

Dr Oliver Mathematics
GCSE Mathematics
2005 November Paper 5H: Non-Calculator
2 hours

The total number of marks available is 100.

You must write down all the stages in your working.

1. A school snack bar offers a choice of four snacks. (2)

The four snacks are burgers, pizza, pasta, and salad.

Students can choose one of these four snacks.

The table shows the probability that a student will choose burger or pizza or salad.

Snack	Burger	Pizza	Pasta	Salad
Probability	0.35	0.15		0.2

300 students used the snack bar on Tuesday.

Work out an estimate for the number of students who chose pizza.

2. Emma repairs bicycles. (2)

She keeps records of the cost of the repairs.

The table gives information about the costs of all repairs which she carried out in one week.

Cost (£ C)	Frequency
$0 < C \leq 10$	3
$10 < C \leq 20$	7
$20 < C \leq 30$	6
$30 < C \leq 40$	8
$40 < C \leq 50$	9

Find the class interval in which the median lies.

3. Jenny and Kath hire the canal boat for 14 days. (2)

They share the hire cost of £1 785.00 in the ratio 2 : 3.

Work out the smaller share.

4. (a) Expand and simplify (2)

$$(x - y)^2.$$

(b) Rearrange

$$a(q - c) = d$$

(3)

to make q the subject.

5. Jill rolls a ball from point C .

$A \bullet$

$\bullet B$

$\bullet C$

At any point on its path, the ball is the same distance from point A and point B .

(a) Draw accurately the path that the ball will take.

(2)

(b) Shade the region that contains all the points that are no more than 3 cm from point B .

(2)

6. Work out an estimate for the value of

(3)

$$\frac{5.79 \times 312}{0.523}$$

7. The sizes of the angles, in degrees, of the quadrilateral are

$$x + 10,$$

$$2x,$$

$$x + 90, \text{ and}$$

$$x + 20.$$

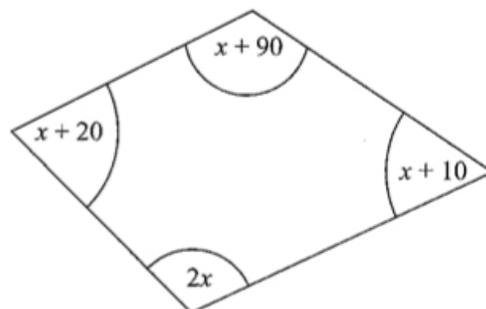


Diagram **NOT**
accurately drawn

- (a) Use this information to write down an equation in terms of x . (2)
- (b) Use your answer to part (a) to work out the size of the smallest angle of the quadrilateral. (3)

8. A semicircle has a diameter of 20 cm. (3)

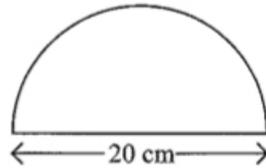


Diagram NOT accurately drawn

Work out the perimeter of the semicircle.
Take the value of π to be 3.14.

9. (a) Write the number 40 000 000 in standard form. (1)
- (b) Write 1.4×10^{-5} as an ordinary number. (1)
- (c) Work out (2)

$$(5 \times 10^4) \times (6 \times 10^9).$$

Give your answer in standard form.

10. QRS is a straight line. (3)

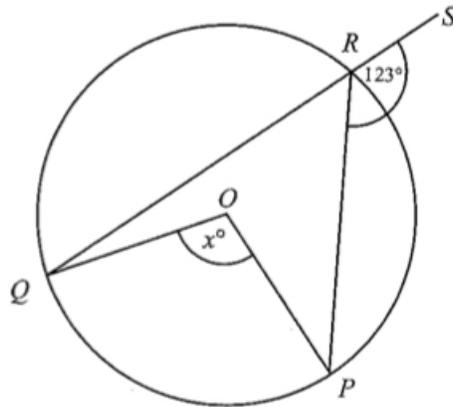


Diagram NOT accurately drawn

QR and PR are chords of a circle, centre O .
Angle $PRS = 123^\circ$.
Angle $QOP = x^\circ$.
Calculate the size of the angle marked x° .
Give reasons for your answer.

11. Here are some expressions. (2)

$\frac{\pi r^3}{x}$	$\frac{r^3}{\pi}$	$\pi x + r$	$\pi r^2 + rx$	$\pi(x + r)$	$\frac{\pi^3}{x^2}$
---------------------	-------------------	-------------	----------------	--------------	---------------------

The letters r and x represent lengths.

π is a number that has no dimensions.

Tick (✓) the boxes underneath the two expressions that can represent areas.

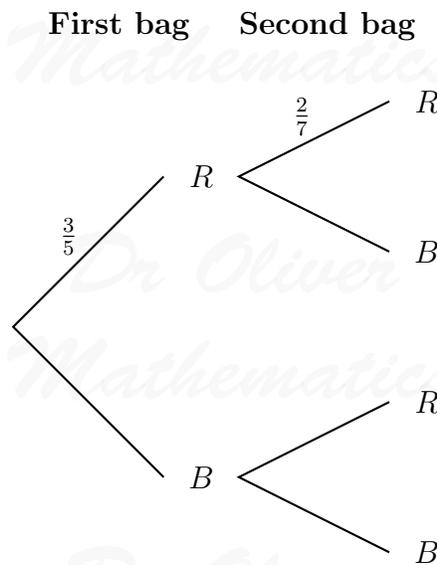
12. Loren has two bags.

The first bag contains 3 red counters and 2 blue counters.

The second bag contains 2 red counters and 5 blue counters.

Loren takes one counter at random from each bag.

- (a) Complete the probability tree diagram. (2)



- (b) Work out the probability that Loren takes one counter of each colour. (3)

13. Bill buys a new machine.

The value of the machine depreciates by 20% each year.

- (a) Bill says, “After 5 years, the machine will have no value.” (1)

Bill is **wrong**.

Explain why.

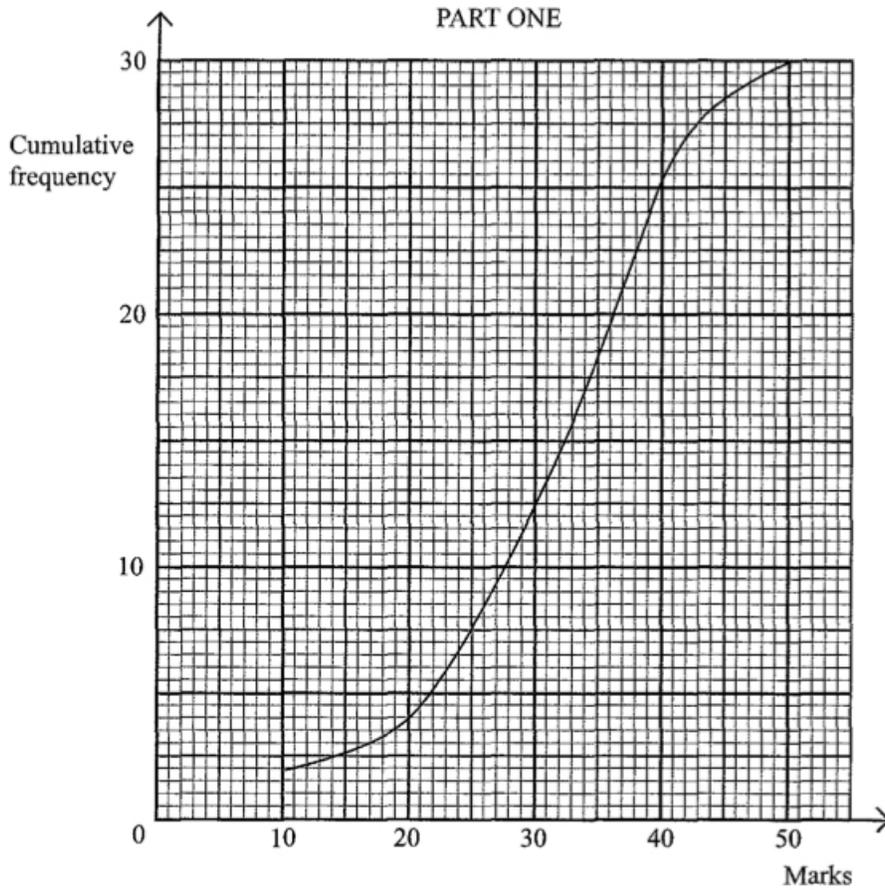
Bill wants to work out the value of the machine after 2 years.

(b) By what single decimal number should Bill multiply the value of the machine when new? (2)

14. 30 students took part in a National Science quiz.

The quiz was in two parts.

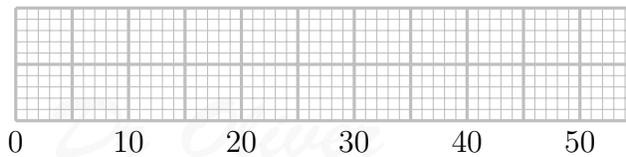
The cumulative frequency graph on the grid opposite gives information about the marks scored in Part One.



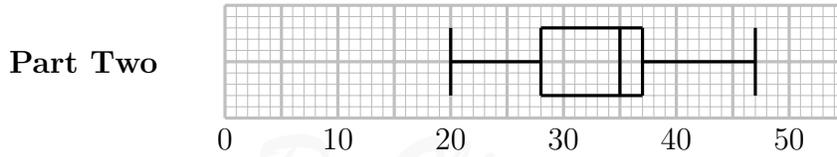
The lowest mark was 5 and the highest mark was 47.

(a) In the space provided on the grid, draw a box plot using the cumulative frequency graph for the results of Part One. (3)

Part One



The diagram also shows a box plot for the results of Part Two.



Use the box plots to compare the two distributions.

(b) Give **two** differences between them. (2)

15. A straight line has equation $y = 2x - 3$.
 The point P lies on the straight line.
 The x -coordinate of P is -4 .

(a) Find the y -coordinate of P . (2)

A straight line L is parallel to $y = 2x - 3$ and passes through the point $(3, 4)$.

(b) Find the equation of line L . (3)

$y = 2x - 3$ $y = 3 - 2x$ $y = \frac{1}{2}x - 3$ $y = 3 - \frac{1}{2}x$ $y = 2x + 3$

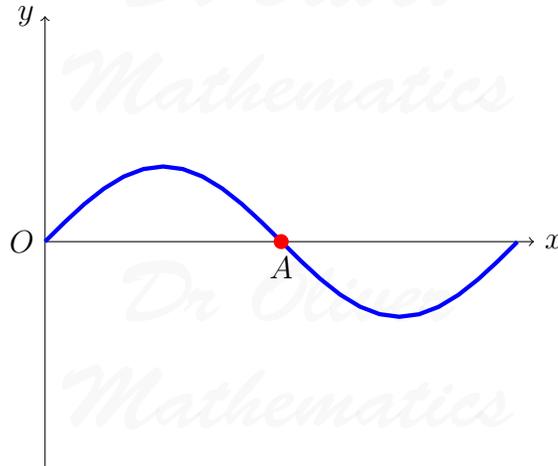
(c) Put a tick (\checkmark) underneath the equation which is the equation of a straight line that is perpendicular to the line with equation $y = 2x - 3$. (1)

16. The table shows the number of students in each year group at a school. (3)

Year Group	7	8	9	10	11
Number of students	190	145	145	140	130

Jenny is carrying out a survey for her GCSE Mathematics project.
 She uses a stratified sample of 60 students according to year group.
 Calculate the number of Year 11 students that should be in her sample.

17. The diagram shows a sketch of part of the curve $y = \sin x^\circ$.



- (a) Write down the coordinates of the point A . (1)
- (b) Sketch the graph of $y = \sin 2x^\circ$. (2)

18. The diagram shows a model.

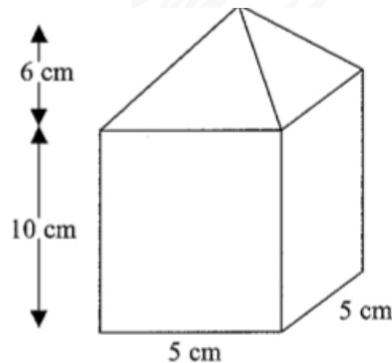


Diagram **NOT**
accurately drawn

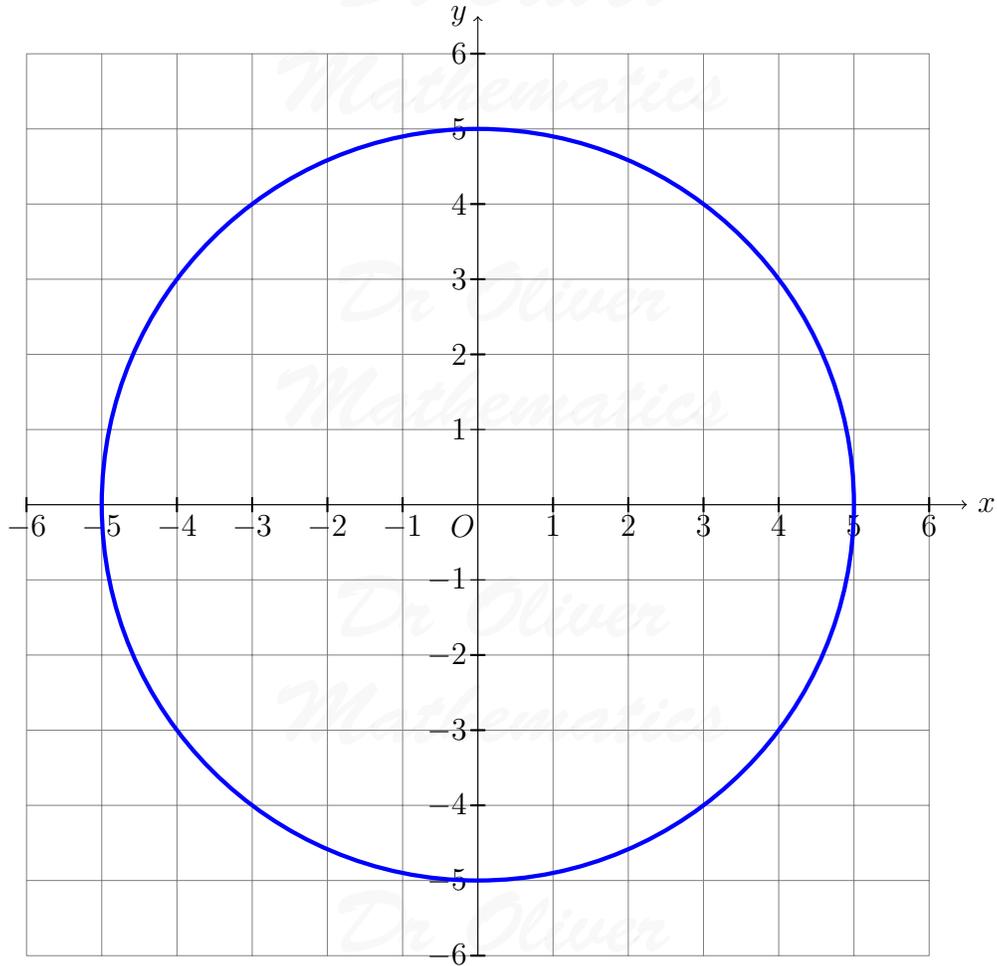
The model is a cuboid with a pyramid on top.
 The base of the model is a square with sides of length 5 cm.
 The height of the cuboid in the model is 10 cm.
 The height of the pyramid in the model is 6 cm.

- (a) Calculate the volume of the model. (3)

The model represents a concrete post.
 The model is built to a scale of 1 : 30.
 The surface area of the model is 290 cm^2 .

- (b) Calculate the surface area of the post. (3)
 Give your answer in square metres.

19. The diagram shows a circle of radius 5 cm, centre the origin. (3)



Draw a suitable straight line on the diagram to find estimates of the solutions to the pair of equations of

$$x^2 + y^2 = 25$$

$$y = 2x + 1.$$

20. (a) Rationalise $\frac{1}{\sqrt{7}}$. (2)

(b) (i) Expand and simplify $(\sqrt{3} + \sqrt{15})^2$. (5)

Give your answer in the form $n + m\sqrt{5}$, where n and m are integers.

(ii) All measurements on the triangle are in centimetres.

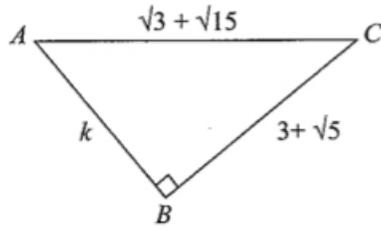


Diagram NOT accurately drawn

ABC is a right-angled triangle.
 k is a positive integer.
 Find the value of k .

21. (a) Simplify (4)

- (i) $(3x^2y)^3$,
- (ii) $(2t^{-3})^{-2}$.

(b) Show that (3)

$$x^2 - 4x + 15$$

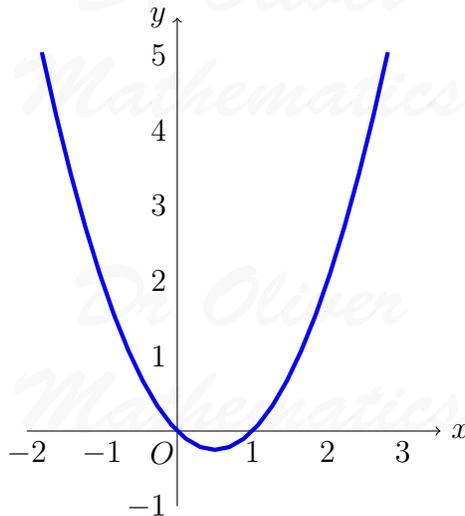
can be written as

$$(x + p)^2 + q$$

for all values of x .

State the values of p and q .

22. The diagram shows a sketch of the graph of $y = x^2 - x$.



(a) Sketch and label the graph of $y = (x - 1)^2 - (x - 1)$. (3)

Show clearly where this graph crosses the x -axis and where it crosses the y -axis

(b) Sketch and label the graph of $y = 3(x^2 - x)$. (1)

The line $y = 4 - 4x$ intersects the curve $y = 3(x^2 - x)$ at the points A and B .

(c) Use an algebraic method to find the coordinates of A and B . (5)

23. Prove algebraically that the sum of the squares of any two odd numbers leaves a remainder of 2 when divided by 4. (3)

24. ABC is an equilateral triangle.

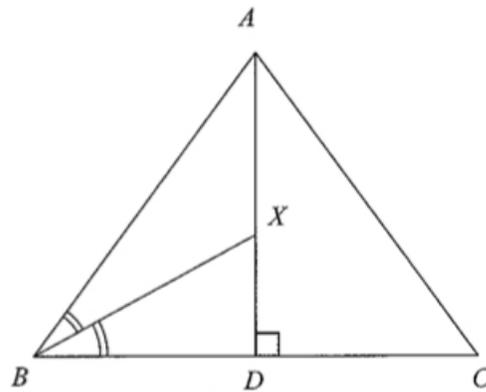


Diagram **NOT** accurately drawn

AD is the perpendicular bisector of BC .

BX is the angle bisector of angle ABC .

(a) Show that triangle BXD is similar to triangle ACD . (2)

In triangle ACD , $AC = 2$ cm and $AD = \sqrt{3}$ cm.

(b) Show that $XD = \frac{1}{\sqrt{3}}$ cm. (3)