No calculators allowed

Exam time: 90 minutes

THE STUDENT
HUB

1. What is the value of the digit 3 in the number 26.531?

   (A) $\frac{3}{100}$

   (B) $\frac{3}{10}$

   (C) 3

   (D) 300

2. $\left(-\frac{2}{5}\right)^2$ is the same as

   (A) $-\frac{4}{25}$

   (B) $\frac{4}{10}$

   (C) $\frac{4}{5}$

   (D) $\frac{4}{25}$

3. $0.274 \times 0.06 =$

   (A) 0.01644

   (B) 0.1644

   (C) 1.644

   (D) 16.44

4. 45×150 is the same as

(A) $(45 \times 100) + 50$

(B) $(45 + 50) \times 100$

(C) $(45 \times 50) + (45 \times 100)$

(D) $(100 \times 50) + (100 \times 45)$

5. Which of the following is a prime number?

(A) 21

(B) 41

(C) 51

(D) 91

6. If $3(n - 3)$ is an even number, which of the following is an odd number?

(A) $3(n - 2)$

(B) $3n + 1$

(C) $(3n - 1)^2$

(D) $4n$

7. What is the value of 6^0?

(A) 0

(B) 1

(C) 6

(D) 60

8. The number 7456 written to 3 significant figures is

   (A) 7450

   (B) 7460

   (C) 745

   (D) 746

9. 0.0064 in scientific notation is

   (A) 6.4×10^{-4}

   (B) 6.4×10^{-3}

   (C) 6.4×10^{3}

   (D) 6.4×10^{4}

10. The H.C.F. of 6, 12, 36 is

    (A) 3

    (B) 6

    (C) 12

    (D) 36

11. A vase costs \$191. If a profit of 19% is to be made on the cost price, the selling price, in dollars is,

    (A) $191\left(1 + \frac{19}{100}\right)$

    (B) $19\left(1 + \frac{191}{100}\right)$

    (C) $191\left(19 + \frac{1}{100}\right)$

    (D) $19\left(191 + \frac{1}{100}\right)$

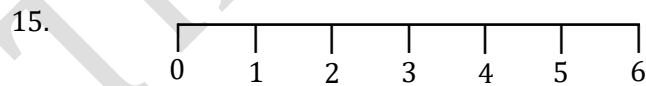12. When simplified, $\frac{2x}{3y} + \frac{3x}{5y}$ is written as

(A) $\frac{5x}{15y}$

(B) $\frac{19x}{15y}$

(C) $\frac{19xy}{15y^2}$

(D) $\frac{10x+9y}{15y^2}$

13. $7^a \times 7^b =$

(A) 49^{ab}

(B) 7^{ab}

(C) 49^{a+b}

(D) 7^{a+b}

14. $\sqrt{9a^{16}} =$

(A) $3a^4$

(B) $3a^8$

(C) $3a^{16}$

(D) $9a^8$

15.

Consider the inequality $x > 4$ where x is an integer. What is the smallest value of x that satisfies this inequality?

(A) $x = 0$

(B) $x = 3$

(C) $x = 4$

(D) $x = 5$

16. Given that $4x - 5 \geq 15$, the range of values of x is

(A) $x \geq 5$

(B) $x > 5$

(C) $x \geq 20$

(D) $x > 20$

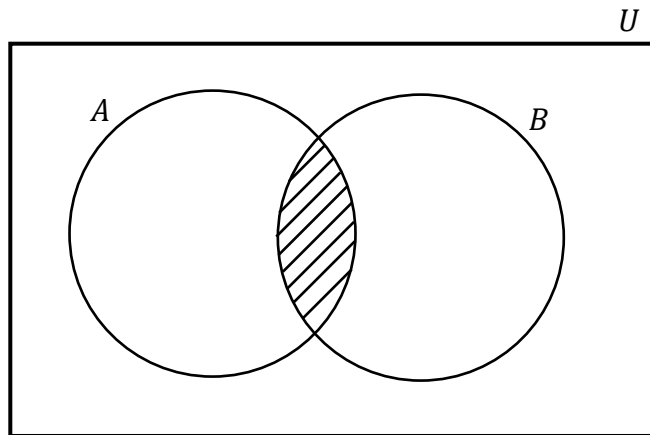17. "When 6 is subtracted from 5 times a certain number n, the result is 20".

The statement above may be represented by the equation

(A) $6n - 20 = 5$

(B) $6n - 5 = 20$

(C) $5n - 6 = 20$

(D) $5n + 20 = 6$

18. Which of the following sets is defined by $\{x \in \mathbb{Z}: -2 \leq x < 2\}$?

(A) $\{0, 1, 2\}$

(B) $\{-1, 0, 1\}$

(C) $\{-2, -1, 0, 1\}$

(D) $\{-2, -1, 0, 1, 2\}$

Item **19** refers to the Venn diagram below.

19. In the figure above, A represents the set of multiples of three. B represents the set of multiples of 7. The shaded region is the set of all multiples of

   (A) 3

   (B) 7

   (C) 10

   (D) 21

20. 500_2 written in base ten is the same as

   (A) 5×2^3

   (B) 5×2^2

   (C) 5×2

   (D) 5×2^0

21. The value of $1110_2 - 110_2$ in base 3 is

    (A) 8

    (B) 22

    (C) 220

    (D) 1000

22. The perimeter of a square is 20 cm. What is the area, in cm^2?

    (A) 16

    (B) 25

    (C) 60

    (D) 400

23. Given that 1 millimetre $= \frac{1}{1000}$ metres, express 7 500 millimetres in metres.

    (A) 0.75

    (B) 7.5

    (C) 75

    (D) 750

24. Which of the following words BEST describes a quadrilateral with all its sides equal?

    (A) kite

    (B) rectangle

    (C) trapezium

    (D) rhombus

25. An isosceles triangle has a perimeter of 56 centimetres and sides of $a, 3a$ and $3a$ centimetres. What is the value of a in centimetres?

(A) 7

(B) 8

(C) 14

(D) 24

26. The gradient of the line $3y = 2x + 4$ is

(A) $\frac{2}{3}$

(B) $\frac{4}{3}$

(C) $\frac{3}{2}$

(D) 2

27. Which of the following represents the equation of a straight line?

(A) $xy = 9$

(B) $y - 3 = 4x$

(C) $y + 9 = x^2$

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

Item **28** refers to the following bar chart below which summarizes the daily number of hours spent playing sports for 50 students at a school.

28. What is the median daily number of hours spent playing sports for the 50 students?
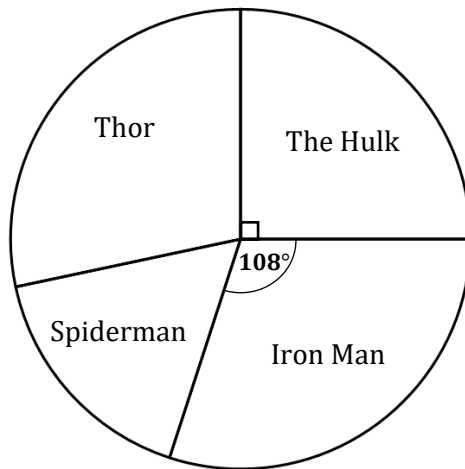
(A) 1

(B) 1.5

(C) 2

(D) 2.5

Item **29** refers to the following cumulative frequency curve showing the amount of money spent by a group of 120 students at the school cafeteria.
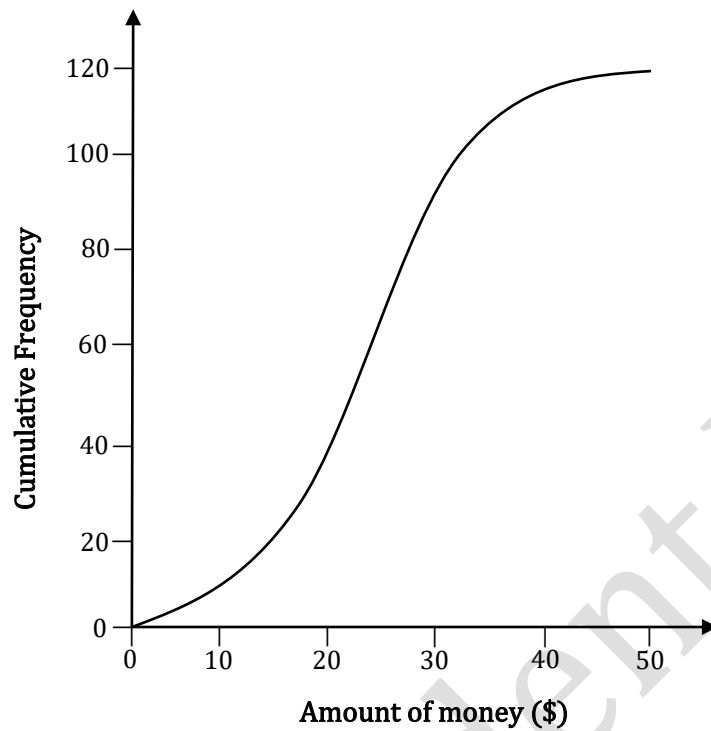
29. We can estimate that the median amount of money spent by the students is

(A) 14

(B) 24

(C) 50

(D) 60

Item **30** refers to the following pie chart showing the favourite superhero by a class of students.

30. What is the probability that a student chosen at random prefers Iron Man?

(A) 108°

(B) 108%

(C) 28%

(D) 30%

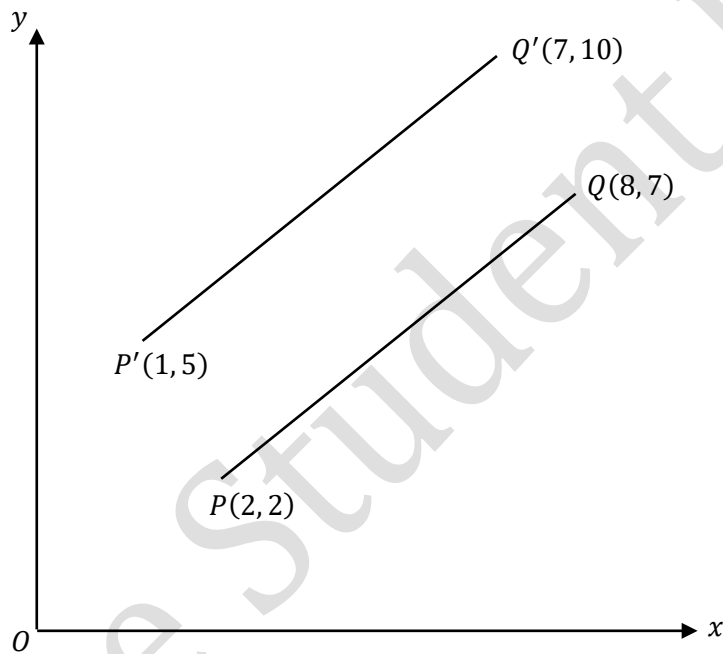Item **31** refers to the following information.

| 5 | 9 | 21 | 21 | 25 | 30 |

31. The mode of the numbers is

(A) 21

(B) 25

(C) 30

(D) 55

32. The image of a point $P(-3, 5)$ under a translation $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$ is

(A) $(-1, 4)$

(B) $(-1, 6)$

(C) $(-5, 4)$

(D) $(-5, 6)$

Item **33** refers to the following diagram which shows a translation.

33. In the diagram, the translation by which PQ is mapped onto $P'Q'$ is represented by

(A) $\begin{pmatrix} -1 \\ -3 \end{pmatrix}$

(B) $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$

(C) $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$

(D) $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$

34. Which of the following matrices do not have an inverse?

(A) $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$

(B) $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$

(C) $\begin{pmatrix} 1 & -2 \\ 4 & -8 \end{pmatrix}$

(D) $\begin{pmatrix} 5 & -2 \\ 4 & 2 \end{pmatrix}$

35. Which of the following represents a transformation matrix that is an enlargement of scale factor 3?

(A) $\begin{pmatrix} 3 & 3 \end{pmatrix}$

(B) $\begin{pmatrix} 3 \\ 3 \end{pmatrix}$

(C) $\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$

(D) $\begin{pmatrix} 0 & 3 \\ 3 & 0 \end{pmatrix}$

Item **36** refers to the following matrix.

$$A = \begin{pmatrix} 4 & 2 \\ 1 & -8 \\ 0 & -5 \end{pmatrix}$$
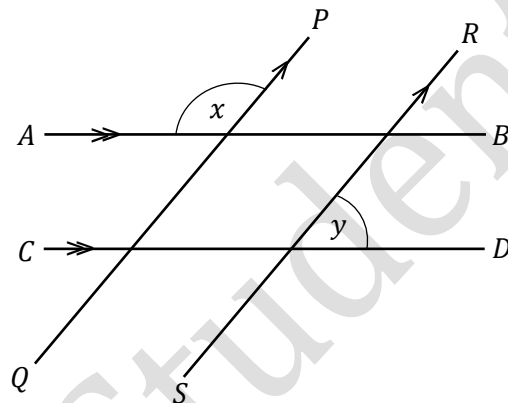
36. What is the size of the matrix above?

(A) 6

(B) 3×2

(C) 2×3

(D) $\frac{1}{6}$

37. If $\begin{pmatrix} 3a \\ 2-5b \end{pmatrix} = \begin{pmatrix} -3 \\ 12 \end{pmatrix}$, then the values of a and b respectively are
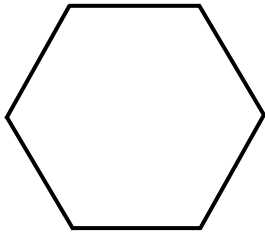
(A) $-9, -58$

(B) $-1, -2$

(C) $-1, 2$

(D) $1, 2$

<u>Item **38**</u> refers to the following transversal diagram in which AB is parallel to CD and PQ is parallel to RS.

38. If the measure of angle x is 125°, what is the measure of angle y?
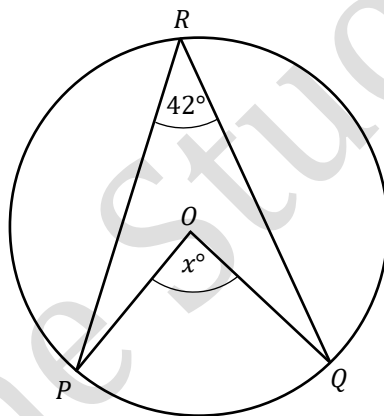
(A) 55°

(B) 70°

(C) 110°

(D) 125°

Item **39** refers to the following shape.

39. The shape above is called a

(A) pentagon

(B) hexagon

(C) heptagon

(D) octagon

Item **40** refers to the following diagram of a circle.

40. If O is the centre of the circle, then $x°$ is

(A) 21°

(B) 48°

(C) 84°

(D) 138°

41. Let $n = 1^4 + 1^8 + 1^{12} + \cdots + 1^{100}$.

    What is the value of n?

    (A) 20

    (B) 25

    (C) 50

    (D) 100

42. If $x^4y^2 = 12$ and $x^2y^4 = 5$, what is the value of x^6y^6?

    (A) 17

    (B) 23

    (C) 30

    (D) 60

43. If $2x - y = 3$, what is the value of $\frac{16^x}{(2)^{2y}}$?

    (A) 2^3

    (B) 2^6

    (C) 4^2

    (D) The value cannot be determined from the information given.

44. The Ministry of Agriculture, Land and Fisheries is conducting research on production of chicken eggs by two farms. They noticed that Farm A produced 25 percent more eggs than Farm B did. Based on the department's observation, if Farm A produced 600 eggs, how many eggs did Farm B produce?

(A) 150

(B) 450

(C) 480

(D) 750

45. How many litres of a 40% organic solution must be added to 6 litres of a 15% organic solution to obtain a 25% organic solution?

(A) 3

(B) 4

(C) 4.5

(D) 5

46. In preparation for a seminar, Dr. Brooks went to a printery to print a number of booklets with p pages per booklet. If every 8 pages cost c cents to print and he spent a total of d dollars, how many booklets did Dr. Brooks print in terms of p, c and d?

(A) $\frac{100d}{cp}$

(B) $\frac{800d}{cp}$

(C) $\frac{cp}{800d}$

(D) $\frac{8d}{cp}$

47. The manager of the Forestry Division estimates that, starting from present, the number
of trees in the Tobago Main Ridge Forest Reserve will decrease by 10 percent every 30
years. If the present number of trees is 400,000, which of the following expressions
represents the manager's estimate of the tree population t years from now?

(A) $400,000(0.1)^{30t}$

(B) $400,000(0.1)^{\frac{t}{30}}$

(C) $400,000(0.9)^{30t}$

(D) $400,000(0.9)^{\frac{t}{30}}$

48. It takes 32 days for 4 cows **OR** 12 horses to graze a field. How long will 8 cows **AND** 8
horses take to graze the same field?

(A) 8 days

(B) 12 days

(C) 16 days

(D) 20 days

49.

$$\frac{1}{\dfrac{1}{x-3}+\dfrac{3}{x+3}}$$

Which of the following is equivalent to the expression shown above?

(A) $\frac{(x-3)(x+3)}{4x+6}$

(B) $\frac{4x+6}{(x-3)(x+3)}$

(C) $\frac{4}{(x-3)(x+3)}$

(D) $\frac{(x-3)(x+3)}{4}$

50.
$$y = 175 + 50x$$

The equation above models the total cost y, in dollars, that a store charges a customer to rent DJ equipment for one day and use the equipment for x hours. The total cost consists of a flat fee plus a charge per hour used. When the equation is graphed in the xy-plane, what does the y-intercept of the graph represent in terms of the model?

(A) A flat fee of $175

(B) A charge per hour of $50

(C) A charge per hour of $175

(D) Total daily charges of $225

51. If $\frac{3a+3c}{5b+5d} = 2$, what is the value of $\frac{6a+6c}{7b+7d}$?

(A) $\frac{6}{14}$

(B) $\frac{14}{6}$

(C) $\frac{20}{7}$

(D) $\frac{36}{35}$

52.

x	$f(x)$
0	−5
3	4
7	16

Some values of the linear function f are shown in the table above. What is the value of

$f(4)$?

(A) 3

(B) 7

(C) 12

(D) 15

53. At a factory, the production of bendy straws dropped from 5 million packages in 1990 to

2.3 million packages in 2002. Assuming that the production of bendy straws decreased at

a constant rate, which of the following linear functions f best models the production, in

millions of packages, t years after the year 1990?

(A) $f(t) = \frac{27}{120}t + 5$

(B) $f(t) = \frac{23}{120}t + 5$

(C) $f(t) = -\frac{27}{120}t + 5$

(D) $f(t) = -\frac{23}{120}t + 5$

54. At a foreign company, office equipment must be shared among the employees. There is one shredder for every 5 employees, one copier for every 4 employees, and one document scanner for every 2 employees. If there is a total of 76 pieces of office equipment at this company, how many employees are there?

(A) 40

(B) 60

(C) 80

(D) 110

55. A group of friends decided to divide the $3000 cost of a trip equally among themselves. When three of the friends decided not to go on the trip, those remaining still had to divide the $3000 cost equally, but each friend's share of the cost increased by $50. How many friends were in the group originally?

(A) 12

(B) 15

(C) 18

(D) 20

56. Every week, Molly purchases a 20-pound gas tank for $14. Molly would like to reduce her weekly expenditure on gas by $5. Which equation can Molly use to determine how many fewer pounds of gas, p, she should use each week?

(A) $\frac{20}{14}p = 9$

(B) $\frac{14}{20}p = 9$

(C) $\frac{20}{14}p = 5$

(D) $\frac{14}{20}p = 5$

57. Oliver bought a tuxedo at a clothing store that gave a 15 percent discount off its original price. The total amount he paid to the cashier was p dollars, including a 6 percent sales tax on the discounted price. Which of the following represents the original price of the tuxedo in terms of p?

(A) $0.91p$

(B) $\frac{p}{0.91}$

(C) $(0.85)(1.06)p$

(D) $\frac{p}{(0.85)(1.06)}$

58. Consider the graph below:
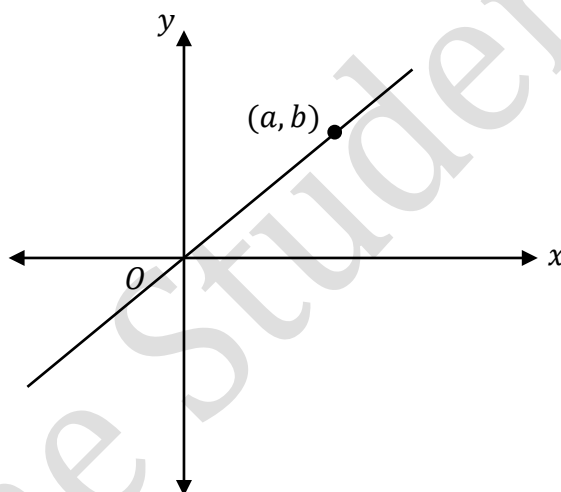
The line shown in the xy-plane above passes through the origin and the point (a, b) where $a < b$. Which of the following could be the slope of the line?

(A) 0.1

(B) 1

(C) $\frac{4}{5}$

(D) $\frac{5}{4}$

59. $y > 3x - 2$

$3x > 7$

Which of the following consists of the y-coordinates of all the points that satisfy the system of inequalities above?

(A) $y > 9$

(B) $y > 5$

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

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

60. In the xy-plane, what is the distance between the two x-intercepts of the parabola

$y = x^2 - 5x - 24$?

(A) 5

(B) 8

(C) 11

(D) 24

61. The function f is defined by $f(x) = (x + 5)(x + 1)$. The graph of f in the xy-plane is a parabola. Which of the following intervals contains the x-coordinate of the vertex of the graph of f?

(A) $-6 < x < -5$

(B) $-5 < x < 1$

(C) $1 < x < 5$

(D) $5 < x < 6$

62. If $(ax + 1)(bx + 5) = 12x^2 + cx + 5$ for all values of x, and $a + b = 7$, what are the two possible values for c?

(A) 3 and 4

(B) 15 and 20

(C) 19 and 23

(D) 21 and 28

63. A bookstore is selling two types of fictional books, historical fiction and literary fiction. The historical fiction book has a volume of 15 cubic centimetres, and the literary fiction book has a volume of 25 cubic centimetres. The bookstore receives an order for 80 fictional books, and the total volume of the order to be shipped is 1,700 cubic centimetres. Which of the following systems of equations can be used to determine the number of historical fiction books, h, and literary fiction books, l, that were ordered?

(A) $80 - h = l$

   $25h + 15l = 1700$

(B) $80 - h = l$

   $15h + 25l = 1700$

(C) $80 - h = l$

   $20(h + l) = 1700$

(D) $h - l = 80$

   $15h + 25l = 1700$

64.
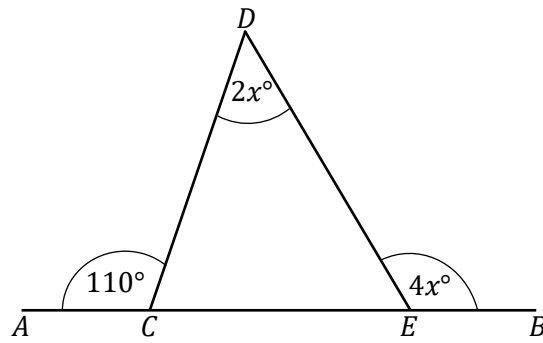
What is the value of x in the figure above?

(A) 35°

(B) 55°

(C) 70°

(D) 140°

65.   <u>Title:</u> Speed-time graph showing Jacob's bicycle journey
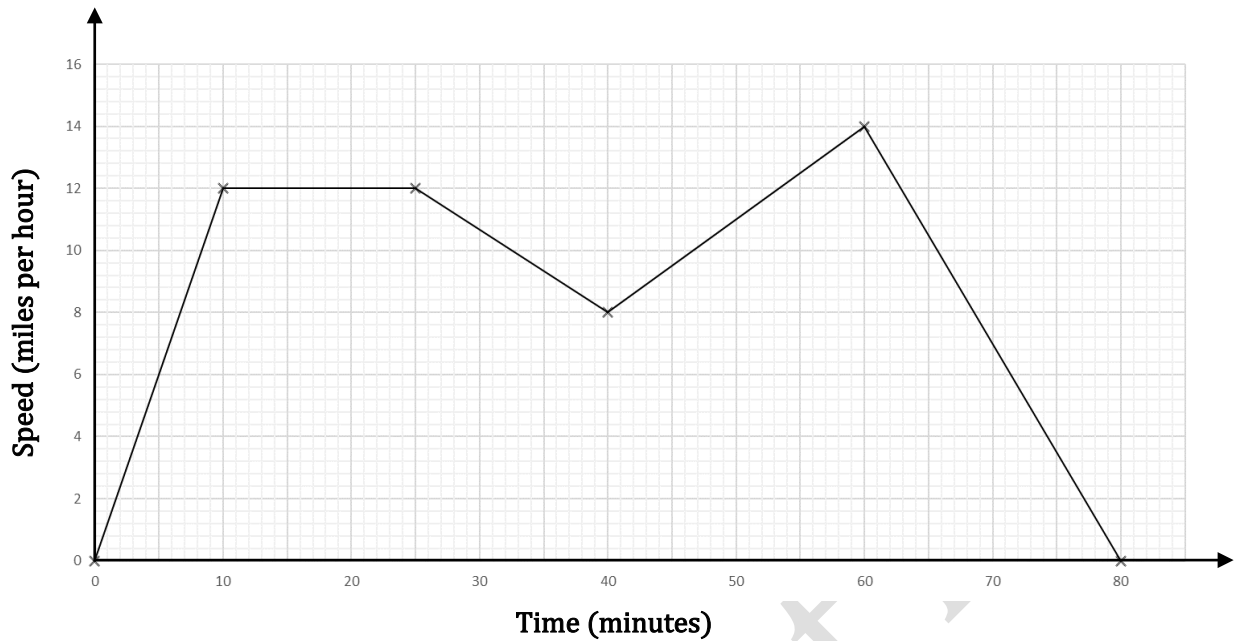
Jacob rode his bicycle for 80 minutes, and his time and speed are shown on the graph above. According to the graph, which of the following statements is NOT true concerning Jacob's journey?

(A) Jacob rode his bicycle at a constant speed for 15 minutes.

(B) Jacob's speed reached its maximum during the last 30 minutes.

(C) Jacob's speed was increasing for a longer period of time than it was decreasing.

(D) Jacob's speed decreased at a constant rate during the last 20 minutes.

66. The cone shaped cup shown below of height, h and radius, r is filled with water from a water cooler dispenser.
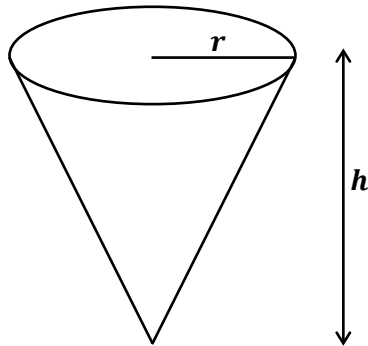
Water pours into the cup slowly to prevent spillage and at a constant rate. Which of the following graphs best illustrates the height of the water level in the cup as it fills?

(A)

(B)

(C)

(D)
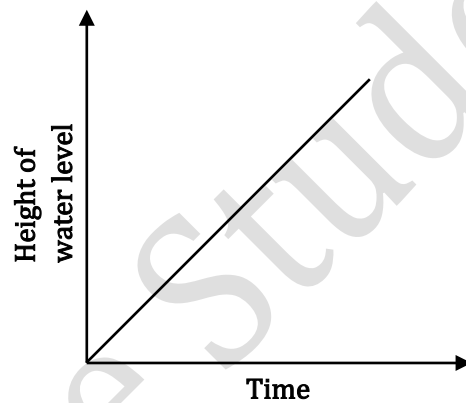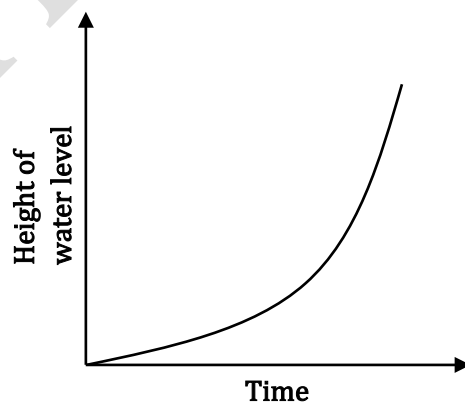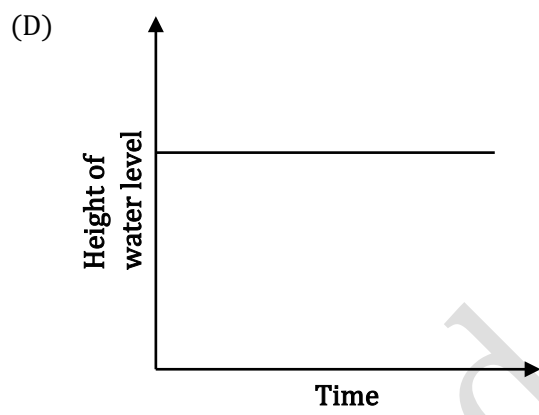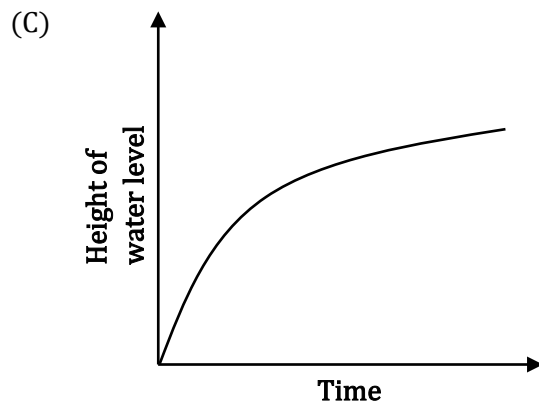
67.
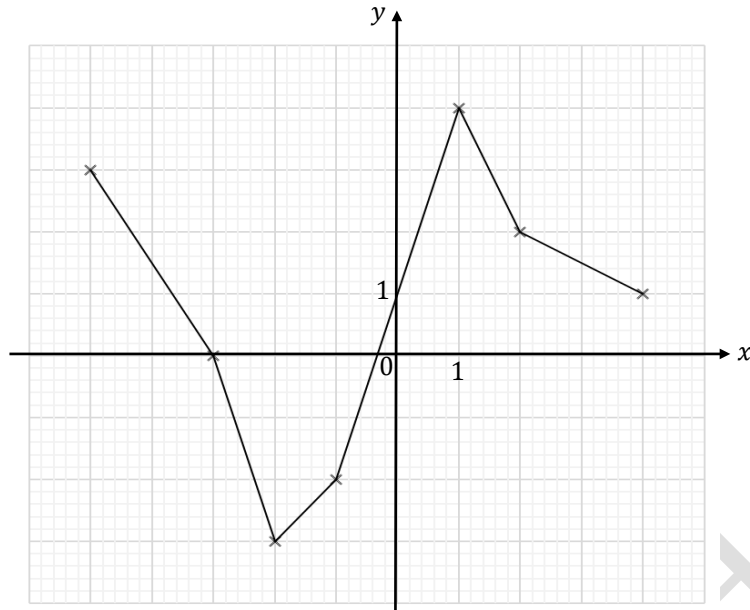
The complete graph of the function f is shown in the xy-plane above. For what value of x is the value of $f(x)$ at its minimum?

(A) -3

(B) -2

(C) -1

(D) 2

68.
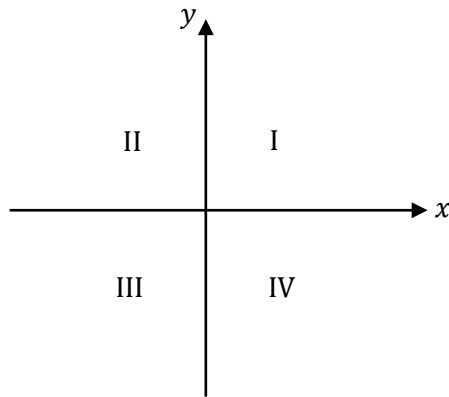
If the system of inequalities $\left\{y \geq 3x + 2 \cap y > \frac{1}{4}x - 2\right\}$ is graphed in the xy-plane

above, which quadrant contains no solutions to the system?

(A) Quadrant II

(B) Quadrant III

(C) Quadrant IV

(D) There are solutions in all four quadrants.

69. A printing company charges $0.50 per page for the first 100 pages and then $1.00 per page thereafter. Which of the following graphs could show the relationship between the number of pages to be printed and the company's charge?

(A)
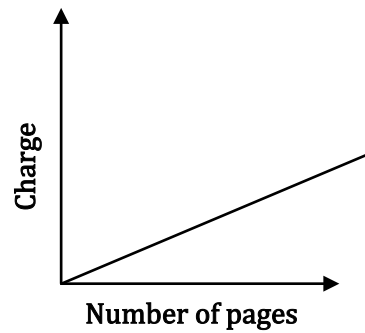
(B)
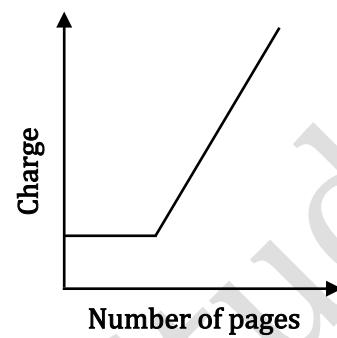
(C)
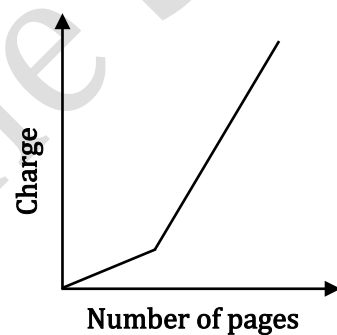
(D)
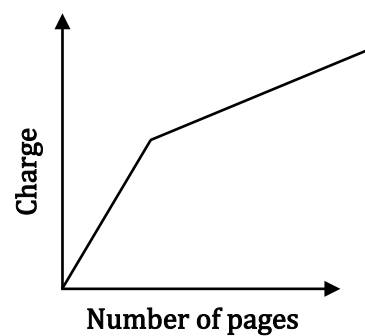
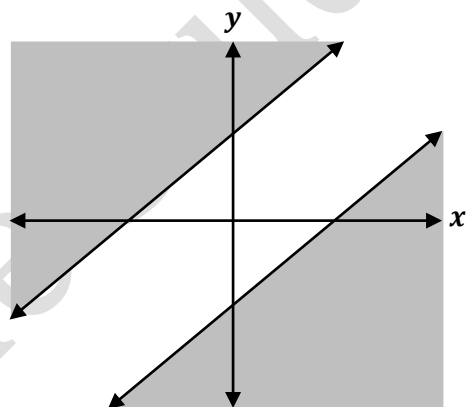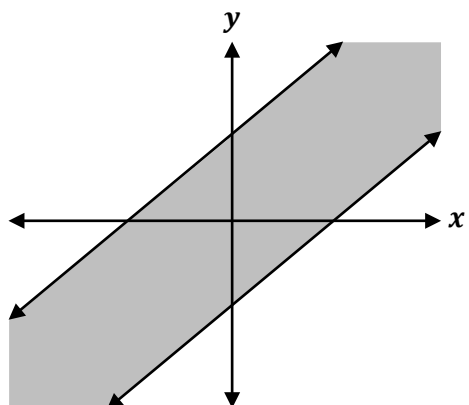70. Which of the following graphs represents all x and y such that $-5 \leq x + y \leq 5$?

(A)
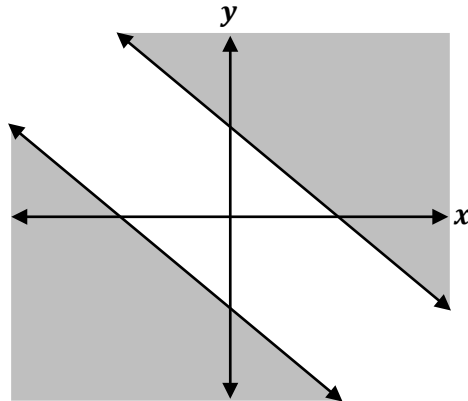
(B)
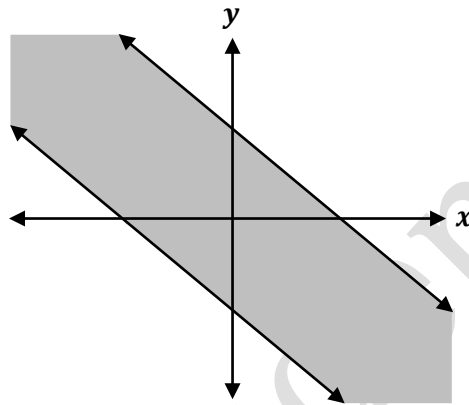
(C)

(D)

71.

Percent of Customers who spent $200

or more at the restaurant.

Restaurant	Percent of customers
Restaurant A	31.2%
Restaurant B	34.6%
Restaurant C	37.9%
Restaurant D	38.4%
Restaurant E	36.5%
Restaurant F	34.3%
Restaurant G	43.1%
Restaurant H	45.2%
Restaurant I	43.7%

A survey was given to customers of all 40 restaurants in a town asking if they had spent

$200 or more at the restaurant. The results from 9 of the restaurants are given in the

table above. The median percent of customers who spent $200 or more for all 40

restaurants was 38.85%. What is the difference between the median percent of

customers who spent $200 or more in the 9 restaurants and the median for all 40

restaurants?

(A) 0.15%

(B) 0.53%

(C) 0.95%

(D) 2.35%

72. Consider the dot plot shown below.

Number of times students were late
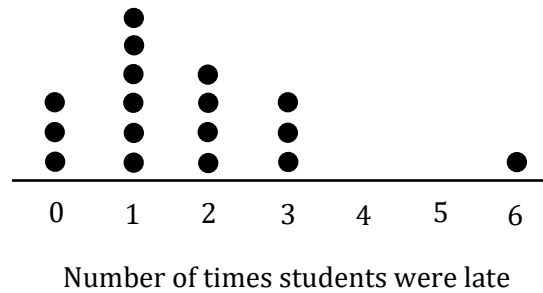
The dot plot above summarizes the number of times a group of 17 secondary school students was late to school during the month of October. If the student who was late to school 7 times in October is removed from the data, which of the following correctly describes the changes to the statistical measures of the data?

I. The mean decreases.

II. The median decreases.

III. The range decreases.

(A) III only

(B) I and II only

(C) I and III only

(D) I, II and III

73.

Number of goals scored

by football team in 19 games
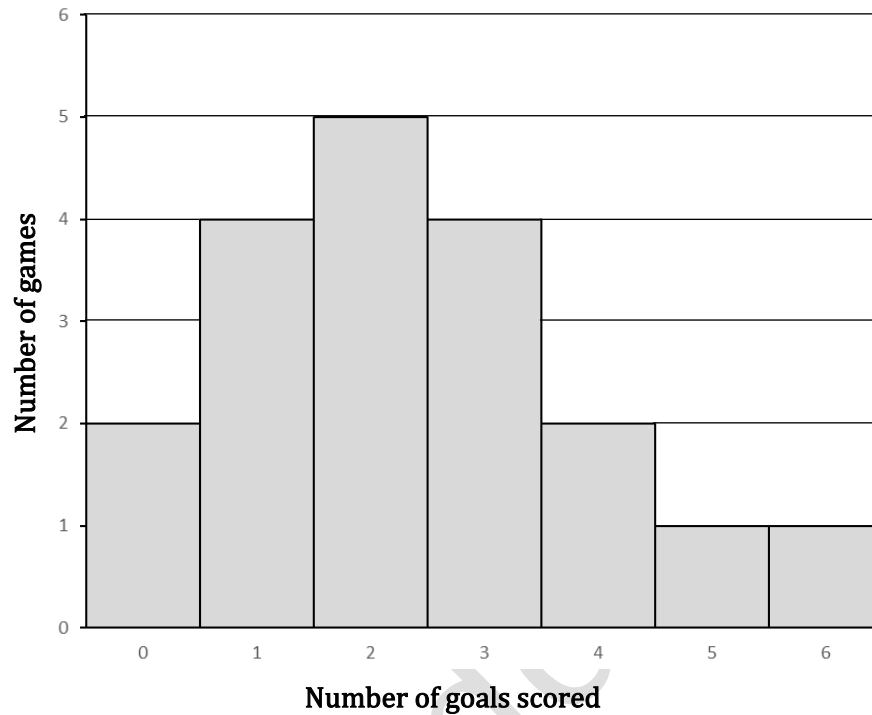
Based on the graph above, in how many of the games played did the football team score goals equal to the median number of goals for the 19 games?
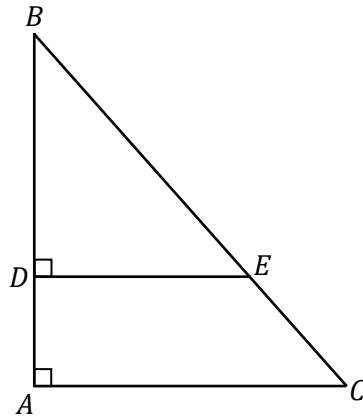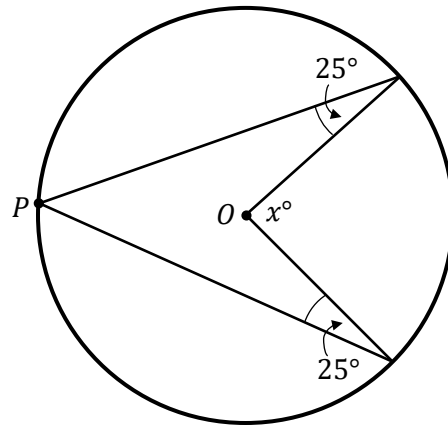
(A) 2

(B) 4

(C) 5

(D) 8

74.

B

D ⊐ E

A C

In the figure above, $\tan B = \frac{3}{4}$. If $BC = 20\ cm$ and $AD = 6\ cm$, what is the length of $\overline{DE}$?

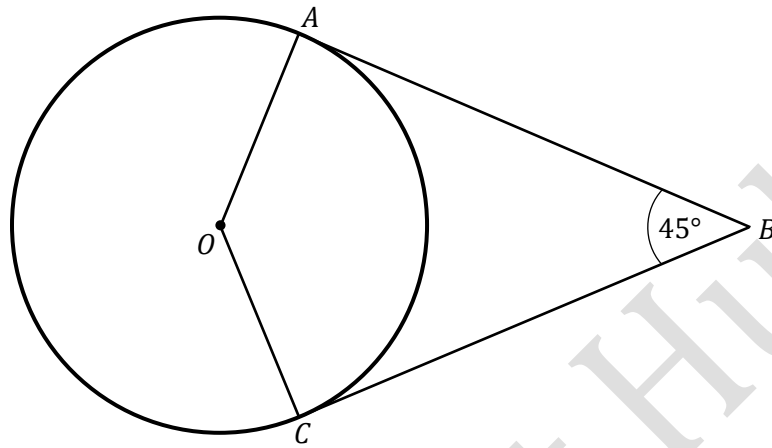(A) $3\ cm$

(B) $7.5\ cm$

(C) $9\ cm$

(D) $15\ cm$

75. In the figure below, point O is the centre of the circle and point P lies on the circumference of the circle.

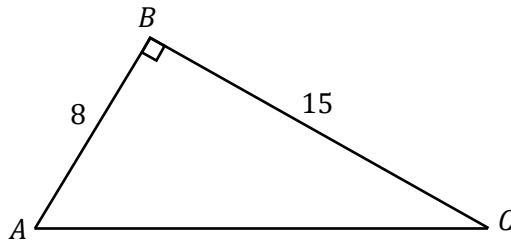What is the value of x?

(A) 50°

(B) 90°

(C) 100°

(D) 125°

76. In the figure below, point O is the centre of the circle, line segments AB and BC are tangents to the circle at point A and C, respectively, and the segments intersect at point B as shown.

If the circumference of the circle is $104\ cm$, what is the length of minor arc $\widehat{AC}$?

(A) $13\ cm$

(B) $26\ cm$

(C) $39\ cm$

(D) $52\ cm$

77. Consider the triangle ABC shown below.

In the triangle ABC above, point P (not shown) lies on $\overline{AC}$.

What is the value of $\cos(\angle ABP) - \sin(\angle PBC)$?

(A) 0

(B) $\frac{8}{15}$

(C) $\frac{8}{17}$

(D) The value cannot be determined from the information given.

78. A sequence of figures is made from straws of unit length. The first three figures in the sequence are shown below.
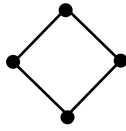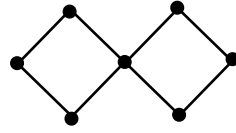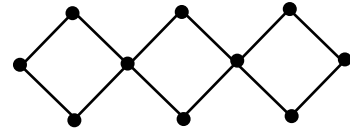

Figure 1   Figure 2   Figure 3

What is the relationship between the numbers of straws in the pattern, S, and the number of dots in the figure, D?

(A) $S = D - 2$

(B) $S = 2D - 2$

(C) $S = 2D - 3$

(D) $S = 2D - 4$

79. The transformation matrix, T, is given as $T = \begin{pmatrix} -3 & 0 \\ -2 & 1 \end{pmatrix}$. Another transformation, S, is defined by the matrix $S = \begin{pmatrix} 2 & -1 \\ 4 & -5 \end{pmatrix}$. What is the single 2×2 combined transformation matrix of T followed by S.

(A) $\begin{pmatrix} -6 & 3 \\ 0 & -7 \end{pmatrix}$

(B) $\begin{pmatrix} -6 & 3 \\ 0 & -3 \end{pmatrix}$

(C) $\begin{pmatrix} -4 & -1 \\ -2 & -5 \end{pmatrix}$

(D) $\begin{pmatrix} -4 & -1 \\ -2 & 5 \end{pmatrix}$

80. The trapezium, $ABCD$, **not drawn to scale**, is shown below.

$\overrightarrow{AB} = \boldsymbol{b}, \overrightarrow{BC} = 4\boldsymbol{a}$ and $\overrightarrow{AD} = 6\boldsymbol{a}$.
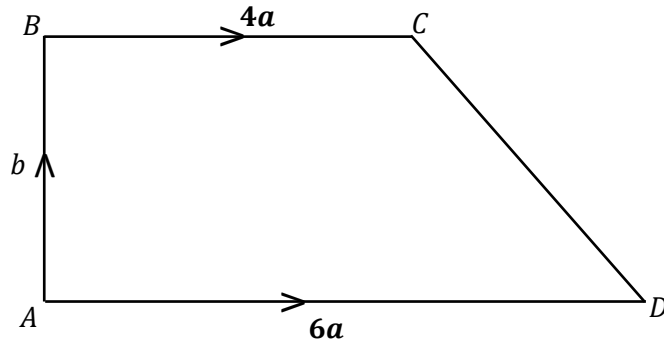
The point, P, lies on CD such that $CP = \frac{1}{2}CD$. An expression for $\overrightarrow{AP}$ in terms of $\boldsymbol{a}$ and

$\boldsymbol{b}$ is:

(A) $5\boldsymbol{a} - \frac{1}{2}\boldsymbol{b}$

(B) $5\boldsymbol{a} + \frac{1}{2}\boldsymbol{b}$

(C) $7\boldsymbol{a} - \frac{1}{2}\boldsymbol{b}$

(D) $7\boldsymbol{a} + \frac{1}{2}\boldsymbol{b}$