

Paper 2 and Paper 3 Predictions

Edexcel - Higher  
Very High Chance



Corbettmaths

Ensure you have: Pencil, pen, ruler, protractor, pair of compasses and eraser

You will need a calculator

### Guidance

1. Read each question carefully before you begin answering it.
2. Don't spend too long on one question.
3. Attempt every question.
4. Check your answers seem right.
5. Always show your workings

Revision for this test

[www.corbettmaths.com/contents](http://www.corbettmaths.com/contents)



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1. Kevin is going on holiday to Japan.  
He wants to change some money into yen.

The bank only stocks ¥1000 notes.  
James wants to change up to £300 into yen.  
He wants as many ¥1000 notes as possible.

The exchange rate is £1 = ¥168

How many ¥1000 notes should he get?

$$£300 \times 168 = \cancel{¥} 50400$$

50 notes

.....  
(3)



2. In 2000 the price of a house was £72,600.  
By 2010 the price of the house had increased to £125,598

Find the percentage increase in the price of the house from 2000 to 2010.

$$125598 - 72600 = 52998$$

$$\frac{52998}{72600} \times 100$$

.....73.....%  
(3)

3. Charlene and Danielle share some money in ratio 7 : 9  
Danielle gets £48 more than Charlie.

How much does each woman receive?

$$9 - 7 = 2$$

$$48 \div 2 = 24$$

$$24 \times 7 = 168$$

$$24 \times 9 = 216$$

Charlene £.....168.....  
Danielle £.....216.....  
(3)

4. £5200 is invested at 2.8% compound interest per annum.  
How many years will it take for the investment to exceed £7000.

$$5200 \times 1.028^{10} = 6853.84$$

$$5200 \times 1.028^{11} = 7045.76$$

.....11.....years  
(3)

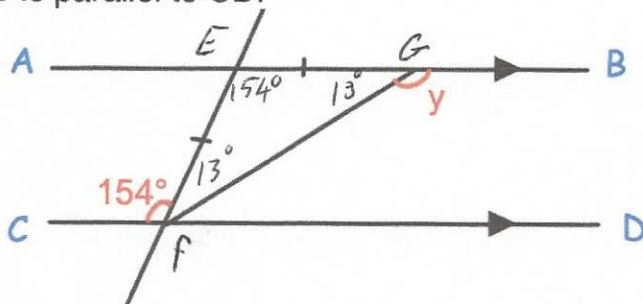
5. Nigel measures the time,  $t$  seconds, to complete a race as 14.8 seconds correct to the nearest tenth of a second.

Write down the error interval for  $t$ .

$$14.75 \leq t < 14.85$$

.....  
(2)

6. AB is parallel to CD.



Work out the size of angle  $y$ .  
Give reasons for your answer.

Angle  $CFE = \text{Angle } FEG$  as alternate angles

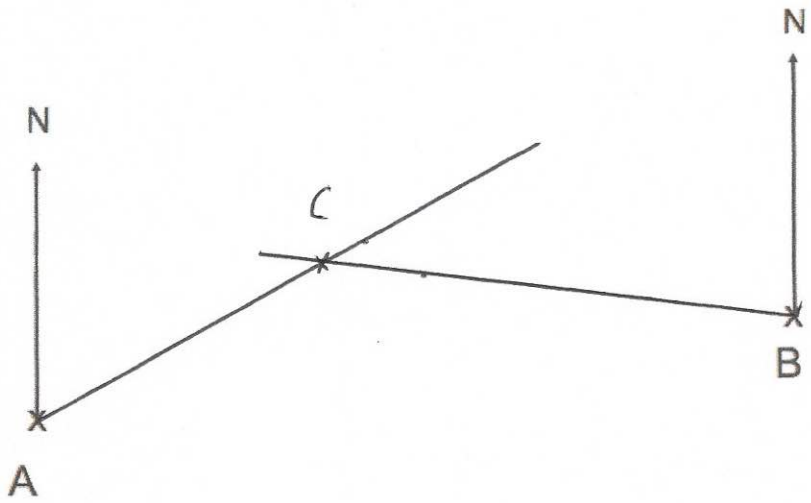
Angles  $EFG = \text{Angle } EGF$  as isosceles triangle  
so both are  $13^\circ$

Angles  $EGF$  &  $BGF$  are in a straight line, so  
add up to  $180^\circ$

$$\text{.....} \underline{167} \text{.....}^\circ$$

(4)

7. The diagram shows the position of two people, A and B, who are on their Duke of Edinburgh expedition.



The bearing of person C from person A is  $062^\circ$   
 The bearing of person C from person B is  $275^\circ$

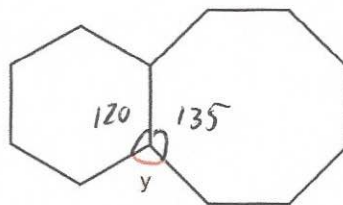
In the space above, mark the position of person C with a cross (x). Label it C.

(3)

8. Shown is a regular hexagon and a regular octagon.

$$720 \div 6 = 120$$

$$1080 \div 8 = 135$$



Calculate the size of angle y.

$$360 - (120 + 135) =$$

$$y = \dots\dots\dots 105 \dots\dots\dots^\circ$$

(3)

9. A circular wheel has a diameter of 30cm.  
The wheel rolls a distance of 60m.  $6000\text{cm}$

Calculate the number of complete revolutions completed.

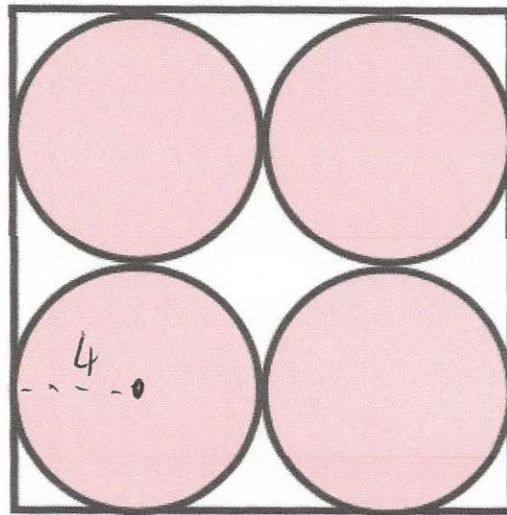
$$\pi \times 30 = 94.247\dots \text{cm}$$

$$6000 \div 94.247\dots = 63.66\dots$$

63

(4)

10. A logo is designed that has four pink circles within a white square.



16cm

The square has side length 16cm. Area of square =  $16 \times 16 = 256\text{cm}^2$

Find the percentage of the logo that is white.

$$\text{Area of 1 circle} = \pi \times 4^2 = 50.265\dots$$

$$\text{Area of 4 circles} = 201.06\dots$$

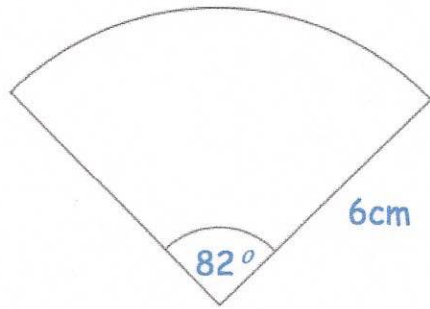
$$\text{White area} : 256 - 201.06\dots = 54.938\dots$$

$$\frac{54.938\dots}{256} \times 100$$

$$\frac{54.938\dots}{256} \times 100 = 21.46\dots\%$$

(5)

11.



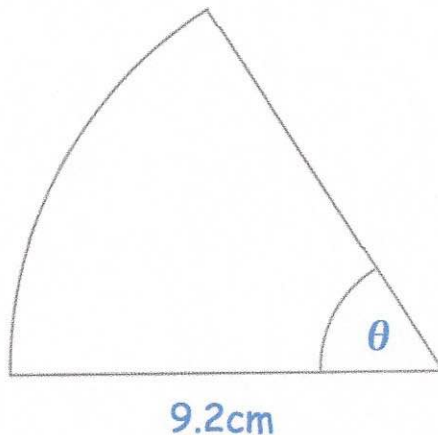
Calculate the perimeter of the sector.  
Give your answer to 2 decimal places.

$$\frac{82}{360} \times \pi \times 12 = 8.587\dots$$

$$8.5870\dots + 6 + 6$$

$$\underline{\hspace{1cm}20.59\text{cm}} \quad (3)$$

12. Shown is a sector of a circle with radius  $9.2\text{cm}$ .



The area of the sector is  $38.4\text{cm}^2$

Find the size of angle  $\theta$   
Give your answer to 2 significant figures.

$$\frac{\theta}{360} \times \pi \times 9.2^2 = 38.4$$

$$\theta = 51.988\dots$$

$$\frac{\theta}{360} \times \pi \times 84.64 = 38.4$$

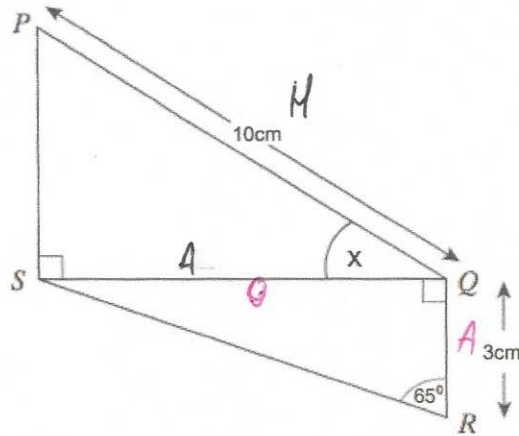
$$\frac{\theta}{360} \times 84.64 = 12.22\dots$$

$$\frac{\theta}{360} = 0.144\dots$$

$$\underline{\hspace{1cm}52^\circ} \quad (3)$$



13. Two right-angled triangles are shown below.  
 PQ is 10cm.  
 QR is 3cm.  
 Angle QRS is  $65^\circ$



Calculate the size of angle PQS

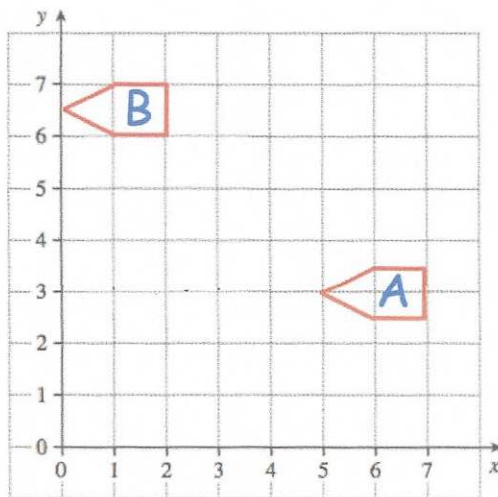
$$QS = \tan(65) \times 3 = 6.4335\dots$$

$$\cos x = \frac{6.4335}{10}$$

$$\cos^{-1}\left(\frac{6.4335}{10}\right) = \underline{\underline{49.96^\circ}}$$

(5)

- 14.

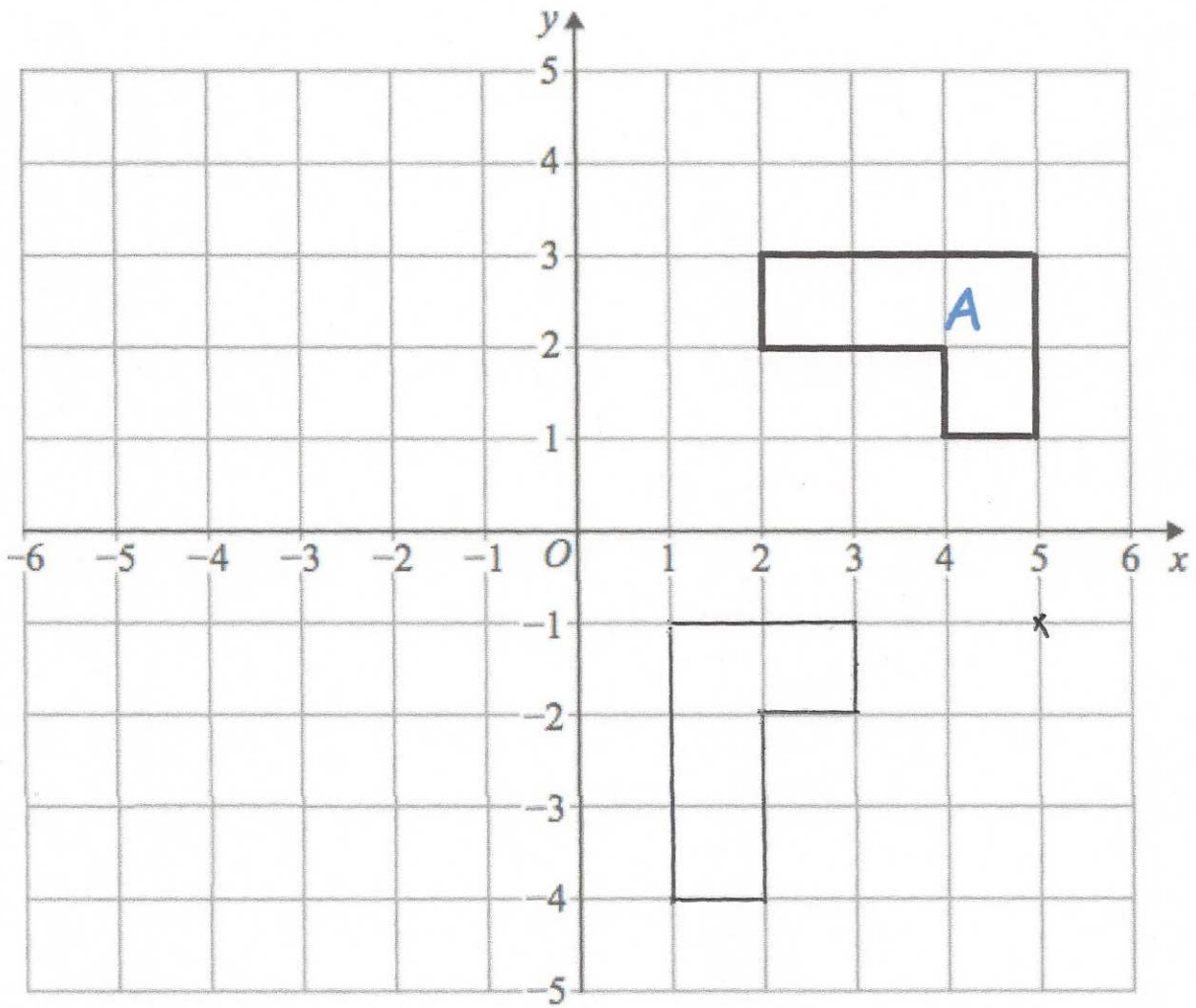


Describe fully the single transformation that maps shape A onto shape B.

Translation by the vector  $\begin{pmatrix} -5 \\ 3.5 \end{pmatrix}$

(2)

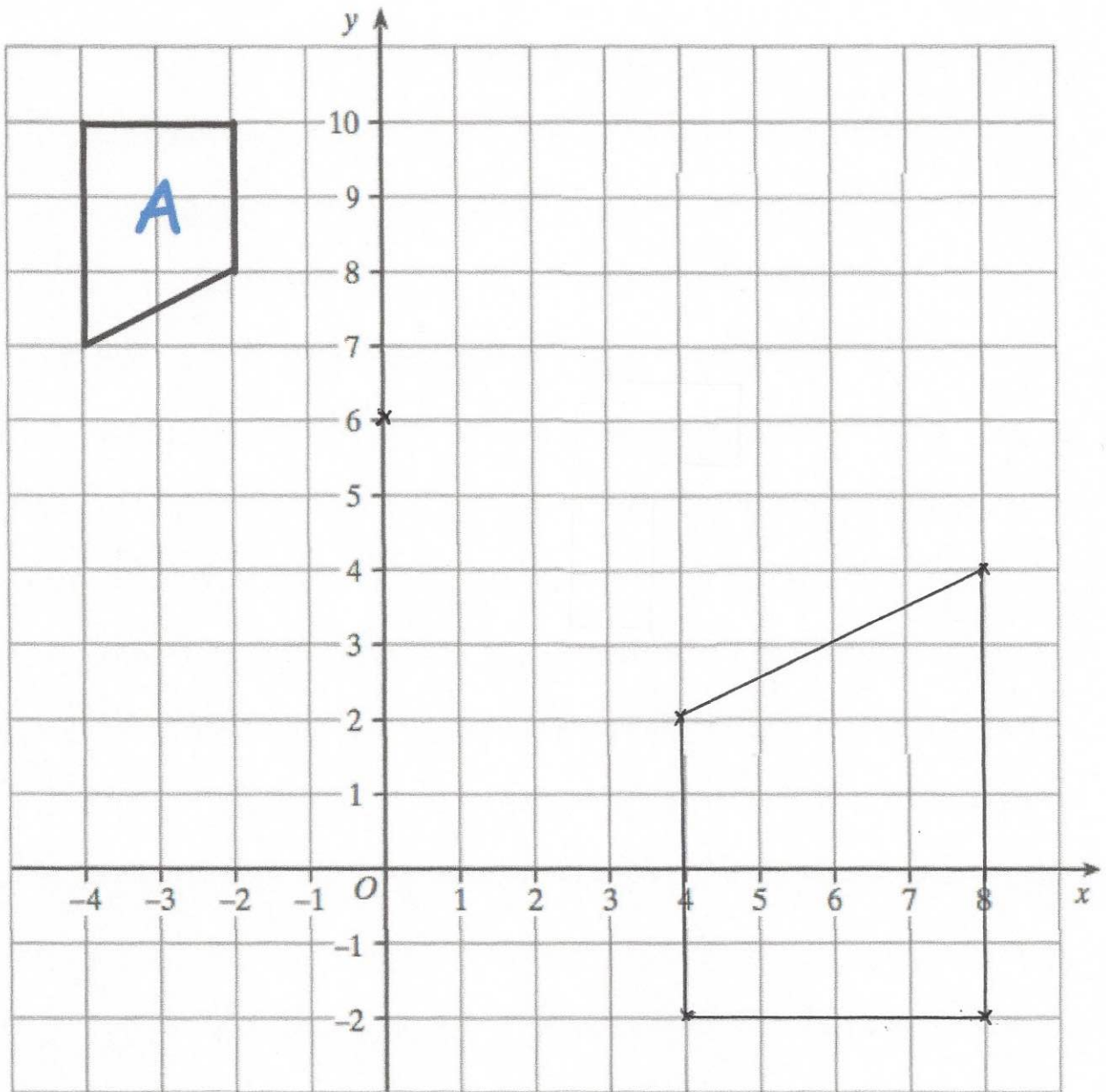
15.



Rotate shape A  $90^\circ$  anti-clockwise about centre (5, -1)

(3)

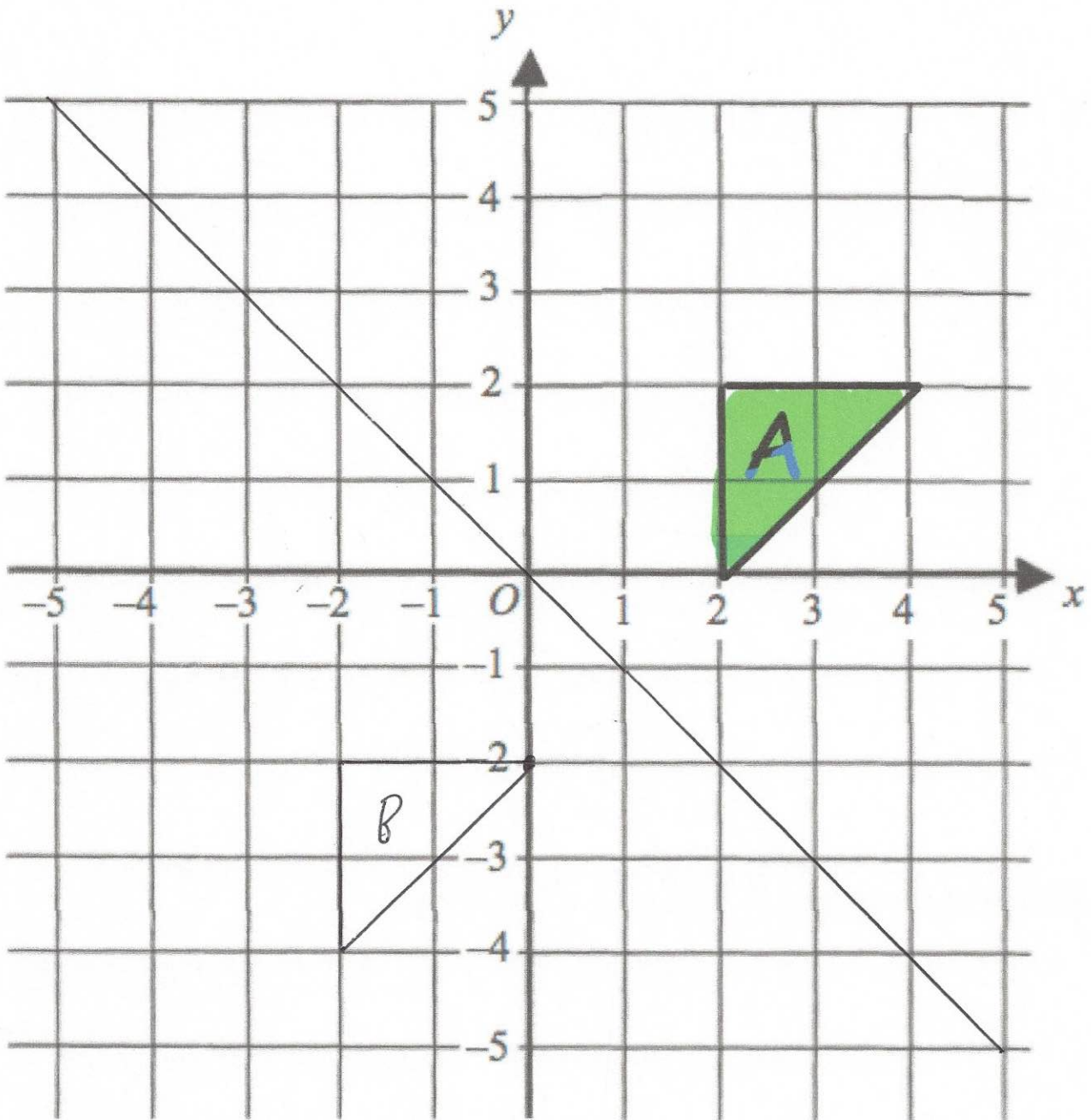
16.



Enlarge the triangle by scale factor  $-2$ , using centre of enlargement  $(0, 6)$

(3)

17.

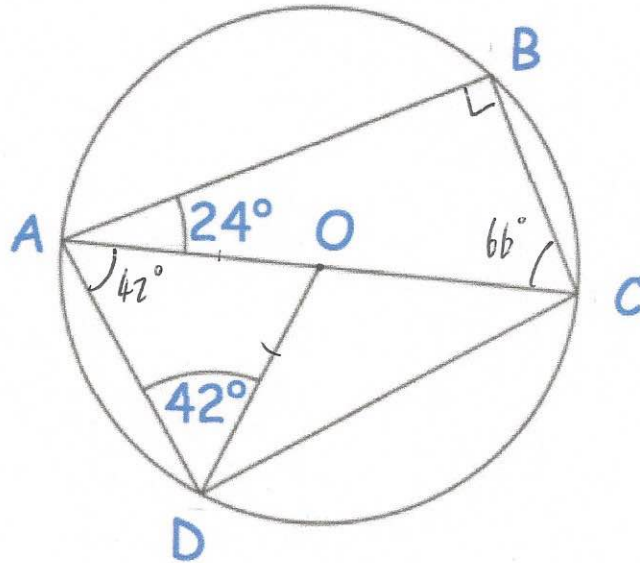


Reflect the triangle in the line  $y = -x$   
Label the new triangle B.

(2)



18.



In the diagram O is the centre of the circle.  
 AOC is a straight line.  
 Angle BAO is  $24^\circ$  and Angle ADO is  $42^\circ$

(a) Find the size of angle CAD.

$$\underline{\quad 42^\circ \quad} \quad (1)$$

(b) Find the size of angle ACB.

$$180 - 24 - 90 =$$

$$\underline{\quad 66^\circ \quad} \quad (1)$$

(c) Find the size of angle BCD.

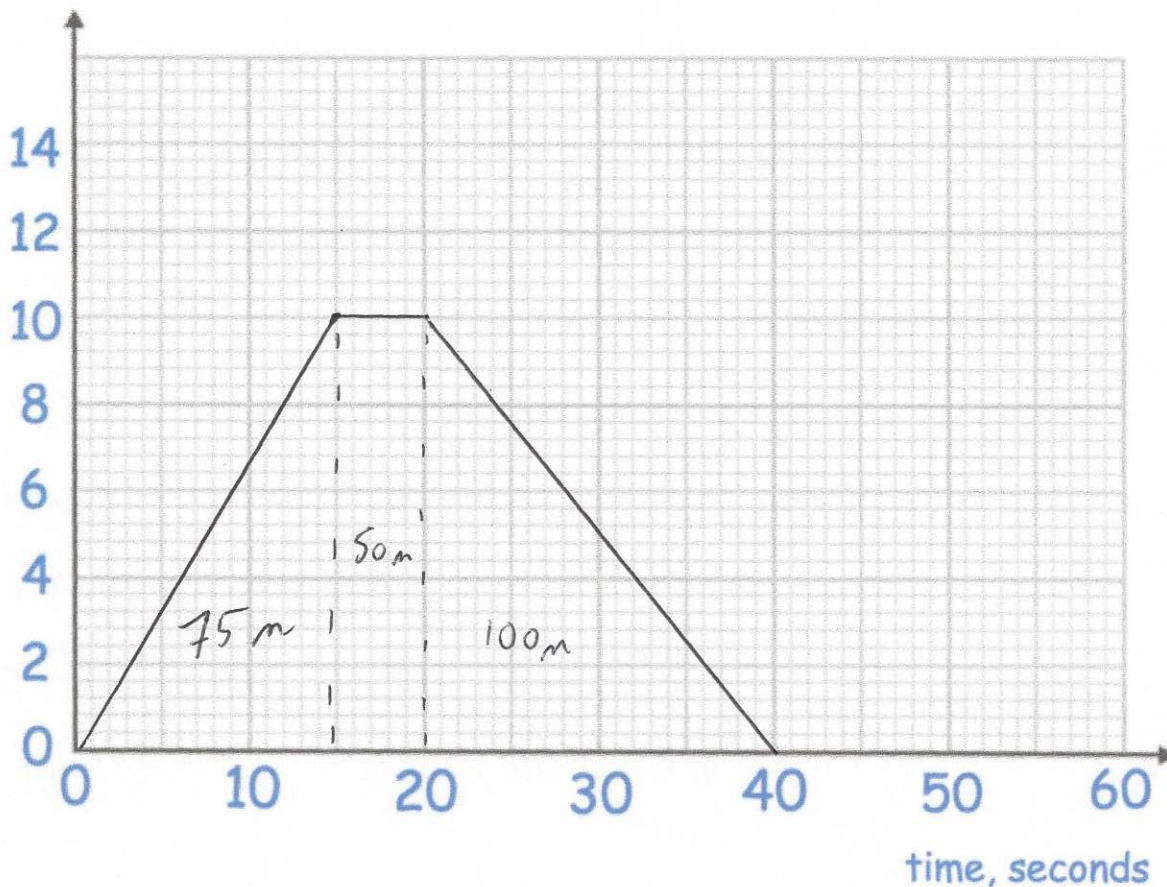
$$\begin{array}{r} 42 \\ + 24 \\ \hline 66 \end{array} \quad \begin{array}{r} 180 \\ - 66 \\ \hline 114 \end{array}$$

$$\underline{\quad 114^\circ \quad} \quad (1)$$

19. A remote control car drives in a straight line.  
 It starts from rest and travels with constant acceleration for 15 seconds reaching a velocity of 10m/s.  
 It then travels at a constant speed for 5 seconds.  
 It then slows down with constant deceleration of  $0.5\text{m/s}^2$ .

(a) Draw a velocity time graph

Velocity, m/s



(b) Using your velocity-time graph, work out the total distance travelled.

*Area under graph*

*225*  
 .....m  
 (2)

20.

(a) Convert 5km/h into m/s.

$$5000 \text{ m/h}$$

$$83.\dot{3} \text{ m/min}$$

$$1.38\dot{8} \text{ m/s}$$

$$\dots\dots\dots 1.38\dot{8} \text{ m/s}$$

(3)

(b) A car travels 240 kilometres in 3 hours 20 minutes.

Calculate the average speed, in km/h, of the car.

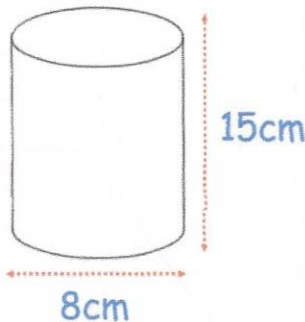
$$s = \frac{d}{t} = \frac{240}{3.\dot{3}}$$

$$\dots\dots\dots 72 \text{ km/h}$$

(3)

21.

The diagram shows a solid cylinder.



$$\begin{aligned} V &= \pi r^2 h \\ &= \pi \times 4^2 \times 15 \\ &= 753.98\dots \text{cm}^3 \end{aligned}$$

The cylinder is made from titanium.  
The density of titanium is  $4.43\text{g/cm}^3$

$$m = d \times v$$

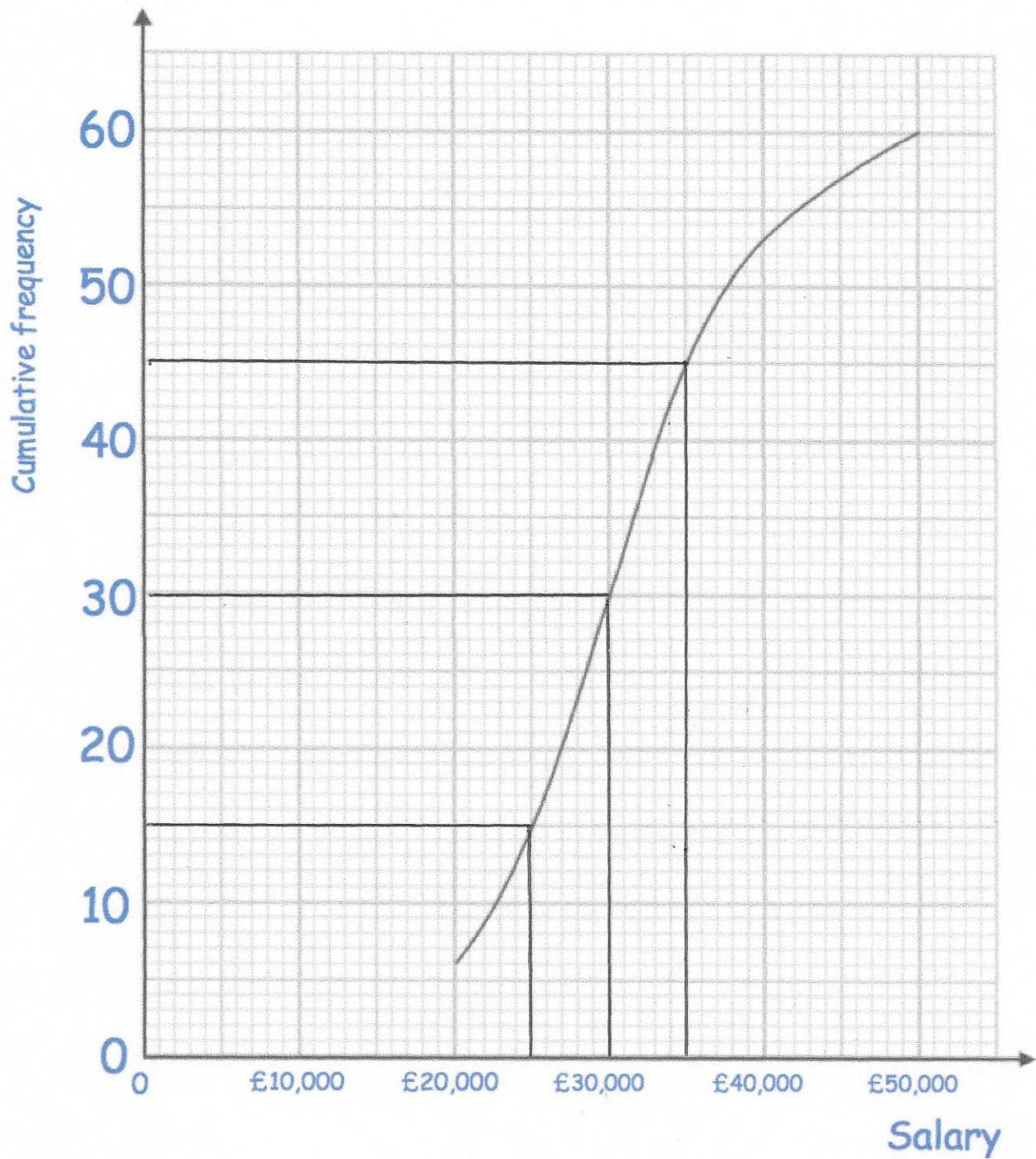
Calculate the mass of the cylinder.

$$= 4.43 \times 753.98\dots$$

$$\dots\dots\dots 3340 \text{ g}$$

(3)

22. A university surveyed 60 mathematics graduates on their starting salary. The cumulative frequency graph shows some information about the salaries.



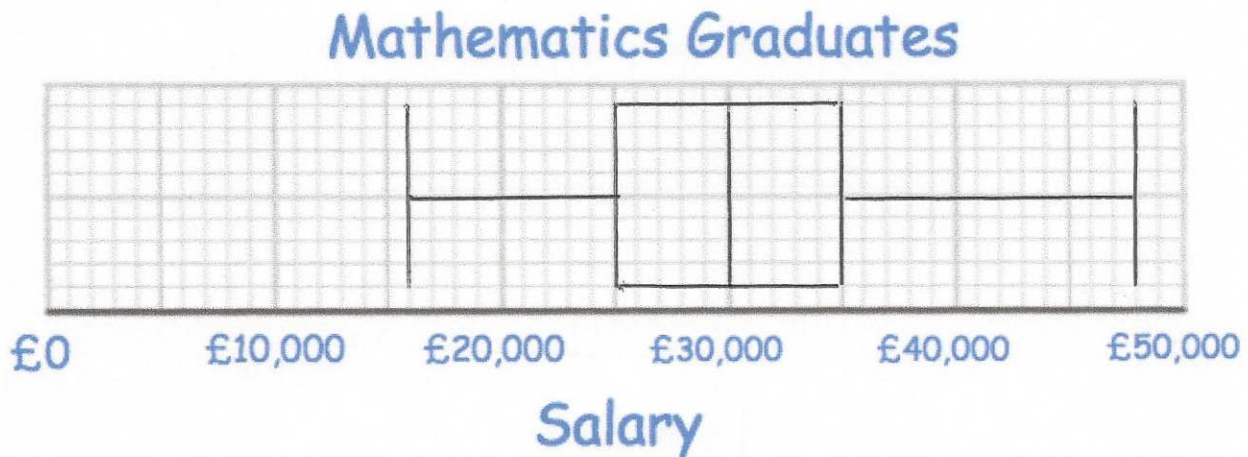
- (a) Use the graph to find an estimate for the median salary.

£ 30000 .....  
(1)



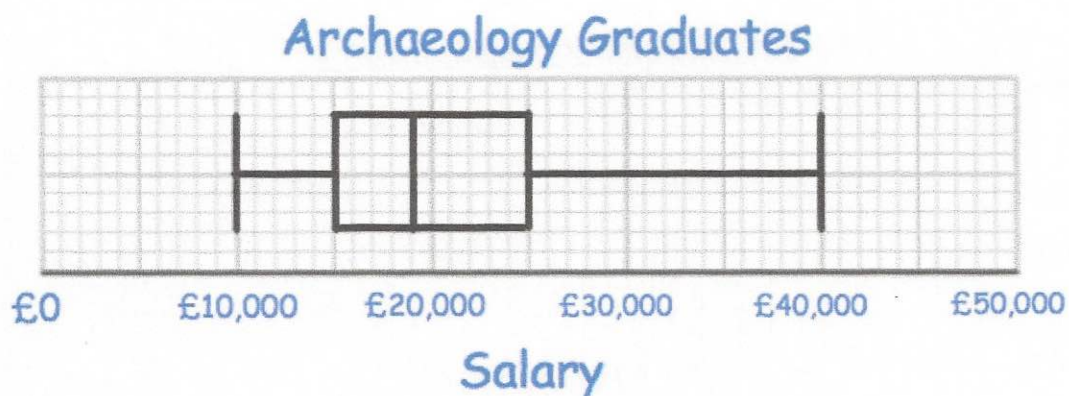
The 60 mathematics graduates  
had a minimum salary of £16,000  
and a maximum salary of £48,000.

- (b) Use this information and the cumulative frequency curve to draw a box plot for the 60 mathematics graduates.



(3)

The university also surveyed 60 archaeology graduates.  
The box plot below shows information about their salaries.



- (c) Compare the distribution of the salaries of the mathematics graduates with the distribution of the salaries of the archaeology graduates.

*The salaries are similarly spread, both with interquartile ranges of £10,000. The mathematics graduates clearly earn more with a median of £30,000 compared to £19,000*

(2)

23. Timothy asked 30 people how long it takes them to get to school.

The table shows some information about his results.

Time (t minutes)	Frequency	midpoint	$fx$
$0 < t \leq 10$	2	5	10
$10 < t \leq 20$	8	15	120
$20 < t \leq 30$	12	25	300
$30 < t \leq 40$	7	35	245
$40 < t \leq 50$	1	45	45
	<u>30</u>		<u>720</u>

Work out an estimate for the mean time taken.

$$720 \div 30 = 24$$

24  
 .....minutes  
 (4)

24. Sally and Laura sit their driving tests.

The probability of Sally passing her driving test is 0.7

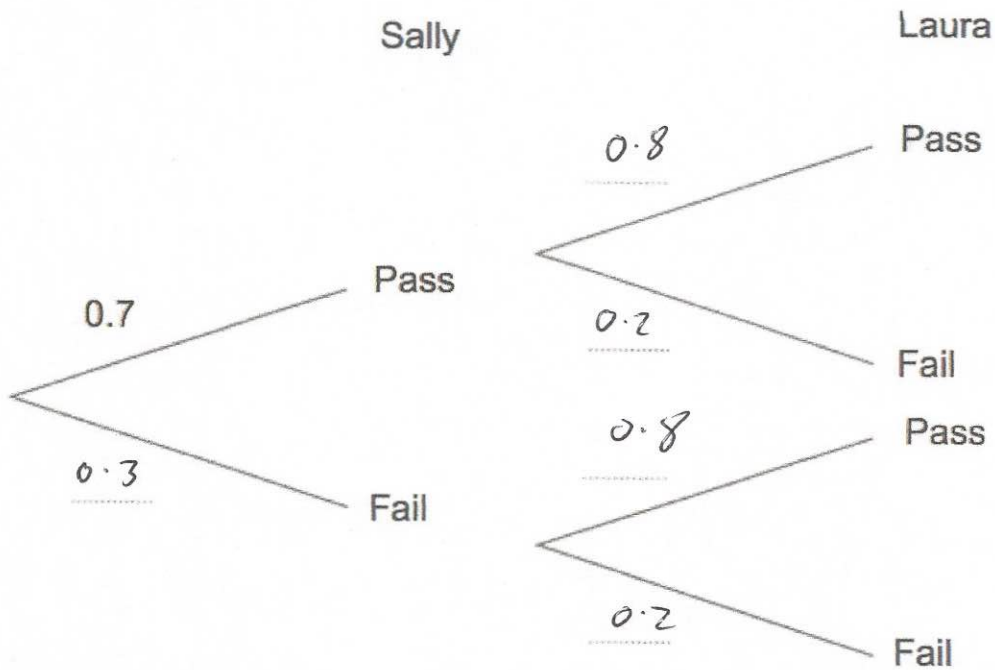
The probability of both Sally and Laura passing is 0.56

(a) Work out the probability of Laura passing her driving test.

$$0.7 \times y = 0.56$$

$$\frac{0.8}{(2)}$$

(b) Complete the tree diagram.



(2)

(c) Find the probability of both women failing.

$$0.3 \times 0.2$$

$$\frac{0.06}{(2)}$$

25. A group of scientists want to estimate the number of squirrels in a wood. They catch and ring 20 squirrels. They return the 20 squirrels to the wood. They then catch 50 squirrels and 13 are ringed.

Estimate the number of squirrels in the wood.

$$\frac{20}{y} = \frac{13}{50}$$

$$1000 = 13y$$

$$\frac{1000}{13} = y$$

$$y = 76.92..$$

$$\approx 77$$

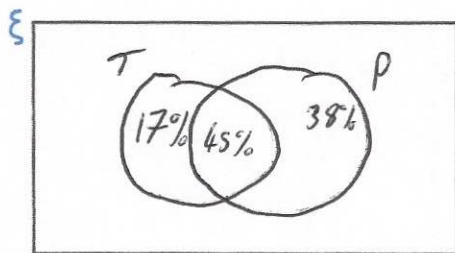
(2)

26. A PE test has two sections, theory and practical.

Everyone in a class who took the PE test passed at least one section. 62% passes the theory section and 83% passed the practical section.

- (a) Represent this information on a Venn diagram

38% passed only practical



only 17% passed just Theory

(3)

A student is selected at random.

Work out the probability that this person

- (a) passed the theory section, given they passed the practical section.

$$\frac{45}{83}$$

$$\frac{45}{83}$$

(2)

- (b) passed the practical section, given they passed only one section.

$$\frac{38}{55}$$

$$\frac{38}{55}$$

(2)



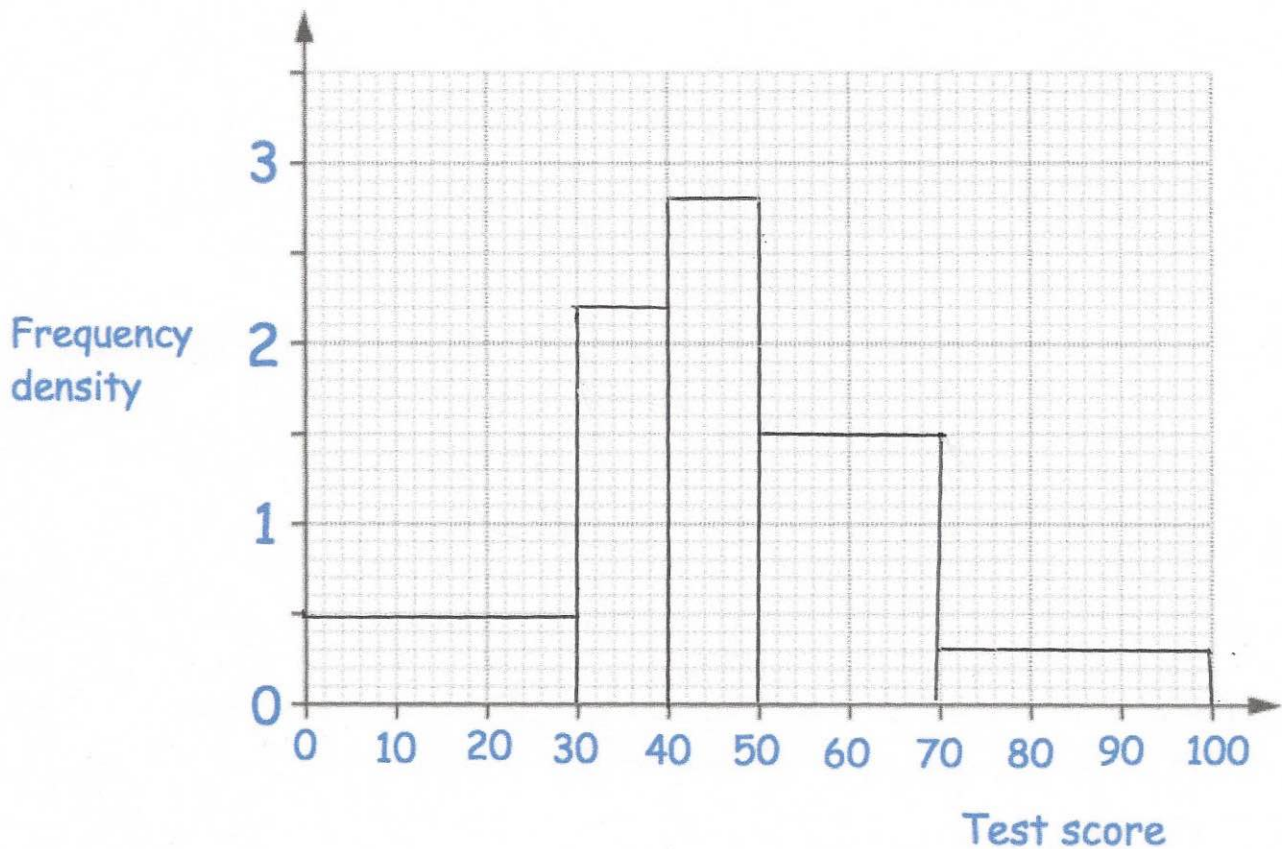
27. The test scores from the students in a school are summarised in the table.

Test score, $x$	Frequency
$0 < x \leq 30$	15
$30 < x \leq 40$	22
$40 < x \leq 50$	28
$50 < x \leq 70$	30
$70 < x \leq 100$	9

Frequency density

0.5  
2.2  
2.8  
1.5  
0.3

Draw a histogram for this data.

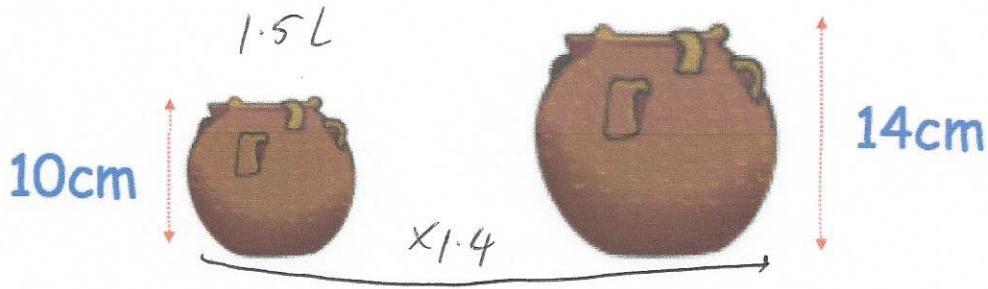


(3)

28. Mrs Hampton is potting plants.  
She is using two mathematically similar pots, the smaller is 10cm tall and the larger 14cm tall.

She has two bags of soil, each containing 30 litres of soil.

With the first bag, Mrs Hampton fills 20 small pots using all of the soil in the bag.



How many large pots can be filled completely using the second bag of soil?

$$30L \div 20 = 1.5 \text{ Litres}$$

$$1.5 \times 1.4^3 = 4.116 \text{ L}$$

$$30 \div 4.116 = 7.28\dots$$

7

.....  
(5)

29. Sophie estimated that the distance between Bristol and Newcastle is about 290 miles and that her average driving speed would be 60 mph.

She estimated the distance to the nearest 10 miles and the speed to the nearest 10 mph.

*quickest time*

Calculate the lower bound of the time the journey should take.

Give your answer in hours and minutes.

Give your answer to the nearest minute.

$$\text{quickest } t = \frac{d}{s} \begin{matrix} \leftarrow \text{min} \\ \leftarrow \text{max} \end{matrix}$$

$$t = \frac{285}{65} = 4.384615$$

$$0.384615 \times 60 = 23.076$$

.....4.....hours .....23.....minutes  
(4)

30. Factorise fully

$$9m^2 - 12mp$$

$$\underline{3m(3m - 4p)}$$

(2)

31. (a) Factorise  $y^2 - 12y - 64$

$$\underline{(y - 16)(y + 4)}$$

(2)

- (b) Factorise  $2y^2 + 7y - 15$

$$\underline{(2y - 3)(y + 5)}$$

(2)

(c) Factorise fully  $4y^2 - 49$

$$\frac{(2y-7)(2y+7)}{\dots\dots\dots}$$

(2)

32. (a) Solve  $m^2 + 24m + 63 = 0$

$$(m+21)(m+3) = 0$$

$$m = -21 \text{ or } m = -3$$

.....  
(2)

(b) Solve  $5y^2 + 8y - 100 = y^2 + 4y - 37$

$$4y^2 + 4y - 63 = 0$$

$$(2y+9)(2y-7) = 0$$

$$y = -\frac{9}{2} \text{ or } -4.5 \quad y = \frac{7}{2} \text{ or } 3.5$$

.....  
(2)

33. Solve the equation  $4x^2 + x - 7 = 0$

$$a = 4 \quad b = 1 \quad c = -7$$

Give your answers to two decimal places.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-1 \pm \sqrt{113}}{8}$$

$$x = \frac{-1 \pm \sqrt{1^2 - (4) \times (4) \times (-7)}}{2 \times 4}$$

$$x = \frac{-1 + \sqrt{113}}{8} \text{ or } x = \frac{-1 - \sqrt{113}}{8}$$

$$x = \dots\dots\dots 1.20 \quad \text{or } x = \dots\dots\dots -1.45$$

(3)



34. The first 5 terms in a number sequence are

10 7 4 1 -2 ... ..

(a) Work out the  $n$ th term of the sequence.

$$-3n + 13$$

or

$$13 - 3n$$

.....  
(2)

(b) Find the 50th term of the sequence.

$$13 - 3 \times 50$$

$$-137$$

.....  
(2)

35. Here are the first 5 terms of a quadratic sequence

4 10 18 28 40

Find an expression, in terms of  $n$ , for the  $n$ th term of this quadratic sequence.

$$\begin{array}{r}
 a + b + c = 4 \quad (4) \\
 1 + 3 + c = 4 \\
 c = 0 \\
 3a + b = 6 \\
 3 + b = 6 \\
 b = 3 \\
 2a = 2 \\
 a = 1
 \end{array}$$

	10	18	28	40
	8	10	12	
	2	2		

$$n^2 + 3n$$

.....  
(3)

36. Solve  $5(3c - 2) - 7c = 40 - 2c$

$$15c - 10 - 7c = 40 - 2c$$

$$8c - 10 = 40 - 2c$$

$$10c = 50$$

$$c = 5$$

$$c = \frac{5}{1}$$

(3)

37. (a) Solve the inequality  $3(x - 4) \leq 15$

$$3x - 12 \leq 15$$

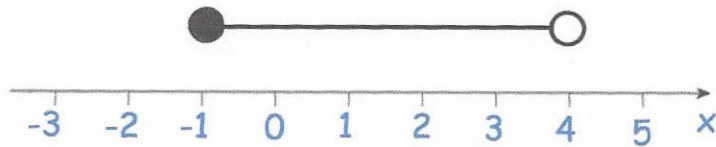
$$3x \leq 27$$

$$x \leq 9$$

$$x \leq 9$$

(2)

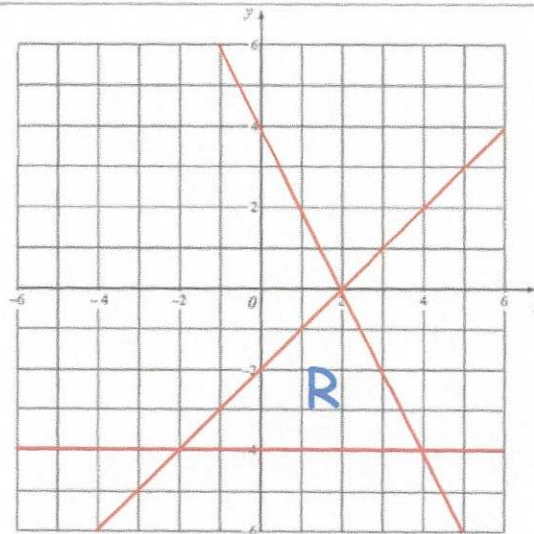
(b) Write down the inequality shown by the diagram.



$$-1 \leq x < 4$$

(2)

38.



The region labelled R satisfies three inequalities.

State the three inequalities

$$y \geq -4$$

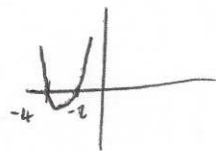
$$y \leq 2x - 2$$

$$y \leq -2x + 4$$

(3)

39. Solve the inequality  $x^2 + 6x + 8 < 0$

$$(x+2)(x+4) = 0$$
$$x = -2 \text{ or } x = -4$$



$$-4 < x < -2$$

.....  
(3)

---

40. A circle has centre (0, 0) and radius 6.

(a) Write down the equation of the circle.

$$x^2 + y^2 = 36$$

.....  
(2)

(b) Does the point (-3, 5) lie on the circle?

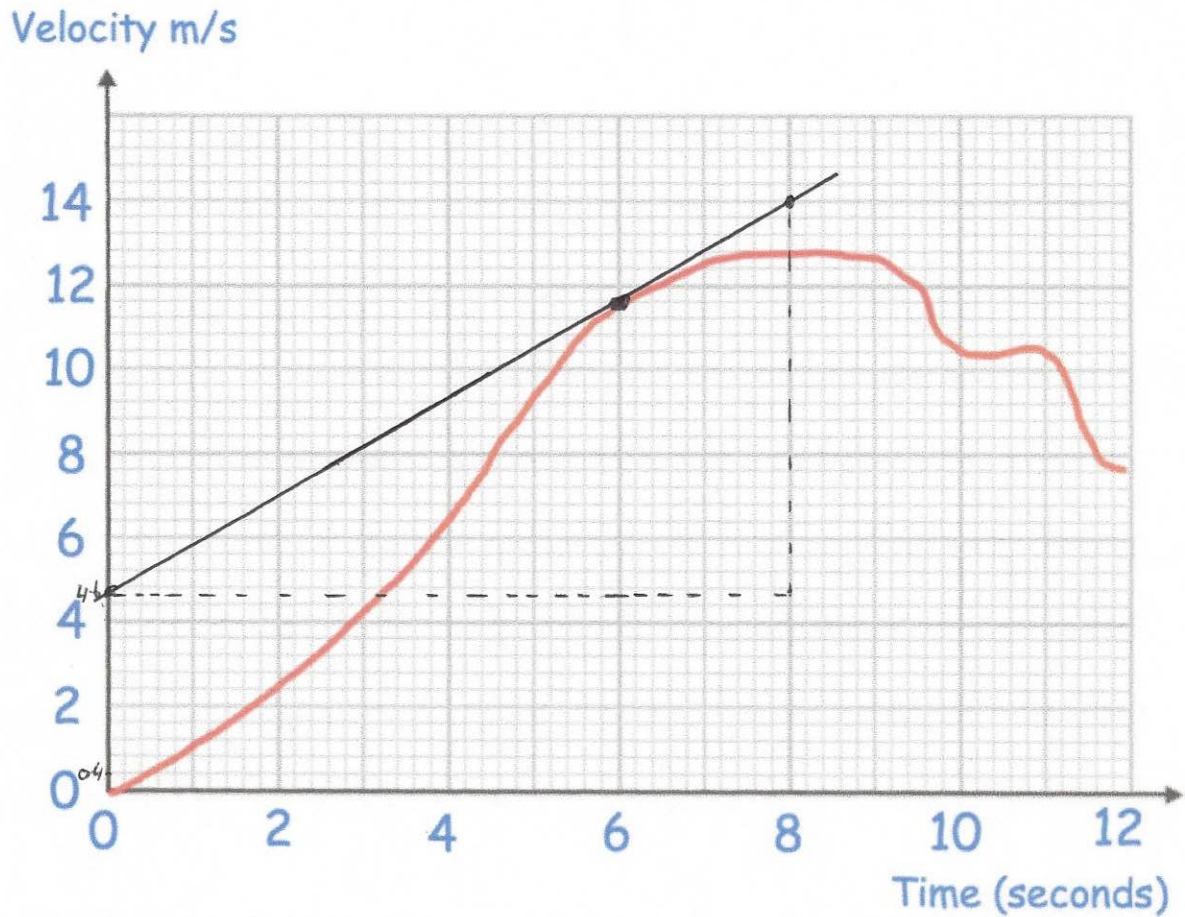
$$(-3)^2 + (5)^2$$
$$9 + 25 = 34$$

No.

.....  
(2)

---

41.



Above is the velocity-time graph of a particle over 12 seconds.

Find an estimate of the particle's acceleration at 6 seconds  
Include suitable units

$$14 - 4.6 = 9.4$$

$$\text{gradient} = \frac{\text{rise}}{\text{run}} = \frac{9.4}{8}$$

$$\frac{1.175 \text{ m/s}^2}{\dots\dots\dots} \quad (3)$$



42. (a) Simplify

$$\frac{x^2 - 3x + 2}{x^2 + 5x - 6}$$

$$\frac{(x-2)(x-1)}{(x+6)(x-1)}$$

$$\frac{x-2}{x+6}$$

(3)

(b) Simplify fully.

$$\frac{v+3}{2} \div \frac{3v+9}{5}$$

$$\frac{v+3}{2} \times \frac{5}{3v+9} = \frac{5(v+3)}{6v+18} = \frac{5(v+3)}{6(v+3)}$$

$$\frac{5}{6}$$

(2)

(c) Solve

$$\frac{7}{x+2} + \frac{10}{2x-5} = 3$$

$$(2x+1)(x-5) = 0$$

$$x = -\frac{1}{2} \text{ or } x = 5$$

$$\frac{7(2x-5) + 10(x+2)}{(x+2)(2x-5)} = 3$$

$$14x - 35 + 10x + 20 = 3(x+2)(2x-5)$$

$$24x - 15 = 3(2x^2 - x - 10)$$

$$24x - 15 = 6x^2 - 3x - 30$$

$$0 = 6x^2 - 27x - 15$$

$$\frac{-\frac{1}{2} \text{ or } 5}{(5)}$$

43.

The functions  $f(x)$  and  $g(x)$  are given by the following:

$$f(x) = 3x - 1$$

$$g(x) = 2x + 4$$

(a) Calculate the value of  $fg(2)$

$$g(2) = 2 \times 2 + 4 = 8$$

$$fg(2) = 23$$

$$f(8) = 3 \times 8 - 1 = 23$$

23

(2)

(b)  $f^{-1}(x)$

$$y = 3x - 1$$

$$y + 1 = 3x$$

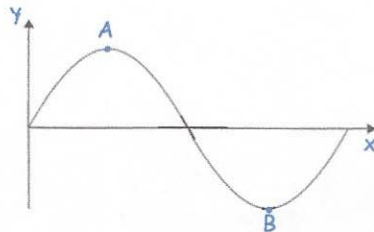
$$\frac{y+1}{3} = x$$

$$f^{-1}(x) = \frac{x+1}{3}$$

$$f^{-1}(x) = \frac{x+1}{3}$$

(2)

44. Shown is part of the curve  $y = \sin x$



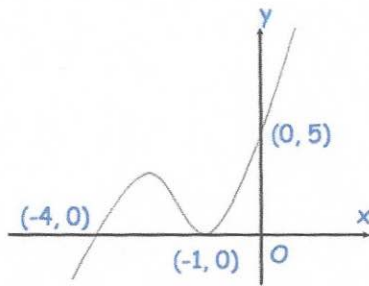
(a) Write down the coordinates of the point A.

(90, 1)  
(1)

(b) Write down the coordinates of the point B.

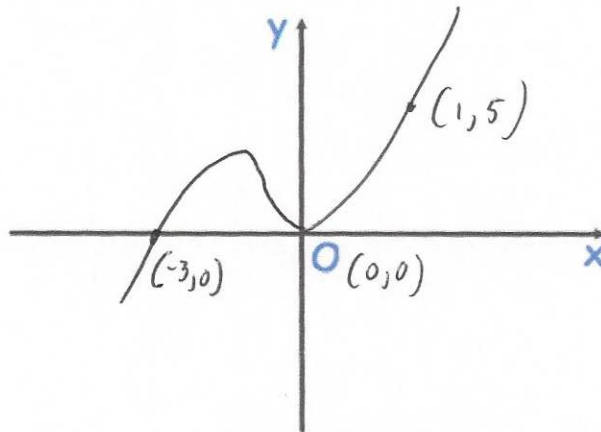
(270, -1)  
(1)

45. Shown below is the curve with equation  $y = f(x)$ .  
 The curve passes through the points  $(-4, 0)$ ,  $(-1, 0)$  and  $(0, 5)$



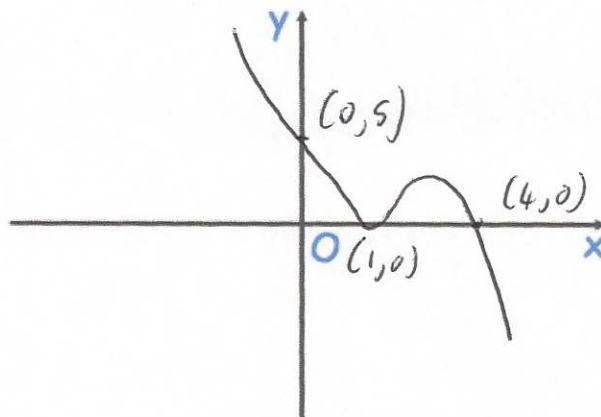
Sketch the curve with equation:

(a)  $y = f(x - 1)$  *one right*



(2)

(b)  $y = f(-x)$  *reflection*



(2)

46. Write  $x^2 + 8x + 6$  in the form  $(x + a)^2 + b$ , where  $a$  and  $b$  are constants.

$$(x+4)^2 - 16 + 6$$

$$(x+4)^2 - 10$$

$$\frac{(x+4)^2 - 10}{\dots\dots\dots}$$

(3)

47. (a) Show the equation  $3x^3 + 7x = 5$  has a solution between 0 and 1

$$f(x) = 3x^3 + 7x - 5$$

$$f(0) = -5$$

$$f(1) = 5$$

Change of sign so there must be a solution between 0 & 1

(2)

(b) Show that  $3x^3 + 7x = 5$  can be rearranged to give

$$x = \frac{5}{7} - \frac{3x^3}{7}$$

$$7x = 5 - 3x^3$$

$$x = \frac{5}{7} - \frac{3x^3}{7}$$

(2)

(c) Starting with  $x_0 = 0$  use the iteration formula

$$x_{n+1} = \frac{5}{7} - \frac{3x_n^3}{7}$$

three times to find an estimate for the solution to  $3x^3 + 7x = 5$

$$x_0 = 0$$

$$x_1 = \frac{5}{7}$$

$$x_2 = \frac{1340}{2401}$$

(2)

$$x_3 = 0.63978\dots$$