

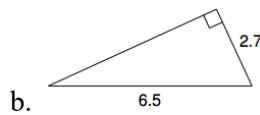
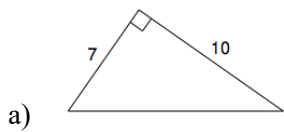
# Dec 2019 Semester Exam Review Qs | Name \_\_\_\_\_

- 1) Find lengths and midpoints of the line segments joining the following pairs of points (and find the measure of the angle these line segments make with the  $x$ -axis as well). Additionally, if the points given represent the end points of a diameter of a circle, determine the equation of the circle through these end points of the diameters.

- a)  $A(-1,3)$  and  $B(5,-7)$                       b.  $C(6,12)$  and  $D(-2,-14)$

- 2) Line segment EF has an endpoint and a midpoint at  $(6,4)$  and  $(1,-5)$ . Determine the possible location(s) of the second endpoint of line segment EF. In your solution, please include a diagram to help you visualize the problem.

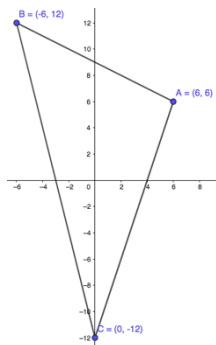
- 3) Given the following right triangles, determine the length of the unknown side. Round your final answers to the nearest hundredth.



- 4) Determine the equation of the line through the points  $X(7,-3)$  and  $Y(3,5)$ . Write your final answer in standard form.

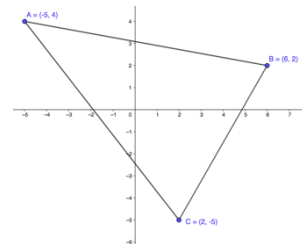
- 5) Here is a diagram of a triangle, where  $A(6,6)$ ,  $B(-6,12)$  and  $C(0,-12)$ .

- a) Draw the median from vertex B.  
b) Determine the equation of this median.  
c) Use trigonometry to find the measure of all three angles.



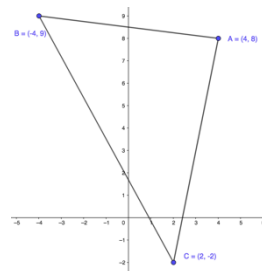
- 6) A triangle has its vertices at  $A(-5,4)$ ,  $B(6,2)$  and  $C(2,-5)$  as shown in the diagram.

- a) Draw the perpendicular bisector of side A  
b) Determine the equation of this perpendicular bisector.  
c) Use trigonometry to find the measure of all three angles.



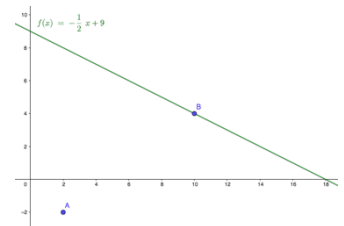
- 7) Given triangle ABC, where  $A(4, 8)$ ,  $B(-4, 9)$  and  $C(2, -2)$  determine:

- a) whether this triangle is scalene, isosceles or equilateral.  
b) whether the triangle is a right triangle or not.  
c) Use trigonometry to find the measure of all three angles.



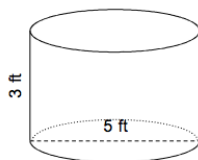
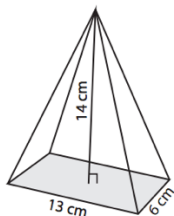
- 8) You are given the linear function  $f(x) = -\frac{1}{2}x + 9$  and the point  $A(2,-2)$ . A diagram showing this line and the point are provided for you.

- a) The point  $B(10,4)$  is on the line  $f(x)$ . How far is the point  $B(10,4)$  from  $A(2,-2)$ ?  
b) What point on  $f(x)$  is closest to the point  $A(2,-2)$ ? Show/explain your reasoning.  
c) Use trigonometry to find the measure of the angle that the line makes with the  $x$ -axis.



- 9) Given the points  $A(3,-5)$  and  $B(-5,7)$ , determine:
- the length of the line segment through these points;
  - the midpoint of the line segments through these points;
  - the equation of the line through these points.
  - Use trigonometry to find the angle that this line makes with the  $x$ -axis.
- 10) A rectangular prism measures 4 m by 6 m by 9 m. Determine its volume and surface area.
- 11) A circle has a diameter of 8 units and its center is at  $(0,0)$ .
- Determine the equation of this circle.
  - Determine the  $x$  coordinate(s) of the point(s) whose  $y$  coordinate is  $y = 2$ .

- 12) Determine the volume of the two solids shown in the following diagrams:



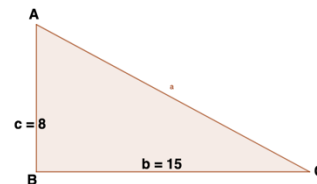
- 13) Determine the type of quadrilateral that is described by the vertices  $R(-3,2)$ ,  $S(-1,6)$ ,  $T(3,4)$  and  $U(3,-1)$ . Show appropriate mathematical reasoning in justifying the type of quadrilateral.
- 14) A rhombus is defined by the vertices  $J(-1,1)$ ,  $K(3,4)$ ,  $L(8,4)$  and  $M(4,1)$ . Show that the diagonals are perpendicular bisectors of each other.
- 15) A circle has a diameter with the endpoints at  $C(-5,11)$  and  $D(9,-7)$ . Determine the equation of this circle.
- 16) A triangle has vertices at  $X(-1,2)$ ,  $Y(4,-2)$  and  $Z(3,5)$ . Determine the equation of the altitude from the vertex at  $Y$ .
- 17) Gabriele is constructing a concrete patio that is in the shape of an isosceles triangle. On his plan, the vertices of the triangle are at  $P(2,1)$ ,  $Q(5,7)$  and  $R(8,4)$ . Each unit represents 3 meters.
- Graph the points to show the triangular patio and draw the triangle.
  - Determine the perimeter of the triangular patio.
  - We know that the median of an isosceles triangle is the **same** as the altitude of an isosceles triangle. Therefore, determine the area of this triangular patio.
  - To build the patio, the depth of the concrete needs to be 30 cm. Determine the volume of concrete that Gabriele needs to construct the patio.
  - If concrete costs  $\$200/\text{m}^3$ , determine the cost of the concrete used in the construction.

# Dec 2019 Semester Exam Review Qs | Name \_\_\_\_\_

18) A chord is a line segment that connects 2 points on a circle. The circle  $(x - 5)^2 + (y - 2)^2 = 125$  has the following 2 points on it: A(-6,0) and B(10,12) which then form the chord AB. Show that the perpendicular bisector of this chord AB goes through the center of the circle.

19) Here is a diagram of a right triangle, complete with some of the lengths of the sides. Use the information in the diagram to:

- find the length of the hypotenuse
- write down the value of the sine **ratio** for  $\angle A$
- write down the value of the cosine **ratio** for  $\angle A$
- write down the value of the tangent **ratio** for  $\angle C$



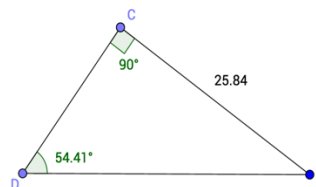
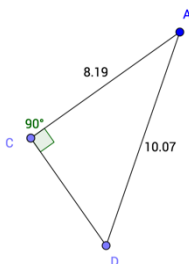
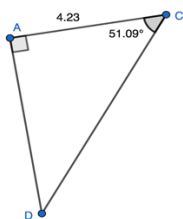
20) Faisal knows that the sine ratio of an angle is  $\frac{4}{7}$ . So Jack says that he therefore knows the cosine ratio of this angle. What does the cosine ratio of this angle equal?

21) Sarah used her calculator to determine  $\sin^{-1}\left(\frac{5}{3}\right)$  and she got an error on her calculator.

- Explain why she got an error.
- Sam therefore decides that trying to do  $\tan^{-1}\left(\frac{5}{3}\right)$  should also give her an error on the calculator. Is she correct or not? Why/why not.

22) Find the measure of the specified lengths in these two triangles

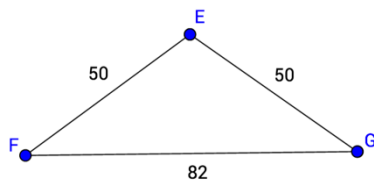
- length DC
- length AD



23) Find the measure of angle A.

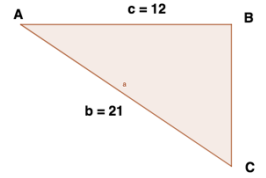
24) From the top of a 150 foot lighthouse, the angle of depression to a ship on the ocean is  $19^\circ$ . How far is the ship from the base of the lighthouse?

25) Find the measure of angle F.



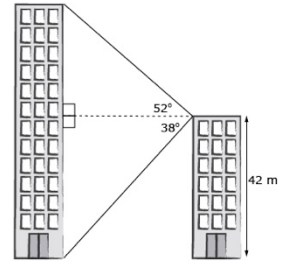
26) Given this triangle pictured here:

- Solve this triangle, i.e. solve for all unknown sides and angles.
- Ishaan now draws a median from vertex C and Tori decides that  $\angle ACB$  was now **bisected** (cut in half). Is Tori correct? Show appropriate mathematical reasoning (and appropriate calculations are one way to do that)

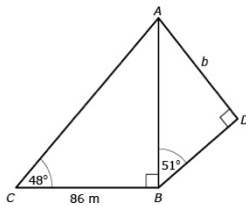


27) Two buildings in downtown Towskiville are positioned such that the angle of elevation from the top of the shorter building to the top of the taller building is  $52^\circ$  and the angle of depression from the top of the shorter building to the bottom of the taller building is  $38^\circ$

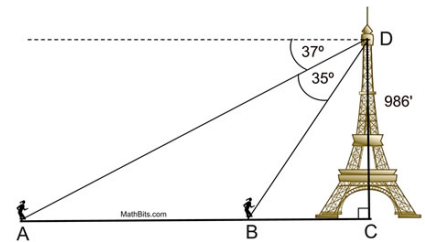
- Find the height of the taller building
- Find the distance between the two buildings.
- What is the angle of depression from the top of the higher building to the bottom of the lower building?



28) Find the length AD.

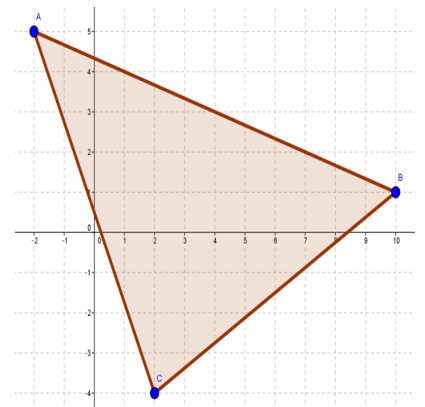


29) Mr. Rawlings and Mr. Smith are visiting the Eiffel Tower. Each one is standing a certain distance away from the tower. Given the diagram below, how far apart are they from each other.

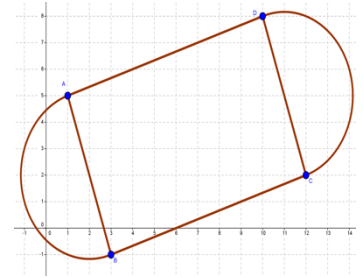


30) Triangle ABC is shown in the diagram with vertices at  $A(-2,5)$ ,  $B(10,1)$ , and  $C(2,-4)$  and answer the following questions:

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

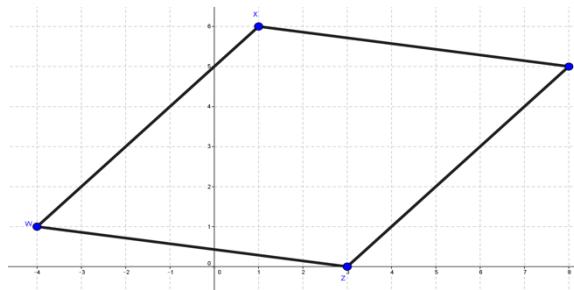


31) Mr. Santowski is designing a new soccer field for the CAC campus. He has marked the 4 corners of the rectangular field at the following coordinate positions: A(1,5), B(3,-1), C(12,2) and D(10,8). At each end of the rectangular field, Mr. S has placed 2 semicircles, as shown in the diagram. **NOTE: 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.
- 32) 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.

33) 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

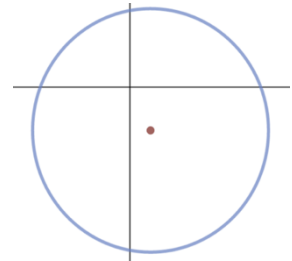
- a. Circle the data that you will use when you make your conclusion and justification
- b. So, now that you have selected the appropriate data, make your conclusion and make your justification(s) for your conclusion.

# Dec 2019 Semester Exam Review Qs Name \_\_\_\_\_

34) 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. Use trigonometry to determine the measure of all four angles of the quadrilateral.

35) 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!!!

36) Mr. Smith tosses a stone into a pond, creating a circular ripple. The radius of the ripple increases by 9 cm/s.

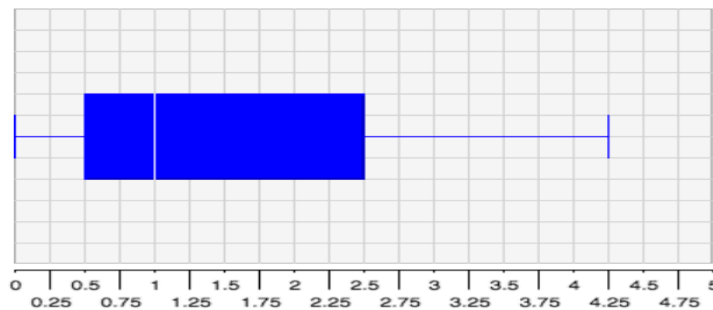


- a) Write an equation that describes the ripple exactly 4 seconds after the stone lands in the water. Use the point (2,-4) as the point where the stone first lands in the water.
- b) A toy boat is located at the point (-28, 64). How many seconds will it take the ripple to reach the toy boat?

37) 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 the mean and median 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.

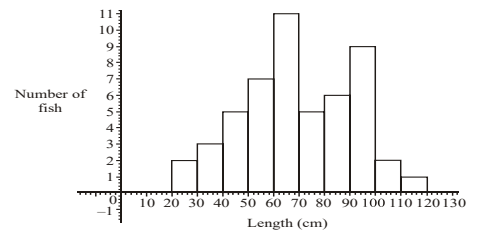


List one thought/observation about the number of fillings in American and another one for the Egyptian children

List one question you may have about the data presented

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

38) 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.

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

- a. What is the next test score Kelly must get to have an 85% test average in science?
- b. 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.

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

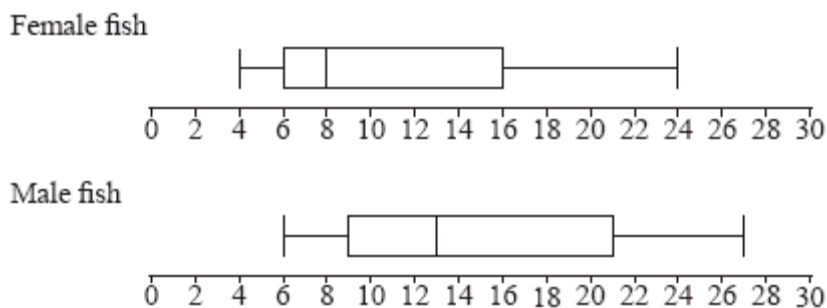
40) A random sample of 167 people who own mobile phones was used to collect data on the amount of time they spent per day using their phones. The results are displayed in the table below.

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?

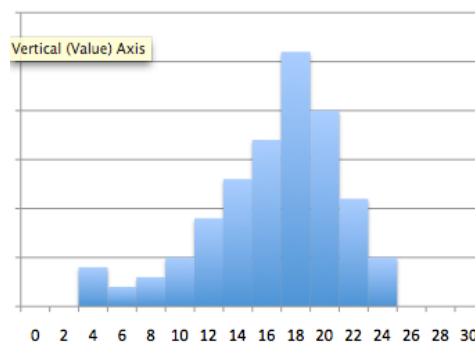
# Dec 2019 Semester Exam Review Qs Name \_\_\_\_\_

41) 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.

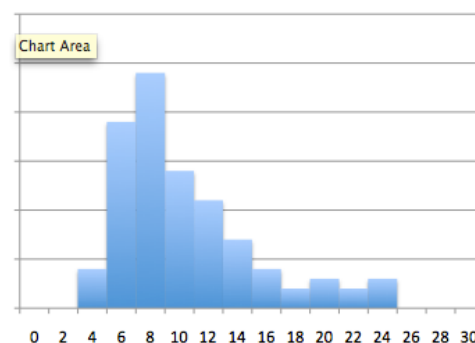


- a. Write down the median length of the female fish.
- b. Write down the median length of the male fish.
- c. Find the interquartile range of the female fish.
- d. Find the interquartile range of the male fish.
- e. Make a conclusion about the lengths of female and male fish.
- f. Find the range of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

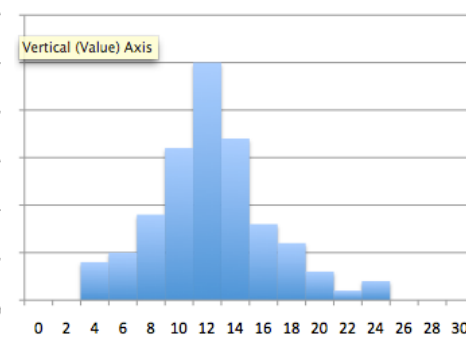
PLOT (A)



PLOT (B)



PLOT (C)

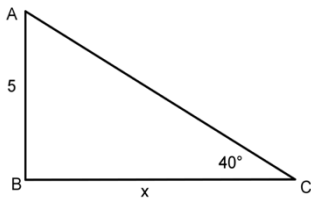


42) Mr. Santowski is on top of the school, on the tennis courts, watching a soccer game on the MS field. The angle of depression he needs to observe the players on the ISM team bench is  $21^\circ$ . Mr. Santowski knows that the players' bench is 52 m from the foot of the wall of the school. Calculate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

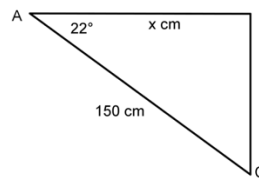
43) You are provided with four diagrams of right triangle. For each triangle, solve for the required unknown. Be sure to properly present your solutions. In all four diagrams, angle B is the right angle.



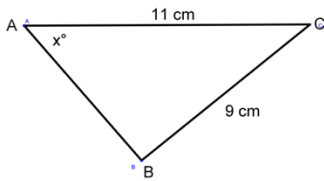
(a) Solve for side BC.



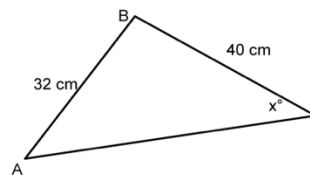
(b) Solve for side AB.



(c) Solve for  $\angle BAC$ .

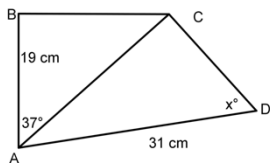


(d) Solve for  $\angle BAC$ .

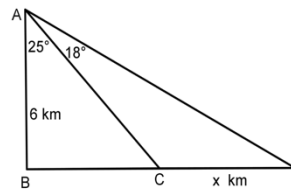


44) You are provided with two diagrams with multiple triangles. Solve for the required unknown in each diagram, providing properly presented solutions. If you require assistance in thinking your way through HOW to set up the solution, intermediate “steps” may be “purchased” from your teacher (at the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

(a) Solve for  $\angle CDA$

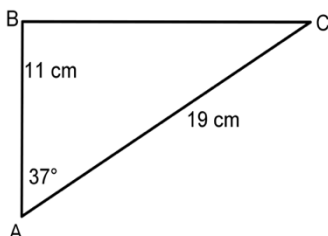
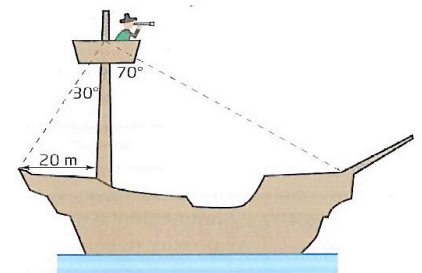


(b) Solve for side CD.



45) 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?



46) Given the diagram of a right triangle on the left, determine whether this triangle can exist.

47) 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  $12^\circ$ . He then moves directly forward 40 meters to Point B. From this new point, he notices the angle of elevation to now be  $36^\circ$ . Use this data to determine the height of the cliff. (a partial diagram is provided and hints can be “purchased” for T marks )

