The Haberdashers' Aske's Boys' School
Elstree

11+ Entrance Examination 2017

MATHEMATICS
One Hour

Full Name.....

Examination Number .....

INSTRUCTIONS

1. DO NOT OPEN THIS PAPER UNTIL YOU ARE TOLD TO DO SO.

2. There are 30 questions on this paper. DO NOT FORGET TO TURN OVER.

3. Work quickly but accurately. You are recommended to use pencil, but you can use pen or biro if you wish.

WRITE YOUR ANSWERS TO THE QUESTIONS IN THE SPACES PROVIDED.
YOU MAY USE THE SPACE AT THE BOTTOM OF EACH PAGE FOR WORKING. Answer

1. Add: $88 + 37$ _____

2. Subtract: $96 - 47$ _____

3. Multiply: 58×7 _____

4. Divide: $78 \div 6$ _____

5. Write down two numbers that add to 14 and multiply to 48. _____ and _____

6. You are given the number 2864.

   You are allowed to swap the position of any two digits.

   For example,  2 8 6 4 gives 2 6 8 4

   or  2 8 6 4 gives 4 8 6 2

   What is the largest possible number you can make using one swap? _____

   What is the smallest possible number you can make using one swap? _____

7. Work out the following:

   $21 - 5 \times 2 + 6$ _____

8. What number is:

   Six less than -10 _____

   Twelve more than -8 _____

SPACE FOR WORKING

Answer

9. Alison, Bethany and Catherine are three sisters.
They are 6 years old, 7 years old and 12 years old.

Bethany is older than Alison.
Catherine's age is a prime number.

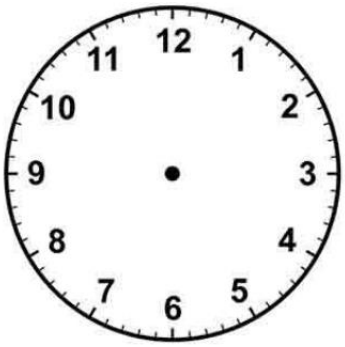
What is each girls' age?

Alison's age _____

Bethany's age _____

Catherine's age _____

10. Draw the hour and minute hands on this clock to show the time 22:30.



What is the reflex angle between the two hands on this clock? _____

11. The sums below were correct before someone rubbed out the brackets.
Write down the correct sums, including the brackets.

a. $8-5+2=1$ _____

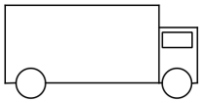
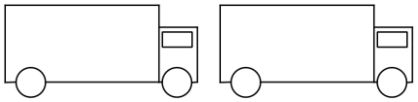
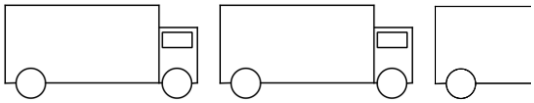
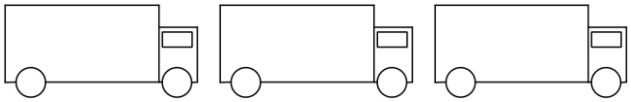
b. $12-11+2-1=0$ _____

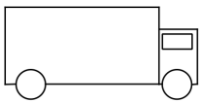
SPACE FOR WORKING

Answer

12. Geoff counted the number of lorries he saw on his journey to school each day.

The results for Monday, Tuesday, Wednesday and Thursday are shown in the pictogram.

Monday	
Tuesday	
Wednesday	
Thursday	
Friday	

Key:	 Four lorries

How many lorries did Geoff see on his journey on Tuesday? _____

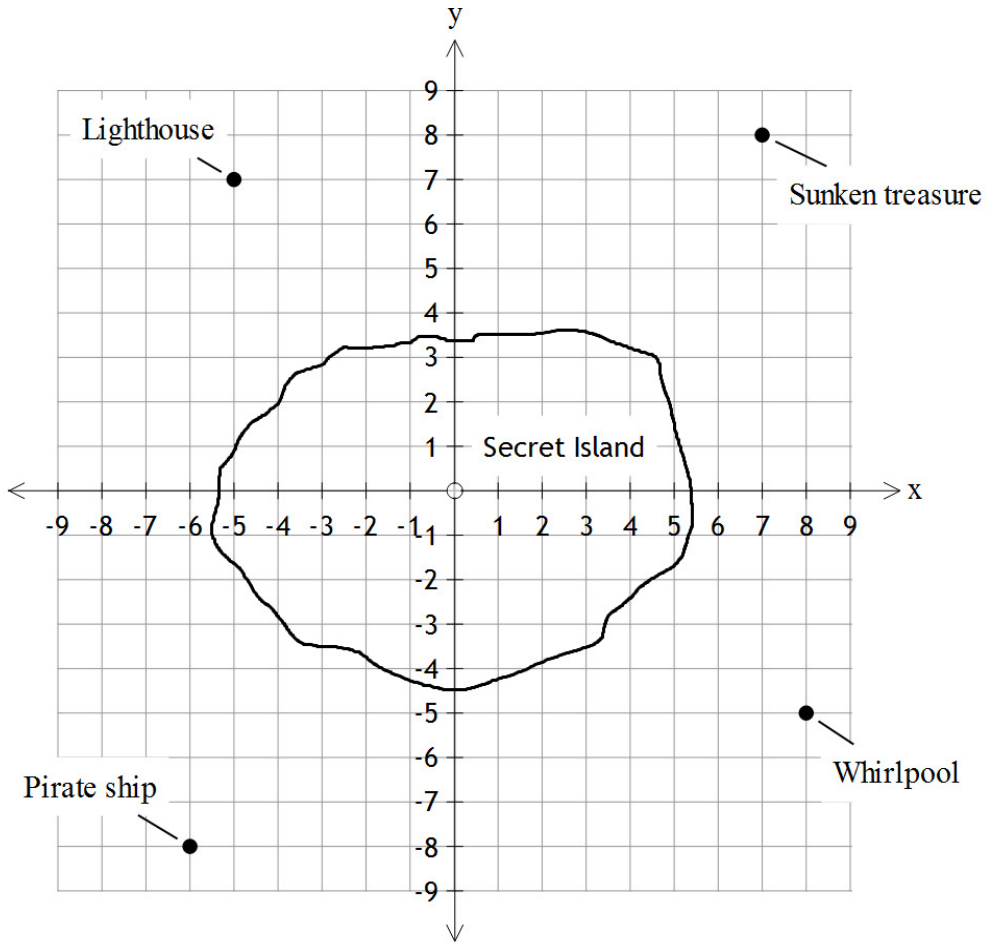
How many lorries did Geoff see on his journey on Wednesday? _____

On Friday Geoff saw six lorries on his journey into school.
Complete the pictogram for Friday.

SPACE FOR WORKING

Answer

13. Here is a map of Secret Island.



What are the co-ordinates of the Sunken Treasure? _____

What are the co-ordinates of the Whirlpool? _____

There is a crocodile at (-7, 6).

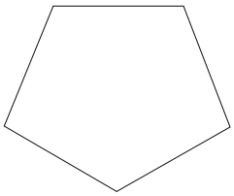
Mark the crocodile on the map. Label the crocodile with the word "CROCODILE".

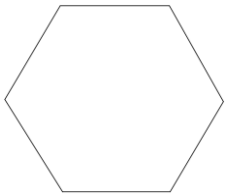
Which of the features shown on the map is the crocodile closest to? _____

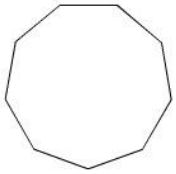
SPACE FOR WORKING

Answer

14. What is the name of each of these three regular polygons?







_____ _____ _____

15. From Year 10 all pupils must join the Combined Cadet Force ("CCF") or opt for School Community Service ("SCS"). Pupils can not opt for both CCF and SCS.

Rachel asked 150 Year 9 pupils whether they wanted to opt for CCF or SCS next year.

60% of the pupils said that they wanted to opt for CCF.

$\frac{1}{6}$ of the pupils said that they wanted to opt for SCS.

The rest of the pupils said that they hadn't yet decided.

How many pupils hadn't yet decided whether to do CCF or carry out SCS next year? _____

16. Sam thinks of a number.

He multiplies that number by 5.
Then he subtracts 12.
Then he divides by 3.
Finally he adds 17.

His answer is 38.

What number did Sam originally think of? _____

SPACE FOR WORKING

Answer

17. A bus can carry 52 passengers. How many buses will be needed to transport 993 people to a sports day? _____

18. In the American state of Kentucky sales tax is charged at 6%.

Anila wants to buy a pair of jeans in Kentucky.
They are priced at $72 before allowing for the sales tax.
How much does Anila pay for the pair of jeans? _____

Peter buys a bag of sweets in Kentucky.
He pays $4.77 including sales tax.
What was the price of sweets before sales tax was added? _____

19. I put the individual twelve letters of the word "HABERDASHERS" into an empty bag. I draw out a letter at random from the bag. What is the probability that I draw out:

a. The letter "B"? _____

b. The letter "T"? _____

c. A vowel? _____

d. A letter that is also in the word "ASKES"? _____

20. The sails of a windmill complete one full turn every 40 seconds.

a. How long does it take the sails to turn through a right angle? _____

b. How many turns do the sails make in fifty-six minutes? _____

SPACE FOR WORKING

Answer

21. A class has thirty pupils.

Eight pupils are left-handed.
Sixteen pupils are girls.
Of the sixteen girls, thirteen are right handed.

Enter this information into the table below. Then complete the rest of the table.

	Left handed	Right handed	Total
Boys			
Girls			
Total			

How many boys in the class are right-handed? _____

22. Stuart's patio is 5 metres long and 5 metres wide.

Stuart wants to cover the patio with paving stones. Each paving stone is 50 centimetres long and 50 centimetres wide.

How many paving stones does Stuart need to buy? _____

Stuart has £200 left after buying the paving stones.
Stuart wants to put a picket fence around **three sides** of his patio.

Each panel of picket fencing is 1 metre long and costs £10.50.
Stuart will also have to pay a delivery charge of £5 regardless of the number of panels of picket fencing he purchases.

How much money does Stuart have left after buying the picket fencing? _____

SPACE FOR WORKING

Answer

23. Elizabeth writes down:

One multiple of 13; and
Two different factors of 77.

Elizabeth adds up her three numbers.
Her answer is greater than fifty but less than sixty.

What three numbers could Elizabeth have written down? _____

24. A cube has side lengths of 5 cm.

What is the volume of the cube? _____

A second cube has a volume of 27 cm^3.

What is the total surface area of the second cube? _____

25. Rinesh started painting his house two years ago.
During that year, Rinesh painted one-third of his house.

Last year, Rinesh painted another five-twelfths of his house.

What fraction of his house does Rinesh need to paint this year, in order to finish completely painting his house? _____

Bijal started weeding her garden two weeks ago.
During that week, she weeded one-fifth of her garden.

Last week, Bijal weeded two and a half times as much of her garden as she weeded two weeks ago.

What fraction of her garden does Bijal need to weed this week, in order to finish completely weeding her garden? _____

Nina is painting garden gnomes.
She has four-fifths of a litre of paint.
Each garden gnome needs one-twentieth of a litre of paint.
How many garden gnomes can she paint? _____

SPACE FOR WORKING

26. Here is a portion of the Monday to Friday bus timetable for the 724 bus between St. Albans and Heathrow.

	Hsch	HNsch	Hsch	HNsch	Hsch	HNsch	Hsch
St. Albans, Railway Station	0555	0603	0641	0715	0745	0808	0909
St. Albans, St Peter's Street	0600	0608	0646	0721	0751	0814	0915
Garston Bus Garage	0625	0633	0716	0748	0831	0845	0944
Watford Junction Railway Station	0637	0645	0733	0803	0853	0901	1002
Watford, Town Hall	0640	0648	0737	0807	0857	0905	1006
Rickmansworth Railway Station	0650	0658	0754	0817	0909	0915	1016
Denham, Station Parade	0709	0713	0820	0832	0925	0930	1031
Uxbridge, Belmont Road	0717	0721	0833	0840	0936	0938	1039
Heathrow Airport	0737	0737	0857	0857	0954	0954	1055

	Hsch	HNsch	Hsch	HNsch	Hsch	HNsch	Hsch
Heathrow Airport	0610	0615	0700	0710	0755	0810	0915
Uxbridge, Belmont Road	0626	0631	0717	0727	0817	0827	0932
Denham, Station Parade	0634	0639	0726	0736	0828	0838	0941
Rickmansworth Railway Station	0650	0655	0743	0753	0850	0855	0957
Watford, Clarendon Road	0704	0709	0804	0814	0911	0911	1011
Watford Junction Railway Station	0707	0712	0807	0817	0914	0914	1014
Garston Bus Garage	0722	0727	0823	0833	0929	0929	1029
St. Albans, St Peter's Street	0745	0750	0850	0900	0952	0952	1052
St. Albans, Railway Station	0756	0801	0901	0911	1003	1003	1103

Notes: **Hsch** – Hertfordshire schooldays only
HNsch – Hertfordshire school holidays only

Answer

a. Andy caught a bus at Denham at 6:39 am.
What time does he arrive at Watford Junction Railway Station? _____

b. Ben wants to travel from Watford Town Hall to Uxbridge by bus. If he catches a bus at Watford Town Hall at 8:57 am how long will his journey take? _____

c. Charlie lives in Uxbridge and works 10 minutes walk away from Garston Bus Garage. He needs to arrive at work by 9:30 am. What time does he need to be at the bus stop in Uxbridge to get to work on time:

   i) if it is a Hertfordshire school day? _____

   ii) if it is a Hertfordshire school holiday? _____

d. Tom has arranged to meet Nic at St. Peters Street in St. Albans at 8:30 am.

   Tom lives in Rickmansworth and is planning to travel by bus. Tom thinks that it is a Hertfordshire school holiday and arrives at the bus stop at Rickmansworth just in time to catch the bus. Unfortunately, it is a Hertfordshire school day.

   How late does Tom arrive for his meeting with Nic? _____

SPACE FOR WORKING

Answer

27. One angle of an isosceles triangle is 80°.

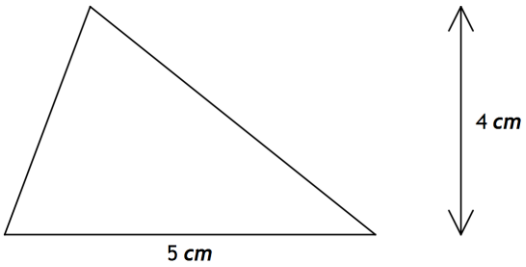
What are the other angles?

There are two possible solutions to this question.

Answer One _____ and _____

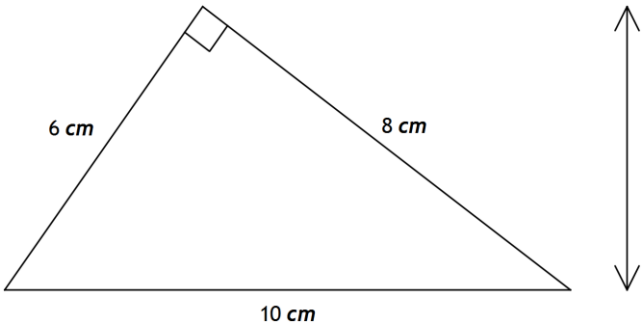
Answer Two _____ and _____

28. a) What is the area of this triangle?



_____

b) What is the area of this triangle?



_____

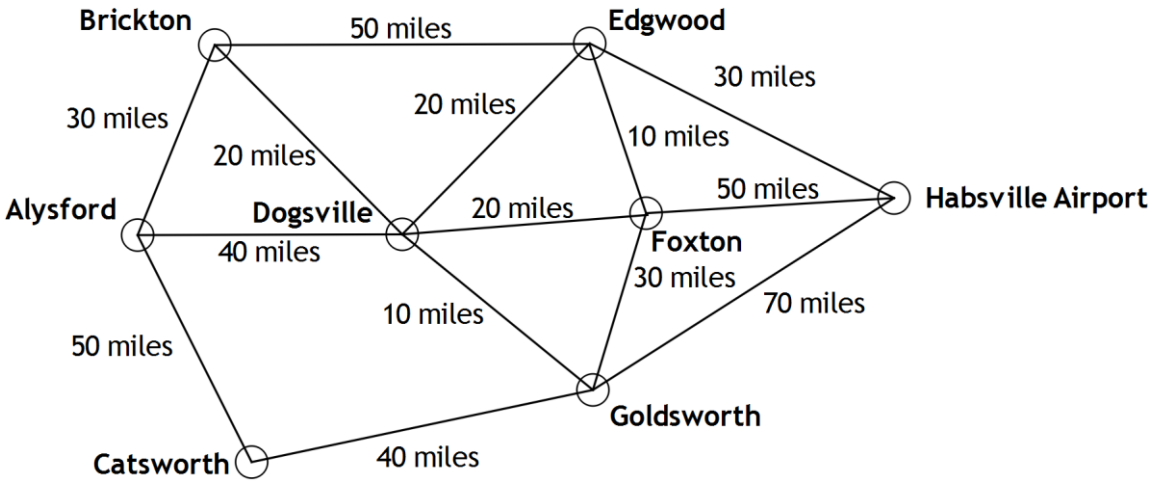
By thinking of two different ways to work out the area of the triangle, calculate the length of arrow.

_____

SPACE FOR WORKING

Answer

29. Here is a map of the roads in Askeshire.



The route from Catsworth to Dogsville via Alysford is written "C➔A➔D".

There has been a robbery in Alysford. The thieves are planning to go to Habsville Airport to flee the country with their loot.

The police want to go from Alysford to Habsville Airport by the **shortest possible** route. What route should the police take?

_____

The thieves also want to go from Alysford to Habsville Airport by the **shortest possible** route. However, the thieves also want to make sure that they don't travel on any of the roads being used by the police. What route should the thieves take?

_____

SPACE FOR WORKING

30. For each of the prime numbers in the table below:
(a) Find the remainder when the prime number is divided by 4; and
(b) Find whether the prime number can be expressed as the sum of two square numbers.

If the prime number can be expressed as the sum of two square numbers, state the two square numbers. If the prime number cannot be expressed as the sum of two square numbers state "Not possible".

Complete the table below. The first two rows have been completed for you.

Prime number	The remainder when the prime number is divided by 4	Can the prime number be expressed as the sum of two square numbers?
3	**3**	**Not possible**
5	**1**	$\mathbf{1^2 + 2^2}$
7		
11		
13		
17		

What is the link between whether a prime number can be expressed as the sum of two square numbers and the remainder when that prime number is divided by 4? If you are not sure you can extend the table above and see what happens for other prime numbers.

_____

_____

_____

SPACE FOR WORKING

The first proof that this pattern is true for all prime numbers was claimed by Pierre de Fermat and is called Fermat's Christmas Theorem (because Fermat's claim was dated December 25, 1640).

Circle "YES" for each of the following prime numbers that can be expressed as the sum of two square numbers.

Circle "NO" for each of the following prime numbers that cannot be expressed as the sum of two square numbers.

<u>You do not need to find the two square numbers</u>.

Prime number	Can the prime number be expressed as the sum of two square numbers?	
58 031	YES	NO
58 043	YES	NO
58 049	YES	NO
58 057	YES	NO

SPACE FOR WORKING

Now go back and check all of your answers carefully.