

**Dr Oliver Mathematics**  
**GCSE Mathematics**  
**2004 June Paper 6H: Calculator**  
**2 hours**

The total number of marks available is 100.

You must write down all the stages in your working.

1. The manager of a school canteen has made some changes. (2)  
She wants to find out what students think of these changes.  
She uses this question on a questionnaire.

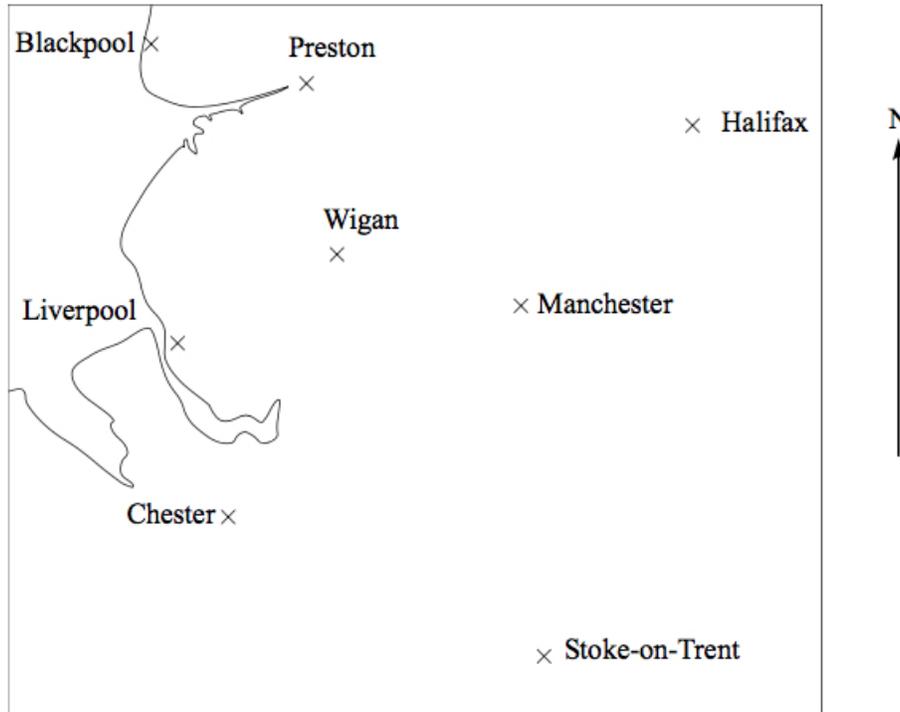
How much money do you normally spend in the canteen?

A lot

Not much

Design a better question for the canteen manager to use.  
You should include some response boxes.

2. This is a map of part of Northern England. (2)



Scale: 1 cm represents 10 km

A radio station in Manchester transmits programmes.  
 Its programmes can be received anywhere within a distance of 30 km.  
 On the diagram, shade the region in which the programmes can be received.

3. The table shows the number of computer games sold in a supermarket each month from January to June.

Jan	Feb	Mar	Apr	May	Jun
147	161	238	135	167	250

- (a) Work out the three-month moving averages for this information. (2)

In a sale, a supermarket took 20% off its normal prices.  
 On Fun Friday, it took 30% off its sale prices.  
 Fred says, "That means there was 50% off the normal prices."

- (b) Fred is wrong. Explain why. (2)

4. The equation (4)

$$x^3 - 2x = 67$$

has a solution between 4 and 5.  
 Use a trial and improvement method to find this solution.  
 Give your answer correct to one decimal place.  
 You must show **all** your working.

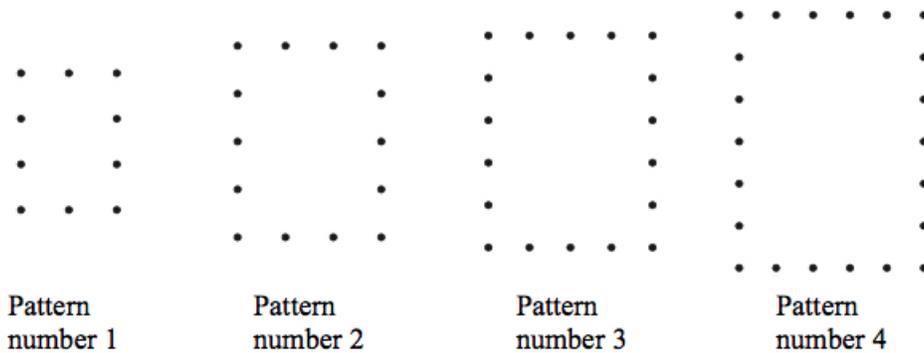
5. A nanosecond is 0.000 000 001 second.  
 (a) Write the number 0.000 000 001 in standard form. (1)

A computer does a calculation in 5 nanoseconds.

- (b) How many of these calculations can the computer do in 1 second? (2)  
 Give your answer in standard form.
6. Use your calculator to work out the value of

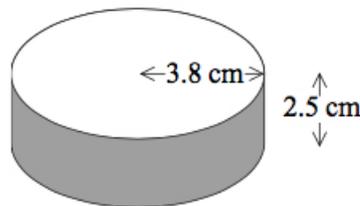
$$\frac{6.27 \times 4.52}{4.81 + 9.63}$$

- (a) Write down all the figures on your calculator display. (2)  
 (b) Write your answer to part (a) to an appropriate degree of accuracy. (1)
7. Here are some patterns made from dots. (2)



Write down a formula for the number of dots,  $d$ , in terms of the Pattern number,  $n$ .

8. An ice hockey puck is in the shape of a cylinder with a radius of 3.8 cm and a thickness of 2.5 cm. (4)



**Diagram NOT  
 accurately drawn**

It is made out of rubber with a density of 1.5 grams per  $\text{cm}^3$ .  
 Work out the mass of the ice hockey puck.  
 Give your answer correct to 3 significant figures.

9.  $DE = 6 \text{ m}$ .  
 $EG = 10 \text{ m}$ .  
 $FG = 8 \text{ m}$ .

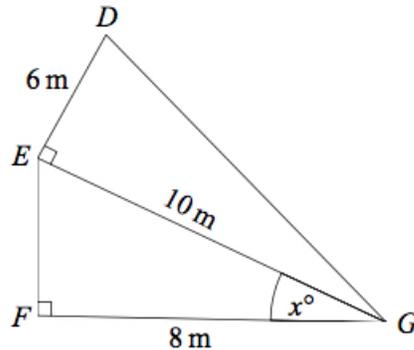


Diagram **NOT**  
 accurately drawn

Angle  $DEG = 90^\circ$ .  
 Angle  $EFG = 90^\circ$ .

- (a) Calculate the length of  $DG$ . (3)  
 Give your answer correct to 3 significant figures.
- (b) Calculate the size of the angle marked  $x^\circ$ . (3)  
 Give your answer correct to one decimal place.
10. Solve the simultaneous equations (4)
- $$6x - 2y = 33$$
- $$4x + 3y = 9.$$
11. A 20 Euro note is a rectangle 133 mm long and 72 mm wide. (3)  
 A 500 Euro note is a rectangle 160 mm long and 82 mm wide.



Pictures  
**NOT**  
 accurately  
 drawn

Show that the two rectangles are **not** mathematically similar.

12. A company bought a van that had a value of £12 000.  
Each year the value of the van depreciates by 25%.  
(a) Work out the value of the van at the end of three years. (3)

The company bought a new truck.

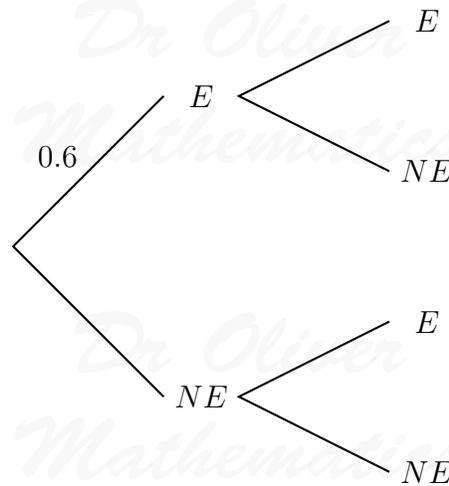
Each year the value of the truck depreciates by 20%.

The value of the new truck can be multiplied by a single number to find its value at the end of four years.

- (b) Find this single number as a decimal. (2)

13. A cone has a volume of  $10 \text{ m}^3$ . (3)  
The vertical height of the cone is 1.5 m.  
Calculate the radius of the base of the cone.  
Give your answer correct to 3 significant figures.

14. Amy has 10 CDs in a CD holder.  
Amy's favourite group is Edex.  
She has 6 Edex CDs in the CD holder.  
Amy takes one of these 10 CDs at random.  
She writes down whether or not it is an Edex CD.  
She puts the CD back in the holder.  
Amy again takes one of these 10 CDs at random.  
(a) Complete the probability tree diagram. (2)



- (b) Find the probability that Amy will pick two Edex CDs. (2)

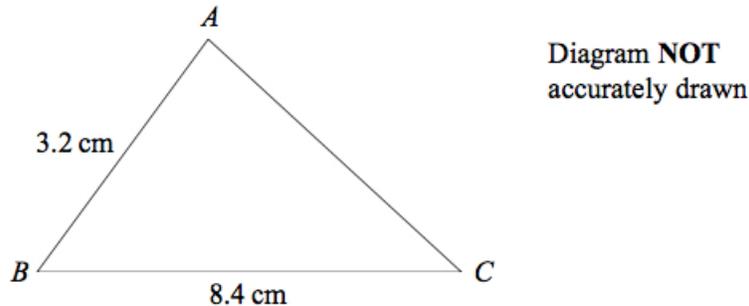
Amy had 30 CDs.

The mean playing time of these 30 CDs was 42 minutes.

Amy sold 5 of her CDs.

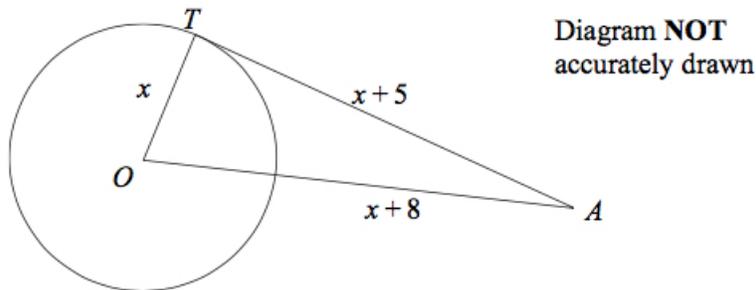
The mean playing time of the 25 CDs left was 42.8 minutes.

- (c) Calculate the mean playing time of the 5 CDs that Amy sold. (3)
15. The shutter speed,  $S$ , of a camera varies inversely as the square of the aperture setting,  $f$ .  
When  $f = 8$ ,  $S = 125$ .
- (a) Find a formula for  $S$  in terms of  $f$ . (3)
- (b) Hence, or otherwise, calculate the value of  $S$  when  $f = 4$ . (1)
16.  $AB = 3.2$  cm. (6)  
 $BC = 8.4$  cm.



The area of triangle  $ABC$  is  $10 \text{ cm}^2$ .  
Calculate the perimeter of triangle  $ABC$ .  
Give your answer correct to three significant figures.

17.  $AT$  is a tangent at  $T$  to a circle, centre  $O$ .

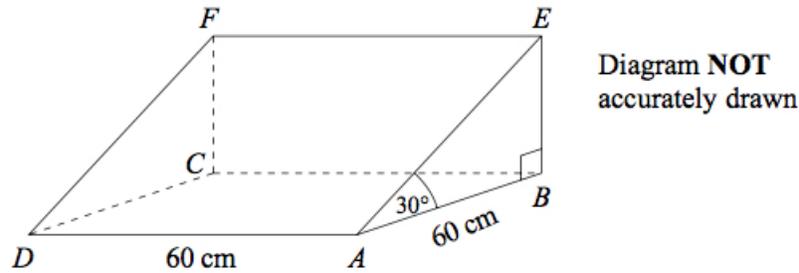


$OT = x$  cm.  
 $AT = (x + 5)$  cm.  
 $OA = (x + 8)$  cm.

- (a) Show that  $x^2 - 6x - 39 = 0$ . (4)
- (b) Solve the equation  $x^2 - 6x - 39 = 0$  to find the radius of the circle. (3)  
Give your answer correct to 3 significant figures.

18. The diagram represents a prism.

(4)



$AEFD$  is a rectangle.

$ABCD$  is a square.

$EB$  and  $FC$  are perpendicular to plane  $ABCD$ .

$AB = 60\text{ cm}$ .

$AD = 60\text{ cm}$ .

Angle  $ABE = 90^\circ$ .

Angle  $BAE = 30^\circ$ .

Calculate the size of the angle that the line  $DE$  makes with the plane  $ABCD$ .

Give your answer correct to 1 decimal place.

19. Bill said that the line  $y = 6$  cuts the curve  $x^2 + y^2 = 25$  at two points.

(a) By eliminating  $y$  show that Bill is incorrect.

(2)

(b) By eliminating  $y$ , find the solutions to the simultaneous equations

(6)

$$\begin{aligned} x^2 + y^2 &= 25 \\ y &= 2x - 2. \end{aligned}$$

20. Martin won the 400 metre race in the school sports with a time of 1 minute.

The distance was correct to the nearest centimetre.

The time was correct to the nearest tenth of a second.

(a) Work out the upper bound and the lower bound of Martin's speed in  $\text{km/h}$ .

(5)

Give your answers correct to 5 significant figures.

(b) Write down an appropriate value for Martin's speed in  $\text{km/h}$ .

(1)

Explain your answer.

The table shows the number of people in each age group who watched the school sports.

Age group	0 – 16	17 – 29	30 – 44	45 – 59	60+
Number of people	177	111	86	82	21

Martin did a survey of these people.

He used a stratified sample of exactly 50 people according to age group.

- (c) Work out the number of people from each age group that should have been in his sample of 50. (3)  
Complete the table.

Age group	0 – 16	17 – 29	30 – 44	45 – 59	60+
Number of people in sample					

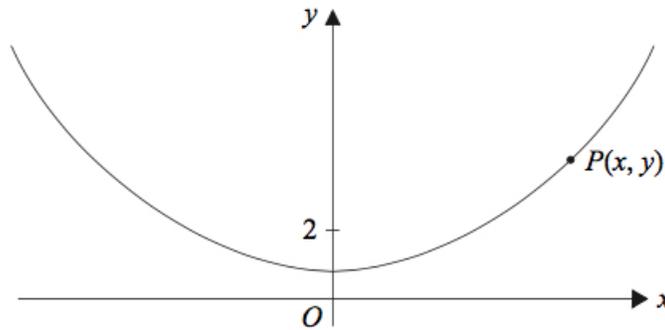
21. (a) Solve (3)

$$\frac{40 - x}{3} = 4 + x.$$

- (b) Simplify fully (3)

$$\frac{4x^2 - 6x}{4x^2 - 9}.$$

22. The diagram shows a sketch of a curve. (4)



The point  $P(x, y)$  lies on the curve.

The locus of  $P$  has the following property: the distance of the point  $P$  from the point  $(0, 2)$  is the same as the distance of the point  $P$  from the  $x$ -axis.

Show that

$$y = \frac{1}{4}x^2 + 1.$$