

Twenty-One Today #4

You have thirty-five minutes to answer 21 questions

Marks Available : 40

GCSE Mathematics
Twenty-One Today

Question 1

- (i) What is the area of a semi-circle of *diameter* 9.6 cm ?
Give your answer to three significant figures.

[1 mark]

- (ii) What is the perimeter of a semi-circle of *diameter* 9.6 cm ?
Give your answer to three significant figures.

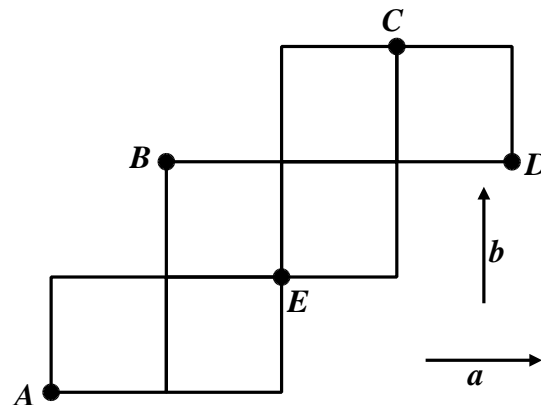
[1 mark]

Question 2

If, between two point on a line, $\Delta y = 49$ and $\Delta x = 14$, what is the gradient ?

[1 mark]

Question 3



Write down in terms of a and b ;

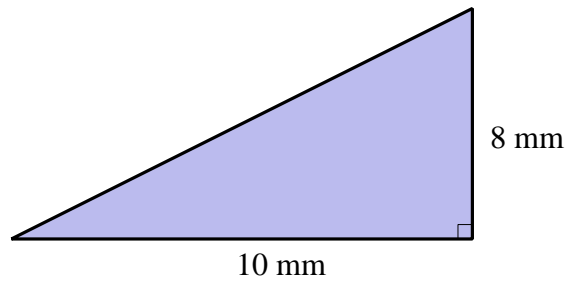
(i) \overrightarrow{BD} (ii) \overrightarrow{AE}

(iii) \overrightarrow{CD} (iv) \overrightarrow{DA}

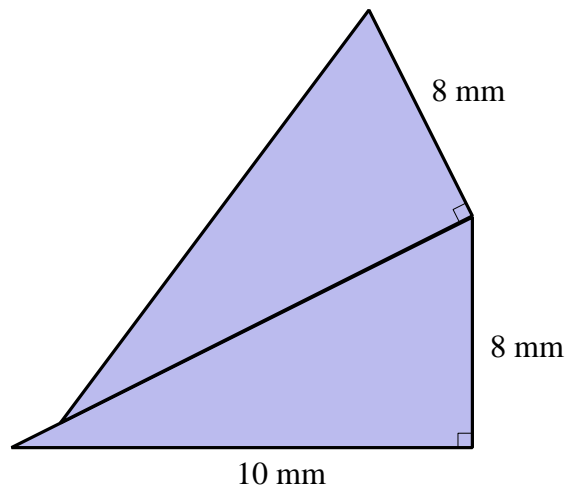
[2 marks]

Question 4

Here is a right-angled triangle,



The shaded shape below is made from two of these triangles,



Work out the perimeter of the shaded shape.

Give your answer correct to 3 significant figures.

[2 marks]

Question 5

When a six faced standard cubical dice is rolled what is the average number of pips that are rolled ?

[1 mark]

Question 6

In a maths test, 11 students scored the following percentage marks;

78 45 63 56 51 48 45 52 58 80 55

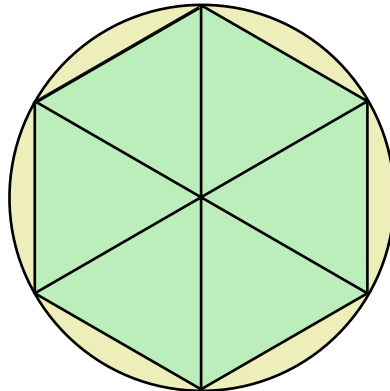
Determine the interquartile range.

[2 marks]

Question 7

Use the formula, $\text{Area } \Delta = \frac{1}{2} a b \sin C$

to work out the area of a hexagon drawn inside a circle of radius 10 cm



[3 marks]

Question 8

In a school there are 16 teachers and 220 students.

Of these students 120 are girls and 100 are boys.

One teacher, one girl and one boy are going to be chosen to represent the school.

Work out the number of different ways there are to choose one teacher, one girl and one boy.

[2 marks]

Question 9

Solve $\frac{3x - 2}{4} - \frac{2x + 5}{3} = \frac{1 - x}{6}$

[4 marks]

Question 10

Given that, y is directly proportional to the square root of x and that y is 100 when x is 400, write down an equation connecting y and x which is of the form $y = k\sqrt{x}$, where k is the constant of the proportionality to be found.

[2 marks]

Question 11

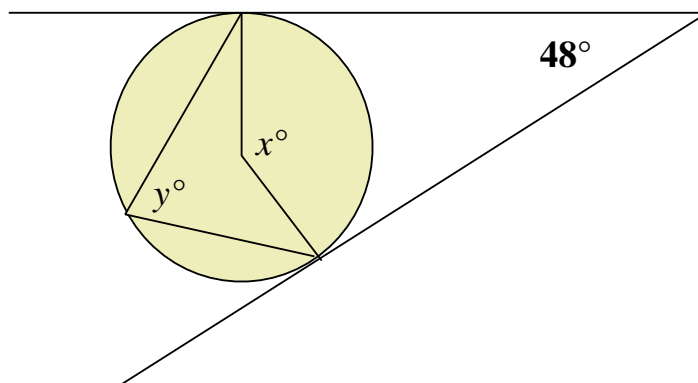
£30 000 is to be split between Peter, Paul and Mary in the ratio 3 : 5 : 7

How much more does Mary receive than Peter ?

[2 marks]

Question 12

Two lines, tangential to a circle, meet in an angle of 48° .



- (i) State the size of angle x

[1 mark]

- (ii) State the size of angle y

[1 mark]

Question 13

The speed of sound is about 340 m s^{-1}

- (i) How long, to the nearest second does it take sound to travel 1 km ?

[1 mark]

- (ii) If there is a gap of 6 seconds between a person seeing a lightening flash, and hearing the resulting thunder, how far away is the lightening ?
(You may assume that the light travels so fast it is instantaneous)

[1 mark]

Question 14

$$f(x) = \frac{16}{x^2}, \quad x \neq 0$$

Determine the value of $fff(2)$

[2 marks]

Question 15

Solve the equation $3x^2 = 108$

[1 mark]

Question 16

Kay invests £200000 in a savings account for 4 years.

The account pays compound interest at a rate of 1.5% per annum.

Calculate the total amount of interest Kay will get at the end of 4 years.

[2 marks]

Question 17

In June 2022 the *Frontier* supercomputer installed at America's Oak Ridge National laboratory was the world's fastest operational supercomputer.

It has a sustained processing rate of 1 102 000 000 000 000 000 floating point instructions per second.

(i) Write this number in standard form.

[1 mark]

(ii) Most personal laptops are around 10 million times slower than the *Frontier*. Suppose you ran a program on your laptop that took one year to complete. How long would it take the *Frontier* ? Give your answer in seconds.

[1 mark]

Question 18

A circle is centred on the origin.

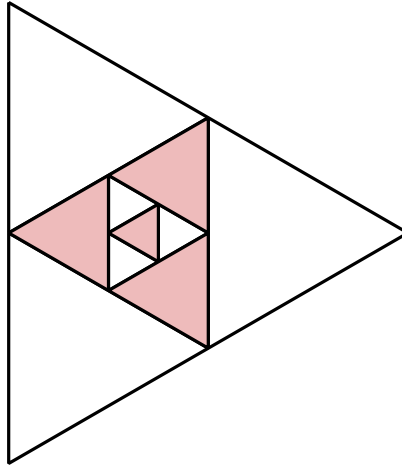
The point (24, 7) is on the circumference of the circle.

What is the radius of the circle ?

[1 mark]

Question 19

What fraction of the area of the larger triangle is shaded ?



[2 marks]

Question 20

Given any function $f(x)$ which has an inverse function $f^{-1}(x)$,
what is $f(f^{-1}(x))$?

[1 mark]

21 Today !

From a standard pack of 52 playing cards four are randomly chosen, one after the other **WITHOUT REPLACEMENT**.

What is the probability that all four cards are Hearts ?
Give your answer as a decimal fraction.

[2 marks]