

TianEn Academy Mathematics 2024

Term 2 Final

Part 1: Multiple Choice (1 Mark Each)

Question 1: What is the standard form of a quadratic function?

- A. $y = ax + b$
- B. $y = ax^2 + bx + c$
- C. $y = ax^3 + bx + c$
- D. $y = a + b + c$

Question 2: What is the line of symmetry for the quadratic function $y = 2x^2 - 4x + 1$?

- A. $x = 1$
- B. $x = -1$
- C. $x = -2$
- D. $x = 2$

Question 3: If a parabola opens downward, what can be said about the coefficient 'a' in the quadratic function $y = ax^2 + bx + c$?

- A. $a > 0$
- B. $a < 0$
- C. $a = 0$
- D. None of the above

Question 4: Which of the following points is the vertex of the quadratic function $y = -2x^2 + 8x - 3$?

- A. $(2, 5)$
- B. $(2, -5)$
- C. $(-2, 5)$
- D. $(-2, -5)$

Question 5: What shape does the graph of a quadratic function take?

- A. Circle
- B. Line
- C. Parabola
- D. Triangle

Question 6: In which quadrant is the point $(-3, 2)$ located?

- A. Quadrant I

- B. Quadrant II
- C. Quadrant III
- D. Quadrant IV

Question 7: What are the coordinates of the origin in the rectangular coordinate system?

- A. (1, 1)
- B. (0, 0)
- C. (-1, 0)
- D. (0, 1)

Question 8: Which of the following points lies on the x-axis?

- A. (3, 5)
- B. (-3, 3)
- C. (0, 4)
- D. (-4, 0)

Question 9: If the equation of a line is $y = 2x + 3$, what is the y-coordinate when $x = 2$?

- A. 4
- B. 5
- C. 7
- D. 8

Question 10: What type of line is represented by the equation $x = -4$?

- A. Horizontal
- B. Vertical
- C. Diagonal
- D. None of the above

Question 11: Which type of graph is best for showing the proportions of a whole?

- A. Bar Graph
- B. Line Graph
- C. Pie Chart
- D. Histogram

Question 12: What type of chart is most suitable for displaying continuous data grouped into intervals?

- A. Bar Chart
- B. Pie Chart
- C. Histogram
- D. Pictogram

Question 13: Which measure of central tendency is most affected by extreme values?

- A. Mean
- B. Median
- C. Mode
- D. Range

Question 14: In a frequency diagram, what does the height of each bar represent?

- A. The total number of data points
- B. The frequency of each value
- C. The range of the data
- D. The median of the data

Question 15: What is the main advantage of using a stem-and-leaf diagram?

- A. It summarizes the data into a single value
- B. It shows the spread and preserves the original data
- C. It displays data in a circular format
- D. It groups data into ranges

Question 16: When calculating the mean from a frequency table, what is the first step?

- A. Find the total number of data points
- B. Multiply each value by its frequency
- C. Sum the frequencies
- D. Divide the total by the number of values

Question 17: Which graph type is most appropriate for showing trends over time?

- A. Pie Chart
- B. Bar Chart
- C. Line Graph
- D. Scatter Plot

Question 18: In a box plot, what does the box represent?

- A. The interquartile range
- B. The mean of the data
- C. The range of the data
- D. The mode of the data

Question 19: What is a key feature of a histogram that differentiates it from a bar chart?

- A. The bars are of equal width
- B. The bars can be of different colors
- C. There are no gaps between the bars
- D. It displays categorical data

Question 20: Which type of graph is best for comparing the frequencies of different categories?

- A. Line Graph
- B. Pie Chart
- C. Scatter Plot
- D. Bar Chart

Question 21: What type of relationship does a scatter graph show?

- A. Categorical relationship
- B. Numerical relationship
- C. Relationship between two sets of data
- D. Relationship between three sets of data

Question 22: Which type of correlation is indicated when the points on a scatter graph form a pattern that slopes upwards from left to right?

- A. Positive correlation
- B. Negative correlation
- C. No correlation
- D. Constant correlation

Question 23: What is the main purpose of a line of best fit in a scatter graph?

- A. To connect all data points
- B. To summarize the data
- C. To estimate results
- D. To show the range of the data

Question 24: In the context of scatter graphs, what does a negative correlation indicate?

- A. As one variable increases, the other decreases
- B. Both variables increase together
- C. Both variables decrease together
- D. There is no relationship between the variables

Question 25: When plotting a scatter graph, what should be plotted on the x-axis?

- A. Dependent variable
- B. Independent variable
- C. Constant variable
- D. Categorical variable

Question 26: What is the main difference between a bar chart and a histogram?

- A. Bar charts have gaps between the bars; histograms do not
- B. Histograms have gaps between the bars; bar charts do not
- C. Bar charts represent continuous data; histograms represent categorical data

D. Histograms represent data using circles; bar charts use bars

Question 27: In a histogram, what does the area of each bar represent?

- A. The frequency density
- B. The class width
- C. The frequency
- D. The height of the data

Question 28: How is frequency density calculated in a histogram?

- A. Frequency density = Frequency \times Class width
- B. Frequency density = Frequency $+$ Class width
- C. Frequency density = Frequency \div Class width
- D. Frequency density = Class width \div Frequency

Question 29: Why are histograms used instead of bar charts for continuous data?

- A. Histograms are easier to draw
- B. Bar charts cannot represent continuous data accurately
- C. Histograms show gaps between the data
- D. Bar charts show the frequency density

Question 30: What does a histogram help to visualize better compared to a bar chart?

- A. The mode of the data
- B. The mean of the data
- C. The distribution of continuous data
- D. The median of the data

Question 31: What does a cumulative frequency curve show?

- A. The total frequency at each interval
- B. The mean of the data
- C. The mode of the data
- D. The median of the data

Question 32: Which term is also used to describe cumulative frequency?

- A. Average
- B. Running total
- C. Mode
- D. Range

Question 33: What is the first step in plotting a cumulative frequency curve?

- A. Plotting the median
- B. Calculating the mean
- C. Plotting the lowest possible value
- D. Finding the range

Question 34: What is the median value of a data set?

- A. The highest value
- B. The middle value
- C. The most frequent value
- D. The lowest value

Question 35: What is the interquartile range (IQR) used to measure?

- A. The range of the entire data set
- B. The spread of the middle 50%. The difference between the highest and lowest values
- D. The average of the data set

Question 36: Where are the quartiles located in a cumulative frequency curve?

- A. At $\frac{1}{3}$ and $\frac{2}{3}$ of the data
- B. At $\frac{1}{4}$ and $\frac{3}{4}$ of the data
- C. At the beginning and end of the data
- D. At the median and mode of the data

Question 37: Which of the following angles are always congruent when two parallel lines are cut by a transversal?

- A. Same side interior angles
- B. Corresponding angles
- C. Same side exterior angles
- D. Linear pair of angles

Question 38: When two parallel lines are cut by a transversal, which of the following pairs of angles are supplementary?

- A. Alternate interior angles
- B. Alternate exterior angles
- C. Same side interior angles
- D. Corresponding angles

Question 39: What is the measure of each alternate interior angle when two parallel lines are cut by a transversal and one of the alternate interior angles is 45° ?

- A. 45°
- B. 90°
- C. 135°
- D. 180°

Question 40: If the measure of one of the same side interior angles is 120° when two parallel lines are cut by a transversal, what is the measure of the other same side interior angle?

- A. 60°

- B. 120°
- C. 90°
- D. 180°

Question 41: Which type of angles are formed on the same side of the transversal and outside the two lines?

- A. Corresponding angles
- B. Alternate interior angles
- C. Same side exterior angles
- D. Vertical angles

Question 42: A bag contains 5 red balls, 3 blue balls, and 2 green balls. If one ball is randomly selected from the bag, what is the probability that the ball is red?

- A. $\frac{5}{10}$
- B. $\frac{3}{10}$
- C. $\frac{2}{10}$
- D. $\frac{1}{4}$

Question 43: In a factory, it is observed that 20 out of every 100 products manufactured are failure. If the factory produces 500 products in a day, what is the predicted number of failure products?

- A. 50
- B. 80
- C. 100
- D. 120

Question 44: You are planning a lunch menu. You have 4 types of sandwiches (ham, turkey, veggie, and chicken) and 3 types of drinks (water, soda, and juice). According to the Fundamental Counting Principle, how many different lunch combinations can you create?

- A. 7
- B. 10
- C. 12
- D. 24

Question 45: A box contains 5 red marbles and 3 blue marbles. If you draw one marble, do not replace it, and then draw a second marble, what is the probability of drawing a red marble first and a blue marble second?

- A. $\frac{5}{64}$
- B. $\frac{15}{64}$
- C. $\frac{5}{56}$
- D. $\frac{3}{56}$

Question 46: A candy company wants to estimate the probability that a randomly chosen piece of candy from a large batch is red. They run a simulation

by randomly selecting 1,250 pieces of candy and find that 287 of them are red. Based on this simulation, what is the estimated probability that a randomly chosen piece of candy is red?

- A. 0.18
- B. 0.23
- C. 0.26
- D. 0.31

Part 2: Fill-in-the-Blank (2 Marks Each)

1. The graph of a quadratic function is called a _____.
2. The vertex of a parabola can be found using the formula $x = \frac{-b}{2a}$ for the _____-coordinate.
3. For a quadratic function in standard form $y = ax^2 + bx + c$, the y-coordinate of the vertex can be found by substituting the x-coordinate into the _____.
4. The line that divides a parabola into two symmetric parts is called the _____.
5. If the quadratic function $y = ax^2 + bx + c$ has $a < 0$, the parabola opens _____.
6. The point where the x-axis and y-axis intersect is called the _____.
7. In the coordinate plane, the coordinates of any point are written as an _____.
8. The slope of a line is determined by the ratio of the change in _____ to the change in _____.
9. For the equation of a vertical line, the form is $x =$ _____.
10. A set of points that form a straight line are called _____.
11. A bar chart is most suitable for displaying _____ data.
12. The median of a data set is the _____ value when the data is ordered.
13. In a stem-and-leaf diagram, the 'stem' represents the _____ digit(s) of the data.
14. The mode of a data set is the value that occurs _____.
15. In a histogram, the area of each bar represents the _____ of the data within that interval.

16. In a scatter graph, the relationship between two sets of data is shown by plotting _____.
17. A _____ correlation is indicated when the points on a scatter graph form a pattern that slopes downwards from left to right.
18. The _____ variable is plotted on the x-axis in a scatter graph.
19. A line of best fit is used in a scatter graph to _____ results.
20. When there is no discernible pattern in the points on a scatter graph, it indicates _____ correlation.
21. In a histogram, the height of each bar represents the _____.
22. To calculate the frequency density, you divide the frequency by the _____.
23. The area of each bar in a histogram represents the _____.
24. Histograms are particularly useful for displaying _____ data.
25. The class width in a histogram is the difference between the _____ and _____ values in a class interval.
26. Probability = 1 means the event will _____ happen.
27. Theoretical and experimental probability of an event may or may not be the _____.
28. The Fundamental Counting Principle (FCP) is a way to find all the possible outcomes of an event. For example, you are choosing an outfit for the day. You have 3 shirts (red, blue, and green) and 2 pairs of pants (jeans and khakis). The total number of different outfit combinations you can create is _____.
29. An Independent Event: is an event whose outcome is _____ affected by another event.
30. A team of biologists wants to estimate the probability that a certain species of bird will be seen in a specific area. They conduct a simulation by observing the area 200 times and spotting the bird 38 times. Based on this simulation, the estimated probability of seeing the bird in this area is _____.

Part 3: Short Answer Questions

Question 1

Solve each equation with the quadratic formula.

1) $v^2 + 2v - 8 = 0$

2) $k^2 + 5k - 6 = 0$

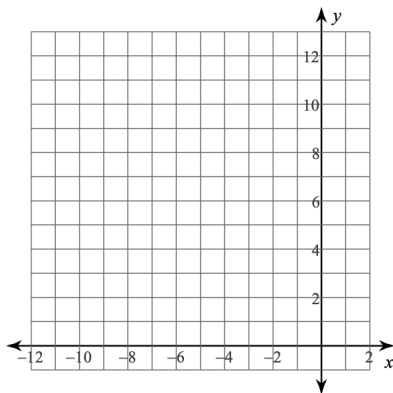
3) $14m^2 + 1 = 6m^2 + 7m$

4) $4x^2 + 4x - 8 = 1$

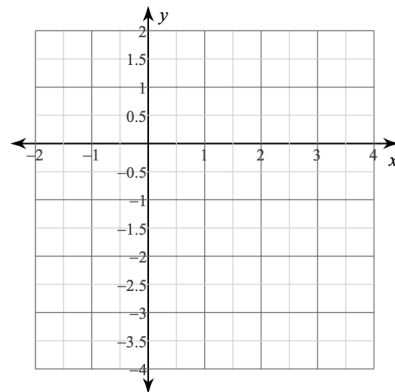
Question 2

Sketch the graph of each function.

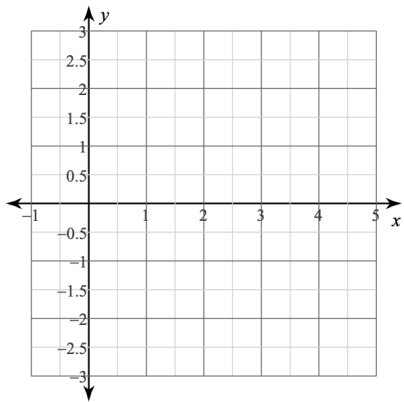
1) $y = 3x^2$



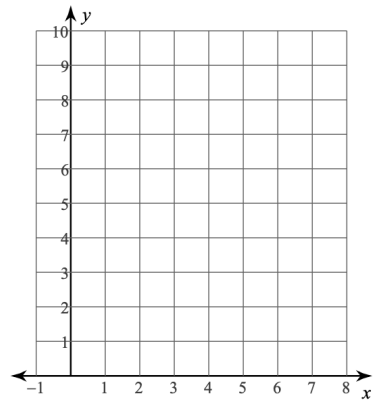
2) $y = -\frac{1}{2}x^2$



3) $y = -x^2 + 2x + 1$



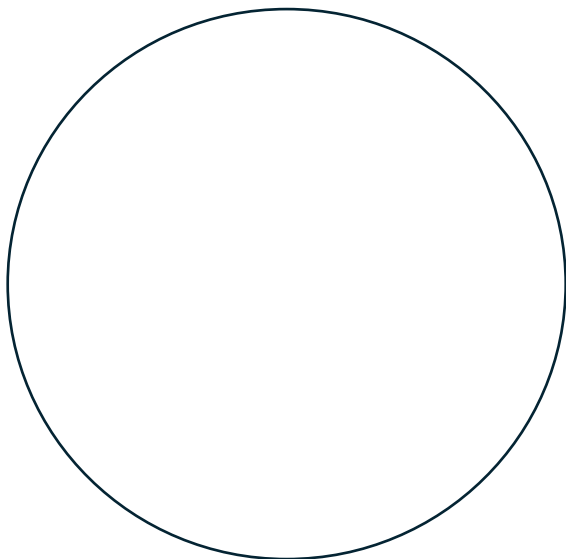
4) $y = 2x^2 - 16x + 33$



Question 3

Please complete the table and draw a pie chart based on the table

Holiday Destination	Frequency	Fraction	Angle
Europe	11	?	?
Asia	25	?	?
Africa	6	?	?
Antarctica	1	?	?



Question 4

a) Draw a bar chart for this frequency table using the axis provided. Ensure you label your axes.

Age	Freq
11-15	3
16-20	6
21-25	2
26-30	7



b) Why technically are we using a bar chart and not a histogram?

Question 5

The sum of five consecutive integers is equal to 140. What is the smallest of the five integers?

Question 6

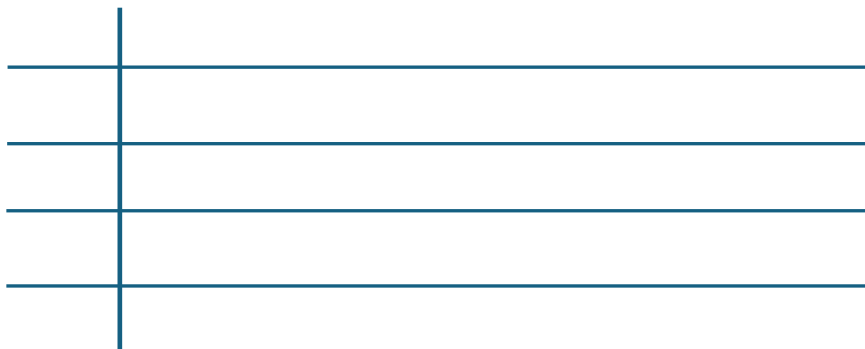
Three different positive integers have a mean of 7. What is the largest positive integer that could be one of them?

Question 7

Here is the weight of 15 cats:

4.5kg 4.9kg 5.2kg 3.9kg 4.1kg
5.0kg 3.6kg 4.9kg 5.3kg 4.3kg
7.4kg 3.6kg 5.3kg 3.8kg 5.3kg

(a) Produce an ordered stem and leaf diagram to show this information.



(b) What is the median weight?

(c) What is the mode weight?

Question 8

Sam collects the weights of 15 squirrels and puts them into weight ranges. His data is presented below. **Estimate the mean weight of a squirrel.**

Weight	10-16kg	16-20kg	20-30kg	30kg-32kg
Frequency	7	3	4	1

Question 9

Miss Clarke values a number of pieces of artwork in the Tiffin School Vault. The price ranges are summarised below. **Estimate the average value of a piece of art in school.**

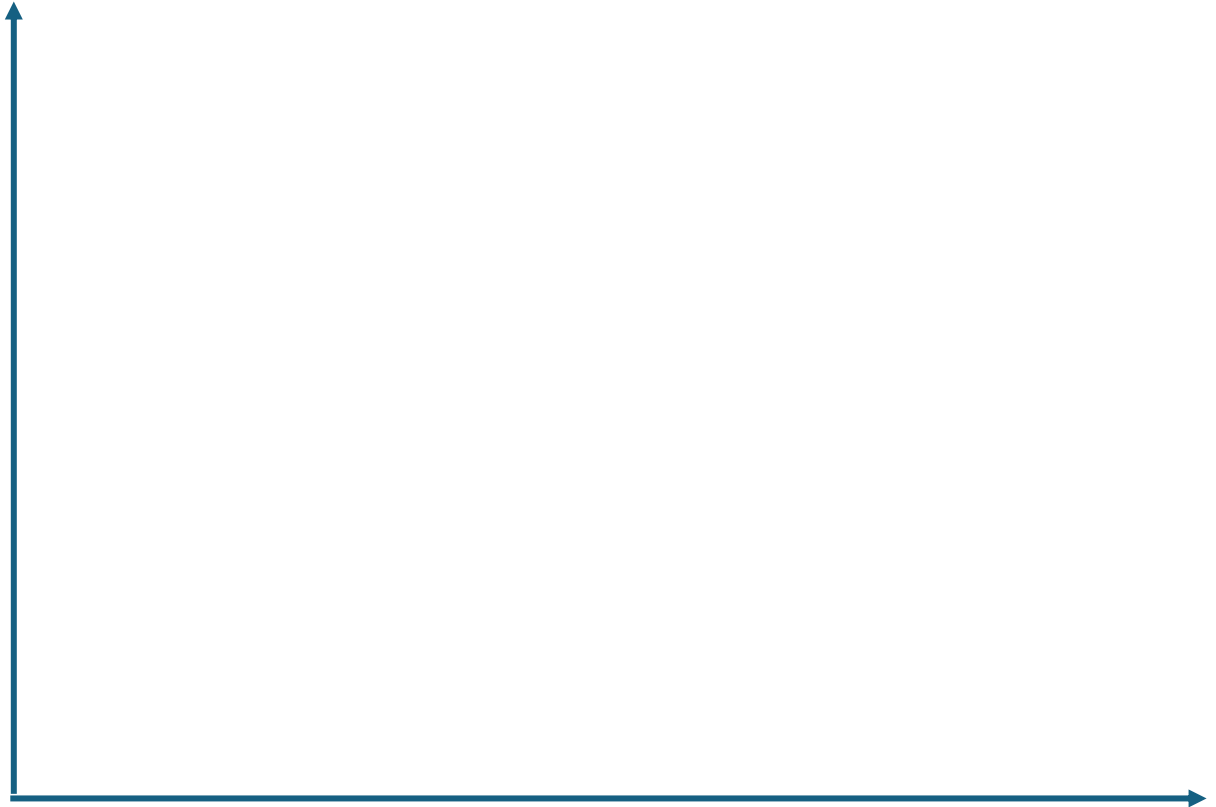
Value	£0-£1000	£1 000-5 000	£5 000-£20 000	£20 000-£100 000
Frequency	10	25	6	1

Question 10

Draw a labelled Histogram for each set of data. Ensure this is done accurately! Remember to think carefully about how you label the x-axis...

Money Spent in a clothes shop.

Money Spent (£)	Frequency	Frequency Density
$0 \leq £ < 20$	40	
$20 \leq £ < 30$	50	
$30 \leq £ < 40$	55	
$40 \leq £ < 50$	40	
$50 \leq £ < 100$	50	



Question 11

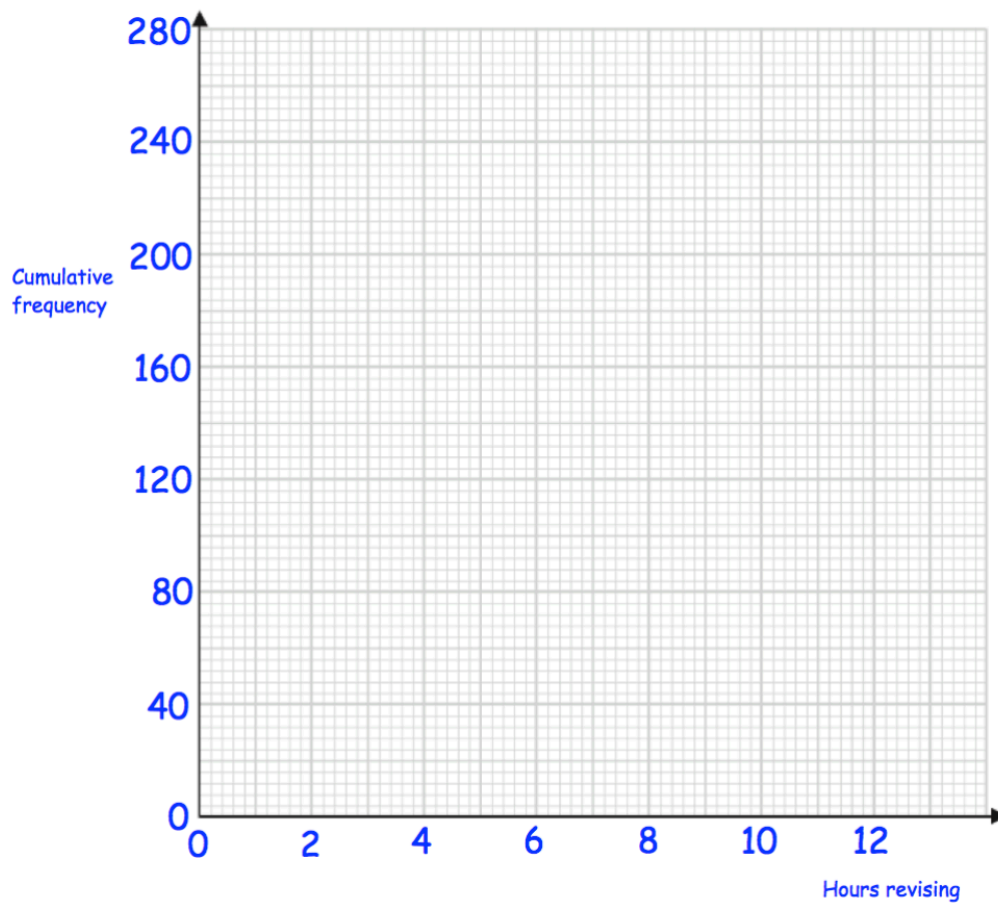
The table shows information about the number of hours that 260 students spent revising for an exam.

Number of hours (h)	Frequency
$0 < h \leq 2$	20
$2 < h \leq 4$	32
$4 < h \leq 6$	48
$6 < h \leq 8$	120
$8 < h \leq 10$	24
$10 < h \leq 12$	16

(a) Complete the cumulative frequency table.

Number of hours (h)	Cumulative frequency
$0 < h \leq 2$	
$0 < h \leq 4$	
$0 < h \leq 6$	
$0 < h \leq 8$	
$0 < h \leq 10$	
$0 < h \leq 12$	

(b) On the grid on the following page, draw a cumulative frequency graph for your table.



(c) Use your graph to find an estimate for the median number of hours spent revising.

.....hours
(1)

(d) Use your graph to find an estimate for the number of students who spent **less** than 3 hours revising.

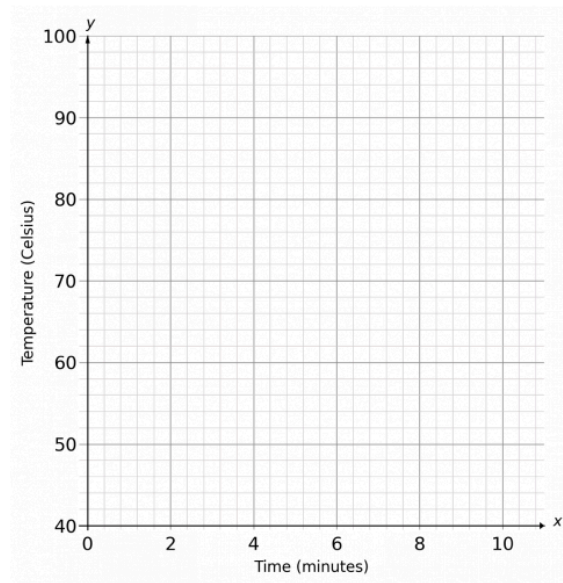
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(2)

Question 12

Question 3: The temperature of a cup of tea is recorded over time. The results are shown in the table below:

Time (mins)	0	1	2	4	5	8	10
Temp ($^{\circ}\text{C}$)	95	89	81	76	72	55	45

a) Draw a scatter graph for the above data.



[3 marks]

b) Describe the correlation between the time and the temperature of the cup of tea.

[1 mark]

c) Describe the relationship shown in the scatter graph.

[1 mark]

d) What is the estimate for the temperature of a cup of tea after 6 minutes?

[1 mark]

e) Explain why it might not be appropriate to use the scatter graph to best estimate the temperature of a cup of tea after 45 minutes.

[1 mark]

Question 13

Draw 2 box plots on the same diagram, using the information on the length of time 2 different types of lightbulb last. Then, answer the questions below.

Speedy Light:

Lowest Value – 1200 hours

Lower Quartile – 1500 hours

Median – 1700 hours

Upper Quartile – 1800 hours

Highest Value – 2800 hours

Ultrabulb:

Lowest Value – 1050 hours

Median – 1400 hours

Upper Quartile – 1900 hours

Range – 1100 hours

Interquartile range – 750 hours

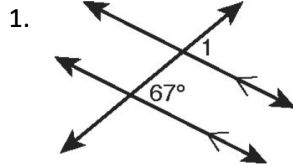
a) Draw **2 box** plot for the information given

b) Look at the medians and interquartile ranges – use these to compare the different types of bulb. Which would you be most likely to use and why?

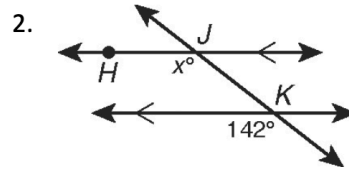
c) What is the probability of a random speedylight bulb lasting more than 1800 hours?

Question 14

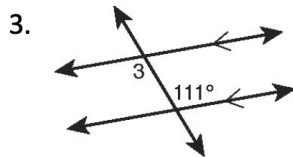
Find each angle measure:



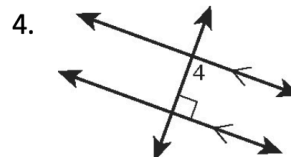
$m\angle 1$ _____



$m\angle HJK$ _____



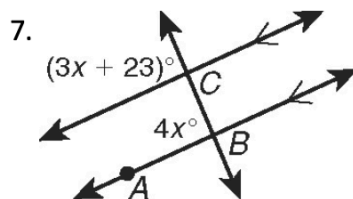
$m\angle 3$ _____



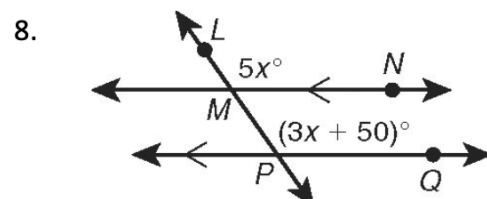
$m\angle 4$ _____

Question 15

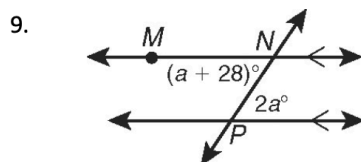
Solve for x , then find the measure of the angle given:



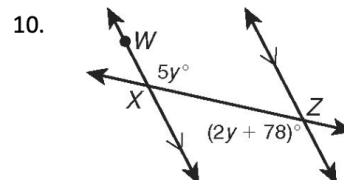
$m\angle ABC$ _____



$m\angle MPQ$ _____



$m\angle MNP$ _____



$m\angle WXZ$ _____

Question 16

A school cafeteria offers 3 types of sandwiches (ham, turkey, and veggie) and 2 types of drinks (water and soda).

- a) If a student randomly selects one sandwich and one drink, what is the probability they choose a turkey sandwich and a soda?
- b) The cafeteria is running a promotion where, if a student chooses a ham sandwich, they must choose water. If a student selects a sandwich first, what is the probability they will end up with a ham sandwich and water?
- c) The cafeteria runs a simulation by observing the choices of 100 students. They find that 30 students chose a veggie sandwich, and 50 chose soda. Based on this simulation, what is the estimated probability that a randomly chosen student selects a veggie sandwich and a soda?

Question 17:

A bag contains 7 red marbles, 5 green marbles, and 3 blue marbles. A student randomly selects two marbles from the bag.

- a) What is the probability that both marbles drawn are green if the first marble **is put back into the bag** before drawing the second?
- b) What is the probability that both marbles drawn are green if the first marble **is not put back** into the bag before drawing the second?

Question 18:

A farmer is planting crops in two fields. Field 1 has a 70% chance of growing wheat and a 30% chance of growing corn. Field 2 has a 60% chance of growing wheat and a 40% chance of growing corn.

- a) What is the probability that both fields will grow wheat?

- b) If Field 1 grows wheat and this increases the likelihood that Field 2 will also grow wheat to 80%, what is the probability that both fields will grow wheat under this new condition?

- c) If the farmer plants crops in 200 fields, how many fields are expected to grow corn based on the original probabilities?