

Circles (Intermediate UKMT)

These questions must be attempted ***without a calculator***

Topics covered in the questions below may not necessarily be from the topic of the title.

1. Which of the following numbers could replace \square so that the value of $\frac{\square}{5}$ lies between 3 and 4?

A 3.2 B 9 C 14 D 19 E 24

2. Granny has been having a smashing time. Yesterday she had 12 cups and 10 matching saucers, but this morning she dropped a tray holding one third of the cups and half the saucers, breaking all of those on the tray.

How many of her cups are now without saucers?

A 1 B 3 C 4 D 5 E 6

3. Which fraction is the odd one out?

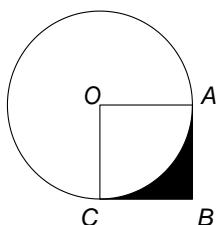
A $\frac{1+4}{7+4}$ B $\frac{20}{140}$ C $\frac{0.2}{1.4}$ D $\frac{1 \div 11}{7 \div 11}$ E $\frac{8}{56}$

4. Which is the largest of these fractions?

A $\frac{7}{15}$ B $\frac{3}{7}$ C $\frac{11}{23}$ D $\frac{4}{9}$ E $\frac{6}{11}$

5. The point O is the centre of a circle of radius 1 unit, OA , OC are radii, and $OABC$ is a square.

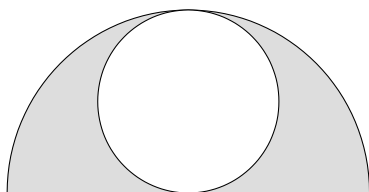
What is the area of the shaded region (in square units)?



A $1 - \frac{\pi}{4}$ B $1 - \frac{\pi}{2}$ C $\frac{(1-\pi)}{4}$ D $2 - \frac{\pi}{2}$ E $2 - \frac{\pi}{4}$

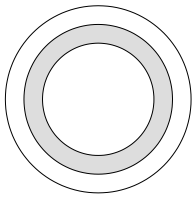
6. The diagram shows a semicircle containing a circle which touches the circumference of the semicircle and goes through its centre.

What fraction of the semicircle is shaded?



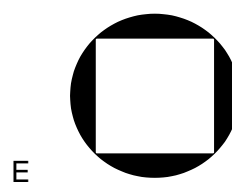
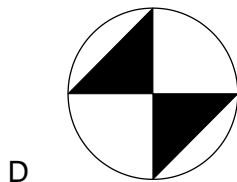
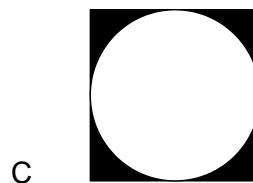
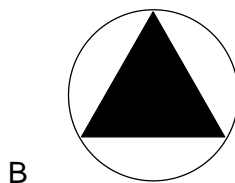
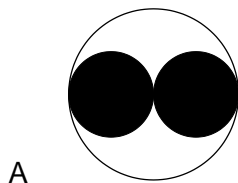
A $\frac{2}{3}$ B $\frac{1}{2}$ C $\frac{1}{\pi}$ D $\frac{2}{\pi}$ E $\frac{3}{\pi}$

7. The three circles in the diagram have the same centre and have radii 3cm, 4cm and 5cm. What percentage of the area of the largest circle is shaded?



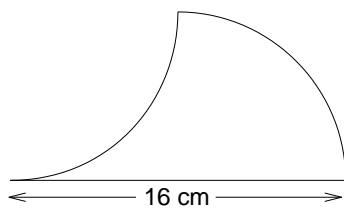
- A 20% B 25% C 28% D 30% E $33\frac{1}{3}\%$

8. The large circles in each figure have the same radius. Which shaded area is the greatest?



9. This figure is made from a straight line 16 cm long and two quarter circles, one with its centre at the midpoint of the straight line.

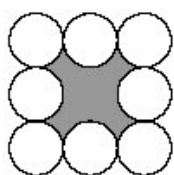
What is the area of the figure (in cm^2)?



- A 64 B 16π C $32 + 16\pi$ D 32π E $16 + 8\pi$

10. The shaded region is bounded by eight equal circles with centres at the corners and midpoints of the sides of a square. The perimeter of the square has length 8.

What is length of the perimeter of the shaded region?



- A π B 2π C 8 D 3π E 4π