

Mathematical Reasoning

FOR SELECTIVE SCHOOL TESTS, OPPORTUNITY
CLASS TESTS AND PROBLEM SOLVING

BOOK 2

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Question 1

A perfect square number is obtained by multiplying a whole number by itself. A prime number is a number that can only be divided by 1 and itself.

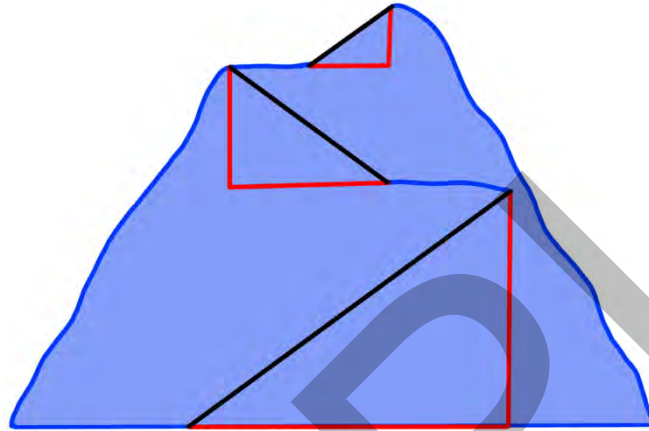
How many perfect square numbers between 10 and 150 have digits that add to a number that is a prime number?

- A none
- B one
- C two
- D three
- E More than three

SAMPLE

Question 2

Justyn wants to climb to the top of this hill. He walks along the slopes where possible instead of walking and then climbing (as shown by the red path). All triangles are right-angled. The smallest triangle has base 4 m and height 3 m. The other two triangles are in the same proportion as the smallest triangle, with base lengths of 12 m and 16 m respectively.

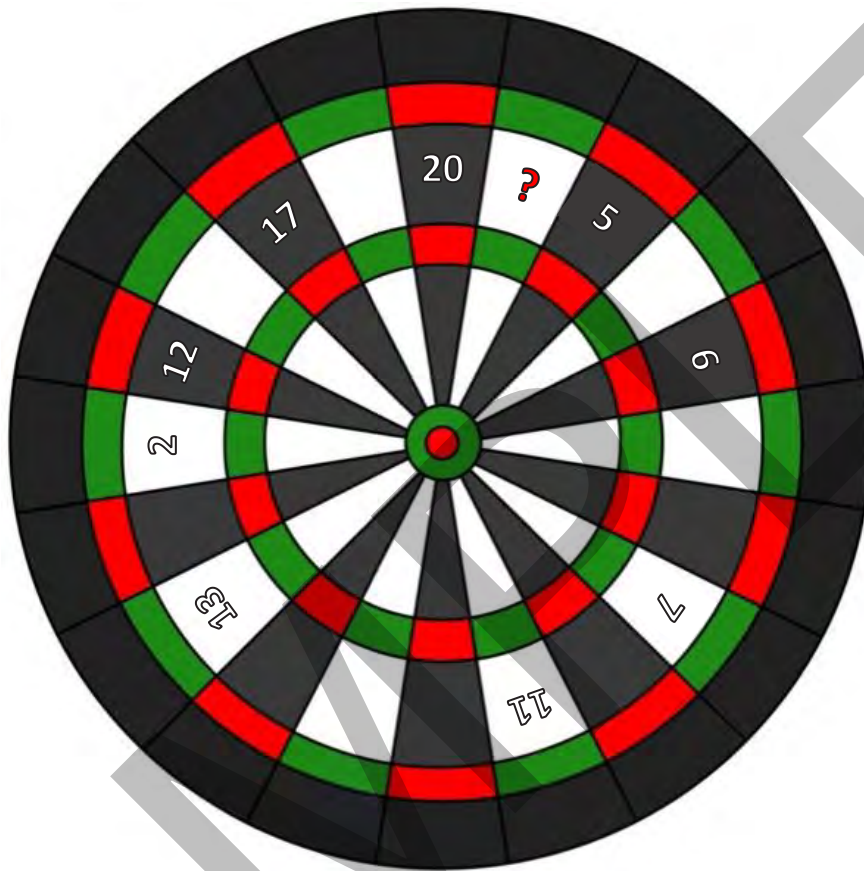


What is the difference in the length of path required to get to the top of the hill along black and blue paths against red and blue paths?

- A 52 m
- B 35 m
- C 28 m
- D 20 m
- E 16 m

Question 3

The dartboard shown below has the numbers 1–20 arranged so that each number and its opposite on the other side of the centre, add to the same number.



What is the number that should replace ? in the sector denoted?

- A 18
- B 16
- C 10
- D 14
- E 8

Fully worked solutions

Question 1

D

The perfect squares are: 16, 25, 36, 49, 64, 81, 100, 121, 144.

Their digits add as follows:

16 → 7 (Prime number)
 25 → 7 (Prime number)
 36 → 9
 49 → 13 (Prime number)
 64 → 10
 81 → 9
 100 → 1
 121 → 4
 144 → 9

Hence the answer is 3, shown in D.

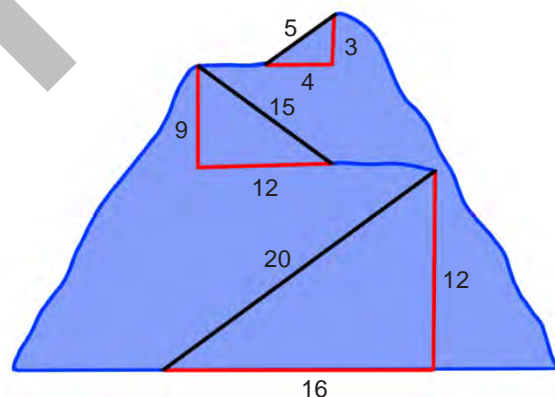
Question 2

E

Small triangle has a base of 4 and a height of 2.

Medium triangle has a base of 12 and a height of 9.

Large triangle has a base of 16 and a height of 12.



The length of the blue path doesn't need to be known to answer this question.

Total of red and blue paths: $16 + 12 + 12 + 9 + 4 + 3 + \text{blue path} = 56 \text{ m} + \text{blue path}$.

Small triangle hypotenuse (black path): 5 m (Pythagorean Triad: 3, 4 and 5).

Medium triangle hypotenuse (black path): 15 m (Pythagorean Triad: 9, 12 and 15).

Large triangle hypotenuse (black path): 20 m (Pythagorean Triad: 12, 16 and 20).

Total of black and blue paths: $20 + 15 + 5 + \text{blue path} = 40 \text{ m} + \text{blue path}$.

Difference between black and blue paths against red and blue paths:

$$= (56 \text{ m} + \text{blue path}) - (40 \text{ m} + \text{blue path}) = 56 - 40 = 16 \text{ m}$$

red and blue paths black and blue paths