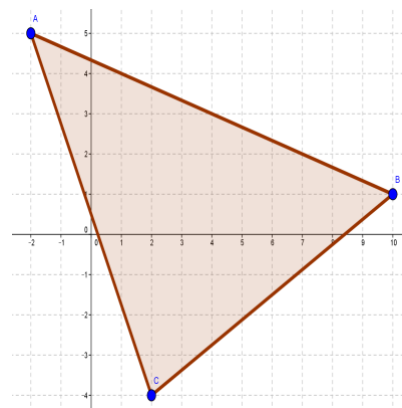


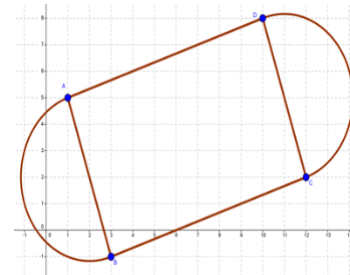
PART 1 - The Basics - Show your calculations to earn full credit for your answers.

1. Triangle ABC is shown in the diagram with vertices at $A(-2,5)$, $B(10,1)$, and $C(2,-4)$ and answer the following questions:

- a. Find the midpoint of BC . Label it as M on the diagram of $\triangle ABC$
- b. Draw the line segment from vertex A to point M
- c. What is the name of this line segment (AM)? Choose the correct name from the list below:
 - (i) angle bisector
 - (ii) altitude
 - (iii) perpendicular bisector
 - (iv) median
- d. Find the slope of side BC .
- e. Is side BC perpendicular to segment AM ? Show appropriate mathematical reasoning to justify why or why not

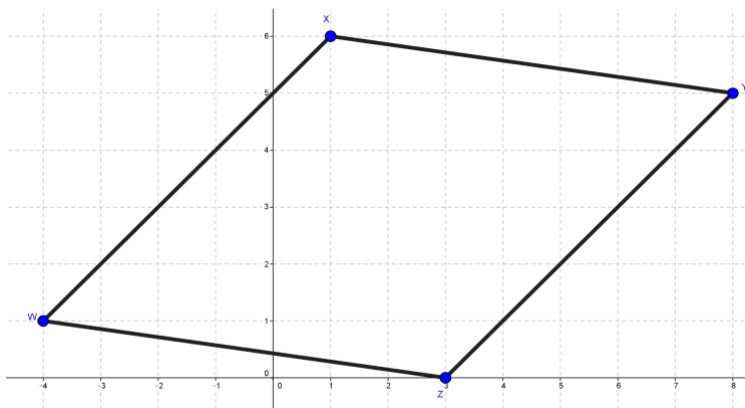


2. Mr. Santowski is designing a new soccer field for the CAC campus. He has marked the 4 corners of the rectangular field at the following coordinate positions: $A(1,5)$, $B(3,-1)$, $C(12,2)$ and $D(10,8)$. At each end of the rectangular field, Mr. S has placed 2 semicircles, as shown in the diagram. **NOTE: Each unit on the grid of this diagram represents 10 meters.**



- a. Determine the length of the rectangular portion of the soccer field.
 - b. Determine the width of the rectangular portion of the soccer field.
 - c. Determine the TOTAL area of the COMPLETE field (including the semicircles).
 - d. Mr. Rutherford wants us to put a running track around the ENTIRE soccer field, so he needs to know the perimeter of the ENTIRE field. Calculate the perimeter of the field.
3. You are given a diagram of triangle DEF , where $D(2,3)$, $E(9,6)$ and $F(7,1)$. You are being asked to prove that $\triangle DEF$ is a right isosceles triangle.

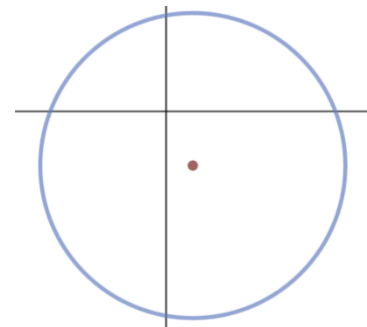
4. You are now working with quadrilateral WXYZ and you are being asked to prove that the diagonals of this quadrilateral are perpendicular bisectors of each other. I have provided a sketch and have also provided all necessary information (calculations, measurements, etc). **You are now required to make the CONCLUSION & JUSTIFICATION.**



Midpoints	Lengths	Slopes
Midpoint of WX = (-1.5, 3.5)	Length of WX = 7.07 units	Slope of WX = 1
Midpoint of WY = (2, 3)	Length of WY = 12.65 units	Slope of WY = 1/3
Midpoint of WZ = (-0.5, 0.5)	Length of WZ = 7.07 units	Slope of WZ = -1/7
Midpoint of XY = (4.5, 5.5)	Length of XY = 7.07 units	Slope of XY = -1/7
Midpoint of XZ = (2, 3)	Length of XZ = 6.32 units	Slope of XZ = -3
Midpoint of YZ = (5.5, 2.5)	Length of YZ = 7.07 units	Slope of YZ = 1

- Circle the data that you will use when you make your conclusion and justification
 - So, now that you have selected the appropriate data, make your conclusion and make your justification(s) for your conclusion.
- Determine the type of quadrilateral described by the vertices R(-6,7), S(3,4), T(-14,-2) and U(4,-8). Show all the steps of your solution.
 - You are given three points at (-9,6), (2,2), and (-2,-3). Determine the location of a fourth point such that you now have a parallelogram. Show/explain the keys steps in your working or thinking as you present your solution. BONUS: Find a second location for this fourth point!!!
 - Mr. Smith tosses a stone into a pond, creating a circular ripple. The radius of the ripple increases by 9 cm/s.

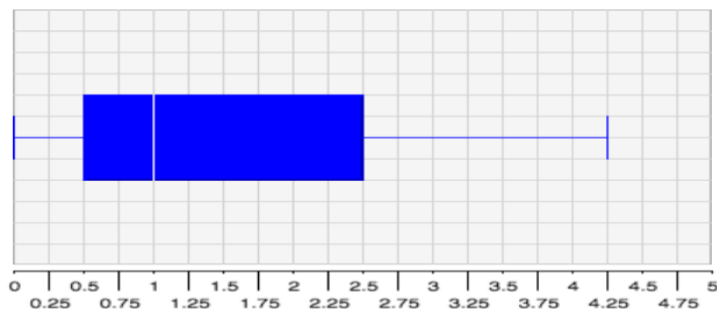
- a. Write an equation that describes the ripple exactly 4 seconds after the stone lands in the water. Use the point $(2, -4)$ as the point where the stone first lands in the water.
- b. A toy boat is located at the point $(-28, 64)$. How many seconds will it take the ripple to reach the toy boat?



8. The table below shows the frequency distribution of the number of dental fillings for a group of 250 American children.

Number of fillings	0	1	2	3	4	5
Frequency	40	30	50	q	40	10

- a. Explain why the value of q is 80.
- b. Is this data an example of discrete data or continuous data? Explain your reasoning.
- c. Use your calculator to find:
- (i) the mean number of fillings (ii) the median number of fillings (iii) the mode number of fillings
- d. The following box and whisker plot showing statistical information about the number of dental fillings for a group of **250 Egyptian children**.

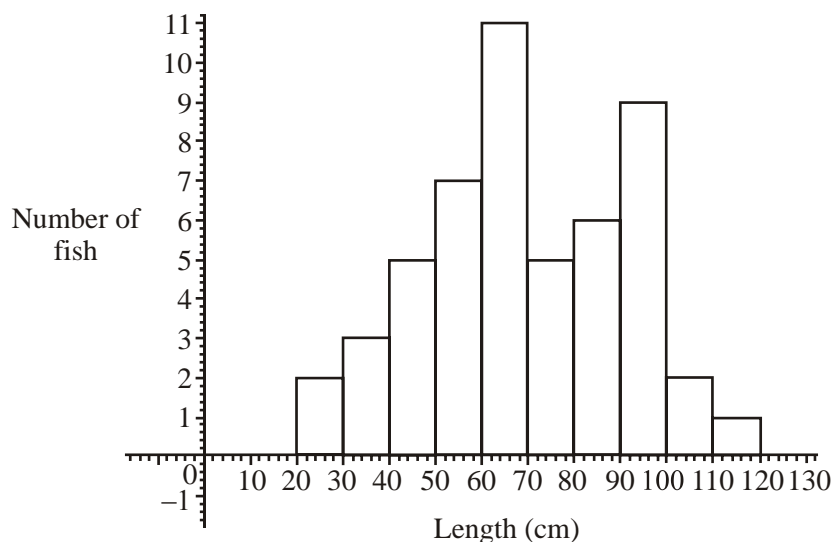


List one thought/observation about the number of fillings in American and another one for the Egyptian children

List one question you may have about the data presented

Which group (American or Egyptian) seems to have more fillings? Explain your reasoning

9. The figure below shows the lengths in centimeters of fish found in the net of a small trawler.



- a. Find the total number of fish in the net
- b. Find
 - i. the modal length interval;
 - ii. the interval containing the median length;
 - iii. an estimate of the mean length.

The fishing company must pay a fine if more than 10% of the catch have lengths less than 40cm.

- c. Will the company be fined? Show your calculations to back up your answer.

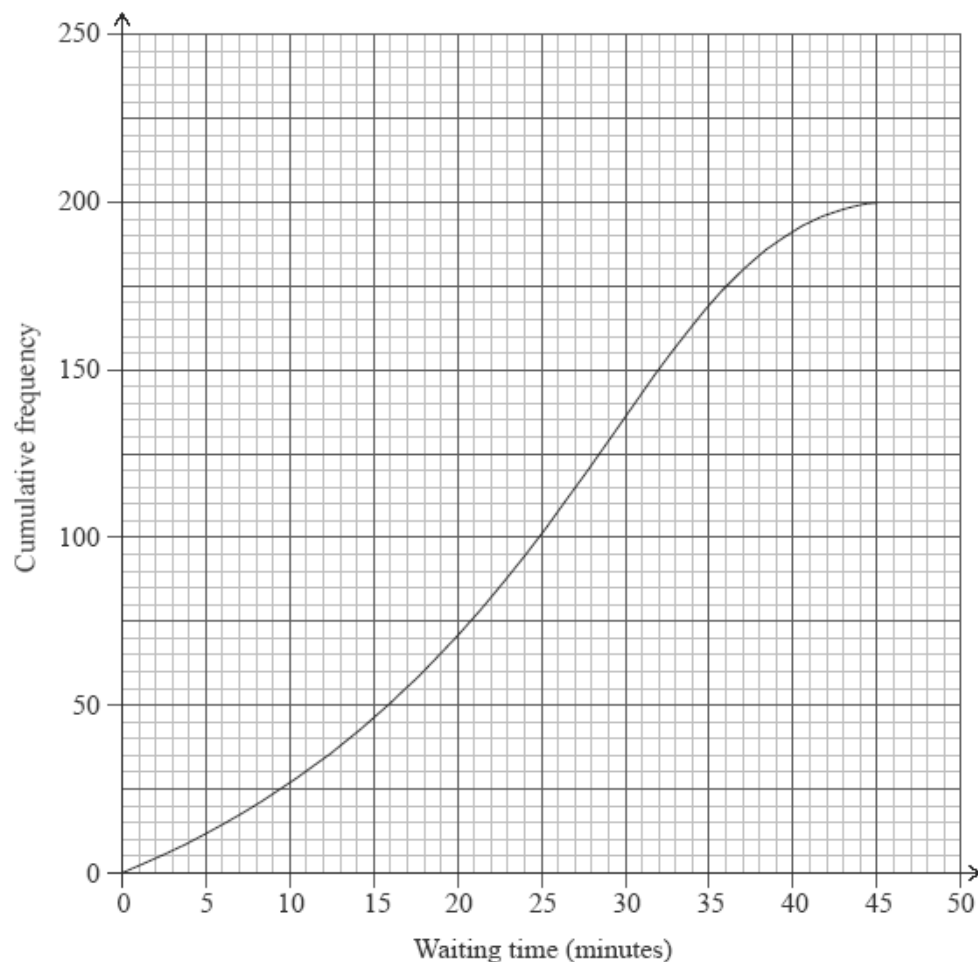
10. Kelly scored the following on 5 science tests during second semester: 73%, 89%, 94%, 87%, 82%.

- d. What is the next test score Kelly must get to have an 85% test average in science?
- e. What is Kelly's maximum possible test average in science?

Let's say Kelly scored 95% on Test #6. Now Kelly's semester grade is 86.7%. In Science, the final exam is weighted 20% of the overall grade and the semester grades are weighted 80% of the overall grade. Kelly's personal goal for second semester is to earn **at least** a B+ in Science.

- f. Is it possible for Kelly to get an A- (90%) in Science?

11. The cumulative frequency graph shows the amount of time in minutes, 200 students spend waiting for their train on a particular morning.



Use the graph to:

- | | |
|--|---|
| <p>a. Write down the median waiting time.</p> | <p>b. Write down an estimate for Q1 and for Q3.</p> |
| <p>c. Find the percentage of students who waited for more than 37 minutes.</p> | <p>d. Find the value of m if 57.5% of the time students waited for less than m minutes.</p> |

12. A random sample of 167 people who own mobile phones was used to collect data on the amount of time they spent per day using their phones. The results are displayed in the table below.

Time spent per day (t minutes)	$0 \leq t < 15$	$15 \leq t < 30$	$30 \leq t < 45$	$45 \leq t < 60$	$60 \leq t < 75$	$75 \leq t < 90$
Number of people	21	32	35	41	27	11

- a. Draw a fully labeled histogram to represent the data.
- b. State the modal group.
- c. Use your calculator to calculate approximate values of the mean and median of the time spent per day on these mobile phones.
- d. If there are 250,783 people in the town where the sample was taken, approximately how many people in this town spend at least 45 minutes on their mobile phones?

13. The local council has been monitoring the number of cars parked near a supermarket on an hourly basis. The results are displayed below.

Parked Cars/Hour	Frequency	Cumulative Frequency
0–19	3	3
20–39	15	18
40–59	25	w
60–79	35	78
80–99	17	95

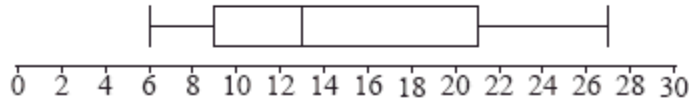
- a. Write down the value of w .
- b. Draw and label the **Cumulative Frequency** graph for this data.

14. A scientist has 100 female fish and 100 male fish. She measures their lengths to the nearest cm. These are shown in the following box and whisker diagrams.

Female fish

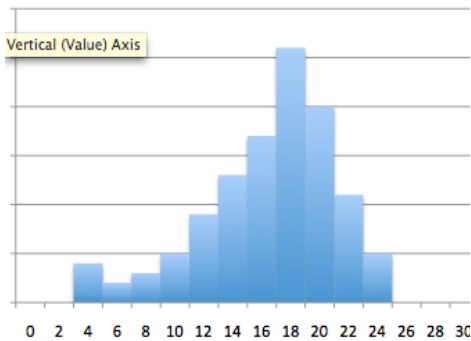


Male fish

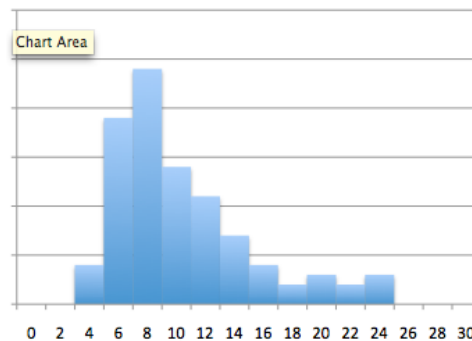


- | | |
|---|---|
| <p>a. Write down the median length of the female fish.</p> <p>c. Find the interquartile range of the female fish.</p> <p>e. Make a conclusion about the lengths of female and male fish.</p> <p>f. Find the range of the lengths of all 200 fish.</p> | <p>b. Write down the median length of the male fish.</p> <p>d. Find the interquartile range of the male fish.</p> |
|---|---|
- g. Here are three plots that **COULD** represent the box & whisker pots for the **female fish**. Select one and explain your reasoning.

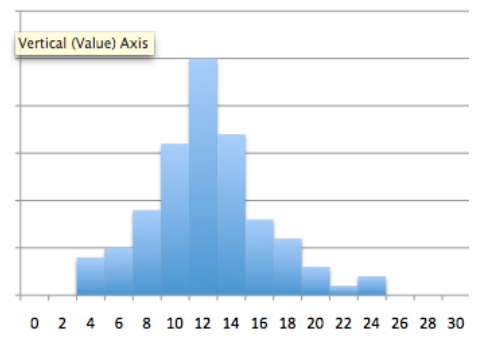
PLOT (A)



PLOT (B)

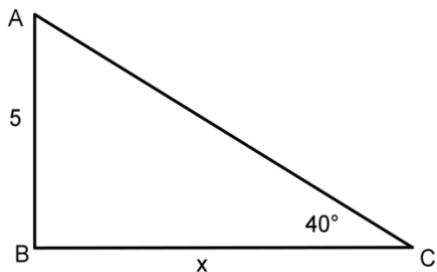


PLOT (C)

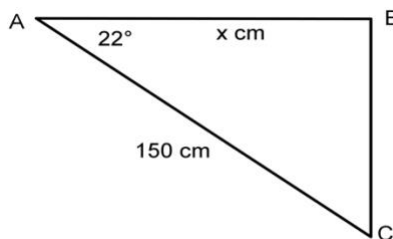


15. You are provided with four diagrams of right triangle. For each triangle, solve for the required unknown. Be sure to properly present your solutions. In all four diagrams, angle B is the right angle.

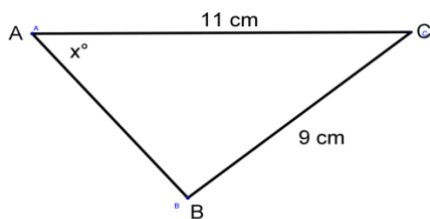
(a) Solve for side BC.



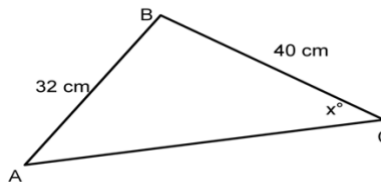
(b) Solve for side AB.



(c) Solve for $\angle BAC$.

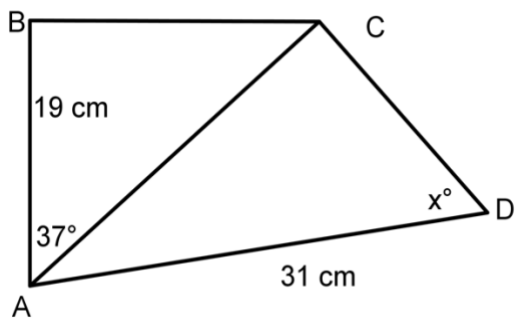


(d) Solve for $\angle BAC$.

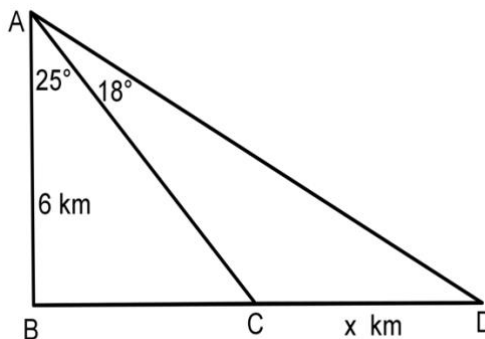


16. You are provided with two diagrams with multiple triangles. Solve for the required unknown in each diagram, providing properly presented solutions. If you require assistance in thinking your way through HOW to set up the solution, intermediate “steps” may be “purchased” from your teacher (at the cost of T marks)

(a) Solve for $\angle CDA$



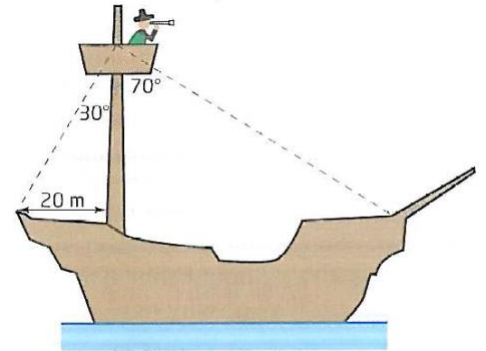
(b) Solve for side CD.



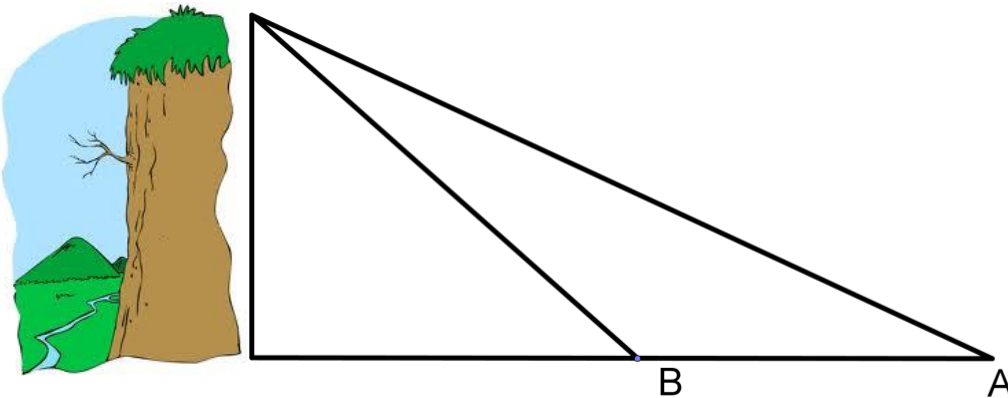
17. Mr. Santowski is on top of the school, on the tennis courts, watching a soccer game on the MS field. The angle of depression he needs to observe the players on the ISM team bench is 21° . Mr. Santowski knows that the players' bench is 52 m from the foot of the wall of the school. Calculate the height of the tennis courts from which Mr. S is watching the game. Draw a diagram to illustrate this problem.

18. Captain Justin is sitting in the crow's-nest of his ship, as shown in the diagram.

- How high above the deck is Captain Justin?
- What is the length of Captain Justin's ship?
- How long is each wire holding up the crow's-nest?



19. Mr. Santowski is about to go rock climbing on the wall of a cliff. He wants to determine the height of the cliff, so from Point A, he observes the top of the cliff with an angle of elevation of 12° . He then moves directly forward 40 meters to Point B. From this new point, he notices the angle of elevation to now be 36° . Use this data to determine the height of the cliff. (a partial diagram is provided and hints can be "purchased" for T marks)



20. Given the diagram of a right triangle below, state whether this triangle can exist.

