



MATHEMATICS

Time: 2 hours

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 18 pages and an Answer Sheet. Please check that your paper is complete.
 2. Read the questions carefully.
 3. Write your examination number in the allocated space on your Answer Sheet.
 4. This is a **multiple choice** assessment. Indicate your selection for each question clearly on the Answer Sheet provided. **Do not** make more than one selection per question.
 5. Answer all the questions.
 6. The use of calculators is **NOT** allowed.
 7. It is in your own interest to write legibly and to present your work neatly.
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QUESTION 1

Simplifying the expression: $16^a - 4^{2a-1}$ gives you

- A 5.4^{2a}
- B 3.4^{2a-1}
- C 3^{2a}
- D 5.4^{2a-1}

QUESTION 2

A line perpendicular to $2x - 3y + 4 = 0$ and passing through $(3 ; -2)$ has the equation

- A $2y - 3x + 5 = 0$
- B $2y - 3x + 13 = 0$
- C $2y + 3x - 5 = 0$
- D $2y + 3x - 13 = 0$

QUESTION 3

Michael is solving a quadratic equation by completing the square.

line 1: $3ax^2 + 2bx + 5 = 0$

line 2: $x^2 + \frac{2b}{3a}x = -\frac{5}{3a}$

line 3: $????$

What could line 3 be?

A $\left(x + \frac{2b}{3a}x\right)^2 = \frac{-5 + 2b}{3a}$

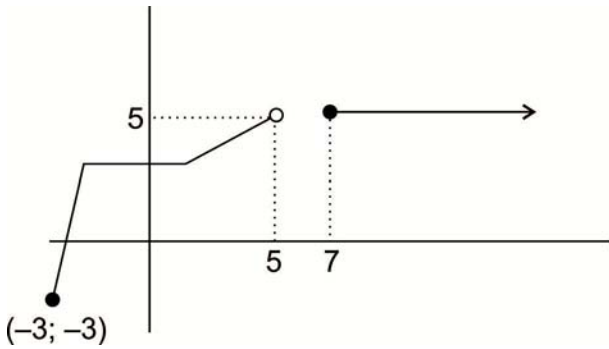
B $\left(x + \frac{b}{3a}\right)^2 = \frac{-5 + 2b}{3a}$

C $\left(x + \frac{2b}{3a}x\right)^2 = \frac{-15a + b^2}{9a^2}$

D $\left(x + \frac{b}{3a}\right)^2 = \frac{-15a + b^2}{9a^2}$

QUESTION 4

Consider the graph (which is not drawn to scale):



The domain and range of the graph are:

- A $x \in [-3 ; 5] \cup [7 ; \infty) ; y \in [-3 ; 5]$
- B $x \in [-3 ; 5) \cup [7 ; \infty) ; y \in [-3 ; 5]$
- C $x \in [-3 ; 5) \cap [7 ; \infty) ; y \in [-3 ; 5]$
- D $x \in [-3 ; 5] \cup [7 ; \infty) ; y \in [-3 ; 5)$

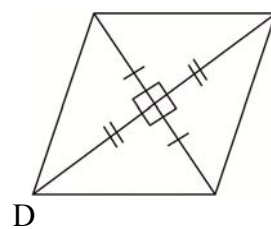
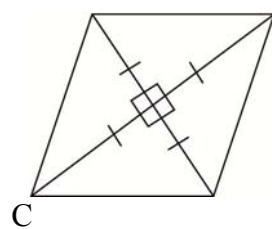
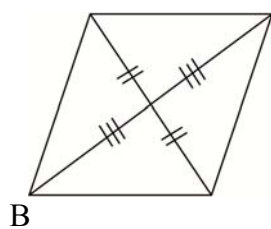
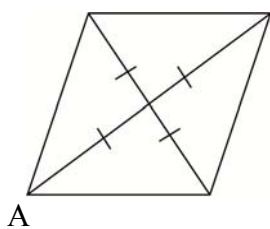
QUESTION 5

The expression $\frac{\cos \theta - \tan(\theta - 180^\circ) \cdot \cos(90 + \theta)}{\cos(-\theta)}$ simplifies to:

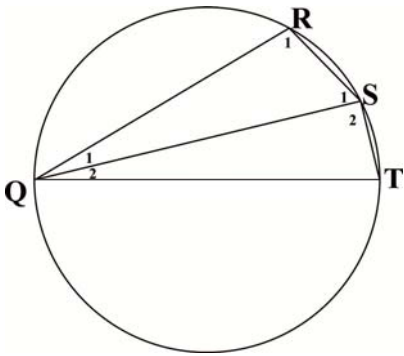
- A 1
- B $\sin^2 \theta$
- C $\frac{1}{\cos^2 \theta}$
- D $\tan^2 \theta$

QUESTION 6

Which quadrilateral is **definitely** a square?



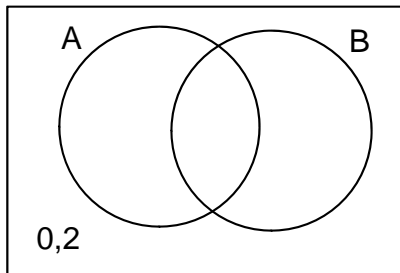
QUESTION 7



QT is a diameter of the circle. R and S are any points on the circumference on the same side of QT. If $\hat{Q}_1 = 12^\circ$ and $\hat{S}_1 = 58^\circ$ then:

- A $\hat{Q}_2 = 12^\circ$
- B $\hat{Q}_2 = 20^\circ$
- C $\hat{Q}_2 = 70^\circ$
- D $\hat{Q}_2 = 78^\circ$

QUESTION 8



Given: $P(A) = 0,3$, $P(B) = 0,7$ and $P(A \cup B)' = 0,2$ then:

- A $P(A \cap B) = 0,8$
- B $P(A \cap B) = 0,4$
- C $P(A \cap B) = 0,2$
- D $P(A \cap B) = 0,1$

QUESTION 9

If $\cos \theta = \cos 2\theta$ and $\theta \in [-360^\circ ; 360^\circ]$ then:

- (i) $\theta = 0^\circ$
- (ii) $\theta = \pm 240^\circ$
- (iii) $\theta = \pm 120^\circ$
- (iv) $\theta = \pm 360^\circ$

Which of the above options gives the best solution for θ ?

- A (i) only
- B (i) and (iv)
- C (iii) and (iv)
- D all of the above

QUESTION 10

Events A and B are such that $P(A) = \frac{1}{4}$ and $P(A \text{ or } B) = \frac{1}{3}$.

Find $P(B)$ (as a simplified fraction) if

A and B are not mutually exclusive events, but A and B are independent events.

- A $\frac{1}{9}$
- B $\frac{1}{4}$
- C $\frac{1}{12}$
- D $\frac{1}{3}$

QUESTION 11

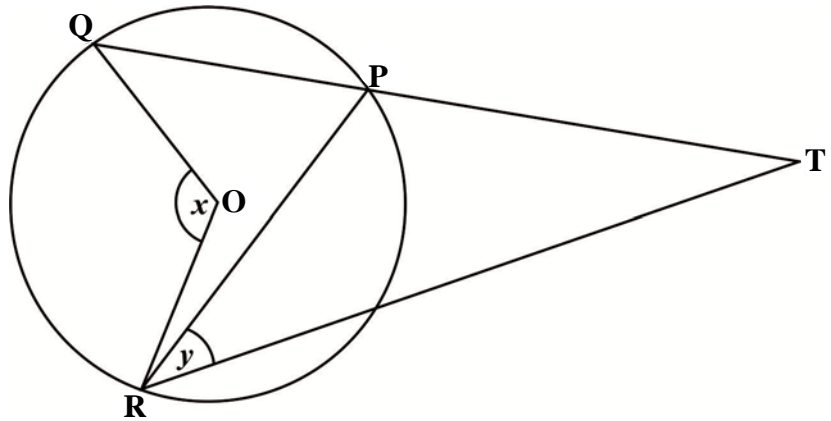
O is the centre of the circle.

$PT = PR$

$\hat{QOR} = x$

$\hat{PRT} = y$

If x is expressed in terms of y then:



- A $x = \frac{1}{4}y$
- B $x = 2y$
- C $x = 4y$
- D $x = \frac{1}{2}y$

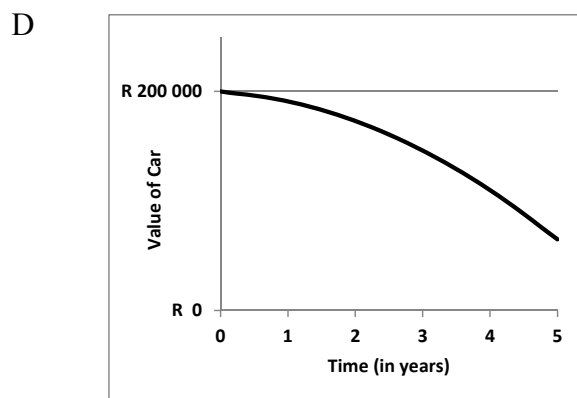
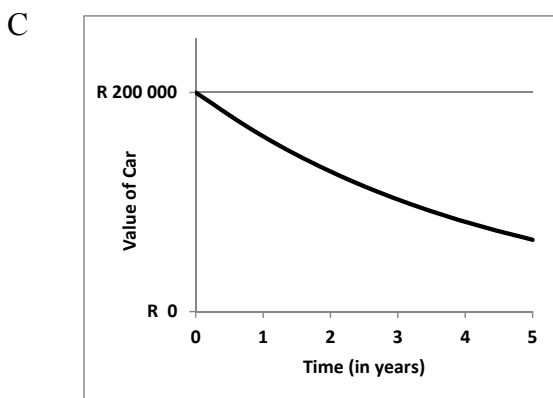
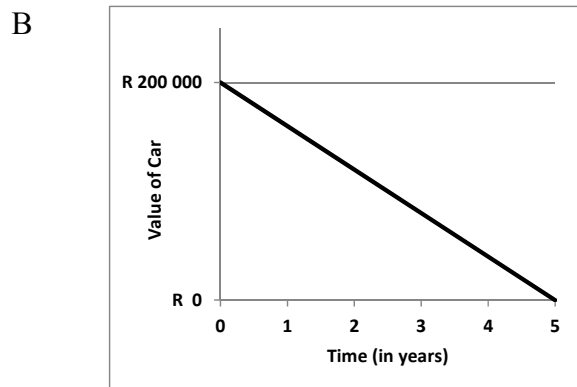
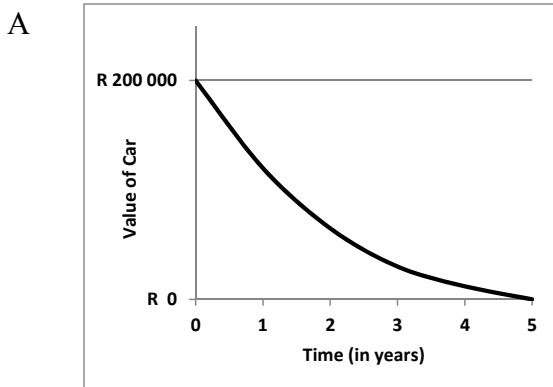
QUESTION 12

Given the equation $b^{\frac{3}{x}-1} = 1$. If $b = 1$, then which of the following is true?

- A x can only be equal to 3
- B x can be any real number except 0
- C x can only be equal to $\frac{3}{2}$
- D x is undefined

QUESTION 13

A car with a purchase price of R200 000 is depreciated by 20% over 5 years using the reducing balance method. Which of the following graphs best represents the depreciation in value of the car over the 5 years?



QUESTION 14

A parabola $f(x) = (x - 2)(x - 4)$ is shifted down 3 units. The equation of the new parabola $g(x)$ is:

- A $g(x) = (x - 2)(x - 7)$
- B $g(x) = (x - 1)(x - 5)$
- C $g(x) = (x - 5)(x - 4)$
- D $g(x) = (x - 2)(x - 4) + 3$

QUESTION 15

John has no idea of the answers to the last three questions of this IeBT examination and randomly guesses the answers. What is the probability that he gets at least two of them correct?

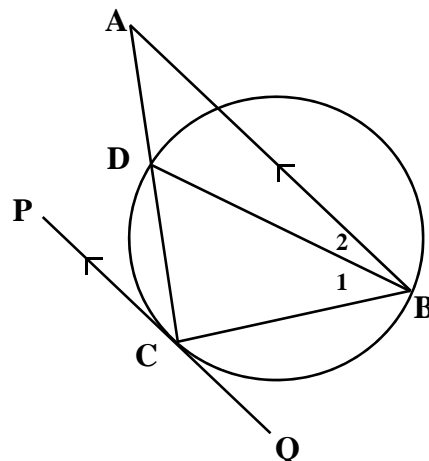
- A $\frac{1}{3}$
- B $\frac{2}{9}$
- C $\frac{5}{32}$
- D $\frac{3}{64}$

QUESTION 16

In the diagram alongside, PQ is tangent to the circle at C. ADC is a straight line. $AB \parallel PQ$.

If $\hat{B}_1 = 40^\circ$ and $\hat{B}_2 = 20^\circ$, then \hat{A} is equal to:

- A 20°
- B 30°
- C 40°
- D 60°



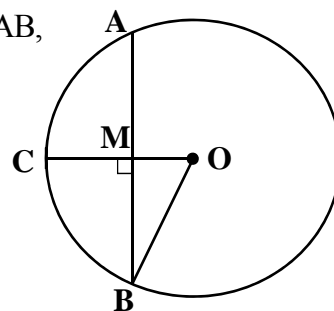
QUESTION 17

In the diagram alongside, O is the centre of the circle. $MO \perp AB$,

$AB = 24$ units, $MC = 8$ units and $MO = x$ units.

Determine the value of x .

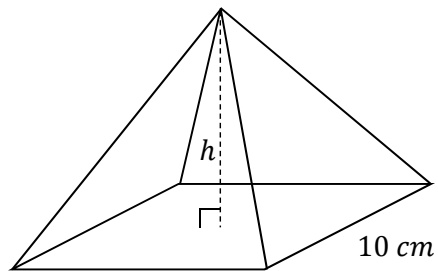
- A 4 units
- B 5 units
- C 6 units
- D 7 units



QUESTION 18

A right square-based pyramid is shown alongside. The base edges are each 10 cm whilst the perpendicular height (h) is 12 cm.

Determine the total surface area of the pyramid including the base.



- A 300 cm^2
- B 320 cm^2
- C 340 cm^2
- D 360 cm^2

QUESTION 19

If $a > 0$, $b = 0$ and $c > 0$ then the roots of $ax^2 + bx + c = 0$ are

- A non-real
- B rational and unequal
- C real
- D rational and equal

QUESTION 20

All the odd numbers are arranged in the following 'pyramid'.

			1			row 1	
		3		5		row 2	
	7		9		11	row 3	
	13		15		17		row 4
	21		23		25		row 5
	\vdots		\vdots		\vdots		\vdots

What is the LAST odd number in row 15 of the pyramid?

- A 235
- B 237
- C 239
- D 241

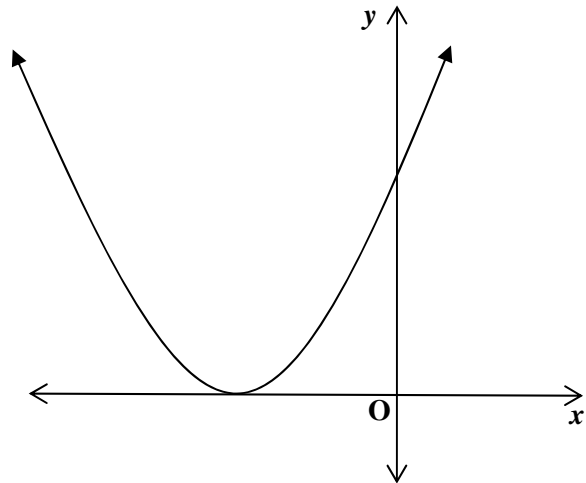
QUESTION 21

The sketch shows the graph defined by:

$$y = ax^2 + bx + c$$

Which of the following statements is completely TRUE?

- A $b^2 - 4ac = 0, c > 0, b < 0$
 B $a > 0, b < 0, c > 0$
 C $b^2 - 4ac = 0, c < 0, b > 0$
 D $\frac{b}{2a} > 0, b^2 - 4ac = 0, c > 0$

**QUESTION 22**

In a group of 25 people, what is the probability that 3 or more of the people have their birthdays in the same month?

- A $\left(\frac{1}{12}\right)^3$
 B $\frac{1}{25} \times \frac{1}{24} \times \frac{1}{23}$
 C $1 - \left(\frac{1}{12}\right)^3$
 D 1

QUESTION 23

If $\sin x - \cos x = \frac{1}{2}$, find the value of $\sin(180^\circ - x) \sin(90^\circ - x)$.

- A $\frac{3}{4}$
 B $\frac{1}{8}$
 C $\frac{1}{4}$
 D $\frac{3}{8}$

QUESTION 24

x and y are **complementary** (acute) angles with $\tan x = \frac{12}{5}$.

The value of $\frac{\sin y}{\tan y}$

- A $\frac{12}{13}$
- B $\frac{5}{13}$
- C $\frac{144}{65}$
- D $\frac{13}{5}$

QUESTION 25

4 data sets each consist of 25 values. **Each** data set has a mean of 50.

The only differences between the 4 data sets occurs at x_8 and x_{12} ; otherwise the data sets are identical. These differences are shown in the table below.

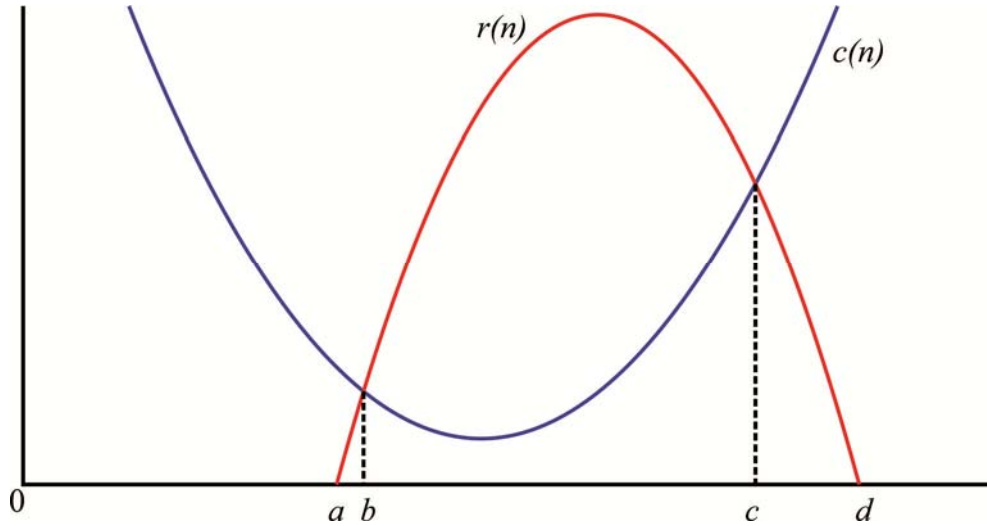
	x_8	x_{12}
Data set A	46	54
Data set B	47	53
Data set C	50	50
Data set D	48	52

Which of the following statements is TRUE?

- A You cannot say which data set has the largest standard deviation.
- B Data set A has the largest standard deviation.
- C Data set C is the most spread out.
- D All 4 data sets have the same standard deviation.

QUESTION 26

Suppose that the cost of manufacturing n items is given by the curve $c(n)$ while the revenue (income) generated from selling n of the items is given by the curve $r(n)$. The curves of $r(n)$ and $c(n)$ are shown below.



Determine the numbers of items which should be made if a profit is to be achieved.

- A $n \in [a; b]$
- B $n \in (b; c)$
- C $n \in (a; b)$ or $n \in (c; d)$
- D $n \in (b; c)$

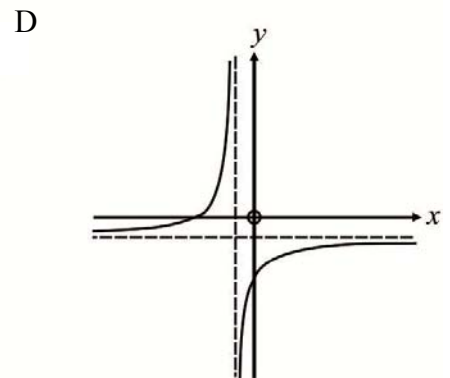
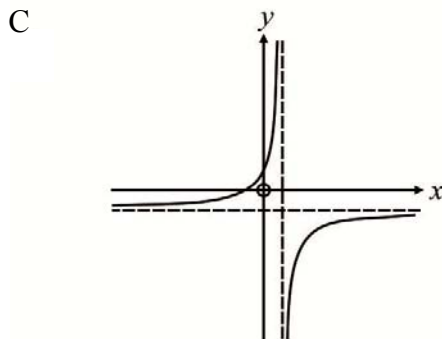
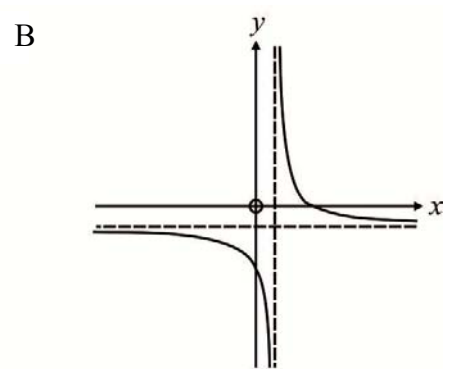
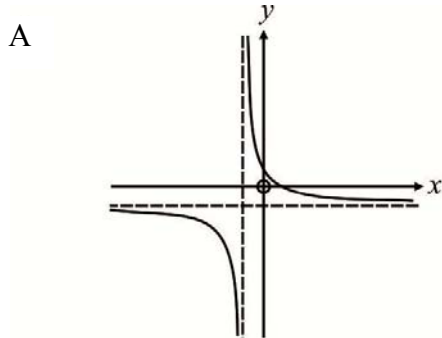
QUESTION 27

What interest rate per annum, compounded monthly will achieve the same return as a rate of 12% per annum compounded quarterly?

- A 3%
- B $12 \left(1.03^{\frac{1}{12}} - 1 \right)$
- C $12 \left(\sqrt[3]{1.03} - 1 \right)$
- D $1.03^{\frac{1}{3}} - 1$

QUESTION 28

Which of the following graphs represents $y = \frac{a}{x+a} + a$?



QUESTION 29

The probability that I pass Geography is 0.5 while the probability that I pass History is 0,46. Assuming that my success in Geography is independent of my success in History, what is the probability that I pass both?

- A 0,5
- B 0,96
- C 0,76
- D 0,23

QUESTION 30

If the point $(k + 1 ; 3)$ is k units from the point $(2 ; 2k + 1)$ then what equation should I solve to find k ?

- A $4k^2 - 10k + 5 = 0$
- B $(k + 1 - 2) + (2k + 1 - 3) = k$
- C $5k^2 - 9k + 5 = 0$
- D $\sqrt{(k + 1 - 2)^2 + (2k + 1 - 3)^2} = k$

QUESTION 31

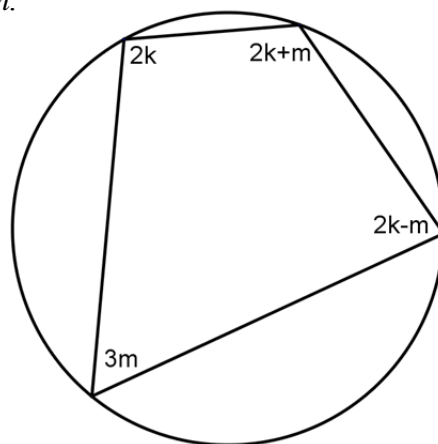
$\frac{1 + \sin \theta}{1 - \sin \theta} - \frac{1 - \sin \theta}{1 + \sin \theta}$ can be simplified to:

- A 0
- B 1
- C $4 \tan \theta \cos \theta$
- D $\frac{4 \tan \theta}{\cos \theta}$

QUESTION 32

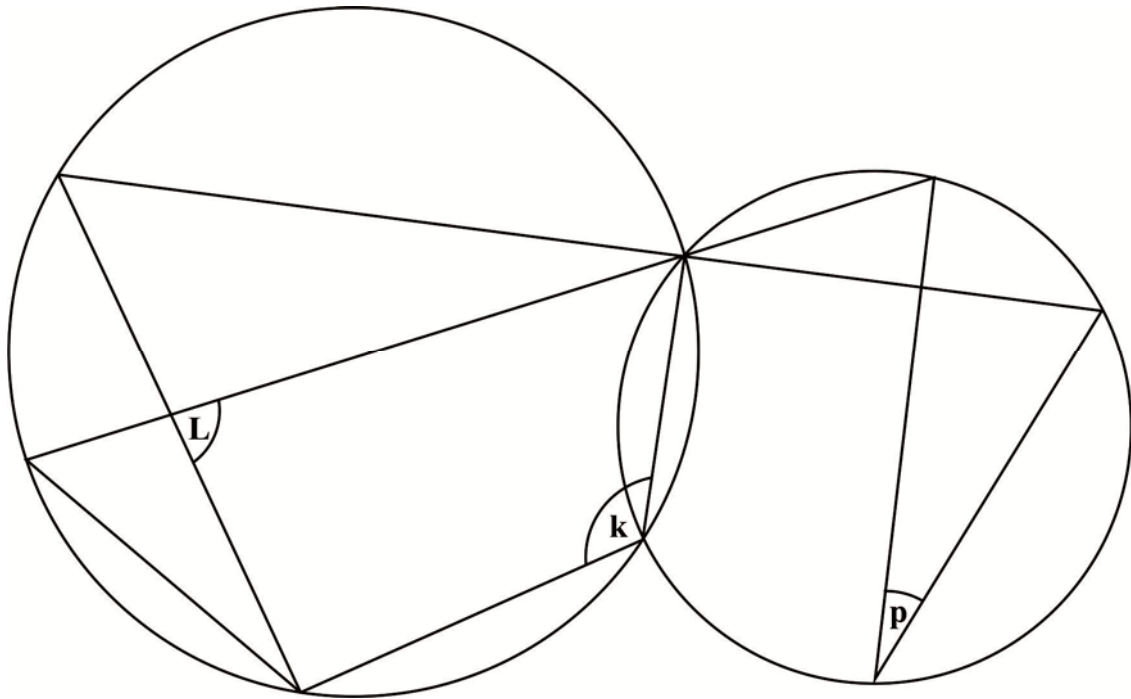
Given the picture alongside, determine the value of $k + m$.

- A 70°
- B 60°
- C 65°
- D 75°



QUESTION 33

Consider the diagram below. Determine, in terms of p and k , the size of the angle marked at L.



- A $180^\circ - k$
- B $k - p$
- C $180^\circ - k - p$
- D $180^\circ - (k - p)$

QUESTION 34

$\left(\frac{2}{\sqrt{5} - \sqrt{3}}\right)^2$ is equivalent to:

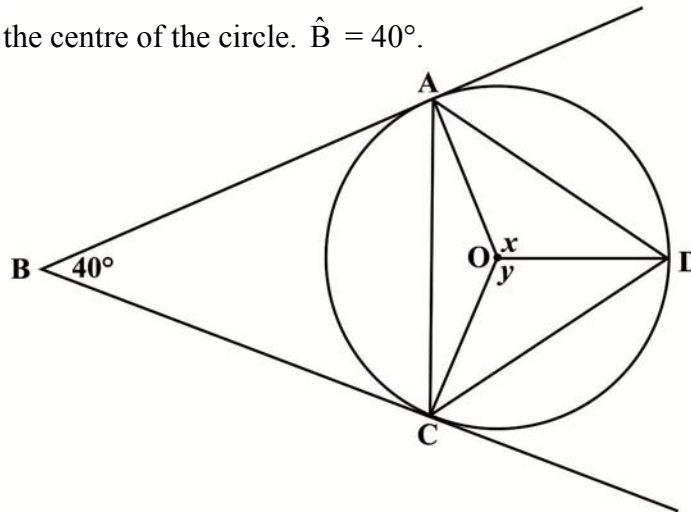
- A $\frac{2}{1 - \sqrt{15}}$
- B $\frac{2}{17 - \sqrt{15}}$
- C $\frac{2}{4 - \sqrt{15}}$
- D $\sqrt{5} + \sqrt{3}$

QUESTION 35

AB and BC are tangents. O is the centre of the circle. $\hat{B} = 40^\circ$.

Find the value of $x + y$.

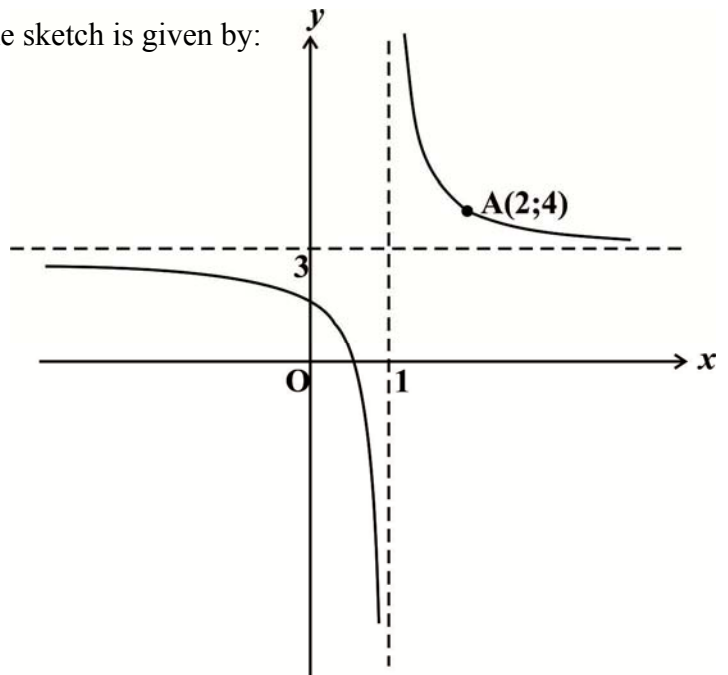
- A 140°
- B 80°
- C 220°
- D 40°



QUESTION 36

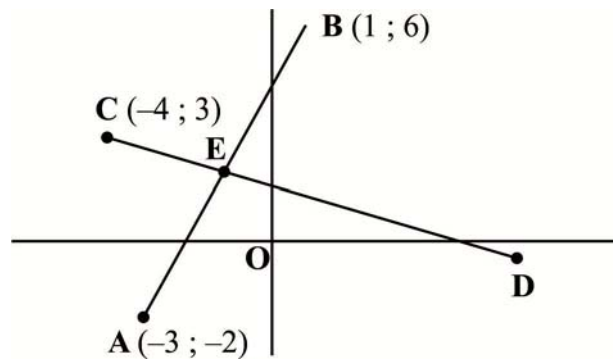
The defining equation of the hyperbola in the sketch is given by:

- A $y = \frac{3x-1}{x-1}$
- B $y = \frac{3x+5}{x+1}$
- C $y = \frac{3x+4}{x+1}$
- D $y = \frac{3x-2}{x-1}$



QUESTION 37

Towns A, B, C and D are located on a grid with co-ordinates as shown in the diagram alongside. There is a straight road joining A and B and another straight road joining C and D. These roads intersect at E. E is the midpoint of AB and DE is three times the length of CE.



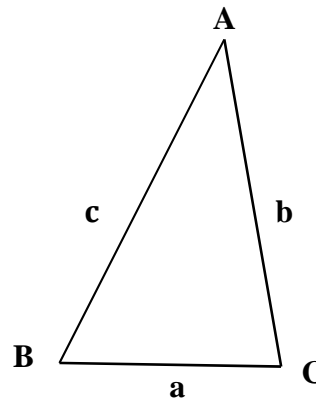
Determine the distance between C and D.

- A $7\sqrt{2}$
- B $6\sqrt{3}$
- C $5\sqrt{6}$
- D $4\sqrt{10}$

QUESTION 38

ΔABC has sides of lengths a , b and c units as indicated in the diagram alongside.

Which of the following sets of side lengths (a ; b ; c) will result in one of the angles \hat{A} , \hat{B} or \hat{C} being equal to 60° ?

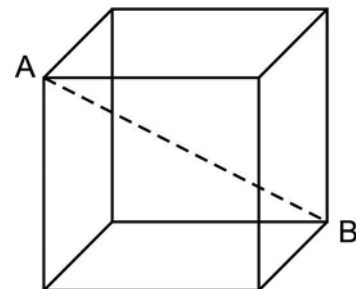


- A $(3; 3; \sqrt{18})$
- B $(3; 4; 5)$
- C $(3; 6; 9)$
- D $(3; 7; 8)$

QUESTION 39

The length of the main diagonal (AB) of the **cube** is 3 units.

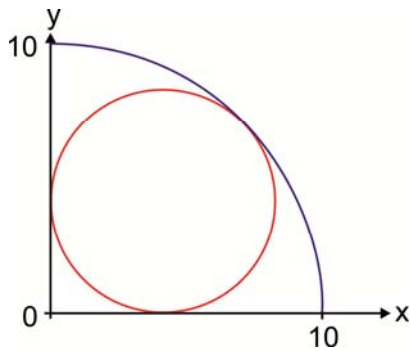
If the volume of the cube is trebled, the length of AB will be:



- A $3 \times 3^{\frac{1}{2}}$
- B $3^{\frac{1}{3}} \times 3^{\frac{1}{2}}$
- C $3 \times 3^{\frac{1}{3}}$
- D $3 \times 3^{\frac{2}{3}}$

QUESTION 40

A circle is inscribed in a quadrant of a circle whose radius is 10. Find the radius of the inscribed circle.



- A $\sqrt{10}$
- B 25π
- C $\frac{10}{\sqrt{2} - 1}$
- D $10\sqrt{2} - 10$