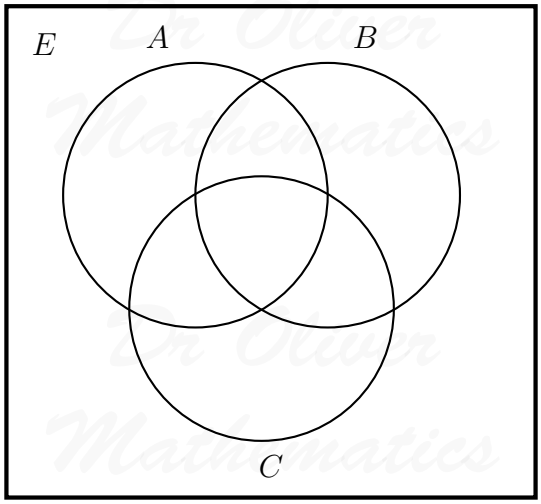
Dr Oliver Mathematics
GCSE Mathematics
2018 November Paper 2H: Calculator
1 hour 30 minutes

The total number of marks available is 80.
You must write down all the stages in your working.

1. $E = \{\text{even numbers between 1 and 25}\}$.
   $A = \{2, 8, 10, 14\}$.
   $B = \{6, 8, 20\}$.
   $C = \{8, 18, 20, 22\}$.

   (a) Complete the Venn diagram for this information. (4)



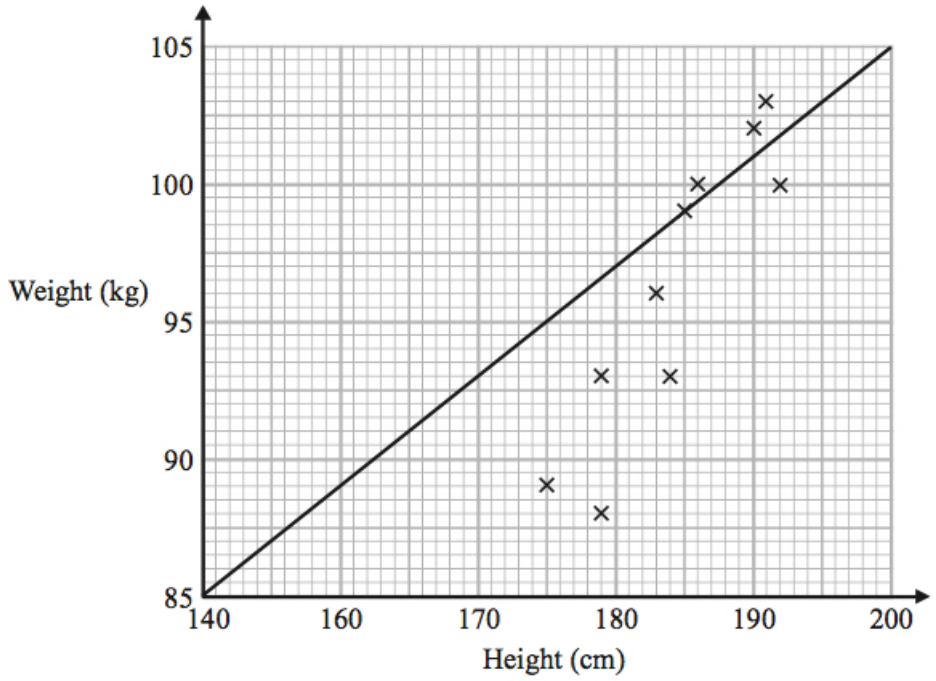
   A number is chosen at random from E.

   (b) Find the probability that the number is a member of $A \cap B$. (2)

2. Sean has information about the height, in cm, and the weight, in kg, of each of ten rugby players. (2)

   He is asked to draw a scatter graph and a line of best fit for this information.

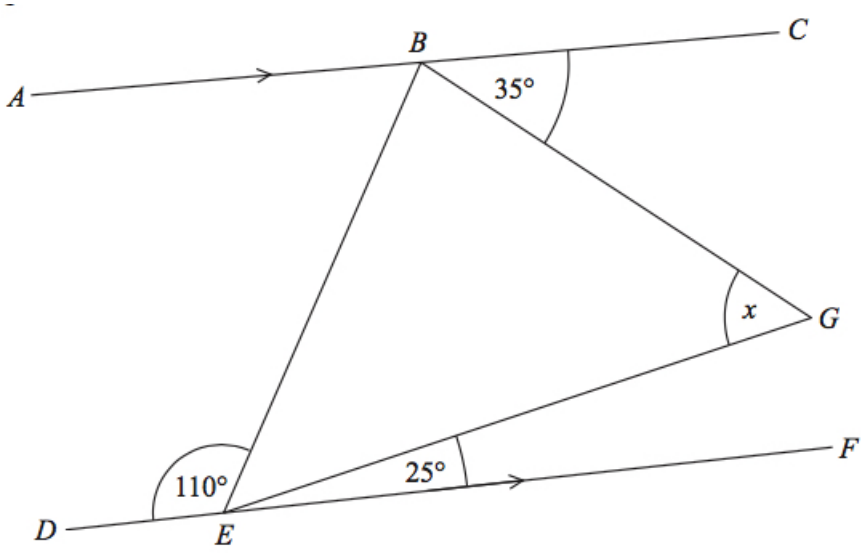
   Here is his answer.



Sean has plotted the points accurately.

Write down two things that are wrong with his answer.

3. BEG is a triangle. (4)



ABC and DEF are parallel lines.

Work out the size of angle x.
Give a reason for each stage of your working.

4. Northern Bank has two types of account.
Both accounts pay compound interest.

Cash savings account
Interest
2.5% per annum

Shares account
Interest
3.5% per annum

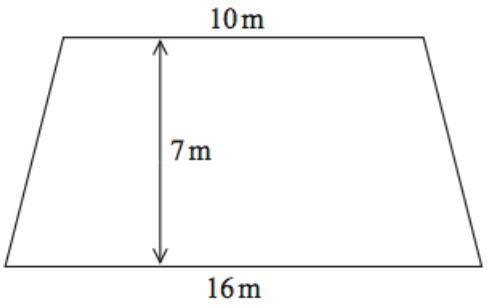
Ali invests £2 000 in the cash savings account.
Ben invests £1 600 in the shares account.

(a) Work out who will get the most interest by the end of 3 years. (4)
You must show all your working.

In the 3rd year the rate of interest for the shares account is changed to 4% per annum.

(b) Does this affect who will get the most interest by the end of 3 years? (1)
Give a reason for your answer.

5. The diagram shows a floor in the shape of a trapezium. (5)



£16.99

John is going to paint the floor.

Each 5 litre tin of paint costs £16.99.
1 litre of paint covers an area of 2 m^2.

John has £160 to spend on paint.

Has John got enough money to buy all the paint he needs?
You must show how you get your answer.

6. A is the point with coordinates $(5, 9)$. (3)
B is the point with coordinates $(d, 15)$.

The gradient of the line AB is 3

Work out the value of d.

7. (a) Write the number (1)

$$0.000\,086\,23$$

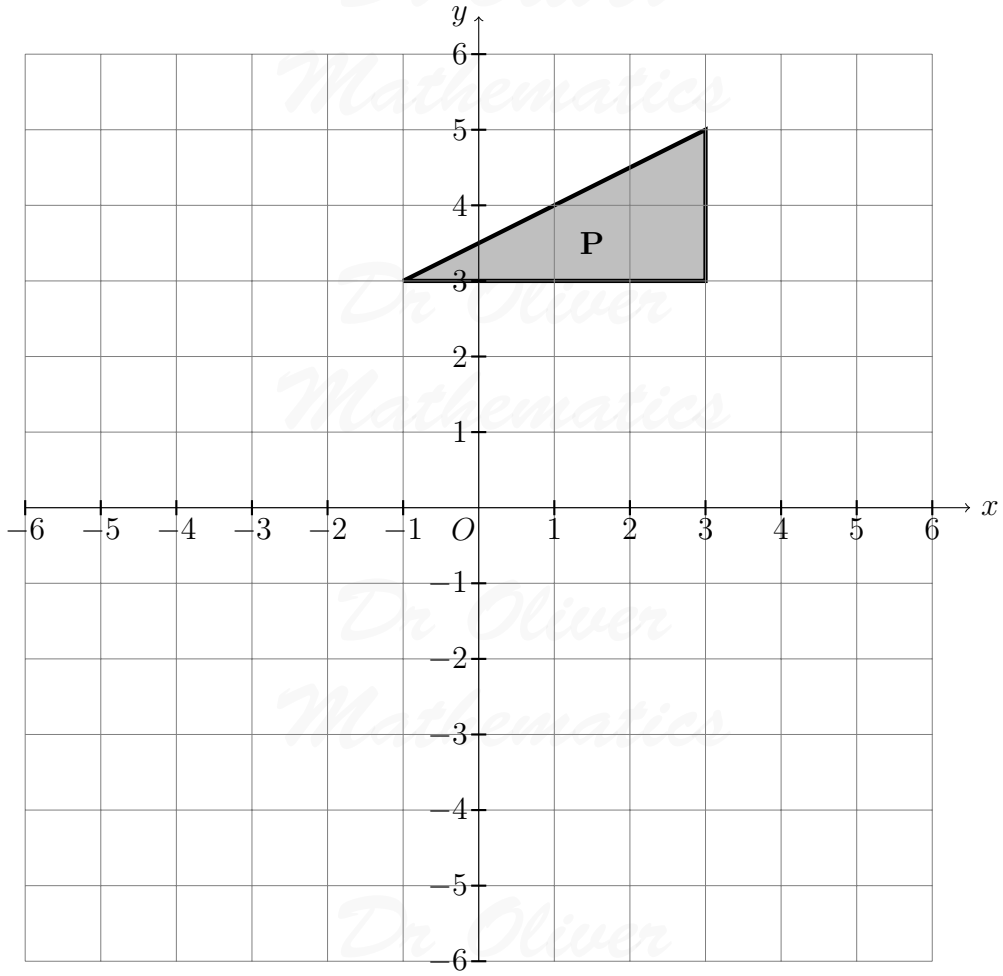
in standard form.

(b) Work out (2)

$$\frac{3.2 \times 10^3 + 5.1 \times 10^{-2}}{4.3 \times 10^{-4}}.$$

Give your answer in standard form, correct to 3 significant figures.

8. Triangle **P** is reflected in the line $y = -x$ to give triangle **Q**. (3)
Triangle **Q** is reflected in the line $x = -1$ to give triangle **R**.



Describe fully the single transformation that maps triangle **R** to triangle **P**.

9. Martin truncates the number N to 1 digit. (2)
The result is 7.

Write down the error interval for N.

10. Robert makes 50 litres of green paint by mixing litres of yellow paint and litres of blue paint in the ratio 2 : 3. (5)

Yellow paint is sold in 5 litre tins.
Each tin of yellow paint costs £26.

Blue paint is sold in 10 litre tins.
Each tin of blue paint costs £48.

Robert sells all the green paint he makes in 10 litre tins.
He sells each tin of green paint for £66.96.

Work out Robert's percentage profit on each tin of green paint he sells.

11. In a restaurant there are (3)

- 9 starter dishes,
- 15 main dishes, and
- 8 dessert dishes.

Janet is going to choose one of the following combinations for her meal.

- a starter dish and a main dish,
- or a main dish and a dessert dish,
- or a starter dish, a main dish, and a dessert dish

Show that there are 1 335 different ways to choose the meal.

12. (a) Write (3)

$$\frac{4x^2 - 9}{6x + 9} \times \frac{2x}{x^2 - 3x}$$

in the form

$$\frac{ax + b}{cx + d},$$

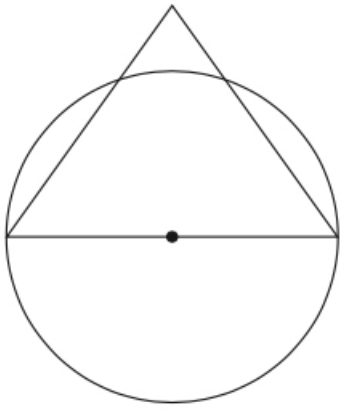
where a, b, c, and d are integers.

(b) Express (3)

$$\frac{3}{x + 1} + \frac{1}{x - 2} - \frac{4}{x}$$

as a single fraction in its simplest form.

13. The diagram shows a circle and an equilateral triangle. (3)



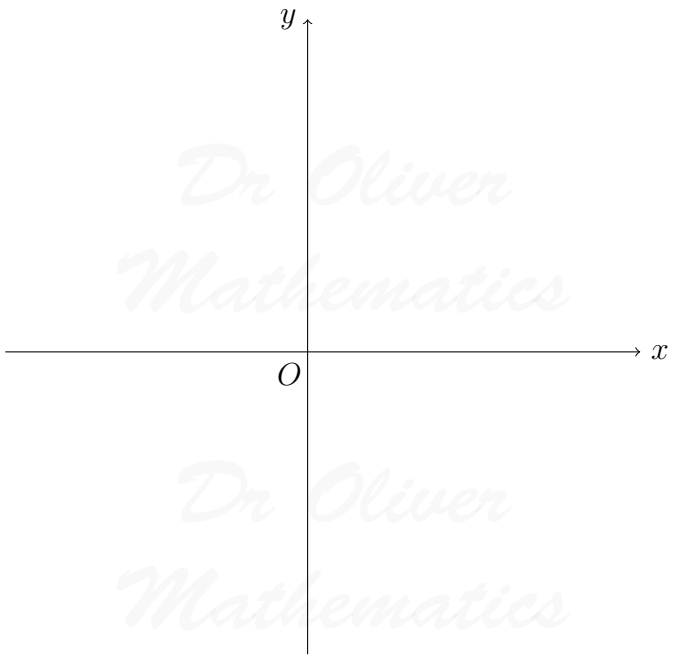
One side of the equilateral triangle is a diameter of the circle.
The circle has a circumference of 44 cm.

Work out the area of the triangle.
Give your answer correct to 3 significant figures.

14. On the grid, sketch the curve with equation (2)

$$y = 2^x.$$

Give the coordinates of any points of intersection with the axes.



15. The equation of a circle is (1)

$$x^2 + y^2 = 42.25.$$

Find the radius of the circle.

16. There are only red counters and blue counters in a bag.

Joe takes at random a counter from the bag.
The probability that the counter is red is 0.65.
Joe puts the counter back into the bag.

Mary takes at random a counter from the bag.
She puts the counter back into the bag.

(a) What is the probability that Joe and Mary take counters of different colours? (2)

There are 78 red counters in the bag.

(b) How many blue counters are there in the bag? (2)

17. p and q are two numbers such that $p > q$. (5)

When you subtract 5 from p and subtract 5 from q the answers are in the ratio 5 : 1.
When you add 20 to p and add 20 to q the answers are in the ratio 5 : 2.

Find the ratio $p : q$.
Give your answer in its simplest form.

18. The straight line $\mathbf{L}_1$ passes through the points with coordinates $(4, 6)$ and $(12, 2)$. (4)
The straight line $\mathbf{L}_2$ passes through the origin and has gradient -3.

The lines $\mathbf{L}_1$ and $\mathbf{L}_2$ intersect at point P.

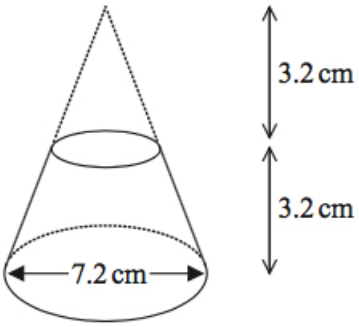
Find the coordinates of P.

19. Solve (5)

$$22 < \frac{m^2 + 7}{4} < 32.$$

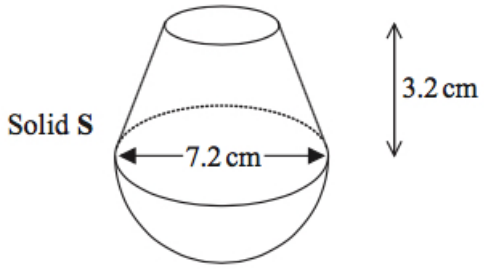
Show all your working.

20. Here is a frustum of a cone. (5)



The diagram shows that the frustum is made by removing a cone with height 3.2 cm from a solid cone with height 6.4 cm and base diameter 7.2 cm.

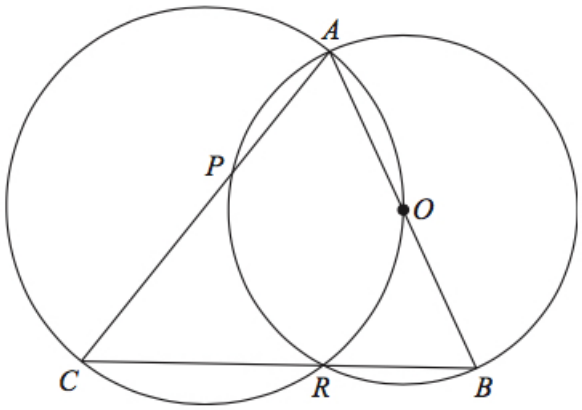
The frustum is joined to a solid hemisphere of diameter 7.2 cm to form the solid **S** shown below.



The density of the frustum is 2.4 g/cm^3.
The density of the hemisphere is 4.8 g/cm^3.

Calculate the average density of solid **S**.

21. A, B, R, and P are four points on a circle with centre O. (4)
A, O, R, and C are four points on a different circle.
The two circles intersect at the points A and R.



CPA, CRB, and AOB are straight lines.

Prove that angle CAB = angle ABC.