## **Worked Solutions for ENGAA Papers by Topic**

# Section 1

## **Topic: Ratio & Proportional**

Section 1 Topic	Number of Questions 2016 - 2020
Algebra	34
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Energy	8
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Forces and equilibrium	
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#### **ENGAA Specimen S1 - Question 9**

Two variables are connected by the relation:  $P \propto \frac{1}{Q^2}$ 9

Q is increased by 40%.

To the nearest percent, describe the change in P in percentage terms.

- A 29% decrease
- 44% decrease в
- C 49% decrease
- D 51% decrease
- E 80% decrease
- F 96% decrease



Answer is C

#### **ENGAA Specimen S1 - Question 11**

11 Three variables x, y and z are known to be related to each other in the following ways:

> x is directly proportional to the square of z. y is inversely proportional to the cube of z.

Which of the following correctly describes the relationship between x and y?

- The square of x is directly proportional to the cube of y. Α
- **B** The square of x is inversely proportional to the cube of y.
- **C** The cube of x is directly proportional to the square of y.
- **D** The cube of x is inversely proportional to the square of y.
- **E** x is directly proportional to  $y^6$ .

### ENGAA Specimen S1 - Question 11 - Worked Solution

 $x \propto z^2$ ,  $y \propto \frac{1}{z^3}$  which can be rewritten as  $x = kz^2$ ,  $y = \frac{c}{z^3}$ cubing the 1st equation:  $x^3 = k^3 z^6$ , squaring the second equation:  $y^2 = \frac{c^2}{z^6}$ aring the ceach other  $g_1$  $x^3 \propto \frac{1}{y^2}$ multiplying these two equations with each other gives  $x^3y^2 = k^3c^2 = constant$ 

Answer is D

9



#### ENGAA S1 2018 - Question 9 - Worked Solution

If the ratio of the lengths (height and radius) is 4:5, then ratio of volumes is  $4^3:5^3 = 64:125$ As volume scales as length<sup>3</sup>

$$\frac{V_R}{V_L} = \frac{64}{125}$$
$$V_L = \frac{125}{64} \times 320$$
$$= 625 cm^3$$

Answer is E.

#### ENGAA S1 2018 - Question 13

13 A scale model of a cylindrical pillar is to be made.

The full-sized pillar has a volume of  $12\pi m^3$ .

The model will use a length scale of 1:40

The model is to be a solid cylinder made of a plastic which has a density of  $\frac{4}{3}$  g cm<sup>-3</sup>. What is the mass of the model in grams?





Ratio of lengths = 1:40  
Ratio of volumes = 1:40<sup>3</sup> as  

$$\frac{V_m}{V_f} = \frac{1}{40^3}$$
  
 $V_m = \frac{12\pi}{40^3} m^3$   
= 1.875 × 10<sup>-4</sup>  $\pi m^3$   
= 1.875 × 10<sup>-4</sup> × 100<sup>3</sup>  $\pi cm^3$   
 $= \frac{375}{2} \pi cm^3$   
 $m = \rho v$   
 $= \frac{375}{2} \pi \times \frac{4}{3}$   
= 250  $\pi q$ 

Answer is E.

#### ENGAA S1 2018 - Question 17

17 The original price of an item is p

The price is increased by 125%

The increased price is then **decreased by** 40% to q

The relationship between *p* and *q* can be expressed as mp = q

What is the value of m?



(1) New price = 
$$(1 + 1.25)p = 2.25p$$
  
(2)  $q = 2.25p \times (1 - 0.4)$   
 $= 2.25p \times 0.6$   
 $= 1.35p$   
 $m = 1.35$   
 $= \frac{135}{100}$   
 $= \frac{27}{20}$ 

Answer is C.

#### ENGAA S1 2016 - Question 5

5 The ratio of Q:R is 5:2 and the ratio of R:S is 3:10

Which one of the following gives the ratio Q:S in its simplest form?

- A 1:2
- **B** 2:1
- **C** 3:4
- D 3:25
- E 4:3
- F 25:3

### ENGAA S1 2016 - Question 5 - Worked Solution



Answer is C

#### ENGAA S1 2016 - Question 23

23 During summer activities week 120 students each chose one activity from swimming, archery, and tennis.

46 of the students were girls.

36 of the students chose tennis, and  $\frac{2}{3}$  of these were boys; 25 girls chose swimming, and 27 students chose archery.

A boy is picked at random. What is the probability that he chose swimming?



Answer is D