sin^2 x - 4 \cos x - 11 = 0$ in the domain $0^\circ \leq x \leq 360^\circ$.

Give your answers correct to the nearest degree.

8 The diagram shows two concentric circles. A tangent to the inner circle cuts the outer circle at B and C , where $|BC| = 2x$. Express the area of the shaded region in terms of x .



9 Five cards are drawn together at random from a standard pack of 52 playing cards. Find, in decimal form, correct to two significant figures, the probability that the five cards include the four aces.

10 Find the two complex numbers $a + bi$ such that $(a + bi)^2 = -3 + 4i$.



Answers

R1	Q1	$(-1,8)$
	Q2	$\log_a 12$
R2	Q1	7
	Q2	$72 - 48x$
R3	Q1	$(x - 3)^2 + (y - 1)^2 = 5^2$
	Q2	720
R4	Q1	174 sq units
	Q2	205
R5	Q1	4 cm
	Q2	21
R6	Q1	$r = 5$
	Q2	8
R7	Q1	$\frac{4}{9}$
	Q2	$k = 2$
	Q3	$t = -6$
	Q4	$p = 1$ and $r = 9$.
R8	Q1	283
	Q2	$n = 23$
	Q3	$x = \pm 3$ (both needed for point)
	Q4	338π
Tiebreak	1	$x = -1, y = 2, z = 2$
	2	i
	3	1 & 11
	4	$x = 18$
	5	$m = \frac{7}{9}$
	6	1.5 Rads
	7	$66^\circ, 132^\circ, 228^\circ, 294^\circ$ (degrees symbol not needed but can be used to separate teams if still tied after tiebreak).
	8	πx^2
	9	0.000018
	10	$\pm(1 + 2i)$

