

2023 Non-calculator paper

1) Write  $9.2 \times 10^{-3}$  as an ordinary number.

(Total 1 mark)

3) Circle the equation of the line perpendicular to  $y = 5x + 2$

$y = 5x - \frac{1}{2}$

$y = 5x - 2$

$y = -\frac{1}{5}x + 3$

$y = -5x$

(Total 1 mark)

4) Write down the value of  $7^0$

(Total 1 mark)

5) Samir and Dan run a race.

Samir finishes in  $2\frac{1}{2}$  minutes.

Dan finishes in 130 seconds.

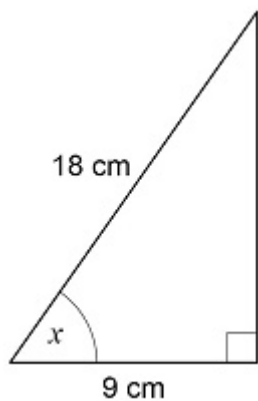
Complete the following sentence.

\_\_\_\_\_ wins by \_\_\_\_\_ seconds.

(Total 2 marks)

6) Use trigonometry to work out the size of angle  $x$ .

Not drawn accurately



(Total 2 marks)

- 7) Show that  $\frac{14}{\sqrt{7}}$  can be written in the form  $a\sqrt{b}$  where  $a$  and  $b$  are integers.

**(Total 2 marks)**

- 8a) Write 18 as a product of prime factors

**(1)**

b)  $c = 2^{10} \times 3 \times 5^6$

Hence work out  $18c$ .

Give your answer as a product of prime factors in index form

**(2)**

**(Total 3 marks)**

- 9) This formula converts temperature in degrees Fahrenheit ( $F$ ) to kelvin ( $K$ )

$$K = \frac{5}{9}(F - 32) + 273$$

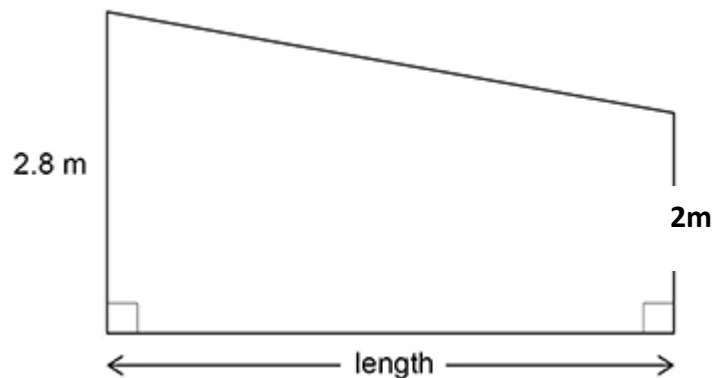
San Francisco reached a temperature of 104 degrees Fahrenheit on 1<sup>st</sup> June.

Work out this temperature in kelvin.

**(Total 4 marks)**

- 10) The diagram shows a wall.

Not drawn accurately



The area of the wall is  $12 \text{ m}^2$

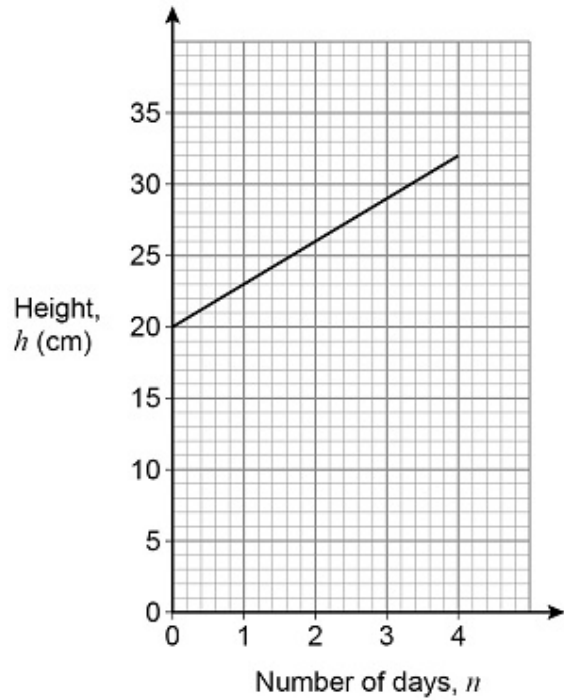
Work out the length of the wall.

**(Total 4 marks)**

11) Jim buys a plant of height 20 cm

The graph shows how the height of the plant changes during the next 4 days.

Work out a formula for  $h$  in terms of  $n$ .



**(Total 3 marks)**

12) To the nearest 1000, there are 18 000 people at a festival.

(a) Write down the minimum possible number of people at the festival.

**(1)**

(b) Write down the maximum possible number of people at the festival.

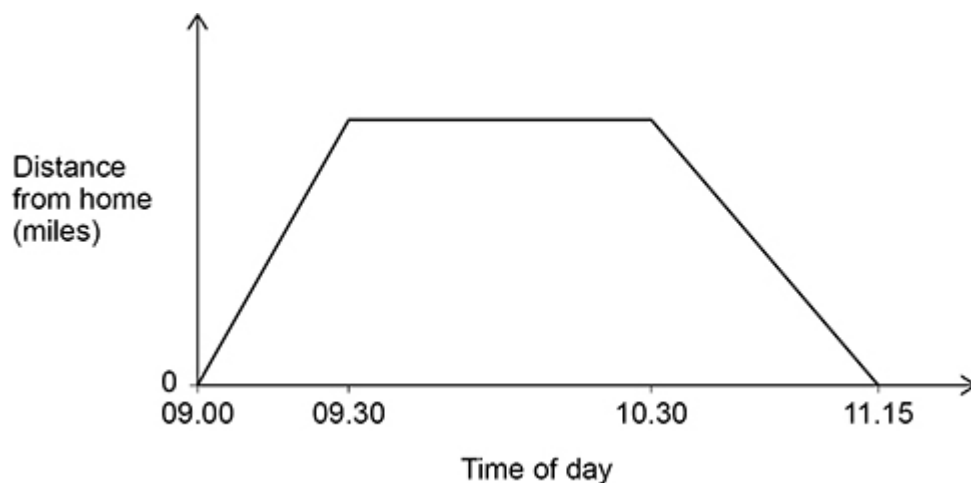
**(1)**

**(Total 2 marks)**

13) Prove algebraically that  $3.4\dot{7} = \frac{313}{90}$

**(Total 3 marks)**

14) Chris visits a library. He cycles to the library in half an hour at a speed of 12 miles per hour. He stays at the library for one hour. He then cycles home. The sketch graph represents his visit.



Work out the speed, in miles per hour, at which Chris cycles home. **(Total 3 marks)**

15) The cost of a holiday is £2400

Rana pays a deposit followed by monthly payments, in the ratio

$$\text{deposit : total of the monthly payments} = 3 : 5$$

She makes 6 equal monthly payments.

Work out her monthly payment.

**(Total 4 marks)**

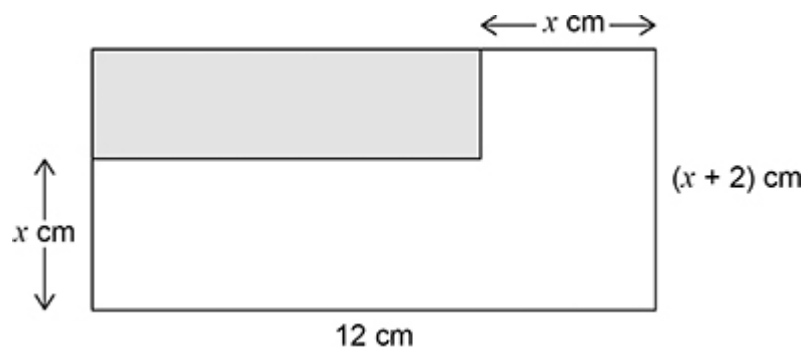
16) Work out  $2\sqrt{10} \times \sqrt{80} \times \sqrt{18}$

Give your answer as an integer.

**(Total 3 marks)**

17) Here are two rectangles.

Not drawn accurately

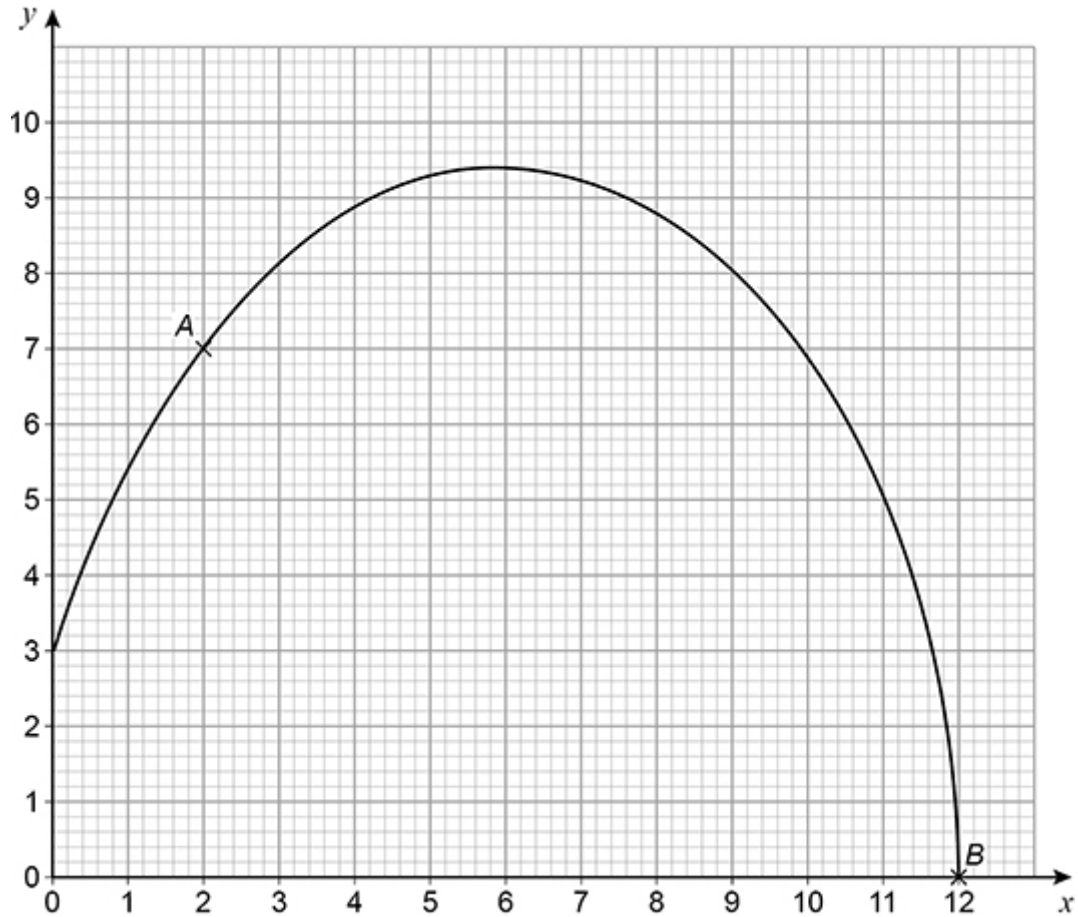


The area of the shaded rectangle is  $\frac{1}{4}$  the area of the large rectangle.

Work out the value of  $x$ .

**(Total 4 marks)**

- 18)  $A$  and  $B$  are points on a curve.  
 $A$  is  $(2, 7)$        $B$  is  $(12, 0)$



- (a) Work out the instantaneous rate of change of  $y$  with respect to  $x$  at point  $A$ .

(2)

- (b) The average rate of change of  $y$  with respect to  $x$  between points  $A$  and  $B$  is worked out.

Which statement is correct?

Tick **one** box.

It is positive.

It is zero.

It is negative.

You cannot tell if it is positive or negative.

(1)

(Total 3 marks)

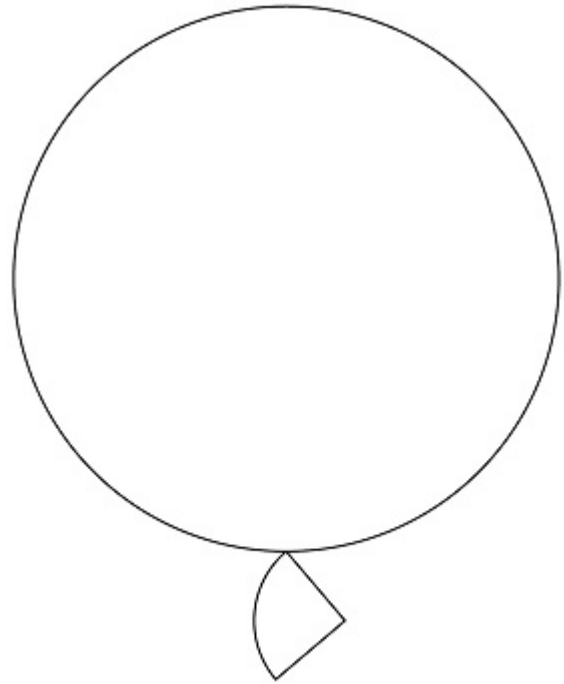
19) Two wire shapes make an earring.

The shapes are

a circle with radius 21 mm

and

a quarter circle.



radius of circle : radius of quarter circle = 7 : 2
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(a) Show that the radius of the quarter circle is 6 mm

(1)

(b) Work out the **total** length of the wire in the earring.

Give your answer in the form  $a\pi + b$  where  $a$  and  $b$  are integers.

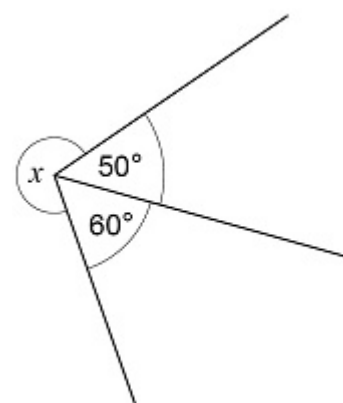
(4)

(Total 5 marks)

### Calculator Paper

1)

Not drawn accurately



Circle the size of angle  $x$ .

70°

110°

250°

270°

(Total 1 mark)

2) Which of these is a correct identity?

Circle your answer.

$x + 4x \equiv 5x$

$6x \equiv 18$

$2x + 1 \equiv 7$

$7x + 9 \equiv x$

(Total 1 mark)

3) Circle the expression that is equivalent to  $(x - 1)^2$

$x^2 - 1$

$x^2 + 1$

$x^2 - 2x - 1$

$x^2 - 2x + 1$

(Total 1 mark)

4) Factorise fully  $2x^2 + 6x$

(Total 2 marks)

5) Work out the highest common factor (HCF) of 75 and 105

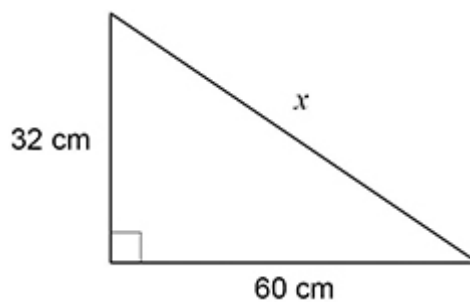
(Total 2 marks)

6) Rearrange  $c = \frac{d+2}{3}$  to make  $d$  the subject.

(Total 2 marks)

7) Use Pythagoras' theorem to work out the value of  $x$ .

Not drawn accurately



(Total 3 marks)

8)  $a$  and  $b$  are whole numbers.

$a \leq 12 \quad b < 9$

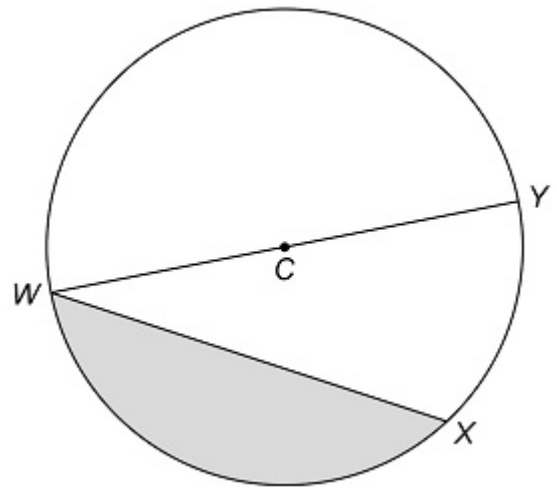
Work out the **largest** possible value of  $2a + b$

(Total 2 marks)

9) Solve  $4 > 3x - 11$

(Total 2 marks)

- 10) This circle has centre  $C$ .  
 $W$ ,  $X$  and  $Y$  are points on the circle.  
 $WY$  is a straight line.



Tick **one** box for each statement.

	True	False
$WY$ is a diameter.	<input type="checkbox"/>	<input type="checkbox"/>
$WX$ is a radius.	<input type="checkbox"/>	<input type="checkbox"/>
The shaded section is a sector.	<input type="checkbox"/>	<input type="checkbox"/>
Arc $XY$ is part of the circumference.	<input type="checkbox"/>	<input type="checkbox"/>

(Total 3 marks)

- 11) A solid piece of silver has  
 mass 2.625 kilograms  
 volume  $250 \text{ cm}^3$

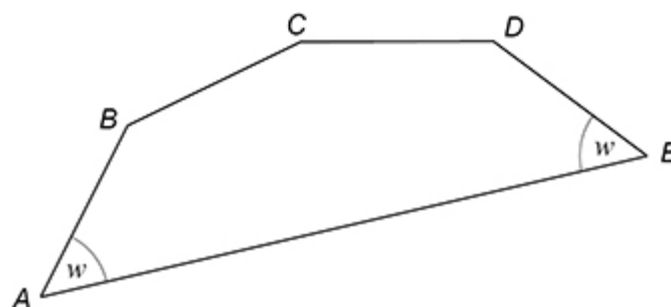
Work out the density of the piece of silver.

Give your answer in **grams per cubic centimetre**.

(Total 2 marks)

- 12)  $AB$ ,  $BC$ ,  $CD$  and  $DE$  are four of the sides of a **regular 10 sided shape**.

Not drawn accurately

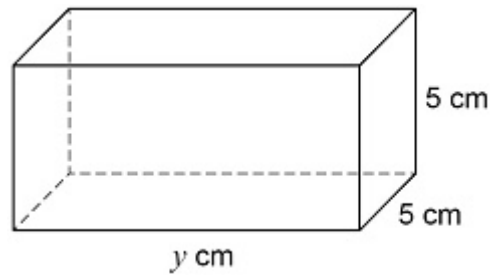


Work out the size of angle  $w$ .

(Total 3 marks)



13) Here is a cuboid.



(a) Assume that the total surface area of the cuboid is  $200 \text{ cm}^2$

Work out the volume of the cuboid.

**(3)**

(b) In fact, the total surface area of the cuboid is smaller than  $200 \text{ cm}^2$

What does this mean about the volume of the cuboid?

Tick **one** box.

It is smaller than the answer to part (a)

It is bigger than the answer to part (a)

It is the same as the answer to part (a)

It could be any of the above

**(1)**

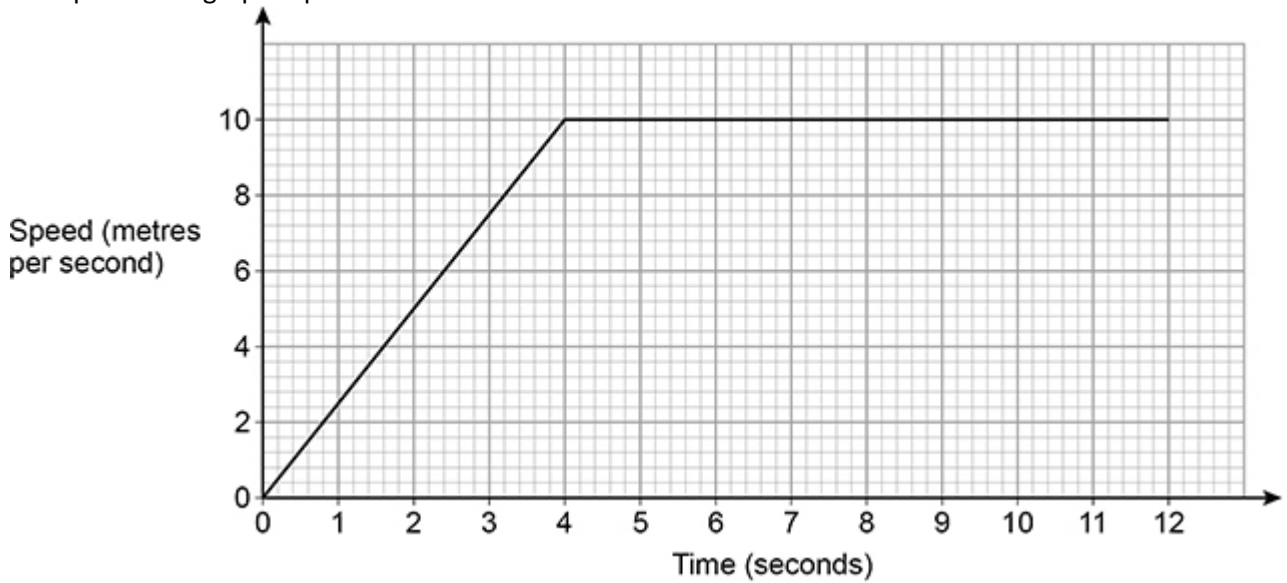
**(Total 4 marks)**

14) Work out the gradient of the straight line through  $(-2, 3)$  and  $(1, 9)$

**(Total 2 marks)**

- 15) A horse runs in a field.

The speed-time graph represents the first 12 seconds of the run.



After how many seconds had the horse run a distance of 70 metres?

**(Total 3 marks)**

- 16) A marathon takes place each year.

In 2020 there were 6500 runners.

<p><b>Prediction</b></p> <p>For each of the next 3 years the number of runners will increase by 5%</p>
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Does this predict that in 2023 there will be more than 7500 runners?

You **must** show your working.

**(Total 3 marks)**

- 17) Edith's van can safely carry a maximum load of 920 kilograms.

She wants to use her van to carry

30 sacks of potatoes, each of mass 25 kilograms to the nearest kilogram

and

20 sacks of carrots, each of mass 7.5 kilograms to 1 decimal place.

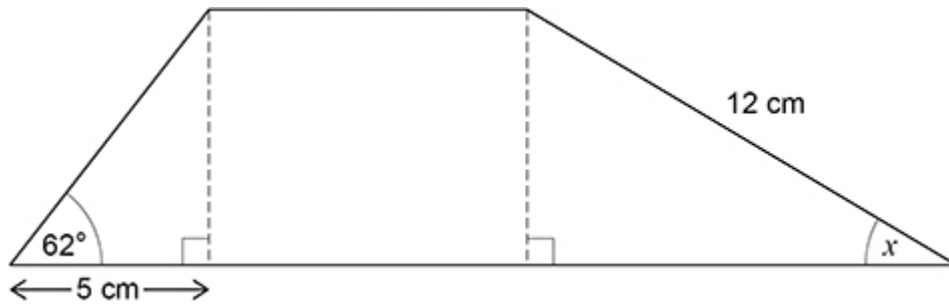
Can she definitely use her van safely in one journey?

You **must** show your working.

**(Total 4 marks)**

- 18) This shape is made from two right-angled triangles and a rectangle.

Not drawn accurately



Work out the size of angle  $x$ .

**(Total 4 marks)**

- 19) Find half of  $2^{1000}$ .  
Write your answer in the form  $2^k$  where  $k$  is an integer

**(Total 2 Marks)**

- 20) A rectangle has an area of  $125\text{cm}^2$  with its side lengths in the ratio 4:5  
Find the perimeter of the rectangle

**(Total 3 Marks)**

Non – calc answers

- 1) 0.0092 3)  $y = -\frac{1}{5}x + 3$  4) 1 5) Dan, 20 6) 60 7)  $2\sqrt{7}$  8)  $2^{11} \times 3^3 \times 5^6$  9) 313  
10) 5m 11)  $h = 3n + 20$  12a) 17500 b) 18499 13)  $9x = 31.3$  in working 14) 8 15) 250  
16) 240 17)  $\frac{18}{5}$  18a) 187.5 b) it is smaller than answer to part a 19a)  $21 \div 7 \times 2$  b)  $45\pi + 12$

Calc answers

- 1) 250 2)  $x + 4x \equiv 5x$  3)  $x^2 - 2x + 1$  4)  $2x(x + 3)$  5) 15 6)  $d = 3c - 2$  7) 68 8) 32  
9)  $x < 5$  10) T, F, F, T 11) 10.5 12) 54 13a) 187.5 b) it is smaller than answer to part a  
14) 2 15) 9.5 16) 7525 Yes 17) 25.5, 7.55, 916 and Yes 18)  $51.536 - 51.63$   
19)  $2^{999}$  20) 45cm