

Inequalities: Starters

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Questions and short answers

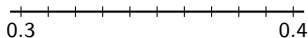
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Worked solutions

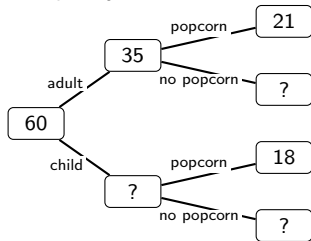
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Starter 1: Inequality Symbols

Number line A



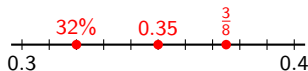
Frequency tree



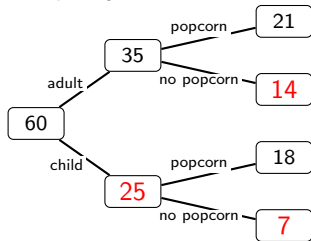
1. Write $\frac{3}{8}$ as a decimal and as a percentage.
2. Write 32 000 in standard form.
3. Mark 32%, 0.35 and $\frac{3}{8}$ on number line A. Write them in order, using $<$.
4. Write $<$ or $>$.
 3.2×10^4 $\underline{\hspace{1cm}}$ 9.8×10^3
 6×10^{-3} $\underline{\hspace{1cm}}$ 2×10^{-2}
5. 60 people watched a film. Complete the frequency tree.
6. An adult is chosen at random. Find the probability that they bought popcorn, as a percentage. Do the same for a child. Write $<$ or $>$ between them.
7. $x > 0.3$ means "x is greater than 0.3". Which of these could x be?
 $\frac{2}{5}$ 0.29 3×10^{-1} 31% $\frac{1}{4}$
8. (Challenge) $0.2 > 0.15$. Is $-0.2 > -0.15$? Explain using a number line.

Starter 1: Inequality Symbols

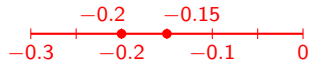
Number line A



Frequency tree



Q8



- Write $\frac{3}{8}$ as a decimal and as a percentage.
 $0.375 = 37.5\%$
- Write 32 000 in standard form.
 3.2×10^4
- Mark 32%, 0.35 and $\frac{3}{8}$ on number line A. Write them in order, using $<$.
 $32\% < 0.35 < \frac{3}{8}$
- Write $<$ or $>$.
 $3.2 \times 10^4 > 9.8 \times 10^3$
 $6 \times 10^{-3} < 2 \times 10^{-2}$
- 60 people watched a film. Complete the frequency tree.
- An adult is chosen at random. Find the probability that they bought popcorn, as a percentage. Do the same for a child. Write $<$ or $>$ between them.
 $\frac{21}{35} = 60\%$ and $\frac{18}{25} = 72\%$, so $60\% < 72\%$
- $x > 0.3$ means "x is greater than 0.3". Which of these could x be?
 $\frac{2}{5}$ 0.29 3×10^{-1} 31% $\frac{1}{4}$
 $\frac{2}{5}$ and 31%, but not $3 \times 10^{-1} = 0.3$
- (Challenge) $0.2 > 0.15$. Is $-0.2 > -0.15$? Explain using a number line. No: $-0.2 < -0.15$

Worked Solution: Starter 1, Question 1

Question: Write $\frac{3}{8}$ as a decimal and as a percentage.

Worked Solution: Starter 1, Question 1

Question: Write $\frac{3}{8}$ as a decimal and as a percentage.

Solution: $\frac{3}{8} = 3 \div 8 = 0.375$. To get a percentage, multiply by 100:
 $0.375 \times 100 = 37.5\%$. So $\frac{3}{8} = 0.375 = 37.5\%$.

Worked Solution: Starter 1, Question 2

Question: Write 32 000 in standard form.

Worked Solution: Starter 1, Question 2

Question: Write 32 000 in standard form.

Solution: Standard form is $A \times 10^n$ with $1 \leq A < 10$. Write
 $32\,000 = 3.2 \times 10\,000 = 3.2 \times 10^4$.

Worked Solution: Starter 1, Question 3

Question: Mark 32%, 0.35 and $\frac{3}{8}$ on number line A. Write them in order, using $<$.

Worked Solution: Starter 1, Question 3

Question: Mark 32%, 0.35 and $\frac{3}{8}$ on number line A. Write them in order, using $<$.

Solution: Convert to decimals: $32\% = 0.32$, $0.35 = 0.35$, $\frac{3}{8} = 0.375$. On the number line from 0.3 to 0.4, 0.32 is 2 hundredths along, 0.35 is 5 hundredths along, and 0.375 is 7.5 hundredths along. So the order is $32\% < 0.35 < \frac{3}{8}$.

Worked Solution: Starter 1, Question 4

Question: Write $<$ or $>$ between 3.2×10^4 and 9.8×10^3 , and between 6×10^{-3} and 2×10^{-2} .

Worked Solution: Starter 1, Question 4

Question: Write $<$ or $>$ between 3.2×10^4 and 9.8×10^3 , and between 6×10^{-3} and 2×10^{-2} .

Solution: $3.2 \times 10^4 = 32\,000$ and $9.8 \times 10^3 = 9\,800$, so $3.2 \times 10^4 > 9.8 \times 10^3$. For the second, $6 \times 10^{-3} = 0.006$ and $2 \times 10^{-2} = 0.02$, so $6 \times 10^{-3} < 2 \times 10^{-2}$.

Worked Solution: Starter 1, Question 5

Question: 60 people watched a film. Complete the frequency tree.

Worked Solution: Starter 1, Question 5

Question: 60 people watched a film. Complete the frequency tree.

Solution: The total is 60. The adult branch is 35, so the child branch is $60 - 35 = 25$. For adults, 21 bought popcorn, so $35 - 21 = 14$ did not. For children, 18 bought popcorn, so $25 - 18 = 7$ did not. Thus the missing values are: child 25, adult no popcorn 14, child no popcorn 7.

Worked Solution: Starter 1, Question 6

Question: An adult is chosen at random. Find the probability that they bought popcorn, as a percentage. Do the same for a child. Write $<$ or $>$ between them.

Worked Solution: Starter 1, Question 6

Question: An adult is chosen at random. Find the probability that they bought popcorn, as a percentage. Do the same for a child. Write $<$ or $>$ between them.

Solution: For adults: $P(\text{popcorn}) = \frac{21}{35} = 0.6 = 60\%$. For children:
 $P(\text{popcorn}) = \frac{18}{25} = 0.72 = 72\%$. Since $60\% < 72\%$, the adult probability is less than the child probability.

Worked Solution: Starter 1, Question 7

Question: $x > 0.3$ means “ x is greater than 0.3”. Which of these could x be? $\frac{2}{5}$, 0.29, 3×10^{-1} , 31%, $\frac{1}{4}$.

Worked Solution: Starter 1, Question 7

Question: $x > 0.3$ means “ x is greater than 0.3”. Which of these could x be? $\frac{2}{5}$, 0.29, 3×10^{-1} , 31%, $\frac{1}{4}$.

Solution: Convert each to a decimal. $\frac{2}{5} = 0.4$, $0.29 = 0.29$, $3 \times 10^{-1} = 0.3$, $31\% = 0.31$, $\frac{1}{4} = 0.25$. We need $x > 0.3$, so x must be strictly more than 0.3. The valid values are $\frac{2}{5} = 0.4$ and $31\% = 0.31$. $3 \times 10^{-1} = 0.3$ is not valid because it is equal to 0.3, not greater.

Worked Solution: Starter 1, Question 8

Question: (Challenge) $0.2 > 0.15$. Is $-0.2 > -0.15$? Explain using a number line.

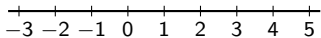
Worked Solution: Starter 1, Question 8

Question: (Challenge) $0.2 > 0.15$. Is $-0.2 > -0.15$? Explain using a number line.

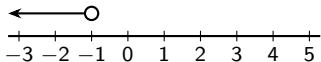
Solution: No. On a number line, negative numbers are to the left of 0. The point -0.2 is further left than -0.15 , so $-0.2 < -0.15$. The order reverses when taking negatives: from $0.2 > 0.15$, we get $-0.2 < -0.15$.

Starter 2: Inequalities on a Number Line

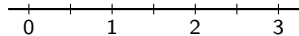
Number line A



Number line B



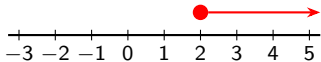
Number line C



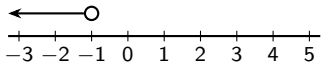
1. Write 0.45 as a fraction and as a percentage.
2. Write 6.1×10^{-3} as an ordinary number.
3. Draw $x \geq 2$ on number line A. Can x be equal to 2?
4. Write the inequality on number line B, and two integers that satisfy it.
5. Draw $y > \frac{3}{2}$ on number line C. Does $y = 150\%$ satisfy it?
6. Which of these satisfy $n > 4 \times 10^3$?
4000 3.9×10^4 0.5×10^4 4.01×10^3
7. A match ends in a win, a draw or a loss.
 $P(\text{win}) = 0.35$ and $P(\text{draw}) = \frac{1}{5}$. Find $P(\text{loss})$ as a percentage. Write $<$ or $>$ between $P(\text{win})$ and $P(\text{loss})$.
8. (Challenge) x is an integer, $x > -3$ and $x \leq 2$. List the values x can take.

Starter 2: Inequalities on a Number Line

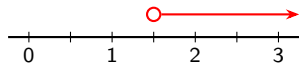
Number line A



Number line B



Number line C



- Write 0.45 as a fraction and as a percentage.
 $\frac{9}{20} = 45\%$
- Write 6.1×10^{-3} as an ordinary number.
0.0061
- Draw $x \geq 2$ on number line A. Can x be equal to 2? **Yes: $\geq$ includes 2, so the circle is filled.**
- Write the inequality on number line B, and two integers that satisfy it. **$x < -1$; for example -2 and -3**
- Draw $y > \frac{3}{2}$ on number line C. Does $y = 150\%$ satisfy it? **No: $150\% = \frac{3}{2}$, not more than $\frac{3}{2}$.**
- Which of these satisfy $n > 4 \times 10^3$?
4000 3.9×10^4 0.5×10^4 4.01×10^3
All except 4000, which equals 4×10^3
- A match ends in a win, a draw or a loss.
 $P(\text{win}) = 0.35$ and $P(\text{draw}) = \frac{1}{5}$. Find $P(\text{loss})$ as a percentage. Write $<$ or $>$ between $P(\text{win})$ and $P(\text{loss})$. **45%, so $P(\text{win}) < P(\text{loss})$**
- (Challenge) x is an integer, $x > -3$ and $x \leq 2$. List the values x can take. **-2, -1, 0, 1, 2**

Worked Solution: Starter 2, Question 1

Question: Write 0.45 as a fraction and as a percentage.

Worked Solution: Starter 2, Question 1

Question: Write 0.45 as a fraction and as a percentage.

Solution: $0.45 = \frac{45}{100} = \frac{9}{20}$. Multiply by 100: $0.45 \times 100 = 45\%$. So $0.45 = \frac{9}{20} = 45\%$.

Worked Solution: Starter 2, Question 2

Question: Write 6.1×10^{-3} as an ordinary number.

Worked Solution: Starter 2, Question 2

Question: Write 6.1×10^{-3} as an ordinary number.

Solution: 10^{-3} means divide by 1000, so $6.1 \times 10^{-3} = 6.1 \div 1000 = 0.0061$.

Worked Solution: Starter 2, Question 3

Question: Draw $x \geq 2$ on number line A. Can x be equal to 2?

Worked Solution: Starter 2, Question 3

Question: Draw $x \geq 2$ on number line A. Can x be equal to 2?

Solution: The inequality $x \geq 2$ means x is 2 or greater. On number line A, place a filled circle at 2 and draw an arrow to the right. Yes, x can equal 2, because the $\geq$ sign includes equality.

Worked Solution: Starter 2, Question 4

Question: Write the inequality on number line B, and two integers that satisfy it.

Worked Solution: Starter 2, Question 4

Question: Write the inequality on number line B, and two integers that satisfy it.

Solution: Number line B has an open circle at -1 and an arrow pointing left. The open circle means -1 is not included, so the inequality is $x < -1$. Two integers that satisfy it are -2 and -3 (any integer less than -1 works).

Worked Solution: Starter 2, Question 5

Question: Draw $y > \frac{3}{2}$ on number line C. Does $y = 150\%$ satisfy it?

Worked Solution: Starter 2, Question 5

Question: Draw $y > \frac{3}{2}$ on number line C. Does $y = 150\%$ satisfy it?

Solution: $\frac{3}{2} = 1.5$. On number line C, draw an open circle at 1.5 and an arrow to the right. $150\% = 1.5$, which equals $\frac{3}{2}$, but the inequality is $y > \frac{3}{2}$, so y must be strictly greater. Therefore $y = 150\%$ does not satisfy it.

Worked Solution: Starter 2, Question 6

Question: Which of these satisfy $n > 4 \times 10^3$? 4000 , 3.9×10^4 , 0.5×10^4 , 4.01×10^3 .

Worked Solution: Starter 2, Question 6

Question: Which of these satisfy $n > 4 \times 10^3$? 4000 , 3.9×10^4 , 0.5×10^4 , 4.01×10^3 .

Solution: $4 \times 10^3 = 4000$. Compare each: 4000 is equal to 4000 , so it does not satisfy $n > 4000$. $3.9 \times 10^4 = 39\,000 > 4000$, so yes. $0.5 \times 10^4 = 5000 > 4000$, so yes. $4.01 \times 10^3 = 4010 > 4000$, so yes. Therefore all except 4000 satisfy the inequality.

Worked Solution: Starter 2, Question 7

Question: A match ends in a win, a draw or a loss. $P(\text{win}) = 0.35$ and $P(\text{draw}) = \frac{1}{5}$. Find $P(\text{loss})$ as a percentage. Write $<$ or $>$ between $P(\text{win})$ and $P(\text{loss})$.

Worked Solution: Starter 2, Question 7

Question: A match ends in a win, a draw or a loss. $P(\text{win}) = 0.35$ and $P(\text{draw}) = \frac{1}{5}$. Find $P(\text{loss})$ as a percentage. Write $<$ or $>$ between $P(\text{win})$ and $P(\text{loss})$.

Solution: Convert $P(\text{draw}) = \frac{1}{5} = 0.2$. The probabilities sum to 1, so $P(\text{loss}) = 1 - 0.35 - 0.2 = 0.45 = 45\%$. Compare $P(\text{win}) = 35\%$ and $P(\text{loss}) = 45\%$, so $P(\text{win}) < P(\text{loss})$.

Worked Solution: Starter 2, Question 8

Question: (Challenge) x is an integer, $x > -3$ and $x \leq 2$. List the values x can take.

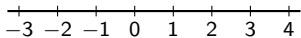
Worked Solution: Starter 2, Question 8

Question: (Challenge) x is an integer, $x > -3$ and $x \leq 2$. List the values x can take.

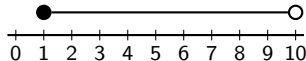
Solution: The inequality $x > -3$ means x is greater than -3 , so -3 is not included. The inequality $x \leq 2$ means x is less than or equal to 2 , so 2 is included. The integers satisfying both are -2 , -1 , 0 , 1 , 2 .

Starter 3: Double Inequalities

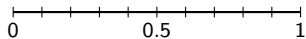
Number line A



Number line B



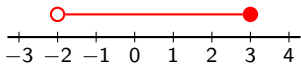
Number line C



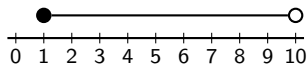
1. Write $\frac{7}{20}$ as a decimal and as a percentage.
2. Work out $(3 \times 10^4) \times (2 \times 10^3)$.
3. Draw $-2 < x \leq 3$ on number line A. List the integers that satisfy it.
4. Standard form is $A \times 10^n$. Number line B shows the values A can take. Write them as a double inequality.
5. Which of these are in standard form?
 0.8×10^3 10×10^2 1×10^5 9.9×10^{-4}
6. Write $\frac{1}{4} < x < 40\%$ using decimals. Does $x = \frac{1}{3}$ satisfy it?
7. Every probability p satisfies $0 \leq p \leq 1$. The probability of rain tomorrow is more than 60%. Show the values p can take on number line C, and write them as a double inequality.
8. (Challenge) $0.6 < P(\text{rain}) \leq 1$. Write a double inequality for $P(\text{no rain})$.

Starter 3: Double Inequalities

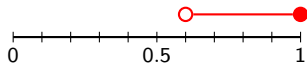
Number line A



Number line B



Number line C



1. Write $\frac{7}{20}$ as a decimal and as a percentage.
 $0.35 = 35\%$
2. Work out $(3 \times 10^4) \times (2 \times 10^3)$.
 6×10^7
3. Draw $-2 < x \leq 3$ on number line A. List the integers that satisfy it. $-1, 0, 1, 2, 3$
4. Standard form is $A \times 10^n$. Number line B shows the values A can take. Write them as a double inequality. $1 \leq A < 10$
5. Which of these are in standard form?
 0.8×10^3 10×10^2 1×10^5 9.9×10^{-4}
 1×10^5 and 9.9×10^{-4} . 0.8 is less than 1, and 10 is not less than 10.
6. Write $\frac{1}{4} < x < 40\%$ using decimals. Does $x = \frac{1}{3}$ satisfy it? $0.25 < x < 0.4$; yes, $\frac{1}{3} = 0.\dot{3}$
7. Every probability p satisfies $0 \leq p \leq 1$. The probability of rain tomorrow is more than 60%. Show the values p can take on number line C, and write them as a double inequality. $0.6 < p \leq 1$
8. (Challenge) $0.6 < P(\text{rain}) \leq 1$. Write a double inequality for $P(\text{no rain})$. $0 \leq P(\text{no rain}) < 0.4$

Worked Solution: Starter 3, Question 1

Question: Write $\frac{7}{20}$ as a decimal and as a percentage.

Worked Solution: Starter 3, Question 1

Question: Write $\frac{7}{20}$ as a decimal and as a percentage.

Solution: $\frac{7}{20} = \frac{7 \times 5}{20 \times 5} = \frac{35}{100} = 0.35$. As a percentage, $0.35 \times 100 = 35\%$. So $\frac{7}{20} = 0.35 = 35\%$.

Worked Solution: Starter 3, Question 2

Question: Work out $(3 \times 10^4) \times (2 \times 10^3)$.

Worked Solution: Starter 3, Question 2

Question: Work out $(3 \times 10^4) \times (2 \times 10^3)$.

Solution: Multiply the numbers and the powers of 10 separately: $3 \times 2 = 6$ and $10^4 \times 10^3 = 10^{4+3} = 10^7$. So the product is 6×10^7 .

Worked Solution: Starter 3, Question 3

Question: Draw $-2 < x \leq 3$ on number line A. List the integers that satisfy it.

Worked Solution: Starter 3, Question 3

Question: Draw $-2 < x \leq 3$ on number line A. List the integers that satisfy it.

Solution: The inequality $-2 < x \leq 3$ means x is greater than -2 but less than or equal to 3 . On number line A, use an open circle at -2 and a filled circle at 3 , and join them. The integers are $-1, 0, 1, 2, 3$.

Worked Solution: Starter 3, Question 4

Question: Standard form is $A \times 10^n$. Number line B shows the values A can take. Write them as a double inequality.

Worked Solution: Starter 3, Question 4

Question: Standard form is $A \times 10^n$. Number line B shows the values A can take. Write them as a double inequality.

Solution: Number line B runs from a filled circle at 1 to an open circle at 10. This means A is at least 1 but strictly less than 10, so the double inequality is $1 \leq A < 10$.

Worked Solution: Starter 3, Question 5

Question: Which of these are in standard form? 0.8×10^3 , 10×10^2 , 1×10^5 , 9.9×10^{-4} .

Worked Solution: Starter 3, Question 5

Question: Which of these are in standard form? 0.8×10^3 , 10×10^2 , 1×10^5 , 9.9×10^{-4} .

Solution: Standard form requires A to satisfy $1 \leq A < 10$. 0.8×10^3 is not standard form because $0.8 < 1$. 10×10^2 is not standard form because 10 is not less than 10. 1×10^5 is standard form. 9.9×10^{-4} is standard form. So the valid ones are 1×10^5 and 9.9×10^{-4} .

Worked Solution: Starter 3, Question 6

Question: Write $\frac{1}{4} < x < 40\%$ using decimals. Does $x = \frac{1}{3}$ satisfy it?

Worked Solution: Starter 3, Question 6

Question: Write $\frac{1}{4} < x < 40\%$ using decimals. Does $x = \frac{1}{3}$ satisfy it?

Solution: $\frac{1}{4} = 0.25$ and $40\% = 0.4$, so the inequality becomes $0.25 < x < 0.4$. Now $\frac{1}{3} = 0.\overline{3} \approx 0.333$, which lies between 0.25 and 0.4. Yes, $x = \frac{1}{3}$ satisfies it.

Worked Solution: Starter 3, Question 7

Question: Every probability p satisfies $0 \leq p \leq 1$. The probability of rain tomorrow is more than 60%. Show the values p can take on number line C, and write them as a double inequality.

Worked Solution: Starter 3, Question 7

Question: Every probability p satisfies $0 \leq p \leq 1$. The probability of rain tomorrow is more than 60%. Show the values p can take on number line C, and write them as a double inequality.

Solution: $60\% = 0.6$. The probability is more than 0.6, so $p > 0.6$, and it is still a probability, so $p \leq 1$. On number line C, put an open circle at 0.6, a filled circle at 1, and join them. The double inequality is $0.6 < p \leq 1$.

Worked Solution: Starter 3, Question 8

Question: (Challenge) $0.6 < P(\text{rain}) \leq 1$. Write a double inequality for $P(\text{no rain})$.

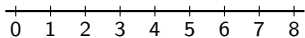
Worked Solution: Starter 3, Question 8

Question: (Challenge) $0.6 < P(\text{rain}) \leq 1$. Write a double inequality for $P(\text{no rain})$.

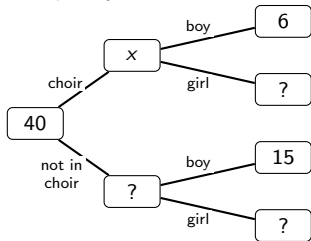
Solution: Since $P(\text{no rain}) = 1 - P(\text{rain})$, the direction of the inequalities reverses. If $P(\text{rain}) > 0.6$, then $P(\text{no rain}) < 1 - 0.6 = 0.4$. If $P(\text{rain}) \leq 1$, then $P(\text{no rain}) \geq 1 - 1 = 0$. So $0 \leq P(\text{no rain}) < 0.4$.

Starter 4: Solving Inequalities

Number line A



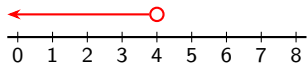
Frequency tree



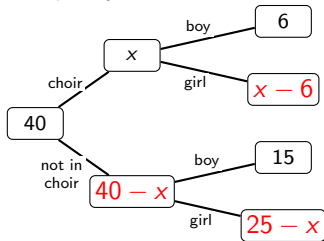
1. Write 12% as a decimal and as a fraction in its simplest form.
2. Work out $(8 \times 10^6) \div (2 \times 10^2)$.
3. Solve $11 > 2x + 3$. Show the solution on number line A.
4. 30% of y is less than 6. Write an inequality and solve it.
5. Solve $3m \leq 1.2 \times 10^5$, giving m in standard form.
6. 40 pupils were asked if they sing in the choir. Complete the frequency tree in terms of x .
7. There are more girls than boys in the choir. Write an inequality in x and solve it.
8. (Challenge) The probability that a pupil chosen at random is in the choir is also less than 0.4. List the values x can take.

Starter 4: Solving Inequalities

Number line A



Frequency tree



1. Write 12% as a decimal and as a fraction in its simplest form. $0.12 = \frac{3}{25}$
2. Work out $(8 \times 10^6) \div (2 \times 10^2)$.
 4×10^4
3. Solve $11 > 2x + 3$. Show the solution on number line A. $8 > 2x$, so $4 > x$, which is $x < 4$
4. 30% of y is less than 6. Write an inequality and solve it.
 $0.3y < 6$, so $y < 20$
5. Solve $3m \leq 1.2 \times 10^5$, giving m in standard form. $m \leq 4 \times 10^4$
6. 40 pupils were asked if they sing in the choir. Complete the frequency tree in terms of x .
7. There are more girls than boys in the choir. Write an inequality in x and solve it. $x - 6 > 6$, so $x > 12$
8. (Challenge) The probability that a pupil chosen at random is in the choir is also less than 0.4. List the values x can take. $0.4 \times 40 = 16$, so $12 < x < 16$: $x = 13, 14$ or 15

Worked Solution: Starter 4, Question 1

Question: Write 12% as a decimal and as a fraction in its simplest form.

Worked Solution: Starter 4, Question 1

Question: Write 12% as a decimal and as a fraction in its simplest form.

Solution: $12\% = 0.12$. As a fraction, $12\% = \frac{12}{100} = \frac{3}{25}$ by dividing numerator and denominator by 4. So $12\% = 0.12 = \frac{3}{25}$.

Worked Solution: Starter 4, Question 2

Question: Work out $(8 \times 10^6) \div (2 \times 10^2)$.

Worked Solution: Starter 4, Question 2

Question: Work out $(8 \times 10^6) \div (2 \times 10^2)$.

Solution: Divide the numbers and the powers of 10 separately: $8 \div 2 = 4$ and $10^6 \div 10^2 = 10^{6-2} = 10^4$. So the result is 4×10^4 .

Worked Solution: Starter 4, Question 3

Question: Solve $11 > 2x + 3$. Show the solution on number line A.

Worked Solution: Starter 4, Question 3

Question: Solve $11 > 2x + 3$. Show the solution on number line A.

Solution: Subtract 3 from both sides: $11 - 3 > 2x$, so $8 > 2x$. Divide both sides by 2: $4 > x$. This is the same as $x < 4$. On number line A, draw an open circle at 4 and an arrow to the left.

Worked Solution: Starter 4, Question 4

Question: 30% of y is less than 6. Write an inequality and solve it.

Worked Solution: Starter 4, Question 4

Question: 30% of y is less than 6. Write an inequality and solve it.

Solution: 30% of y is $0.3y$. The statement gives $0.3y < 6$. Divide both sides by 0.3 (or multiply by $10/3$): $y < 20$. So the solution is $y < 20$.

Worked Solution: Starter 4, Question 5

Question: Solve $3m \leq 1.2 \times 10^5$, giving m in standard form.

Worked Solution: Starter 4, Question 5

Question: Solve $3m \leq 1.2 \times 10^5$, giving m in standard form.

Solution: $1.2 \times 10^5 = 120\,000$. Divide both sides by 3: $m \leq 120\,000 \div 3 = 40\,000$. In standard form, $40\,000 = 4 \times 10^4$. So $m \leq 4 \times 10^4$.

Worked Solution: Starter 4, Question 6

Question: 40 pupils were asked if they sing in the choir. Complete the frequency tree in terms of x .

Worked Solution: Starter 4, Question 6

Question: 40 pupils were asked if they sing in the choir. Complete the frequency tree in terms of x .

Solution: The total is 40. If x pupils are in the choir, then $40 - x$ are not in the choir. In the choir, 6 are boys, so $x - 6$ are girls. Among those not in the choir, 15 are boys, so the girls are $(40 - x) - 15 = 25 - x$. Thus the missing entries are $40 - x$, $x - 6$, and $25 - x$.

Worked Solution: Starter 4, Question 7

Question: There are more girls than boys in the choir. Write an inequality in x and solve it.

Worked Solution: Starter 4, Question 7

Question: There are more girls than boys in the choir. Write an inequality in x and solve it.

Solution: In the choir, girls = $x - 6$ and boys = 6. More girls than boys gives $x - 6 > 6$.
Add 6 to both sides: $x > 12$. So $x > 12$.

Worked Solution: Starter 4, Question 8

Question: (Challenge) The probability that a pupil chosen at random is in the choir is also less than 0.4. List the values x can take.

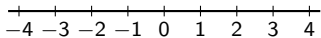
Worked Solution: Starter 4, Question 8

Question: (Challenge) The probability that a pupil chosen at random is in the choir is also less than 0.4. List the values x can take.

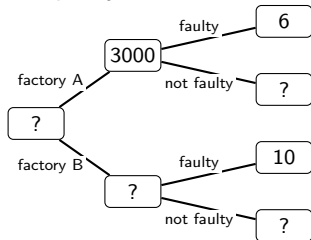
Solution: $P(\text{in choir}) = \frac{x}{40}$. We already have $x > 12$ from the previous question. The extra condition is $\frac{x}{40} < 0.4$. Multiply both sides by 40: $x < 16$. So $12 < x < 16$. Since x is a number of pupils, it must be an integer. The possible values are $x = 13, 14, 15$.

Starter 5: Solving Double Inequalities

Number line A



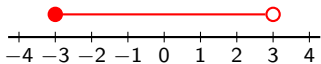
Frequency tree



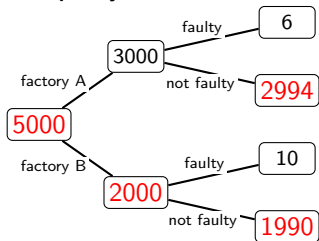
1. Write $\frac{1}{8}$ as a decimal and as a percentage.
2. Write 0.0032 in standard form.
3. Solve $5x - 3 \leq 2x + 9$.
4. A company made 5×10^3 phones. Complete the frequency tree.
5. Write the probability that a phone from factory A is faulty in standard form. Do the same for factory B. Write $<$ or $>$ between them.
6. Solve $-5 \leq 2x + 1 < 7$. Show it on number line A, and list the integers that satisfy it.
7. A biased spinner lands on red with probability $2x - 0.4$. Use $0 \leq P(\text{red}) \leq 1$ to find the values x can take.
8. (Challenge) A bag holds 4 red and n blue counters. $P(\text{red}) < 20\%$. Find the smallest value n can take.

Starter 5: Solving Double Inequalities

Number line A



Frequency tree



1. Write $\frac{1}{8}$ as a decimal and as a percentage.
 $0.125 = 12.5\%$
2. Write 0.0032 in standard form.
 3.2×10^{-3}
3. Solve $5x - 3 \leq 2x + 9$.
 $3x \leq 12$, so $x \leq 4$
4. A company made 5×10^3 phones. Complete the frequency tree.
5. Write the probability that a phone from factory A is faulty in standard form. Do the same for factory B. Write $<$ or $>$ between them.
 $\frac{6}{3000} = 2 \times 10^{-3} < \frac{10}{2000} = 5 \times 10^{-3}$
6. Solve $-5 \leq 2x + 1 < 7$. Show it on number line A, and list the integers that satisfy it.
 $-3 \leq x < 3$; $-3, -2, -1, 0, 1, 2$
7. A biased spinner lands on red with probability $2x - 0.4$. Use $0 \leq P(\text{red}) \leq 1$ to find the values x can take.
 $0.4 \leq 2x \leq 1.4$, so $0.2 \leq x \leq 0.7$
8. (Challenge) A bag holds 4 red and n blue counters. $P(\text{red}) < 20\%$. Find the smallest value n can take.
 $0.2(4 + n) > 4$, so $4 + n > 20$ and $n > 16$; $n = 17$

Worked Solution: Starter 5, Question 1

Question: Write $\frac{1}{8}$ as a decimal and as a percentage.

Worked Solution: Starter 5, Question 1

Question: Write $\frac{1}{8}$ as a decimal and as a percentage.

Solution: $\frac{1}{8} = 1 \div 8 = 0.125$. As a percentage, $0.125 \times 100 = 12.5\%$. So $\frac{1}{8} = 0.125 = 12.5\%$.

Worked Solution: Starter 5, Question 2

Question: Write 0.0032 in standard form.

Worked Solution: Starter 5, Question 2

Question: Write 0.0032 in standard form.

Solution: Move the decimal point so that the number is between 1 and 10:

$0.0032 = 3.2 \times 10^{-3}$. The power is -3 because the decimal point moved 3 places to the right.

Worked Solution: Starter 5, Question 3

Question: Solve $5x - 3 \leq 2x + 9$.

Worked Solution: Starter 5, Question 3

Question: Solve $5x - 3 \leq 2x + 9$.

Solution: Subtract $2x$ from both sides: $3x - 3 \leq 9$. Add 3 to both sides: $3x \leq 12$. Divide both sides by 3: $x \leq 4$. So the solution is $x \leq 4$.

Worked Solution: Starter 5, Question 4

Question: A company made 5×10^3 phones. Complete the frequency tree.

Worked Solution: Starter 5, Question 4

Question: A company made 5×10^3 phones. Complete the frequency tree.

Solution: $5 \times 10^3 = 5000$. Factory A made 3000, so factory B made $5000 - 3000 = 2000$. For factory A, 6 were faulty, so $3000 - 6 = 2994$ were not faulty. For factory B, 10 were faulty, so $2000 - 10 = 1990$ were not faulty. The missing values are 5000, 2000, 2994, and 1990.

Worked Solution: Starter 5, Question 5

Question: Write the probability that a phone from factory A is faulty in standard form. Do the same for factory B. Write $<$ or $>$ between them.

Worked Solution: Starter 5, Question 5

Question: Write the probability that a phone from factory A is faulty in standard form. Do the same for factory B. Write $<$ or $>$ between them.

Solution: For factory A: $P(\text{faulty}) = \frac{6}{3000} = 0.002 = 2 \times 10^{-3}$. For factory B: $P(\text{faulty}) = \frac{10}{2000} = 0.005 = 5 \times 10^{-3}$. Since $2 \times 10^{-3} < 5 \times 10^{-3}$, the probability for factory A is less than for factory B.

Worked Solution: Starter 5, Question 6

Question: Solve $-5 \leq 2x + 1 < 7$. Show it on number line A, and list the integers that satisfy it.

Worked Solution: Starter 5, Question 6

Question: Solve $-5 \leq 2x + 1 < 7$. Show it on number line A, and list the integers that satisfy it.

Solution: Subtract 1 from all three parts: $-6 \leq 2x < 6$. Divide all three parts by 2: $-3 \leq x < 3$. On number line A, put a filled circle at -3 , an open circle at 3 , and join them. The integers satisfying this are $-3, -2, -1, 0, 1, 2$.

Worked Solution: Starter 5, Question 7

Question: A biased spinner lands on red with probability $2x - 0.4$. Use $0 \leq P(\text{red}) \leq 1$ to find the values x can take.

Worked Solution: Starter 5, Question 7

Question: A biased spinner lands on red with probability $2x - 0.4$. Use $0 \leq P(\text{red}) \leq 1$ to find the values x can take.

Solution: Since $0 \leq P(\text{red}) \leq 1$, we have $0 \leq 2x - 0.4 \leq 1$. Add 0.4 to all parts:
 $0.4 \leq 2x \leq 1.4$. Divide all parts by 2: $0.2 \leq x \leq 0.7$. So x can take any value from 0.2 to 0.7 inclusive.

Worked Solution: Starter 5, Question 8

Question: (Challenge) A bag holds 4 red and n blue counters. $P(\text{red}) < 20\%$. Find the smallest value n can take.

Worked Solution: Starter 5, Question 8

Question: (Challenge) A bag holds 4 red and n blue counters. $P(\text{red}) < 20\%$. Find the smallest value n can take.

Solution: Total counters $= 4 + n$, so $P(\text{red}) = \frac{4}{4+n}$. $20\% = 0.2 = \frac{1}{5}$. The condition is $\frac{4}{4+n} < \frac{1}{5}$. Multiply both sides by $4 + n$ (which is positive): $4 < \frac{4+n}{5}$. Multiply by 5: $20 < 4 + n$. Subtract 4: $16 < n$, so $n > 16$. Since n is a whole number of blue counters, the smallest possible value is $n = 17$.