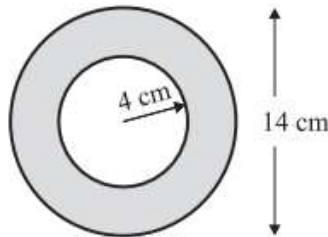


## ***The $\pi$ Quiz 2016 – Round 1***

**Irish Maths Teachers' Association, Cork Branch**

- Q1.** A disc of radius 4 cm is removed from a larger disc of diameter 14 cm as shown. Find the remaining area correct to one decimal place.



- Q2.** Solve  $x^2 = \frac{1}{2} - 2x$  and give your solutions correct to 2 decimal places.

## ***The $\pi$ Quiz 2016 – Round 2***

**Irish Maths Teachers' Association, Cork Branch**

- Q1.** The endpoints of the diameter of a circle are  $(-5, t)$  and  $(4, -10)$ . Given that the radius is 7.5 units, find  $t$ .

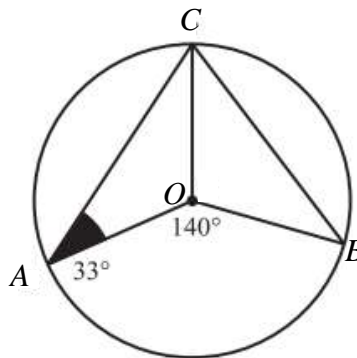
- Q2.** A right angled triangle contains an angle A such that  $\cos A = \frac{2}{7}$ .

Evaluate  $\tan A - 3\sin A$ , giving your answer in the form  $\frac{a\sqrt{b}}{c}$  where  $a, b, c \in N$ .

## The $\pi$ Quiz 2016 – Round 3

Irish Maths Teachers' Association, Cork Branch

- Q1.**  $A, B$  and  $C$  are points on a circle, as shown.  $O$  is the centre of the circle.  
 $|\angle CAO| = 33^\circ$  and  $|\angle BOA| = 140^\circ$ , find  $|\angle BOC|$ .



- Q2.** Brenda has been evicted from her apartment and needs to find a new place to live. She looks at a few places and decided on an apartment close by. She needs to have a deposit of €800 and 1<sup>st</sup> months rent of €800. She also needs to arrange a removal company who will move her furniture for a fee of €12.30 per item. She has 17 items of furniture. They also charge VAT at 13.5% on this amount and charge mileage at a rate of 98c per km for the complete load. She is moving 7 km and no VAT is payable on this amount. During the move, she buys a washing machine at a cost of €387 plus delivery of €18. VAT is included in this price. How much will Brenda spend during her move (to the nearest cent)?

## The $\pi$ Quiz 2016 – Round 4

Irish Maths Teachers' Association, Cork Branch

- Q1.** Fully factorise:  $(3x + y)^2 - y(6x + 37y)$ .
- Q2.**  $(-1, 2)$ ,  $(3, -4)$  and  $(5, y)$  are 3 points on line  $l$ . Find the equation of a line  $k$  through the point  $(5, y)$  which is perpendicular to  $l$ .

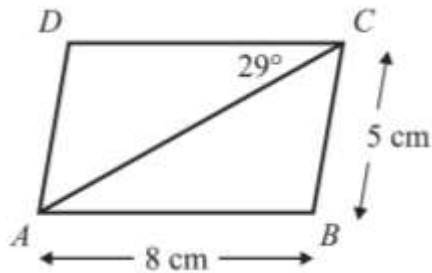
# The $\pi$ Quiz 2016 – Round 5

## Irish Maths Teachers' Association, Cork Branch

**Q1.** Given that  $r = \frac{1}{x} + q$ , find the value of  $x$ , when  $q = \frac{5}{2}$  and  $r = \frac{5}{3}$ .

**Q2** A snail is crawling up a wall. The first hour it climbs 20 cm, the second hour it climbs 18 cm and the third hour it climbs 16 cm and so on. Assuming that the snail reaches the top of the wall just as it stops climbing, find the height of the wall in metres.

**Q3**

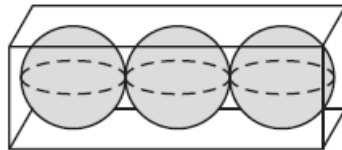


In the parallelogram  $ABCD$ ,  $|AB| = 8$  cm,  $|BC| = 5$  cm and  $|\angle ACD| = 29^\circ$ .

$$|\angle ABC| = 2|\angle BCA|.$$

Calculate the area of the parallelogram  $ABCD$  correct to the nearest whole number.

**Q4.** 3 identical spherical balls fit exactly into a rectangular box of internal volume  $192 \text{ cm}^3$ , as shown.



Express the volume of the box not occupied by the golf balls as a percentage of the internal volume of the box. Give your answer correct to two significant figures.

# The $\pi$ Quiz 2016 – Round 6

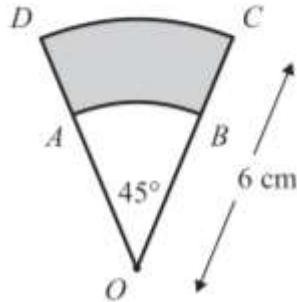
## Irish Maths Teachers' Association, Cork Branch

**Q1** A local newsagent conducted a survey regarding newspaper deliveries. In a certain street, it was found that  $\frac{1}{5}$  of the households have no newspaper delivered,  $\frac{1}{2}$  of the households on this street have a national paper delivered and  $\frac{1}{3}$  of the households have a local paper delivered. If a household is selected at random find the probability that it will have both national and local papers delivered.

**Q2.** Anne saves 20 cent and 50 cent coins to pay for a ticket to a 'Walking on cars' concert ticket. After counting her money, she has 299 coins in total which add up to €94. Find the number of 50 cent coins she saved.

**Q3.** Simplify  $\frac{125^{\frac{1}{3}} \times 5^2}{5^5 \times 25^{\frac{1}{2}}}$  into the form  $5^n$ , where  $n \in \mathbb{Z}$ .

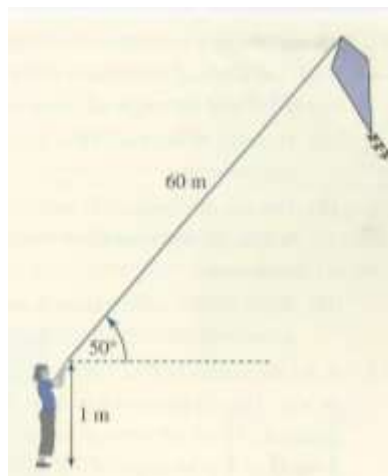
**Q4.** A sector  $DOC$  has a radius of 6 cm and subtends an angle of  $45^\circ$ . The area of the sector  $OAB$  is  $2\pi \text{ cm}^2$ . Find the total perimeter of ABCD giving your answer in the form  $a + b\pi$ ,  $a, b \in \mathbb{R}$ .



# The $\pi$ Quiz 2016 – Round 7

Irish Maths Teachers' Association, Cork Branch

- Q1.** A kite is flown on a string 60 m long. The cord, held taut by a girl with its end at a height of 1m above the ground level, makes an angle of  $50^\circ$  with the horizontal as shown. From a point P on level ground, the angle of elevation of the kite is  $40^\circ$ . Calculate the distance from the girl to the point P, correct to one decimal place.



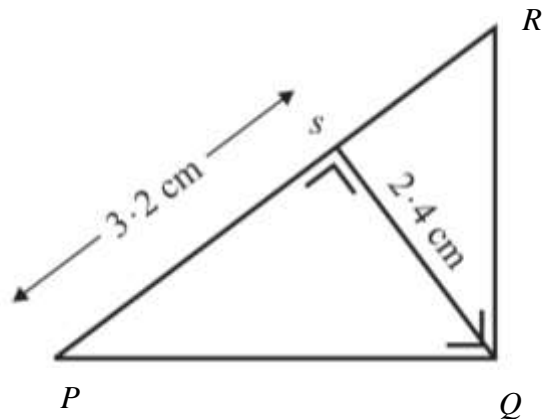
..... P  
Ground level

- Q2.** A market trader has a dozen eggs left at the end of the day, 3 of which are bad. He selects 2 eggs at random for his tea that night. Find the probability he selects at least 1 bad egg.
- Q3.**  $U$  is the universal set.  $A$ ,  $B$  and  $C$  are 3 subsets of  $U$ .  
 $\#(A \cap B \cap C) = 3x$   
 $\#(A \cap C) = 4x$   
 $\#((A \cap B) \setminus C) = y$   
 $\#(B \cap C) = 16$   
 $\#(C \setminus (A \cup B)) = 2y$   
 $\#(B \setminus (A \cup C)) = 11$ .  
Given that  $\# B = 32$  and  $\# C = 29$ , calculate the value of  $x$  and the value of  $y$ .
- Q4.** The graph of  $f(x) = x^2 - 3$  is shifted right by 2 units and down by 3 units to generate  $g(x)$ . Find a suitable expression for  $g(x)$ .

# The $\pi$ Quiz 2016 – Round 8

Irish Maths Teachers' Association, Cork Branch

- Q1.**  $x < \sqrt{19} < y$ .  
Find correct to 2 decimal places the maximum value of  $x$ , ' $x_1$ ' and the minimum value of  $y$ , ' $y_1$ '. Hence, evaluate the product of  $x_1$  and  $y_1$ .
- Q2.** The triangles  $PQR$  and  $PQS$  are similar triangles. Given that  $|SQ| = 2.4$  cm and  $|PS| = 3.2$  cm, find  $|SR|$ .



- Q3.** A set of 4 odd numbers has a mode of 5, a median of 6 and a mean of 6.5.  
What are the four numbers?
- Q4.** Emma has inherited a house and decides to renovate it. She employs a builder to do some work on the house and he charges €130 per day plus VAT at a rate of 13.5%. He works for 6 days. Materials needs to be bought including 5 doors at €87 per door, 5 boxes of tiles at €120 per box, 3 bags of grout at €25 per bag, 1 cooker at €560, 1 dishwasher at €399, 7 pots of paint at €21 per pot and timber flooring at €45 per sq m. She has to cover 20 sq m. VAT must be added to all materials at 20%. The builder hits a pipe with a nail so she must get a plumber to call in an emergency. She charges a call out fee of €100 and charges €35 per hour. It takes 2 hours to complete the job and VAT is included in the price.  
How much does the renovation cost Emma ?

# ***The $\pi$ Quiz 2016 – Tie –break 1***

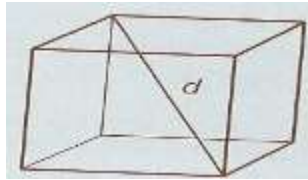
**Fill answers onto question page.**

**Irish Maths Teachers' Association, Cork Branch**

- Q1.**  $X$  and  $Y$  are 2 sets such that  $\# X = 11$  and  $\# Y = 8$ , find the difference between the greatest possible value and the least possible value for  $\#(X \cup Y)$ .

\_\_\_\_\_

- Q2.** The diagonal length ( $d$ ) of a cube is  $4\sqrt{3}$  cm. Find the length of a side of this cube.



\_\_\_\_\_

- Q3.** Three cans of juice fill  $\frac{2}{3}$  of a 1L jug. How many cans of juice are needed to completely fill 8 1L jugs? \_\_\_\_\_

- Q4.** A cardboard box has surface area of  $12,156 \text{ cm}^2$ . The cost of covering the box in wrapping paper is €0.73 per  $\text{m}^2$ . If a shopkeeper covers 163 of these boxes per month on average, what is the cost per annum correct to 2 decimal places?

\_\_\_\_\_

# ***The $\pi$ Quiz 2016 – Tie –break 2***

**Fill answers onto question page.**

**Irish Maths Teachers' Association, Cork Branch**

**Q1** In 2006 the population of Peru was approximately  $2.8 \times 10^7$ . By 2013 the population had increased by 2.3 million.

What was the approximate population in 2013? Express your answer in the form  $a \times 10^n$ , where  $a \in N$  and  $1 \leq a < 10$ . \_\_\_\_\_

**Q2.** An oil tanker contains 125 L of fuel. It is leaking at a rate of 0.2 % of its volume per minute. What will be the volume of water left in the tanker after 90 seconds correct to 2 decimal places? \_\_\_\_\_

**Q3** A box with a square base of side length  $2x - 3$  units has a volume of  $4x^3 - 40x^2 + 93x - 63$  units<sup>3</sup>. Find its height in terms of  $x$ .

\_\_\_\_\_

**Q4**  $f(x) = 2^x$ .

Find  $f(x) + f(x+3)$  in the form  $m2^x$  where  $m \in N$ .

\_\_\_\_\_



## Answers

	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8
Q1	103.7 cm <sup>2</sup>	$t = 2$ $t = -22$	106°	$9(x + 2y)(x - 2y)$	$-\frac{6}{5}$	$\frac{1}{30}$	94.5 m	18.966
Q2	$x = 0.22$ $x = -2.22$	$\frac{3\sqrt{5}}{14}$	€2249.19	$2x - 3y - 31 = 0$	1.1 m	114	$\frac{5}{11}$	1.8 cm
Q3					39 unit <sup>2</sup>	$5^{-7}$	$x = 3$ $y = 5$	5,5,7,9
Q4					48%	$4 + \frac{5}{2}\pi$ or $4 + 2.5\pi$	$(x - 2)^2 - 6$	€4794.50

### Tiebreak 1

Q1. 8

Q2 4

Q3 36

Q4 €1735.73

### Tiebreak 2

Q1  $3.03 \times 10^7$

Q2 124.63 L

Q3  $x - 7$

Q4  $9(2^x)$