UKMT+ Factorising and simplifying fractions

Attempt the UKMT question below – If you are struggling then they the questions on the next pages first before trying this one again!

8. What is the value of

$$\frac{2+4+6+8+10+12+14+16+18+20}{1+2+3+4+5+6+7+8+9+10}?$$

A 2 B 10 C 20 D 40 E 1024

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Simplify the following fraction by finding common factors

$$\frac{2+4+6}{1+2+3}$$

Example:

$$\frac{2+4+6}{1+2+3} \equiv \frac{2(1+2+3)}{1+2+3}$$

$$\equiv 2 \times \frac{(1+2+3)}{1+2+3}$$

$$\equiv 2$$

Simplify the following fraction by finding common factors

$$\frac{2+4+6+8}{1+2+3+4}$$

Fill in the blanks:

$$\equiv \frac{[\quad](1+2+3+4)}{1+2+3+4}$$

$$\equiv [\quad] \times \frac{(1+2+3+4)}{1+2+3+4}$$

$$\equiv [\quad]$$

Simplify the following fraction by finding common factors

$$\frac{3+6+9}{3+2+1}$$

Fill in the blanks:

$$\equiv \frac{3([\quad]+[\quad]+[\quad])}{3+2+1}$$

$$\equiv 3 \times \frac{([\quad]+[\quad]+[\quad])}{3+2+1}$$

$$\equiv [\quad]$$

Simplify the following fraction by finding common factors

$$\frac{6+12+18}{3+6+9}$$

Fill in the blanks:

$$\equiv \frac{6([\quad]+[\quad]+[\quad])}{[\quad](1+2+3)}$$

$$\equiv \frac{6}{\quad} \times \frac{([\quad]+[\quad]+[\quad])}{1+2+3}$$

$$\equiv [\quad]$$

Simplify the following fraction by finding common factors

$$\frac{5+10+15+20}{1+2+3+4}$$

Simplify the following fraction by finding common factors

$$\frac{2+4+6+8+10+12+14}{1+2+3+4+5+6+7}$$

Simplify the following fraction by finding common factors

$$\frac{5+10+15+20}{40+30+20+10}$$

Simplify the following fraction by finding common factors

$$\frac{2 \times 4}{2+4}$$

Example:

Here finding common factors can still help to simplify

$$\frac{2 \times 4}{2+4} \equiv \frac{2(1 \times 2)}{2(1+2)}$$

$$\equiv \frac{2}{2} \times \frac{2}{1+2}$$

$$\equiv \frac{2}{3}$$

Simplify the following fraction by finding common factors

$$\frac{2 \times 4 \times 6}{1+2+3}$$

Fill in the blanks:

$$\frac{2 \times 4 \times 6}{1+2+3} \equiv \frac{2([\quad] \times [\quad] \times [\quad])}{1+2+3}$$

$$\equiv 2 \times \frac{\quad}{1+2+3} \equiv 2 \times \frac{[\quad]}{6}$$

$$\equiv 2$$

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Simplify the following fraction by finding common factors $\frac{2\times4\times6}{1\times2\times3}$ **Example** $\frac{2\times4\times6}{1\times2\times3}\equiv\frac{2(1\times2\times3)}{1\times2\times3}$ $\equiv 2\times\frac{(1\times2\times3)}{1\times2\times3}$ $\equiv 2$	*Simplify the following fraction by finding common factors* $\frac{2\times4\times6\times8}{1\times2\times3\times4}$ **Fill in the blanks:** $\frac{2\times4\times6\times8}{1\times2\times3\times4}$ $\equiv\frac{2([\ ]\times[\ ]\times[\ ]\times[\ ])}{1\times2\times3\times4}$ $\equiv 2\times\frac{([\ ]\times[\ ]\times[\ ]\times[\ ])}{1\times2\times3\times4}$ $\equiv 2$	*Simplify the following fraction by finding common factors* $\frac{3\times6\times9\times12}{4\times3\times2\times1}$ **Fill in the blanks:** $\equiv\frac{[\ ](1\times2\times3\times4)}{1\times2\times3\times4}$ $\equiv[\ ]\times\frac{1\times2\times3\times4}{1\times2\times3\times4}$ $\equiv[\ ]$
Simplify the following fraction by finding common factors **Fill in the blanks:** $\frac{6\times12\times18\times24}{3\times6\times9\times12}$ $\equiv\frac{[\ ](1\times2\times3\times4)}{[\ ](1\times2\times3\times4)}$ $\equiv\frac{[\ ]}{[\ ]}\times\frac{1\times2\times3\times4}{1\times2\times3\times4}$ $\equiv[\ ]$	*Simplify the following fraction by finding common factors* $\frac{5\times15\times25}{1\times3\times5}$	*Simplify the following fraction by finding common factors* $\frac{4\times8\times12}{3\times2\times1}$
Extension: Factorial Notation $6!=6\times5\times4\times3\times2\times1$ $n!=n\times(n-1)\times\ldots\times2\times1$ **Fill in the following:** $\mathbf{4}!=[\ ]\times[\ ]\times[\ ]\times[\ ]$ $\frac{\mathbf{4}!}{\mathbf{2}!}\equiv\frac{\mathbf{4\times3\times2\times1}}{\mathbf{2\times1}}\equiv\mathbf{4\times3}=$ $\frac{\mathbf{6}!}{\mathbf{2}!}\equiv\frac{[\ ]\times[\ ]\times[\ ]\times[\ ]\times[\ ]\times[\ ]}{\mathbf{2\times1}}$ $\equiv$	*Simplify the following factorials by finding common factors* $\frac{\mathbf{100}!}{\mathbf{99}!}\equiv$ Can you think of a way to do this without having to write it all out? $\frac{\mathbf{100}!\times\mathbf{99}!}{\mathbf{99}!\times\mathbf{101}!}\equiv$	*Simplify the following factorials by finding common factors* $\frac{\boldsymbol{n}!}{(\boldsymbol{n-1})!}\equiv$ $\frac{\boldsymbol{n}!\times(\boldsymbol{n-1})!}{(\boldsymbol{n-1})!\times(\boldsymbol{n+1})!}\equiv$

8.1 What is the value of

$$\frac{2\times4\times6\times8\times10\times12\times14\times16\times18\times20}{1\times2\times3\times4\times5\times6\times7\times8\times9\times10}?$$