

UKMT Percentage Questions
(Answers follow after all the questions)

2006...

1. The promotion 'AMAZING! 20% OFF ALL OUR BEDFRAMES' appears on the cover of the 2006 brochure of a well-known furniture company. If 20% were to be taken off the length of a bedframe originally 2.10 m long, what would be the resulting length of the bedframe?
- A 2.00 m B 1.90 m C 1.89 m D 1.78 m E 1.68 m
8. Matt black paint absorbs 97% of light, the remainder being reflected. Scientists have developed a new superblack coating, "10 times blacker" than matt black paint, meaning that it reflects $\frac{1}{10}$ of the light reflected by matt black paint. What percentage of light does the new coating absorb?
- A 9.7 B 90.3 C 99.7 D 99.9 E 970

2007...

9. In a sale, a shopkeeper reduced the advertised selling price of a dress by 20%. This resulted in a profit of 4% over the cost price of the dress. What percentage profit would the shopkeeper have made if the dress had been sold at the original selling price?
- A 16% B 20% C 24% D 25% E 30%

2008...

5. 200 T-shirts have been bought for a Fun Run at a cost of £400 plus VAT at $17\frac{1}{2}\%$. The cost of entry for the run is £5 per person. What is the minimum number of entries needed in order to cover the total cost of the T-shirts?
- A 40 B 47 C 80 D 84 E 94

2009...

1. What is 20% of 30%?
- A 6% B 10% C 15% D 50% E 60%
8. The entries to the Senior Mathematical Challenge grew from 87400 in 2007 to 92690 in 2008. Approximately what percentage increase does this represent?
- A 4% B 5% C 6% D 7% E 8%

2011...

17. Jamie conducted a survey on the food preferences of pupils at a school and discovered that 70% of the pupils like pears, 75% like oranges, 80% like bananas and 85% like apples. What is the smallest possible percentage of pupils who like all four of these fruits?
- A at least 10% B at least 15% C at least 20%
D at least 25% E at least 70%

2012...

15. Professor Rosseforp runs to work every day. On Thursday he ran 10% faster than his usual average speed. As a result, his journey time was reduced by x minutes. How many minutes did the journey take on Wednesday?
- A $11x$ B $10x$ C $9x$ D $8x$ E $5x$

2013...

9. According to a headline, 'Glaciers in the French Alps have lost a quarter of their area in the past 40 years'. What is the approximate percentage reduction in the length of the side of a square when it loses one quarter of its area, thereby becoming a smaller square?
- A 13% B 25% C 38% D 50% E 65%

2015...

3. When Louise had her first car, 50 litres of petrol cost £40. When she filled up the other day, she noticed that 40 litres of petrol cost £50. By approximately what percentage has the cost of petrol increased over this time?
- A 50% B 56% C 67% D 75% E 80%

2016...

2. On a Monday, all prices in Isla's shop are 10% more than normal. On Friday all prices in Isla's shop are 10% less than normal. James bought a book on Monday for £5.50. What would be the price of another copy of this book on Friday?
- A £5.50 B £5.00 C £4.95 D £4.50 E £4.40

UKMT Percentage Answers

2006...

1. E The resulting length of the bedframe would be 80% of 2.10 m, that is 1.68 m.
8. C Matt black paint reflects 3% of light, so the superblack paint reflects only 0.3% of light. Hence it absorbs 99.7% of light.

2007...

9. E Let the original cost price and original selling price of the dress be C and S respectively. Then $0.8 \times S = 1.04 \times C$. So $S = \frac{1.04}{0.8} \times C = 1.3 \times C$.
Therefore the shopkeeper would have made a profit of 30% by selling the dress at its original price.

2008...

5. E Since 1% of £400 = £4, the total VAT charged was £4 × 17.5 = £70, giving a total cost of £400 + £70 = £470. Therefore the minimum number of entries needed is 94.

2009...

1. A 20% of 30% = $0.2 \times 0.3 = 0.06 = 6\%$.
8. C The increase in entries from 2007 to 2008 is $92\,690 - 87\,400 = 5290$.
Hence the percentage increase is $\frac{5290}{87400} \times 100\% = \frac{5290}{874}\% \approx \frac{5400}{900}\% = 6\%$.
(The exact value is $6\frac{1}{19}$.)

2011...

17. A Let a, b, o and p represent the percentage of pupils liking apples, bananas, oranges and pears respectively.
As $a = 85$, there are 15% of pupils who do not like apples. As $b = 80$, $a \cap b$ is greater than or equal to $80 - (100 - 85) = 65$. As $o = 75$, $a \cap b \cap o$ is greater than or equal to $75 - (100 - 65) = 40$. Finally, as $p = 70$, $a \cap b \cap o \cap p$ is greater than or equal to $70 - (100 - 40) = 10$.
Hence the percentage of pupils who like all four fruits is at least 10%.

2012...

15. A Let Professor Rosseforp's usual journey take t minutes at an average speed of v metres/minute. Then the distance to work is vt metres. On Thursday his speed increased by 10%, i.e. it was $11v/10$ metres/minute. The time taken was $(t - x)$ minutes.
Therefore $11v/10 \times (t - x) = vt$. So $11(t - x) = 10t$, i.e. $t = 11x$.

2013...

9. A When a square loses a quarter of its area, thereby becoming a smaller square, three quarters of its area remains. Therefore the lengths of the sides of the original square have been multiplied by $\sqrt{\frac{3}{4}} = \frac{1}{2}\sqrt{3} \approx 0.866$. This means a reduction of $(100 - 86.6)\%$ which is approximately 13%.

2015...

3. B When 50 litres of petrol cost £40, 1 litre cost $\frac{£40}{50}$ which is 80 pence. More recently, 1 litre cost $\frac{£50}{40} = 125$ pence. The percentage increase is then $\frac{\text{actual increase}}{\text{original price}} \times 100$ which is $\frac{45}{80} \times 100 = \frac{450}{8} = 56.25$. So the approximate increase is 56%.

2016...

2. D James bought a book for £5.50, so the normal price would be £5. On Friday, another copy of this book would therefore cost £4.50.