

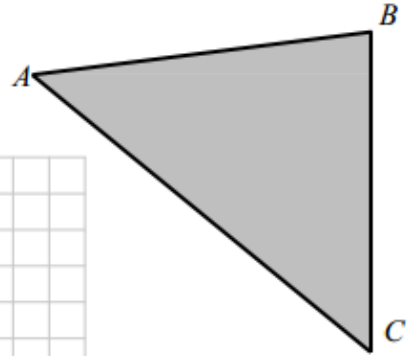


Trigonometry

Question 1.

The lengths of the sides of a flat triangular field ACB are,
 $|AB| = 120$ m, $|BC| = 134$ m and $|AC| = 150$ m.

- (a) (i) Find $|\angle CBA|$. Give your answer, in degrees, correct to two decimal places.



- (ii) Find the area of the triangle ACB correct to the nearest whole number.

Question 2.

In a triangle XYZ , $|XY| = 5$ cm, $|XZ| = 3$ cm and $|\angle XYZ| = 27^\circ$.

- (i) Find the two possible values of $|\angle XZY|$. Give your answers correct to the nearest degree.
- (ii) Draw a sketch of the triangle XYZ , showing the two possible positions of the point Z .
- (iii) In the case that $|\angle XZY| < 90^\circ$, write down $|\angle ZXY|$, and hence find the area of the triangle XYZ , correct to the nearest integer.



Question 3.

A glass Roof Lantern in the shape of a pyramid has a rectangular base $CDEF$ and its apex is at B as shown. The vertical height of the pyramid is $|AB|$, where A is the point of intersection of the diagonals of the base as shown in the diagram.

Also $|CD| = 2.5$ m and $|CF| = 3$ m.

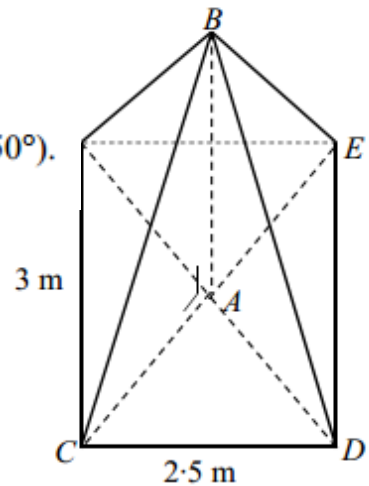
(a) (i) Show that $|AC| = 1.95$ m, correct to two decimal places.

(ii) The angle of elevation of B from C is 50° (i.e. $|\angle BCA| = 50^\circ$). Show that $|AB| = 2.3$ m, correct to one decimal place.

(iii) Find $|BC|$, correct to the nearest metre.

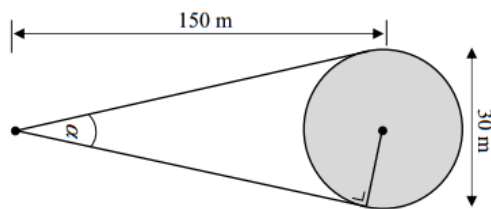
(iv) Find $|\angle BCD|$, correct to the nearest degree.

(v) Find the area of glass required to glaze all four triangular sides of the pyramid. Give your answer correct to the nearest m^2 .

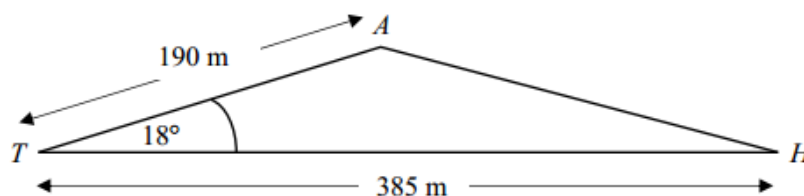


Question 4.

(a) Joan is playing golf. She is 150 m from the centre of a circular green of diameter 30 m. The diagram shows the range of directions in which Joan can hit the ball so that it could land on the green. Find α , the measure of the angle of this range of directions. Give your answer, in degrees, correct to one decimal place



(b) At the next hole, Joan, at T , attempts to hit the ball in the direction of the hole H . Her shot is off target and the ball lands at A , a distance of 190 metres from T , where $|\angle ATH| = 18^\circ$. $|TH|$ is 385 metres. Find $|AH|$, the distance from the ball to the hole, correct to the nearest metre.





Probability

Question 5.

Leaving Cert Paper 2, 2013, Q1

Question 1

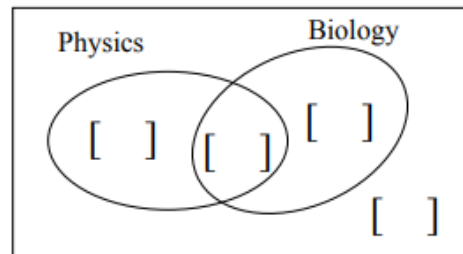
(25 marks)

(a) Explain each of the following terms:

- (i) Sample space
- (ii) Mutually exclusive events
- (iii) Independent events.

(b) In a class of 30 students, 20 study Physics, 6 study Biology and 4 study both Physics and Biology.

(i) Represent the information on the Venn Diagram.



A student is selected at random from this class.

The events E and F are:

- E: The student studies Physics
- F: The student studies Biology.

(ii) By calculating probabilities, investigate if the events E and F are independent.

Question 6.

Leaving Cert Paper 2, 2017, Q1

Question 1

(25 marks)

When Conor rings Ciara's house, the probability that Ciara answers the phone is $\frac{1}{5}$.

- (a) Conor rings Ciara's house once every day for 7 consecutive days. Find the probability that she will answer the phone on the 2nd, 4th, and 6th days but not on the other days.
- (b) Find the probability that she will answer the phone for the 4th time on the 7th day.
- (c) Conor rings her house once every day for n days. Write, in terms of n , the probability that Ciara will answer the phone at least once.
- (d) Find the minimum value of n for which the probability that Ciara will answer the phone at least once is greater than 99%.

Question 7.



- (c) List all the ways that Michael could be successful with his third free throw in a game and hence find the probability that Michael is successful with his third free throw.
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- (d) (i) Let p_n be the probability that Michael is successful with his n^{th} free throw in the game (and hence $(1-p_n)$ is the probability that Michael is unsuccessful with his n^{th} free throw). Show that $p_{n+1} = 0.6 + 0.2p_n$.
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- (ii) Assume that p is Michael's success rate in the long run; that is, for large values of n , we have $p_{n+1} \approx p_n \approx p$.

Using the result from part (d) (i) above, or otherwise, show that $p = 0.75$.

- (e) For all positive integers n , let $a_n = p - p_n$, where $p = 0.75$ as above.

- (i) Use the ratio $\frac{a_{n+1}}{a_n}$ to show that a_n is a geometric sequence with common ratio $\frac{1}{5}$.
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- (ii) Find the smallest value of n for which $p - p_n < 0.00001$.
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- (f) You arrive at a game in which Michael is playing. You know that he has already taken many free throws, but you do not know what pattern of success he has had.

- (i) Based on this knowledge, what is your estimate of the probability that Michael will be successful with his next free throw in the game?

Answer: _____

- (ii) Why would it **not** be appropriate to consider Michael's subsequent free throws in the game as a sequence of Bernoulli trials?
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Statistics

Question 9.

Models of cars are classified according to their engine capacity, measured in cubic centimetres (cc).

Seven new cars are tested to find the distance they will travel, from rest, during the first 10 seconds.

The results are given in the table below.

Engine capacity (cc)	800	1000	1200	1500	2000	2400	3000
Distance (m)	85	120	140	175	190	235	280

- i) Draw a scatter plot for these results and then
 - a) Calculate the mean engine capacity
 - b) Calculate the mean distance
 - c) Plot and label the point M (mean engine capacity, mean distance) on the scatter diagram
 - d) Draw a line of best fit through the point M
- ii) By using the scatter diagram and showing your method clearly, estimate the following:
 - a. The distance that a car with an engine capacity of 1,800 cc will travel in the first 10 seconds
 - b. The engine capacity of a car that will travel a distance of 125m in the first 10 seconds.
- iii) Calculate the correlation coefficient, r .

Question 10.

In a food packaging company, they are investigating the size of potatoes in 5kg bags. They are investigating the hypothesis that the median mass of potatoes in a bag correlates with the number of potatoes in it. They weigh some potatoes and tabulate the results.

Median mass of potatoes (grams)	72	87	96	105	110	125	136	142	147	159	174	192
Number of potatoes per bag	50	51	36	40	45	35	35	36	40	28	32	25

- i) Draw a scatter plot to illustrate the data
- ii) Which does the scatter plot show? Explain your answer
 - a. No correlation
 - b. Positive correlation
 - c. Negative correlation
- iii) Would you accept or reject the hypothesis from your observations of the scatter plot?
- iv) Use your calculator to evaluate r , the correlation coefficient of the data. Write down your value for r .
- v) Would you accept or reject the hypothesis based on your calculation of r ? Explain your answer.