13+

Dulwich College

YEAR 9 ENTRANCE AND SCHOLARSHIP EXAMINATION

SAMPLE PAPER

MATHEMATICS

1 HOUR 30 MINUTES

Use a calculator where appropriate.
Answer all the questions.
Show all your working.
Marks for parts of questions are shown in square brackets [ ].

Surname …….

First Names……

1. (a) Use your calculator to evaluate $\sqrt{13.5^2 - 4.9}$, writing down all the figures shown on your calculator display.

Answer: _____ [2]

(b) Give your answer to part (a) rounded to 2 decimal places.

Answer: _____ [1]

---

2. In a sale, prices are reduced by 15%. The normal price of a camera is £140. Calculate the sale price of the camera.

Answer: £ _____ [2]

---

3. A duck walks along side a river at a speed of 2 kilometres an hour. Calculate how far in metres the duck walks in 45 minutes.

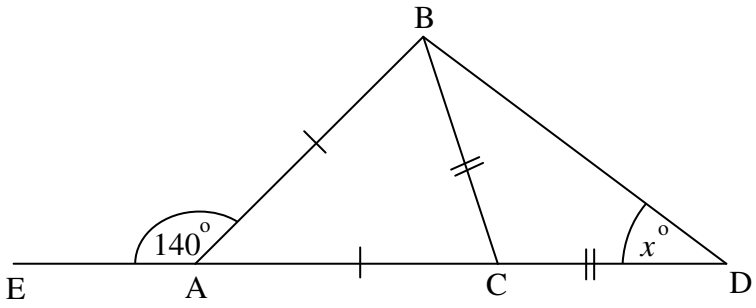
Answer: _____ m [3]

---

4. Three monkeys share 120 peanuts between them in the ratio 3 : 2 : 1. Calculate how many more peanuts the first monkey gets than the third.

Answer: _____ [3]

5.



In the diagram above, AB = AC and BC = CD and angle EAB = 140°.

Find the value of x.

Answer: x = _____ [3]

---

6. There are 20 people in a room, 14 of whom are male.

(a) Calculate the probability that a randomly chosen person from the room is female, giving your answer in its lowest form.

Answer: _____ [2]

(b) State the minimum number of people who need to be chosen from the room in order that the probability of picking at least one male is 1.

Answer: _____ [1]

---

7. (a) Simplify the following expressions:

(i) $3x + y - 6x + 2y$

Answer: _____ [2]

(ii) $2(3x - 2) - 4x(2 - x)$

Answer: _____ [3]

(iii) $\dfrac{12a^3b}{3a^2b^2}$

Answer: _____ [2]

(b) Factorise fully $5x^2y - 10xy^2$

Answer: _____ [3]

---

8. Solve the following equations:

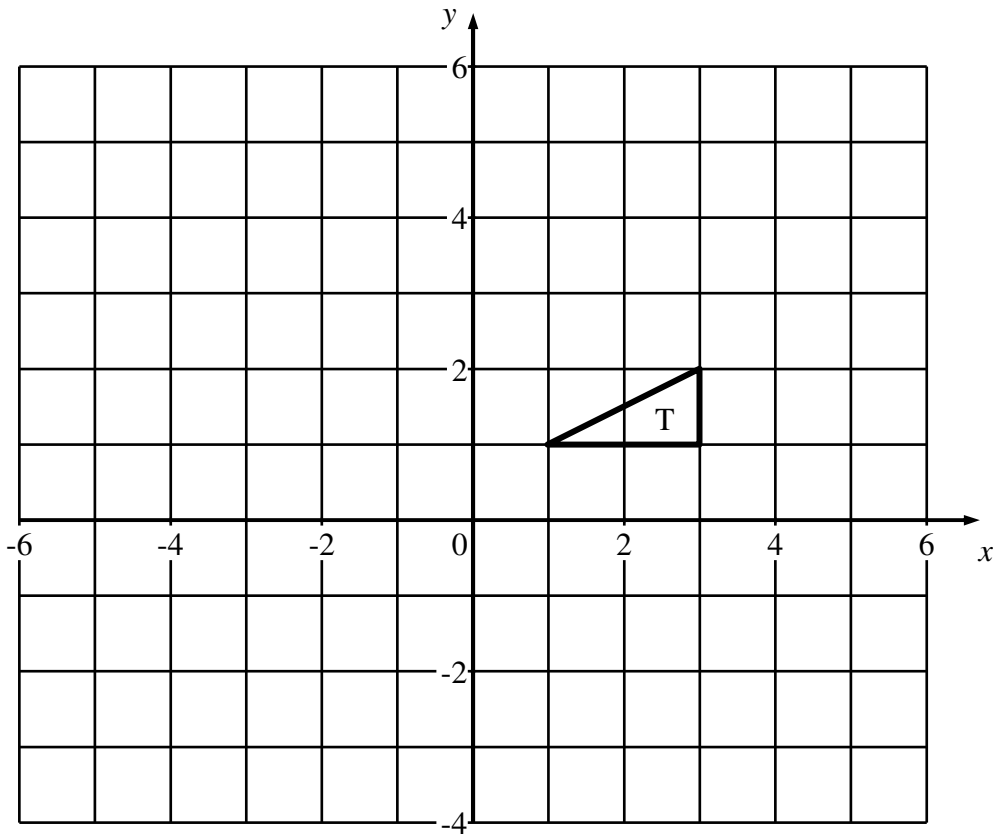
(a) $\dfrac{x}{12} = 6$

Answer: x = _____ [2]

(b) $2(6 - y) + 4(y + 2) = 34$

Answer: y = _____ [3]

9.



The diagram shows a triangle labeled T.

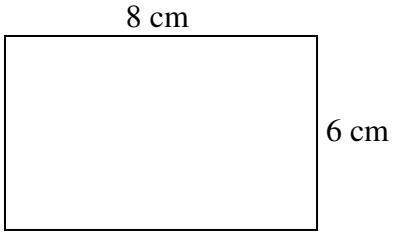
(a) Reflect T in the *y*-axis. Label the new shape U. [2]

(b) Enlarge T by scale factor 2 with centre of enlargement (2, 3). Label this shape V. [2]

(c) Draw the image of T under a translation $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$. Label the image W. [2]

---

10. Calculate the length of a diagonal of a rectangle which is 8 cm by 6 cm.



Answer: _____ cm [3]

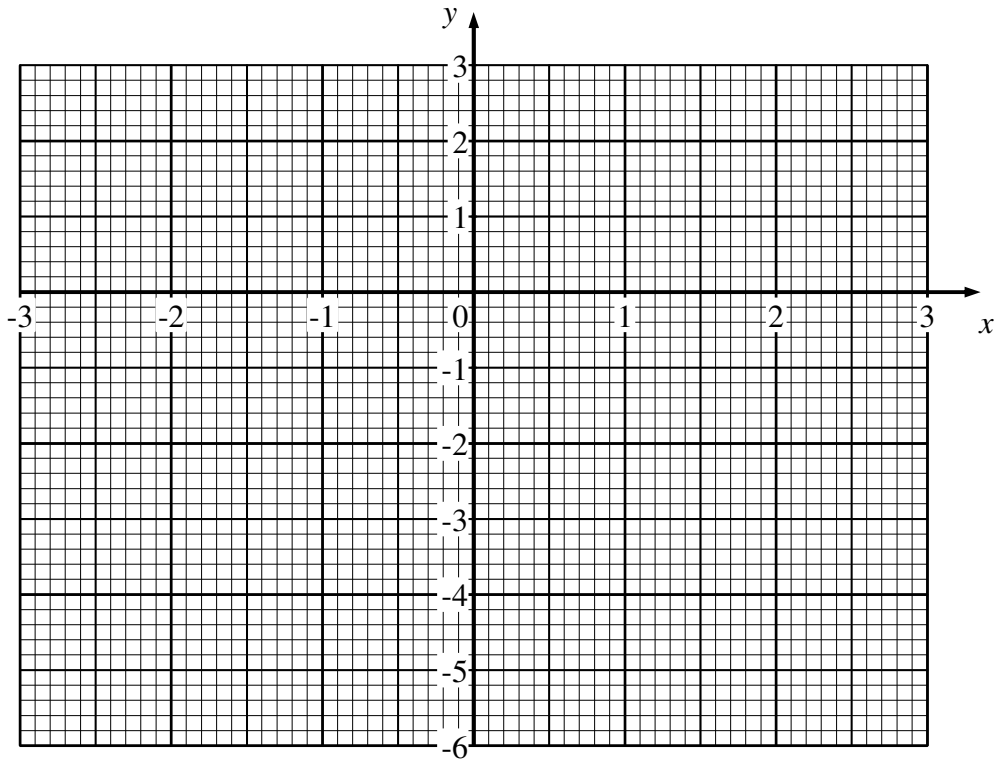
---

11. (a) Complete the table of values for $y = x - 2$

x	–3	0	3
y			1

[3]

(b) Plot the graph of $y = x - 2$ on the axes below.



[2]

(c) Write down the co-ordinates of where the line $y = x - 2$ crosses the x-axis.

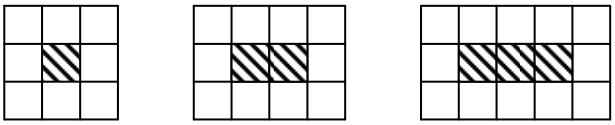
Answer: _____ [2]

(d) Draw the line $y = -1.5$ on the axes above.

(e) Write down the co-ordinates of where the line $y = x - 2$ crosses the line $y = -1.5$.

Answer: _____ [2]

12.



Stage 1 Stage 2 Stage 3

The diagram above shows a garden patio which is developed in stages using black and shaded square tiles.

(a) Complete the table below showing the number of **white** tiles in each stage.

Stage	Number of white tiles
1	
2	10
3	
4	

[3]

(b) Write down the number of white tiles in the 7^{th} stage.

Answer: _____ [2]

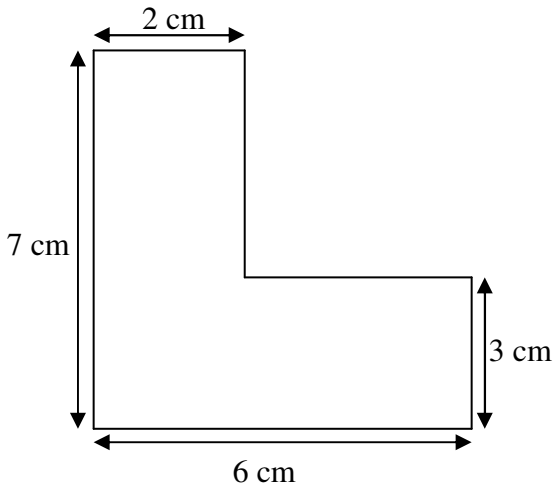
(c) Write down a formula for the number of white tiles in the n^{th} stage in terms of n.

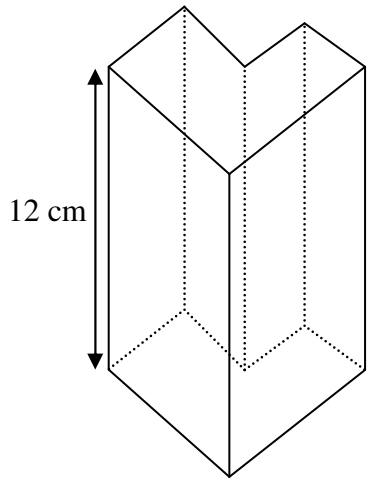
Answer: _____ [2]

(d) Calculate which stage would give a patio containing 76 white tiles.

Answer: _____ [3]

13.





The diagram on the left shows the base of a prism (all angles are right angles). The diagram on the right shows the prism standing on its base.

Calculate:

(a) the area of the base of the prism,

Answer: _____ cm^2 [3]

(b) the volume of the prism;

Answer: _____ cm^3 [2]

(c) the total surface area of the prism;

Answer: _____ cm^2 [3]

14. The minute hand of a clock is 10 cm long. Calculate how far the tip of this hand travels in one week, giving your answer to the nearest cm.

Answer: _____ cm [3]

---

15. (a) The mean weight of 6 ballet dancers is 56 kg. The mean weight of 10 rugby players is 100 kg.

Calculate the mean weight of all 16 people.

Answer: _____ kg [3]

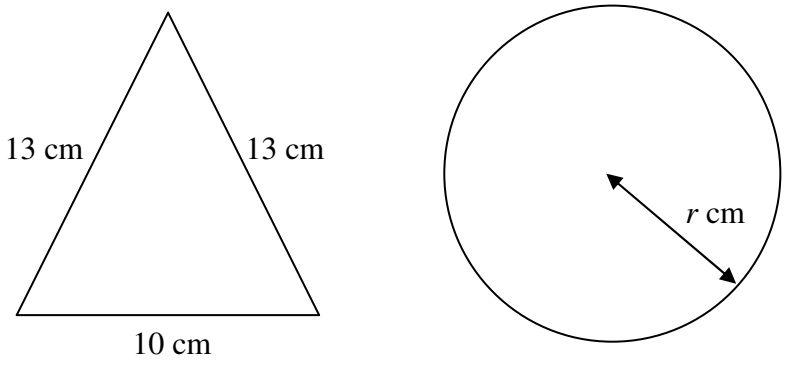
(b) x, y, and z represent three numbers. The mean of x, y and z is three times x.

Calculate the mean of y and z.

Answer: _____ [3]

---

16. A triangle has sides 13 cm , 13 cm and 10 cm, and a circle has radius r cm.



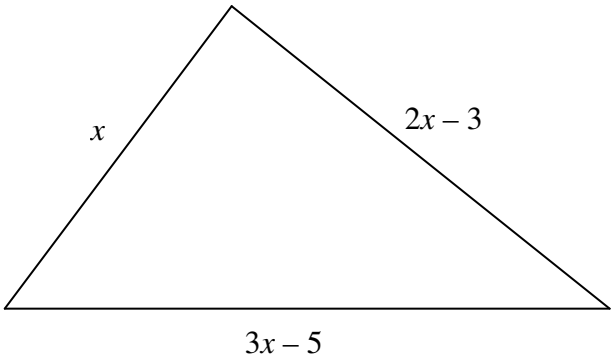
(a) If the perimeter of the triangle is the same as the circumference of the circle, calculate the value of r, giving your answer to 2 decimal places.

Answer: r = _____ cm [3]

(b) If instead the triangle on the left has the same **area** as the circle on the right, calculate the new value of r, giving your answer to 2 decimal places.

Answer: r = _____ cm [4]

17. A triangle has sides of x cm, $2x - 3$ cm and $3x - 5$ cm, as shown:



Find the three values of x for which the triangle is **isosceles**.

Answer: x = _____, x = _____, x = _____ [5]

18. A new way to combine two numbers, written $a \otimes b$, is calculated by adding up both numbers squared.

For example $4 \otimes 3 = 4^2 + 3^2 = 16 + 9 = 25$

(a) Calculate

(i) $5 \otimes 2$

Answer: _____ [2]

(ii) $((-5) \otimes (-2)) \otimes (-3)$

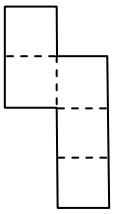
Answer: _____ [3]

(b) Solve for x:

$$(x \otimes 2) = 61 - (x \otimes 5)$$

Answer: x = _____ [3]

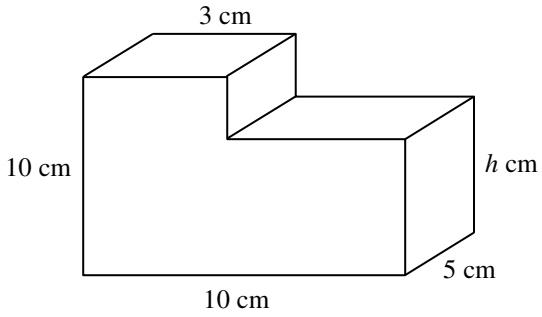
19. A piece of paper is cut out as shown in the diagram. It is folded along the dotted lines to make an open box. The box is placed on a table so that the top of the box is open. Shade the square which is the bottom of the box.



[2]

---

20. The rectangular block shown has total surface area 358 cm^2.
Find the value of h.



Answer: _____ [3]

---

21. Find the value of 1 – 2 + 3 – 4 + 5 – ... + 97 – 98 + 99 – 100.

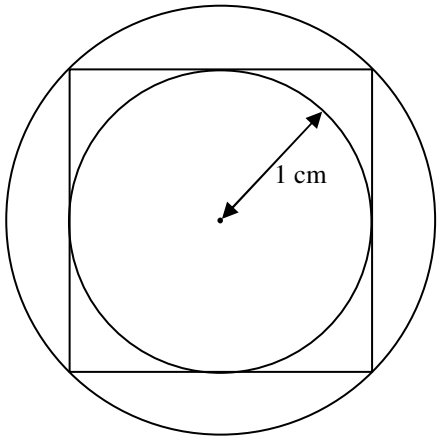
(Note: the ... indicates that the numbers 6 to 96 are also included in the sum, with + and – following the pattern in the rest of the sum.)

Answer: _____ [3]

---

22. The diagram shows a circle of radius 1 cm, around which a square has been drawn to just touch the circle, around which a second circle has been drawn just touching the square, as shown.

Calculate the ratio of the area of the smaller circle to the larger circle, giving your answer in its simplest form.



Answer: _____ [3]

THE END