



GRADE 10 IEB STANDARDISATION PROJECT
NOVEMBER 2012

MATHEMATICS: PAPER II

Time: 2 hours

100 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 10 pages and an Information Sheet of 1 page. Please check that your paper is complete.
 2. Read the questions carefully.
 3. Answer all the questions.
 4. Number your answers exactly as the questions are numbered.
 5. You may use an approved non-programmable and non-graphical calculator, unless otherwise stated.
 6. Round off your answers to one decimal digit where necessary, unless otherwise indicated.
 7. All the necessary working details must be clearly shown.
 8. It is in your own interest to write legibly and to present your work neatly.
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SECTION A**QUESTION 1**

The mathematics marks obtained by the 93 pupils from a certain school are represented below:

Interval	Frequency
$0 \leq x < 10$	0
$10 \leq x < 20$	0
$20 \leq x < 30$	4
$30 \leq x < 40$	5
$40 \leq x < 50$	8
$50 \leq x < 60$	12
$60 \leq x < 70$	23
$70 \leq x < 80$	16
$80 \leq x < 90$	10
$90 \leq x < 100$	15

- (a) What is the modal interval? (1)
- (b) In which interval does the median lie? (1)
- (c) In which interval does the lower quartile lie? (1)
- (d) Give an estimate for the mean mark. You should show working in order to demonstrate your understanding of the process. Express your answer correct to one decimal place. (4)
- (e) The actual mean of the data is known to be 66.8% correct to one decimal place. Explain why your estimate in (d) differs from the exact answer. (1)

[8]

QUESTION 2

(a) Indicate whether each of the following statements is TRUE or FALSE. If false, give a neat sketch illustrating a counter example.

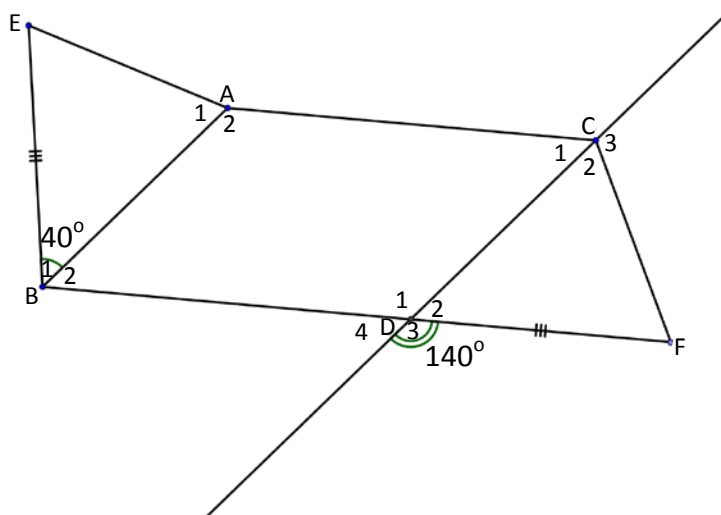
- (1) All rectangles are parallelograms
- (2) The diagonals of a rhombus are equal in length.
- (3) If the corresponding sides of two triangles are in the same proportion then the triangles must be equiangular.

(4)

(b) In the diagram below ABDC is a parallelogram.

$BE = DF$, $\hat{B}_1 = 40^\circ$, $\hat{D}_3 = 140^\circ$.

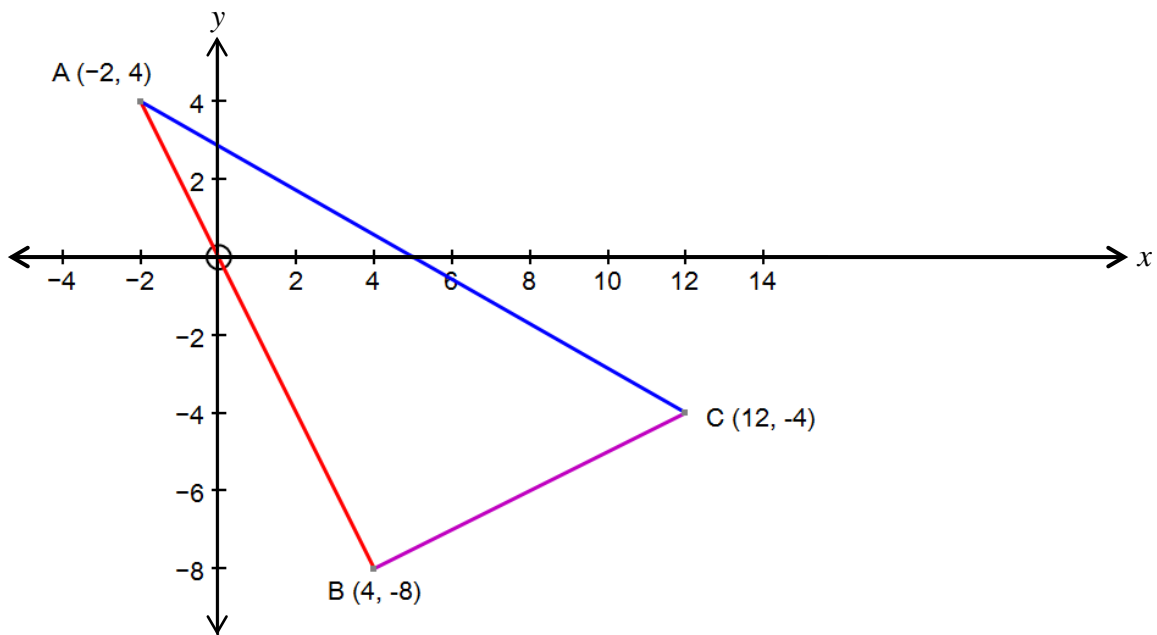
Prove that $AE = CF$



(5)
[9]

QUESTION 3

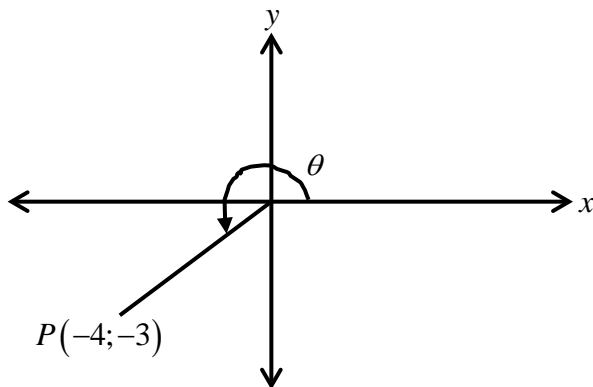
Consider the diagram below:



- (a) Show that $\triangle ABC$ is right-angled at B. (3)
 - (b) Determine the coordinates of P and Q, the mid-points of AB and AC respectively. (2)
 - (c) Use analytical methods to show that the line joining P and Q is parallel to BC. (4)
 - (d) Use analytical methods to prove that $PQ = \frac{1}{2}BC$. (4)
 - (e) Determine the coordinates of D if ABCD is a rectangle. (2)
- [15]**

QUESTION 4

(a) Consider the diagram below:



Without the use of a calculator,

- (1) determine $\cot \theta$, expressing your answer as a fraction. (1)
- (2) determine $\sin \theta$, expressing your answer as a fraction. (2)
- (b) Calculate $\tan \alpha$, if it is given $\sin \alpha = \frac{5}{13}$ **and** $\cos \alpha < 0$ (4)
Hint: use a sketch.
- (c) Calculate $\sin 60^\circ + \operatorname{cosec} 30^\circ + \tan 45^\circ$ without a calculator. Express your answer as a single fraction. (3)
- (d) Calculate $\theta \in [0^\circ; 90^\circ]$ without a calculator if $\sin \theta = \cos 0^\circ + \sin 180^\circ - \cos 60^\circ$. (3)
- (e) Solve the following equations for $\theta \in [0^\circ; 90^\circ]$. Give your answers to one decimal place:
 - (1) $\sin \theta = 0,234$ (1)
 - (2) $\cot \theta = \tan 53^\circ + \sin 233^\circ$ (4)

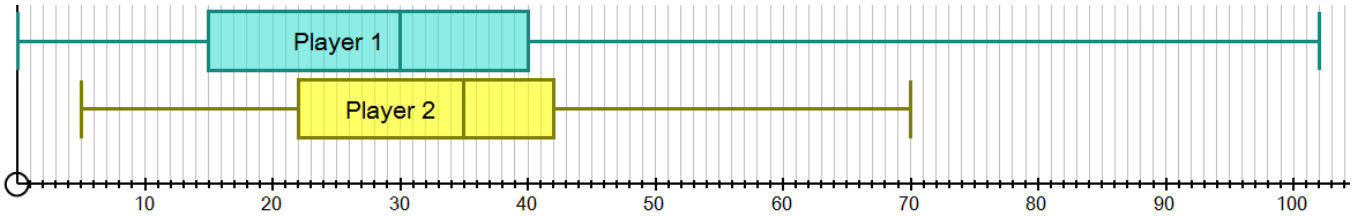
[18]

50 marks

SECTION B

QUESTION 5

The box and whisker plots for the scores made by two cricketers during the past season are as follows:



You do not need any cricketing knowledge for this question other than to know that a high score is better than a low score!

- (a) Determine the inter-quartile range for player 1. (2)

 - (b) Player 2 makes the following claim:
"I score more than x in half of my matches."
 What is the value of x? (2)

 - (c) Assuming that both players have played a similar number of matches, which player would you select for your team? Justify your answer by referring to statistical concepts you have learnt. (2)
- [6]**

QUESTION 6

Determine the length of EF to the nearest metre if the following lengths are given:

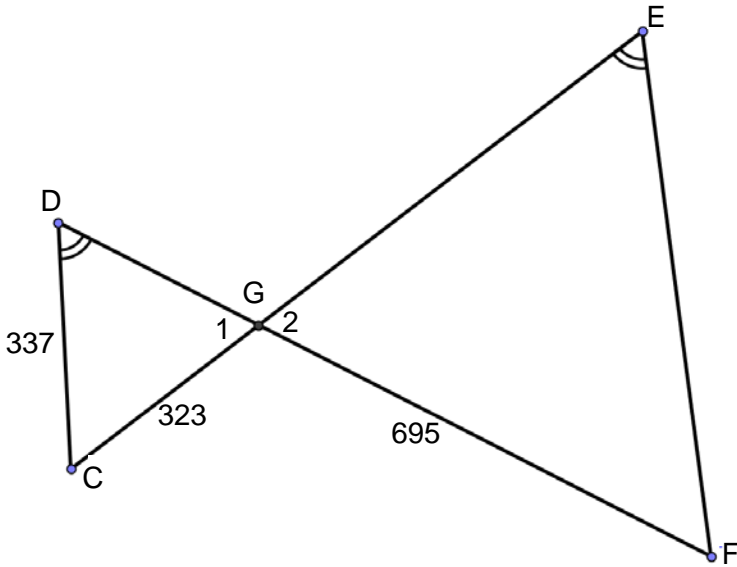
CG is 323 m

CD is 337 m

GF is 695 m

DF and CE are straight lines.

You are also given that $\hat{D} = \hat{E}$.

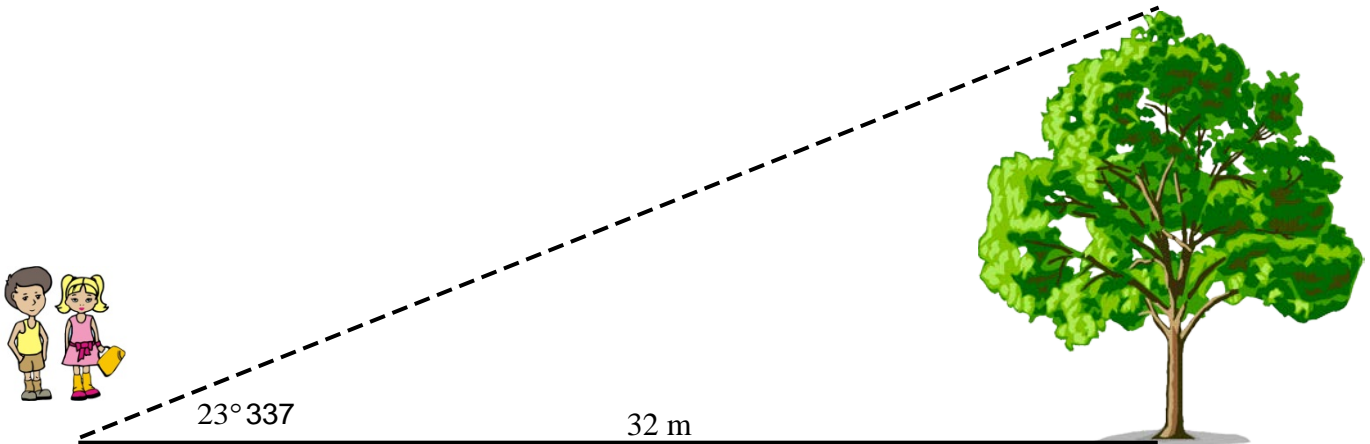


You should show all calculations.

[6]

QUESTION 7

- (a) Sipho and Mary are trying to work out the height of a tree. They are standing 32 m away from the base of the tree.



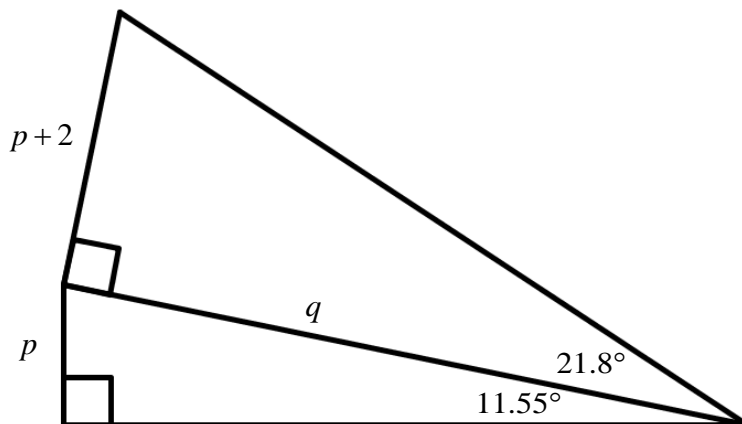
[Images taken from <http://www.proprofs.com/flashcards/story.php?title=onebuntwoshoethreetree-mnemonic> and <http://www.ignyte.com/portfolio-graphics-illustrations-2.html>]

Sipho has measured the angle of inclination of the top of the tree to be 23° .

- (1) Sipho says that he can use trigonometry with the given information to calculate the height of the tree. Show the method Sipho might use and calculate the height of the tree in metres to one decimal place. (3)

- (2) Mary says that she has not started trigonometry yet but that she can calculate the height of tree using similar triangles. She measures the length of the tree's shadow as 6,27 m. Then she measures her shadow as 77 cm. Mary uses her height of 1,67 m with the other information to correctly calculate the height of the tree. Show the method Mary might use and calculate the height of the tree in metres to one decimal place. (4)

- (b) Solve for q to one decimal place in the diagram below:



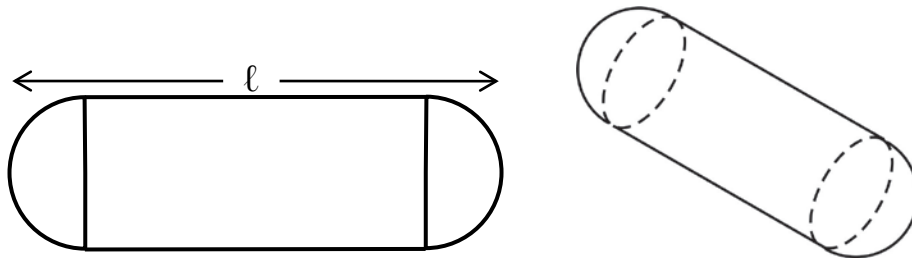
(6)
[13]

QUESTION 8

A bug crawls a distance of $\sqrt{40}$ units on a straight line in the Cartesian Plane. If the gradient of the line is $-\frac{1}{3}$ and the bug ends up at the point $T(2; -5)$, determine the co-ordinates of the point where it started.

[6]

QUESTION 9



Given: $V = \frac{4}{3}\pi r^3$ $V = \pi r^2 h$

A large three-dimensional capsule is made up of two hemispheres and a cylinder. The radius of the hemispheres is 4,22 m.

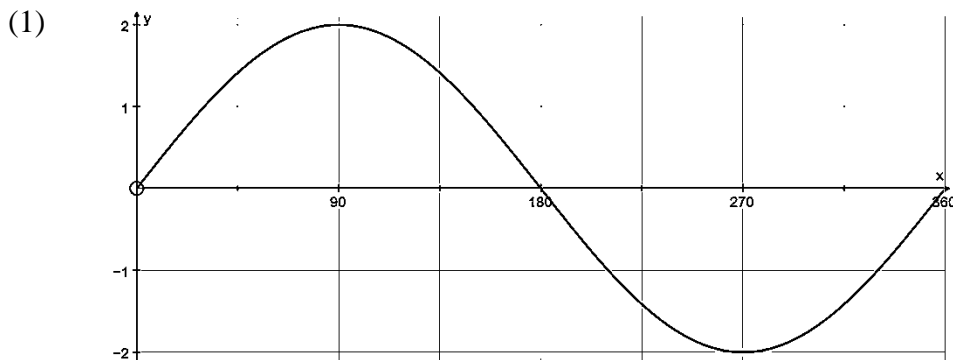
(a) If the overall length of the capsule is ℓ , give an expression for the volume of the capsule in terms of ℓ . (2)

(b) If the volume of the capsule is $1\,521\text{ m}^3$ then determine the value of ℓ to the nearest metre. (4)

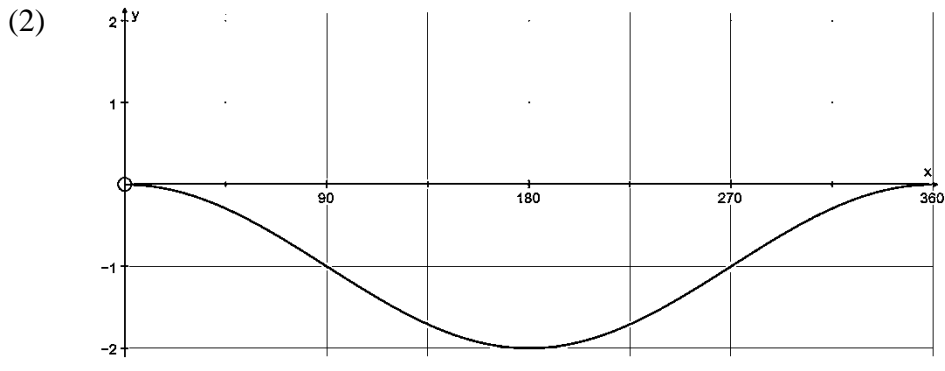
[6]

QUESTION 10

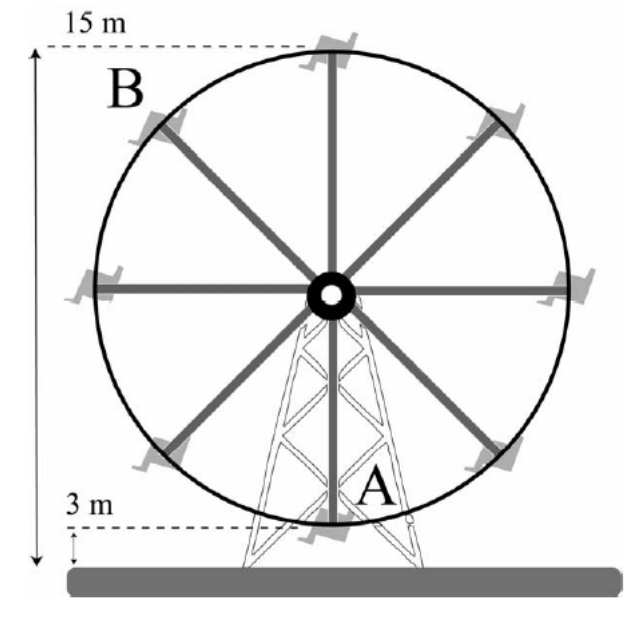
(a) Give the equations of each of the following graphs:



(2)



- (b) A Ferris wheel at an amusement park has riders get on at position A, which is 3 metres above the ground.
 The highest point of the ride is 15 metres above the ground.
 The ride takes 40 seconds for one complete revolution.



The height of a rider above the ground can be modeled by the formula:
 $h(\theta) = a \cos \theta + b$ for $\theta \in [0^\circ; 360^\circ]$

- (1) Show that $a + b = 3$. (2)
- (2) Show that $-a + b = 15$. (2)
- (3) If a rider makes 3 complete revolutions, determine the amount of time (to the nearest second) spent above 13 metres above the ground.
 Assume that $h(\theta) = -6 \cos \theta + 9$ for $\theta \in [0^\circ; 360^\circ]$. (5)

[13]

50 marks

Total: 100 marks