Write your name here

Surname	Other Names

Mathematics

2022 Paper 3 (Calculator)
Foundation Tier

Time: 1 hour 30 minutes

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – there may be more space than you need.
- **Calculators may be used**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working.**

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets – use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Foundation Tier Formulae Sheet

Perimeter, area and volume

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

Area of a trapezium = $\frac{1}{2}(a + b)\, h$

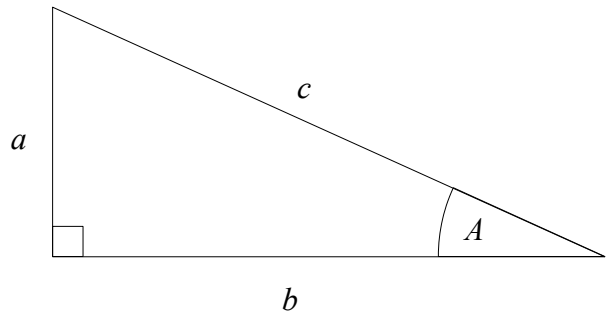
Volume of a prism = area of cross section × length

Where r is the radius and d is the diameter:

Circumference of a circle = $2\pi r = \pi d$

Area of a circle = πr^2

Pythagoras' Theorem and Trigonometry



In any right-angled triangle where a, b and c are the length of the sides and c is the hypotenuse:

$$a^2 + b^2 = c^2$$

In any right-angled triangle ABC where a, b and c are the length of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c} \qquad \cos A = \frac{b}{c} \qquad \tan A = \frac{a}{b}$$

Compound Interest

Where P is the principal amount, r is the interest rate over a given period and n is number of times that the interest is compounded:

Total accrued = $P\left(1 + \frac{r}{100}\right)^n$

Probability

Where P (A) is the probability of outcome A and P (B) is the probability of outcome B:

P (A or B) = P (A) + P (B) – P (A and B)

END OF EXAM AID

1 Write 3.84761 correct to 3 decimal places.

3.848

(Total for Question 1 is 1 mark)

2 Write 23% as a fraction.

$\frac{23}{100}$

(Total for Question 2 is 1 mark)

3 Find $\sqrt{0.49}$

$\frac{7}{10}$

(Total for Question 3 is 1 mark)

4 Write down all the factors of 18

1×18

2×9

3×6

1, 2, 3, 6, 9 and 18

(Total for Question 4 is 2 marks)

5 Here is a list of fractions.

$$\frac{18}{45} \quad \frac{14}{30} \quad \frac{10}{25} \quad \frac{8}{20} \quad \frac{16}{40}$$

One of these fractions is not equivalent to $\frac{2}{5}$

Write down this fraction.

$\frac{14}{30}$

(Total for Question 5 is 1 mark)

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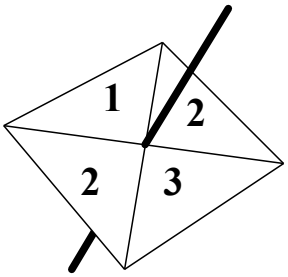
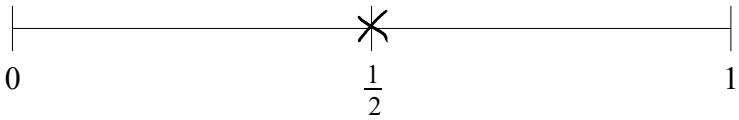
6 Sophie spins a fair 4-sided spinner.



(a) On the probability scale mark with a cross (X) the probability that the spinner lands on 2.



(1)

(b) Write down the probability that the spinner lands on **4**.

0

(1)

(Total for Question 6 is 2 marks)

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7 Write 22 as a percentage of 58
Give your answer correct to the nearest whole number.

$\frac{22}{58} \times 100 = 37.93...$

38 %

(Total for Question 7 is 2 marks)

8 In a box of chocolates there are

11 milk chocolates
5 dark chocolates
7 white chocolates

$11 + 5 + 7 = 23$

Charlie takes one of the chocolates at random.

Write down the probability that Charlie takes a white chocolate.

$\frac{7}{23}$

(Total for Question 8 is 2 marks)

9 There are 1100 students at a school.

540 students are girls, the rest are boys.

$\frac{1}{10}$ of the girls are left handed.

$\frac{1}{8}$ of the boys are left handed.

Work out the number of left handed students in the school.

$1100 - 540 = 560$ Boys

$\frac{1}{10} \times 540 = 54$ (left handed girls)

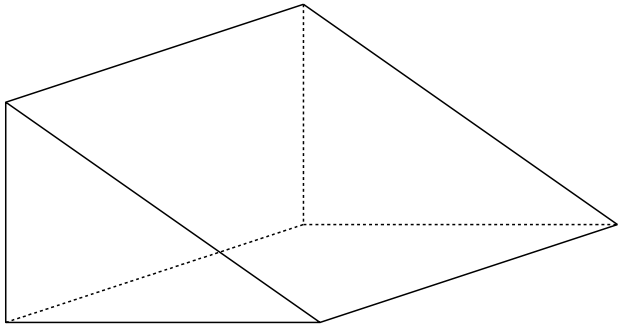
$\frac{1}{8} \times 560 = 70$ (left handed boys)

$54 + 70 = 124$

124

(Total for Question 9 is 3 marks)

10 Here is a 3-D shape.



(a) Write down the name of this 3-D shape.

Triangular Prism

(1)

(b) Write down the number of edges of this 3-D shape.

9

(1)

(Total for Question 10 is 2 marks)

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11 A shop sells washing powder in 650g packs.

Jacob has no washing powder.
He estimates that he does 2 washes a week, using 40g each wash.

Jacob wants to buy enough washing powder for 13 weeks.

How many packs of washing powder does Jacob need to buy?

$2 \times 40 \times 13 = 1040\text{g}$ needed

$2 \times 650 = 1300\text{g}$

2

(Total for Question 11 is 3 marks)

12 Last year the cost of Tom's train ticket was £42
This year the cost of Tom's train ticket increased to £50

Write down the increase in the cost of Tom's ticket as a fraction of last year's cost.

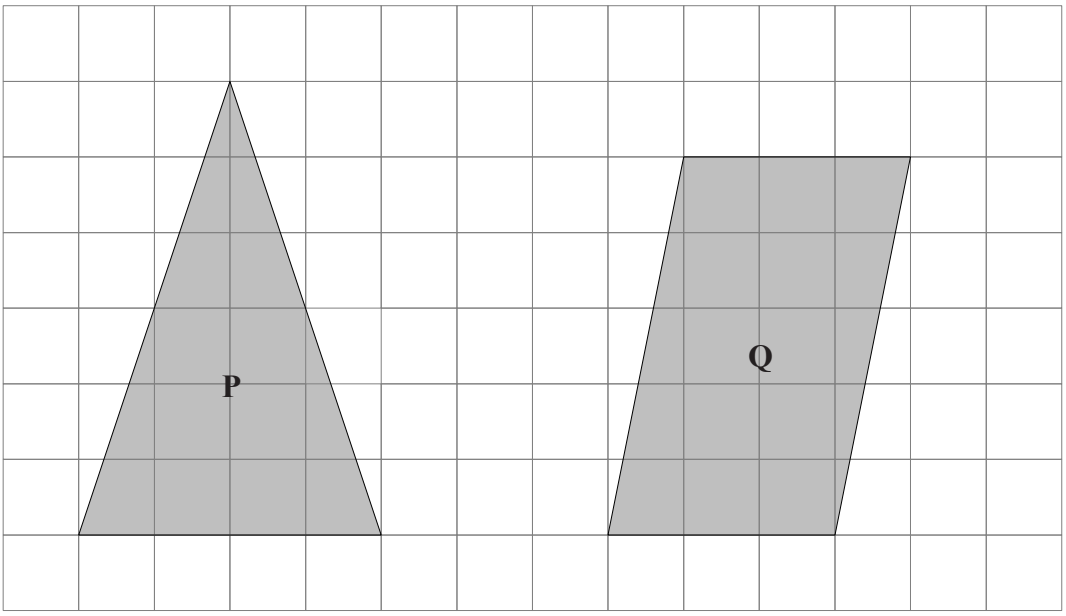
$50 - 42 = £8$ increase

$\frac{8}{42}$ or $\frac{4}{21}$

$\frac{8}{42}$

(Total for Question 12 is 2 marks)

13 The diagram shows two shapes on a centimetre grid.



(a) Find the area of shape **P**

$\frac{1}{2} \times$ base $\times$ height

$\frac{1}{2} \times 4 \times 6$

12 cm^2

(2)

(b) Write down the mathematical name for shape **Q**.

parallelogram

(1)

(Total for Question 13 is 3 marks)

14 (a) Find the value of $30.5^2 + 12.1^2$

1076.66

(1)

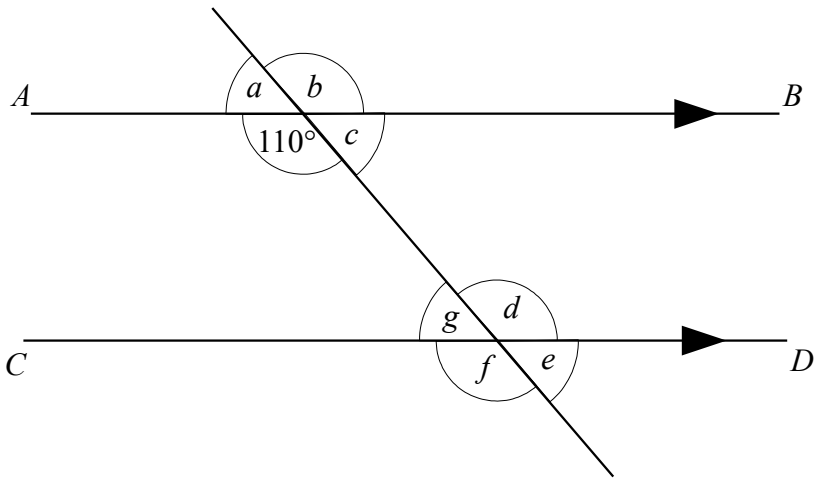
(b) Find the value of $\sqrt{5.13 + 10.28} - 0.97$

2.955557285

(2)

(Total for Question 14 is 3 marks)

15



AB and *CD* are parallel lines.
An angle of 110° is shown on the diagram.

(a) Write down the letter of one other angle of size 110°

b

(1)

(b) Give a reason for your answer.

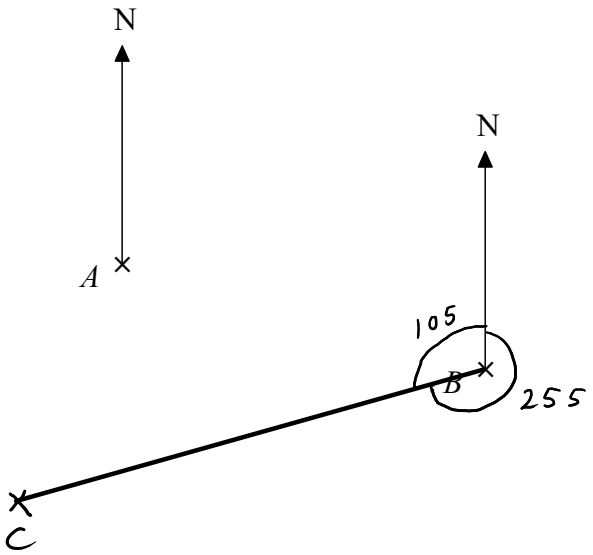
vertically opposite angles are equal

(1)

OR f corresponding angles
OR d alternate angles

(Total for Question 15 is 2 marks)

16 The accurate scale drawing shows the positions of two towns, town *A* and town *B*.
2 cm represents 1 km.



(a) Find the real distance between town *A* and town *B*.

5cm = 2.5km

2.5km

(1)

Town *C* is 3.2 km from *B* on a bearing of 255°

(b) Draw the position of town *C*, with a cross (×), on the diagram. **(2)**

3.2km = 6.4cm

360 - 255 = 105

(Total for Question 16 is 3 marks)

17 A car is travelling at a speed of 120 km/hour.

Find the speed of the car in metres/second.

120 km/h

120 000 m/h

÷ 60

2000 m/minute

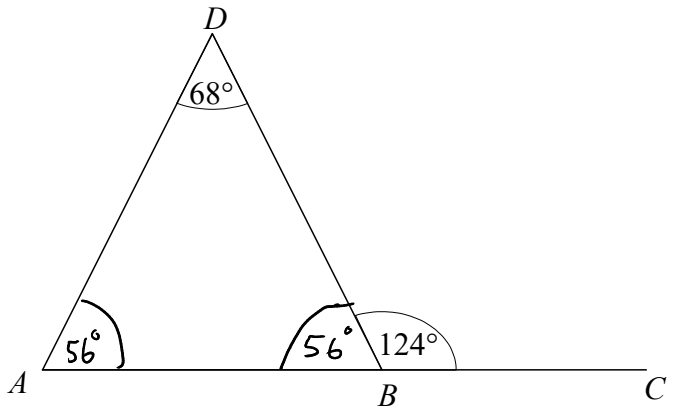
÷ 60

33.3̇ m/s

33.3 ..... m/s

(Total for Question 17 is 2 marks)

18 *ABC* is a straight line.



Show that *ABD* is an isosceles triangle

ABD = 180 − 124 = 56° Angles in a straight line add to 180°

BAD = 180 − 56 − 68 = 56° Angles in a triangle add to 180°

ABD is isosceles because ABD = BAD

(Total for Question 18 is 4 marks)

19 (a) Factorise fully $30x^3 + 12x$

$6x(5x^2 + 2)$

(2)

(b) Solve $5(f - 2) = 22$

$5f - 10 = 22$

$5f = 32$

$f = \frac{32}{5}$

$f =$ 6.4

(2)

(Total for Question 19 is 4 marks)

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20 Light **A** flashes every 8 seconds.
Light **B** flashes every 20 seconds.

Both lights flash at the same time.

Work out how long it will take for both lights to flash at the same time again.

8 16 24 32 (40)

20 (40)

40 ..... seconds

(Total for Question 20 is 3 marks)

21 Here are the times, in seconds, it took 15 boys to complete a puzzle.

45	32	47	52	33
54	58	42	40	36
54	44	35	43	59

(a) Work out the median.

32 33 35 36 40 42 43 44 45 47 52

54 54 58 59

44

(1)

(b) Find the range.

59 − 32

27

(1)

15 girls also completed the puzzle.
The table below shows information about the times, in seconds, it took 15 girls to complete a puzzle.

Least Time	30
Median	47
Greatest Time	58

Range = 58 − 30 = 28

(c) Compare the distribution of the times of the girls with the distribution of the times of the boys.

The girl's median time was longer, on average it took the girls longer to complete the puzzle

The girl's range is greater. The girl's times were more spread out.

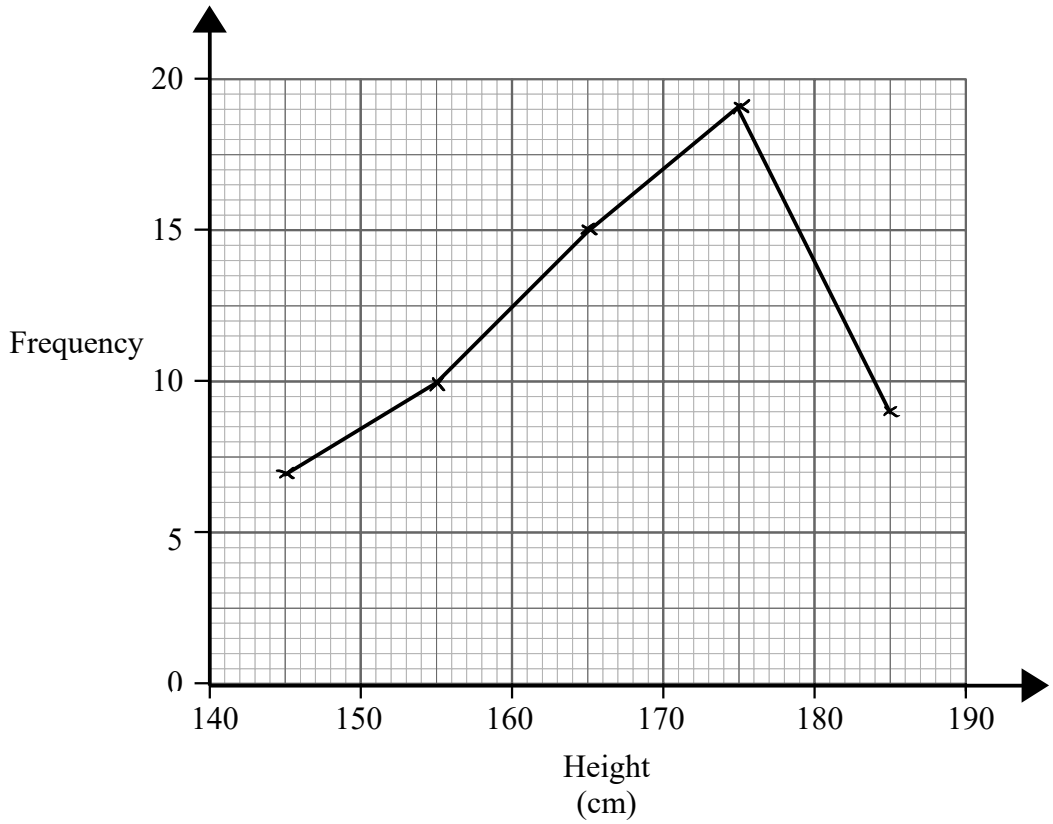
(3)

(Total for Question 21 is 5 marks)

22 The frequency table shows the heights, in cm, of some tomato plants.

Height (cm)	Frequency
$140 < h \leqslant 150$	7
$150 < h \leqslant 160$	10
$160 < h \leqslant 170$	15
$170 < h \leqslant 180$	19
$180 < h \leqslant 190$	9

Draw a frequency polygon to show this information.



(Total for Question 22 is 2 marks)

23 Banana computers sold 19.3 million computers in 2017.

In 2018, they sold 18.2 million computers.

Work out the percentage decrease in the number of computers sold.

Give your answer to three significant figures.

$$\frac{\text{change}}{\text{original}} \times 100$$

$$\frac{19.3 - 18.2}{19.3} \times 100 = 5.70\ \%$$

5.70 ..... %

(Total for Question 23 is 3 marks)

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24 The value of a house increased by 6%.
The house then had a value of £265 000

Work out the value of the house before the increase.

$$106\% = 265000$$
$$\div 106 \qquad \div 106$$
$$1\% = 2500$$
$$\times 100 \qquad \times 100$$
$$100\% = 250000$$

£ 250 000

(Total for Question 24 is 2 marks)

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25 $s = ut + \frac{1}{2}at^2$

$u = -5$
$a = 4$
$t = 3$

(a) Work out the value of s.

$$s = (-5)(3) + \frac{1}{2}(4)(3)^2$$

$s =$ 3

(2)

(b) Make a the subject of $s = ut + \frac{1}{2}at^2$

$$s - ut = \frac{1}{2}at^2$$

$$2(s - ut) = at^2$$

$$\frac{2(s-ut)}{t^2} = a$$

$a = \frac{2s - 2ut}{t^2}$

(2)

(Total for Question 25 is 4 marks)

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26 There are 120 people in a school canteen.
40% of the people in the canteen are in year 11 students.

The number of year 11 students in the canteen is three times the number of year 10 students.
The rest of the people in the canteen are year 9 students.

the number of year 9 students : the number of year 10 students = n : 1

Work out the value of n.
You must show how you get your answer.

$40\% \times 120 = 48$ (Yr 11)

$\frac{48}{3} = 16$ (Yr 10)

$120 - 48 - 16 = 56$ (Yr 9)

$\div 16$ 56 : 16 $\div 16$
3.5 : 1

$n =$ 3.5

(Total for Question 26 is 2 marks)

27 Amy drives 300 miles from London to Newcastle.
She drives the first 165 miles at an average speed of 60 mph.
From this point it takes Amy 3 hours and 5 minutes to complete her journey.

What was Amy's average speed for the whole journey?
Give your answer correct to 3 significant figures.

speed = distance / time

First 165 miles $s = 60$ $d = 165$

$$t = \frac{d}{s}$$

$$= \frac{165}{60}$$

$$= 2.75 \text{ hours} \quad (2\text{hrs } 45\text{ mins})$$

$$\text{Speed} = \frac{\text{Total Distance}}{\text{Total Time}}$$

$$= \frac{300}{2\text{hrs } 45 + 3\text{hrs } 5}$$

$$= \frac{300}{5\text{hrs } 50\text{ mins}}$$

$$= 51.4 \text{ mph}$$

…51.4… mph

(Total for Question 27 is 4 marks)

28 Potatoes cost £9 for a 12.5 kg bag at a farm shop.
The same type of potatoes cost £1.83 for a 2.5 kg bag at a supermarket.

Where are the potatoes the better value, at the farm shop or at the supermarket?
You must show your working.

Farm Shop 12.5kg £9

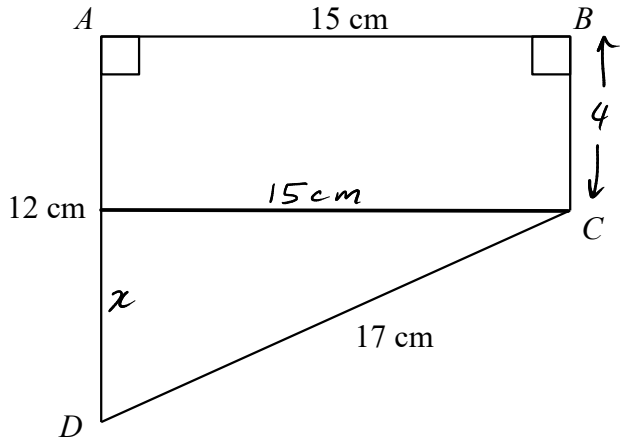
Supermarket 2.5kg £1.83
×5 ×5
12.5kg £9.15

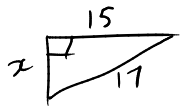
The farm shop £9 < £9.15

(Total for Question 28 is 3 marks)

29 *ABCD* is a trapezium.

Calculate the area of *ABCD*.





$x^2 + 15^2 = 17^2$

$x^2 = 17^2 - 15^2$

$x^2 = 64$

$x = \sqrt{64}$

$= 8$

$12 - 8 = 4$

Area of trapezium $= \frac{1}{2}(a+b) \times h$

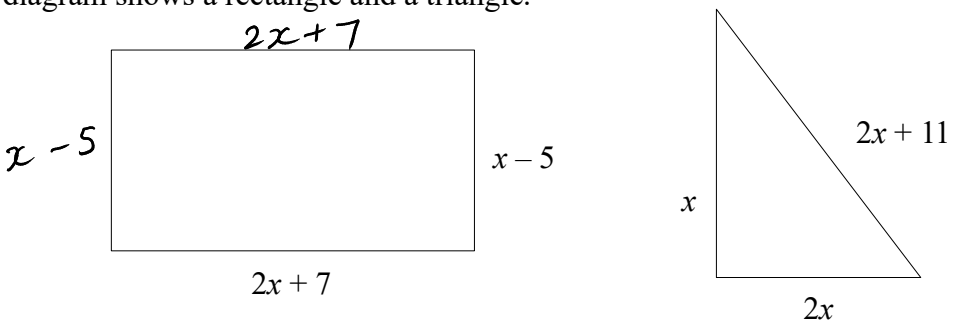
$= \frac{1}{2}(4+12) \times 15$

$= 120$

.....120.....cm^2

(Total for Question 29 is 4 marks)

30 The diagram shows a rectangle and a triangle.



The perimeter of the rectangle is equal to the perimeter of the triangle.
Find the value of x.

$6x + 4 = 5x + 11$

$x + 4 = 11$

$x = 7$

$x = 7$

(Total for Question 30 is 3 marks)

31 Here are the first 5 terms of a sequence.

9 14 19 24 29

Find an expression, in terms of n, for the nth term of this sequence.

5n 5 10 15 20 25

$5n + 4$

(Total for Question 31 is 2 marks)