Practice Unit Assessment (1) for National 4 Expressions and Formulae

1. Expand the brackets:

$5(2m - 7)$ **(1)**

2. Expand the brackets:

$4(2 - 3h)$ **(1)**

3. Expand the brackets: $2(5 - 4x)$ **(1)**

4. Factorise $4x + 32$. **(2)**

5. Factorise $6x - 54$. **(2)**

6. Factorise $72 - 6x$ **(2)**

7. Simplify $3m + 5n + 6m - 2n$. **(1)**

8. Simplify $6a + 3b + b - 2a$. **(1)**

9. Simplify $5g + 4h - 2h - g$ **(1)**

10. **(a)** When $x = 2$ and $y = 3$, find the value of $5x - 3y$. **(2)**

(b) Norrie is a plumber.

He calculates the cost of a job using the formula:

$$C = 26 \cdot 5H + 1 \cdot 5M$$

where C is the cost (in pounds), H is the number of hours he works, and M is the number of miles he travels to the job.

On one job he worked for 7 hours and travelled 32 miles.

Calculate how much Norrie charged for this particular job. **(2)**

11. **(a)** When $c = 4$ and $d = 7$, find the value of $2c + 3d$. **(2)**

(b) The Pronto Parcels delivery company uses this formula to calculate the cost of delivering parcels.

$$C = 6{\cdot}5P + 0{\cdot}75M$$

where C is the cost (in pounds), P is the number of parcels delivered, and M is the number of miles travelled to make the delivery.

Calculate the cost of delivering 7 parcels to an address 140 miles away. **(2)**

12. **(a)** When $m = 5$ and $n = 7$, find the value of $4n - 3m$. **(2)**

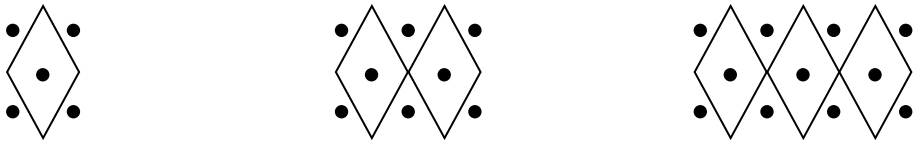
(b) A publishing company sends out flyers to customers to advertise its services.
The cost to the company of doing this is calculated using this formula:

$$C = 9{\cdot}15H + 0{\cdot}5S$$

where C is the cost (in pounds), H is the number of hours someone is paid to prepare the flyers , and S is the number of stamps bought to post them.

Calculate the cost when it took Stewart 5 hours to prepare the flyers and 420 stamps were used. **(2)**

13. Milly bought a new top which has some coloured glass diamonds and beads round the neck. Here is how the pattern is built up.



Pattern 1
1 Diamond

Pattern 2
2 Diamonds

Pattern 3
3 Diamonds

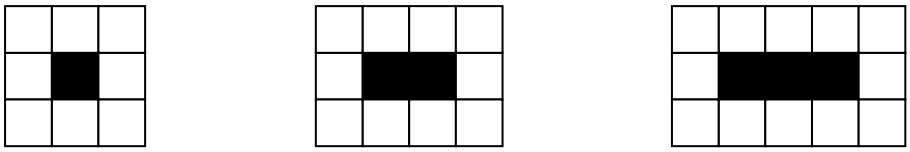
(a) Copy and complete the table below. **(2)**

Number of Diamonds (D)	1	2	3	4	5		10
Number of Beads (B)	5	8					

(b) Write down a formula for calculating the number of beads (B) needed when you know the number of diamonds (D). **(2)**

(c) A pattern has 50 beads. How many diamonds does it have?
You must show your working. **(#2.1 and 1)**

14. A pattern of black and white tiles is made up as shown in these diagrams.



(a) Complete the table below. **(2)**

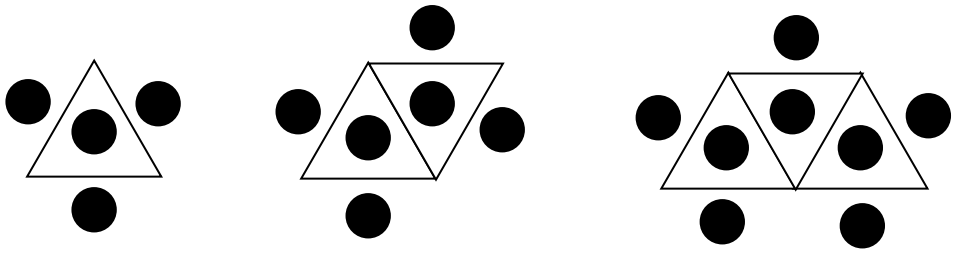
Number of black tiles (*B*)	1	2	3	4	5	6		10
Number of white tiles (*W*)	8	10	12					

(b) Write down a rule for finding the number of white tiles (*W*) needed when you know the number of black tiles (*B*). **(2)**

(c) Another pattern has a total of 46 white tiles. How many black tiles were there?
(#2.1 and 1)

15. Carol is making a pattern with triangles and circles.

Here is how the pattern is built up.



Pattern 1

1 Triangle

Pattern 2

2 Triangles

Pattern 3

3 Triangles

(a) Complete the table below. **(2)**

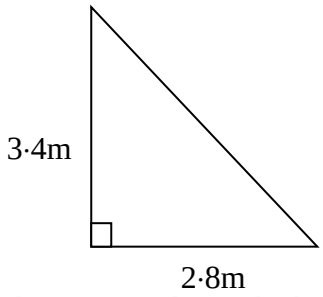
Number of Triangles (T)	1	2	3	4	5	6		10
Number of Circles (C)	4	6	8					

(b) Write down a rule for finding the number of circles (C) needed when you know the number of triangles (T). **(2)**

(c) Another pattern has a total of 56 circles. How many triangles were there?

You must show your working. **(#2.1 and 1)**

16. I have just had a new staircase fitted in my house. It has a height of 3·4m and is 2·8m horizontally.

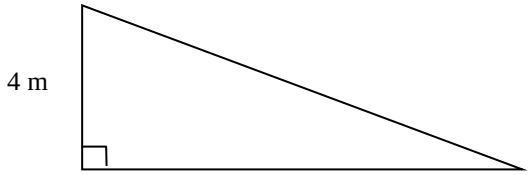


To be safe the gradient of the staircase has to be between 1·2 and 1·3.

(a) Calculate the gradient of the staircase. **(1)**

(b) Is this staircase safe? Give a reason for your answer. **(#2.2)**

17. A skateboard ramp has been designed to have the following dimensions.



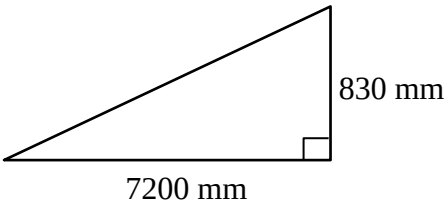
The ramp can only be used in competitions if the gradient of the slope is greater than 0·3.

(a) Calculate the gradient of the slope. **(1)**

(b) Can this ramp be used in a competition? Give a reason for your answer. **(#2.2)**

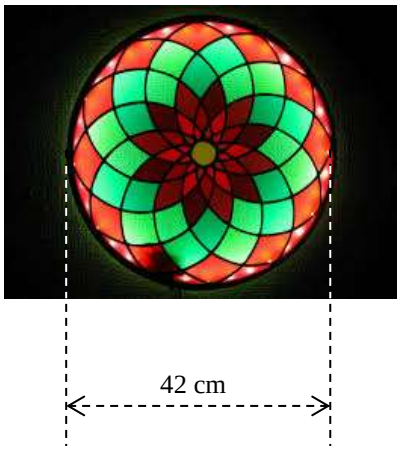
18. The manufacturer of a ramp for a shop entrance states that to be suitable for a wheelchair user the gradient of the ramp must lie between 0·1 and 0·15.

(a) Calculate the gradient of the slope. **(1)**



(b) Is this ramp suitable for wheelchair users?
Give a reason for your answer. **(#2.2)**

19. A decorative plaque in a church window is circular and has a diameter of 42cm.



(a) Calculate the circumference of the plaque. **(2)**

(b) Calculate the area of the area of the plaque. **(2)**

20. The speed limit outside schools is 20 miles per hour. The warning sign for this is shown below. The diameter of the sign is 30 cm.

(a) Calculate the circumference of the sign. **(2)**

(b) Calculate the area of the sign. **(2)**

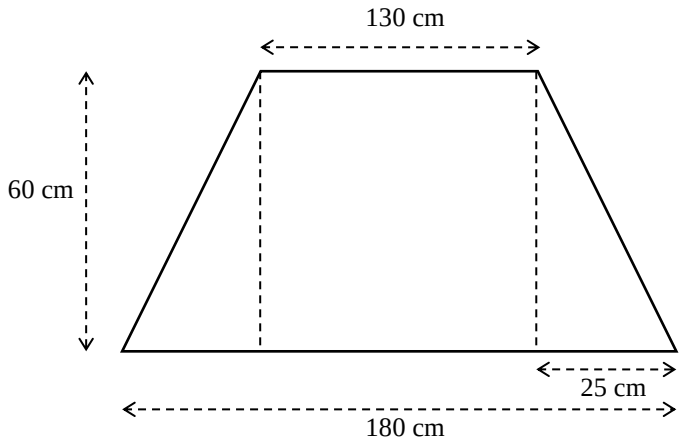
20. Polly's Pizza Parlour sells pizzas with diameter 26cm.

(a) Calculate the circumference of the pizza. **(2)**

(b) Calculate the area of the area of the pizza. **(2)**

21. A car windscreen is formed from a ‘curved’ trapezium.

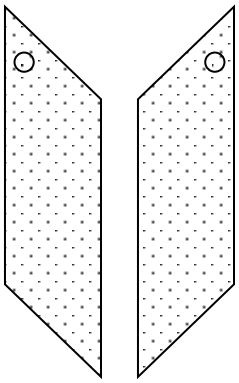
The trapezium is made up of a rectangle and two identical right-angled triangles, as shown in the diagram below.

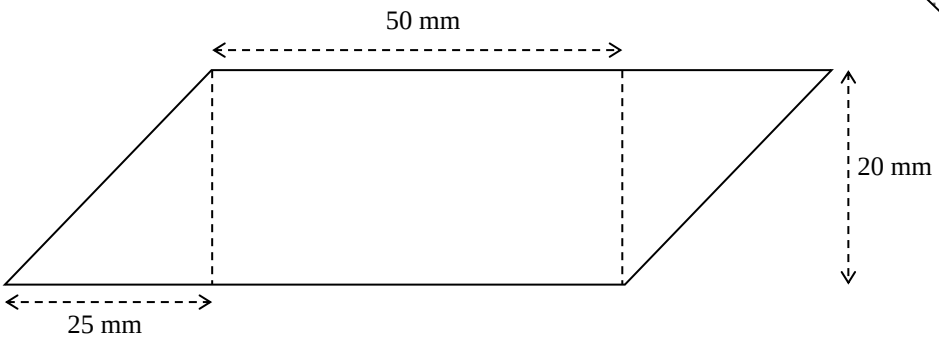


Find the area of the windscreen. **(3)**

22. Earrings are shaped like a parallelogram.

Each earring is made up of a rectangle and two identical right-angled triangles, as shown in the diagram below.

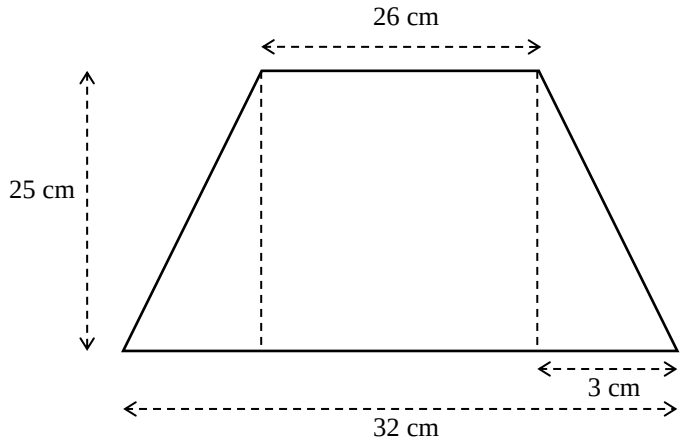




Find the area of one of the earrings. **(3)**

23. The front of a handbag is shaped like a trapezium.

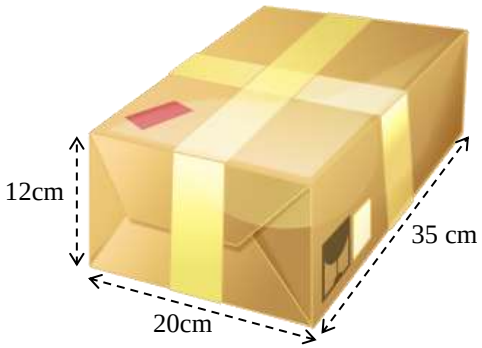
The trapezium is made up of a rectangle and two identical right-angled triangles, as shown in the diagram below.



Find the area of the front of the handbag. **(3)**

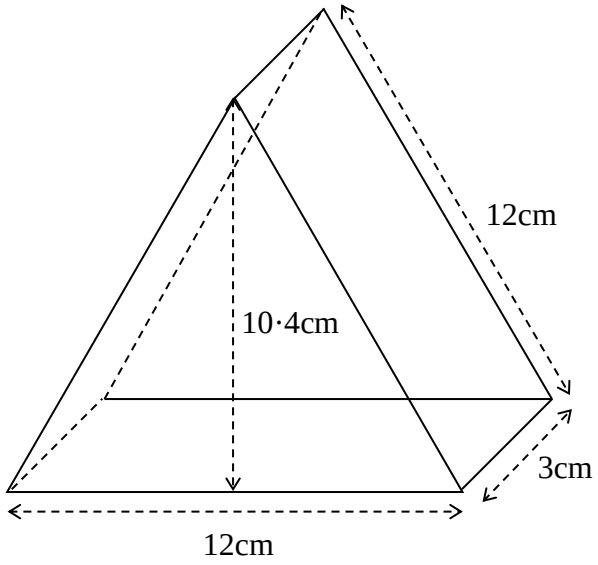
24. A parcel is in the shape of a cuboid.

It is 35 centimetres long, 20 centimetres wide and 12 centimetres high, as shown below.



Find the surface area of the cuboid shown. **(2)**

25. A box is in the shape of a triangular prism with dimensions as shown in the diagram.

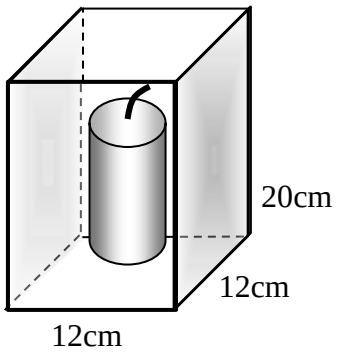


Calculate the surface area of the triangular prism.

(2)

26. As a safety measure, a candle is displayed in a glass case in the shape of a cuboid which is **open at the top.**

The base measures 12cm by 12cm and its height is 20cm.

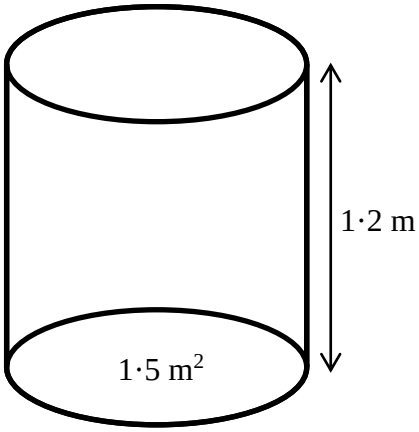


Calculate the amount of glass that would be need to used to make this case. **(2)**

27. I have a large container in my garden for collecting water.

The area of the base of the container is 1·5 square metres.

The height of the container is 1·2 metres.



Calculate the volume of the container. **(2)**

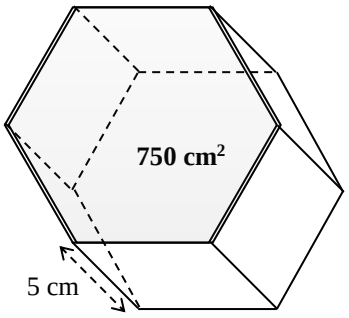
28. A heart – shaped chocolate box has a base area of 250 cm².

The depth of the box is 4·5 centimetres.

Calculate the volume of the chocolate box. **(2)**

29. A box of toiletries is a prism as shown in the diagram.

The area of the base is 750cm² and has height 5cm.

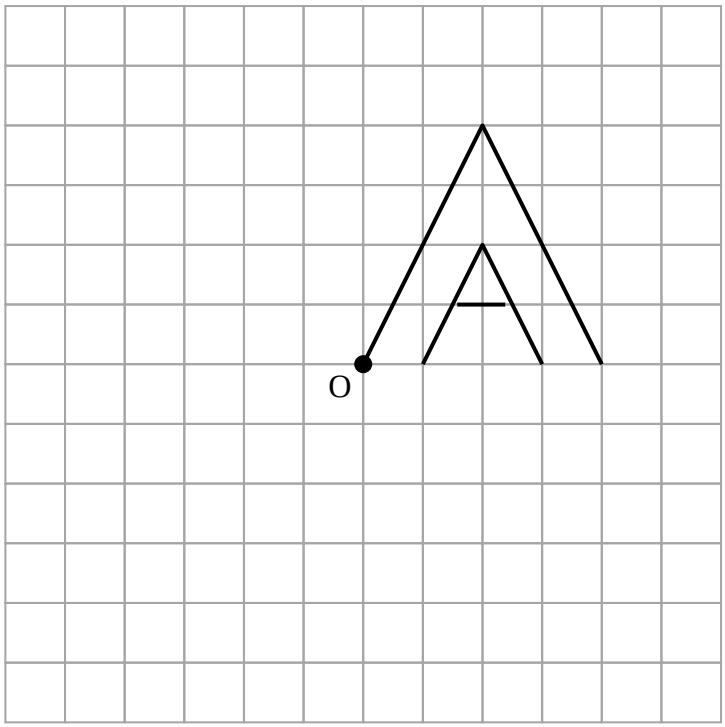


Calculate the volume of the box. **(2)**

30. Andy's Autos have designed a new logo for their company.

Part of the design for the logo is shown below.

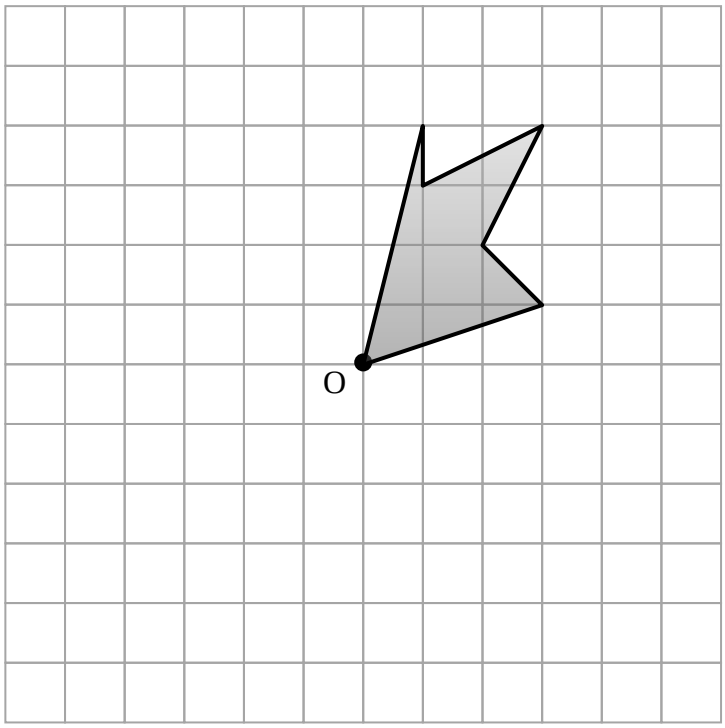
Complete this shape so that it has rotational symmetry of order 4, about 0. **(2)**



31. A textile company is designing a new cushion pattern which has rotational symmetry.

Part of the design is shown below.

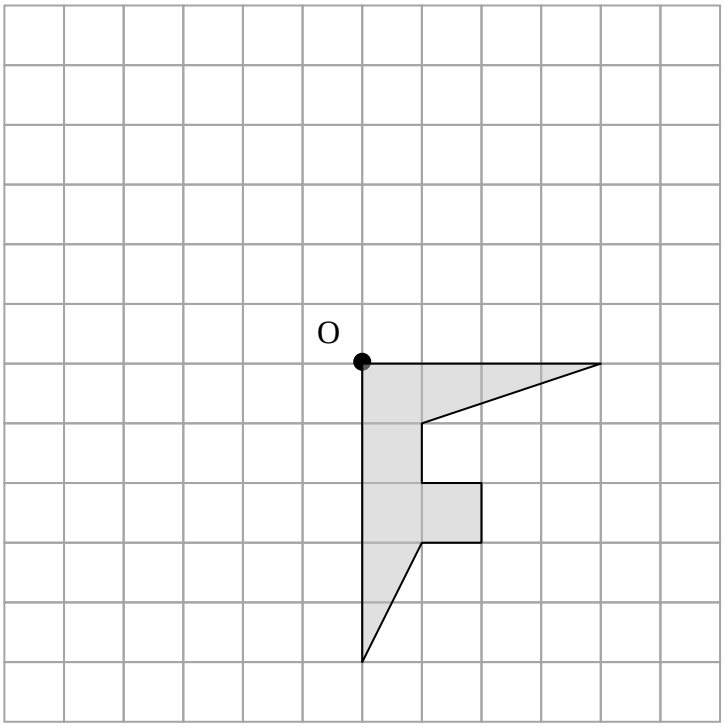
Complete this shape so that it has rotational symmetry of order 4, about 0. **(2)**



32. A company is designing a new logo.

Part of the design is shown below.

Complete this shape so that it has rotational symmetry of order 4, about 0. **(2)**



33. The number of visitors to an exhibition was recorded each day for two weeks.

The results are shown below.

77	93	87	71	90	98	100
78	84	91	97	88	102	107

Copy and complete the frequency table for these results. **(2)**

Score	**Tally**	**Frequency**
70 – 79		
		Total =

34. The marks obtained (out of 30) in a test by a group of students are given in this list.

26	23	17	29	2	19	20
27	24	21	30	18	22	17

Copy and complete the frequency table for these results. **(2)**

Score	**Tally**	**Frequency**
1 – 6		
		Total =

35. The number of people attending an emergency dental clinic over the course of three weeks was recorded. Here are the results

13	12	5	19	15	10	12	22
18	13	12	21	9	11	16	

Copy and complete the frequency table for these results. **(2)**

Score	**Tally**	**Frequency**
1 – 5		
		Total =

36. The tips received by a group of 8 waiters in a restaurant one Saturday evening are shown here.

£12	£24	£17	£22
£19	£20	£23	£15

(a) Calculate the mean tips received. **(2)**

(b) Calculate the range. **(1)**

The waiters went on a customer services course during the following week.
The next Saturday evening:

the mean was £25 and
the range of £9.

(c) Write two comments comparing the results before and after the course. **(#2.2)**

37. Ten people were asked how long they had waited in a queue to get into an exhibition.
The time, in minutes, was recorded and the results are shown below.

14	23	21	15	12
22	26	22	17	16

(a) Calculate the mean time taken. **(2)**

(b) Calculate the range. **(1)**

The manager thought that these times were too long and introduced measures to cut the waiting times.

After this happened: the mean waiting time was 15 minutes
and
the range was 10.

(c) Write two comments comparing the results before and after these measures were introduced.
(#2.2)

38. Eight people were weighed at a slimming class before embarking on a healthy eating campaign. Their weights, in kilograms, are shown below.

84	75	61	65
72	86	64	77

(a) Calculate the mean weight. **(2)**

(b) Calculate the range. **(1)**

After two months on the healthy eating campaign they were weighed again.

This time: the mean was 70 kg and
the range was 20.

(c) Write two comments comparing the results before and after the healthy eating campaign.

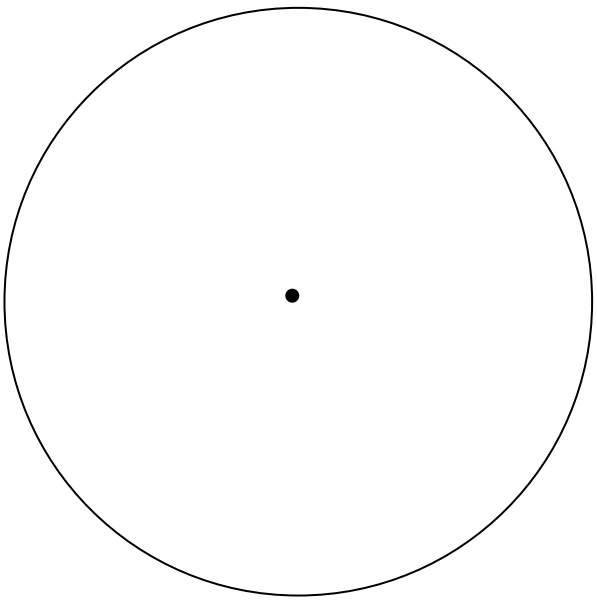
(#2.2)

39. A group of sixty students were asked what there favourite 'soap' was.

The table below shows the results.

Complete the blanks in the table and then use the information to complete the pie chart. **(3)**

Soap	No. of pupils	Angle at centre
Eastenders	15	
Emmerdale	20	
Corrie	25	

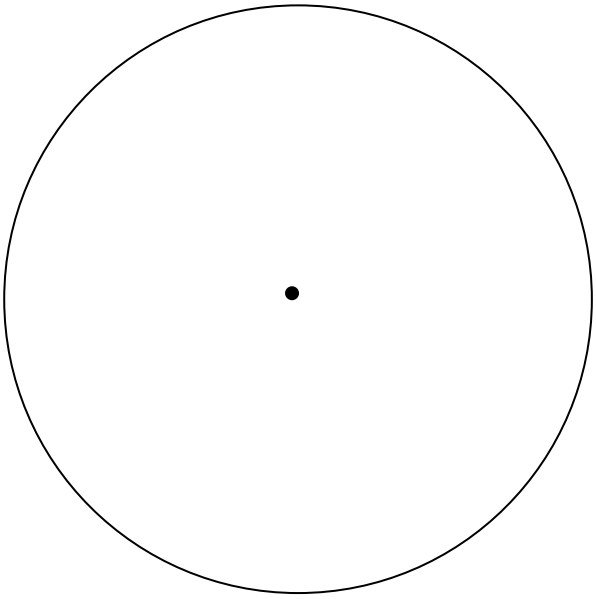


40. One hundred and sixty people were asked to say what sports they played.

The table below shows the results.

Complete the blanks in the table and then use the information to complete the pie chart. **(3)**

Sport	No. of pupils	Angle at centre
Indoor	40	
Outdoor	72	
Don't play sport	48	

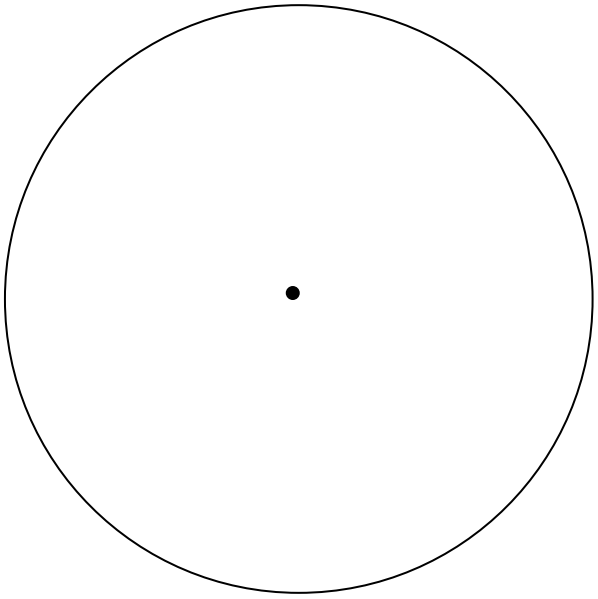


41. One hundred and twenty people were asked in which season their birthday fell.

The table below shows the results:

Complete the blanks in the table and then use then information to complete the pie chart. **(3)**

Season	No. of pupils	Angle at centre
Spring	30	
Summer	35	
Autumn	45	
Winter	10	



.42. An octahedral die has eight faces numbered one to eight.

When it is thrown it comes to rest on one of its faces.

What is the probability that it comes to rest on a number greater than 3? **(1)**

43. As people left a travel agent they were asked what kind of holiday they had booked. Here is what they said:

Package Holidays:	24
Cruise:	13
Camping:	6
Activity:	7

What is the probability that someone chosen at random will have booked a cruise?

(1)

44. A card is chosen from this set of cards.

What is the probability that it will **not** be a face card? **(1)**