

Secondary 3 Mathematics

2nd Term Pre-exam (Paper 2)

Time allowed: 1 hour 15 minutes

Total Mark: 100

- Answer *ALL* questions in Sections A and B.
- All the answers should be marked on the Answer Sheet. No steps are required.
- Note that you may only mark **ONE** answer to each question. Two or more answers will score **NO MARKS**.
- All questions carry equal marks. No marks will be deducted for wrong answers.
- The diagrams in the paper are not necessarily drawn to scale.

SECTION A (30 marks)

1. The translation $(x, y) \rightarrow (x+4, y-3)$ transforms A(5, 1) to A'. Find the distance between A and A'.
2. A, B, C represent three groups of numbers. In group A, there are 5 numbers and their mean is 8. In group B, there are 8 numbers and their mean is 11.25. In group C, there are 16 numbers and their mean is x . Putting the numbers in groups A, B and C together, the mean of all numbers is 10. Find the value of x .
3. If $x^m = 9$ and $x^n = 81$, find the value of x^{2m-n} .
4. The area of a square is found to be 5.3 cm^2 , correct to 2 significant figures. Find the percentage error correct to 2 significant figures.
5. Simplify $\frac{5}{\sqrt{12}} - \frac{\sqrt{18}}{7}$ and rationalize the answer when necessary.
6. The table shows the weights (in kg) of a group of men.

Weight (kg)	46 – 50	51 – 55	56 – 60	61 – 65	66 – 70	71 – 75
Number of men	6	13	16	16	18	21

If the data within each interval are weighted by the corresponding frequency, find the weighted mean of the weights of the men.

7. Sam finds that the volume of a pack of milk is 996 mL, and the percentage error is $\frac{25}{83}\%$. What is the range of the actual volume of this pack of milk?
8. Simplify $\frac{(x+y)^{-1}}{(x^{-1}+y^{-1})^{-1}}$.
9. The mean of seven numbers is 20. The mean of the four largest numbers is 23 and the mean of the four smallest numbers is 17. Find the median.
10. $A(x, y)$ is rotated 90° about O in an anticlockwise direction, and then reflected along the x -axis. What are the coordinates of the resulting image A' ?
11. If $2\sin(2\theta - 30^\circ) = \cos 50^\circ + 1$, find the value of θ correct to 1 decimal place.
12. In a rectangular coordinate plane, the coordinates of the vertices of a parallelogram ABCD are A(3, -1), B(5, 2) C(3, 4) and D(5, 7). Find the area of parallelogram ABCD.
13. Simplify $\frac{(m^2n)^{-2}}{2mn^2} \times \frac{(2m^{-3}n)^2}{(4n^2)^3}$, giving the answer with positive indices.
14. $A(2, -1)$ is reflected along the horizontal line passing through $(3, -2)$. What are the coordinates of the image A' ?
15. Simplify $(1 + \sqrt{2} - \sqrt{3})(1 - \sqrt{2} + \sqrt{3})$.

(Hint: Consider the identity $a^2 - b^2 = (a+b)(a-b)$.)

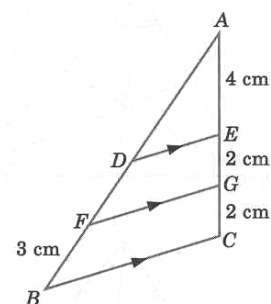
SECTION B (70 marks)

1. Solve the simultaneous equations $4y - 3x = 3y + 4x - 11 = 6$.
 - A. $x = 2, y = 0$
 - B. $x = 2, y = 3$
 - C. $x = \frac{68}{7}, y = \frac{37}{2}$
 - D. $x = \frac{68}{7}, y = -\frac{31}{2}$

2. If a, b and n are three positive integers, which of the following is true?
 - A. $a^{-b} = b^{-a}$
 - B. $(n^a)^b = n^{a+b}$
 - C. $(a \times b)^n = a^n \times b^n$
 - D. $(a + b)^n = a^n + b^n$

3. $0.000\ 052 + 0.000\ 8 =$
 - A. 52.8×10^{-4}
 - B. 8.52×10^{-4}
 - C. 8.52×10^{-10}
 - D. 13.2×10^{-10}

4. Find the length of AB in the figure.

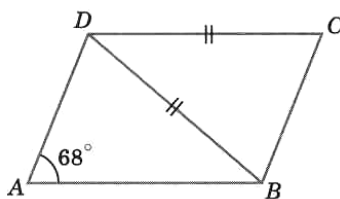


5. If $(\sqrt{5} + \sqrt{3})x = 1$, then
 - A. $\sqrt{5} - \sqrt{3}$
 - B. $\frac{\sqrt{5} - \sqrt{3}}{2}$
 - C. $\frac{\sqrt{5} + \sqrt{3}}{2}$
 - D. $\sqrt{6}$

6. Given three points $P(k + 1, m + 1)$, $Q(k, m - 2)$ and $R(2k + 2, m + 3)$. If $PQ \perp PR$, find the slope of QR .

- A. -1
 B. $\frac{5}{7}$
 C. m
 D. $-m$

7. In the figure, $ABCD$ is a parallelogram and $DC = DB$. If $\angle DAB = 68^\circ$, find $\angle CDB$.



- A. 44°
 B. 46°
 C. 55°
 D. 70°
8. If $a > b > 0$, which of the following is / are true?

- I. $\frac{1}{a} > \frac{1}{b}$
 II. $-5a > -5b$
 III. $2a + 3 > 2b + 3$

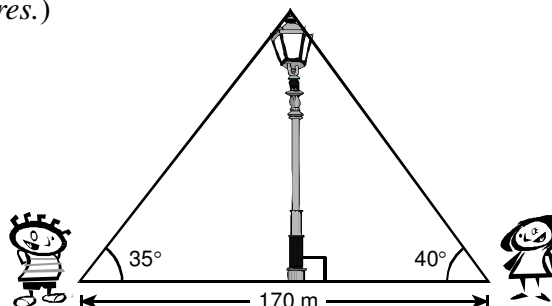
- A. I only.
 B. II only.
 C. III only.
 D. I, II and III.
9. The following table shows the ages of the members of a certain choir. Find their median age.

Age	10	11	12	13	14	15	16
Number of members	5	9	14	2	8	7	4

- A. 11
 B. 12
 C. 12.5
 D. 13

10. In the figure, Sammi and Andy are 170 m apart. Find the height of the lamp-post.
(Correct your answer to 3 significant figures.)

- A. 61.1 m
B. 64.9 m
C. 87.3 m
D. 87.7 m



11. A factory produces steel bars by 6 machines P, Q, R, S, T and U. In a survey for 100 steel bars, the number of steel bars produced by each machine is recorded as follows:

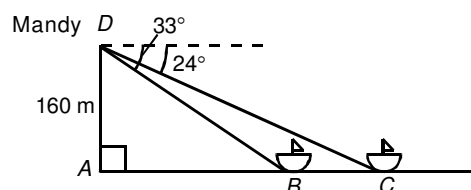
Machine	P	Q	R	S	T	U
Frequency	8	19	36	25	9	3

What is the experimental probability that a steel bar chosen at random from the factory is produced by machine R, S or T?

- A. $\frac{1}{4}$
B. $\frac{7}{10}$
C. $\frac{9}{20}$
D. $\frac{4}{25}$
12. $5\sqrt{63} + 4\sqrt{7} - 7\sqrt{28} =$
A. $\sqrt{7} - \sqrt{28}$
B. $\sqrt{7}$
C. $3\sqrt{7}$
D. $5\sqrt{7}$

13. The angles of depression of boats B and C from Mandy on top of a 160 m cliff are 33° and 24° respectively. Find the distance between the two boats.
(Correct your answer to the nearest 0.1 m.)

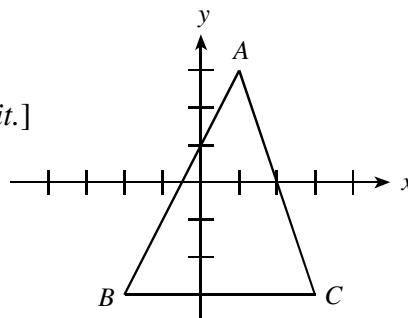
- A. 32.7 m
B. 112.9 m
C. 113.0 m
D. 605.7 m



14. In the figure, find the area of $\triangle ABC$.

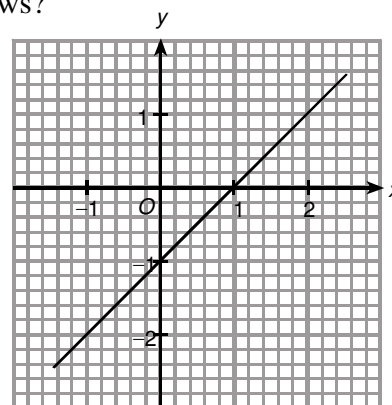
[Each grid on the x-axis and y-axis represents 0.5 unit.]

- A. 10 square units
- B. 7.5 square units
- C. 3.75 square units
- D. 15 square units



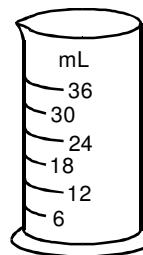
15. Which of the following equations has the graph as follows?

- A. $x + y = 1$
- B. $x + y = -1$
- C. $y - x = 1$
- D. $x - y = 1$



16. What is the maximum absolute error of the following instrument?

- A. 0.5 mL
- B. 3 mL
- C. 5 mL
- D. 6 mL



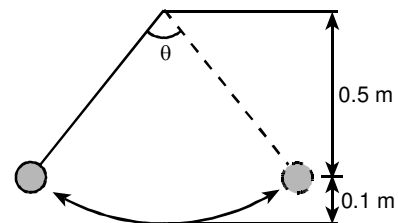
17. Trees are planted long the side of a road at regular intervals of approximately 20 m. Estimate the number of trees to be planted along a road of 3.978 km long.

- A. 160
- B. 180
- C. 200
- D. 220

18. How many solutions do the simultaneous equations $\begin{cases} 3x - 3y = 9 \\ x - y = 3 \end{cases}$ have?

- A. Unlimited
- B. One
- C. Two
- D. 0

19. There are 20 boys and 12 girls in a class. $\frac{2}{5}$ of the boys and $\frac{1}{3}$ of the girls go to school on foot. If a student who goes to school on foot is chosen at random, find the probability that the student is a boy.
- A. 1
B. $\frac{2}{3}$
C. $\frac{1}{3}$
D. $\frac{3}{5}$
20. A quadrilateral ABCD moves 3 units to the right and 1 unit upwards to get a new image $A_1B_1C_1D_1$. Then the vertices C_1 and D_1 of the image $A_1B_1C_1D_1$ both move 2 units to the left and 2 units downwards to get C_2 and D_2 . If $A_1B_1C_2D_2$ is a parallelogram and their vertices are $A_1(2, 3)$, $B_1(4, 3)$, $C_2(2, -1)$ and $D_2(0, -1)$. What kind of quadrilateral is ABCD?
- A. Square
B. Parallelogram
C. Rectangle
D. Trapezium
21. It is known that y is an odd number. If $4y - 5 < 39$, find the greatest value of y .
- A. 9
B. 10
C. 11
D. 13
22. A pendulum swings back and forth as shown in the figure. Find θ .
(Correct your answer to 3 significant figures.)
- A. 33.6°
B. 67.1°
C. 78.7°
D. 157.4°

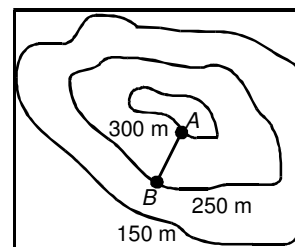


23. Given a set of data 4, 4, 5, 5, 5, 6, 6, 13, if a new datum “6” is inserted, find the difference between the new mean and the original mean.

A. 0
B. 1
C. 5
D. 6

24. The figure shows a map of the scale 1 : 10 000, where $AB = 0.8$ cm. Find the angle of inclination of the line AB .
(Correct your answer to 3 significant figures.)

A. 3.6°
B. 32.0°
C. 42.1°
D. 86.4°



Scale 1 : 10 000

25. Mary tossed a fair coin for 21 times. The numbers of tails and heads gotten were 7 and 14 respectively. Find the probability that Mary will get a tail in the next toss.

A. $\frac{1}{6}$
B. $\frac{1}{4}$
C. $\frac{1}{3}$
D. $\frac{1}{2}$

26. If the distance between $(3, x)$ and $(3, -3)$ is 4 units, find the value(s) of x .

A. 7 or -1
B. -7
C. -7 or 1
D. 1

27. Simplify $\sin^4 \theta + \sin^2 \theta \cos^2 \theta$.

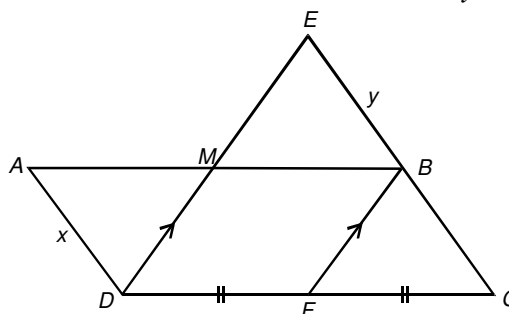
A. $\sin^2 \theta$
B. $\cos^2 \theta$
C. $\sin \theta \cos \theta$
D. $\sin^2 \theta \cos^2 \theta$

28. Which of the following simultaneous equations have no solution?

- A. $\begin{cases} y = 2x - 3 \\ y = 5x - 3 \end{cases}$
 B. $\begin{cases} y = 4x - 5 \\ y = 4x - 7 \end{cases}$
 C. $\begin{cases} 2y = 3x - 1 \\ 2y = 4x - 1 \end{cases}$
 D. $\begin{cases} 3y = 2x + 7 \\ y = 2x + 7 \end{cases}$

29. In the figure, ABCD is a parallelogram. DME and EBC are straight lines. Find $\frac{x}{y}$.

- A. $\frac{1}{6}$
 B. $\frac{5}{6}$
 C. 1
 D. It cannot be found.



30. Which of the following straight line(s) is/are parallel to the straight line passing through A(0, 7) and B(1, 13)?

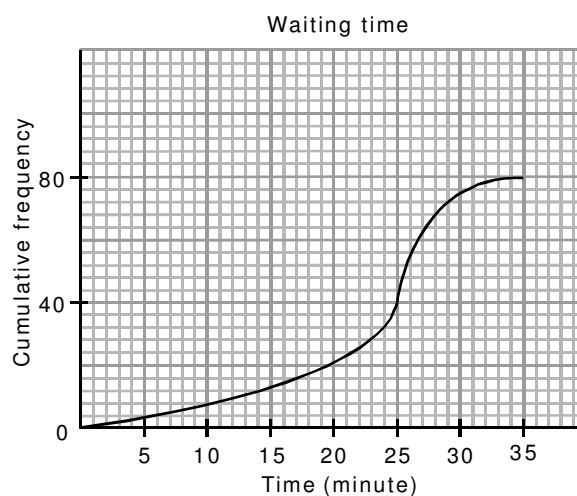
- I. The straight line which passes through C(1, 13) and D(-2, -5).
 II. The straight line which passes through E(-2, -5) and F(3, 25).
 III. The straight line which passes through G(0, 8) and H(1, 15).
 IV. The straight line which passes through X(3, 29) and Y(-1, 1).

- A. I only
 B. I and II only
 C. II and III only
 D. III and IV only

31. Which of the following statements about the inequality (*): $4 - 5x < 9$ must be **false**?

- A. $x = 0$ satisfies (*).
 B. $x > -1$
 C. All positive integers are solutions of (*).
 D. -7 is a solution of (*).

32. Given two points $A(a + b, c - d)$ and $B(a + b, -c + d)$, if C is the mid-point of AB , which of the following is correct?
- C is on the x -axis.
 - C is on the y -axis.
 - A and B are on the x -axis.
 - A and B are on the y -axis.
33. The figure shows the waiting time of 80 passengers at a bus stop. Find the median waiting time of these 80 passengers.



- 16 min
 - 25 min
 - 35 min
 - 80 min
34. If $x = \sqrt{3}$, then $\frac{1}{\sqrt{27}} =$
- $9x^{-1}$
 - $9x^{-2}$
 - $3x^{-2}$
 - x^{-3}
35. Correct $0.037\ 48\ \text{m}^2$ to the nearest cm^2 .
- $3.748\ \text{cm}^2$
 - $3.75\ \text{cm}^2$
 - $37.5\ \text{cm}^2$
 - $375\ \text{cm}^2$

END OF PAPER

Secondary 3 Mathematics
2nd Term Pre-exam (Paper 2)
(Answer Sheet)

Write down the answers on the spaces provided.

SECTION A (30 marks)

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____

SECTION B (70 marks)

1	2	3	4	5

6	7	8	9	10

11	12	13	14	15

16	17	18	19	20

21	22	23	24	25

26	27	28	29	30

31	32	33	34	35