

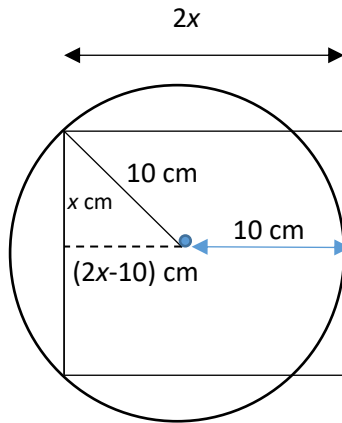
DOKA Paper T (for Year Level 9-10)

Sample Questions

(Part A - Basic Reasoning)

Find the perimeter of the square (in cm) given that the radius of the circle is 10 cm (see diagram).

Solution:



$$x^2 + (2x - 10)^2 = 10^2$$

$$x^2 + 4x^2 - 40x + 100 = 100$$

$$5x^2 - 40x = 0$$

$$5x(x - 8) = 0$$

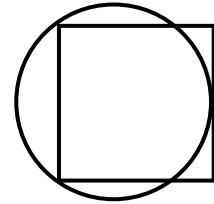
$$x = 0 \text{ (rejected), } x = 8$$

$$\text{Perimeter} = 4 \times 2x$$

$$= 8x$$

$$= 8(8)$$

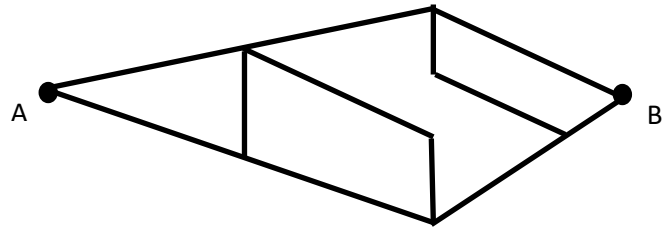
$$= \mathbf{64 \text{ cm}}$$



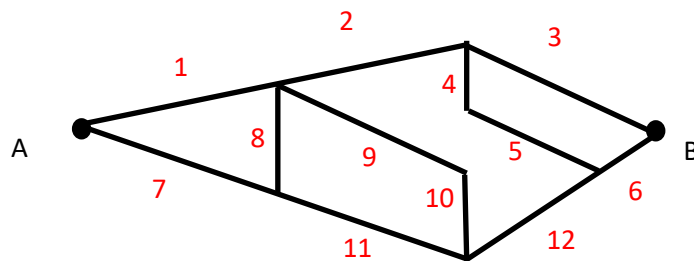
(Part B - Intermediate Reasoning: NVR)

How many different ways are there to go from A to B along the lines shown in the diagram? In each way, you cannot go over the same path twice.

- A. 15
- B. 16
- C. 17
- D. 18
- E. 19

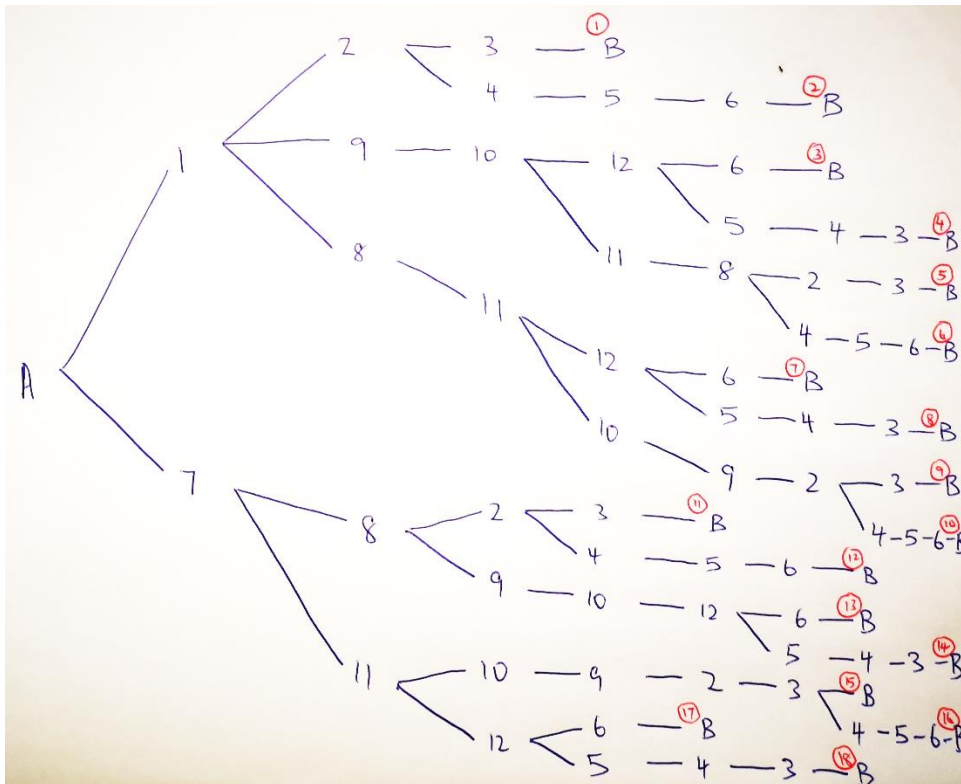


Solution:



Every path, give a name. Then we can see Road 1, Road 2 till Road 12 (see above).

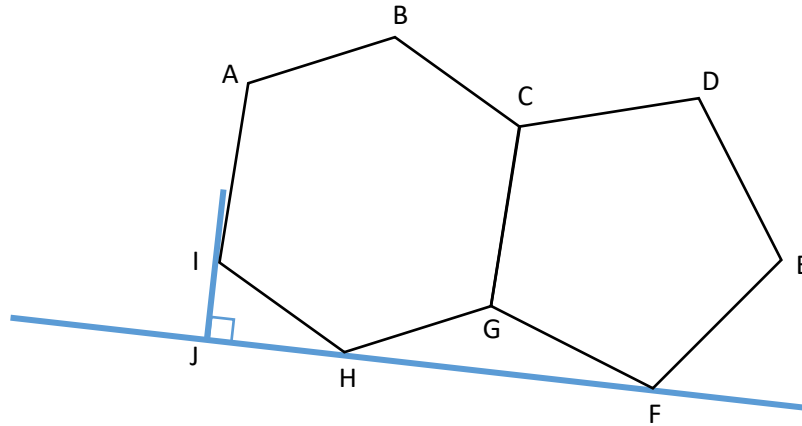
By using **Branching Method**, we will get the total of different ways, without missing any one or few ways.



Option **D**: 18 ways

(Part C - Advanced Reasoning)

2 pieces of wires with total length of 100 cm are bent into the shape below. ABCGHI is a regular hexagon and CDEFG is a regular pentagon. JHF is a straight line. Find the area of the right-angled triangle HIJ, correct to the nearest cm^2 . (Hint: $\cos 54^\circ = 0.5878$, $\sin 54^\circ = 0.8090$)



Solution:

$$AB = 100 \text{ cm} \div 10 = 10 \text{ cm}$$

$$\angle HGF = 360 - 120 - 108 = 132^\circ$$

$$\angle GHF = (180 - 132) \div 2 = 24^\circ$$

$$\angle JHI = 180 - 120 - 24 = 36^\circ$$

$$\angle JIH = 180 - 90 - 36 = 54^\circ$$

$$\begin{aligned} \text{Area of } \triangle JHI &= 0.5 \times IJ \times JH \\ &= 0.5 \times 10 \cos 54^\circ \times 10 \sin 54^\circ \\ &= 0.5 \times 10 \times 10 \times \cos 54^\circ \times \sin 54^\circ \\ &= (50 \times 0.8090) \times 0.5878 \\ &= 40.45 \times 0.5878 \\ &= 23.78 \text{ cm}^2 \\ &= \mathbf{24 \text{ cm}^2} \text{ (to the nearest cm}^2\text{)} \end{aligned}$$

(Part D - Extended Reasoning)

There is a square that is formed by 9 small squares. There are many different ways to colour any 3 of the small squares with green. Considering if one way is reflection or rotation of the other one, it is not counted as different. Therefore, how many different ways are there to do the colouring?

Solution:

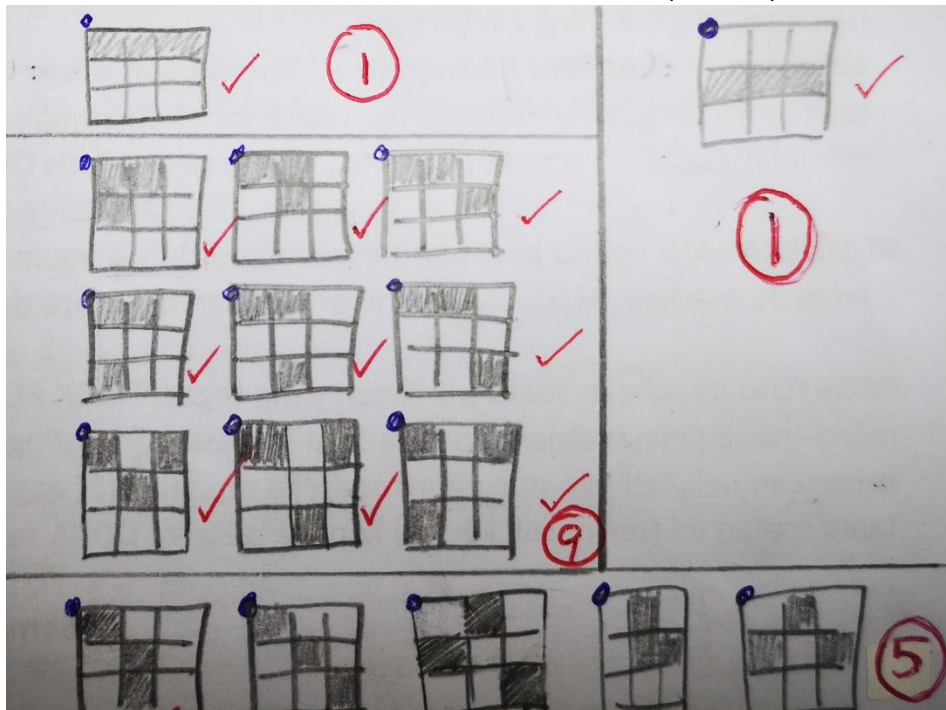
Draw few ways of colouring/ shading any 3 squares then compare. Agree that some ways are counted the same as they looked the same when one way is reflected or rotated.

There are many ways and more than half can be the same, need to find a good method to avoid repetition, that is **Staircase Method**. Randomly shade 3 boxes may end up final answer differs by few less or few more. Replace all boxes using numbers 1 to 9 before colouring/ shading any 3 boxes.

1	2	3
4	5	6
7	8	9

Don't shade 1-2-3
(or 7-8-9)

Shade 1-2-3



Shade either
1-2, 1-3 or *2-3

*2-3 is repetition
by reflection

Shade either 1, 2 or **3

**3 is repetition by reflection

1+9+5+1=16 ways