DULWICH COLLEGE | SINGAPORE |

Year 9 Examination
Mathematics (Paper 2 - Extended)
May 2017

Name:.....

Time allowed: 1 hour 30 minutes. Calculators allowed.

Marks		**Teacher comment:**
	%	
Level/Grade		

Student reflection

1

A pattern of numbers is shown below.

						1								
					1		1							
				1		2		1						
			1		3		3		1					
		1		4		6		4		1				
	1		5		10		10		5		1			
1		6		x		20		x		6		1		

Write down the value of x.

Answer ..... [1]

2

Calculate $\left(3+3\sqrt{3}\right)^3$ giving your answer correct to 1 decimal place.

Answer ..... [2]

3

Solve the equation

$$\frac{3x-2}{5}=8.$$

Answer $x =$ ..... [2]

4

From the list of numbers $\frac{22}{7}$, π, $\sqrt{14}$, $\sqrt{16}$, 27.4, $\frac{65}{13}$ write down

(a) one integer,

Answer(a) ..... [1]

(b) one irrational number.

Answer(b) ..... [1]

5

A train left Sydney at 23 20 on December 18th and arrived in Brisbane at 02 40 on December 19th. How long, in hours and minutes, was the journey?

Answer h min [1]

6

Simplify

$$\frac{2}{3}p^{12}\times\frac{3}{4}p^{8}.$$

Answer [2]

= < >

Choose one of the symbols given above to complete each of the following statements.

When $x = 6$ and $y = -7$, then

(a) x y [1]

(b) x^2 y^2 [1]

(c) $y - x$ $x - y$ [1]

8 Write the numbers 0.5^2, $\sqrt{0.5}$, 0.5^3 in order with the **smallest** first.

Answer < < [2]

9 A square has sides of length d metres.
This length is 120 metres, correct to the nearest 10 metres.

(a) Complete the statement in the answer space.

Answer(a) ..... $\leqslant d <$ ..... [1]

(b) Calculate the difference between the largest and the smallest possible areas of the square.

Answer(b) ..... m^2 [2]

10 Work out the value of

$$\frac{-\frac{1}{2}-\frac{3}{8}}{-\frac{1}{2}+\frac{3}{8}}.$$

Answer [2]

11

The area of a small country is 78 133 square kilometres.

(a) Write this area correct to 1 significant figure.

Answer(a) km^2 [1]

(b) Write your answer to **part (a)** in standard form.

Answer(b) km^2 [1]

12

Solve the simultaneous equations

$$\tfrac{1}{2}x + y = 5,$$
$$x - 2y = 6.$$

Answer $x =$ $y =$ [3]

13

Make d the subject of the formula

$$c = kd^2 + e.$$

Answer $d =$ [3]

14

(a) Factorise completely $12x^2 - 3y^2$.

Answer(a) [2]

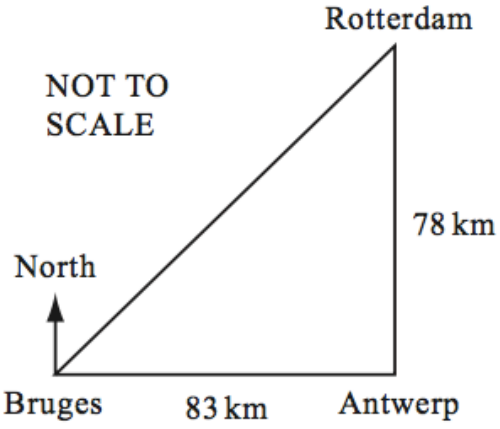
(b) **(i)** Expand $(x-3)^2$.

Answer(b)(i) [2]

(ii) $x^2 - 6x + 10$ is to be written in the form $(x-p)^2 + q$.
Find the values of p and q.

Answer(b)(ii) $p =$ $q =$ [2]

15



Antwerp is 78 km due South of Rotterdam and 83 km due East of Bruges, as shown in the diagram.

Calculate

(a) the distance between Bruges and Rotterdam,

Answer(a) km [2]

(b) the bearing of Rotterdam from Bruges, correct to the nearest degree.

Answer(b) [3]

16

Show that $3^{-2} + 2^{-2} = \frac{13}{36}$.

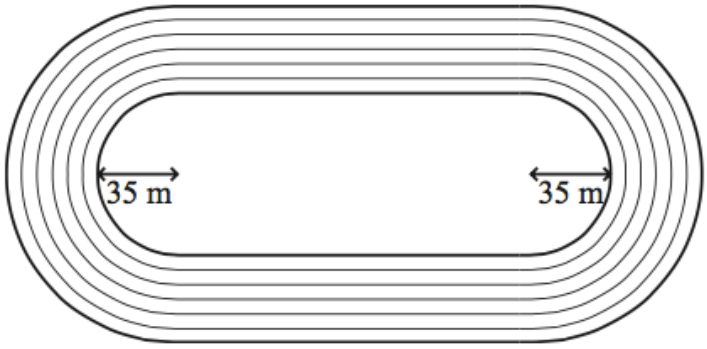
Write down all the steps of your working.

[2]

(b) Express the ratio $3\frac{1}{2}$ hours : 14 minutes in the form $k : 1$.

Answer ..... : 1 [2]

17



NOT TO SCALE

The diagram shows an athletics track with six lanes.
The distance around the inside of the inner lane is 400 metres.
The radius of each semicircular section of the inside of the inner lane is 35 metres.

(a) Calculate the total length of the two straight sections at the inside of the inner lane.

Answer(a) ..... m [3]

(b) Each lane is one metre wide.
Calculate the difference in the distances around the outside of the outer lane and the inside of the inner lane.

Answer(b) ..... m [2]

18 Simplify

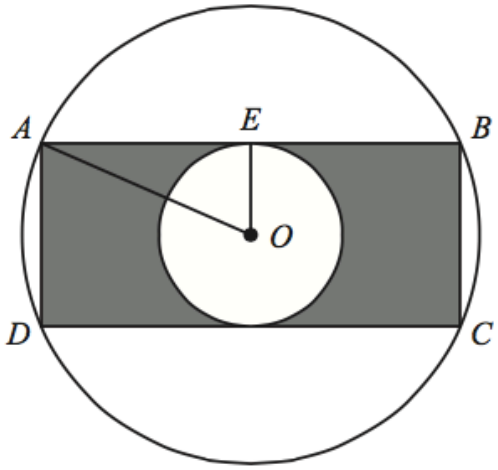
(a) $\left(\frac{x^{27}}{27}\right)^{\frac{2}{3}}$,

Answer(a) [2]

(b) $\left(\frac{x^{-2}}{4}\right)^{-\frac{1}{2}}$.

Answer(b) [2]

19



NOT TO SCALE

A,B,C and *D* lie on a circle, centre *O*, radius 8 cm.
AB and *CD* are tangents to a circle, centre *O*, radius 4 cm.
ABCD is a rectangle.

(a) Calculate the distance *AE*.

Answer(a) *AE* = cm [2]

(b) Calculate the shaded area.

Answer(b) cm^2 [3]

20

The mass of the Earth is $\frac{1}{95}$ of the mass of the planet Saturn.

The mass of the Earth is 5.97×10^{24} kilograms.
Calculate the mass of the planet Saturn, giving your answer in standard form, correct to 2 significant figures.

Answer kg [3]

21

Two sequences have 1, 3, 5 as their first three terms.

(a) In the first sequence, each term is 2 more than the term before it.

(i) Find an expression, in terms of n, for the nth term.

Answer ..... [1]

(ii) The kth term of this sequence is 841.

Find the value of k.

Answer $k =$ ..... [1]

(b) The nth term of the second sequence is

$$2^{n-1} - \frac{(n-1)(n-4)}{2}.$$

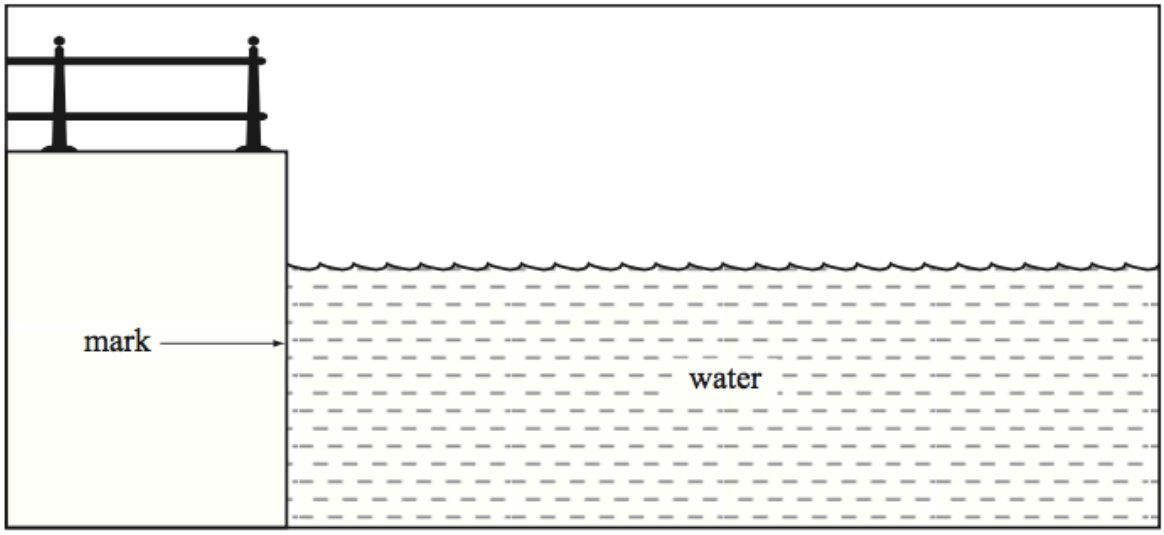
(i) Find the fourth term of this sequence.

Answer.....(2)

(ii) Find the fifth term of this sequence.

Answer.....(2)

22



The height, h metres, of the water, above a mark on a harbour wall, changes with the tide.
It is given by the equation

$$h = 3\sin(30t)^\circ$$

where t is the time in hours after midday.

(a) Calculate the value of h at midday.

Answer (a) [1]

(b) Calculate the value of h at 1900.

Answer (b) [2]

(c) Explain the meaning of the negative sign in your answer.

Answer (c) [1]

TOTAL: 70 MARKS