

IB Math Studies 2 -- Do this now:

A rectangle has length  $2.6 \times 10^4$  and width  $1.9 \times 10^4$ . Find each of the following, giving your answer in the form  $a \times 10^k$ , where  $1 \leq a < 10$  and  $k \in \mathbb{Z}$ .

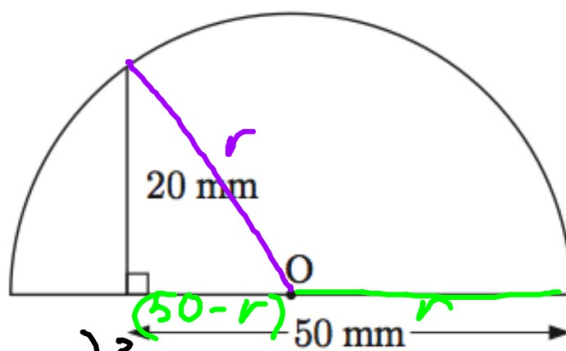
- (a) The area of the rectangle;
- (b) The perimeter of the rectangle.

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Questions on the assignment?

Exercise 12 A # 3 a-c, # 4 e-f, # 5 d-f, # 6,7,8,9 all

Find the radius of this semi-circle.



$$20^2 + (50-r)^2 = r^2$$

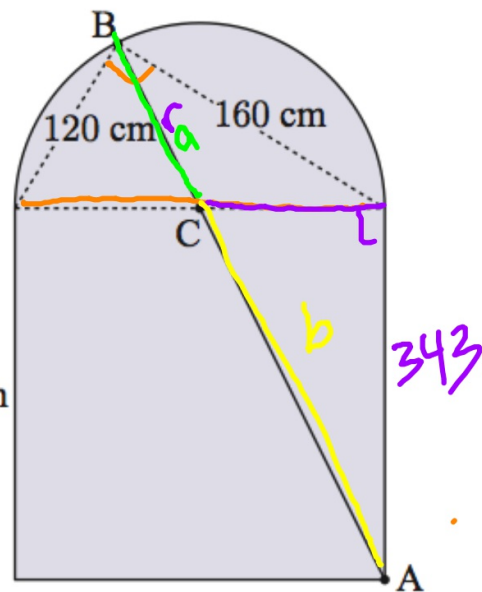
$$400 + 2500 - 100r + \cancel{r^2} = \cancel{r^2}$$

$$2900 = 100r$$

The doorway alongside is rectangular at the bottom with a semi-circular arch at the top.

- a Find the radius of the semi-circle.
- b Find the length of line segment AC.
- c Hence find the length of the line segment AB which passes through the circle's centre C.

457.28 cm  
 $\sim 457 \text{ cm (3sf)}$



# Chapter 12

## Pythagoras' theorem

- C The converse of Pythagoras' theorem
- D Problem solving
- E Three-dimensional problems

**C****THE CONVERSE OF PYTHAGORAS' THEOREM**

If we know all the side lengths of a triangle, we can determine whether the triangle is right angled by using the **converse of Pythagoras' theorem**.

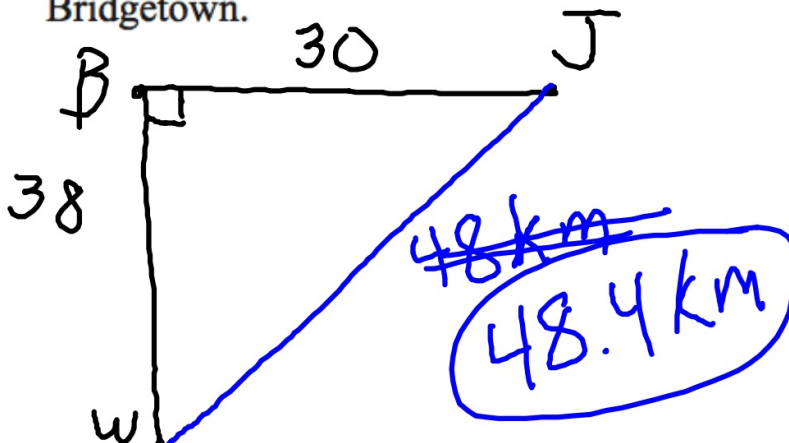
If a triangle has sides of length  $a$ ,  $b$ , and  $c$  units and  $a^2 + b^2 = c^2$ , then the triangle is right angled.

if  $a^2 + b^2 \neq c^2 \therefore$  Not a right  $\Delta$

**D****PROBLEM SOLVING**

Captain Jack and Captain Will leave Bridgetown at the same time. Jack sails due east at a constant speed of  $15 \text{ km h}^{-1}$ , and Will sails due south at a constant speed of  $19 \text{ km h}^{-1}$ .

- How far has each captain travelled after two hours?
- Find the distance between them 2 hours after leaving Bridgetown.



Police Officer Francisca has had her bicycle stolen. She walks north from the police station trying to find it. Officer Gisela also searches by travelling west of the station, and she goes at twice the speed because her bicycle wasn't stolen. After 2 hours, their walkie-talkies are just out of their 12 km range. How fast did each officer travel?

$$(2x)^2 + x^2 = 12^2$$

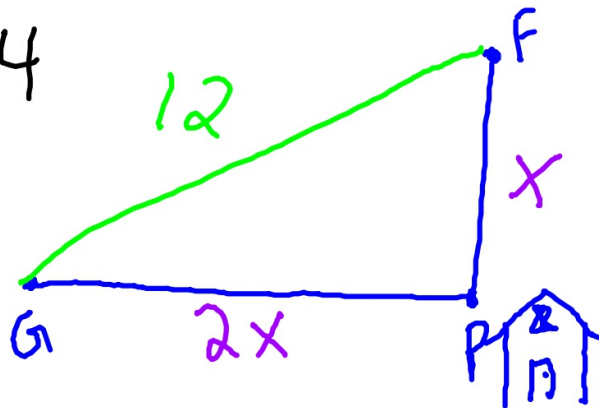
$$4x^2 + x^2 = 144$$

$$5x^2 = 144$$

$$x^2 = 28.8$$

$$x = 5.37$$

$$\frac{5.37 \text{ km}}{2 \text{ hr.}} = 2.69 \frac{\text{km}}{\text{hr}}$$



## E

## THREE-DIMENSIONAL PROBLEMS

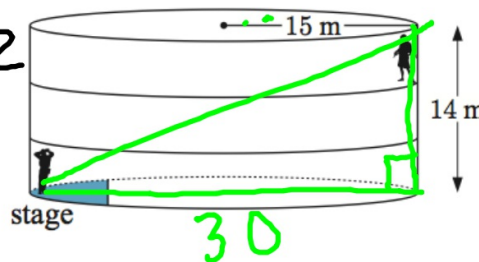
An actor stands at the back of the stage of Shakespeare's Globe theatre, which is cylindrical. How far must his voice reach so that he can be heard by the audience member furthest away from him?

$$a^2 + b^2 = c^2$$

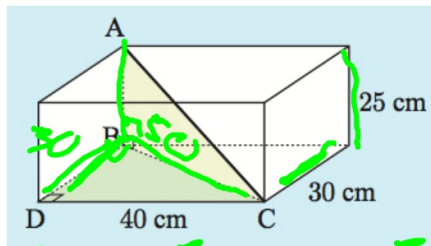
$$14^2 + 30^2 = c^2$$

$$1096 = c^2$$

$$c = 33.1 \text{ m}$$



Skyways Airlines has the policy that passengers cannot carry on luggage with diagonal measurement of more than 56 cm. Katie's bag is 40 cm × 30 cm × 25 cm. Is she allowed to carry it on board the plane?



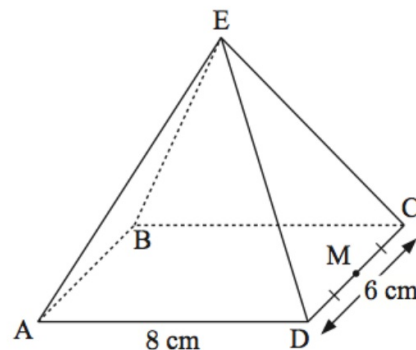
Yes, s

$$40^2 + 30^2 = 50^2$$

$$\sqrt{50^2 + 25^2} = c \quad \text{Math} \rightarrow 55.9$$

The pyramid shown is 12 cm high, and has a rectangular base.

- Find the distance AM.
- Find the length AE of the slant edges.



## Review Set 12 C