DULWICH COLLEGE | SINGAPORE |

Name:

YEAR 9 Mathematics
End of Year Assessment
2020/21

Time limit: 45 **minutes**
Marks available for this paper: 45 marks

READ THESE INSTRUCTIONS FIRST

Write in dark blue or black pen. You may use a pencil for any diagrams or graphs.

Do not use correction fluid.

Answer **all** questions.

If working is needed for any question it must be shown below that question.

**Final answer marks will not be awarded without preceding method marks.**

Electronic calculators should be used.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to **three significant figures**.

Q1.

The diagram shows triangle ABC with side $AB = (4\sqrt{3} + 1)$cm. Angle B is a right angle. It is given that the area of the triangle is $\frac{47}{2}$ cm^2.
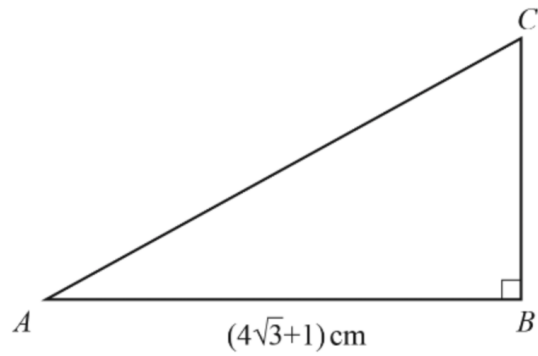
(i)   Show that the length of BC is $(4\sqrt{3} - 1)$ cm.

[3]

(ii)   Hence find the length of the side AC in the form of $p\sqrt{2}$ cm, where p is an integer.

$p =$...
[3]

(Total for question = 6 marks)

Q2.

(i)   Simplify $\sqrt{6}\,(\sqrt{6} - \sqrt{3})$. Show full workings.

....

[2]

(ii)   Given that $\dfrac{\left(a^{\frac{1}{3}}\,b^{-\frac{1}{2}}\right)^3}{a^{-\frac{2}{3}}\,b^{\frac{1}{2}}} = a^p\,b^q,$ Find the values of the constants p, q.

$p = $...

$q = $...

[3]

(iii)   Solve the following equations to find m and n.

$$2^{m-1} \times 2^{2n+1} = 2^8$$

$$3^{m-4} \times 3^n = 27$$

$m = $...

$n = $...

[3]

(Total for Question is 8 marks)

Q3.

(i) Solve the following quadratic equation by **factorisation**.

$$6x^2 - x - 2 = 0$$

....
[2]

(ii) Hence, or otherwise, solve the quadratic inequality

$$6x^2 - x - 2 > 0$$

....
[2]

(iii) Find the values of k for which the line $y = kx - \frac{8}{3}$ and the curve $y = 6x^2 - 2x - 2$ **do not** intersect.

....
[5]

(Total for question = 9 marks)

Q4.

Consider a quadratic function $y = 3x^2 + 12x + 1$.

(i)   Find the values of a, b and c such that $y = a(x + b)^2 + c$.

$a =$...................................

$b =$...................................

$c =$...................................

[3]

(i)   Hence, or otherwise, find the minimum value of y and state the value of x at which it occurs.

Minimum vale: ....

When this occurs, the value of x:...

[2]

(ii)   How many roots does the quadratic function $y = 3x^2 + 12x + 1$ have? Give reasons for your answers.

....

[2]

(Total for question = 7 marks)

Q5.

The diagram shows a triangular prism with a horizontal rectangular base $ABCD$.
$AB = 10$cm, $BC = 7$cm. M is the midpoint of AD.
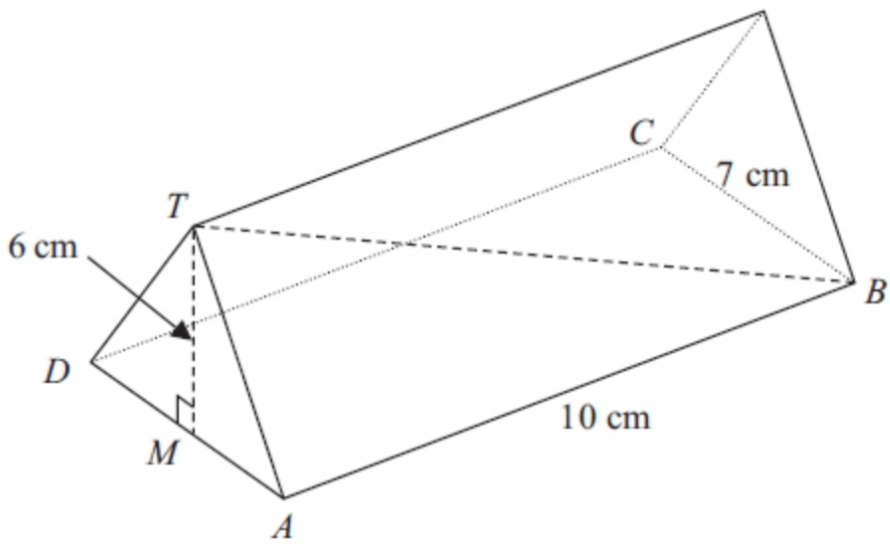The vertex T is vertically above M.
$MT = 6$cm.

Diagram **NOT** accurately drawn

(i)   Calculate the length of TB, give your answer to three significant figures.

[3]

(ii)   Calculate the size of the angle between TB and the plane $ABCD$. Give your answer to one decimal place.

[2]

(Total for question = 5 marks)

Q6.

The diagram shows two circles, centres A and B, each of radius 10 cm. The point B lies on the circumference of the circle with centre A. The two circles intersect at the points C and D. The point E lies on the circumference of the circle centre B such that ABE is a diameter.
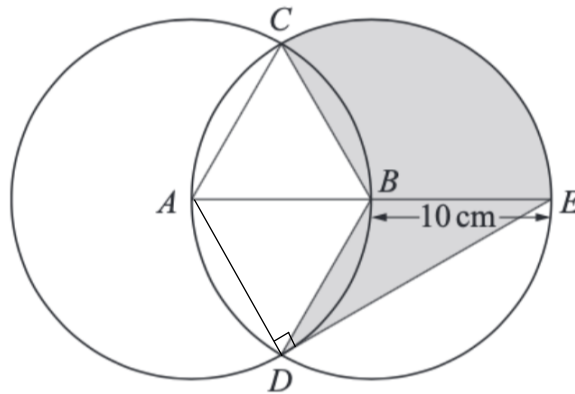
(i)   Explain why triangle ABC is equilateral.

[2]

(ii)   Write down, **in terms of π,** angle CBE.

[1]

(iii)   Find the perimeter of the shaded region. Give your answer to three significant figures.

[4]

(The question continues at the next page)

(iv)   Find the area of the shaded region. Give your answers to three significant figures.

[4]

(Total for question = 10 marks)

End of Exam

Q7. Optional question.

Find the set of values of k for which the curve $y = (k+1)x^2 - 3x + (k+1)$

    (i)   Lies below the x axis.
    (ii)   Lies above the x axis.
    (iii)   Has a vertex and the vertex lies on the line $y = x$.

(Total for question = 0 marks)