RADLEY

Scholarship Examination

MATHEMATICS II

2024

Time allowed – 1 hour

Show all working

Calculators may be used

1. a. 20% of w is 15. Find w.

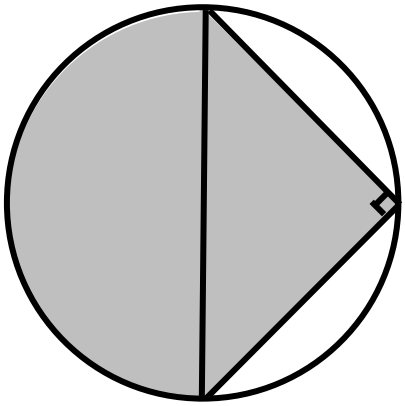
   b. x% of 20 is 8. Find x.

   c. y% of y is £576. Find y.

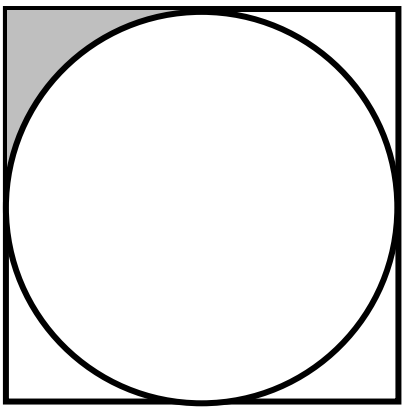
   d. $(z+10)$% of $(z-20)$ is 4. Find z.

2. In each of the following, find the shaded area.

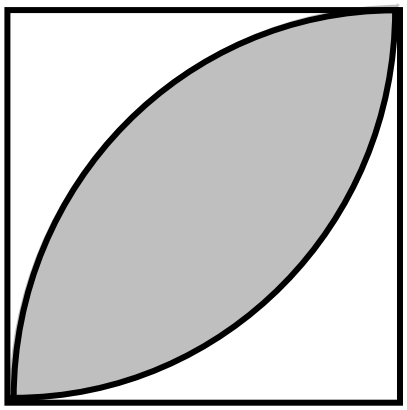
   a. The circle has radius 1 cm and the triangle is isosceles.



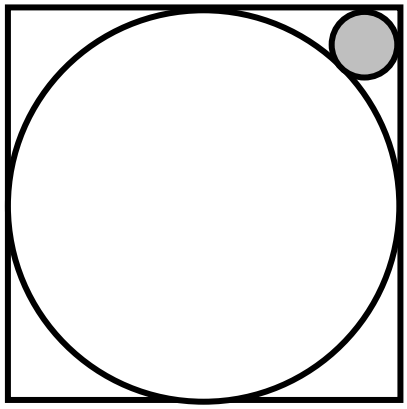
   b. The circle has radius 1 cm.



c. The square has sides of length 2 cm and the curves are quarter circles.



d. The large circle has radius 1 cm.



3. There are four statues on a shelf, A, B, C and D.

   The total weight of A and B is four times the total weight of C and D.

   The weight of A is $\frac{2}{5}$ of the weight of B.

   The weight of C is 80% of the weight of D.

   Calculate the ratio:

   weight of A : weight of B : weight of C : weight of D

4. a. Solve the simultaneous equations

$$\left.\begin{aligned} 3x+5y&=25\\ 7x-2y&=31 \end{aligned}\right\}$$

b. Using your answer to part a. solve the simultaneous equations

$$\left.\begin{aligned} 3\sqrt{x}+5\sqrt{y}&=25\\ 7\sqrt{x}-2\sqrt{y}&=31 \end{aligned}\right\}$$

c. Using your answer to part a. solve the simultaneous equations

$$\left.\begin{aligned} 3x+5y&=25xy\\ 7x-2y&=31xy \end{aligned}\right\}$$

5. I have five cards numbered 1, 2, 3, 4, 5. I can lay them out to make various numbers. Three such different numbers are shown below.

a. How many different numbers can I make?

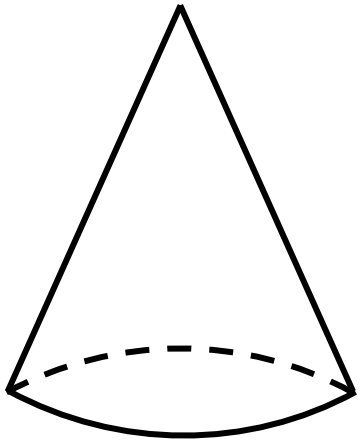
b. How many different odd numbers can I make?

c. How many different odd numbers greater than 2000 can I make?

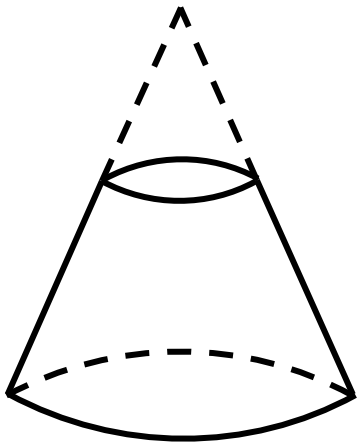
I replace the 5 with another 3, so I now have cards numbered 1, 2, 3, 3, 4

d. How many different numbers can I now make?

6. a. A cone has a circular base of radius 8cm and height 24cm. Find its volume.



b. A frustrum is formed by cutting a cone of height $h$cm from the top of the cone in part a. Find an expression, in terms of h, for the volume of the frustrum.



c. Given that the volume of the frustrum is seven-eighths of the volume of the cone, find the value of h.

Hint: the formula for the volume of a cone is $\frac{1}{3}\times(\textit{base area})\times(\textit{height})$