**CANDIDATE – PLEASE NOTE!**

**PRINT your name on the line below and return this booklet with your answer sheet. Failure to do so may result in disqualification.**

TEST CODE **01234010**

**FORM TP 2022093**

MAY/JUNE 2022

# CARIBBEAN EXAMINATIONS COUNCIL

## CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

## MATHEMATICS

### Paper 01 – General Proficiency

***1 hour 30 minutes***

**11 MAY 2022 (p.m.)**

**READ THE FOLLOWING INSTRUCTIONS CAREFULLY.**

1. This test consists of 60 items. You will have 1 hour and 30 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. **A list of formulae is provided on page 2 of this booklet.**
4. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
5. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

$2a + 6a =$

(A) $8a$
(B) $8a^2$
(C) $12a$
(D) $12a^2$

Sample Answer

● Ⓑ Ⓒ Ⓓ

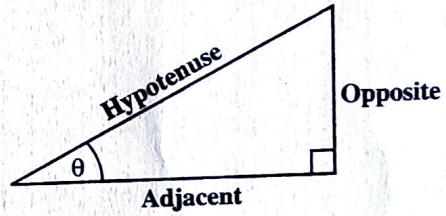
The best answer to this item is "$8a$", so (A) has been shaded.

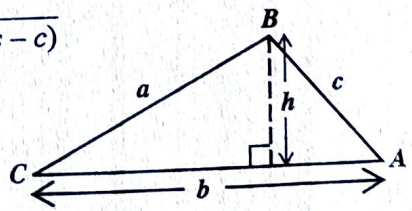
6. If you want to change your answer, erase it completely before you fill in your new choice.
7. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
8. You may do any rough work in this booklet.
9. Calculators and mathematical tables are NOT allowed for this paper.
10. **ALL diagrams in this booklet are NOT drawn to scale, unless otherwise stated.**

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.**

## LIST OF FORMULAE

| | |
|---|---|
| Volume of a prism | $V = Ah$ where $A$ is the area of the cross-section and $h$ is the perpendicular length. |
| Volume of a cylinder | $V = \pi r^2 h$ where $r$ is the radius of the base and $h$ is the perpendicular height. |
| Volume of a right pyramid | $V = \frac{1}{3} Ah$ where $A$ is the area of the base and $h$ is the perpendicular height. |
| Circumference | $C = 2\pi r$ where $r$ is the radius of the circle. |
| Arc length | $S = \frac{\theta}{360} \times 2\pi r$ where $\theta$ is the angle subtended by the arc, measured in degrees. |
| Area of a circle | $A = \pi r^2$ where $r$ is the radius of the circle. |
| Area of a sector | $A = \frac{\theta}{360} \times \pi r^2$ where $\theta$ is the angle of the sector, measured in degrees. |
| Area of a trapezium | $A = \frac{1}{2}(a + b)\,h$ where $a$ and $b$ are the lengths of the parallel sides and $h$ is the perpendicular distance between the parallel sides. |
| Roots of quadratic equations | If $ax^2 + bx + c = 0$, then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ |
| Trigonometric ratios | $\sin\theta = \frac{\text{length of opposite side}}{\text{length of hypotenuse}}$<br>$\cos\theta = \frac{\text{length of adjacent side}}{\text{length of hypotenuse}}$<br>$\tan\theta = \frac{\text{length of opposite side}}{\text{length of adjacent side}}$ |
| Area of a triangle | Area of $\Delta = \frac{1}{2} bh$ where $b$ is the length of the base and $h$ is the perpendicular height.<br>Area of $\Delta ABC = \frac{1}{2} ab \sin C$.<br>Area of $\Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$<br>where $s = \frac{a+b+c}{2}$ |
| Sine rule | $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ |
| Cosine rule | $a^2 = b^2 + c^2 - 2bc\cos A$ |

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1. $(-3)^2 + (-2)^2$ is equal to

(A) $-13$
(B) $-10$
(C) 5
(D) 13

2. What is the value of the digit 2 in the number 48.621?

(A) $\frac{2}{100}$
(B) $\frac{2}{10}$
(C) 2
(D) 200

3. What number when added to $1\frac{1}{3}$ gives 2?

(A) $\frac{1}{3}$
(B) $\frac{2}{3}$
(C) 1
(D) 3

4. The next term in the sequence

1, 6, 13, 22, 33, _____ is

(A) 44
(B) 45
(C) 46
(D) 52

5. If 30% of a number is 45, what is $\frac{4}{5}$ of the number?

(A) 36
(B) 120
(C) 150
(D) 180

6. A certain amount of money is shared in the ratio 2:3:9. If the difference between the first and second shares is \$40, then the amount of money shared is

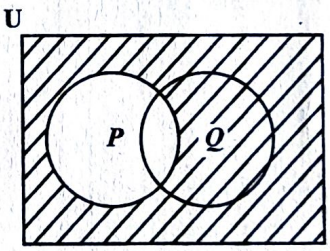
(A) \$280
(B) \$360
(C) \$400
(D) \$560

7. If $P = \{2, 3, 5, 7\}$,
$Q = \{2, 3, 6\}$ and
$S = \{2, 4, 5\}$,

then $P \cap Q \cap S =$

(A) $\{2\}$
(B) $\{2,3\}$
(C) $\{2, 3, 5\}$
(D) $\{2, 3, 4, 5, 6, 7\}$

Item 8 refers to the following Venn diagram.




8. The shaded region represents

(A) $P'$
(B) $(P \cup Q)'$
(C) $P \cup Q'$
(D) $Q \cap P'$

GO ON TO THE NEXT PAGE

9. The elements of the set $\{x: 6 \leq x < 10, \text{ where } x \text{ is an integer}\}$ are

(A) $\{7, 8, 9\}$

(B) $\{6, 7, 8, 9\}$

(C) $\{7, 8, 9, 10\}$

(D) $\{6, 7, 8, 9, 10\}$

Item 10 refers to the following information.

$M = \{p, q, r\}$

$N = \{p, q\}$

10. Which of the following statements is true?

(A) $M \subset N$

(B) $M \cap N = N$

(C) $M \cup N = N$

(D) $M \cap N = \{\ \}$

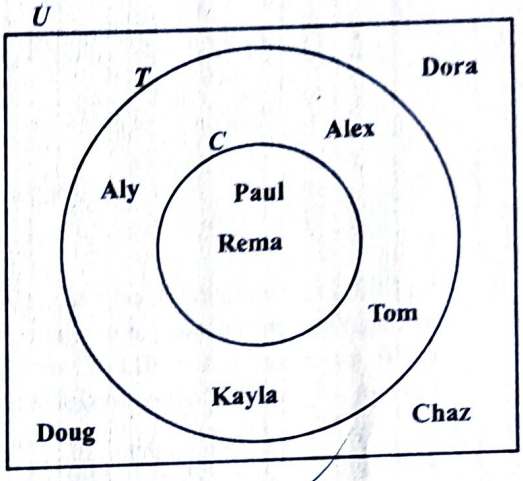
Item 11 refers to the the following information which describes 3 sets.

$P$ = {Prime numbers}
$Q$ = {Odd numbers}
$R$ = {Even numbers}

11. Which of the following sets is empty?

(A) $P \cap R$
(B) $P \cup Q$
(C) $P \cap Q$
(D) $Q \cap R$

Item 12 refers to the following Venn diagram which shows the universal set ($U$), and two sets, $T$ and $C$, that represent the students in a class who play tennis ($T$) and chess ($C$).




12. How many students play EXACTLY one game?

(A) 2
(B) 3
(C) 4
(D) 6

13. A dress which costs $180.00 is being sold at a discount of 10%. The amount of the discount is

(A) $ 1.80
(B) $ 10.00
(C) $ 18.00
(D) $170.00

14. The cost of a refrigerator is $1 850.00. If a sales tax of 5% is paid on the cost price of the refrigerator, a buyer who purchases the refrigerator by cash will pay

(A) $1 350.00
(B) $1 757.50
(C) $1 845.00
(D) $1 942.50

15. A salesman sells a car for $11 000. If he is paid a commission of 4.5% for the first $10 000 and 7.5% on the remainder, then the commission he receives is

(A) $ 495
(B) $ 525
(C) $ 825
(D) $1 320

16. The value of a plot of land is $18 000.00. Land tax is charged at the rate of $0.70 per $100.00 value. What is the TOTAL amount of tax paid for the land?

(A) $110.00
(B) $126.00
(C) $180.70
(D) $257.15

17. A man's basic wage for a 40-hour week is $160.00. He is paid overtime at the rate of $1\frac{1}{4}$ times the hourly rate. If he works $6\frac{1}{2}$ hours overtime in a certain week, his wage for that week is

(A) $165.00
(B) $166.50
(C) $171.50
(D) $192.50

18. At the end of any year a car is worth 5% less than what it was worth at the beginning of the year. If a car was worth $9 500 in December 2016, then its value in January 2016 was

(A) $ 9 025
(B) $ 9 995
(C) $10 000
(D) $10 025

19. A loan of $8 000 was repaid in 24 equal monthly instalments of $400. The rate of interest on the loan was

(A) 5%
(B) $8\frac{1}{3}\%$
(C) $16\frac{1}{3}\%$
(D) 20%

20. At a sale, each book was marked $3.00 off the original price. Daniel paid $46.00 for 2 books that had the same sale price. What was the **original** cost of ONE of his books?

(A) $20.00
(B) $21.50
(C) $24.50
(D) $26.00

21. $3x^2 \times 2x^3 =$

(A) $6x^5$
(B) $5x^5$
(C) $6x^6$
(D) $72x^5$

22. If $5(2x - 1) = 35$, then $x =$

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

23. When twice a certain number is subtracted from 7 and the result is multiplied by 3, the answer is 33. What is the **original** number?

(A) –3
(B) –2
(C) 2
(D) 9

24. Given that $3 * 6 = 12$ and $2 * 5 = 9$, then $a * b$ may be defined as

(A) $4(b - a)$
(B) $a^2 - b$
(C) $6a - b$
(D) $2a + b$

25. If $x = -2$, $y = 3$, $t = 2$, then $\left(\frac{x}{y}\right)^t =$

(A) $\frac{-4}{9}$
(B) $\frac{4}{9}$
(C) $\frac{4}{3}$
(D) $\frac{9}{4}$

26. If $3^{2x+1} = 9(3^x)$, then the value of $x$ is

(A) 0
(B) $\frac{1}{3}$
(C) 1
(D) 3

27. Given that $A = \begin{bmatrix} 1 & 3 & -3 \\ 3 & 0 & 5 \end{bmatrix}$, then $3A$ equals

(A) $\begin{bmatrix} 3 & 9 & -9 \\ 9 & 0 & 15 \end{bmatrix}$

(B) $\begin{bmatrix} 4 & 6 & -6 \\ 6 & 3 & 8 \end{bmatrix}$

(C) $\begin{bmatrix} 3 & 9 & -6 \\ 9 & 0 & 15 \end{bmatrix}$

(D) $\begin{bmatrix} -2 & 0 & 6 \\ 0 & 3 & 2 \end{bmatrix}$

28. The determinant of the $2 \times 2$ identity matrix is

(A) one
(B) zero
(C) undefined
(D) negative one

Item **29** refers to the following vectors, **p** and **q**.

$\mathbf{p} = \begin{bmatrix} 3 \\ 7 \end{bmatrix}$ $\mathbf{q} = \begin{bmatrix} -2 \\ 5 \end{bmatrix}$

29. The vector $\mathbf{p} - \mathbf{q}$ is represented by

(A) $\begin{bmatrix} 1 \\ 12 \end{bmatrix}$

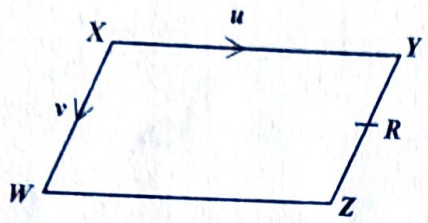
(B) $\begin{bmatrix} 5 \\ 12 \end{bmatrix}$

(C) $\begin{bmatrix} 5 \\ 2 \end{bmatrix}$

(D) $\begin{bmatrix} 1 \\ 5 \end{bmatrix}$

GO ON TO THE NEXT PAGE

Item 30 refers to the following parallelogram, $WXYZ$. In the parallelogram, $\overrightarrow{XY} = u$ and $\overrightarrow{XW} = v$. $R$ is the midpoint of $YZ$.




30. $\overrightarrow{WR}$, expressed in terms of $u$ and $v$, is

(A) $u - \frac{1}{2}v$

(B) $u + \frac{1}{2}v$

(C) $-u + \frac{1}{2}v$

(D) $-\frac{1}{2}v - u$

31. Given that 1 millimetre = $\frac{1}{1000}$ metres, then 2 500 millimetres, in metres, is

(A) 0.25
(B) 2.5
(C) 25
(D) 250

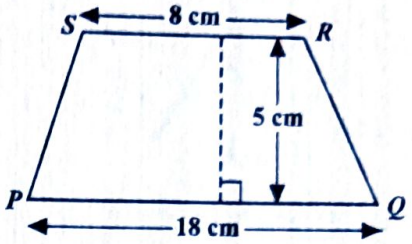
32. The volume, in cm$^3$, of a cube of edge 3 cm is

(A) 9
(B) 18
(C) 27
(D) 54

33. The perimeter of a square is 48 cm. What is its area, in cm$^2$?

(A) 36
(B) 72
(C) 108
(D) 144

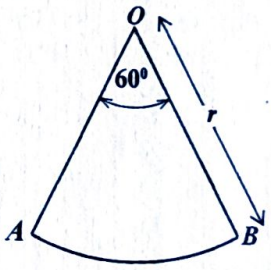
Item 34 refers to the following diagram of a trapezium.




34. The area of the trapezium, $PQRS$, above is

(A) 45 cm$^2$
(B) 65 cm$^2$
(C) 90 cm$^2$
(D) 130 cm$^2$

Item 35 refers to the following diagram which shows a sector of a circle, $AOB$. $AOB = 60°$ and the radius $OB$ is $r$ units long.




35. The area of $AOB$ is

(A) $\frac{1}{6}\pi r^2$

(B) $\frac{1}{6}\pi r$

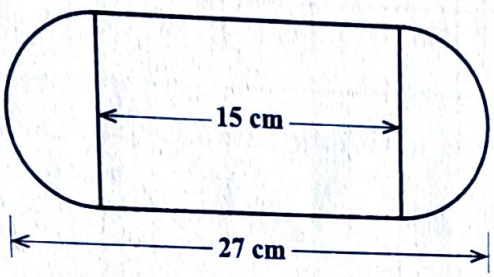
(C) $\frac{1}{3}\pi r^2$

(D) $\frac{1}{3}\pi r$



GO ON TO THE NEXT PAGE

Item 36 refers to the following diagram which shows a compound shape made up of a rectangle and two identical semi-circles, one on either of the short sides.



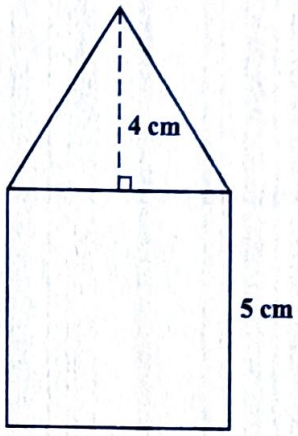

**36.** The perimeter of the figure above, in terms of $\pi$, is

(A) $6(5 + \pi)$
(B) $6(9 + \pi)$
(C) $6(5 + 2\pi)$
(D) $6(9 + 2\pi)$

**37.** The area of a rectangle is 53.6 cm². If the length is multiplied by 4 and the width is halved, the area would then be

(A) 26.8 cm²
(B) 53.6 cm²
(C) 107.2 cm²
(D) 214.4 cm²

Item 38 refers to the following diagram, which consists of a triangle resting on a square of side 5 cm.




**38.** If the height of the triangle is 4 cm, what is the TOTAL area of the figure?

(A) 35 cm²
(B) 45 cm²
(C) 50 cm²
(D) 100 cm²



GO ON TO THE NEXT PAGE

Items 39 and 40 refer to the following frequency distribution which shows the average mass, in kg, of a group of children in a school.

| Mass (kg) | 21–30 | 31–40 | 41–50 | 51–60 | 61–70 |
|---|---|---|---|---|---|
| Frequency | 28 | 40 | 12 | 34 | 18 |

**39.** The number of children who have a mass $\leq 40$ kg is

(A) 15
(B) 40
(C) 64
(D) 68

**40.** The upper boundary of the median class is

(A) 30.5
(B) 40.5
(C) 50.5
(D) 60.5

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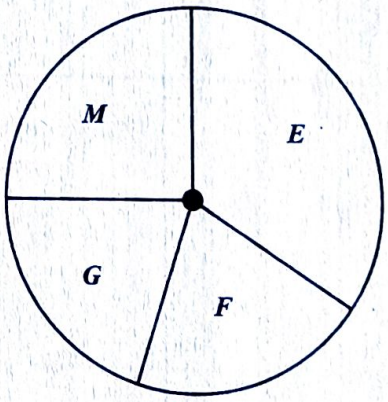
**41.** Ms Clarke arranged the 15 test scores of her students in order of size and selected the 8th score for reporting purposes. Which of the following statistical measures did Ms Clarke obtain?

(A) Mean
(B) Mode
(C) Range
(D) Median

**42.** The pie chart below, **drawn to scale**, shows how a student used 12 hours in studying English ($E$), Mathematics ($M$), French ($F$) and Geography ($G$).




The amount of time spent studying Mathematics is APPROXIMATELY

(A) 1 hour
(B) 2 hours
(C) 3 hours
(D) 4 hours

**43.** If the mean of the FOUR numbers 4, 8, $x$ and 12 is 10, then $x$ is

(A) 4
(B) 10
(C) 12
(D) 16



GO ON TO THE NEXT PAGE

Item 44 refers to the following table which shows the results of a survey of 100 persons, from 2 major ethnic groups, *P* and *R*. Respondents were interviewed about their attitude towards Mathematics.

| Attitude Towards Mathematics | Ethnicity | | Total |
|---|---|---|---|
| | *P* | *R* | |
| Positive | 25 | 12 | 37 |
| Neutral | 11 | 9 | 20 |
| Negative | 24 | 19 | 43 |
| Total | 60 | 40 | 100 |

**44.** A respondent is selected at random. What is the probability that he has a positive attitude towards Mathematics?

(A) 0.20
(B) 0.37
(C) 0.43
(D) 0.60

**45.** The point where a linear function crosses the horizontal axis is

(A) the $x$-intercept
(B) the $y$-intercept
(C) always positive
(D) always negative

**46.** The equation of the straight line which passes through the point (0, 5) and has a gradient of 4 is

(A) $y = 4x$
(B) $y = 5x$
(C) $y = 4x + 5$
(D) $y = 5x + 4$

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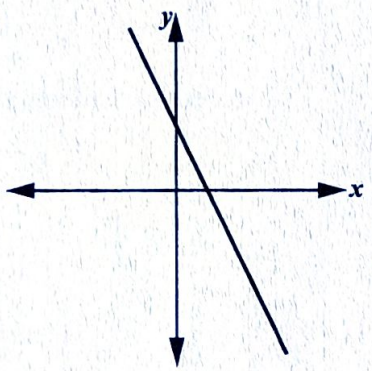
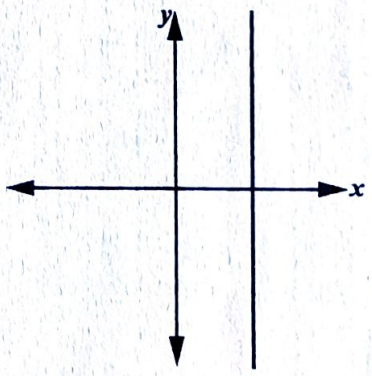
**47.** Which of the following graphs represents a linear function?

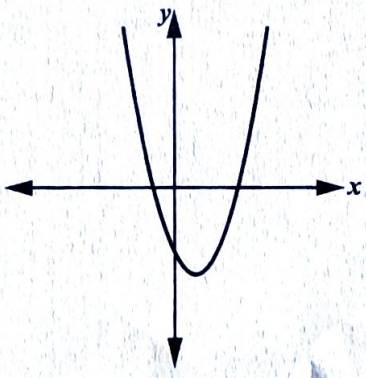
(A)



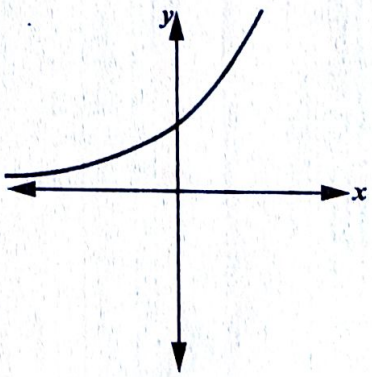

(B)



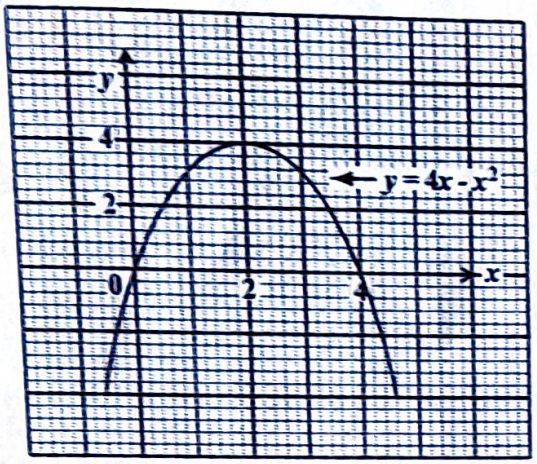

(C)




(D)



Item 48 refers to the following graph of a quadratic function.




48. The coordinates of the maximum point of the function $y = 4x - x^2$ are

(A) (2, 4)
(B) (0, 4)
(C) (4, 2)
(D) (4, 4)

49. A line $L$ is parallel to the line

$$3x - 7y - 9 = 0.$$

What is the gradient of the line $L$?

(A) $-\frac{7}{3}$

(B) $-\frac{9}{7}$

(C) $\frac{3}{7}$

(D) $\frac{7}{3}$

50. If $g(x) = \frac{7x-3}{5}$, then $g(-6) =$

(A) $-9$

(B) $-\frac{39}{5}$

(C) $\frac{39}{5}$

(D) 9

51. The range of $f: x \rightarrow x^3$ for the domain $\{-2, -1, 0, 1, 2\}$ is

(A) {8, 1, 0, 1, 8}
(B) {6, 3, 0, 3, 6}
(C) {–6, –3, 0, 3, 6}
(D) {–8, –1, 0, 1, 8}

52. Which of the following pairs of lines is perpendicular?

(A) $2y = -3x - 8$
$3x - 2y = -8$

(B) $y = 2x + 1$
$y = 2x - 6$

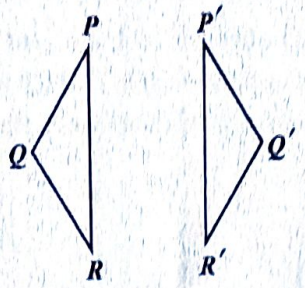
(C) $y = -4x + 10$
$4y = x + 1$

(D) $x - 2y = -1$
$3x + 5y = 8$

53. If the sum of the interior angles of a polygon is 4 right angles, then the polygon is a

(A) triangle
(B) hexagon
(C) pentagon
(D) quadrilateral

Item 54 refers to the following diagram of a transformation.




54. What transformation maps $PQR$ onto $P'Q'R'$?

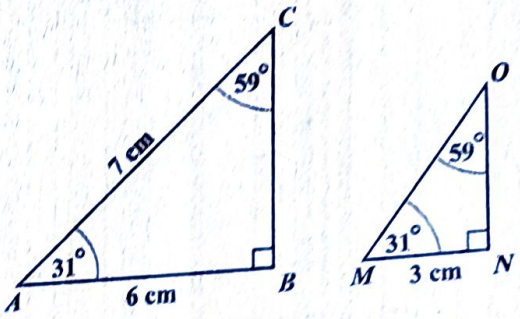
(A) Rotation
(B) Reflection
(C) Translation
(D) Enlargement

Item 55 refers to the following diagram of an isosceles triangle.


55. In the triangle, the value of $x$ is

(A) 30°
(B) 60°
(C) 120°
(D) 150°

Item 56 refers to the following pair of similar triangles.




56. The length of $MO$, in cm, is

(A) 2.5
(B) 3.0
(C) 3.5
(D) 7.0

57. The image of a point $P(1, 2)$ under a translation is $P'(-5, -4)$. What is the translation vector?

(A) $\begin{bmatrix} -6 \\ -6 \end{bmatrix}$

(B) $\begin{bmatrix} -4 \\ -2 \end{bmatrix}$

(C) $\begin{bmatrix} 4 \\ 2 \end{bmatrix}$

(D) $\begin{bmatrix} 6 \\ 6 \end{bmatrix}$

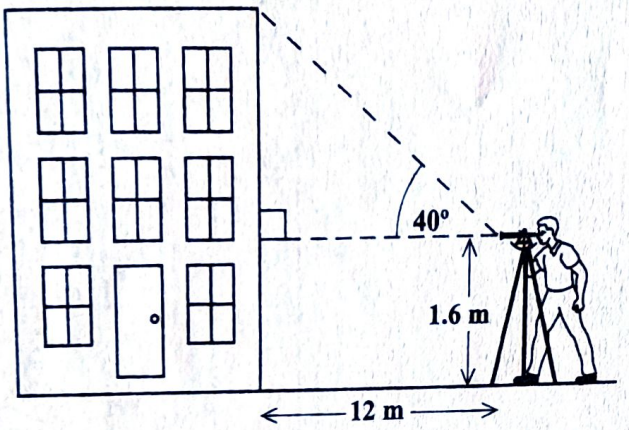
58. A plane is flying in a direction of 045° and changes course in a clockwise direction to 135°. The angle through which the plane turns is

(A) 45°
(B) 90°
(C) 135°
(D) 270°

GO ON TO THE NEXT PAGE

Item **59** refers to the following diagram of a building.

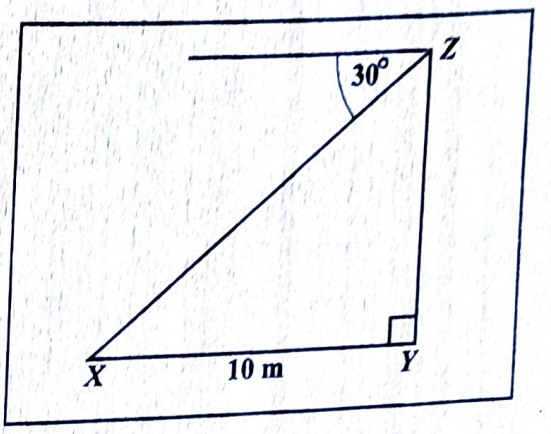
A surveyor sets up his instruments 12 metres from the foot of the building and records the angle of elevation of the top of the building.




**59.** An estimate of the height of the building can be obtained by calculating

(A) $1.6 + 12 \cos 40°$
(B) $1.6 + 12 \tan 40°$
(C) $(12 \tan 40°) - 1.6$
(D) $(12 \sin 40°) - 1.6$

Item **60** refers to the following diagram.




**60.** The diagram above shows that the angle of depression of a point $X$ from $Z$ is $30°$. If $X$ is 10 metres from $Y$, the height of $YZ$, in metres, is

(A) $10 \tan 30°$
(B) $10 \sin 30°$
(C) $10 \cos 30°$
(D) $10 \cos 60°$

**END OF TEST**

**IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.**