

***My Left Thumb* – challenging maths paper**

Optional time limit: 60 minutes

This paper is similar to a paper I sent out a few months ago, called 'The Road To Perdition'. You may like to compare your marks, to see how you have progressed.

1. What is $1155 \div 1980$?

Answer: (2)

2. What is the sum of 1, 12, 123, 1234 and 12345?

Answer: (2)

3. (a) What is $\frac{7}{5} \div \frac{14}{21}$?

Answer: (2)

(b) What is $\frac{6}{11} + \frac{5}{3}$?

Answer: (2)

(c) What is $(-\frac{7}{4}) \times (\frac{3}{5})$?

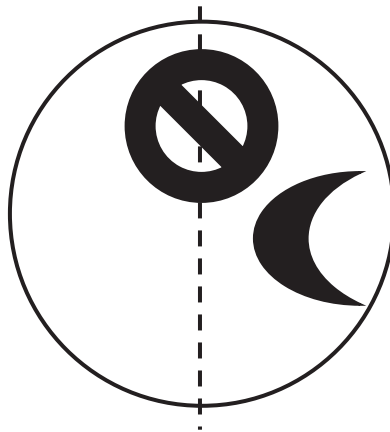
Answer: (2)

4. Six numbers have a mean of 14. Five of the numbers are 1, 22, 22, 15 and 4.

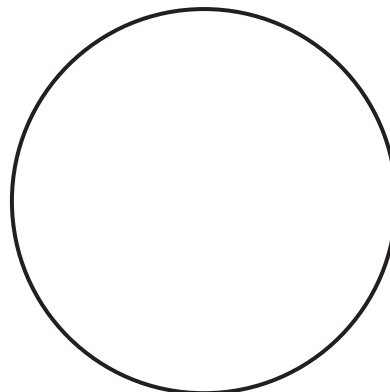
What is the sixth number?

Answer: (2)

5. This picture shows a disc:



Sketch the appearance of the disc after it has been reflected in the dashed mirror line. (Do not include the original unreflected shapes.)



(2)

6. **Cross out** the statements in the following list which are **untrue**.

100 has three square roots.

Any whole number multiplied by 3 is odd.

The square of a negative number is always positive.

2 is a prime number.

3 divided by 1 is 1.

(2)

-
7. Over the course of 5 weeks (starting on a Monday), I buy a newspaper every Wednesday and Sunday and a 10p lollypop every weekday (Monday to Friday).

I go to Alton Towers twice, paying £27.50 on each occasion.

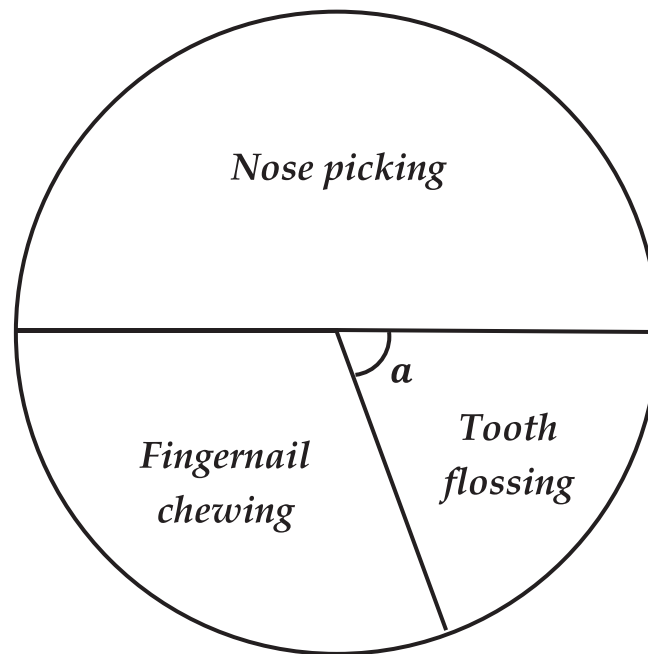
I spend an average of £13.70 during each of the 5 weeks.

If a newspaper always costs the same, how much does one newspaper cost?

Answer: **(3)**

8. The polling company Youguess conducts a survey to find out the proportion of people in the United Kingdom who prefer to floss their teeth, pick their nose or chew their fingernails.

The following pie chart shows the results.



- (a) 1860 people respond to the survey. How many people prefer to pick their nose?

Answer: (2)

- (b) Angle a is 84° . How many people prefer to chew their fingernails?

Answer: (3)

9. Draw a line to connect each journey described on the left to its most likely distance in centimetres.

<i>Journey</i>	<i>Distance in cm</i>
London to Madrid	14,960,000,000,000
My left thumb to my left little finger	18.5
The door of Andrea's third-floor flat to the front door of the building	126,300,000
The width of a pencil lead	185
From the top to the bottom of a stack of three dice	0.15
Earth to the Sun	1850
From one end of a dining table to the other	3.4

10. What is the product of all the prime numbers and square numbers between 40 and 50?

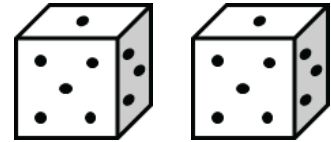
Answer: (3)

-
11. Complete the following statements by placing one of $+$, $-$, \times or \div in each gap. You don't need to use all the symbols, and you can use some of them in more than one gap.

(a) $32 \quad \underline{\hspace{1cm}} \quad 12 \quad = \quad 132 \quad \underline{\hspace{1cm}} \quad 3$ (2)

(b) $60 \quad \underline{\hspace{1cm}} \quad 20 \quad = \quad \frac{1}{5} \quad \underline{\hspace{1cm}} \quad \frac{1}{400}$ (2)

12. I throw two fair, six-sided dice.



I calculate my score by multiplying the numbers on the dice together.

- (a) Complete the following table to show all my possible scores. Two entries have already been filled in. (3)

		<i>Die 2</i>					
		1	2	3	4	5	6
<i>Die 1</i>	1	1					
	2						
	3						
	4						
	5						
	6						36

- (b) If I repeat my experiment a very large number of times, what two scores would you expect to be most common?

Answer: (1)

(c) If I repeat my experiment a very large number of times, what fraction of my results would you expect to be odd numbers?

Answer: (2)

13. Catherine is deciding on some prices for her shop's January sale.

If she discounts an iPad by 35% it will cost £305.50.

How much will it cost if she discounts it by 25% instead?

Answer: (4)

14. (a) Exactly how many weeks are there in a leap year?

Give your answer as a mixed number (e.g. $3\frac{2}{3}$).

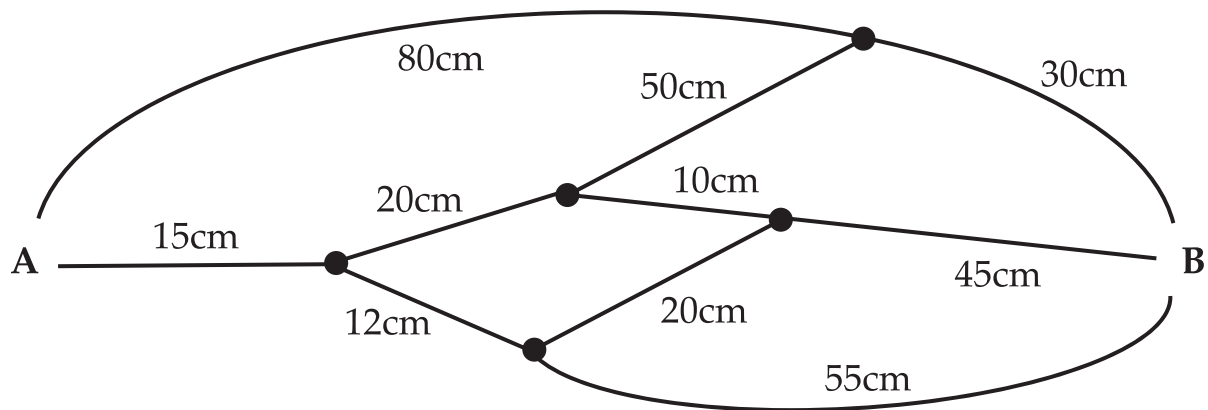
Answer: **(2)**

(b) Today is the 10th of April. What will the date be in 320 days?

Answer: **(3)**

15. I am conducting an experiment into cat behaviour. I release each cat into a series of passageways at **A**, and see which route they take to reach a tasty treat at **B**. I want to find out whether cats always find the shortest route.

There isn't enough space to turn round in the passageways. Each junction has a one-way door, meaning that cats can only move from left to right.



- (a) How many different routes are there from **A** to **B**?

Answer: (2)

- (b) I find that cats are most likely to take the third-shortest route. How much further does a cat travel if it takes the third-shortest route than if it had taken the shortest route?

Answer: (3)

16. Stranded in a glacial crevasse, the mountaineer Lars Grobbelstein must drag himself to safety up a 26 metre ice wall. His only tools are three tentpoles, which he decides to dig into the ice, using them as steps.

Every time Lars drags himself 3.5 metres up the wall, he has to reach down for his tentpoles, at which point he always slips back 50cm. You should assume that he makes no other movements. Once he has reached the top, he does not need to go back for his poles!

Including all of his movements up and down the wall, how far does Lars travel in total before he is safely out of the crevasse?

Answer: (4)

17. A racetrack is 5 km long.

(a) Roland's Buggy completes the course in 20 minutes.

What is the buggy's average speed in km/h?

Answer: (2)

(b) Romolo's Whizzer travels at an average speed of 60 km/h.

How many minutes does the whizzer take to complete the course?

Answer: (2)

(c) Rogelio's Roller only completes 80% of the course, and takes the same time to do this that the Whizzer takes to cover the whole track.

What is the average speed of the Roller in km/h?

Answer: (3)

18. Here is a sequence, Q :

Term n	1	2	3	4	5	6	7	8
Q	1	8	15	22				

(a) Fill in the four gaps. (2)

(b) What is Q for the 11th term?

Answer: (2)

(c) Using words **or** an algebraic expression (or formula), explain how any value of Q can be found when you know the value of n .

.....

 (3)

(d) Now explain how any value of n can be found when you know the value of Q .

.....

.....

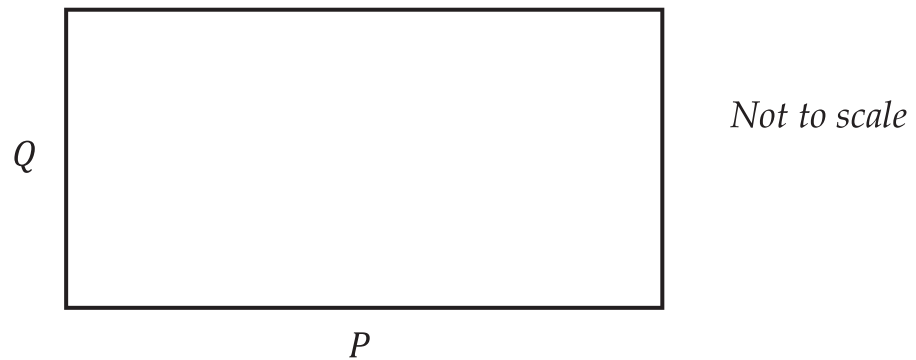
.....

..... (3)

(e) What is n when Q is 134?

Answer: (2)

19. The following diagram shows a rectangle:



Side P is two and a half times as long as side Q . The area of the rectangle is 202.5 cm^2 .

What is the length of Q ?

Answer: (3)

20. If I write down all the numbers from 1 to 1000, how many times in total will I write the digit 3?

(For example, the number 33 contains two 3s.)

Answer: (4)

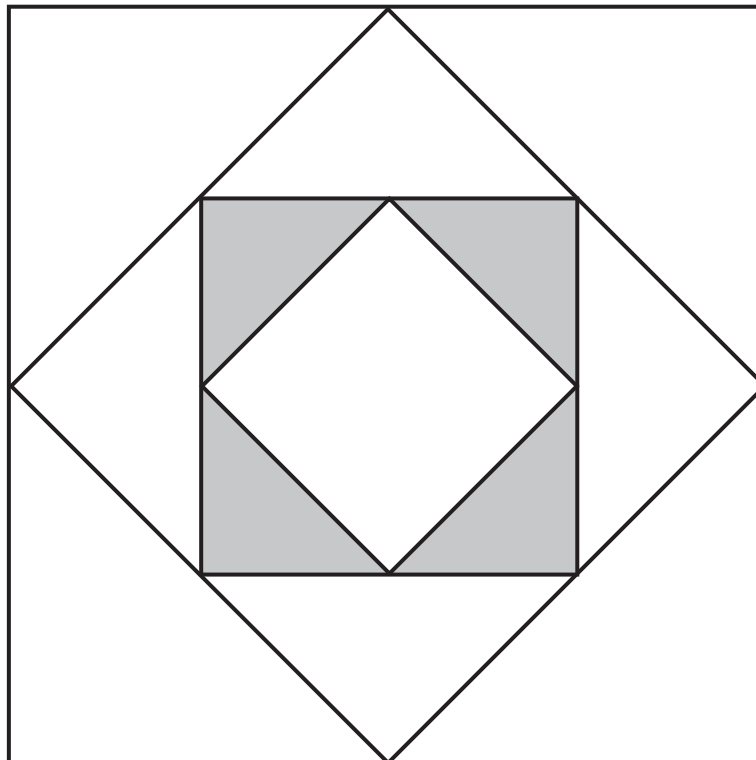
21. How often in a week do the minute and hour hands of a clock form a 90 degree angle? Assume that each hand moves constantly and smoothly.

Answer: (4)

22. The following diagram is made of differently sized squares. Where a corner touches the side of another square, it does so at the midpoint of the side.

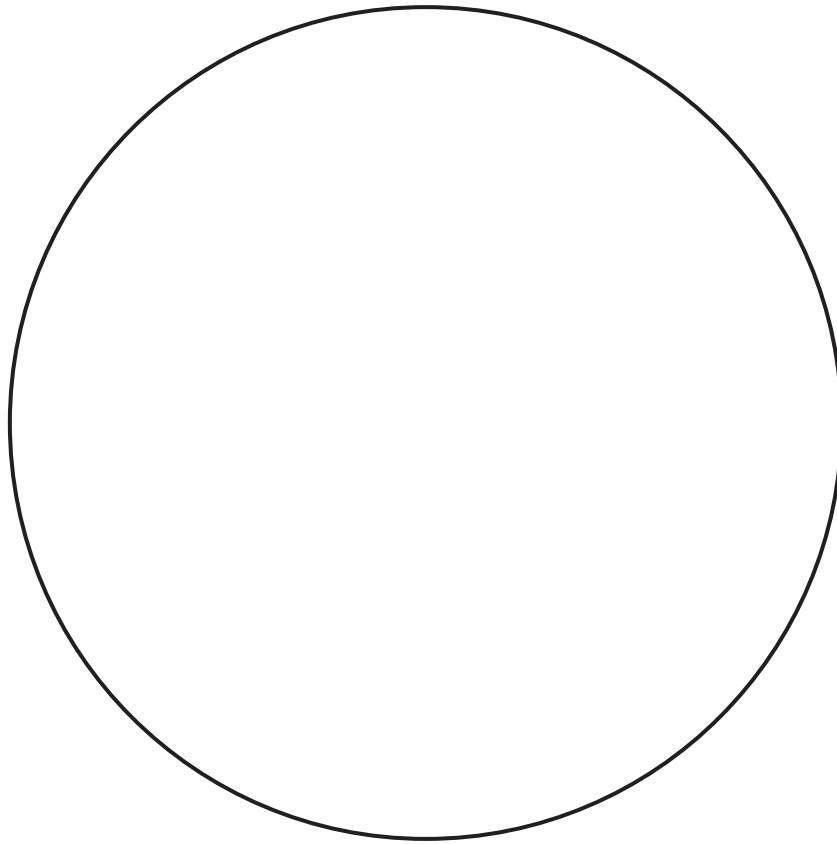
What fraction of the largest square is shaded?

(Even if you do not find the answer, you will receive marks for sensible working.)



Answer: (5)

23. I have a lemon pie, which looks like this:



(a) If I divide the pie by using straight cuts which meet the edge of the pie at each end, what is the largest number of pieces I can make with 4 cuts?

Note that the pieces do not need to be the same shape or size as each other.

Answer: (2)

(b) What is the largest number of pieces I can make with 5 cuts?

Answer: (1)

(c) What is the largest number of pieces I can make with 12 cuts?

(You are unlikely to be able to solve this by drawing 12 cuts. Try some smaller numbers and look for a mathematical pattern.)

Answer: (3)

TOTAL 100 MARKS
