Twenty-One Today #2

You have thirty-five minutes to answer 21 questions
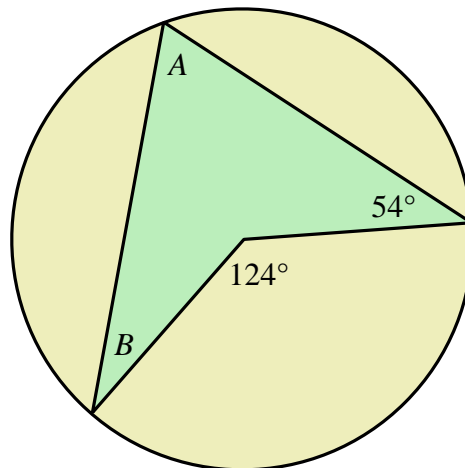
Marks Available : 40

Question 1

Consider the functions, $f(x) = \dfrac{x^2 + 1}{2}$ $\qquad$ $g(x) = 4x + 3$

Determine $fg(2)$

[1 mark]

Question 2

A Quadrilateral is shown with one vertex at the centre of a circle.

(**i**) $\qquad$ Write down the size of angle A

[1 mark]

(**ii**) $\qquad$ Calculate the size of angle B

[1 mark]

Question 3

Solve the equation, $4(3x + 2) - 3(2x + 1) = 29$

[2 marks]

Question 4

(**i**)   Solve the inequality;

$$-5 < 4x + 3 \leqslant 13$$

[2 marks]

(**ii**)   If x is an integer, list the values of x that satisfy the part (**i**) inequality.

[1 mark]

Question 5

Write the number 0.00000315 in standard form.

[1 mark]

Question 6

Felix is interested in buying a drone, priced at £425.
When the drone is reduced by 40% in a sale, Felix decides he can't afford not to buy.
What is the reduced cost of the drone ?

[1 mark]

Question 7

You are told the "product of primes" for two numbers;

$2340 = 2 \times 2 \times 3 \times 3 \times 5 \times 13$ $6615 = 3 \times 3 \times 3 \times 5 \times 7 \times 7$

What is the Highest Common factor of 2340 and 6615 ?

[1 mark]
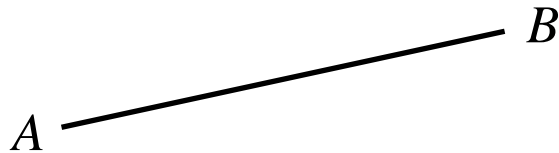
Question 8

Make c the subject of the formula, $E = mc^2$

<div align="right">[1 mark]</div>

Question 9

Use a compass and a straight edge to construct the perpendicular bisector to the line AB drawn given below.

Do NOT rub out any marks used in the construction.

B

A

<div align="right">[3 marks]</div>

Question 10

A supermarket measures the time spent by 100 customers in their store.

Time	N° of Customers (frequency)	Cumulative Frequency
$0 < t \leqslant 5$	8	
$5 < t \leqslant 10$	11	
$10 < t \leqslant 15$	23	
$15 < t \leqslant 20$	42	
$20 < t \leqslant 25$	9	
$25 < t \leqslant 30$	5	
$30 < t \leqslant 35$	2	

Complete the column headed Cumulative Frequency.

[1 mark]

Question 11

Expand the brackets and simplify; $(3x + 4) (2x - 3)$

[1 mark]

Question 12

Consider the following number which is written in standard form;

$$8.13 \times 10^4$$

Write this as an ordinary number.

[1 mark]

Question 13

(**i**)   What is the area of a circle of radius 6.4 cm ?
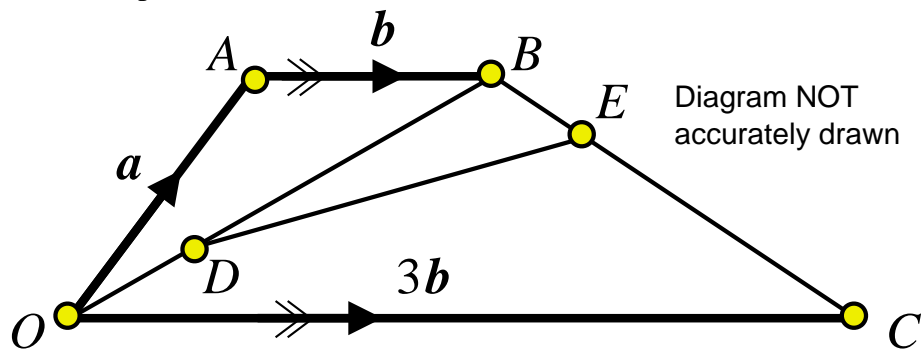Give your answer to three significant figures.

[1 mark]

(**ii**)   A cylinder has a cross section that is a circle of radius 6.4 cm.
It is 25 cm in length.
What is the volume of the cylinder ?
Give your answer to three significant figures.

[1 mark]

Question 14

OABC is a trapezium.

Diagram NOT accurately drawn

$\overrightarrow{OA} = a$

$\overrightarrow{AB} = b$

$\overrightarrow{OC} = 3b$

D is the point on *OB* such that $OD : DB = 2 : 3$

E is the point on *BC* such that $BE : EC = 1 : 4$

Work out the vector $\overrightarrow{DE}$ in terms of *a* and *b*

Give your answer in its simplest form.

[4 marks]

Question 15

9 is a square number.
(**i**)   List the three factors of 9.

[1 mark]

Jack says that all square numbers have exactly three factors.
(**ii**)   Give an example of a square number that proves Jack is wrong.

[1 mark]

Question 16

Two ordinary six faced dice are rolled, one red and one blue.

A *prime roll* is one in which both dice show a prime number.

For example, if the red shows 5 and the blue shows 3 that is a *prime roll*.

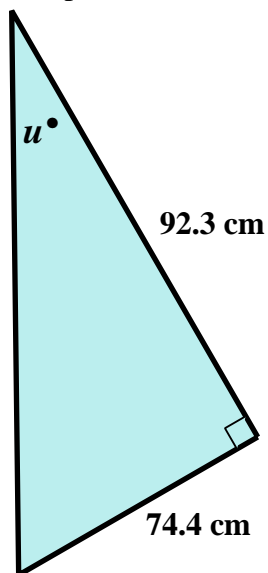Using the grid below to help, determine the probability of a *prime roll*.

R E D

	1	2	3	4	5	6
1						
2						
3				P		
4						
5						
6						

B L U E

[3 marks]

Question 17

Calculate the size of angle u in the triangle below.

Give your answer to one decimal place.

$u^\bullet$

92.3 cm

74.4 cm

[2 marks]

Question 18

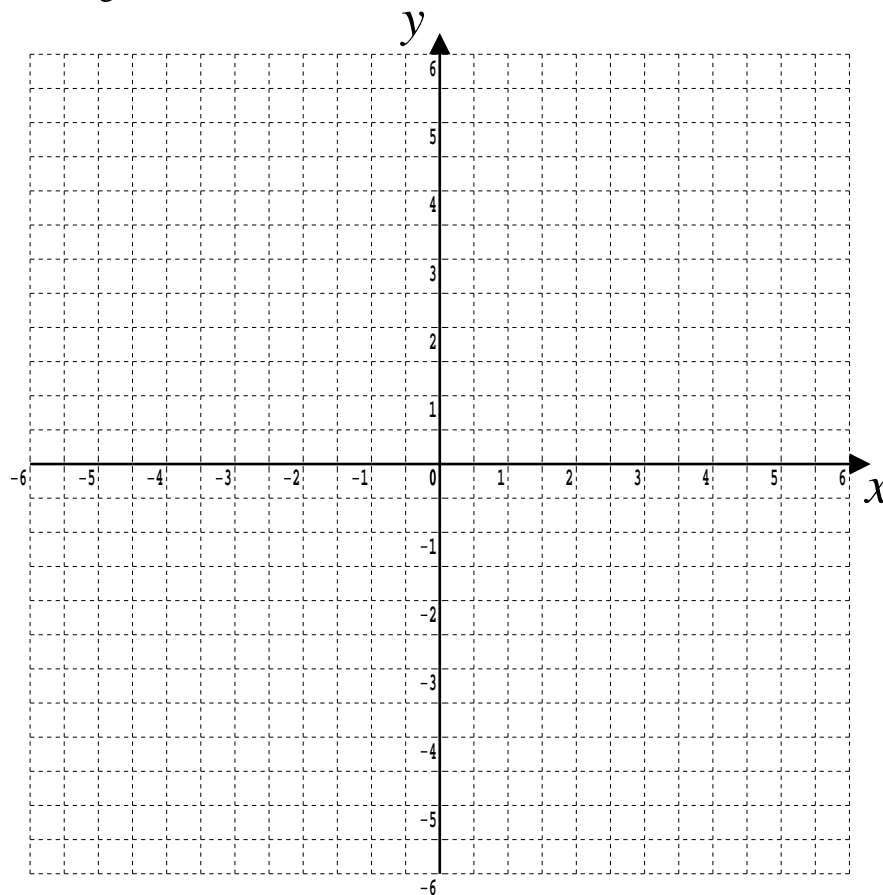Expand the brackets and simplify, $(3x)^2 \times (2x)^3$

[2 marks]

Question 19

On the grid show, by shading, the region that satisfies all of these inequalities,

$$2y + 4 < x \qquad x < 3 \qquad y < 6 - 3x$$

Label the region **R**.

[**3 marks**]

Question 20

By first factorising solve the equation $x^2 + 3x - 28 = 0$

[**2 marks**]

21 Today !

Use the observation that, $1 + 3 = 2^2$, $1 + 3 + 5 = 3^2$, $1 + 3 + 5 + 7 = 4^2$

to calculate: $1 + 3 + 5 + 7 + 9 + 11 + 13 + \ldots + 95 + 97 + 99$

[**2 marks**]