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SOLUTIONS  
WMO 2014 (7th world cup) Level 2

Section 1

$$\begin{aligned} 2.15 &= 2 \frac{15}{100} \\ &= 2 \frac{3}{20} \end{aligned}$$

$$\begin{aligned} 1) \quad 10 \frac{1}{20} + (3 - 0.85) \div \frac{5}{6} &= 10 \frac{1}{20} + 2.15 \div \frac{5}{6} \\ &= 10 \frac{1}{20} + 2 \frac{3}{20} \div \frac{5}{6} \\ &= 10 \frac{1}{20} + \frac{43}{20} \times \frac{6}{5} \\ &= 10 \frac{1}{20} + \frac{129}{50} \\ &= 10 \frac{1}{20} + 2 \frac{29}{50} \\ &= (10 + 2) + \left( \frac{5}{100} + \frac{58}{100} \right) \\ &= 12 \frac{63}{100} \\ &= \boxed{12.63} \end{aligned}$$

Answer: B

2) Change  $\frac{1}{4}$  and  $\frac{1}{16}$  to fractions with the same denominator.

$$\begin{array}{ccc} \frac{1}{4} & \overset{\text{middle}}{\circlearrowleft} \frac{2.5}{16} & \frac{1}{16} \\ \downarrow (\times 2) & \downarrow (\times 2) & \downarrow (\times 2) \\ \frac{8}{32} & \frac{5}{32} & \frac{2}{32} \end{array}$$

Answer: A

$$3) \quad \frac{30}{100} = \frac{x}{70}$$

Answer: A

$$\begin{aligned} \text{Solve for } x: \quad x &= 30 \times 70 \div 100 \\ &= 2100 \div 100 \\ &= \boxed{21} \end{aligned}$$

4) Answer: C

Since the circumferences are in a ratio of 9:10,  
the radii will also be in a ratio of 9:10.  
Compare the formulas for circumference + area:

$$C = \pi \times 2 \times r \quad (\text{or } \pi \times D)$$

$$A = \pi r^2$$

Notice that, when finding area, the radius is squared.  
So the ratio of the areas will also be squared:

$$9^2 : 10^2 = 81 : 100$$

5) **Answer: A**

Try some lengths that are divisible by 4:

| Length of ropes | A-75cm | # of B |
|-----------------|--------|--------|
| 100 cm          | 25 cm  | 25 cm  |
| 120 cm          | 45 cm  | 30 cm  |
| 160 cm          | 85 cm  | 40 cm  |
| 400 cm          | 325 cm | 100 cm |

Not possible  
but helpful  
for comparing

You can see that "A" will always be bigger if the rope is longer than 1 meter.

6) **Answer: C**

Probability =  $\frac{\text{\# of ways to get desired outcome}}{\text{Total \# of possibilities}}$

First possible solution:  $\frac{2}{4} \times \frac{1}{3} = \frac{2}{12} = \frac{1}{6}$

(Probability of the first ball being white.)

(Probability of the second ball being white. After the first white ball has been chosen, there are only 3 balls left, one of which is white.)

Second possible solution:

Determine the total number of possibilities:

1st ball      2nd ball

R

- G
- W<sub>1</sub>
- W<sub>2</sub>

G

- R
- W<sub>1</sub>
- W<sub>2</sub>

There are 2 ways to get 2 white balls.

W<sub>1</sub>

- R
- G
- W<sub>2</sub>

W<sub>2</sub>

- R
- G
- W<sub>1</sub>

There are a total of 12 possibilities (4x3).

So the probability of getting 2 white balls is

$$\frac{2}{12} = \frac{1}{6}$$



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7) **Answer: A**

To calculate 20% of \$60 :  $0.20 \times \$60 = \$12$

So the profitable transaction gained \$12 and the other lost \$12.

$$\$12 - \$12 = 0$$

They came out even.

8) **Answer: B**

Try with a distance that is divisible by 4 and 5: (100)

If the distance between A and B is 100km,  
- the speed of the car from A → B was 20 km/h  
(100 km ÷ 5 hours)

- the speed of the car from B → A was 25 km/h  
(100 km ÷ 4 hours)

So the return speed was increased by  $25 - 20 = 5$  km/h.

To determine this increase as a percentage, set it up as a fraction and multiply by 100:

$$\frac{\text{Increase}}{\text{original}} = \frac{5}{20} \times 100$$

$$= \frac{5}{20} \times \frac{100}{1}$$

$$= 25\%$$

9) **Answer: A** Because there are multiple choices, you can use the process of elimination.

The average height of the boys is less than the girls.

So the average height of the boys must be less than the class average. (A) is the only choice.

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10) Answer: B  $\left. \begin{array}{l} A = 2B \\ B = 2E \end{array} \right\} \rightarrow \text{so } A = 4E$   
 $C = 2D$

E B E 4 5 B A 8 A 10

A must be a large multiple of 4.

Try 16: ~~6+10~~ (eliminated after solving B below)  
or 7+9

E would have to be 4: 1+3

B would have to be 8: 2+6

$C = 2D$  and looking at the remaining numbers,  
you know C has 4+5 and D has 8+10.

## Section 2

1) Answer: Go to store B

Store A  $\rightarrow$  20% discount

Store B  $\rightarrow$  3 + 1 free

3 + 1 free

3 + 1 free

3 + 1 free

12 + 4 free  $\therefore \frac{4}{16}$  are free

To convert to a percentage, multiply the fraction by 100.

$$\frac{4}{16} = \frac{1}{4}, \quad \frac{1}{4} \times 100 = \frac{1}{4} \times \frac{100}{1} = 25 \\ = 25\%$$

So store B gives a discount of 25%.



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2) Answer: There are 5 555 555 households.

1 metric ton = 1000 kg

$$25,000 \text{ forests} \times 14 \text{ tons} = 350,000 \text{ tons}$$

$$350,000 \text{ tons} \times 1000 \text{ kg} = 350,000,000 \text{ kg}$$

↑ amount of CO<sub>2</sub>  
that can be reduced  
by 1 city.

$$3 \times 21 = 63 \text{ kg} \leftarrow \text{amount that can be reduced by each house}$$

$$\therefore 350,000,000 \div 63 = \# \text{ of houses in the city}$$

$$\begin{array}{r} 5555555(.5) \\ 63 \overline{) 350000000} \\ \underline{-315} \\ 350 \\ \underline{-315} \\ 350 \\ \text{etc.} \end{array}$$

3) Answer: Tickets to City D cost \$244 each.

abscissa means x axis  
ordinate means y axis

$$\begin{aligned} C+E &= 20+4 \\ &= 24 \text{ tickets total} \end{aligned}$$

$$\begin{aligned} \therefore A+B+D &= 100-24 \\ &= 76 \text{ tickets total} \end{aligned}$$

$$A:B:D = 1:15:22$$

(1+15+22=38)  
↑ when you add these up, you get a total of 38  
Since you know  $A+B+D=76$  (which happens to be  $38 \times 2$ )  
you can double all the numbers in the ratio  
to get the actual number of tickets.

$$\text{So, } A:B:D = 2:30:44$$

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(Section 2, Question 3 cont'd)

Total price of all tickets:  $100 \times 205 = 20500$

Total price of tickets to each city:

A:  $\$96 \times 2 = \$192$

B:  $\$154 \times 30 = \$4620$

C:  $\$192 \times 20 = \$3840$

D:

E:  $\$278 \times 4 = \$1112$

Total  $\$9764$

$$\begin{array}{r} \$20500 \\ - \$9764 \\ \hline \end{array}$$

$\$10736$  ← total for 44 tickets to D

$$\begin{array}{r} 44 \overline{) 10736} \\ \underline{-88} \phantom{00} \\ 193 \phantom{00} \\ \underline{-176} \phantom{00} \\ 176 \phantom{00} \\ \underline{-176} \\ 0 \end{array}$$

4) Answer: The radius is approximately 7 cm

This is our understanding of the question:

- "the radius of the outer rings is 10 cm" means that the radius of each circle from the centre to the outer line is 10 cm (here we'll call this 'big circle')
- "the entire area covered by the five rings is  $684.8 \text{ cm}^2$ " means the entire area covered by the five actual rings (not circles) as pictured
- "Can you calculate the radius of the inner rings?" is asking you to find the radius of the 'small circles' (from the centre point to the inner circle)

To solve: Imagine the rings are separated

$$684.8$$

$$+ 40 \text{ (overlapping areas)}$$

$$\hline 724.8 \text{ cm}$$

sum of the areas of the rings

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(Section 2, Question 4 cont'd)

$$5 \times \pi r^2 = 5 \times 3.14 \times 10^2$$

$$= 1570 \text{ cm}$$

sum of the areas of  
the big circles

$$\begin{array}{r} 500 \\ \times 3.14 \\ \hline 2000 \\ 500 \\ \hline 1500 \\ \hline 1570.00 \end{array}$$

$$\begin{array}{r} 1570.0 \\ - 724.8 \\ \hline \end{array}$$

845.2 ← sum of the areas of the small circles

169.04 ← the area of 1 small circle

$$5 \overline{) 845.2}$$

$$A = \pi r^2$$

$$169 \approx 3.14 \times r^2$$

$$169 \div 3.14 \approx r^2$$

$$53 \approx r^2$$

$$\boxed{7 \approx r}$$

$$\begin{array}{r} 53.8... \\ 3.14 \overline{) 169.00} \\ \underline{-1570} \\ 1200 \\ \underline{-942} \\ 2580 \end{array}$$

5) Answer: It takes 40 min. to fill the gauge in pic. 2

Picture 1

$$\text{Total water} : 10 \times 10 \times 30 = 3000 \text{ cm}^3$$

Picture 2

$$\begin{aligned} \text{Total water} : (30 \times 5 \times 10) + (10 \times 10 \times 5) &= 1500 + 500 \\ &= 2000 \text{ cm}^3 \end{aligned}$$

$\frac{\text{cm}^3}{\text{min.}}$

Picture 1    Picture 2

$$\frac{3000}{60} = \frac{2000}{x}$$

$$\begin{aligned} x &= 2000 \times 60 \div 3000 \\ &= \boxed{40 \text{ minutes}} \end{aligned}$$