

Name: _____

IB placement test in Mathematics
after grade 9 (V1)

Non-calculator part, 50 minutes

1)	2)	3)	4)	5)	6)	7)	8)	9)	10)
6	2	8	5	2	2	2	6	6	6
_____ marks out of 45 marks									

Calculator part, 50 minutes

1)	2)	3)	4)	5)
11 marks	8 marks	8 marks	12 marks	6 marks
_____ marks out of 45 marks				

_____ marks out of 90 marks

Grade boundaries:

1 (0 - 15), 2 (16 - 30), 3 (31 - 41), 4 (42 - 53), 5 (54 - 64), 6 (65 - 76), 7 (77 - 90)

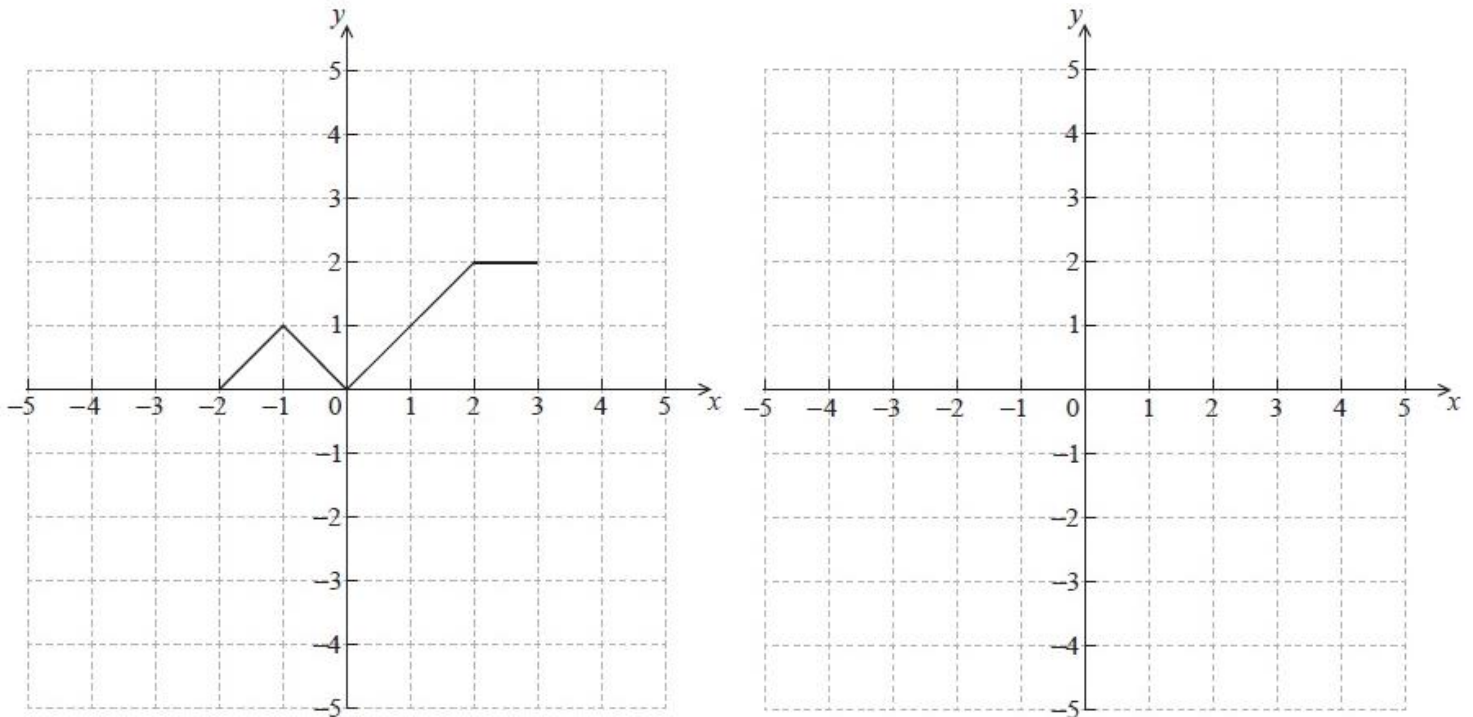
Instructions:

Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures. All necessary work must be shown. Use appropriate notation.

1) The diagram below shows the graph of a function $f(x)$, for $-2 \leq x \leq 3$.

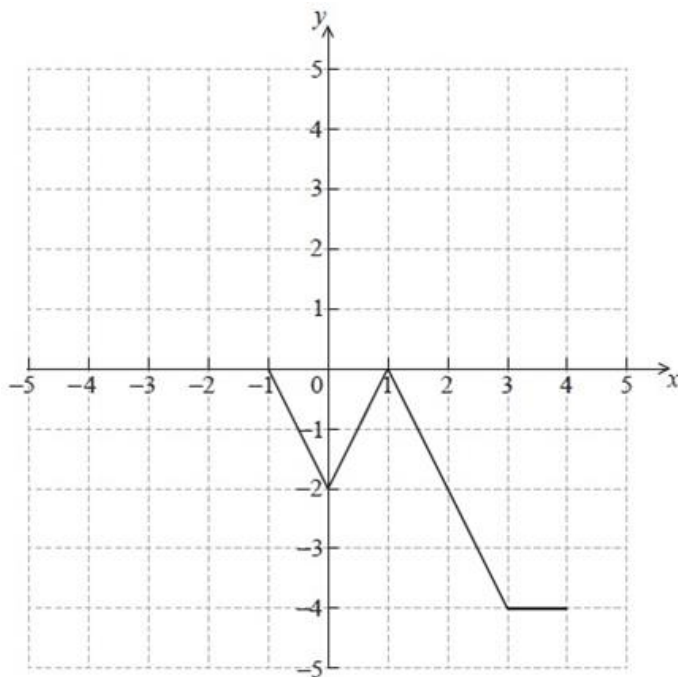
(a) Sketch the graph of $f(-x)$ on the grid below.

/3



(b) The graph of f is transformed into the graph of g . The graph of g is shown below.
The function g can be written in the form $g(x) = af(x + b)$.
Write down the value of a and of b .

/2



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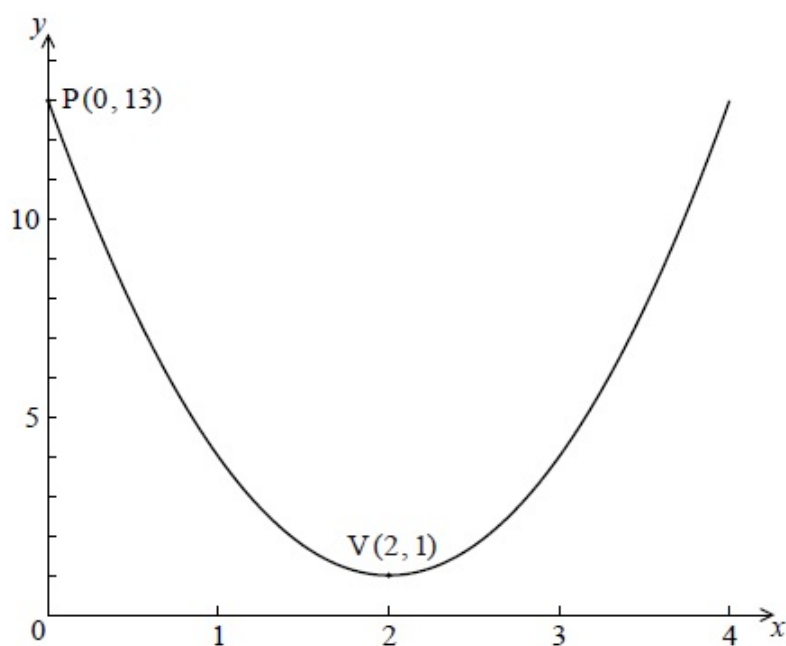
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- 2) The radius of a hydrogen atom is 0.000 000 005 cm.
Tick off the answer, which is **not** correct!

/2

- ☐ $0.000\ 000\ 005 \cdot 10^1\ \text{mm}$
☐ $0.5 \cdot 10^{-8}\ \text{cm}$
☐ $5 \cdot 10^{-11}\ \text{m}$
☐ $5 \cdot 10^{-8}\ \text{mm}$
☐ $5 \cdot 10^{-9}\ \text{cm}$
☐ $0.005 \cdot 10^{-3}\ \text{cm}$

- 3) The following diagram shows the graph of a quadratic function $f(x)$, for $0 \leq x \leq 4$.
The graph passes through the point $P(0, 13)$, and its vertex is the point $V(2, 1)$.



- (a) Write down the **equation** of the axis of symmetry.

/1

- (b) The function can be written in the form $f(x) = a(x - h)^2 + k$.

- (i) Write down the value of h and of k .

/2

- (ii) Show that $a = 3$.

/2

- (c) Find $f(x)$, giving your answer in the form $f(x) = Ax^2 + Bx + C$

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- 4) Given a triangle XYZ, with $XZ = 4$ cm, $XY = 10$ cm and $\angle X = 60^\circ$.

(a) Draw a neat labelled sketch of this triangle. /2

(b) Find the **exact** area of triangle XYZ. /3

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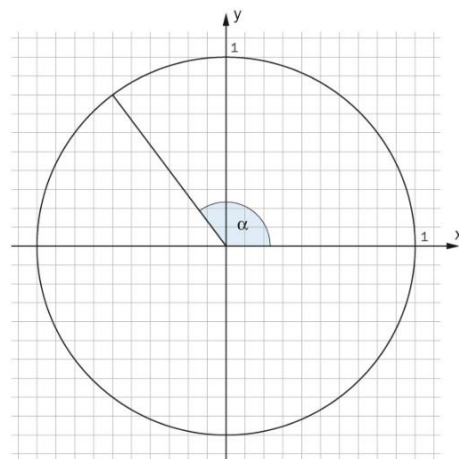
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- 5) Use the diagram alongside to draw the sine and the cosine of the given angle α . /2

Label your diagram!



- 6) Convert into degrees. Give the exact value! /2

$$\frac{7\pi}{4} = \dots\dots\dots$$

- 7) Tick off all correct answers. /2

$\sin(180^\circ - \varphi) = \sin \varphi$	☐
$\cos(180^\circ - \varphi) = \cos \varphi$	☐
$\sin(90^\circ - \varphi) = \sin \varphi$	☐
$\sin(90^\circ - \varphi) = \cos \varphi$	☐
$\cos(180^\circ - \varphi) = \sin \varphi$	☐

- 8) Consider two different quadratic functions of the form $f(x) = 4x^2 - qx + 25$.

The graph of each function has its vertex on the x -axis.

- (a) Find both values of q . /2
- (b) For the greater value of q , solve $f(x) = 0$. /2
- (c) Find the coordinates of the point of intersection of the two graphs. /2

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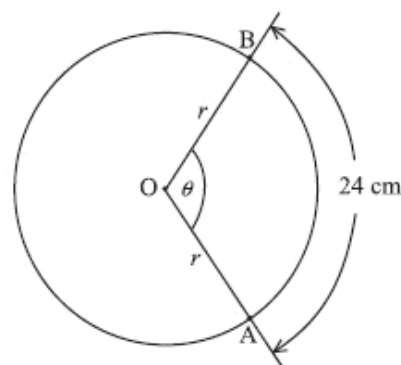
- 9) The diagram below shows a circle of radius r and centre O .

The angle $\angle AOB = \theta$.

The length of the arc AB is 24 cm.

The area of the sector OAB is 180 cm^2 .

- (a) Find the value of r . /3
- (b) Find the value of θ (in radians). /3



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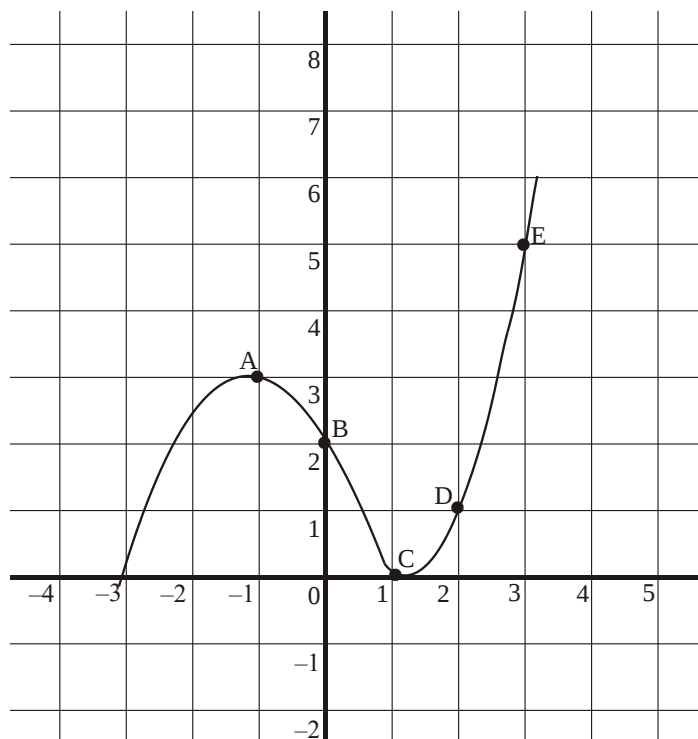
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10) The sketch shows part of the graph of $y = f(x)$ which passes through the points

$A(-1, 3)$, $B(0, 2)$, $C(1, 0)$, $D(2, 1)$ and $E(3, 5)$.



A second function is defined by $g(x) = 2f(x - 1)$.

(a) Calculate $g(0)$, $g(1)$, $g(2)$ and $g(3)$.

/3

(b) On the same axes, sketch the graph of the function $g(x)$.

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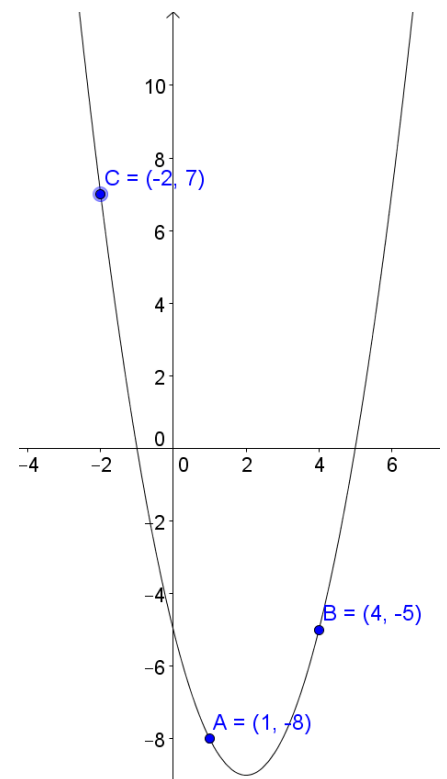
- 1) Given the equation of the straight line g and the point P .
Line g : $2y - x + 4 = 0$; point $P(2, -3)$
- (a) Using an algebraic method, find whether the point P lies on the graph of the function. **/3**
- (b) Find the equation of the function. Hence write down the gradient and the y-intercept. **/4**
- (c) Calculate the zero (x-intercept) of the function. **/2**
- (d) Draw the graph of the function in a coordinate grid. **/2**

- 2) Use the information provided in the graph alongside to find the equation of the function in the form

$$f(x) = ax^2 + bx + c.$$

Show your working!

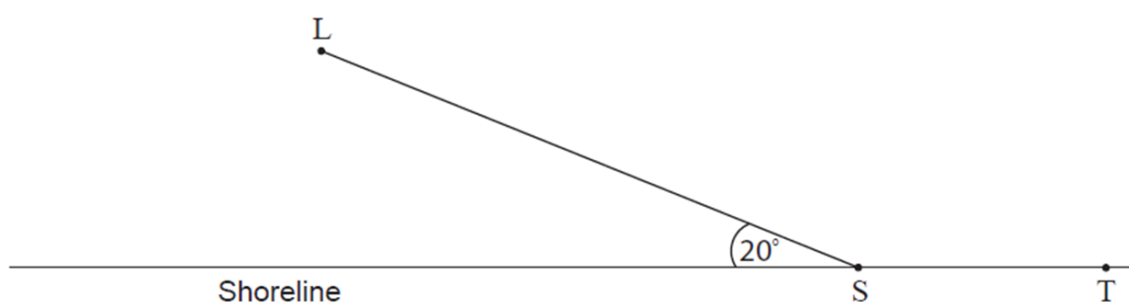
/8



- 3) The equation $x^2 - 3x + k^2 = 4$ has two distinct real roots. **/8**
Find the set of **all possible values** of k .

Please turn over!

- 4) The following diagram shows a straight shoreline, with a supply store at S, a town at T, and an island L.



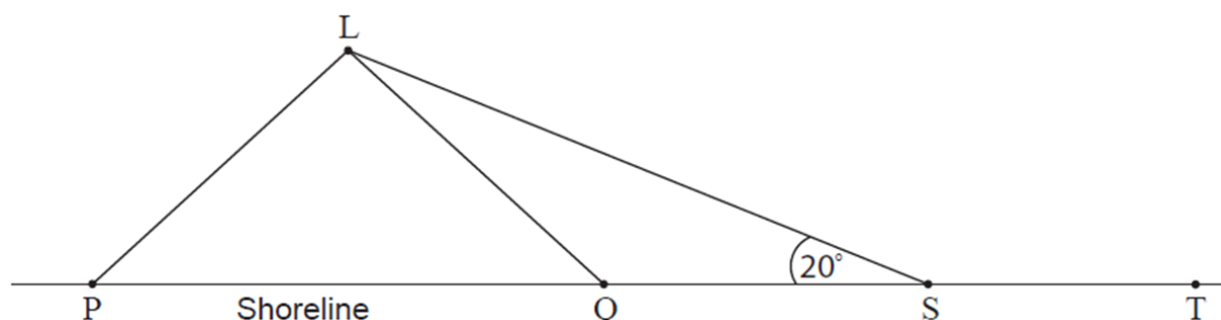
A boat delivers supplies to the island. The boat leaves S and sails to the island. Its path makes an angle of 20° with the shoreline.

- (a) The boat sails at 6 km per hour, and arrives at L after 1.5 hours.
Find the distance from S to L.

/2

It is decided to change the position of the supply store, so that its distance from L is 5 km.

The following diagram shows the two possible locations P and Q for the supply store.



- (b) Find the size of $\angle SPL$ and $\angle SQL$.

/5

- (c) The town wants the new supply store to be as near as possible to the town.

- (i) State which of the points P or Q is chosen for the new supply store.
(ii) Hence find the distance between the old supply store and the new one.

/1

/4

- 5) The diagram beside shows a circle of radius 5 cm with centre O. Points A and B are on the circle, and $\angle AOB$ is 0.8 radians. The point N is on [OB] such that [AN] is perpendicular to [OB]. Find the area of the shaded region.

/6

